

**Land off the A46
Ashchurch
Gloucestershire**

MAGNETOMETER SURVEY REPORT

for

Linden Limited

David Sabin and Kerry Donaldson

September 2014

Ref. no. 562

ARCHAEOLOGICAL SURVEYS LTD

**Land off the A46
Ashchurch
Gloucestershire**

Magnetometer Survey Report

for

Linden Limited

Fieldwork by David Sabin
Report by David Sabin BSc (Hons) MIFA and Kerry Donaldson BSc (Hons)

Survey dates – 1st, 2nd, 3rd & 8th September 2014
Ordnance Survey Grid Reference – **SO 93679 33387**



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SUMMARY

A detailed magnetometer survey was carried out by Archaeological Surveys Limited, at the request of Linden Limited, over three fields near Ashchurch in north Gloucestershire. The results have revealed a complex series of linear and rectilinear ditches and enclosures, ring ditches and pits in the north western part of the site (Area 2), showing several phases of development, that relate to a settlement likely to date from the Iron Age and Roman periods. The archaeological features do not appear to extend eastwards and southwards into Areas 1 and 3, but these parts of the site do contain a small number of short and weakly positive linear anomalies of uncertain origin. There is evidence for former ridge and furrow, which has truncated many of the archaeological features. Along the southern edge of the site are several anomalies that relate to former channels of the Tirlle Brook.

1 INTRODUCTION

1.1 *Survey background*

1.1.1 Archaeological Surveys Ltd was commissioned by Linden Limited, trading as Linden Homes Western, to undertake a magnetometer survey of an area of land at Ashchurch, Gloucestershire. The site has been outlined for a proposed residential development and the survey forms part of an archaeological assessment of the site.

1.2 *Survey objectives and techniques*

1.2.1 The objective of the survey was to use magnetometry to locate geophysical anomalies that may be archaeological in origin so that they may be assessed prior to development of the site. The methodology is considered an efficient and effective approach to archaeological prospection.

1.2.2 The survey and report generally follow the recommendations set out by: English Heritage (2008) *Geophysical survey in archaeological field evaluation*; and Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations*. The work has been carried out to the Institute for Archaeologists (2011) *Standard and Guidance for Archaeological Geophysical Survey*.

1.3 *Site location, description and survey conditions*

1.3.1 The site is located at Ashchurch, 4km east of Tewkesbury in the northern part of Gloucestershire. It is centred on Ordnance Survey National Grid Reference (OS NGR) SO 93679 33387, see Figures 01 and 02.

- 1.3.2 The geophysical survey covers approximately 12ha within three separate land parcels. Area 1 forms the north eastern part of the site and contained stubble with some small ploughed zones at the time of survey. Area 2 forms the north western part of the site and cultivation was being carried out during data collection. Area 3 is a small field of pasture forming the south western part of the site.
- 1.3.3 The ground conditions across the site were variable with mainly good conditions in Area 1, very poor conditions in Area 2 due to ploughing and uneven surface conditions in Area 3. Weather conditions during the survey were mainly fine.

1.4 *Site history and archaeological potential*

- 1.4.1 An Archaeological Desk-Based Assessment has been carried out for the site by Avon Archaeology Ltd (2014). It outlines that the site does not contain any designated or undesignated heritage assets, with the exception of a possible MOD water tower close to the southern boundary. However, there are a number of Iron Age and Romano-British farmsteads and settlements that have been located through geophysical survey and archaeological evaluation within a 1km radius, and particularly to the west of the site. There is some conjecture that the A46 that bounds the northern edge of site may relate to a Roman road. The site appears to have been in agricultural use since at least the medieval period, and there is evidence for several former land divisions and former courses of the Tirl Brook along the southern edge.
- 1.4.2 The surface conditions within the site were mainly unsuitable for the observation of cultural material during the course of the survey. A single sherd of Romano-British pottery was noted within the eastern part of Area 2, although in general the soil surface in this area was not visible due to shredded field beans.

1.5 *Geology and soils*

- 1.5.1 The underlying geology is Charmouth mudstone with overlying sand and gravel deposits from the Wasperton sand and gravel member along the northern edge of the site and alluvial deposits of clay, silt, sand and gravel within the southern part of the site (BGS, 2014).
- 1.5.2 The overlying soil across the site is from the Evesham 2 association and is a typical calcareous pelosol. It consists of a slowly permeable, calcareous, clayey soil (Soil Survey of England and Wales, 1983).
- 1.5.3 Magnetometry carried out over similar geology and soil has produced good results. The site is, therefore, considered suitable for magnetic survey.

2 METHODOLOGY

2.1 *Technical synopsis*

- 2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance are factors associated with the formation of localised fields. Additional details are set out below and within Appendix A.
- 2.1.2 Iron minerals within the soil may become altered by burning and the break down of biological material; effectively the magnetic susceptibility of the soil is increased, and the iron minerals become magnetic in the presence of the Earth's magnetic field. Accumulations of magnetically enhanced soils within features, such as pits and ditches, may produce magnetic anomalies that can be mapped by magnetic prospection.
- 2.1.3 Magnetic thermoremnance can occur when ferrous minerals have been heated to high temperatures such as in a kiln, hearth, oven etc. On cooling, a permanent magnetisation may be acquired due to the presence of the Earth's magnetic field. Certain natural processes associated with the formation of some igneous and metamorphic rock may also result in magnetic thermoremnance.
- 2.1.4 The localised variations in magnetism are measured as sub-units of the Tesla, which is a SI unit of magnetic flux density. These sub-units are nano Teslas (nT), which are equivalent to 10^{-9} Tesla (T).

2.2 *Equipment configuration, data collection and survey detail*

- 2.2.1 The detailed magnetic survey was carried out using a SENSYS MAGNETO®MXPDA 5 channel cart-based system. The instrument has 5 fluxgate gradiometers spaced 0.5m apart with readings recorded at 20 Hz. The gradiometers have a range of recording data between 0.1nT and 10,000nT. They are linked to a Leica GS10 RTK GPS with data recorded by SENSYS MAGNETO®MXPDA software on a rugged PDA computer system.
- 2.2.2 Data are collected along a series of parallel survey transects wherever possible. The length of each transect is variable and relates to the size of the survey area and other factors including ground conditions. A visual display allows accurate placing of transects and helps maintain the correct separation between adjacent traverses.

2.3 *Data processing and presentation*

- 2.3.1 Magnetic data collected by the MAGNETO®MXPDA cart-based system are initially prepared using SENSYS MAGNETO®DLMGPS software. Georeferenced data are then exported in ASCII format for compensation (destriping), interpolation and clipping using TerraSurveyor. Greyscale images are also produced using TerraSurveyor.

