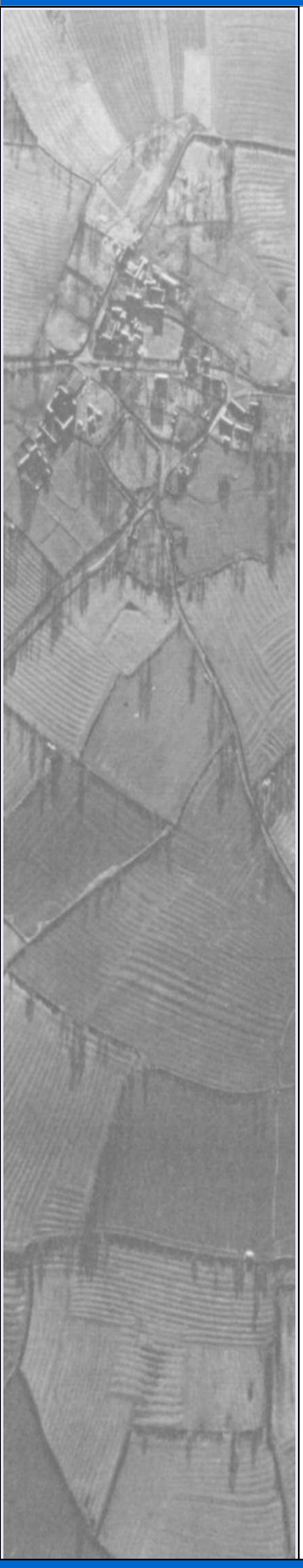


Land at Crisps Farm
Church Lane
Austrey
Warwickshire

MAGNETOMETER SURVEY REPORT

for

Border Archaeology

Kerry Donaldson & David Sabin

April 2018

Ref. no. J747

ARCHAEOLOGICAL SURVEYS LTD

Land at Crisps Farm
Church Lane
Austrey
Warwickshire

Magnetometer Survey Report

for

Border Archaeology

Fieldwork by David Sabin BSc (Hons) MCIfA
Report by Kerry Donaldson BSc (Hons)
Report checked by David Sabin
Primary archive location - Archaeological Surveys Ltd, Yatesbury, Wiltshire

Survey date – 26th March 2018
Ordnance Survey Grid Reference – **SK 29565 06085**

Archaeological Surveys Ltd
1 West Nolands, Nolands Road, Yatesbury, Calne, Wiltshire, SN11 8YD
Tel: 01249 814231 Fax: 0871 661 8804
Email: info@archaeological-surveys.co.uk
Web: www.archaeological-surveys.co.uk

CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUMMARY

A geophysical survey, comprising detailed magnetometry, was carried out by Archaeological Surveys Ltd at Crisps Farm, to the south of Church Lane in Austrey, North Warwickshire. The results indicate a positive rectilinear anomaly that appears to relate to a former ditch-like feature, possibly an enclosure. It is located immediately west of an extant linear depression within the field, which is likely to relate to a former field boundary ditch. The possible enclosure may extend further west; however, its orientation becomes parallel with former ridge and furrow cultivation and, as a consequence, its continuation cannot be confidently determined. Several other positive linear, curvilinear and discrete anomalies have been located within the site and although they may relate to cut features, they are generally weak, poorly defined or lack a coherent morphology.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Border Archaeology, on behalf of their client, to undertake a magnetometer survey of an area of land at Crisps Farm, Austrey, Warwickshire. The site has been outlined for a proposed residential development and the survey forms part of an archaeological assessment.

1.1.2 The geophysical survey has been carried out with reference to the terms of a written specification provided during the tendering process. The specification has been submitted to the client and provides a framework against which the results of the survey can be measured.

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 Geophysical survey can provide useful information on the archaeological potential of a site; however, the outcome of any survey relies on a number of factors and as a consequence results can vary. The success in meeting the aims and objectives of a survey is, therefore, often impossible to predetermine.

1.3 Standards, guidance and recommendations for the use of this report

1.3.1 The survey and report generally follow the recommendations set out by: English Heritage (2008) *Geophysical survey in archaeological field evaluation;*

European Archaeological Council (2015) *Guidelines for the Use of Geophysics in Archaeology;* Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations*. The work has been carried out to the Chartered Institute for Archaeologists (2014) *Standard and Guidance for Archaeological Geophysical Survey.*

1.3.2 Archaeological Surveys Ltd provide a detailed geophysical survey report and it is recommended that where possible the contents should be considered in full. The Summary provides a brief overview of the results with more detail available in the Discussion and/or Conclusion. The *List of anomalies* within the Results provides a detailed assessment of the anomalies within separate categories which can be useful in inferring a level of confidence to the interpretation. Quality and factors influencing the interpretation of anomalies is also set out within the results.

