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Land west of Heath Close, Milcombe, Oxfordshire

Geophysical Survey (Magnetic)

by Luciano Cicu

Site Code: HCM22/100

(SP 4069 3458)

Land west of Heath Close, Milcombe, Oxfordshire

Geophysical Survey (Magnetic) Report

For Abbeymill Homes

by Luciano Cicu

Thames Valley Archaeological Services Ltd

HCM 22/100

November 2022

Summary

Site name: Land west of Heath Close, Milcombe, Oxfordshire

Grid reference: SP 4069 3458

Site activity: Magnetometer survey

Date and duration of project: 14th November 2022

Project coordinator: Kyle Beaverstock

Site supervisor: Luciano Cicu

Site code: HCM 22/100

Area of site: 2.3ha

Summary of results: The survey has recorded several magnetic anomalies across the site but few if any are considered to be of archaeological origin.

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✓ 30.11.22
	David Sanchez ✓ 30.11.22

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Land east of Heath Close, Milcombe, Oxfordshire
A Geophysical Survey (Magnetic)

by Luciano Cicu

Report 22/100

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Land west of Heath Close, Milcombe, Oxfordshire (SP 4069 3458) (Fig. 1). The work was commissioned by Tim Northey of Abbeymill Homes, Market House, Silver End, Olney, MK46 4AL. The results are to support a planning application made to Cherwell District Council for a residential development on a c. 2.23ha parcel of land. Due to the potential disturbance of below ground archaeological features, archaeological work (evaluation) is required, to inform the planning process. The evaluation was to comprise two components with geophysical survey to be followed by trenching. This is in accordance with the Ministry of Housing, Communities and Local Government's National Planning Policy Framework (NPPF 2021) and the Council's relevant local planning policies. The fieldwork was undertaken by Luciano Cicu and Edmund Cush on the 14th November 2022 with the site code is HCM 22/100.

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

Location, topography and geology

The survey area is located on the western extent of Milcombe bound by Main Road to the south, properties on Heath Close to the east and a dismantled railway to the north west.. The site is used for the grazing of livestock. The site has a very gentle slope with an elevation of 134m above Ordnance Datum (aOD) in the south, rising to 138m aOD in the north. The site is located on Whitby Mudstone, with no superficial deposits (BGS 1968).

Site history and archaeological background

The archaeological potential of the site has been highlighted in the archaeological desk-based assessment (Procter and Elliott 2022). In summary the site lies to the southwest of Milcombe which has late Saxon origins and is documented in Domesday Book of 1086 (Williams and Martin, 2002). Excavations at Oak Tree Farm to the east recorded parts of the Medieval and Post-Medieval settlement (Platt and Tabor, 2014).

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 north-south pattern along a north-south orientation across the all survey areas. In the north-west portion of the survey area, there is a small portion of the area that wasn't surveyed, due to a heap of ferrous material and branches. Other pockets weren't surveyed in the south east of the area, due to further ferrous materials and obstacles – tree remains, blocking access. The survey was traversed in several individual portions, due to fencing placed likely to separate the sheep and cattle.

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 -10.23 to +9.47 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 most intensive areas of magnetic disturbance were detected adjacent to the boundaries of the survey area **[Fig 4: 1]**. This is represented by bipolar anomalies represented by high responses of both positive and negative, this is likely to indicate the presence of fences with a large amount of ferrous material eg (nails, barbed wire, etc). There is also an area magnetic debris **[2]** located in the south west of the site represented by numerous dipolar responses. This could be associated with a spread of thermo-remnant material such as brick or ash. The survey shows magnetic spikes **[3],** these are associated with very strong singular dipolar anomalies of both positive and negative responses, linked to ferrous materials.

In the north of the site are anomalies **[4]**, shown in a faint positive response running parallel with each other aligned SW- NE. These are likely to be of agricultural origin, possibly ridge and furrow, too little is recorded to be certain of this interpretation.

Following this the data did present dense pockets of geological changes, located in the middle of the survey area, highlighted by the wide scale of weak magnetic variations.

North east of the agricultural anomalies is a week negative archaeological linear **[5]** heading north to south for 12.5m. This type of anomaly which is entirely negative in polarity are generally caused by a build up of material, such as earth and banks, or structural remains such as a wall.

