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Wendling Beck and Fransham, Norfolk

Aerial Investigation and Mapping Project

Jack Powell and Sophie Tremlett, Norfolk County Council

Aerial Survey

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Summary

The aerial investigation and mapping (AI&M) survey for Wendling Beck and Fransham (Historic England Project 8500) was developed to investigate a 116 sq km area of central Norfolk, covering the Wendling Beck nature recovery scheme and the parish of Fransham. The Wendling Beck scheme is a 2,000-acre nature recovery project, creating habitats and supporting nature-driven processes on a large scale within the Wendling Beck catchment. Prior to the project, AI&M data existed only for the northern half of the scheme, and this was out of date, having been completed in 2008, prior to the availability of Google Earth aerial imagery and Environment Agency airborne laser scanning (lidar) data. The parish of Fransham, a short distance to the south-west, has been the subject of systematic fieldwalking and documentary study (Rogerson 2022). This provides a uniquely detailed record of the parish, but there had not previously been any comprehensive survey using aerial sources.

The project used a wide range of aerial sources to investigate the project area and identify, map, record, interpret and analyse visible archaeological features and sites. It also incorporated a 'citizen science' project, which trained and equipped volunteers to update the record for the northern half of the Wendling Beck nature recovery area and its environs using Google Earth and Environment Agency lidar data.

The project was highly successful, recording significant numbers of new and previously recorded archaeological sites, potentially ranging in date from the Neolithic to the Second World War. The large numbers of sites relating to dispersed medieval to post-medieval settlement and agriculture recorded as earthworks visible on 1940s aerial photographs was an unexpected highlight. While the nature and density of the settlement pattern was itself predictable, the survey has been the first to identify the degree to which earthwork elements still survived as late as 1946.

Contributors

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The project was funded by Historic England and undertaken and managed by Norfolk County Council's Environment Team. Daniel Voisey initially acted as Project Manager and Executive, before that role was taken over by Dr Zeenat Noordally in October 2023.

Heather Hamilton and Peter Watkins provided support in relation to the Norfolk Historic Environment Record (HER) and related data.

At Historic England, advice and support was provided by Helen Winton (Project Assurance Officer and Quality Assurance Officer), Matthew Oakey (Aerial Survey Principal) and Sally Evans (Aerial Survey Manager).

Thanks are extended to all those who kindly provided access to photographs held in the Historic England Archive (HEA), in particular Helen Brett, Luke Griffin and Fiona Matthews. Lidar visualisations were created using Relief Visualization Toolbox (Zakšek, Oštir and Kokalj 2011; Kokalj and Somrak 2019).

The authors would like to thank all those who kindly read and commented on drafts of the report. We are particularly grateful to Dr Andrew Rogerson, whose many years of research in Fransham inspired the project and greatly informed the interpretation of the mapping.

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Date of survey/research/investigation

Aerial investigation, mapping and recording were carried out between March 2023 and November 2024. The report was written between September and November 2024, with final editing taking place in February 2025.

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Introduction

The Wendling Beck and Fransham aerial investigation and mapping (AI&M) project (Historic England project 8500) comprised a survey of a 116 sq km of central Norfolk (Fig. 1). It covered the area of the Wendling Beck nature recovery project, a landscape-scale, nature restoration project covering 2,000 acres of mid-Norfolk, which brings together multiple landowners and environmental stakeholders to create habitats and support nature-driven processes on a large scale. It is one of Natural England's Biodiversity Net Gain pilot projects. The AI&M project also covered the parish of Fransham, where a systematic fieldwalking and documentary study by Dr Andrew Rogerson (2022) provides a uniquely comprehensive record of the archaeology and history of the parish.

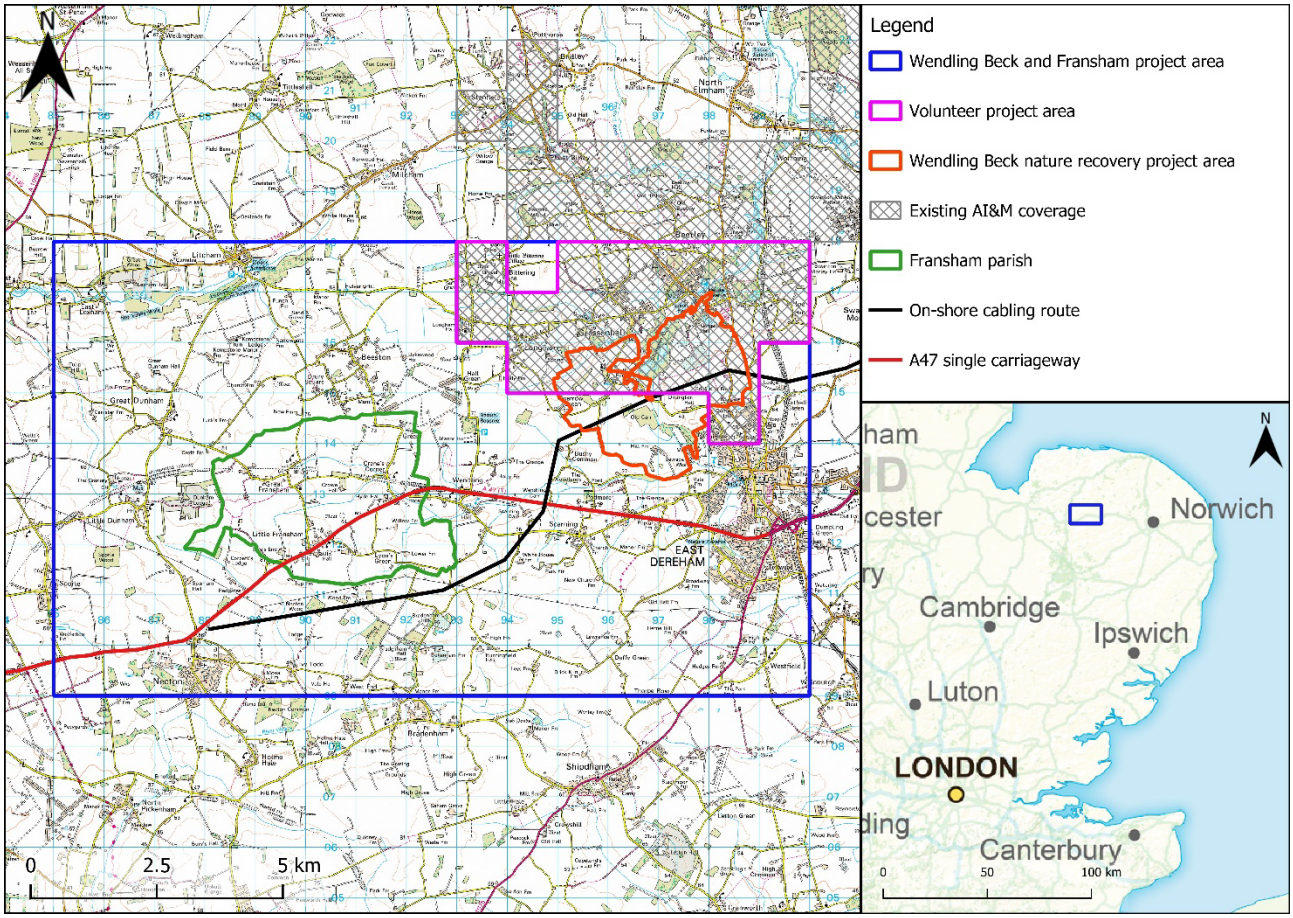

Figure 1. The project area; inset shows wider location. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Additional data sourced from third parties, including public sector information licensed under the Open Government Licence.

More broadly, the results of the project provide site specific and contextual data for areas of development, for example around the growing market town of Dereham, along the A47 corridor and along the on-shore cabling route for two wind farms (Vanguard and Boreas). The project has investigated an area of Norfolk that – aside from Fransham and the aforementioned areas of development – has been relatively little studied, particularly in terms of aerial archaeology. Like any comprehensive survey using aerial sources, it has unlocked the potential of the aerial photographic collections of both the Norfolk Air Photo Library (NAPL) and the Historic England Archive (HEA), together with digital aerial resources and the airborne laser scanning (lidar) data held by the Environment Agency. By collating the information visible on the aerial sources into a GIS map, interpreting and recording the archaeology in a standardised and comprehensive way, it makes that information easier to use. It also makes it accessible, by making that data available through the Norfolk Historic Environment Record (HER) and Norfolk Heritage Explorer, the Heritage Gateway, Historic England's Aerial Archaeology Mapping Explorer and their Open Data Hub.

The data created by the project provides a high-quality baseline dataset for archaeological sites that will potentially be impacted by future development and changes in land use, agricultural regimes and climate. The work both identifies new archaeological sites that could be at risk and allows the results of site-specific research to be viewed within the context of its wider environs. The Norfolk HER has been substantially enhanced, through the identification of new sites, the addition of new information about previously recorded sites, and by the rationalisation and standardisation of records relating to aerial sources and the sites they show. The depiction of the form and extent of the sites visible on the aerial sources has been substantially improved. This will contribute to a better understanding of their character and significance, and in turn to better informed decisions concerning their management. The archaeological mapping, its associated records, and this report also provide a means for both professional and non-professional audiences to engage with the archaeology of the area in a more nuanced way than is normally possible with more rudimentary archaeological records.

Alongside the AI&M survey, the project incorporated a 'citizen science' volunteering project investigating the northern half of the Wendling Beck nature recovery project area, for which AI&M standard data already existed (Figs 1 and 2). This was created in 2007–2008 as part of the Norfolk Aggregates Assessment project (Albone, Massey and Tremlett 2008). This earlier survey did not include consultation of Google Earth or Environment Agency lidar data, both now important sources for AI&M standard surveys. The project recruited and trained volunteers to use this data to identify additional archaeological sites and features which were not identified by the earlier survey. This strand of the project

covered an area of 18 sq km (from an original 19 sq km, see Fig. 7), encompassing the northern portion of the Wendling Beck nature recovery project area. It followed a methodology previously developed for the Broads Hidden Heritage Aerial Perspectives project, delivered by Norfolk County Council as part of the Water Mills and Marshes Landscape Partnership scheme funded by the National Lottery Heritage Fund.

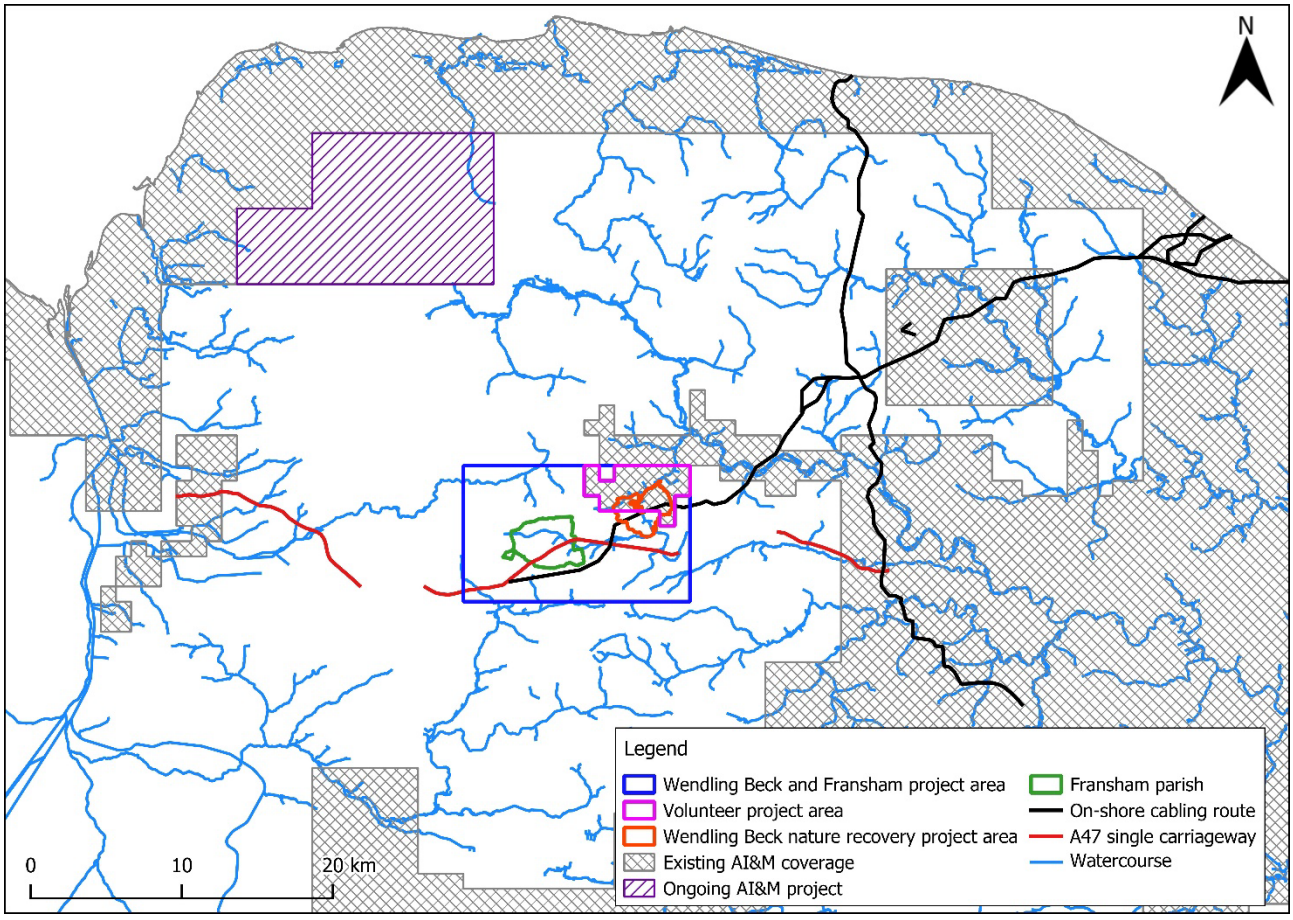

Figure 2. The project area in relation to previously completed and ongoing AI&M standard surveys. Watercourse data contains Ordnance Survey data © Crown copyright and database right 2024. Additional data sourced from third parties, including public sector information licensed under the Open Government Licence.

The Wendling Beck and Fransham AI&M survey has made a very significant contribution to baseline knowledge of the heritage of central Norfolk. It has recorded a wide variety of sites potentially ranging in date from the Neolithic to the 20th century, and significantly enhanced our understanding of the historic environment of the project area. It has identified 445 new records for the Norfolk HER, 406 of which relate to new discoveries, representing an increase of 29 per cent within the area surveyed (39 of the new records were re-numberings of previously recorded sites where information needed to be split into a separate record). The project also identified amendments for a further 116 entries. This

equates to a total average density of 4.8 records per sq km. The survey has created a digital archaeological map covering 116 sq km, bringing AI&M coverage in Norfolk up to 46 per cent. The work has provided locational and interpretative data that will facilitate planning, management, preservation and research decisions concerning the historic environment of the project area at every level, from strategic planning and national designation to local interventions, site visits and research.

This report provides a summary of the project results, highlighting significant discoveries, identifying important research themes and assessing the potential for further work.

Aims and Objectives of the Survey

The principal aims of the survey were outlined in the project proposal (Tremlett 2022, 3–4) as follows:

- To provide comprehensive AI&M data for the project area.
- To improve planning decisions at local, regional and national levels by providing significant amounts of new and improved information for the Norfolk HER.
- To identify and describe local, regional and nationally significant archaeological sites and landscapes to enable appropriate levels of protection.
- To contribute to ongoing and future research by creating data that addresses specific questions and themes in the East of England Regional Research Framework.
- To provide ‘added value’, by engaging, training and supporting volunteers in a 'citizen science' project to identify and record archaeological sites and features visible on Google Earth and lidar, thereby expanding the geographical and/or archaeological scope of the project, and its impact.
- To enable key research questions to be addressed by creating baseline data relating to: What? When? Where?.
- To provide extensive archaeological data that can both inform and be informed by future planning and mitigation decisions and ongoing archaeological research.
- To address a physical gap in coverage by AI&M standard surveys, in an area where earthwork sites are known to be relatively numerous and where the analysis of lidar data – not previously used in AI&M surveys on the Norfolk boulder clay – might be expected to have a significant impact in terms of enabling new archaeological information to be recorded. The project would raise AI&M standard coverage in

Norfolk to 46 per cent and unlock the potential of the extensive archaeological aerial reconnaissance that has taken place there. The project would consult more than 1,000 specialist oblique aerial photographs from the NAPL and HEA collections.

- To champion ‘hidden heritage’ by making information available for previously unrecognised and poorly recorded archaeological sites and landscapes. No comprehensive mapping programme had been undertaken previously for this area, and even for previously recorded sites there were likely to be issues relating to the identification of sites, their interpretation and their mapped extent.
- To champion the use of archives by demonstrating the archaeological value contained in physical and online archives with aerial photographs and lidar. The project would not only unlock and disseminate the information contained on the aerial photographs and lidar, it would liaise with end users of the data and encourage and facilitate the use of both the data and of aerial sources by volunteers and researchers.
- To highlight where existing Scheduled Monument descriptions could be improved and ‘Enrich the List’ (the latter project has since become the Missing Pieces Project). New information about Scheduled Monuments will be available via the HER and a link to this report will be submitted as part of the Missing Pieces Project.

The project’s main objectives were summarised as:

- The identification, mapping, interpretation and recording to Historic England's AI&M standards of archaeological sites within the project area.
- The identification and recording of previously unidentified sites and features in an area previously covered by an AI&M standard survey, using more recently available sources (Google Earth and lidar).
- The training of volunteers to undertake analysis and interpretation of aerial sources for the northern portion of the Wendling Beck nature recovery project and its environs.
- The integration of the resulting data into the Norfolk HER, from where maps and records can be transferred to other platforms and end users as required.
- The analysis and dissemination of the results of the project, through the production of a Historic England Research Report, and ‘signposting’ on the Historic England website.

- Liaison within Norfolk County Council and with external bodies to promote the use of AI&M data as a tool for informing and facilitating future management decisions concerning the historic environment.

The results of the project contribute to the delivery of Historic England's Corporate Plan 2023-26 (updated 2024). It will improve people's lives by championing and improving knowledge and understanding of the historic environment of the project area, and by enhancing the Norfolk HER, which in turn will facilitate the better protection of heritage assets. The project has made a particular contribution to the 'Thriving places' and 'Active participation' areas of focus and contributes to the priorities of 'Better places', 'Planning, listing, conservation advice and investment', 'Climate action' and 'Stewardship of the national collections'.

The project has contributed to priorities in Historic England's Future Strategy (2021b), in particular 'Connected Communities' and 'Active Participation'. It also contributes to priorities in Historic England's Research Agenda (2017), in particular:

- Existing entries in the National Heritage List for England (NHLE) will be enriched.
- The significance of poorly understood/undervalued heritage assets will be better understood.
- Risks and liabilities for developers and owners of heritage will be reduced.
- Records of the historic environment will become more comprehensive and up to date.
- Local authority plan makers and decision takers will be supported by better evidence.

Project Area

The AI&M project area encompassed 116 sq km of central Norfolk, comprising towns, villages, river valleys, parkland, extant and former commons and arable fields (Fig. 1). It was selected to cover the parish of Fransham, and several linear routes of known or potential development, along the on-shore cabling route for the Vanguard and Boreas wind farms and a single carriageway section of the A47 road. At is north-east corner, the AI&M project area covers the southern portion of the Wendling Beck nature recovery project, for which no AI&M standard data existed. The northern part of the Wendling Beck nature recovery area had been covered by the earlier Norfolk Aggregates Assessment project (Albone, Massey and Tremlett 2008), which included an AI&M standard survey. This, however, had not included more recent sources which are now regarded as critical to the

success of AI&M surveys, namely Google Earth imagery and Environment Agency lidar data. As a consequence, this area was included in a parallel volunteering project which involved updating the HER record for an area of up to 19 sq km using Google Earth imagery from July 2006 and Environment Agency lidar data.

The project area lies towards the western edge of what is often referred to as Norfolk's Boulder Clay Plateau (Rogerson 2022, 1), within Williamson's Central Norfolk Claylands region (2005, 9) and the Mid Norfolk National Character Area. British Geological Survey data shows almost the entire AI&M survey area as chalk bedrock covered by till, with limited deposits of sands, gravels and alluvium along the major river valleys, and some exposures of chalk in the west. The volunteering area differs in being dominated by glacial sands and gravels, with alluvium along the valley of the Wendling Beck. Soils are predominantly classified as Soilscape 18 on the higher ground and Soilscape 8 on the valley sides. Soilscape 18 is described as moderately fertile, slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. Soilscape 8 is described as slightly acid loamy and clayey soils, with moderate to high fertility. As well as being more fertile, the soils of the valley sides have better drainage. Soilscape 8 is described as having only slightly impeded drainage, whereas the drainage of Soilscape 18 is described as impeded. (information from Land Information System Soilscapes viewer, accessed 5 December 2024 and 13 February 2025). Agriculturally, the land is classified as Grade 3 – good to moderate quality, with some patches of Grade 2 – very good quality, and Grade 4 – poor quality along the Nar and Wendling Beck valley bottoms.

The claylands of northern East Anglia have been characterised by Williamson (2006, 154–155) as possessing wide, level tablelands between the principal valleys, with the plateau areas occupied by poorly draining yet slightly sandy clays, with sandier, more free-draining soils on the valley sides. The topography is quite varied (Fig. 3) for a landscape usually noted for being flat. It occupies a position on the county's central watershed (Williamson 1993, fig. 3), between river systems draining east and those draining west. Drainage is dominated by the Wendling Beck, with tributaries flowing east and north respectively across the central and eastern portions of the AI&M survey area, towards Gressenhall and Beetley in the volunteering project area; from there it flows north-east before joining the River Wensum at Worthing. In the north-west corner of the project area, at East Lexham, the River Nar flows westwards towards the fen edge. At Necton, in the south-west corner of the project area, tributaries of the River Wissey flow southwards towards Breckland.

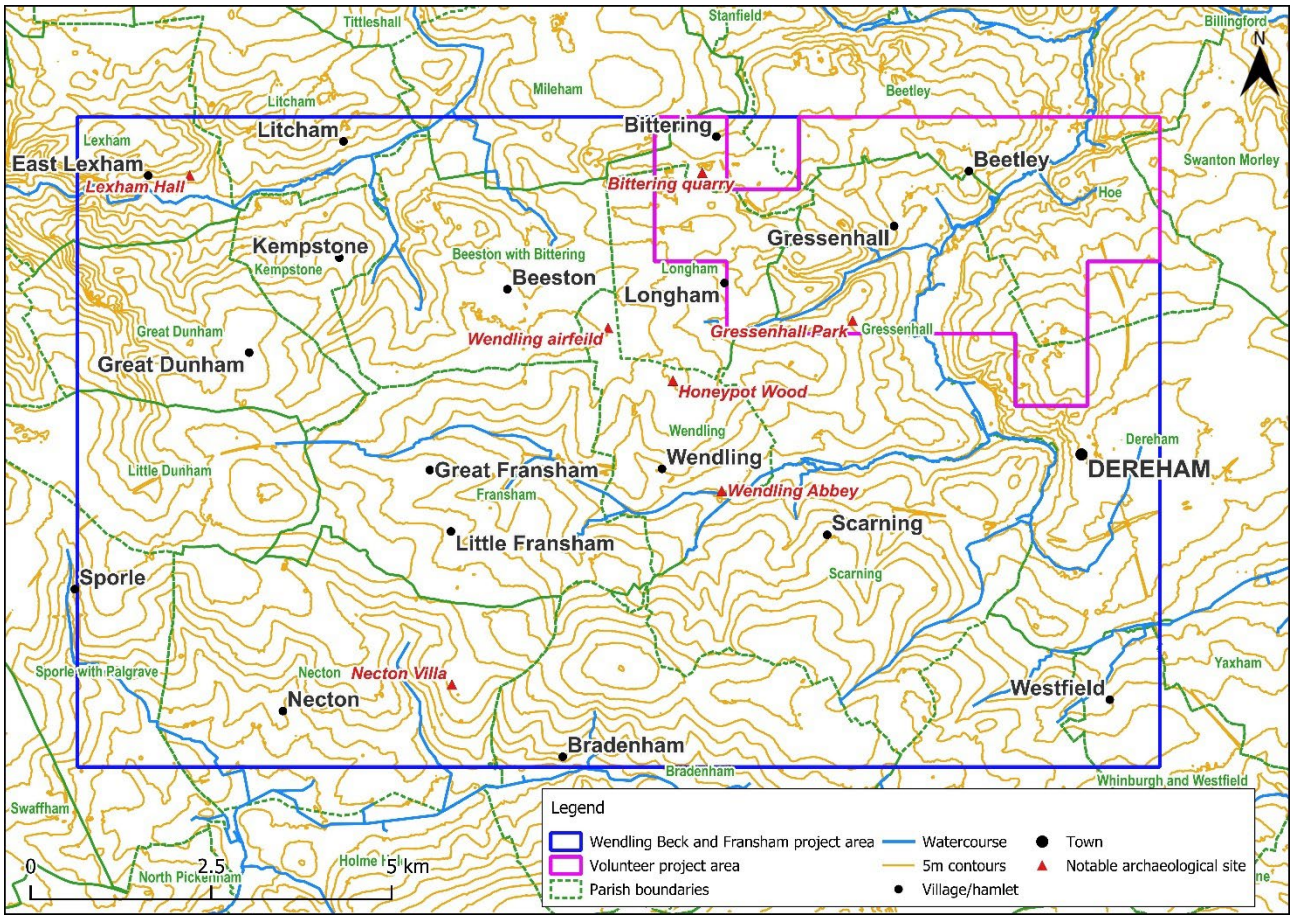

Figure 3. Locations mentioned in the text, shown in relation to topography and hydrology. Height data supplied to Norfolk County Council through the PSGA agreement by Bluesky International Ltd and Getmapping Plc © Bluesky International Limited 2024 and onwards. Watercourse data contains Ordnance Survey data © Crown copyright and database right 2024. Additional data sourced from third parties, including public sector information licensed under the Open Government Licence.

Modern land use is almost entirely dominated by arable agriculture (Fig. 4). Patches of woodland survive, most extensively in the river valleys and particularly along Wendling Beck in the north-east. The only urban development is the market town of Dereham, on the eastern edge of the project area. Smaller villages, hamlets and isolated farms are dispersed across the rest of the area. The A47, a major trunk road, cuts across the centre of the project area from east to south-west, following a former railway line for some of its course.

Figure 4. The AI&M survey area (blue outline) and volunteering project area (magenta outline) in July 2022; the town of Dereham is clearly visible to the east, the valley of Wendling Beck in the north-east, the Nar Valley in the north-west, and the line of the former Lynn and Dereham railway and A47 road (contiguous on east side of project area) running east-west across the centre. Photographic image: 17-JUL-2022 made available to Norfolk County Council via the PSGA agreement © Bluesky International Limited and Getmapping Limited 1999–2023.

Historic Landscape Character data for the area (Fig. 5) also shows a landscape overwhelmingly dominated by 20th-century fields, with some fragmentary remnants of 18th- to 19th-century enclosure recorded across the project area. Only a few small patches of pre-18th-century enclosure survive, with a notable cluster to the north of the A47 at Wendling, Scarning and Gressenhall. Very little survives of the commons which were such a dominant feature of the medieval landscape. Narrow strips of wetland survive along the valley bottoms. There is no immediately obvious correlation between the archaeological features mapped by the project and the Historic Landscape Character of the area. More detailed analysis was beyond the scope of the project, but such work might identify more nuanced patterns in the distribution of specific types of sites.

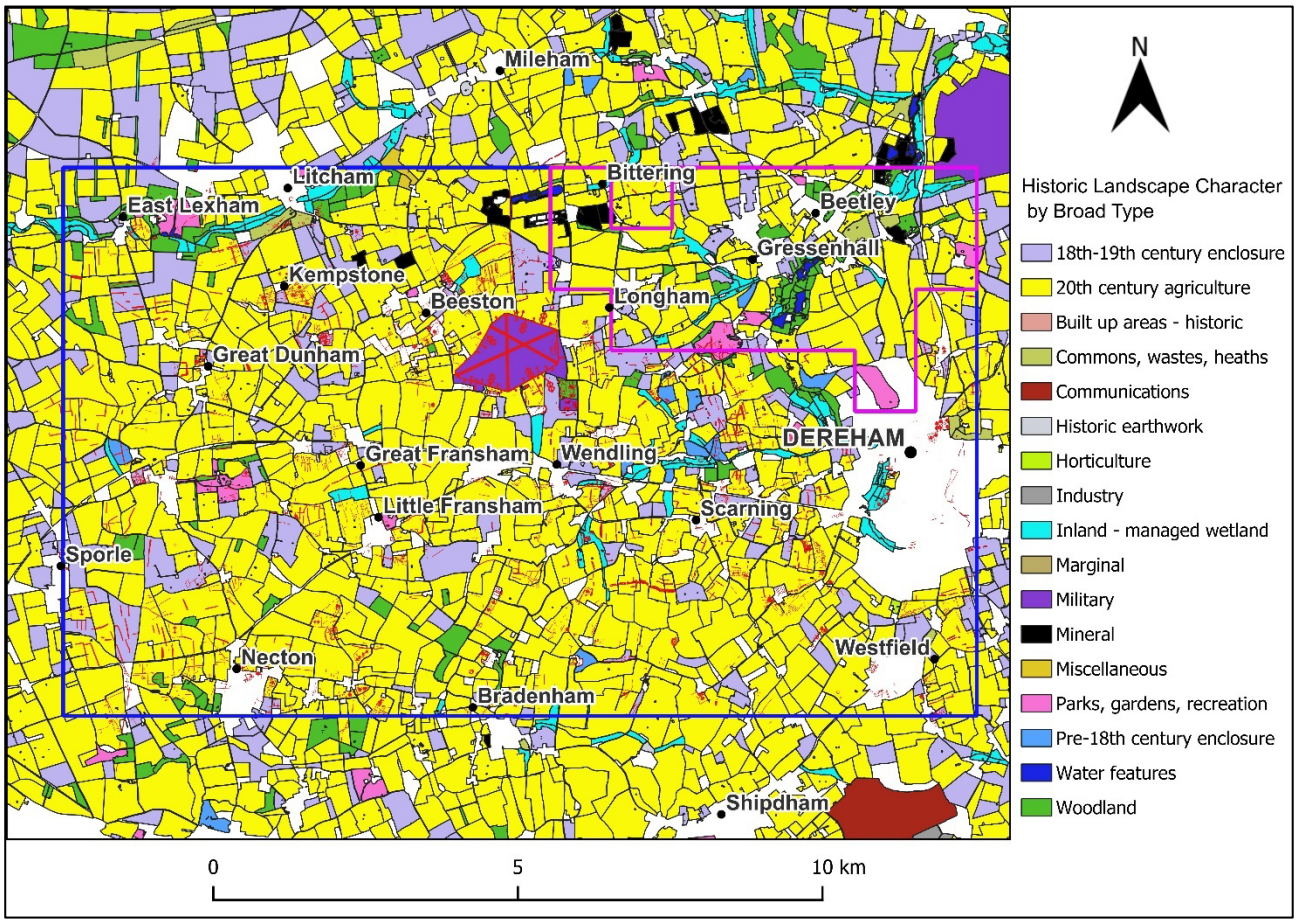

Figure 5. Historic Landscape Character data for the project area, mapped by Broad Type and overlaid with the archaeological mapping from the project (outlined in red). Historic Landscape Character data © Historic England and Norfolk County Council.