1.3.3 It is recommended that the full report should always be considered when using data and interpretation plots; where this is not possible, in the field for example, the abstraction and interpretation plots should retain their colour coding and be used with a corresponding legend.

1.3.4 Where targeting of anomalies by excavation is to be carried out, care should be taken to place trenches over solid lines or features visible on the abstraction and interpretation plots. Archaeological Surveys abstraction and interpretation avoids the use of dashed or dotted lines; broken or fragmented anomalies may well correspond closely with subsurface truncation.

1.4 Site location, description and survey conditions

1.4.1 The site is located at Crisps Farm, to the south of Church Lane and west of Main Road, Austrey in North Warwickshire. It is centred on Ordnance Survey National Grid Reference (OS NGR) SK 29565 06085, see Figs 01 and 02.

1.4.2 The site is approximately 3.26ha including Crisps Farm buildings. The area covered by the magnetometry is approximately 2.1ha as the buildings and immediately adjacent areas were unsuitable for survey due to very high magnitude magnetic disturbance, relating to modern ferrous objects, fencing, uneven surfaces, etc. The main area of survey (Area 3) lies within a pasture field, with a smaller field to the east (Area 4) only partly surveyable due to unchecked wild vegetation (briars, saplings and overgrown hedgerows). Two small paddocks in the northern part of the site were also surveyed (Areas 1 and 2).

1.4.3 The ground conditions were variable with tall vegetation in parts of the site creating difficulties when traversing. Areas of magnetic disturbance were avoided where possible. Weather conditions during the survey were fine.

1.5 Site history and archaeological potential

1.5.1 The site lies to the south of the Church of St Nicholas which was once the focus of the medieval settlement of Austrey, with another focus further north centred on the Manor House. Earthworks, probably relating to further medieval settlement, lie 70m north west of the church and there is evidence for ridge and furrow in the western part of the site. The Vicarage gardens are mapped as containing pleasure grounds, a carriage circle and paddock to the north of the site. From 1972 the eastern field is mapped as Playing Fields, although it is now disused, this field may be the paddock associated with the Vicarage to the north.

1.5.2 The surface conditions within the site were not suitable for the observation of cultural material during the course of the survey. Low ridge and furrow earthworks orientated west south west to east north east were noted along the western side of the surveyed area (Area 3), although there is no clear evidence for a headland possibly indicating that they once extended further to the east. A linear ditch-like depression, running north south within the central part of Area 3, may indicate an infilled field boundary ditch, although it deepens and widens at its southern end possibly indicating it was at one time used as a track.

1.6 Geology and soils

1.6.1 The underlying geology is from the Mercia Mudstone Group with sandstone from the Tarporley Siltstone Formation in the western part and along the eastern edge of the site, with interbedded siltstone, mudstone and sandstone across the rest of the site (BGS, 2017).

1.6.2 The overlying soil across the site is from the Hodnet association and is a stagnogleyic argillic brown earth. It consists of a reddish, fine and coarse loamy soil with slowly permeable subsoils and slight seasonal waterlogging over siltsone (Soil Survey of England and Wales, 1983).

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 (FGM650) spaced 0.5m apart with readings recorded at 20 Hz. The cart is pushed at walking speed and not towed. Each sensor is not zeroed in the field as the vertical axis alignment is precisely fixed leaving sensor offsets that are removed during data processing. The fixing of the vertical alignment ensures the sensors are not unduly influenced by localised magnetic fields and that the vertical component of a magnetic anomaly is measured. 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 Due to the fixed offsets within the fluxgate sensors, as a result of the manufacturing and tensioning process, the survey data do not provide a visually useful dataset until a zero median traverse algorithm is applied. It is recognised that this has the potential to affect some anomalies detrimentally by removing linear features orientated parallel to survey transects. However, this has not been noted as a particular problem with the system due to the high resolution data collection, generally long length of traverses and variability within the magnetic characteristics of a linear anomaly.

