

An archaeological magnetometer survey

Land at Tregoddick Madron, Cornwall

Centred on NGR: 145415,032000

Report: 1806MAD-R-1

Ross Dean BSc MSc MA MCIfA Mark Edwards BA

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Substrata Ltd Langstrath Goodleigh Barnstaple Devon EX32 7LZ

Tel: 01271 342721

Email: geophysics@substrata.co.uk

Web: substrata.co.uk

Client AC Archaeology Ltd 4 Halthaies Workshops Bradninch Nr Exeter

Devon EX5 4QL Tel: 01392 882410

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1 Introduction

This report presents the results of an archaeological geophysical survey at the site listed in Section 4 and shown in Figure 1, hereafter referred to as the 'Survey Area'. It was commissioned by AC Archaeology Ltd on behalf of clients. The commissioning of this report was in keeping with the National Planning Policy Framework, Chapter 16, Paragraph 189 (Ministry of Housing, Communities & Local Government, 2018).

The survey and report were completed in compliance with a Survey Method Statement (Dean, 2018).

2 Client

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

3 Copyright

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4 Survey type and location

4.1 Survey

Method: shallow depth magnetometer survey Instrument: twin-sensor fluxgate gradiometer

Date: 30 July 2018 Area: 0.5ha

4.2 Location

Site name: Land at Tregoddick

Village: Madron
Civil Parish: Madron
District: Penwith
County: Cornwall
Nearest post code: TR20 8SS
Survey centre NGR: SW 45415 32000
Survey centre NGR (E/N): 145415,032000

Historic environment designation: None

OASIS ID: substrat1-324650

5 Summary

A magnetometer survey was selected to provide a relatively fast and cost-effective evaluation of any buried archaeology across the Survey Area (see Section 14). The magnetic anomaly groups pertaining to potential buried archaeology were georeferenced to the Ordnance Survey National Grid, mapped, characterised and assigned with an appropriate degree of certainty in conformance with the survey aims and objectives set out in Section 6.

The differences in magnetic responses across the Survey Area were sufficient to be able to differentiate between anomalies representing possible buried archaeology and background magnetic responses. One magnetic anomaly group was characterised as representing either a potential linear archaeological deposit or recent ground disturbance.

6 Aims and objectives

6.1 Aims

- 1. Within the framework set out in Chartered Institute for Archaeologists (2014a), complete an archaeological geophysical survey and report which will, as far as possible, establish the presence or absence, extent and character of any buried archaeology within the Survey Area.
- 2. Provide sufficient information on the nature of any archaeological remains to facilitate the assessment of their interest prior to the determination of the planning application.

6.2 Objectives

- 1. Complete a magnetometer survey across the Survey Area.
- 2. Identify any magnetic anomalies that may be related to buried archaeology.
- 3. Within the limits of the technique 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 informs any subsequent development on the survey area about the location and possible archaeological character of the recorded anomalies.

7 Standards

The standards used to complete this survey are defined by the Chartered Institute for Archaeologists (2014a) and Historic England (2008). The codes of approved practice that were followed are those of the Chartered Institute for Archaeologists (2014b) and Archaeology Data Service (undated).

8 Methodology

The magnetometer survey was undertaken in accordance a Survey Method Statement (Dean, 2018) to achieve the aims and objectives set out in Section 6 using the standards and guidance specified in Section 7. The survey method was selected to provide a relatively fast and cost-effective evaluation of any buried archaeology across the Survey Area (see Section 14).

Data processing was undertaken using appropriate software (Table 2), with all anomalies being digitised and geo-referenced. The final report (this document) includes 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. The survey and report conform to the Chartered Institute for Archaeologists standard for geophysical survey (CIfA, 2014a).

9 Survey Area

9.1 Location and description

The 'Survey Area' comprises a single plot of land on the eastern side of the village of Madron (Figure 1). The plot is bounded by hedges, wooden fencing and stone walling fronted by high, rough vegetation (Figure 2).

