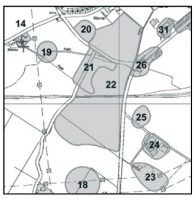
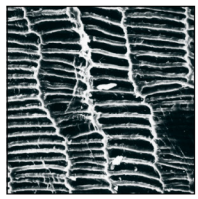
SRST/02










LAND SOUTH OF SOULBURY ROAD, STEWKLEY, BUCKINGHAMSHIRE

GEOPHYSICAL SURVEY

commissioned by NLP Planning

December 2015

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

LAND SOUTH OF SOULBURY ROAD, STEWKLEY, BUCKINGHAMSHIRE

GEOPHYSICAL SURVEY

commissioned by NLP Planning

December 2015

project info

HA JOB NO.	SRST/02
NGR	SP 85358 25824
PARISH	Stewkley
LOCAL AUTHORITY	Buckinghamshire
OASIS REF.	headland5-234762

project team

PROJECT MANAGER	Sam Harrison
AUTHOR	David Harrison
FIELDWORK	Alex Schmidt, David Harrison, Ross Bishop
GRAPHICS	Caroline Norrman, Rafael Maya-Torcelly
APPROVED BY	Sam Harrison – Project Manager

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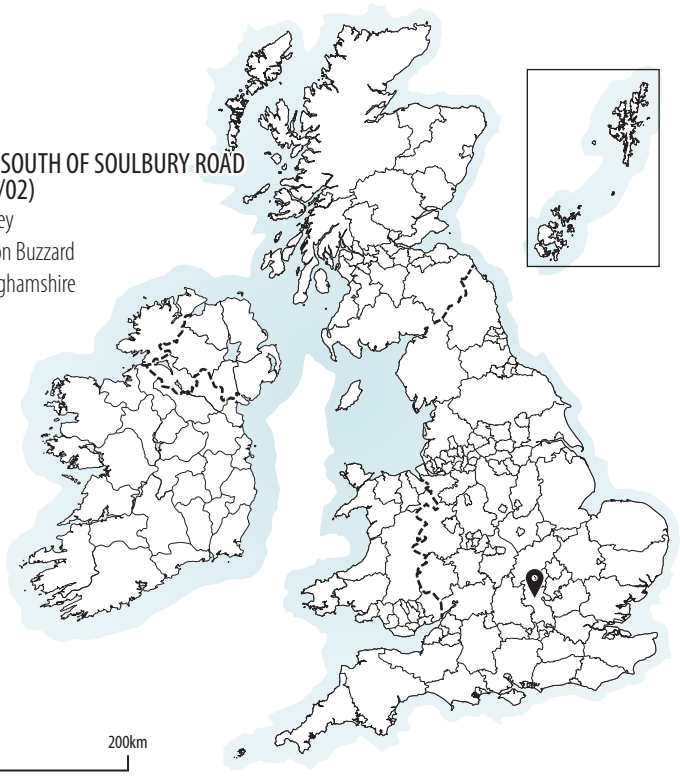
PROJECT SUMMARY

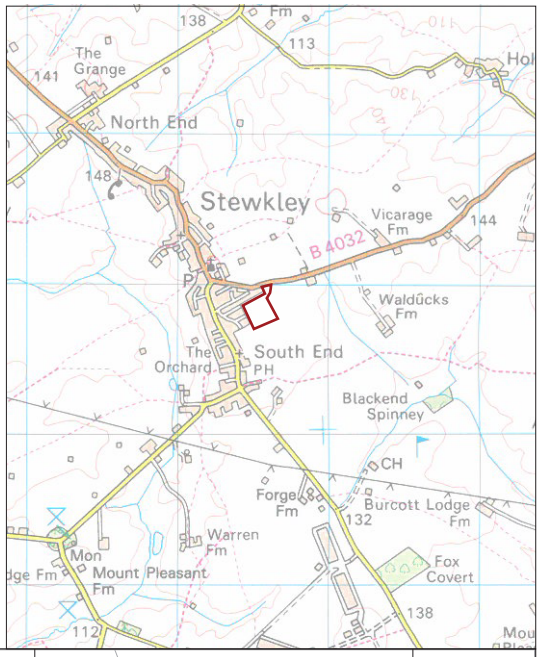
Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 3.3 hectares to the south of Soulbury Road, Stewkley, to provide information about the archaeological potential of the site which is proposed for development. A well-defined square area of magnetic disturbance in the north-western corner of the site corresponds with an area of cropmarks which are recorded as possible medieval enclosures within the Buckinghamshire Historic Environment Record (HER MBC3264). The disturbance is likely to be caused by the spreading of magnetically-enhanced material throughout the former enclosure prior to its removal. However, no anomalies specifically locating the enclosure, or any features within it, have been identified by the survey. Elsewhere, anomalies have been identified which reflect the former agricultural landscape in the form of ridge and furrow cultivation. Therefore, based on the results and interpretation of the data, the archaeological potential of the site is considered to be low and moderate within the vicinity of the possible medieval enclosure.