In the southern area, there are a few positive anomalies **[6]**. These are represented as segmented linears, two of these are heading north to south running parallel 18m apart. Of the two linear that run parallel, the linear towards the west is around 13m long. The linear in the east is around 20m, turning west for 4m, before terminating. The linear continues along the east to west alignment for 5m, terminating and then re-emerging in the adjacent field. Here the linear continues for 2.5m before terminating. In this linear around 1.5m a second anomaly protrudes up for a further 2.5m, this anomaly runs in same alignment as the 13m linear below. These features are positive in polarity, usually related to an infilled cut feature. These features lie in a zone occupied by small paddocks and small buildings and seem likely to relate to use of the latter.

Conclusion

The geophysical survey has recorded a range of magnetic anomalies across the site. Most of the anomalies can be considered to reflect modern activity, the presence of magnetic debris or anomalies of geological origin. A few anomalies might reflect medieval or post-medieval agriculture and others might reflect boundaries associated with the use of the current structures occupying the site. One linear anomaly is of uncertain origin. It is considered that non of the anomalies recorded are of unambiguous archaeological interest.

References

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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

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Platt, D and Tabor, R, 2014, *Medieval Settlement at Oak Farm, Milcombe, Banbury, Oxfordshire: Excavation in 2012,* TVAS Occasional Paper 7, Reading

Procter, C and Elliott, G, 2022. 'Land west of Heath Close, Milcombe, Oxfordshire; Archaeological Desk-based Assessment' Thames Valley Archaeological Services unpubl rep 22/100, Reading

Williams, A and Martin, G H, 2002, *Domesday Book, A complete Translation,* London

Appendix 1. Survey and data information

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

Raw data
Filename: Milcombe A RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 440511.91804209, 234599.293451659 m
Southeast corner: 440610.45804209, 234439.133451659 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 98.5 m x 160 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 30343, Recorded: 30343

Stats
Max: 106.71
Min: -109.72
Std Dev: 7.10
Mean: 0.26
Median: 0.89
Composite Area: 1.5782 ha
Surveyed Area: 1.1496 ha

Filename: Milcombe B RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 440594.035576275, 234608.955409749 m
Southeast corner: 440654.745576275, 234543.565409749 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 60.7 m x 65.4 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 7479, Recorded: 7479

Stats
Max: 106.50
Min: -109.71
Std Dev: 14.04
Mean: -0.58
Median: 1.71
Composite Area: 0.39698 ha
Surveyed Area: 0.29796 ha

Filename: Milcombe C RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 440600.558034174, 234546.067817417 m
Southeast corner: 440634.098034174, 234502.127817417 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions

Processed data
Filename: Milcombe A.xcp
Stats
Max: 2.28
Min: -2.43
Std Dev: 0.89
Mean: -0.02
Median: 0.03
Composite Area: 1.5248 ha
Surveyed Area: 1.0854 ha

GPS based Proce7
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip at 1.00 SD
5 DeStagger by: 50.00cm, Shift Positions
6 Clip at 1.00 SD
7 DeStagger by: 50.00cm, Shift Positions

Filename: Milcombe B.xcp
Stats
Max: 2.10
Min: -2.19
Std Dev: 0.93
Mean: 0.03
Median: 0.01
Composite Area: 0.37277 ha
Surveyed Area: 0.267 ha

GPS based Proce7
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip at 1.00 SD
5 DeStagger by: 50.00cm, Shift Positions
6 Clip at 1.00 SD
7 Clip at 1.00 SD

Filename: Milcombe C.xcp
Stats
Max: 4.49
Min: -4.85
Std Dev: 1.79
Mean: -0.06
Median: -0.01
Composite Area: 0.13224 ha
Surveyed Area: 0.10169 ha

GPS based Proce7
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip at 1.00 SD
5 DeStagger by: 50.00cm, Shift Positions
6 DeStagger by: 50.00cm, Shift Positions
7 Clip at 1.00 SD

Filename: Milcombe D.xcp
Stats
Max: 3.32
Min: -4.17
Std Dev: 1.94
Mean: -0.14
Median: 0.02
Composite Area: 0.14873 ha
Surveyed Area: 0.1077 ha

