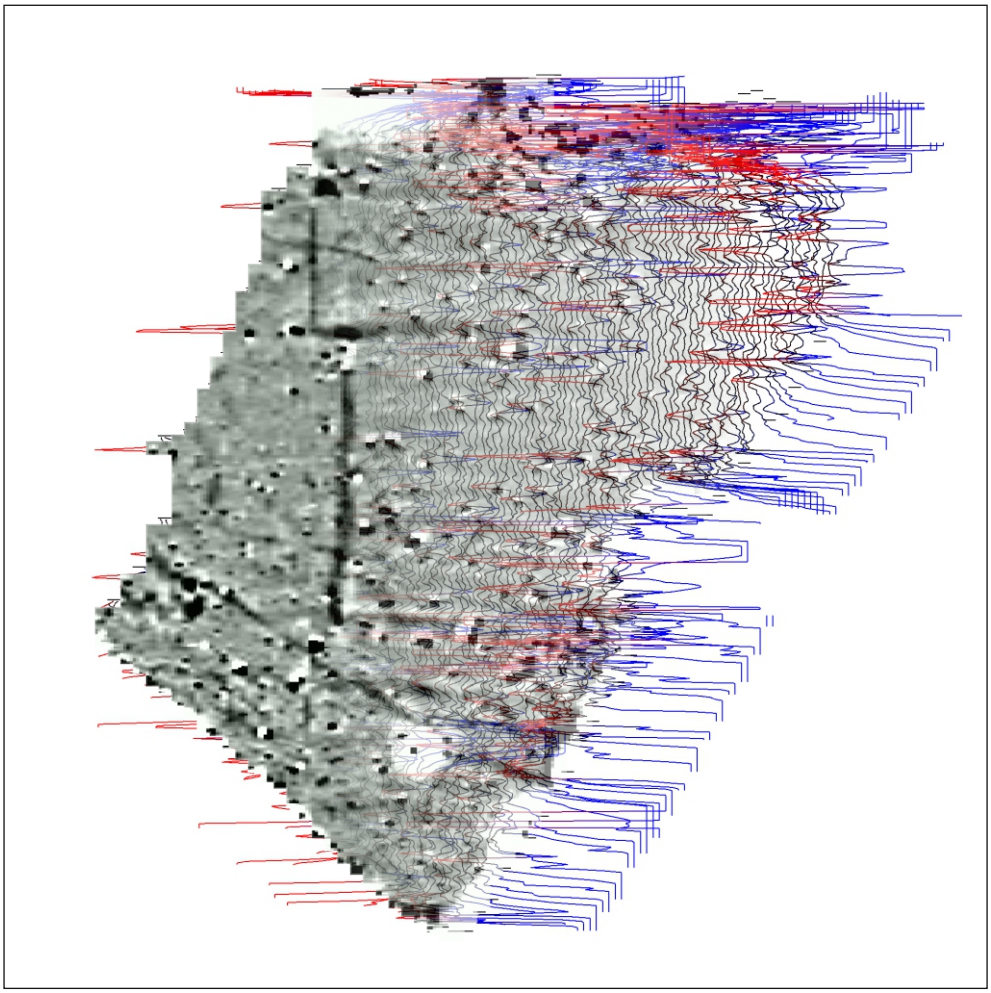
making sense of heritage

Land at Long Hazel Farm Sparkford, Somerset

Detailed Gradiometer Survey Report



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geoservices

Land at Long Hazel Farm
Sparkford, Somerset

Detailed Gradiometer Survey Report

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* I= Internal Draft; E= External Draft; F= Final

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Contents

Figures

Land at Long Hazel Farm
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Detailed Gradiometer Survey Report

Summary

A detailed gradiometer survey was conducted over land at Long Hazel Farm, Sparkford, Somerset (centred on NGR 360125, 126095). The project was commissioned by Larry Piper with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features ahead of the potential sale for future development of the site.

