STRATASCAN

# Geophysical Survey Report

## Mill Common, Huntingdon

for

**Atkins Ltd**

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Job ref. J2725


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**Document Title:** **Geophysical Survey Report**
**Mill Common, Huntingdon**

**Client:** **Atkins Ltd**

**Stratascan Job No:** **J2725**

**Techniques:** **Detailed magnetic survey (gradiometry)**

**National Grid Ref:** **TL 236 715**

**Plate 1: View from east to west across survey area.**

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## 1 SUMMARY OF RESULTS

A detailed gradiometry survey was conducted over approximately 4.5 hectares of pasture land just south of Huntingdon, Cambridgeshire. The data collected shows a significant number of both positive and negative magnetic anomalies which are present in both linear and area formations and which may be of archaeological origin. The positive anomalies are interpreted as possible in-filled cut features such as ditches, while the negative anomalies are indicative of former earthen banks. It is interesting to note that there is a large anomaly present in the centre of the site consisting of both positive and negative data which may represent a bank and ditch feature (Figure 6: Anomaly A). Further positive and negative area anomalies are present throughout much of the survey area including two possible cut features seen to the far north of the site (Figure 6: Anomaly D) and a band of anomalies running from west to east across the central portion of the survey (Figure 6: Anomaly J). To the east of the site a collection of alternating positive and negative anomalies can be seen which may represent a sequence of bank and ditch features (Figure 6: Anomaly K). A further group of linear anomalies can be seen to the west of the site which is interpreted as ridge and furrow (Figure 6: Anomaly B). Numerous discrete positive anomalies can be seen across the survey area that are interpreted as possible pits.

A modern service running through the site has created areas of magnetic disturbance, which is also present where the survey area is in close proximity to the field boundary. Also evident are areas of magnetic debris possibly associated with ground disturbance and a number of linear features possibly associated with field drains.

## 2 INTRODUCTION

### 2.1 Background synopsis

Stratascan were commissioned to undertake a geophysical survey over an area of common land. This survey forms part of an archaeological investigation being undertaken by Atkins Ltd to inform the mitigation strategy in advance of the proposed improvements to the A14 between Ellington and Fen Ditton.

### 2.2 Site location

The site is located at Mill Common, Huntingdon, Cambridgeshire at OS ref. TL 236 715. (See Figure 01).

### 2.3 Description of site

The survey area is approximately 4.5 hectares of rough grazing land just south of Huntingdon, Cambridgeshire. The site varies in height quite markedly, rising from 13.50m AOD in the south-eastern end to 21.00m AOD in the north-west. There is a history of gravel and clay extraction on Mill Common, evidence of which survives today as the remnants of a large quarry pit in the centre of site and further earthworks across site, including upcast mounds in the south-east corner.

## 2.4 Geology and soils

The underlying geology is Oxford Clay and Kellaways Beds (British Geological Survey South Sheet, Fourth Edition Solid, 2001). The drift geology is river terrace deposits made up of mainly gravel and sand (British Geological Survey South Sheet, First Edition Quaternary, 1977).

The overlying soils are known as Fladbury 1 which are typical pelo-alluvial gley soils. These consist of stoneless clayey soils, calcareous in places and variably affected by groundwater – flat land with a risk of flooding (Soil Survey of England and Wales, Sheet 4 Eastern England).

## 2.5 Site history and archaeological potential

The following is taken from - *Mill Common Trench Evaluation and Community Archaeology Project: Report*, by Richard Mortimer on behalf of Cambridgeshire Archaeology, Archaeological Field Unit. June 2006. (CCC AFU Report Number 823).