- 2.3.2 Appendix C contains specific information concerning the survey and data attributes and is derived directly from TerraSurveyor; this should be used in conjunction with information provided by Figure 02.
- 2.3.3 Only minimal processing is carried out in order to enhance the results of the survey for display. Raw data are always analysed, as processing can modify anomalies. The following schedule sets out the data and image processing used in this survey for the SENSYS MAGNETO data:
- clipping of processed data at $\pm 10\text{nT}$ to enhance low magnitude anomalies,
 - zero median traverse is applied in order to balance readings along each traverse.
- 2.3.4 An abstraction and interpretation is offered for all geophysical anomalies located by the survey. A brief summary of each anomaly, with an appropriate reference number, is set out in list form within the results (Section 3) to allow a rapid and objective assessment of features within each survey area.
- 2.3.5 Reference should be made to Appendix B for further information on the specific processes carried out on the data. Appendix C metadata includes details on the processing sequence used for each survey area.
- 2.3.6 The main form of data display prepared for this report is the 'processed' greyscale plot followed by an abstraction and interpretation plot. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing.
- 2.3.7 Data captured with the SENSYS MAGNETO cart-based system are resampled to a resolution of effectively 0.5m between tracks and 0.15m along each survey track. A TIFF file (OSGB36) is produced by TerraSurveyor software along with an associated world file (.TFW) that allows automatic georeferencing when using GIS or CAD software.
- 2.3.8 The raster images are combined with base mapping using ProgeCAD Professional 2014 and AutoCAD LT 2007, creating DWG file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. Quality can be compromised by rotation of graphics in order to allow the data to be orientated with respect to grid north; this is considered acceptable as the survey results are effectively georeferenced allowing relocation of features using GPS, resection method, etc.
- 2.3.9 A digital archive is produced with this report, see Appendix D below. The main archive is held at the offices of Archaeological Surveys Ltd.

3 RESULTS

3.1 General assessment of survey results






- 3.1.1 The detailed magnetic survey was carried out over a total of three survey areas covering approximately 12ha.
- 3.1.2 Magnetic anomalies located can be generally classified as positive linear and discrete positive responses of archaeological potential, positive anomalies of an uncertain origin, anomalies relating to land management, linear anomalies of an agricultural origin, anomalies with a natural origin, areas of magnetic debris and disturbance, strong discrete dipolar anomalies relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried services or pipelines. Anomalies located within each survey area have been numbered and are described below.

3.2 Statement of data quality

- 3.2.1 Data are considered representative of the magnetic anomalies present within the site. Localised magnetic disturbance along the northern part of the site has been caused by heavy traffic, particularly lorries, on the A46 and underground services. Some disturbance is also associated with a steel bridge crossing the Tirl Brook immediately south of the site.
- 3.2.2 Very rough ground conditions were encountered within Area 2 although this does not appear to have significantly affected the dataset.

3.3 Data interpretation

- 3.3.1 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the survey. A basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, a basic key is indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files (.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading CAD layer names and plot colour	Description and origin of anomalies
<p>Anomalies with archaeological potential</p> <p>AS-ABST MAG POS LINEAR ARCHAEOLOGY </p> <p>AS-ABST MAG POS DISCRETE ARCHAEOLOGY </p> <p>AS-ABST MAG POS ARCHAEOLOGY </p>	<p>Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc..</p>
<p>Anomalies with an uncertain origin</p> <p>AS-ABST MAG POS LINEAR UNCERTAIN </p> <p>AS-ABST MAG POS DISCRETE UNCERTAIN </p>	<p>The category applies to a range of anomalies where <u>there is not enough evidence to confidently suggest an origin</u>. Anomalies in this category <u>may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should</u></p>








		<u>be considered</u> . Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning may also produce positive anomalies.
Anomalies relating to land management		Anomalies are mainly linear and may be indicative of the magnetically enhanced fill of cut features (i.e. ditches). The anomalies may be long and/or form rectilinear elements and they may relate to topographic features or be visible on early mapping.
AS-ABST MAG BOUNDARY		
Anomalies with an agricultural origin		The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. Where the response is narrow it is often related to modern ploughing. A broad response, often with a reversed "S" shape may indicate former ridge and furrow. The response can be positive and/or negative, and can relate at times to either the ridge or furrow.
AS-ABST MAG AGRICULTURAL		
AS-ABST MAG RIDGE AND FURROW (POSITIVE)		
AS-ABST MAG RIDGE AND FURROW (NEGATIVE)		
Anomalies with a natural origin		Naturally formed magnetic anomalies are caused by localised variability in the magnetic susceptibility of soils, subsoils and other drift or solid geologies. Anomalies may be amorphous, linear or curvilinear and may appear 'fluvial' or discrete; the latter are <u>almost impossible to distinguished from pit-like anomalies with an anthropogenic origin</u> . Fluvial, glacial and periglacial processes may be responsible for their formation within drift material and subsoil. Igneous and metamorphic activity can lead to anomalies within more solid geology.
AS-ABST MAG NATURAL FEATURES		
Anomalies associated with magnetic debris		Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. It often occurs where there has been dumping or ground make-up and is related to magnetically thermoremnant materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, or hearths and <u>may therefore be archaeologically significant</u> . It is also possible that the response may be caused by natural material such as certain gravels and fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
AS-ABST MAG DEBRIS		
AS-ABST MAG STRONG DIPOLAR		
Anomalies with a modern origin		The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc.. Often a significant area around such features has a strong magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are present. Fluxgate sensors may respond erratically and with hysteresis adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.
AS-ABST MAG DISTURBANCE		
AS-ABST MAG SERVICE		

Table 1: List and description of interpretation categories

3.4 List of anomalies - Area 1

Area centred on OS NGR 393832 233468, see Figures 03 – 06.

Anomalies with an uncertain origin

(1) – A very weakly positive linear anomaly appears to extend eastwards from the

western edge of the survey area. The weak (<1nT) and short response prevents confident interpretation of the anomaly; however, given the proximity to anomalies with an archaeological origin (19) in Area 2 to the west, this may indicate that it relates to a cut, ditch-like feature.

(2) – A short positive linear anomaly appears to extend northwards from the eastern end of anomaly (1). It is not possible to determine if this relates to a cut feature, or if it is associated with the former ridge and furrow.

(3) – The survey area contains a small number of weakly positive linear anomalies that lack a coherent morphology. It is not possible to determine if they relate to cut, ditch-like features.

(4) - Located towards the eastern edge of the survey area is a discrete positive anomaly. It has a response of up to 22nT, which is moderately strong and similar to those seen within anomaly (13). It is not possible to determine if this relates to a cut, pit-like feature, or to material with some ferrous or magnetically thermoremanent content.

Anomalies associated with land management

(5) – Extending south eastwards from the northern field boundary is a weakly positive linear anomaly. This appears to relate to a former mapped field boundary.

Anomalies with an agricultural origin

(6) – The survey area contains evidence for former ridge and furrow cultivation in the form of broad, weakly positive linear responses oriented north north west to south south east.

(7) - Extending along the length of the survey area are a series of parallel linear anomalies relating to a more modern cultivation trend.

Anomalies with a natural origin

(8) – Located along the southern edge of the survey area are a number of magnetically variable anomalies that are a response to the former meanders of the Tirlle Brook before it was canalised in the early 19th century.

Anomalies associated with magnetic debris

(9) – A patch of magnetic debris is located at the southern edge of anomaly (5) and may relate to material associated with ground consolidation, but this is uncertain.

