East Anglia ONE North and East Anglia TWO Offshore Windfarms

Onshore Archaeology: Geophysical Survey Report

Part 1 of 9

Applicants: East Anglia ONE North Limited and East Anglia TWO Limited
Document Reference: ExA.AS-14.D1.V1
SPR Reference: EA1N_EA2-DWF-ENV-REP-IBR-001113

Date: 2nd November 2020
Revision: Version 01
Author: Headland Archaeology

Applicable to East Anglia ONE North and East Anglia TWO

EAON18

EAST ANGLIA ONE NORTH AND EAST ANGLIA TWO OFFSHORE WINDFARMS, ONSHORE CABLE CORRIDOR AND SUBSTATION SITES, SUFFOLK

GEOPHYSICAL SURVEY

commissioned by Royal HaskoningDHV
on behalf of East Anglia ONE North and East Anglia TWO Limited

October 2020

Applicable to East Anglia ONE North and East Anglia TWO

EAST ANGLIA ONE NORTH AND EAST ANGLIA TWO OFFSHORE WINDFARMS, ONSHORE CABLE CORRIDOR AND SUBSTATION SITES, SUFFOLK

GEOPHYSICAL SURVEY

commissioned by Royal HaskoningDHV
on behalf of East Anglia ONE North and East Anglia TWO Limited

October 2020

This report adheres to the quality standard of ISO 9001:2015

PROJECT INFO:

HA Project Code **EAON18** / NGR **TM 41000 61200, TM 41500 61100, TM 47500 60000, TM 47000 60000** / Parish **Aldringham-cum-Thorpe, Leiston, Knodishall, Friston** / Local Authority **Suffolk** / OASIS Ref. **OASIS ID: headland5-317948**

PROJECT TEAM:

Project Manager **Alistair Webb** / Author **Alistair Webb** / Fieldwork **Krasimir Dyulgerski, Mark Evans, Olivier Vansassenbrouck, Ross Bishop, Richard McGregor Edwards** / Graphics **David Harrison, Eleanor Winter, Nick Hannon**

Approved by **Alistair Webb** [redacted]....

Headland Archaeology Yorkshire & North
Units 23–25 & 15 | Acorn Business Centre | Balme Road | Cleckheaton BD19 4EZ
t 0113 387 6430
e yorkshireandnorth@headlandarchaeology.com
w www.headlandarchaeology.com

HEADLAND ARCHAEOLOGY part of the RSK Group

REGISTERED ClfA ORGANISATION

Applicable to East Anglia ONE North and East Anglia TWO

PROJECT SUMMARY

Headland Archaeology (UK) Ltd has carried out a geophysical (magnetometer) survey, covering approximately 500 hectares, within the boundary comprising the onshore development area (ODA), as presented for the Environmental Statement (ES) and the Development Control Order (DCO), for the East Anglia One NORTH and East Anglia TWO Offshore Windfarms. This report covers the survey completed up until the end of May 2019, with the final phase of survey between August and October 2019 included as an appendix to the main report. The aim of the survey was to provide further information about the archaeological potential within the ODA and to help determine (where possible within the confines of other environmental and engineering constraints) the preferred cable route and sub-station locations and therefore to help determine the appropriate mitigation strategy to be formally agreed in the early post-consent stages of the projects, if consent is achieved. This report discusses the broad areas of archaeological activity (AAA's) identified within the ODA and will be included within the forthcoming ES. Any additional survey will be reported separately and added to the ES as addenda, the intention being, dependent on access, that the information will be available during the examination process of the projects (i.e post-application but pre-determination/pre-consent).

The survey has clearly demonstrated that the prevailing geological and pedological conditions are favourable for the detection of sub-surface archaeological remains and consequently it is assessed that the results provide a reliable indication of the extent of all the significant areas of sub-surface archaeological remains within the ODA, subject to the limitations of the technique. Anomalies indicative of probable or possible archaeological features and activity have been identified throughout the ODA, the majority of which were previously unknown, thus adding significantly to the archaeological understanding of the landscape across which the cable corridor will traverse. Although the suspected archaeological remains extend throughout the ODA there are still large areas where no anomalies of archaeological potential have been identified from the geophysical survey. However, the low

magnitude exhibited by some of the anomalies and the partial and discontinuous nature of others suggests that, in certain instances, the archaeological remains may be more extensive than revealed by the survey, either due to partial truncation by modern agricultural techniques and/or a lack of magnetic contrast on a variable geological substrate. Nevertheless, eleven broad areas comprising both concentrations of anomalies or single clearly defined features are identified as AAA's. Most of the linear anomalies are interpreted as being the result of soil-filled ditches forming an extensive and complex network of field systems and enclosures, most likely for animals, which extends across the full length and width of the ODA. These field systems and potential stock enclosures are of uncertain date but probably date to the later prehistoric or early Roman periods and possibly post-medieval. Smaller, sub-divided, enclosures with numerous discrete anomalies are interpreted as more likely to have been the sites of human occupation. Several of these settlement sites are identified, particularly in the western half of the ODA, again varying dates are likely including medieval. As well as the enclosures and settlement sites two circular anomalies, interpreted as locating a round barrow of possible Bronze Age date and a windmill of likely post-medieval date, are also highlighted.

CONTENTS

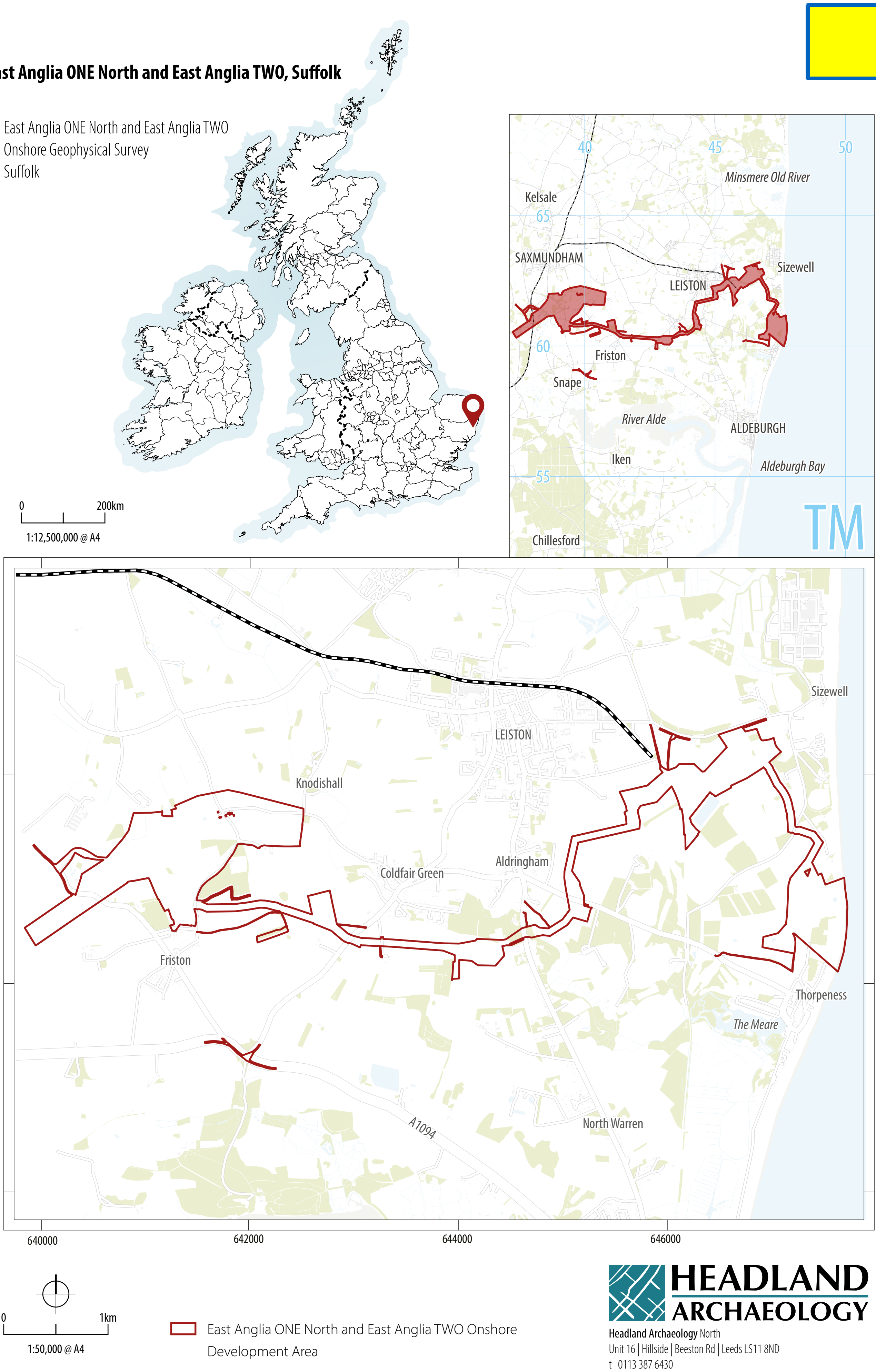
LIST OF ILLUSTRATIONS

Applicable to East Anglia ONE North and East Anglia TWO

Applicable to East Anglia ONE North and East Anglia TWO

East Anglia ONE North and East Anglia TWO, Suffolk

East Anglia ONE North and East Anglia TWO
Onshore Geophysical Survey
Suffolk



HEADLAND ARCHAEOLOGY
Headland Archaeology North
Unit 16 | Hillside | Beeston Rd | Leeds LS11 8ND
t 0113 387 6430
e north@headlandarchaeology.com
w www.headlandarchaeology.com

ILLUS 1 Site location

Applicable to East Anglia ONE North and East Anglia TWO

EAST ANGLIA ONE NORTH AND EAST ANGLIA TWO OFFSHORE WINDFARMS, ONSHORE CABLE CORRIDOR AND SUBSTATION SITES, SUFFOLK

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by East Anglia ONE North Limited and East Anglia TWO Limited (the Client) to undertake a geophysical (magnetometer) survey within the Onshore Development Area (ODA) for the East Anglia ONE North and East Anglia TWO Offshore Windfarms (Illus 1). The survey is required to provide information on the archaeological potential of the project and to inform the Environmental Statements (ES) being prepared by Royal HaskoningDHV.