Previous Archaeological Work

A range of archaeological investigations and recording had taken place across the project area prior to the survey. Most substantial was the years of fieldwalking, documentary research and analysis completed by Dr Andrew Rogerson for the parish of Fransham (Rogerson 2022). This included a brief assessment of the aerial photographs held for the parish by the NAPL, but no extensive comprehensive survey using aerial sources. Running approximately north-east to south-west across the project area (Fig. 1), the on-shore cabling route for the Vanguard and Boreas wind farms provided a transect through any archaeological sites it encountered. A survey of aerial photographs and lidar completed as part of the Environment Impact Assessment for the scheme (Royal HaskonigDHV 2019) and the subsequent trenching report (Andrews, Hatherley and McGalliard forthcoming) and geophysics where relevant were referred to when recording sites within the corridor. Updated information on fully excavated sites – the Necton Roman villa, and the Iron Age to Roman enclosure at Scarning – was provided by John Percival,

Historic Environment Senior Officer (Specialist Advice) for Norfolk County Council. Other work included excavations in advance of development at Fransham and Dereham, and at Bittering Quarry. Earlier earthwork surveys and research by Cushion and Davison (2003) were invaluable for those sites for which they were available, as were smaller scale unpublished surveys by Cushion of several additional earthwork sites.

Summary of Project Methodology

AI&M projects comprise large area archaeological surveys, which map and record archaeological features using aerial photographs and lidar data as the main sources. The principal products are typically a digital map of the archaeological features, new and updated records for HER databases, a report, recommendations for heritage protection, including potential designation candidates, and suggested updates to the NHLE.

The methodology employed by the project generally conformed to that detailed in the project proposal (Tremlett 2022, 11–14). It was based on Aerial Investigation and Mapping Technical Specification (Evans 2019b), the 2021 revision of Historic England Standards and Guidance for Aerial Investigation and Mapping Projects (Winton 2021), and MoRPHE PPN 7 (Historic England 2021a). It was also informed by the Norfolk Air Photo Interpretation Team's previous experience of delivering AI&M standard projects in the region.

The project looked at all available aerial photographs, held in national and local archives, which spanned around 80 years of photography, and included vertical photographs taken for non-archaeological purposes and specialist archaeological oblique photograph collections. Online photo mosaics such as Google Earth were also reviewed. The Environment Agency National Lidar Programme data was used, downloaded from the Survey Open Data website. This covered the entire project area at 1m resolution. For the lidar data several different visualisations were consulted, created using Relief Visualisation Toolbox (Zakšek, Oštir and Kokalj 2011; Kokalj and Somrak 2019). Both DTM and DSM data was consulted. In general, the hillshade, multi-direction hillshade and simple local relief model visualisations, created using the default settings, were found to be most useful. The simple local relief model visualisations were particularly useful for recording very low earthworks within arable fields, as they remove large-scale morphological elements of the landscape, thereby rendering more localised topographical changes – including very low, spread archaeological earthworks – more clearly visible. Additional standard sources were also used, for example, historical mapping, Norfolk HER Monument records, published and unpublished excavation results and archaeological

syntheses; however, the constraints of time meant that the use of such material was by necessity limited.

All archaeological sites and landscapes were analysed, with dates potentially ranging from the Neolithic period to the Second World War (no Cold War sites were identified). The scope of AI&M projects includes recording buried sites, usually visible as cropmarks, features seen as earthworks and stonework, and some structures and buildings. Standard mapping and recording techniques were used to produce an archaeological map of features visible on the aerial sources with linked archaeological site descriptions. The site descriptions include references to the source aerial photographs and/or lidar, to inform any re-evaluation of a site, for example for development or research purposes.

The archaeological map was created in QGIS, either from sources that were already georeferenced or rectified (such as the lidar and Google Earth extracts), or from aerial photographs rectified and georeferenced to Ordnance Survey MasterMap base mapping (usually 1:1,250 scale). Rectification was undertaken using University of Bradford AERIAL 5.36 software. The GIS mapping shapefiles were created using the standards set out in the Aerial Investigation and Mapping Technical Specification (Evans 2019b) and consist of three shapefiles AI&M_Lines, AI&M_Polygons and Monument_Polygons. Archaeological features were transcribed following the standards for spatial data set out in Appendix 2. The Monument polygons indicating the limits of each site were linked to associated HBSMR database records.

Attribute data including the Norfolk HER number and – where relevant – Historic England Research Record (HERR) UID was attached to each object, to ensure full linkage between the mapping and the records. The Norfolk HER Monument UID was also included, to aid correlation with HER records via Heritage Gateway. The attribute data also included basic indexing relating to the interpretation of the feature and site (broad Monument type, narrow Monument type and period), the form of the feature when mapped and on the latest available source (earthwork, cropmark, structure, etc.), and source references (source used for mapping and latest source available). Basic categorisation of the feature (bank, ditch, structure, etc.) was also included, and used as the basis for formatting the mapping (see Appendix 2).

Descriptive records with associated indexing were added directly to the Norfolk HER. The records include a descriptive account and an index of the interpretation, form (cropmark, earthwork, etc.) and date of the features. The archaeological interpretations were based on evidence from aerial photographs or lidar, together with any contextual or supplementary sources used.

The volunteering project followed the methodology outlined in the project proposal (Tremlett 2022, 13), which was based on that used for the Broads Aerial Perspectives project. Volunteer induction/training events were held on separate days in November 2023 and comprised the option of an in-person day school or a shorter online induction. Both combined a mix of presentations and 'hands-on' activities: online attendees were encouraged to suggest possible interpretations for features shown in the presentation; in-person attendees received additional training using printouts of maps and aerial sources. Participants who chose to register as volunteers were then provided with digital sources for a 1 km^2 area, comprising maps, a Google Earth extract and lidar visualisations, which they annotated using basic drawing software. The annotations were numbered and linked to a Word table in which they listed the sites and features they had identified, along with the relevant source and possible interpretation. A volunteers' manual was provided for step-by-step guidance, and further advice and support was also available directly from the project team. An online 'catch-up' meeting was held in December 2023, to provide an opportunity to answer questions, provide support, disseminate results, and discuss issues of interpretation. Upon completing a grid square, volunteers returned their annotated documents for validation and feedback. Relevant information was added to the Norfolk HER in the form of new or amended Monument records and associated polygons. Analysis of and highlights from the results of the project are incorporated into this project report.

The project's mapping and records will be accessible through the Norfolk HER and the database records will become available on the Norfolk Heritage Explorer website and the Heritage Gateway. In due course, the mapping will be added to Historic England's Aerial Archaeology Mapping Explorer and Open Data Hub.

An important impetus for the project was the need for baseline data to facilitate better heritage protection, for example by informing responses to planning issues, or providing precise information regarding the location and extent of features at risk from agricultural activity and forestry. Throughout all phases of the project, the Air Photo Interpretation Team has liaised with Norfolk County Council and Historic England to highlight any significant discoveries. A list of sites where further management, heritage protection or research might be of particular value is included as Appendix 3. Suggested updates to the NHLE record for designated sites is included as Appendix 4.

The methodology of the project is detailed more fully in Appendices 1 and 2.

Factors Affecting the Results of the Survey

As is the case with any archaeological survey, the results of the Wendling Beck and Fransham AI&M project have been influenced by a variety of different factors. Some of these are inherent in the methodology used for AI&M projects, or in the nature of aerial photographic and lidar evidence and its interpretation. Others relate to archaeological work undertaken both before and during the project's lifespan. The effects are evident in both the number and nature of sites recorded in different environments and under different conditions, and they need to be borne in mind when interpreting the project results.

Methodology

The comprehensive analytical and interpretative aerial photographic survey provided by the methodology used by AI&M projects makes an essential contribution to the understanding and protection of the historic environment of any area it covers. It advocates the systematic use of all available aerial photographs and lidar to map and record any visible new and previously known sites, irrespective of their present-day survival and encompassing every period, usually spanning the period from the Neolithic to the Cold War (for a national overview see Evans 2019a).

Details of the project methodology are given in Appendix 1. The project encountered no methodological issues during its lifetime.

Geology and Soils

The geology, soils and topographic formation of any geographical area all have a direct impact on the efficacy of using aerial photographs, and to a lesser extent lidar data, to record the historic environment. This is especially the case in arable areas, like central Norfolk, where it is normal for sites to predominantly consist of sub-surface remains, although as will be discussed below, this was mitigated for this specific project by the unusually good visibility of archaeological earthworks on 1940s aerial photographs. The complex and varied processes and conditions which lead to differential crop growth and the formation of cropmarks are described in detail elsewhere (for example Wilson 2000, 67–86).

Compared to other areas investigated by the team, such as north-east Norfolk (Powell and Tremlett 2023, 15) or Breckland (Powell and Tremlett 2020, 16–17), there were few instances of confusion between geological and archaeological features. This was in part due to the relatively few cropmark sites recorded by the project; in arable areas geological features are most readily seen as cropmarks, the free-draining soils conducive to

cropmark formation – such as sands and gravels – tending to show both archaeology and geology under the right conditions. The nature of the predominantly clay geology and soils in the project area were such, however, that even when cropmarks were visible, it was rare for geological features to be visible, or easily confused for archaeology. In terms of both earthworks and cropmarks, there were no areas where geological features were particularly visible or prominent. Nevertheless, there is still potential (albeit limited) for some features of natural origin to have been recorded as archaeology, and some archaeological features to have been misinterpreted as features of natural origin and excluded from the record.

Topography and Land Use

The topography of an area and its land use (which are closely related) can both have a significant impact upon the existence, survival and visibility of archaeological sites. Some topographic and/or land use settings will have been preferred or avoided in the past, for settlement, industry, burial or land division, for example. Alluvial deposits within valleys, and undisturbed heathland vegetation, pasture or parkland can favour the survival of archaeological remains, both as earthworks and as sub-surface deposits, while sites on light arable soils and exposed hilltops and ridges may be more affected by ploughing. In terms of visibility, the alluvial deposits protecting valley sites may also mask them, making them difficult or impossible to detect using conventional aerial photography. Ploughing may reveal the soilmarks of near-surface remains, while arable cultivation favours the formation of germination marks and cropmarks.

In terms of topography within the project area, although no detailed analysis has been undertaken, it is evident from the project's results that the greatest variety of sites – from prehistoric round barrows to Roman and medieval/post-medieval settlement – is found along the river valleys, in close proximity to a watercourse or on the valley sides above. Archaeological sites on the higher ground (excluding 20th-century military sites) tend to relate to routeways, boundaries and field boundaries; often the latter appear more likely to be of post-medieval rather than medieval date, filling gaps within the field pattern depicted on 19th-century maps. This distribution is not unexpected – it is discussed by Williamson (1993, 14–17), for example – and reflects past patterns of land use as much as (or more than) survival and visibility, but it is marked. It is interesting to note that despite the project recording field boundaries on the higher ground, ridge and furrow was for the most part recorded in valley or valley-side locations. It is possible that heavy ploughing of the clay soils of the uplands removed most traces of earlier agriculture in these areas, more completely and at an earlier date than in the valleys. Some blocks of ridge and furrow recorded to the north-west of Wendling airfield are a possible exception to this pattern.

Here the earthworks may have survived longer due to the presence of accommodation huts and other structures associated with the airfield, preserving areas of pasture long enough for the ridge and furrow to be captured on 1940s aerial photographs, while surrounding areas had already been converted to arable.

Much of the project area is now used for arable farming (Figs 4 and 5). This means there is an opportunity for cropmarks to form under the right conditions. In practice, the heavy soils of the area and potentially a lack of aerial reconnaissance at fortuitous times (see below), means that relatively few cropmark sites have been recorded, and – albeit with some exceptions – those that have tend to be relatively small, isolated and unspectacular. They lack the complexity and 'palimpsest' nature of cropmark sites recorded in more responsive / more frequently flown parts of the county (north-east Norfolk, for example; Powell and Tremlett 2023). Again, as well as reflecting the conduciveness of the soils to form cropmarks, and the history of aerial reconnaissance in the area, this may be as much a reflection of the character of human activity in this area in the past – particularly in the prehistoric period – as it is the visibility of archaeological sites and features.

The only large settlement within the project area is the town of Dereham. It is likely that pre-Second World War suburban development around the historic core has hidden earlier archaeological features.

The project recorded an unexpectedly high number of earthwork sites, largely due to the survival of medieval to post-medieval features as earthworks as late as the mid-1940s. This was a product of both the dispersed nature of settlement in the past, the large number of small agrarian settlements that once existed here (see below) and the continuation of small farms until the end of the Second World War. Combined with unusually clear aerial photographs from the early months of 1946 (see below), this allowed large numbers of sites to be identified, interpreted and recorded. Although some elements still survive as earthworks in some form, most of the sites were ploughed up after the Second World War. Environment Agency lidar data was the best source for assessing the current survival of earthwork sites, as although not the latest source (dating to 2017, later aerial photography was available), the visualisations allowed even low earthworks not detectable on later digital (or sometimes any) aerial photographs to be identified. Often, the simple local relief model visualisations were the only source to clearly show the earthworks of ploughed out medieval and post-medieval settlements and boundaries (see Figs 19 and 29, for example). By removing large-scale morphological elements of the landscape, these visualisations render more localised topographical changes – such as a very plough-damaged field boundary – more clearly visible.

The project area for the volunteering strand was rather different to the area investigated by the AI&M survey. Dominated by the valley of Wendling Beck, its more freely draining geology of glacial sands and gravels means that cropmarks are more likely to form. This was evident in the recording of both the volunteering project and the earlier Aggregates Assessment Project (Albone, Massey and Tremlett 2008).

In lower-lying areas it was sometimes difficult to distinguish between hydrological features such as drainage ditches or natural channels, which fell outside of scope for recording by the project, and more significant features, such as moats or enclosure boundaries. For example, some of the ditches mapped to the east of the site of Drayton Hall (Fig. 26) almost certainly relate to drainage rather than enclosures; similarly, apart from its rectilinear shape the previously recorded moat at Beeston (Fig. 25) is virtually indistinguishable from the surrounding drainage ditches. Where relevant, a note was made in the descriptive record concerning any uncertainty regarding interpretation.

Aerial Photo and Lidar Coverage

The date, distribution and density of accessible aerial photographs has a significant impact upon the results of any project utilising aerial sources. The project used a wide range of aerial photographic sources, which provided oblique and vertical coverage taken at various dates across the project area. The HEA loan consisted of 1,786 vertical aerial photographs and 166 oblique aerial photographs. These figures include 355 images which were provided digitally rather than as prints. Vertical and oblique photography held by the NAPL – much of it consisting of specialist archaeological photographs – was also consulted, along with digital vertical aerial photographs including those accessible via Google Earth, the Public Sector Geospatial Agreement (PSGA) and Bing Maps. The authors are not aware of controlled airspace, either current or historical, impacting coverage by aerial photographs or lidar.

While non-specialist vertical imagery provided multiple years of coverage for the entirety of the project area, specialist oblique coverage was extremely patchy. Large numbers of photographs were available for the market town of Dereham and its environs, for example, while other parts of the project area had none. The distribution of such photographs will of course be dependent to a large extent on the presence of visible archaeology, but it does also demonstrate that the average number of specialist oblique images for the project area hides significant gaps in coverage. It is also the case, amongst the NAPL oblique collection at least, that many of the images were of subjects that could contribute little to a survey of this type. Many of the images were of historic buildings (often churches or farms), modern farming scenes, excavations (such as Bittering Quarry) and development,

particularly around the town of Dereham. A very rapid (and imprecise) assessment of the NAPL material suggests that of the approximately 1,500 images pulled from the library's oblique collection to use for the project, less than 50% were of subjects likely to show earthworks, cropmarks or military structures, dropping below 30% for some areas.

The CUCAP library was closed for the duration of the project, meaning that only copies of CUCAP photographs held in other collections or accessible online could be viewed. Calculated using the online catalogue, and excluding the volunteer area or any surrounding buffer, there were 94 photographs listed in the coversearch for the project area. Of these, it was possible to consult 39 or 40 images (it was not always possible to identify the specific prints held in the HEA collection). All the consulted images were oblique; none of the 12 vertical images of the area could be accessed. The consulted photographs constitute just over 40 per cent of the CUCAP coverage for the area. There is, of course, potential for additional sites or new information which was not recorded by the project to be visible on the photographs that could not be consulted. Most of the oblique photographs in this category, however, are of the built environment, or of sites where at least one CUCAP oblique photograph from the same flight was available for consultation, and/or there is coverage by other photographs. The vertical photographs were flown in August 2000 and April 2004; the timing of the former suggests that they could potentially show late cropmarks, but the ten photographs cover the relatively small area of unimproved grassland and woodland at Scarning Fen nature reserve and adjacent Potter's Fen, on the outskirts of Dereham, where the formation of cropmarks is unlikely.

Amongst the non-specialist vertical photographs consulted by the project, RAF aerial photographs from January 1946 and March 1946 were particularly useful for recording earthwork sites, generally relating to dispersed medieval to post-medieval settlement and associated elements such as hollow ways and tracks, fields and ridge and furrow (Fig. 6). The photographs were taken at an opportune time of year, when a combination of low vegetation and low sun means that earthworks show with unusual clarity. They were also flown before many of these sites were destroyed by ploughing, as more land was cultivated for arable crops, grassland was improved, and small mixed farms were amalgamated into larger holdings. These sites are only rarely visible on later sources, deep ploughing on relatively heavy soils apparently removing most earthwork traces, and their relatively low-lying position in valleys not favouring cropmark formation. There is coverage by these photographs for much of the project area, but there are some gaps between the east-west oriented runs. More detailed analysis of the project mapping in relation to the HEA's recorded footprints for those runs would be needed to assess the degree to which these gaps may have impacted on the recording of sites. Basic analysis undertaken using the central grid references for the photos suggests a possible partial

correlation between the photographs and sites mapped as earthworks assigned a specifically medieval (rather than medieval to post-medieval) date.

Figure 6. Earthworks relating to medieval to post-medieval settlement and land use in the village of Beeston, visible on an RAF photograph taken in January 1946, including a possible moat, ridge and furrow, enclosures, and field boundaries (also see Fig. 25); most were newly identified by the survey, and most elements now appear to have been levelled. Photograph: RAF/3G/TUD/UK/51 V 5215 31-JAN-1946 (detail). Source: Historic England Archive. RAF Photography.

Also of particular use amongst the non-specialist imagery were aerial photographs pre-dating the 1946 RAF surveys. These included United States Army Air Forces (USAAF) photographs from 1944 (see Fig. 42, for example). These facilitated the recording of Second World War sites, some of which had already been removed by 1946. Again, coverage for the project area was not complete, with a notable gap in photographs for the south-west corner of the project area. Non-specialist vertical imagery taken at opportune times of year was also useful for capturing cropmark sites not visible on other sources. Google Earth imagery from July 2006 and to a lesser extent August 2020, and PSGA imagery from 2022 were particularly useful for this. For example, the newly identified (and subsequently excavated) Late Iron Age to Roman enclosure on the Vanguard and Boreas on-shore cabling route (Fig. 15) was recorded from these photographs.

The project had complete lidar coverage at 1m resolution using the Environment Agency National Lidar Programme data, flown between 16 and 24 November 2017. Both the DTM and DSM data were downloaded and visualised, using Relief Visualization Toolbox. The simple local relief model visualisations were particularly useful for recording former field boundaries, which were frequently indistinct or barely visible in the hillshade visualisations. Environment Agency lidar data from 2009, 2010 and 2021 was also available, but was not used as it did not provide full coverage for the project area, and there was no data available at a resolution better than 1m.

Summary of Archaeological Results

Overall Results

The AI&M mapping and recording identified 445 new records for the Norfolk HER, and amendments for a further 116 entries. In total, the records relating to 561 individual 'sites' were created or enhanced (Fig. 7). The 'new' records include a proportion (39, or 9 per cent) of previously recorded sites that were split into separate elements, and renumbered or included in the recording for a more extensive new site. Nevertheless, the genuinely new discoveries (406 records) – new at least in terms of being recorded in the Norfolk HER – still represent a very significant number of archaeological sites and landscapes recorded for the first time. Prior to the project starting the HER had mapped 1,408 sites within the project area (grouped by HER number). Setting aside the renumbered sites, the project results therefore represent a 29 per cent increase to this record.

Table 1. Quantification of AI&M project results.

AI&M project area (sq km)	Existing HER records (mapped by NHER)	Total 'sites' recorded by project	Records created by project	Records amended by project	Increase to HER	Density of sites recorded by project (per sq km)
116	1,408	561	445	116	29%	4.8

For Historic England Research Records (HERR), the increase is even greater. At the start of the survey, the project area contained 202 HERR Monument records. Seventeen of the new records created by the project correlate with one or more of these. Across the project area, therefore, a total of 428 sites were newly recorded that were also new to the Historic England dataset, equivalent to a 112 per cent increase for the area.

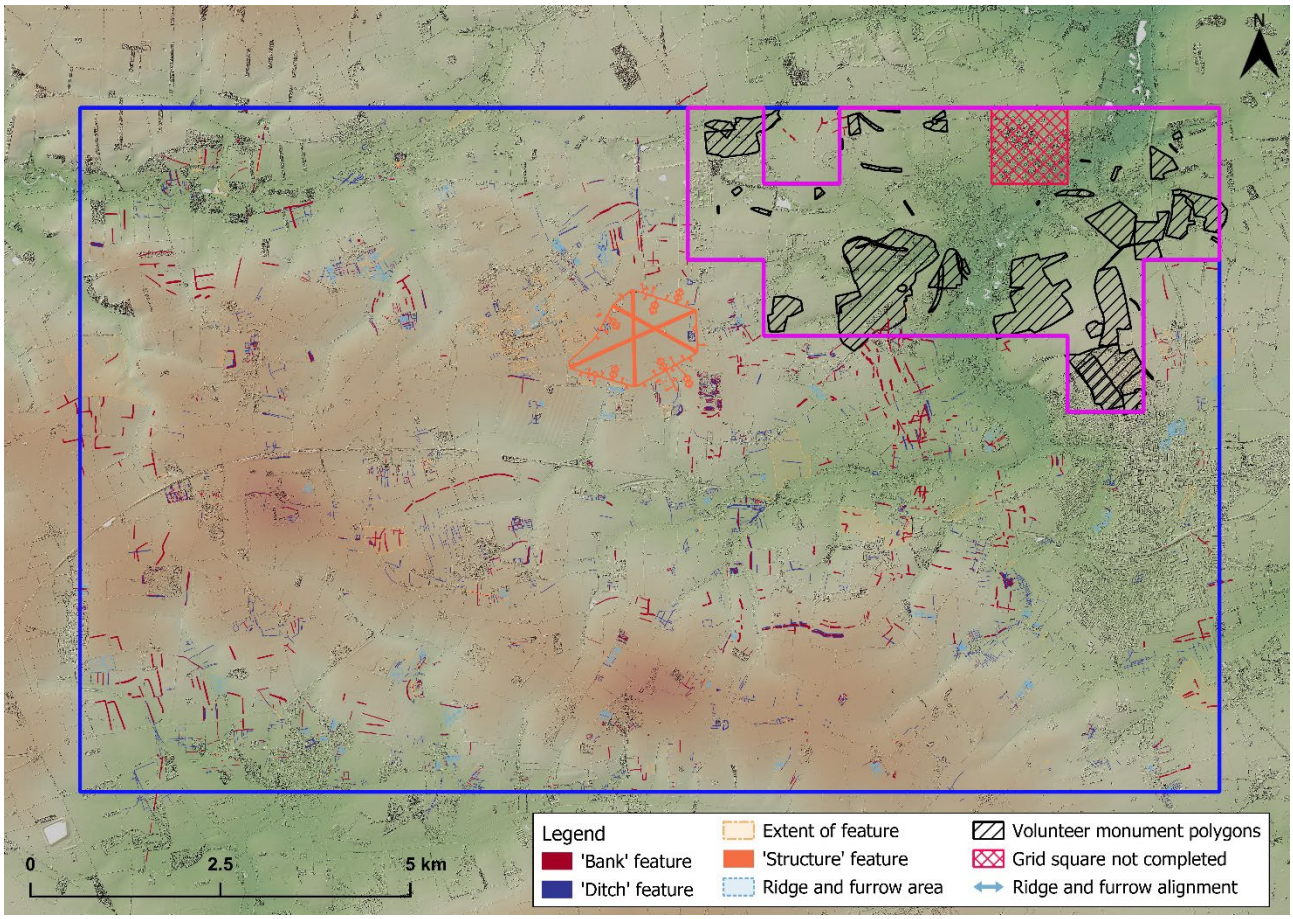

Figure 7. All archaeological features mapped by the project; extent of records created or amended as part of the volunteering project also shown (top right). Background topographic model derived from lidar, source: National LIDAR Programme Environment Agency 1m DSM 16 to 24-NOV-2017 © Environment Agency copyright and/or database right 2024. All rights reserved. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

The volunteering element of the project completed analysis of Google Earth imagery from July 2006 and Environment Agency lidar data for 18 sq km out of a 19 sq km area; grid square TF9717 remained uncompleted. The work led to the creation of 27 new records and the amendment of a further 17 records (Fig. 7). Considering that the area investigated by the volunteers had already been covered by a comprehensive AI&M survey (the Norfolk Aggregates Assessment project; Albone, Massey and Tremlett 2008), and only a very limited range of new sources were looked at, this is an important contribution to our knowledge and understanding of the area. It has not only updated the record created by the earlier AI&M project, but it has also enhanced its results by recording new insights into some of the sites and landscapes it recorded (Gressenhall Park, for example). The earlier AI&M survey mapped 50 sites (both newly identified and previously known) within the volunteering project area. The new sites recorded by the volunteering project represent a

54 per cent increase to this. It is the equivalent of a 12 per cent increase for the area to the Norfolk HER as a whole.

Table 2. Quantification of volunteer project results.

Volunteer project area (sq km)	Existing HER records (mapped by NHER)	Total 'sites' recorded by project	Records created by project	Records amended by project	Increase to HER	Density of sites recorded by project (per sq km)
18	214	44	27	17	12%	2.4

Highlights from the results of the project are described below, in broadly chronological order. Period names and – where relevant – date ranges are those in use in the Norfolk HER, and those used in reports relating to earlier AI&M work in Norfolk and Suffolk.

Late Prehistoric and Roman

Only a minority of sites recorded by the project were of known, probable or suspected prehistoric, Roman or Anglo-Saxon date. Some highlights of the more convincingly dated or notable sites are described below.

Late Prehistoric

Although certain types of substantial or distinctive earlier prehistoric sites are relatively scarce in the project area (Ashwin 1996), activity dating to this period is well-attested. Various phases of work at Bittering Quarry, in the north-east corner of the project area, have recorded numerous prehistoric features and finds, interpreted as relating to a palimpsest of settlement and occupation dating from the Neolithic to the Iron Age (see Wymer and Healy 1996; Ashwin 1998; Ashwin and Flitcroft 1999). The site is situated on Norfolk's central watershed (Williamson 1993, 14–19, fig. 1.3), on what may have been an important corridor of relatively well-drained land between the east-flowing Wensum and west-flowing Nar river valleys (Wymer and Healy 1996, 52). To the south-west, Rogerson's comprehensive fieldwalking in the parish of Fransham recovered large quantities of worked flint, predominantly dating to the later Neolithic and early Bronze Age (Rogerson 2022, 15). The survey also identified 87 surface concentrations of 'pot-boilers' (burnt flints), interpreted as prehistoric burnt mounds (ibid., 20).

An intriguing site of possible prehistoric date was identified as part of the volunteering project (Fig. 8). At Longham, the cropmarks of an undated square enclosure (NHER 49691) and adjacent ring ditch (NHER 11697) – the latter interpreted as relating to a Bronze Age round barrow – had been identified from cropmarks and subsequently mapped as part of the Norfolk Aggregates Assessment project (Albone, Massey and Tremlett 2008). Google Earth imagery from 2006, examined as part of the volunteering project, appears to show the faint cropmarks of an additional rectilinear enclosure (NHER 68241) – or possibly two conjoined rectilinear enclosures – overlapping the square enclosure and abutting the north-east side of the ring ditch. To date the cropmarks have only been seen on one year of photography, and the archaeological origin of the cropmarks must be regarded as uncertain. If real, however, their faint appearance might reflect the newly identified enclosure (or enclosures) being relatively older and pre-dating the overlapping square enclosure, which could feasibly be of Iron Age or Roman date (see discussion below). At the same time, the new enclosure(s) appears to have a positional relationship with the ring ditch. This relationship, with its juxtaposition of circular ring ditch with a rectilinear enclosure, is broadly reminiscent of some potentially Neolithic sites in Norfolk: Markshall, to the south of Norwich, where a large elongated D-shaped enclosure (NHER 9583) lies with its short, flat (façade?) side adjacent to a possible henge monument (NHER 9582; Bales et al. 2010, 56, figs 4.19 and 4.10), and Oulton Street, in north-east Norfolk, where an elongated, slightly oval enclosure (possibly a Neolithic funerary monument) is conjoined with a ring ditch at its western end (NHER 65390; Powell and Tremlett 2023, 25–26, fig. 11). While such comparisons are entirely speculative, there is clear evidence of earlier prehistoric activity from the area surrounding the site, which borders Bittering Quarry (Wymer and Healy 1996; Ashwin 1998; Ashwin and Flitcroft 1999). Future aerial reconnaissance, and/or work in advance of extending Bittering Quarry, may offer the opportunity to investigate the site further.