Although Mill Common is an area of known archaeological interest, limited investigation had occurred on the land prior to the community excavations of 2005. Actual information on the archaeology of the area had been patchy. Visible on the site are a number of earthworks which may be of archaeological significance, including ridge and furrow, headlands and a large bank and ditch along the western side of the Common known as Bar Dyke (SAM CB 188). This feature has been attributed to both the Saxon and Civil war periods and is deemed defensive in both cases. An excavation was carried out by the Ministry of Works in the 1970's prior to the partial destruction of the feature by the construction of the A14, however the only surviving records are a few photographs. There are surviving earthworks on Mill Common which are associated with quarrying; there is historical evidence of clay quarrying on Mill Common in the $18^{th}$ Century (Huntingdon Common Council 1772 & 1776). There is also evidence of gravel extraction on the Common in the $19^{th}$ century (order of Huntingdon Town Clerk, Dec 1840).

Prehistoric –

Mill Common is situated within the Ouse Valley, which is rich in prehistoric remains. During the Late Neolithic and Bronze Age, major ritual complexes sprang up and evolved along the course of the Ouse. The community excavations carried out in 2005 found limited evidence of Prehistoric features; two ditches have been tentatively identified and are situated in the northwest of the survey area, the only artefacts recovered from them are two crudely produced flint flakes, broadly datable to the Bronze Age. Further worked flint, dating to the Late Neolithic or Mesolithic was found throughout the site, although this was residually deposited and not found in-situ

Roman –

The 2005 Excavations at Mill Common found Romano British material in all of the trenches excavated, however in very small quantities. There is significant evidence of Roman activity in the Huntingdon area – Ermine Street; the Roman road is known to cross from Godmanchester to Huntingdon and is believed to run along the line of the High Street. Archaeological investigations carried out in the early 1970's at Pathfinder House (the area between Mill Common and the Hartford Road site ) identified a Roman road and further investigation in May 2006 confirmed the presence of the road and identified Romano-British settlement features to the north of it.

Saxon/Early Medieval –

Interestingly, the 2005 excavations discovered what appears to be a sunken lane on Mill Common. It has been identified as such as the base is shallow and wide with two cart ruts present within it. A further ditch and tree throw have been discovered on site. The sunken lane has been dated to between the 7$^{th}$ and 13$^{th}$ centuries. Two of the features discovered contained purely Late Saxon pottery assemblages and these appear to relate to the setting out of the ridge and furrow.

Medieval and Post-Medieval -

Excavations suggest that the use of Mill Common as Medieval ploughland had ceased by the 19$^{th}$ Century. Two further large ditches dating to this period were also recorded, one of which is part of the Bar Dyke Scheduled Monument and the second to the east of the site which finds have dated to the period 1150 – 1350. The history of Bar Dyke appears to show its use beginning as a lane, replaced by a defensive ditch and then being used as a lane again. A much larger ditch was subsequently dug; possibly as a Civil War defence.

Modern –

There are two areas of quarrying identified on Mill Common, both dating to the late 19$^{th}$ or early 20$^{th}$ centuries. The small area located to the far south east of the common has been identified as a gravel extraction pit due to the nature of the spoil heap. The large depression seen to the central area has not been excavated, but the size suggests that the underlying clay was also extracted. Most recently, a WW1 Royal Flying Corps camp was situated on the common.

## 2.6 Survey objectives

The objective of the survey was twofold, firstly to provide a fuller survey of Mill Common in order to inform the mitigation strategy in advance of proposed improvements to the A14 between Ellington and Fen Ditton, secondly to provide a test of the partial survey undertaken in 2005.

### 2.7 Survey methods

Detailed magnetic survey (gradiometry) was used as an efficient and effective method of locating archaeological anomalies. More information regarding this technique is included in the Methodology section below.

## 3 METHODOLOGY

### 3.1 Date of fieldwork

The fieldwork was carried out over 2 days from Tuesday 20th – Wednesday 21st April 2010. Weather conditions during the survey were dry and sunny, however there had been rain in the previous days. For comparison purposes, the weather during the 2005 evaluation survey was sun and showers.

### 3.2 Grid locations

The location of the survey grids has been plotted in Figure 2 together with the referencing information. Grids were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site.

