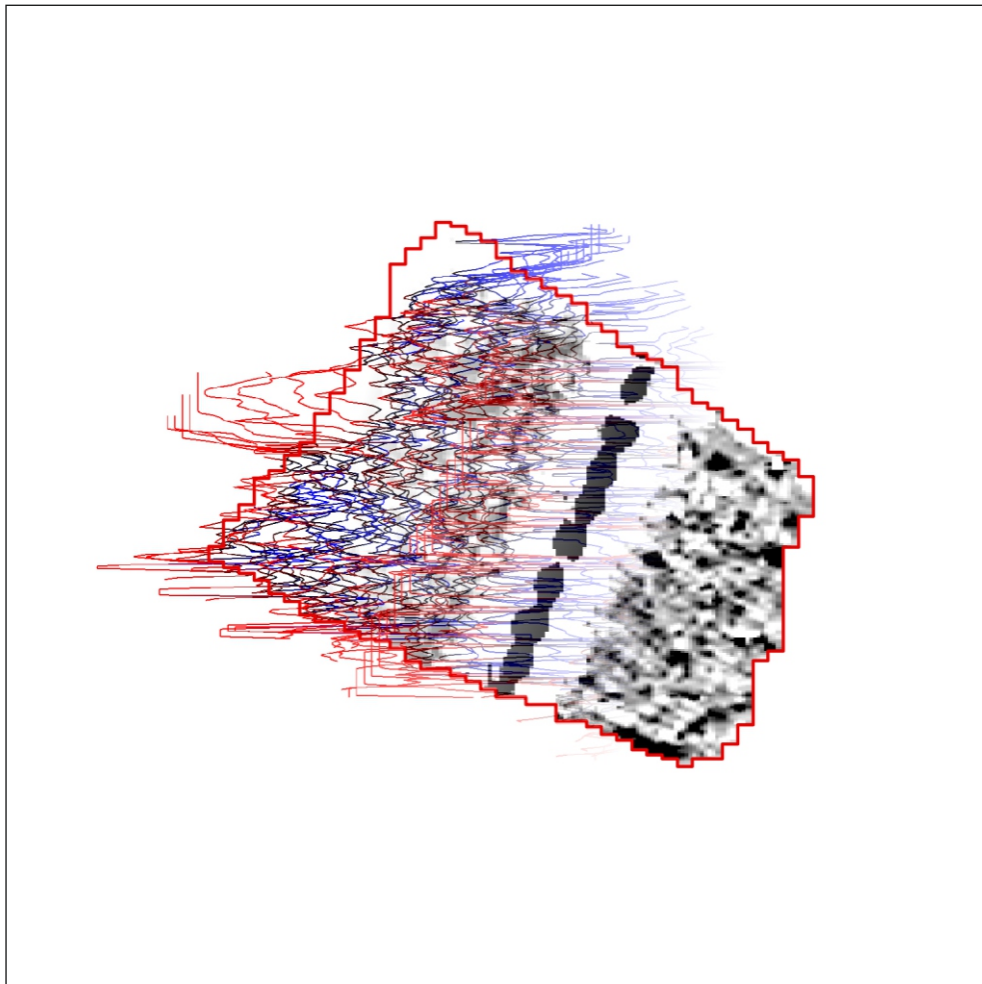




making sense of heritage

Premier Inn, Helston Business Park Helston, Cornwall

Detailed Gradiometer Survey Report



Ref: 112120.04
February 2016



**Premier Inn, Helston Business Park
Helston, Cornwall**

Detailed Gradiometer Survey Report

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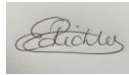

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Premier Inn, Helston Business Park Helston, Cornwall

Detailed Gradiometer Survey Report

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Detailed Gradiometer Survey Report

Summary

A detailed gradiometer survey was conducted over land at The Premier Inn, Helston Business Park, Helston, Cornwall (centred on NGR 167050, 27400). The project was commissioned by Walsingham Planning, on behalf of Whitbread Group Plc., with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the extension of the Premier Inn.

