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Land at Upper Farm Road, Chilton, Oxfordshire

Geophysical Survey (Magnetic)

by Daniel Bray and Tim Dawson

Site Code: UCO15/09

(SU 4840 8575)

Land at Upper Farm Road, Chilton, Oxfordshire

Geophysical Survey (Magnetic) Report

For Ms H King-Thompson and Ms H Shorthouse

by Daniel Bray and Tim Dawson

Thames Valley Archaeological Services Ltd

Site Code UCO 15/09

February 2015

Summary

Site name: Land at Upper Farm Road, Chilton, Oxfordshire

Grid reference: SU 4840 8575

Site activity: Magnetometer survey

Date and duration of project: 11th – 12th February 2015

Project manager: Steve Ford

Site supervisor: Daniel Bray

Site code: UCO 15/09

Area of site: 3.68ha (1.74ha surveyed)

Summary of results: The survey identified several magnetic anomalies of possible archaeological, agricultural and unknown origin. These appear to be concentrated in the central area of the site and primarily aligned on an east-west axis with the anomalies with possible archaeological origin appearing to form field boundaries and a drove-way. A series of strong dipolar anomalies on the southern side of the site may represent the remains of a structure of unknown date.

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✓ 17.02.15
	Andrew Mundin✓ 17.02.15

Thames Valley Archaeological Services Ltd, 47–49 De Beauvoir Road, Reading RG1 5NR
Tel. (0118) 926 0552; Fax (0118) 926 0553; email **tvas@tvas.co.uk;** *website: www.tvas.co.uk*

Land at Upper Farm Road, Chilton, Oxfordshire
A Geophysical Survey (Magnetic)

by Daniel Bray and Tim Dawson

Report 15/09

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at on land at Upper Farm Road, Chilton, Oxfordshire (SU 4840 8575) (Fig. 1). The work was commissioned Mr Simon Handy of Strutt & Parker LLP, 269 Banbury Road, Oxford, OX2 7LL on behalf of Mrs Hilary King-Thompson and Mrs Helen Shorthouse.

An outline planning application (P14/V2462/O) has been submitted to the Vale of White Horse District Council for the construction of 57 dwellings with associated means of access, car parking, new footpath links, amenity space and landscaping. An archaeological evaluation has been requested prior to the application being determined. This report deals with the geophysical survey undertaken to further inform on any archaeological deposits that might be present and highlight areas to investigate during the trial trenching phase. This is in accordance with the Department for Communities and Local Government's *National Planning Policy Framework* (NPPF 2012) and the District's policies on archaeology. The field investigation was carried out to a specification approved by Mr Hugh Coddington, Principal Archaeologist for Oxfordshire County Archaeological Service. The work was undertaken by Daniel Bray and Joanna Pine on 11th and 12th February 2015 with the site code UCO 15/09.

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

Location, topography and geology

The site consists of a trapezoidal parcel of land directly west of the A34 and the village of Chilton, 5km south west of Didcot and south of Harwell Laboratories and Chilton Primary School. The site lies on the southeast side of Upper Farm Road covering an area of 3.20ha and is relatively flat lying at a height between 116m-117m above Ordnance Datum (aOD). An area of 0.78ha in the north-eastern corner is occupied by an industrial building and yard separated from the field by a hedge and trees. The site is bounded by a wooden post-and-rail fencing to the east, trees and a machine dug trench to the south and west and metal fence and trees separate the field from the footpath to the north. The underlying geology is recorded as Head and Younger Coombe Deposits

(BGS 1971). The conditions at the time of the survey were cold and overcast. The ground was dry and a large number of rabbit warrens were observed.

Site history and archaeological background

The archaeological potential of the site area stems from the presence of a number of sites and finds recorded within the Oxfordshire Historic Environment Record. Most significant of these is the presence of a Roman villa *c*.400m to the west with surrounding field system (Pine and Preston, 2014). The excavation also revealed an underlying Middle Iron Age house. Elsewhere to the north further Iron Age deposits have been recorded.

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 survey grid was laid out across the open field part of the site with the grids around the borders abutting the hedgerows that surround the site.

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).