Figure 8. The previously mapped ring ditch (Bronze Age round barrow?, NHER 11697) and square enclosure (NHER 49691) at Longham; the faint cropmarks of a newly identified rectilinear enclosure(s) (NHER 68241) are highlighted by arrows. Photographic image: 02-JUL-2006 made available to Norfolk County Council via the PSGA agreement Bluesky International Limited and Getmapping Limited 1999–2023. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

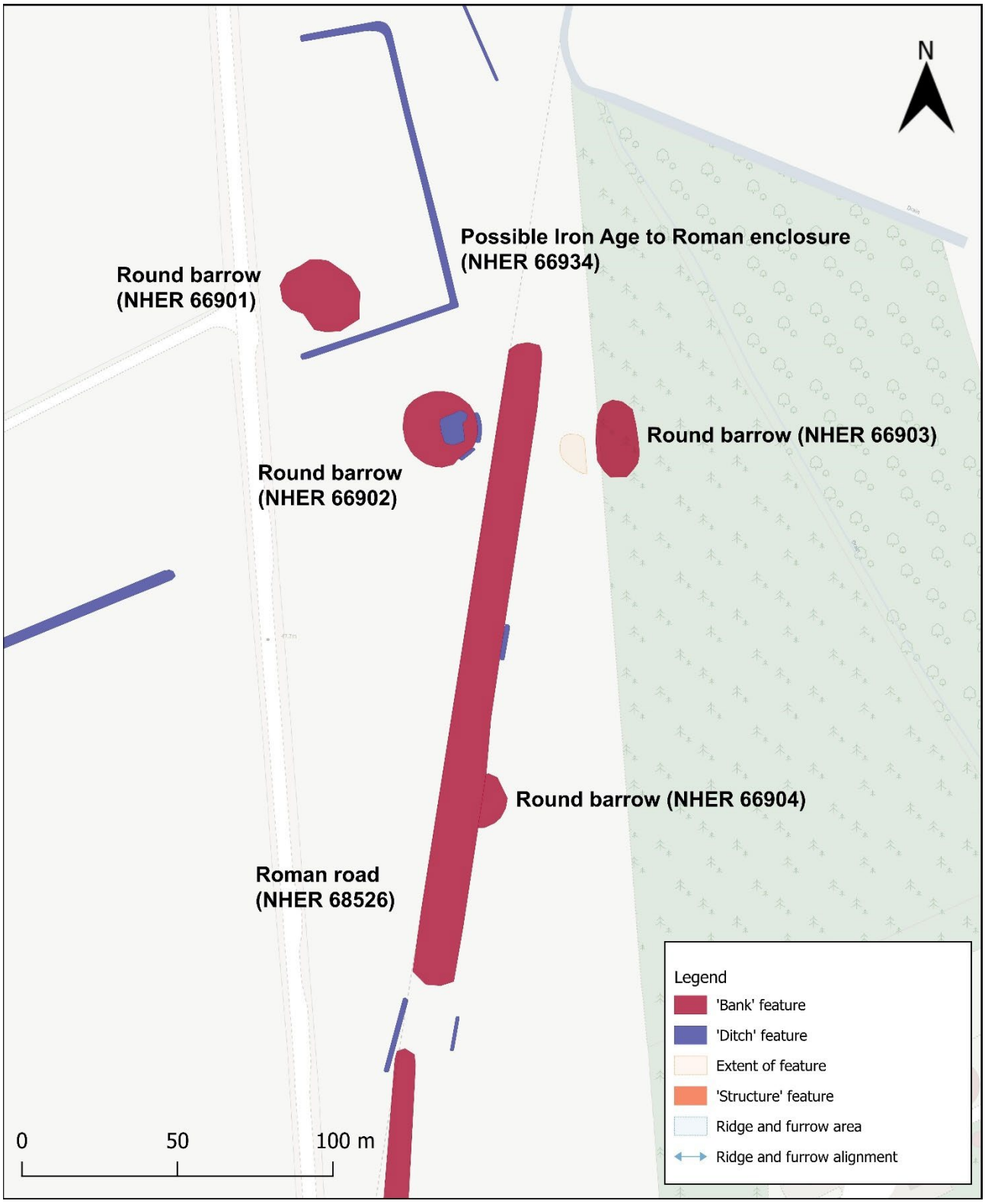

Figure 9. The Bronze Age barrow cemetery at Sporle with Palgrave (NHER 4598); a section of Roman road (NHER 68526) is visible crossing the centre of the area, apparently truncating one of the barrows. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

The project mapped 25 sites interpreted as the remains of Bronze Age round barrows, one of which is interpreted as a disc barrow. Five additional ring ditches were recorded which could not be interpreted with any certainty, but at least some of which could also relate to Bronze Age funerary sites. A previously recorded Bronze Age barrow cemetery (NHER 4598) at Sporle with Palgrave was mapped in the south-east of the project area (Fig. 9). The site consists of three round barrows (NHER 66901–66903) visible as cropmarks on aerial photographs, with a fourth (NHER 66904) visible as an earthwork on the visualised lidar data, surviving within an area of woodland. Previous antiquarian excavations, re-examined by Ashley and Penn (2012), recorded early Anglo-Saxon burials within the central barrow (now recorded as NHER 66902) and a horse burial – presumed to date to the same period – within the north-western barrow (now recorded as NHER 66901). As part of the re-examination, aerial photographs held in the NAPL were analysed to confirm the location of the barrows and to further inform the study. The form, location, and arrangement of the barrows has led to them being interpreted as being of prehistoric date (information from NHER 4598). The site of the southern barrow is also truncated by a low earthwork section of Roman road (NHER 68526, recorded more broadly as NHER 3697) which runs through the centre of the area, indicating a pre-Roman date for that barrow at least (ibid., 287; information from NHER 4598). Although it is possible that some of the barrows could be Anglo-Saxon in date, the practice of Anglo-Saxon burials being inserted into earlier prehistoric barrow mounds is well attested elsewhere in Norfolk (ibid., 304–5; information from NHER 4598). A pit feature visible as a cropmark within the central barrow (NHER 66902) has been suggested to be consistent with the location of the six excavated Anglo-Saxon skeletons. It is uncertain whether the cropmark represents the secondary Anglo-Saxon grave deposit cut or the antiquarian excavation trench (ibid., 287; information from NHER 4598).

In the parish of Kempstone, in the north of the project area, the project enhanced the records for a group of six previously recorded ring ditches (NHER 11689, 11690, 68097, 68098, 68099, 68101). The ring ditches have been interpreted as the site of a Bronze Age barrow cemetery (NHER 68100; Fig. 10). The ring ditches are visible as cropmarks on a range of oblique and vertical aerial photographs taken between June 1974 and July 2022. The project has newly recorded that three of the ring ditches (NHER 11690, 68097 and 68098) are visible as very low earthworks on RAF vertical aerial photographs taken in 1946. No definite evidence for associated earthwork mounds was evident. It is possible that mounds may survive as very low earthworks undetectable on the consulted sources, that they had been previously levelled, or that they were never present at all. On Google Earth photography from 2006, four of the ring ditches (NHER 11689, 68097, 68098 and 68099) appear to have a pale mark within the interior of the ring ditch. Two of the ring

ditches (NHER 11689 and 68099) appear to have a slightly raised interior on the visualised lidar data. It is possible that the pale marks and slightly raised earthwork interiors may indicate the presence of central mounds, but they could equally relate to localised topography or the underlying geology. NHER 11690, in the east of the area, could relate to the site of a pond barrow: a slight hollow is visible within the interior of the ring ditch on the visualised lidar data, and part of an external earthwork bank may be visible on the 1946 aerial photographs.

Figure 10. The cropmarks of five previously recorded ring ditches (NHER 11689, 68097, 68098, 68099, 68101) located in the parish of Kempstone; together with the site of a sixth barrow (not visible) recorded further to the east (NHER 11690), they are interpreted as a Bronze Age round barrow cemetery (NHER 68100). Photographic image: earth.google.com 02-JUL-2006 made available to Norfolk County Council via the PSGA agreement © Bluesky International Limited and Getmapping Limited 1999–2023.

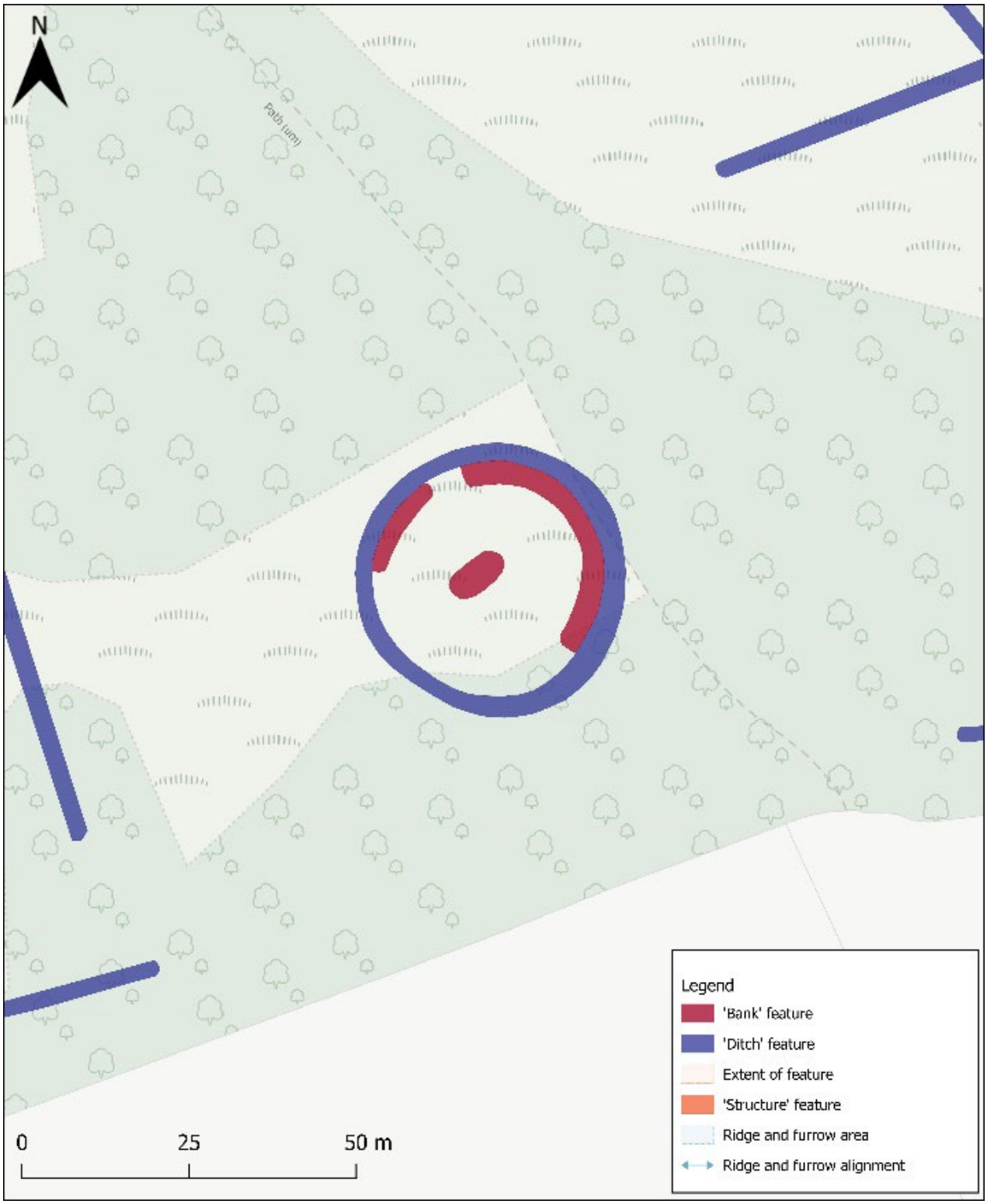

Figure 11. The Scheduled Bronze Age disc barrow (NHLE 1021132; NHER 31522) on Litcham Common; boundary ditches of unknown date (NHER 68536) are visible in the surrounding area. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping © Norfolk County Council, licensed to Historic England.

The record for a Scheduled Bronze Age disc barrow (NHLE 1021132; NHER 31522), situated on Litcham Common in the north of the project area, was enhanced by the project (Fig. 11). The site had been recorded previously from aerial photographs, with the earthwork ring ditch being clearly visible on RAF vertical aerial photographs taken in 1946. The site has also been the subject of a number of field visits, which recorded a circular, flat platform, encircled by a ditch measuring approximately 30m in diameter. The low earthworks of a slightly raised sub-circular mound located just off the centre of the feature, and sections of an inner bank were also recorded. The ring ditch, central mound, and sections of inner bank were mapped by the project principally from the visualised lidar data. As the lidar survey was flown relatively recently (2017), it is likely that the features still survive as very low earthworks.

There is also evidence of activity later in the prehistoric period from within the project area. The excavations at Bittering Quarry recorded continuing activity into the Iron Age. Within one area of the extensive site, this included a palisade or fence, the post holes of which contained Iron Age pottery, and at least two four-post structures interpreted as being of characteristically Iron Age type (Ashwin and Flitcroft 1999). The major monument of possible Iron Age date within the project area – the linear earthwork known as the Launditch or Devil's Dyke (NHER 7235) – lies immediately to the west of these features (Rogerson 2022, 23). The date of the monument remains a matter of debate, with evidence put forward to support both a pre- and post-Roman date for its construction (ibid.). Believed, primarily on the basis of documentary and map evidence, to have extended for approximately 6km from Mileham to Wendling (Wade-Martins 1976; Davies 1996, fig. 9), the earthwork would have crossed north-south across the central part of the project area.

Very little of the Launditch could be identified on the aerial sources. Towards the northern end of its presumed course, a length of approximately 500m of the feature is designated as a Scheduled Monument (NHLE 1003795). This lies either side of an east-west road, Salter's Lane, which marks, to the east, the parish boundary between Beeston with Bittering and Longham, and may follow the line of a Roman road (NHER 2796). To the north, earthworks were mapped within the designated area from visualised lidar data, but modern disturbance made it difficult to be certain which elements actually constituted part of the Launditch earthwork. To the south of Salter's Lane, the earthworks which presumably originally led to the designation of this section have been completely levelled. Further to the south, beyond another road, a further short section was mapped as a ditch, visible as a broad cropmark on aerial photographs and as a low earthwork on visualised lidar data. Beyond that, another section of bank was recorded from the visualised lidar

data. The latter may instead simply be part of the modern field boundary which follows the same course.

The project was unfortunately not able to contribute significant new information relating to the construction, date and function of the Launditch. It has highlighted, however, that consideration may need to be given to which elements are designated, given its current state of preservation (see Appendix 4 below).

The excavations at Bittering Quarry to the east of the Launditch also revealed a small square enclosure, measuring approximately 10m square, and containing a central sub-circular pit. It was tentatively interpreted as a possible later Iron Age barrow or funerary monument, similar to those excavated at Harford Farm, to the south of Norwich (Ashwin and Flitcroft 1999, 233, fig. 15, 253; Ashwin 2000). Similar square enclosures have been identified from aerial sources at various locations in Norfolk (Tremlett, Albone and Horlock 2011, 34–37). Within the project area, a small rectilinear enclosure (NHER 36389) was mapped from a cropmark at Beeston with Bittering (Fig. 12). Previously identified on specialist oblique aerial photographs from 1996, the enclosure is broadly trapezoidal in plan and measures 18m long. It overlaps with – and presumably pre-dates – a probable post-medieval field boundary. It lies approximately 30m to the south-east of a probable Bronze Age round barrow (NHER 7244; visible as a ring ditch), 50m west of the Launditch (NHER 7235), and 300m to the south of the supposed (albeit disputed, see below) line of a Roman road (NHER 2796). This juxtaposition of rectilinear enclosure, ring ditch and road is very similar to another site (NHER 49691) located approximately 1.3km to the east at Longham; the latter site is the same as that described above in relation to possible Neolithic activity and was mapped as part of the Norfolk Aggregates Assessment project (Albone, Massey and Tremlett 2008). The rectilinear enclosure at the eastern site is larger (approximately 30m wide) and squarer in shape. While there is no direct evidence that they date to the same period, both enclosures can be tentatively interpreted as relating to possible funerary sites of Iron Age date, similar to those excavated at Bittering Quarry and Harford Farm. Like the excavated examples, both exhibit polar alignment and proximity to what is presumed to be an earlier funerary monument, characteristics which are typical of such sites (Tremlett, Albone and Horlock 2011, 35). An Iron Age date is therefore feasible for the two rectilinear enclosures, but far from certain, as both sites also have characteristics which diverge from the ‘norm’ for such enclosures in Norfolk: the Beeston enclosure is rectangular rather than square, and the Longham example is rather larger than most other sites (ibid.). An alternative interpretation is that they represent some sort of shrine or funerary monument of Roman date, perhaps sited in deliberate proximity to both the road, the earlier round barrows and the Launditch.

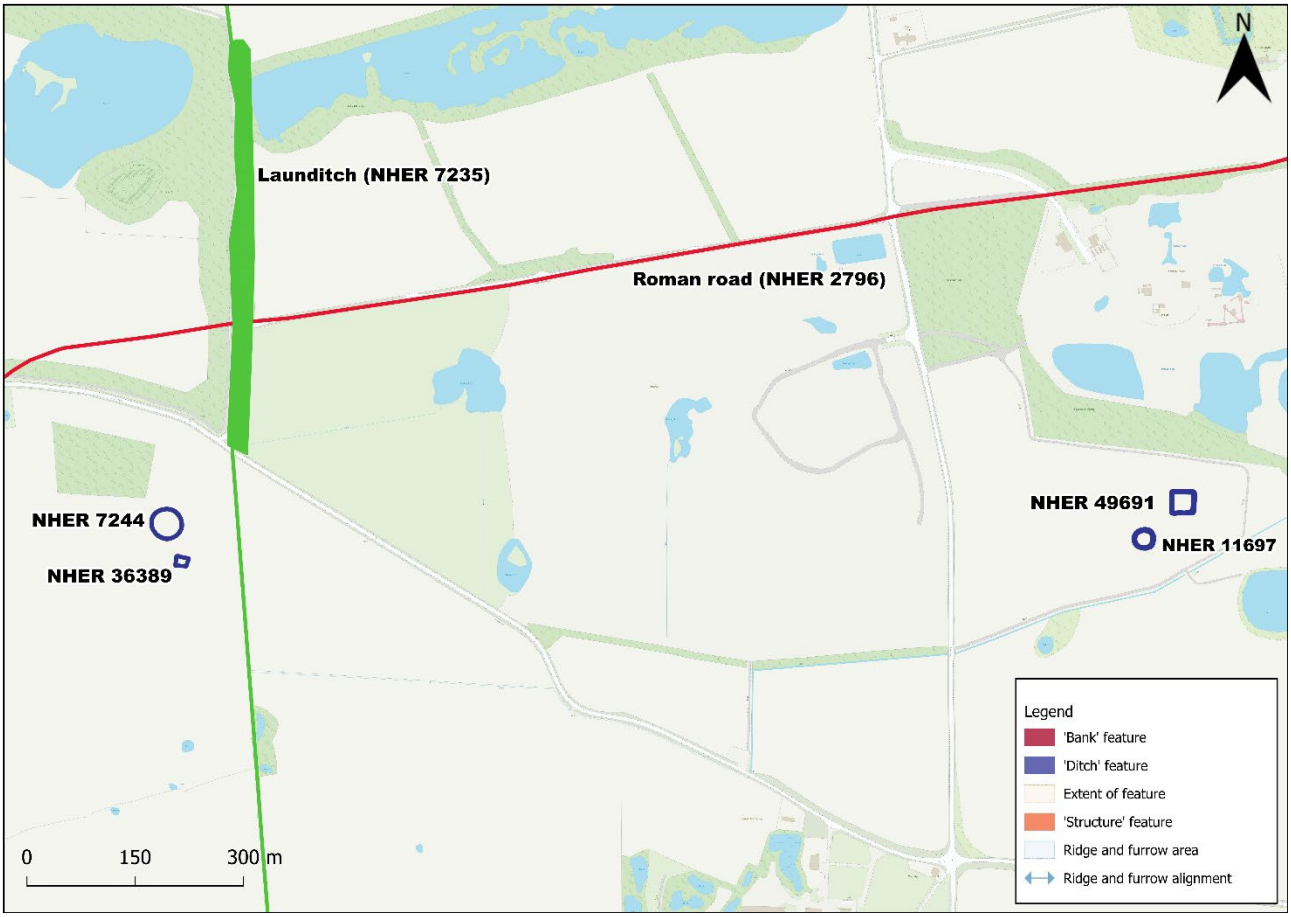

Figure 12. The ring ditches and rectilinear enclosures at Beeston (NHER 7244 and 36389; west / left) and Longham (NHER 11697 and 49691; east / right), located to the south of a possible (albeit disputed) Roman road (NHER 2796; depicted as red) and either side of the Launditch (NHER 7235; depicted as green). Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

A previously recorded site visible as cropmarks at Lexham, in the north-west of the project area, may be part of a prehistoric multiple ditch system, with a conjoined rectilinear enclosure (NHER 17588; Fig. 13). The site consists of at least five fragmented or discontinuous, roughly parallel ditches. Part of what appears to be a conjoined rectilinear enclosure is visible on its eastern side. The fragmented parallel ditches have similarities with other multiple ditch boundaries recorded elsewhere in Norfolk (Tremlett, Albone and Horlock 2011, 31–34; Powell and Tremlett 2023, 33–34), and further afield in Lincolnshire (Boutwood 1998) and Yorkshire (Stoertz 1997), where they are generally considered to be of Late Bronze Age to Iron Age date. The Lexham example cuts across a now dry valley, potentially demonstrating a significant relationship with a (former) watercourse, a characteristic noted at other sites in Norfolk (Tremlett, Albone and Horlock 2011, 32).

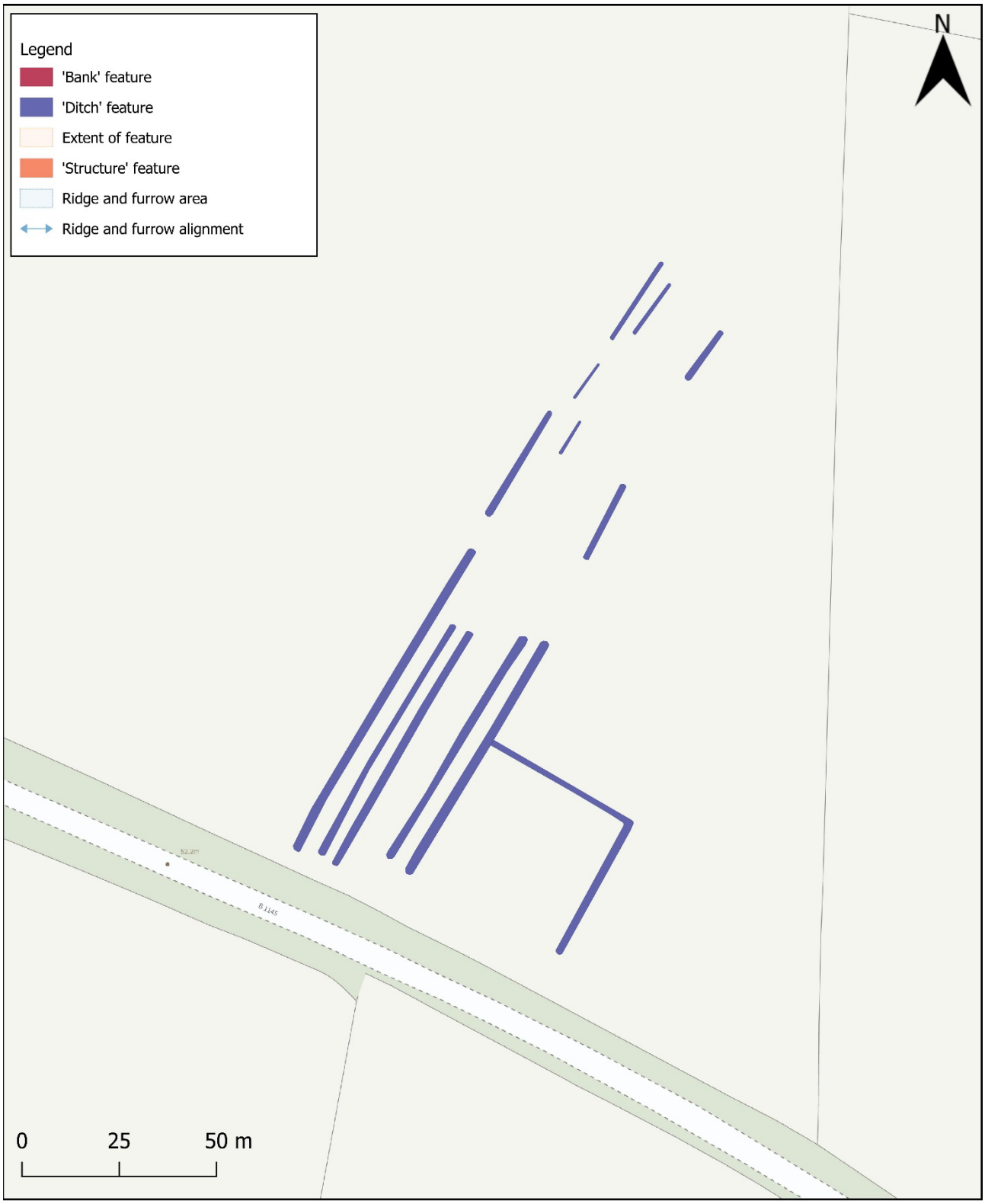

Figure 13. The possible prehistoric multiple ditch boundary and conjoined rectilinear enclosure (NHER 17588) in the parish of Lexham. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

Roman

While relatively few Roman sites have been excavated within the project area, evidence from surface finds, and occasionally other forms of investigation, demonstrate that it is likely to have been as densely populated as most other parts of Norfolk during the period (Rogerson 2022, 27). Evidence from the parish of Fransham indicates a settlement pattern made up of small, dispersed settlements, focussed primarily on agriculture (ibid., 27–36). Kempstone, in the north-west corner of the project area, is thought to be the site of a small agrarian settlement supported by iron smelting (Rogerson 2022, 27; De Bootman 2023, 189–190); it had previously been interpreted as a Roman small town (Gurney 2005; NHER 4079). A Roman road is thought to branch from the Peddar's Way, which passes just to the west of the project area, northwards towards Kempstone, continuing on to a small town at Toftrees (Gurney 2005, 29). Parts of this route were mapped by the project (see below). A major east-west Roman road, running from Denver on the fen edge to Brampton in north-east Norfolk (and beyond; ibid.) was thought to pass through the north of the project area, but recent work has cast doubt on the reality of its course through this area (Albone 2016, fig. 10, 361–362). Very recently (2020–22), a new Roman villa site was discovered and excavated at Necton (NHER 66097), during work in advance of the construction of the Vanguard/Boreas on-shore cabling route and electrical substation. Post-excavation assessment is still ongoing, but the archaeological excavations revealed a high-status settlement comprising a partially masonry main villa building with a tile roof, a number of associated timber buildings, a bathhouse and associated structures. Significant quantities of ceramics and metalwork were recovered. The villa is thought to have been occupied through most of the Roman period (Andrews, Hatherley and McGalliard forthcoming; J. Percival, Norfolk County Council, pers. comm., 22 October 2024).

Features relating to the Roman villa at Necton (NHER 66097) were not visible on the sources consulted by the project. It is possible that the weather conditions, the type of crop, or the background soils were not optimum for cropmark formation when the area was captured on aerial photographs. The AI&M survey did record the earthworks of a possible medieval to post-medieval trackway or road (NHER 67625) which can be seen running across the site on the 1946 RAF aerial photographs (Fig. 14). The features were subsequently levelled and are visible as cropmarks on aerial photographs taken in 1971 and 1988. The trackway was also recorded by the recent excavations at the site. It was interpreted as being primarily medieval to post-medieval in date, but with some of the western elements dating to the Roman period (Hatherley et al. 2025). A further possible section of the trackway or road (NHER 67626) was mapped by the project approximately 100m to the west of the villa site. This section of trackway is again likely to be medieval to post-medieval in date but could also potentially have Roman origins.

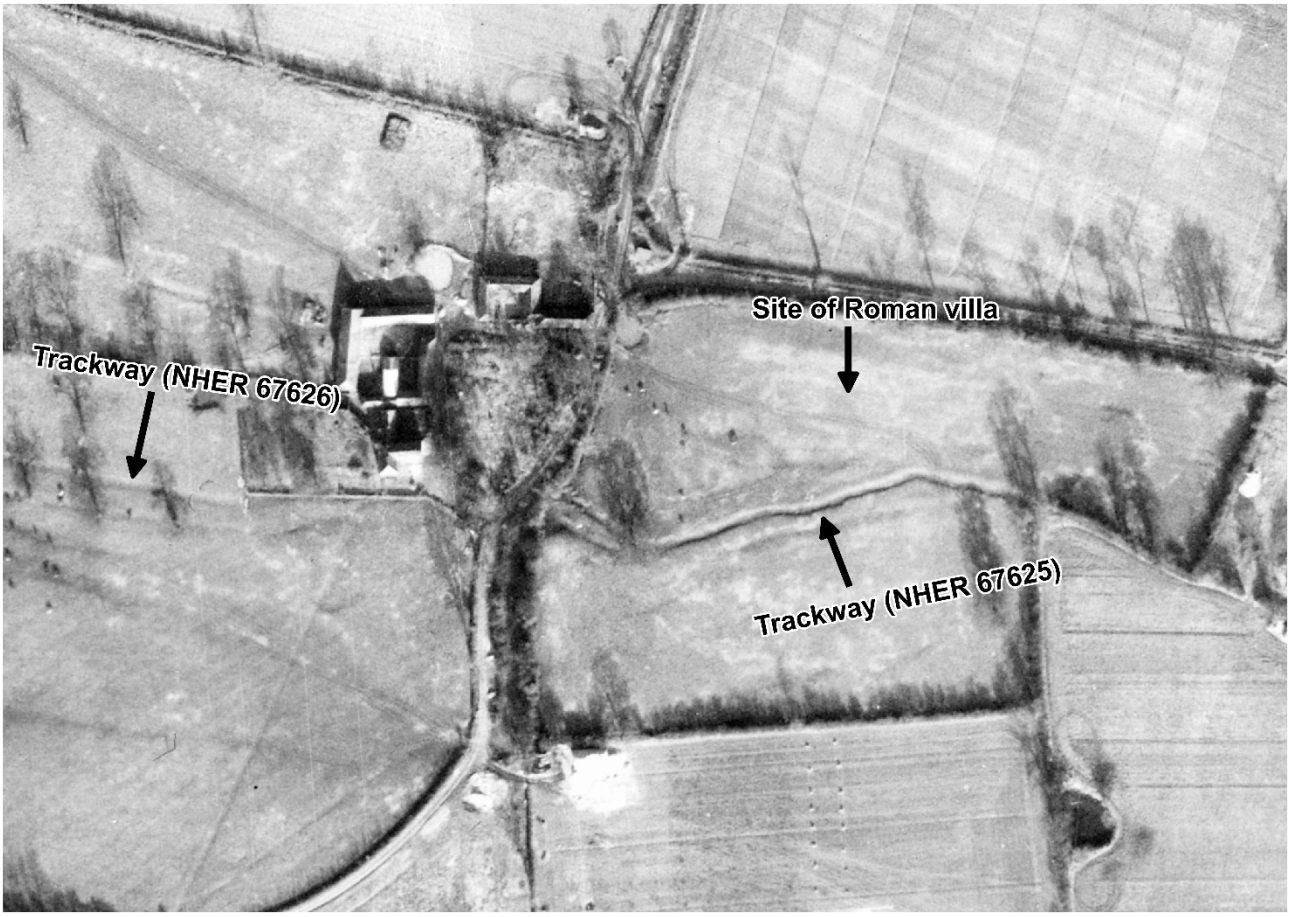

Figure 14. Extract of an aerial photograph taken in 1946 covering the Roman villa site at Necton. Photograph: RAF/3G/TUD/UK/52 V 5078 31-JAN-1946 (detail). Source: Historic England Archive. RAF Photography.