Scottish Power Renewables is currently building the 714MW East Anglia ONE Offshore Windfarm approximately 43km off the coast of Suffolk and are proposing to develop further offshore windfarms in the area, including the up to 800MW East Anglia ONE North Windfarm and the up to 900MW East Anglia TWO Windfarms.

Both projects are in the pre-application stage and their application programmes run in parallel, however they have been submitted as separate DCO applications. The onshore development area, which includes landfall location, onshore cable route, onshore substation locations and National Grid infrastructure, has been developed to allow for the construction of both the proposed projects. At this stage it is not known whether both projects would be constructed simultaneously or sequentially.

Scoping opinions for the two windfarms have been received from the Planning Inspectorate, comments relating to the Archaeology and Cultural Heritage (Onshore) sections have been partly addressed by the completion of a Desk-Based Assessment (DBA – Headland 2018) and the Preliminary Environmental Information Report (PEIR – Royal HaskoningDHV 2019) and subsequent Environmental Statements (ES) of which this report will form an appendix.

The survey was undertaken in accordance with a Written Scheme of Investigation (WSI) (Royal HaskoningDHV 2017a), with guidance contained within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (David et al 2008).

1.1 SITE LOCATION, LAND USE AND TOPOGRAPHY

The Site (for the substations and route of the proposed onshore cables) has been identified by a detailed site selection process as outlined in Chapter 4 Site Selection and Consideration of Alternatives of the East Anglia TWO and East Anglia ONE North Environment Statements (forthcoming). It includes land between Sizewell and Thorpeness at the landfall and extends inland approximately 7km terminating at the proposed substation site just to the north of Friston, encompassing the parishes of Aldringham-cum-Thorpe, Leiston, Knodishall and Friston. The ODA is in multiple landownership and the land use is a mixture of arable and market garden agriculture with areas of heath, scrub, woodland and sand dunes to the far east along the coastal edge.

Since the commencement of the geophysical survey the limits of the ODA have undergone substantial revision and refinement. The most recent iteration of the ODA is presented in the illustrations throughout and covers an area of up to approximately 555 hectares across the parishes of Aldringham-cum-Thorpe, Leiston, Knodishall and Friston.

All of the farmed land within the ODA has been surveyed except where ground conditions mitigated against survey, such as areas of bird cover around the periphery of some fields, where access could not be agreed within the project timetable or in areas on the periphery of the ODA which it was subsequently decided were likely to fall outwith the cable corridor.

The survey was undertaken in several phases as crops were harvested and access agreed between August 2018 and May 2019. A final phase of survey (August to October 2019) was carried out after the survey report was finalised. The results of this latter survey are included as an appendix to this report. In total approximately 500 hectares were surveyed.

1.2 GEOLOGY AND SOILS

The underlying bedrock geology comprises Crag Group Sand (NERC 2019). This is overlain across most of the ODA with superficial deposits of Lowestoft Formation Diamicton, Sand and Gravel and Clay and Silt. A small band of Alluvium is recorded adjacent to the Hundred River and there are also small areas where there are no recorded superficial deposits (Illus 2).

The soils are classified in the Soilscape 10 and Soilscape 7 associations which are characterised as freely draining slightly acid sandy soils and freely draining slightly acid but base rich soils respectively (Cranfield University 2018).

2 ARCHAEOLOGICAL BACKGROUND

A Cultural Heritage Desk-Based Assessment has been undertaken (Headland 2018). This report compiled baseline data from a variety of sources including aerial photographs, historic maps and LIDAR data and archaeological records held by Suffolk Historic Environment Record. The latter source revealed that there are no designated assets and 41 previously recorded non-designated assets within the ODA (Illus 3). Following the desk-based research a further 72 previously unrecorded assets have been identified.

It is not proposed to give a detailed description of the assets, but a general overview is given below.

Nearly half (19 out of 41) previously recorded assets relate to Second World War activity, mostly on or near to the coast and in areas that were/are unsuitable for survey. Other assets relate to extant features in the landscape, quarry pits or post-medieval features. Only eight records relate to cropmarks likely to be due to features pre-dating the post-medieval period.

Out of the 72 newly identified assets hardly any relate to previously unidentified cropmarks with the majority due to features/activity, such as post-medieval or modern activity such as depressions probably relating to small scale quarrying activity or perhaps to bomb craters, relict field boundaries and post-medieval buildings and Second World War infrastructure, identified from analysis of LIDAR data or historic mapping. The conclusions of the DBA are summarised below.

The DBA stated that '*the LiDAR assessment is considered likely to have identified all substantial upstanding heritage assets within the (I)ODA, although smaller discrete features may have been missed due to the limited coverage at resolutions greater than 2m*'. In relation to the '*below ground archaeological remains the map regression will have identified any features still present in the 19th century, but will not have identified earlier features, which may not have survived above ground to this date*', and '*the aerial photography analysis is likely to have detected a majority of cropmark features*'. The report concluded that '*there remains the potential that further below ground archaeological remains are present, either as smaller features not readily detected in aerial photography or due to the ground conditions at the time the photos were taken not being conducive to cropmark formation*'.

It was therefore concluded that '*on the basis of the known archaeological and historical background of the (I)ODA ….. there is considered to be a moderate to high likelihood that further prehistoric remains survive within the (I)ODA*'. These may include possible assemblages of flint artefacts, especially along the gravel terraces of the Hundred River; it should be noted that these type of remains are not likely to be identified by geophysical survey and are only likely to be identified during intrusive archaeological investigation.

It was also considered that there is '*a moderate likelihood of further Iron Age and Romano-British remains in the form of possible settlements and associated field systems*'. It was recognised that Iron Age and Roman sites (likely to comprise traces of ditches and earthworks) were more conducive to identification through geophysical survey.

It was also considered that there was '*a high potential for evidence of Anglo-Saxon and medieval agricultural land use within the (I)ODA*'. Patterns of medieval land use are again readily identified through geophysical survey, but such remains were assessed as '*unlikely to be of more than local importance*'. However, within the area around the probable church of Buxlow (HA69) there was considered to be a very high likelihood of burials.

Overall the archaeological potential of the (I)ODA was assessed as 'medium'. According to the standard criteria this means that '*undiscovered heritage assets of low importance are likely to be present; and it is possible, though unlikely, that assets of high or medium importance may also be present*'.

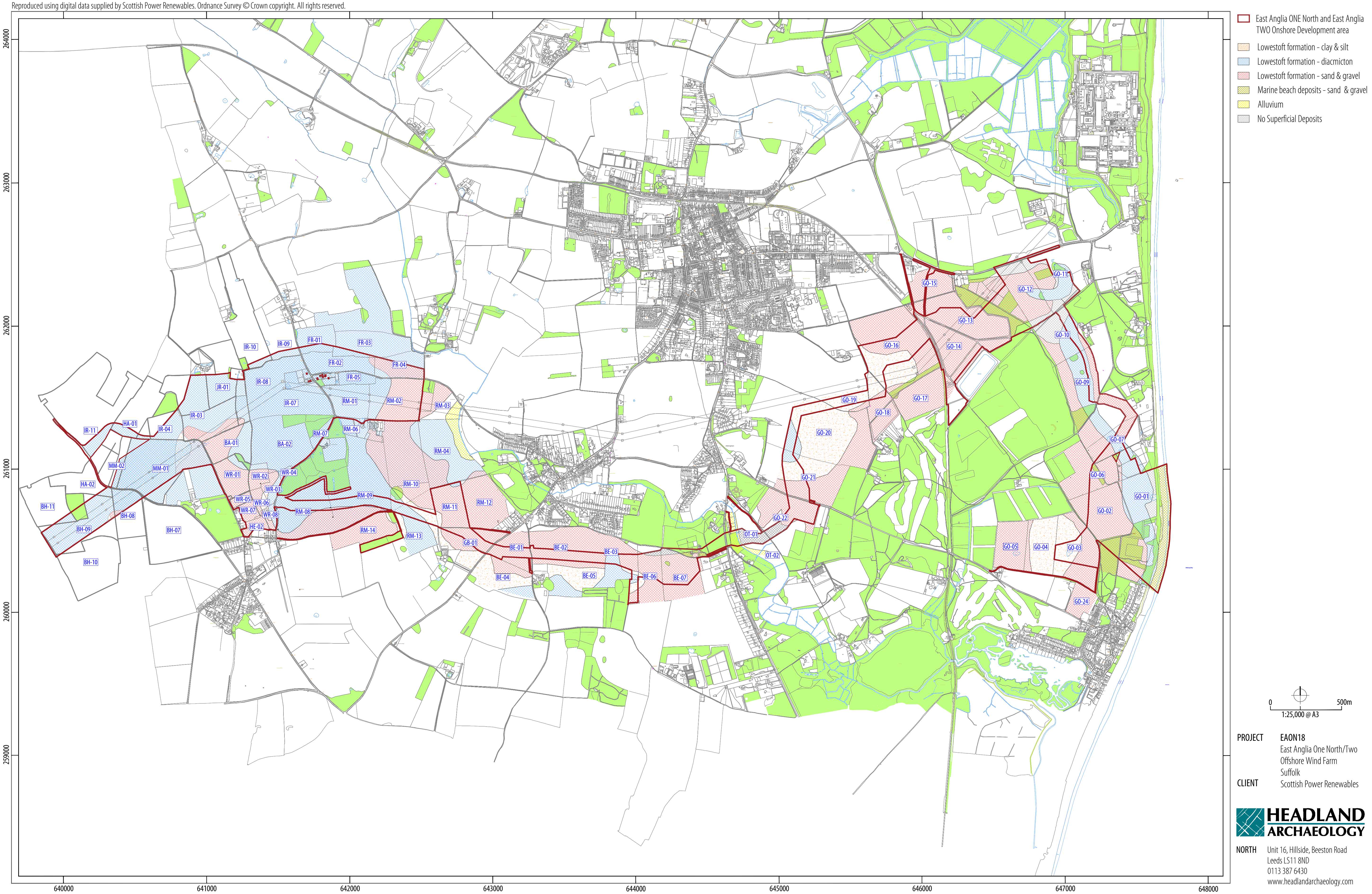
3 AIMS, METHODOLOGY AND PRESENTATION

The overall aim of the geophysical survey was to gather sufficient information to enable an assessment to be made of the density and extent of any sub-surface archaeological remains within the defined limits of the (I)ODA. This information would then be used to further inform the route of the onshore cable and the precise location of the substation.