2.2.3 Data are collected along a series of parallel survey transects to achieve 100% coverage of the surveyable land. 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. Data are not collected within fixed grids and data points are considered to be random even though the data are collected in a systematic manner covering all accessible areas (Aspinall, Gaffney and Schmidt, 2009).

2.2.4 Fluxgate sensors are highly sensitive to temperature change and this is manifest as drift during the course of a survey. This can be particularly noticeable during the morning as temperatures rise and the equipment warms or cools. Sensor drift within

the course of a traverse will appear as a line trending from negative to positive after processing with a zero median traverse algorithm. To remove the potential for temperature drift data were collected after a 20 minute stabilisation period and traverses were limited to a time of generally <100s.

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. The software effectively allocates a geographic position for each data point and can compensate for fixed offsets present within the FGM650 sensors. The offsets are positive or negative values present on all fluxgate gradiometer sensors. Some systems use manual or electronic balancing to effectively zero the sensors; however, this is a short term measure that is prone to drift through temperature changes and vibration and can easily be incorrectly set due to localised magnetic fields. The FGM650 sensors are very accurately aligned to the vertical magnetic gradient and are highly stable showing negligible drift on long traverses. The offset values are removed using TerraSurveyor software.

2.3.2 Survey tracks are analysed and georeferenced raw data (UTM Z30N) are then exported in ASCII format for further analysis and display within TerraSurveyor. The removal of offset values (compensation) of the sensors is also carried out in TerraSurveyor using a zero median traverse function. Data are then considered to be minimally processed. Note: without the zero median traverse function it is not possible to create a meaningful data plot as all sensors have a different offset value. Although a zero median traverse algorithm can remove anomalies aligned with the survey tracks, in practice this rarely occurs due to the use of long traverses, high resolution measurement and variability within the magnetic susceptibility of long linear features.

2.3.3 The minimally processed data are collected between limits of ±10000nT and clipped for display at ±2nT (Fig 03). Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track.

2.3.4 Additional data processing has been carried out in the form of high pass filtering (Fig 04). This effectively removes low frequency variation along a traverse that has been caused by large magnetic bodies, cultivation or rapid temperature change. Data treated to additional processing has been compared to unprocessed data to ensure that no significant anomalies have been removed.

2.3.5 Appendix C contains metadata concerning the survey and data attributes and is derived directly from TerraSurveyor. Reference should be made to Appendix B for further information on processing.

2.3.6 A TIF file is produced by TerraSurveyor software along with an associated world file (.TFW) that allows automatic georeferencing (OSGB36 datum) when

using GIS or CAD software. The main form of data display used in the report is the minimally processed greyscale plot. With regard to the Sensys MXPDA, minimally processed data are considered by the manufacturer to be data that are compensated by SENSYS MAGNETO DLMGPS software, see 2.3.1 and 2.3.2. Note: traceplots are not considered to be appropriate as they do not provide an accurate or useful assessment of the magnetic anomalies due to the very high density of data collection.

2.3.7 The raster images are combined with base mapping using ProgeCAD Professional 2016, creating DWG (2010) file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. The CAD plots are effectively georeferenced facilitating relocation of features using GPS, resection method, etc.

2.3.8 An abstraction and interpretation is drawn and plotted for all geophysical anomalies located by the survey. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing. Appendix E sets out CAD layer names with colour and graphic content for each interpretation category, see 3.3.

2.3.9 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. The results for the site are however, considered as a whole.

2.3.10 The abstraction and interpretation procedure has been supported by analysis of a digital terrain model and/or contour plot derived from GNSS height data automatically logged during the survey. The GNSS heights are converted from the ETRS89 ellipsoid using the National Geoid Model OSGM02 to obtain ODN (Ordnance Datum Newlyn) + the GNSS antenna height (approximately 1.5M). Shaded relief plots are created using Surfer 10.

2.3.11 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 four survey areas covering approximately 2.1ha. The results of the survey are considered as a whole further below.

3.1.2 Magnetic anomalies located can be generally classified as positive linear anomalies of archaeological potential, positive anomalies of an uncertain origin, anomalies associated with land management, linear anomalies of an agricultural origin, areas of magnetic debris and disturbance and strong

discrete dipolar anomalies relating to ferrous objects. Anomalies located within each survey area have been numbered and are described in 3.4 below.

3.2 Statement of data quality and factors influencing the interpretation of anomalies

3.2.1 Data are considered representative of the magnetic anomalies present within the site. There are no significant defects within the dataset.

