

Hornsea 4

Ørsted



Hornsea Project Four: Preliminary Environmental Information Report (PEIR)

Volume 6, Annex 5.3: Priority Archaeological Geophysical Survey

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Glossary

| Term | Definition |
|---------------------|--|
| Agricultural trends | Anomalies created by either historical or modern agricultural activities, such as ridge and furrow ploughing, tractor track marks, ploughing headlands, field drains. |
| Archaeology - Trend | These are made up of linear / curvilinear / rectilinear anomalies and are either characterised by an increase or decrease in values compared to the magnetic background. This evidence is normally supported by the presence of archaeological remains and is confirmed by other forms of evidence such as Historic Environment Record (HER) records and aerial photography. |
| Bipolar anomaly | An anomaly composed of a positive magnetic response and a negative magnetic response. The responses often alternate and are usually in relation to a modern service pipe or cable. |
| Dipolar anomaly | An anomaly composed of a single positive anomaly surrounded by / adjacent to a corresponding negative response. These responses are in relation to a single feature within the ground and are likely to relate to ferrous items. |
| Enhanced magnetism | A group or area of numerous heightened magnetic responses. The responses can consist of both positive and negative readings and usually indicate disturbed ground or a spread of debris. |

| Term | Definition |
|-----------------------------|---|
| Export cable corridor (ECC) | The specific corridor of seabed (seaward of Mean High Water Springs (MHWS)) and land (landward of MHWS) from the Hornsea Project Four array area to the Creyke Beck National Grid substation, within which the export cables will be located. |
| Ferrous anomalies | A response normally caused by ferrous materials on the ground surface or within the topsoil, which causes a 'spike' representing a rapid variation in the magnetic response. These are generally not assessed to be archaeological when surveying on rural sites, and generally represent modern material often re-deposited during manuring. |
| Negative trend / anomaly | A linear / curvilinear magnetic response composed of negative magnetic readings. These are usually in relation to built up features where the material has a lower magnetic than its surroundings. |
| Onshore substation / OnSS | Located as close as practical to the NGET substation at Creyke Beck and will include all necessary electrical plant to meet the requirements of the National Grid. |
| Pit-like anomaly | An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is suggestive of buried remains, such as the infill of a pit. |
| Positive trend / anomaly | A linear / curvilinear magnetic response composed of positive magnetic readings. These are usually in relation to infilled features, such as ditches, field boundaries or ploughing trends but are sometimes isolated in their location and association with other features. |
| Possible Archaeology | Trends that are indicative of archaeological remains, but lack supporting evidence from HER data, cropmark or LiDAR data or excavation to confirm an archaeological origin. |
| Hornsea Four | This is Hornsea Project Four offshore wind farm, owned by 'Orsted Hornsea Project Four Ltd'. |
| Unclear Origins | Anomalies of a linear / curvilinear form or areas of enhanced magnetism which are composed of a weak or different change in magnetic values. Coupled with poor patterning, the anomalies are difficult to interpret, and it is unclear whether they have an archaeological origin. |

Acronyms

| Acronym | Definition |
|---------|--|
| aOD | Above Ordnance Datum |
| BGL | Below Ground Level |
| BGS | British Geological Survey |
| DMV | Deserted Medieval Village |
| dGPS | Differential Global Positioning System |
| EAC | European Archaeological Council |
| GPS | Global Positioning System |
| HAP | Humber Archaeology Partnership |
| HER | Humber Historic Environment Record |
| LGM | Last Glacial Maximum |
| NGR | National Grid Reference |
| NHLE | National Heritage List for England |

| Acronym | Definition |
|---------|--|
| NMP | National Mapping Programme |
| PEIR | Preliminary Environmental Information Report |
| RTK | Real-time Kinematic |
| WSI | Written Scheme of Investigation |

Units

| Unit | Definition |
|------|-----------------------------------|
| GW | Gigawatt (power) |
| ha | Hectares |
| km | kilometre |
| kV | Kilovolt (electrical potential) |
| KW | Kilowatt (power) |
| nT | Nanotesla (magnetic flux density) |

1 Introduction

1.1 Project Background

- 1.1.1.1 Ørsted Hornsea Project Four Limited (hereafter the 'Applicant') is proposing to develop Hornsea Four offshore wind farm. Hornsea Four will be located approximately 65 km offshore the East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone. Hornsea Four will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall, and connection to the electricity transmission network. The location of the Hornsea Four onshore infrastructure is illustrated on [Figure 1](#). This Technical Report presents the findings of the geophysical survey of the onshore infrastructure.
- 1.1.1.2 AOC Archaeology Group was commissioned to undertake a Priority Archaeological Geophysical Survey along targeted sections of the Hornsea Four, comprising the landfall, onshore Export Cable Corridor (ECC), Onshore substation (OnSS) and 400 kV ECC. The area designated for priority archaeological geophysical survey totals approximately 356 ha however only 53.2 ha were available at the time of the initial survey mobilisation. This covered 11 survey blocks within eight survey areas (see [Figure 2](#)).
- 1.1.1.3 The route designated for priority archaeological geophysical survey runs from the OnSS near Creyke Beck Substation in the south (National Grid Reference (NGR) TA 04446 35012) to landfall close to the settlement of Fraisthorpe in the north (NGR TA 16621 61461), ([Figure 1](#)).

1.2 Site Description

- 1.2.1.1 The onshore works consist of a refined landfall location at Fraisthorpe Sands (south of Bridlington), a 40 km long, 80 m wide onshore ECC easement with eight logistics compounds, heading south-westwards and crossing the River Hull before curving southwards to the west of Beverley and terminating at the OnSS, 4 km south of Beverley and 10 km north-west of Hull. The onshore ECC route passes through 15 parishes within East Riding (Barmston, Ulrome, Beeford, Foston, Hutton Cranswick, Watton, Beswick, Lockington, Leconfield, Cherry Burton, Molescroft, Bishop Burton, Walkington, Rowley and Skidby). The vast majority of current land-use around Hornsea Four is arable farmland and the landscape contains numerous small villages, with larger urban centres located to the north (Bridlington) and east (Beverley).

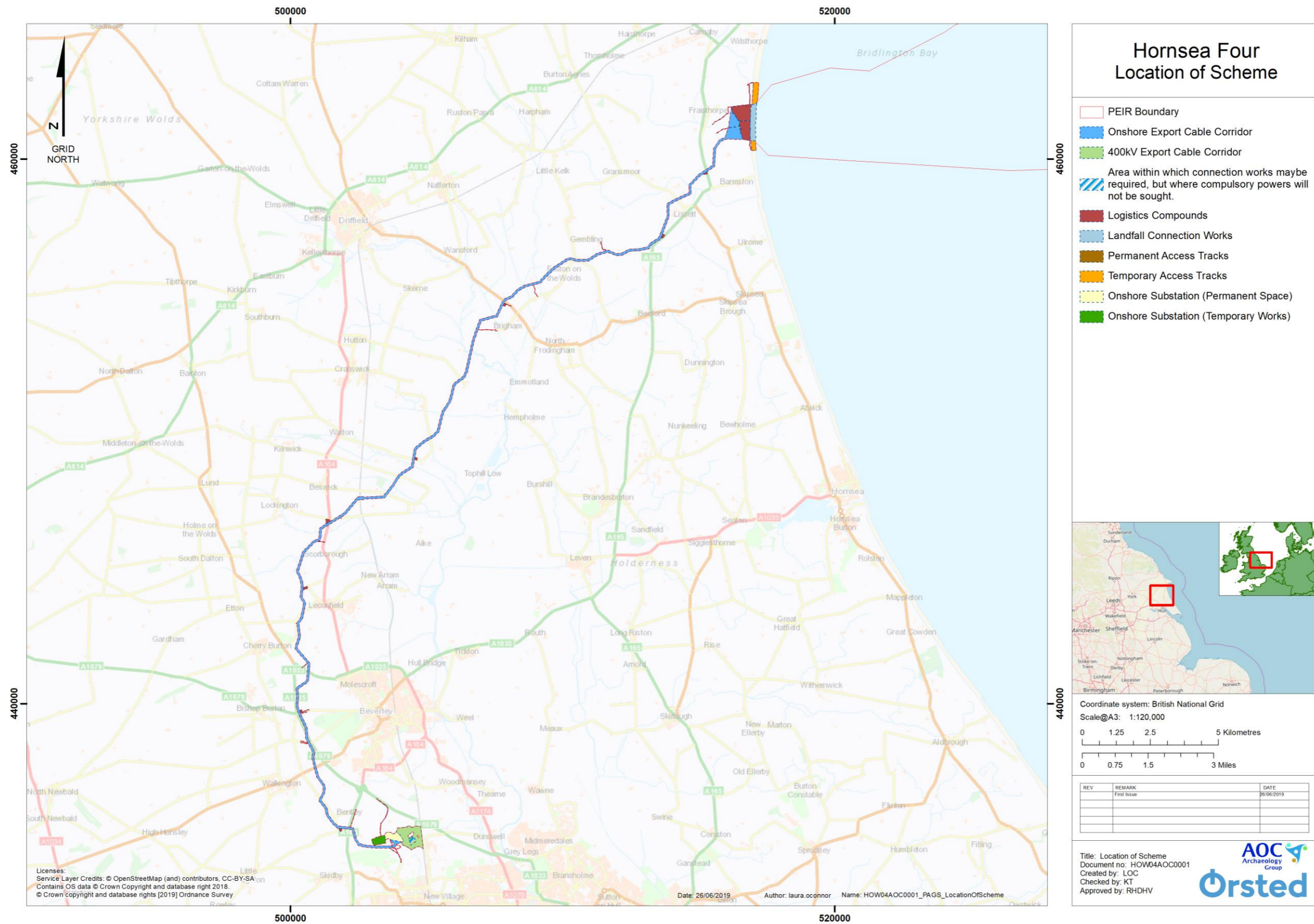
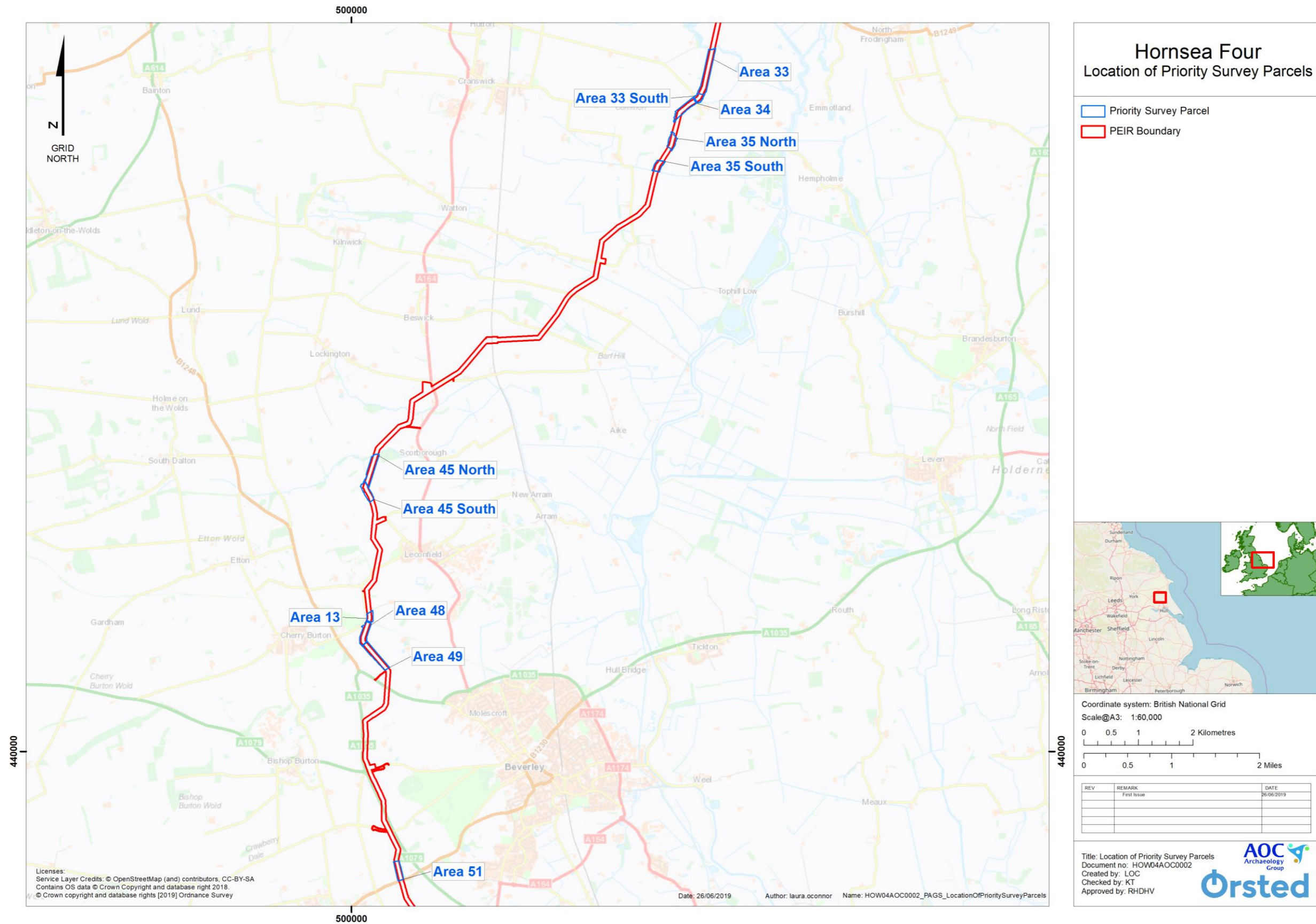
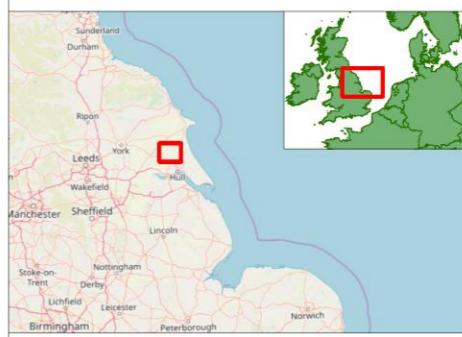