The site covers an area of 1.2 ha, of which it was only possible to survey 0.32 ha due to on site conditions. The survey extents were constrained due to the current land use of the site which comprises a small arable field that was surveyed, alongside the current extent of the Premier Inn hotel and car park. The geophysical survey was undertaken on 20th to the 21st January 2016 and has identified a few anomalies of potential archaeological interest. The strong readings of a modern service running north-south dominate the central portion of the results.

The anomalies identified as being of archaeological interest are primarily pit- and ditch-like features which can be seen across the site along with some areas of increased magnetic response. These features may be associated with potential prehistoric pits identified from aerial photographs and located at the southern end of the site, beneath the existing hotel and car park.



Premier Inn, Helston Business Park Helston, Cornwall

Detailed Gradiometer Survey Report

Acknowledgements

Wessex Archaeology would like to thank Walsingham Planning for commissioning the geophysical survey. The assistance of Euan Brown is gratefully acknowledged in this regard.

The fieldwork was undertaken by Vi Pieteron and Alistair Salisbury. Alistair Salisbury processed and interpreted the geophysical data and wrote the report. The geophysical work was quality controlled by Elizabeth Richley. Illustrations were prepared by Lizzie Richley. The project was managed on behalf of Wessex Archaeology by Caroline Budd.



Premier Inn, Helston Business Park Helston, Cornwall

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology (WA) was commissioned by Walsingham Planning, on behalf of Whitbread Group, to carry out a geophysical survey at Premier Inn, Helston Business Park, Helston, Cornwall (hereafter 'the Site', centred on NGR 167050, 27400) (**Figure 1**). The survey forms part of an ongoing programme of archaeological works being undertaken in support of a planning application for the extension of the Premier Inn.

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 on the eastern extent of the town of Helston and 3.7 km west north-west of the village of Gweek.

1.2.2 The Site occupies an area of 1.2 ha of land. The southern end of the Site is current location of the Premier Inn Hotel and The May Tree Restaurant. The northern part of the Site is currently utilised for growing crops. The Site is bounded by the A394 to the west, an unnamed road to the south and a hedgerow and farm track/lane to the north with further agricultural land to the east.

1.2.3 The Site is on a slight incline sloping from 65 m aOD (above Ordnance Datum) at the western edge to approximately 60 m aOD at the eastern edge.

1.3 Soils and geology

1.3.1 The solid geology comprises Slate and Siltstone of the Mylor Slate Formation. No overlying superficial geological deposits have been recorded (BGS 2015).

1.3.2 The soils underlying the Site are likely to consist of typical browns earths of the 541k (Denbigh 2) association (SSEW SE Sheet 5_1 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 detailed Desk Based Assessment (DBA) has been produced by WA (WA 2016) covering a Study Area of 1 km radius from the Site boundary. Presented below is a summary of the key information from the DBA and from publically available online resources as well as the results of any previous investigations undertaken by WA. Relevant entries numbers from the Cornwall and Scilly Historic Environment Record (HER) are included where appropriate. This information will be referred to when necessary during the interpretation of the geophysics results.
- 1.4.2 There are no World Heritage Sites, Scheduled Monuments, Registered Parks and Gardens, Conservation Areas or Historic Battlefields identified within the Survey Area however two Grade II Listed Buildings are recorded to the east and a number of cropmarks have been located within the immediate vicinity.
- 1.4.3 No recorded previous archaeological works have been undertaken over the Site. However a group of oblong cropmarks have been located by aerial photography as part of the NMP (National Mapping Programme) within the bounds of the Site (HER No. MCO50032). These are noted on the eastern extent and south eastern area where the current Premier Inn and carpark are situated. These have been interpreted as possible prehistoric pits and lie within an area of Anciently Enclosed Land.
- 1.4.4 The settlement and Royal Manor of Helston (HER No. 30250), was first recorded in the Domesday Survey of 1086, named as 'Henlistona'. Helston Castle (HER No. 30104), erected between 1272 and 1300, it is located 1200 m to the west of the Site. The area immediately surrounding Helston Castle, and the high street (Helston-Godolphin road) is a Conversation Area with a number of Grade II Listed medieval and post-medieval buildings.
- 1.4.5 To the south of the Site (c. 50 m) a number of enclosures have been identified from aerial photography (HER No. MCO50028). These have been identified as possible Iron Age or Romano-British Round enclosures and measure c. 50 m x 40 m with a possible entrance to the south. Further prehistoric enclosures are recorded 560 m south-east of the Site (HER No. MCO50037, MCO50045-46, MCO50048 and MCO50050) and to the north-east where potential barrows (HER No. MCO50033 and MCO50021) have been identified in aerial photography. Two early medieval settlements are recorded from documentary evidence, Tresprison (HER No. MCO11525) lies c. 50m south-east of the Site and Tregarrick (HER No. MCO17226) c. 300 m south-east.
- 1.4.6 The map regression exercise undertaken has indicated that the Site area has been in use as arable fields from at least the 19th century to present, however internal boundaries have changed over time.