3.2.2 The northern part of the site (Areas 1 and 2) contains widespread magnetic debris that in places may be dense enough and of sufficient magnitude to obscure weak anomalies. Ferrous fencing materials, gates and troughs have also caused high magnitude anomalies between Areas 1 and 3 although these are quite localised. Very uneven surfaces associated with rough vegetation within Area 4 have slightly increased data 'noise' due to irregular movement of the instrument; it is possible that this has affected the clarity of responses in this part of the site.

3.2.3 Several linear anomalies located by the survey are of low magnitude and low contrast and are located within a zone containing anomalies associated with former agricultural activity. As a consequence their abstraction and interpretation has an increased level of uncertainty.

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, see Table 1.

Interpretation category	Description and origin of anomalies
Anomalies with archaeological potential	Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc. The category is used where there is a high level of confidence which may be due to additional supporting information where morphology is unclear or uncharacteristic.
Anomalies with an uncertain origin	The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Morphology may be unclear or uncharacteristic and there may be a lack of additional supporting information. 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. Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.
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. Associated agricultural anomalies

	(e.g. headlands, plough marks and former ridge and furrow) may support the interpretation. Land drains can appear in a classic herringbone pattern of interconnected multiple dipolar linear anomalies, or as parallel linear anomalies. The multiple dipolar response indicates ceramic land drains.
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 broad, former ridge and furrow is likely; narrow response is often related to modern ploughing. This category does not include agricultural features of early date or considered to be of archaeological potential (e.g. animal stockades, enclosures, farmsteads, etc).
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. They often occur where there has been dumping or ground make-up and are 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, hearths and nail spreads from former wooden structures or rooves and may, therefore, be archaeologically significant. 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.
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 these 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 adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 1: List and description of interpretation categories

3.4 List of anomalies

Area centred on OS NGR 429565 306085, see Figs 03 - 05.

Anomalies of archaeological potential

(1) - A positive rectilinear anomaly lies immediately west of, and in part parallel with, extant linear depression (8). It appears to then extend towards the west north west. It is possible that it continues to the west south west as anomaly (2).

Anomalies with an uncertain origin

(2) - A positive linear anomaly is parallel with the ridge and furrow (9); however, it is generally of a similar magnitude as anomaly (1) at c1nT, rather than the weaker <0.5nT response of the ridge and furrow. It is possible, therefore, that it is a continuation of anomaly (1).

(3) - A number of positive linear and a curvilinear anomalies are located to the west of anomaly (1) and north of anomaly (2). It is possible that these anomalies have been truncated by the ridge and furrow (9) and they may relate to further cut

features, although they lack a well defined and coherent morphology.

(4) - Two positive linear anomalies and a pit-like response could form a rectilinear feature, indicative of an enclosure; however, their full extent and origin is not clear.

(5) - A positive and negative linear anomaly is oriented north north west to south south east, parallel with linear depression (8). The anomaly appears to be associated with agricultural activity or land management.

(6) - Within Area 4, in the eastern part of the site, is a possible positive curvilinear anomaly as well as a small number of positive linear and discrete responses. Due to the extremely rough ground conditions in this part of the site, the results are not clear, and it is not possible to confidently determine an origin for these anomalies.

(7) - A weakly positive linear anomaly extends across the northern part of Area 4 and may relate to a cut, ditch-like feature.

Anomalies associated with land management

(8) - An extant linear depression extends through the central part of the site from north to south. Although not marked on any Ordnance Survey mapping from the 1st edition onwards, it is likely to relate to a former field boundary. Anomalies caused by former ridge and furrow (9) appear to extend towards it from the west, but not beyond it to the east.

Anomalies with an agricultural origin

(9) - A series of former ridge and furrow cultivation is located in the western part of the site.

Anomalies associated with magnetic debris

(10) - Magnetic debris is a response to magnetically thermoremnant material, probably of relatively recent origin, associated with the farm immediately to the north ('soil' spreads, tracks, ground consolidation material, former areas of burning, etc.).

(11) - Strong, discrete, dipolar anomalies are responses to ferrous and other magnetically thermoremnant objects, such as brick and tile, within the topsoil.

Anomalies with a modern origin

(12) - Magnetic disturbance from modern fencing material.

4 CONCLUSION

4.1.1 Within the south western part of the site, the geophysical survey results indicate the presence of a positive rectilinear anomaly that appears to relate to a former ditch-like feature with archaeological potential. It is situated immediately west of an extant linear depression that is likely to relate to a former field boundary. Other positive linear, curvilinear and discrete responses have been located within the site and these may relate to further cut features.

