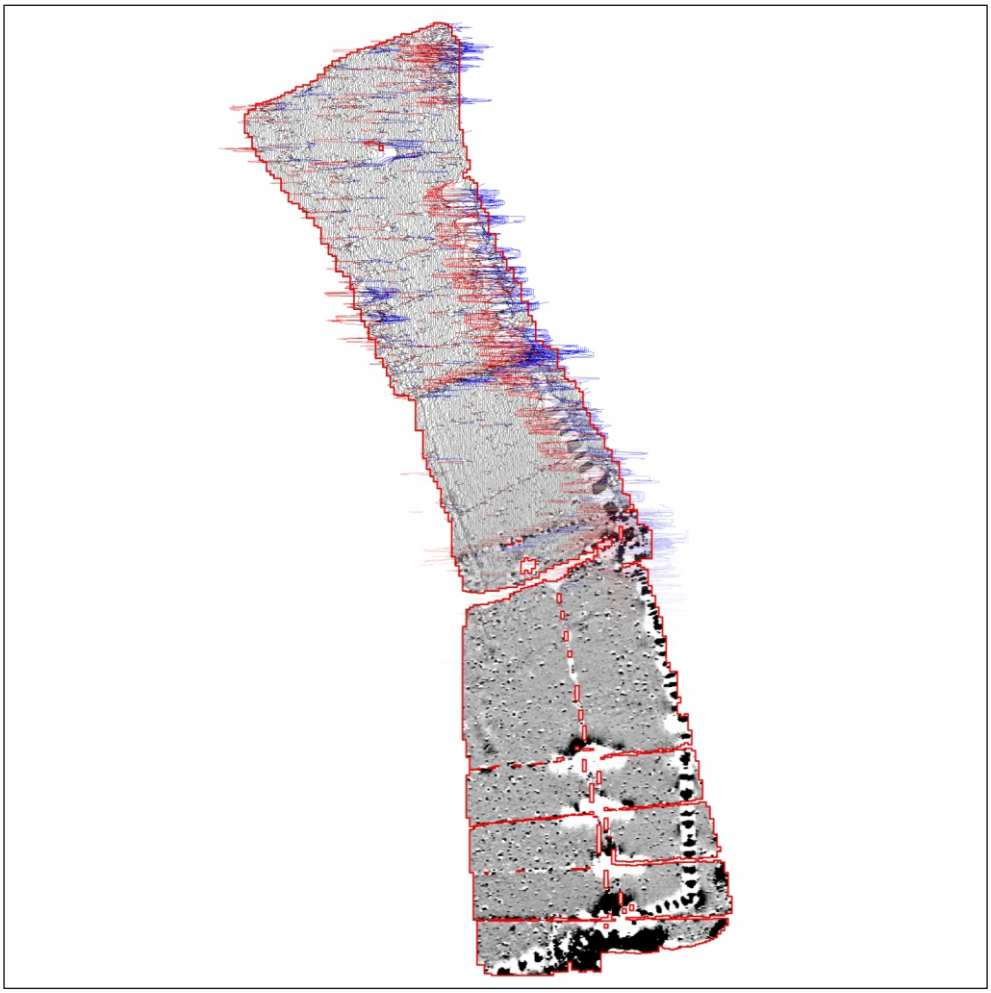
making sense of heritage

Land North of Romsey
Hampshire

Detailed Gradiometer Survey Report



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May 2015

geoservices

Land North of Romsey
Hampshire

Detailed Gradiometer Survey Report

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Hampshire

Detailed Gradiometer Survey Report

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Summary

A detailed gradiometer survey was conducted over land north of Romsey, Hampshire (NGR 436100, 122640) with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features a head of proposed development. The project was commissioned by CgMS Consulting ahead of potential development of the land.

The survey area consists of two adjacent fields situated north of the town centre of Romsey, on the east side of the valley of the River Test and on the west of Cupernham Lane. The southernmost field is subdivided by fencing into small paddocks for horses associated with the site's current use as an equestrian centre whereas the northern most field remains open with horses grazing.

The detailed gradiometer survey was undertaken between 22nd and 25th April 2015 and has demonstrated the presence of anomalies of potential archaeological interest alongside areas of superficial geology, ploughing, trends of uncertain origin and a modern service.

In the northern section of the survey area, the geophysical data revealed several parallel linear anomalies, interpreted as field subdivisions or field drains. They may indicate the presence of previous segmentation of the land.