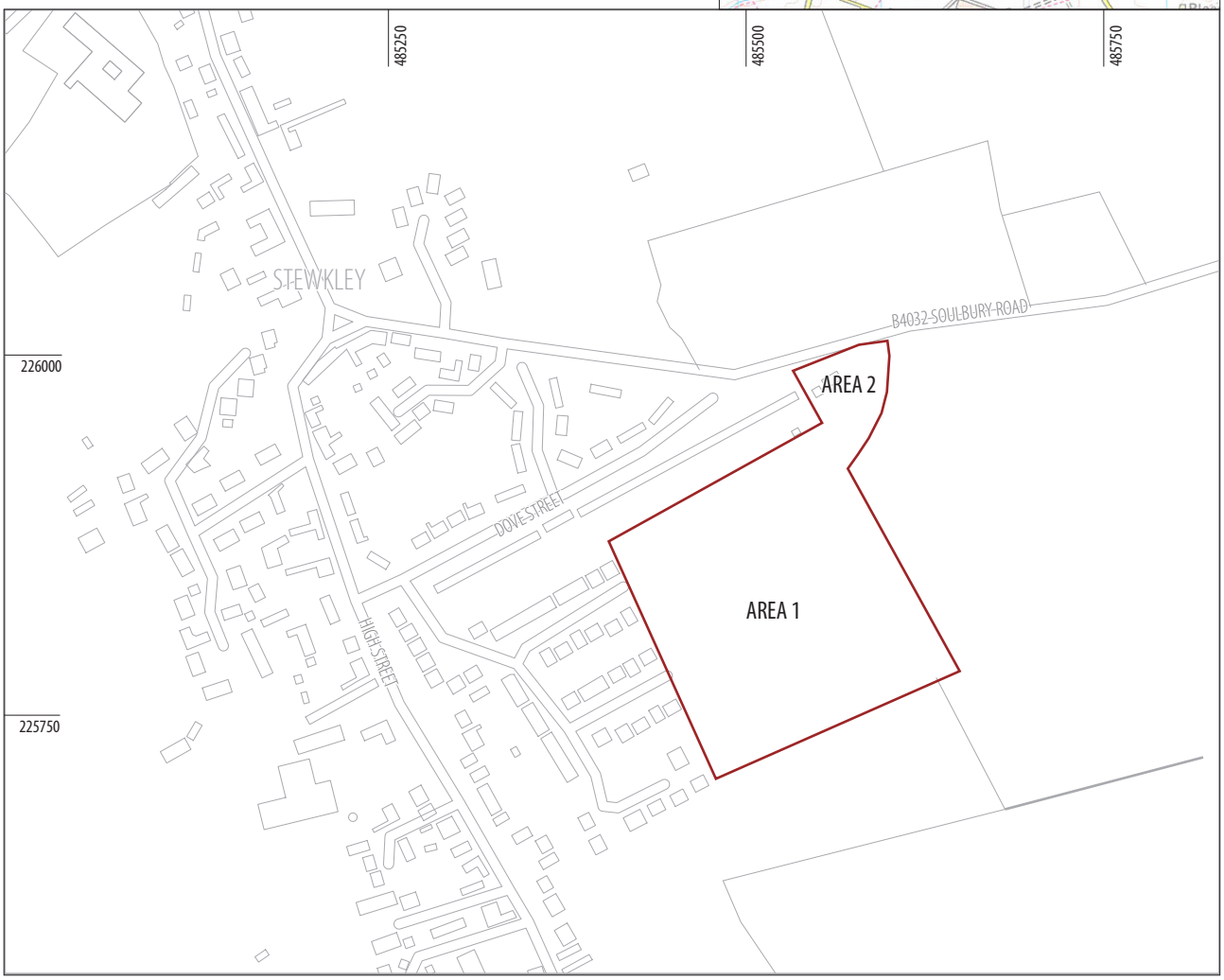
CONTENTS

LIST OF ILLUSTRATIONS

LAND SOUTH OF SOULBURY ROAD (SRST/02)
Stewkley
Leighton Buzzard
Buckinghamshire







KEY
geophysical survey boundary

N
0 250m
scale 1:5,000 @ A4

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ILLUS 1 Site location

LAND SOUTH OF SOULBURY ROAD, STEWKLEY, BUCKINGHAMSHIRE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by NLP Planning (The Client) to undertake a geophysical (magnetometer) survey on land which is proposed for residential development to the south of Soulbury Road, Stewkley, Buckinghamshire. The survey was recommended in an Archaeological Desk-based Assessment (Headland Archaeology 2015b).

