THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

Laurel Farm, Thame Road, Princes Risborough, Buckinghamshire

Geophysical Survey (Magnetic)

by Kyle Beaverstock and Tim Dawson

Site Code: LPB15/04

(SP 7920 0475)

Laurel Farm, Thame Road, Princes Risborough, Buckinghamshire

Geophysical Survey (Magnetic) Report

For Mr. D Briant

by Kyle Beaverstock and Tim Dawson

Thames Valley Archaeological Services Ltd

Site Code LPB 15/04

August 2015

Summary

Site name: Laurel Farm, Thame Road, Princes Risborough, Buckinghamshire

Grid reference: SP 7920 0475

Site activity: Magnetometer survey

Date and duration of project: 27th July 2015

Project manager: Steve Ford

Site supervisor: Kyle Beaverstock

Site code: LPB 15/04

Area of site: 1.02ha

Summary of results: A moderate number of magnetic anomalies were recorded across the survey area. However, these are all likely to be modern in origin, representing interference from above ground magnetic objects such as the field gates and a metalled track.

Location of archive: The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Report edited/checked by:	Steve Ford✓ 11.08.15
	Andrew Mundin✓ 11.08.15

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Laurel Farm, Thame Road, Princes Risborough, Buckinghamshire
A Geophysical Survey (Magnetic)

by Kyle Beaverstock and Tim Dawson

Report 15/04

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Laurel Farm, Thame Road, Princes Risborough, Buckinghamshire (SP 7920 0475) (Fig. 1). The work was commissioned by Mr Bernard Smith of Bernard Smith Associates Ltd, Westbrook Cottage, Chinnor Road, Towersey, Thame, Oxfordshire, OX9 3RB on behalf of Mr. D Briant, Laurel Farm, Thame Road, Longwick, Princes Risborough, Buckinghamshire, HP27 9SF.

A planning application (14/08253/OUT) has been submitted to Buckinghamshire County Council for the construction of six new dwellings on the site. This is however subject to an archaeological condition which requires the implementation of a programme of archaeological work. This is in accordance with the Department for Communities and Local Government's National Planning Policy Framework (NPPF 2012), and the County's policies on archaeology. The field investigation was carried out to a specification approved by Mr Phil Markham Senior Archaeology Planning Officer for Buckingham County Council. The fieldwork was undertaken by Kyle Beaverstock and Rebecca Constable and the site code is LPB 15/04.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Location, topography and geology

The site is located to the north-west of Princes Risborough on the north-eastern edge of the hamlet of Longwick (Fig. 1). The southern side of the triangular parcel of land is bordered by the A4129 (Thame Road) and by hedgerows on its northern and western sides (Fig. 2). The topography of the site was generally flat at about 89.4m above Ordinance Datum (aOD). The underlying geology is recorded as Gault Formation (BGS 1994).

Site history and archaeological background

The archaeological potential of the site has been highlighted in a briefing document prepared by Mr. Phillip Markham of Buckinghamshire County Archaeology Service. In summary the Buckinghamshire Historic Environment Record notes the presence nearby of a scatter of Neolithic flint work that might indicate the

location of below ground deposits of this period. The site also lies on the margins of Longwick, a post-medieval settlement which may have earlier origins.

Methodology

Sample interval

Data collection required a temporary grid to be established across the survey area using wooden pegs at 20m intervals with further subdivision where necessary. Readings were taken at 0.25m intervals along traverses 1m apart. This provides 1600 sampling points across a full 20m × 20m grid (English Heritage 2008), providing an appropriate methodology balancing cost and time with resolution. The entire parcel of land was surveyed as there were no major obstructions.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to 10^{-9} Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations and standards set out by both English Heritage (2008) and the Chartered Institute *for* Archaeologists (2002, 2011, 2014).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for the fast yet detailed surveying of an area.

The detailed magnetometry survey was carried out using a dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometer. The instrument consists of two fluxgates mounted 1m vertically apart with a second set positioned at 1m horizontal distance. This enables readings to be taken of both the general background magnetic field and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this

base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches, can be seen from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

A Trimble Geo7x handheld GPS system with sub-decimetre real-time accuracy was used to tie the site grid into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the TerraSurveyor software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

Process	**Effect**
Clip from -4.80 to 5.20 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
Interpolate: *y* doubled	Increases the resolution of the readings in the *y* axis, enhancing the shape of anomalies.
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
De-spike: threshold 1, window size 3×3	Compresses outlying magnetic points caused by interference of metal objects within the survey area.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.