Survey Size (meters): 33.5 m x 43.9 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 3231, Recorded: 3231

Stats
Max: 99.24
Min: -108.83
Std Dev: 15.13
Mean: -0.53
Median: 1.83
Composite Area: 0.14737 ha
Surveyed Area: 0.1188 ha

Filename: Milcombe D RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 440604.717887187, 234505.626370583 m
Southeast corner: 440636.307887187, 234453.496370583 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 31.6 m x 52.1 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 3399, Recorded: 3399

Stats
Max: 103.12
Min: -109.71
Std Dev: 14.99
Mean: -2.31
Median: 0.82
Composite Area: 0.16468 ha
Surveyed Area: 0.12642 ha

Filename: Milcombe E RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 440644.391140808, 234574.431828038 m
Southeast corner: 440660.121140808, 234547.781828038 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 15.7 m x 26.6 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 479, Recorded: 479

Stats
Max: 30.01
Min: -51.10
Std Dev: 5.98
Mean: -0.93
Median: -0.37
Composite Area: 0.04192 ha
Surveyed Area: 0.02399 ha

Filename: Milcombe F RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 440630.890113263, 234545.692166994 m
Southeast corner: 440670.800113263, 234463.272166994 m
Direction of 1st Traverse: 90 deg

GPS based Proce8
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip at 1.00 SD
5 DeStagger by: 50.00cm, Shift Positions
6 Clip at 1.00 SD
7 DeStagger by: 50.00cm, Shift Positions
8 Clip at 1.00 SD

Filename: Milcombe E.xcp
Stats
Max: 2.68
Min: -2.89
Std Dev: 1.47
Mean: -0.01
Median: -0.01
Composite Area: 0.033857 ha
Surveyed Area: 0.015829 ha

GPS based Proce8
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip at 1.00 SD
5 DeStagger by: 50.00cm, Shift Positions
6 Clip at 1.00 SD
7 DeStagger by: 50.00cm, Shift Positions
8 Clip at 1.00 SD