### 3.3 Survey equipment and gradiometer configuration

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTesla (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The instrument consists of two fluxgates very accurately aligned to nullify the effects of the Earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each gradiometer has a 1m separation between the sensing elements so enhancing the response to weak anomalies. The 2005 evaluation survey also used the Bartington Grad 601-2 Magnetic Gradiometer with the same sample interval, traverse interval and grid size.

## 3.4 Sampling interval, depth of scan, resolution and data capture

### 3.4.1 Sampling interval

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

### 3.4.2 Depth of scan and resolution

The Grad 601 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. The collection of data at 0.25m centres provides an optimum methodology for the task balancing cost and time with resolution.

### 3.4.3 Data capture

The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

## 3.5 Processing, presentation of results and interpretation

### 3.5.1 Processing

Processing is performed using specialist software known as *Geoplot 3*. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all processed gradiometer data used in this report:

1. *Despike* (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)

   *Geoplot parameters:*
   X radius = 1, y radius = 1, threshold = 3 std. dev.
   Spike replacement = mean

2. *Zero mean traverse* (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

   *Geoplot parameters:*
   Least mean square fit = off

3.5.2 Presentation of results and interpretation

The presentation of the data for each site involves a print-out of the minimally processed data both as a greyscale plot (Figure 3) and a colour plot showing extreme magnetic values (Figure 4), together with a greyscale plot of the processed data (Figure 5). Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site (Figure 6).

# 4 RESULTS

The gradiometer survey carried out at Mill Common, Huntindon, demonstrates a highly complex environment with many examples of anomalies which may be of archaeological origin. Firstly, identified in the centre of the survey area, is a complex anomaly which consists of both positive and negative magnetic responses (See Figure 6, Anomaly A). A positive linear anomaly can be seen running approximately north to south and terminates as it meets the linear earthwork which crosses the common from east to west. In association with this positive linear anomaly, eight positive area responses can be seen. These positive responses are indicative of in-filled cut features and are often associated with former ditches which may be of archaeological origin. In close proximity and similar orientation to these positive anomalies, a group of four negative area responses have been identified; negative readings indicate the presence of former earthen banks and may also be of archaeological origin. As with the positive responses, these anomalies terminate at the current earthwork, but a further four negative anomalies are seen to the south of the earthworks which may suggest a continuation of the responses. Further weak positive and negative area responses are seen in close association with this anomaly and may suggest further cut or banked features. These anomalies are seen in part in area four of the data collected during the 2005 geophysical survey, but were interpreted as possible ridge and furrow (Masters 2005).

Seen to the west of Mill Common are four linear anomalies which are identified as agricultural marks (Figure 6, Anomaly B). These responses and interpretation are consistent with anomalies found in area 1 during the 2005 survey. To the north of these anomalies, a series of linear responses are observed (Figure 6, Anomaly C), which excavation during the 2005 investigation showed to be associated to modern land drains (Mortimer 2006). However, identified within these modern linear responses, two positive curvilinear anomalies (Figure 6, AnomalyD) can be observed which are interpreted as possible in-filled cut features of archaeological origin.

Numerous discrete positive anomalies can be seen throughout the survey area but with concentrations to the north (Figure 6, Anomaly E) and south-east (Figure 6, Anomaly F). These responses are interpreted as possible pits and may be of archaeological origin. Anomaly F is very definitely in an area of Mill Common associated with late $19^{th}$ and early $20^{th}$ Century gravel extraction and is likely to represent the remains of in-filled pits and upcast spoil.

Positive linear anomalies are identified in three locations on Mill Common and are associated with in-filled cut features, possibly archaeological in origin. Firstly, a group of three positive responses which appear to form a right angle can be seen to the centre of the survey area within the depression created by the quarrying activity (Figure 6, Anomaly G). Three curvilinear responses are identified in the central region of the survey area (Figure 6, Anomaly H). A final pair of linear anomalies (Figure 6, Anomaly I) are visible towards the southern boundary of the site, the longer of the two perhaps associated with an adjacent negative response which appears to run alongside and can be seen in aerial photographs.

