GEOPHYSICAL SURVEY REPORT G1454

Mount Farm Evesham

HER Ref. WSM57562

Client:

On Behalf Of:

INRG Solar

GSB PROSPECTION Ltd

Celebrating over 25 years at the forefront of Archaeological Geophysics

sumo Survey Services

GSB Survey Report No. G1454

Mount Farm Evesham

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Survey Personnel

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Project Assistants:	Adrian Dillon BSc, Kathryn Ormston BSc MSc, Claire Stephens BA MA, Leanne Swinbank BA

Dates

Fieldwork:	30 June - 4 July & 1 September 2014
Report:	16 July 2014

Report Approved: Dr John Gater MIfA FSA

Background Project Details

NGR	SP 055 406
Location	Approximately 25km south-east of Worcester, 4km south-east of Evesham to the south of the A44 and west of Murcot.
HER/SMR	Worcestershire
District	Wychavon
Parish	Childswickham
Topography	Flat
Current Land Use	Mixture of arable and pasture.
Soils	Evesham 2 (no. 411b): slowly permeable calcareous clayey soils (SSEW 1983).
Geology	Lias Formation and Charmouth Mudstone Formation - mudstone (BGS 2014).
Archaeology	A Roman Road is purported to border the survey area to the north, while an undated boundary stone has been identified at the eastern extremity of the survey area; ridge and furrow is still evident in some parts. For a detailed assessment of the archaeological potential of the survey area and its environs see CA, (2014).
Survey Methods	Detailed magnetometer survey (fluxgate gradiometer).
Study Area	45ha

Aims

To locate and characterise any anomalies of possible archaeological interest within the study area. The work forms part of a wider archaeological assessment being carried out by **Cotswold Archaeology** on behalf of **INRG Solar**.

Summary of Results

A small cluster of anomalies in the south of the survey area has the potential to be of archaeological interest; the responses include probable linear ditches and an enclosure.

Extensive evidence relating to medieval or more recent agricultural practices has been identified, including ridge and furrow cultivation, headlands, and former boundaries. Anomalies of an uncertain origin have been identified; though these are likely to be either agricultural or natural in origin.

Pipes, pylons and modern ferrous debris have also been detected.

Method

All survey grid positioning was carried out using Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS equipment. The geophysical survey areas are georeferenced relative to the Ordnance Survey National Grid by tying in to local detail and corrected to the OS Mastermap provided by the client. These tie-ins are presented in Figure T1. Please refer to this diagram when re-establishing the grid or positioning trenches.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

All survey work is carried out in accordance with the current English Heritage guidelines (EH 2008).

Data Processing

Data processing was performed as appropriate using an in-house software package (GeoSuB) as outlined below.

Magnetic Data
Zero Mean Sensor, Step Correction (De-stagger) and Interpolation (on the Y axis).

Interpretation

When interpreting the results several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to very specific known features documented in other sources, this is done (for example: *Abbey Wall*, *Roman Road*). For the generic categories levels of confidence are indicated, for example: *Archaeology – ?Archaeology*. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification *?Archaeology*. Details of the data plot formats and interpretation categories used are given in the Appendix: Technical Information at the end of the report.

General Considerations

Site conditions were good with the land being level and generally free from obstruction. Areas 1-3 were under pasture and contained grazing cattle, while 4 contained stubble. Areas 5 and 6 where under tall crop which caused some difficulty keeping the sensors level while maintaining an even pace; any effects from this have been corrected for during processing. Area 6 contained a number of hay bales which had to be surveyed round, accounting for the small gap in the data.

Area 5 was found to contain anomalies of interest, seemingly leading out of the south-western survey boundary; this area was revisited and expanded westwards to investigate the possibility that these anomalies may show archaeological potential and continue further than the survey limits.

1.0 Survey Results - Magnetometer Survey

?Archaeology

1.1 Anomalies of potential archaeological interest have been detected within Area 5; linear responses, roughly aligned north-south and east-west, are apparent in the centre of Area 5, with a rectilinear anomaly immediately to the east.

1.2 No anomalies of archaeological potential have been identified in Area 1, which lies next to the purported route of a Roman Road (CA 2014). However, due to the technique's success in detecting relatively weak ridge and furrow anomalies across Area 1, it seems reasonable to assume that any significant deposits associated with the road, if present, would have been detected.

Agricultural

1.3 An extensive network of anomalies relating to ridge and furrow cultivation has been detected across Areas 1-4. These are largely parallel in nature and can be seen following a number of orientations consistent with an open field system. The southern half of Area 2 and the northern half of Area 3 are devoid of these anomalies. This demarcation matches an old-field boundary denoted on the first edition ordnance survey map (CA 2014), though the boundary itself has not been detected. The south-eastern corner of Area 4 also lacks any ridge and furrow responses, however in this case a boundary was detected between the ploughing to the north and magnetically quiet area to the south.