The work was undertaken in accordance with a Written Scheme of Investigation (Headland Archaeology 2015a) which was submitted to and approved by Phil Markham (Senior Archaeological Officer at Buckinghamshire County Council), with guidance within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (David et al. 2008). The survey was carried out on 25th November 2015 in order to provide additional information on the archaeological potential of the site.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The proposed development area (PDA) comprises of an irregularly-shaped parcel of land to the south of the B4032 Soulbury Road, Stewkley, and consist of a square field (Area 1), centred at NGR 485358 225824, and a small parcel of land (Area 2) to its north-east and immediately south of Soulbury Road which will be used for access (see **ILLUS 1** and **ILLUS 2**). At the time of the survey Area 1 was under pasture whereas Area 2 contained a young cereal crop (see **ILLUS 2** and **ILLUS 3**).

The site is flat at 147m above Ordnance Datum (aOD).

1.2 GEOLOGY AND SOILS

The underlying bedrock geology consists of Kimmeridge Clay Formation – mudstone, which is overlain by superficial deposits of Oadby Member - diamicton (British Geological Survey 2015).

The soils are classified in the Soilscape 8 association, characterised as slightly acid loams and clays with impeded drainage (LandIS 2015).

2 ARCHAEOLOGICAL BACKGROUND

A desk-based assessment (Headland Archaeology 2015b) has identified one heritage asset within the north-west corner of the proposed development area which consists of possible medieval enclosures (Buckinghamshire Historic Environment Record (HER) MBC3264). The possible enclosure(s) is clearly visible on a 1946 aerial photograph of the site (CPE/UK1897, Frame 4287) where it appears as a roughly square ditch which cuts into and through a series of ridge and furrow cropmarks. The desk-based assessment suggests that the feature may represent a field enclosure, village pound or livestock enclosure, or even a moated site. It is important to note however that ridge and furrow features were formed through agricultural methods up to the 19th century, and it is possible that the enclosure dates to the post-medieval period.

2.1 AIMS, METHODOLOGY AND PRESENTATION

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of any proposed development on any potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended.

The general archaeological objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore model the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

2.2 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. Features such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the Earth's magnetic field. In mapping

ILLUS 2 General view of Area 1, looking south

these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney and Gater 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system is programmed to take readings at a frequency of 10Hz (allowing for a 10-15cm sample interval) on roaming traverses 4m apart. These readings are stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system is linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software has been used to collect and export the data. Terrasurveyor V3.0.27.1 (DWConsulting) software has been used to process and present the data.

2.3 REPORTING

A general site location plan is shown in **ILLUS 1** at a scale of 1:,5000. **ILLUS 2** and **ILLUS 3** are general site condition photographs. **ILLUS 4** is a large scale (1:2,500) survey location plan showing the processed greyscale magnetometer data. Detailed data plots ('raw' and processed) and an interpretative illustration are presented at a scale of 1:1000 in **ILLUS 5**, **ILLUS 6** and **ILLUS 7**.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 4.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Headland Archaeology 2015a) and guidelines outlined by English Heritage (David et al. 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

3 RESULTS AND DISCUSSION

Generally, the survey has detected a low level of background magnetic variation throughout. This is due to the homogenous properties of the clay bedrock. Nevertheless, occasional areas of magnetic enhancement have been identified by the survey. These are discussed below and cross-referenced to specific examples on the interpretive figures, where appropriate.

ILLUS 3 General view of Area 2, looking north-east

3.1 FERROUS ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on most sites, often being present as a consequence of manuring or tipping/infilling.

Within the north-west corner of Field 1 a broad, roughly square, area of high magnitude magnetic disturbance, A, corresponds closely to the site of the possible medieval enclosure which is recorded in the Buckinghamshire HER (Ref. MBC3264). This close correlation suggests that the magnetic disturbance is contemporary or, in some way, associated with the possible medieval enclosure. The disturbance is likely to be caused by magnetically-enhanced material being spread throughout the interior of the former enclosure prior to its removal. Magnetic disturbance of this magnitude may mask or obscure any anomalies of archaeological potential, if present, within the affected area.