The site comprises arable fields located around Long Hazel Farm, covering an area of 1.1 ha of which 0.95 ha was achieved. The geophysical survey was undertaken on 13th August 2015. The detailed gradiometer survey has demonstrated the presence of a number of linear anomalies and sub-circular anomalies of potential archaeological interest across the site.

Anomalies recognised bearing archaeological interest are typically ditch- or pit- like features. These appear to form possible areas of land enclosure. Additionally, this archaeological investigation has detected an area of increased magnetic response and superficial geology in the north of the site.

Land at Long Hazel Farm
Sparkford, Somerset

Detailed Gradiometer Survey Report

Acknowledgements

Wessex Archaeology would like to thank Larry Piper for commissioning the geophysical survey.

The fieldwork was undertaken by Alistair Black and Alistair Salisbury. Alistair Salisbury processed and interpreted the geophysical data and also wrote the report. The geophysical work was quality controlled by Garreth Davey and Elizabeth Richley. Illustrations were prepared by Nancy Dixon. The project was managed on behalf of Wessex Archaeology by Lucy Learmonth.

Land at Long Hazel Farm
Sparkford, Somerset

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by Larry Piper to carry out a geophysical survey at Long Hazel Farm, Sparkford, Somerset (hereafter "the Site", centred on NGR 360125, 126095) (**Figure 1**). The survey forms part of an ongoing programme of archaeological works being undertaken in support of the potential sale for development of the Site.

1.1.2 The aim of the geophysical survey was to establish the presence/absence, extent and character of detectable archaeological remains within the survey area.

1.1.3 This report presents a brief description of the methodology followed, the detailed survey results and the archaeological interpretation of the geophysical data.

1.2 Site location and topography

1.2.1 The Site is located within the village of Sparkford, 1.6km north-east of Queen Camel and approximately 15 km to the south-east of Glastonbury, in the county of Somerset.

1.2.2 The Site occupies an area of 1.1 ha. This comprises of agricultural land, buildings and an access drive. The Site is bounded by the A303 to the north-west, the A359 to the south-east, Long Hazel Farm to the north-east and a wooded copse to the south-west.

1.2.3 The Site is on a flat parcel of land approximately 48m to 50m above Ordnance Datum (aOD).

1.3 Soils and geology

1.3.1 The solid geology comprises Mudstone, Siltstone, Limestone and Sandstone of the Lias Group from the Mesozoic Age. These are predominantly grey, well bedded, marine calcareous mudstones with tabular and nodular beds of limestone. Overlying superficial geological deposits are undifferentiated River Terrace Deposits from the Quaternary (BGS 2015).

1.3.2 The overlying soils are likely to be typical stagnogley soils of the 711d (Martock) association to the north and typical calcareous paleosols of the 411a (Evesham 1) association to the south of the Site (SSEW 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

1.4 Archaeological background

1.4.1 A Written Scheme of Investigation (WSI) undertaken by Wessex Archaeology (2015) examined the potential for the survival of buried archaeological remains within a 2.5 km

radius of the Site. This WSI used information provided by the Somerset Historic Environment Record (SHER) and the National Heritage List for England (NHLE). The following background is summarised from the WSI.

1.4.2 There are no World Heritage Sites or Historic Battlefields identified within 2.5 km of the Site, however there is one Scheduled Monument, 84 listed buildings and one Registered Park and Garden.

1.4.3 The Scheduled Monument is situated 1.7km south-west of the Site and is identified as a second to 4th century AD Romano-British settlement located to the north of the A303.

1.4.4 The majority of the listed buildings consist of 17th century cottages and farmhouses with the exception of The Church of the Holy Cross, a 13th century build with subsequent refurbishments made in the 15th century and The Church of St Mary Magdalene constructed in the 14th century.

1.4.5 Outside of the 2.5 km study area, Cadbury Castle lies 2.7km south-east of the Site. A large hillfort dated to the Late Bronze Age.