Once processed, the results are presented as a greyscale plot shown in relation to the site (Fig. 3), followed by a second plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons. The grid layout and georeferencing information (Fig. 2) is prepared in EasyCAD v.7.58.00, producing a .FC7 file format, and printed as a .PDF for inclusion in the final report.

The greyscale plot of the processed data is exported from TerraSurveyor in a georeferenced portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is combined with grid and site plans in QGIS 2.6.1 Brighton and exported again in .PNG format in order to present them in figure templates in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised they are exported in .PDF format for inclusion within the finished report.

Results

A number of magnetic anomalies were identified, the most significant of which **[Fig. 4: 1]** runs from the south towards the north before turning north-west. This anomaly is accounted for by a track, originally laid with hardcore to run between the southern gate and the western gate. Similarly, the eastern area of the site is characterised by a large area of strong magnetic noise **[2]** which is likely to be caused by the dumps of rubble or hardcore probably containing ferrous debris (eg: nails) that were observed in that area of the site. Strong dipolar anomalies **[3]** and **[4]** are most likely caused by the gates used to access the field from the south, north and western part of the site.

Conclusion

The survey identified several magnetic anomalies which are all of probable modern origin. These include a track, surfaced with hardcore, an area of dumped rubble and the modern field gates. No anomalies which may have represented buried archaeological features were identified. It is worth noting, however, that the large areas of magnetic disturbance caused by the modern features may mask any weaker anomalies which indicate the presence of buried archaeological deposits.

References

BGS, 1994, *British Geological Survey*, 1:50000, Sheet 237, Solid and Drift Edition, Keyworth

English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*, English Heritage, Portsmouth (2nd edn)

CI*f*A, 2002, *The Use of Geophysical Techniques in Archaeological Evaluation*, IFA Paper No. 6, Reading

CI*f*A, 2011, *Standard and Guidance: for archaeological geophysical survey*, Reading

CI*f*A, 2014, *Standard and Guidance: for archaeological geophysical survey*, Reading

NPPF, 2012, *National Planning Policy Framework*, Dept Communities and Local Government, London

Appendix 1. Survey and data information

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

Raw data
Survey corner coordinates (X/Y):
Northwest corner: 479080.36, 204736.47 m
Southeast corner: 479200.36, 204516.47 m
Direction of 1st Traverse: 33.58 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 2047.5

Dimensions
Composite Size (readings): 480 x 220
Survey Size (meters): 120 m x 220 m
Grid Size: 20 m x 20 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 100.00
Min: -100.00
Std Dev: 26.26
Mean: -4.27
Median: -0.93
Composite Area: 2.64 ha
Surveyed Area: 0.9083 ha

Source Grids: 40
1 Col:0 Row:0 grids\39.xgd
2 Col:0 Row:1 grids\40.xgd
3 Col:1 Row:0 grids\35.xgd
4 Col:1 Row:1 grids\36.xgd
5 Col:1 Row:2 grids\37.xgd
6 Col:1 Row:3 grids\38.xgd
7 Col:2 Row:0 grids\29.xgd
8 Col:2 Row:1 grids\30.xgd
9 Col:2 Row:2 grids\31.xgd
10 Col:2 Row:3 grids\32.xgd
11 Col:2 Row:4 grids\33.xgd
12 Col:2 Row:5 grids\34.xgd
13 Col:3 Row:0 grids\19.xgd
14 Col:3 Row:1 grids\20.xgd
15 Col:3 Row:2 grids\21.xgd
16 Col:3 Row:3 grids\22.xgd
17 Col:3 Row:4 grids\23.xgd
18 Col:3 Row:5 grids\24.xgd
19 Col:3 Row:6 grids\25.xgd
20 Col:3 Row:7 grids\26.xgd
21 Col:3 Row:8 grids\27.xgd
22 Col:3 Row:9 grids\28.xgd
23 Col:4 Row:1 grids\10.xgd
24 Col:4 Row:2 grids\11.xgd
25 Col:4 Row:3 grids\12.xgd
26 Col:4 Row:4 grids\13.xgd
27 Col:4 Row:5 grids\14.xgd
28 Col:4 Row:6 grids\15.xgd
29 Col:4 Row:7 grids\16.xgd
30 Col:4 Row:8 grids\17.xgd
31 Col:4 Row:9 grids\18.xgd
32 Col:5 Row:1 grids\01.xgd
33 Col:5 Row:2 grids\02.xgd
34 Col:5 Row:3 grids\03.xgd
35 Col:5 Row:4 grids\04.xgd
36 Col:5 Row:5 grids\05.xgd
37 Col:5 Row:6 grids\06.xgd
38 Col:5 Row:7 grids\07.xgd
39 Col:5 Row:8 grids\08.xgd
40 Col:5 Row:9 grids\09.xgd

