



**magnitude  
surveys**

**Geophysical Survey Report  
of  
Land off Colne Road, Bluntisham  
Huntingdonshire**

**For  
CgMs Consulting**

**On Behalf Of  
R2 Developments Ltd**

**Magnitude Surveys Ref: MSTL90**

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## **Abstract**

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of a c. 7.5ha area of land off Colne Road, Bluntisham, Huntingdonshire. A fluxgate gradiometer was successfully completed and no anomalies of possible or probable archaeological origin have been identified. The geophysical results primarily reflect agricultural and modern activity, as well as natural variations in the soil and geology. Ploughing activity is predominate over much of the site, representing several distinct ploughing regimes.

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## 1. Introduction

- 1.1. Magnitude Surveys Ltd (MS) was commissioned by CgMs Consulting on behalf of R2 Developments Ltd to undertake a geophysical survey on a c. 7.5ha area of land off Colne Road, Bluntisham, Cambridgeshire (TL 3672 7534).
- 1.2. The geophysical survey comprised hand pulled, cart-mounted fluxgate gradiometer survey.
- 1.3. The survey was conducted in line with the current best practice guidelines produced by Historic England (David *et al.*, 2008), the Chartered Institute of Field Archaeologists (ClfA, 2014) and the European Archaeological Council (Schmidt *et al.*, 2015).
- 1.4. The survey was conducted in line with written scheme of investigation supplied to CgMs Consulting in advance of commencement.
- 1.5. The survey commenced on 27<sup>th</sup> February and took 3 days to complete.

## 2. Quality Assurance

- 2.1. Project management, survey work, data processing and report production have been carried out by qualified and professional geophysicists to standards exceeding the current best practice (ClfA, 2014; David *et al.*, 2008, Schmidt *et al.*, 2015).
- 2.2. Magnitude Surveys is a corporate member of ISAP (International Society of Archaeological Prospection).
- 2.3. Director Graeme Attwood is a Member of the Chartered Institute for Archaeologists (ClfA), the chartered UK body for archaeologists, as well as the Secretary of GeoSIG, the ClfA Geophysics Special Interest Group. Director Finnegan Pope-Carter is a Fellow of the London Geological Society, the chartered UK body for geophysicists and geologists, as well as a member of GeoSIG, the ClfA Geophysics Special Interest Group. Director Chrys Harris is a doctoral candidate in archaeological geophysics at the University of Bradford.
- 2.4. All MS managers have postgraduate qualifications in archaeological geophysics. All MS field staff have relevant archaeology or geophysics degrees and supervisors have at least three years' field experience.

## 3. Objectives

- 3.1. The geophysical survey aimed to assess the subsurface archaeological potential of the survey area.

## 4. Geographic Background

- 4.1. The site is located at the northern edge of the village of Bluntisham and c. 640m south-west of the village of Colne (Figure 1). Huntingdon is located c. 13.6km south-west of site. Survey was undertaken over a gently sloping arable field. The site is bounded to the north, north-east, and west by further agricultural land, to the south by housing, and to the east by Colne Road (Figure 2).
- 4.2. The underlying geology comprises West Walton Formation and Ampthill Clay Formation mudstones with superficial deposits of Diamicton in the west of the survey area and river terrace deposits of sand and gravel in the east (British Geological Survey, 2017).
- 4.3. The soils consist of lime-rich loamy and clayey soils with impeded drainage (Soilscapes, 2017).
- 4.4. Survey considerations:

| Survey Area | Ground Conditions   | Further notes:   |
|-------------|---|--|
| 1           | Gently sloping down to the east. Muddy underfoot with a young crop coverage, extending E-W across site. | Wire fencing along southern boundary. Hedges along eastern and western boundaries. A track and hedge along the northern boundary. A shed was located the easternmost end of site. Three small telegraph poles were located in the central area on a SW-NE alignment. The southernmost had a tethering cable to the ground. |