Other features identified included several round anomalies interpreted as pits of various sizes, irregular areas of superficial geology across the survey area and ploughing trends. The southern field is heavily disturbed by a large amount of ferrous material, although some ploughing trends were identified; few anomalies of archaeological potential have been identified in this area.

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Detailed Gradiometer Survey Report

Acknowledgements

The detailed gradiometer survey was commissioned by CgMS Consulting and Wessex Archaeology is grateful to Matthew Smith in this regard.

The fieldwork was directed by Laura Andrews with assistance from Patrick Dresch. The geophysical data was processed by Laura Andrews and interpreted by Elizabeth Richley. Elizabeth Richley wrote this report. The geophysical work was quality controlled by Garreth Davey and Lucy Learmonth. Illustrations were prepared by Elizabeth Richley and Karen Nichols. The project was managed on behalf of Wessex Archaeology by Lucy Learmonth.

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Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology (WA) was commissioned by CgMS Consulting, to carry out a geophysical survey on land north of Romsey, Hampshire (**Figure 1**), hereafter "the Site" (centred on NGR 436100, 122640). The geophysical survey forms part of an ongoing programme of archaeological works being undertaken. A Desk-Based Assessment (DBA) has been completed by Southampton Archaeological Unit, which established the likelihood of the presence of buried archaeological remains (Southampton Archaeological Unit 2012).

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 approximately 1.5km northeast of the town centre of Romsey, Hampshire, immediately north of Fishlake Meadows Road and to the west of Cupernham Lane (**Figure 1**). The Site measures approximately 5.7ha and comprises two fields, the southern most of which is subdivided into smaller paddocks associated with the lands current use as an equestrian centre. The whole site is used for horse paddocks.

1.2.2 The Site is bounded by a barge canal to the west, Oxlease Farm to the south, a tree-line track way to the east and to the north by a small stream, hedgerows and trees. A total area of 5.73ha was surveyable.

1.2.3 The natural topography of the Site gently slopes down from the east with the north-eastern part approximately 25m above Ordnance Datum (aOD) and the south-western extent approximately 17m. The southern paddocks are bounded by a small stream that lies on an east-southeast to west-northwest alignment. This stream passes under the track way that runs along the eastern edge of the Site. A further stream bounds the northern extents of the Site and as detailed above a barge canal delimits the western extent of the site.

1.3 Soils and Geology

1.3.1 The bedrock geology under the Site comprises the Wittering Formation to the south, the London Clay formation to the north, with the Whitecliff Sand member recorded as encroaching on the north east and western extents. No superficial deposits were recorded along the eastern boundary of the Site, with River Terrace deposits recorded in the south and Alluvium to the west (British Geological Survey, 2015).

1.3.2 The soils underlying most of the Site are unsurveyed due to urban and industrial development near the Site. Along the western extents of the Site, earthy eutro-amorphous peat soils of the 1024c (Adventurers 3) association, are likely to be present. 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 The Site lies within the parish boundary of Romsey Extra. The town of Romsey developed around a Benedictine nunnery founded in AD 907 however evidence of Saxon iron smelting there has been taken as evidence for a Saxon royal estate that pre-dates the nunnery. The tenement known as Oxlease originated during the medieval period as part of the estates of Romsey Abbey. The earliest known evidence to it is dated 1506.

1.4.2 A DBA undertaken by Southampton Archaeological Unit (2012) for Filia Property Limited assessed the archaeological potential of land at Oxlease Farm, Cupernham Lane, Romsey. The following background is summarised from the DBA.

1.4.3 Evidence for prehistoric activity has been found in the town of Romsey and the surrounding area that includes a Palaeolithic axe, a Neolithic mace-head plus Bronze Age and Iron Age material. Flint tools have been recovered from several sites to the east and north-east of the town centre.

1.4.4 Romano-British building materials have been identified in the fabric of the abbey, and settlement evidence is known to the south of the abbey. Romano-British pottery has been found to the north of the town, near Cupernham.

1.4.5 There is substantial evidence for occupation of the town during the Anglo-Saxon, Medieval and PostMedieval periods.

1.4.6 Whilst there are no listed buildings or scheduled monuments within the Site, seven listed buildings lie within 1km and a significant number of finds dating from the prehistoric through to the Post-medieval period have been uncovered within 2km of the site.