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 fast yet detailed survey 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 seem 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 -1.00 to 1.20 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.
Search & Replace: from: ±30 nT to: ±1000 nT with: dummy	Removes extreme values resulting from magnetic interference caused by near-by ferromagnetic objects.
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

The geophysical survey identified a range of magnetic anomalies across the site (Fig. 3), several of which may be archaeological in origin (Fig. 4). A linear strong positive anomaly **[Fig. 4: 1]** crosses the northern part of the site on an east-west alignment, probably representing a buried cut feature, e.g. a ditch, of potential archaeological origin. A second set of five linear positive anomalies follow roughly the same alignment further to the south-east **[2, 3]**. These appear to form two parallel ditch-type features 3.6m apart and may indicate the presence of a infilled drove-way. Another positive linear anomaly **[4]** branches out from the northern element of **[3]** at its eastern end before appearing to turn and run parallel for a short distance. South of these magnetic anomalies is a strong discreet positive anomaly **[5]** which can be interpreted as a discrete pit-type feature. Further to the west, at the western end of **[2]**, are two weaker linear positive anomalies **[6, 7]** on a loose north-east to south-west alignment. Another set of weak linear positive anomalies were identified in the north-eastern corner of the site. These consist of a 27m stretch running south from the edge of the survey area **[8]**, a fork **[9]** at the southern end of **[8]** and a continuation of the western fork with another weak linear feature at its southern terminus **[10]** on the south side of the possible drove-way **[3]**. A larger area of weak positive anomaly are present in the north-eastern corner **[11]** which probably represents a infilled hollow that has naturally accrued organic material over time.

Several other linear positive anomalies **[12, 13, 14]** were identified which are most likely to be the result of agricultural activity due to their orientation when compared with the modern field boundaries. A third category of anomaly is represented by a series of strong dipolar readings that were detected in the centre of the site's southern boundary **[15, 16]**. It is unclear what they are caused by but they do appear to form a regular, almost rectangular shape and may therefore represent structural remains although, if this were the case, this structure

would measure 15m × 25m. **[16].** This large strong dipolar anomaly within the rectangle may indicate the presence of a buried ferromagnetic object. While not an anomaly in itself, the general background magnetic readings are noticeably noisier to the north of the anomaly **[1]** (Fig. 3). This may indicate a different form of land use in this area and is possibly of archaeological significance.

The survey was affected by a series of ferromagnetic objects, such as fences, along its perimeter. The resulting areas of strong magnetic disturbance may have a masking effect on any weaker anomalies in these locations.

Conclusion

The geophysical survey at Upper Road Farm was undertaken successfully and was able to investigate the open area of the site. It identified several magnetic anomalies of possible archaeological, agricultural and unknown origin. These appear to be concentrated in the central area of the site and primarily aligned on an east-west axis with the anomalies with possible archaeological origin appearing to form field boundaries and a drove-way. The strong dipolar anomalies on the southern side of the site may represent the remains of a structure of unknown age and the change in background readings in the north could indicate a different land use to the remainder of the area.

References

BGS, 1971, *British Geological Survey*, 1:50,000, Sheet 253, 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

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

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Appendix 1. Survey and data information

Raw data
Instrument Type: Grad 601 (Magnetometer)
Units: nT
Survey corner coordinates (X/Y):
Northwest corner: 448392.85, 185634.27 m
Southeast corner: 448592.85, 185454.27 m
Direction of 1st Traverse: 342.526 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 2047.5

Dimensions
Composite Size (readings): 800 x 180
Survey Size (meters): 200 m x 180 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: 7.54
Mean: -0.51
Median: -0.03
Composite Area: 3.6 ha
Surveyed Area: 1.6953 ha

Source Grids: 62
1 Col:0 Row:5 grids\01.xgd
2 Col:0 Row:6 grids\02.xgd
3 Col:0 Row:7 grids\03.xgd
4 Col:1 Row:4 grids\04.xgd
5 Col:1 Row:5 grids\05.xgd
6 Col:1 Row:6 grids\06.xgd
7 Col:1 Row:7 grids\07.xgd
8 Col:2 Row:2 grids\08.xgd
9 Col:2 Row:3 grids\09.xgd
10 Col:2 Row:4 grids\10.xgd
11 Col:2 Row:5 grids\11.xgd
12 Col:2 Row:6 grids\12.xgd
13 Col:2 Row:7 grids\13.xgd
14 Col:2 Row:8 grids\14.xgd
15 Col:3 Row:1 grids\15.xgd
16 Col:3 Row:2 grids\16.xgd
17 Col:3 Row:3 grids\17.xgd
18 Col:3 Row:4 grids\18.xgd
19 Col:3 Row:5 grids\19.xgd
20 Col:3 Row:6 grids\20.xgd
21 Col:3 Row:7 grids\21.xgd
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57 Col:8 Row:3 grids\59.xgd
58 Col:8 Row:4 grids\61.xgd
59 Col:9 Row:1 grids\56.xgd
60 Col:9 Row:2 grids\58.xgd
61 Col:9 Row:3 grids\60.xgd
62 Col:9 Row:4 grids\62.xgd