## 5. Archaeological Background

- 5.1. The following archaeological background summarises the heritage assets within a 1km radius of the site from an archaeological desk-based assessment produced by CgMs Consulting (Robertson, 2016). No designated heritage assets are recorded within the site's boundary. However, a non-designated find spot of Early Neolithic to Late Bronze Age lithic implements has been recorded within the survey area.
- 5.2. Prehistoric activity has been recorded within close proximity to the site, including Palaeolithic finds and a possible pit containing Prehistoric pottery. Numerous other Prehistoric finds of lithic implements and pottery fragments have also been recorded in the site's wider landscape. Excavations c. 700m south of site recorded a multi-phase occupation with a series of pits, ditches and postholes. Evidence for Bronze Age activity was recovered, but most of the activity dated to the Late Iron Age/Roman period. However, further evidence for Roman activity in the site's wider landscape is limited to scattered find spots of coins and pottery sherds.
- 5.3. The site is situated c. 800m and c.850m outside of the Saxon/Medieval cores of the villages of Bluntisham and Colne, respectively. LiDAR data indicates the presence of ploughed out ridge and furrow within the site, suggesting the site was incorporated within the agricultural hinterland. A Scheduled Medieval moated site lies c. 700m north of site and is believed to

represent the manor of Colne. An isolated find of Medieval Colne-type pottery is recorded c. 250m east of site.

- 5.4. A map regression in the DBA tracks the configuration of the site through the Post-Medieval and Modern periods. The 1778/1814 Bluntisham cum Earith Inclosure Map records the site in its current configuration: as a single field. The parish boundary is recorded at the very northern end of site. In the 1843 Bluntisham and Earith Tithe map, a sub N-S aligned boundary separates the site into two eastern and western areas. This feature is still present in the 1888 1<sup>st</sup> Edition Ordnance Survey map. The 1902 Ordnance Survey map records the site as enclosing three fields, with the eastern area halved by a E-W aligned boundary. In the 1927 Ordnance Survey, the configuration is maintained, but a footpath is recorded within the more southern of the eastern halves. These features are still present in the 1952 Ordnance Survey, but the site is depicted as under an orchard plantation. By the time of the 1973 Ordnance Survey, the boundaries within the eastern area have been removed and the site is recorded as two enclosed fields. The 1982 Ordnance Survey does not include any internal boundaries, with the site depicted in its current configuration.

## 6. Methodology

### 6.1. Data Collection

- 6.1.1. Geophysical prospection comprised the magnetic method as described in the following table.

- 6.1.2. Table of survey strategies:

| Method   | Instrument  | Traverse Interval | Sample Interval                  |
|----------|---|-------------------|----------------------------------|
| Magnetic | Bartington<br>Instruments Grad-13 Digital<br>Three-Axis Gradiometer | 1 m               | 200 Hz reprojected<br>to 0.125 m |

- 6.1.3. The magnetic data were collected using MS' bespoke hand-pulled cart system.

- 6.1.3.1. MS' cart system was comprised of Bartington Instruments Grad 13 Digital Three-Axis Gradiometers. Positional referencing was through a Hemisphere S321 GNSS Smart Antenna RTK GPS outputting in NMEA mode to ensure high positional accuracy of collected measurements. The Hemisphere S321 GNSS Smart Antenna is accurate to 0.008 m + 1 ppm in the horizontal and 0.015 m + 1 ppm in the vertical.

- 6.1.3.2. Magnetic and GPS data were stored on an SD card within MS' bespoke datalogger. The datalogger is continuously synced, via an in-field Wi-Fi unit, to servers within MS' offices. This allows data collection, processing and visualisation to be monitored in real-time as fieldwork is ongoing.

- 6.1.3.3. A series of temporary sight markers were established in each survey area to guide the surveyor and ensure full coverage with the cart. Data were collected by

traversing the survey area along the longest possible lines, to ensure that the data was efficiently collected and processed.

## 6.2.Data Processing

6.2.1. Magnetic data were processed in bespoke in-house software produced by MS. Processing steps conform to Historic England's standards for "raw or minimally processed data" (see sect 4.2 in David *et al.*, 2008: 11).

Sensor Calibration – The sensors were calibrated using a bespoke in-house algorithm, which conforms to Olsen *et al.* (2003).

Zero Median Traverse – The median of each sensor traverse is calculated within a specified range and subtracted from the collected data. This removes striping effects caused by small variations in sensor electronics.