1.4.7 The DBA concluded that archaeological remains are likely to be present and these would be indicative of prehistoric, Romano-British, Anglo-Saxon, Medieval or Post-Medieval activity associated with rural or agricultural activity. References to archaeological information from the DBA are included where relevant to the geophysical interpretation.

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 English Heritage guidelines (English Heritage 2008).

2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 22th and 24th April 2015. Field conditions at the time of the survey were good with favourable weather and pasture underfoot. Segmentation of the land for horse paddocks however did increase the difficulty of the survey.

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 English Heritage recommendations (2008).

2.2.2 The 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 English Heritage guidelines (2008). Data was 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 to all survey areas, with no interpolation applied.

2.2.4 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

3.1 Introduction

3.1.1 The gradiometer survey has been successful in identifying a few anomalies of probable and possible archaeological interest across the Site, along with ploughing trends, areas of superficial geology and regions of increased magnetic response. A system of modern services has also been identified. Results are presented as a series of greyscale and XY plots, with corresponding archaeological interpretations, at a scale of 1:2000 (**Figures 2** to **4**). 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 4**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.

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

3.1.4 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 encountered than have been identified through geophysical survey.

3.2 Gradiometer Survey Results and Interpretation

3.2.1 The most significant anomalies are concentrated in the northern part of the survey area with a series of linear anomalies (**4000** to **4006**) of approximately 1nT that cross the site on a east-southeast to west northwest alignment. These features run parallel from each other and appear to extent from a further anomaly of similar value **4007** that runs parallel to the western boundary. It is likely they represent field drains as they follow the topography of the land however it is also possible they represent earlier field subdivisions

as they produce similar size parcels of land to those that can be seen in the southern area. These have been interpreted as possible archaeology as their origin is uncertain.

3.2.2 Across the site are several small sub-circular anomalies (**4008** and **4009**) these vary in size and measuring some 1-2nT. These have uncertain origins but have been interpreted as possible archaeology and may present small pit or posthole features. There is no discernible alignment for these features so no further interpretation is possible.

3.2.3 The southern area has revealed several linear trends across the site (**4011**) these may be related to earlier agricultural activity. The northern area contains strong ploughing trends (**4012**) representing the Site's agricultural heritage as Oxlease Farm before its current use as an equestrian centre.

3.3 Gradiometer Survey Results and Interpretation: Modern Services

3.3.1 A modern service has been identified at **4010** with the main section running almost parallel with the eastern boundary before turning east and cutting across to the southwest corner of the survey area.

3.3.2 It is not clear from the geophysical data whether the services identified are in active use. It should also be noted that 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.

3.3.3 The relative dimensions of the modern service (**4010**) identified by the gradiometer survey are indicative of the strength of their magnetic response; it is assumed that the centreline of services is coincident with the centreline of their anomalies. Similarly, it is difficult to estimate the depth of burial of the services through gradiometer survey.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of possible archaeology as well as ploughing and agricultural trends, areas of geological disturbance, a region of magnetic disturbance and a modern service.

4.1.2 The Site was identified by the DBA as an area of suspected multi-period use ranging from the Bronze Age to post-medieval and 19th century, and considered to be used primarily for agriculture.

4.1.3 The most interesting anomalies are the parallel linear anomalies **4000** to **4006** and **4007** interpreted as field divisions or field drains.

4.1.4 Several smaller anomalies of possible archaeological potential have been identified across the Site (**4008** to **4009**), interpreted as pits with a weak geophysical response.

4.1.5 The remaining anomalies appear to be agricultural in origin, mainly in the form of regularly spaced linear ploughing trends identified across the majority of the site alongside more randomly aligned trends in the southern part of the Site.

4.1.6 In the south-eastern area especially few anomalies of archaeological potential have been identified due to the strong magnetic response from modern services, wire fencing and areas of ferrous debris.

6 REFERENCES

6.1 Bibliography

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

Chartered Institute for Archaeologists, 2014. *Standards and Guidance for Archaeological Geophysical Survey* Unpublished Guidance.

Southampton Archaeological Unit, 2012. *Desk-based assessment of the archaeological potential of land at Oxlease Farm, Cupernham Lane, Romsey.* Unpublished Report.

6.2 Cartographic Sources

British Geological Survey 2015 http://www.bgs.ac.uk/discoveringgeology/geologyofbritain/viewer.html [accessed May 2015]

Soil Survey of England and Wales SSEW 1983, 1983. *Sheet 6, South East England*. Ordnance Survey, Southampton.

APPENDIX 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 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 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.

