



# Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

## Environmental Statement

### **Volume 3**

### **Appendix 21.2** - Aerial Photographic, LiDAR Data and Historic Map Regression Analysis

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## Glossary of Acronyms

ALSF	(Norfolk) Aggregates Levy Sustainability Fund
AP	Aerial Photographs
APS	Air Photo Services Ltd
ArcGIS	Aeronautical Reconnaissance Coverage Geographic Information System
ASCII	American Standard Code for Information Interchange
BL	British Library
CRS	Coordinate Reference System
CSV	Comma-Separated Value
CUCAP	Cambridge University Collection of Aerial Photography
DEM	Digital Elevation Model
DEP	The Dudgeon Offshore Wind Farm Extension Project
SEP and DEP	The Dudgeon and Sheringham Offshore Wind Farm Extension Projects
DOW	Dudgeon Offshore Wind Farm
DSM	Digital Surface Model
DTM	Digital Terrain Model
DXF	Drawing Exchange Format
EA	Environment Agency
EPSG	European Petroleum Survey Group
ES	Environmental Statement
GIS	Geographic Information System
HE	Historic England
HER	Historic England Record
LiDAR	Light Detection And Ranging
MGE	Medium Gun Emplacement
NA	The National Archives
NGR	National Grid Reference
NHER	Norfolk Historic Environment Record
NHLE	National Heritage List for England
NLP	National LiDAR Programme
NMP	(Historic England) National Mapping Programme
NRO	Norfolk Record Office

OS	Ordnance Survey
PEIR	Preliminary Environmental Report
PrefRef	NHER site reference
QGIS	Quantum Geographic Information System
RAF	Royal Air Force
RVT	Relief Visualisation Toolbox
SEP	The Sheringham Offshore Wind Farm Extension Project
SLRM	Simple Local Relief Model
SM	Scheduled Monument
SOW	Sheringham Offshore Wind Farm
TVAS	Thames Valley Archaeological Services
UEA	University of East Anglia
USAAF	United States of America Air Force
WWI	World War One (1914 – 1918)
WWII	World War Two (1939 – 1945)

## Glossary of Terms

Order Limits	The area subject to the application for development consent, including all permanent and temporary works for SEP and DEP.
Cropmark	Differential growth and colour/tone of crops and vegetation over buried features
Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
DEP onshore site	The Dudgeon Offshore Wind Farm Extension onshore area consisting of the DEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
Earthwork	A large bank of soil which forms a boundary, fortification, or mound
Horizontal directional drilling (HDD) zones	The areas within the onshore cable route which would house HDD entry or exit points.
Jointing bays	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The point at the coastline at which the offshore export cables are brought onshore, connecting to the onshore cables at the transition joint bay above mean high water
Onshore cable corridor	The area between the landfall and the onshore substation sites, within which the onshore cable circuits will be installed along with other temporary works for construction.
Onshore export cables	The cables which would bring electricity from the landfall to the onshore substation. 220 – 230kV.
Onshore Substation	Compound containing electrical equipment to enable connection to the National Grid.
PEIR boundary	The area subject to survey and preliminary impact assessment to inform the PEIR.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
SEP onshore site	The Sheringham Shoal Wind Farm Extension onshore area consisting of the SEP onshore

	substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
Soilmark	Soil marks are differences in soil colour because of the ploughing of buried archaeological feature
Study area	Area where potential impacts from the project could occur, as defined for each individual Environmental Impact Assessment (EIA) topic.
The Applicant	Equinor New Energy Limited



## 21.2 AERIAL PHOTOGRAPHIC, LIDAR DATA AND HISTORIC MAP REGRESSION ANALYSIS

### 21.2.1 Introduction

1. Air Photo Services Ltd (APS) was commissioned to undertake an assessment of Aerial Photographic (AP), Light Detection and Ranging (LiDAR) and satellite imagery, alongside historic map regression analysis, for the Preliminary Environmental Information Report (PEIR) boundary for the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects (SEP and DEP).
2. This report is a 'point in time' document prepared during the initial stages of the iterative project design process for the PEIR submission in 2021 and submitted again as part of the DCO application, 2022.
3. The DCO order limits, project description, study areas and baseline information referred to therein have thus been refined and superseded those set out in this document and associated figures with those referred to in **Chapter 21 Onshore Archaeology and Cultural Heritage**.
4. The analyses were undertaken to provide aerial imagery interpretation and historic map regression data for the following areas:
  - The PEIR boundary; and
  - The Study Area within a 100m buffer to the onshore PEIR boundary.
5. The location of the PEIR boundary is presented on **Figure 21.2-1** which displays the following onshore elements:
  - The PEIR Boundary;
  - The Onshore Substation Sites; and
  - The Study Area, which is a 100m buffer to the PEIR boundary to allow for landscape context in recording of the remote sensing and historic map regression data.
6. This review is required as part of the overall baseline data compilation for the Environmental Statement (ES) Chapter, to which it forms a Technical Appendix. It is undertaken in accordance with the specification for Onshore Archaeology and Cultural Heritage: Analysis of Aerial Photographic and LiDAR data and Historic Map Regression (Royal HaskoningDHV 2020).
7. This technical report represents the work undertaken by APS between June 2020 and March 2021. The results of additional survey work undertaken by APS post-March 2021, covering the final DCO order limits, are presented in ES **Appendix 21.3 Aerial Photography and Historic Map Regression Addendum**.

### 21.2.2 Sources of Data

8. The assessment has systematically examined the following sources of data:
  - Historic and modern aerial photographs via online sources;
  - Satellite imagery via online sources;

- Online search of the Cambridge University Collection of Aerial Photographs (CUCAP) database at <https://www.cambridgeairphotos.com/map/> which generates a Comma Separated Value file (CSV) file showing the locations of vertical and oblique aerial photographic surveys and site targets which are shown at **Figure 21.2-2**. This collection remains in long term closure during its digitisation in Cambridge and it is not possible to see any of the actual images at the time of writing. Once again these have been examined by the National Mapping Programme (NMP) in areas where this survey has been completed;
- Search by the Norfolk Historic Environment Record (NHER) of their archive of oblique aerial photographs which was supplied remotely as a metadata-only CSV file. The distribution of these specialist aerial photography is shown at **Figure 21.2-3**;
- Online search of the Aerofilms archive curated by Historic England (HE) at [www.britainfromabove.org.uk](http://www.britainfromabove.org.uk) which did not contain any relevant aerial photographs within the Study Area;
- The Norfolk National Mapping Programme (NMP), which covers part of the Study Area. This NMP coverage is shown at **Figure 21.2-4**. These projects are the Norfolk Coast full NMP July 2002 - January 2006 (Albone et al 2007), Norwich – Thetford A11 full NMP April 2006 - August 2007 (Cattermole et al 2013) and the Norfolk Aggregates Levy Sustainability Fund (ALSF) full NMP August 2007 - March 2008 (Albone et al 2008);
- Environment Agency (EA) and National LiDAR Programme (NLP) 1m resolution 2017 LiDAR data over the whole Study Area as shown at **Figure 21.2-5**;
- Norfolk Historic Environment Record (NHER) data;
- Available Enclosure Maps supplied as digital data by the Norfolk Records Office (NRO);
- Some historic map and full coverage aerial photographic data displayed by the NRO's Map Explorer at [www.historic-maps.norfolk.gov.uk](http://www.historic-maps.norfolk.gov.uk). This website dates to 2012 and is only accessible via the Internet Explorer web browser. The whole county is covered by mosaics of vertical aerial photographs dating to 1946, taken by the Royal Air Force (RAF) and a colour layer taken in 1988, likely by Geonex; and
- Envirocheck Historical Map reports.

### 21.2.3 Restrictions to Data Acquisition Due to Covid-19

9. The assessment was undertaken in accordance with COVID-19 secure methodology during a time when the major aerial imagery archives at HE and the NHER at Gressenhall were closed to all visitors.
10. The material held at these archives has been incorporated to the Norfolk NMP in areas where this has been undertaken and to the dates when these surveys were completed.

11. The report is caveated by the absence of consultation of the aerial photographs at HE and NHER due to COVID-19 closures of these facilities for health and safety reasons in accordance with Government guidelines and regulations.

## 21.2.4 Aims and Objectives

### 21.2.4.1 Aerial photographic and LiDAR survey

12. The aim of the survey was to provide information on the location and nature of buried and upstanding archaeological features visible on historic aerial photographs, modern aerial and satellite imagery and visualised LiDAR data to assess the buried, topographic and micro topographic features within the Study Area.
13. The analysis aimed to assess the present level of preservation of the buried historic landscape in the study area. This was assessed in respect of the considerable landscape change wrought by a high concentration of defensive features dating to World Wars One and Two (WWI and WWII) and intense arable farming over much of the open land in the Study Area.
14. The objective of this survey is to identify the potential for heritage asset presence and preservation through the assessment of aerial imagery and LiDAR data.
15. This report highlights the key data sources consulted, the methodologies employed, and the results and conclusions drawn from the data acquisition and processing.

### 21.2.4.2 Map Regression Analysis

16. The aim of the map regression analysis was to collect and present all relevant historic maps, including available Tithe and Enclosure maps where present, Ordnance Survey (OS) and other pre-modern cartographic sources. The objective was to investigate and demonstrate landscape changes within the Study Area over the 19<sup>th</sup>, 20<sup>th</sup> and 21<sup>st</sup> Centuries using cartographic sources derived from the archives listed above. The online catalogues of the National Archive (NA) and British Library (BL) refer the reader back to the archive at the NRO and some maps are not available at this time or are damaged and under conservation. The maps presented in this assessment are those which were available online during the COVID-19 restrictions, which precluded in-person consultations and enquiries.

## 21.2.5 Methodology

### 21.2.5.1 Data Type and Sources

17. This survey has utilised a range of sources and archives in order to identify, interpret and map heritage features from the air and from satellites. This section gives details about the methodology employed to search each archive, the type of data available for study and the interpretation methods applied to each data set.