Magnetic disturbance at the perimeter of the survey areas is caused by ferrous material within, or forming part of, the adjacent field boundaries.

3.2 MODERN ANOMALIES

At the western boundary of Area 2 a concentration of anomalies, B, has been identified orientated north-west/south-east, parallel with the adjacent field boundary. No features are depicted in this location on any historical Ordnance Survey mapping but a possible structure is shown here on the 1946 aerial photograph (CPE/UK1897). Therefore these anomalies are interpreted as being modern in origin, perhaps being due to buried rubble/building materials.

3.3 GEOLOGICAL ANOMALIES

Numerous low magnitude discrete anomalies have been identified across the PDA. However, there is no discernible pattern to the anomalies and their sheer number and widespread distribution tends to preclude an archaeological interpretation. Therefore a geological interpretation is preferred with the anomalies likely to be due to localised variations in the soils and the diamicton superficial deposits from which they derive.

3.4 AGRICULTURAL ANOMALIES

Four field drains have been detected across Area 1 as faint linear trends. The westernmost field drain, C, corresponds closely to a former field boundary which is depicted on the first edition Ordnance Survey map (1884).

Broad, widely spaced, parallel linear anomalies can be seen running east-west across Area 2. These anomalies are characteristic of the medieval and post-medieval practice of ridge and furrow cultivation. The anomalies are due to the contrast between the soil-filled furrows and the ploughed-down ridges.

No ridge and furrow anomalies have been identified within Area 1 despite their presence as low earthworks (Headland Archaeology 2015b) and on aerial photographs. This is due to the orientation of the survey traverses and does not necessarily indicate an absence of features.

4 CONCLUSION

The geophysical survey has identified a square area of magnetic disturbance which is defined by the limit of the possible medieval enclosure(s) (HER MBC3264) identified on the aerial photographs (Headland Archaeology 2015b). It is likely that the magnetic disturbance is due to the spreading of ferrous material throughout the former enclosure prior to its removal. However, no anomalies specifically locating the enclosure, or any features within it, have been identified by the survey. It should be noted that magnetic disturbance of this magnitude may mask or obscure any anomalies of archaeological potential, if present, within the affected area.

Elsewhere, anomalies have been identified which are due to ridge and furrow cultivation, modern agriculture and the possible remains of a twentieth century structure.

Based solely on the results and interpretation of the geophysical data, the archaeological potential of the site is assessed to be low, and moderate within the vicinity of the possible medieval enclosure.