Processed data
Stats
Max: 5.20
Min: -4.80
Std Dev: 2.80
Mean: -0.13
Median: 0.02

Processes: 6
1 Base Layer
2 DeStripe Median Sensors: All
3 De Stagger: Grids: All Mode: Both By: -1 intervals
4 Despike Threshold: 1 Window size: 3x3
5 Interpolate: Y Doubled.
6 Clip from -4.80 to 5.20 nT

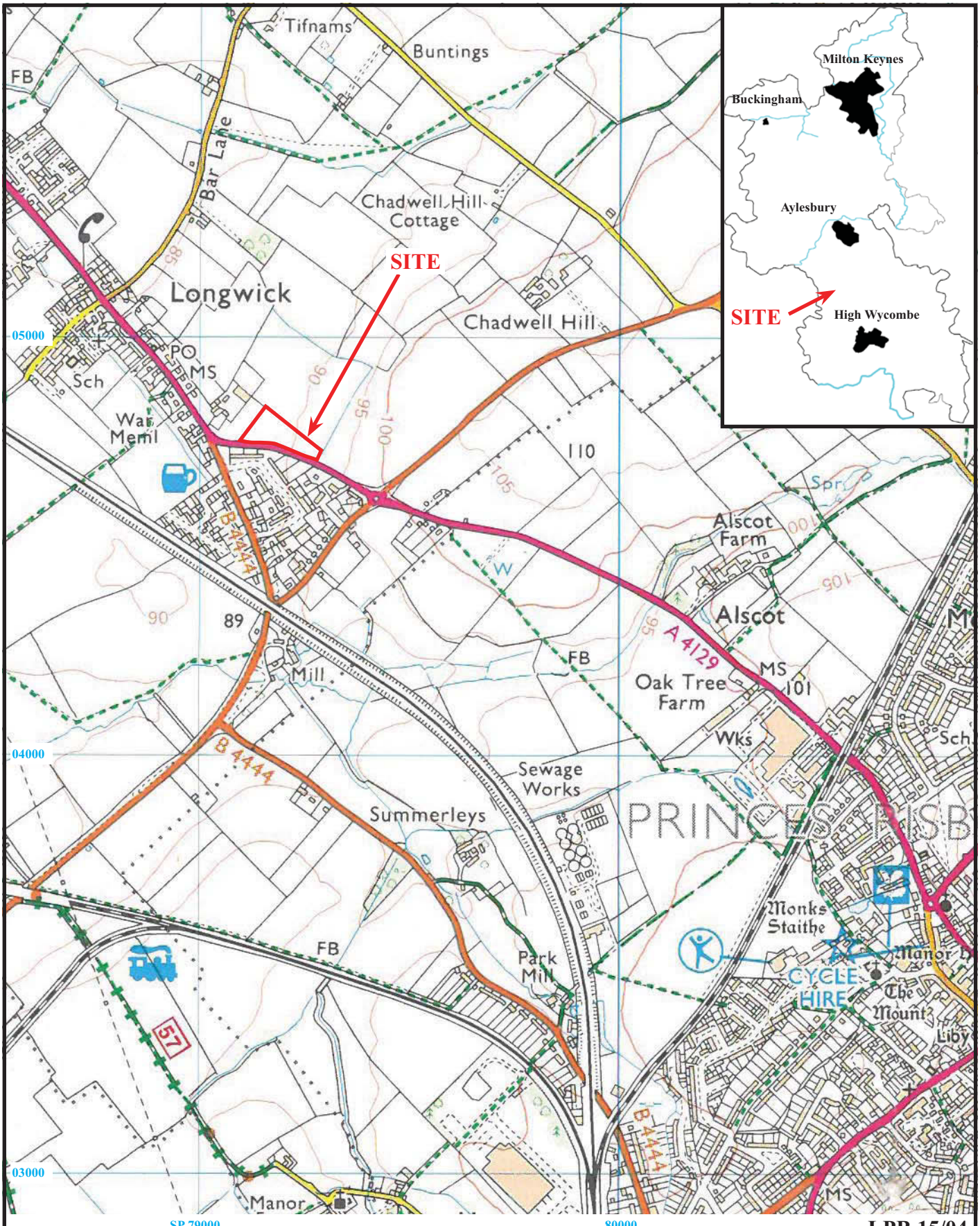

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Figure 1. Location of site within Princes Risborough and Buckinghamshire.

