

An archaeological gradiometer survey

Land at Bickland Hill, Falmouth
Cornwall

Centred on NGR 178460,32700

Report: 150529

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Accompanying CD-ROM

Report.....	Adobe PDF format
Copies of report figures.....	Adobe PDF format
Raw and processed grid & composite files	DW Consulting TerraSurveyor 3 formats
Minimal processing data plots and metadata	DW Consulting TerraSurveyor 3 formats
Final data processing data plots and metadata	DW Consulting TerraSurveyor 3 formats
GIS project, shape files and classification schema	
GIS project	Manifold 8 ‘.map’ file
GIS shape files	ESRI standard
GIS classification schema	Adobe PDF format
AutoCAD version of the survey interpretation	AutoCAD DXF

Website: substrata.co.uk

For an overview of Substrata, our archaeological geophysical surveying techniques and the results we obtain.

1 Survey description and summary

1.1 Survey

Type: twin-sensor fluxgate gradiometer
Date: 7 May 2015
Area: 1.3 ha
Lead surveyor: Ross Dean BSc MSc MA MifA

1.2 Client

AC Archaeology Ltd, 4 Halthaies Workshops, Bradninch, Nr Exeter, Devon EX5 4QL

1.3 Location

Site: Land at Bickland Hill
Town & Civil Parish: Falmouth
County & Unitary Authority: Cornwall
Nearest Postcode: TR10 8WS
NGR: SW 784 327
Ordnance Survey NGR (E/N): 178460,32700 (point)

1.4 Archive

OASIS number: substrat1-212531
Archive: At the time of writing, the archive of this survey will be held by Substrata and will be deposited with the ADS in due course.

1.5 Introduction

This report was commissioned by AC Archaeology Ltd on behalf of clients. The location of the site is shown in Figure 1.

1.6 Summary

The magnetic contrast across the area was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses. Two magnetic anomaly groups were identified as possibly representing linear archaeological deposits or features although recent origins could not be ruled out and no further archaeological characterisation was possible.

2 Survey aims and objectives

2.1 Aims

The main aim of the geophysical survey was to establish the presence or absence, extent and character of any archaeological features and deposits within the site. The results of the survey and any subsequent trial trenching will be reviewed and used to inform any subsequent mitigation.

The site specific aims are to:

- Establish the presence/absence of archaeological remains;
- Determine the extent, condition, nature, character, date and significance of any archaeological remains encountered;
- Establish the nature of activity on the site;
- Identify any deposits or structures that may relate to the occupation or use of the site;
- Provide further information on the archaeology of the site from any archaeological remains encountered.

2.2 Survey objectives

1. Complete a gradiometer survey across agreed parts of the application area.
2. Identify any magnetic anomalies that may be related to archaeological deposits, structures or artefacts.
3. Within the limits of the techniques and dataset, archaeologically characterise any such anomalies or patterns of anomalies.

4. Accurately record the location of the identified anomalies.
5. Produce a report based on the survey that is sufficiently detailed to inform any subsequent development on the site about the location and possible archaeological character of the recorded anomalies.

3 Standards

The standards used to complete this survey are defined by the Chartered Institute for Archaeologists (2014a) and English Heritage (2010). The codes of approved practice that were followed are those of the Chartered Institute for Archaeologists (2014b) and Archaeology Data Service/Digital Antiquity Guides (undated). The document text was written using the house style of the Chartered Institute for Archaeologists (Chartered Institute for Archaeologists, undated).

4 Site description

4.1 Landscape and land use

The site occupies an area of approximately 1.3 hectares and is situated to the west of the town of Falmouth, abutting the western extent of the urban edge. The land is generally sloping north-east to south-west and lies at approximately 90m AOD.

4.2 Geology

The application area is located close to a solid geology boundary with microgranite of the Permian and Carboniferous Carnmenellis Intrusion to the west and metamorphic bedrock of hornfelsed slate and hornfelsed siltstone of the Devonian Mylor Slate Formation (British Geological Survey, undated).