At Scarning, in the centre of the project area, the survey identified a rectilinear enclosure of Late Iron Age to Early Roman date from cropmarks visible on aerial photographs (NHER 68218; Fig. 15). Never previously recorded, like the Necton villa it also lay on the Vanguard/Boreas cabling route. The site was not identified until March 2024. Fortunately, although much of the archaeological work along the scheme had already been completed by that time, it was possible for the enclosure to be partially excavated (NHER 66084). A post-excavation assessment has yet to be completed, but pottery of Late Iron Age to Early Roman date was recovered from the enclosure ditch (J. Percival, Norfolk County Council, pers. comm., 25 June 2024).

Figure 15. The Late Iron Age to Early Roman rectilinear enclosure newly identified at Scarning (NHER 68218). Photographic image: earth.google.com 07-AUG-2020 © Google Earth.

A large, previously recorded rectangular enclosure (NHER 60529), visible as cropmarks and of potential Roman date, was mapped in the parish of Kempstone, in the north of the project area (Fig. 16). Linear ditches visible within the interior of the enclosure may relate to internal boundaries or to a smaller rectangular enclosure, potentially dating to a different period. A Roman date for the enclosure and associated internal features has been previously suggested on the basis of the morphology of the site, the large quantity of Roman finds recovered through metal detecting and fieldwalking (NHER 13042), and the proximity of the site to a suggested small Roman settlement and ironworking site (mentioned above; De Bootman 2023, 189–190; NHER 4079). Probable boundary ditches and field boundaries of unknown date (NHER 68096) are also visible as cropmarks in the vicinity of the enclosure. It is possible that some could be Roman in date while others probably date to the medieval to post-medieval period. The large enclosure appears to be cut on its west side by one of the possible medieval to post-medieval field boundaries.

Figure 16. The possibly Roman rectangular enclosure at Kempstone (NHER 60529); a series of field boundaries of an unknown but possibly Roman or medieval to post-medieval date are visible in the vicinity (NHER 68096 and 68535). Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

Figure 17. Lidar visualisation showing sections of probable Roman road to the east of Lexham Hall and park (NHER 68093; area outlined in red); towards the top and bottom of the image these are visible as raised earthworks within areas of woodland and grassland, and in the centre of the image as a low earthwork in an arable field. Lidar source: National LIDAR Programme TF81NE Environment Agency 1m DTM 17 to 24-NOV-2017 © Environment Agency copyright and/or database right 2024. All rights reserved. Simple local relief model visualisation © Norfolk County Council.

As described above, a suggested Roman road between Toftrees and North Pickenham (NHER 3697) traverses the west of the project area. Although the alignment of the road has long been proposed, the project has identified several new sections of physical remains relating to it and has enhanced the records for the previously recorded sections. In the north-west of the project area, new sections surviving as earthworks have been recorded. Some survive as very low earthworks in areas of agricultural land (for example NHER 68071), whilst others appear to be better preserved within areas of woodland and grassland (for example NHER 68092 and 68093, located to the east of Lexham Hall and park; Fig. 17). Additional low earthwork sections of the road can be seen on the visualised lidar data extending beyond the northern limit of the project area. In the south-west, the project has enhanced the record for a section of road (NHER 68526) by mapping additional elements visible as soilmarks on Ordnance Survey vertical aerial photographs taken in 1968. In addition to the mapped segments, the alignment of the road is also visible solidified in the post-medieval and modern field boundaries, particularly in the south-west of the project area.

The cropmarks of a field system of an unknown, but possible Roman date (NHER 67798) was mapped at Fransham in centre of the project area. Finds from multiple periods (including Iron age, Roman, medieval and post-medieval) had been recorded previously from across the site and the surrounding area (for example, NHER 23082 and 23897). It had been suggested that the site relates to an area of Roman settlement due to the density of Roman finds recovered by fieldwalking. This may indicate a Roman date for the features, which comprise a rectilinear pattern of parallel fields or enclosures, with a dominant north-south axis (Fig. 18). They bear some resemblance to co-axial field systems of probably Iron Age and/or Roman date recorded from aerial photographs in east Norfolk, which have themselves been compared to ‘brickwork pattern’ field systems recorded in North Nottinghamshire and South Yorkshire (Albone, Massey and Tremlett 2007b, 26–30). It is also possible, however, that at least some of the features, such as an embanked trackway in the north of the area (not illustrated), could be medieval to post-medieval in date.

Other than the barrow cemetery at Sporle with Palgrave (NHER 4598; described above), where at least one of the barrows – themselves interpreted as being of Bronze Age date – was found to contain Anglo-Saxon burials, no sites known or suspected to date specifically to the Anglo-Saxon period were recorded by the project. It is possible that at least some of the medieval to post-medieval sites described below have origins which pre-date the medieval period but in no instances could features of certain or even probable Anglo-Saxon date be identified.

Figure 18. A field system of unknown, possibly Roman date (NHER 67798) mapped at Fransham. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

Medieval and Post-Medieval

The results of the project were overwhelmingly dominated by sites of medieval to post-medieval date. In many cases there was little in the way of direct dating evidence, and sites were interpreted solely on the basis of their morphology, character, and relationship with other sites and the surrounding landscape. The archaeology recorded by the project reflects the typical settlement pattern of the region, reflecting an early drift away from nucleated villages and towards the edges of commons and greens (Rogerson 2022, 68; Williamson 1993, 169–171). There is also an absence of developed open field systems in Norfolk (Williamson ibid.); Hall characterises Norfolk's fields as 'irregular' (Hall 2014, 64–73, 289–292). This means that there is a scarcity of features that can be regarded as distinctively medieval rather than post-medieval. For this reason, medieval and post-medieval sites are treated here together, as in most cases it was not possible to date sites any more precisely.

Manorial and Moated Sites

The eastern counties possess the highest number of moated sites in England (Wade 1997, 52; Martin 2021). Within Norfolk, their distribution is concentrated on the boulder clay plateau, which stretches from central Norfolk to the south-eastern border of the county (Rogerson 2005). The project area lies in the north-western portion of this broad band, and the project recorded several moated and/or manorial sites across the area it covered. These had for the most part been recorded previously in some form, but the AI&M survey represents the first time that they have been digitally mapped from the aerial sources in a comprehensive and standardised way. It should be noted that while moats are often associated with manorial sites, some moated sites were not manorial, although in Norfolk this is rare outside of the southern boulder clay region (Rogerson 2005, 68). Equally, some manorial sites were never enclosed by a moat (ibid.). It is assumed that the moats recorded by the project all surrounded some type of settlement, although they did occasionally serve other functions (ibid.; Albone, Massey and Tremlett 2007a, 95).

Earthworks and cropmarks relating to the moated manorial site of Drayton Hall, Scarning (NHER 2874; Fig. 19), were recorded for the first time by the project. Its location had been recorded previously from historical Ordnance Survey maps, on which its site was marked. Finds of medieval date had also been recovered. Examination of the aerial sources revealed that the moat still survived as a low earthwork until at least 2017 (it may still survive). Banks and ditches visible as earthworks and cropmarks in the surrounding area (NHER 68208 and 68207) may define external enclosures contemporary with the moated settlement. The site lies at the northern end of an extensive spread of extant and levelled

earthworks, relating to settlement, land division and land use of broadly medieval to post-medieval date which extends south-westwards along Watery Lane (see below; Fig. 26).

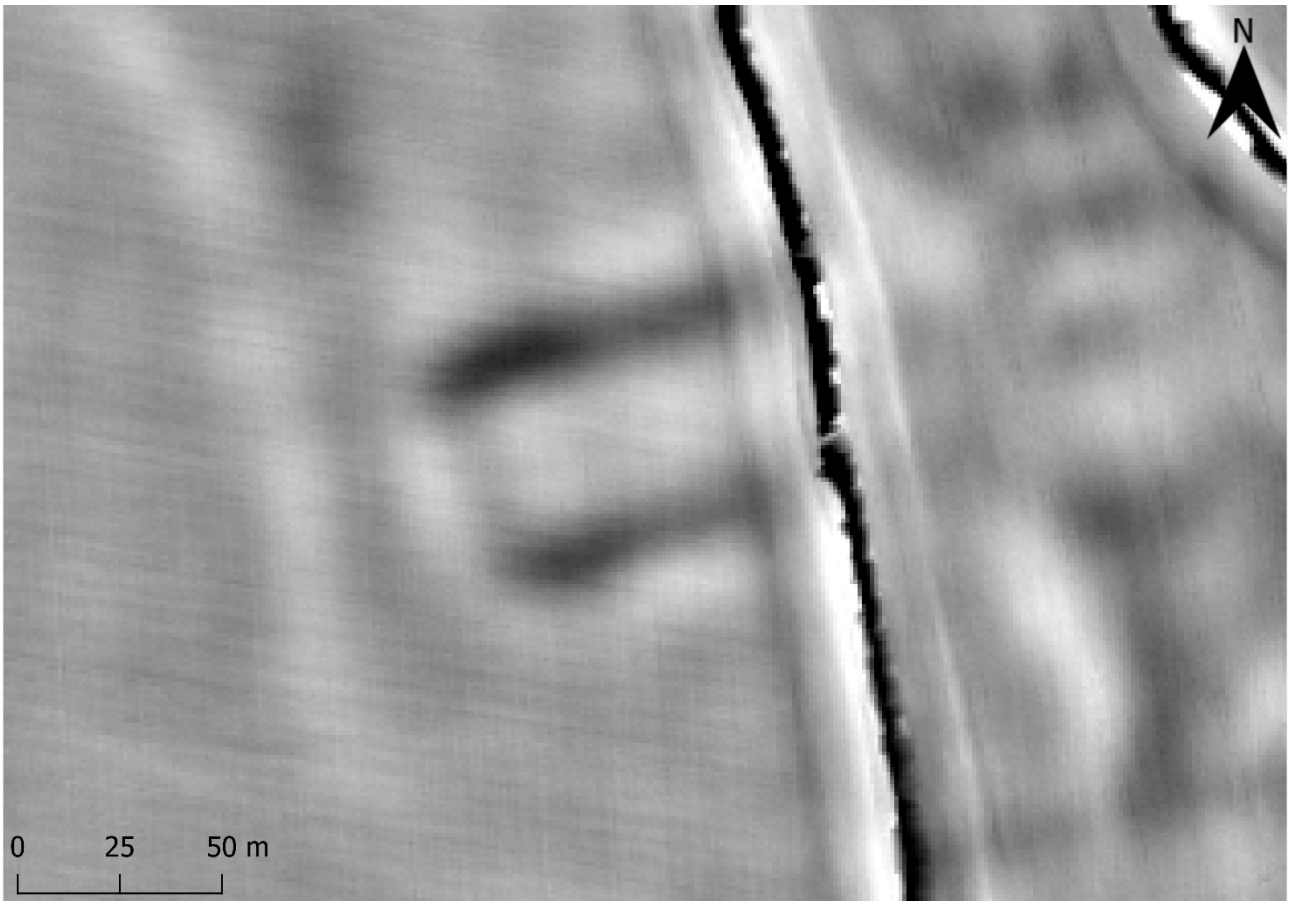

Figure 19. The moated site of Drayton Hall, Scarning (NHER 2874), as visible on visualised lidar data. Lidar source: National LIDAR Programme TF91SE Environment Agency 1m DTM 17 to 24-NOV-2017 © Environment Agency copyright and/or database right 2024. All rights reserved. Simple local relief model visualisation © Norfolk County Council.

To the south-west of the market town of Dereham, a previously recorded moat (NHER 68076; Fig. 20) was mapped within Vicarage Park (NHER 33465). The site is now tree-covered and was mapped from visualised lidar data. The earthworks comprise a broadly square enclosure, matching the depiction of the moat on historical Ordnance Survey maps. Additional features to its east could form part of an outer enclosure contemporary with the moat but could equally be associated with the later park and gardens. An oblong depression to the north (NHER 68075) is perhaps a pond or quarry pit but may be of recent origin.

Records relating to the moat and previous archaeological investigations at the site are somewhat confused, in terms of the extent and character of the remains, and the function

of the site. The medieval house which once stood at the site was originally a grange of the Bishop of Ely, which was later converted into a vicarage (Hollis 1977, 342; NHLE 1077064). The early 19th-century vicarage, The Old Vicarage, which still stands approximately 100m to the north-east of the moat, is recorded as ‘succeeding a large medieval house, the moats of which still remain’ (NHLE 1077064). This suggests that more than one moat existed, and that the medieval house did not occupy the previously recorded moated platform. The ditches recorded to the east of the moat could feasibly form part of a second moated enclosure. The use of the moat’s internal platform remains unclear. Excavations within the moated area in 1964 uncovered the remains of a possible clay-surfaced courtyard (HERR 358810). A field visit in 1978 recorded the presence of a well and scattered building debris (ibid.). Possible features visible on 1946 RAF aerial photographs in the interior of the moat were not mapped by the project, as they appear more likely to relate to modern gardening activity.

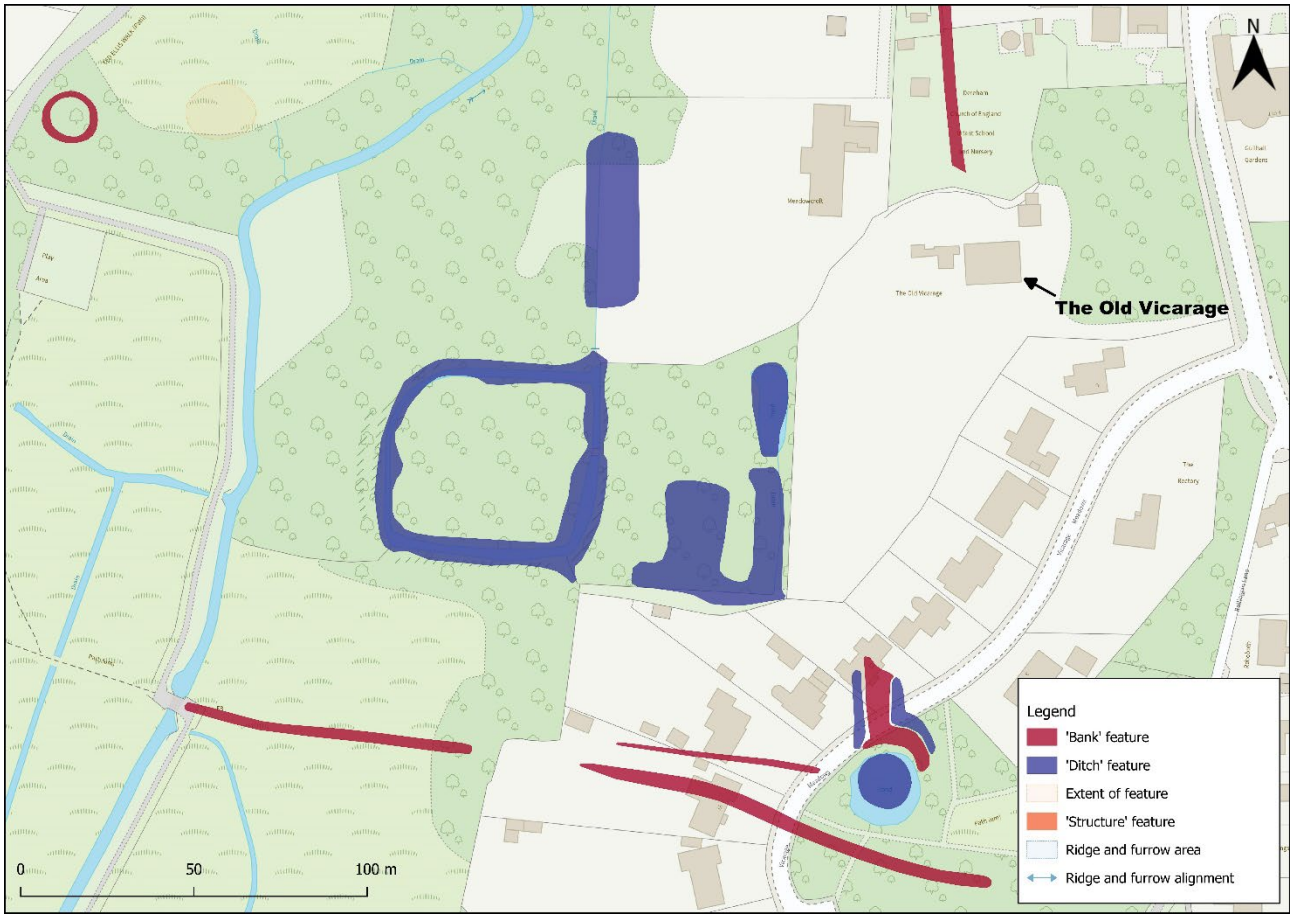

Figure 20. The moated site (NHER 68076) within Vicarage Park (NHER 33465), Dereham. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

A previously recorded moated site at Necton (NHER 4190) in the south of the project area was mapped by the project. The site consists of a large rectilinear moat with internal features most likely relating to boundaries. A rectilinear pit feature within the interior of the moat may mark the site of a building with a cellar. The moat and associated features are visible as earthworks on aerial photographs taken in 1946 (Fig. 21). The site was subsequently levelled and is visible as cropmarks on later aerial photographs (Google Earth 2006, for example). Visualised lidar data, from a survey flown in 2017, shows that the moat remains visible as a very low earthwork within what are now arable fields, and that its south-east corner survives within an area of woodland as a still substantial earthwork. Immediately to the north-east of the moat the earthworks of possible fishponds were also mapped from the 1946 aerial photographs. To its north, the project recorded a series of drainage ditches and boundaries (NHER 67628) and a possible flood bank or causewayed trackway (NHER 67633) which could also be associated with the moated site.

Figure 21. The moated site at Necton (NHER 4190). Base mapping © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

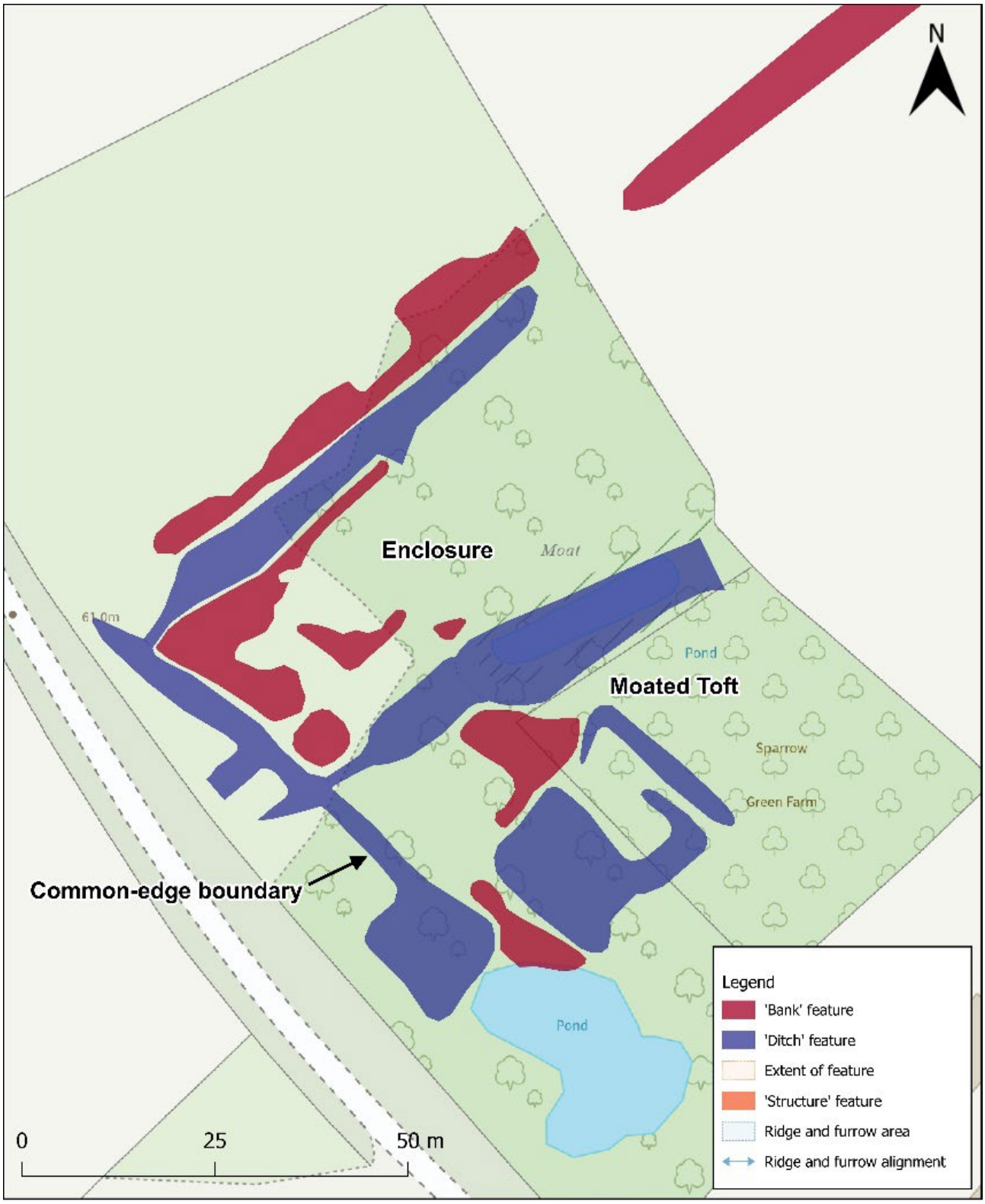

Figure 22. The probable partially moated toft, enclosure and common-edge boundary at Sparrow Green Farm, Gressenhall (NHER 7292). Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

A previously recorded earthwork site at Gressenhall (NHER 7292; Fig. 22) has been variously interpreted as a medieval moat, a double compartment moat, or a part-moated toft and enclosure. A bounding ditch to the south-west has been interpreted as a common-edge boundary (Cushion 1996): the site lies on the edge of Sparrows Green, shown on Faden's 1797 Map of Norfolk. The AI&M mapping for the site broadly accords with an earlier earthwork survey (ibid.), and the interpretation of the earthworks by that survey as a part-moated toft and adjacent enclosure and common-edge boundary seems to fit best with the visible features. A few fragments of Late Saxon and possibly medieval pottery have been found on the site.

Other moated sites recorded by the project include one situated immediately to the south of St Mary's Church, Beeston, the northern arm of which forms part of the boundary of the churchyard (NHER 4090). Scheduled moats at Bradenham and Longham were also mapped (see Appendix 4), including the double moated site at Huntingfield Hall (NHER 1036). Mapping and interpretation of a previously recorded curvilinear moat at Wendling (NHER 7291) and rectilinear moat on low-lying ground at Beeston with Bittering (NHER 25909) suggested that these features were more likely to relate to drainage rather than settlement. The moat that forms part of the monastic site of Wendling Abbey (NHER 7281) is discussed briefly below.

Settlement and Agriculture

Much of the mapping for this period is characterised by enclosures, boundaries, possible building platforms and trackways. Often settlement and agricultural features were intermixed, and are in any case difficult to interpret precisely, so are considered together in the descriptions below. What is clear is that the character of the sites is highly indicative of dispersed settlement, often along roads or common edges. As described above, this is the characteristic settlement pattern of the Norfolk claylands. Numerous blocks of ridge and furrow were recorded, despite such features being regarded as a rarity in Norfolk. In many cases, the ridges were relatively straight, suggesting a post-medieval origin, but in some the width of the ridges, or slight curves in the furrows, could suggest a medieval date. The lack of developed open fields across much of Norfolk means that the ridge and furrow that has been identified can be difficult to interpret; it may as much reflect the need to drain the edge of a strip field, as it does the creation of parallel ridges within a field (Dr A. Rogerson, pers. comm., 21 November 2024).

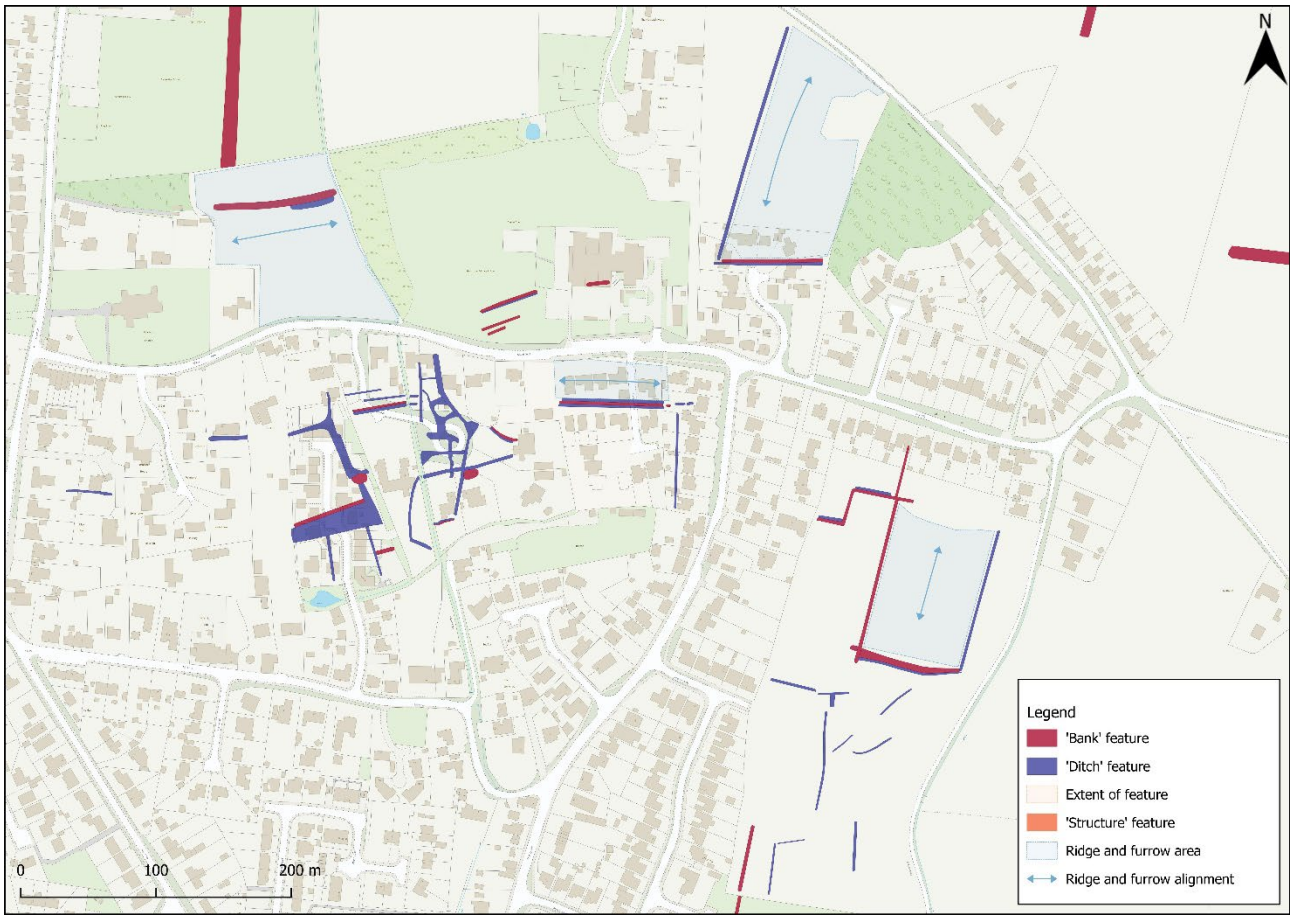

Figure 23. Newly recorded features in the village of Necton, interpreted as relating to medieval to post-medieval settlement and land use. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

Evidence of medieval to post-medieval settlement and agricultural activity was mapped across the project area. Some sites are relatively isolated whilst others, particularly in the south of the project area, are more extensive, either individually or as part of a cluster of broadly contemporary sites. Most sites were mapped as earthworks visible on the 1946 RAF vertical aerial photographs, but some are visible – as well or instead – as crop- and/or soilmarks on aerial photographs of various dates. The survival of such earthworks until the 1940s – and until such time that they could be captured by aerial photography – is unusual within the context of previous AI&M surveys in Norfolk and means that an unusually high density of sites for this period could be recorded by the project. Undoubtedly, and as discussed above, the availability (for much of the project area) of extremely clear vertical aerial photographs from January and March 1946 greatly aided the identification of such sites. In several instances, the features were much harder to recognise, map and interpret from later aerial photographs, even those from later in 1946. Added to this is the

prevalence in this part of Norfolk of small mixed farms, which were probably not only more numerous here in the past than elsewhere, but also survived much later (Dr Andrew Rogerson, pers. comm., 21 November 2024). This appears to have favoured the survival of medieval and post-medieval earthworks until the 1940s in far greater numbers than encountered by earlier AI&M surveys in Norfolk. The post-Second World War amalgamation of farms, the creation of larger fields and the conversion of pasture to arable, a process noted in other boulder clay regions (in Essex, for example, Ingle and Saunders 2011, 14), is also more evident in the aerial photographic record that it was in other areas of the county. Nevertheless, despite the fact that many of the earthworks recorded by the project have been effectively levelled since 1946, visualised lidar data from 2017 shows that at many sites low earthworks still remain. These are so low and spread that they are often only clearly visible on simple local relief model visualisations.

At Necton, in the south-west of the project area, features including a series of boundary ditches, field boundaries and ridge and furrow were mapped as earthworks visible on the 1946 RAF vertical aerial photographs (Fig. 23). Most of the earthworks were subsequently levelled, with some being visible as cropmarks and soilmarks on later aerial photographs.

A newly recorded area of medieval to post-medieval settlement (NHER 67620) was mapped in the parish of Bradenham in the centre of the project area (Fig. 24). The mapped features most likely relate to boundary banks, boundary ditches, a trackway, enclosures, pits and drainage ditches. The substantial embankment partially enclosing the site, and the complexity of the features within it suggests that this is the site of a settlement. The latter include the earthworks of a mound in the centre of the area and a rectilinear pit in the east of the area, both of which may mark the site of former buildings. The mound feature could represent a building platform whilst the rectilinear pit feature could relate to the site of a building with a cellar (it could instead be an area of extraction). The probable settlement site appears to be associated with an area of medieval to post-medieval agricultural features (NHER 67621 and 67622), including ridge and furrow and field boundaries, recorded to its immediate south.

Figure 24. A newly recorded area of medieval to post-medieval settlement (NHER 67620) and possibly associated field boundaries and ridge and furrow (NHER 67621 and 67622) in the parish of Bradenham; probable post-medieval field boundaries are also visible to the west. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping © Norfolk County Council, licensed to Historic England.