2 METHODOLOGY

2.1 Introduction

2.1.1 The detailed gradiometer survey was conducted using a Bartington Grad 601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with Historic England guidelines (English Heritage 2008).

2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team on 13th August 2015. Field conditions at the time of the survey were good, with dry conditions throughout the period of survey. An overall coverage of 0.95 ha was achieved.

2.2 Method

2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS instrument, which is precise to approximately 0.02m and therefore exceeds Historic England recommendations (2008).

2.2.2 The detailed gradiometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1m between sensors. Data were collected at 0.25m intervals along transects spaced 1m apart with an effective sensitivity of 0.03nT, in accordance with Historic England guidelines (English Heritage 2008). Data were collected in the zigzag method.

2.2.3 Data from the survey was subject to minimal data correction processes. These comprise a zero mean traverse function (±5nT thresholds) applied to correct for any variation between the two Bartington sensors used, and a de-step function to account for variations in traverse position due to varying ground cover and topography. These two steps were applied throughout the survey area, with no interpolation applied.

2.2.4 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 6.1**.

3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

3.1 Introduction

3.1.1 The detailed gradiometer survey has identified magnetic anomalies across the Site, along with areas of increased magnetic response and a large amount of ferrous. Results are presented as a series of greyscale plots, XY plots and archaeological interpretations at a scale of 1:1800 (**Figures 2** to **3**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale image and ±25nT at 25nT per cm for the XY trace plots.

3.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 3**). Full definitions of the interpretation terms used in this report are provided in **Appendix 6.2**.

3.1.3 Magnetic anomalies have been identified across the entirety of the Site. Linear anomalies are likely to represent former field boundaries and areas of archaeology. Sub-circular positive anomalies are likely to be pitted features.

3.1.4 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

3.1.5 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.

3.1.6 Gradiometer survey may not detect all services present on Site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on Site.

3.2 Gradiometer survey results and interpretation

3.2.1 In the centre of the Site, an L-shaped linear **4000** shows a clear, cut feature. This is potentially a ditch feature which may represent a section of a recti-linear enclosure. The anomaly is approximately 1.5 m wide with an east-west extent of approximately 30 m and north-south extent of approximately 20 m.

3.2.2 A feature of similar magnetic values and physical properties is evident at **4001**. This is on a similar north-south alignment to the western extent of feature **4000**. It is interpreted as an infilled ditch, possibly relating to a former field system which was in place previous to the year 1887 (Ordnance Survey, 1887). **4002** may have a physical relationship as it is on a directly perpendicular east-west alignment in close proximity however, the amplitude for this potential feature are weaker than those observed at **4001**.

3.2.3 A fragmented linear anomaly is identified at **4003,** on a south-east to north-west alignment. This may relate to a former field boundary given the amount of associated ferrous and, given the proximity, may have a relationship with **4001** but this supposition would require further investigation to confirm.

3.2.4 A short, weakly magnetised anomaly at **4004** is interpreted as possible archaeology. It is likely the trend represents a ditch feature. This feature intersects with **4000** but given the

responses and nature of the survey, the relationship and therefore the chronology, is uncertain at this time.

3.2.5 A large pit-like anomaly is highlighted at **4005**. The response is approximately 3 m in diameter and may be of archaeological origin.

3.2.6 Evidence for ploughing trends can be seen in the data across the majority of the Site, especially at **4006**. These are orientated primarily east-west.

3.2.7 The very northern-most extent of the Site around **4007** is heavily disturbed with highly ferrous readings by the close proximity of the Long Hazel Farm compound. Also along the eastern extent a band of ferrous readings are visible. This is the tarmac driveway leading to the farm.

3.2.8 Weak linear trends can be seen traversing the Site. These are of unknown origin and are not thought to have archaeological significance.

3.2.9 There were no modern services were identified within the survey area.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of archaeological interest across the Site. In addition to these, anomalies interpreted as ploughing trends, areas of superficial geology and former field boundaries have also been identified.