5 Archaeological background

The archaeological background for this site is discussed in Lutescu-Jones (2015).

There are no previously recorded heritage assets recorded within the site itself, but it does lie in an area where there is piece meal evidence for prehistoric activity. However, it is likely that the main focus of prehistoric occupation would have concentrated within the area of the River Fal. There is likely to be a general low potential for the site to contain buried remains relating to the Roman-British, Medieval or Post-medieval periods, although the general paucity of known information might be a reflection of the limited amount of archaeological work undertaken in the immediate area, rather than an absence of buried remains.

6 Results, discussion and conclusions

This survey was designed to record magnetic anomalies. The anomalies themselves cannot be regarded as actual archaeological features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeological features. The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to archaeological deposits and structures.

The terms ‘archaeological features’ and ‘archaeological deposits’ refer to any artefacts, material deposits or disturbance of natural deposits thought to be the result of human activity and not undertaken as recent land maintenance or farming.

The reader is referred to section 7.

6.1 Results

Figure 2 shows the interpretation of the survey data. It includes the anomaly groups identified as relating to archaeological deposits along with their numbers. A detailed analysis of the survey data is provided in the attribute tables of the GIS project on the accompanying CD-ROM and in the project archive.

Plots of the processed data are provided in Figures 3 and 4.

6.2 Discussion

6.2.1 General points

Anomalies thought to relate to natural features were not mapped.

Recent man-made objects such as manholes, water management equipment, drains, cables and other services were only mapped where they comprised significant magnetic responses across the dataset that needed clarification. If mapped, they are listed in Table 1 but are not discussed below.

There are numerous anomaly groups that could be interpreted as relating to large postholes or pits although most will have natural origins. Anomalies of this sort are only mapped as potential archaeology if they are clustered in groups or otherwise form recognisable patterns.

Data collection along the survey area edges was restricted as shown in Figures 3 and 4 due to the presence of magnetic materials in and adjacent to field and roadside boundaries. Strong magnetic responses mapped close to the field and roadside boundaries are likely to relate to these materials except where otherwise indicated in Figure 2.

All of the surveyed fields display parallel linear anomaly patterns orientated with the long axes of each field with a subsidiary set at right-angles. These patterns are likely to reflect former ploughing.

6.2.2 Data relating to historical maps and other records

No survey data related to features recorded on historical maps.

6.2.3 Data with no previous archaeological provenance

The magnetically positive linear group **1** may relate to archaeological deposits or to field drainage.

Group **2** is a magnetically negative group which may reflect archaeological deposits but relatively recent established animal tracks cannot be ruled out.

Some linear trends were recorded in the data set as shown in Figure 2. These are likely to represent field drains.

6.3 Conclusions

The magnetic contrast across the area was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses.

Two magnetic anomaly groups were identified as possibly representing linear archaeological deposits or features although recent origins could not be ruled out and no further archaeological characterisation was possible.

7 Disclaimer and copyright

The description and discussion of the results presented in this report are the authors, based on his interpretation of the survey data. Every effort has been made to provide accurate descriptions and interpretations of the geophysical data set. The nature of archaeological geophysical surveying is such that interpretations based on geophysical data, while informative, can only be provisional. Geophysical surveys are a cost-effective early step in the multi-phase process that is archaeology. The evaluation programme of which this survey is part may also be informed by other archaeological assessment work and analysis. It must be presumed that more archaeological features will be evaluated than those specified in this report.

Ross Dean, trading as Substrata, will assign copyright to the client upon written request but retains the right to be identified as the author of all project documentation and reports as defined in the Copyright, Designs and Patents Act 1988 (Chapter IV, s.79).

8 Acknowledgements

Substrata would like to thank John Valentin of AC Archaeology Ltd for commissioning us to complete this survey and Mr Daniel Busk for arranging access to the site.

