THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

Land east of Berricot Lane, Badbury, Swindon, Wiltshire

Geophysical Survey (Magnetic)

by Kyle Beaverstock

Site Code: BLB19/159

(SU 1951 8064)

Land east of Berricot Lane, Badbury, Swindon, Wiltshire

Geophysical Survey (Magnetic) Report

For Bower Mapson Homes

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code BLB 19/159

March 2020

Summary

Site name: Land east of Berricot Lane, Badbury, Swindon, Wiltshire

Grid reference: SU 1951 8064

Site activity: Magnetometer survey

Date and duration of project: 17th March 2020

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: BLB 19/159

Area of site: c. 0.8ha

Summary of results: A series of linear and discrete positive magnetic anomalies were identified which may represent buried archaeology. A significant amount of magnetic disturbance was also recorded. This can be attributed to ferrous service runs (pipes or cables).

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

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Report edited/checked by:	Steve Ford✓ 31.03.20
	Tim Dawson✓ 31.03.20

Thames Valley Archaeological Services Ltd, 47–49 De Beauvoir Road, Reading RG1 5NR
Tel. (0118) 926 0552; Email tvas@tvas.co.uk; Website: www.tvas.co.uk

Land east of Berricot Lane, Badbury, Swindon, Wiltshire
A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 19/159b

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Berricot Lane, Badbury, Swindon, Wiltshire (SU 1951 8064) (Fig. 1). The work was commissioned by Peter Mapson on behalf of Bower Mapson Homes Limited, Willow House 7, The Avenue, Stanton Fitzwarren, Swindon, Wiltshire, England, SN6 7SE. Planning permission is to be sought from Swindon Borough Council to construct new housing on a parcel of land of 0.8ha east of Berricot Lane. This is in accordance with the *National Planning Policy Framework* (NPPF 2019), and the Borough's policies on archaeology. The fieldwork was undertaken by Kyle Beaverstock and Luciano Cicu on the 17th of March 2020 and the site code is BLB 19/159.

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 on the northern edge of Badbury (Fig. 1) 400m southeast of Junction 15 of the M4. The site is an irregular parcel of land which slopes from a height of 149m above Ordnance Datum (aOD) in the southwest to 140m aOD in the northeast. The site is currently being utilised for pasture and the underlying geology is stated as Upper Greensand (BGS 1974).

Site history and archaeological background

The archaeological potential of the site has been highlighted in a desk-based assessment (Balkikas 2019). In summary, this potential stems from its location on the margins of the hamlet of Badbury, which has Medieval origins. However, it is prehistoric and Roman sites and finds which are more frequently recorded in the county Historic Environment Record. The landscape is dominated by the Iron Age hillfort on Liddington Hill to the east.

Methodology

Sample interval

Data collection involved the traversing of the survey area along straight and parallel lines using two cart-mounted Bartington Grad601-2 fluxgate gradiometers. Even coverage was achieved with the use of regularly spaced markers at the ends of traverses and the real-time positional trace plot. Readings were taken at 0.25m intervals along traverses 1m apart, providing an appropriate methodology balancing cost and time with resolution. Traverses were walked at an alternating zig-zag pattern orientated southwest to northeast across the survey area. The survey area was relatively clear of obstructions other than overgrowth on the western edge and boggy ground at the site entrance.

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 European Archaeological Council (EAC 2015) and the Chartered Institute *for* Archaeologists (2002, 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 two dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometers mounted upon a Bartington non-magnetic cart. A two-wheeled lightweight structure pushed by hand, the cart consisted a bank of four vertically-mounted Bartington Grad601-2 magnetic sensor tubes at 1m apart and a Trimble Geo 7x centimetre edition GPS. Readings were collected by two Bartington Grad601-2 loggers and collated using MLgrad601 software on a Linx 12x64 tablet running Windows 10 mounted at the rear of the cart. 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.

The Trimble Geo7x centimetre edition GPS system with centimetre real-time accuracy was used to tie the cart traverses 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 -7.74 to 7.70 nT	Enhance the contrast of the image to improve the appearance of possible archaeological 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.

The raw data plot is presented as a greyscale plot shown in relation to the site (Fig. 2) with the processed data then presented as a second figure (Fig. 3), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons.