1.4 Former field boundaries identified on historic mapping have been detected within Area 4; these are visible on the Second Edition Ordnance Survey Map (OMO 2014). The eastern half of the stepped east-west boundary has a considerably stronger magnetic response, almost certainly relating to a pipe or service that was laid along the old field edge before the boundary was removed.

Uncertain

1.5 A few uncertain anomalies have been identified within the survey area; this generally reflects the magnetically quiet nature of the survey results. Where anomalies have been recorded they are likely to be of a natural or agricultural origin; However, Area 5 displays a cluster of anomalies that may be associated with the potential archaeological features discussed in section 1.1. The masking of anomalies due the presence of a pipe in the south inhibits understanding the true nature of the responses.

Ferrous

1.6 In addition to the possible pipe in Area 4 (see section. 1.4), a definite pipe has been detected in Area 6. Small linear clusters of ferrous type anomalies have been identified at the southern edges of Areas 4 and 5; these are consistent with noise from farm tracks. Several pylons in a north-south alignment have created characteristic magnetic 'halos' in both Areas 1 and 4. Smaller scale responses are due to iron debris within the topsoil, or on the surface, and are best seen in the XY trace plot which can be found on the Archive CD.

2.0 Conclusions

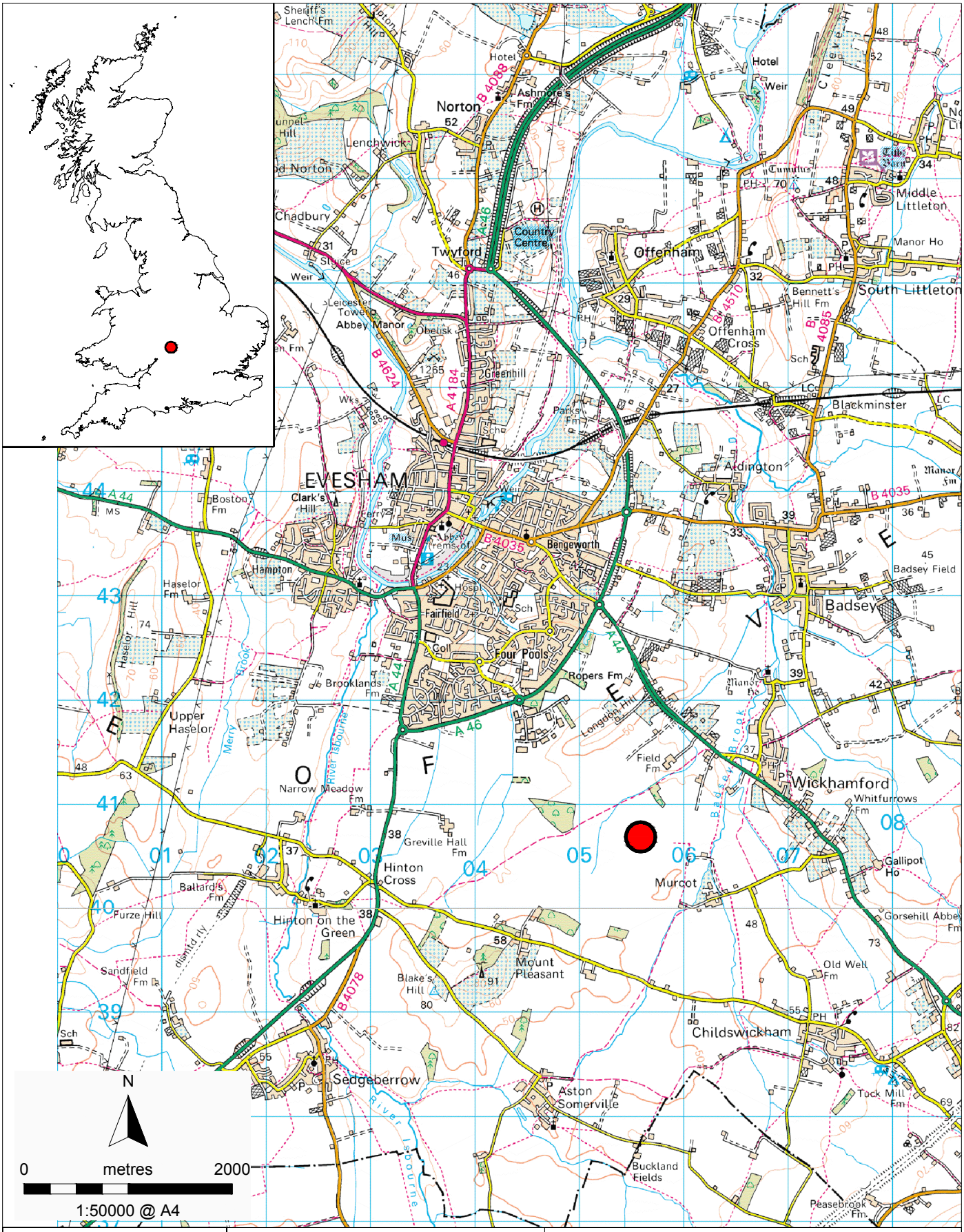
2.1 A number of anomalies in Area 5 have some archaeological potential, comprising of linear and rectilinear ditch systems. No anomalies of a similar archaeological nature have been detected in Areas 1-4 and 6.