9 Bibliography

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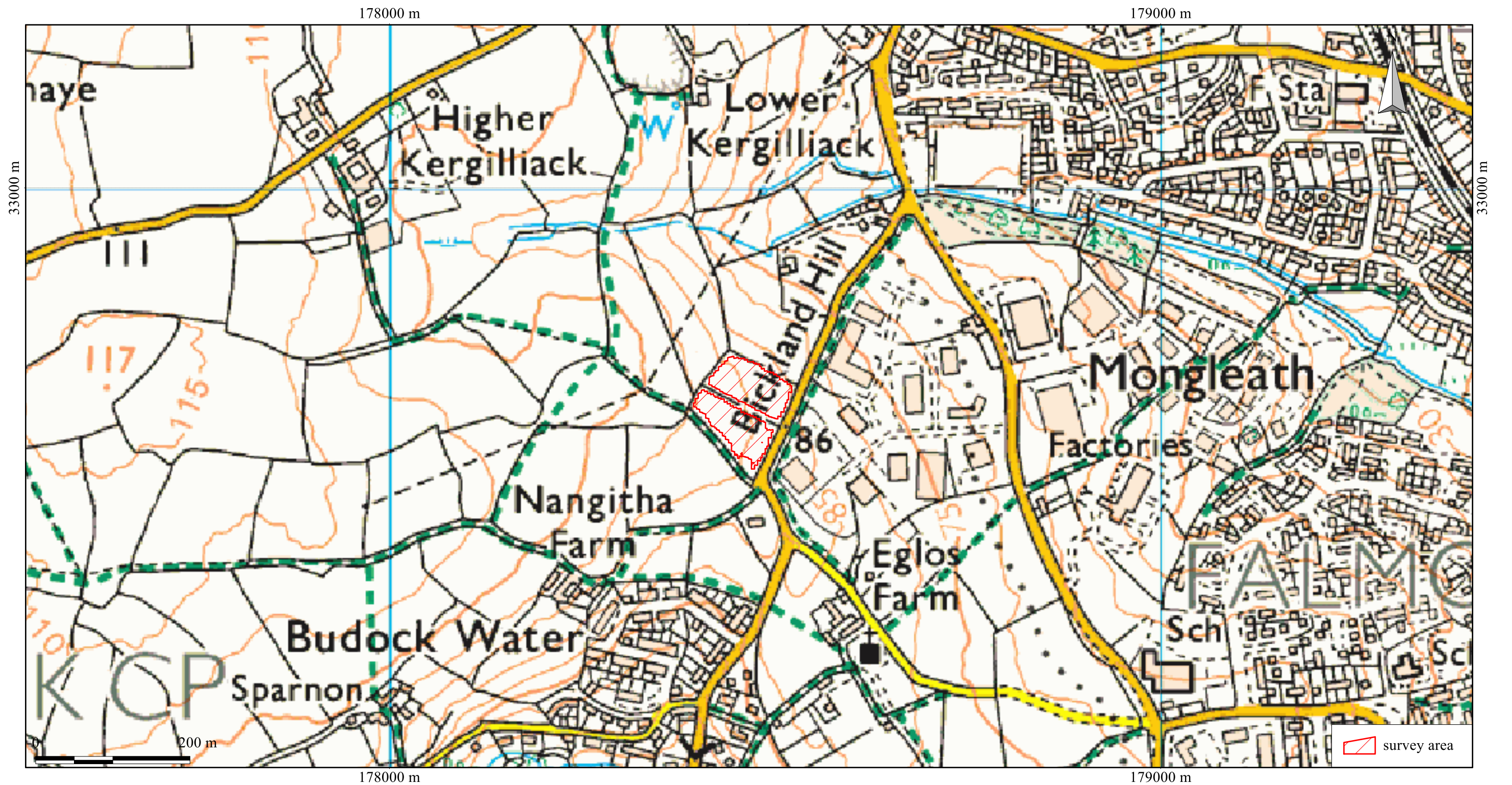
Lutescu-Jones, P. (2015) *Land at Bickland Hill: Historic Environment Assessment*. AC Archaeology Ltd unpublished document ACD1132/1/0

Appendix 1 Analysis table and supporting plots

General Guidance

The anomalies represented in the survey plots provided in this appendix are magnetic anomalies. The apparent size of such anomalies and anomaly patterns are unlikely to correspond exactly with the dimensions of any associated archaeological features.