Projection to a Regular Grid – Data collected using RTK GPS positioning requires a uniform grid projection to visualise data. Data are rotated to best fit an orthogonal grid projection and are resampled onto the grid using an inverse distance-weighting algorithm.

Interpolation to Square Pixels – Data are interpolated using a bicubic algorithm to increase the pixel density between sensor traverses. This produces images with square pixels for ease of visualisation.

## 6.3.Data Visualisation and Interpretation

6.3.1. This report presents the gradient of the sensors' total field data as greyscale images. Multiple greyscales images at different plotting ranges have been used for data interpretation. Greyscale images should be viewed alongside the XY trace plot (Figure 7). XY trace plots visualise the magnitude and form of the geophysical response, aiding in anomaly interpretation.

6.3.2. Geophysical results have been interpreted using greyscale images and XY traces in a layered environment, overlaid against satellite and LiDAR imagery; historic mapping; soils and geology mapping; and topographic contours.



## 7. Results

### 7.1. Qualification

7.1.1. Geophysical techniques are not a map of the ground and are instead a direct measurement of subsurface properties. Detecting and mapping features requires that said features have properties that can be measured by the chosen technique(s) and that these properties have sufficient contrast with the background to be identifiable. The interpretation of any identified anomalies is inherently subjective. While the scrutiny of the results is undertaken by qualified, experienced individuals and rigorously checked for quality and consistency, it is often not possible to classify all anomaly sources. Where possible an anomaly source will be identified along with the certainty of the interpretation. The only way to improve the interpretation of results is through a process of comparing excavated results with the geophysical reports. MS actively seek feedback on their reports as well as reports of further work in order to constantly improve our knowledge and service.

### 7.2. Discussion

7.2.1. The geophysical results are presented in consideration with satellite imagery (Bing, 2017; Figure 5) and historic mapping (Ordnance Survey, 6" 2<sup>nd</sup> edition c.1882-1913; Figure 6). Google Earth (2017) was consulted as well, to track the recent land usages of the site.

7.2.2. The fluxgate gradiometer survey has responded well to the site's environment. The results reveal a relatively quiet magnetic background, punctuated by discrete natural deposits (Figure 7). Modern intrusions are generally limited towards the edges of the fields, reflecting adjacent structures and fencing. The eastern end of site demonstrates a stronger magnetic background, due to the presence of modern activity and superficial sand and gravel deposits. Ploughing activity is evident across the site, but demonstrates stronger magnetic contrast in the western half of site; this could be a result of the different land usage history of these fields. Ploughing responses occur on several alignments and reflect a combination of ploughing regimes. Further anomalies have been classified as Undetermined. These are more likely to reflect agricultural or modern processes; although a potential archaeological origin cannot be entirely ruled out.

### 7.3. Interpretation

#### 7.3.1. General Statements

7.3.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually.

7.3.1.2. **Undetermined** – Anomalies are classified as Undetermined when the anomaly origin is ambiguous through the geophysical results and there is no supporting or correlative evidence to warrant a more certain classification. These anomalies are likely to be the result of geological, pedological or agricultural processes--although an archaeological origin cannot be entirely ruled out. Undetermined anomalies are generally not ferrous in nature.

**7.3.1.1. Ferrous (Discrete/Spread)** – Discrete ferrous-like, dipolar anomalies are likely to be the result of modern metallic disturbance on or near the ground surface. A ferrous spread refers to a concentrated scattering of these discrete, dipolar anomalies. Broad dipolar ferrous responses from modern metallic features, such as fences, gates, neighbouring buildings and services, may mask any weaker underlying archaeological anomalies should they be present.

### **7.3.2. Magnetic Results - Specific Anomalies**

**7.3.2.1. Agricultural** – Ploughing activity has been identified through a series of parallel, linear anomalies. Two main groups of such patterning have been detected in the western half of site. The first of these runs on an approximate north-south alignment at the western end of site, while the second group runs on an approximate east-west alignment in the centre of site.

The eastern extent of the north-south ploughing alignment appears to terminate at a broad boundary feature visible in LiDAR imagery of the site, which suggests an older, ridge and furrow origin for this ploughing.