Processed data
Stats
Max: 1.20
Min: -1.00
Std Dev: 0.58
Mean: 0.02
Median: 0.01

Processes: 8
1 Base Layer
2 De Stagger: Grids: All Mode: Both By: -1 intervals
3 Search & Replace From: 30 To: 1000 With: Dummy
4 Search & Replace From: -1000 To: -30 With: Dummy
5 DeStripe Median Sensors: All
6 Despike Threshold: 1 Window size: 3x3
7 Interpolate: Y Doubled.
8 Clip from -1.00 to 1.20 nT

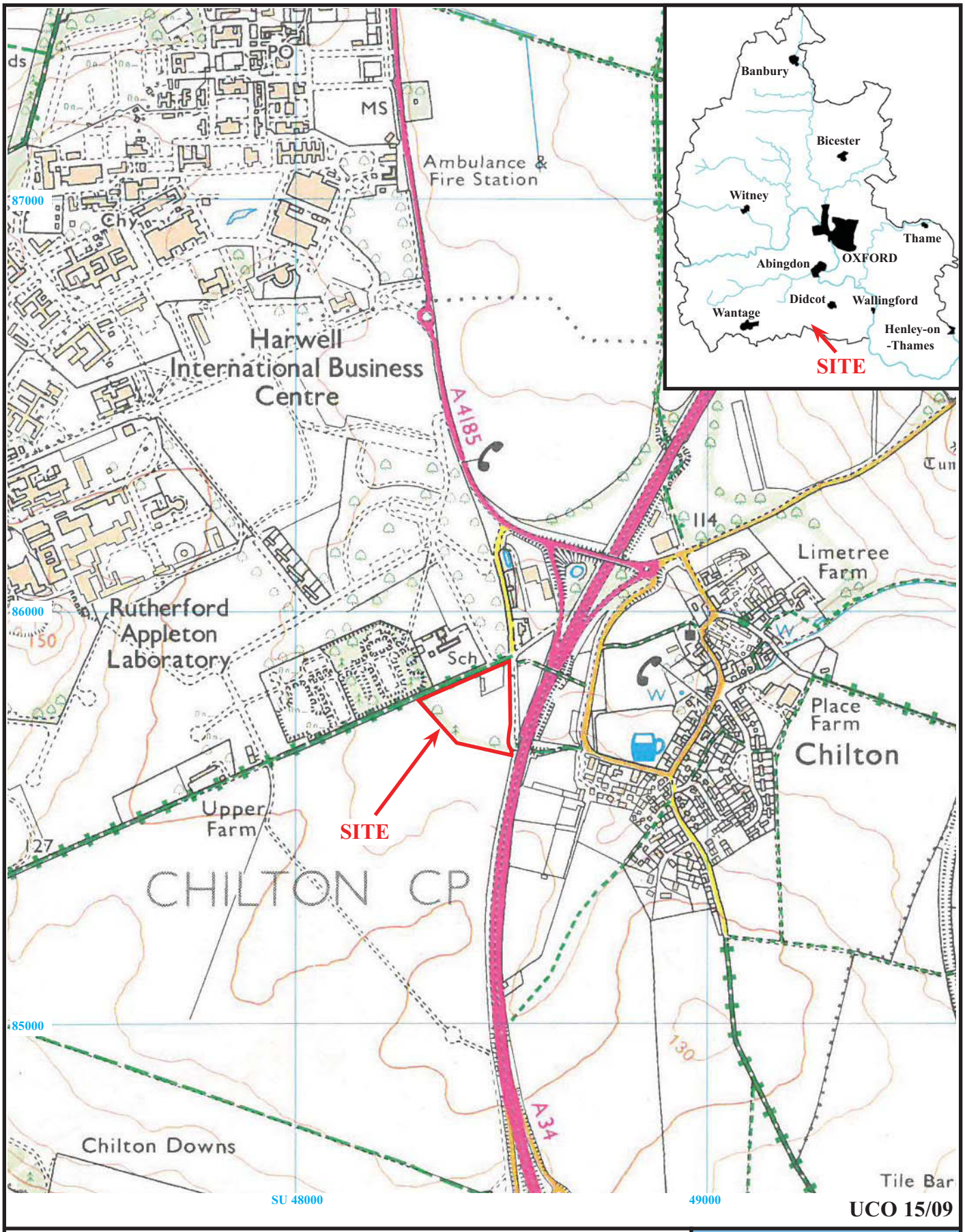

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Figure 1. Location of site within Chilton and Oxfordshire