A rough rule for interpreting magnetic anomalies is that the width of an anomaly at half its maximum reading is equal to the width of the buried feature, or its depth if this is greater (Clark, 2000: 83). Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies. In northern latitudes the position of the maximum of a magnetic anomaly will be displaced slightly to the south of any associated physical feature.



British Grid
 centre X: 178466.37 m, centre Y: 32729.93 m

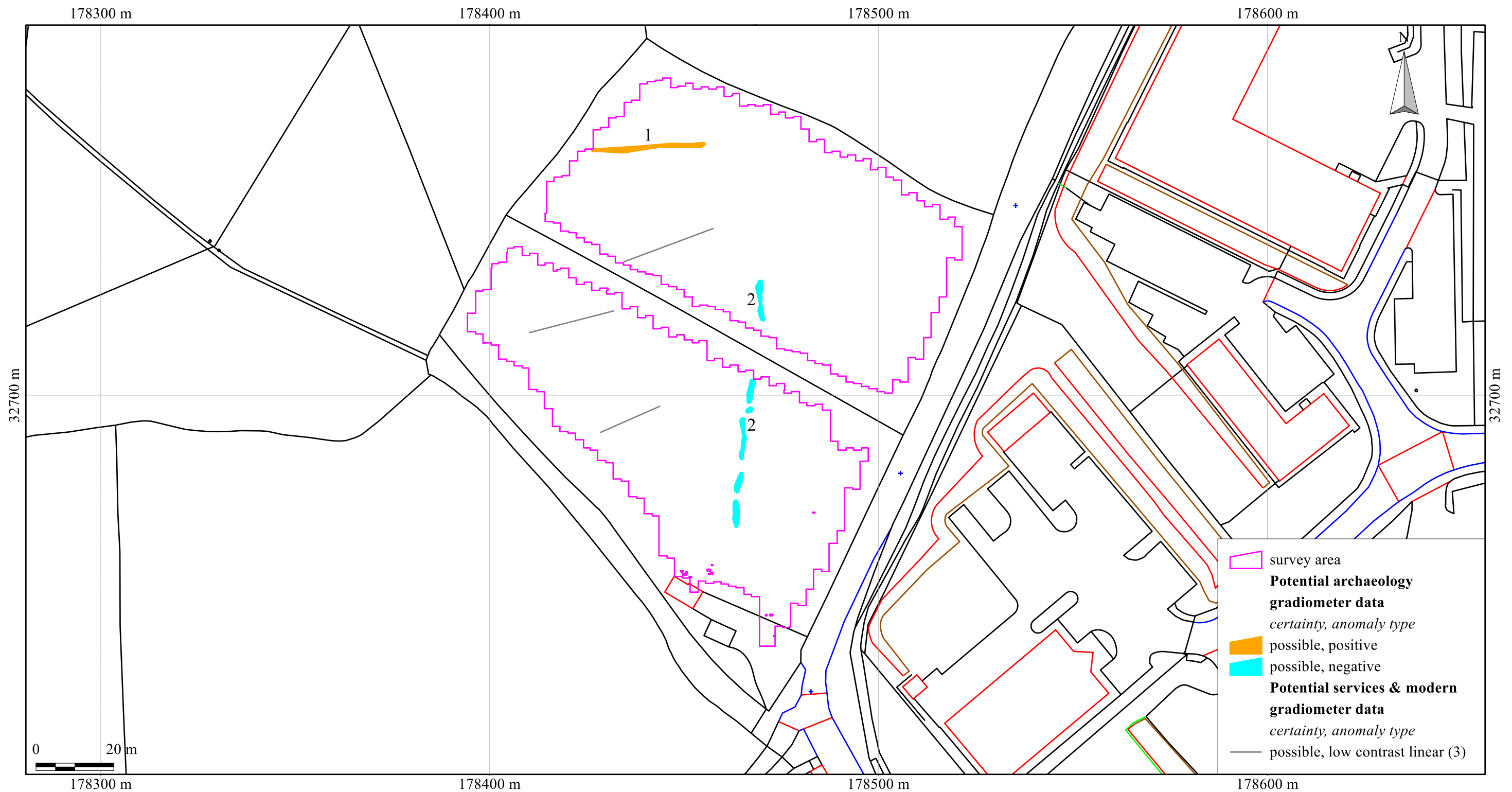
Scale: 1:5000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 1: location map