Figure 1: Location of Scheme (not to scale)



Hornsea Four Location of Priority Survey Parcels

- Priority Survey Parcel
- PEIR Boundary



Coordinate system: British National Grid
Scale@A3: 1:60,000
0 0.5 1 2 Kilometres
0 0.5 1 2 Miles

| REV | REMARK | DATE |
|-----|--------|------|
| | | |
| | | |
| | | |
| | | |

Title: Location of Priority Survey Parcels
Document no: HOW04AOC002
Created by: LOC
Checked by: KT
Approved by: RHDHV

Licenses:
Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA
Contains OS data © Crown Copyright and database right 2018.
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Date: 26/06/2019 Author: laura.oconnor Name: HOW04AOC002_PAGS_LocationOfPrioritySurveyParcels

Figure 2: Location of Priority Survey Parcels (not to scale)

1.3 Aims and Objectives

1.3.1.1 The aim of the priority archaeological geophysical survey is to identify any potential archaeological anomalies that would enhance the current understanding of the archaeological resource at targeted locations within the PEIR boundary for Hornsea Four.

1.3.1.2 Specifically, the aims of the priority archaeological geophysical survey are to:

- locate, record and characterise any surviving sub-surface archaeological remains at targeted locations within Hornsea Four;
- inform the Onshore Historic Environment PEIR Chapter (and subsequent Environmental Statement (ES) Chapter) and determine the requirements for a subsequent stage of (non-intrusive and intrusive) evaluation;
- provide an assessment of the potential significance of any identified archaeological remains in a local, regional and (if relevant) national context; and
- produce a comprehensive site archive and report.

2 Methodology

2.1 Survey Methods

2.1.1.1 The priority archaeological geophysical survey comprised a detailed magnetometer survey of targeted locations (35 survey areas) covering a total of 356 ha of land. These areas were targeted based on known locations of recorded heritage assets relating to buried archaeology within the Humber Historic Environment Record (HHER). Records of heritage assets located near or adjacent to the onshore ECC were also considered and the nearest section of the onshore ECC was identified for survey. This was due to the potential for the archaeological remains to extend into the footprint of the onshore ECC.

2.1.1.2 The priority archaeological geophysical survey was based on a 120 m wide corridor which included a 20 m buffer either side of the onshore ECC and comprised the full extent of the fields associated with the landfall and OnSS.

2.1.1.3 The scope of the survey was set out within the Written Scheme of Investigation (WSI) which was agreed in advance of the survey with the heritage stakeholders at a Historic Environment Technical Panel meeting on 2 April 2019.

2.1.1.4 Prior to the survey commencing, the availability of the fields for survey amounted to 53.2 ha due to landowner access constraints. This report, therefore, only discusses the results of the available 53.2 ha of survey.

2.1.1.5 All geophysical survey work was carried out in accordance with the WSI and recommended good practice specified in the European Archaeological Council (EAC) guideline documents published by Historic England (Schmidt et al., 2016) and the Chartered Institute for Archaeologists' *Standard and Guidance for archaeological geophysical survey* (2014).

2.1.1.6 Parameters were selected that were suitable for the prospective aims of the survey and in accordance with recommended professional good practice (Schmidt et al., 2016).

2.1.1.7 Tasks and activities during the survey included:

- Magnetometer survey of Priority Archaeological Geophysical Survey areas at targeted locations within Hornsea Four totalling approximately 53.2 ha;
- Provision of interim preliminary data plots of the survey areas completed to date; and
- Provision of greyscale images and interpretations of these survey areas incorporated into this full report.

2.2 Dates of Fieldwork

2.2.1.1 The priority archaeological geophysical surveys were undertaken between 8 April and 17 April 2019. The remaining priority archaeological geophysical survey will recommence post-harvest, which is currently anticipated to be late August 2019. The results will be presented in an updated Priority Archaeological Geophysical Survey report and will inform the ES presented for the DCO.

2.3 Grid Location

2.3.1.1 The priority archaeological geophysical survey was conducted within a grid system, tailored specifically to each survey area. The grids covered the PEIR boundary and included a 20 m buffer either side of the onshore ECC ([Figure 2](#)). Where the survey area falls across the landfall and OnSS, the full extent of each field was surveyed.

2.3.1.2 It is anticipated that the Hornsea Four development footprint will be refined sufficiently to remove the buffers from the scope of the geophysical survey which would result in a reduced scope of works.

2.3.1.3 The survey grids measured 30 m by 30 m, with temporary markers (canes) inserted at each grid node.

2.3.1.4 Grid nodes were set out using a Trimble R8s dGPS offsetting from a 30 m grid line defined in AutoCAD LT 2009, with specific grid coordinates uploaded to the Global Positioning System (GPS) controller. Grid nodes were laid out with an error no greater than +/- 0.1 m.

2.4 Instruments Used

2.4.1.1 The following instruments were used during the survey:

- Trimble R8s dGPS system (for the purposes outlined above); and
- Bartington Grad601-2 fluxgate gradiometers to undertake the priority archaeological geophysical survey.

2.4.1.2 It was agreed with the heritage stakeholder at the Technical Panel meeting on 2 April 2019 that this was a satisfactory survey method for Hornsea Four and that no further equipment or techniques were necessary.

2.5 Equipment Configurations

2.5.1.1 The Trimble dGPS system used on-site comprised a carbon-fibre detail pole, TSC3 control unit and R8s receiver, connected via Bluetooth. The GPS system used the Trimble "VRS

Now" service to provide instant access to real-time kinematic (RTK) corrections enabling an accuracy of < 2 cm. It was connected via a SIM card run on the Vodafone network with good cellular signal in the survey areas, meaning a repeater was not required.

2.5.1.2 The Bartington Grad 601-2 fluxgate gradiometers comprise a data logger, battery cassette and two Grad-01-1000L sensors mounted on a carrying bar. Surveyors support the instrument array using a counter-balancing backpack to which the gradiometer can be attached.

2.6 Data Capture

2.6.1.1 Data was collected on an east-west alignment using zig-zag traverses, with a sample interval of 0.25 m and a traverse interval of 1 m. Care was taken to attempt to avoid metal obstacles present within the survey area, such as metal fencing around hedge boundaries as gradiometer survey is affected by 'above-ground noise'.

2.6.1.2 Before each session of use, each gradiometer was balanced around a single set up point within that particular survey block, specifically chosen for use by all machines. This point is magnetically quiet and in balancing the machine around this point, produces a more uniform dataset throughout and allows all data to be plotted with ease within the stipulated plotting range of -1 nT to 2 nT.

2.6.1.3 Where significant drift occurred on a machine throughout a survey session, the affected grids were re-surveyed. Striping of the data may occur due to machine drift and it is decided in the field if this is within a sensible and acceptable limit.

2.7 Data Processing

2.7.1.1 Data was downloaded daily using Geoplot V.3 or Geoplot V.4 and backed up to cloud storage.

2.7.1.2 Digital photographs of every survey parcel were taken before, during and after geophysical survey to show any changes to field conditions following the programme of works. The photos were downloaded and stored off site.

2.7.1.3 Once downloaded, the magnetometer data was processed using Geoplot V.4 to align the grids and enhance the data results for presentation. The principle steps for processing the magnetometer data are as follows:

- Step 1: For the data presented as a 'minimally processed' plot; guidelines were adhered to where a grid-match process is applied, where possible, to produce the most visually uniform dataset as possible without any other processes being applied.
- Step 2: For the data presented as 'minimally processed', initially, a de-spike of all the data is carried out. If the data values require clipping, this process is added. A zero-mean-traverse process is then added to the data, either without thresholds or within a -5 to 5 range, (this range was determined as the most effective for display of minimally processed plots). Any data which required a greater range than this was deemed to be of poor quality and was re-surveyed. The data was then de-staggered where required. Most handheld data will require a degree of de-stagger processing;

however, if the data was obviously misaligned and required any more than 4-6 steps of de-stagger; the data was re-surveyed.

- Step 3: For 'fully processed' plots, a Low Pass filter is then applied followed by two Interpolation filters along the Y axis.
- Step 4: The gradiometer data was interpreted with linework produced in AutoCAD and converted to ESRI geodatabase feature class following Quality Assurance procedures and signoff.

2.8 Data Presentation

2.8.1.1 The final processed data are presented as Ordnance Survey (EPSG: 27700) georeferenced greyscale plots, at a suitable scale for interpretation of identified features. These appear as three panels on the figures, showing the minimally processed data, processed data and interpretation. Figures are supplied in PDF format through this report. Individual greyscale plots will be supplied as bitmap (.bmp) files and georeferenced JPGs and deposited with the HHER and Archaeology Data Service as part of the archive.

2.8.1.2 Mapping and spatial data deliverables have been produced in accordance with the requirements of Historic England's *Geophysical Survey in Archaeological Field Evaluation* (2008).

3 Desktop Review

3.1 Geology

3.1.1.1 Hornsea Four is located within the Hull Valley and Holderness which is underlain by solid geological deposits of chalk belonging to the White Chalk Subgroup. The British Geological Survey (BGS) geology maps show the bedrock within Hornsea Four to comprise the following formations (from oldest to youngest bedrock age):

- Burnham Chalk Formation;
- Flamborough Chalk Formation; and
- Rowe Chalk Formation.

3.1.1.2 The BGS geology maps show that various superficial deposits underlie Hornsea Four. These deposits include (from oldest to youngest deposit age):

- Diamicton Till;
- Glacifluvial Sand and Gravel Deposits;
- River Terrace Sand and Gravel Deposits; and
- Alluvial Clay Silt and Sand Deposits.

3.1.1.3 A more detailed geoarchaeological background is provided in the Geoarchaeological Desk Based Assessment ([Volume 6, Annex 5.4](#)).