The Survey Area was relatively flat and under recently cut rough vegetation at the time of the survey.

9.2 Geology

The bedrock across the Survey Area is hornfelsed slate and hornfelsed siltstone of the Devonian Mylor Slate Formation. A geological fault, trending north-north-west to south-southeast, passes through or close by the Survey Area. The superficial geology is not recorded in the source used (British Geological Survey, undated).

9.3 Soils and near-surface deposits

The topsoil is 'Freely draining slightly acid loamy soils over rock' (LandIS, undated).

No site-relevant geotechnical reports or borehole logs of near-surface deposits were available at the time of writing.

10 Archaeological background

10.1 Historic landscape characterisation

'Farmland: Prehistoric'

The agricultural heartland, with farming settlements documented before the 17th century AD and whose field patterns are morphologically distinct from the generally straight-sided fields of later enclosure (Cornwall Council, undated).

10.2 Statement of research

The Cornwall Council Historic Environment Record was examined via the Heritage Gateway (Historic England, undated) to gain an appreciation of historic assets pertinent to the geophysical survey data within approximately 500m of the survey area perimeter. Whilst providing a useful context for the data analysis, this source is not necessarily comprehensive and publication of the information in commercial reports is not permitted.

11 Results

11.1 Scope and definitions

This survey was designed to record magnetic anomalies. A magnetic anomaly is a local variation in the Earth's magnetic field. Such variations can result from differences in the magnetic properties of the underlying solid geology, superficial geology and other near-surface deposits including those altered and created by past human activities. Near-surface artefacts can also create magnetic anomalies.

The dimensions of magnetic anomalies mapped as representing potential buried archaeology do not represent the dimensions of any associated archaeology.

The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to buried archaeology.

11.2 Analysis

Figure 2 shows the interpretation of the survey data and includes the anomaly groups identified as possibly relating to archaeological deposits along with their identifying numbers. Table 1 is an extract of the detailed analysis of the survey data sourced from the attribute tables of the GIS project provided in the project archive.

Figure 2 and Table 1 comprise the analysis of the survey data.

Figures 3 and 4 are plots of the processed data as specified in Table 3. Figure 5 is a plot of minimally processed data as specified in Table 4. Figure 6 shows the location of the survey grid and grid data files.

12 Discussion

12.1 General points

Scope

Not all anomalies or anomaly groups identified in Table 1 are necessarily discussed below. All identified anomaly groups are recorded in the GIS project held in the survey archive.

Data collection

Data collection along the survey area edges was restricted as shown in the figures due to the presence of dense, rough vegetation and magnetic materials within and adjacent to the plot boundaries. Strong magnetic responses mapped close to the boundaries are likely to relate to the magnetic materials except where otherwise indicated in Figure 2 and Table 1.

Anomaly characterisation

There are a number of anomaly groups that could be interpreted as relating to large postholes or pits although most will have natural origins. Anomalies of this sort are mapped as potential archaeology when they are associated with other significant anomaly groups or otherwise formed recognisable patterns as listed in Table 1.

Anomalies thought to relate to natural features and recent man-made objects such as manholes, water management equipment, drains, cables and other services are only mapped where they comprise significant magnetic responses across the dataset that need clarification.

Numerous dipole magnetic anomalies are present within the dataset. These are likely to represent recent ferrous objects. They are only mapped if they could influence the analysis of anomaly groups thought to have an archaeological origin.

12.2 Data relating to historic maps and other records

None of the magnetic anomaly groups relate to known historic assets.

12.3 Data with no previous archaeological provenance

Magnetic anomaly group 1 (Figure 2) may represent a linear archaeological deposit such as a former ditch but recent ground disturbance is equally likely.

No other anomaly groups were characterised as representing potential buried archaeology.

13 Conclusions

The differences in magnetic responses across the Survey Area were sufficient to be able to differentiate between anomalies representing possible buried archaeology and background magnetic responses.

One magnetic anomaly group (1) was characterised as representing either a potential linear archaeological deposit or recent ground disturbance.

