

ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of  
Satnam Planning Services Ltd  
for  
Teviot Way Investments Ltd

Little Maltby Farm  
Ingleby Barwick  
Teesside

geophysical survey

report 3042  
December 2012

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## **1. Summary**

### **The project**

- 1.1 This report presents the results of geophysical surveys conducted in advance of proposed development at Little Maltby Farm, Ingleby Barwick, Teesside. The works comprised the geomagnetic survey of four areas of pasture totalling 12.5ha.
- 1.2 The works were commissioned by Satnam Planning Services Ltd for Teviot Way Investments Ltd and conducted by Archaeological Services Durham University.

### **Results**

- 1.3 Probable soil-filled ditches were identified across the north-western part of Area 1, which could reflect a continuation of features of probable Neolithic date identified during previous archaeological works.
- 1.4 Further soil-filled ditches and possible pits and post-holes were identified across Area 1.
- 1.5 Part of a possible circular enclosure was identified in Area 2. Possible soil-filled pits and post-holes were also identified in Area 2.
- 1.6 The probable footings of a small rectangular structure were identified in Area 4, together with probable materials from its demolition.
- 1.7 Former field boundaries were identified in Areas 1 and 2. Traces of former ploughing were identified in Areas 1, 2 and 3.
- 1.8 A service pipe was identified in Area 1 and possible land drains were identified in Area 3.

## 2. Project background

### Location (Figure 1)

- 2.1 The proposed development area (PDA) was located at Little Maltby Farm, Ingleby Barwick, Teesside (NGR centre: NZ 4530 1320). Four surveys totalling 12.5ha were conducted in four land parcels. The site is bounded to the west by the Bassleton Beck and residential housing and to the north and east by open farmland. To the south is the A1044 Low Lane.

### Development proposal

- 2.2 The development proposal is for a secondary school and playing fields in the western part of the site, with housing over the northern and eastern parts

### Objective

- 2.3 The principal aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in relation to the development.

### Methods statement

- 2.4 The surveys have been undertaken in accordance with instructions from the client and in line with national standards and guidance (see para. 5.1 below).

### Dates

- 2.5 Fieldwork was undertaken between 14th and 15th November 2012. This report was prepared for 6th December 2012.

### Personnel

- 2.6 Fieldwork was conducted by Matt Claydon, Ashley Hayes, Natalie Swann (supervisor) and Nathan Thomas. The geophysical data were processed by Natalie Swann. This report was prepared by Natalie Swann, with illustrations by Janine Watson, and edited by Duncan Hale, the Project Manager.

### Archive/OASIS

- 2.7 The site code is **IBL12**, for Ingleby Barwick Little Maltby Farm 2012. The survey archive will be supplied on CD to the client for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **Online AccesS to the Index of archaeological investigationS** project (**OASIS**). The OASIS ID number for this project is **archaeol3-138123**.

## 3. Historical and archaeological background

### Previous archaeological works

- 3.1 An archaeological desk-based assessment has been conducted for the site (Archaeological Services 2012); the results of that assessment are summarised here.
- 3.2 In 1997 an archaeological evaluation was conducted across the proposed development area (Archaeological Services 1997a & 1997b). Twenty-two trial trenches were excavated to inform on the possible nature and extent of any archaeological deposits that may survive on the site. Eleven trenches were

excavated in Area 1 of this survey and two in Area 2. No trenches were excavated in Areas 3 and 4 though geophysical survey was undertaken and two trenches excavated, within the same field as Area 3 but north of the current proposed development area.

- 3.3 A number of features of archaeological origin were recorded in Area 1 during the evaluation. Trench 12 produced a Neolithic or Bronze Age cremation urn. A ditch, gully and a small 'bowl furnace' type oven were recorded in Trench 18, all possibly Neolithic in date. Trench 19 revealed a series of occupation deposits consisting of bands of clay, charcoal, silt and sand which produced several fragments of flint, also possibly Neolithic in date. Four stake holes were identified in Trench 22.
- 3.4 The proposed development area lies within a region of high archaeological potential, particularly relating to the Neolithic and Bronze Age. Excavations at High Leven recorded a group of features dating to the late Neolithic or Early Bronze Age. Excavations at Low Lane produced an assemblage of 50 pieces of flint probably Neolithic in date.
- 3.5 Just over 1km west of the PDA further Neolithic/Bronze Age activity was recorded at Ingleby Barwick. Excavations here recorded a large scatter of worked flints and debitage along with a Bronze Age pot sherd (Adams and Carne 1995).
- 3.6 The presence of activity of early medieval date within the surrounding landscape indicates that there is some potential for a resource of this date to exist within the proposed development area.
- 3.7 Agricultural activity relating to the medieval and post-medieval period may survive over the site. This evidence is likely to be in the form of ridge and furrow cultivation and boundary features.