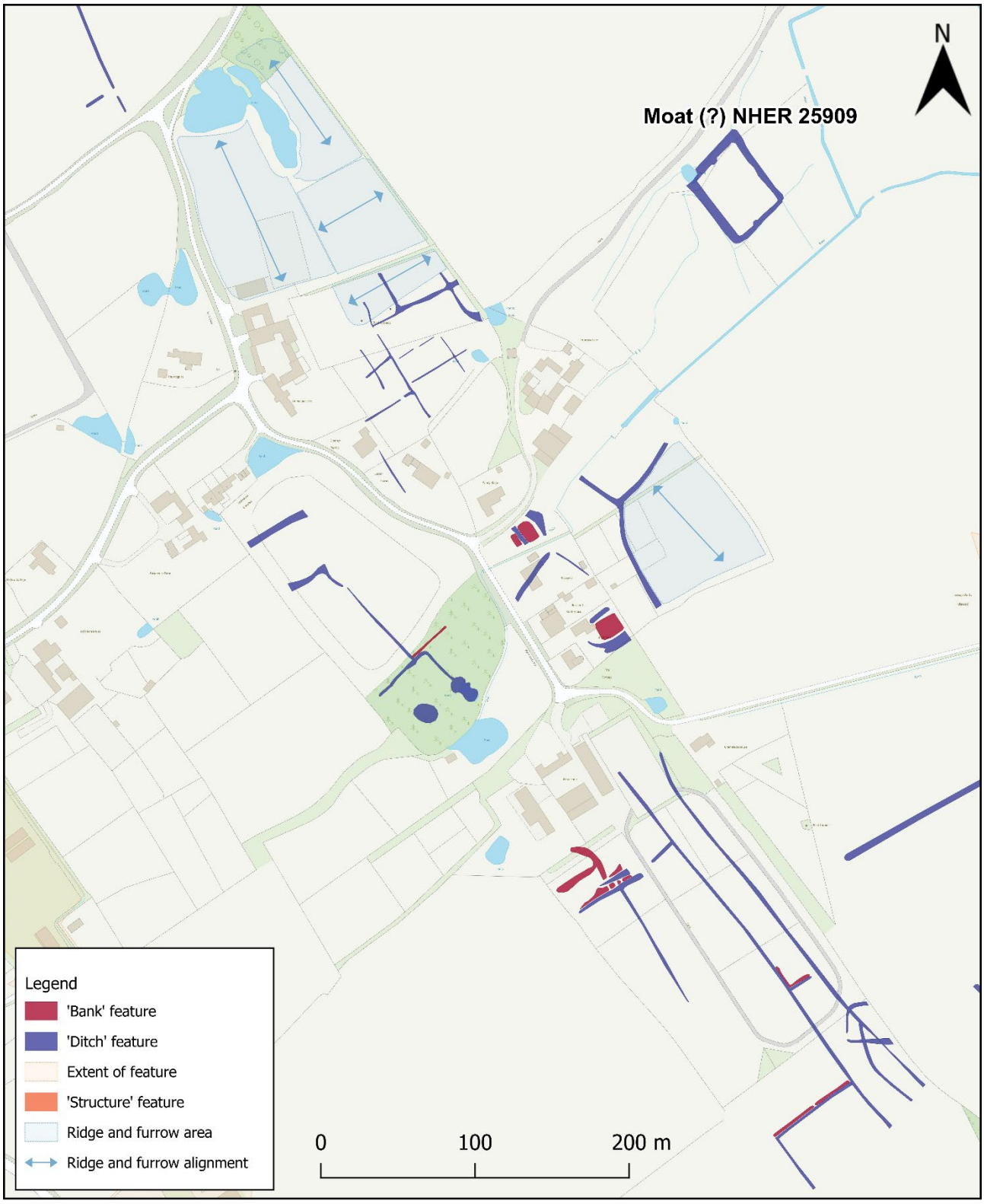

Figure 25. Features recorded in the village of Beeston, interpreted as relating to medieval to post-medieval settlement and land use (also see Fig. 6). Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

In the north of the project area, a previously unidentified area of medieval to post-medieval earthworks relating to settlement and land use was recorded at Beeston (Fig. 25). The features are located on the eastern side of the modern village, adjacent to the area marked as ‘The Green’ on historical Ordnance Survey maps and ‘Bradmore Green’ on Faden’s 1797 Map of Norfolk. The area appears to represent further common-edge settlement, with Faden depicting parts of the area as common. The earthworks comprise features relating to settlement, enclosures (possibly paddocks), strip fields and ridge and furrow (NHER 67649, 67651–67655). Visible on 1940s aerial photographs, the earthworks have mostly been levelled, but visualised lidar data (from a survey flown in 2017) shows that some remnants may still survive. To the north-east, a rectilinear enclosure previously interpreted as a moat (NHER 25909) was also mapped. Situated on low-lying ground and connected to several drainage channels, it is difficult to distinguish from the surrounding drainage system, and its identification as a moat is doubtful.

The moated manorial site of Drayton Hall, Scarning (NHER 2874) has been discussed above. The site lies at the northern end of an extensive spread of features interpreted as relating to settlement, land division and land use, of predominantly medieval to post-medieval date (NHER 68103–4, 68201–9). Although some features are visible to the west of the site (NHER 68209), they are mainly evident extending for more than a kilometre south-westward along Watery Lane (Fig. 26). At their southern extent, they cluster around Old Hall Farm (NHER 2886), a 17th-century and later farmhouse. It is unlikely that all the features are contemporary. A possible Roman and medieval settlement was identified prior to the survey to the north-east of Old Hall Farm, on the basis of metal-detected and surface finds (NHER 53143). Linear ditches and banks recorded in the area of this site (NHER 68104) look more characteristic of land division than settlement and may be of post-medieval date. To the west of the farm, and adjacent to the road, small rectilinear enclosures could be the remains of medieval tofts. South of the road, narrowly spaced, parallel, slightly curved boundary ditches (part of NHER 68201), appear to demarcate strip fields, potentially originating in the medieval period. Several blocks of ridge and furrow – generally fairly straight and narrow, and therefore of probable post-medieval date – are also visible. A similar variety of features is evident between the hall and the farm, where again a long period of use and change is likely, although they all appear to fit the same broad pattern. Taken as a whole, the features recorded by the project – many for the first time – suggest a long history of agricultural activity, with settlement based around the sites of Drayton Hall and Old Hall Farm. The features were mostly recorded as earthworks visible on 1940s aerial photographs. Analysis of visualised lidar data, from a survey flown in 2017, suggests that although most of the earthworks appear to have been levelled, some elements still survive as low earthworks.

Figure 26. Features relating to settlement, land division and land use of probable medieval to post-medieval date recorded between the site of Drayton Hall and the extant farmhouse Old Hall Farm, in Scarning. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

At Wendling, in the centre of the project area, a scattered spread of enclosures, boundaries and possible trackways was recorded to the south of the village (NHER 67808; Fig. 27). Visible as cropmarks on aerial photographs, some of the features had been recorded prior to the survey and interpreted as possible tofts (NHER 13099). Certainly, some of the smaller enclosures and subdivisions could relate to settlement. Other features appear to define land divisions, probably representing field boundaries and perhaps small paddocks. While a medieval origin is likely for at least some of the features, several correspond with divisions depicted on the parish Enclosure map from 1815.

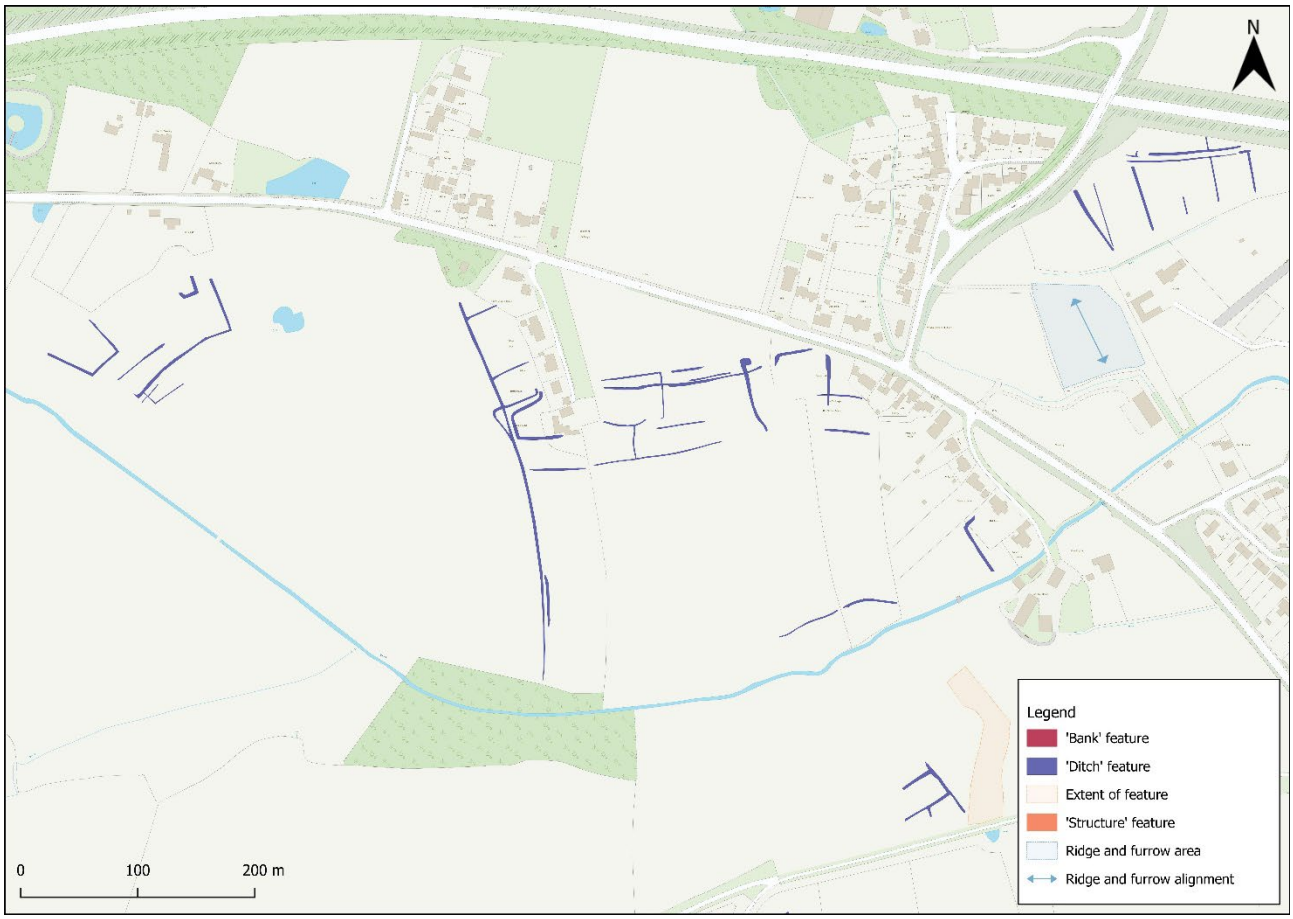

Figure 27. Features relating to medieval to post-medieval settlement and land division (NHER 67808), mapped from cropmarks visible at Wendling. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

Several blocks of ridge and furrow, of probable post-medieval rather than medieval date, were newly recorded on the outskirts of the market town of Dereham (NHER 68068). Visible as earthworks on aerial photographs taken in 1946 (Fig. 28), the area has subsequently been built over. Several of the blocks appear to have been cut by the

Wymondham to Wells railway line (NHER 13588), which was constructed in the mid-19th century.

Figure 28. Probable ridge and furrow of post-medieval date newly recorded to the north-east of Dereham (NHER 68068). Photograph: RAF/106G/UK/1606 RV 6264 27-JUN-1946 (detail). Source: Historic England Archive. RAF Photography.

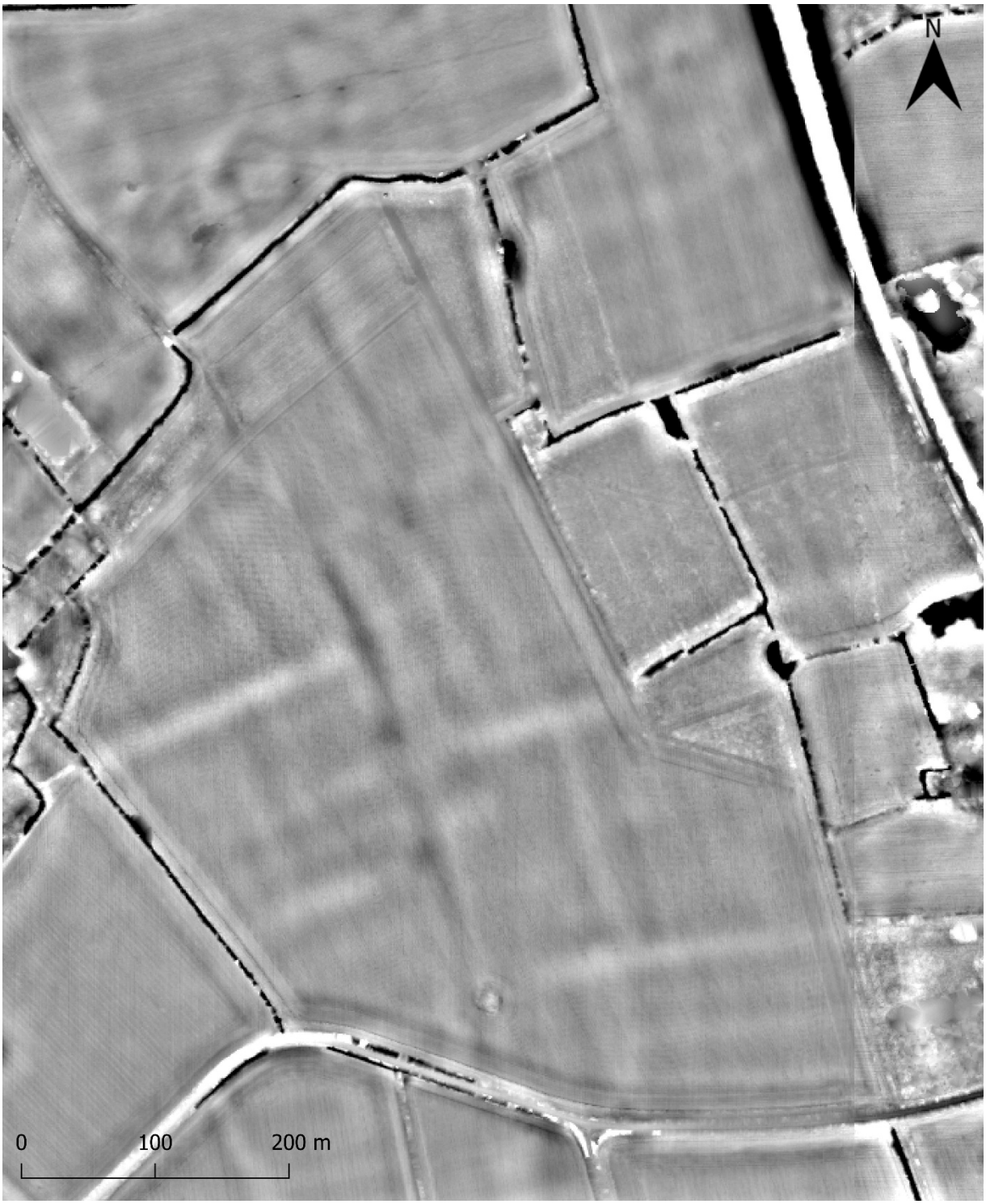

Figure 29. Medieval to post-medieval field boundaries visible as low earthworks on visualised lidar data to the west of the hamlet of Westfield (NHER 68808); the more substantial features correspond with field boundaries on 19th-century maps; faint linear subdivisions within the post-medieval fields may mark the remnants of medieval strip fields. Lidar source: National LIDAR Programme TF91SE and TG01NW Environment Agency 1m DTM 16 to 24-NOV-2017 © Environment Agency copyright and/or database right 2024. All rights reserved. Simple local relief model visualisation © Norfolk County Council.

More isolated medieval to post-medieval field boundaries were recorded across the project area in large numbers, mostly from the visualised lidar data, on which they showed particularly clearly on the simple local relief model visualisations. These boundaries often filled gaps within the field pattern depicted on 19th-century maps, suggesting that while a medieval origin was possible, they can be best understood part of the post-medieval field pattern. Frequently only disjointed fragments were recorded, but in some places larger areas of field system were evident. At these, it was not unusual for the lidar visualisations to have a ‘wobbly’ appearance, with gaps between the more prominent boundaries taken up by poorly defined, parallel ridges or banks (Fig. 29). Too wide for ridge and furrow, they may mark the remnants of strips within the fields. The demarcations between these may have been enhanced to improve drainage (Dr A. Rogerson, pers. comm., 21 November 2024).

Religious Sites

The site of Wendling Abbey (NHER 7281), which is designated as a Scheduled Monument (NHLE 1003964), was mapped by the project. Founded around 1265 as a Premonstratensian house, it was always a relatively small abbey (Knowles and Hadcock 1953, 169). At Dissolution, it was granted to Christ Church, Oxford, in 1546 (Cushion and Davison 2003, 153). The site has already been the subject of various investigations and surveys, including a detailed earthwork survey published in 2003 (Bulwer 1859; Butler 1960; Cushion and Davison, 153, fig. 100). While the AI&M mapping for the site largely accords with earlier surveys, it draws together for the first time all the features visible on the aerial sources, includes those visible on more recent sources such as Environment Agency lidar data (from 2017), Google Earth aerial imagery, and aerial photography available via the PSGA agreement. Strikingly, Google Earth and PSGA imagery clearly show the outline of buildings at the site (as narrow banks and parchmarks; Fig. 30), allowing additional elements to be mapped which had not been recorded by earlier surveys, or at least those readily available for consultation.

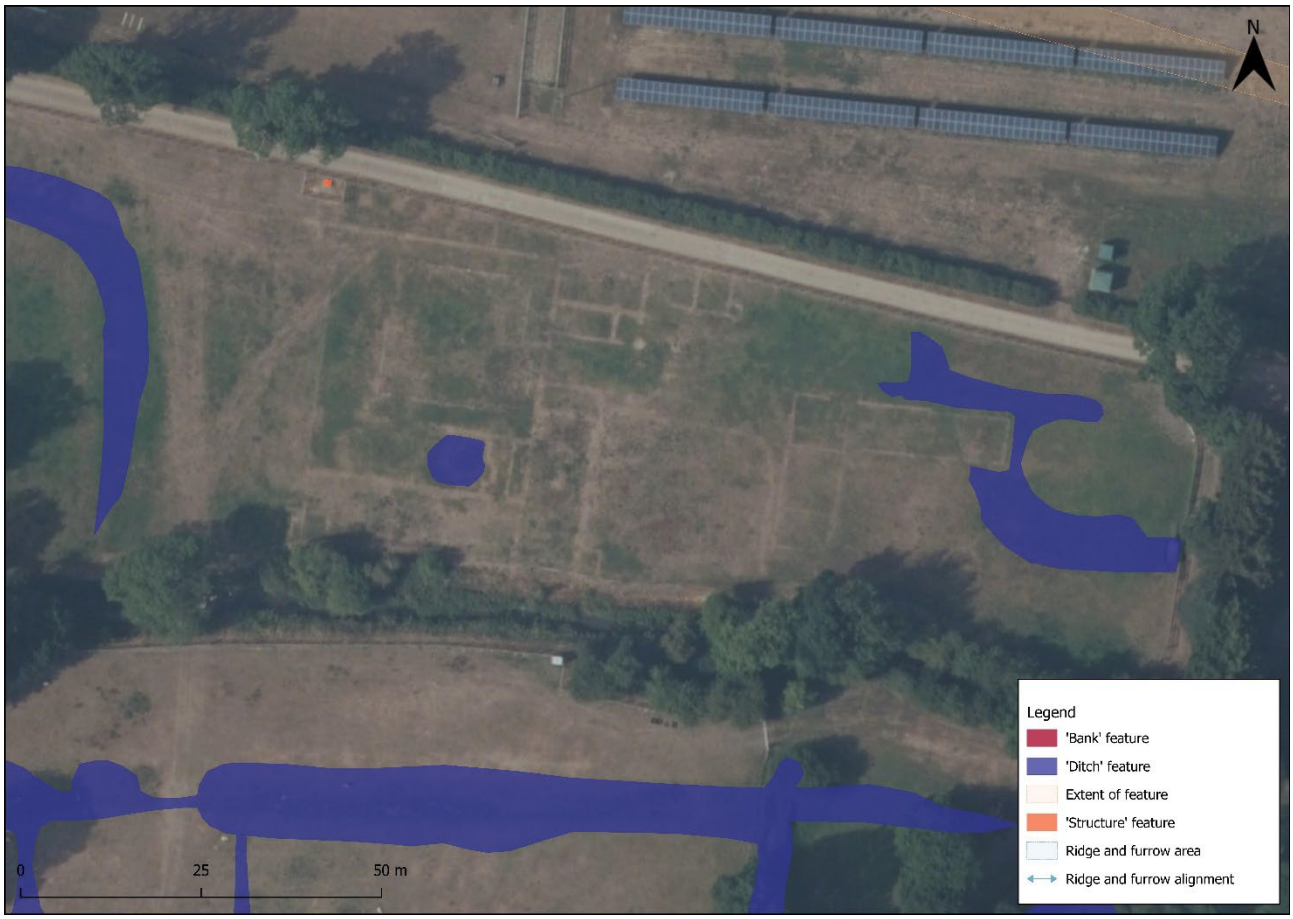

Figure 30. The cloister and buildings of Wendling Abbey (NHER 7281) visible as narrow banks and parchmarks on an aerial photograph. Photographic image: 17-JUL-2022 made available to Norfolk County Council via the PSGA agreement © Bluesky International Limited and Getmapping Limited 1999–2023. Archaeological mapping (partial): © Norfolk County Council, licensed to Historic England.

The results of the AI&M survey provide information not only about the abbey itself but also its surroundings (Fig. 31). A substantial curving ditch and bank to its south (NHER 67809) may represent a routeway or water management feature contemporary with the monastic site. The entire circuit of a suggested moat is also depicted; it is stated in the HER record that the moat pre-dates the foundation of the abbey, but it is not clear on what this is based. The abbey is located on low-lying ground, straddling a stream, and several broad, irregularly defined ditches mapped at and around the site are likely to relate to water management and/or previous courses of the stream. To the north of the abbey buildings, a curving ditch noted in Bulwer's publication of a 1950s survey (Bulwer 1960, 227–228), appeared more like a scarp on the consulted aerial photographs (including those used by Bulwer). Located to the north of the abbey buildings, and depicted by 'extent of feature' on Figure 31, it may be the result of landscaping to create a level and relatively drained area for the construction of the abbey church and monastic complex.

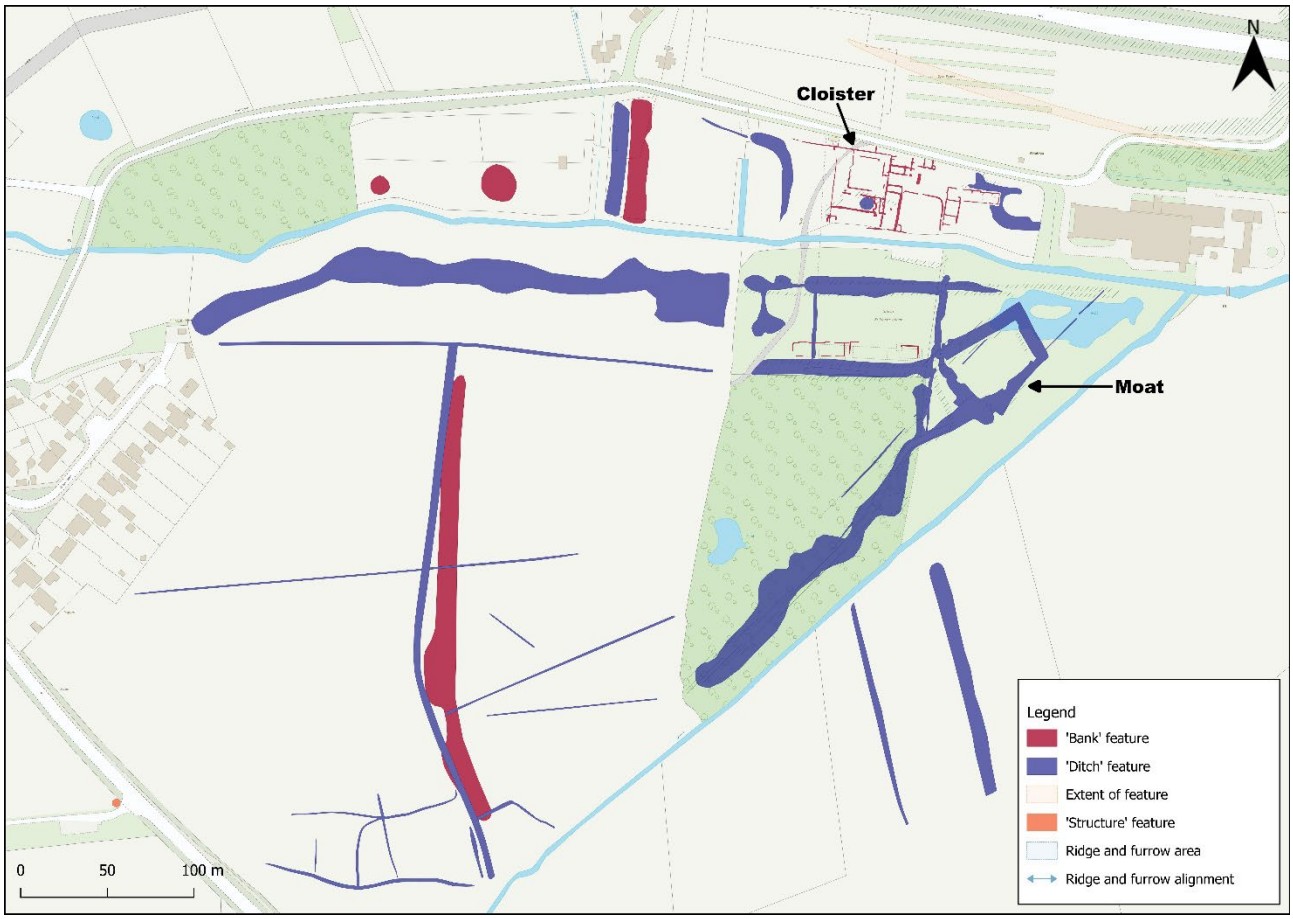

Figure 31. Wendling Abbey (NHER 7281). Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping: © Norfolk County Council, licensed to Historic England.

Earthworks probably associated with the site of a previously recorded Benedictine alien priory cell (NHER 4185) were mapped to the south of St Mary's Church in the village of Sporle, located in the west of the project area (Fig. 32). The site was initially recorded from documentary evidence. The cell was founded before 1123 and dissolved around 1414 (Knowles and Hadcock 1953, 89). It is suggested that the cell would have had at most two or three monks and one prior (ibid.). It was granted to Eton College in 1414 (ibid.). Site visits and fieldwalking undertaken at the site prior to the AI&M survey recorded roughly carved stones, brick fragments and a range of finds from various periods, including medieval pottery (NHER 4185). 'Cropmarks' (more accurately, soilmarks) had also been noted on an aerial photograph from 1976. The features mapped by the project consist of a series of banks, ditches and pits which may relate to the site of the priory cell and possible associated boundaries. They define a broadly rectilinear enclosure with internal pits and a partition. The features are visible as earthworks on the vertical RAF aerial photographs taken in 1946 and on a CUCAP oblique aerial photograph taken in 1955. Most of the

features were subsequently levelled and are visible as soilmarks on the aerial photographs taken in 1976. Some remain visible as very low earthworks on visualised lidar data from a survey flown in 2017.

Figure 32. Features probably associated with the Benedictine priory cell at Sporle (NHER 4185). Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping © Norfolk County Council, licensed to Historic England.

Boundaries and Routeways

Numerous sites relating to boundaries and/or roads were recorded by the project, often as low earthworks visible on the visualised lidar data. In some cases, it was not possible to say for certain whether the site represented a boundary or a road, particularly if there was no readily available cartographic or documentary evidence to better inform interpretation of the site. For the most part, such sites were visible as broad banks or ditches, sometimes with flanking ditches/banks on one or both sides, with little direct evidence of their original purpose. Although mostly recorded as boundaries, the group includes some possible routeways and for this reason both are discussed together.

Multiple sections of parish boundary were mapped across the project area. Several examples of common-edge boundaries were also recorded. Just as common-edge settlement is a characteristic of the project area, the commons themselves were also an important feature of the historic landscape (Barringer 2005, 85; Rogerson 2022, fig. 7.1, for example; Williamson 1993, 169). These were sometimes furnished with banks and/or ditches defining their extent and potentially limiting the movement of grazing animals. At Beetley, part of a common-edge boundary (NHER 68033; Fig. 33) was newly recorded from Google Earth photography examined as part of the volunteering project. Visible as a double ditch making a distinctive dogleg, it matches closely the outline of Hoe Common depicted on Faden's 1797 Map of Norfolk. While this indicates that the boundary was in use in the late 18th century, evidence from elsewhere suggests that the boundaries of at least some commons and greens changed very little over several centuries (Barringer 2005, 84), so an older origin is plausible.

Figure 33. Part of the boundary of Hoe Common, depicted on Faden's 1797 Map of Norfolk, visible as cropmarks at Beetley (NHER 68033). Photographic image: earth.google.com 02-JUL-2006 made available to Norfolk County Council via the PSGA agreement © Bluesky International Limited and Getmapping Limited 1999–2023.

At Scarning, sections of a broad bank, generally flanked on one or both sides by ditches, was recorded from low earthworks visible on visualised lidar data (NHER 68545; Fig. 34). In many instances the banks correspond to field boundaries, depicted on 19th- and early 20th-century maps. For this reason, they would not normally fall within scope for recording by the project, but the fact that together they form a sinuous boundary stretching for more than a kilometre made them slightly unusual. They appear to represent the remains of an extensive boundary, subsequently divided by and fossilised within the post-medieval field pattern. Although not now followed by a parish boundary, it appears to correspond with the hundred boundary depicted on Faden's Map of Norfolk, running east-west to the north of Daffy Green and Huntingfield Hall. If its interpretation is correct, it would have marked the boundary between South Greenhoe hundred to the south and Launditch hundred to the north.