Specifically, the aims were to:

- undertake a programme of detailed magnetometry across as much of the (I)ODA as possible;

East Anglia ONE North and East Anglia TWO, Suffolk



ILLUS 2 East Anglia ONE North and East Anglia TWO Onshore Development area showing superficial geology

Applicable to East Anglia ONE North and East Anglia TWO

- to corroborate, identify and characterise sub-surface anomalies that may have an archaeological origin (including defining the spatial limits of already known or suspected heritage assets);
- to discount areas within the survey area that are found to have been subject to previous 'modern' disturbance, for example where the geophysical survey data indicate the presence of 'made' or previously heavily disturbed ground;
- provide an interpretation of all recorded geophysical anomalies in order to inform the design of a scheme-wide programme of archaeological evaluation trial trenching (in this instance this will be an initial informative stage of mitigation, post-consent); and
- to produce a comprehensive site archive and report that is compliant with all relevant standards, guidance and good practice.

3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. Features such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the Earth's magnetic field. In mapping these slight variations, detailed plans of archaeological sites can be obtained as buried features often producing reasonably characteristic anomaly shapes and strengths (Gaffney and Gater 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system is programmed to take readings at a frequency of 10Hz (allowing for a 10–15cm sample interval) on roaming traverses 4m apart. These readings are stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system is linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc) software has been used to collect and export the data. Terrasurveyor V3.0.32.4 (DWConsulting) software has been used to process and present the data.

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:140,000. Survey location plans showing the superficial geology and field numbers, heritage assets, processed and interpreted data are shown on Illus 2 to Illus 9 inclusive at scales of 1:25,00 and 1:12,500. The data is presented and interpreted at a scale of 1:2,500 in Illus 10 to Illus 87 inclusive. This includes fully processed (greyscale) data, minimally processed data (XY traceplot) and accompanying interpretative plots. The data from the eleven AAA's are also presented at a larger scale (1:1,000) in Illus 88 to Illus 195 inclusive.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. Data processing details are presented in Appendix 4. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 5.

The survey methodology, report and any recommendations comply with the Method Statement (Headland Archaeology 2018), supplied to Scottish Power Renewables Ltd and submitted to Suffolk County Council Archaeology Service, guidelines outlined by Historic England (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

4 RESULTS AND DISCUSSION

4.1 GENERAL

A variable magnetic background has been recorded throughout the ODA manifesting in the data as a plethora of discrete areas of magnetic enhancement. These are due to localised variations in the depth and composition of the soils and the superficial deposits from which they derive. Areas of variation are also caused by differing agricultural activities and ploughing regimes.

Mostly the survey was carried out after the arable and market garden crops had been harvested although Headlands' bespoke system did allow survey between mature and semi-mature potato and parsnip crops. Ground conditions were generally good across the ODA and the data quality is correspondingly good throughout with two instances of poor data quality due to sensor errors when working close to the high voltage overhead cables. Archaeological anomalies have been identified across all soil types and on all the different superficial geologies. Consequently, it is assessed that the results provide a reliable indication of the extent of all the significant areas of sub-surface archaeological remains within the ODA. However, as discussed previously, there are certain types and periods of archaeological activity that are unlikely to be identified by magnetic survey. These include unenclosed prehistoric activity and Saxon settlement. Alternative strategies, such as fieldwalking and metal detecting, would be the best methodologies to employ to identify archaeological activity of these periods and types.

The discontinuous nature of some of the anomalies which have been interpreted as of possible or probable archaeological origin demonstrates that detection of some soil-filled features may be hampered by either low magnetic contrast in the surrounding soils and/or the depth of the superficial deposits or differential degradation due to modern intensive farming practices. In these circumstances some discrete and low magnitude anomalies may not manifest in the data at all.

The anomalies identified by the survey fall into a number of categories but are broadly interpreted according to their origin, whether archaeological or non-archaeological.

The non-archaeological anomalies are described first and are categorised as being due to modern, agricultural, geological or quarrying activity. Only exemplar anomalies (i.e those that can be clearly and directly related to extant or mapped features or that correspond with heritage assets described in the DBA) are described in detail in the report text. However, all significant anomalies are shown on the interpretation illustrations.

Anomalies that are interpreted as of possible or probable archaeological origin are then described and discussed within the context of the eleven areas of archaeological activity (AAA's) which have been identified across the ODA. The AAA's are described from east to west starting at the point at which the cable makes landfall and moving westwards to the substation site. Each AAA has been interpreted by period (based on morphology and other supporting information) and an attempt has been made to ascribe significance. It should be noted, however, that these are subjective assessments and the date and importance of the remains can only be objectively assessed by intrusive means (i.e excavation).

It should also be noted that not all the anomalies interpreted as of possible archaeological origin fall within AAA's. In these cases the anomalies are typically single linear or discrete anomalies which cannot be confidently interpreted as non-archaeological and which have therefore been ascribed a possible archaeological cause.

4.2 MODERN ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris is common on most sites, often being present as a consequence of manuring or tipping/infilling. Throughout the ODA there is no obvious clustering to these ferrous anomalies which might indicate an archaeological origin, although this cannot be guaranteed. Far more probable is that the 'spike' responses are likely caused by the random distribution of ferrous debris in the upper soil horizons.

Several high magnitude dipolar linear anomalies have been identified across the ODA, such as that running along the southern boundary of Field GO-09 (Illus 28–30 inclusive – 647158, 261455). These are caused by buried service pipes.

Of particular note are the parallel linear anomalies, aligned broadly east/west, in the north-eastern corner of GO-11 (Illus 22–24 inclusive – 646962, 262500) that locate the underground power cables from the Galloper Offshore Windfarm.

Discrete areas of disturbance are identified around the base of the electricity pylons which support the overhead power lines that skirt around the northern limits of the ODA, such as in BH-11 (see Illus 85–87 inclusive – 639944, 260505) and GO-14 (see Illus 31–33 inclusive – 646173, 261922). The disturbance is caused by the proximity of the magnetometer to the pylon superstructure.

A rectilinear area of disturbance, in the north-west of BE-05 (Illus 52–54 inclusive – 643403, 260307), corresponds with modern agricultural buildings visible on AP60. These buildings have obviously been demolished since the air photograph was taken and the disturbance is due to magnetic debris left over from the demolition which has then been incorporated into the topsoil.

Magnetic disturbance around the periphery of fields is due to ferrous material within or close to the adjacent boundaries and is of no archaeological interest unless specified otherwise.

4.3 GEOLOGICAL ANOMALIES

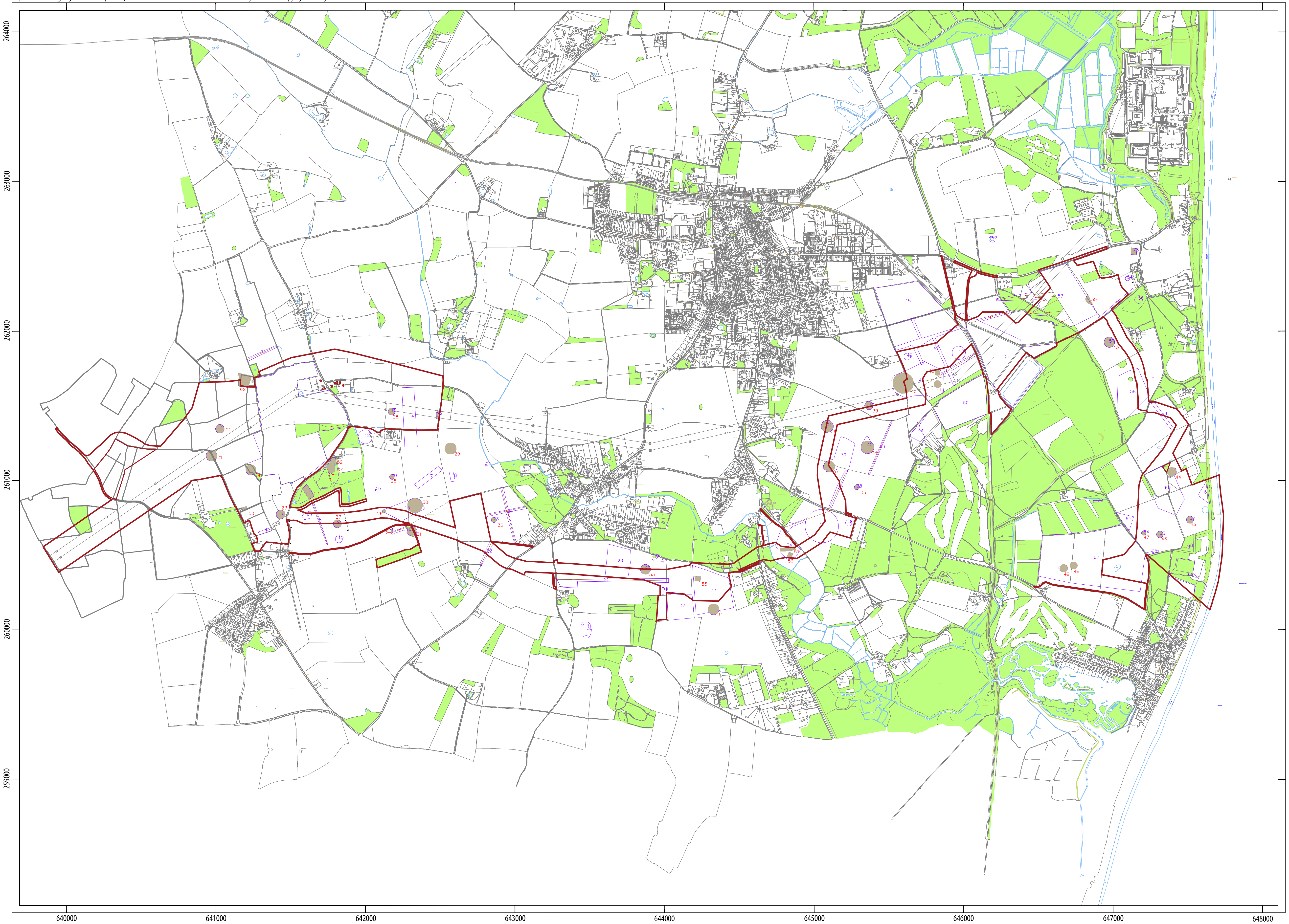
Discrete low magnitude anomalies are identified throughout the ODA. These are geological in origin and are caused by minor variations in the depth and composition of the topsoil (or the superficial deposits from which the upper soil horizons are derived), or the accumulation of topsoil along the breaks in, or bottom of, slopes.