#### **4. Landuse, topography and geology**

- 4.1 At the time of survey the proposed development area comprised four fields of rough pasture, boggy in places, used for grazing horses. The fields were overgrown and in places the density of thistles and other vegetation prevented data collection, resulting in very small blank areas across each survey area.
- 4.2 The proposed development area is predominantly level with a mean elevation of approximately 30m OD. The western boundary of the site follows the Bassleton Beck.
- 4.3 The underlying solid geology of the area comprises Permian and Triassic strata of the Sherwood Sandstone Group, which are overlain by Devensian glaciolacustrine and glaciofluvial deposits of diamicton till.

## 5. Geophysical survey Standards

- 5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Institute for Archaeologists (IfA) *Standard and Guidance for archaeological geophysical survey* (2011); the IfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Guide to Good Practice: Geophysical Data in Archaeology* (Schmidt & Ernenwein 2011).

### Technique selection

- 5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.
- 5.3 In this instance, based on the desk-based assessment and previous work in the area, it was considered probable that cut features such as ditches and pits might be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.
- 5.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

### Field methods

- 5.5 A 30m grid was established across each survey area and related to known, mapped Ordnance Survey points and the National Grid using a Leica GS15 global navigation satellite system (GNSS) with real-time kinematic (RTK) corrections typically providing 10mm accuracy.
- 5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 3,600 sample measurements per 30m grid unit.
- 5.7 Data were downloaded on site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

### Data processing

5.8 Geoplot v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw (minimally processed) data. The greyscale images and interpretations are presented in Figures 2-5; the trace plots are provided in Figure 6. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.9 The following basic processing functions have been applied to each dataset:

<i>clip</i>	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
<i>zero mean traverse</i>	sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities
<i>destagger</i>	corrects for displacement of geomagnetic anomalies caused by alternate zig-zag traverses
<i>interpolate</i>	increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.25m x 0.25m intervals

### Interpretation: anomaly types

5.10 Colour-coded geophysical interpretation plans are provided. Three types of geomagnetic anomaly have been distinguished in the data:

<i>positive magnetic</i>	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches
<i>negative magnetic</i>	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids
<i>dipolar magnetic</i>	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths

### Interpretation: features

#### General comments

5.11 Colour-coded archaeological interpretation plans are provided.

5.12 Except where stated otherwise in the text below, positive magnetic anomalies are taken to reflect relatively high magnetic susceptibility materials, typically sediments in cut archaeological features (such as ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.

- 5.13 Small, discrete dipolar magnetic anomalies have been detected in all of the survey areas. These are likely to reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments, and in most cases will have little or no archaeological significance. However, given the presence of small hearths and accumulations of occupation debris identified during the evaluation it is possible some of these anomalies may have an archaeological origin. A sample of these is shown on the geophysical interpretation plans, however, they have been omitted from the archaeological interpretation plans and the following discussion.

#### **Area 1**

- 5.14 Several linear positive magnetic anomalies have been detected in the north-west part of this survey area; these anomalies are likely to reflect soil-filled ditches. These ditches could represent the continuation of features of possible Neolithic date recorded during the evaluation of the site. The ditches appear to form a series of small enclosures possibly indicating an enclosed settlement.
- 5.15 Further linear and curvilinear positive magnetic anomalies were detected along the northern edge of the survey area which may also reflect soil-filled ditches. These features are located just north of where a Bronze Age cremation urn was excavated during the evaluation of the site.
- 5.16 Linear positive magnetic anomalies have also been detected across the central and southern parts of this survey area which may reflect further soil-filled ditches associated with the prehistoric occupation of the site.
- 5.17 A number of discrete positive magnetic anomalies have been detected across the survey area which may reflect soil-filled pits or post-holes such as those excavated during the evaluation of the site.
- 5.18 Broad diffuse positive magnetic anomalies have been detected across the survey area which could reflect soil-filled features, however, bands of gravel were noted within the glacial clay during the evaluation of the site indicating that these diffuse anomalies reflect geological variation.
- 5.19 Series of parallel, alternate positive and negative magnetic anomalies have been detected across the survey area, aligned approximately north-west/south-east and north-east/south-west. These anomalies almost certainly reflect former ploughing of this area.
- 5.20 A linear positive magnetic anomaly was detected across the central part of the survey area, aligned approximately north-east/south-west, which corresponds to a former field boundary shown on historic Ordnance Survey maps.
- 5.21 A second former field boundary has been detected as a chain of dipolar magnetic anomalies resulting from the remains of a post and wire fence aligned north-west/south-east in the south-west corner of this area. This boundary is also shown on historic Ordnance Survey maps of the area.
- 5.22 A broad and intense magnetic anomaly crossing the south-eastern corner of this area almost certainly reflects a service pipe.