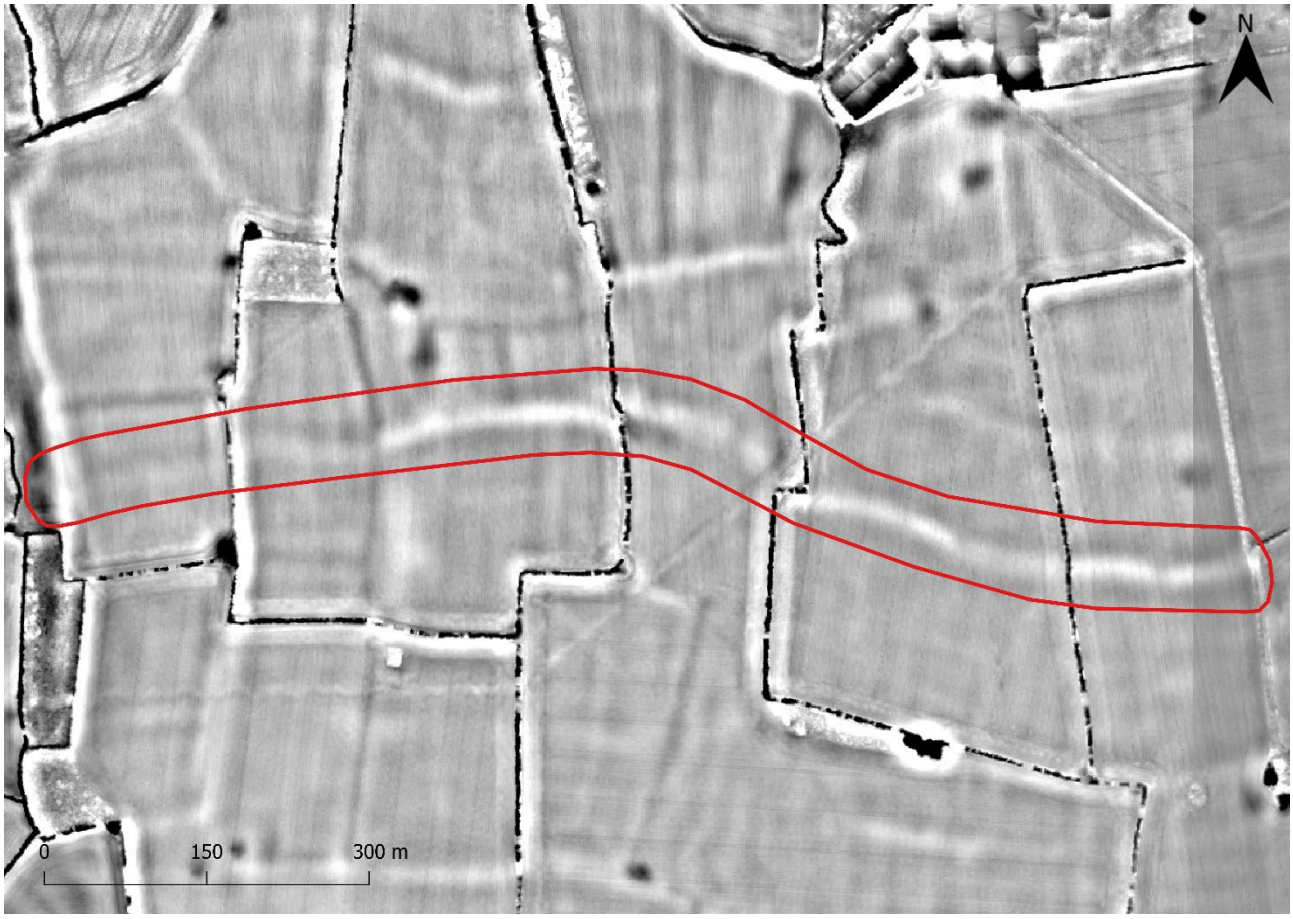

Figure 34. Segments of earthwork bank at Scarning, visible on visualised lidar data, which appears to correspond with a hundred boundary depicted on Faden's 1797 Map of Norfolk. Lidar source: National LIDAR Programme TF91SW and TF91SE Environment Agency 1m DTM 17 to 24-NOV-2017 © Environment Agency copyright and/or database right 2024. All rights reserved. Simple local relief model visualisation © Norfolk County Council.

At Mileham, on the north-eastern edge of the project area, a low earthwork bank visible on aerial photographs and visualised lidar data probably relates to a former common edge boundary or a road/track of post-medieval – possibly medieval to post-medieval – date (NHER 66996; Fig. 35). It lies on the northern edge of an area marked as 'Longham Common' on Faden's 1797 Map of Norfolk. Faden depicts several roads or tracks crossing the common or skirting its northern edge, and it is likely that this feature – newly identified by the project – corresponds with one of these, or with the edge of the common itself.

Figure 35. Part of a probable common-edge boundary or road/track of post-medieval date (NHER 66996) visible as a low earthwork bank and soilmark on the northern edge of former Longham Common. Photograph: RAF/3G/TUD/UK/51 V 5048 31-JAN-1946 (detail). Source: Historic England Archive. RAF Photography.

Sections of a previously recorded earthwork bank (NHER 16095; Fig. 36) were mapped at Fransham in the centre of the project area. The sections of bank most likely relate to a medieval road known by the 15th century as Southgateway or Greneway (Rogerson 2022, 40). It has been suggested that the road has earlier origins and may have been in use during the Roman period (ibid.). Once out of use, the eastern sections of the road appear to have been solidified into the landscape and correspond with post-medieval boundaries mapped on the Tithe map and historical Ordnance Survey maps. The sections of bank had

previously been recorded from field visits and also from soilmarks visible on aerial photographs. The project has extended the recorded extent of the physical remains of the road by mapping further earthwork sections to the west. These were visible as low spread earthwork banks on visualised lidar data.

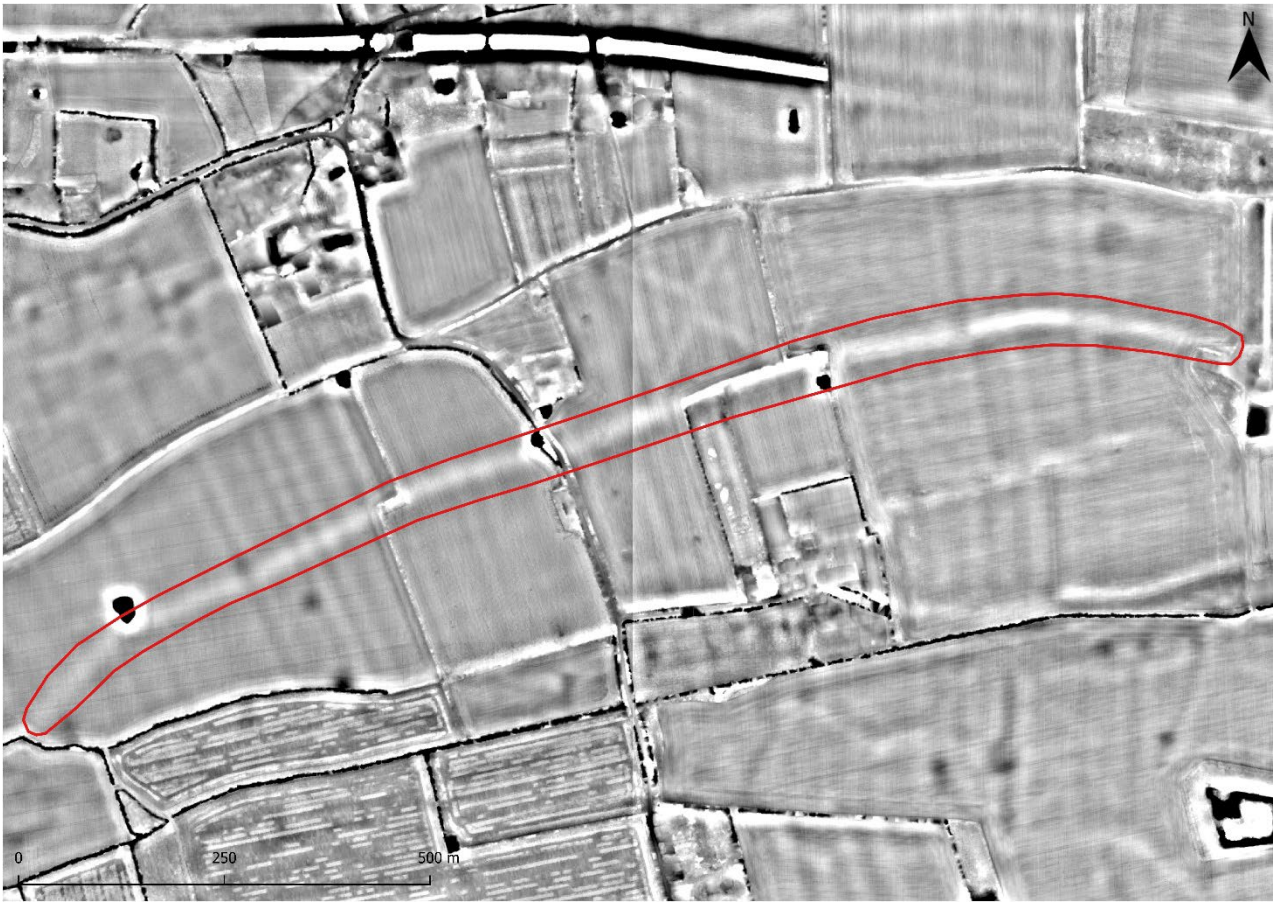

Figure 36. The extent (outlined in red) as visible on visualised lidar data of the medieval road known as Southgateway or Greneway (NHER 16905), located at Fransham. Lidar source: National LIDAR Programme TF81SE and TF91SW Environment Agency 1m DTM 17 to 24-NOV-2017 © Environment Agency copyright and/or database right.

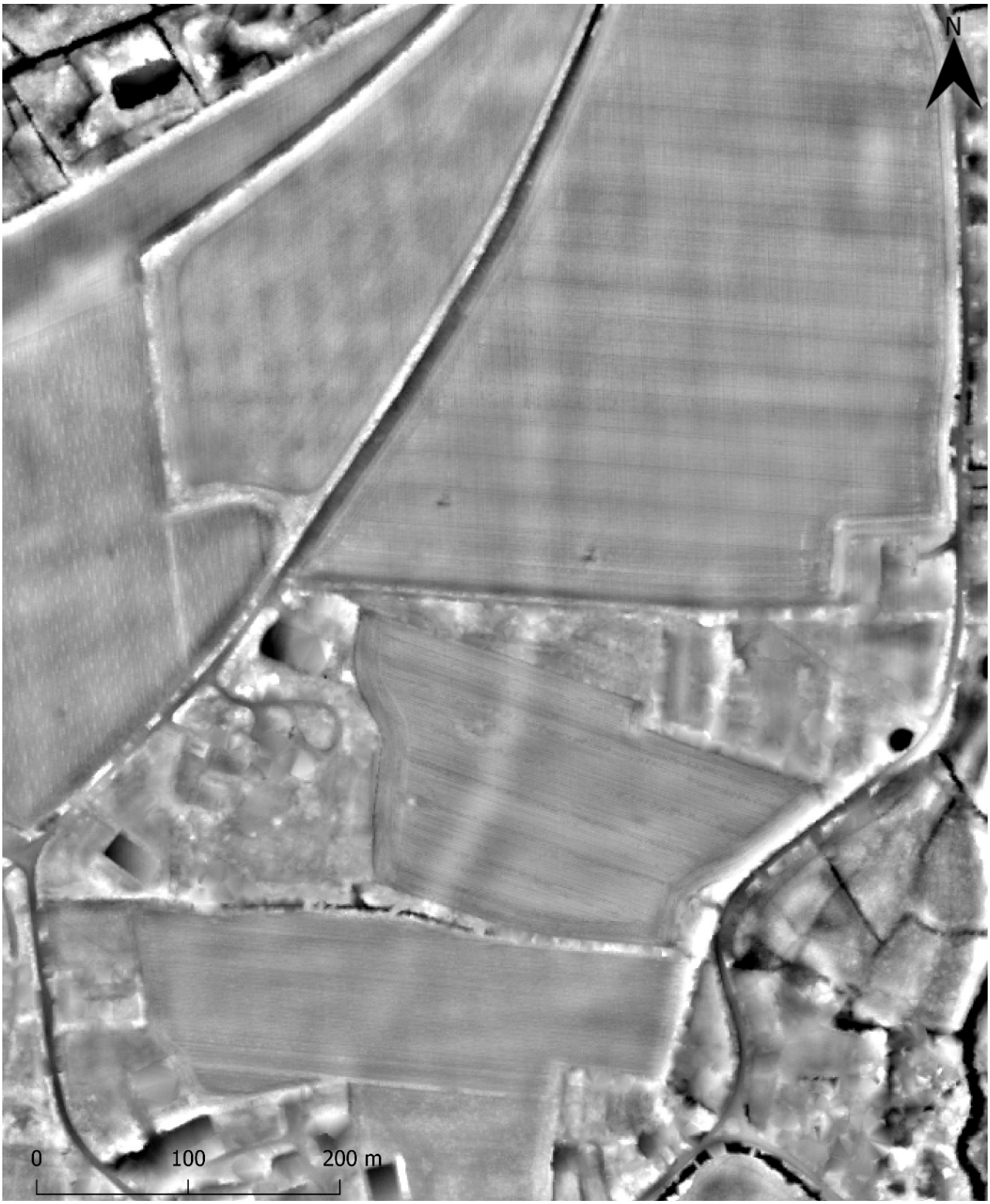

Figure 37. Lidar visualisation showing a newly recorded boundary bank or road to the south of Gressenhall village (NHER 68046). Lidar source: National LIDAR Programme TF91NE Environment Agency 1m DTM 17 to 24-NOV-2017 © Environment Agency copyright and/or database right 2024. All rights reserved. Simple local relief model visualisation © Norfolk County Council.

What appears to have been a substantial boundary, road or track (NHER 68046; Fig. 37), now visible as a low spread earthwork on visualised lidar data, was newly identified at Gressenhall as part of the volunteering project. It could be part of a former road, but lies between two extant roads, both shown on Faden's 1797 Map of Norfolk, and it is not clear what function it would have served in this landscape, unless it was significantly earlier than the road layout shown by Faden, the origins of which could well be medieval. It could be a drive or track leading to a late 18th-century farmhouse, Hall Farm (NHER 46213), which lies at its southern end. It is not, however, shown on Faden's Map (the farmhouse is), it cuts across other properties and boundaries depicted on historical Ordnance Survey maps (a tree belt to the south of a nearby rectory, for example) and the farmhouse was already well-served by roads on its southern side A third possibility is that it could be part of the boundary of the medieval to post-medieval Gressenhall Park (NHER 50576; described in more detail below). Although located significantly further to the east than the current recorded boundary of the park ('C' on Fig. 39), it could relate to an earlier or later change to its extent.

Parks and Gardens

The project area contained only one Registered Park or Garden. Lexham Hall (NHER 4089) and its associated park and gardens (NHER 30469; NHLE 1000268) is located in the north-west of the project area. The hall dates to the 17th century with later remodelling and enlargements undertaken in the 18th,19th and 20th centuries. The associated grounds consist of a late 20th-century formal garden surrounded by 18th-century parkland, which was further expanded in the 19th century.

Within or adjacent to the boundary of the Registered landscape, the AI&M survey mapped a series of new and previously recorded sites (Fig. 38). These included features relating to the pre-park landscape, such as the previously recorded earthworks of a Scheduled Bronze Age round barrow (NHER 13546; NHLE 1021126) and two previously recorded medieval moated sites, suggested to be the sites of Rogues or Rowess Manor (NHER 4082) and Lexham Manor (NHER 13544).

Contemporary with the park, the project mapped various earthwork banks and ditches (NHER 68089 and NHER 68210), which most likely relate to post-medieval parkland features, boundary banks and trackways. The newly recorded earthworks of what may have been a post-medieval to modern plant bed or ornamental garden feature (NHER 68090) were mapped to the south of the hall. An earthwork mound of unknown date (NHER 68095) was recorded in the north-east of the park. Although recorded for the first time, it is similar in form to other low earthwork mounds (NHER 11921 and NHER 55662) previously recorded in the surrounding area. It is possible that some or all of the mounds

are the remains of Bronze Age round barrows, or they could be post-medieval features associated with the park, such as tree mounds, vantage points or sites of ornamental statues. The project also enhanced the record for an area of previously recorded post-medieval floated water meadows (NHER 68087) visible to the south-east of the hall on aerial photographs taken in 1946. The water meadows within Lexham Hall park (referred to as East Lexham) have been previously discussed by Wade-Martins and Williamson (1994, 25 and 31) alongside further examples from across the county. It is presumed that the earthworks associated with the water meadows were levelled during the extension of the modern lake.

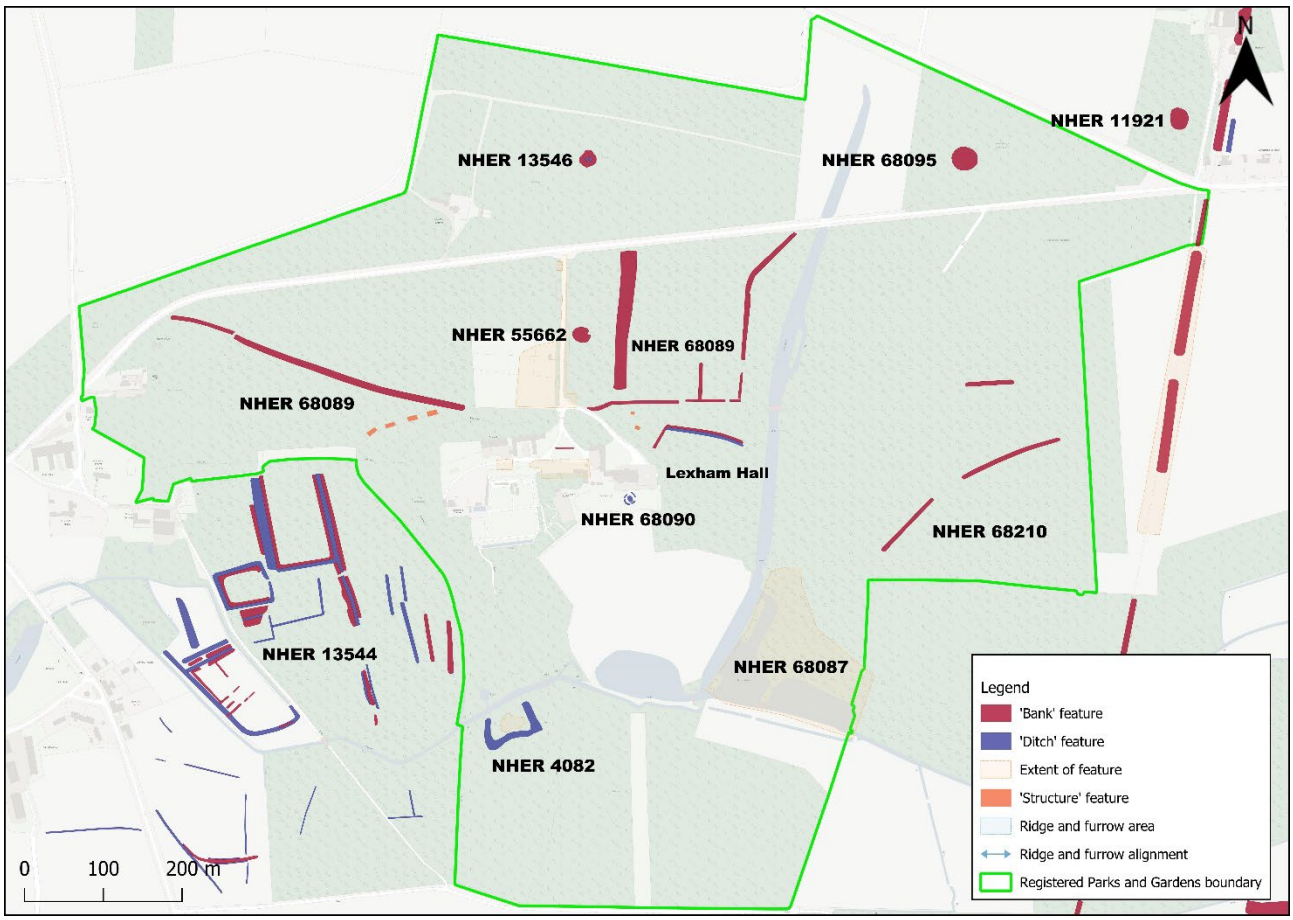

Figure 38. New and previously recorded sites mapped by the project within and close to the Registered Park and Garden of Lexham Hall (NHLE 1000268; boundary shown as green). Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping © Norfolk County Council, licensed to Historic England.

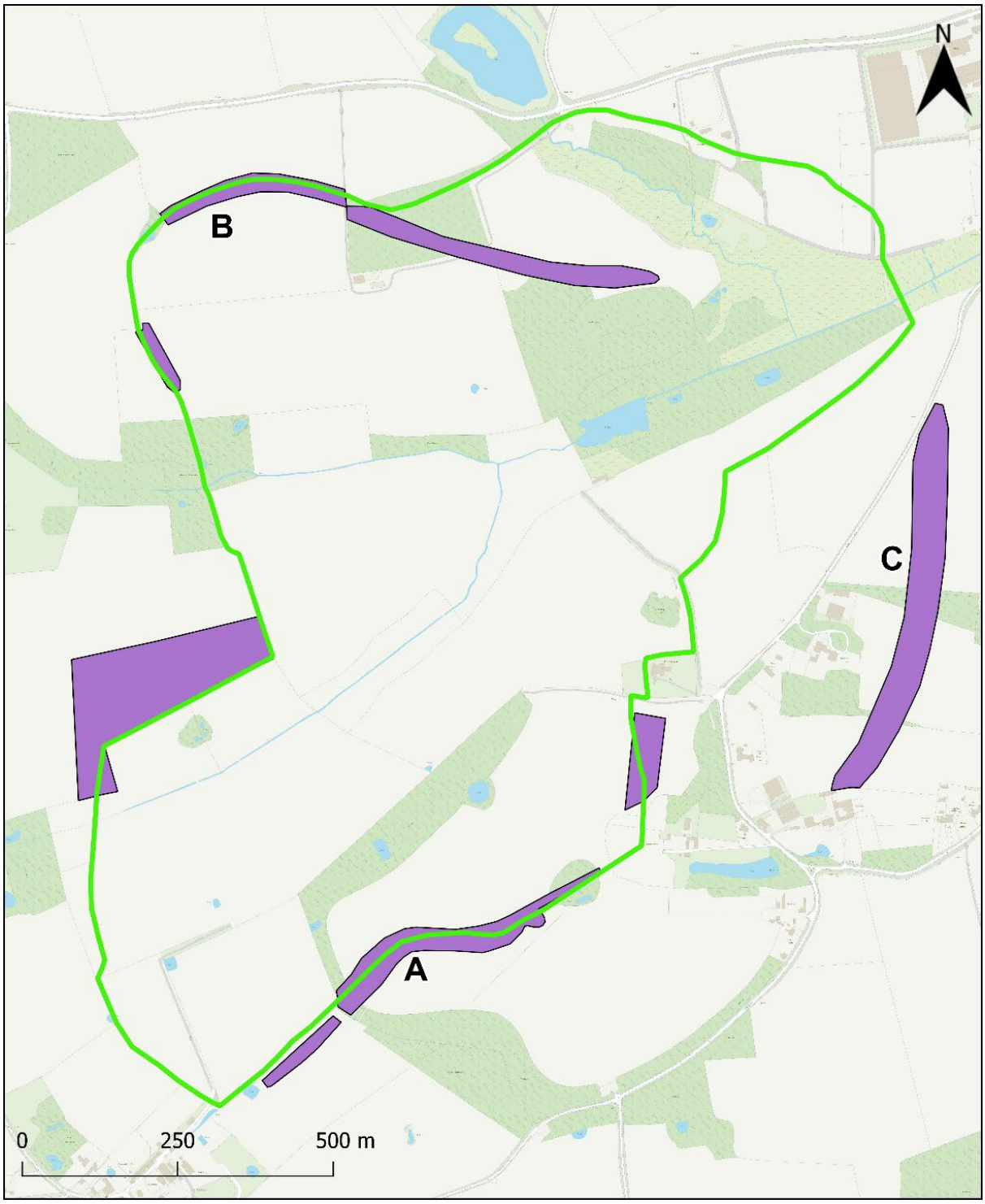

Figure 39. The recorded outline of the earlier Gressenhall Park (NHER 50576; shown as green), based on a 1624 map; Monument polygons relating to probable or possible sections of its boundary recorded by the project are shown in purple; some deviate significantly from the recorded outline, but may represent parts of earlier or later layouts; Figures 40, 41 and 37 show individual sections marked 'A', 'B' and 'C' above. Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping © Norfolk County Council, licensed to Historic England.

Figure 40. A ditched boundary, visible as an earthwork on 1946 aerial photographs (NHER 68223), which corresponds with part of the recorded outline of Gressenhall Park (NHER 50576; 'A' on Fig. 39); the section within the oval copse (top right) is still visible as a prominent ditch earthwork on visualised lidar data from a survey in 2017, while the remainder shows as a low, spread earthwork bank. Photograph: RAF/3G/TUD/UK/100 V 5343 30-MAR-1946 (detail). Source: Historic England Archive. RAF Photography.

Located in the north-east corner of the project area, and straddling both the AI&M survey area and the volunteer project area, modern Gressenhall Park (NHER 51031) comprises a relatively small area of gardens and parkland which once surrounded Gressenhall House (NHER 2823). The current extent of the park was established by at least the late 18th century, as it is depicted on Faden's 1797 Map of Norfolk. The extent of an earlier, larger park (NHER 50576) was first fully recorded by the Norfolk Aggregates Assessment NMP project (Albone, Massey and Tremlett 2008, 66), principally on the basis of a 1624 map of Gressenhall, but also from sections fossilised in modern field and woodland boundaries, and visible as cropmarks on aerial photographs. It is possible that the replanning of the park occurred during the 18th century, when a new house appears to have been constructed on the site of the earlier hall (NHER 2823).

The current project has enhanced the record for the park, by recording additional sections – or possible sections – of the earlier park boundary (Fig. 39). For example, on the southern boundary, a sinuous earthwork ditch with low flanking banks (NHER 68223; Fig. 40; ‘A’ on Fig. 39), visible on 1940s RAF aerial photographs and on visualised lidar data from 2017, corresponds with the recorded outline of the early park. Although under arable cultivation and now substantially levelled, a section traversing a small oval copse is still evident as a prominent earthwork on the visualised lidar data. On the northern boundary, two curving parallel ditches (NHER 68236; Fig. 41; ‘B’ on Fig. 39), again corresponding with the recorded park boundary, were identified as cropmarks visible on Google Earth photography as part of the volunteering project. To the east of the recorded extent of the park, a broad bank, visible on visualised lidar data, could also relate to the earlier park (NHER 68046; ‘C’ on Fig. 39; described in greater detail above, and see Fig. 37). The date and function of the bank are not known but although it lies some distance to the east of the recorded park boundary, it could feasibly represent a remnant of a park layout pre-dating that shown on the 1624 map or dating to the period between 1624 and the late 18th century.

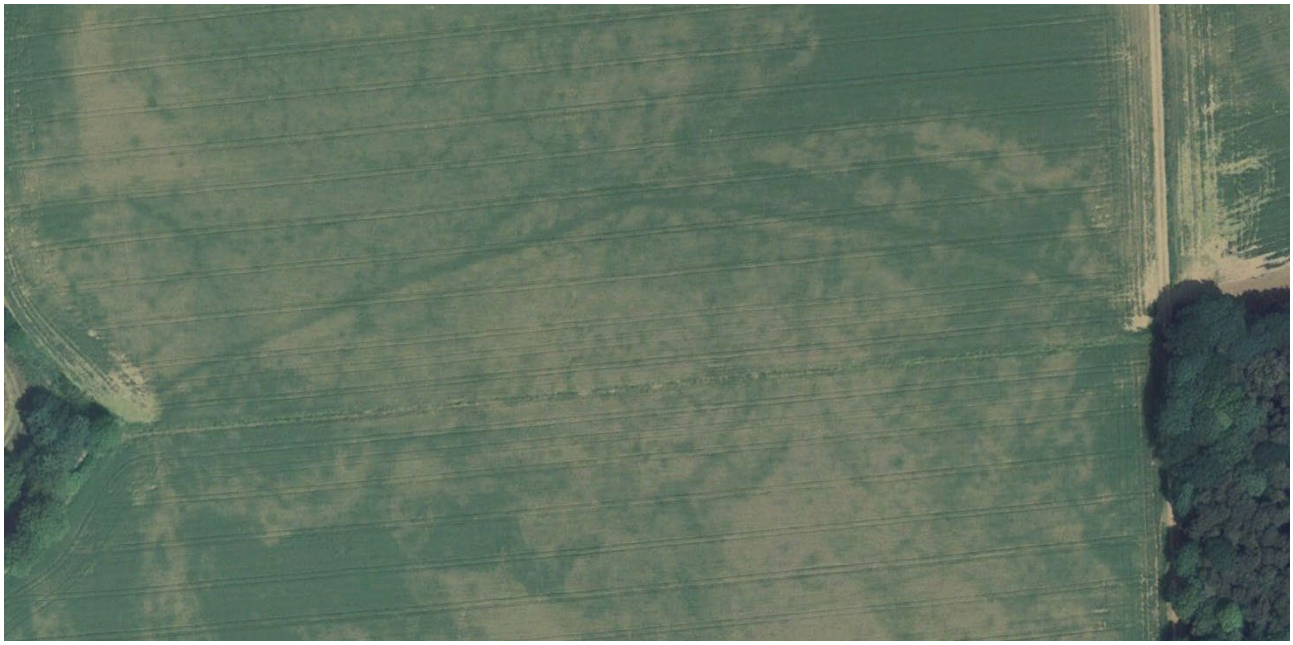

Figure 41. A double ditched boundary (NHER 68236), visible as cropmarks, which corresponds with part of the recorded outline of Gressenhall Park (NHER 50576; ‘B’ on Fig. 39). Photographic image: earth.google.com 02-JUL-2006 © Google Earth.

20th-Century Military Sites

All of the 20th-century military sites mapped and recorded as part of the project date to the Second World War. For the most part they were mapped from contemporary or near-contemporary 1940s aerial photography.

Wendling Second World War airfield (NHER 7275) is situated in the north-east of the project area and was the largest Second World War site to be mapped. The airfield was built for the USAAF Eighth Air Force in 1942 and opened in August 1943 (McKenzie 2004, 115). The only unit to operate from Wendling during its use by the USAAF was the 392nd bomb group, flying B24 Liberators. The 392nd left Wendling in June 1945, when the airfield was handed back to the RAF (ibid.). After the war, the airfield never hosted flying units again but was still in use until 1961, before being sold off in 1963 (ibid.). Recent aerial photographs (Google Earth 2022) show the runways occupied by poultry sheds.

Figure 42. Wendling airfield (NHER 7275) in 1944. Photograph: US/7PH/GP/LOC276 V 5046 18-APR-1944 (detail). Source: Source: Historic England Archive. USAAF Photography.