2 METHODOLOGY

2.1 Introduction

2.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between the 20th and 21st January 2016. Field conditions at the time of the survey were good, with dry conditions throughout the period of survey. An overall coverage of 0.32 ha was achieved.

2.2 Method

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

2.2.2 The detailed gradiometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1 m between sensors. Data were collected at 0.25 m intervals along transects spaced 1 m apart with an effective sensitivity of 0.03 nT, 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 (± 10 nT 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 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 1:2000 (**Figure 2**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale image and ± 25 nT at 25 nT 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 2**.
- 3.1.3 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.
- 3.1.4 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 present than have been identified through geophysical survey.
- 3.1.5 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 On the north-western-most extent a small cluster of positive anomalies are present at **4000**. These readings are consistent with pit- and ditch-like features. Curvilinear responses are likely to represent ditches and the more discrete sub-circular anomalies are likely to be possible pits.
- 3.2.2 A very strong positive response at **4001** (>20 nT) shows a large pit-like feature measuring c.15 m on its longest axis (north-east to south-west). This feature abuts the survey extent and may continue beyond. A further irregularly shaped positive feature is present at **4002**. This feature displays strong positive magnetic properties (+9-12 nT), and also may continue beyond the edge of the survey extent. As such, both of these anomalies have been interpreted as possible archaeology but their full size and extent, and therefore, context is unknown from this data alone and while no definitive interpretation can be given to them, it is possible that they relate to pits identified on aerial photographs located beneath the hotel and car park (MCO50032). These cropmarks were recorded as a group of 10 oblong pits and are tentatively interpreted as prehistoric in date, given the prevalence of prehistoric pits and enclosures in the surrounding area. Just to the south of the Site is a prehistoric or Romano-British round (MCO50028), also identified from aerial photographs and may potentially be associated with the features identified in the survey.
- 3.2.3 A large area of increased magnetic response c. 30 m x c.15 m centred on **4003** has a number of pit-like anomalies and curvilinear anomalies present within. As with **4001** and **4002**, these may represent prehistoric pits similar to those noted in cropmarks (MCO50032) recorded in the location of the existing hotel and car park.



3.2.4 A possible modern service was discovered bisecting the Site north-east to south-west at **4004**. The 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.

3.2.5 Linear trends and plough marks have been identified in the gradiometer data, there as attributed to medieval, post medieval and modern agricultural land-use.

4 CONCLUSIONS

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 areas of increased magnetic response and a modern service has been identified.

4.1.2 The anomalies of archaeological interest are primarily pit- and ditch-like features, identified at **4000-3**. The exact date of these features cannot be determined without excavation but within a 1 km study area of the Site a number of prehistoric are recorded suggesting a possible date for these features. The Site also lies adjacent to the medieval farmstead of Treprison and there is the potential for features associated with this settlement to extend into the Site.

4.1.3 Frequent linear trends are visible across the Site on differing alignments. These are likely to be due to a variety of farming methods and are considered to be medieval, post-medieval and/or modern in provenance.

5 RECOMMENDATIONS

5.1.1 Due to the identification of a number of possible archaeological features it is considered that a programme of archaeological strip, map and sample within the greenfield area of the Site in advance of construction works would be an appropriate means to further characterise and record these features within the Site.

5.1.2 The features identified may be associated with possible prehistoric pits at the southern end of the Site, under the existing hotel and car park. Any intrusive works within the car park during the construction of the hotel extension should be monitored by an archaeologist in order to record any surviving pits, however, it should be noted it is likely that a number of services are located within the car park which may have impacted on any archaeological features in this area.