4.4 AGRICULTURAL ANOMALIES

Analysis of historic cartographic sources (tithe and estate maps and early edition Ordnance Survey maps) indicates that the pattern of land division throughout the ODA has undergone change from the late 18th century up to the present day. Some boundaries have been removed to create larger fields. Some of these former boundaries manifest in the data as linear anomalies (soil-filled ditches), such as in GO-20 (645267, 260847) and GO-21 (Illus 40–45 inclusive – 644997, 260860) in the eastern half of the ODA or in BE-04 (Illus 61–63 inclusive – 643093, 260238) or as linear alignments of ferrous anomalies, which are caused by modern debris within the fill of the ditch or which has accumulated along the former field margins.

In other areas, such as in AAA1 (see below), there is clearly an extensive system of land division, on more than one alignment, which is only partially recorded on historic mapping. Where the anomalies clearly match boundaries displayed on the tithe maps, or clearly intersect with boundaries that are recorded, they are interpreted as of agricultural origin. Other linear anomalies which do not correlate with mapped boundaries, or which are on slightly different alignments, are interpreted as of possible archaeological origin (see below). It is considered equally possible that these too are post-medieval boundary divisions although alternatively they may be significantly earlier, hence the possible archaeological interpretation.

The more closely-spaced linear anomalies, aligned parallel with the extant field boundaries, are due to modern ploughing, such as in GO-04 (Illus 13–15 inclusive – 646802, 260287) and GO-12 (Illus 25–27 inclusive – 646862, 262133). Perhaps surprisingly, no anomalies have been identified which are caused by medieval and/or post-medieval



East Anglia ONE North and East Anglia TWO Onshore Development area
LiDAR features (polygon)
LiDAR features (linear)
Previously Unidentified Heritage Asset

0 500m
1:25,000 @ A3

PROJECT EAON18
East Anglia One North/Two
Offshore Wind Farm
Suffolk

CLIENT Scottish Power Renewables

HEADLAND ARCHAEOLOGY
NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 3 East Anglia ONE North and East Anglia TWO Onshore Development Area showing LiDAR features and previously unidentified heritage assets

ridge and furrow cultivation. This is presumably due to the intensive nature of the current agricultural regimes having removed any vestigial traces of older agricultural practices.

Linear trend anomalies have also been identified, most prominently at the western end of the corridor in BA-02 (Illus 64–67 inclusive – 641553, 261181), within the site of the substations, and BH-11 (Illus 85–87 – 6399543, 260686). These anomalies are sometimes oblique to the surrounding field boundaries and/or arranged in a partial herring-bone pattern and are characteristic of modern field drains. Unsurprisingly the land drains are concentrated on the less well draining areas, predominantly where superficial deposits of diamicton are recorded.

4.5 QUARRYING ANOMALIES

Numerous amorphous localised areas of magnetic disturbance are identified throughout the ODA being more prevalent in the eastern half of the corridor. These anomalies are interpreted as being due to backfilled clay and gravel extraction pits. The largest examples are located in fields GO-01 (647514, 260736), GO-05 (646652, 260412), GO-10 (646977, 261920) and GO-20 (Illus 13–15, 25–30 and 40–42 inclusive – 645340, 261234), in the eastern half of the ODA, being visible in the LiDAR data being recorded as LF45 in GO-01 (647513, 260739), LF48 (646735, 260431) and LF49 in GO-05 (646666, 260412), LF43 in GO-10 (646971, 261924) and LF38 in GO-20 (645355, 261224). In the western half of the ODA LF29 in RM-04 (Illus 58–60 inclusive – 642569, 261215) also locates an area of disturbance interpreted as a pit. Some of these pits are visible as cropmarks on the air photographs, such as in GO-09 (647134, 261628), where AP2, AP22 and AP23 all locate pits identified as anomalies in the survey (Illus 28–30). Many of these small-scale enterprises would have been designed to cater for a specific, local, purpose and hence short lived. Consequently, although some of these pits are recorded on historic mapping many more are not but have been identified using air photographs, LIDAR data and geophysical survey data. The magnetic disturbance is caused by magnetic debris (brick, tile, iron etc.) within the material used to infill the extraction pits.

It is considered possible that some of these anomalies (i.e ones not recorded on historic mapping) may be due to backfilled bomb craters but there is no definite information on this and no basis in the data on which to discriminate between a backfilled extraction pit or a backfilled bomb crater.

4.6 POSSIBLE ARCHAEOLOGICAL ANOMALIES

Unless specified all the linear anomalies described are likely to be due to soil-filled cut features, such as ditches, forming clear patterns of enclosure and land division. Against a variable magnetic background, it is difficult to confidently discriminate between discrete anomalies which may be due to archaeological features, such as pits, which may be indicative of occupational activity, and those that are probably due to localised geological variation. For this reason, most of the discrete anomalies within enclosures have been ascribed a possible archaeological origin with those outside, except where the responses are particularly broad or high in magnitude, interpreted as of non-archaeological origin.

Anomalies interpreted as being of possible archaeological origin are caused by soil-filled features such as pits or ditches or by spreads of magnetically enhanced material within the upper soil horizons. Whilst these anomalies do not manifest in any coherent archaeological pattern, they are either located near to areas of known archaeology, or cannot be satisfactorily interpreted as either modern, agricultural or geological in origin. Several of these anomalies lead to/from areas of previous quarrying activity and so could be associated with this extraction. On this basis, these anomalies are interpreted as potentially archaeological in origin.

4.7 AREAS OF ARCHAEOLOGICAL ACTIVITY

Unless specified all the linear anomalies described are likely to be due to soil-filled cut features, such as ditches, forming clear patterns of enclosure and land division. With the variable magnetic background it is difficult to confidently discriminate between discrete anomalies which may be due to archaeological features, such as pits, which may be indicative of occupational activity, and those that are probably due to localised geological variation. For this reason, most of the discrete anomalies within enclosures have been ascribed a possible archaeological origin with those outside, except where the responses are particularly broad or high in magnitude, interpreted as of non-archaeological origin.

Eleven distinct areas of archaeological activity (AAA) have been identified, which are discussed below. These range from individual features to extensive areas of settlement and/or enclosure.

AAA1 (Illus 88–120 inclusive)

The most extensive area of potential archaeological activity comprises a c 3km section of the ODA extending northwards from the point at which the cable route makes landfall. Numerous conjoining linear anomalies form a huge, complex, system of land division and enclosure covering an area of approximately 116 hectares.

The most coherent pattern of former fields is seen in field GO-03 (Illus 91–99 inclusive – 647030, 260465). Further to the north (beyond the defined AAA) the anomalies become fragmentary and less coherent in GO-09 (647079, 261687), 10 (646941, 261910), 11 (646947, 262265) and 12 (646774, 262185) but nevertheless are still present albeit in a more truncated pattern. The size and shape of the enclosures vary but all are broadly rectilinear in morphology and are generally aligned on a similar orientation to the current field pattern. A few of the linear anomalies correspond with boundaries on tithe or estate maps indicating a likely post-medieval origin whilst others clearly intersect with mapped boundaries and on this basis these anomalies have been interpreted as of agricultural origin (green on the interpretation illustrations). Some anomalies do not readily fit this pattern of land division and for this reason have been interpreted as of possible archaeological origin. However, on balance, it would seem most likely that most of the field system in AAA1 is of likely post-medieval origin. This area is also characterised by evidence of small-scale extraction and it is also possible that some of the linear anomalies may be associated with this activity, possibly being caused by drains. Certainly, no anomalies indicative of settlement activity have been identified and on this basis these anomalies are assessed as of moderate archaeological significance.

On the northern edge of GO-04 (Illus 88–90 inclusive – 646772, 260590) a semi-circular anomaly locates the ploughed down remains of a likely Bronze Age barrow, approximately 16m in diameter. Other barrows are recorded in the wooded area immediately to the north, outside the ODA. A distinct discrete anomaly situated in the centre of the barrow is highly likely to be associated with the barrow, possibly a cremation burial. This barrow feature is assessed as of moderate to high archaeological significance.

AAA2 (Illus 121–129 inclusive)

AAA2 in GO-16 (645922,261879) encompasses a single circular anomaly which is also interpreted as the ploughed down remains of a Bronze Age barrow (Illus 121–123 inclusive). Two discrete anomalies immediately north of the probable former monument could be pits or areas of burning associated with the former monument. This barrow feature is assessed as of moderate to high archaeological significance.

Fifty metres to the east of the double pylons and 250m south of the barrow a rectangular enclosure, of unknown date, is identified. Several discrete anomalies, two with the characteristic X-Y traceplot profile of a kiln (see Illus 125) is identified in GO-16 (646016, 261724). These features are assessed as of moderate to high archaeological significance.