The RAF and USAAF 1940s vertical aerial photographs were a key source for mapping and recording the airfield and its associated structures, as they show the airfield whilst still in operation. The airfield is visible under construction on the 1942 RAF aerial photographs

and is clearly visible on USAAF aerial photographs taken in 1944 (Fig. 42). The airfield was primarily mapped from the 1945 RAF aerial photographs, as they showed the site at its most complete and were the clearest aerial source.

The main elements of the airfield visible on the 1940s aerial photographs include the runways, control tower, technical site, T2 hangars, groups of huts, hardstanding, roads, dispersal pens, butts, sewage works, large letters relating to the airfield's pundit code for the identification of the airfield from the air, signal square and earthworks possibly relating to emplacements for defence. To the west of the main airfield, groups of huts relating to accommodation and support structures (NHER 68043) interconnected by a series of roads, pathways and trackways are visible, along with above ground and below ground air raid shelters and compounds, the latter most likely used for storage.

The bomb store for Wendling Airfield (NHER 35925) lay a short distance to its east, within an area of woodland known as Honeypot Wood. The site is now a Norfolk Wildlife Trust reserve, and its northern half is recorded as Ancient Woodland (NHER 49112). Previously recorded by Ordnance Survey mapping, aerial photographs and ground photography/site visits, the fantastic preservation of earthworks and structures relating to the bomb store is clearly apparent from the visualised lidar data (Fig. 43).

The dismantling of the airfield in a piecemeal fashion over time can be seen on the aerial photographs. Elements of the airfield, including sections of runway, areas of hardstanding, sections of perimeter track, some of the huts, buildings and roads can still be seen as extant features on more recent (2018 and 2022) aerial photographs. The earthworks of some of the underground shelters and the bases of some of the removed huts are also visible on the recent aerial photographs (2018 and 2022) and relatively recent (2017) visualised lidar data.

Figure 43. Visualised lidar data showing elements of the bomb store (NHER 35925) for the Second World War Wendling airfield surviving within Honeypot Wood; some earlier features are also visible. Lidar source: National LIDAR Programme TF91SW Environment Agency 1m DTM 17 to 24-NOV-2017 © Environment Agency copyright and/or database right 2024. All rights reserved. Multi-direction hillshade visualisation © Norfolk County Council.

It can be noted that within the areas of Second World War activity at Wendling airfield, archaeological features relating to earlier periods are also visible. For example, the earthworks (since levelled) of medieval to post-medieval ridge and furrow (NHER 68042), were recorded between areas of accommodation and support structures to the west of the

runways. Fragments of a previously recorded, probably medieval to post-medieval field system – including a rectilinear enclosure (NHER 36135) – were overlain by the Second World War runway (Fig. 44). The earthworks of a moat, which was probably the site of a medieval manor (NHER 7274), are situated within the interior perimeter track on the eastern side of the airfield. The former airfield is also crossed by the supposed line of the prehistoric or Anglo-Saxon Launditch linear earthwork (NHER 7235; described above), parts of which were recorded by the project within the northern perimeter runway. To the south, field boundaries once thought to have marked the course of the Launditch are now understood to be the result of a reorganisation of the fieldscape in the early 19th century (Wade-Martins 1974, 28–29).

Figure 44. Rectilinear enclosure and field system of probable medieval to post-medieval date (NHER 36135) overlain by the perimeter track of Wendling Second World War airfield (NHER 7275). Base mapping: © Crown copyright and database rights 2024 Ordnance Survey AC0000851272. Archaeological mapping © Norfolk County Council, licensed to Historic England.

A newly recorded military camp (NHER 68088) was mapped at Lexham Hall (NHER 4089) in the north-west of the project area (Fig. 45). The mapped features consist of a series of accommodation huts, storage huts, support structures, roads and a possible water tower.

Some of the probable accommodation huts are visible close to an area of trees which were presumably used for cover from aerial reconnaissance. The Norfolk HER records that Lexham Hall was occupied by the Royal Army Service Corps from 1939 to 1945, and it is likely that the mapped features relate to this phase of activity. Most of the features were removed after 1946, but earthworks relating to some of the huts remain visible on visualised lidar data from a survey flown in 2017.

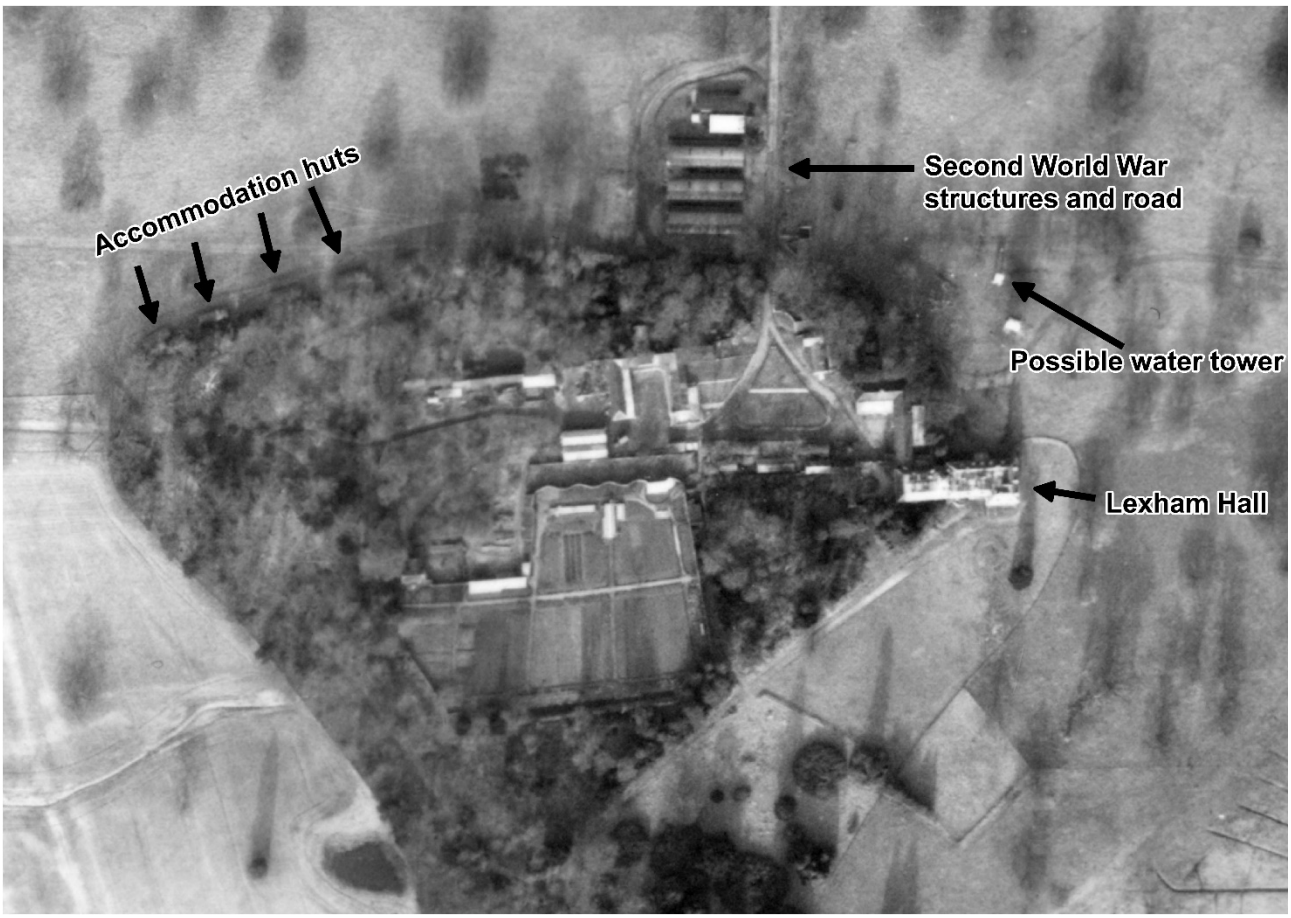

Figure 45. The Second World War military camp (NHER 68088) at Lexham Hall (NHER 4089). Photograph: RAF/3G/TUD/UK/51 V 5222 31-JAN-1946 (detail). Source: Historic England Archive. RAF Photography.

Figure 46. The Second World War searchlight battery to the south-east of Litcham (NHER 36517). Photograph: RAF/3G/TUD/UK/51 V 5042 31-JAN-1946 (detail). Source: Historic England Archive. RAF Photography.

The record for a previously recorded Second World War searchlight battery (NHER 36517), located to the south-east of Litcham in the north of the project area (Fig. 46), was enhanced by the project. The features recorded at the site include a series of huts (most likely accommodation huts and support buildings), structures, gun or searchlight

emplacements, slit trenches, trackways, hardstanding and two possible compounds or enclosures defined by either low earthwork banks or fences. The features are visible as extant buildings, structures and earthworks on aerial photographs taken in 1942, 1945 and 1946. Some elements of the site appear to have been removed before June 1945 with several areas of disturbed ground visible as soilmarks on the aerial photographs taken in 1945 and 1946. These areas may have related to recently removed structures or levelled earthworks. The majority of the remaining earthworks and structures continued to be levelled and removed over time, although some of the features are visible on visualised lidar data from a survey flown in 2017 and probably still survive as earthworks.

Figure 47. Second World War trenches (NHER 68062) to the south of Dereham cemetery. Photograph: RAF/3G/TUD/UK/100 V 5305 30-MAR-1946 (detail). Source: Historic England Archive. RAF Photography.

Several Second World War sites were recorded in and around the market town of Dereham, in the north-east corner of the project area. These mainly comprised pillboxes, sited at strategic locations such as cross-roads and along the railway line, and lengths of trenches (Fig. 47), probably dug as practice trenches or for protection from air raids. A more substantial site, previously recorded in the Norfolk HER and mapped by the project largely by extent, was an Air Ministry railway sidings (NHER 55624), to the east of

Dereham station. Since levelled by more recent development, the sidings were built to supply an Air Ministry munitions depot. Granite chippings and tar were delivered for mixing at an adjacent tar works, with the resulting product being distributed around Norfolk to be used for surfacing airfields (information from Norfolk Industrial Archaeology Society, held as part of NHER 55624). On the 1940s aerial photographs (Fig. 48), the railway tracks are largely obscured by freight trucks. A possible hopper may form part of a cluster of machinery at the northern end of the site.

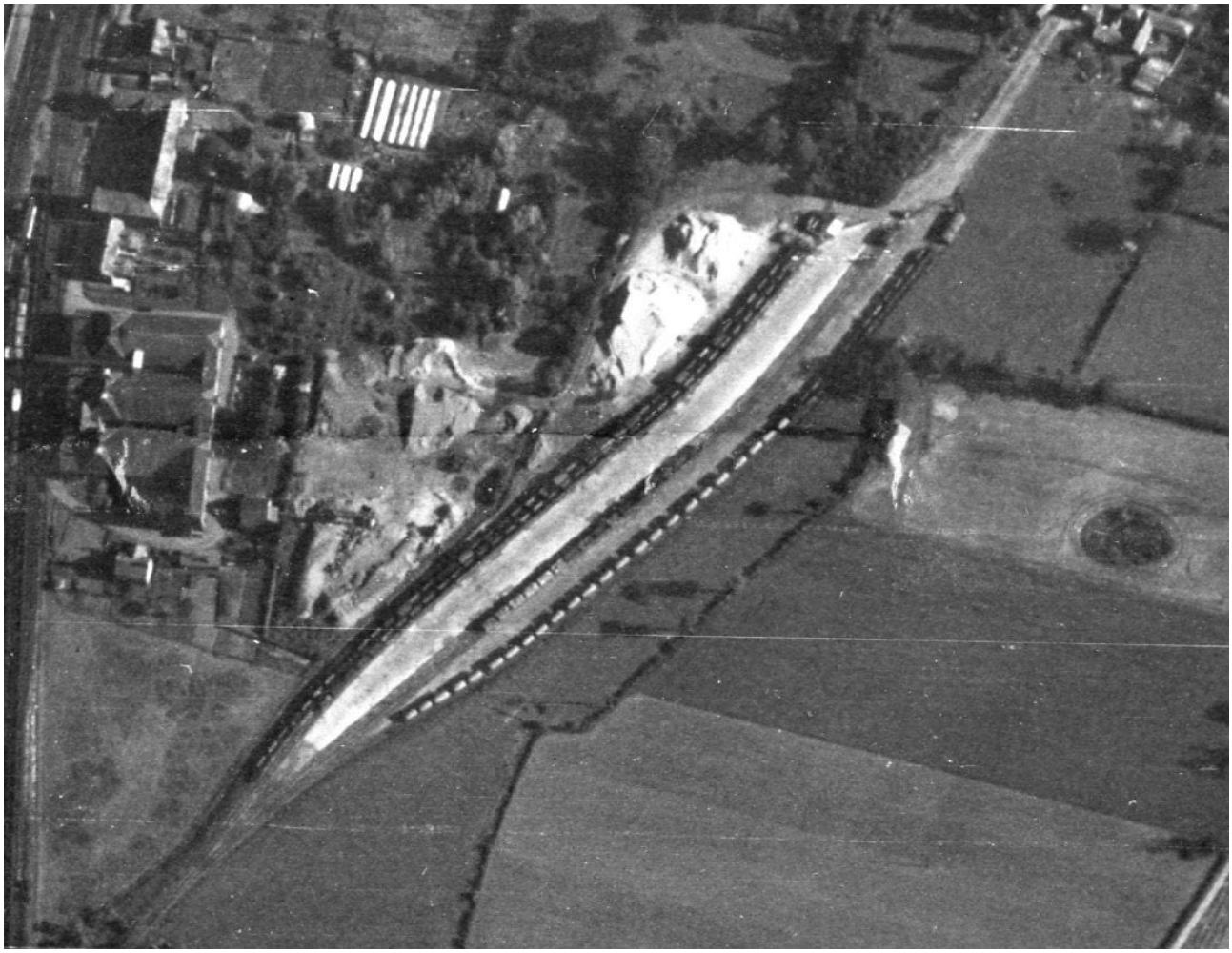

Figure 48. The Second World War Air Ministry sidings at Dereham (NHER 55624). Photograph: RAF/106G/UK/1606 RS 4113 27-JUN-1946 (detail). Source: Historic England Archive. RAF Photography.

Figure 49. A barbed wire enclosure (NHER 66937) with an internal mound (NHER 66938), which may have been associated with military activity at Necton Hall in the south of the project area. Photograph: RAF/3G/TUD/UK/52 V 5031 31-JAN-1946 (detail). Source: Historic England Archive. RAF Photography.

The project also recorded a range of smaller Second World War sites and features across the project area. These included several previously recorded pillboxes, such as NHER 32416 at Little Dunham. At Fransham, the site of a gun or spigot mortar emplacement was identified, at a location previously recorded as the site of a pillbox and Home Guard post; the latter could not be identified (NHER 23139). What appears to be a barbed wire

enclosure (NHER 66937) and associated internal mound (NHER 66938) may have been associated with military activity at Necton Hall in the south of the project area (Fig. 49); it is also possible, however, that both features relate to wartime civilian activity, and there is no evidence that the mound covers a military structure such as a pillbox. Similarly, a possible searchlight battery, comprising what appears to be a single emplacement and a row of huts, was newly recorded at Scarning (NHER 68806), but its identification as a military site is not certain.

Conclusions

The Wendling Beck and Fransham AI&M project has added 445 new records to the Norfolk HER – 91 per cent of which relate to new discoveries – and amended a further 116 existing HER records. In addition, it has created an archaeological map covering 116 sq km. These results represent a very significant contribution to our knowledge and understanding of the historic environment of this area of central Norfolk. The increase – of 29 per cent – to the number of known sites within the project area represents a significant advance in our understanding of the archaeological landscape of this part of the county. Averaged across the project area, the survey has recorded a density of 4.8 sites for every sq km it covered. Crucially, these sites – whether new discoveries or not – are now accurately mapped, allowing them to be better understood and better managed. This is also the case for the 44 sites recorded by the volunteering project.

Improved heritage protection, through the provision of better and more accessible information, is one of the principal outcomes of any AI&M project. The incorporation of the project's results into the Norfolk HER, and their availability via Heritage Gateway and Historic England's Aerial Archaeology Mapping Explorer and Open Data Hub, will ensure better heritage protection across the project area. Those charged with the management and guardianship of the historic environment, for whom HER data is a central resource, will be better informed as to the existence, location, nature and extent of archaeological sites within the project area. For many sites, this will be first time that this information will not be 'hidden' on a variety of aerial sources, stored at several different locations. Instead, it will be readily accessible in a standardised and comprehensible format, namely HER records and AI&M-standard mapping (the former also accessible via the Norfolk Heritage Explorer website).

In terms of the results themselves, the most unexpected discovery has been the high density of medieval to post-medieval sites visible as earthworks on RAF vertical photographs from 1946. This has been unprecedented when compared with other projects undertaken by the team in both Norfolk and Suffolk. The existence of such sites is not in itself surprising. Medieval Norfolk was the most densely populated county in England (Campbell 2005, 48; Williamson 1993, 110). In Fransham, Rogerson (2022) was able to identify 105 dispersed settlements in existence in the 13th century; almost half of these were abandoned in the 14th century. The features recorded by the project – generally comprising dispersed clusters of enclosures, building platforms, field boundaries and ridge and furrow – are characteristic of the dispersed settlement pattern so typical of the region. What has been surprising is the extent to which these elements survived long enough

within the landscape to be captured on aerial photographs. Most sites were levelled soon after 1946, and only a proportion are visible on later sources. Even those sites that are visible are for the most part less easy to recognise and characterise from the later sources than they are from the 1946 aerial photographs.

The project also recorded a variety of sites potentially dating from the Neolithic to the Second World War. For the late prehistoric period, the project tentatively identified a possible Neolithic enclosure at Longham (NHER 68241) and mapped the sites of numerous known or suspected Bronze Age round barrows, including several cemeteries. Late Iron Age and Roman sites included the Toftrees to North Pickenham Roman road (NHER 3697), the landscape surrounding the Roman villa at Necton, and the newly discovered rectilinear enclosure at Scarning (NHER 68218); prompt liaison with the Specialist Advice team enabled the latter to be partially excavated before it was destroyed by development. Two medieval monastic sites were recorded, the aerial sources providing new information about these previously known sites. For the Second World War, many new discoveries were added to the record, as well as new information about previously recorded sites.

The Wendling Beck and Fransham AI&M project was the first where the team included a volunteering strand. The methodology and processes developed for the Broads Aerial Perspectives project translated well to the rather different landscape of central Norfolk. While it could not be expected that the spectacular results from the Broads would be reproduced – given that the latter were very much dependent on the excellent cropmark formation in July 2006 on the lighter soils of the northern Broads uplands – the results of the project are still significant, representing a more than 50 per cent increase to the sites recorded when the area was originally surveyed as part of the Norfolk Aggregates Assessment project (Albone, Massey and Tremlett 2008). The success of both the Broads Aerial Perspectives project and volunteering element of the Wendling Beck and Fransham AI&M project has led to the inclusion of a similar volunteering strand as part of the Northwest Norfolk AI&M project, which is currently in progress.

In all, the project provided training to 21 participants, who attended either an in-person day school or a shorter online induction. Seventeen individuals went on to register as a volunteer for the project, and of these 13 completed the analysis of one or more grid squares. Six of the participants had previously volunteered for the Broads Aerial Perspectives project, and eight have continued as volunteers for the Northwest Norfolk AI&M project. Feedback on the training events and the volunteering experience was generally excellent; comments included:

Norfolk has such an interesting and unusual landscape.

It is empowering to embrace the new technologies available in interpreting the landscape.

The introduction of Google Earth Pro as a way of using remote sensing to look at local maps, and then linking it with lidar and mapping made me connect with heritage in a new way.

I found it useful to be able to see and have access to a range of mapping resources and be guided to other sources which might be of use in interpretation. The feedback on the work carried out was always detailed and enabled me to understand more about the processes involved in aerial interpretation.

An excellent project to be involved in, which provides skills which can be built upon and used on other projects and in independent research.

I found the experience of sinking myself into the lidar maps very mindful. It was easy to get into a flow state. I'm sure this experience carries over into other areas of my life.

Pleased to help with a project that has a tangible result that is useful to many people.

Recommendations for Heritage Protection and Further Work

This report has aimed to signpost those sites that are arguably of greatest interest, research potential and significance. A list of sites where further work and/or heritage protection measures are recommended is given in Appendix 3. This list is not exhaustive, nor is it intended to be limiting. Rather, it includes the sites that appeared to the project team to be those with the most to gain from additional work, and where the next steps to take in terms of research were most apparent.

Although the vast majority of sites recorded by the project are not designated, the integration of the project data into the Norfolk HER will ensure that they are taken into consideration when Norfolk County Council archaeological advisers are consulted regarding future development or land management decisions, for example. This is a key outcome of the project, with accurate maps and database records enabling better-informed decision making. Within the context of the Wendling Beck nature recovery project, the data created and enhanced by the project will continue to inform decisions concerning historic environment assets within the project area.

No potential candidates for designation were identified. Most of the substantial sites surviving within the project area are already designated as Scheduled Monuments. No outstanding new prehistoric or Roman sites were identified: the surviving earthwork segments of the Toftrees to North Pickenham Roman road (NHER 68071, NHER 68092, 68093) in the north-west of the project area, might be considered in the future, but need to be checked on the ground to establish to what extent the earthworks relate to Roman construction rather than later field boundaries.

Review of Designated Sites

Suggested updates to the NHLE, mainly comprising updates/corrections to the mapping of designated areas, are listed in Appendix 4. For the case of the Launditch (NHLE 1003795; NHER 7235) consideration may need to be given to the value of the current designation, which includes an area of now levelled earthworks, when other, non-designated sections may be better preserved (albeit not as substantial earthworks). The medieval settlement earthworks of Little Bittering (NHLE 1003906; NHER 7266), which fell within the volunteering project area, might usefully be reassessed and/or the recording augmented by more detailed analysis of the lidar data for the area.

Recommendations for Future Research

Many of the sites recorded by the project – and particularly those highlighted in this report – would benefit from further research, whether site survey, surface collection or metal detecting of finds, excavation and/or documentary research. Some areas for future research are included in Appendix 3 below, including further work to integrate the results of the AI&M project with the fieldwalking and documentary evidence for Fransham, and to examine the relationship between the different strands of evidence in more detail, as to do this in any great depth fell outside the scope of the project. More detailed analysis of groups of sites – for example, the medieval to post-medieval sites summarised above – also has the potential make significant contributions to ongoing research. At a number of sites where earthworks are thought to survive – for example, the sections of Roman road in the parishes of Great Dunham, Kempstone and Litcham (NHER 68071, NHER 68092, 68093), the medieval to post-medieval earthworks on the eastern side of Beeston, sections of Gressenhall Park boundary – field visits to better understand the preservation of the site would be beneficial.

In more general terms, further AI&M standard surveys of claylands in East Anglia would also be of benefit. This would facilitate placing the results of the project in their regional context and allow similarities and differences between areas to be better examined. In particular, it would enable questions relating to the visibility and identification of pre-medieval clayland sites on aerial sources, and the potential survival of medieval to post-

medieval archaeological earthworks as late as 1946, to be examined. In Essex, the only county in the eastern region to have full AI&M standard coverage, relatively high numbers of medieval sites were recorded on both the London clays and the boulder clay (Ingle and Saunders 2011, 93).

Given the gaps in specialist oblique coverage described earlier in the report, further aerial reconnaissance of the Norfolk clays under the right conditions to potentially capture sites visible as cropmarks would be useful. In the more than two decades since Norfolk had a dedicated archaeological aerial photographer, reconnaissance of the admittedly lighter Suffolk clays has been successful in recording the cropmarks of several areas of medieval settlement and fields (Damian Grady and Edward Carpenter, Historic England, pers. comm.). Although cropmark formation on the Norfolk clays is clearly less dependable than on the county's more free-draining soils, a concerted effort to undertake reconnaissance here under optimum conditions might prove fruitful, both in recording the levelled remains of the medieval to post-medieval landscape, but potentially also elements of the Roman and late prehistoric activity which is attested by excavations, fieldwalking and metal detecting, for example, but is currently relatively poorly represented on the aerial sources.

Research Framework Themes

The project proposal included a list of themes and questions that could potentially be addressed or contributed to by the results of the project (Tremlett 2022, appendix 3). This list was compiled from the Research Agenda available as part of the East of England Regional Research Framework.

Of the list put forward as part of the proposal, the project can be said to have contributed to the following themes and questions. For the most part, its contribution has been to identify new sites and provide new and improved information for both new discoveries and previously recorded features. Similar themes and questions are grouped together.

Neolithic

How can we increase our understanding of Neolithic ring ditches and other burial monuments?

By identifying, albeit extremely tentatively, a possible new prehistoric (Neolithic?) monument at Longham (NHER 68241), the project has potentially contributed to the corpus of known monuments within the county.

Early to Middle Bronze Age

How can we characterise Bronze Age monuments?

By providing detailed and accurate archaeological mapping, alongside text descriptions and database indexing, the project is facilitating future characterisation and analysis of Bronze Age funerary monuments within the project area.

Late Iron Age to Roman

How can we better understand the region's Roman villas?

The project has added contextual information relating to the landscape surrounding the newly discovered villa at Necton.

Can we map the development of Late Iron Age and Roman roads?

The project has added to the record of the physical remains of the Toftrees to North Pickenham Roman road (NHER 3697), significantly enhancing the record for the feature, better enabling future research into its origins, development and relationships.

How can we increase our understanding of Late Iron Age and Roman farmsteads?

The project identified the site of a rectilinear enclosure at Scarning (NHER 68218) which proved upon excavation to be the site of Late Iron Age to Roman date, contributing to the knowledge of such sites in central Norfolk, where relatively few are known.

Medieval Rural

How can we improve our understanding of medieval agricultural practices?

The project has mapped numerous sites relating to the medieval to post-medieval rural landscape, including features relating to agriculture such as field boundaries, strip fields, paddocks, enclosures and ridge and furrow. This is in an area of dispersed settlement, where the pattern of agriculture is also likely to differ from that seen in areas of more nucleated settlement. The detailed, accurate and comprehensive mapping provided by the project will facilitate future research by providing better data for characterisation and comparison with other sites.

How can we improve our understanding of medieval rural monastic establishments, especially those of the minor orders?

The project mapped two monastic sites: Wendling Abbey (NHER 7281) and the Benedictine priory cell at Sporle (NHER 4185). Detailed, accurate and comprehensive mapping from a wide range of aerial sources has enhanced the record of these sites and their surrounding landscapes, better enabling their characterisation and comparison with other sites.

Although the interpretation of such sites is not necessarily straightforward, the project mapped numerous sites potentially relating to medieval settlement, in an area where dispersed common-edge settlement is the typical pattern. The availability of detailed, accurate and comprehensive mapping for these sites will facilitate future research, including morphological classification and comparison with settlement sites elsewhere.

Can we clarify the dating, form and function of medieval rural moated sites?

The project area contains a high density of moated sites. Detailed, accurate and comprehensive mapping from a wide range of aerial sources has considerably improved the record of these sites, better enabling their characterisation and comparison with other sites.

How can we characterise medieval rural settlement morphology and relationships?

How can we characterise and explain medieval rural settlement change, evolution and abandonment?

How can we characterise medieval rural farms and farmsteads?

The project has created detailed, accurate and comprehensive mapping for an area where medieval to post-medieval settlement remains were visible on the aerial sources with unusual clarity and in unusually high numbers. Combined with Dr Andrew Rogerson's fieldwalking and documentary research for the parish of Fransham, this creates a unique dataset with significant potential for further research. The value of the data is enhanced by the fact that unusually for medieval settlement studies, it covers an area where dispersed settlement is the norm, rather than the shrunken or deserted nucleated 'villages' which have traditionally been the focus for archaeological study. The availability of the digital mapping, indexed database records, and analytical report created by the project will facilitate future research, for example by better enabling morphological characterisation and comparison to be carried out.

Post-Medieval

How can we increase our understanding of post-medieval farms and farmsteads?

How can we characterise the post-medieval historic landscape and the factors which affected it?

As for the medieval period, the project has mapped considerable numbers of sites relating to the post-medieval (more accurately, medieval to post-medieval) rural landscape, including farms, settlements, routeways, boundaries and agricultural features (field

boundaries, ridge and furrow). By providing detailed, accurate and comprehensive digital mapping, linked to indexed database records, the results of the project will facilitate future research characterising, analysing and comparing this data, to better understand the post-medieval landscape as a whole and the various elements of which it is formed.

Multi-Period

How can we ensure that areas not subject to development-led archaeology are studied?

Development-led archaeology has taken place in only limited areas in central Norfolk, which is predominantly rural in character. Within the project area, notable exceptions are Bittering Quarry, recent excavations on the outskirts of Dereham, and excavations along infrastructure such as pipelines and on-shore cabling for wind farms. The results of such work have undoubtedly been of value – the prehistoric features recorded at Bittering Quarry, and the discovery of a new Roman villa site at Necton being of particular note – but most of the project area (and central Norfolk more widely) are likely to remain unexamined by development-led work for the foreseeable future. The use of aerial sources – many of them previously unexamined – to record archaeological features has a proven record of significantly increasing knowledge and understanding of archaeological sites within the area covered. For the Wendling Beck and Fransham AI&M project area, the project results have increased the HER by 29 per cent.

What can we learn by revisiting old data?

The volunteering element of the project revisited a 19 sq km area covered by an earlier AI&M survey carried out as part of the Norfolk Aggregates Assessment project (Albone, Massey and Tremlett 2008). Using just a limited number of new sources (Environment Agency National Lidar Programme data from 2017, and Google Earth imagery from 2006 and occasionally other years), the project was able to record 27 new records and enhance the record for 17 previously recorded sites. The results represent a 12 per cent increase to the Norfolk HER for the area, and a 54 per cent increase to the results of the earlier AI&M survey. The value of revisiting areas covered by earlier AI&M, for which new sources such as lidar and Google Earth are now available, is clearly demonstrated by the project results.

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Appendix 1. Methodology

The methodology employed by the project generally conformed to that detailed in the project proposal (Tremlett 2022, 11–14). It was based on Aerial Investigation and Mapping Technical Specification (Evans 2019b), the 2021 revision of Historic England standards and guidance for AI&M projects (Winton 2021), and MoRPHE PPN 7 (Historic England 2021). It was also informed by the Norfolk Air Photo Interpretation Team's previous experience of delivering AI&M standard projects in the region.

The volunteering project followed the methodology outlined in the project proposal (Tremlett 2022, 13), which was based on that used for the Broads Aerial Perspectives project. Aside from the provision of sources to volunteers, and subsequent feedback and validation, most processes (database recording, archiving, etc.) were the same as for the AI&M survey.

Archaeological Scope of the Survey

All archaeological monuments, both plough-levelled and upstanding, usually dating from the Neolithic period to the 20th century, were recorded. The scope included industrial sites pre-dating 1945 and military remains up to the Cold War. Those features adequately depicted by readily accessible historical maps, existing surveys or excavation plans were not usually mapped.