4.1.2 Former ridge and furrow cultivation appears to have once extended further east than is currently indicated by the surviving earthworks in the western part of the site. It appears likely that its eastern extent was bounded by the extant linear depression orientated north south running through the central part of the site.

4.1.3 Several linear and curvilinear anomalies of uncertain origin were located in the eastern part of the site within a former playing field. It is not possible to determine whether the anomalies are related to this relatively recent use or have an earlier origin.

5 REFERENCES

Aspinall, A., Gaffney, C. and Schmidt, A. 2009. *Magnetometry for Archaeologists*. Lanham (US), AltaMira Press.

British Geological Survey, 2017. *Geology of Britain viewer [online]* available from http://mapapps.bgs.ac.uk/geologyofbritain3d/index.html [accessed 23/03/2018].

Chartered Institute for Archaeologists, 2014. *Standard and Guidance for archaeological geophysical survey*. IfA, University of Reading.

English Heritage, 2008. *Geophysical survey in archaeological field evaluation. Research and Professional Service Guideline No.1.* 2nd ed. Swindon: English Heritage.

European Archaeological Council, 2015. *EAC Guidelines for the Use of Geophysics in Archaeology: Questions to Ask and Points to Consider.* Europae Archaeologia Consilium and Association Internationale sans But Lucratif, Belgium.

Institute for Archaeologists, 2002. *The use of Geophysical Techniques in Archaeological Evaluations*. IfA Paper No. 6. IfA, University of Reading.

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 3 Midland and Western England.*

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 thermoremnant 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. Thermoremnant 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. Thermoremnant features include ovens, hearths, and kilns. In addition thermoremnant 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 magnetic field. The difference between the two sensors will relate to the strength of the magnetic field created by the buried feature.

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 ±5nT and ±3nT 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 (destripe) 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 differences between the baseline value of gradiometer sensors.

High Pass Filtering

A mathematical process used to remove low frequency anomalies relating to survey tracks, modern agricultural features and other large magnetic bodies within or adjacent to survey areas.

Low Pass Filtering

A mathematical process used to remove high frequency anomalies relating to uneven ground, vibration, etc.

Appendix C – survey and data information

Area 1 minimally processed data

Filename: J747-mag-Area1-proc.xcp
Description: Imported as Composite from: J747-mag-Area1.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSB36
Northwest corner: 429488.794, 306171.525 m
Southeast corner: 429571.294, 306126.775 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702
Source GPS Points: 57600
Dimensions
Composite Size (readings): 660 x 358
Survey Size (meters): 82.5 m x 44.8 m
Grid Size: 82.5 m x 44.8 m
X Interval: 0.125 m
Y Interval: 0.125 m
Stats
Max: 2.21
Min: -2.20
Std Dev: 1.17
Mean: 0.04
Median: 0.01
Composite Area: 0.36919 ha
Surveyed Area: 0.19576 ha
PROGRAM
Name: TerraSurveyor
Version: 3.0.23.0
Processes: 1
1 Base Layer
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 Clip from -2.00 to 2.00 nT

Area 1 filtered data

Filename: J747-mag-Area1-proc-hpf.xcp
Stats
Max: 2.21
Min: -2.20
Std Dev: 1.10
Mean: 0.02
Median: 0.00
Composite Area: 0.36919 ha
Surveyed Area: 0.19576 ha
Processes: 1
1 Base Layer
GPS based Proce6
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 High pass Uniform (median) filter: Window dia: 400
6 Clip from -2.00 to 2.00 nT

Area 2 minimally processed data

Filename: J747-mag-Area2-proc.xcp
Description: Imported as Composite from: J747-mag-Area2.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y): OSGB36
Northwest corner: 429495.248, 306180.770 m
Southeast corner: 429524.873, 306156.770 m
Source GPS Points: 18600
Dimensions
Composite Size (readings): 237 x 192
Survey Size (meters): 29.6 m x 24 m
Grid Size: 29.6 m x 24 m
X Interval: 0.125 m
Y Interval: 0.125 m
Stats
Max: 2.21
Min: -2.20
Std Dev: 1.35
Mean: 0.05
Median: 0.08
Composite Area: 0.0711 ha
Surveyed Area: 0.054823 ha
Processes: 1
1 Base Layer
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 Clip from -2.00 to 2.00 nT