## 21.2.5.2 Modern Digital Aerial and Satellite-Derived Imagery and Data: Types and Sources Used for This Assessment

### 21.2.5.2.1 Online Aerial and Satellite-Derived Images

18. Since 1999, digital mosaics of multiple timelines of georeferenced aerial photographs have been uploaded to geoportals such as Google Earth and at Bing.com. The dates attributed to these images are not 100% assured or authenticated, but for heritage survey purposes this has no legal implication in this instance. They are available in real time as open-source imagery online, with some copyright requirements. The imagery may change when new sources are uploaded.
19. All available online aerial and satellite derived images which constitute the open-source mosaics of aerial imagery displayed on Google Earth and Bing.com/ Maps (aerial and birds-eye if available) were consulted for this survey. All timelines available on these geoportals were systematically consulted, between 1st June and 20th October 2020. Following magnification, relevant images were captured at the highest resolution using the 'save-image' function in Google Earth Pro or a screen snipping tool. They were saved, labelled and filed for geo-referencing.
20. Summer timelines at Google Earth, particularly captured in 2006, were very helpful in the recording of crop marked buried sites throughout this Study Area.
21. Aerial images displayed at Bing Maps was used in the same manner but with the limitations that there was a restricted single view timeline and less flexible image capture mechanisms. The Microsoft 'snipping tool' was used to capture the relevant images which generally were not as informative as the comprehensive timeline datasets at Google Earth.

### 21.2.5.2.2 Norfolk NMP Data

22. NMP data were supplied in GIS-ready format via AutoCAD Drawing Exchange Format (DXF) files and have been integrated into this survey as separate shapefile layers to maintain the integrity and acknowledgement of the source of these data.

### 21.2.5.2.3 Environment Agency LiDAR Data

23. LiDAR data have been collected from airborne survey platforms in recent years at varying resolutions, and are available for downloading, processing, visualising and interpreting via the Environment Agency website.
24. LiDAR data indicates variation in the height of the ground surface. Data is collected by an active laser beam fired in pulses which scans the ground surface. The reflected pulses are recorded by the sensor on board a geolocated airborne survey platform, fitted with an inertial measurement unit to record the roll, pitch and yaw of the aircraft.
25. The point cloud data derived from the survey are processed into a series of Digital Elevation Models (DEM) usually in American Standard Code for Information Interchange (ASCII) format. These include Digital Surface Models (DSM) which contain tree cover and buildings, and Digital Terrain Models (DTM) which remove tree cover and can reveal features beneath the tree canopy (Bennett et al 2012; Hesse 2010; Štular et al 2012).

26. These data are of assistance in recording micro and macro topographic features which may indicate relict or extant archaeological features and historic landscapes alongside more modern features. LiDAR data are best interpreted and used in conjunction with modern and historic aerial photographs and maps to provide ground truth information for features and sites recorded via this prospection method.
27. The data needed were identified by using the EA timestamp shapefile detailing the LiDAR file names within the area of interest and the OS 10km and 5km grid square to identify the grids and quarter sheets. Digital Terrain Models were selected as the primary data source as the ability to remove the tree canopy makes it ideal for prospection. All available LiDAR data for this site were downloaded for completeness of evidence.
28. The whole study area was covered by NLP LiDAR data at 1m resolution with other data available in individual survey areas. A map detailing the LiDAR data coverage can be seen at [Figure 21.2-5](#).
29. The data were visualised into Hillshade, Multi Directional Hillshade, Sky View Factor, Slope, Open Positive and Open Negative using the Relief Visualisation Toolbox (RVT) Version 2.2.1. These visualisations were chosen as they are of most use for archaeological prospection. The multiple ASCII tiles were merged before being visualised for ease of use in the GIS. The data were analysed alongside the aerial photographs and base mapping to double check the topography and nature of features interpreted from LiDAR data.
30. An additional visualisation was created using a simplified process based upon the methodology proposed by Hesse to create a Simple Local Relief Model (SLRM) (Hesse, 2010). A low pass filter was applied to nearest neighbour resampling, and the resampled model was removed from the original DTM, creating a Local Relief Model. This was then processed through the RVT with a smoothing factor of 20m.

### 21.2.5.3 Data Processing

31. The collected digitised photographs and images were labelled and archived and selected frames were georectified to the OS digital map base with the QGIS and ArcGIS georectification tools for interpretation and mapping. The project used an OSGB/1936 British National Grid European Petroleum Survey Group (EPSG):27700 Coordinate Reference System (CRS).
32. Interpretative or source queries were addressed as appropriate by further reference to the archived photographs in the survey files.
33. Following comparison to other airborne sources and all NHER data, extent of area polygons were digitised around the interpreted extent of features identified, and a site database created in QGIS as an attribute table within a shapefile.
34. When all data sources had been examined, interpretative polygons were digitised to further shapefiles to indicate the form, extent and type of extant features within areas.

#### 21.2.5.4 Data Presentation

35. The data were presented in shapefile data format within the project GIS. A shapefile contains geographical reference data as individual objects such as a ditch, a bank, a structure or a coordinate area. Features exist as 'objects' and their 'attributes' where the interpretations are recorded within the shapefile.
36. In addition to the shapefile, the data derived from the survey are presented in the Heritage Mapbook sheets 01 – 23 (**Figure 21.2-9**) which is indexed at **Figure 21.2-8**.
37. The map book presents keyed, labelled and individually numbered illustrations at a consistent scale.
38. The data are also presented as a gazetteer of sites at **Table 21.2-1**. The gazetteer is derived from selected attributes within the extent of area mapping shapefile. It summarises the location, type, condition and interpretation of each individually identified site or area of features.

#### 21.2.6 Interpretive Mapping

##### 21.2.6.1 Extent of Area Mapping

39. Extent of area mapping was undertaken initially to identify archaeological assets through 'APS Site Polygons'. These polygons indicate the extent of area around a feature or group of archaeological features. A detailed supporting attribute table was compiled at this stage detailing the following for each feature:
  - APS Site Number;
  - SEPDEP ID Number for concordance;
  - Asset Type;
  - Broad Type;
  - NMP coverage;
  - APS derived records;
  - Evidence Type (1-10);
  - Source (1-10);
  - Period;
  - Monument UID Number;
  - Source HER;
  - Comment;
  - By;
  - Supplier;
  - Client;
  - Project;
  - Easting;
  - Northing;

- National Grid Reference;
- Map Source; and
- Map Book Number.

40. This process created a database which forms the basis for all detailed mapping and analysis.
41. Aerial imagery and LiDAR analysis is a non-intrusive survey method, and not all features which are identified may be accurately dated by this means alone.

### 21.2.7 Assumptions and Limitations

#### 21.2.7.1 Historic Aerial Photographs

42. The assumption that aerial photographic survey and vertical and oblique aerial photographs show all features and will reveal a complete archaeological record in any given area is erroneous. This is due to many interactive survey, seasonal, environmental, meteorological and perception and interpretation issues which are set out below.
43. Interpretation of aerial photographs relies either on visual identification of the effect heritage assets have on crops and other vegetation, marks in soils or visible features or earthworks which are more visible at times of clear low light.
44. It is important to note that aerial photographs usually only show part of the horizontal and vertical extent of buried and upstanding features. Their capacity to reveal features as cropmarks, vegetation marks, soil marks or as the shadows cast by banks, ditches and walls, depends upon several environmental and agricultural factors prevalent at the time of the photographic survey. It is possible for many years' photography over one site to show nothing at all, and then during one instance of survey to reveal complex buried cropmark features. The direction of light at the time of photography, with reference to shadows cast and crop or soil marked features highlighted, can also affect the visibility of features on aerial photographs. Unlike digitally processed LiDAR and other data, the azimuth of the sun cannot be changed on a conventional aerial photograph.
45. Past and present land use also presents limitations to visibility of features. A cropped arable regime of cereals often allows the formation of cropmarks, whereas grassland, unless seen in times of extreme moisture stress, can mask the appearance of buried features. The time of year is thus important in gaining maximum benefit from aerial photographic sorties. In winter, the low leaf index and lower light angle assists visibility of topographic and earthwork features. In summer, ripening crops, often from April through to harvest in July/August, may show differential marks over buried features. Dry conditions will often cause parching in grass, which will then reveal areas of former foundations as the grass dies over the harder less moisture retentive buried features. Following harvest, weathering and ploughing, marks in soil often show where buried archaeological deposits are being actively ploughed and brought to the surface.
46. In Norfolk, the arable areas have been intensively eroded by ploughing. The lighter shallow soils over well drained substrates are conducive to the formation of crop marks over both buried heritage assets and geological anomalies in the substrates.

47. Aerial photographs cannot be used to detect features in heavily wooded areas whilst LiDAR survey may, under conditions of lower leaf index, penetrate gaps in the tree canopy to provide a DTM of the ground surface beneath.
48. In constructing a comprehensive interpretation of the archaeological landscape, it is thus advantageous to examine a range of photographs, taken under a variety of environmental conditions.
49. The aerial photographs taken in the 1940s often recorded extant landscapes which have been altered often beyond recognition by modern development. These historic photos provide a starting point for the assessment of landscape change, in conjunction with the study of historic maps and modern aerial and satellite-derived imagery. The 1946 layer of mosaiced vertical aerial photos taken by the RAF was used for baseline survey at [www.historic-maps.norfolk.gov.uk](http://www.historic-maps.norfolk.gov.uk) with comparative analysis at the same site from a mosaic of vertical images taken in 1988.
50. The remit of past oblique aerial surveys, the survey areas chosen and the visibility of sites to the aerial archaeologist can often determine the content and coverage of oblique aerial photography. Observer led flights may be heavily biased and may miss features which were present but were not seen or recorded. This is apparent when comparing vertical aerial photographs taken at times when crops were responsive to concurrent oblique observer-led surveys. In these instances, vertical photographs often record much more extensive cropmark landscapes than the observer-led oblique photographs.
51. It is also important to note that the perception of the environment and expectation of what is to be found may often limit the air photo analyst's mental 'openness' to features. This perception factor is mitigated by repeated examination of imagery taken in different years and under different conditions, and by teamwork between two or more interpreters checking the data. 'Photo fatigue' is also a factor in drop-off rates of discovery or perception of features. It is mitigated by alternating activities and personnel, checking interpretations with other team members and taking adequate visual breaks.

#### 21.2.7.2 Online aerial photographs and satellite-derived images

52. Google Earth regularly uploads new images and attributes some images with the name of the provider and a date of capture. These dates are not verified, but for archaeological survey this is not a legally essential element of the metadata. The issue with data derived from geoportals such as Google Earth is that it changes and is added to; it is a dynamic collection of varied mosaiced dated images and varied resolutions of data derived from aerial photography and satellite imagery. During 2017-2018, Google began to capture its own data, and these layers are largely 'unattributed' in terms of provider. The main UK providers to Google Earth include Getmapping, Infoterra and Bluesky, The GeoInformation Group, Maxar and CNES/Airbus. The mosaic 'cuts' where images have been blended together and captured in different seasons are readily apparent, often within the same 'timeline' data.