### **Area 2**

- 5.23 Discrete positive magnetic anomalies have been detected in the south-west corner of this survey area, which may reflect soil-filled features such as large pits or the remains of a continuous ditch that has been disturbed by later activity. Together these anomalies could possibly form part of a circular enclosure.
- 5.24 A number of smaller discrete positive magnetic anomalies were detected across this survey area which could reflect soil-filled pits or post-holes.
- 5.25 A linear positive magnetic anomaly was detected parallel to the northern edge of the survey area, aligned north-east/south-west, which reflects a soil-filled ditch and corresponds to a former field boundary shown on historic Ordnance Survey maps.
- 5.26 Further linear positive magnetic anomalies were detected aligned parallel to the former field boundary; these anomalies are likely to reflect a former plough regime.

### **Area 3**

- 5.27 A series of parallel positive magnetic anomalies were detected along the eastern edge of the survey area aligned approximately north-east/south-west with a central linear positive magnetic anomaly aligned at right angles to them. These anomalies may reflect soil-filled features but their spacing and configuration suggests they are more likely to reflect land-drains.
- 5.28 Weak linear positive magnetic anomalies were detected across this survey area aligned north-west/south-east, which are likely to reflect a recent plough regime.

### **Area 4**

- 5.29 Linear negative magnetic anomalies were detected near the southern edge of this survey area which may reflect the remains of wall footings and appear to form a small rectangular structure measuring approximately 10m by 5m. This could be the remains of a small outbuilding or animal pen.
- 5.30 A concentration of dipolar magnetic anomalies has been detected in the western half of this area which may reflect ground disturbance or a concentration of near-surface ferrous or fired debris. These materials are probably derived from the former adjacent building.

## **6. Conclusions**

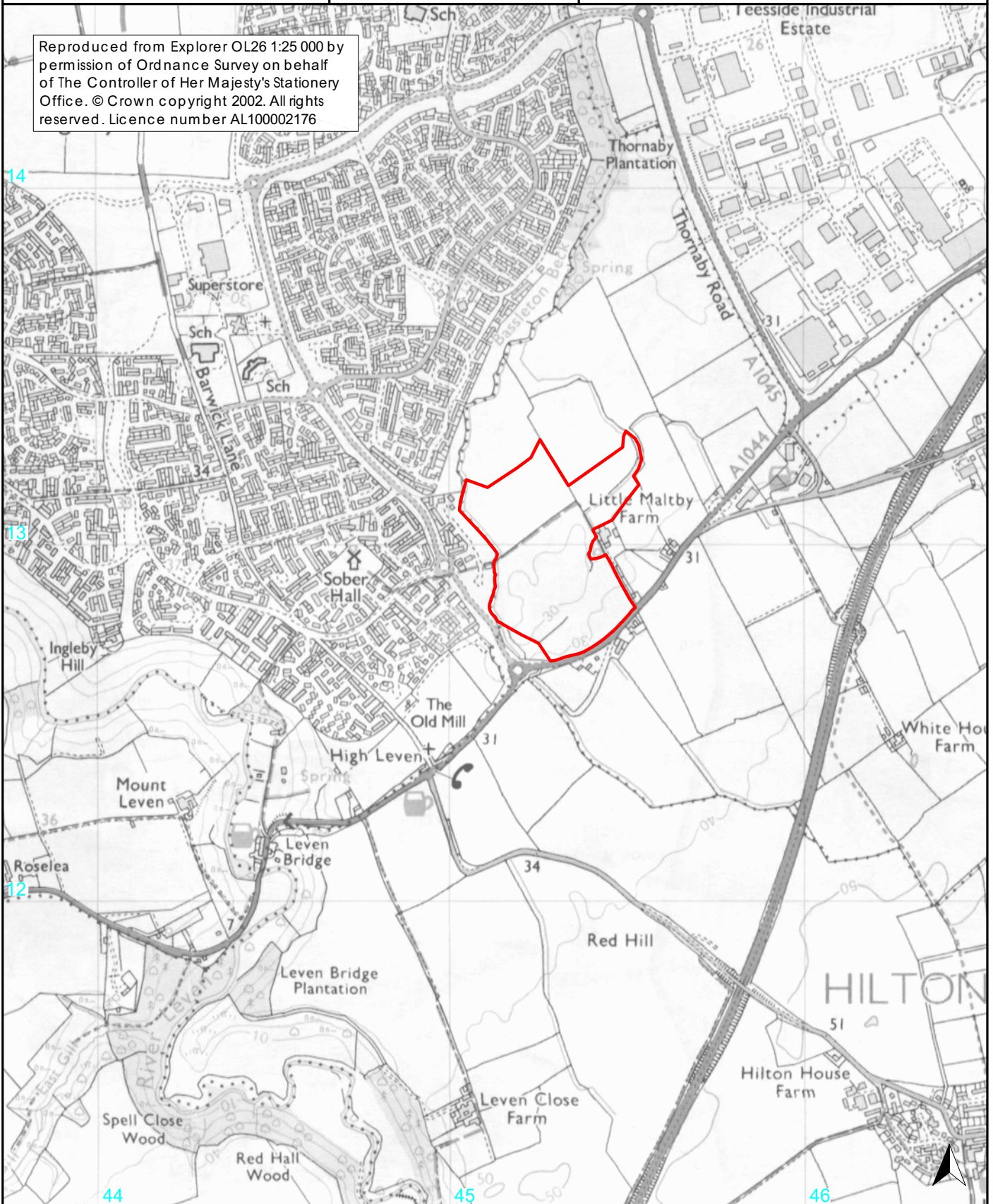
- 6.1 12.5ha of geomagnetic survey was undertaken at Little Maltby Farm, Ingleby Barwick, Teesside, prior to proposed development.
- 6.2 Probable soil-filled ditches were identified across the north-western part of Area 1 which could reflect a continuation of features of probable Neolithic date identified during previous archaeological works.
- 6.3 Further soil-filled ditches and possible pits and post-holes were identified across Area 1.