5.1.3 The need for, timing and scope of any such investigations should be agreed in consultation with the Local Planning Authority.



6 REFERENCES

6.1 Bibliography

English Heritage 2008 *Geophysical Survey in Archaeological Field Evaluation. Research and Professional Service Guideline No 1*. Swindon (2nd Edition)

Wessex Archaeology 2016 *Premier Inn, Helston Business Park, Helston, Cornwall: Historic Environment Desk-Based Assessment*. Salisbury, unpublished report, ref. 112120.03

6.2 Cartographic and documentary sources

Ordnance Survey 1983 *Soil Survey of England and Wales Sheet 5, Soils of South and South West England*. Southampton.

6.3 Online resources

British Geological Survey Geology of Britain Viewer [Accessed January 2016]
<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Heritage Gateway [Accessed January 2016] <http://www.heritagegateway.org.uk/>



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 ± 100 nT 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.



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.
- 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:

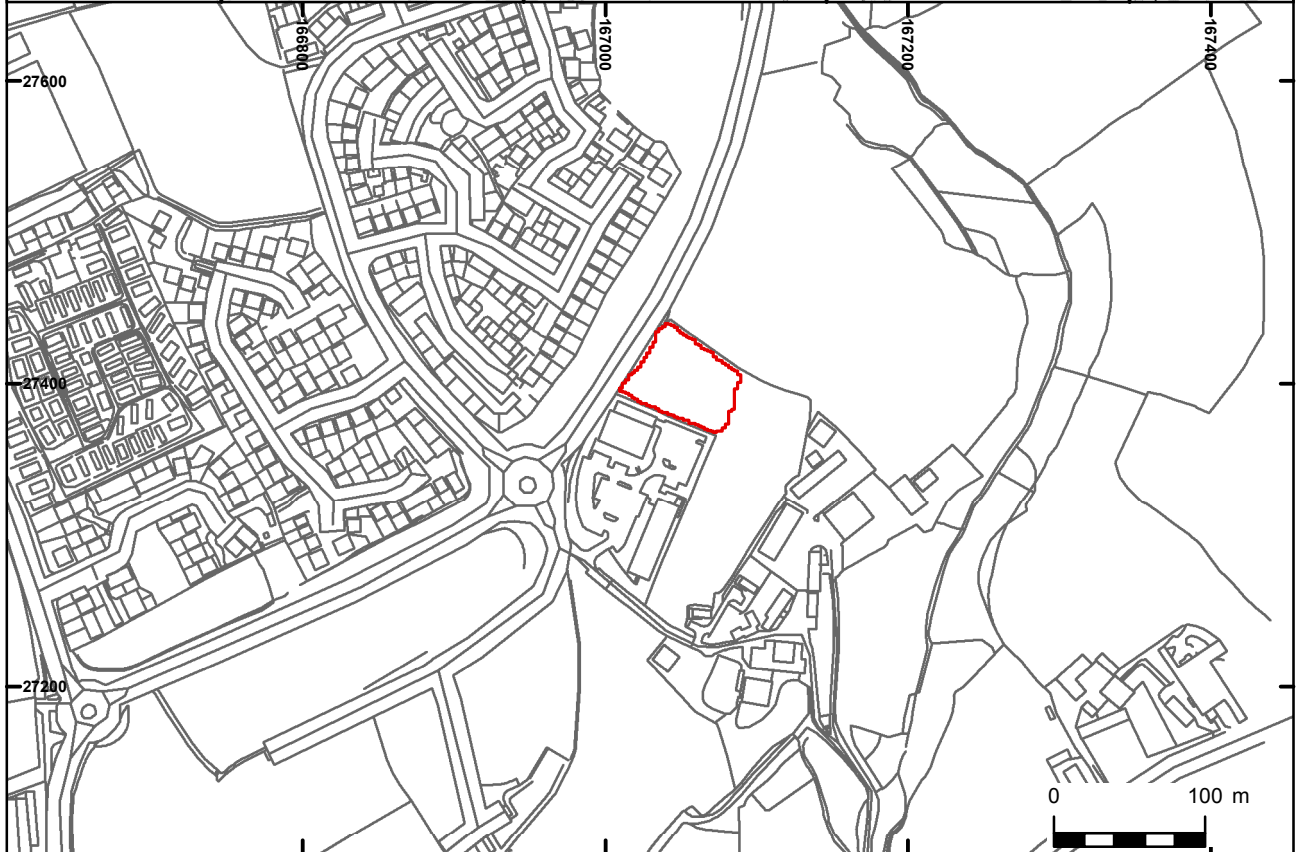
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be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