Area 3 minimally processed data

Filename: J747-mag-Area3-proc.xcp
Description: Imported as Composite from: J747-mag-Area3.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 429475.845, 306129.488 m
Southeast corner: 429601.345, 305986.988 m
Source GPS Points: 488200
Dimensions
Composite Size (readings): 1004 x 1140
Survey Size (meters): 126 m x 143 m
Grid Size: 126 m x 143 m
X Interval: 0.125 m
Y Interval: 0.125 m
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.73
Mean: 0.00
Median: 0.01
Composite Area: 1.7884 ha
Surveyed Area: 1.4908 ha
Processes: 1
1 Base Layer
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 Clip from -2.00 to 2.00 nT

Area 3 filtered data

Filename: J747-mag-Area3-proc-hpf.xcp
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.65
Mean: 0.00
Median: 0.00
Composite Area: 1.7884 ha
Surveyed Area: 1.4908 ha

Processes: 1
1 Base Layer
GPS based Proce7
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 High pass Uniform (median) filter: Window dia: 400
6 Lo pass Uniform (median) filter: Window dia: 13
7 Clip from -2.00 to 2.00 nT

Area 4 minimally processed data

Filename: J747-mag-Area4-proc.xcp
Description: Imported as Composite from: J747-mag-Area4.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 429606.158, 306130.329 m
Southeast corner: 429663.608, 306028.479 m
Source GPS Points: 171400
Dimensions
Composite Size (readings): 383 x 679
Survey Size (meters): 57.5 m x 102 m
Grid Size: 57.5 m x 102 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.83
Mean: -0.01
Median: 0.00
Composite Area: 0.58513 ha
Surveyed Area: 0.34113 ha
Processes: 1
1 Base Layer
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 Clip from -2.00 to 2.00 nT

Area 4 filtered data

Filename: J747-mag-Area4-proc-hpf.xcp
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.81
Mean: -0.01
Median: 0.00
Composite Area: 0.58513 ha
Surveyed Area: 0.34113 ha
Processes: 1
1 Base Layer
GPS based Proce6
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 High pass Uniform (median) filter: Window dia: 400
6 Clip from -2.00 to 2.00 nT

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their offices in Wiltshire. 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.

Three printed copies of the report and a PDF copy will be supplied to the Warwickshire Historic Environment Record. The report will also be uploaded to the Online AccesS to the Index of archaeological investigationS (OASIS). A summary of the survey will also be supplied to *West Midlands Archaeology.*

Archive contents:

File type	Naming scheme	Description
Data	J747-mag-**[area number/name]**.asc J747-mag-**[area number/name]**.xcp J747-mag-**[area number/name]**-proc.xcp	Raw data as ASCII CSV TerraSurveyor raw data TerraSurveyor minimally processed data
Graphics	J747-mag-**[area number/name]**-proc.tif	Image in TIF format
Drawing	J747-**[version number]**.dwg	CAD file in 2010 dwg format
Report	J747 report.odt	Report text in Open Office odt format

Table 2: Archive data

Appendix E – CAD layers for abstraction and interpretation plots

The table below sets out Archaeological Surveys Ltd CAD layer names with associated colours and graphical content. Where CAD files are available layers may be extracted for further CAD/GIS use. Note: hatched polygon boundaries are contained within layers with the RGB colour code 254, 255, 255 (near white) in order to prevent their visibility.

Report sub-heading and associated CAD layer names	Colour with RGB index		Layer content
Anomalies with archaeological potential			
AS-ABST MAG POS LINEAR ARCHAEOLOGY		Red 255,0,0	Polygon (solid)
Anomalies with an uncertain origin			
AS-ABST MAG POS LINEAR UNCERTAIN		255,127,0	Line, polyline or polygon (solid)
AS-ABST MAG NEG LINEAR UNCERTAIN		Blue 0,0,255	Line, polyline or polygon (solid)
AS-ABST MAG POS DISCRETE UNCERTAIN		255,127,0	Solid donut, point or polygon (solid)
Anomalies relating to land management			
AS-ABST MAG BOUNDARY		127,0,0	Line, polyline or polygon (solid or cross hatched ANSI37)
Anomalies with an agricultural origin			
AS-ABST MAG RIDGE AND FURROW		0,127,63	Line, polyline or polygon (cross hatched ANSI37)
Anomalies associated with magnetic debris			
AS-ABST MAG DEBRIS		132, 132, 132	Polygon (cross hatched ANSI37)
AS-ABST MAG STRONG DIPOLAR		132, 132, 132	Solid donut, point or polygon (solid)
Anomalies with a modern origin			
AS-ABST MAG DISTURBANCE		132, 132, 132	Polygon (hatched ANSI31)
AS-ABST MAG SERVICE		132, 132, 132	Line or polyline