5 REFERENCES

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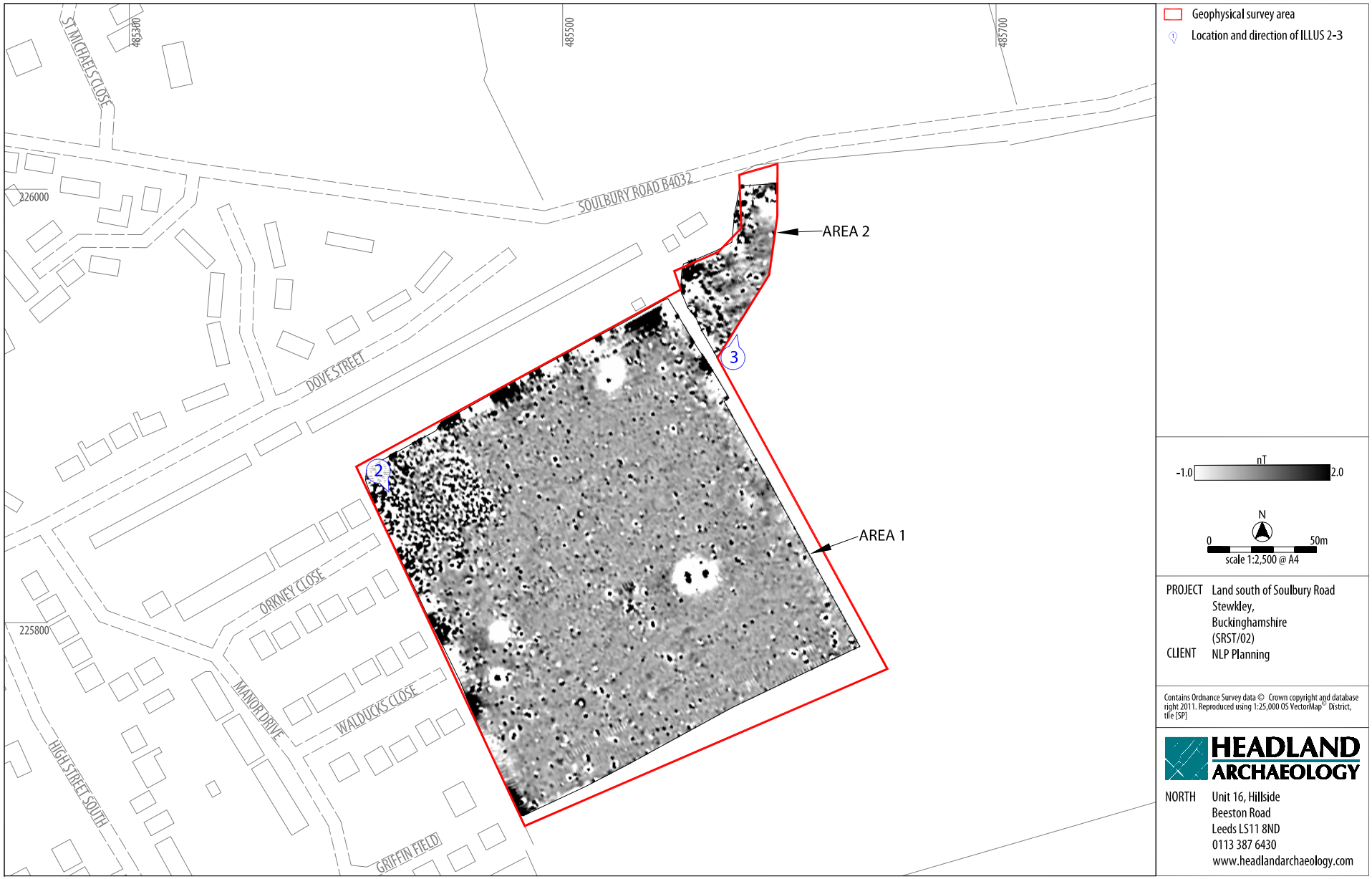
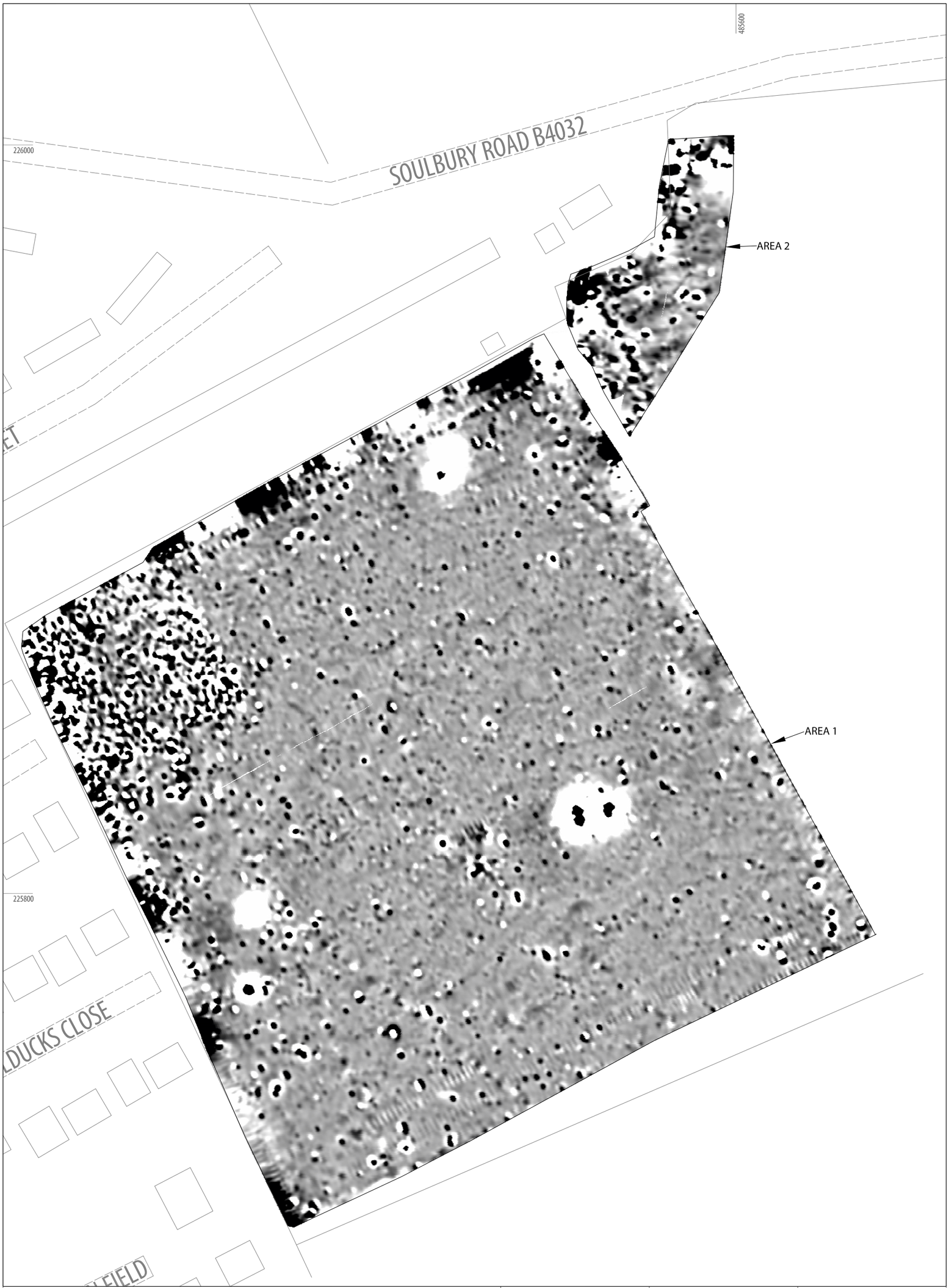