4.1.2 The potential archaeology across the Site shows clearly defined linear anomalies, none of which can be clearly identified through historic mapping. It is therefore probable that these potential features are of archaeological origin. Given the limited extent of the survey area it is difficult to further interpret the overall scale and origin of these features.

4.1.3 It is worth considering that, typically, Romano-British settlements are associated with dense clusters of pits coupled with enclosures bearing strong right-angles, such as those identified within the dataset. Given the proximity of a Romano-British settlement as identified in the WSI (Wessex Archaeology, 2015), there is potential for archaeological remains relating to this period.

5 REFERENCES

5.1 Bibliography

Wessex Archaeology, 2015. *Written Scheme of Investigation, Land at Long Hazel Farm, Sparkford, Somerset*. Unpublished Client Report.

English Heritage, 2008.*Geophysical Survey in Archaeological Field Evaluation*. Research and Professional Service Guideline No 1, 2nd edition.

5.2 Cartographic and documentary sources

1887 Ordnance Survey 25 inch map / 1:2,500 (Somerset)

Soil Survey of England and Wales, 1983.*Sheet 3, Soils of Midland and Western England*. Ordnance Survey: Southampton.

5.3 Online resources

UK Soil Observatory, http://www.ukso.org [accessed August 2015]

British Geological Survey, http://www.bgs.ac.uk [accessed August 2015]

6 APPENDIX

6.1 Survey equipment and data processing

Survey methods and equipment

The magnetic data for this project was acquired using a Bartington 601-2 dual magnetic gradiometer system. This instrument has two sensor assemblies fixed horizontally 1m apart allowing two traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation, and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03nT over a ±100nT range, and measurements from each sensor are logged at intervals of 0.25m. All of the data are stored on an integrated data logger for subsequent post-processing and analysis.

Wessex Archaeology undertakes two types of magnetic surveys: scanning and detail. Both types depend upon the establishment of an accurate 20m or 30m site grid, which is achieved using a Leica Viva RTK GNSS instrument and then extended using tapes. The Leica Viva system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by Historic England (English Heritage 2008) for geophysical surveys.

Scanning surveys consist of recording data at 0.25m intervals along transects spaced 10m apart, acquiring a minimum of 80 data points per transect. Due to the relatively coarse transect interval, scanning surveys should only be expected to detect extended regions of archaeological anomalies, when there is a greater likelihood of distinguishing such responses from the background magnetic field.

The detailed surveys consist of 20m x 20m or 30m x 30m grids, and data are collected at 0.25m intervals along traverses spaced 1m apart. These strategies give 1600 or 3600 measurements per 20m or 30m grid respectively, and are the recommended methodologies for archaeological surveys of this type (EH, 2008).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125m intervals along traverses spaced up to 0.25m apart, resulting in a maximum of 28800 readings per 30m grid, exceeding that recommended by Historic England (English Heritage 2008) for characterisation surveys.

Post-processing

The magnetic data collected during the detail survey are downloaded from the Bartington system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

As the scanning data are not as closely distributed as with detailed survey, they are georeferenced using the GPS information and interpolated to highlight similar anomalies in adjacent transects. Directional trends may be removed before interpolation to produce more easily understood images.

Typical data and image processing steps may include:

- Destripe – Applying a zero mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data)

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.