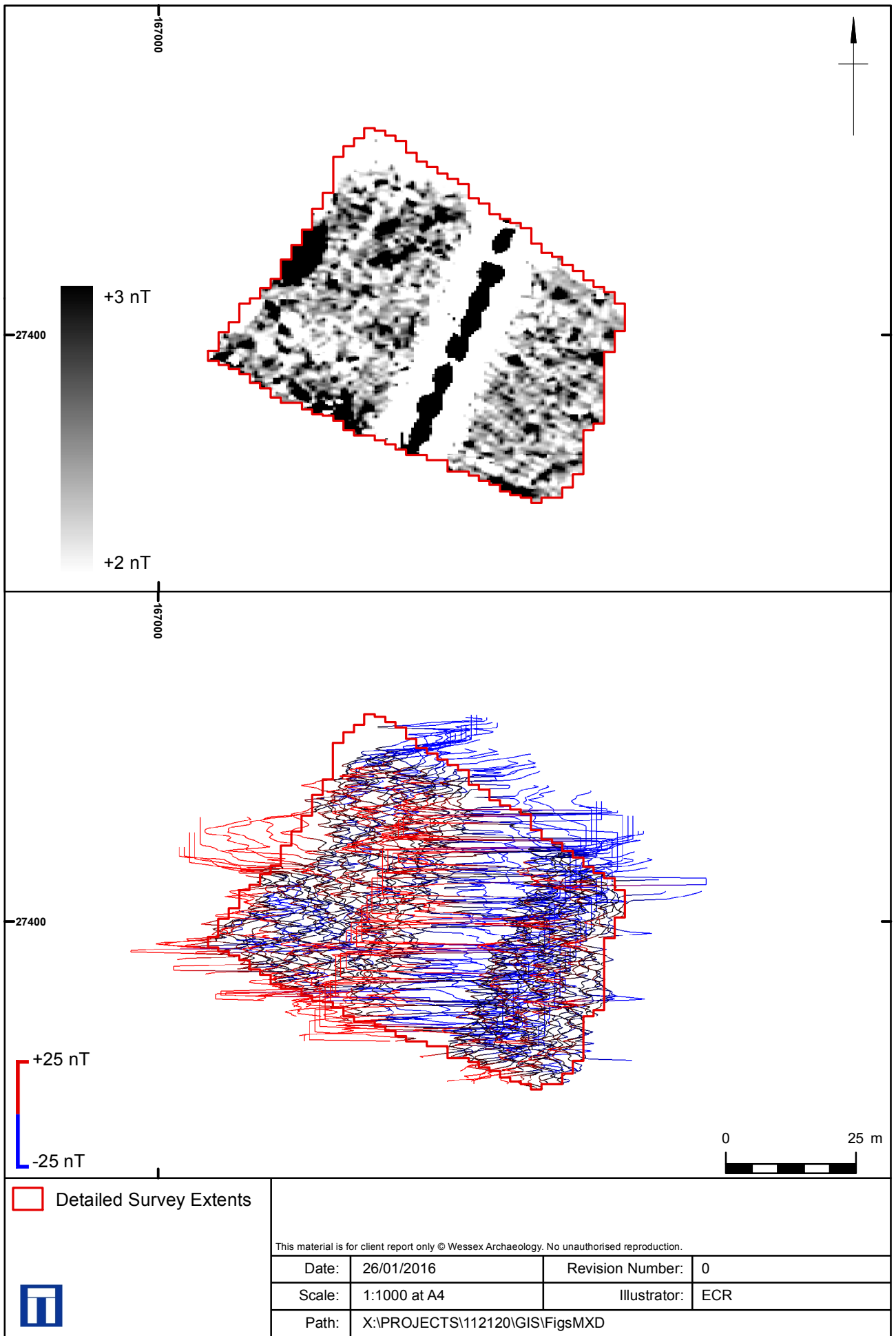
- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They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