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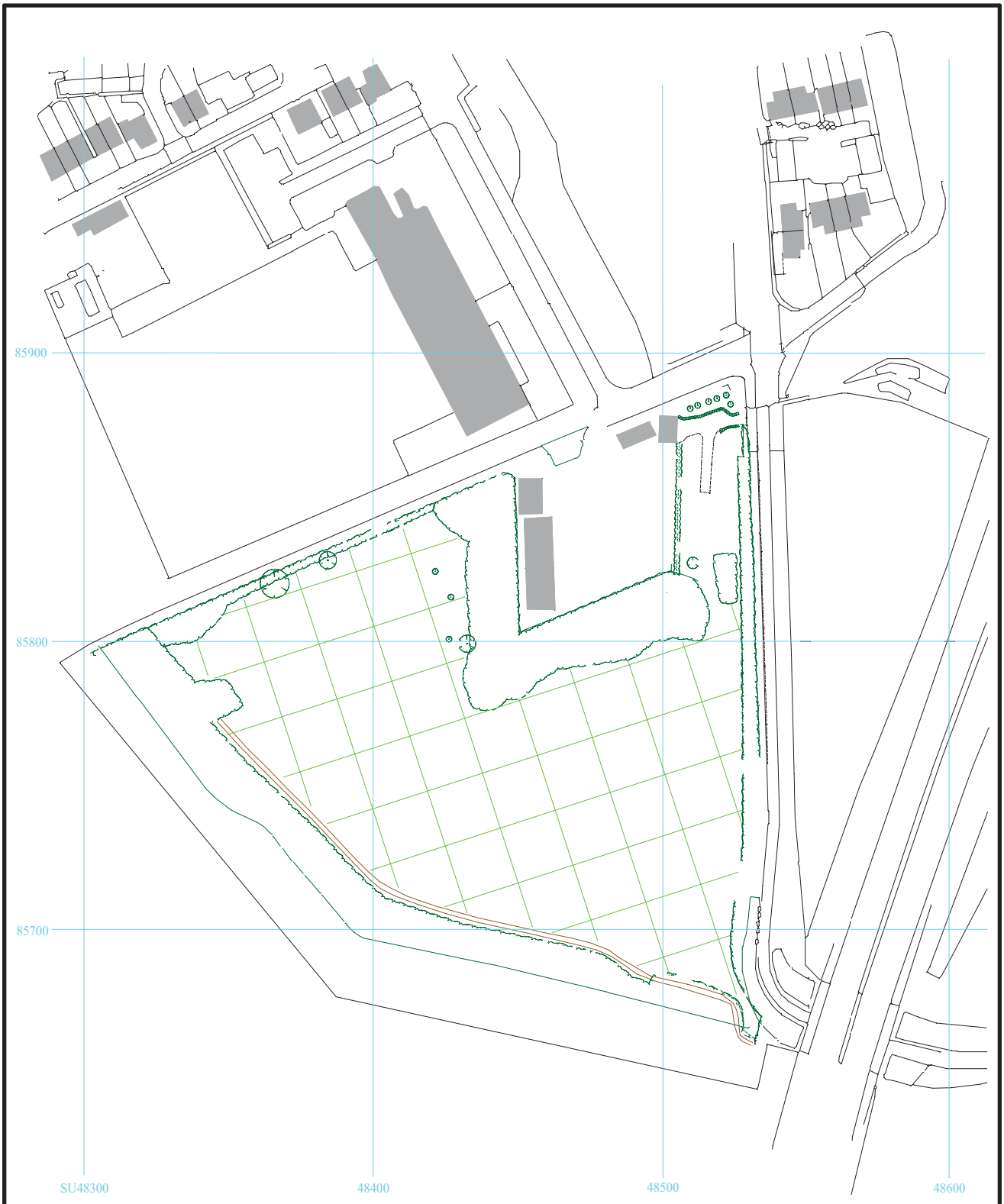

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Figure 2. Detailed site location showing survey grid layout.

0 100m

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Figure 3. Plot of minimally processed gradiometer data.