- 6.4 Part of a possible circular enclosure was identified in Area 2. Possible soil-filled pits and post-holes were also identified in Area 2.
- 6.5 The probable footings of a small rectangular structure were identified in Area 4, together with probable materials from its demolition.
- 6.6 Former field boundaries were identified in Areas 1 and 2. Traces of former ploughing were identified in Areas 1, 2 and 3.
- 6.7 A service pipe was identified in Area 1 and possible land drains were identified in Area 3.

## 7. Sources

- Adams, M, and Carne, P, 1995 Excavations at Site P, Village 3, Ingleby Barwick, Cleveland. *Durham Archaeological Journal* 11, 19-33
- Archaeological Services 1997a *Archaeological excavation at Little Maltby Farm, Ingleby Barwick: Interim Statement*. Unpublished report **433**, Archaeological Services Durham University
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- David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage
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- IfA 2011 *Standard and Guidance for archaeological geophysical survey*. Institute for Archaeologists
- Schmidt, A, & Ernenwein, E, 2011 *Guide to Good Practice: Geophysical Data in Archaeology*. Archaeology Data Service

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 site location

0 750m  
scale 1:15 000 for A4 plot





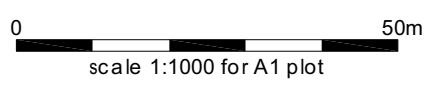
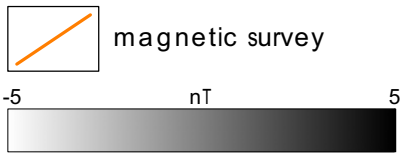
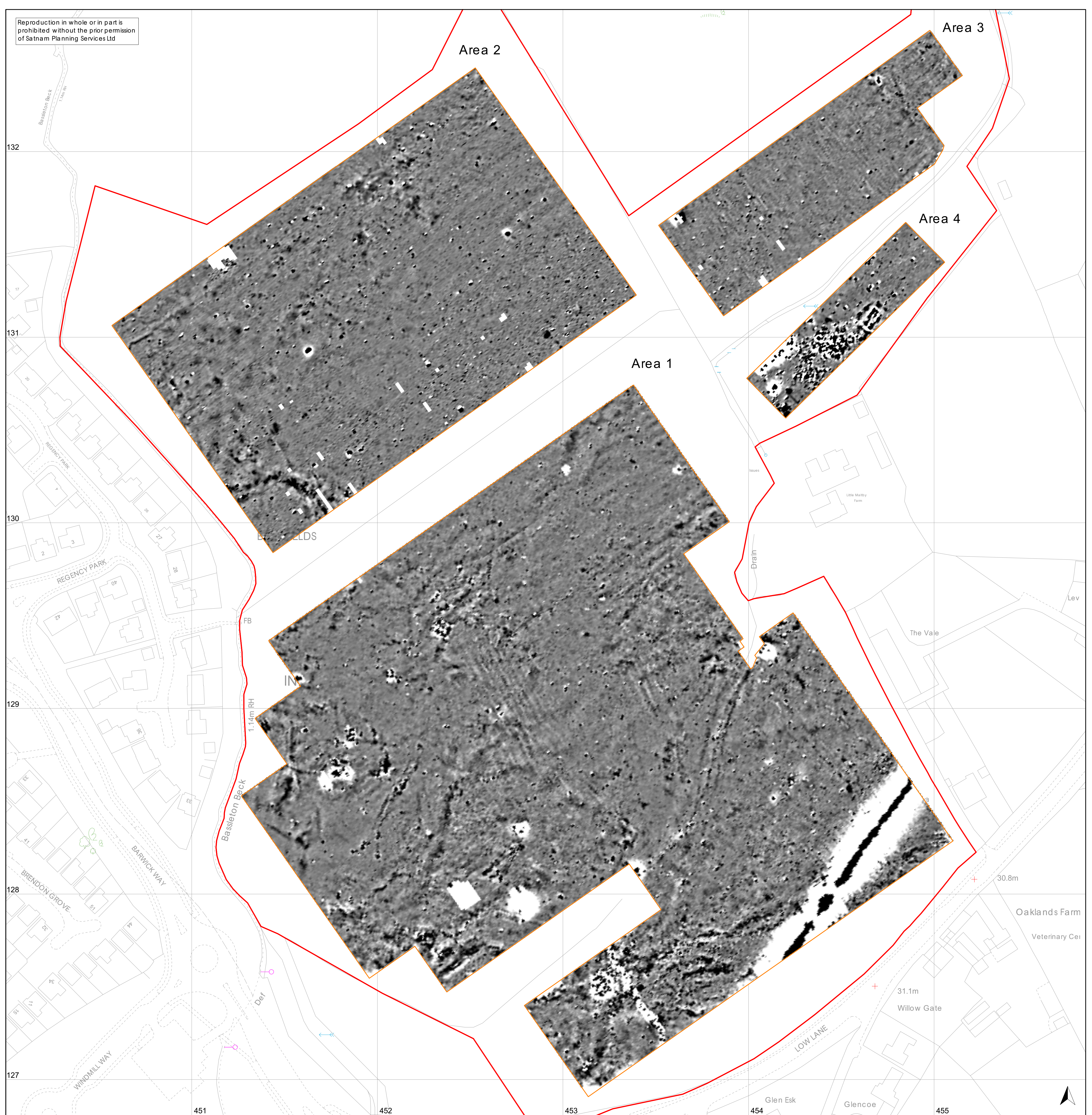
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Figure 2: Geophysical survey overview