Table 3: CAD layering

Appendix F – copyright and intellectual property

This report may contain material that is non-Archaeological Surveys Ltd copyright (eg Ordnance Survey, Crown Copyright) or the intellectual property of third parties, which we are able to provide for limited reproduction under the terms of our own copyright licences, but for which copyright itself is non-transferable by Archaeological Surveys Ltd. Users remain bound by the conditions of the Copyright, Design and Patents Act 1988 with regard to multiple copying and electronic dissemination of this report.

Archaeological Surveys Ltd shall retain intellectual property rights for the materials and records created as part of this project. A non-exclusive, transferable, sub-licensable, perpetual and royalty-free licence shall be granted to the client on full payment of works in order for them to use, reproduce and enhance the reports, documentation, graphics and illustrations produced as part of this project for the purpose for which they were commissioned. Copyright licence will also be granted to the local authority for planning use and within in the Historic Environment Record for public dissemination upon payment by the client. Any document produced to meet planning requirements may be freely copied for planning, development control, research and outreach purposes without recourse to the originator, subject to all due and appropriate acknowledgements being provided and to the terms of the original contract with the client. Archaeological Surveys Ltd shall retain the right to be identified as the author and originator of the material.

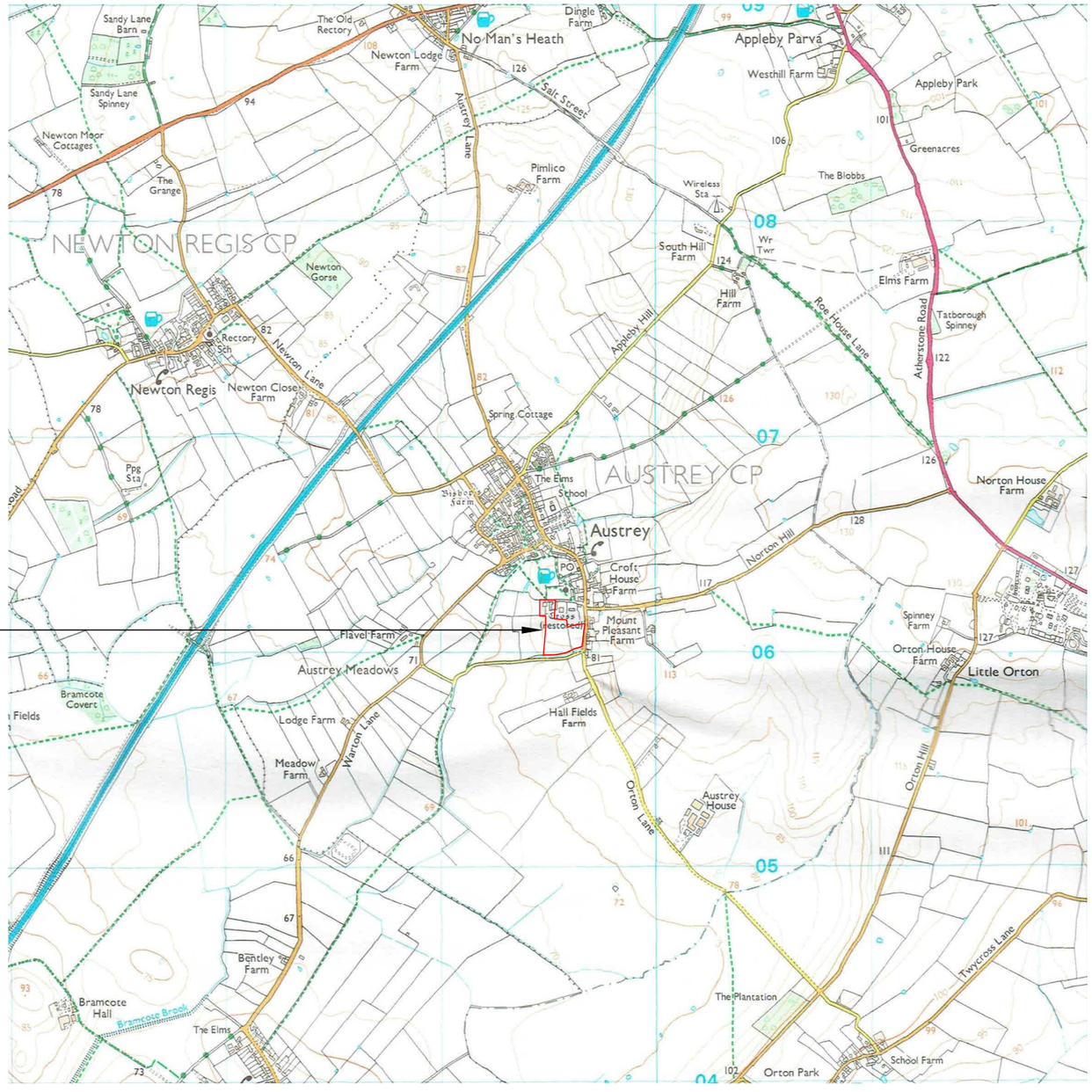
The report, data and any associated material produced by Archaeological surveys Ltd cannot be freely used for any commercial activity other than those set out above. Any unauthorised use will be considered to be in breach of copyright.