### 21.2.7.2.1 *Online aerial photographs and satellite-derived images: conclusion*

53. The multiple timelines displayed at Google Earth provided a major source of data for this survey, and revealed detailed crop marked evidence, particularly visible on the 2006 timelines.

### 21.2.7.3 **LiDAR Data**

54. LiDAR data are collected for multiple environmental and engineering survey purposes and are therefore sometimes not in compliance with optimum timeframes for heritage survey requirements. An optimum LiDAR survey date for recovery of micro and macro topographic heritage data spans late November to mid-March in the northern hemisphere. This is when leaf canopy and vegetation are at their lowest and a higher proportion of bare earth is exposed in both woodland and open areas to ensure that the laser pulses reach and return to and from the ground in sufficient density to record topography to create an accurate and detailed DTM.
55. Whilst of excellent high resolution, some data are not gathered at an optimal time for specific heritage survey purposes, as they are provided to serve the needs of multi-disciplinary surveys. A lower resolution survey captured during the winter months very often provides more data due to the lack of intervening vegetation which prevents sufficient laser points from reaching the ground surface. A low density of vegetation and leaf canopy is essential to the effectiveness of LiDAR survey in that it ensures maximum penetration of light signals to the ground surface in vegetated areas. The LiDAR data are, however, of assistance in recording some micro and more macro topographic features which may indicate relict or extant archaeological features and historic landscapes. They were used over the survey area in multiple visualisations alongside the aerial photographs and satellite image data. LiDAR data are best interpreted and used in conjunction with modern and historic aerial photographs and maps to provide ground truth information, and this was achieved in this survey.
56. For LiDAR data captured during 'leaf / crop on' conditions, less data is recorded due to foliage and vegetation masking the route of the laser. Similarly, areas of water will absorb the laser giving no returned points.
57. The majority of the NLP LiDAR data were collected between October and March, with varied dates for smaller surveys.
58. When the point cloud is processed into a DTM, reduced ground coverage results in a simplified geometry surface interpolated from the few available data points which can obstruct features of interest.
59. The horizontal cell resolution of LiDAR data can also influence the detection rates of archaeological features. This can occur where the spacing of point measurements is sufficiently wide to conceal or reduce the visibility of small archaeological features. This may have affected this assessment in areas where LiDAR data were gathered at 2m, 1m and 50cm resolutions as opposed to the more detailed 25cm resolution data.

60. It is also important to note that LiDAR visualisation techniques are continually developing and advancing. The multiple visualisations now applied to DSM and DTM data via the RVT used for this survey are effective in heritage interpretation. Hillshade, and particularly fixed-direction Hillshade, visualisations do not show the correct position of the actual features, only the position of their virtual 'shadows' on the ground. It is thus important to use multiple visualisations of LiDAR data to ensure accurate positioning of recorded features and optimise the results.

#### 21.2.7.3.1 *LiDAR Data: conclusion*

61. The majority of the LiDAR data were captured at times of low leaf index; however these data did not reveal consistently significant topographic heritage assets over the whole of this area. This is due to the eroded and buried nature of the crop marked sites which constitute the majority of the aerial evidence which is largely eroded to sub-surface level.
62. Many of the defensive sites have also been dismantled and levelled, however some were recorded effectively via LiDAR data.

#### 21.2.7.4 **Aerial Imagery Limitations: conclusions**

63. Aerial photograph assessments are often based on sequences of historical imagery which provide a series of 'snapshots' of the landscape under different conditions. In contrast, LiDAR and multi-spectral data are typically gathered at a single or series of closely spaced points in time. Levelled features which are now only visible as cropmarks are not usually visible via LiDAR data unless they are recorded as substantially differing vegetation heights within a DSM, or the features causing the cropmarks are still extant as micro topographic differences in the ground surface.
64. The limitations of these data sources are appreciated and considered during survey and use of multiple data sources. Multiple times of survey increases the discovery rate and certainty of interpretation from all airborne data sources when they are examined concurrently.

### 21.2.8 **Environment Within the Study Area**

65. The nature of the environment has a complex effect on both the preservation and visibility of both buried and upstanding features from the air. Many factors combine to influence very marked seasonal and temporal limitations to visibility of cropmarks soil marks and earthworks, and the modern land use, geology and soil types are all major contributing factors to the visibility of heritage assets from airborne and satellite-derived sources.

### 21.2.9 **Topography and Land use**

66. The Study Area lies within a flat - gently undulating predominately arable landscape with some areas of military, or former military, land use.

67. There are some areas of heathland at Kelling, and some areas of coppice or deciduous woodland. The Study Area traverses open countryside around small towns and villages, from Landfall at Weybourne southwards towards Hethersett where it crosses the A11 Hethersett bypass and the Breckland Line railway, to the south of the town. The Study Area then directs to the east to terminate between Swardeston and the A140 and the Great Eastern Main railway line, south of Norwich.
68. The River Wensum crosses the study area at Attlebridge, the River Tud crosses between Honington and Easton and the River Yare crosses the area between Marlingford and Barford.
69. The land use is predominantly arable with some areas given over to other crops, grass and outdoor piggeries.

#### 21.2.9.1 Topography and Land Use Conclusion

70. The Study Area presents an optimal environment for early settlement. The soils and substrates are well drained and easily worked and there is optimal access to watercourses with fertile river valley environments. A considerable resource and opportunity is presented by the coast and sea in the north of the Study Area at Weybourne.
71. This is largely an optimum environment for the recording of buried features from the air, particularly as marks in crops following intensive use for cereal and other arable crop production. This is reflected in the high number of sites which were visible on aerial photographs in arable areas.

#### 21.2.10 Geology

72. The drift deposits (Cranfield University 2020, British Geological Survey (BGS) 2020) are largely chalky till, chalky drift and glacio-fluvial drift, with some areas of Fen peat and an area of marine alluvium at the coast.
73. The extent, type and location of these deposits is shown on **Figure 21.2-6**.

##### 21.2.10.1 Geology Conclusion

74. The well drained chalky and drift substrates provided a favourable environment for settlement from prehistoric times to the present day and give rise to free draining soils which are conducive to the formation of cropmarks over buried features in times of mild drought.
75. Marine alluvium and Fen peat may mask some heritage assets in the discrete areas where these deposits are present.

#### 21.2.11 Soils

76. The drift geologies give rise to areas of shallow well drained soils, and there are other areas with some deeper, more moisture retentive deposits. The soils are shown on **Figure 21.2-7**, and have the following associations and characteristics:
  - Adventurer's 2 Soil Association, classification 1024b: Fen peat over glacio-fluvial drift and Tertiary cretaceous sand;

- Beccles 1 Soil Association, classification 711r: seasonally wet loam and clay over chalky till;
- Burlingham 1 and 3 Soil Associations, classifications 572n and 572p: deep loam over chalky till and glacio-fluvial drift;
- Felthorpe Soil Association, classification 643d: deep sandy soil over Glaciofluvial till and drift;
- Hanworth Soil Association, classification 871c: seasonally wet peat to clayey fine silty and loamy soils, which are affected by groundwater.
- Isleham 2 Soil Association, classification 861b: seasonally wet deep sand over glacio-fluvial peat and drift;
- Newmarket 2 Soil Association, classification 343g: Deep sandy soil over glacio-fluvial drift;
- Newport 1, 3 and 4 Soil Association, classification 551 d, f and g: Deep sandy soils over glacio-fluvial drift and chalky till;
- Wallsea 2 Soil Association, classification 813g: seasonally wet deep clay over marine alluvium; and
- Wick 2 and 3 Soil Association, classification 541 s and t: Deep loam over glacio-fluvial and aeolian drift and till.

#### 21.2.11.1 Soils Conclusion

77. The soils in the Study Area present a mixed group of substrates with some soils better draining than others, particularly the loams and sand over glacio-fluvial drift and chalky drift and tills.
78. In this area of Norfolk, the chalk substrate within parts of the Study Area is well drained, and crops respond readily to differences in the depth and consistency of the topsoil, over areas where buried ditched and embanked features are present. This effect also applies to anomalies in the consistency of the substrate. Aerial images in this region show widespread marks in crops over large areas of 'patterned ground' which are caused by these geological patterns and anomalies in the chalk (Stephens 1990 121 – 124). These patterns are particularly visible in some areas of the Study Area and are easily discernible from crop marks caused by archaeological features which are more regular and obviously anthropogenic.

#### 21.2.12 Previously Recorded Heritage Assets

##### 21.2.12.1 Sources of Data

79. Information regarding statutorily protected heritage assets has been provided by the National Heritage List for England (NHLE). One site which is Scheduled within the NHLE lies within the Study area and outside of the PEIR Boundary. NHLE 1013097 is a moated site, which lies to the west of Holt Road near Weybourne, 380m south-southwest of Rosedale Farm at APS\_206.

80. The NHER PrefRef reference numbers have been used to refer to sites identified by the survey where a PrefRef is available. The NHER data were provided as shapefiles in point, line and polygon format and were loaded into the project GIS for analysis. Not all heritage assets recorded in the NHER and NHLE are likely to be seen via aerial sources and as such will not be discussed in detail, alongside listed buildings and other historic landscape based data.
81. The survey results have been concorded to a concurrent desk-based heritage assessment (see **Appendix 21.1 – Archaeological Desk Based Assessment**).
82. The NHER contains records spanning all periods of prehistory and history, including prehistoric funerary sites, early and later prehistoric settlement and farming sites and artefactual evidence of land use and activity from the prehistoric and Roman periods onwards.
83. The landscape was settled and used in the Medieval period, and post-medieval field systems which comprise the ‘bones’ of the modern post enclosure landscape are either extant or recently removed.
84. The Study Area was at the forefront of the coastal defence of Britain in WWI and II. Many military sites, defences, training areas and airfields have been identified within the NHER and by the Norfolk NMP. This survey has sought to qualify these records, by recording their present condition. Whilst some features such a pill boxes and some airfields remain; the 20th Century military landscape is now very different to that observed from aerial photographs taken in the 1940s.

### 21.2.13 Baseline Summary

85. In summary, the NHER data have provided an important overview of the types of sites that are known within the study area and has recorded and highlighted the potential for and types of heritage asset that were likely to be encountered during this assessment of aerial imagery and LiDAR data.

