Archaeological Services
University of Durham

Wild Rose Caravan Park, Ormside, Appleby-in-Westmorland, Cumbria

geophysical survey

on behalf of
Unwin Jones Partnership

Report 1501
July 2006

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Contents

1. Summary

The project

1.1 This report presents the results of a geophysical survey conducted in advance of a proposed development at Wild Rose Caravan Park, Ormside, Appleby-in-Westmorland. The works comprised a magnetometer survey of the southern part of the proposed development area.

1.2 The works were commissioned by Unwin Jones Partnership and conducted by Archaeological Services in accordance with a Project Design provided by Archaeological Services.

Results

1.3 Several very weak anomalies have been detected during the survey which may reflect archaeological features.

Recommendations

1.4 The Planning Authority may require further investigation of these possible features.

2. Project background

Location (Figure 1)

2.1 The study area is located near Wild Rose Caravan Park, Ormside, Appleby-in-Westmorland, Cumbria. (NGR: NY 6995 1630). The proposed development area comprises 17ha, of which approximately 3.2ha in the south was subject to a geomagnetic survey.

Development proposal

2.2 The proposed development consists of an extension to the Wild Rose Caravan Park to create space for luxury lodges along with associated access roads, parking and services.

Objective

2.3 The principal aim of the survey was to assess the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, so that an informed decision may be made regarding the nature, and scope of, any further scheme of archaeological works that may be required in advance of development.

Methods statement

2.4 The surveys have been undertaken in accordance with a Project Design (DS06.150) provided by Archaeological Services.

Dates

2.5 Fieldwork was undertaken on the 29th and 30th June 2006. This report was prepared between 14th and 18th July 2006.

Personnel

2.6 Fieldwork was conducted by Graeme Attwood (supervisor) and Richard Villis. This report was prepared by Graeme Attwood, with illustrations by David Graham. The Project Manager was Daniel Still.

Archive/OASIS

2.7 The site code is **WRA06**, for **W**ild **R**ose Caravan Park, **A**ppleby-in-Westmorland 20**06**. The survey archive is currently held by Archaeological Services Durham University. Archaeological Services is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (OASIS). The OASIS ID number for this project is **archaeol3-16735**.

3. Archaeological and historical background

3.1 The land of the Eden Valley in which Appleby-in-Westmorland lies has been extensively settled and exploited since the Mesolithic period. It was one of the most densely populated parts of Cumbria in the later prehistoric periods and became an important route north during the Roman period.

3.2 Exploitation of the valley continued throughout the medieval and post-medieval periods with continued cultivation of the land. The construction of the Settle to Carlisle Railway, which crosses the proposed development area, will have had a considerable affect on the landscape.

3.3 A detailed assessment of the archaeological and historical background of the proposed development area has previously been undertaken (Archaeological Services 2006).

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised a field of pasture containing sheep; it was bounded on all sides by wire fences.

4.2 The survey area was predominantly level at a mean elevation of *c*.165m OD.

4.3 The underlying solid geology of the area comprises Penrith sandstone, which is overlain by glacial boulder clay.

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation* (David 1995); the Institute of Field Archaeologists Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2001).

Technique selection

5.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features within landscapes and can involve a variety of complementary techniques such as magnetometry, electrical resistivity, ground-penetrating radar and electromagnetic survey. Some techniques are more suitable than others in particular situations, depending on a variety of site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.

5.3 In this instance, based on our earlier desktop assessment, it was considered likely that cut features, such as ditches and pits, might survive on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.

5.4 Given the anticipated shallowness of the targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting each of these types of

feature. This technique involves the use of hand-held magnetometers to detect and record minute anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

5.5 A 30m grid was established across the survey area and tied-in to known, mapped Ordnance Survey points using a Leica GS50 global positioning system (GPS) with subsequent RINEX calibration.

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 fluxgate gradiometers with automatic datalogging facilities. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was set to 0.1nT, the sample interval to 0.25m and the traverse interval to 1.0m, thus providing 3600 measurements per 30m grid unit.

5.7 Data were downloaded on-site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

5.8 Geoplot v.3 software was used to process the geophysical data and to produce both a continuous tone greyscale image and a trace plot of the raw data. The greyscale image and interpretations are presented in Figures 2-4; the trace plot is provided in Appendix I. In the greyscale image, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.9 The following basic processing functions have been applied to the data:

Clip – clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.

Zero mean traverse – sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities.

Despike – locates and suppresses random iron spikes in gradiometer data.

Low pass filter – is useful for smoothing data or for enhancing larger weak features.

Interpolate – increases the number of data points in a survey to match sample and traverse intervals. In this instance the gradiometer data have been interpolated to 0.25m intervals.

Interpretation: anomaly types

5.10 A colour-coded geophysical interpretation plan is provided in Figure 3. Two types of geomagnetic anomaly have been distinguished in the data:

positive magnetic	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches.
dipolar magnetic	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths.