3.2 Archaeological and Historical Background Summary

- 3.2.1.1 The following archaeological and historical overview has been taken from the Historic Environment Desk-Based Assessment ([Volume 6, Annex 5.1](#)).
- 3.2.1.2 Early prehistoric activity is known within the region through pollen analysis, which indicates that forests were beginning to be cleared during the Mesolithic period. Following this, the Yorkshire Wolds and wider area became well settled during the Neolithic period, due to the wide range of natural resources. Evidence for this habitation is seen in the surviving Neolithic ceremonial/funerary monuments in the Wolds landscape, such as long barrows and henges. Evidence for seasonal occupation during the Mesolithic and Neolithic period within the wetlands of Holderness is also evident in environmental remains and flint scatters.
- 3.2.1.3 Settlement of the Wolds continued during the Bronze Age period, with over 140 Early Bronze Age round barrows known across the region, particularly on the higher ground overlooking river valleys. Groupings of barrows are notable within the valley of the River Hull and its tributaries.
- 3.2.1.4 A distinctive material culture called the 'Arras Culture' prevailed throughout East Yorkshire during the Iron Age. A well-known element of this culture is burial within a square barrow, a subset of which contain high-status chariot burials. Square barrows survive as cropmarks on aerial photographs, usually in small groups, and as low earthworks, such as those at a cemetery containing approximately 120 square barrows just south of Scarborough, and the grouping of earthworks at Westwood Pasture, south-west of Beverley.
- 3.2.1.5 Activity during the Romano-British period often relates to periods of enclosure and land division, seen in the form of cropmarks. Enclosures were the most common recorded feature-type during the National Mapping Programme (NMP), often rectilinear in plan and isolated, although occasionally they were found in groups, aligned with trackways. Some of these identified enclosures survive as existing earthworks such as those at Westwood Pasture, which are designated as Scheduled Monuments (National Heritage List for England (NHLE) 1013994, 1013999, 1014001 and 1310087). Trackways have been identified in archaeological excavations or from cropmarks which are thought to be Iron Age to Romano-British in origin (although could be earlier) and are often aligned to define access down into the Hull Valley. A single possible Roman villa has been identified in the cropmark records at Skidby (MHU6598).
- 3.2.1.6 There is little evidence for Anglo-Saxon archaeological remains within the region, although the earliest phases of Beverley Minster, then known as *Inderauda*, were constructed during the period. It was founded at the turn of the 8th century and re-founded after the reconquest from the Danes by King Athelstan in the 10th century. It is during the latter centuries of the Anglo-Saxon period that many of East Yorkshire's settlements and their open-field systems were established.
- 3.2.1.7 Medieval activity is better attested to within the region. A total of 29 moated or defended sites were recorded during the NMP, with six sites potentially indicative of monastic granges. Two are moated sites are located at Beeford and Lockington (Belagh Grange; MHU 7293). Sites of potential deer parks are located at Leconfield, Bentley, Skidby, Cottingham, Risby, Beverley and Woodmansey. Deer parks were ostentatious signals of power and wealth to the wider landscape and population, setting aside areas of managed woodland under

seigniorial ownership for personal hunting use and coppicing of the woodland. They were identifiers of wealth and often developed nearby moated manor sites.

- 3.2.1.8 During the late medieval period, a worsening climate (known as the 'Little Ice Age') and poor rural economic stability, along with outbreaks of the Bubonic Plague, reduced the quantity and quality of grain production, leading to land being laid to pasture and creating opportunity to encourage peasant migration to urban centres. Deserted settlements are relatively common within the region, found at Wilsthorpe, Auburn, Hartburn (Fraisthorpe), Winkton (Barmston), Gembling, Raventhorpe (Cherry Burton), Risby, Rotsea, Winthorpe (Etton) and Bentley.
- 3.2.1.9 Rotsea is worthy of distinction (NHLE 1005212), consisting of 15 ha of preserved earthworks, with an associated nearby moated site. Beverley Minster and most parish churches within the region were built in the medieval period and retain most or much of their late medieval fabric.
- 3.2.1.10 A large number of World War II pillboxes, anti-tank defences, searchlight batteries, observation posts and other military installations and structures are common along the Holderness coast. This includes the Royal Observer Corps underground monitoring post at Skipsea and the anti-aircraft gunsite at Butt Farm, near Beverley, both of which are Scheduled Monuments.

4 Results

4.1 Interpretation of Results

- 4.1.1.1 The minimally processed and processed gradiometer survey results have been plotted at -1 nT to 2 nT as recommended by EAC guidelines. The results are presented as two greyscale plots (minimally processed and processed) alongside an interpretation of the data and the relevant figures for each area are listed within each results section.
- 4.1.1.2 For the most part, only geophysical anomalies of an archaeological origin, possible archaeological origin, uncertain origin or historical origin have been assigned an anomaly number on the interpretation figures. Trends that are integral to the discussion have also been assigned anomaly numbers. A table detailing the identified anomalies is presented in [Appendix A](#). The descriptions of the headings discussed below are explained in the glossary above.

4.2 Area 33

- 4.2.1.1 The data is presented in [Figure 3](#), [Figure 4](#) and [Figure 5](#).

4.2.2 Archaeology - Definitive

- 4.2.2.1 No responses indicating the presence of definitive archaeological remains has been identified in this area.

4.2.3 Possible Archaeology

- 4.2.3.1 A group of linear and curvilinear trends have been identified within the south of Area 33, which could potentially be archaeological in origin (33A). Two parallel linear trends have been identified running roughly east-west across the south of the area, situated approximately 15 m apart. The trends could represent a prehistoric trackway through the area. Towards the western end of this potential trackway, a ring ditch feature has been identified which measures approximately 7 m in diameter.
- 4.2.3.2 These anomalies may relate to a ditched field system, recorded in the HER to the east of the survey area (Monument I.D. MHU2252). The remains are not close enough to be plotted on the interpretation.
- 4.2.3.3 A second potential trackway consisting of two parallel linear trends has been identified in the south of the dataset for Area 33 (33B). The trackway appears to run from the south-east towards the north-west, where it continues into Area 34 and is seen as anomaly 34B. The distance between these trends is approximately 10 m, which matches trackway 34B identified in Area 34, suggesting they are likely to be related or are the same feature.
- 4.2.3.4 In the centre of Area 33, a number of curvilinear trends of a positive magnetic enhancement have been identified (33C). These trends could potentially be archaeological in nature, given their magnetic strength and shaping, however they are much more truncated in appearance. They could alternatively be geological in origin.
- 4.2.3.5 Discrete pit-like anomalies have been identified across the dataset, which although have the potential to be archaeological in nature, could also relate to geological variations.

4.2.4 Uncertain Origins

- 4.2.4.1 Across Area 33, many trends and areas of enhanced magnetism have been identified. Many of these could be archaeological, given the presence of possible archaeological remains, however a number could alternatively have non-archaeological origins.
- 4.2.4.2 An area of unclear magnetic enhancement is visible (33D) surrounding the potential archaeological features 33C. The anomaly could indicate the presence of archaeological activity; however, it could also be geological.
- 4.2.4.3 A further area of enhanced magnetism is located in the south of the dataset, which could indicate further possible archaeological activity (33E). Within this location, a number of linear and rectilinear trends have been identified which also have unclear origins (33F).
- 4.2.4.4 In the central and northern part of Area 33, a number of tentative linear trends have been identified (33G – 33I). These trends all have the potential to be archaeological in origin but due to their weak magnetic appearance they are equally likely to be a result of recent agricultural activity in the area.
- 4.2.4.5 Magnetically weak sub-circular trends of an unclear origin have been identified in the centre of the dataset (33J).

4.2.4.6 Rectilinear trends are visible in the north of Area 33 (e.g. 33K), but these are more likely related to agricultural drainage rather than archaeological remains.

4.2.5 Agricultural

4.2.5.1 Two former field boundaries have been identified running north-west to south-east through the dataset (33L). These boundaries appear on first edition ordnance survey mapping (National Library of Scotland, 2019) and have since been removed, and are now only visible in the data as an area of magnetic enhancement.

4.2.5.2 Ploughing trends are visible across the dataset which are likely of a conventional age, and follow the same orientation as the former boundaries, suggesting they are of a similar age.

4.2.6 Geological

4.2.6.1 A number of geological variations relating to former river channels and areas of alluvium likely caused by flooding events can be seen across the dataset for Area 33.

4.2.7 Magnetic Disturbance

4.2.7.1 Areas of magnetic disturbance are visible in the far north of the survey area and surrounding the former field boundaries.

4.2.7.2 Across the whole of Area 33 large quantities of isolated dipolar anomalies are visible (ferrous / iron spikes). These are commonly caused by ferrous or highly magnetic material on the surface or within the topsoil of the area and it is likely that modern agricultural activity has created a high level of background 'noise' within the data set.

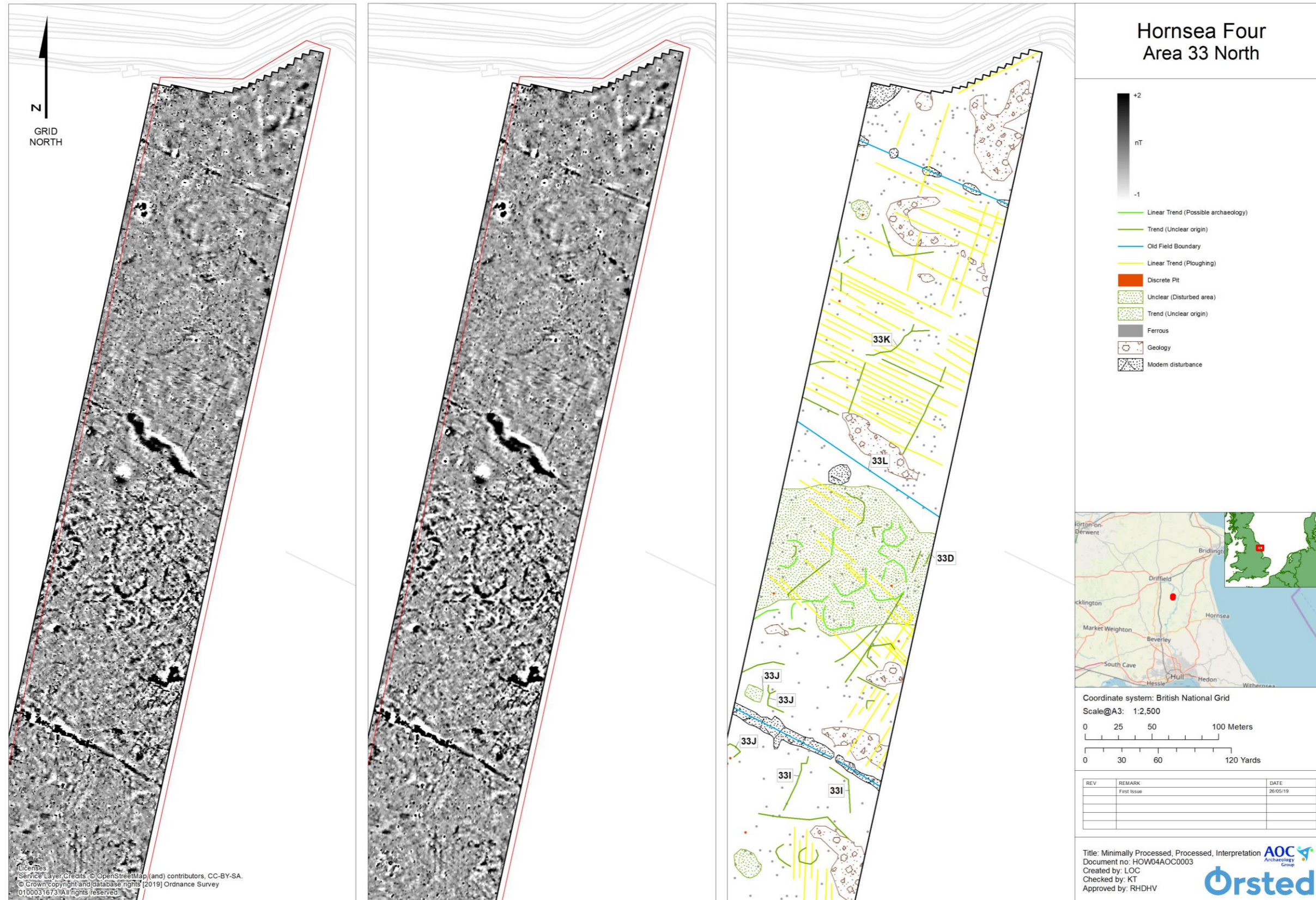


Figure 3: Area 33 North (not to scale).