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 2.18.15 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

The site has a significant amount of magnetic disturbance across the site, represented by bipolar and dipolar signals of a high amplitude in a linear pattern (Figs 2 and 3). One of these is orientated from west to east running from the western boundary to the eastern edge of the survey area before turning to the southeast with a small section running to the northeast while another runs along the edge of the southern boundary. These indicate the presence of buried services, most likely ferrous pipes or cables (Fig. 4). There are also a number of magnetic spikes in the central area of the site, these are represented by bipolar responses of a high amplitude and are likely caused by buried ferrous objects.

In the central area of the site there are also a number of anomalies which may be of archaeological interest. A positive linear anomaly is orientated southeast to northwest and measuring c.20m long, parallel to this to the southwest is a weak positive linear c.14m long. These may represent ditches or possibly the remnants of a trackway. To the south of these area a series of rounded positive magnetic anomalies running in a line from northeast to the southwest. These may be magnetic spikes of a low amplitude may represent geological anomalies of they may represent discrete buried features such as pits or post holes.

Conclusion

The site has a significant amount of magnetic disturbance across the survey area due to buried services, these may be masking more subtle features such as gullies or pits. Beyond this are several anomalies of possible archaeological interest such as a positive linear anomaly with a parallel weak positive linear anomaly which may represent ditches or a possible trackway. These are accompanied by a series of discrete positive anomalies of weak amplitude which may represent pits or postholes.

References

Baljkas, G 2019, 'Land east of Berricot Road, Badbury, Swindon, Wiltshire, an archaeological desk-based assessment', Thames Valley Archaeological Services report 19/159, Reading

BGS, 1974, *British Geological Survey*, 1:50,000, Sheet 266, Solid and Drift Edition, Keyworth

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

EAC, 2015, *EAC Guidelines for the use of Geophysics in Archaeology: Questions to Ask and Points to Consider*, EAC Guidelines 2, Namur

IFA, 2002, 'The Use of Geophysical Techniques in Archaeological Evaluation', IFA Paper No. 6, Reading

NPPF, 2019, *National Planning Policy Framework (revised)*, Ministry for Housing, Communities and Local Government, London

Appendix 1. Survey and data information

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

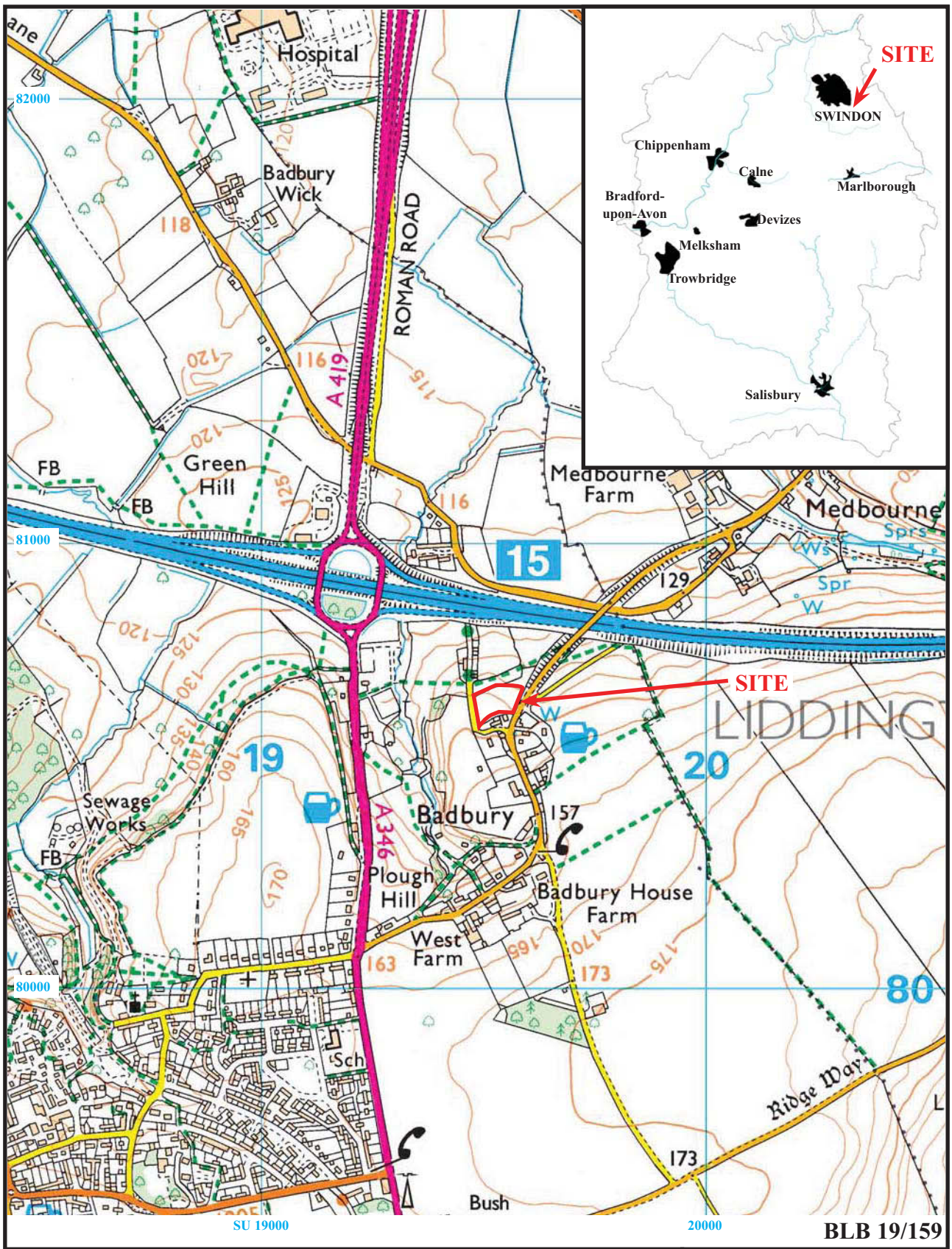
Raw data
Filename: Badbury RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30U
Survey corner coordinates (X/Y):
Northwest corner: 588750.34001059, 5708979.51103943 m
Southeast corner: 588853.56001059, 5708881.49103943 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 103 m x 98 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 22447, Recorded: 22447