(10) – A small patch of weakly magnetic debris is located in the south eastern part of the survey area. The strength of the response may indicate an association with magnetically thermoremanent material rather than ferrous material.

(11) – The survey area contains widespread and numerous strong, discrete, dipolar

anomalies which are a response to ferrous and other magnetically thermoremanent objects within the topsoil. All the survey areas contain such responses.

Anomalies with a modern origin

(12) – Magnetic disturbance is evident along the northern and eastern edges of the survey area and is a response to ferrous fencing material, services and passing vehicles along the A46.

(13) – A linear series of positive responses relates to a buried service or pipe.

3.5 *List of anomalies - Area 2*

Area centred on OS NGR 393487 233325, see Figures 03, 04, 07 & 08.

Anomalies with an archaeological origin

(14) – A complex series of ditches, enclosures, ring ditches and pits relate to a settlement likely to date to the Iron Age and Roman periods. This is formed from a series of positive discrete (18), curvilinear (16), linear and rectilinear (17 & 19) anomalies displaying evidence of several phases. The anomalies have a response of between 2nT and 15nT indicating that they relate to cut features with an enhanced fill generally indicative of long term settlement. These have been subsequently truncated by ridge and furrow (21 & 22), likely to date from the medieval period.

(15) – A number of positive curvilinear anomalies are located within the confines of (14) and appear to relate to ring ditches with dimensions of between 9m and 10m, which may indicate Iron Age occupation of the site. Other larger curvilinear anomalies are also evident, which appear to relate to larger enclosures. These have been cut by subsequent linear ditches and enclosures (17).

(16) – A large number of positive linear and rectilinear anomalies relating to enclosure ditches, subsequently cut by anomalies (17).

(17) – A series of positive linear and rectilinear anomalies oriented north to south and east to west relate to internal and external linear ditches and enclosures. These cut through earlier curvilinear (15), linear and rectilinear anomalies (16).

(18) – A number of discrete positive responses relate to pits. Many are over 2m in diameter and are contained within the small enclosures (16) and ring ditches (15).

(19) – Positive linear anomalies relating to linear and rectilinear ditches that appear to define the majority of archaeological responses. They extend as linear anomalies eastwards and northwards and many can be seen as discontinuous linear anomalies. These have been truncated by later ridge and furrow (20 & 21).

Anomalies with an agricultural origin

(20 & 21) – A series of parallel linear anomalies can be seen within the survey area. They are a combination of positive (20) and negative (21) responses. This may relate to a positive response within the former ridge and a negative response to the former furrow, or a mixture of both. The ridge and furrow can be clearly seen to truncate the earlier archaeological features (14).

Anomalies associated with magnetic debris

(22) – Several small patches of magnetic debris may be associated with the location of a former mapped field boundary.

(23) – Two patches of strongly magnetic debris are located along the southern edge of the survey area and may relate to dumped magnetically thermoremanent material.

Anomalies with a modern origin

(24) – A series of positive responses relate to a buried service or pipeline that extends south westwards across the entire survey area from Area 1 to the east.

3.6 *List of anomalies - Area 3*

Area centred on OS NGR 393455 233192, see Figures 03, 04, 07 & 08.

Anomalies with an uncertain origin

(25) – Extending southwards from close to the northern edge of the survey appear to be two very weakly positive linear anomalies. Their weak response (<1nT) means that they are very indistinct and it is not possible to determine their origin.

(26) – A positive slightly curvilinear anomaly may relate to a former field boundary or former fluvial feature.

(27) – The survey area contains a number of short, very weakly positive linear anomalies. This part of the site has been subject to alluvial deposition, both naturally and through dredging and the origin of these anomalies cannot be determined.

(28) – A number of discrete positive responses have been located. It is not possible to determine if they relate to anthropogenic or naturally formed features.

Anomalies with a natural origin

(29) – The survey area contains a number of curvilinear anomalies that relate to former channels of the Tirlle Brook, which was canalised during the early 19th century and now lies immediately south of the survey area.

Anomalies associated with magnetic debris

(30) – Magnetic debris is located adjacent to the southern and eastern edges of the site and is a response to material dredged out of the Tirlle Brook.

Anomalies with a modern origin

(31) – A series of strong, discrete dipolar anomalies has resulted in strong magnetic disturbance. This type of response can often relate to a buried service or pipeline; however, the arrangement of the dipolar anomalies is not linear, and it may be that it relates to a former, relatively modern boundary feature, although none has been mapped in this position at any time from the early 19th century onwards.

4 CONCLUSION

- 4.1.1 The detailed magnetometer survey located a series of positive linear, rectilinear, curvilinear and discrete anomalies in the north western part of the site (Area 2). These relate to a complex of linear ditches, enclosure ditches, ring ditches and pits that reveal several phases of construction and occupation. The inclusion of several ring ditches and other enclosures could indicate a settlement that dates from the Iron Age, with subsequent overlying linear ditches and enclosure ditches that suggest several phases and a continuation as a Romano-British settlement.
- 4.1.2 The main core of the settlement, although showing several phases of construction and occupation, is generally well contained within approximately 1.5ha. However, linear ditches extend eastward from the north eastern corner of the settlement complex and also to the north of it, covering at least another 1ha.
- 4.1.3 Across much of the site there is evidence for former ridge and furrow and this has truncated the archaeological anomalies so that many appear as discontinuous linear features. It is not clear if any of the archaeological features extend eastwards into Area 1, although there are a small number of short and very weakly positive linear anomalies in this part of the site.

5 REFERENCES

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Appendix A – basic principles of magnetic survey

Iron minerals are always present to some degree within the topsoil and enhancement associated with human activity is related to increases in the level of magnetic susceptibility and thermoremanent material.

Magnetic susceptibility is an induced magnetism within a material when it is in the presence of a magnetic field. This can be thought of as effectively permanent due to the presence of the Earth's magnetic field.

Thermoremanent magnetism occurs when ferrous material is heated beyond a specific temperature known as the Curie Point. Demagnetisation occurs at this temperature with re-magnetisation by the Earth's magnetic field upon cooling.

Enhancement of magnetic susceptibility can occur in areas subject to burning and complex fermentation processes on biological material; these are frequently associated with human settlement. Thermoremanent features include ovens, hearths, and kilns. In addition thermoremanent material such as tile and brick may also be associated with human activity and settlement.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil can create an area of enhancement compared with surrounding soils and subsoils into which the feature is cut. Mapping enhanced areas will produce linear and discrete anomalies allowing an assessment and characterisation of hidden subsurface features.

It should be noted that areas of negative enhancement can be produced from material having lower magnetic properties compared to the topsoil. This is common for many sedimentary bedrocks and subsoils which were often used in the construction of banks and walls etc. Mapping these 'negative' anomalies may also reveal archaeological features.