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▭ survey area
Potential archaeology
gradiometer data
certainty, anomaly type
 possible, positive
 possible, negative
Potential services & modern
gradiometer data
certainty, anomaly type
 possible, low contrast linear (3)

British Grid
 centre X: 178468.36 m, centre Y: 32698.84 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Notes:

1. All interpretations are provisional and represent potential archaeological deposits.
2. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
3. Representative; not all instances are mapped.
4. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

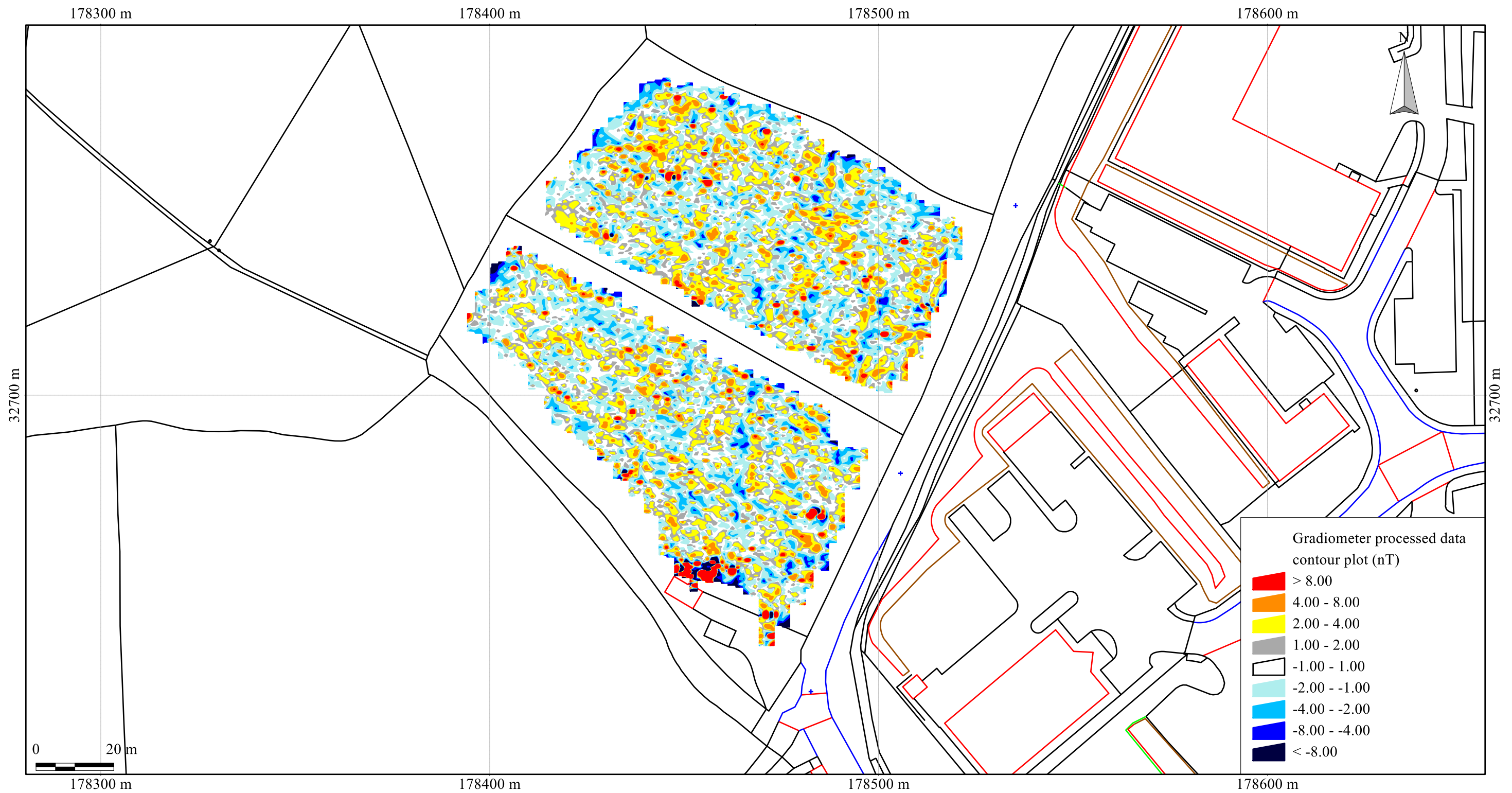
Figure 2: survey interpretation



British Grid
centre X: 178468.36 m, centre Y: 32698.84 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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British Grid
 centre X: 178468.36 m, centre Y: 32698.84 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 4: contour plot of processed data

Appendix 2 Methodology Summary

Table 1: methodology summary	
<p>Documents Survey methodology statement: Dean (2015)</p>	
<p>Methodology</p> <ol style="list-style-type: none"> 1. The work was undertaken in accordance with the survey methodology statement. The geophysical (gradiometer) survey was undertaken with reference to standard guidance provided by the Chartered Institute for Archaeologists (2014) and Archaeology Data Service/Digital Antiquity Guides (undated). 2. The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system. 