Stats
Max: 107.13
Min: -109.74
Std Dev: 28.09
Mean: -6.39
Median: -1.07
Composite Area: 1.0118 ha
Surveyed Area: 0.62618 ha

Processed data
Filename: Badbury.xcp
Stats
Max: 7.74
Min: -7.70
Std Dev: 3.69
Mean: -0.62
Median: 0.04
Composite Area: 1.0118 ha
Surveyed Area: 0.62139 ha

GPS based Proce6
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip from -7.00 to 7.00
5 DeStagger by: 20.00cm, Shift Positions
6 DeStagger by: 20.00cm, Shift Positions



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Land east of Berricot Lane, Badbury, Swindon, Wiltshire, 2020
Geophysical Survey (Magnetic)
Figure 1. Location of site within Badbury and Wiltshire.

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Land east of Berricot Lane, Badbury, Swindon, Wiltshire, 2020
Geophysical Survey (Magnetic)
Figure 2. Plot of raw gradiometer data.

0m 50m

+100
nT
-100

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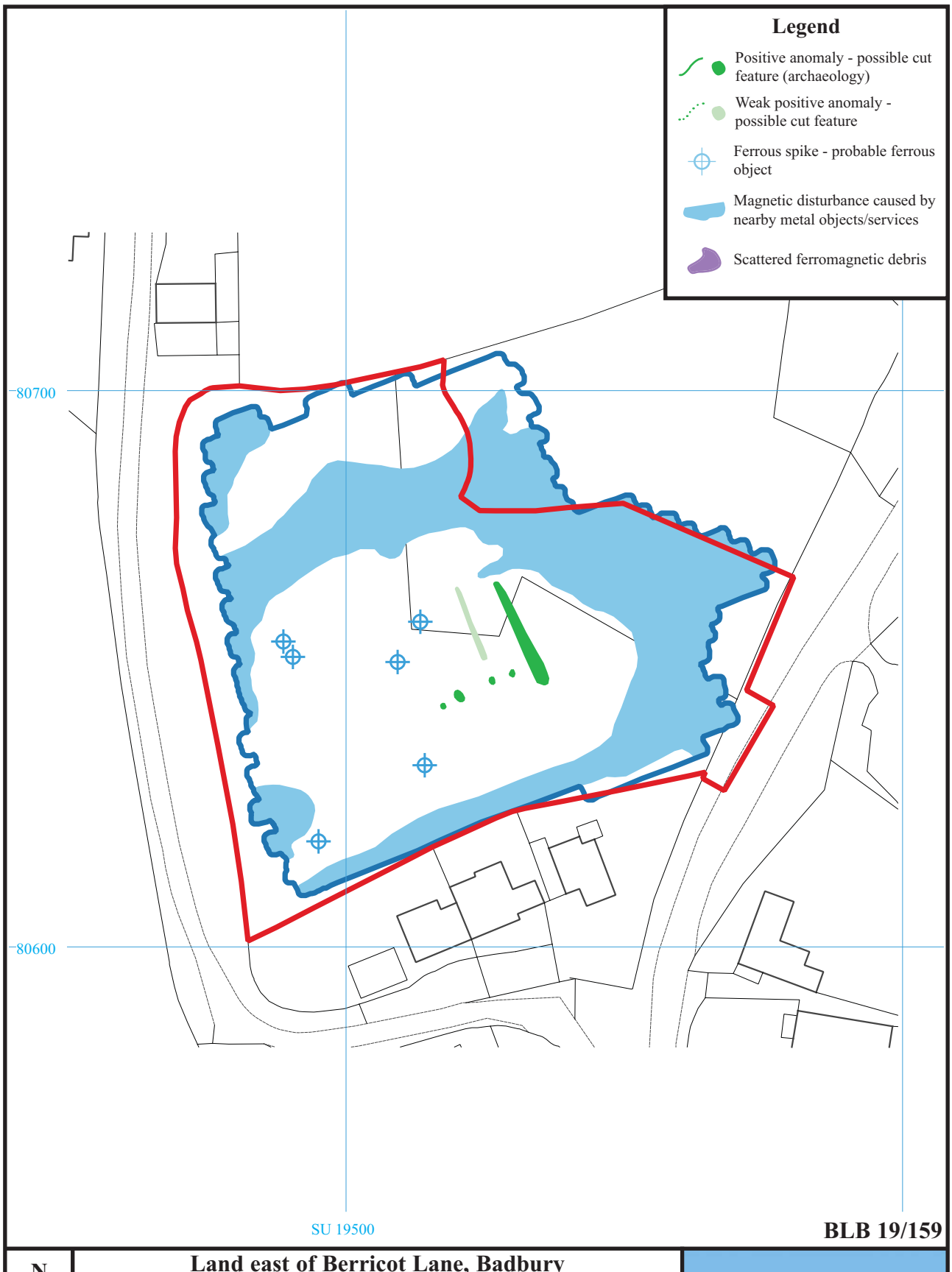
Land east of Berricot Lane, Badbury, Swindon, Wiltshire, 2020
Geophysical Survey (Magnetic)
Figure 3. Plot of processed gradiometer data.