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Georeferencing
A: E 479185, N 204786
B: E 479218, N204764

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N

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Figure 2. Survey grid layout.

0 100m

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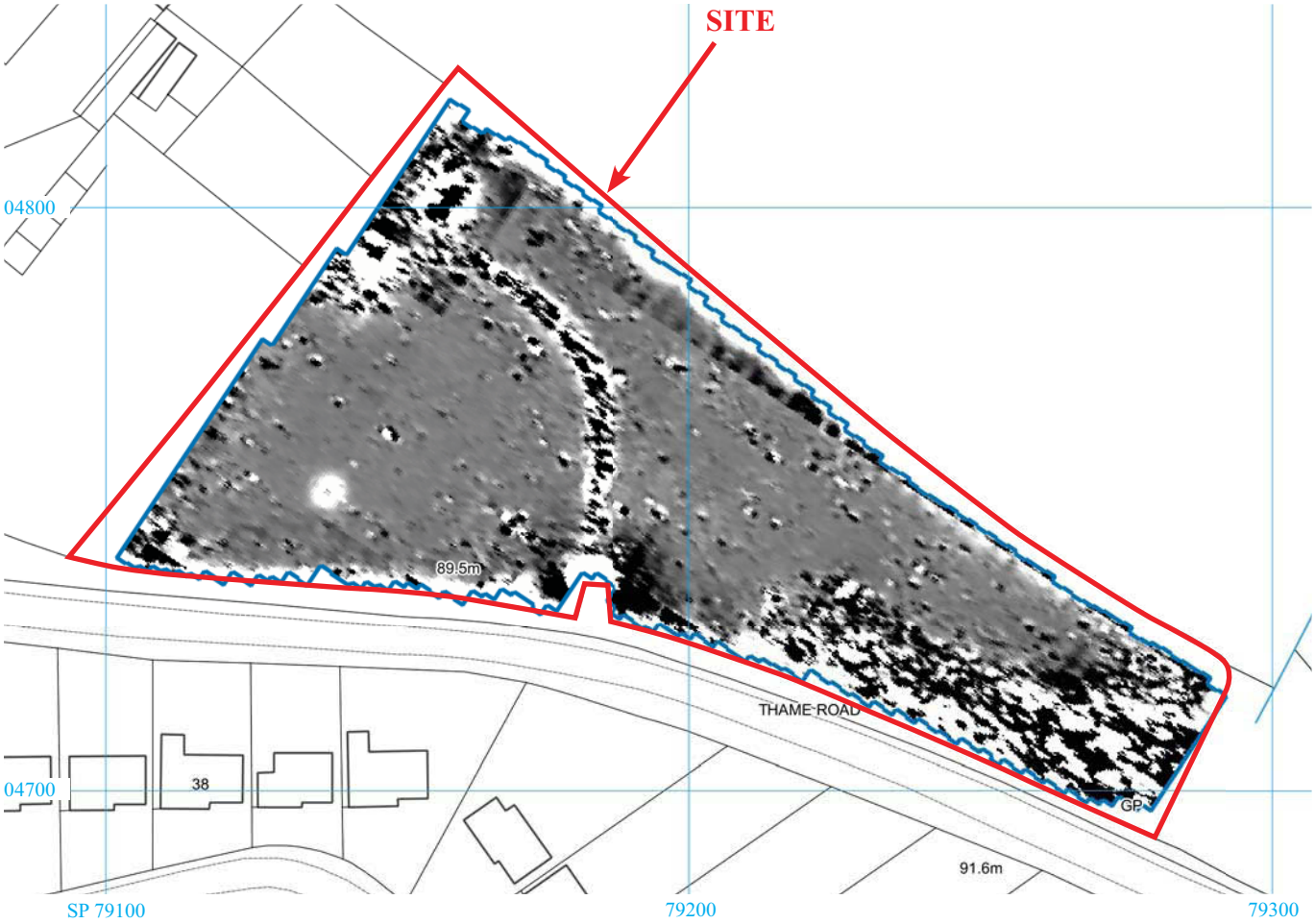

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Figure 3. Plot of minimally processed gradiometer data.