2.2 Anomalies related to ridge and furrow cultivation have been recorded across the north of the survey area, as have associated former field boundaries with a shared alignment.

2.3 The course of two pipes and a number of pylons have been detected together with ferrous anomalies likely to be of a modern origin.

References

BGS 2014	British Geological Survey, Geology of Britain Viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html 1:50 0000 scale geology, centred on 405297 240571. Accessed 14/07/2014
CA 2014	*Mount Farm Solar Park, Evesham, Worcestershire*; *Heritage Desk-Based Assessment.* Cotswold Archaeology, Andover.
EH 2008	*Geophysical Survey in Archaeological Field Evaluation.* English Heritage, Portsmouth.
OMO 2014	http://www.oldmapsonline.org/ Gloucestershire Sheet IV, SE. Second Edition Ordnance Survey, 1903, 1:10,560 Accessed 16/07/2014
SSEW 1983	*Soils of England and Wales. Sheet 3, Midland and Western England*. Soil Survey of England and Wales, Harpenden.



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Site Location

Project: G1454 Mount Farm, Evesham

Title: Site Location

Drawn by: ELBrunning

Figure 1

1

2

3

4

5

6

N

0 metres 200

1:5000 @ A3

Gradiometer Survey

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Project: G1454 Mount Farm, Evesham

Title: Magnetometer Survey - Location of Survey Areas

Drawn by: ELWatson

Figure 2

1

2

3

4

N

0 metres 200

1:5000 @ A3

5

6

N

0 metres 80

1:2000 @ A3

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Project: G1454 Mount Farm, Evesham

Title: Magnetometer Survey - Greyscale Plot [All Areas]

Drawn by: ELWatson

Figure 3

1

2

3

4

N

0 metres 200

1:5000 @ A3

5

6

N

0 metres 80

1:2000 @ A3

?Archaeology
(discrete anomaly / trend)

Uncertain Origin
(discrete anomaly / trend)

Old Field Boundary
(discrete anomaly)

Ridge and Furrow
(trend)

Ferrous
(discrete anomaly)

Ferrous
(area of increased response)

Drain
(trend)

Pipe
(trend)

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Title: Magnetometer Survey - Interpretation [All Areas]

Drawn by: ELWatson

Figure 4

Appendix - Technical Information: Magnetometer Survey

Instrumentation: Bartington *Grad*601-2 / GSB CARTEASY^{N} Cart system

Both the Bartington and CARTEASY^{N} instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The CARTEASY^{N} system has four gradiometer units mounted at 0.75m intervals across its frame – rather than working in grids, the cart uses an on-board survey grade GNSS for positioning. The cart system allows for the collection of topographic data in addition to the magnetic field measurements.

Data Processing

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (Destagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.
Interpolation	When geophysical data are presented as a greyscale, each data point is represented as a small square. The resulting plot can sometimes have a 'blocky' appearance. The interpolation process calculates and inserts additional values between existing data points. The process can be carried out with points along a traverse (the x axis) and/or between traverses (the y axis) and results in a smoother greyscale image.

Display

XY Trace Plot	This involves a line representation of the data. Each successive row of data is equally incremented in the Y axis, to produce a stacked profile effect. This display may incorporate a hidden-line removal algorithm, which blocks out lines behind the major peaks and can aid interpretation. The advantages of this type of display are that it allows the full range of the data to be viewed and shows the shape of the individual anomalies. The display may also be changed by altering the horizontal viewing angle and the angle above the plane.
Greyscale/ Colourscale Plot	This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.
3D Surface Plot	This is similar to the XY trace, but in 3 dimensions. Each data point of a survey is represented in its relative position on the x and y axes and the data value is represented in the z axis. This gives a digital terrain, or topographic effect.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall,* etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

Archaeology	This term is used when the form, nature and pattern of the response are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
?Archaeology	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
Increased Magnetic Response	An area where increased fluctuations attest to greater magnetic enhancement of the soils, but no specific patterns can be discerned in the data and no visual indications on the ground surface hint at a cause. They may have some archaeological potential, suggesting damaged archaeological deposits.
Industrial / Burnt-Fired	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
Old Field Boundary	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions.
Ridge & Furrow	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases the response may be the result of more recent agricultural activity.
Ploughing	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions. Smaller, isolated responses which do not form such obviously 'natural' patterns but which are, nonetheless, likely to be natural in origin may be classified as *?Natural*.
Uncertain Origin	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *?Archaeology* and *?Natural* or (in the case of linear responses) *?Archaeology* and *?Ploughing*; occasionally they are simply of an unusual form.
Magnetic Disturbance	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present. They are presumed to be modern.
Ferrous	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

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