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Land east of Berricot Lane, Badbury
Swindon, Wiltshire, 2020
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Figure 4. Interpretation plot.

0m 50m

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Plate 1. Eastern part of the survey area looking north

Plate 2. Southern boundary of the survey area looking west.

Plate 3. Western boundary of the survey area looking north.

Plate 4. Northeastern corner of the survey area looking north, showing possible edge of dump.

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Land east of Berricot Lane, Badbury, Swindon, Wiltshire, 2020
Geophysical Survey
Plates 1 to 4.

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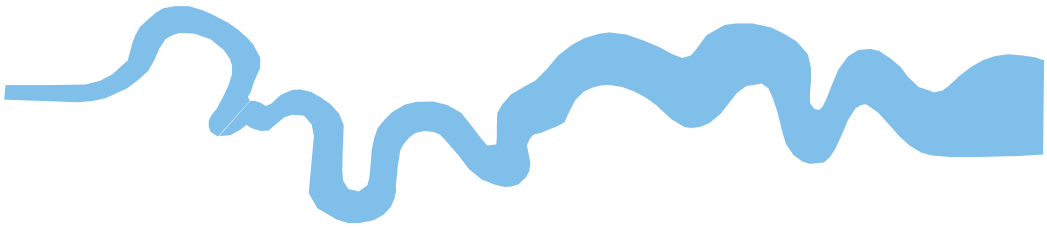
TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
	AD 0 BC
Iron Age	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



Thames Valley Archaeological Services Ltd,
47-49 De Beauvoir Road,
Reading RG1 5NR

Tel: 0118 9260552
Email: tvas@tvas.co.uk
Web: www.tvas.co.uk

Offices in:
Brighton, Taunton, Stoke-on-Trent, Wellingborough and Ennis (Ireland)