The east-west ploughing alignment appears to respect the former field boundary [1a] that divided the site through the Tithe Map of 1843 until the 1982 Ordnance Survey map (Figure 6). While the responses on an east-west alignment do occur in-line with modern ploughing (Figure 5), the separation and broadness of the anomalies are more characteristic of older ploughing. The ploughing responses exhibit relatively weak magnetic enhancement from the surrounding soil; although a number of localised areas of greater magnetic enhancement have been detected [1b]. The discrete disturbances of these areas, marked as “Undetermined”, may be a result of the plough disturbing magnetically enhanced deposits; whether these would be anthropogenic or natural in origin is not possible to identify.

The evidence for ploughing activity in the eastern half of site is more ephemeral than the western half, and likely reflects the different land usages of these areas. The Tithe Map of 1843 records the western field as arable and the eastern field as pasture (see Robertson, 2016); the more intensive cultivation of the western field almost certainly contributed to the greater presence of ploughing responses detected.

**7.3.2.2. Natural** – Magnetic anomalies caused by natural variations in the soils and superficial geology have been detected across the site. The small, discrete responses scattered across the site are characteristic of superficial deposits. Concentrated areas of these deposits have been categorised as “Natural (Spread)”. It is conceivable some of these responses have an anthropogenic origin; however, these would appear indistinguishable in the magnetic results from those responses produced by natural geology.

**7.3.2.3. Ferrous** – Broad ferrous anomalies caused by modern activity have been detected near the edges of the field and reflect adjacent structures and fencing (Figure 5). A broad dipolar anomaly caused by a small building can be seen in the south-eastern corner of the survey area. A large, discrete anomaly [1c] near the south-western

end of site has been produced by a telegraph post with a tethering cable. The presence of the cable on this post accounts for its broad response, in contrast to the other poles.

## 8. Conclusions

- 8.1. A fluxgate gradiometer survey has been successfully undertaken across the site. A generally low level magnetic background over most of the area has allowed a range of anomalies to be detected. Agricultural and modern activity have been detected across the site, as well as minor natural variations in the soils and geology. The detection of anomalies anthropogenic and natural in origin, weak and strong in magnitude, demonstrates the method has been effective at this site. No anomalies of a possible or probable origin have been identified.
- 8.2. A series of anomalies of an agricultural origin have been identified. Agricultural activity is primarily characterised by weak, parallel linear anomalies that reflect several different ploughing regimes, undertaken across several time periods. A former field boundary has been identified as well. Strong responses within the ploughing may reflect the disturbance of magnetically enhanced material by the plough.
- 8.3. Anomalies of a natural origin have been detected across the site. These responses reflect superficial deposits and localised changes in the magnetic susceptibility of the soil.
- 8.4. Modern activity has been detected across the site, but is generally limited to the perimeter of the field. A small building in the south-eastern corner and a telegraph pole with tethering cable have produced broad ferrous anomalies.

## 9. Archiving

- 9.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein (2013). This stores the collected measurements, minimally processed data, georeferenced and un-georeferenced images, XY traces and a copy of the final report.
- 9.2. MS contributes all reports to the ADS Grey Literature Library subject to any time embargo dictated by the client.
- 9.3. Whenever possible, MS has a policy of making data available to view in easy to use forms on its website. This can benefit the client by making all of their reports available in a single repository, while also being a useful resource for research. Should a client wish to impose a time embargo on the availability of data, this can be achieved in discussion with MS.

## 10. Copyright

- 10.1. Copyright and the intellectual property pertaining to all reports, figures, and datasets produced by Magnitude Services Ltd. is retained by MS. The client is given full licence to use such material for their own purposes. Permission must be sought by any third party wishing to use or reproduce any IP owned by MS.