APPENDIX 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:

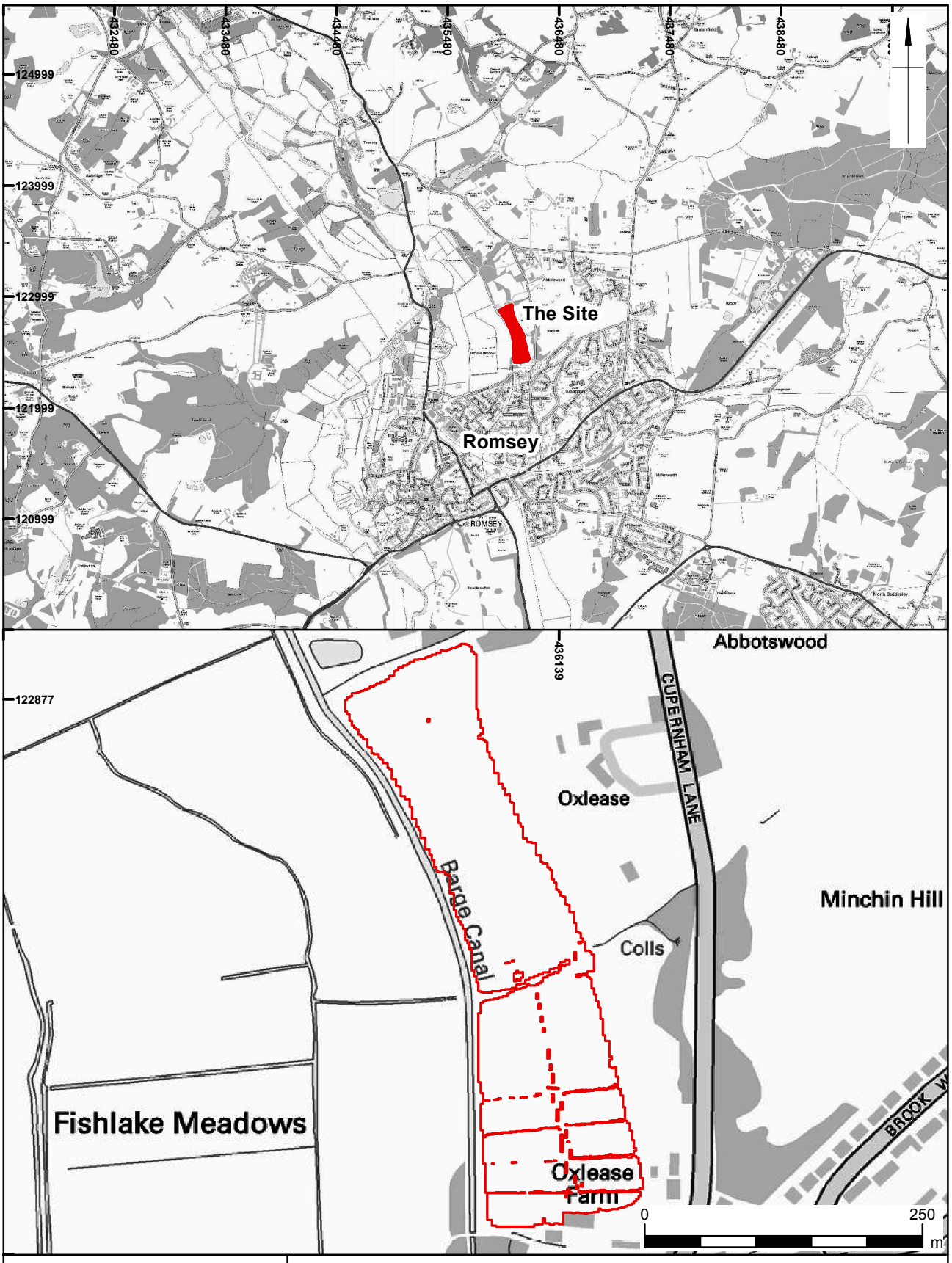
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be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



Detailed Survey Extents

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Site Location and Survey Extent