### 21.2.14 Results

#### 21.2.14.1 Presentation

86. The results from the interpretation and mapping are presented in **Table 21.2 1**. Results are illustrated by **Figure 21.2-9**, an indexed mapbook which shows all sites which have been recorded, in 23 sheets numbered 01-23 from south to north. The fields in **Table 21.2-1** comprise:
  - APS Site Id;
  - Mapbook sheet;
  - Located in PEIR boundary;
  - SEPDEP\_ID;
  - NHER PrefRef;
  - Asset Type;
  - Condition on latest source;
  - Period;

- Interpretation notes;
- Easting coordinates;
- Northing coordinates; and
- Six figure National Grid Reference (NGR).



*Table 21.2-1: Sites Within the Study Area*

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_001	1	N			Headland	Eroded	Medieval	Eroded bank which may have been a headland to Medieval ploughing	620514	301457	TG 205 014
APS_002	1	Y			Curvilinear enclosure	Cropmark	Unknown	Cropmarked eroded linear ditches, likely boundaries and tracks, and a curvilinear ditched enclosure which may be a Bronze Age funerary feature	621779	301494	TG 217 014
APS_003	1	N			Ditch	Cropmark	Unknown	Cropmarks over ditches, of unknown date and origin	621254	301554	TG 212 015
APS_004	1	Y			Ditch	Cropmark	Unknown	Cropmarked ditch with a terminal defined gap, which could be part of an undated enclosure	620080	301715	TG 200 017
APS_005	1	Y	1138, 1147	52080	Boundary	Cropmark	Post-medieval	Cropmarks over post medieval field boundaries	621978	301877	TG 219 018
APS_006	1	Y	926	9752	Circular enclosure	Cropmark	Unknown	Earthwork ring ditch of possible medieval to post medieval date, perhaps relating to a former mill or industrial site	620880	301905	TG 208 019

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_007	1	N			Field system	Eroded	Post-medieval	Post-enclosure boundaries which have been removed to facilitate modern farming	620523	301976	TG 205 019
APS_008	1	N	1082	52066	Extraction pit	Cropmark	Post-medieval	Possible area of post medieval brick making and clay extraction on and around the edges of the former Swardeston Hill	620888	302004	TG 208 020
APS_009	1	N	962	52062	Enclosure	Cropmark	Post-medieval	Cropmarks over probable medieval to post medieval date field boundaries and a possible enclosure	620574	302013	TG 205 020
APS_010	1	N	1010	52084	Road	Cropmark	Medieval - post-medieval	Possible medieval or post medieval road or trackway	620823	302086	TG 208 020
APS_011	1	N	804	52065	Circular enclosure	Cropmark	Unknown	Cropmarks over two possible ring ditches of unknown date and function	621127	302128	TG 211 021
APS_012	1	N	1007	9750	Moot	Cropmark	Unknown	The site of the moot for the Humbeleyard Hundred. Earthworks and cropmarks at this location may relate to this former site.	621117	302140	TG 211 021



Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_013	1	N	997	9717	Chapel	Cropmark	Medieval	The site of St James Chapel, thought to have stood within this rectangular enclosure	621048	302150	TG 210 021
APS_014	1	N	913, 1120	52069 52070	Settlement	Cropmark	Medieval	Recorded site of medieval village of Gowthorpe, cropmark boundaries and enclosures may indicate the remains of this site	621043	302177	TG 210 021
APS_015	1	N	809	52071	Boundary	Cropmark	Unknown	Cropmarks over a small group of fragmentary ditched cropmarks, represent the remains of undated former field boundaries	621345	302223	TG 213 022
APS_016	1	N	443	20008	Curvilinear enclosure	Cropmark	Unknown	Banked curvilinear enclosure of unknown date and function	620574	302248	TG 205 022
APS_017	1	N	1323	52077	Military site	No longer extant	Modern	Probable site of WWII searchlight battery	622004	302315	TG 220 023
APS_018	1	Y	1323	52077	Military site	Built over	Modern	Probable site of WWII searchlight battery	621965	302435	TG 219 024
APS_019	1	Y	1146	52067	Boundary	Cropmark	Post-medieval	Probable post medieval boundary	621146	302503	TG 211 025

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_020	1	N		52073	Field system	Cropmark	Unknown	Cropmarks over undated ditches, probably represent the remains of a rectilinear enclosure and/or field boundaries	620855	302624	TG 208 026
APS_021	3	N	1335	54604	Air raid shelter	No longer extant	Modern	WWII accommodation site probably related to Hethel airfield NHER 9522	616134	302637	TG 161 026
APS_022	1	Y			Bank	Earthwork	Modern	A bank or bund which may be associated with quarrying to the north	621775	302664	TG 217 026
APS_023	1	Y		52035 52061 52072	Field system	Cropmark	Unknown	Fragmentary cropmarks of possible enclosures and boundaries relating to several phases of past activity	620626	302723	TG 206 027
APS_024	2	N	541, 573		Extraction	Eroded	Unknown	An area of uneven ground which may be banks and area of possible extraction, but the features are very eroded and only visible via LiDAR data	617698	302749	TG 176 027

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_025	2	Y			Headland	Eroded	Medieval	Very eroded bank which is likely to be a headland created by medieval ploughing which is now fully eroded	618966	302811	TG 189 028
APS_026	1	Y	965	52134	Field system	Cropmark	Medieval - post-medieval	Earthworks of medieval to post medieval date enclosures and boundaries surrounding Mangreen Hall	621378	302849	TG 213 028
APS_027	1	N			Ditch	Eroded	Unknown	Cropmarks over ditches, of unknown date and origin	622112	302867	TG 221 028
APS_028	3	Y	1093	54616	Parkland boundary	Eroded	Post-medieval	Earthwork which may be a post medieval park boundary	616358	302892	TG 163 028
APS_029	2	N			Field system	Eroded	Post-medieval	Eroded banks and ditches where field boundaries have been removed to facilitate modern farming	618505	303030	TG 185 030
APS_030	3	Y			Extraction	Eroded	Unknown	An area of uneven ground visible only via LiDAR data, which may be an area of former extraction or earthworks, which are very eroded	616548	303042	TG 165 030

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_031	2	Y	1095	54623	Ditch	Woodland	Unknown	Earthwork ditch, possible post medieval drainage feature	617523	303046	TG 175 030
APS_032	1	N		52032	Ditch	Cropmark	Post-medieval	Cropmarks over medieval to post medieval field boundaries and enclosures	620290	303074	TG 202 030
APS_033	3	N			Field system	Eroded	Post-medieval	Post-enclosure boundaries which have been removed to facilitate modern farming	615230	303136	TG 152 031
APS_034	4	Y	723	19725	Road	Cropmark	Roman	Cropmarks over Roman road from Venta Icenorum to Watton	614371	303345	TG 143 033
APS_035	2	Y	6 541	9481	Mound	Eroded	Unknown	Two possible Bronze Age round barrows near Norwich Lodge, Ketteringham Hall	617373	303440	TG 173 034
APS_036	03, 04	N			Field system	Cropmark	Post-medieval	Post enclosure field boundaries which have been removed and show as cropmarks	614502	303530	TG 145 035
APS_037	3	Y			Field system	Cropmark	Post-medieval	Former field boundaries	615608	303620	TG 156 036

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_038	4	N			Field system	Eroded	Post-medieval	Post-enclosure boundaries which have been removed to facilitate modern farming	613696	304025	TG 136 040
APS_039	04, 05	Y	1379	53602	Boundary	Cropmark	Unknown	Undated rectilinear ditches which may be boundaries	612658	305454	TG 126 054
APS_040	5	N	1355	53603	Enclosure	Cropmark	Unknown	Cropmarked rectilinear enclosure and some large infilled pits. Prehistoric and Roman finds from area, and the feature is respected by boundaries set out on the Tithe map	612476	305644	TG 124 056
APS_041	5	Y	969	53601	Deserted settlement	Eroded	Medieval	Shrunken medieval to post medieval settlement. Plentiful medieval to post medieval finds recorded under NHER 15287-8	612716	306121	TG 127 061
APS_042	5	Y			Field system	Cropmark	Post-medieval	Post enclosure field system, boundaries have been removed and now show as marks in crops	612488	306256	TG 124 062

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_043	5	N	1358	17345	Trackway	Cropmark	Unknown	Possible trackway and additional parallel ditch of unknown date. Modern in appearance and not aligned to the boundaries shown on the tithe and enclosure maps	612577	306390	TG 125 063
APS_044	5	Y	475	53487	Enclosure	Cropmark	Unknown	Fragmentary field boundaries, some probably post medieval, others earlier, and a possible enclosure which may be Neolithic. A ditched circular feature also recorded as a cropmark	612191	306641	TG 121 066
APS_045	5	Y	520	15767	Round barrow	Cropmark	Unknown	Site of probable Bronze Age round barrows	612083	306979	TG 120 069
APS_046	5	N	564, 563, 489, 1441	53488	D shaped enclosure	Cropmark	Unknown	Multi-period cropmarks, over former field boundaries, enclosures and perhaps settlement	612210	307064	TG 122 070
APS_047	6	N			Ditch	Cropmark	Unknown	Buried linear ditches of uncertain origin	611666	308314	TG 116 083
APS_048	6	Y			Enclosure	Cropmark	Unknown	Probable ditched buried enclosures which may form part of a focus of prehistoric settlement	611974	308367	TG 119 083

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_049	6	Y	1005	53501	Bank	Woodland	Unknown	Possible compartment boundaries or similar within Colton Wood, an area of Replanted Ancient Woodland	611486	308785	TG 114 087
APS_050	7	N			Extraction site	Extracted	Modern	Area of active soil stripping and a works compound to east of TVAS excavation of round barrow site NHER ENF147074	612113	310494	TG 121 104
APS_051	7	N	705	53628	Settlement	Cropmark	Unknown	Cropmarks over enclosures and fields of probable Roman date	612441	310774	TG 124 107
APS_052	7	N	509	53679	Round barrow	Cropmark	Bronze Age	Cropmarks over one ring ditch, possibly two, which are likely to be the eroded remains of Bronze Age round barrows	612356	310917	TG 123 109
APS_053	7	N	877	28552	Settlement	Earthwork	Medieval	Extant platforms and ditched enclosures relating to former medieval tofts	612033	311376	TG 120 113
APS_054	7	N	972	54360	Boundary	Cropmark	Unknown	Cropmarks over undated ditches and possible trackway	611923	311617	TG 119 116
APS_055	7	N	1262	34084	Military site	No longer extant	Modern	Site of a WWII searchlight battery	611725	311780	TG 117 117