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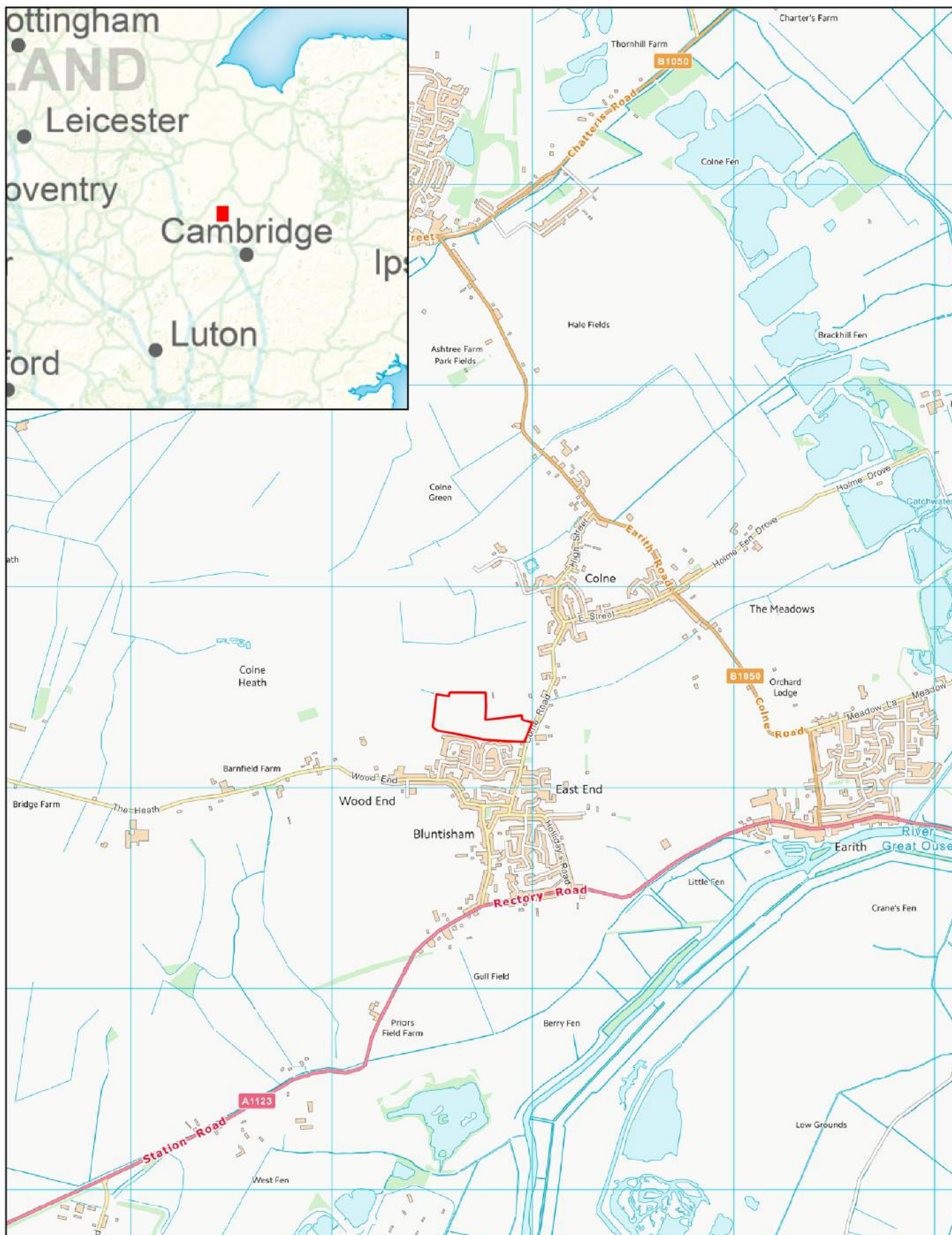
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MSTL90 - Land off Colne Road, Bluntisham, Huntingdonshire


Figure 1 - Site Location

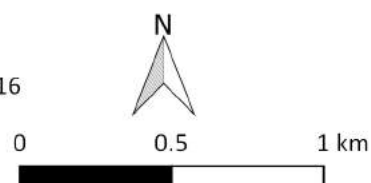
1 : 25,000 @ A4

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OS (100056946)