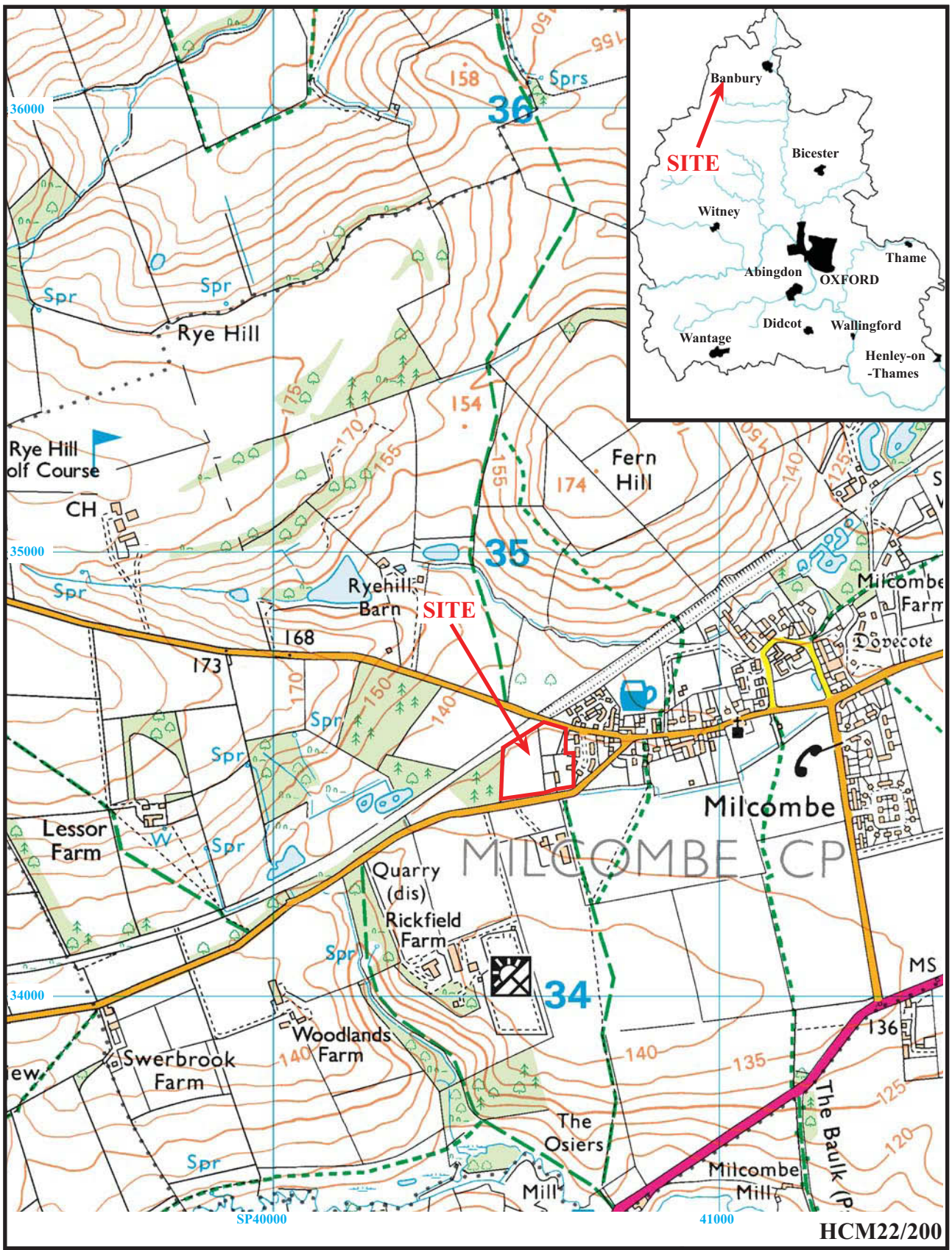
Filename: Milcombe F.xcp
Stats
Max: 9.47
Min: -10.23
Std Dev: 4.64
Mean: 0.00
Median: 0.04
Composite Area: 0.30546 ha
Surveyed Area: 0.15113 ha

GPS based Proce7
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip at 1.00 SD
5 DeStagger by: 50.00cm, Shift Positions
6 Clip at 1.00 SD
7 DeStagger by: 50.00cm, Shift Positions

Collection Method: *Parallel*
Sensors: *2 @ 1 m spacing.*
Dummy Value: *32702*

Dimensions
Survey Size (meters): *39.9 m x 82.4 m*
X&Y Interval: *0.13 m*
Source GPS Points: *Active: 4567, Recorded: 4567*

Stats
Max: *107.01*
Min: *-109.75*
Std Dev: *22.18*
Mean: *-4.03*
Median: *0.52*
Composite Area: *0.32894 ha*
Surveyed Area: *0.18443 ha*



Land west of Heath Close, Milcombe, Oxfordshire, 2022
Geophysical Survey

Figure 1. Location of site within Milcombe and Oxfordshire.