Magnetic survey or magnetometry can be carried out using a fluxgate gradiometer and may be referred to as gradiometry. The SENSYS gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 65cm apart. The instrument is carried about 10-20cm above the ground surface and the upper sensor measures the Earth's magnetic field as does the lower sensor but this is influenced to a greater degree by any localised buried field. The difference between the two sensors will relate to the strength the magnetic field created by the buried feature. If no enhanced feature is present the field measured by both sensors will be similar and the difference close to zero.

There are a number of factors that may affect the magnetic survey and these include soil type, local geology and previous human activity. Situations arise where magnetic disturbance associated with modern services, metal fencing, dumped waste material etc., obscures low magnitude fields associated with archaeological features.

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. It has been found that clipping data to ranges between $\pm 15\text{nT}$ and $\pm 10\text{nT}$ often improves the appearance of features associated with archaeology. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Zero Median/Mean Traverse

The median (or mean) of each traverse is calculated ignoring data outside a threshold value, the median (or mean) is then subtracted from the traverse. The process is used to equalise slight differences between the set-up and stability of gradiometer sensors and can remove striping. The process can remove archaeological features that run along a traverse so data analysis is also carried out prior its application.

High Pass Filtering

A mathematical process used to remove low frequency anomalies relating to survey tracks and modern agricultural features.

Appendix C – survey and data information

Area 1

COMPOSITE

Filename: J562-Area1-proc.xcp
 Description: Imported as Composite from: J562-Area1.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y):
 Northwest corner: 393643.332313845, 233622.542861068 m
 Southeast corner: 394026.432313845, 233322.992861068 m
 Direction of 1st Traverse: 90 deg
 Collection Method: Parallel
 Sensors: 1
 Dummy Value: 32702

Source GPS Points: 1740000

Dimensions

Composite Size (readings): 2554 x 1997
 Survey Size (meters): 383 m x 300 m
 Grid Size: 383 m x 300 m
 X Interval: 0.15 m
 Y Interval: 0.15 m

Stats

Max: 10.00
 Min: -10.00
 Std Dev: 3.34
 Mean: 0.00
 Median: -0.20
 Composite Area: 11.476 ha
 Surveyed Area: 5.2233 ha

Processes: 3

- 1 Base Layer
- 2 Clip from -20.00 to 20.00 nT
- 3 Clip from -10.00 to 10.00 nT

GPS based Proce2

- 1 Base Layer.
- 2 Unit Conversion Layer (Lat/Long to OSGB36).

Area 2

COMPOSITE

Filename: J562-mag-Area2-proc.xcp
 Description: Imported as Composite from: J562-mag-Area2.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y):
 Northwest corner: 393313.116243081, 233443.448802482 m
 Southeast corner: 393653.166243081, 233207.348802482 m
 Direction of 1st Traverse: 90 deg
 Collection Method: Parallel
 Sensors: 1
 Dummy Value: 32702

Source GPS Points: 1723800

Dimensions

Composite Size (readings): 2267 x 1574
 Survey Size (meters): 340 m x 236 m
 Grid Size: 340 m x 236 m
 X Interval: 0.15 m
 Y Interval: 0.15 m

Stats

Max: 10.00
 Min: -10.00
 Std Dev: 5.15
 Mean: 0.16
 Median: 0.06
 Composite Area: 8.0286 ha
 Surveyed Area: 4.8251 ha

Processes: 3

- 1 Base Layer
- 2 Clip from -20.00 to 20.00 nT
- 3 Clip from -10.00 to 10.00 nT

GPS based Proce3

- 1 Base Layer.
- 2 Unit Conversion Layer (Lat/Long to OSGB36).
- 3 High pass Uniform (median) filter: Window dia: 300

Area 3

COMPOSITE

Filename: J562-mag-Area3-proc.xcp
 Description: Imported as Composite from: J562-mag-Area3.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y):
 Northwest corner: 393352.168831609, 233267.801618226 m
 Southeast corner: 393548.668831609, 233120.351618226 m
 Direction of 1st Traverse: 90 deg
 Collection Method: Parallel
 Sensors: 1
 Dummy Value: 32702

Source GPS Points: 471000

Dimensions

Composite Size (readings): 1310 x 983
 Survey Size (meters): 197 m x 147 m
 Grid Size: 197 m x 147 m
 X Interval: 0.15 m
 Y Interval: 0.15 m

Stats

Max: 10.00
 Min: -10.00
 Std Dev: 4.83
 Mean: -0.02
 Median: 0.04
 Composite Area: 2.8974 ha
 Surveyed Area: 1.3361 ha

Processes: 4

- 1 Base Layer
- 2 Clip from -40.00 to 40.00 nT
- 3 Clip from -20.00 to 20.00 nT
- 4 Clip from -10.00 to 10.00 nT

GPS based Proce3

- 1 Base Layer.
- 2 Unit Conversion Layer (Lat/Long to OSGB36).
- 3 High pass Uniform (median) filter: Window dia: 303

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their offices in Wiltshire (see inside cover for address). Data are backed-up onto an on-site data storage drive and at the earliest opportunity data are copied to CD ROM for storage on-site and off-site.

Where requested, surveys are reported on in hardcopy (recycled paper) using A4 for text and A3 for plots (all plots are scaled for A3). A digital copy of the report will be provided to the Gloucestershire County Archaeology Service together with a dxf of the survey location for the Gloucestershire Historic Environment Service.

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This report has been prepared using the following software on a Windows XP platform:

- TerraSurveyor version 3.0.23.0 (geophysical data analysis),
- SENSYS MAGNETO@ARCH version 1.00-04(geophysical data analysis),
- ProgeCAD Professional 2014 (report graphics),
- AutoCAD LT 2007 (report figures),
- OpenOffice.org 3.0.1 Writer (document text),
- PDF Creator version 0.9 (PDF archive).

Digital data produced by the survey and report include the following files:

- TerraSurveyor grid and composite files for all geophysical data,
- CSV files for raw and processed composites,
- geophysical composite file graphics as Bitmap images,
- AutoCAD DWG files in 2000 and 2007 versions,
- report text as OpenOffice.org ODT file,
- report text as Word 2000 doc file,
- report text as PDF,
- PDFs of all figures.