Figure 1

123000

436000

122500

+3nT

-2nT

Detailed Survey Extents

0 100 m

Date:	19/05/2015	Revision Number:	0
Scale:	1:2000	Illustrator:	ECR
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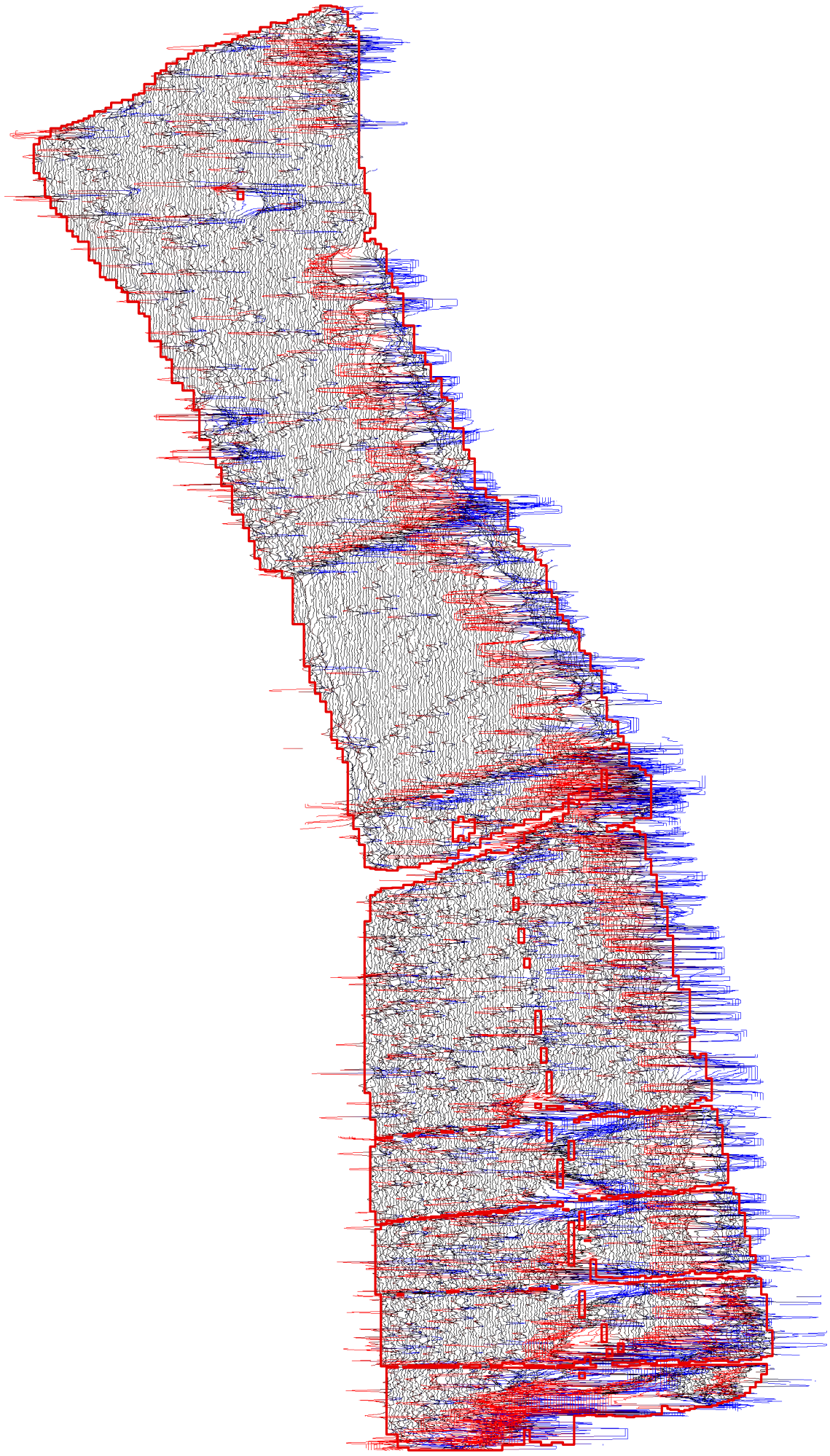
Greyscale Plot

Figure 2

123000

436000



122500

+25nT

-25nT

Detailed Survey Extents

0 100 m

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Scale:	1:2000	Illustrator:	ECR
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XY Trace Plot

Figure 3

123000

436000

122500

Detailed Survey Extents
Trend
Ploughing
Possible Archaeology
Modern Service
Increased Magnetic Response
Ferrous
Superficial Geology

0 100 m

Date:	19/05/2015	Revision Number:	0
Scale:	1:2000	Illustrator:	ECR
Path:	X:\PROJECTS\108800\GIS\FigsMXD\2015_05_19		

Archaeological Interpretation

Figure 4

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