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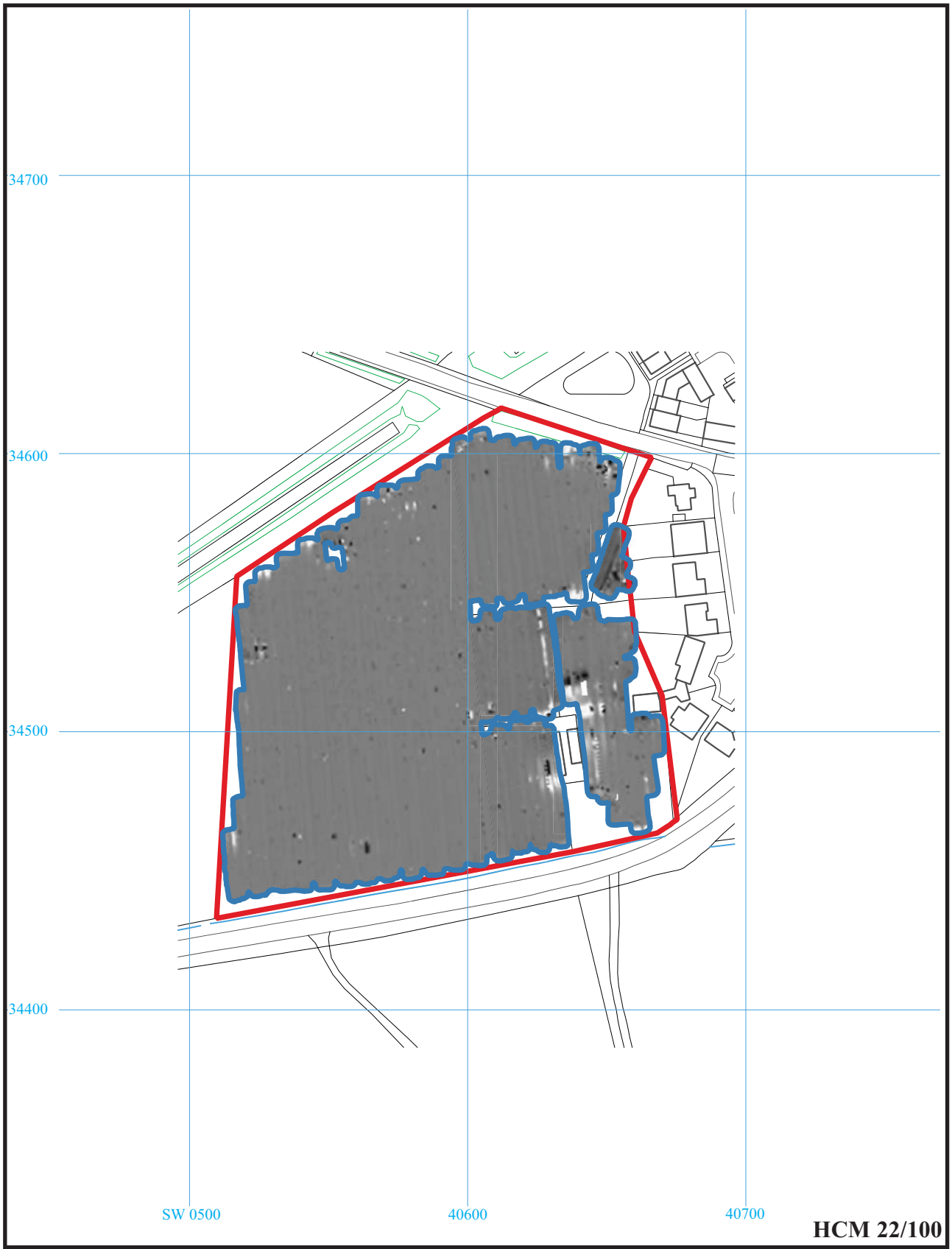

HCM 22/100

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Land west of Heath Close, Milcombe, Oxfordshire 2022

Geophysical Survey (Magnetic)

Figure 2. Plot of raw gradiometer data.