In GO-17 (645985, 261422), immediately to the south of GO-16, a series of discontinuous linear anomalies perhaps forming another rectilinear enclosure are identified (Illus 127–129 inclusive). A small square enclosure within the south-eastern corner of the 'enclosure' is also identified. Seven high magnitude 'spike' anomalies are also recorded. Linear cropmarks corresponding with some of these anomalies are recorded on AP74 and AP77. A tentative military interpretation was placed on the cropmarks. No definitive archaeological interpretation can be made from the magnetic data hence a possible archaeological interpretation is given. An assessment of moderate potential would be appropriate.

AAA3 (Illus 130–147 inclusive)

AAA3 encompasses another very large area (approximately 98 hectares) which covers five fields extending from OT1 and OT2 in the south-west to GO-20 (645509, 261278) in the north-east. Three separate foci of activity are identified.

To the north of AAA3 (GO-21 and GO-22) a confusing pattern of linear and rectilinear anomalies, aligned broadly on the points of the compass, extend 0.75km from north/south. Considerable quarrying activity in these two fields makes confident interpretation more difficult but the pattern of enclosure appears dissimilar to that defined within AAA1 being considerably less regular. The only well-defined feature is a rectangular enclosure in GO-20 (Illus 40–42 inclusive – 645043, 260728), aligned broadly north/south with a much smaller enclosure appended to the its south-eastern corner. Other linear anomalies then extend southwards into GO-21 where the enclosures then extend westwards across the full width of the field. Some discrete anomalies have been interpreted as of possible archaeological origin but given the quarrying activity and general variation in the magnetic background this interpretation is far from certain. The date of this system of enclosures is uncertain and could date from the Iron Age to post-medieval periods. A moderate to high potential is ascribed.

In the field immediately to the south, GO-22 (644969, 260518), a small square enclosure is appended on the eastern side of a linear anomaly that locates a former field boundary. High magnitude discrete anomalies within the enclosure are also interpreted as archaeological in origin. Linear anomalies immediately to the east define at least five former fields/enclosures. These former fields are on the same alignment as the former field boundary to the west and also to the current field layout so are interpreted as of likely post-medieval date. Nevertheless, an archaeological origin for these anomalies has been ascribed.

The final focus of activity is around the southern edge of GO-22 extending south into OT-01 (Illus 43–45). Here sinuous parallel curvilinear anomalies (which cross the current field boundary between) mark the northern boundary (possibly a trackway) of a series of small enclosures that extend from the southern side of the possible trackway; the south-western sides of these enclosures are not identified and the archaeological activity does not continue into OT-02. In OT-01 the archaeological activity clearly does continue although with no obvious pattern except for the continuation of the trackway. Numerous anomalies of enhanced susceptibility attest to archaeological activity.

AAA4 (Illus 148–159)

Immediately west of Aldeburgh Road is AAA4. This large area comprises an extensive system of former field division and settlement which have been split into three main foci of archaeological activity.

Aligned parallel with, and adjacent to, the eastern boundary of BE-07 is a complex arrangement of linear anomalies forming a ladder-like series of smaller conjoined enclosures aligned north/south across the full length of the field (644388, 260175). At the southern end of the field the enclosures are much smaller with numerous internal discrete anomalies suggestive of settlement and/or industrial activity. As elsewhere within the corridor quarrying activity in the south-eastern corner of the field has truncated some of the archaeological remains. This area is assessed as of high archaeological potential, particularly to the south-eastern corner of the field.

Approximately 250 metres to the west, in BE-06 (644146, 260219), is a trackway, also aligned north/south, running the length of the field, and clearly defined by two parallel ditches. A fragmentary ditch type anomaly aligned east/west, extending east from the trackway, strongly suggests that the land between the trackway and the settlement described above was divided into large fields as is the land to the west of the trackway. Of particular note is a small circular feature (644187, 260168 – bisected by the current field boundary) lying immediately to the south of this ditch. It is not clear whether this is a small enclosure appended to the former boundary, or perhaps to a ploughed-out barrow feature which has been deliberately avoided by later activity. This area is assessed as of moderate archaeological potential with the circular feature of possible high potential.

The third element in this AAA is located in BE-03 and BE-05 (643705, 260320) and comprises a more complete pattern of former field division. However, along the northern edge of BE-03 the enclosures become much smaller with numerous discrete anomalies hinting at activity other than just stock control. One small circular anomaly (643950, 260283) with a possible entrance to the western side is particularly noted. The archaeological potential along the northern edge of BE-03 is assessed as moderate to high and moderate within the wider field system.

AAA5 (Illus 169–171)

Along the western edge of BE-04 (642905, 260320), parallel with the road, a roadside enclosure approximately 70m in length is clearly identified. Several discrete anomalies, which are interpreted as of possible or probable archaeological origin, are identified within this enclosure. The enclosure appears to be in turn enclosed by a linear ditch type anomaly which extends from the current field boundary to the north to the small wooded area to the south-west. To the east of the enclosure several linear ditch type anomalies, on broadly the same south-west/north-east alignment, indicate a wider field system in the surrounding area.

AAA6/7 (Illus 160–168)

A circular anomaly with a cross-shaped anomaly central within it in field RM-04 (Illus 160–163 inclusive – 642659, 261072) locates a post-medieval windmill recorded on historic mapping. This feature is assessed as of high potential.

The partial remains of a probable barrow are identified on the boundary between RM-10 and RM-11 (642601, 260657). The archaeological potential of this feature is assessed as high.

A small cluster of sub-rectangular enclosures in the centre of field RM-13 (Illus 166–168 inclusive – 642554, 260561) may potentially be dated to the Middle Bronze Age through to the early Roman period although the partial remains of the barrow, less than 100m to the north-east, could suggest a prehistoric date for the enclosures to be more likely. Linear anomalies suggest the partial remains of larger enclosures to the north and east in RM-10, 11 and 12 (642778, 260729). Another small isolated rectilinear enclosure is identified on the northern limit of the survey area in RM-10. This cluster of archaeological activity is assessed as moderate to high.

AAA8 (Illus 181–183)

Three or four conjoining rectangular enclosure aligned north/ south are identified on the southern boundary of RM-09 (642153, 260715). The enclosures do not continue into RM-14 although other discontinuous linear anomalies are identified throughout this field hinting at the presence of larger fields to the south. The date of these features is uncertain but again could be from the Iron Age to post-medieval. These remains are assessed as of moderate archaeological potential.

AAA9 (Illus 175–180 and 184–192)

AAA9 also encompasses a large area, approximately 45 hectares, extending across several fields, BA-01, WR-01, WR-02, WR-03, WR-05, WR-06, WR-07, WR-08 and RM-08 (Illus 67–69 and Illus 73–78 inclusive – 641589, 260811). Of greatest significance is the cluster of conjoining enclosures in field RM-08 which extends for approximately 225 metres on a north-east/south-west alignment from the adjacent lane, bordering the south-western section of Grove Wood. The numerous discrete anomalies are indicative of occupation and this cluster of anomalies is probably the remains of a roadside settlement of likely medieval date. To the north-western side of the lane the anomalies become much weaker and disparate but are likely to indicate the continuation of the settlement. Throughout the remainder of AAA9 discontinuous linear anomalies are again indicative of a former system of field division of uncertain date. The areas of possible settlement bordering Grove Wood are assessed as of high potential whilst the field system is likely to be of only low significance.

AAA10 (Illus 172–174)

Another small square cluster of rectilinear enclosures, approximately 70m by 70m, is identified in the far north-west of the ODA in RM-01 (641948, 261472), adjacent to the power lines. Some of the responses are very low magnitude suggesting that the archaeological activity may be more extensive than currently revealed by the magnetic survey. These enclosures again could date from the later prehistoric through to the early post-Roman periods. The archaeological potential is assessed as high.

AAA11 (Illus 193–195)

The final area of potential is located at the extreme western end of the ODA in BH-09 (640267, 260688). Two foci of activity are identified.

The smaller area is located immediately south of the twin pylons and the magnetic response from the pylons is clearly masking the full extent of the archaeology. Anomalies locating two small enclosures aligned north/south are identified as well as several large discrete anomalies which are interpreted as of possible archaeological origin. This area is assessed as of moderate archaeological potential.

The second area is far more extensive and comprises an L-shaped arrangement of enclosures which extends 150m south from the corner of Grove Wood to the southern boundary of BH-09 (640267, 260688) and then extending 225m east, following, but overlapping with, the current boundary between BH-09 and BH-10 (640189, 260541). Several large discrete anomalies are almost certainly archaeological in origin. This area is assessed as of high archaeological interest of uncertain date.

The substation site

The fields where the substations will be sited (centred at 641395, 261184) have perhaps the least apparent archaeological interest within the areas surveyed to date with virtually no anomalies of possible archaeological origin and none of probable archaeological origin being identified. Whilst it is accepted that no geophysical survey will identify all archaeological features it can be stated with a reasonable degree of confidence that it is unlikely that there will be any significant or extensive archaeological activity within the substation area on the basis that archaeological activity has been clearly identified (AAA10 and AAA11) on the same geology and soils (diamicton overlying Crag Group Sand) as prevail within the footprint of the substations.

Buxlow/Buxton Chapel

Two possible locations of the site of the former parish church of Buxlow/Buxton are noted in the DBA and both have been covered by the survey, although one field (HE-02) was only partly surveyed. On the HER the site of the church is recorded as KND 009 (641417, 260629) in field HE-02/WR-08. No anomalies of clear or obvious archaeological potential have been identified here although there is a distinct area of disturbed readings in the centre of the field (641362, 260609) which might not be inconsistent with a spread of material resulting from the destruction of a building. However, variation in the superficial deposits and soils might also account for the recorded response. Part of this field was also unsuitable for survey (allotments) and therefore remains currently unevaluated.