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_056	7	N	1262	34084	Military site	No longer extant	Modern	Site of a WWII searchlight battery	611844	311811	TG 118 118
APS_057	7	Y	1333	53629	Military site	No longer extant	Modern	Site of probable WWII weapon pits	612394	312082	TG 123 120
APS_058	8	N	487	12807	Round barrow	Cropmark	Unknown	Cropmarks over a ring ditch, probably the remains of a Bronze Age barrow	612158	312706	TG 121 127
APS_059	8	N	1380	53678	Boundary, trackway	Cropmark	Unknown	Cropmarks over fragmentary field boundaries and trackways of unknown date	612199	312764	TG 121 127
APS_060	08, 09	Y	1372	50617	Boundary	Cropmark	Unknown	Cropmarks over a series of undated linear ditches, probably the remains of former field boundaries	611450	313509	TG 114 135
APS_061	8	N	585	50615	Enclosure	Cropmark	Unknown	Cropmarks over a series of possible enclosures and associated field boundaries of unknown, but possible Iron Age to Roman date	611537	313756	TG 115 137
APS_062	8	N	956	50614	Boundary	Cropmark	Unknown	Cropmarks over a series of undated ditches, probably the remains of former field boundaries of possible med to post med date	612000	314130	TG 120 141



Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_063	8	Y	584	50610	Settlement	Cropmark	Unknown	Cropmarks over a series of possible enclosures and associated field boundaries of unknown, but possible Iron Age to Roman date	611941	314286	TG 119 142
APS_064	8	N	1320	50611	Military site	No longer extant	Modern	A possible WWII military structure, uncertain origin could be agricultural	612115	314446	TG 121 144
APS_065	8	N	1072	50609	Boundary	Cropmark	Unknown	Cropmarks over a series of undated linear ditches, probably the remains of former field boundaries of post medieval date	611704	314510	TG 117 145
APS_066	9	N	1249	3063	Airfield	Partially extant	Modern	Some elements of RAF/USAAF Attlebridge remain extant. Others have been moved and are visible as marks in grass or slight height differences <i>via</i> LiDAR over areas of removed hard surfacing	610304	314718	TG 103 147
APS_067	09, 10	N			Foundation	Cropmark	Unknown	Very slight light toned linear marks in crops which may indicate either buried foundations or possibly natural features	611431	315120	TG 114 151

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_068	10	N	1374	50673	Ditch	Cropmark	Unknown	Cropmarks over fragmentary linear ditches of unknown and multi-period date	612001	315949	TG 120 159
APS_069	10	N	505	50655	Circular enclosure	Cropmark	Unknown	Cropmarks over a ring ditch and oval enclosure, both probably Bronze Age barrows	612371	316628	TG 123 166
APS_070	10	N	946	35933	Field system	Cropmark	Medieval - post-medieval	Earthworks and cropmarks related to medieval to post medieval boundaries and drains on the valley floor	612518	316645	TG 125 166
APS_071	10	Y	912	50676	Platform	Eroded	Medieval - post-medieval	Two extant oblong mounds, which are possibly medieval building platforms, and a possible site of a church recorded by NHER 7741	612607	316654	TG 126 166
APS_072	10	Y	562	50656	Circular enclosure	Cropmark	Unknown	Cropmarks over possible causewayed ring ditch, potentially remains of Bronze Age barrow, or alternatively a medieval or post medieval post mill	612229	316685	TG 122 166

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_073	10	N	696	50664	Boundary	Cropmark	Unknown	Cropmarks over fragmentary linear ditches, probably representing field boundaries and trackways	613587	316739	TG 135 167
APS_074	10, 11	N	829	50679	Enclosure	Cropmark	Early medieval	Cropmarks over early medieval timber structure, which along with three other buildings recorded as part of HER 17217	613064	316932	TG 130 169
APS_075	10, 11	Y	700	50678	Circular enclosure	Cropmark	Roman	Cropmarks over a ring ditch that is the remains of a Roman roundhouse (excavated and recorded as part of HER 17217)	613051	316937	TG 130 169
APS_076	10	N	840	50677	Settlement	Cropmark	Medieval	Cropmarks over medieval field boundaries and enclosures, some of which have been excavated as part of HER 17217	613151	316987	TG 131 169
APS_077	10, 11	Y	506	50657	Round barrow	Cropmark	Unknown	Cropmarks of a possible ring ditch, which may represent the remains of a Bronze Age round barrow	613090	317134	TG 130 171

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_078	11	N	1386	54355	Boundary	Cropmark	Unknown	Cropmarks over fragmentary ditches and former field boundaries of unknown date	613065	317338	TG 130 173
APS_079	11	Y	1385	54354	Boundary	Cropmark	Unknown	Cropmarks over an undated ditch	613382	317481	TG 133 174
APS_080	11	N	971	54353	Road	Cropmark	Medieval - post-medieval	Cropmarks over a former road or trackway and field boundaries of medieval to post medieval date	613339	317595	TG 133 175
APS_081	11	N	706	53700	Boundary	Cropmark	Unknown	Cropmarks over fragmentary ditches and former field boundaries of unknown date	613266	318111	TG 132 181
APS_082	11	Y	1384	53699	Structure	Soilmark	Unknown	Soilmarks of possible buried walls of uncertain date and origin, an agricultural or extraction cause or marks is possible	613252	318228	TG 132 182

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_083	11	N	1383	53698	Pond	Cropmark	Unknown	NMP has identified cropmarks over possible ditches and a possible ring ditch. From available evidence, the features may be natural, or possibly a former pond or pit. However, consultation of the original sources is necessary and the NMP description is likely based on more archaeological evidence than has been available from purely online sources, and thus to be noted and accepted	613686	318561	TG 136 185
APS_084	11	N			Headland	Eroded	Medieval	A very eroded bank which may be a headland to an area of totally medieval ploughing	613988	318735	TG 139 187
APS_085	11	Y	914	53481	Platform	Eroded	Medieval - post-medieval	Earthworks of probable medieval building platforms	614502	319022	TG 145 190

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_086	11	N	587	53482	Ditch	Cropmark	Unknown	Cropmarks over ditches, probable former field boundaries and trackway, some of which may be Iron Age to Roman in date	614559	319391	TG 145 193
APS_087	12	Y	1382	53697	Curvilinear enclosure	Cropmark	Unknown	Uncertain interpretation of a possible ring ditch and some further straighter ditches to the east. The 'ring ditch' may be a natural feature as is not well defined	613860	319804	TG 138 198
APS_088	12	N	1342	7465	Foundation	Cropmark	Unknown	Cropmarked trackway with attached features, which may be associated with the former military airfield MNF7465. Series of slight depressions recorded by LiDAR data and an area of differently toned crop on some vertical images at Google Earth	613608	320412	TG 136 204
APS_089	12	N	1342	7465	Military site	Grassmark	Modern	Swannington WWII airfield	614273	320657	TG 142 206

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_090	12	N			Military site	Cropmark	Unknown	A circular area of parched or differential crop which may indicate a buried feature associated with the former military airfield, MNF7465	613689	320671	TG 136 206
APS_091	12	Y			Mound	Eroded	Unknown	An eroded mound, of unknown type and origin	613673	321669	TG 136 216
APS_092	13	N			Trackway	Cropmark	Unknown	Likely trackway, and a focus of ditches and possible enclosures	613817	322176	TG 138 221
APS_093	13	N			D shaped enclosure	Cropmark	Prehistoric	A complex of likely multi-phased rectilinear ditched enclosures and pits, with an outlying D-shaped ditched enclosure to the immediate east of the buffer area	614334	323114	TG 143 231
APS_094	13	N	1439		Field system	Cropmark	Post-medieval	Likely post enclosure field system which has been removed	614472	323653	TG 144 236
APS_095	13, 14	Y			Trackway	Cropmark	Unknown	Cropmarked ditch which may be a boundary, and a parallel ditched track which lies just to the west of the buffer area	614147	324486	TG 141 244

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_096	14	N			Field system	Cropmark	Unknown	Extensive natural frost cracks and pits, which show as marks in crops with overlying ditches and possible enclosures	614734	324654	TG 147 246
APS_097	14	Y			Enclosures	Cropmark	Roman	Multiple rectilinear enclosures with straight sides, round corner and one terminal defined entrance. This may be a Roman settlement or military site	614739	325024	TG 147 250
APS_098	14	N	1414		Settlement	Cropmark	Unknown	Straight sided enclosures, one visible terminal defined entrance, ditches and pits. A likely settlement site	614419	325355	TG 144 253
APS_099	14	N			Extraction pit	Cropmark	Unknown	A possible ditched enclosure and several areas of hand dug extraction pits, visible in an area where many geological features also show as marks in crops	614330	326151	TG 143 261
APS_100	15	N			Ditch	Cropmark	Unknown	Ditches which may be former boundaries or earlier features	613253	327344	TG 132 273



Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_101	15	N			Trackway	Cropmark	Unknown	Cropmarked pits and ditches which indicate buried tracks and possible settlement traces	612997	327662	TG 129 276
APS_102	15	N			Ditch	Cropmark	Unknown	A long straight feature which may be a former small roadway or track	612966	328817	TG 129 288
APS_103	15, 16	N	397		Oval enclosure	Cropmark	Prehistoric	An ovoid single ditched enclosure which may date to the earlier prehistoric period, possibly Neolithic or Iron Age. Adjacent former quarry of unknown date	613515	329497	TG 135 294
APS_104	16	Y			Ditch	Cropmark	Unknown	Buried ditches of unknown date and origin	613199	329751	TG 131 297
APS_105	16	N			Ditch	Cropmark	Unknown	Ditches which may be part of a former field system	613017	330597	TG 130 305
APS_106	16	N			Settlement	Cropmark	Unknown	Buried linear ditches which may be boundaries and some fragmentary ditches and pits which may indicate an area of past settlement	612203	331581	TG 122 315
APS_107	16, 17	N	558	51591	Settlement	Cropmark	Unknown	Buried eroded settlement enclosures with a central trackway and other outlying	612775	332147	TG 127 321

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
								enclosures and boundaries			
APS_108	17	N			Field system	Cropmark	Unknown	Straight sided round cornered enclosures and part of a regular pre-modern former field system. A multi period site which may have Roman elements	613427	332374	TG 134 323
APS_109	17	Y			Field system	Cropmark	Unknown	Part of a former field system, possibly post-enclosure boundaries and lanes	613243	332810	TG 132 328
APS_110	17	N			Field system	Cropmark	Unknown	Continuation of a former ditched field system with an integral trackway	613724	333036	TG 137 330
APS_111	17	Y			Field system	Cropmark	Unknown	Part of a former field system and possible trackway	613452	333181	TG 134 331