The gradiometer survey has identified a series of positive anomalies present to the west of the common, running approximately west to east (Figure 6, Anomaly J). The anomalies present are of different shapes and sizes but they appear to be in a loose grouping and are all interpreted as possible cut feature of archaeological origin. Further positive and negative area anomalies can be seen extending to the east and may be of archaeological origin. The interpretation of these anomalies is problematic as the location could indicate that they are an extension of Anomaly J or, as they are located within the area of earthworks, may be in part associated with quarrying activity.

Identified in the east of the common are a series of negative and positive parallel area responses which are orientated north-south and appear to be related (Figure 6, Anomaly K). The aerial photography highlights a number of earthworks present in close proximity to these anomalies and may suggest a larger scale bank and ditch feature.

A group of four positive area anomalies have been identified in the north east of the common (Figure 6, Anomaly L) and are in the area excavated in the 2005 Community Archaeology Project. These responses are interpreted as cut features of possible archaeological origin

There are five spreads of magnetic debris present. One is seen to the extreme north of the survey area, while the second is located over the known gravel/clay extraction pit in the centre of the site. The largest spread is located along the north eastern boundary and extends into the centre of the survey area. Two smaller areas of magnetic debris can be observed on the eastern side of the site.

The western side of the survey area is separated from the east by what appears to be a large modern service. This service can be seen in the data as the large linear magnetic anomaly running north-south across site with associated disturbance running parallel to it. The survey has recorded several positive anomalies with associated negative response. These are caused by ferrous objects. Where the site meets a physical boundary there has been a recorded magnetic disturbance, this can be seen flanking the survey area. Also noted in the data are three linear anomalies which have been identified as relating to the modern footpath which runs across the site.

A key objective for this survey was for Atkins Ltd to ascertain the extent of the ditch which was identified in the northeast of the site during the previous geophysical investigation carried out by PC Geophysics in July of 2005. This anomaly was subsequently excavated and a 12$^{th}$ Century ditch was exposed at a maximum depth of two and a half metres. This feature was found to be sealed beneath the medieval ridge and furrow with a finds assemblage consisting of pottery, bone and shell. The majority of the pottery sherds found have been dated from the mid 12$^{th}$ to the mid 14$^{th}$ centuries. As shown in Plate 2, the previous gradiometer survey identified two apparently distinct positive linear anomalies which have been interpreted as relating to this ditch. Our detailed gradiometer survey has not identified any linear anomalies of such a significant amplitude in this location and therefore we have not picked out any responses as possible ditches. However, as shown in Plate 3, an extremely weak positive anomaly can be identified in the same location. This response is of a similar nature to that seen throughout the site as a geological anomaly and is of such a weak amplitude that would not usually signify a cut feature, however it is possible that this is the same response as seen in the 2005 survey.