14 Disclaimer

The description and discussion of the results presented in this report are the authors', based on their 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.

15 Archive

15.1 Online Access to the Index of archaeological investigationS (OASIS)

OASIS ID: substrat1-324650

The OASIS entry has been completed and the boundary file and report uploaded with six months delay in publication.

15.2 Substrata Limited archive

A full archive of this survey will be held by Substrata Limited on cloud and local hard drive storage as specified in Appendix 3.

15.3 Archaeological Data Service (ADS)

Depending on local authority policy, an archive may be deposited with the ADS as specified in Appendix 3.

15.4 Historic Environment Record (HER)

Subject to any contractual requirements on confidentiality, a PDF or printed copy of the report will be submitted to the appropriate HER within six months of completion.

16 Acknowledgements

Substrata would like to thank John Valentin of AC Archaeology Ltd for commissioning us to complete this survey.

17 Bibliography

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Appendix 1 Figures

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.

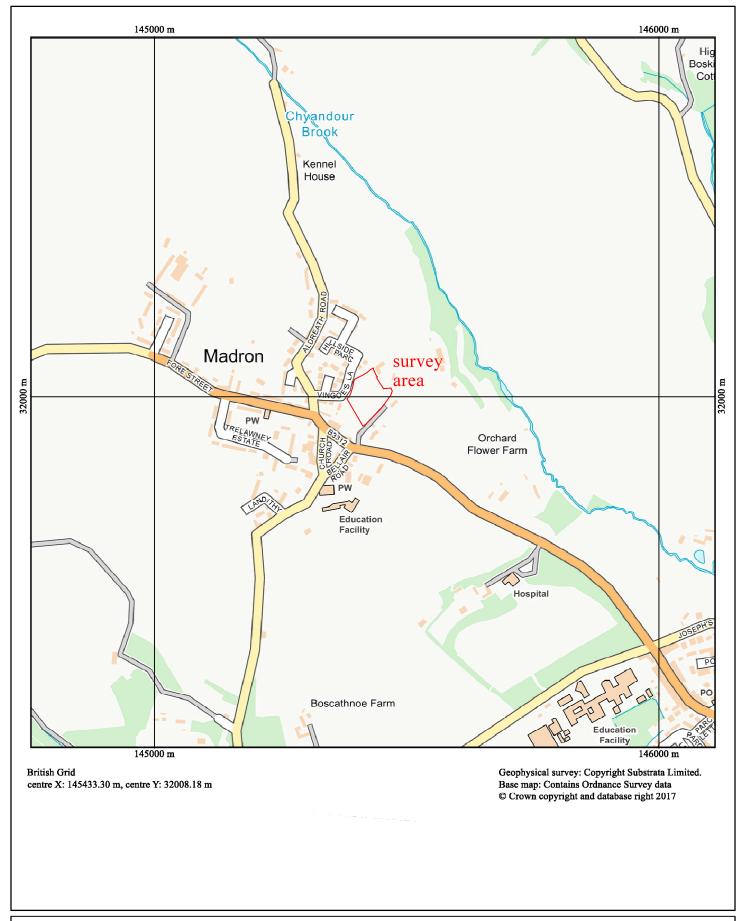


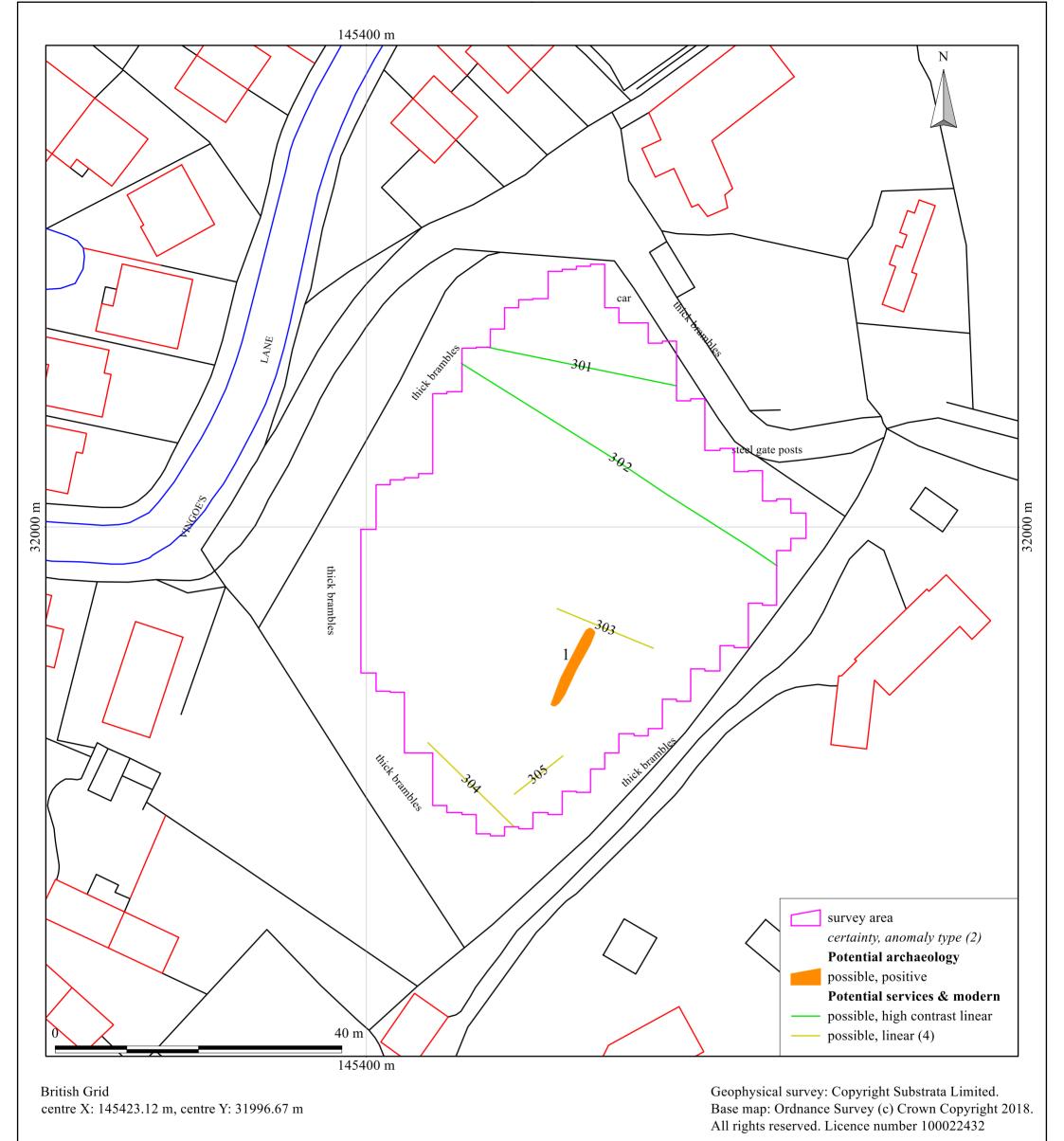
Figure 1: location map

An archaeological magnetometer survey Land at Tregoddick, Madron, Cornwall Centred on NGR: 145415,032000

Report: 1806MAD-R-1

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Email: enquiries@substrata.co.uk



Scale: 1:500 @ A3. Spatial Units: Meter. Do not scale off this drawing

Notes:

- 1. All interpretations are provisional and represent potential archaeological deposits.
- 2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
- 3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
- 4. Not all instances are mapped.
- 5. Anomalies likely to represent recent deposits or ground disturbance, or geological and other natural deposits are not mapped unless relevant to potential buried archaeology.