An alternative location is slightly further to the north-east in RM-08 where a rectilinear cropmark has been identified (HA6 – 641613, 260763). This cropmark again corresponds with an area of very variable magnetic responses although a geological origin is preferred at this stage.

5 CONCLUSION

The survey has successfully evaluated approximately 500 hectares across the full extent of the ODA with anomalies indicative of archaeological activity identified on all prevailing soils and geologies. This leads to the conclusion that the survey has likely identified all significant areas of archaeological activity, excepting those types and periods of archaeology that are not readily identified by magnetometry. The periods represented by this activity are uncertain in most instances but overall there is likely to be activity dating from the Bronze Age (round-barrows) to the post-medieval (field systems, quarrying). The potential or significance of the remains is also uncertain but is likely to range from low, in the case of the field systems, to high in the case of the areas of settlement and possibly the round barrows. It is worth noting that many of the archaeological features identified in the AAA' s are likely to be outwith the cable corridor or the sub-station area. It should also be noted that the possibility of archaeological remains in apparently 'blank' areas cannot be discounted.

6 REFERENCES

Chartered Institute for Archaeologists (CIfA) 2014 ***Standard and guidance for archaeological geophysical survey*** (Reading) http://www.archaeologists.net/sites/default/files/CIfAS&Geophysics_1.pdf accessed 10 June 2019

Cranfield University 2019 ***Cranfield Soil and Agrifood Institute Soilscapes http://www.landis.org.uk/soilscapes/ accessed 10 June 2019***

English Heritage (now Historic England) 2008 ***Geophysical Survey in Archaeological Field Evaluation: Research and Professional Services Guidelines*** (2nd edn) http://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf accessed 10 June 2019

Gaffney C & Gater J (2003) ***Revealing the Buried Past: Geophysics for Archaeologists*** Stroud

Headland Archaeology 2018 ***East Anglia Two and East Anglia One North Offshore Windfarms Onshore Archaeology and Cultural Heritage Desk Based Assessment*** [unpublished client report]

Natural Environment Research Council (NERC) 2019 ***British Geological Survey*** http://www.bgs.ac.uk/ accessed 10 June 2019

Royal HaskoningDHV 2017 ***East Anglia ONE North and East Anglia TWO Specification for: Onshore Archaeological Geophysical Survey and Archaeological Trial Trenching***

East Anglia ONE North and East Anglia TWO, Suffolk

East Anglia ONE North and East Anglia TWO Onshore Development area

-1 nT 1

0 500m

1:25,000 @ A3

PROJECT **EAON18**
East Anglia One North/Two
Offshore Wind Farm
Suffolk

CLIENT Scottish Power Renewables

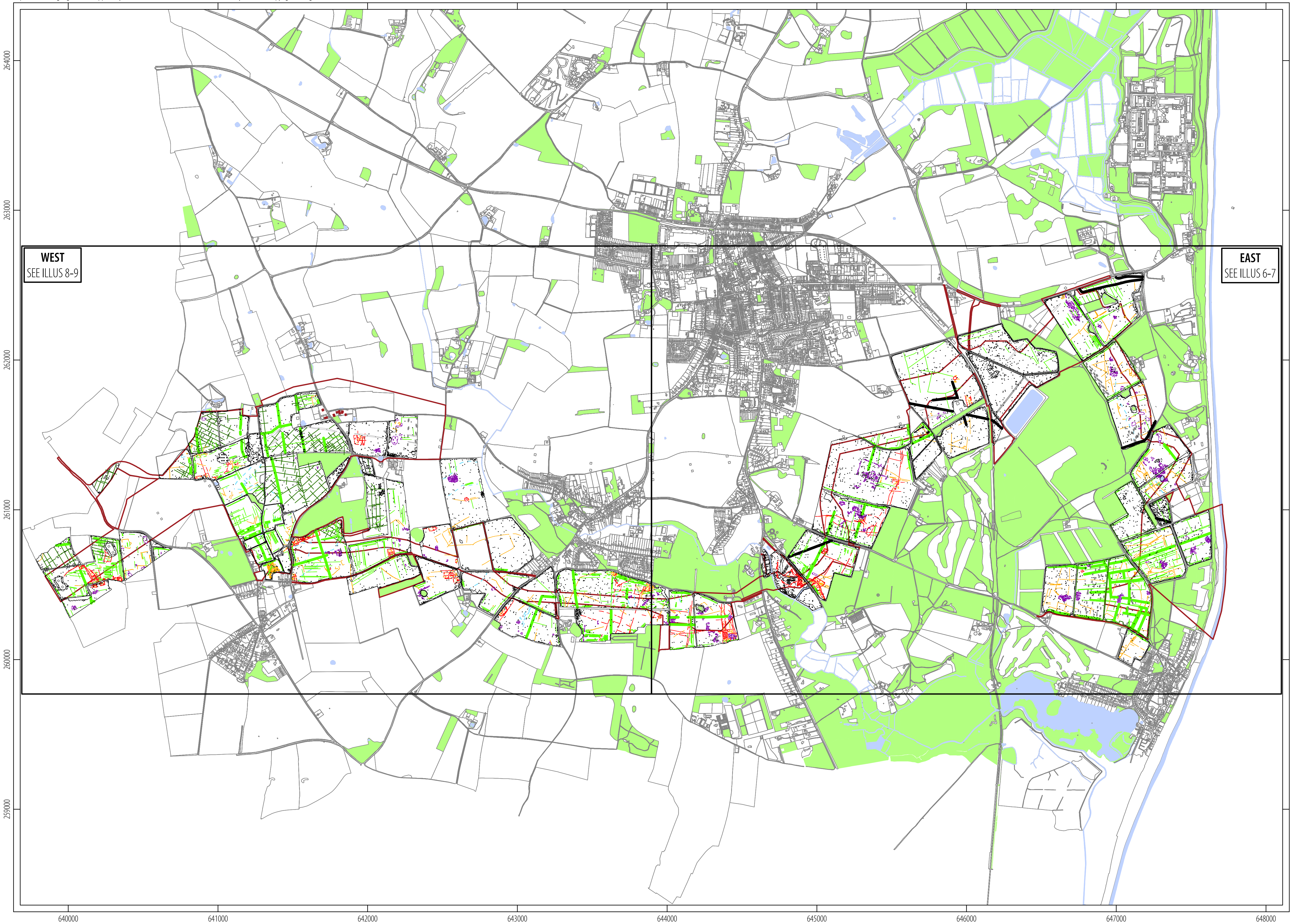
HEADLAND ARCHAEOLOGY

NORTH Unit 16, Hillside, Beeston Road
Leeds, LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 4 Processed greyscale magnetometer data

Applicable to East Anglia ONE North and East Anglia TWO

East Anglia ONE North and East Anglia TWO, Suffolk



East Anglia ONE North and East Anglia TWO Onshore Development area

TYPE OF ANOMALY	- INTERPRETATION
dipolar isolated	- ferrous material
dipolar linear	- service pipe
linear trend	- bad data
linear trend	- agricultural
linear trend	- former field boundary
linear trend	- former field boundary?
linear trend	- field drain
linear trend	- geological variation
magnetic disturbance	- ferrous material
magnetic disturbance	- quarrying
magnetic enhancement	- archaeology
magnetic enhancement	- archaeology?
null value	- overhead cables

0 500m
1:25,000 @ A3

PROJECT **EAON18**
East Anglia One North/Two
Offshore Wind Farm
Suffolk

CLIENT Scottish Power Renewables

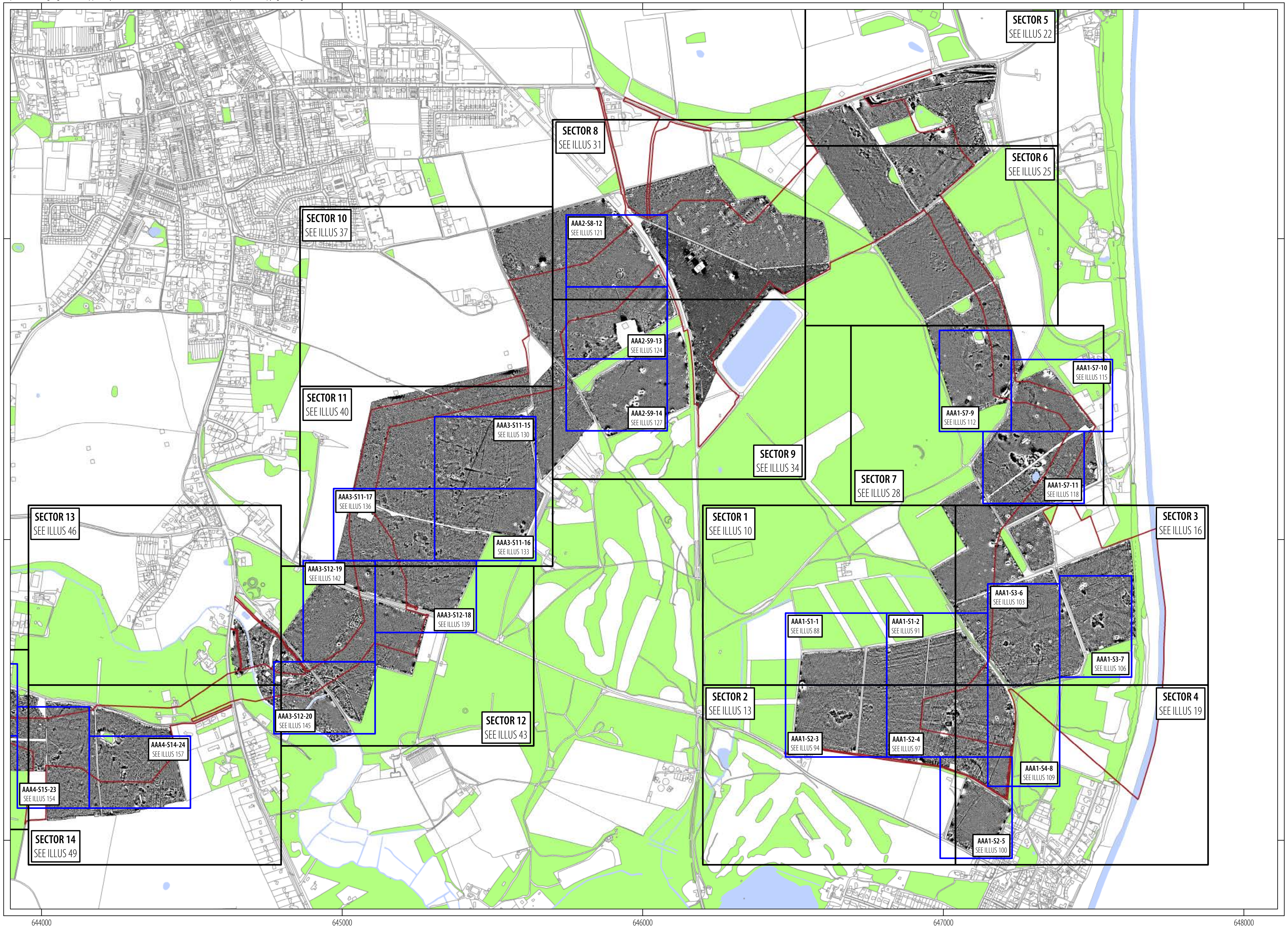
HEADLAND ARCHAEOLOGY

NORTH Unit 16, Hillside, Beeston Road
Leeds, LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 5 Interpretation of magnetometer data excluding geological anomalies