Title of Goods remains with Archaeological Surveys Ltd until payment has cleared. Late payment may jeopardise any planning decision as there will be no transfer of title, licensing or any other right of copy or use of this report. Archaeological Surveys Ltd do not give permission for use of the report and associated data in cases of late payment. Any such use will be considered to be in breach of copyright. Late payment may also incur interest at 8% over the Bank of England base rate. Non-payment will be pursued by legal action.

Archaeological Surveys Ltd

Geophysical Survey
Land at Crisps Farm
Church Lane
Austrey
Warwickshire

Map of survey area



Survey location

Survey location

Site centred on OS NGR
SK 29565 06085

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01

Archaeological Surveys Ltd

Geophysical Survey
Land at Crisps Farm
Church Lane
Austrey
Warwickshire

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

429500 306000

Development boundary

SCALE 1:2000

0m 20 40 60 80 100m

SCALE TRUE AT A3

FIG 02

CHURCH LANE

Silo

The Dell

Church View

Crisp Farm

Area 1

Area 2

Area 3

Area 4

The Old Vicarage

Pump

Vicarage

Cross

Orchard House

87.2m

81.4m

Hall

GLEBE RISE

LB

Pond

121

134

138

125

135

1

7

145

151

N

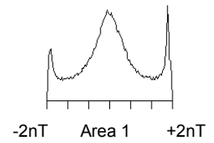
Archaeological Surveys Ltd

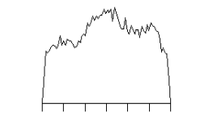
Geophysical Survey
Land at Crisps Farm
Church Lane
Austrey
Warwickshire

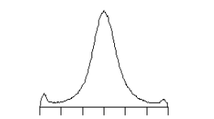
Greyscale plot of minimally processed magnetometer data

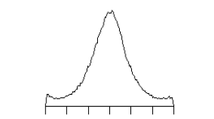
+2nT

-2nT









SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 03

CHURCH LANE

Silo

The Dell

Church View

Crisp Farm

Area 1

Area 2

Area 3

Area 4

The Old Vicarage

Vicarage

Pump

Cross

Orchard House

87.2m

81.4m

Hall

GLEBE RISE

LB

Pond

121

134

125

138

135

1

7

145

151

N

Archaeological Surveys Ltd

Geophysical Survey
Land at Crisps Farm
Church Lane
Austrey
Warwickshire

Greyscale plot of filtered magnetometer data

+2nT

-2nT

-2nT Area 1 +2nT

-2nT Area 2 +2nT

-2nT Area 3 +2nT

-2nT Area 4 +2nT

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 04

CHURCH LANE

Silo

The Dell

Church View

Crisp Farm

Area 2

Area 1

10

11

Area 4

7

6

Area 3

9

3

2

1

8

5

4

12

Cross

Orchard House

121

87.2m

Vicarage

The Old Vicarage

Pump

134

125

138

Hall

135

1

GLEBE RISE

7

145

LB

151

81.4m

Pond

N

Archaeological Surveys Ltd

Geophysical Survey
Land at Crisps Farm
Church Lane
Austrey
Warwickshire

Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - cut feature of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - ridge and furrow
- Broad negative anomaly - extant linear depression, possible former field boundary
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 05