ILLUS 4 Survey location showing greyscale magnetometer data (1:4,000)



PROJECT Land south of Soulbury Road
Stewkley,
Buckinghamshire
(SRST/02)

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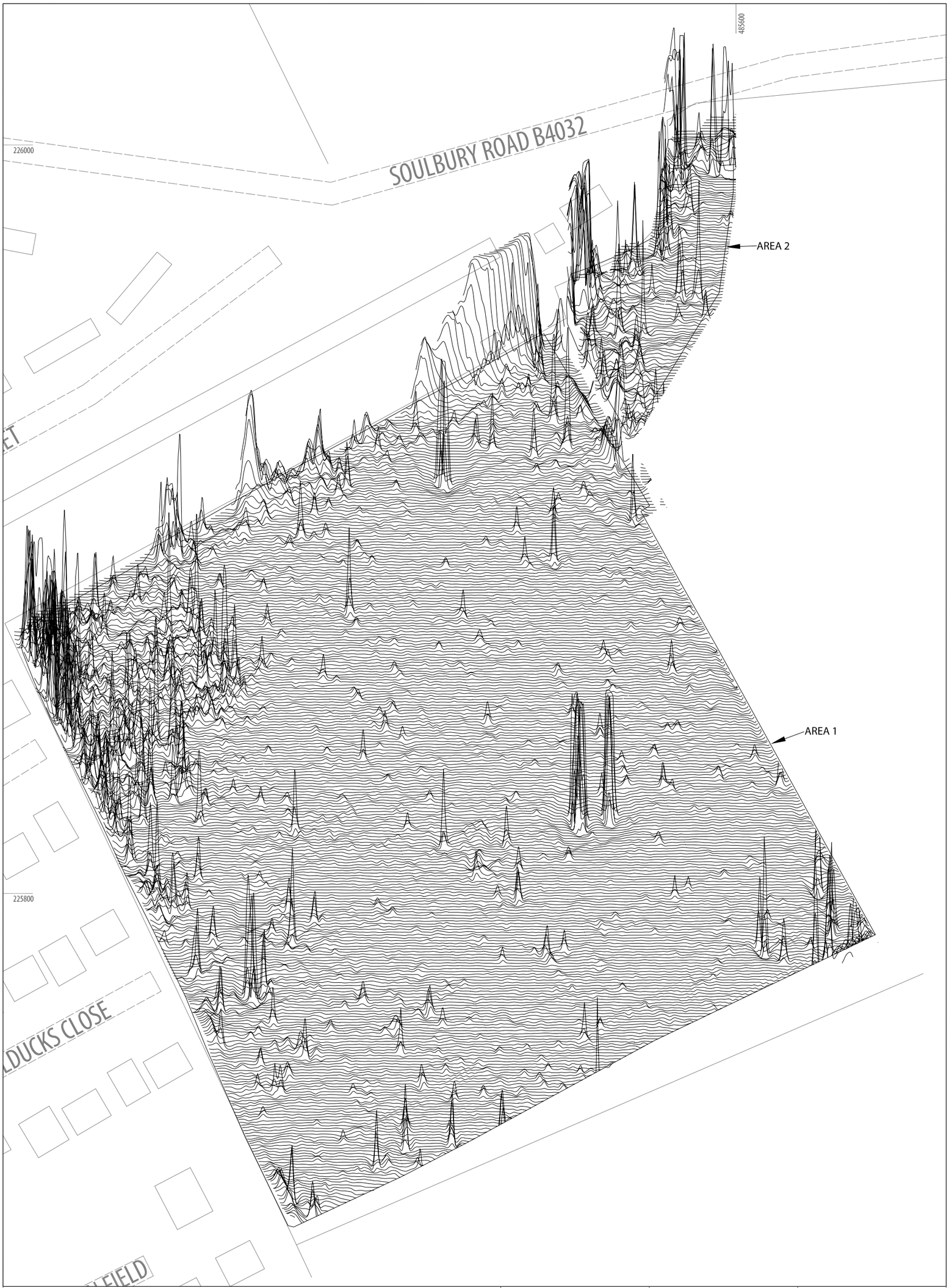
ILLUS 5 Processed greyscale magnetometer data (1:1,000)