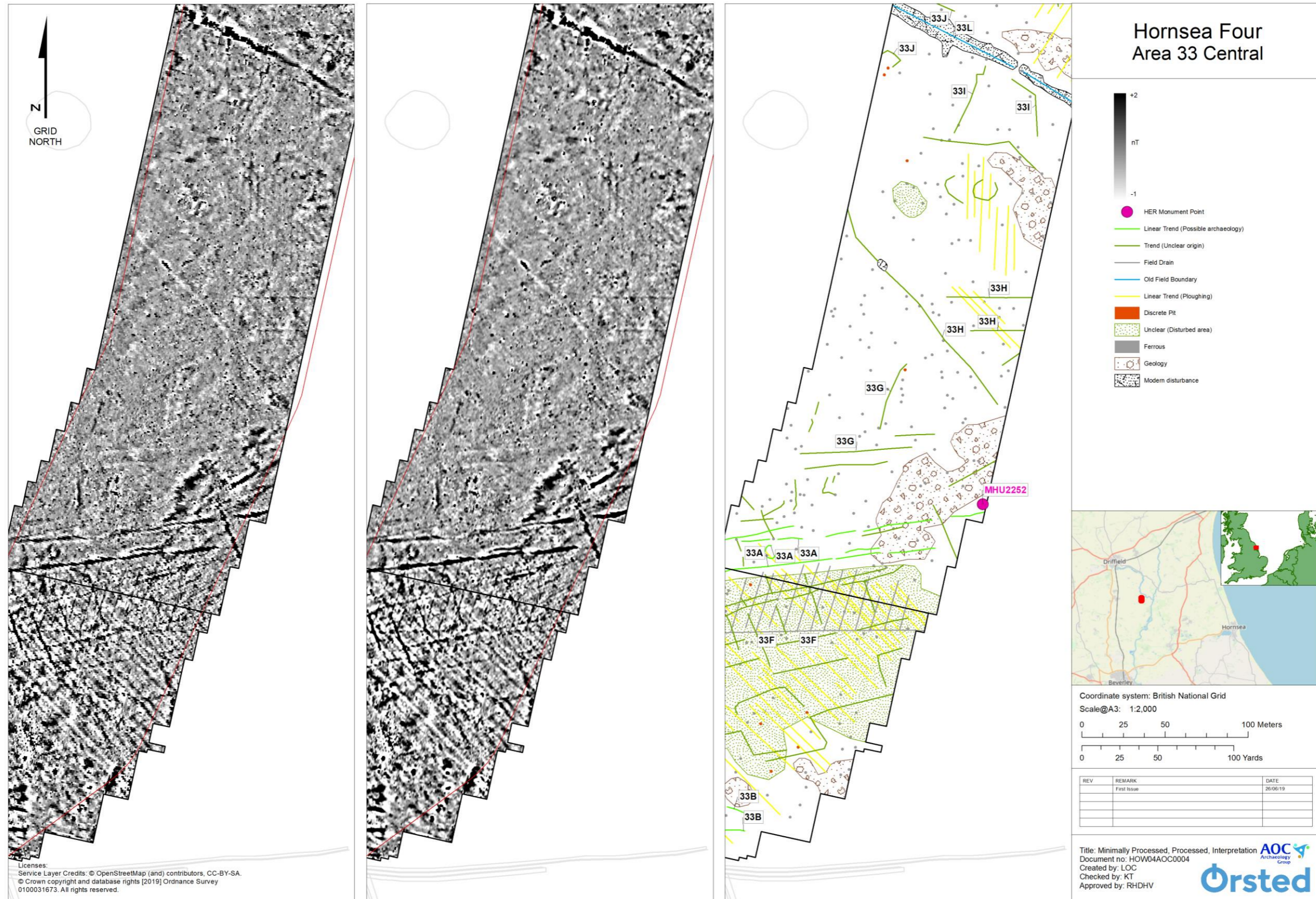


Figure 4: Area 33 Central (not to scale).



Figure 5: Area 33 South (not to scale).

4.3 Area 34

4.3.1.1 The data is presented in [Figure 6](#) and [Figure 7](#).

4.3.2 Archaeology - Definitive

4.3.2.1 Within Area 34, two square enclosures have been identified (34A). These enclosures are known and recorded within the HER as a square ditched enclosure (Monument I.D MHU8109).

4.3.2.2 The larger square enclosure visible in the dataset measures approximately 40 m by 40 m alongside a circular anomaly measuring 15 m in width. The second smaller enclosure measures approximately 25 m by 25 m and adjoins the larger enclosure to the east.

4.3.3 Possible Archaeology

4.3.3.1 Possible archaeology has been identified throughout Area 34 which is likely to relate to the square enclosures above, though the remains have not been identified on the HER record.

4.3.3.2 Two parallel trends have been identified to the north and east of the square enclosures which are likely to be directly related (34B). The trends run north-west to south-east and are situated 10 m apart. They are likely to be the same features seen in Area 33 to the east (trends 33B). These trends could potentially represent a trackway and could relate to access into the square enclosures.

4.3.3.3 To the south of the square enclosures, but within close proximity, a number of long linear, rectilinear and curvilinear trends have been identified (34C). These are also likely to be directly related to the square enclosure and be archaeological in origin. The trends could represent further enclosures and trackways.

4.3.3.4 Several curvilinear and linear trends have been identified in the centre-west of the dataset which could be archaeological in origin (34D). The trends are not as well defined as those previously described.

4.3.3.5 In the west of Area 34, a possible archaeological large sub-circular enclosure has been identified (34E). Geological variations are visible in the vicinity of this anomaly therefore interpretation is tentative.

4.3.4 Uncertain Origins

4.3.4.1 Unclear linear and curvilinear trends have been identified in the Area (34F and 34G). These trends are less well defined than other trends in the area, therefore could potentially relate to geological or agricultural origins rather than archaeological origins. However, trend 34F is similar in appearance to trends of a possible archaeological nature located close by.

4.3.4.2 A strong trend is recorded in the west of Area 34 (34H). Although the trend has the potential to relate to archaeological remains, part of the anomaly is shadowed by a negative halo which is suggestive of more modern origins, such as a modern service.

4.3.4.3 In the far west of Area 34, a number of strong sub-circular anomalies have been identified which have unclear origins (34I).

4.3.5 Agricultural

4.3.5.1 A former field boundary is noted running north-west to south-east through the north of the dataset (34J). This boundary appears on first edition ordnance survey mapping and has since been removed and is now only visible in the data as an area of magnetic enhancement.

4.3.5.2 Conventional ploughing trends are visible across the dataset, particularly in the west.

4.3.6 Geological

4.3.6.1 A number of geological variations relating to former river channels are visible in the west of the area.

4.3.7 Magnetic Disturbance

4.3.7.1 Areas of magnetic disturbance have been recorded around the periphery of the survey area and along upstanding field boundaries.

4.3.7.2 Large quantities of ferrous are visible across the dataset.

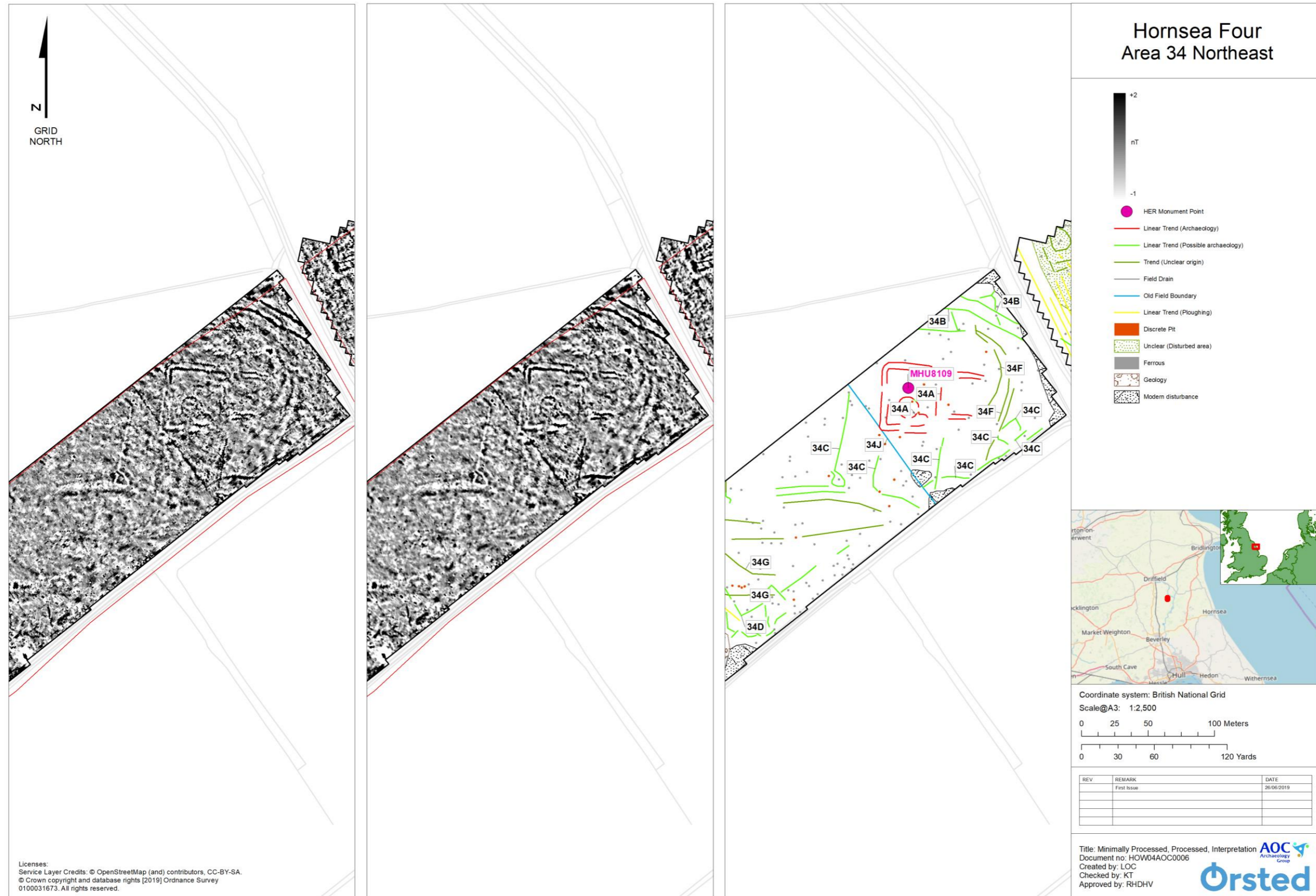


Figure 6: Area 34 Northeast (not to scale).



Figure 7: Area 34 Southwest (not to scale).

4.4 Area 35

4.4.1.1 The data is presented in [Figure 8](#) and [Figure 9](#).

4.4.2 Archaeology - Definitive

4.4.2.1 No responses are present within the data which indicate the presence of archaeological remains.

4.4.3 Possible Archaeology

4.4.3.1 No responses are present within the data which indicate the presence of possible archaeological remains.

4.4.4 Uncertain Origins

4.4.4.1 Unclear linear and curvilinear trends have been identified in the southern part of Area 35. These trends are potentially archaeological in origin but are not well defined. If they are archaeological, it is likely that the remains have been heavily truncated by ploughing. The anomalies could alternatively reflect geological variations across the area. The trends in the south and east of the area could relate to a HER rectangular enclosure found to the east (MHU 19368).

4.4.4.2 In the far south of the dataset, rectilinear and linear trends have the appearance of enclosures (35A and 35B). To the south of these, circular anomalies identified could relate to ring ditches or barrows (35C). A potentially discrete large pit-like anomaly could also be related and could be archaeological in origin (34D).

4.4.4.3 In the north of Area 35, a number of tentative negative and weak positive linear trends have been identified which have unclear origins (35E and 35F). Across the whole of Area 35, discrete pit-like anomalies have been recorded which could be archaeological or natural in origin.

4.4.5 Agricultural

4.4.5.1 Two former field boundaries are noted running through the dataset in the north (35G) and in the south (35H). These boundaries appear on first edition ordnance survey mapping and have since been removed and are now only visible in the data as a magnetic enhancement.

4.4.5.2 Ridge and furrow ploughing remains have been recorded in the southern part of the dataset, as well as more recent conventional ploughing trends.

4.4.6 Geological

4.4.6.1 A large geological variation is visible in the north of the dataset and is likely to relate to a former river channel in the area.

4.4.7 Magnetic Disturbance

4.4.7.1 An area of modern magnetic disturbance was recorded in the centre north of the dataset. A moderate level of ferrous can be seen throughout the dataset.