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_112	17	Y	1101		Oval enclosure	Cropmark	Unknown	Single ditched cropmarked ovoid enclosure which is likely to be a prehistoric site. Some fragmentary features may be ditches to the north, and the field also contains drainage ditches and natural anomalies in the soil which cause cropmarks	613506	333746	TG 135 337
APS_113	17	N	1365		Field system	Cropmark	Unknown	Ditches, pits and boundaries indicative of field and sentient features in this area. Also visible beneath deeper probably alluvial soils to the immediate east of the buffer area	613765	333771	TG 137 337
APS_114	18	Y			Field system	Cropmark	Unknown	Pits and possible buried ditches	613671	334755	TG 136 347
APS_115	18	Y			Ditch	Cropmark	Unknown	Cropmarked pits and ditches which are widespread, and are likely to be buried archaeological features	613727	335752	TG 137 357
APS_116	19	Y			Trackway	Cropmark	Unknown	Buried ditches and a possible ditched trackway	613206	337147	TG 132 371

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_117	19	Y			Field system	Cropmark	Unknown	Buried ditches	613688	337860	TG 136 378
APS_118	19	Y			Field system	Cropmark	Post-medieval	Post enclosure field system which has been removed. NMP records a ring ditch and enclosures in the same area	613089	339096	TG 130 390
APS_119	20	Y			Mound	Soilmark	Unknown	Two circular light toned marks in soil which may be the site of former mounds, possibly Bronze Age round barrows	613182	339416	TG 131 394
APS_120	20	Y	1360	27980	Field system	No longer extant	Unknown	Parallel banks closely set on the common, which may be traces of ridge and furrow or tree planting ridges	613099	340869	TG 130 408
APS_121	20	Y			Mound	Cropmark	Unknown	Two possible mounds, near the crop marked remains of a ring ditch and a possible cropmarked mortuary enclosure	612515	340909	TG 125 409

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_122	20	Y			Circular enclosure	Cropmark	Unknown	Cropmarked ring ditch which may be the ditch surrounding an eroded Bronze Age barrow, alongside the recorded cropmarked remains of a possible mortuary enclosure to the north west	612553	341023	TG 125 410
APS_123	20	Y	1362	27993	Ditch	Cropmark	Unknown	Possible linear ditches	612207	341049	TG 122 410
APS_124	20	Y	390	22883	Long barrow	Cropmark	Neolithic	Elongated long-mortuary enclosure of Neo funerary tradition	612304	341091	TG 123 410
APS_125	20, 21	Y	1361	27987	Trackway	Cropmark	Unknown	Possible trackway visible as cropmark	611870	341176	TG 118 411
APS_126	20	N	1053	38641	Extraction pit	Woodland	Unknown	Probable area of post med extraction	612410	341278	TG 124 412
APS_127	20	Y	1250	30708	Pillbox	No longer extant	Modern	Large adapted type 20V pillbox	611964	341347	TG 119 413
APS_128	20	Y	1304	38642	Weapons pit	Woodland	Modern	Group of WWII pits, recorded not mapped	612466	341442	TG 124 414
APS_129	20	N	1303	38639	Military site	No longer extant	Modern	WWII barbed wire enclosures and gun emplacements in Weybourne Wood	611993	341443	TG 119 414

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_130	20	N	1137, 1138	27992	Rifle butts	Woodland	Modern	Square and oblong mounds within cleared area, could be very recent in date	612827	341475	TG 128 414
APS_131	20	Y	837, 1390	38640	Extraction pit	Woodland	Modern	Group of earthwork iron procurement pits, likely Medieval, recorded under HERs 6280-2	612339	341481	TG 123 414
APS_132	20, 22	Y	1052	38638	Enclosure	Eroded	Unknown	Possible slight earthworks of an embanked rectilinear enclosure with sunken interior	612083	341813	TG 120 418
APS_133	20, 22	Y	856	38637	Extraction pit	Woodland	Unknown	Possible iron procurement pits, medieval date, although some may date to WWII	611991	341833	TG 119 418
APS_134	21, 22	N	496	32047	Curvilinear enclosure	Cropmark	Unknown	Previously recorded as ring ditch but looks like natural knoll which has been plough levelled, revealing geological cropmarks. Google Earth 2019 shows further cropmarks here which indicate this is an archaeological feature, possibly a ditched settlement enclosure and associated ditches	611081	341977	TG 110 419

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_135	21, 22	Y	1353	18108	Pillbox	Built over	Modern	Type 22 pillbox at Weybourne Station	611848	341984	TG 118 419
APS_136	21, 22	N	995		Trackway	Eroded	Unknown	NMP monument, a likely oval or round barrow, curvilinear ditch and possible access trackway	611203	341995	TG 112 419
APS_137	22	Y	1264	38328	Trench	Woodland	Modern	WWII trenches on edge of wood	612154	342091	TG 121 420
APS_138	22	N	1050	38347	Woodland boundary	Woodland	Unknown	Post medieval plantation boundary	612592	342133	TG 125 421
APS_139	22	Y	855	38345	Military site	Woodland	Unknown	Group of pits possibly relating to iron working, although some may be modern military features	612594	342155	TG 125 421
APS_140	22	Y	948	38266	Trackway	Cropmark	Medieval - post-medieval	Post medieval field boundaries and a trackway	612313	342283	TG 123 422
APS_141	21, 22	Y	1263	34181	Military site	No longer extant	Modern	WWII searchlight battery and associated defences and structures	611492	342335	TG 114 423
APS_142	21, 22	Y	497	32048	Round barrow	Cropmark	Bronze Age	Probable Bronze Age round barrow showing as cropmark over an eroded ring ditch	611100	342338	TG 111 423

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_143	22	N	1227		Field system	Eroded	Post-medieval	Post enclosure boundaries which have been removed to facilitate modern agriculture	611822	342393	TG 118 423
APS_144	21, 22	Y	13, 747	6304	Moated site	Eroded	Medieval	Moated complex with enclosures and fishponds and line of old road	610959	342517	TG 109 425
APS_145	22, 23	Y			Field system	Cropmark	Unknown	Likely post-enclosure field system which has been removed	610803	342689	TG 108 426
APS_146	21, 22	N	1264	38274	Military site	Eroded	Modern	WWII trenches and possible pillboxes	611872	342698	TG 118 426
APS_147	22	Y	949	38272	Boundary	Cropmark	Unknown	Cropmarks over linear features of unknown date and type	612152	342817	TG 121 428
APS_148	23	Y	1261	32528	Pillbox	Woodland	Modern	WWII pillbox, type 2/20	610385	342827	TG 103 428
APS_149	23	Y	1282	38369	Military site	Woodland	Modern	WWII trenches and pits, although some possible confusion with earlier iron pits recorded as NHER 6251	610336	342943	TG 103 429
APS_150	23	Y	1272	38358	Trench	No longer extant	WWII, modern	WWII practice trench on Muckleburgh Hill	610128	343103	TG 101 431



Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_151	23	Y	1269	38356	Trenches	No longer extant	WWII, modern	Group of practice trenches which were situated on Muckleburgh Hill	609996	343123	TG 099 431
APS_152	23	Y	1281	38368	Military site	Woodland	Modern	Possible WWII gun emplacement and defensive bank near approach to Weybourne Camp	610384	343126	TG 103 431
APS_153	23	N	5, 485	6249	Round barrow	No longer extant	Bronze Age	Bronze Age barrow with post WWII slit trenches cut into the mound	610121	343134	TG 101 431
APS_154	23	N	1279	38366	Military site	Woodland	Modern	Two probable WWII gun emplacements	610278	343135	TG 102 431
APS_155	23	N	1267	38350	Gun emplacement	Extant	Modern	WWII earthwork gun emplacement on Muckleburgh Hill	609917	343198	TG 099 431
APS_156	23	N			Military site	Eroded	Modern	Possible WWII gun emplacements or defensive features. Some identified by NMP, others as eroded mounds and tracks via LiDAR data in absence of original 1940s APs	609939	343218	TG 099 432
APS_157	22, 23	N	1302	38635	Military site	No longer extant	Modern	Three probable bomb craters, although could be weapons pits, from 1940	611032	343269	TG 110 432

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_158	23	N	1233	32502	Pillbox	Extant	Modern	WWI pillbox in hedge within Weybourne Camp. Structure observed and still extant in 2019	610274	343318	TG 102 433
APS_159	23	N			Service	Cropmark	Modern	A long slightly curvilinear feature which is not mapped from 1940s photos by the NMP and could possibly be part of an early airfield or a more modern service. Either under or overlies the sites of former military accommodations buildings	610413	343366	TG 104 433
APS_160	23	N	1253	32476	Gun emplacement	Extant	WWII, modern	Medium Gun Emplacement (MGE) and observation bunker	609863	343367	TG 098 433
APS_161	23	N			Boundary	Eroded	Unknown	Very slight banks which show as microtopography on visualised LiDAR data and slight vegetation differences on aerial images, likely to be post enclosure boundaries	610495	343415	TG 104 434

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_162	23	N			Military site	Grassmark	Modern	Grassmarks over the sites of WWII military buildings which were mapped from 1940s photos by NMP	610279	343426	TG 102 434
APS_163	22, 23	N	1228, 329, 335, 1234, 1235, 1237, 1244, 1245, 1256, 1258, 1259, 1279, 1296, 1297, 1298, 1299, 1300, 1314, 1327, 1329, 1422	11335	Military site	No longer extant	Modern	Weybourne Camp, military defensive site. Barbed wire defences around Weybourne Camp (HER 11335), plus two rectangular structures, possibly pillboxes	610409	343592	TG 104 435
APS_164	23	Y			Pillbox	Extant	Modern	Partially extant structure which may be a WWII pillbox	609599	343793	TG 095 437

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_165	23	N			Pillbox	No longer extant	Modern	A mound which shows on LiDAR data, and is also visible as a slight trace of ruined foundations on <a href="http://www.google.com/earth">www.google.com/earth</a> . This feature may possibly be the remains of a ruined pillbox or other defensive feature associated with the adjacent battery	609655	343804	TG 096 438
APS_166	23	Y	1051	38634	Defensive features	Eroded	Post-medieval	Earthwork channels or trenches and banks along coast, possibly relating to the Armada defences at Weybourne Hope	610387	343807	TG 103 438
APS_167	23	Y	1255	32500	Military site	No longer extant	Modern	Type 2 heavy gun emplacement (1940) and slit trench (1941)	610229	343809	TG 102 438
APS_168	23	N	1343	32460	Battery	Extant	WWII modern	5.25 inch battery two guns constructed by 1946, third added later, original command post building now used by UEA	609753	343812	TG 097 438
APS_169	23	Y	1252, 1301	32471, 38633	Gun emplacement	Extant	WWII, modern	WWII heavy machine gun emplacement, part of defences her 38633	609837	343813	TG 098 438