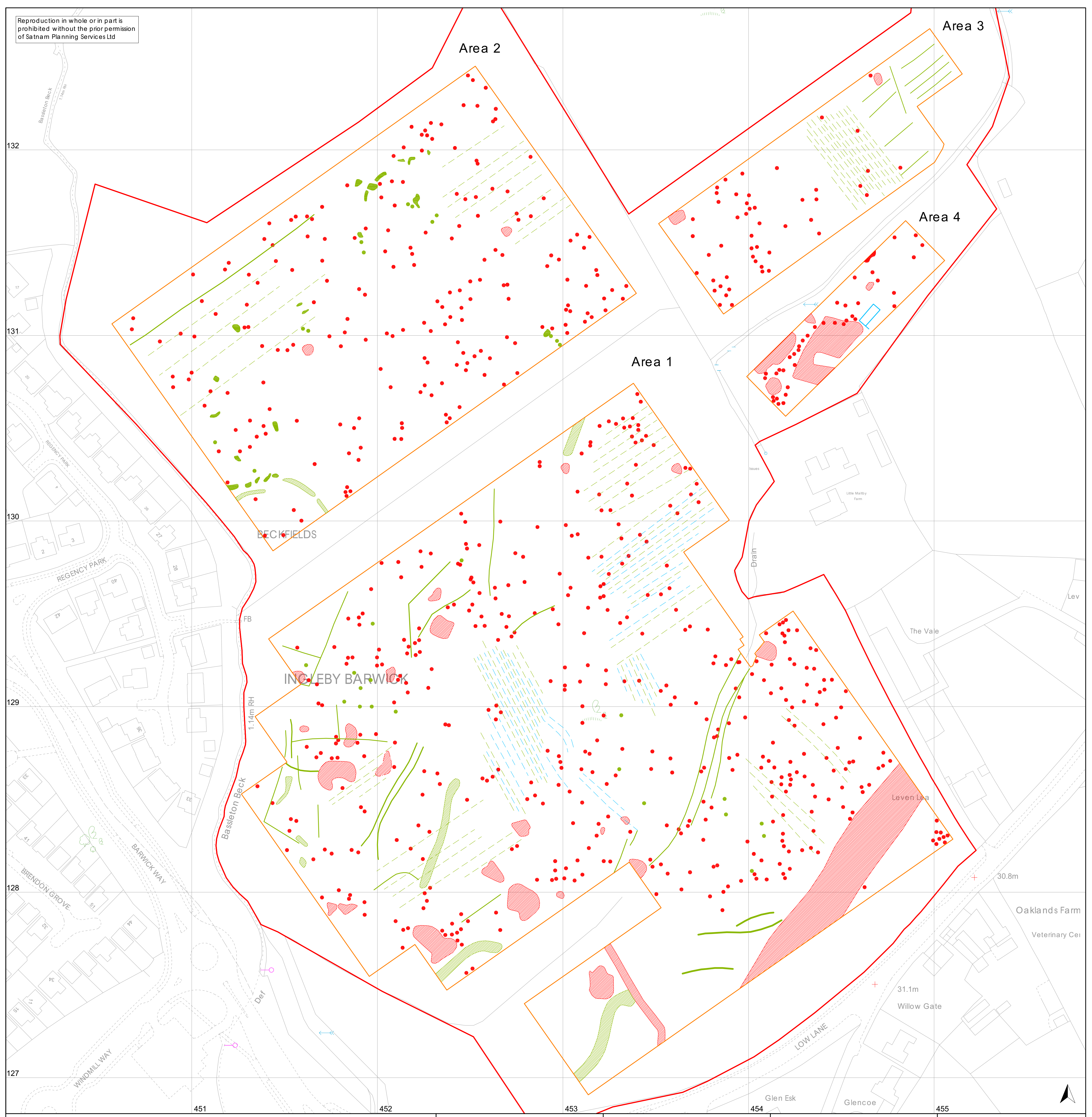


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Figure 3: Geophysical survey