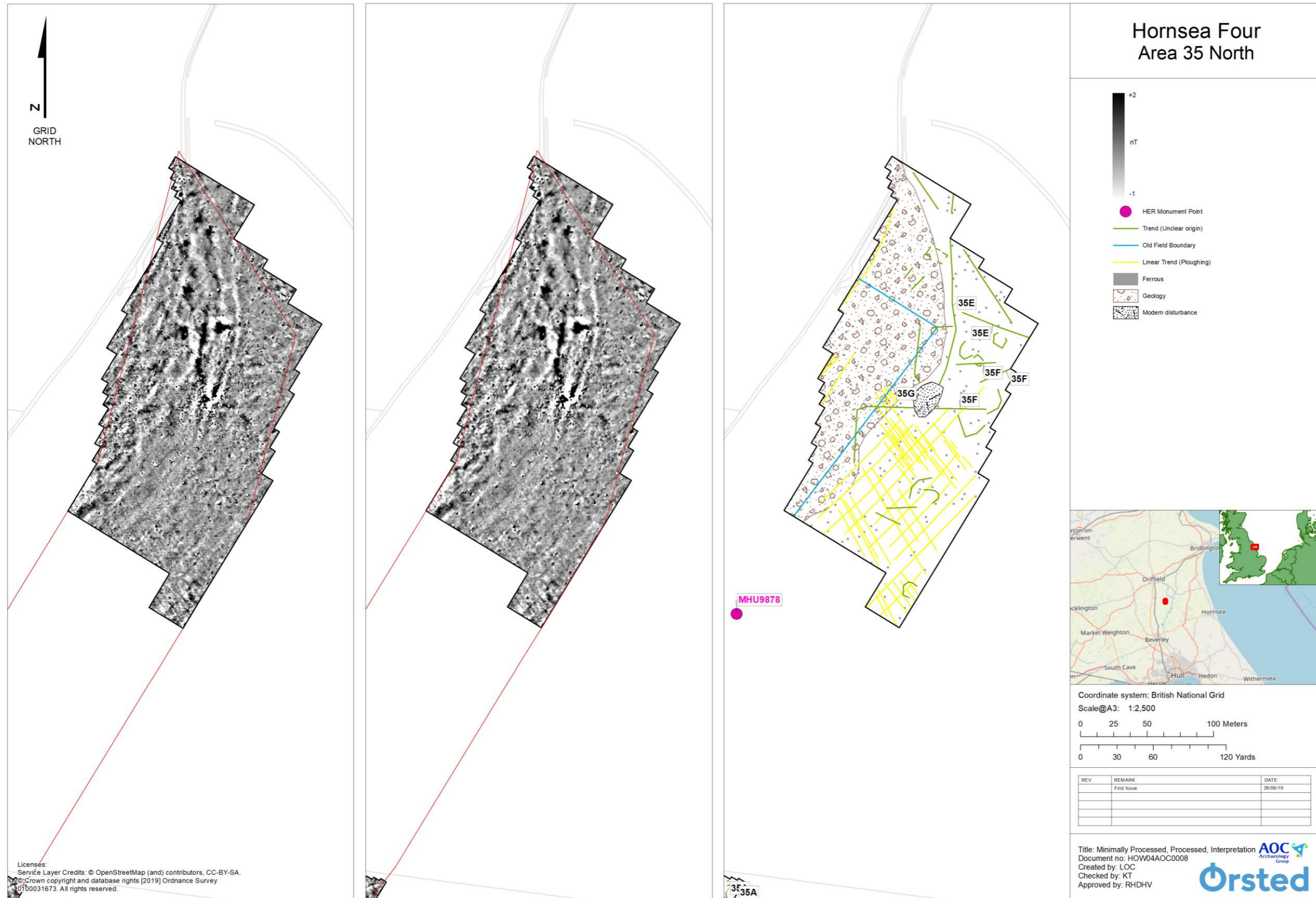


Figure 8: Area 35 North (not to scale).

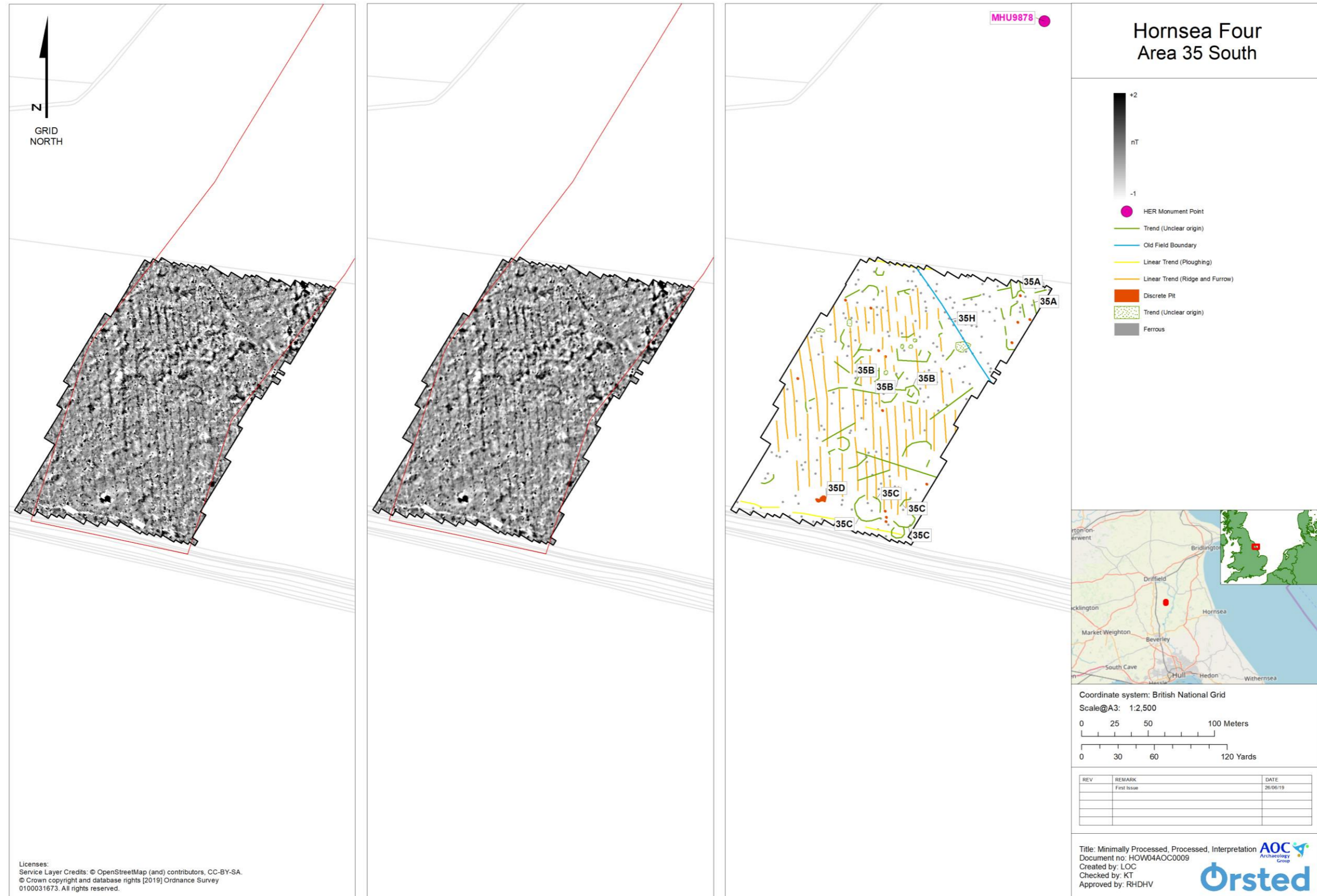


Figure 9: Area 35 South (not to scale).

4.5 Area 45

4.5.1.1 The data is presented in [Figure 10](#) and [Figure 11](#).

4.5.2 Archaeology - Definitive

4.5.2.1 No responses indicating the presence of definitive archaeological remains have been identified in this area.

4.5.3 Possible Archaeology

4.5.3.1 No responses are present within the data which indicate the presence of possible archaeological remains.

4.5.4 Uncertain Origins

4.5.4.1 Three areas of enhanced magnetism of an unclear origin have been recorded across the dataset (45A – 45C). The northernmost area is particularly magnetically noisy and is potentially related to an area where a former building stood. The areas visible in the centre and south of the dataset could potentially be archaeological but are most likely geological.

4.5.4.2 A number of linear and curvilinear trends have been identified across the dataset. These trends are less well defined than other trends in the area and have unclear origins. A group of unclear rectilinear and curvilinear trends are visible in the centre of the dataset for Area 45 (45D). They are indicative of enclosures or archaeological activity.

4.5.4.3 In the south of the area, a number of tentative curvilinear and rectilinear anomalies have been identified (45E and 45F). These potentially could be archaeological but are quite weak and tentative in appearance and they could instead relate to agricultural variations.

4.5.5 Agricultural

4.5.5.1 Three former field boundaries are noted running through the northeast of the dataset, with a further former boundary visible in the south (45G – 45I). These boundaries appear on first edition ordnance survey mapping and have since been removed and are now only visible in the data as a magnetic enhancement. Of particular interest is the curving boundary visible in the north which appears to follow a former Authority/Parish boundary (45G). It is possible the boundary followed a former river channel that split the area. Conventional ploughing trends can be seen throughout the dataset.

4.5.6 Geological

4.5.6.1 A number of geological variations relating to former river channels and geological variations are visible across the dataset.

4.5.7 Magnetic Disturbance

4.5.7.1 Areas of magnetic disturbance are visible around the periphery of the dataset and along upstanding field boundaries. A modern trackway was also recorded in the central part of Area 45. A small amount of ferrous is also visible throughout the dataset.

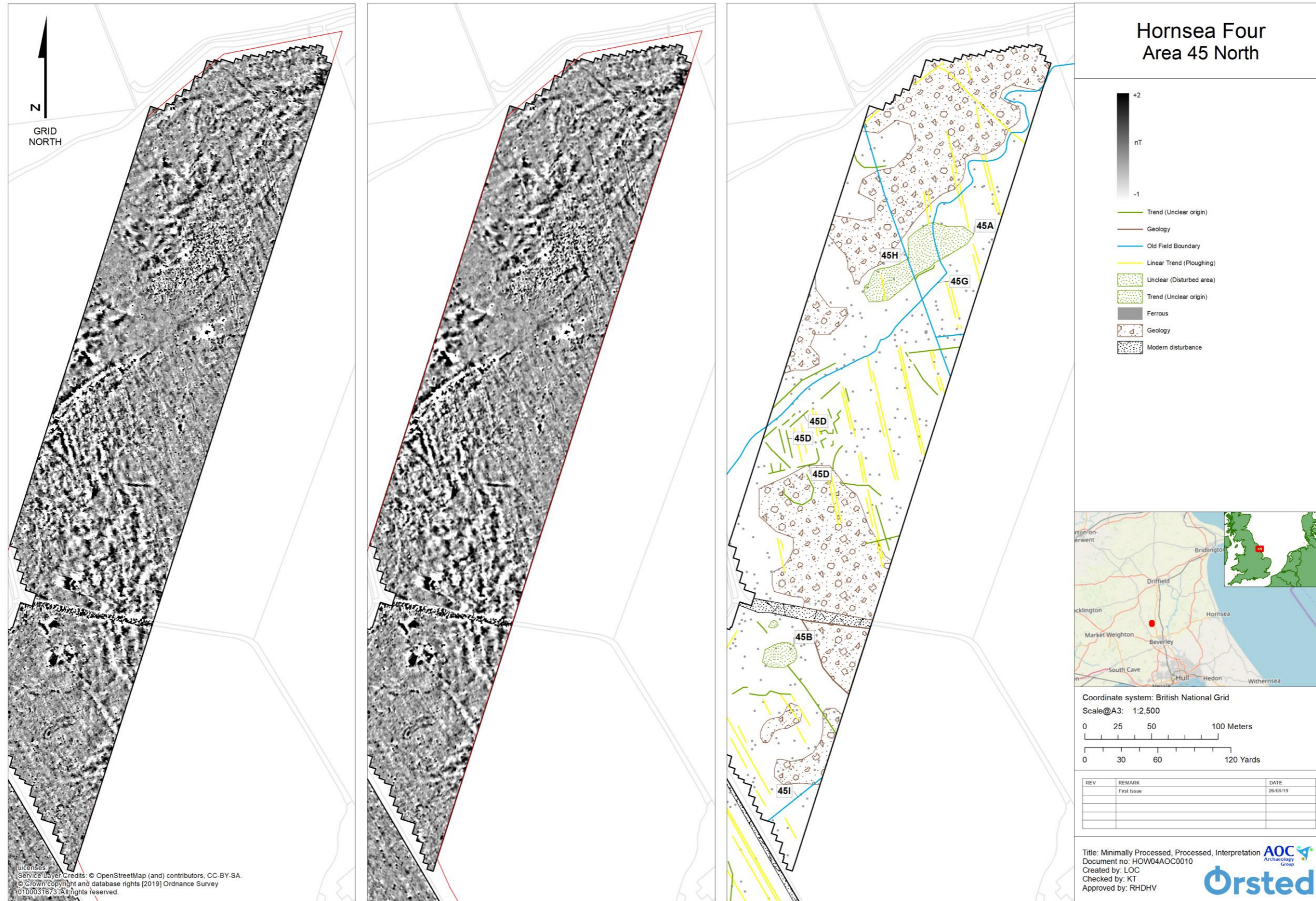


Figure 10: Area 45 North (not to scale).