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scale 1:1,000 @ A3

PROJECT Land south of Soulbury Road
Stewkley,
Buckinghamshire
(SRST/02)

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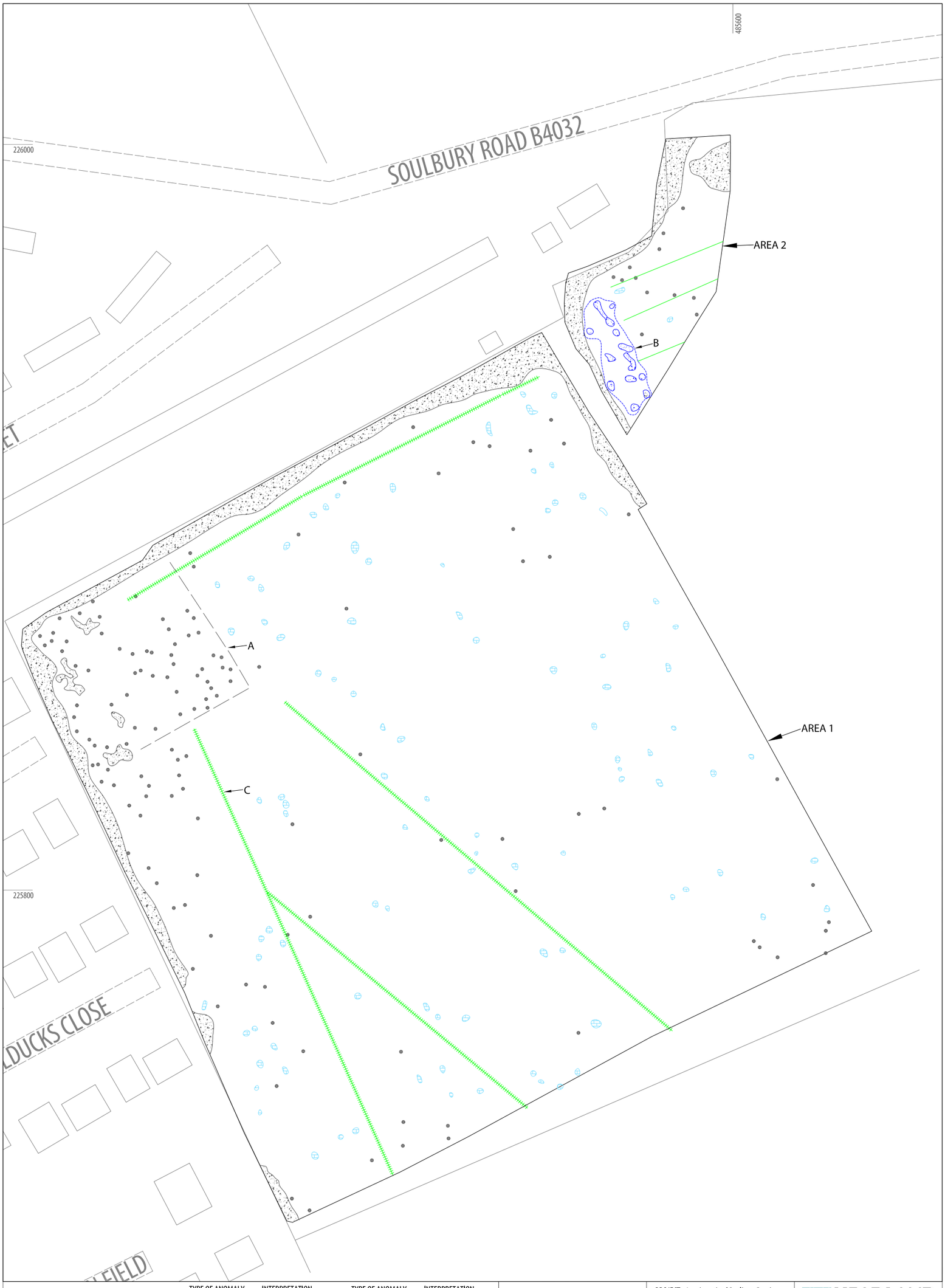
ILLUS 6 XY trace plot of minimally processed magnetometer data (1:1,000)