An archaeological magnetometer survey Land at Tregoddick, Madron, Cornwall Centred on NGR: 145415,032000

Report: 1806MAD-R-1

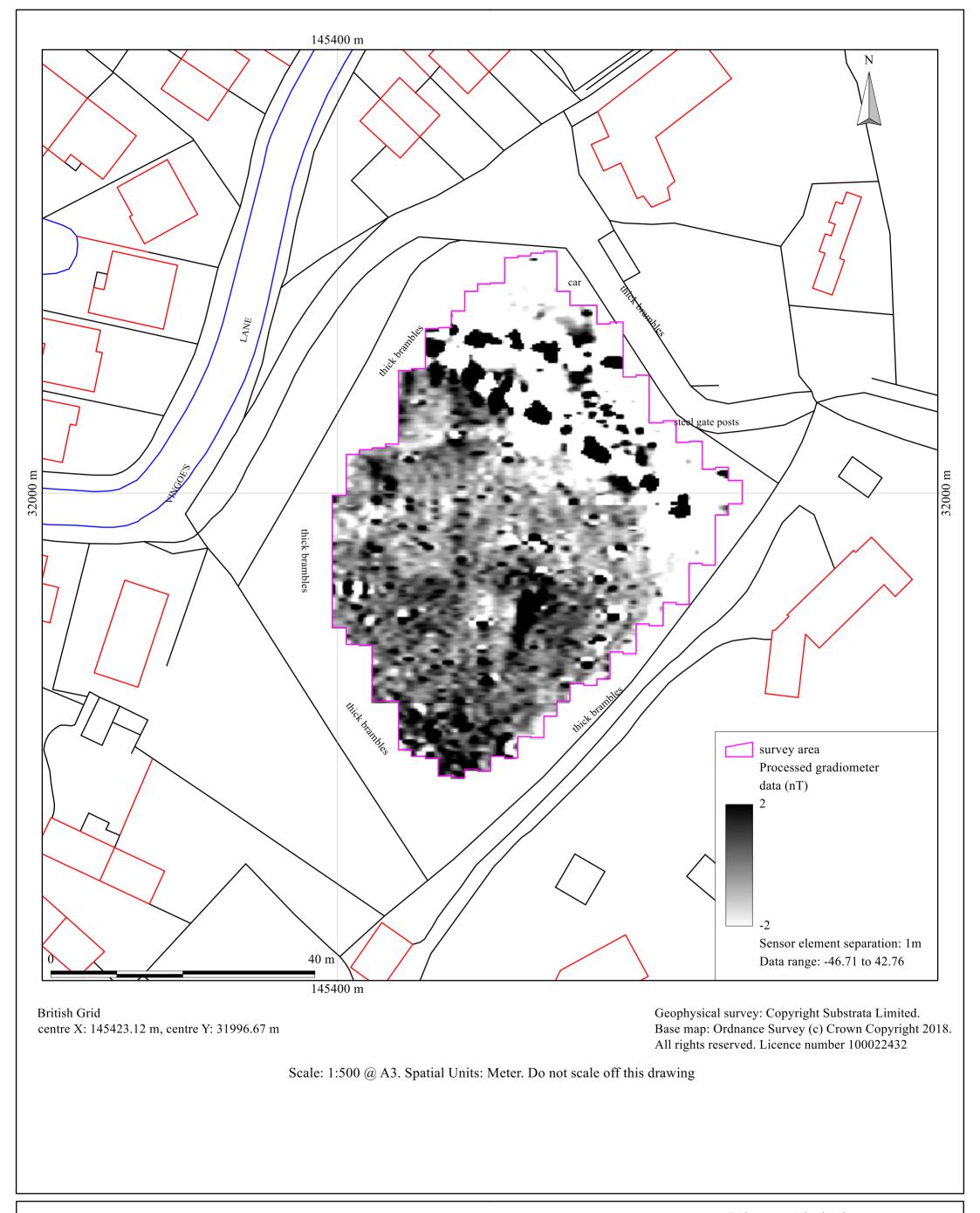
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Web: substrata.co.uk