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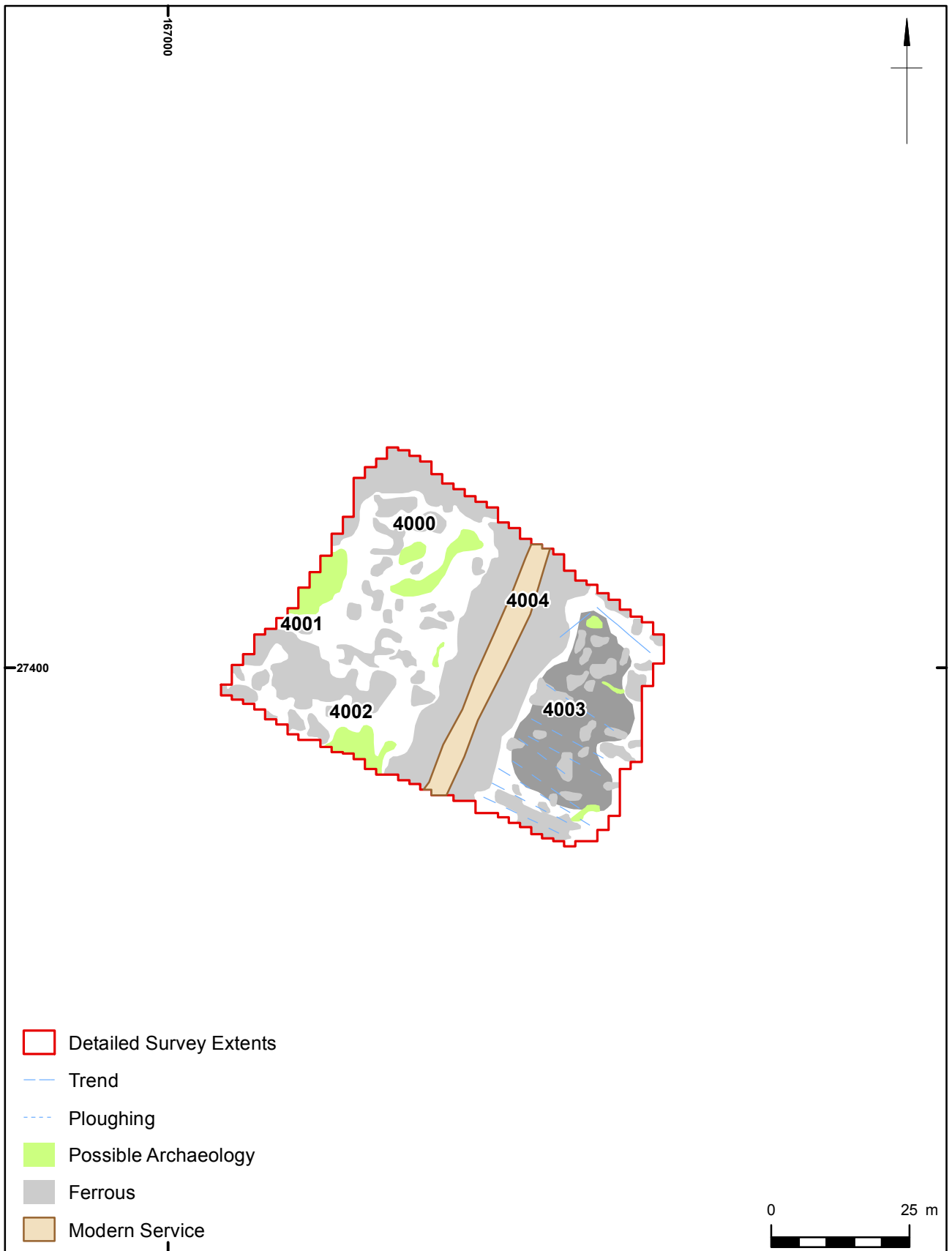
Site Location and Survey Extents

Figure 1




Greyscale and XY Trace Plot

Figure 2



- Detailed Survey Extents
- Trend
- Ploughing
- Possible Archaeology
- Ferrous
- Modern Service



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