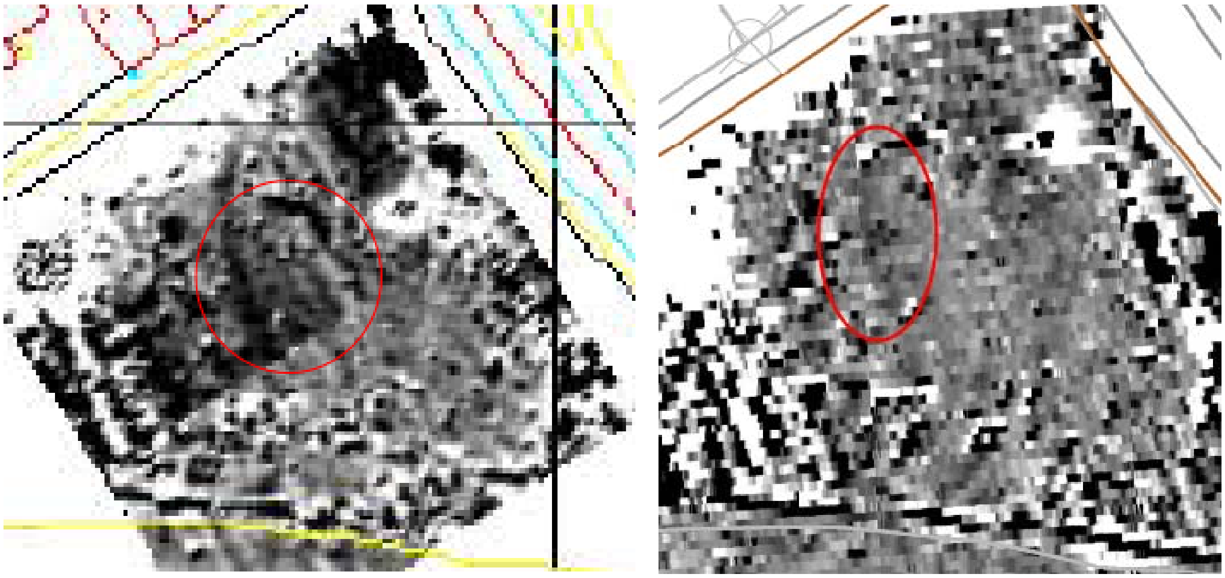

**Plate 2: Left - Gradiometer results from the 2005 survey showing two positive linear anomalies; interpreted as possible ditches. Right – Results from 2010 survey showing a possible faint anomaly.**

The linear response seen to the north of the 2005 survey which is also interpreted as a possible ditch can be identified in our data, but appears as an area anomaly rather than a linear ditch. It is possible that the differences in the data sets could be caused through the different processing methods involved. We note that the previous survey data was processed using the *Archeosurveyor v.1.3.0.7*. software and the data has been rotated into position, this process can cause an 'interpolation' effect. Interpolation enhances the data by increasing the number of points displayed and so has the effect of smoothing the data set. This processing artifact could explain the differing results.

It is noted that large amounts of burrowing activity associated with rabbits is visible on Mill Common, however, the ground disturbance caused by rabbit activity is unlikely to cause ground disturbance of a great enough amplitude to be evident within this survey. Likewise, the trenches cut during the 2005 excavations are not evident as distinct anomalies in this data.

## 5 CONCLUSION

The detailed gradiometry survey carried out in April 2010 has identified numerous complex anomalies which, when examined in conjunction with the Mill Common Community Excavations of August 2005 Report (Mortimer 2006) provides evidence to support the interpretation of the magnetic data. The two large negative area anomalies with associated positive responses in close proximity (Figure 6, Anomaly A) may indicate the presence of a bank and ditch arrangement of potential archaeological origin.

The two small curvilinear cut features in the north of the site (Figure 6, Anomaly D) may well be related to the Late Neolithic or Early Bronze Age ditches previously excavated in this area. The ridge and furrow in the west of Mill Common (Figure 6, Anomaly B) extend beyond the survey area and have been dated positively to the late $10^{th}$ and early $11^{th}$ century. The curvilinear anomalies located to the north of the site (Figure 6, Anomaly C) have been positively identified as land drains after excavation although the rigid formation of these anomalies may suggest a connection to the WW1 Royal Flying Corps camp known to be on the common. A group of positive area anomalies have been identified in the western region of the survey (Figure 6, Anomaly J) and have been interpreted as in-filled cut features of possible archaeological origin, Likewise, similar responses are noted in the north east of the site (Figure 6, Anomaly L). These anomalies are in the region of the site investigated during the 2005 excavation but although the data suggests the presence of cut features, the results are not indicative of a ditch. A group of positive and negative area anomalies are seen in the east of the site (Figure 6, Anomaly K) these appear to relate to the earthworks present on site and suggest a bank and ditch formation. Positive linear anomalies have been noted in the centre of the common and have been interpreted as possible in-filled cut features such as ditches. Numerous discrete positive anomalies are seen throughout the site and are interpreted as possible pits. The large gravel/clay extraction pit, clearly visible in the centre of the site, is also visible in the data as one of the five spreads of magnetic debris while further magnetic disturbance is evident in the results caused by modern services or field boundaries.