Langstrath, Goodleigh

Barnstaple, Devon EX32 7LZ

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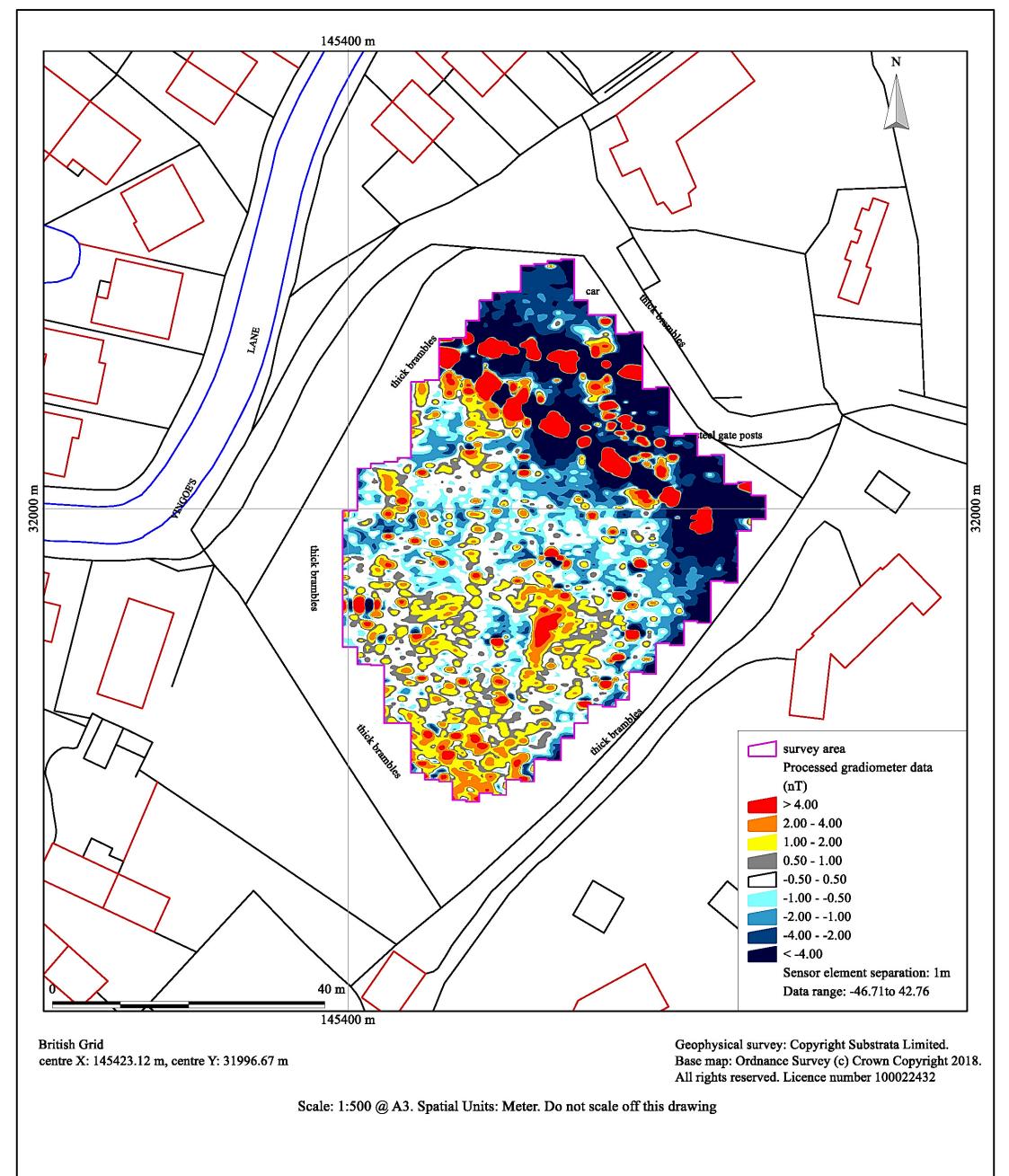


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Figure 3: shade plot of processed data