 Site Boundary



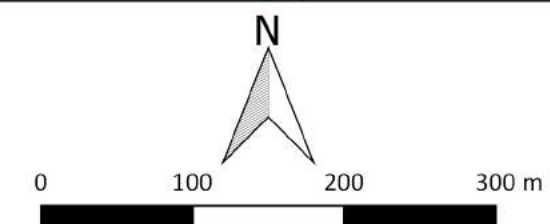
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MSTL90 - Land off Colne Road, Bluntisham, Huntingdonshire  
 Figure 2 - Location of Survey Area  
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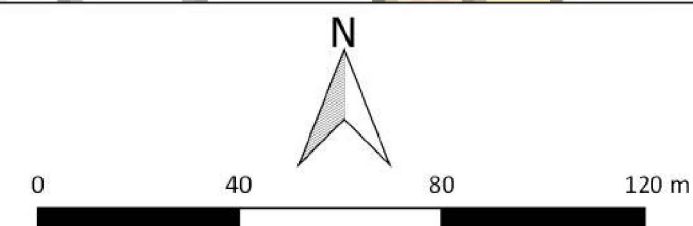
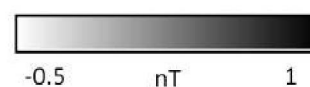
 Survey Extent







MSTL90 - Land off Colne Road, Bluntisham, Huntingdonshire  
Figure 3 - Magnetic Greyscale  
1:1500 @ A3  
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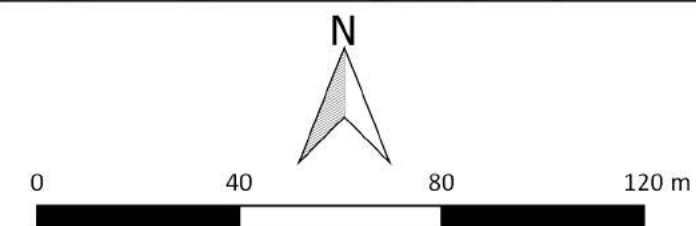






MSTL90 - Land off Colne Road, Bluntisham, Huntingdonshire  
 Figure 4 - Magnetic Interpretation  
 1:1500 @ A3  
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- |                       |                     |                       |
|-----------------------|---------------------|-----------------------|
| Undetermined (Trend)  | Agricultural (Weak) | Natural (Weak)        |
| Natural (Trend)       | Ferrous (Dipolar)   | Undetermined (Spread) |
| Ploughing (Trend)     | Ferrous (Spread)    | Undetermined (Strong) |
| Agricultural (Strong) | Natural (Spread)    |                       |