3. Data processing was undertaken using appropriate software, with all anomalies being digitised and geo-referenced. The final report included a graphical and textual account of the techniques undertaken, the data obtained and an archaeological interpretation of that data and conclusions about any likely archaeology. 	
<p>Grid <i>Method of Fixing:</i> DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates. <i>Composition:</i> 30m by 30m grids <i>Recording:</i> Geo-referenced and recorded using digital map tiles. <i>DGPS used:</i> Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program.</p>	
<p>Equipment <i>Instrument:</i> Bartington Instruments grad601-2 <i>Firmware:</i> version 6.1</p>	<p>Data Capture <i>Sample Interval:</i> 0.25-metres <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN42</p>
<p>Data Processing, Analysis and Presentation Software IntelliCAD Technology Consortium IntelliCAD 7.2 DW Consulting TerraSurveyor3 Manifold System 8 GIS Microsoft Corp. Office Excel 2013 Microsoft Corp. Office Publisher 2013 Adobe Systems Inc Adobe Acrobat 9 Pro Extended</p>	

Appendix 3 Data processing

Table 2: gradiometer survey - processed data metadata	
SITE	
Instrument Type:	Bartington Grad 601
Units:	nT
Direction of 1st Traverse:	0 deg
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing.
Dummy Value:	32702
PROGRAM	
Name:	TerraSurveyor
Version:	3.0.25.0
Stats	
Max:	124.00
Min:	-124.43
Std Dev:	5.39
Mean:	0.07
Median:	0.00
Processes: 4	
1	Base Layer
2	Clip at 2.00 SD
3	De Stagger: Grids: All Mode: Both By: -2 intervals
4	DeStripe Median Sensors: All