**Geophysical Survey
Land off the A46
Ashchurch
Gloucestershire**

Map of survey area

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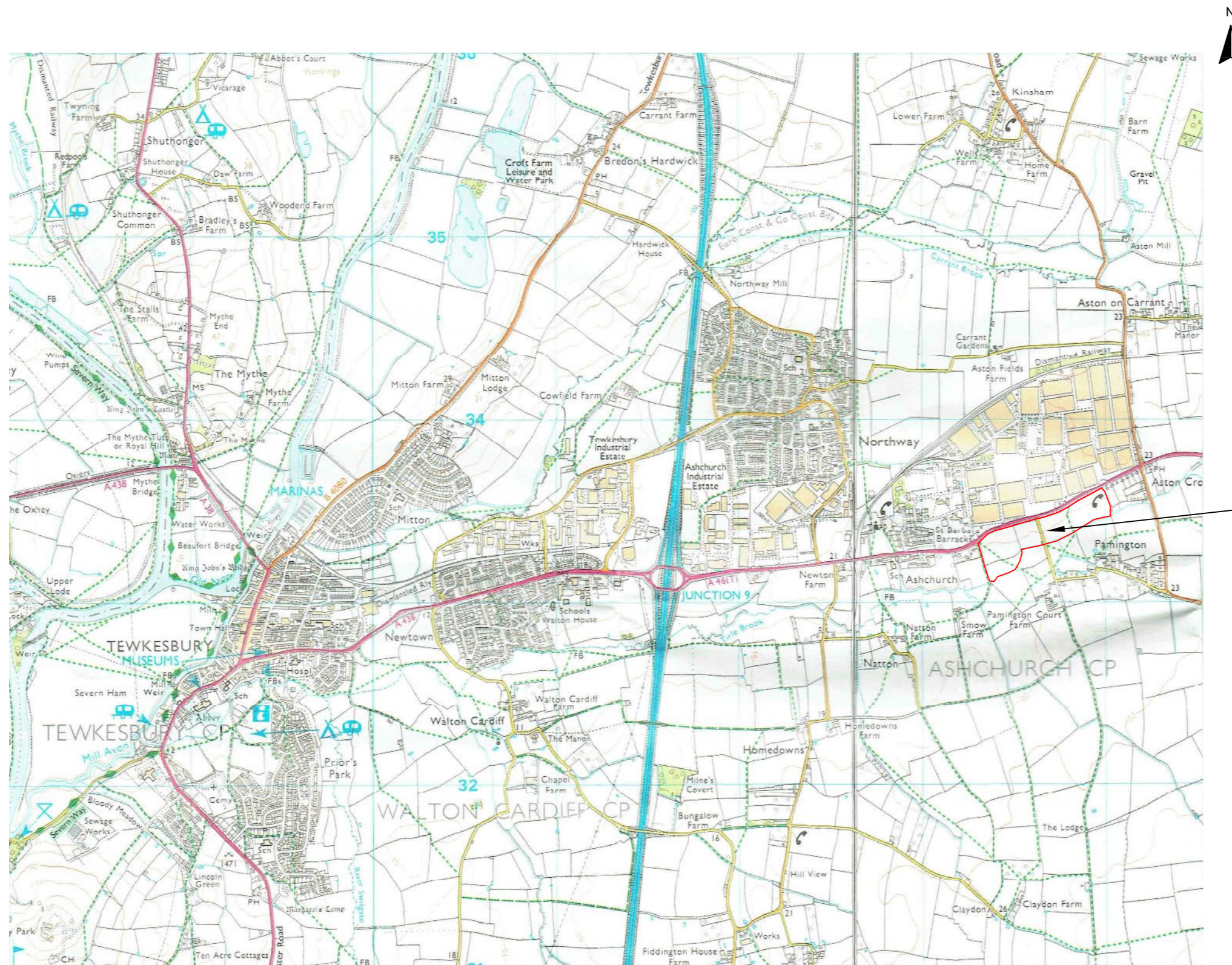
● Survey location

Site centred on OS NGR
SO 93679 33387

SCALE 1:25 000



SCALE TRUE AT A3



Survey location

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Land off the A46
Ashchurch
Gloucestershire**

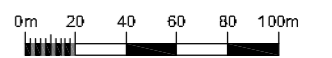
Referencing information

Referencing grid to OSGB36 datum at 50m intervals

Data collected at 20Hz and georeferenced to ETRS89 zone 30 with conversion to OSGB36 using OSTN02