Id	Map book sheet	In DCO	SEP DEP ID	PrefRef	Asset type	Condition	Period	Interpretation notes	Easting	Northing	NGR
APS_170	23	N	1251	32469	Pillbox	Extant	WWII, modern	Type 20/A/X pillbox within group of WWII defences HER 38633	609840	343829	TG 098 438
APS_171	23	N	1247	24264	Pillbox	No longer extant	Modern	Type 22 pillbox visible in 1940, now eroded off cliff edge	610149	343860	TG 101 438

87. This aerial imagery and LiDAR data assessment has recorded 171 areas of interest and archaeological sites within the Study Area, some of which have been recorded previously by the NMP and NHER. These previous interpretations have been incorporated to the GIS database, where they are fully acknowledged and separated from the newly interpreted or augmented site interpretations made by APS.
88. In many instances this assessment has augmented the information and mapping available for the existing sites and has identified a significant number of new sites in areas where NMP mapping has not been undertaken. These areas where no previous assessment of aerial imagery has been completed are illustrated at **Figure 21.2-4**, where they are shown as the blank areas between the areas surveyed by the NMP.
89. Newly recorded sites have in this instance been discovered via modern digital aerial and satellite imagery which has been accessioned to and displayed at Google Earth between 1999 and 2019.
90. There are likely to be further sites to be recorded from aerial photographs held in the NHER and HE archives. **Figure 21.2-3** indicates locations where the NHER holds aerial photos which have not yet been examined for this assessment.
91. The information is, however, as complete as can possibly be achieved whilst working under restricted access to the physical archives.
92. The assessment has built upon the considerable body of evidence from aerial photographic sources contained within the NMP data derived from three individual Norfolk NMP surveys. New and previously known sites have been recorded which date from the Neolithic to modern periods, including crop marked sites which indicate the presence of likely Roman settlement remains alongside earlier settlement and funerary features and likely Iron Age – Roman settlement and farming features. Many of these sites are recorded as ‘undated’ as they cannot be firmly dated from remote sensing evidence alone.
93. There is a notable absence of extant or crop marked medieval or post medieval ridge and furrow indicative of agricultural land division and use in this period. This has been observed at other sites in Norfolk and is likely ascribed not to absence of land use, but to the erosion of these fields by subsequent agriculture. Some elements of medieval settlement and agriculture, such as tofts, enclosures, headlands and a Scheduled moated site are indicative of medieval settlement and land use in this area.
94. The Study Area has been heavily ploughed and the majority of the crop marked remains do not display any significant microtopography, as evidenced by examination of LiDAR data. There is however obvious potential for the discovery of sub-surface features and deposits in and around the visible foci of crop marked archaeological features.

95. Some military sites may be preserved residually in woodland and elements of former military landscapes are visible as individual extant features, residual crop and grass marked features and parts of former airfields and training grounds. The NMP recorded the WWI and WWII features in detail from 1940s and 1950s aerial photographs in areas where this survey has been undertaken. These features were prevalent in the area at the coast near Weybourne in the 1940s, when they were instrumental to the defence of Britain. Many of these defensive elements have since been removed entirely. This present survey has sought to record their latest observed condition in order to facilitate assessment of the impact of the cable corridor on areas as they are now, with knowledge of the content of those areas in their original condition at the time of use.

#### 21.2.14.2 Discussion of Sites Recorded Within the PEIR Boundary

##### 21.2.14.2.1 Prehistoric sites within the PEIR boundary

96. The majority of recorded prehistoric sites within the PEIR boundary are eroded and were seen as marks in crop or grass.
97. Some sites are undated and are likely to date from the prehistoric or Roman periods but dating often cannot be proven solely from airborne remote sensing data.
98. A Neolithic long mortuary enclosure was identified at site APS\_124 (**Figure 21.2-9** sheet 20) by both this survey and the NMP at Upper Sheringham Common. The site is visible as a crop mark and is likely to be an element of other landscape and funerary features in this area.
99. An undated curvilinear enclosure which may indicate the presence of an eroded Bronze Age round barrow is visible as a crop mark nearby at APS-122 (**Figure 21.2-9** sheet 20). Further sites which are dated firmly or morphologically to the Bronze Age comprise:
100. APS\_052 (**Figure 21.2-9** sheet 7) is a crop marked ring ditch indicative of a round barrow to the south of the A47 west of Easton; and
101. APS\_142 (**Figure 21.2-9** sheet 22) is a crop marked round barrow, recorded by the NMP, which are situated nearer to the coast to the north and south of Weybourne.
102. Rectilinear ditched enclosures and a curvilinear feature identified by the NMP and recorded as APS\_093 (**Figure 21.2-9** sheet 13) to the southwest of Cawston lie within the PEIR boundary and adjacent to a 'D' shaped enclosure within the wider Study Area. This site is likely to have been a focus of rural prehistoric, possibly Iron Age settlement, where APS\_094 (**Figure 21.2-9** sheet 13) records former boundaries, which may possibly be a prehistoric or later field system to the immediate north of APS\_093.

##### 21.2.14.2.2 Roman sites within the PEIR boundary

103. The true extent of the Iron Age – Roman landscape in this area is not reflected in the firmly dated sites recorded by this survey. The majority of features dating to the later prehistoric period and transition to the Roman period which are visible from the aerial imagery consulted for this assessment or by the NMP have been classified as 'undated' prior to further investigation.

104. The area to the north of Cawston carries potential for buried Roman remains, as cropmarked evidence indicates Roman settlement and military features in this area.
105. Site APS\_096 (**Figure 21.2-9** sheet 14) is a possible cropmarked enclosure and field system, which may be associated with nearby likely Roman sites.
106. Sites APS\_097 and 098 (**Figure 21.2-9** sheet 14) lie in open countryside to the north of Cawston and to the east of Holt Road. Their main visible elements lie outside the Study Area. The core part of APS\_098, a straight sided enclosure with terminal defined entrance, lies outside and to the west of the PEIR boundary. APS\_097, a likely Roman military and settlement site again lies to the west of the PEIR boundary. Some ditches extend into the PEIR boundary from the core of site 098, but these are likely to be outlying boundaries rather than visible enclosures or buried ditched military features. This area is described here as, whilst the visible core of the complex crop marked remains lie outside the PEIR boundary, they indicate a potential in this area for sub-surface Roman remains which may not be fully visible via airborne remote sensing sources.

#### *21.2.14.2.3 Undated, possibly Prehistoric or Roman, sites within the PEIR boundary*

107. Marks in crops are visible at intervals along the majority of the PEIR boundary, which indicate undated pre-modern settlement enclosures, field and access ways.
108. Notable foci of tracks, boundaries, pits and enclosures are recorded around Little Barningham at APS\_106 – 108 and 110-113 (**Figure 21.2-9** sheet 17) and APS\_114 and 115 (**Figure 21.2-9** sheet 18), parts of which lie within the PEIR boundary. Elements of this cropmarked landscape are likely to date to the later prehistoric or Roman periods, with some possible medieval or post-medieval field systems and drainage.
109. Further isolated enclosures, ditches and tracks along the PEIR boundary indicate the presence of pre-modern features. Again, this landscape is likely to have been more extensive than shown by the crop marked evidence.

#### *21.2.14.2.4 Medieval and Medieval-Post Medieval sites within the PEIR boundary*

110. Whilst medieval settlements and a moated site are recorded in the wider Study Area, no Medieval settlement sites are recorded from airborne remote sensing sources directly within the PEIR boundary.
111. Other sites dated to this period comprise boundaries, tracks and headlands to medieval ploughing.
112. It is noteworthy that there are few traces of extant or eroded ridge and furrow field systems recorded during this assessment. It is likely that the medieval fields may have been ploughed out by later intense agricultural land use.
113. Post-medieval field boundaries, which have been removed to enable mechanised agriculture, are visible in places on aerial imagery and via visualised LiDAR data.
114. The post medieval landscape and the enclosed fields are best represented by the 18th and 19th Century Enclosure maps discussed and presented in the Map Regression Analysis within this report (**Section 21.2.16**).



#### 21.2.14.2.5 Modern sites within the PEIR boundary

115. The area within the PEIR boundary formed part of Britain's front line coastal and hinterland defence area, particularly during WWII (1939 – 1945) and beyond into the 1950s and Cold War. Defensive training areas, camps, training airfields, pillboxes, coastal and land defences and ordnance training sites are recorded in detail by the NMP and by APS.
116. As stated above, when discussing the wider Study Area, some military sites may be preserved residually in woodland, and elements of former military landscapes are visible as individual extant features (particularly pillboxes), residual crop and grass marked features and parts of former airfields and training grounds. The NMP recorded the WWI and WWII features in detail from 1940s and 1950s aerial photographs in areas where this survey has been undertaken. These features were prevalent in the area at the coast to the north and northwest of Weybourne in the 1940s, when they were instrumental to the defence of Britain at and around Weybourne Camp and its ancillary training and defensive facilities, APS\_156, 159, 161, 162, 164 and 168 (**Figure 21.2-9** sheet 01). Many of these defensive elements have since been removed entirely and were concentrated at the coastal area.
117. This present survey has sought to record their latest observed condition in order to facilitate assessment of the impact of the onshore development area on areas as they are now, with knowledge of the content of those areas in their original condition at the time of use which has been provided in detail by the NMP using contemporary aerial photos.
118. The PEIR boundary also contains remains of a military airfield at APS\_089 and 90, former RAF Swannington (**Figure 21.2-9** sheet 12) where grass and cropmarked remains of access and runways are visible.
119. Some of the residual eastern parts of the disused RAF/USAAF WWII airfield at Attlebridge also lie within the study area to the west of the PEIR boundary at APS\_066. Many of the original dispersals and accessways have been removed, and these are recorded as former hardstanding areas which in places are visible as crop or grass marks, and as extant features from contemporary 1940s aerial photographs at APS\_065, 066 and as possible structural evidence at 067 (**Figure 21.2-9** sheet 09).