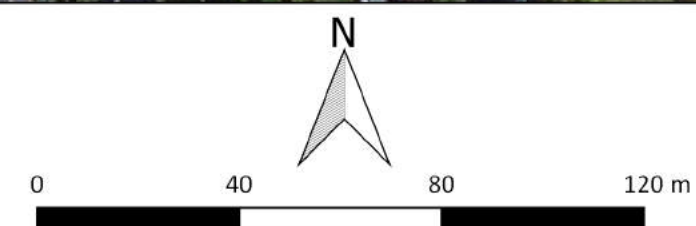




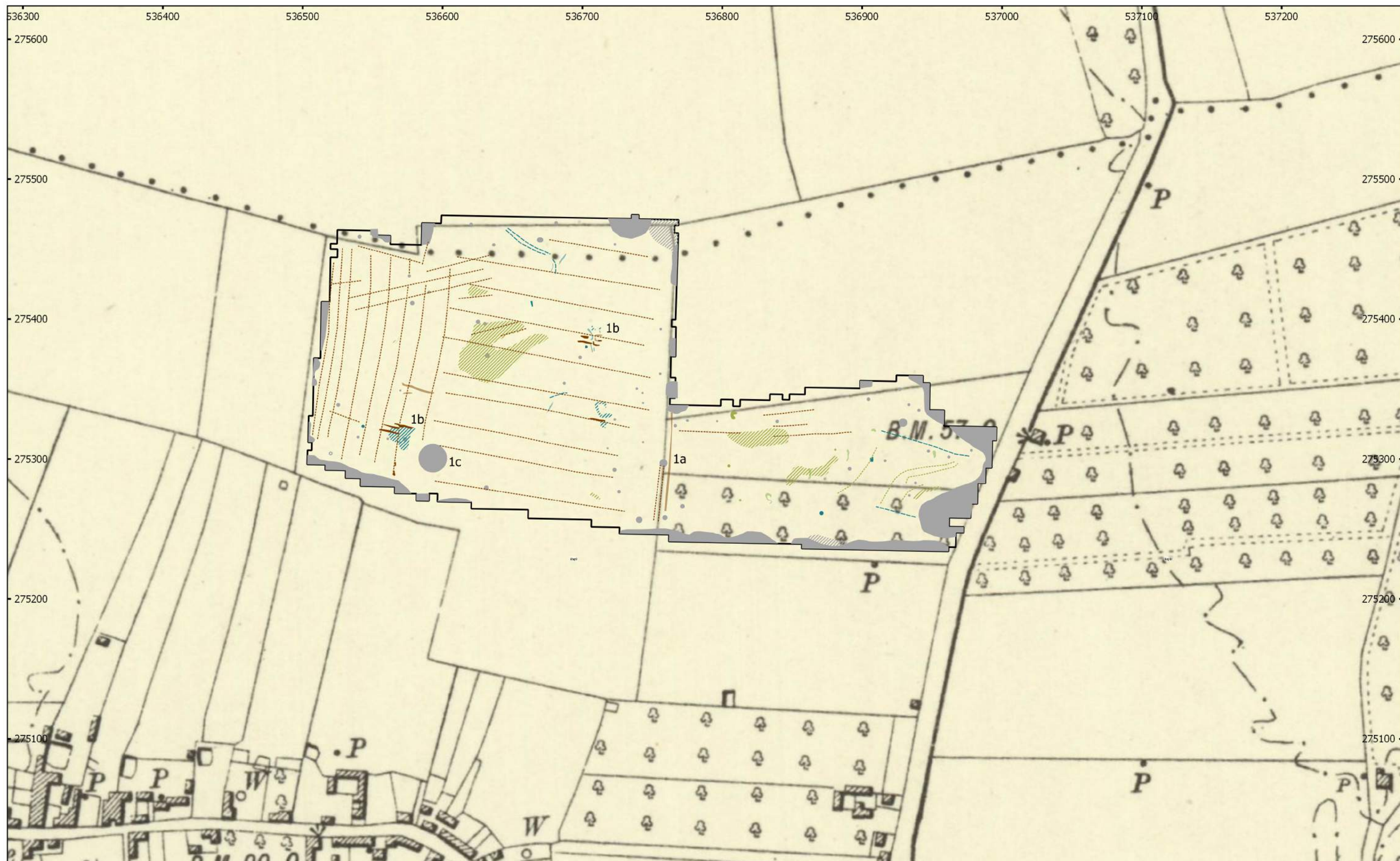


MSTL90 - Land off Colne Road, Bluntisham, Huntingdonshire  
 Figure 5 - Magnetic Interpretation - Satellite  
 1:1500 @ A3  
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 2017

- |                       |                     |                       |
|-----------------------|---------------------|-----------------------|
| Undetermined (Trend)  | Agricultural (Weak) | Natural (Weak)        |
| Natural (Trend)       | Ferrous (Dipolar)   | Undetermined (Spread) |
| Ploughing (Trend)     | Ferrous (Spread)    | Undetermined (Strong) |
| Agricultural (Strong) | Natural (Spread)    |                       |