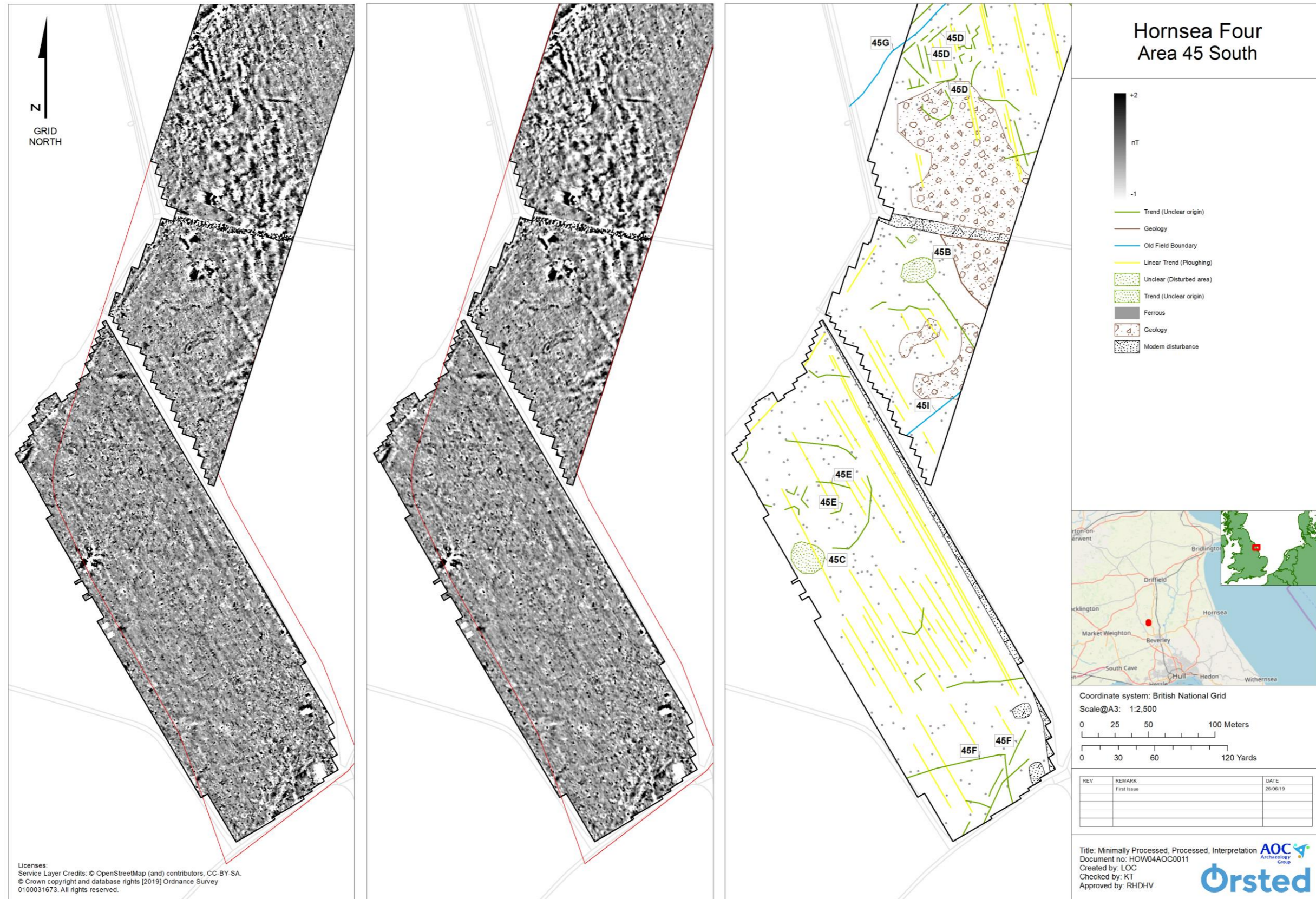


Figure 11: Area 45 South (not to scale).

4.6 Area 13

4.6.1.1 The data is presented in [Figure 12](#).

4.6.2 Archaeology - Definitive

4.6.2.1 Raventhorpe Deserted Medieval Village (DMV) (non-designated Monument I.D MHU3350) is recorded as being located within Area 13 and the remains have been identified in the dataset (13A).

4.6.2.2 Several linear trends identified in the dataset correlate with identified features from aerial photographic records. The anomalies identified continue directly on from features mapped in the HER and display a continuation of a field system and smaller enclosures and features.

4.6.3 Possible Archaeology

4.6.3.1 Possible archaeological trends have been identified throughout Area 13, which likely relate to Raventhorpe DMV though they are not described within the record itself. Trends identified in the south of the dataset, close to the recorded definitive archaeology, include a circular anomaly and several pit-like anomalies (13B).

4.6.3.2 Several rectilinear trends have been identified adjacent to these trends (13C). The trends are likely archaeological in origin and are related to the DMV.

4.6.3.3 In the north-east of Area 13, a possible archaeological circular ring ditch feature has been identified which does not appear to be related to the DMV, and potentially could be earlier in age (13D). A larger sub-circular anomaly has been recorded in the centre of the dataset which could also be archaeological in origin and not related to the DMV (13E).

4.6.4 Uncertain Origins

4.6.4.1 Unclear linear and curvilinear trends have been identified in the area (13F and 13G). These trends are less well defined than other potential archaeological trends in the area and could be natural or geological in origin, though an archaeological origin should not be ruled out.

4.6.5 Agricultural

4.6.5.1 A former field boundary is noted running roughly north-south through the survey area (13H). This boundary appears on first edition ordnance survey mapping and has since been removed and is now only visible in the data as a magnetic enhancement.

4.6.5.2 Ridge and furrow ploughing trends have been recorded across the entire dataset as well as more recent conventional ploughing trends. The ridge and furrow ploughing trends are likely to relate directly to the DMV and are a typical example of landscape management of that period.

4.6.6 Magnetic Disturbance

4.6.6.1 Areas of magnetic disturbance were recorded in and around the periphery of the survey area and along upstanding field boundaries. A moderate amount of ferrous is visible throughout the dataset.

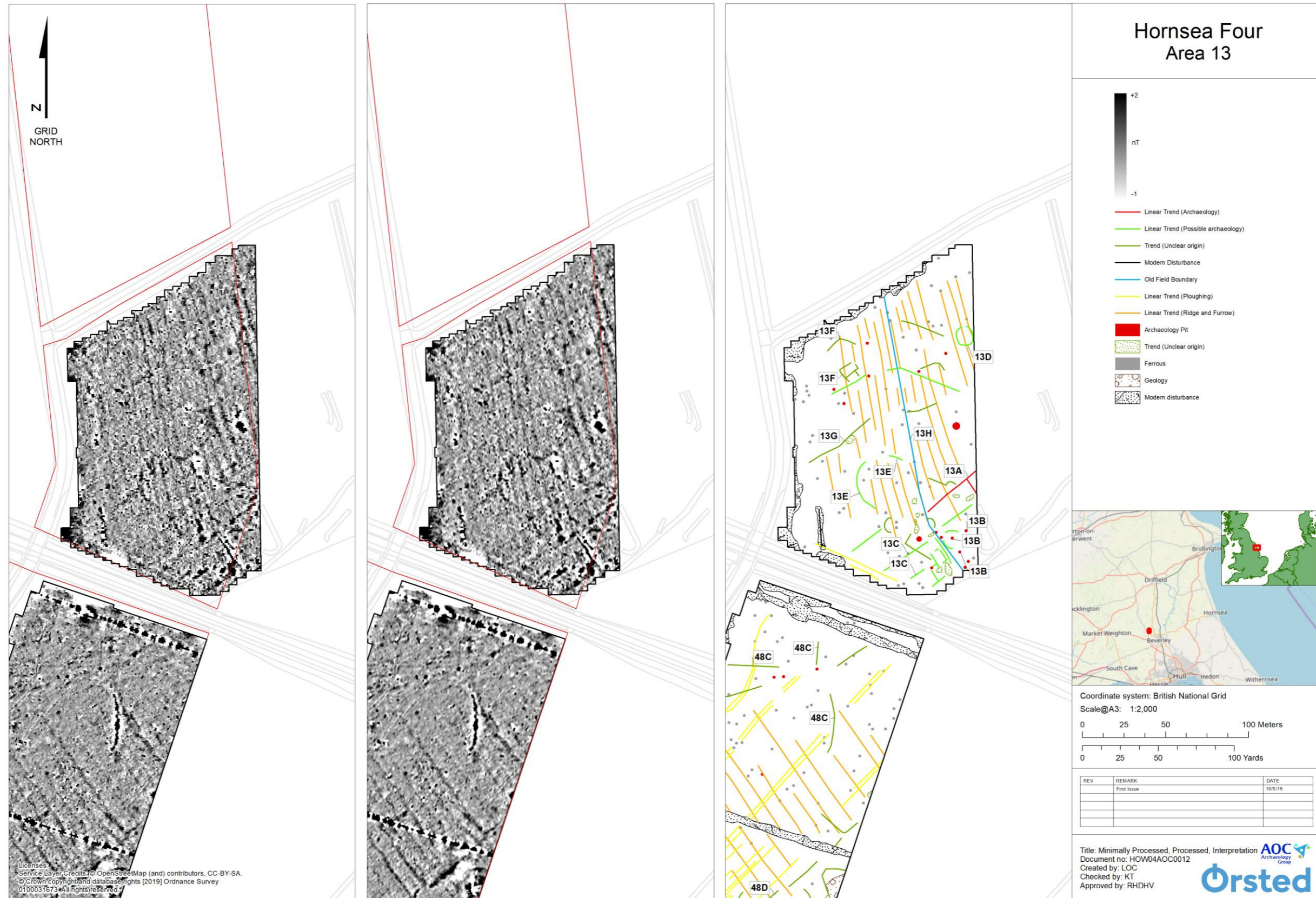


Figure 12: Area 13 (not to scale).

4.7 Area 48

4.7.1.1 The data is presented in [Figure 13](#).

4.7.2 Archaeology - Definitive

4.7.2.1 No responses indicating the presence of definitive archaeological remains have been identified in this area.

4.7.3 Possible Archaeology

4.7.3.1 Possible archaeology has been identified in the southern part of the dataset for Area 48 and could possibly relate to a field system recorded in the HER to the west (Monument ID MHU3346).

4.7.3.2 The trends consist of small pit-like anomalies which run along a linear trend, spaced approximately 1 m apart (48A). These anomalies are suggestive of a prehistoric pit alignment and have the potential to be quite significant in terms of their heritage importance.

4.7.3.3 A number of rectilinear negative trends have also been identified in the same area which appear to form small enclosures around internal pit-like anomalies (48B). These potentially could relate to former buildings, enclosures or even small square barrow remains.

4.7.3.4 Pit-like anomalies have been located throughout the dataset which potentially could be archaeological.

4.7.4 Uncertain Origins

4.7.4.1 Unclear linear and curvilinear trends have been identified across the dataset. These trends are less well defined than other potential archaeological trends in the area and potentially could relate to geological or agricultural origins rather than archaeology.

4.7.4.2 A strong trend is recorded in the northern part of Area 48, which although potentially archaeological, is significantly strong in magnetic appearance (very dark grey/black), partly shadowed by a negative (white) halo and fragmented in appearance (48C). It is most likely modern in origin and appears to be associated with other unclear linear trends which converge in the area.

4.7.4.3 Similarly, in the central part of the dataset, a further set of linear trends cross the area and a particularly strong trend with some associated disturbance may also be suggestive of archaeological origins (48D).

4.7.4.4 In the far south of Area 48, a large negative magnetic curvilinear anomaly is visible (48E). The trend appears to form a potential enclosure, which could be archaeological. However, the negative nature of the anomaly is unusual. Although the remains are potentially archaeological, the curvilinear form is also suggestive of a geological origin and could possibly be related to a former stream or river channel.

4.7.5 Agricultural

- 4.7.5.1 Agricultural trends relating to former ridge and furrow ploughing regimes have been recorded across Area 48. These run north-west to south-east through the southern half of the dataset. They are formed by a number of parallel trends with spacings averaging 8.5 m apart.
- 4.7.5.2 Conventional ploughing trends have also been identified, running north-east to south-west across the centre of the dataset.
- 4.7.5.3 Several pairs of agricultural tractor ruts have also been identified running across the dataset from north-east to south-west, which suggests the background magnetism is quiet.