AI&M projects are intended to provide only assessment-level data, at a nominal scale of 1:2,500. Any detail not clearly visible and comprehensible at a 1:2,500 output scale was usually omitted, for example internal features within buildings.

The volunteering project used a similar scope in terms of what information was added to the Norfolk HER. Volunteers were free to record any features they deemed to be of interest, and feedback was provided on all their annotations (and on features they might have missed), but only information meeting the recording standards for the Norfolk HER was added as a new record or an amendment to an existing record.

Plough-Levelled Features

All cropmarks, parchmarks and soilmarks representing sub-surface archaeological remains were recorded.

Earthworks

All earthwork sites visible on the aerial photographs and/or lidar visualisations were mapped, unless already adequately recorded by existing earthworks surveys or historical

maps (see below). Earthworks were recorded whether or not they were still extant on the latest aerial photographs/lidar source. The accompanying attribute data and HER database records specify which elements of earthwork groups are surviving or levelled. Monument types were indexed with the evidence visible on the latest available sources, usually the Environment Agency lidar data from 2017, Google Earth aerial photography from 2022 or earlier, or PSGA aerial photographs from 2022.

Where the features visible on the sources were already recorded adequately, and at a comparable scale, by existing and readily accessible earthwork surveys or historical maps, for example, they were usually excluded from the mapping. Where necessary an amendment might be made to an existing record to signpost the most useful aerial sources. Significant archaeological features depicted on historical maps, such as moats, were usually included in the mapping, while less significant features, such as field boundaries, were usually excluded.

Buildings and Structures

For the most part, the mapping does not include buildings other than where these are recorded as earthworks, masonry foundations or as cropmarks or soilmarks. Standing buildings that have been destroyed were recorded where there was no other adequate record, although it is probable that a map record existed in most cases; where this was not the case, they were transcribed and the date and cause of their destruction, where known, was recorded. Buildings relating to military or industrial sites were mapped and/or defined by 'extent of area' where appropriate.

Industrial Archaeology and Areas of Extraction

The survey recorded baseline evidence of industrial activity (for example, salt-making, lime burning or brickmaking), where they could be recognised as pre-dating 1945 and only where the sites were not adequately recorded already by map evidence. Areas of former extraction were only mapped where they were judged to be of archaeological significance or had a bearing on surrounding sites; where such features had been recorded as an HER entry by previous surveys, an updated outline was recorded where required and when time allowed. Urban industrial areas were excluded from the recording, unless archaeologically significant or if they contained evidence for the provision of air raid shelters for workers, for example.

20th-Century Military Archaeology

No sites of First World War or Cold War military remains were recorded by the survey. Second World War military remains, such as airfields and camps, were recorded to an appropriate level of detail, ranging from an outline defining their extent, to the recording of

all structural components, depending on their significance and the amount of time available. Isolated military sites, such as pillboxes and searchlight batteries, were mapped and recorded, again to an appropriate level of detail. Small domestic air raid shelters, which are not readily visible at 1:2,500 scale, were only mapped if time allowed or their location was of particular significance. At sites where multiple phases of 20th-century military activity were evident, a single phase was usually mapped, the team member using their judgement as to which was the most significant and most in need of a record by transcription. Other phases were summarised briefly in the descriptive record.

Coastal and Inter-Tidal Archaeology

The project area did not include any coastal or inter-tidal areas.

Post-Medieval Field Boundaries

Post-medieval field boundaries visible as cropmarks, soilmarks or earthworks were usually mapped and recorded, unless they were depicted on readily accessible historical maps, and/or could be seen extant on earlier aerial photographs.

Ridge and Furrow and Water Meadows

All remains of ridge and furrow were recorded using a standard convention to indicate the extent and direction of the furrows. As for other sites, the distinction between earthwork and levelled ridge and furrow was made in the attribute data and HER database record.

Areas of water meadows were mapped to a basic level of detail, usually by extent rather than as individual features.

Drainage Features

For the most part, drainage features were not recorded by the project, unless they formed part of a more significant archaeological site, or where their interpretation and significance was uncertain. It is not within the usual scope of the AI&M methodology to map drainage features. Where archaeologically significant, information can generally be derived from a detailed historical map-based search.

Parks and Gardens

Earthworks and levelled landscape features associated with historic parks and gardens were recorded, including those listed in the Historic Parks and Gardens Register maintained by Historic England and Norfolk County Council's Inventory of Parks and Gardens of Special Historic Interest. Where other parkland features, such as tree avenues, could be identified, they were also mapped or, more often, a note was made in the record; this was done on a site-by-site basis and decisions were inevitably influenced by the

amount of time available, the relative archaeological significance of the feature, and whether it could be recorded adequately from non-aerial sources.

Features relating to modern or 20th-century parks and gardens may have been recorded where information on the aerial sources added significant new information to the record. This was judged on a case-by-case basis but might include evidence for public parks being used for allotments during the Second World War, or a record of a park or garden which had since been entirely redeveloped.

Transport

Major transport features, such as disused canals or main railways, were not mapped unless the evidence visible on the aerial photographs or lidar was considered to be of particular archaeological significance; in general, it is probable that such features were already adequately recorded by other sources such as historical maps. Smaller features, such as tramways or industrial railways, were recorded where they were not depicted on historical maps, and/or where they were archaeologically significant, for example in relation to a nearby industrial or military site.

Geological and Geomorphological Features

Geological features were not plotted unless their presence helped to define the limits of an archaeological site or feature. Geological and geomorphological features may have been noted in site records, as their presence in some instances could assist with an assessment of the archaeological potential of an area.

Sources

Aerial Sources

The principal aerial photographic and lidar sources that were consulted by the project are summarised in Table 3.

Table 3. Principal aerial sources consulted by the project.

Collection	**Type**	**Media**
PSGA	Colour vertical photography, infra-red vertical photography, contour data	Digital
Apple Map	Colour vertical photography	Digital
Bing Maps	Colour vertical photography	Digital

Collection	Type	Media
Environment Agency	Airborne laser scanning (lidar) data	Digital
Google Earth	Colour vertical photography	Digital
HEA	Black and white vertical photographs, colour and black and white oblique photographs, black and white military oblique photographs	Prints and digital
Norfolk County Council	Vertical colour and black and white photographs, oblique colour and black and white photographs	Prints, slides

It was not possible to consult vertical and oblique prints held by the Cambridge University Collection of Aerial Photography (CUCAP) as the library is currently closed. Copies of CUCAP photographs held by other collections and digital images viewable on the CUCAP website were consulted when available.

A single year of lidar data was consulted, comprising the National Lidar Programme data flown between 16 and 24 November 2017. Both DTM and DSM datasets were processed for consultation in Relief Visualisation Toolbox. For the entire project area, the DSM single and 16-direction hill shade visualisations, and the DTM single and 16-direction hillshade and simple local relief model visualisations were consulted. Additional visualisations were occasionally used where they might show additional detail or show features more clearly.

‘Source Packs’ prepared for the volunteering project comprised jpeg files of a modern map with AI&M overlay, Ordnance Survey 1st edition six inch to 1 mile map extract, an extract of Google Earth imagery from July 2006, and three Environment Agency National Lidar Programme lidar visualisations – DSM single direction hillshade, DTM multi-direction hillshade, and DTM simple local relief model. An initial assessment at the beginning of the project, and prior experience from the Broads Aerial Perspectives project, suggested these would be the most useful sources to be consulted. For a few grid squares, an additional extract of Google Earth imagery from a different year was also provided, if potential features were spotted during the initial assessment. Volunteers were also encouraged to make use of additional sources available online, including the full range of imagery available via Google Earth Pro. Guidance was provided for using Google Earth Pro, and downloading and processing Environment Agency lidar data.

Background Sources

The primary archival sources for the project were HER digital maps and records. HER secondary files and paper records, including grey literature reports, were not consulted as a matter of course, due to time constraints and limited accessibility (material being made inaccessible by the HER move, for example). Where such material was judged to be fundamental to the interpretation and recording of a site, it was consulted on a site-by-site basis. HERR data, geology and soils maps, maps and notes from previous NMP/AI&M surveys, and digitised historical Ordnance Survey maps (dating from the 1880s onwards) were also consulted throughout. Digitised Tithe and Enclosure maps were consulted where available. Where the Vanguard/Boreas on-shore cabling route crossed the project area, the results of the aerial imagery assessment undertaken for the desk-based assessment were consulted (Royal HaskonigDHV 2019), along with any relevant geophysical survey data, and evaluation/excavation results. A selection of bibliographic sources was used where relevant and where time allowed. However, due to the limited resources available, such additional research took place for only a limited number of sites or areas.

Digital Transcription

Transcription was undertaken in QGIS, at a nominal scale of 1:2,500. Each interpreter worked in their own copy of the project workspace, creating their own subset of the project dataset, which was later amalgamated.

Wherever possible, archaeological features were mapped from georectified sources, such as visualisations of Environment Agency lidar data, or from scanned images rectified in AERIAL 5.36. Control information for rectifications was usually derived from OS MasterMap (usually scale 1:1,250), as this was generally found to be adequate, but occasionally it was necessary to take some or all control from PSGA orthophotographs, historical maps or previously rectified photographs. Where adequate control existed, the digital terrain model function in AERIAL was used to compensate for distortion due to slope and terrain. A level of accuracy of at least +/- 2m should have been achieved at this scale of mapping. Where this accuracy may not have been achieved, due to problems of inadequate or inaccurate control points, for example, a note was made in the relevant HER record(s).

Rectified images were imported into QGIS. Archaeological features were transcribed following the standards for spatial data set out in Appendix 2. The original photographic scans and rectified images will be discarded following the publication of this report.

The project used several georeferenced digital photo layers, including those held by Norfolk County Council, PSGA imagery, and online via Google Earth and Bing Maps. It also used Environment Agency lidar data. When required, these digital layers were inserted into QGIS and mapping undertaken directly from the image; Google Earth images were saved, inserted into QGIS and georeferenced onto the map base. Lidar data was visualised using Relief Visualization Toolbox (Zakšek, Oštir and Kokalj 2011; Kokalj and Somrak 2019), and the resulting images inserted into QGIS (later in the project, it was possible to use the QGIS plug-in to produce visualisations within the workspace). Given the limited time available to complete the mapping, rectifications of aerial photographs were kept to a minimum, particularly where good digital coverage (or other sources) showed the main components of sites. Where necessary, small amounts of additional detail were added directly to the plot by eye.

Once the mapping was complete, checks were undertaken before the creation of a final draft dataset. The resulting tables were exported to MapInfo, for integration into the HER workspace. Once all database records had been added, Monument polygons defining the extent of each site were copied to the Mon layer of the HER and linked to the related database record.

Database Records

Drawings

Following national standards (Evans 2019b), attribute tables were created for the mapping layers, as outlined in Appendix 2.

Norfolk HER (ExeGesIS HBSMR)

HER numbers were allocated in liaison with the HER officer for Norfolk. A record of each number used was maintained, continuing the method used for previous AI&M projects undertaken by the team.

Records were inputted directly into the database, although individual interpreters may have used a temporary Word document for greater ease of editing before copying and pasting text into the database. Each record includes a short written description and summary, an index of Monument types and dates, evidence type, locational data, and links to sources, events and other Monument records, as necessary. Once the mapping was complete and imported into the HER, each record was linked to a Monument polygon defining the extent of the site on the HER Mon layer. Any sensitive sites have been highlighted by the Air Photo Interpretation Team and noted in the report. Once integrated into the HER, the data will feed directly into uploads to the Heritage Gateway, and the

Norfolk Heritage Explorer website, with sensitive sites handled in the same way as for the core HER data.

Following any changes made as a result of comments on the draft of this report, final copies of the mapping data will be provided to Historic England for incorporation into the Aerial Archaeology Mapping Explorer and Open Data Hub.

Event and OASIS Records

An Event Record for the project (ENF153472) was created in the HER. This provides information on the compiler, date of work, associated events and any additional information of note. The Event Record is linked to all the project's associated Monument Records. A separate Event Record (ENF155311) was created for the volunteer strand of the project.

An OASIS record (norfolks1-517171) was created at the start of the project and will be completed following the completion of all outstanding project tasks, including the publication of this report.

Progress Sheets

Formal progress sheets were not kept, but team members were able to use a checklist of sources to ensure that all had been referred to. A register of HER numbers for new and amended sites was maintained and correlated against both the completed mapping and the number of records linked to the Event Record. Time spent on each individual project task, including mapping and recording, was recorded in a timesheet. Information on areas completed, time taken and numbers of new and amended records was included in quarterly progress reports to Historic England. Information required for the archive has been or will be transferred to the relevant Event record, and/or included in the Archaeological Report or Closure Report or will form part of the Project Management file.

Reports and Publications

Archaeological Report

This report provides a quantification, assessment and overview of the results of the project. It summarises the main chronological trends and the character of the archaeological sites and landscapes recorded. It highlights any significant and/or sensitive sites and provides a synthesis of the results of the mapping and interpretation, assessing its significance in the context of both the county and the region. Where relevant, it makes recommendations for future work, including further aerial reconnaissance, ground truthing, ground survey, and publication.

A list of sites which might benefit from further heritage protection measures, including potential candidates for designation, is included as Appendix 3. A list of potential updates to the NHLE is included as Appendix 4.

Data Access and Copyright

This report is copyright Historic England. All AI&M transcriptions and associated records are copyright Norfolk County Council. A perpetual non-exclusive royalty-free licence to use and/or sub-licence the project archive and all other project materials for any purpose is granted to Historic England. The provision of the mapping and records to other users by Norfolk County Council will be subject to a series of existing data agreements for using HER data.

Storage, Data Exchange and Archiving

HEA photographs were held according to their terms and conditions. When not in use, all photographic material on loan from the HEA was held in the secure store at Norfolk Record Office's Archive Centre.

Provisionally, all digital mapping and recording data was stored on the Norfolk County Council Environment Team shared drive for the duration of the project. The exported data will be stored within the Norfolk HER, as part of their ExeGesIS HBSMR database and GIS data. A copy will also be provided to Historic England for inclusion in the Aerial Archaeology Mapping Explorer and Open Data Hub. Responsibility for storage and access lies with Historic England and the HER; the Air Photo Interpretation Team will retain copies of the data for reference purposes.

A copy of the finalised report will be supplied to Historic England, to be made available as part of their Research Report Series.

All other project data (report files, management and administration documents, and so forth) have been (or will be) rationalised before archiving on the Norfolk County Council network (where appropriate, copies will be provided to Historic England on request).

Appendix 2. Spatial Data

The formatting of the project's spatial data follows Historic England's Updated Aerial Investigation and Mapping Technical Specification (Evans 2019b). The exception is the colour and fill of some AIM mapping layers, which for this report have been formatted to match those now used for Historic England's Aerial Archaeology Mapping Explorer; these meet accessibility requirements. Within the Norfolk HER, data may be formatted differently, to match existing aerial investigation and mapping data held for the county, for example.

Table 4. Attribute data attached to mapped archaeological features.

Field name	**Type (no. character)**	**Description**	**Sample data**
LAYER	Text (50)	The form of the archaeological feature (AIM Layer Name, see Table 5).	BANK
PERIOD	Text (254)	Date of feature (derived from HER periods list); single or dual-indexed terms.	MEDIEVAL; or MEDIEVAL/POST MEDIEVAL
NARROWTYPE	Text (254)	Monument Type (derived from HER Monument type list); specific Monument type for individual features. Dual indexing avoided.	TOFT
BROAD_TYPE	Text (254)	Monument Type (derived from HER Monument type list); broader Monument type to enable grouping of individual features. Field not useful in all cases, in which case entry for NARROWTYPE field repeated. Dual indexing avoided.	SETTLEMENT

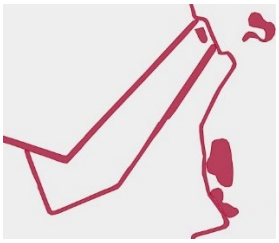
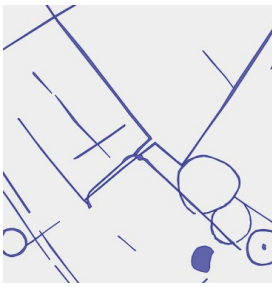
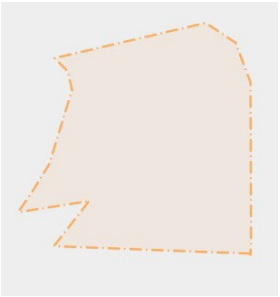
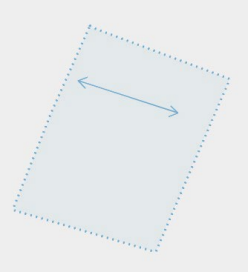
Field name	Type (no. character)	Description	Sample data
EVIDENCE_1	Text (254)	Form of remains (derived from HER evidence type list) as seen on SOURCE_1.	EARTHWORK
SOURCE_1	Text (254)	Source feature was mapped from (aerial photograph or lidar).	HISTORIC ENGLAND ARCHIVE OS/67307 V 0065 20-AUG-1967
EVIDENCE_2	Text (254)	Latest form of remains (derived from HER evidence type list), as seen on SOURCE_2. If EVIDENCE_1 is CROPMARK, then CROPMARK is repeated (unless now quarried away, for example, in which case DESTROYED MONUMENT used).	LEVELLED EARTHWORK
SOURCE_2	Text (254)	Latest available source, aerial photograph or lidar, to give indication of current state of preservation. For cropmark sites SOURCE_1 entry is repeated. Some professional discretion required if an earthwork shows well on lidar, but is not visible on slightly later orthophotography.	LIDAR English Heritage Trust DSM 03 & 14-MAR-2016
HE_UID	Integer (64 bit) (10)	HERR Unique Identifier (UID) for those sites recorded in the HERR dataset or concorded with an existing HERR record.	23092

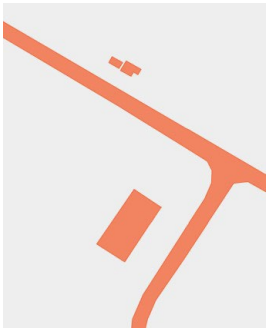
Field name	Type (no. character)	Description	Sample data
HER_NO	Text (254)	HER number for those sites recorded in the HER or concorded with existing HER records.	10928
NOTES	Text (254)	**Temporary field**, used for annotations during mapping and recording process.	Part depicted on historical OS.
MON_UID	Text (254)	**Temporary field**; HBSMR database Monument UID, included to aid correlation with HER records.	MNF77248

Table 5. Attribute data attached to Monument polygons.

Field name	Type (no. character)	Description	Sample data
HE_UID	Integer (64 bit) (10)	HERR (formerly NRHE) Unique Identifier (UID) for those sites recorded in the HERR dataset or concorded with an existing HERR record.	23092
HER_NO	Text (254)	HER number for those sites recorded in the HER or concorded with existing HER records.	10928
MON_UID	Text (254)	**Temporary field**; HBSMR database Monument UID, included to aid correlation with HER records.	MNF77248

Table 6. AI&M 'layer' name (form of feature) and mapping conventions.

'Layer' name	**'Layer' content**	**'Layer' colour**	**Feature type**	**Example**
BANK	Positive/embanked features such as banks, platforms, mounds and spoil heaps.	Red	Polygon	
DITCH	Negative/cut features such as ditches, ponds, pits and hollow ways.	Dark blue	Polygon	
EXTENT_OF _FEATURE	Outline depicting extent of large area features such as airfields, military camps or major extraction / deposition.	Orange	Polygon	
RIDGE_AND _FURROW _ALIGNMENT and RIDGE_AND _FURROW _AREA	Polyline depicting the direction of the rigs in a plot of ridge and furrow and outline depicting the extent of a block of ridge and furrow.	Light blue	Polyline / polygon	

‘Layer’ name	‘Layer’ content	‘Layer’ colour	Feature type	Example
STRUCTURE	Structures including stone, concrete, metal and timber constructions, such as buildings, Nissen huts, tents, radio masts, camouflaged airfields, wrecks and fish traps.	Orange	Polygon	

Appendix 3. Site/Area Specific Recommendations for Heritage Protection and Further Work

No potential candidates for designation assessment were identified by the project. Detailed information — accurate mapping of form and extent, written interpretation and indexing, references for aerial photographs and other sources, information on survival, and so on — is recorded for each site in the HER database. The database records include a link to existing designation records where applicable.

Table 7. Recommendations for heritage protection and further work.

HER no.	Parish	Description	Condition / evidence	Comments / recommendations
7235	Beeston with Bittering, Longham, Mileham, Wendling	Launditch linear earthwork.	Comprises earthworks, levelled earthworks, cropmarks, landscape alignments and documentary evidence. Section of earthworks and levelled earthworks at northern end are designated (NHLE Scheduled Monument 1003795).	Further investigation of and research into the entire monument, the course, survival and date of which remain uncertain.

HER no.	Parish	Description	Condition / evidence	Comments / recommendations
67649, 67651, 67653, 67654, 67655	Beeston with Bittering	Earthworks relating to probable medieval to post-medieval settlement, paddocks, field boundaries and ridge and furrow.	Comprises several earthwork sites visible principally on 1946 aerial photographs, some of which have been levelled but others appear to survive extant and are visible on visualised lidar data.	Site visit(s) to confirm condition of archaeological features, and better characterise them where possible.
7275, 68043, 68044, 68045,	Beeston with Bittering, Longham, Wendling	Wendling Second World War airfield and associated features	Extant buildings, structures and earthworks visible on aerial photographs and visualised lidar data.	Site visits to record and assess the condition of any surviving earthworks and structures associated with the airfield. Synthesis of the mapping results with documentary evidence to provide further detail about the function and use of the buildings, structures and associated features mapped by the project.

HER no.	Parish	Description	Condition / evidence	Comments / recommendations
Various	Fransham	High density of HER records for the parish of Fransham, a large proportion of which are associated with Rogerson's comprehensive fieldwalking in the parish (Rogerson 2022) and related investigations.	Not applicable.	Rationalisation of older HER records to bring them up to current standards. Further enhancement of the records by synthesising the historic data held in the HER with the information given in Rogerson 2022 and the results of this AI&M. This would improve the accessibility and usability of these datasets to benefit future research.
3697, 68071, 68092, 68093,	Great Dunham, Kempstone, Litcham	Sections of the Toftrees to North Pickenham Roman road visible primarily as sections of earthwork bank and ditch.	Low earthworks visible on visualised lidar data. Some sections also visible as soilmarks on aerial photographs.	Further investigations such as field visits and earthwork surveys could be undertaken to assess the current survival and condition of the earthworks. Also to establish to what extent the earthworks relate to Roman activity rather than later field boundaries.

HER no.	Parish	Description	Condition / evidence	Comments / recommendations
50576, 68221, 68222, 68223, 68224, 68235, 68236, 68237	Gressenhall	Former extent of medieval to post-medieval Gressenhall Park (NHER 50576). Various sections of probable park boundary, as depicted on a map of 1624, are visible on aerial sources.	Parts of probable park boundary are visible as earthworks on visualised lidar; for the most part the earthworks are low, spread and poorly defined, but they include a well-preserved section surviving as a drainage ditch within woodland in modern Gressenhall Park (NHER 51031). One section is visible as cropmarks on aerial photographs.	Further research into origin and extent of Gressenhall Park. Site visit(s) to confirm condition of archaeological features, and better characterise them where possible.
68046	Gressenhall	Broad curvilinear bank, possibly a former road, but more likely a boundary bank. Could relate to former extent of medieval to post-medieval Gressenhall Park (NHER 50576).	Low earthwork visible on visualised lidar data.	Further research into possible origin and date. Site visit to confirm condition and potentially better characterise the feature.

HER no.	Parish	Description	Condition / evidence	Comments / recommendations
68094	Litcham	A low earthwork mound and sections of a surrounding ditch, possibly relating to a Bronze Age round barrow.	Low earthworks visible on visualised lidar data.	Site visit to confirm that the feature is archaeological in origin and to assess the condition of the earthworks.
68241	Longham	Possible rectilinear enclosure(s), perhaps of prehistoric date.	Faint cropmarks visible on only one year of photography, their archaeological origin must be regarded as uncertain.	Further aerial reconnaissance to try to capture better/more aerial photography of the features. Further investigation of this area as part of mitigation works relating to Bittering Quarry.

Appendix 4. Comments on the National Heritage List for England

Table 8. Designated sites within the project area.

HER no.	NHLE dataset	NHLE no. (source: NHLE dataset)	Legacy UID (source: NHLE dataset	Current NGR (source NHLE dataset)	Name (source NHLE dataset)	NHLE designated area accurate?	Condition	Comments / recommendations
7235	Scheduled Monument	1003795	NF 215	TF 92350 17062	Devil's Dyke ('The Launditch')	Scheduled Area limited to earthwork sections to north and south of Salter's Lane. Earthworks to south were levelled in ?1950s and not visible on sources. To north, Scheduled Area could be extended slightly to include entirety of earthworks depicted by modern Ordnance Survey mapping.	Scheduled Area covers earthworks and levelled earthworks. Undesignated elements comprise cropmarks, possible earthworks and landscape alignments.	Assessment of currently scheduled areas – de-scheduling of levelled earthworks? Scheduling of additional non-earthwork sections? Analytical measured earthwork survey of surviving upstanding elements – previous investigations appear to have relied on historical Ordnance Survey mapping. Tree and scrub cover is likely to be an issue. Further investigation of and research into the entire monument, the course, survival and date of which remain uncertain.

HER no.	NHLE dataset	NHLE no. (source: NHLE dataset)	Legacy UID (source: NHLE dataset	Current NGR (source NHLE dataset)	Name (source NHLE dataset)	NHLE designated area accurate?	Condition	Comments / recommendations
7266	Scheduled Monument	1003906	NF 386	TF 93726 17577	Deserted medieval village	Yes; includes main elements of site as mapped by earlier Aggregates NMP project (Albone, Massey and Tremlett 2008) and as visible on visualised Environment Agency lidar from survey flown in 2017. At same time, both earlier survey and lidar indicate additional features outside of Scheduled area, but these either levelled or may be drainage related.	Earthworks within Scheduled areas (Environment Agency 2017 lidar data).	There is potential to use lidar data to enhance and augment the existing record of the earthworks, and to assess survival, for example. This was not undertaken for the current AI&M survey, however, as too little of the site fell within the project area. The earthworks in the small part of the site that was within the AI&M project area (at its easternmost extent) may relate to drainage rather than settlement. As part of the volunteer project, relevant HER records were updated to record visibility of features on visualised lidar data.

HER no.	NHLE dataset	NHLE no. (source: NHLE dataset)	Legacy UID (source: NHLE dataset	Current NGR (source NHLE dataset)	Name (source NHLE dataset)	NHLE designated area accurate?	Condition	Comments / recommendations
7281	Scheduled Monument	1003964	NF 263	TF 93912 12781	Wendling Abbey	Yes; it includes main areas of buildings relating to the abbey. Features such as the moat and water management features are only partially included.	Earthworks and buried archaeological features visible as on aerial photographs and lidar. Single upstanding structural element (pillar of masonry from church nave) is within Scheduled Area.	None.
1037	Scheduled Monument	1020645	35060	TF 91702 09725	Moated site 430m south-west of Bradenham Hall	Yes.	Earthwork moat within Scheduled area. Clearly visible on the Environment Agency 2017 lidar data.	None.

HER no.	NHLE dataset	NHLE no. (source: NHLE dataset)	Legacy UID (source: NHLE dataset	Current NGR (source NHLE dataset)	Name (source NHLE dataset)	NHLE designated area accurate?	Condition	Comments / recommendations
1036	Scheduled Monument	1020646	35061	TF 93497 09884	Two moated sites at Huntingfield Hall	No, although the earthworks of the moats are mostly within the Scheduled areas some sections of the moats extend just outside of the Scheduled area.	The Scheduled moats survive as earthworks visible on the Environment Agency 2017 lidar data. The moats are under trees on recent (2022) aerial photographs. Undesignated potentially associated elements include levelled boundary banks and ditches to the south-west of the western moat.	The earthworks of the moats are mostly within the scheduled areas. However, some sections of the moats extend just outside of the scheduled area. The scheduled areas could be slightly amended to correlate with the location of the earthworks as mapped from the Environment Agency 2017 lidar data to fully encompass the surviving earthworks.

HER no.	NHLE dataset	NHLE no. (source: NHLE dataset)	Legacy UID (source: NHLE dataset	Current NGR (source NHLE dataset)	Name (source NHLE dataset)	NHLE designated area accurate?	Condition	Comments / recommendations
2885	Scheduled Monument	1020785	35066	TF 95046 10220	Moated site 700m north-west of Brick Kiln Farm Cottages	No, the earthworks mapped by the AI&M survey extend slightly further to the north-west, outside of the Scheduled area.	The moat and associated features survive as earthworks visible on the Environment Agency 2017 lidar data. The site is under an area of trees on recent (2022) aerial photographs.	The earthworks of the moat and the majority of the associated features are within the Scheduled area. Some of the associated earthworks in the north-west of the site extend beyond the Scheduled area. The scheduled area could be amended to correlate with the location of the earthworks as mapped from the Environment Agency 2017 lidar data to fully encompass the surviving earthworks.
7251	Scheduled Monument	1020791	35068	TF 93026 15703	Old Hall moated site 100m north-west of Almshouse Bungalow	Yes.	Most of moat circuit survives as an earthwork; north-west corner levelled.	None.

HER no.	NHLE dataset	NHLE no. (source: NHLE dataset)	Legacy UID (source: NHLE dataset	Current NGR (source NHLE dataset)	Name (source NHLE dataset)	NHLE designated area accurate?	Condition	Comments / recommendations
13546	Scheduled Monument	1021126	35070	TF 86600 17565	Bowl barrow in Great Wood, 400m north of Lexham Hall	Yes.	Earthwork mound within Scheduled area. Clearly visible on the Environment Agency 2017 lidar data. The site is within an area of woodland on recent (2022) aerial photographs.	None.
31522	Scheduled Monument	1021132	35077	TF 88946 17082	Disc barrow on Litcham Common, 250m south-west of Bridge Farm	No, the earthworks mapped by the AIM survey extend further to the north, outside of the Scheduled area.	The disc barrow survives as a very low earthwork visible on the Environment Agency 2017 lidar data.	The Scheduled area only covers part of the disc barrow. The Scheduled area could be amended to correlate with the location of the earthworks as mapped from the Environment Agency 2017 lidar data to fully encompass the surviving earthworks.

HER no.	NHLE dataset	NHLE no. (source: NHLE dataset)	Legacy UID (source: NHLE dataset	Current NGR (source NHLE dataset)	Name (source NHLE dataset)	NHLE designated area accurate?	Condition	Comments / recommendations
30469	Registered Parks and Gardens	1000268	1184	TF 86703 17531	LEXHAM HALL	Yes.	Extant parkland visible on recent aerial photographs (2022).	None.

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