- magnetic survey
- dipolar magnetic anomaly
- positive magnetic anomaly
- negative magnetic anomaly

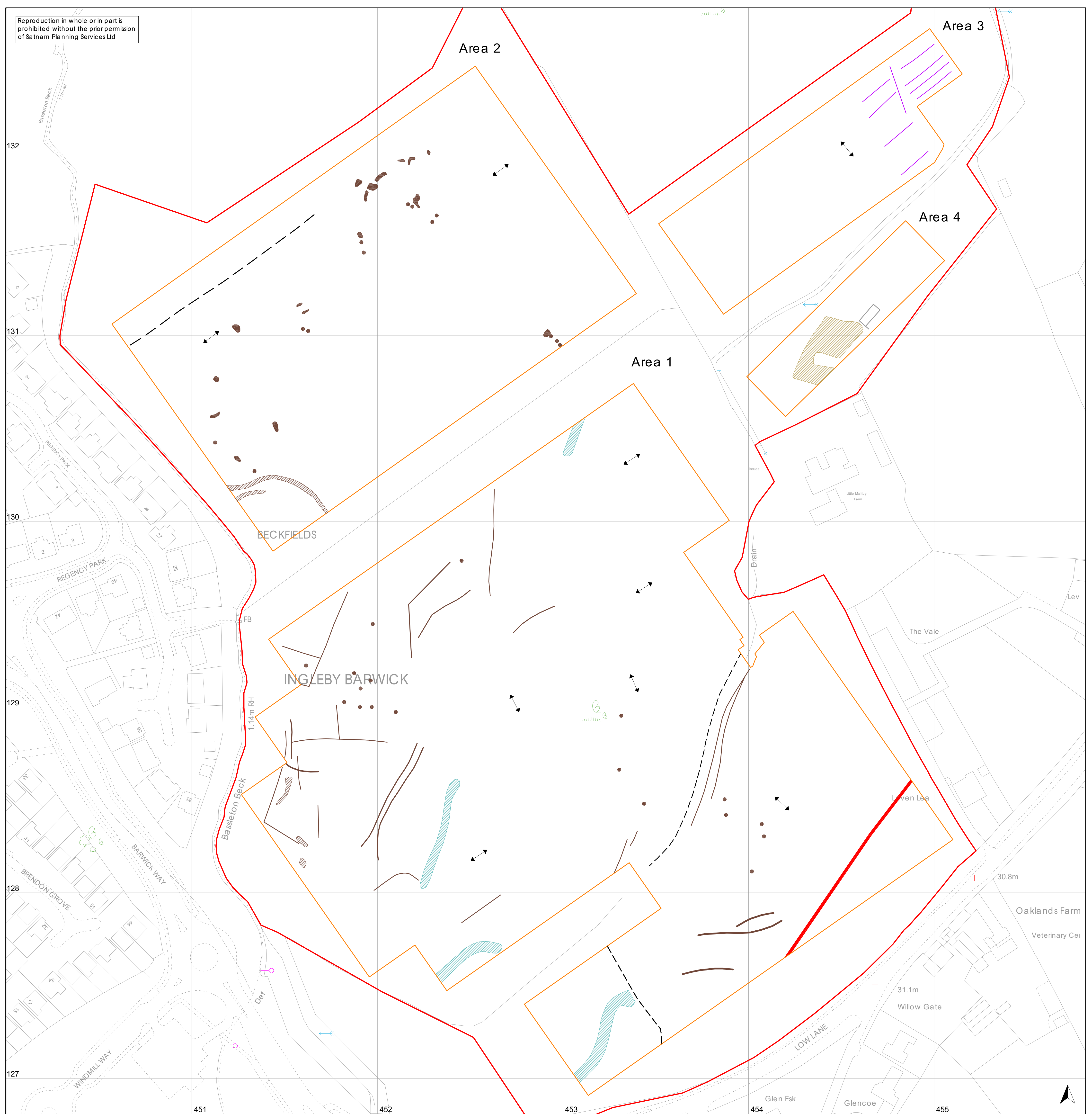
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
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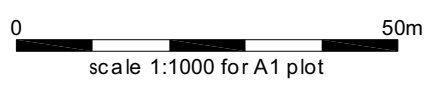
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Figure 4: Geophysical interpretation





-  magnetic survey
-  soil-filled feature
-  possible structure
-  possible geological feature
-  ferrous / fired rubble
-  service pipe
-  former ploughing
-  land drain
-  former field boundary