0m 100m

+100
nT
-100

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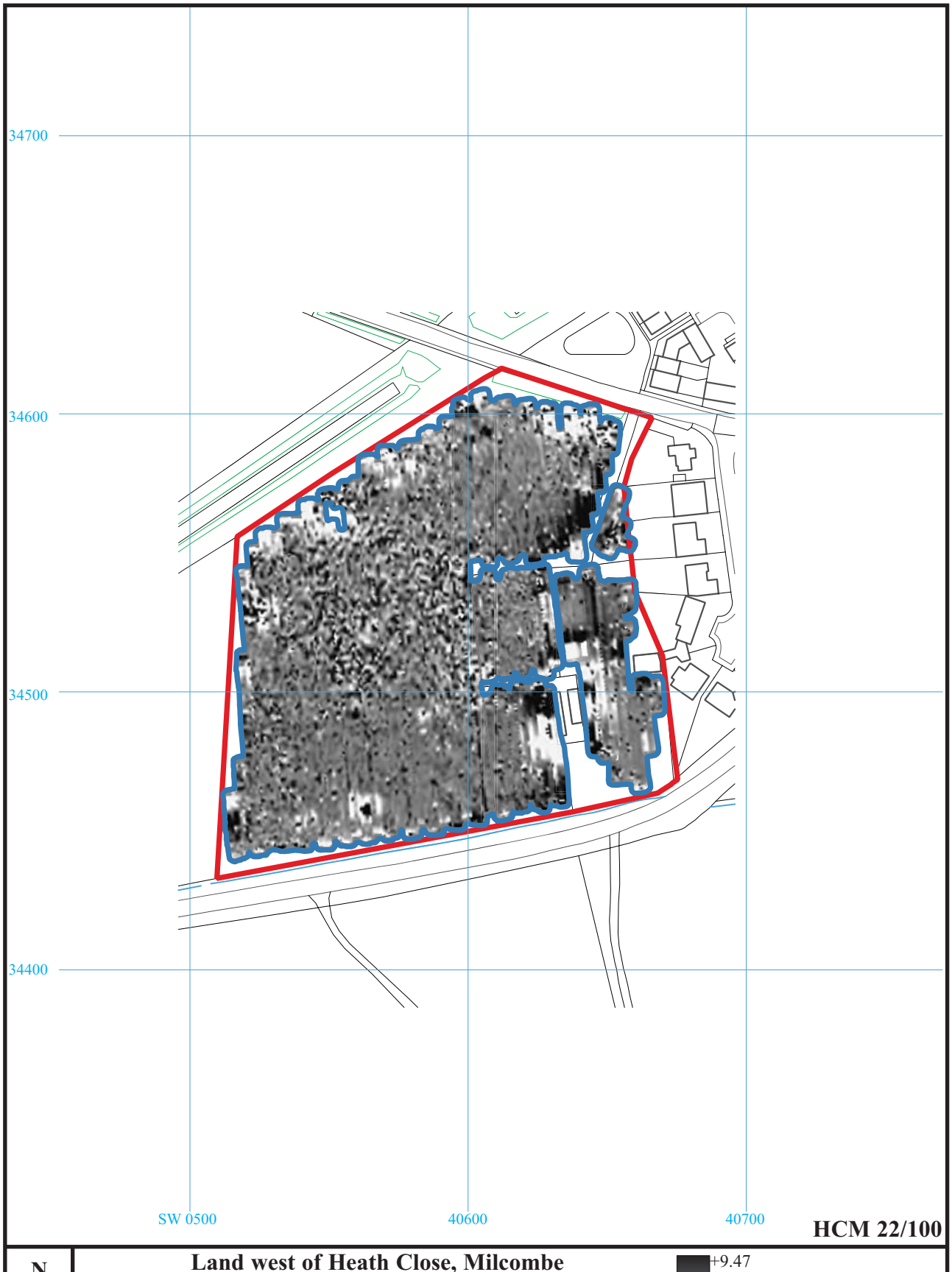
34700
34600
34500
34400
SW 0500
40600
40700
HCM 22/100
N
Land west of Heath Close, Milcombe
Oxfordshire, 2022
Geophysical Survey (Magnetic)
Figure 3. Plot of raw gradiometer data.
0m
100m
+9.47
nT
-10.23
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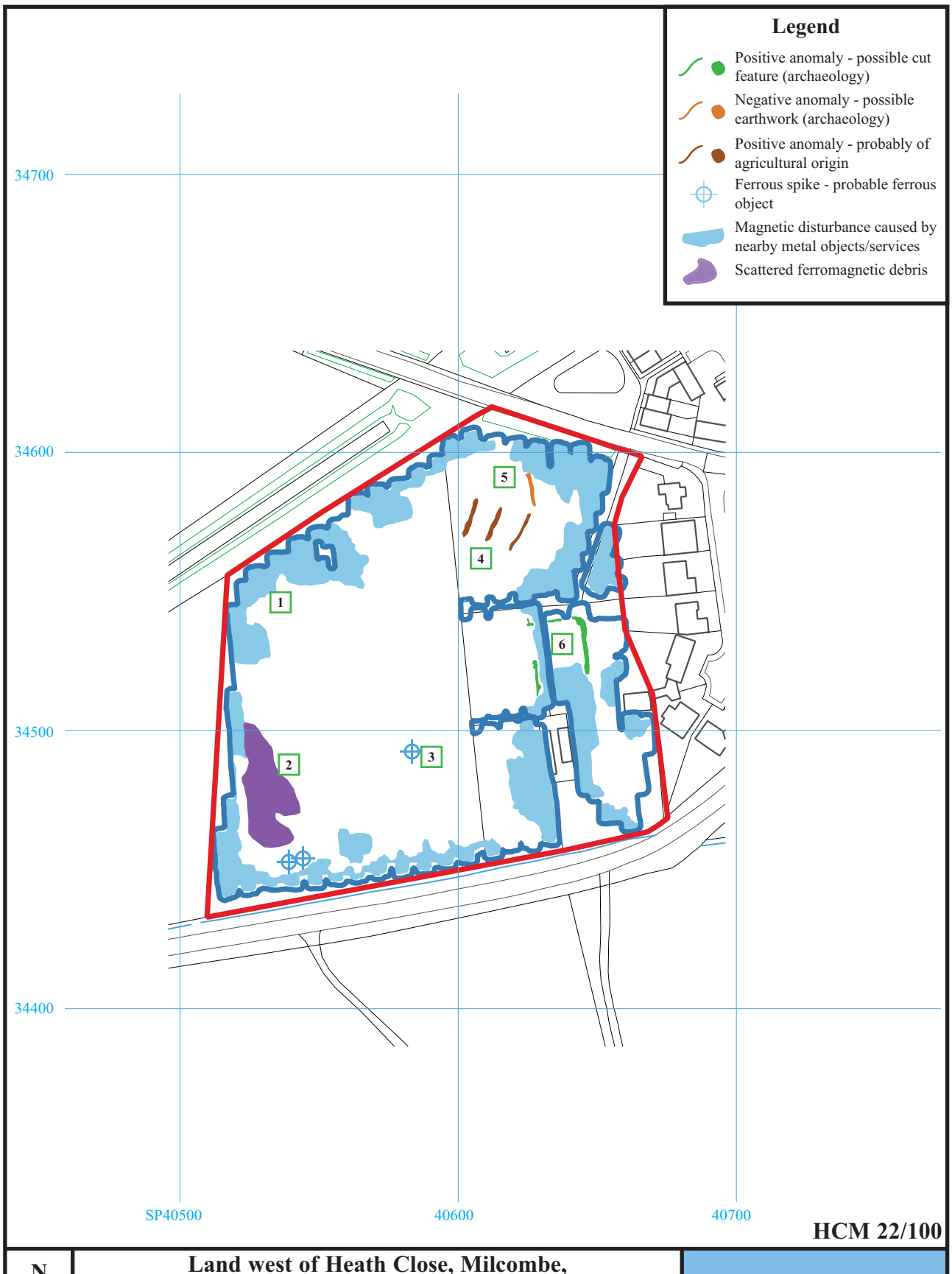