6.2 Geophysical interpretation

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

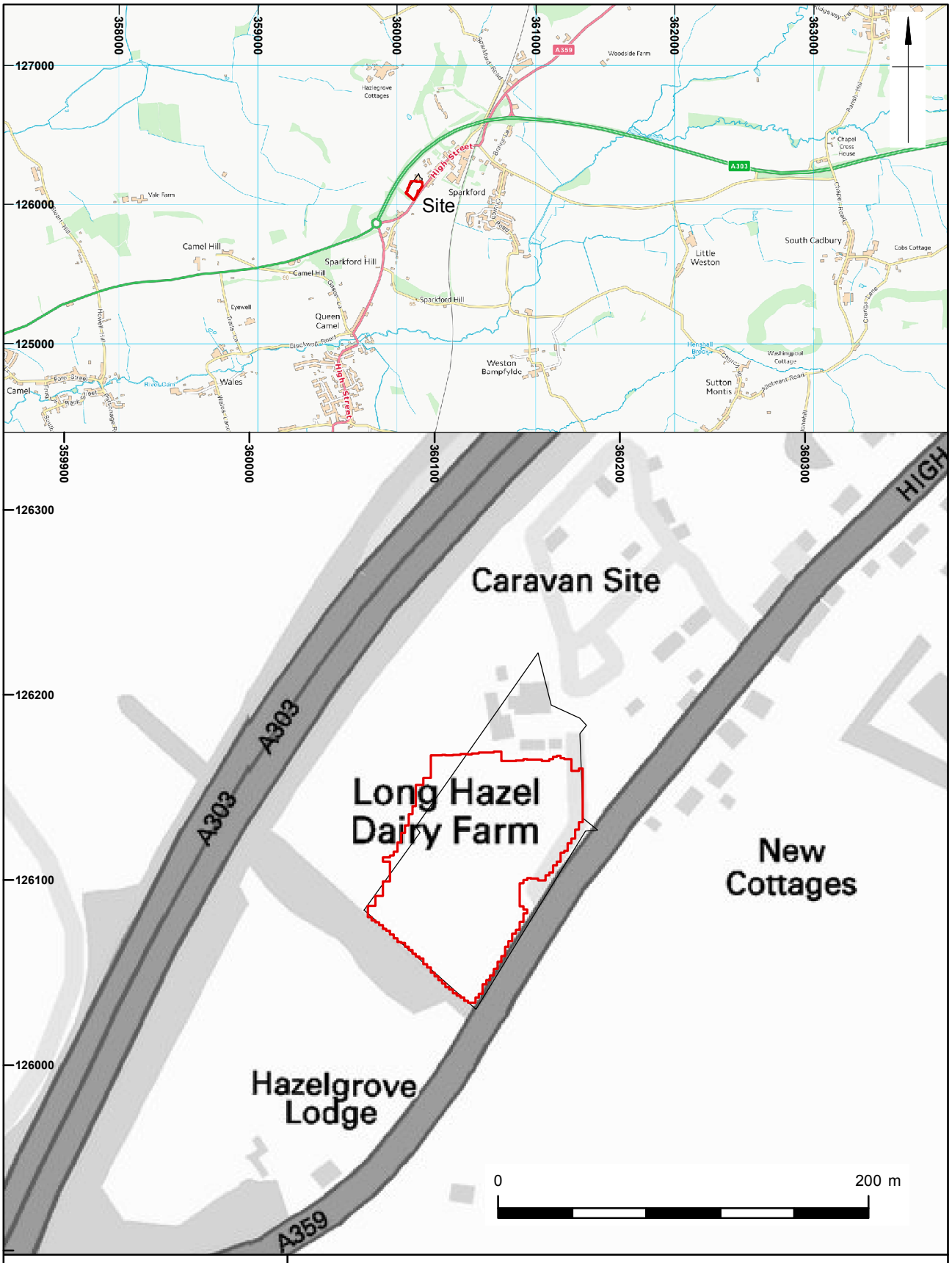
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Agricultural ditches – used for ditch sections that are aligned parallel to existing boundaries and former field boundaries that are not considered to be of archaeological significance.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative or broad bipolar (positive and negative) anomalies.