0m 100m

+1.2 nT
-1 nT

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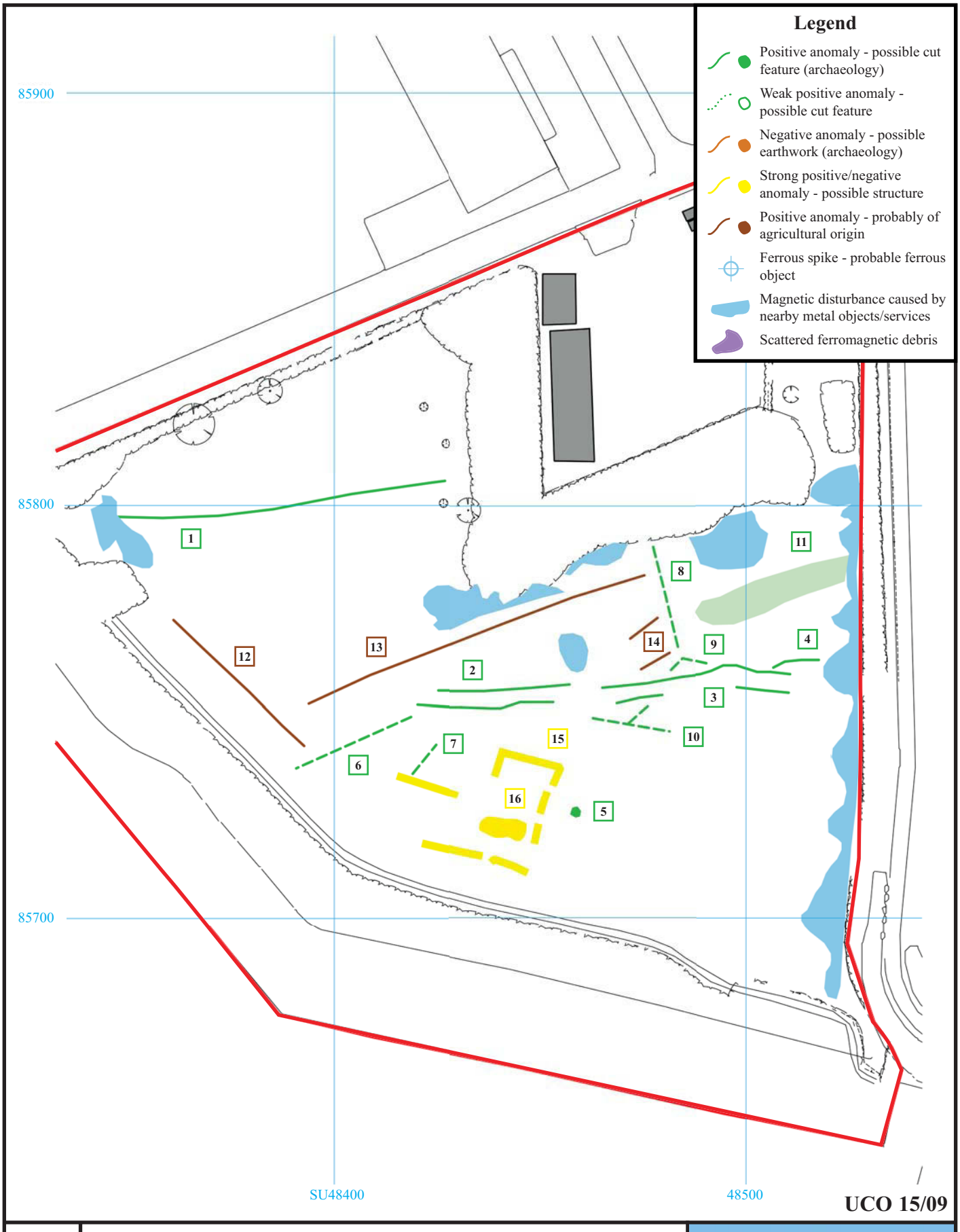

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Land at Upper Road Farm, Chilton, Oxfordshire, 2015
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Figure 4. Interpretation plot.

0m 100m

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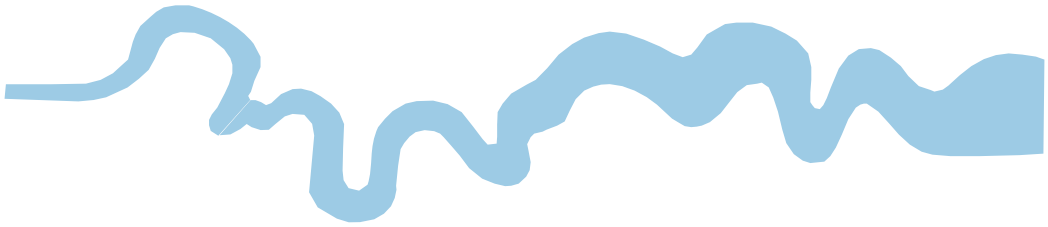
TIME CHART

	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



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

Tel: 0118 9260552
Fax: 0118 9260553
Email: tvas@tvas.co.uk
Web: www.tvas.co.uk