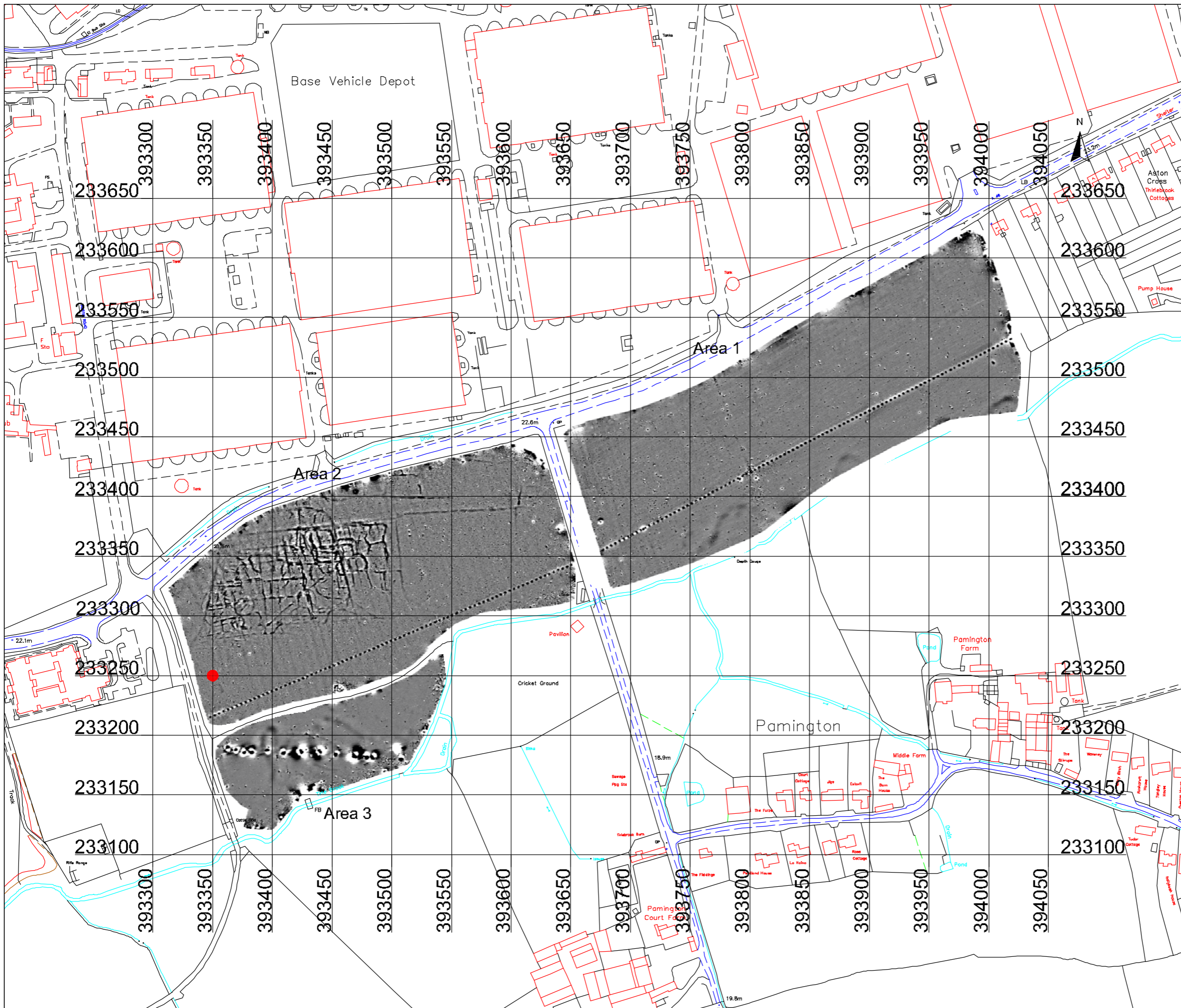
● 393350 233250

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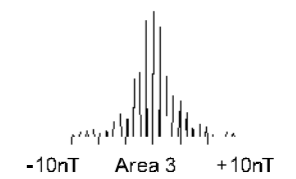
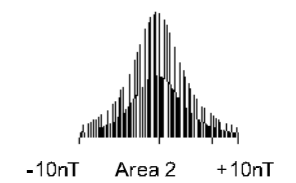
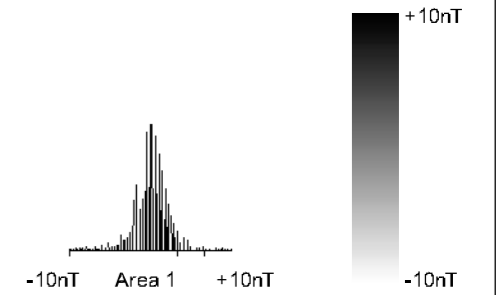
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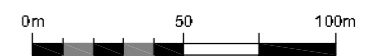


**Geophysical Survey
Land off the A46
Ashchurch
Gloucestershire**

**Greyscale plot of processed
magnetometer data**



SCALE 1:2500
















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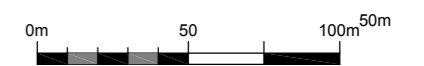
FIG 03

Geophysical Survey Land off the A46 Ashchurch Gloucestershire

Abstraction and interpretation of magnetometer anomalies

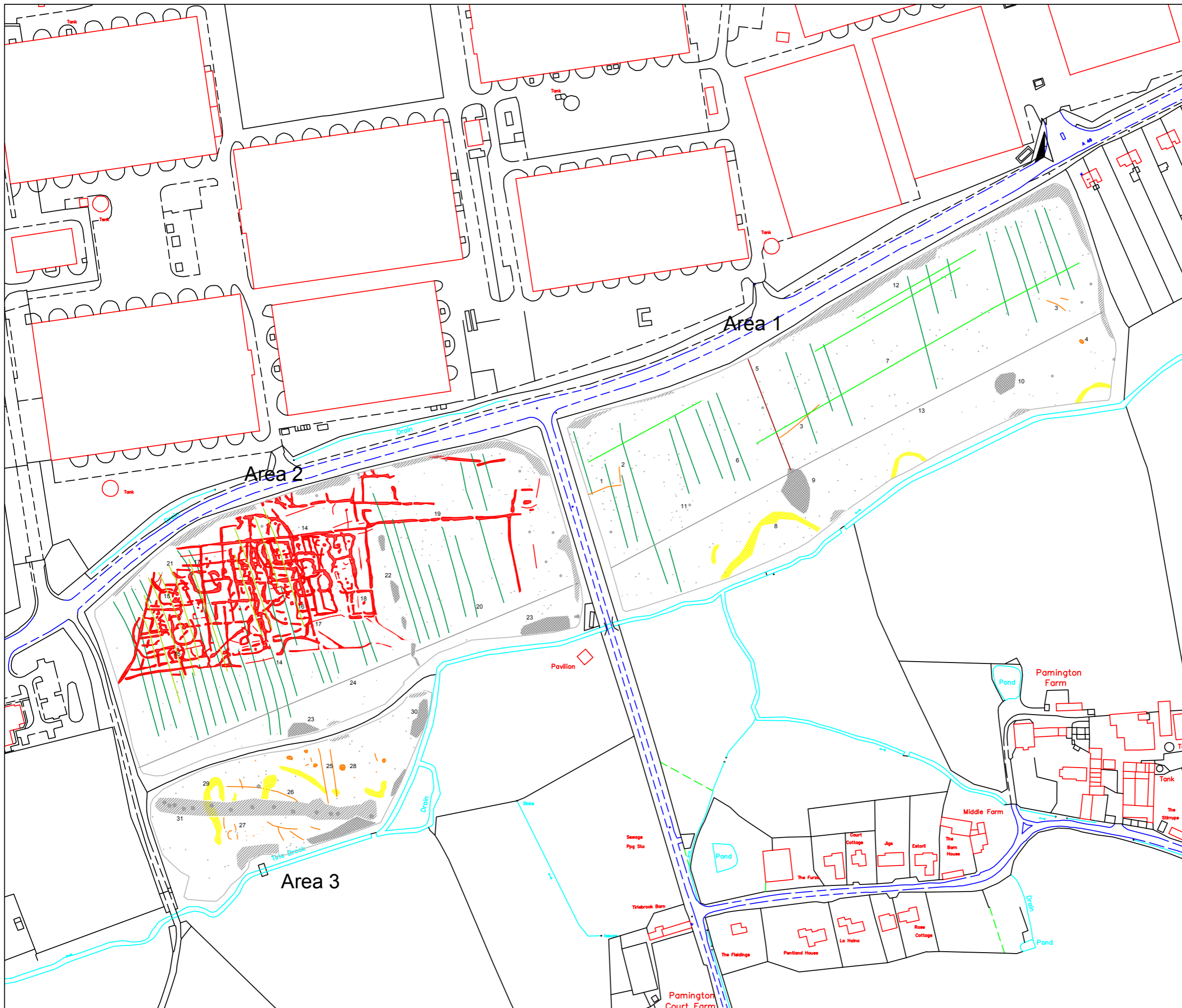
-  Positive linear anomaly - cut feature of archaeological potential
-  Positive linear anomaly - possible ditch-like feature
-  Positive linear anomaly - ridge and furrow
-  Negative linear anomaly - ridge and furrow
-  Linear anomaly - modern cultivation trend
-  Positive linear anomaly - possible former field boundary
-  Discrete positive response - cut feature of archaeological potential
-  Discrete positive response - possible pit-like feature
-  Variable magnetic response - of natural origin
-  Magnetic debris - spread of magnetically thermoremanent/ferrous material
-  Magnetic disturbance from ferrous material
-  Strong multiple dipolar linear anomaly - pipeline / cable / service
-  Strong dipolar anomaly - ferrous object

SCALE 1:2500



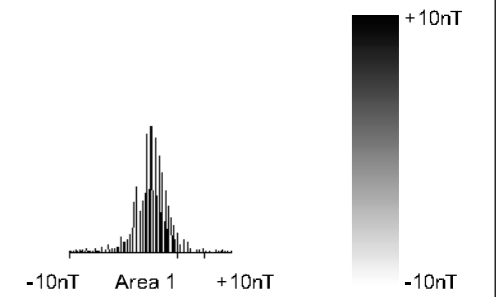
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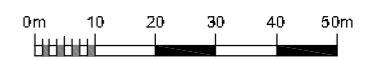


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Land off the A46
Ashchurch
Gloucestershire**