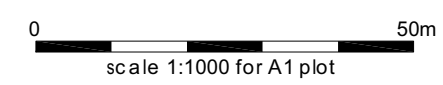
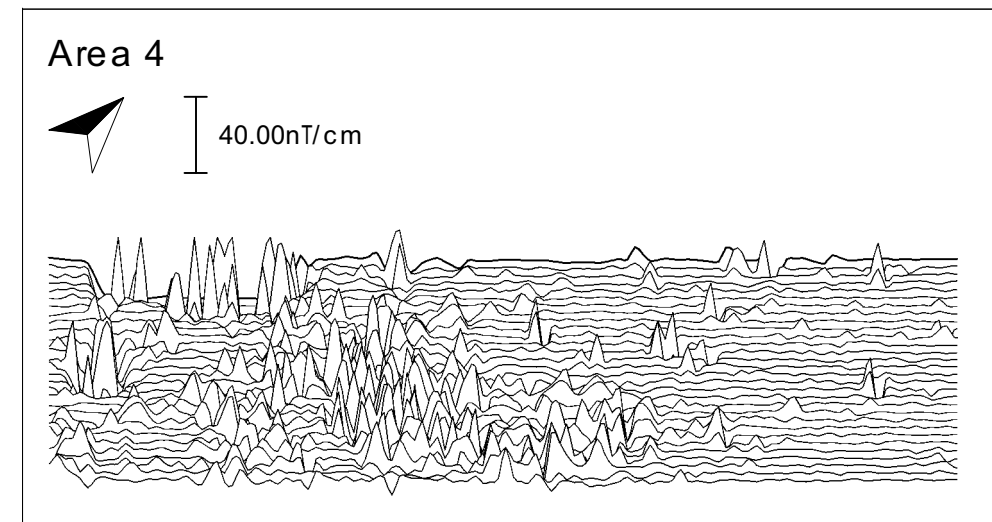
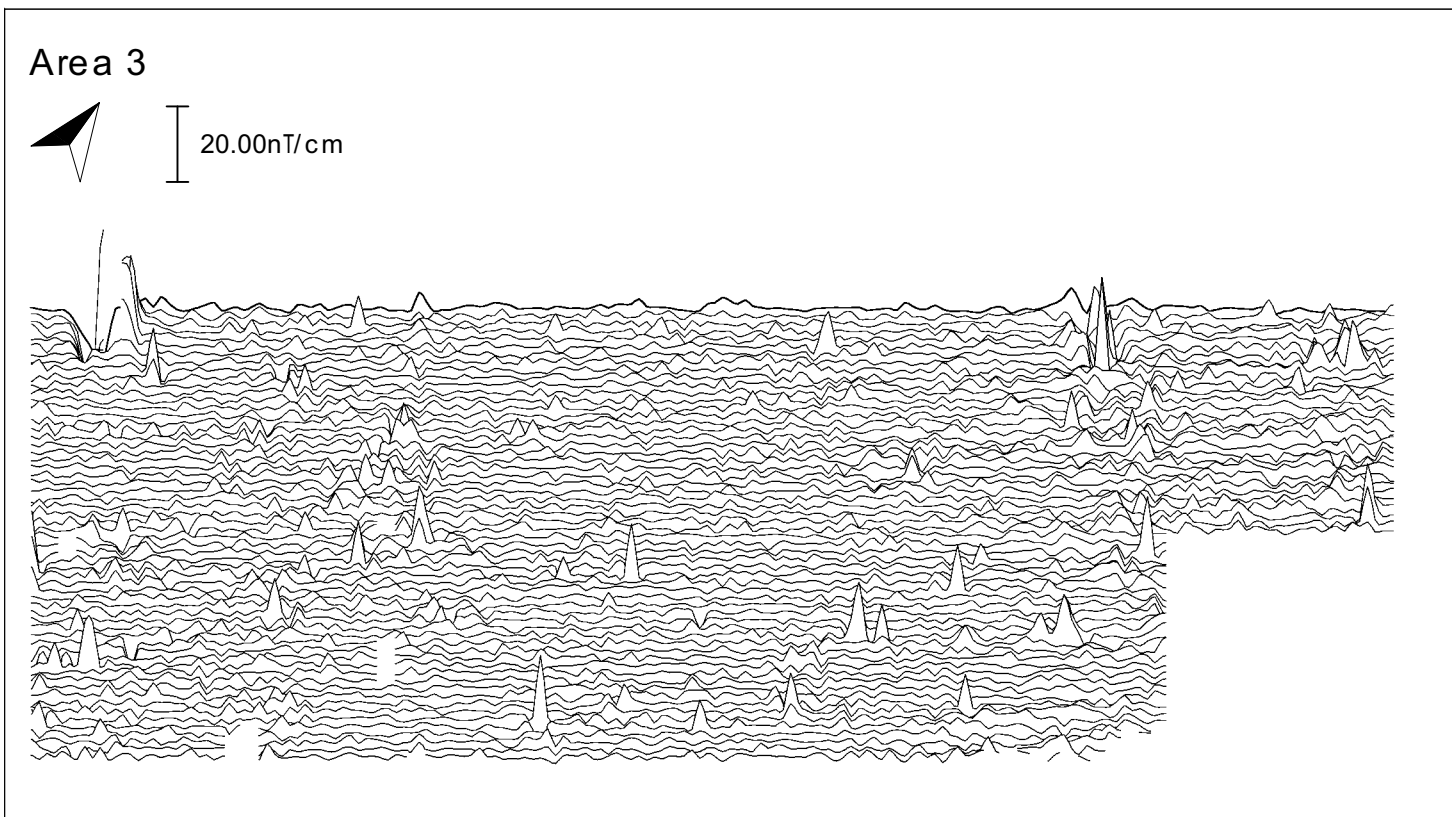
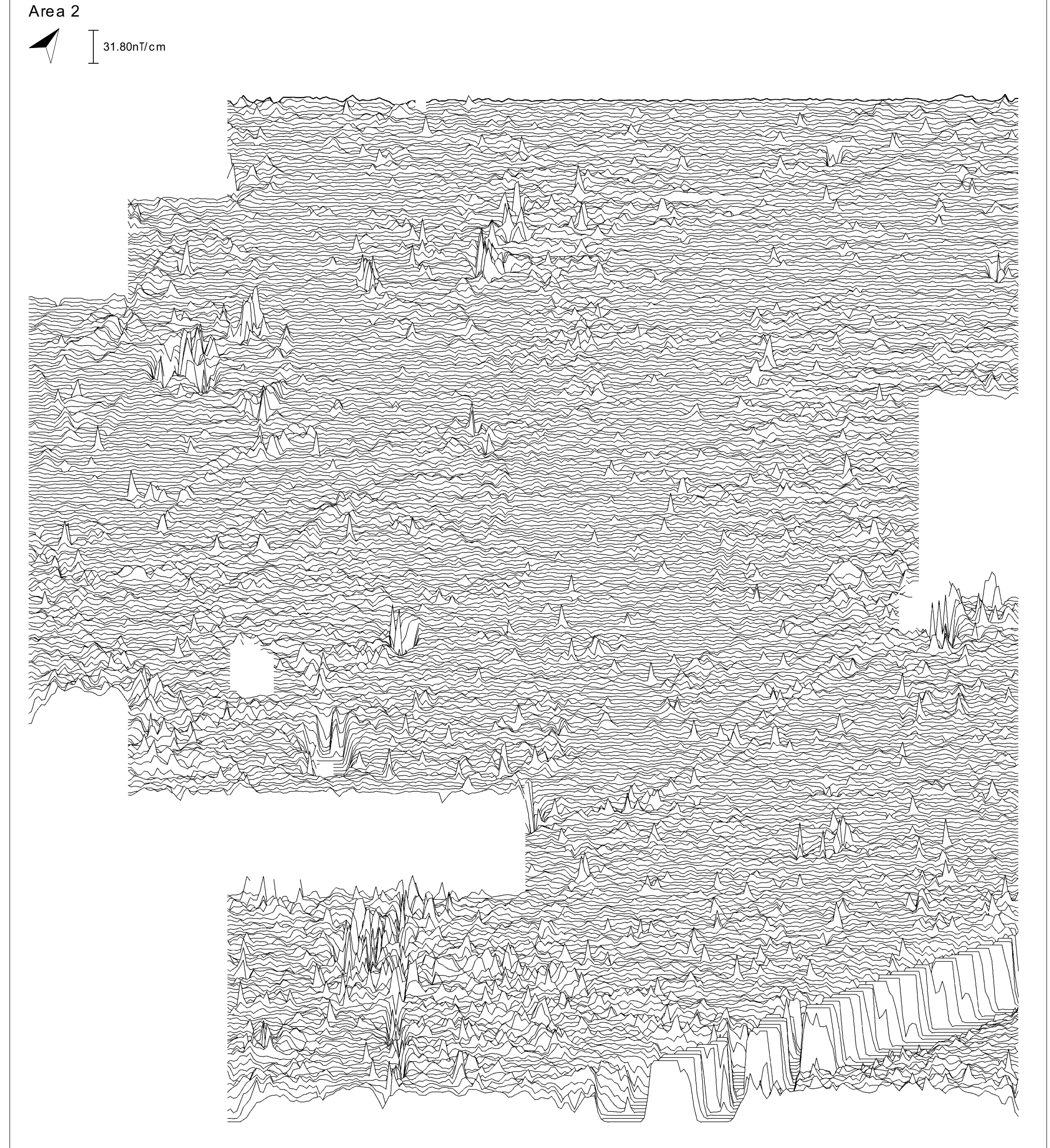


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Figure 5: Archaeological  
interpretation





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Figure 6: Trace plots of  
 geomagnetic data