#### 21.2.15 Conclusion

120. Aerial photographs and LiDAR survey data gathered between the 1940s and the present time show a former landscape of buried eroded cropmark features across the study area.
121. Features dating to the prehistoric, medieval, post-medieval and modern periods have been identified and mapped. Some of these features have been previously identified by the NHER and in areas where NMP survey has been undertaken.
122. In many cases this assessment has augmented and added to these data from modern airborne and satellite imagery sources.

123. It is obvious that the below-ground archaeological deposits which cause the marks in crops and grass in this area are more extensive, both horizontally and vertically, than shown via the aerial imagery. Absence of cropmark evidence, due to the limitations detailed above, does not necessarily indicate an absence of archaeological deposits in apparently blank areas.
124. The separation of dating into specific periods of prehistory and history can only be confirmed by ground-based or documentary analyses, but some dating evidence for sites within the Study Area has been proposed by the NMP and by observation of morphological characteristics of crop marked sites.
125. From an aerial perspective, this landscape may be analysed in a 'living' manner as one which developed over time and contains many multi-period elements. These will be more deeply stratified and extensive below the ground than is apparent in the results of the survey. The remains visible as cropmarks are all likely to have been impacted by agricultural cultivation, to some degree, with little or no micro-topographic features visible on the ground.
126. This assessment has identified a range of features and has highlighted the potential for heritage assets within the Study Area and its immediate environs.
127. It leads into and has benefited from a concurrent study of historic maps, which detail the development of the landscape over the past two centuries. This map regression study is presented below ([Section 21.2.16](#)).

### 21.2.16 Map Regression Analysis

128. An historic map regression study was undertaken concurrent with the aerial imagery and LiDAR analysis to provide understanding of the development of the modern landscape.

### 21.2.17 Aims and Objectives of the Map Regression Analysis

129. The aim of the map regression analysis was to collect all relevant historic maps, including, Tithe and Enclosure maps where present, in areas where Ecclesiastical Parishes levied Tithes, followed by OS and other pre-modern and modern cartographic sources.
130. The objective was to investigate and demonstrate any landscape changes within the Study Area over the 19th, 20th and 21st Centuries using maps derived from the sources listed at [Section 21.2.2](#) above.

## 21.2.18 Cartographic Sources

### 21.2.18.1 Tithe Maps

131. Where available the Tithe maps are displayed at [www.historic-maps.norfolk.gov.uk](http://www.historic-maps.norfolk.gov.uk), and the configuration of the fields, accessways and landscape is rural, enclosed and reflected in the patterns depicted on the available enclosure maps. They represent the foundation of the Post-Medieval landscape, and some of the boundaries changed configuration between their depiction on the earlier Tithe and Enclosure maps and by the OS in the late 19th Century. Capturing the Tithe maps as screenshots was evaluated and trialled to provide figures for this report. However, the resolution when captured and georeferenced was inappropriately coarse to determine meaningful detail as remotely accessed screen captures.

### 21.2.18.2 Enclosure Maps

132. **Figure 21.2-10** presents an index to the Enclosure Maps which are shown in detail on **Figure 21.2-11** (Sheet 01 - 14). Available Enclosure maps were supplied by the NRO from Deposit C/Sca 2 as .jpg files. None were available online at [www.historic-maps.norfolk.gov.uk](http://www.historic-maps.norfolk.gov.uk) within the Study Area and PEIR boundary.
133. Some maps are not held in the NRO deposit C/Sca2 and are referred back to the NRO from the National Archive online catalogue. These items cannot be located by either archive.
134. **Table 1-2** lists and comments on the available Enclosure maps.

*Table 21.2-2: Analysis of Available Enclosure Maps*

Parish	Enclosure map ref. no. (deposited with Norfolk Quarter sessions only)	Date	Mapbook sheet no	APS notes on Enclosure map
<b>Hethersett</b>	Not stated	1799	1	The area of the PEIR boundary traverses rural enclosed fields and an open area which may be common land in Hethersett parish in 1799
<b>Great Melton</b>	C/Sca 2/195	1826	2	The Great Melton Enclosure map indicates a rural environment of enclosed fields with details of private and public roads in 1826
<b>Wrampingham</b>	Not stated	1815	3	The area of the PEIR boundary just traverses the eastern part of the mapped enclosed land in Wrampingham parish. The map depicts rural enclosed fields
<b>Barford</b>	C/Sca 2/12	1816	4	The Barford Enclosure map indicates a rural environment of enclosed fields and a public road in 1816. The PEIR boundary traverses the northeast edge of the parish
<b>Marlingford and Colton</b>	C/Sca 2/191	1863 and 1804	5	The Marlingford and Colton Enclosure maps indicates again a rural landscape of enclosed fields in the PEIR boundary
<b>Weston Longville</b>	Not stated	1825	6	The PEIR boundary traverses rural enclosed fields and an area of scrubby woodland at Weston Breck within the enclosed parts of Weston Longville
<b>Morton on the Hill (32)</b>	C/Sca 2/155	1826	7	The area of the PEIR boundary traversed rural enclosed fields with some small areas of woodland and a public road in 1826
<b>Swannington</b>	C/Sca 2/282 and C/Sca 2/283	1852	8	The PEIR boundary traverses an area which was laid to rural enclosed fields in 1852
<b>Brandiston</b>	Not stated	1852	9	The area of the PEIR boundary traversed rural enclosed fields through Brandiston parish in 1852
<b>Cawston</b>	C/Sca 2/68	1801	10	The Cawston Enclosure map indicates a rural environment with enclosed fields in 1801
<b>Oulton</b>	C/Sca 2/178	1823	11	In 1823, the land within the PEIR boundary at Oulton comprised rural enclosed fields
<b>Little Barningham</b>	C/Sca 2/166	1832	12	The Little Barningham Enclosure map indicates that the PEIR boundary lay within rural fields, traversed a public road and crossed named fields at Patch Piece and Dog Lover Close to the south of Dog Lane

<b>Bodham</b>	C/Sca 2/45	1810	13	The Bodham Enclosure map indicates a rural environment of enclosed fields where the PEIR boundary traverses the parish to the south of Weybourne
<b>West Beckham</b>	C/Sca 2/20	1843	14	A small part of enclosed land mapped in West Beckham lies within the area of the PEIR boundary and is laid to enclosed rural fields at a farm tenanted or owned by Benjamin Emery
<b>Kelling</b>	C/Sca 2/241	1854	15	Kelling parish was part enclosed fields and part heathland. The mapped area in Kelling lies just to the west of the PEIR boundary and shows a rural agricultural landscape

### 21.2.18.3 Historic Ordnance Survey Maps

135. **Figures 21.2-12 – 18** present the Historic OS mapping which was published between 1885 and 1995. Historic OS map data are used to illustrate the landscape at the following survey or revision dates:
- 1885 – 1887
  - 1907 – 1908
  - 1923 – 1929
  - 1938 – 1952
  - 1957
  - 1973 – 1977
  - 1994 – 1995

#### 21.2.18.3.1 1885-1887 (**Figure 21.2-12**)

136. The PEIR boundary predominately traverses smaller enclosed rural fields and localised deciduous woodlands and coppices in the late 19th Century. By this date, the foundations of the modern landscape as we see it today had been formed, with a continuous landscape of adjacent fields and farms.
137. The maps depict the Great Eastern and the Eastern Midlands Railway lines to the north of Ketteringham (**Figure 21.2-12** sheets 1 and 2).
138. The rural landscape to the north of Bodham and Kelling Heath to Weybourne (**Figure 21.2-12** sheet 9) contains a mapped depiction of a Scheduled moated site within the Study Area but not within the PEIR boundary.
139. These early OS maps present a clear insight into the pre-WWI and WWII countryside, particularly near the coast, which was heavily defended in the early to mid-20th Century.

#### 21.2.18.3.2 1907-1908 (**Figure 21.2-13**)

140. These maps are largely a revision to the first editions, and do not show that the countryside has undergone significant change in the first decade of the 20th Century. The Midland and Great Northern Joint Railway was developed since 1887 and in 1907 – 08 is extant near Attlebridge and the Midland and Great Northern Railway is still extant to the east of Heydon (**Figure 23.2-13** sheet 6) and at Weybourne (**Figure 23.2.13** sheet 9).

#### 21.2.18.3.3 1923 – 1929 (**Figure 21.2-14**)

141. No major change to the rural landscape was depicted by the OS since 1885 – 87 in the areas covered by the 1920s revision of the First Edition mapping.

#### 21.2.18.3.4 1938 – 1952 (Figure 21.2-15)

142. The same rural landscape is depicted between 1938 and 1952, with some gaps in the mapping, and no direct mapping of military airfields. The structures at Weybourne military camp, which were recorded by the NMP from aerial imagery, are depicted for the first time on this map edition (Figure 21.2-15 sheet 9).

#### 21.2.18.3.5 1957 (Figure 21.2-16)

143. The 1957 map depicts the same rural features as previous editions, with the addition of WWII airfields. Part of RAF Attlebridge is depicted (Figure 21.2-16 sheet 4) as is RAF Swannington, which is depicted in full, with runways and dispersals and is labelled as disused (Figure 21.2-16 sheet 5).
144. RAF Oulton is similarly depicted and labelled as disused to the north of the PEIR boundary at Oulton (Figure 21.2-16 sheet 6).
145. Kelling and Weybourne Heaths are depicted in a largely unchanged landscape around Weybourne in the north with unsurprisingly little indication of the once-extensive defensive features at the coast beyond depiction of the structures at Weybourne Camp (Figure 21.2-16 sheet 9).

#### 21.2.18.3.6 1973 – 1977 (Figure 21.2-17)

146. The 1973 – 1977 revision of the OS mapping departed from the traditional depictions utilised in the earlier editions, and adopted a metric grid at 1:10,000 scale. The mapping coverage is not quite complete. It shows that the railway at Weybourne was dismantled (probably in the 1960s) and the area of Weybourne Camp was then depicted as a disused camp with access ways and some mapped structures (Figure 21.2-17 sheet 8).
147. The same rural landscape is indicated along the PEIR boundary as on earlier map editions.

#### 21.2.18.3.7 1994 – 1995 (Figure 21.2-18)

148. This is a somewhat stylised 'modern' map which indicates some removed boundaries as confirmed by the aerial imagery.

#### 21.2.18.4 Map Regression Conclusion

149. The landscape within this Study Area is rural, and has largely been under arable cultivation, with woodland and heath or breckland in parts since first observed on maps in the late 18th Century.
150. Railway lines have been constructed and dismantled, alongside some WWII airfields and the defensive camp at Weybourne. Small hamlets, farms and settlements have developed moderately over the last two centuries.

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