**Greyscale plot of processed
magnetometer data - Area 1**



SCALE 1:1250

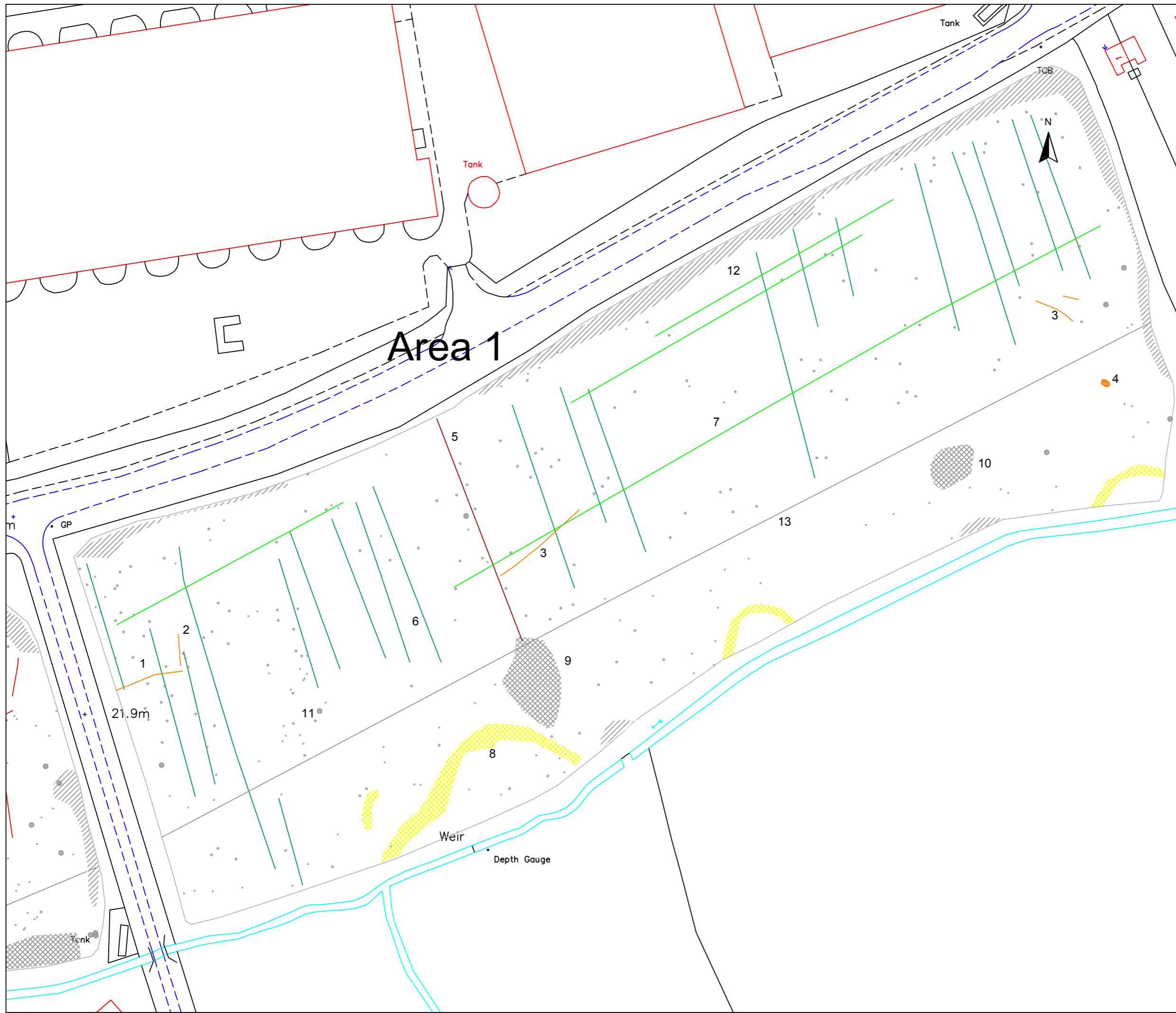












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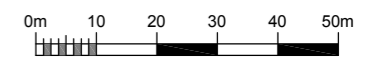
**Geophysical Survey
Land off the A46
Ashchurch
Gloucestershire**

**Abstraction and interpretation of
magnetometer anomalies -
Area 1**



-  Positive linear anomaly - possible ditch-like feature
-  Linear anomaly - ridge and furrow
-  Linear anomaly - modern cultivation trend
-  Positive linear anomaly - possible former field boundary
-  Discrete positive response - possible pit-like feature
-  Variable magnetic response - former fluvia channel
-  Magnetic debris - spread of magnetically thermoremnant/ferrous material
-  Magnetic disturbance from ferrous materia
-  Strong multiple dipolar linear anomaly - pipeline / cable / service
-  Strong dipolar anomaly - ferrous object

SCALE 1:1250

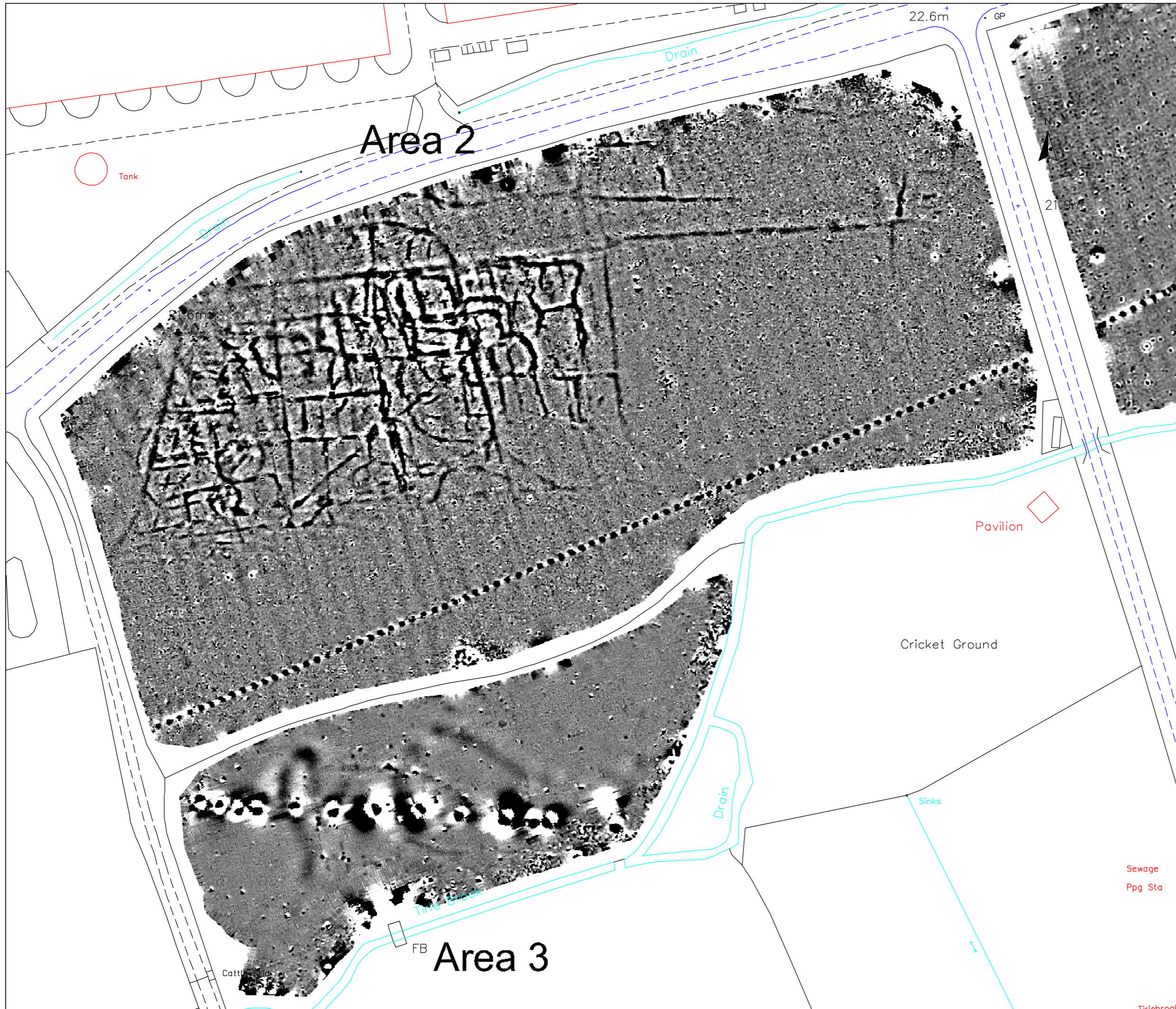
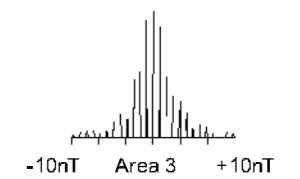
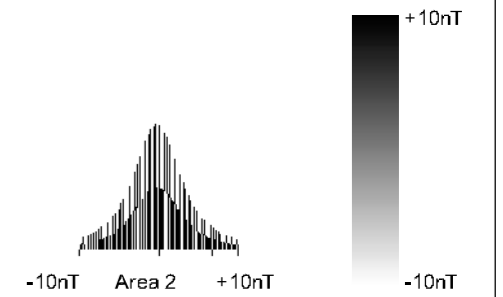