## 6 REFERENCES

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Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 4 Eastern England*.

British Geological Survey South Sheet, 1977. *Geological Survey Ten Mile Map, South Sheet First Edition* (*Quaternary).* Institute of Geological Sciences.

Cambridge Archaeology, Archaeology Field Unit, 2006. *Mill Common, Huntingdon, Cambridgeshire – Trench Evaluation and Community Archaeology project.*

Aerial Photography Google Earth 2010

# **APPENDIX A –** Basic principles of magnetic survey

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns and material such as brick and tile may be magnetised through the same process.

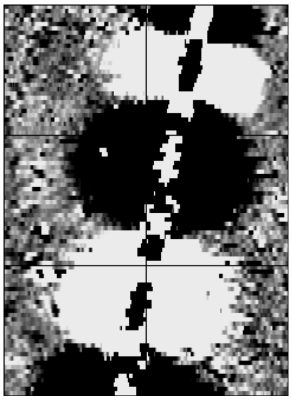
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically either 0.5 or 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

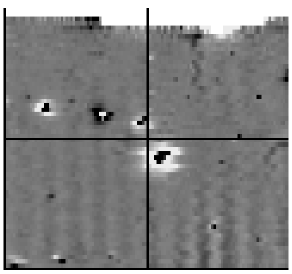
## APPENDIX B – Glossary of magnetic anomalies

### Bipolar



A bipolar anomaly is one that is composed of both a positive response and a negative response. It can be made up of any number of positive responses and negative responses. For example a pipeline consisting of alternating positive and negative anomalies is said to be bipolar. See also dipolar which has only one area of each polarity. The interpretation of the anomaly will depend on the magnitude of the magnetic field strength. A weak response may be caused by a clay field drain while a strong response will probably be caused by a metallic service.

### Dipolar

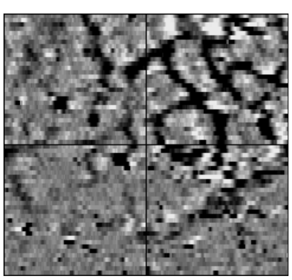


This consists of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These responses will be created by a single feature. The interpretation of the anomaly will depend on the magnitude of the magnetic measurements. A very strong anomaly is likely to be caused by a ferrous object.

### Positive anomaly with associated negative response

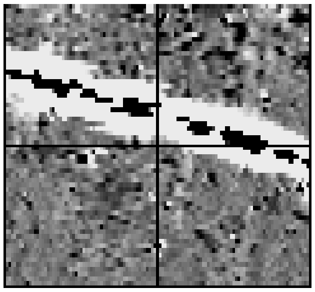
See bipolar and dipolar.

### Positive linear



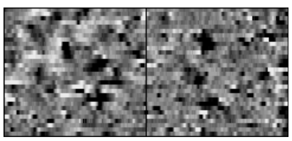
A linear response which is entirely positive in polarity. These are usually related to in-filled cut features where the fill material is magnetically enhanced compared to the surrounding matrix. They can be caused by ditches of an archaeological origin, but also former field boundaries, ploughing activity and some may even have a natural origin.

**Positive linear anomaly with associated negative response**



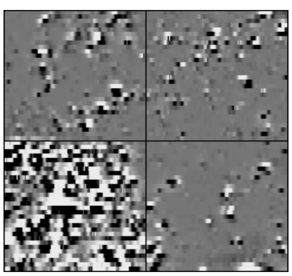
A positive linear anomaly which has a negative anomaly located adjacently. This will be caused by a single feature. In the example shown this is likely to be a single length of wire/cable probably relating to a modern service. Magnetically weaker responses may relate to earthwork style features and field boundaries.