Applicable to East Anglia ONE North and East Anglia TWO

East Anglia ONE North and East Anglia TWO, Suffolk



East Anglia ONE North and East Anglia TWO Onshore Development area

-1 nT 1

0 250m

1:12,500 @ A3

PROJECT EAON18
East Anglia One North/Two
Offshore Wind Farm
Suffolk

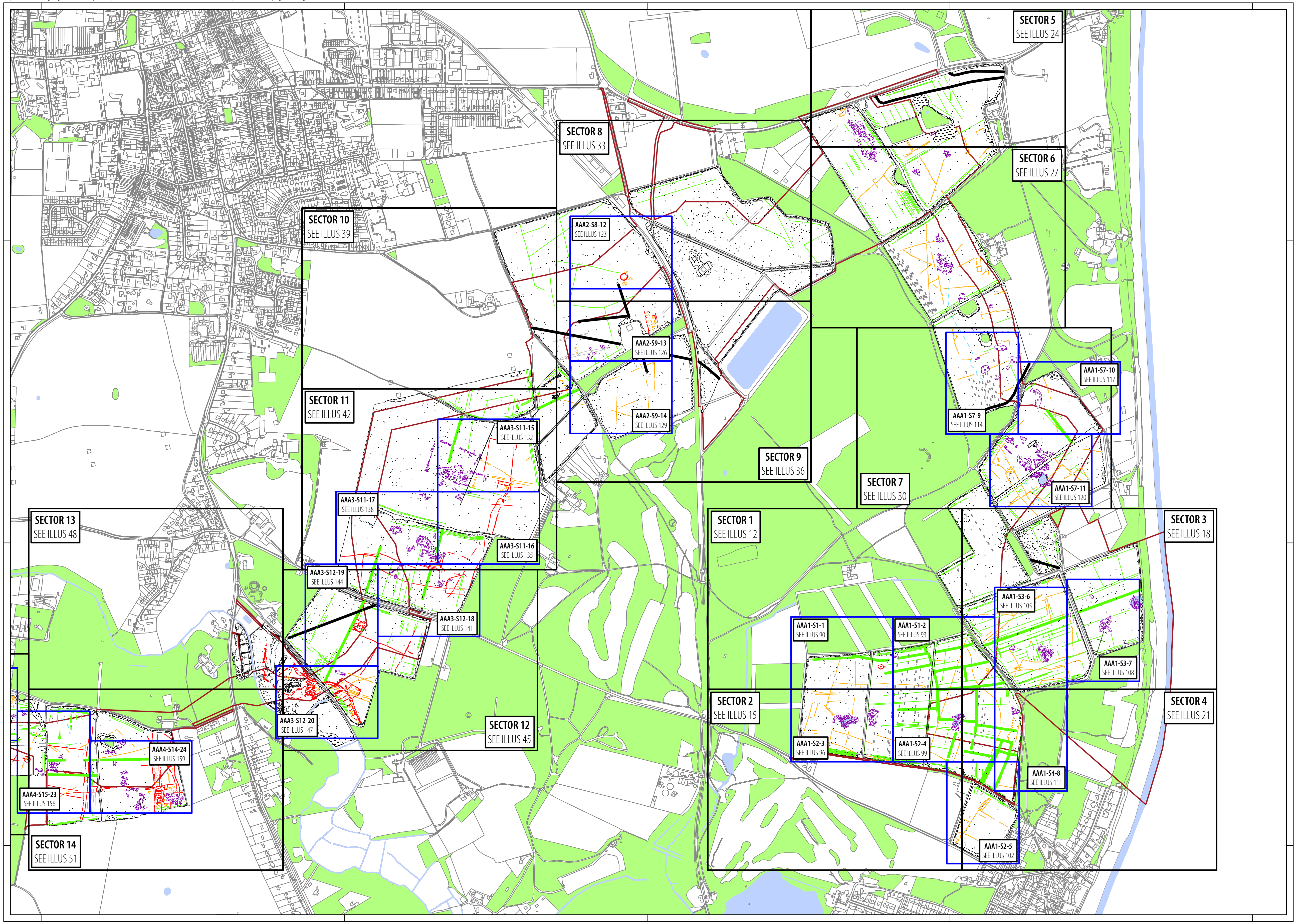
CLIENT Scottish Power Renewables

HEADLAND ARCHAEOLOGY

NORTH Unit 16, Hillside, Beeston Road
Leeds, LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 6 Processed greyscale magnetometer data; east

Applicable to East Anglia ONE North and East Anglia TWO



East Anglia ONE North and East Anglia TWO Onshore Development area

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
dipolar linear	service pipe
linear trend	bad data
linear trend	agricultural
linear trend	former field boundary
linear trend	field drain
linear trend	geological variation
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
magnetic enhancement	archaeology
magnetic enhancement	archaeology?
null value	overhead cables

0 250m

1:12,500 @ A3

PROJECT EAON18
East Anglia One North/Two
Offshore Wind Farm
Suffolk

CLIENT Scottish Power Renewables

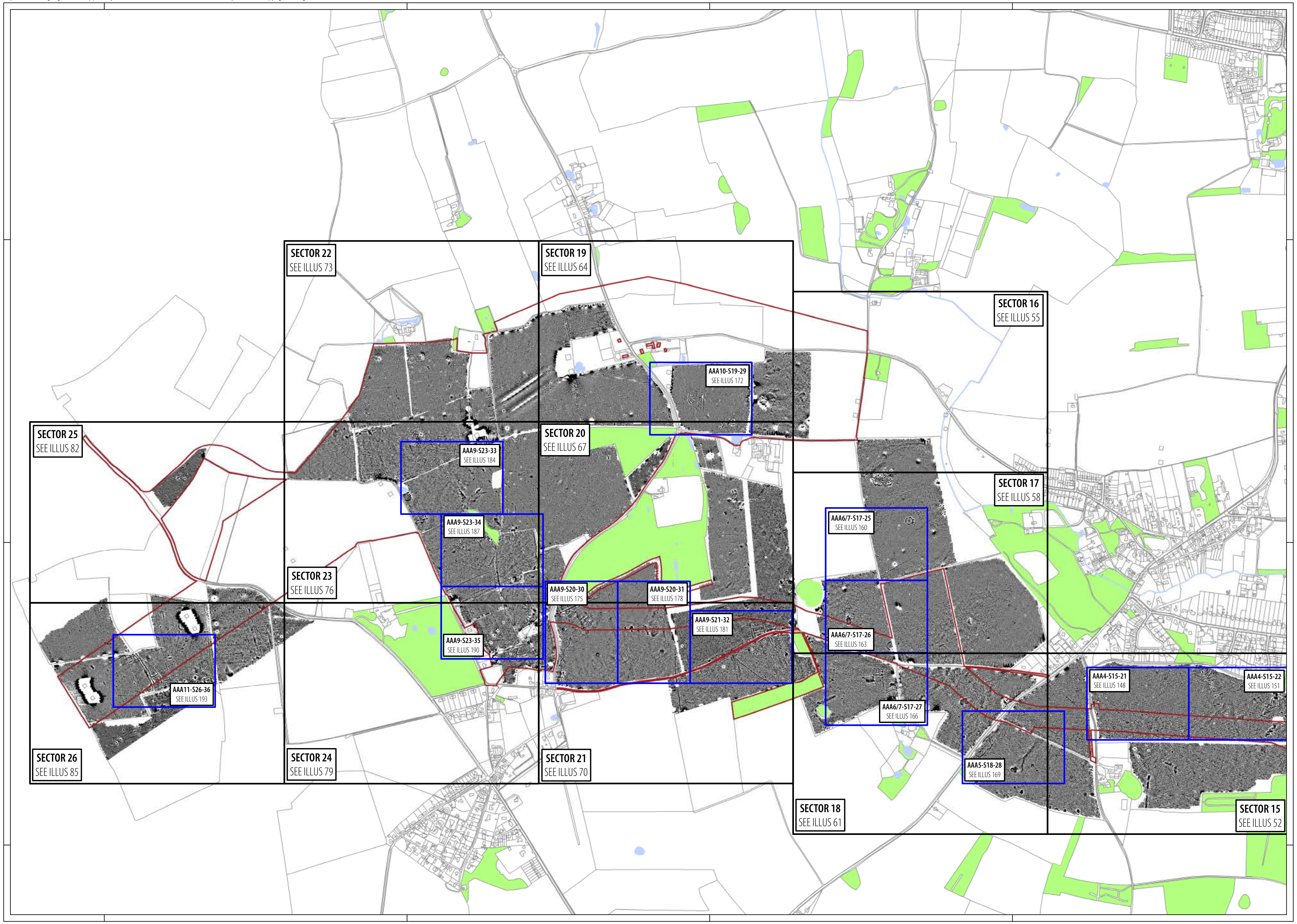
HEADLAND ARCHAEOLOGY

NORTH Unit 16, Hillside, Beeston Road
Leeds, LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 7 Interpretation of magnetometer data; east excluding Geological anomalies