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Land west of Heath Close, Milcombe, Oxfordshire, 2022
Geophysical Survey (Magnetic)
Figure 5. Interpretation plot.

0m 100m

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Plate 1. Surve area north facing south

Plate 2. Survey area, north east facing south west

Plate 3. Survey area, south facing north

Plate 4. Survey area south facing north east

Plate 5. Survey are, south west facing north east

HCM22/100

Land west of Heath Close, Milcombe, Oxfordshire, 2022
Geophysical Survey (Magnetic)
Plates 1-5

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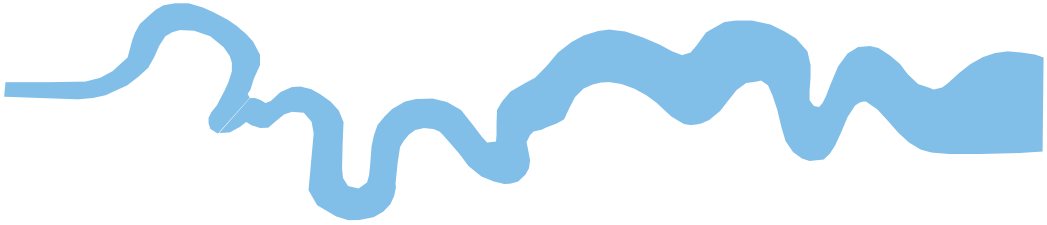
TIME CHART

	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



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