4.7.6 Geological

- 4.7.6.1 A number of geological variations relating to former river channels have been identified in the central part of the dataset. These appear to run in a north-east to south-west direction and possibly show the location of a former river channel.

4.7.7 Magnetic Disturbance

- 4.7.7.1 Areas of magnetic disturbance were recorded in and around the periphery of the survey and along upstanding field boundaries.
- 4.7.7.2 Two linear trends relating to possible modern services were also recorded running north-west to south-east across the centre and north of Area 48.
- 4.7.7.3 Small ferrous objects are also visible throughout the dataset.

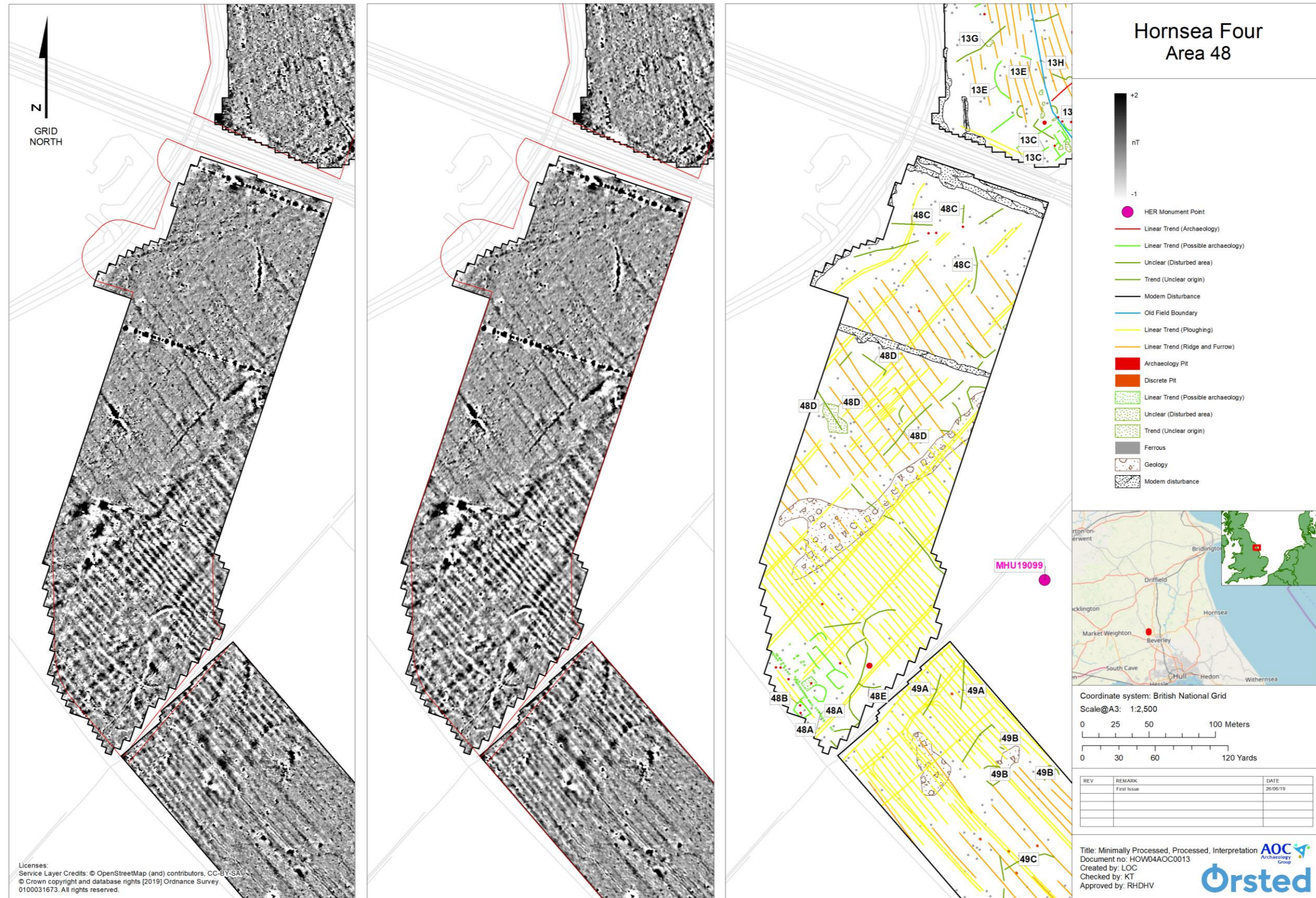


Figure 13: Area 48 (not to scale).

4.8 Area 49

4.8.1.1 The data is presented in [Figure 14](#) and [Figure 15](#).

4.8.2 Archaeology - Definitive

4.8.2.1 No responses indicating the presence of definitive archaeological remains have been identified in this area.

4.8.3 Possible Archaeology

4.8.3.1 No responses are present within the data which indicate the presence of possible archaeological remains.

4.8.4 Uncertain Origins

4.8.4.1 Unclear linear and curvilinear trends have been identified in the area. These trends don't represent any obvious archaeological monuments or remains and therefore their origins are uncertain.

4.8.4.2 Two parallel trends have been identified running north to south in the north of Area 49 and appear to form a potential trackway (49A). However, the trends are magnetically weak and have been truncated by agricultural ploughing.

4.8.4.3 Three circular anomalies have been identified to the south of 49A, which could be archaeological in origin and relate to ring ditches (49B). However, the strength of these responses is very weak and tentative, and the trends may not have archaeological origins.

4.8.4.4 A very weak curvilinear and rectilinear trend located in the centre-north of Area 49 could reflect a potential archaeological enclosure (49C).

4.8.4.5 A group of short, well-defined linear trends to the east of this potential enclosure could be archaeological given their magnetic strength (49D). The anomalies do not appear as any recognisable archaeological monument or remains, therefore may reflect more recent activity in the area.

4.8.4.6 An area of enhanced magnetism is located in the far south of Area 49 (49E). The trend has the potential to be archaeological but is magnetically weak and tentative in nature.

4.8.5 Agricultural

4.8.5.1 A former field boundary has been identified, running north-east to south-west through the centre of the dataset (49F). This boundary appears on first edition ordnance survey mapping and has since been removed and is now only visible in the data as a slight magnetic enhancement.

4.8.5.2 A former ridge and furrow ploughing regime is visible running north-west to south-east throughout the survey area.

4.8.5.3 Conventional ploughing trends have also been identified running along the same orientation as the ridge and furrow remains. As with Area 48, agricultural tractor ruts have also been identified running through the area which suggests the background magnetism is quiet.

4.8.6 Geology

4.8.6.1 Several geological variations relating to former river channels are visible in the north-west of the dataset. These appear to run in a north-east to south-west direction and possibly show the direction of the former river channel and relate to those seen in the dataset for Area 48.

4.8.7 Magnetic Disturbance

4.8.7.1 An area of magnetic disturbance was recorded in the far south-west of the dataset, close to the field boundary and corner of the field.

4.8.7.2 Moderate levels of ferrous are visible throughout the dataset.



Figure 14: Area 49 Northwest (not to scale).

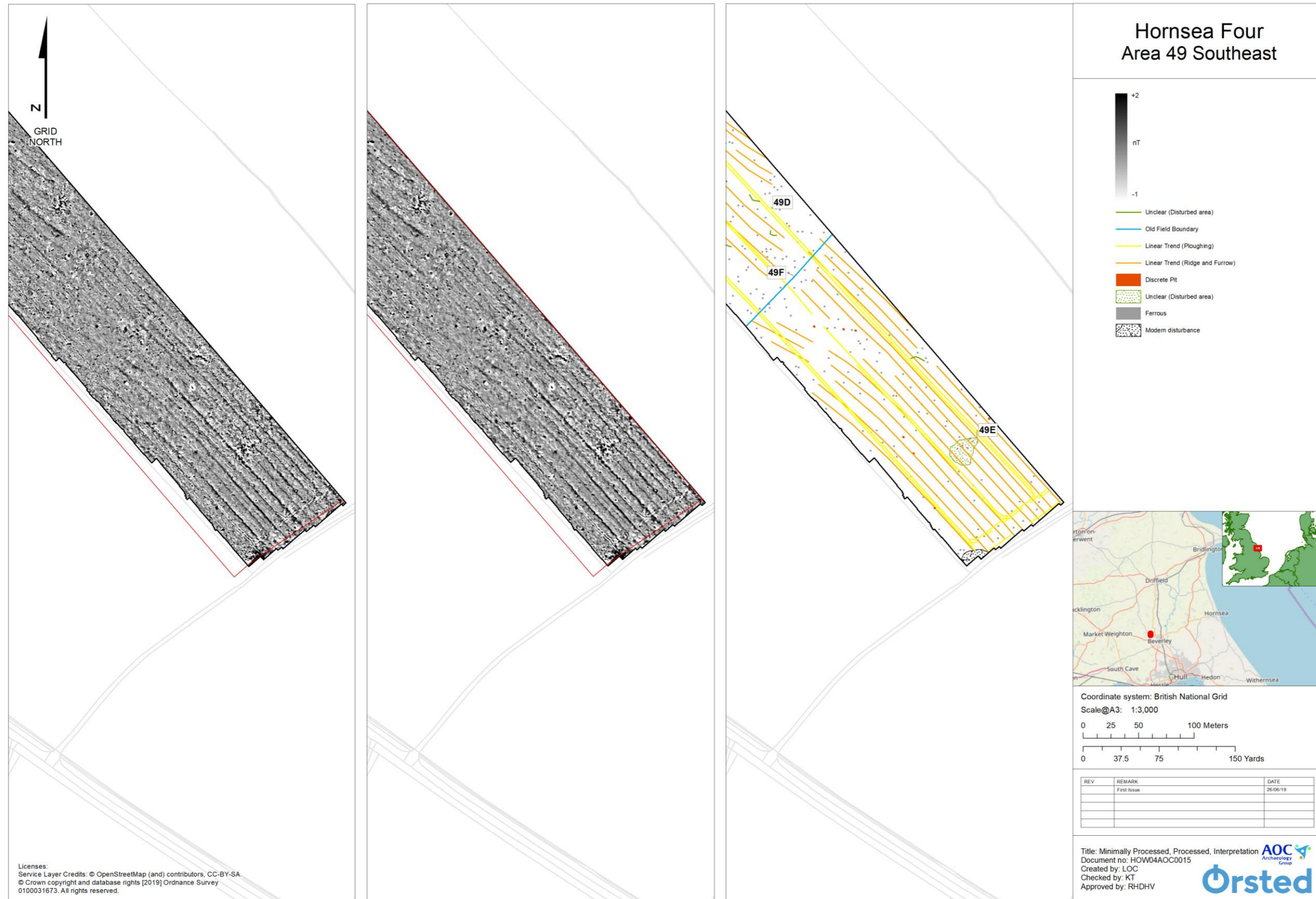


Figure 15: Area 49 Southeast (not to scale)

4.9 Area 51

4.9.1.1 The data is presented in [Figure 16](#).

4.9.2 Archaeology - Definitive

4.9.2.1 No anomalies indicating the presence of definitive archaeological remains have been identified in this area.

4.9.3 Possible Archaeology

4.9.3.1 No responses are present within the data which indicate the presence of possible archaeological remains.

4.9.4 Uncertain Origins

4.9.4.1 Linear and curvilinear trends have been identified in the dataset which have unclear origins. The trends are notable in the dataset but don't represent any obvious potential archaeological remains.

4.9.4.2 A curvilinear anomaly is visible with a potential small enclosure attached (51A). Although it potentially looks archaeological, such as a building or enclosure, the scale and lack of associated anomalies suggests it could relate to more recent agricultural activity.

4.9.4.3 A group of trends alongside small areas of enhanced magnetism are visible in the western half of the dataset (51B). The trends are indicative of archaeological remains, however they are very weak in strength and their interpretation is tentative.

4.9.4.4 In the far north-east of Area 51, a small area of unclear enhanced magnetism is visible which potentially could be archaeological (51C). The circular appearance of the anomaly is indicative of archaeological remains such as a barrow, however it is magnetically very weak and tentative. Further unclear trends can be seen slightly north of the centre of the dataset (51D). These consist of two linear trends running various orientations and a potential pit-like anomaly.

4.9.4.5 A number of further pit-like anomalies can be seen across the entire dataset which could be either agricultural or natural in origin.

4.9.5 Agricultural

4.9.5.1 A former ridge and furrow ploughing regime has been recorded in the dataset, running north-south in the north and south of the dataset and east-west through the centre of the dataset. Conventional ploughing trends have also been identified running along a similar north to south orientation in the east of the dataset.