**Positive point/area**



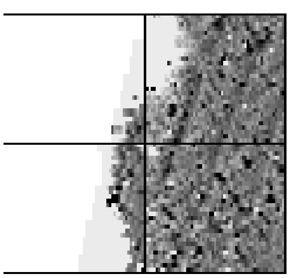
These are generally spatially small responses, perhaps covering just 3 or 4 reading nodes. They are entirely positive in polarity. Similar to positive linear anomalies they are generally caused by in-filled cut features. These include pits of an archaeological origin, possible tree bowls or other naturally occurring depressions in the ground.

**Magnetic debris**



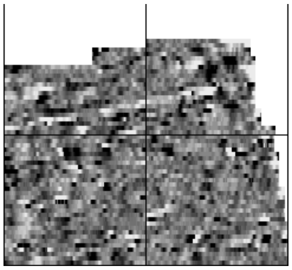
Magnetic debris consists of numerous dipolar responses spread over an area. If the amplitude of response is low (+/-3nT) then the origin is likely to represent general ground disturbance with no clear cause, it may be related to something as simple as an area of dug or mixed earth. A stronger anomaly (+/-250nT) is more indicative of a spread of ferrous debris. Moderately strong anomalies may be the result of a spread of thermoremanent material such as bricks or ash.

**Magnetic disturbance**



Magnetic disturbance is high amplitude and can be composed of either a bipolar anomaly, or a single polarity response. It is essentially associated with magnetic interference from modern ferrous structures such as fencing, vehicles or buildings, and as a result is commonly found around the perimeter of a site near to boundary fences.

**Negative linear**

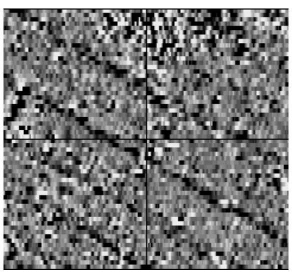


A linear response which is entirely negative in polarity. These are generally caused by earthen banks where material with a lower magnetic magnitude relative the background top soil is built up. See also ploughing activity.

**Negative point/area**

Opposite to positive point anomalies these responses may be caused by raised areas or earthen banks. These could be of an archaeological origin or may have a natural origin.

**Ploughing activity**



Ploughing activity can often be visualised by a series of parallel linear anomalies. These can be of either positive polarity or negative polarity depending on site specifics. It can be difficult to distinguish between ancient ploughing and more modern ploughing, clues such as the separation of each linear, straightness, strength of response and cross cutting relationships can be used to aid this, although none of these can be guaranteed to differentiate between different phases of activity.

**Polarity**

Term used to describe the measurement of the magnetic response. An anomaly can have a positive polarity (values above 0nT) and/or a negative polarity (values below 0nT).

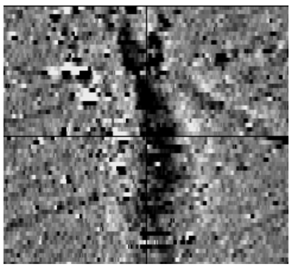
**Strength of response**

The amplitude of a magnetic response is an important factor in assigning an interpretation to a particular anomaly. For example a positive anomaly covering a $10m^2$ area may have values up to around 3000nT, in which case it is likely to be caused by modern magnetic interference. However, the same size and shaped anomaly but with values up to only 4nT may have a natural origin. Trace plots are used to show the amplitude of response.

**Thermoremanent response**

A feature which has been subject to heat may result in it acquiring a magnetic field. This can be anything up to approximately +/-100 nT in value. These features include clay fired drains, brick, bonfires, kilns, hearths and even pottery. If the heat application has occurred in situ (e.g. a kiln) then the response is likely to be bipolar compared to if the heated objects have been disturbed and moved relative to each other, in which case they are more likely to take an irregular form and may display a debris style response (e.g. ash).

**Weak background variations**



Weakly magnetic wide scale variations within the data can sometimes be seen within sites. These usually have no specific structure but can often appear curvy and sinuous in form. They are likely to be the result of natural features, such as soil creep, dried up (or seasonal) streams. They can also be caused by changes in the underlying geology or soil type which may contain unpredictable distributions of magnetic minerals, and are usually apparent in several locations across a site.