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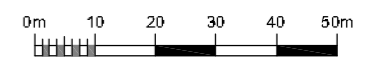
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**Greyscale plot of processed
magnetometer data - Areas 2 & 3**



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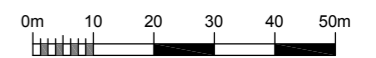
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**Abstraction and interpretation of
magnetometer anomalies -
Areas 2 & 3**

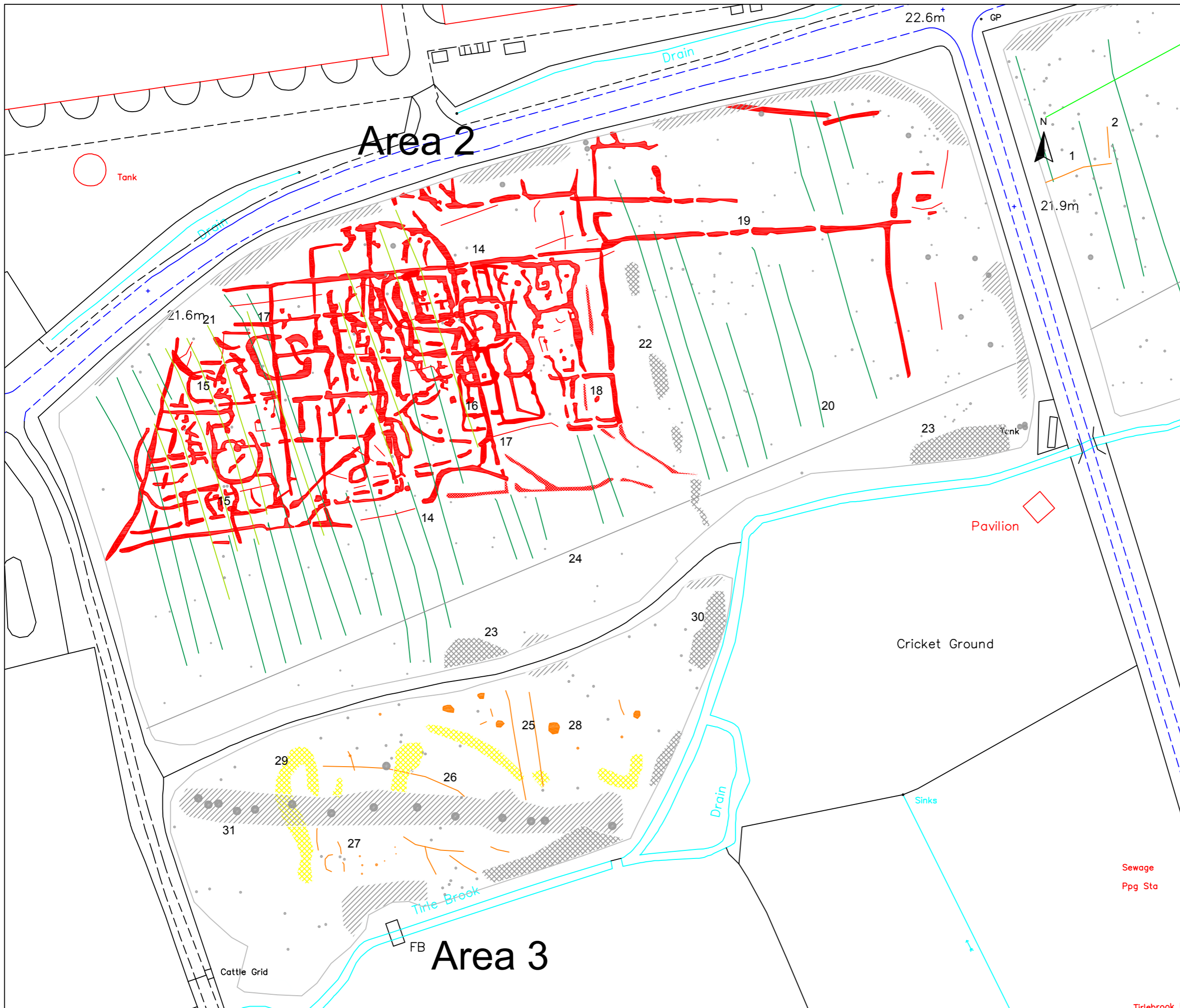
-  Positive linear anomaly - cut feature of archaeological potential
-  Positive linear anomaly - possible ditch-like feature
-  Positive linear anomaly - ridge and furrow
-  Negative linear anomaly - ridge and furrow
-  Positive linear anomaly - possible former field boundary
-  Discrete positive response - cut feature of archaeological potential
-  Discrete positive response - possible pit-like feature
-  Variable magnetic response - of natural origin
-  Magnetic debris - spread of magnetically thermoremnant/ferrous material
-  Magnetic disturbance from ferrous material
-  Strong multiple dipolar linear anomaly - pipeline / cable / service
-  Strong dipolar anomaly - ferrous object

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Sewage
Ppg Sta

Tirebrook B