Applicable to East Anglia ONE North and East Anglia TWO

East Anglia ONE North and East Anglia TWO, Suffolk



East Anglia ONE North and East Anglia TWO Onshore Development area

-1 nT 1

0 250m

1:12,500 @ A3

PROJECT EAON18
East Anglia One North/Two
Offshore Wind Farm
Suffolk

CLIENT Scottish Power Renewables

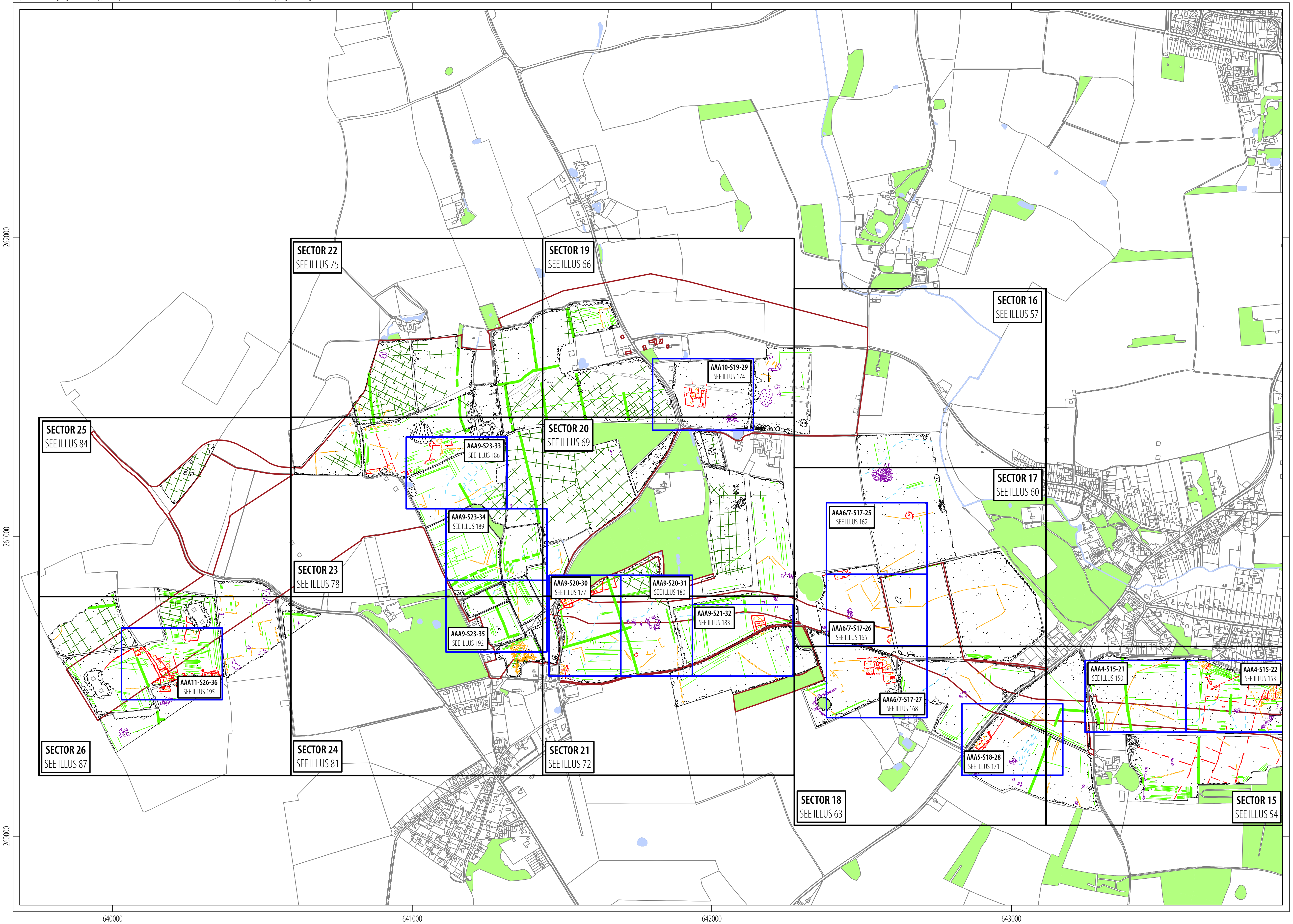
HEADLAND ARCHAEOLOGY

NORTH Unit 16, Hillside, Beeston Road
Leeds, LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 8 Processed magnetometer data; west excluding geological anomalies

Applicable to East Anglia ONE North and East Anglia TWO

East Anglia ONE North and East Anglia TWO, Suffolk



East Anglia ONE North and East Anglia TWO Onshore Development area

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
linear trend	bad data
linear trend	agricultural
linear trend	former field boundary
linear trend	former field boundary?
linear trend	field drain
linear trend	geological variation
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
magnetic enhancement	archaeology
magnetic enhancement	archaeology?
null value	overhead cables

0 250m
1:12,500 @ A3

PROJECT EAON18
East Anglia One North/Two
Offshore Wind Farm
Suffolk

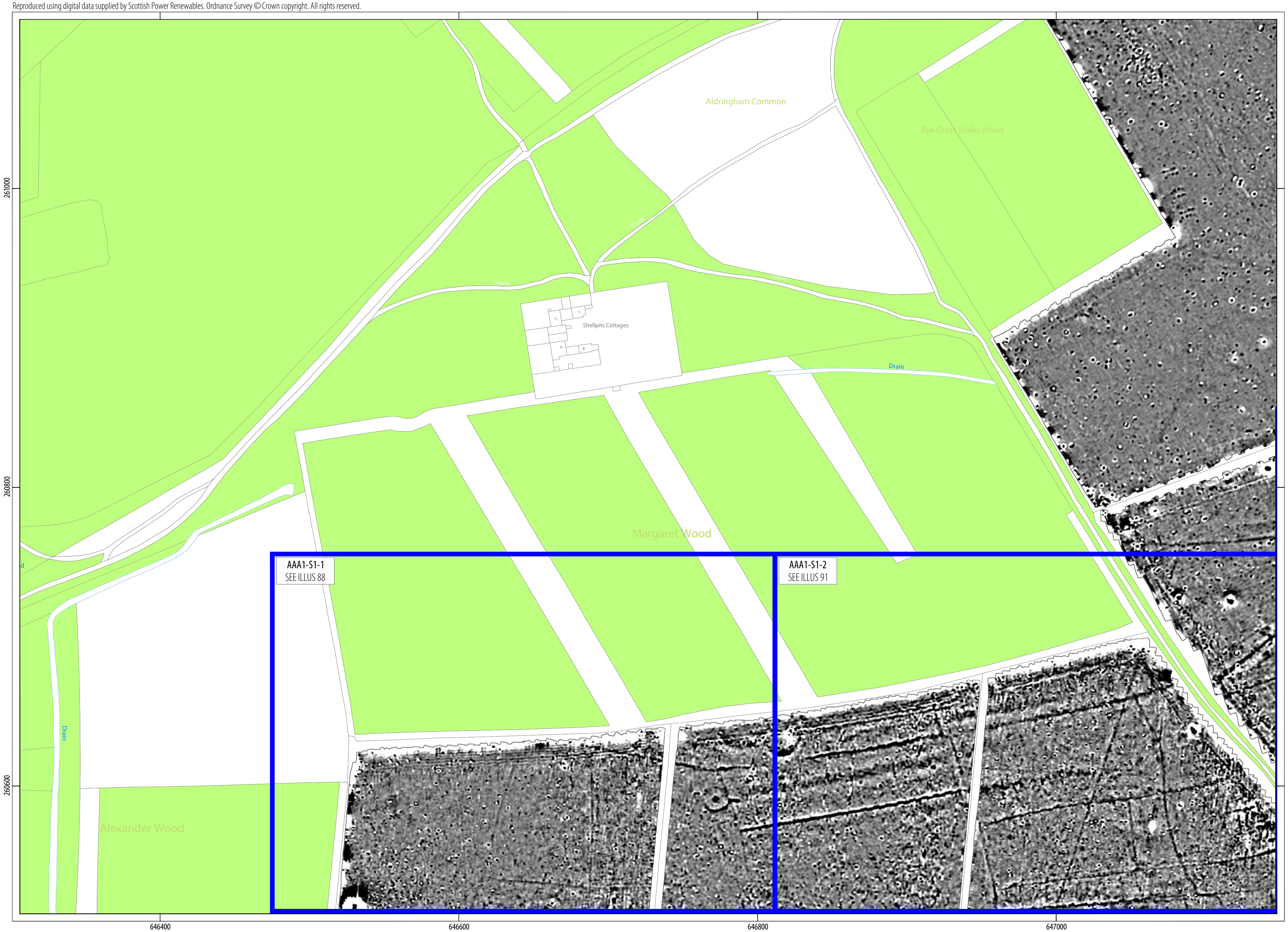
CLIENT Scottish Power Renewables

HEADLAND ARCHAEOLOGY
NORTH Unit 16, Hillside, Beeston Road
Leeds, LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 9 Interpretation of magnetometer data; west excluding geological anomalies

Applicable to East Anglia ONE North and East Anglia TWO

East Anglia ONE North and East Anglia TWO, Suffolk



nT
-1.0 1.0

0 50m
1:2,500 @ A3

PROJECT EAON18
East Anglia One North/Two
Offshore Wind Farm
Suffolk

CLIENT Scottish Power Renewables

HEADLAND ARCHAEOLOGY

NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 10 Processed greyscale magnetometer data: Sector 1

Applicable to East Anglia ONE North and East Anglia TWO