Interpretation: features

5.11 A colour-coded archaeological interpretation plan is provided in Figure 4.

5.12 Several very weak rectilinear and curvilinear positive magnetic anomalies have been detected across the survey area, which could reflect the remains of soil-filled features, possibly ditches.

5.13 A chain of intense dipolar magnetic anomalies crosses the site in a north-south direction and almost certainly reflects a service pipe. Several chains of weaker dipolar magnetic anomalies have also been detected and are likely to reflect further utilities.The only other anomalies detected here are small, discrete dipolar magnetic anomalies. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments.

5.14 The ferrous nature of the field boundaries is reflected in the strong anomalies evident around the edges of the survey area.

6. Conclusions

6.1 A geomagnetic survey has been conducted on land proposed for an extension to the Wild Rose Caravan Park, Appleby-in-Westmorland.

6.2 Several very weak anomalies have been detected during the survey which could reflect archaeological ditch features.

7. Sources

Archaeological Services 2006 *Wild Rose Park, Ormside, Appleby-in-Westmorland, Cumbria:* a*rchaeological desk-based assessment and walkover survey,* unpublished report **1451** for Unwin Jones Partnership, Archaeological Services Durham University

David, A, 1995 *Geophysical survey in archaeological field evaluation,* Research and Professional Services Guideline **1**, English Heritage

Gaffney, C, Gater, J & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*, Technical Paper **6**, Institute of Field Archaeologists

Schmidt, A, 2001 *Geophysical Data in Archaeology: A Guide to Good Practice*, Archaeology Data Service, Arts and Humanities Data Service

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Figure 1
Location of the proposed development area

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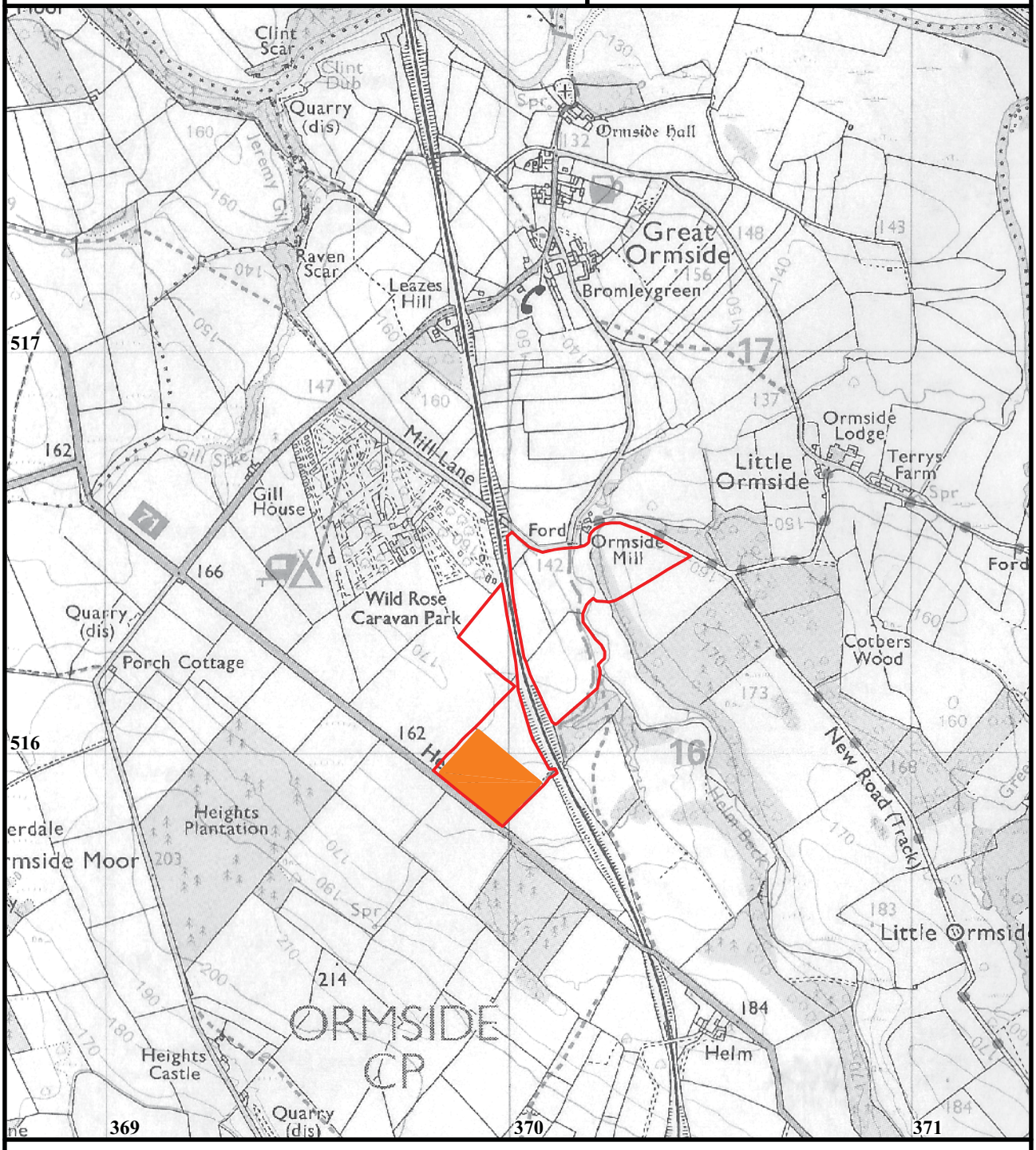