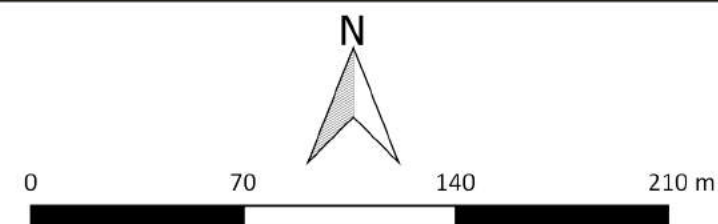




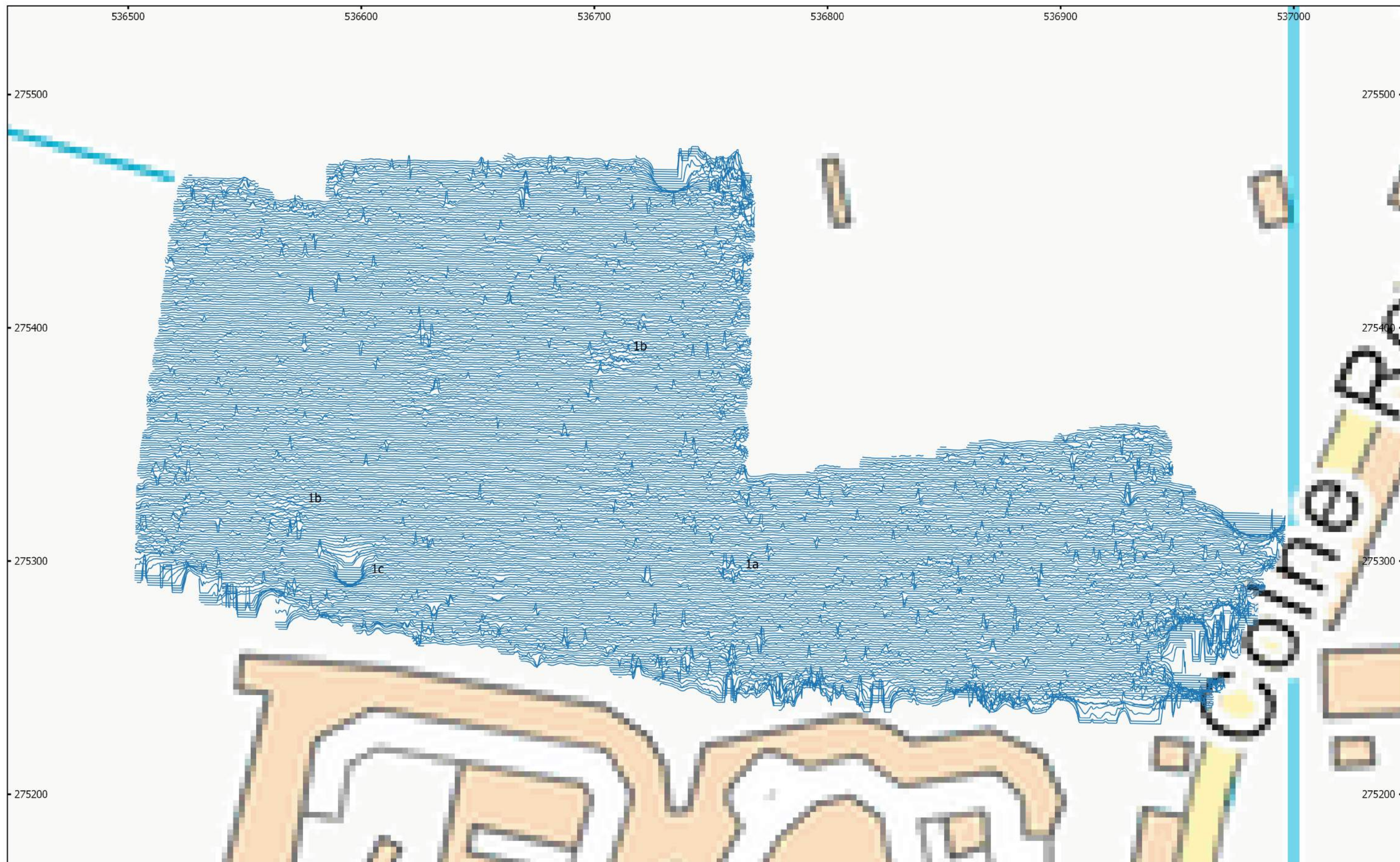


MSTL90 - Land off Colne Road, Bluntisham, Huntingdonshire  
 Figure 6 - Magnetic Interpretation - Historic  
 1:2500 @ A3  
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 Historic mapping Ordnance Survey, 6" 2nd edition c. 1882-1913 © National Library of Scotland

- |                         |                       |                         |
|-------------------------|-----------------------|-------------------------|
| — Undetermined (Trend)  | — Agricultural (Weak) | — Natural (Weak)        |
| — Natural (Trend)       | — Ferrous (Dipolar)   | — Undetermined (Spread) |
| — Ploughing (Trend)     | — Ferrous (Spread)    | — Undetermined (Strong) |
| — Agricultural (Strong) | — Natural (Spread)    |                         |







MSTL90 - Land off Colne Road, Bluntisham, Huntingdonshire  
Figure 7 - XY Trace Plot  
30 nT/cm at 1:1500 @ A3  
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