0m 100m

+5.2 nT
-4.8 nT

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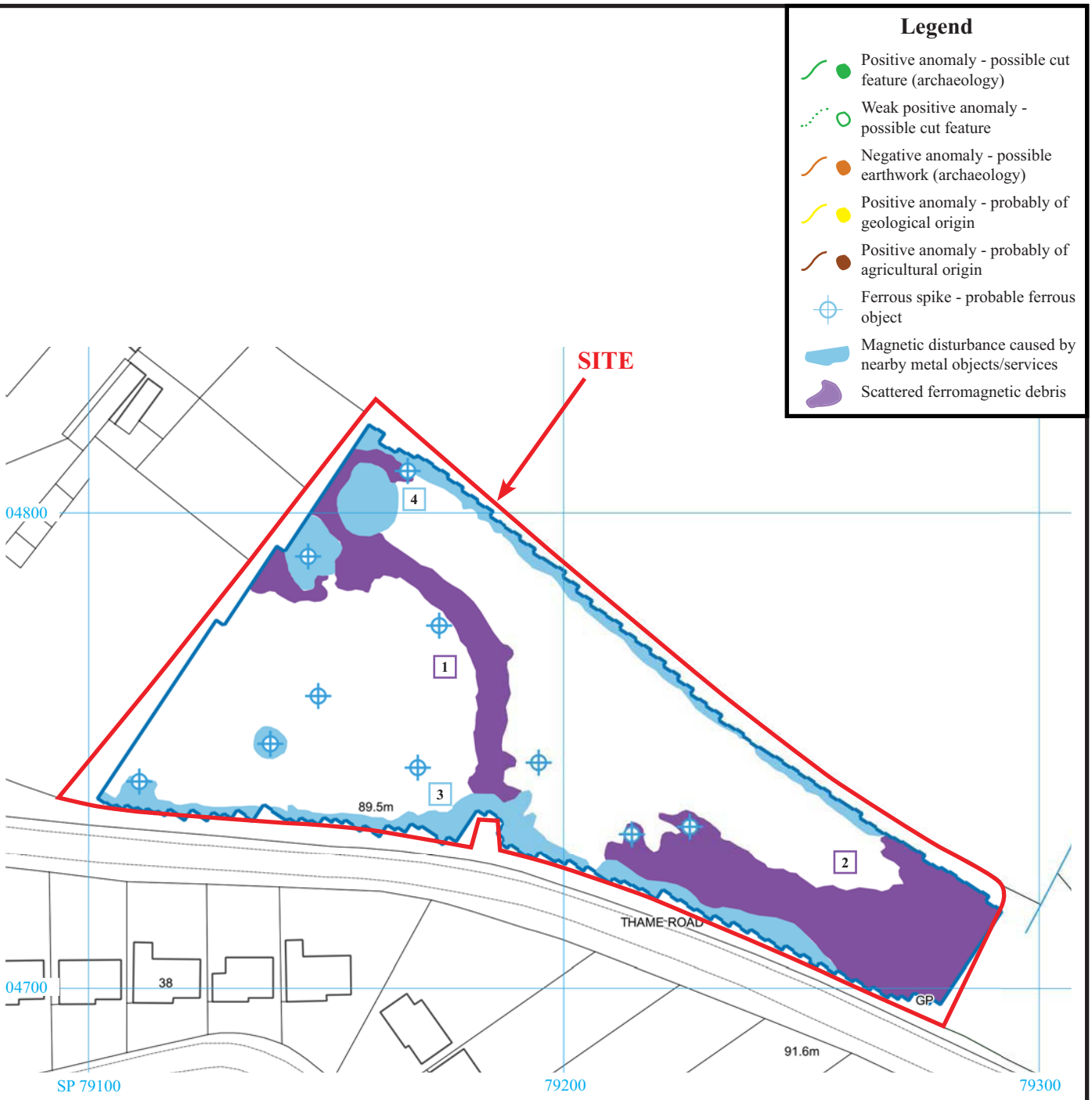

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Figure 4. Interpretation plot.

0m 100m

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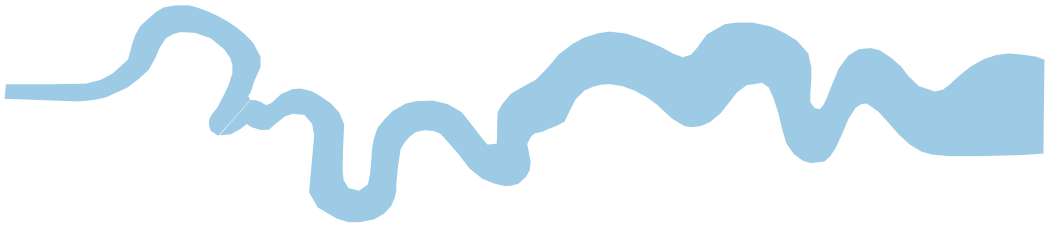
TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
Iron Age	BC/AD 750 BC
Bronze Age: Late	1300 BC
Bronze Age: Middle	1700 BC
Bronze Age: Early	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC



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