Site Boundary

Detailed Survey Extents

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Site location

Figure 1

126200

360100

360200

126100

+3nT

-2nT

25nT

-25nT

0 50 m

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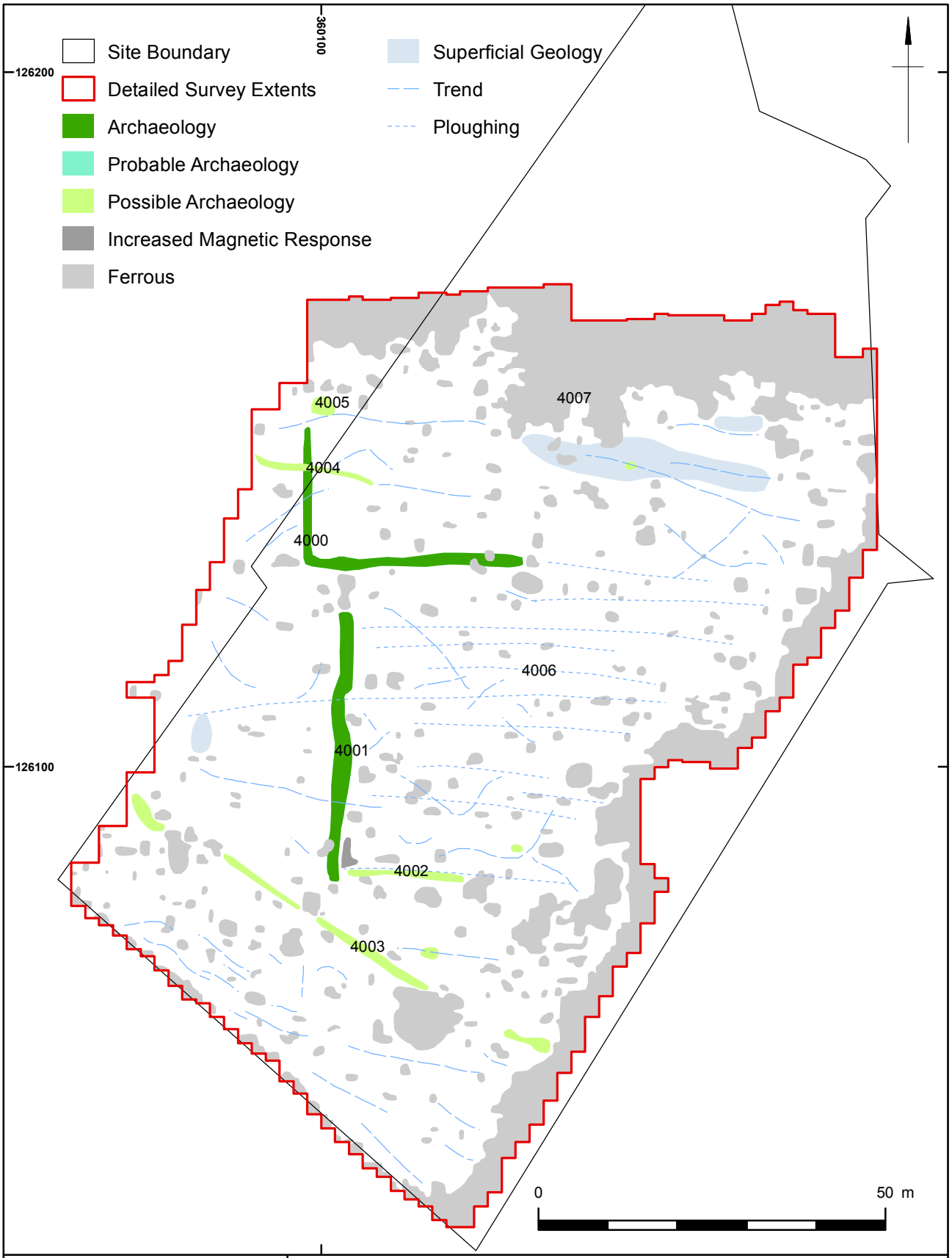
Greyscale plot and XY trace

Figure 2



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Interpretation

Figure 3

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