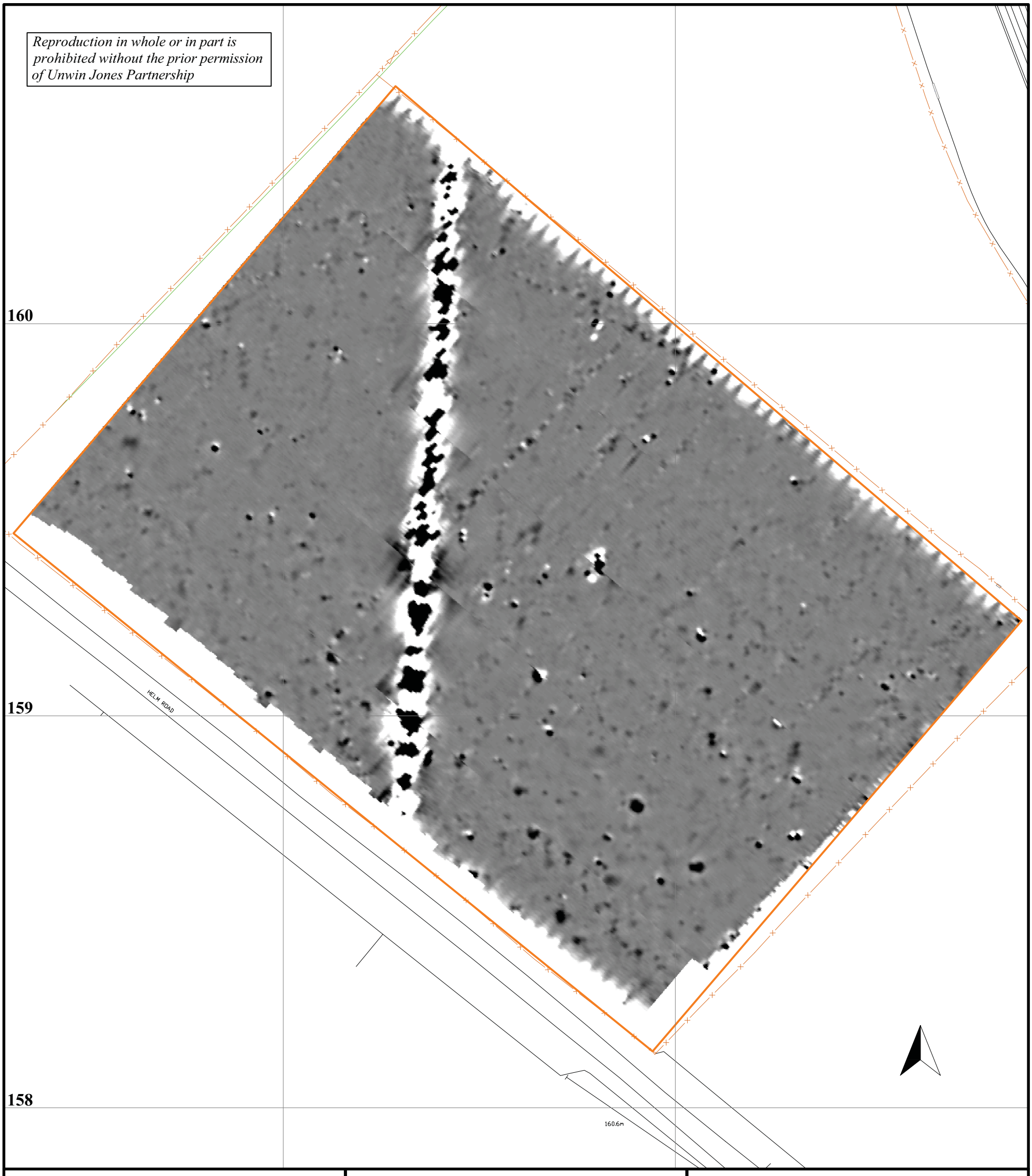

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Figure 2
Geophysical survey

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0 50m

scale 1:1000 - for A3 plot

outline of survey area

10.41
8.68
6.94
5.21
3.47
1.74
0
-1.73
-3.47
-5.21
-6.94
-8.68
-10.41 nT

160

159

158

HELM ROAD

160.6m

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Figure 3
Geophysical interpretation

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0 50m

scale 1:1000 - for A3 plot

outline of survey area

positive magnetic anomalies

dipolar magnetic anomalies

160

159

HELM ROAD

158

160.6m

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Figure 4
Archaeological interpretation

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0 50m

scale 1:1000 - for A3 plot

outline of survey area

possible soil-filled features

utilities

Appendix I: Trace plot of geophysical data