TYPE OF ANOMALY	INTERPRETATION	TYPE OF ANOMALY	INTERPRETATION
Dipolar Isolated	Ferrous Material	Linear Trend	Former Field Boundary
Magnetic Disturbance	Ferrous Material	Magnetic Enhancement	Geology
	Area of increased magnetic response		
Magnetic Disturbance	Modern		
Linear Trend	Ridge and Furrow		
Linear Trend	Field Drain		

N

0 25m

scale 1:1,000 @ A3

PROJECT Land south of Soulbury Road
Stewkley,
Buckinghamshire
(SRST/02)

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ILLUS 7 Interpretation of magnetometer data (1:1,000)

6 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

Appendix 1.1 Magnetic susceptibility and soil magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haematite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected.

The magnetic susceptibility of a soil can also be enhanced by the application of heat. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

Appendix 1.2 Types of magnetic anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

APPENDIX 2 SURVEY LOCATION INFORMATION

An initial survey base station was established using a Trimble VRS differential Global Positioning System (dGPS). The magnetometer data was georeferenced using a Trimble RTK differential Global Positioning System (Trimble R8s model).

Temporary sight markers were laid out using a Trimble VRS differential Global Positioning System (Trimble R8s model) to guide the operator and ensure full coverage. The accuracy of this dGPS equipment is better than 0.01m.

The survey data were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises:-

an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-234762

Project details	
Project name	Land south of Soulbury Road, Stewkley, Buckinghamshire: Geophysical Survey
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 3.3 hectares to the south of Soulbury Road, Stewkley, to provide information about the archaeological potential of the site which is proposed for development. A well-defined square area of magnetic disturbance in the north-western corner of the site corresponds with an area of cropmarks which are recorded as possible medieval enclosures within the Buckinghamshire Historic Environment Record (HER MBC3264). The disturbance is likely to be caused by the spreading of magnetically-enhanced material throughout the former enclosure prior to its removal. However, no anomalies specifically locating the enclosure, or any features within it, have been identified by the survey. Elsewhere, anomalies have been identified which reflect the former agricultural landscape in the form of ridge and furrow cultivation. Therefore, based on the results and interpretation of the data, the archaeological potential of the site is considered to be low and moderate within the vicinity of the possible medieval enclosure.
Project dates	Start: 25-11-2015 End: 25-11-2015
Previous/future work	Yes / Not known
Any associated project reference codes	SRST - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology (other)	Kimmeridge Clay Formation – mudstone
Drift geology (other)	Oadby Member - diamicton
Techniques	Magnetometry

Project location	
Country	England
Site location	BUCKINGHAMSHIRE AYLESBURY VALE STEWKLEY Land south of Soulbury Road, Stewkley
Study area	3.3 Hectares
Site coordinates	SP 85358 25824 51.923947132542 -0.758590131354 51 55 26 N 000 45 30 W Point

Project creators	
Name of Organisation	Headland Archaeology
Project brief originator	Headland Archaeology
Project design originator	Headland Archaeology
Project director/manager	Webb, A.

Project creators	
Project supervisor	Schmidt, A
Type of sponsor/funding body	Developer

Project archives	
Physical Archive Exists?	No
Digital Archive recipient	In house
Digital Contents	"other"
Digital Media available	"Geophysics"
Paper Archive recipient	in house
Paper Contents	"other"
Paper Media available	"Report"

Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	Land south of Soulbury Road, Stewkley, Buckinghamshire
Author(s)/Editor(s)	Harrison, D.
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