4.9.6 Magnetic Disturbance

4.9.6.1 Areas of magnetic disturbance were recorded in and around the periphery of the survey area, relating to modern boundary fencing. Moderate quantities of ferrous are visible across the entire dataset.

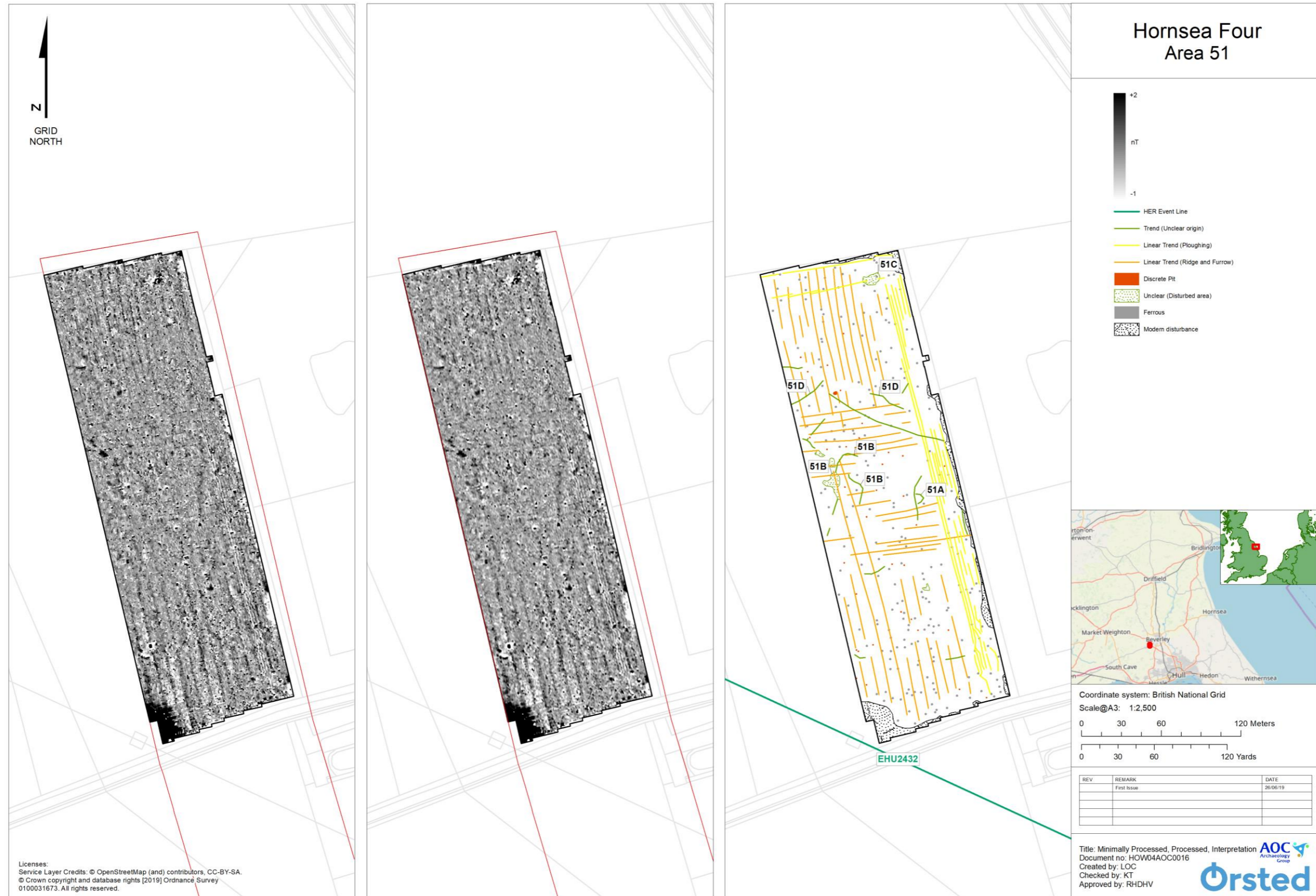


Figure 16: Area 51 (not to scale)

5 Discussion and Conclusion

5.1 Assessment and Interpretation of the Results

- 5.1.1.1 The survey successfully identified anomalies that are related to the presence of definitive archaeology in Area 34 and Area 13.
- 5.1.1.2 In Area 34, a square enclosure was identified in the dataset which correlates with the location of a HER record of a square ditched enclosure (HER ref. MHU8109). Furthermore, the survey has added to the existing detail and knowledge of this monument by geospatially locating the exact extent of the remains and illustrating a wider previously unknown archaeological landscape which they fall within.
- 5.1.1.3 In Area 13, anomalies identified in the dataset correlate with HER linework indicating the location of the remains of the Raventhorpe DMV (HER ref. MHU3350). Further evidence supplementing the HER records for the former village have likely been identified in the dataset.
- 5.1.1.4 The geophysical survey has also located remains of a potential archaeological origin in four of the eight surveyed areas.
- 5.1.1.5 These include Area 33, where two linear trackway features were identified along with a ring ditch feature, which could possibly represent a small barrow. In Area 34, where the HER record relating to an archaeological square enclosure is located, a number of other linear and rectilinear features likely associated to the enclosure were identified as well as a trackway continuing through from Area 33.
- 5.1.1.6 Further evidence relating to possible archaeological enclosures were identified in Area 34, however they appear to be un-associated to the square ditched enclosure.
- 5.1.1.7 In Area 13, where a former DMV was identified, other remains have likely been detected, in particular a ring ditch feature.
- 5.1.1.8 The dataset for Area 48 also identified a number of interesting potential archaeological anomalies, including a potential pit alignment and a number of small rectilinear shapes with associated pit-like anomalies.
- 5.1.1.9 Anomalies of an unclear origin have been located in all the areas surveyed. It is likely that some of these anomalies may be archaeological, but only more intrusive works will establish the potential of these remains and it is likely that a number will relate to agricultural, geological or natural variations. The anomalies should not be disregarded, particularly those observed in areas containing possible archaeological remains.
- 5.1.1.10 In Area 35, a number of unclear trends and anomalies were identified in the southern half of the dataset. In this location it is thought that these may be heavily truncated archaeological remains, affected by ploughing, but the remains are too unclear to form a possible interpretation.
- 5.1.1.11 Throughout the scheme, agricultural trends have been identified in the form of old field boundaries, ridge and furrow ploughing, drainage and conventional ploughing trends. Of

note, the boundary running through Area 45 winds quite sporadically across the north-east of the area and is thought to follow a former stream or river channel dividing up the land. The significant number of ploughing trends seen throughout the datasets is indicative of a very rural landscape that has been intensively and historically farmed.

5.1.1.12 Areas of modern disturbance and ferrous spikes have been identified in the majority of survey areas. Many of these anomalies relate to recent activities in these areas in the form of services, modern boundary fencing and gates, infrastructure and manuring.

5.1.1.13 The clarity of the geophysical results within this report is an indication that if archaeological magnetically enhanced remains were to exist in the adjacent survey areas, that this method would successfully identify the remains. It has not been deemed necessary at this point to recommend further study through alternative geophysical survey methods.

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Appendix A Characterisation of Identified Anomalies

Area: 33

Area Specific Anomaly Code: 33

| Anomaly | Type of Archaeology |
|---------|-------------------------------------|
| 33A | Possible Archaeology – Linear trend |
| 33B | Possible Archaeology – Linear trend |
| 33C | Possible Archaeology – Linear trend |
| 33D | Unclear Origin – Area disturbance |
| 33E | Unclear Origin – Area disturbance |
| 33F | Unclear Origin – linear trend |
| 33G | Unclear Origin – linear trend |
| 33H | Unclear Origin – linear trend |
| 33i | Unclear Origin – linear trend |
| 33J | Unclear Origin – linear trend |
| 33K | Agricultural – Old field boundary |

Area: 34

Area Specific Anomaly Code: 34

| Anomaly | Type of Archaeology |
|---------|---------------------------------------|
| 34A | Definitive Archaeology – Linear trend |
| 34B | Possible Archaeology – Linear trend |
| 34C | Possible Archaeology – Linear trend |
| 34D | Possible Archaeology – Linear trend |
| 34E | Possible Archaeology – Linear trend |
| 34F | Unclear Origin – linear trend |
| 34G | Unclear Origin – linear trend |
| 34H | Unclear Origin – linear trend |
| 34I | Unclear Origin – linear trend |
| 34J | Agricultural – Old field boundary |

Area: 35

Area Specific Anomaly Code: 35

| Anomaly | Type of Archaeology |
|---------|-----------------------------------|
| 35A | Unclear Origin – linear trend |
| 35B | Unclear Origin – linear trend |
| 35C | Unclear Origin – linear trend |
| 35D | Unclear Origin – linear trend |
| 35E | Unclear Origin – linear trend |
| 35F | Unclear Origin – linear trend |
| 35G | Agricultural – Old field boundary |
| 35H | Agricultural – Old field boundary |

Area: 45

Area Specific Anomaly Code: 45

| Anomaly | Type of Archaeology |
|---------|--------------------------------------|
| 45A | Unclear Origin – Area of disturbance |
| 45B | Unclear Origin – Area of disturbance |
| 45C | Unclear Origin – Area of disturbance |
| 45D | Unclear Origin – linear trend |
| 45E | Unclear Origin – linear trend |
| 45F | Unclear Origin – linear trend |
| 45G | Agricultural – Old field boundary |
| 45H | Agricultural – Old field boundary |
| 45i | Agricultural – Old field boundary |

Area: 13

Area Specific Anomaly Code: 13

| Anomaly | Type of Archaeology |
|---------|-------------------------------------|
| 13A | Definitive Archaeology |
| 13B | Possible Archaeology – Linear trend |
| 13C | Possible Archaeology – Linear trend |
| 13D | Possible Archaeology – Linear trend |
| 13E | Possible Archaeology – Linear trend |
| 13F | Unclear Origin – linear trend |
| 13G | Unclear Origin – linear trend |
| 13H | Agricultural – Old field boundary |

Area: 48

Area Specific Anomaly Code: 48

| Anomaly | Type of Archaeology |
|---------|-------------------------------------|
| 48A | Possible Archaeology – Linear trend |
| 48B | Possible Archaeology – Linear trend |
| 48C | Unclear Archaeology – Linear trend |
| 48D | Unclear Archaeology – Linear trend |
| 48E | Unclear Archaeology – Linear trend |

Area: 49

Area Specific Anomaly Code: 49

| Anomaly | Type of Archaeology |
|---------|------------------------------------|
| 49A | Unclear Archaeology – Linear trend |
| 49B | Unclear Archaeology – Linear trend |
| 49C | Unclear Archaeology – Linear trend |
| 49D | Unclear Archaeology – Linear trend |
| 49E | Unclear Archaeology – Linear trend |
| 49F | Agricultural – Linear trend |

Area: 51

Area Specific Anomaly Code: 51

| Anomaly | Type of Archaeology |
|---------|------------------------------------|
| 51A | Unclear Archaeology – Linear trend |
| 51B | Unclear Archaeology – Linear trend |
| 51C | Unclear Archaeology – Linear trend |
| 51D | Unclear Archaeology – Linear trend |

Appendix B Processing steps – Geoplot

Table 1: Description of Geoplot processes

| Process Type | Effect |
|--------------------|---|
| Clip | Limits data values to within a specified range |
| De-spike | Removes exceptionally high readings in the data that can obscure the visibility of archaeological features. In gradiometer survey, these can be caused by highly magnetic items such as buried ferrous objects. |
| De-stagger | Corrects a misalignment of data when the survey is conducted in a zig-zag traverse pattern. |
| Interpolate | Increases the resolution of a survey by interpolating new values between surveyed data points, creating a smoother overall effect. |
| Low Pass filter | Uses a Gaussian filter to remove high-frequency, small scale detail, typically for smoothing the data. |
| Zero Mean Traverse | Resets the mean value of each traverse to zero, in order to address the effect of striping in the data and counteract edge effects. |

Table 2: Details of Geoplot processing

| Process Used | Extent |
|--------------------|--|
| Zero Mean Traverse | All LMS =on, threshold: none / -5 to 5 |
| De-spike | X=1 Y=1 Thr = 3 Repl = Mean |
| Clip | Min =-5 Max = 5 |
| De-stagger | Line Pattern 34-78 Dual-DS |
| Low Pass filter | X=1 Y=1 Wt=G |
| Interpolate | Y, Expand – Expand |
| Raw Palette Scale | Grey08 Min= -1nT Max= 2nT |
| Palette Scale | Grey08 Min= -1nT Max= 2nT |