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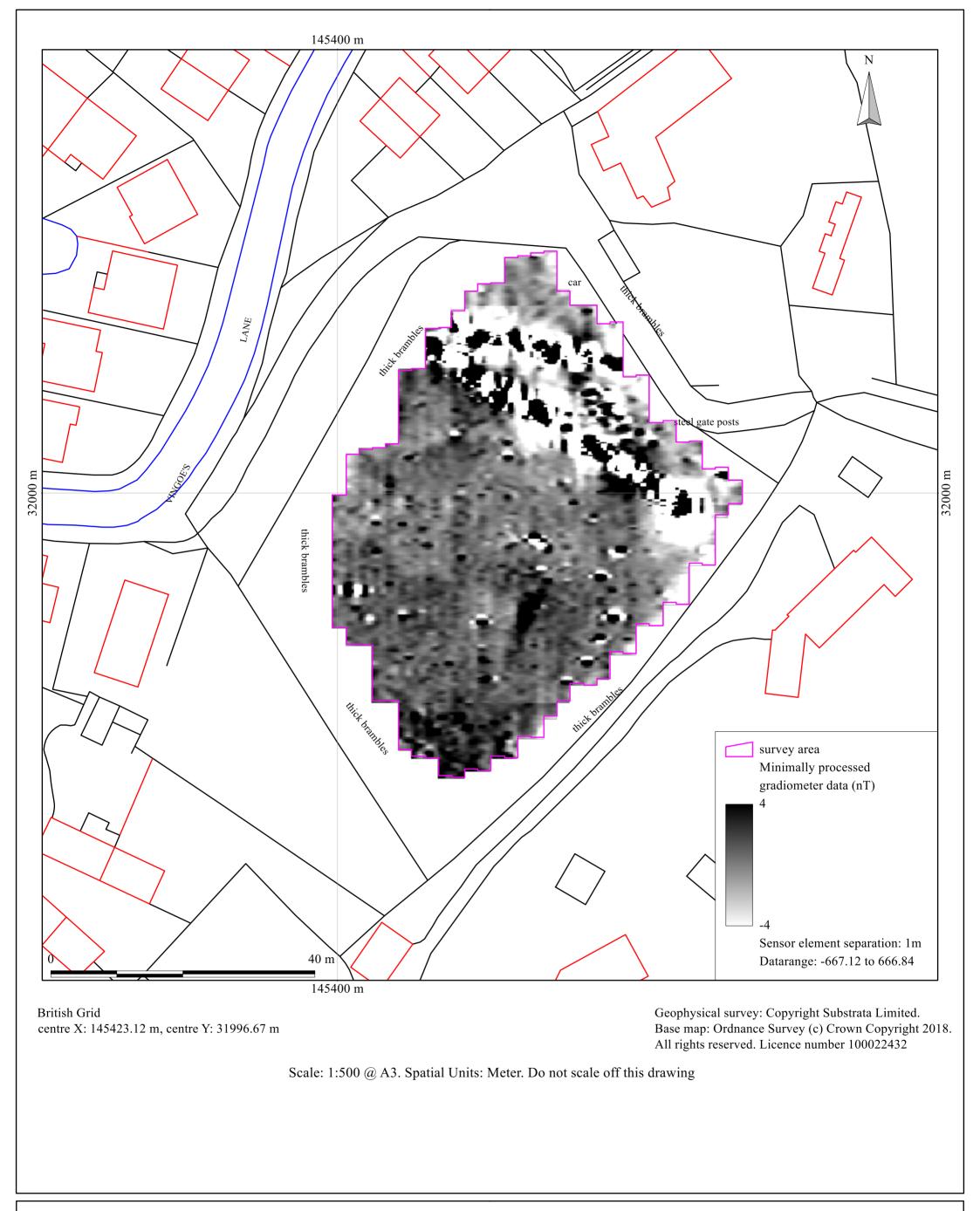
Report: 1806MAD-R-1

Figure 4: contour plot of processed data

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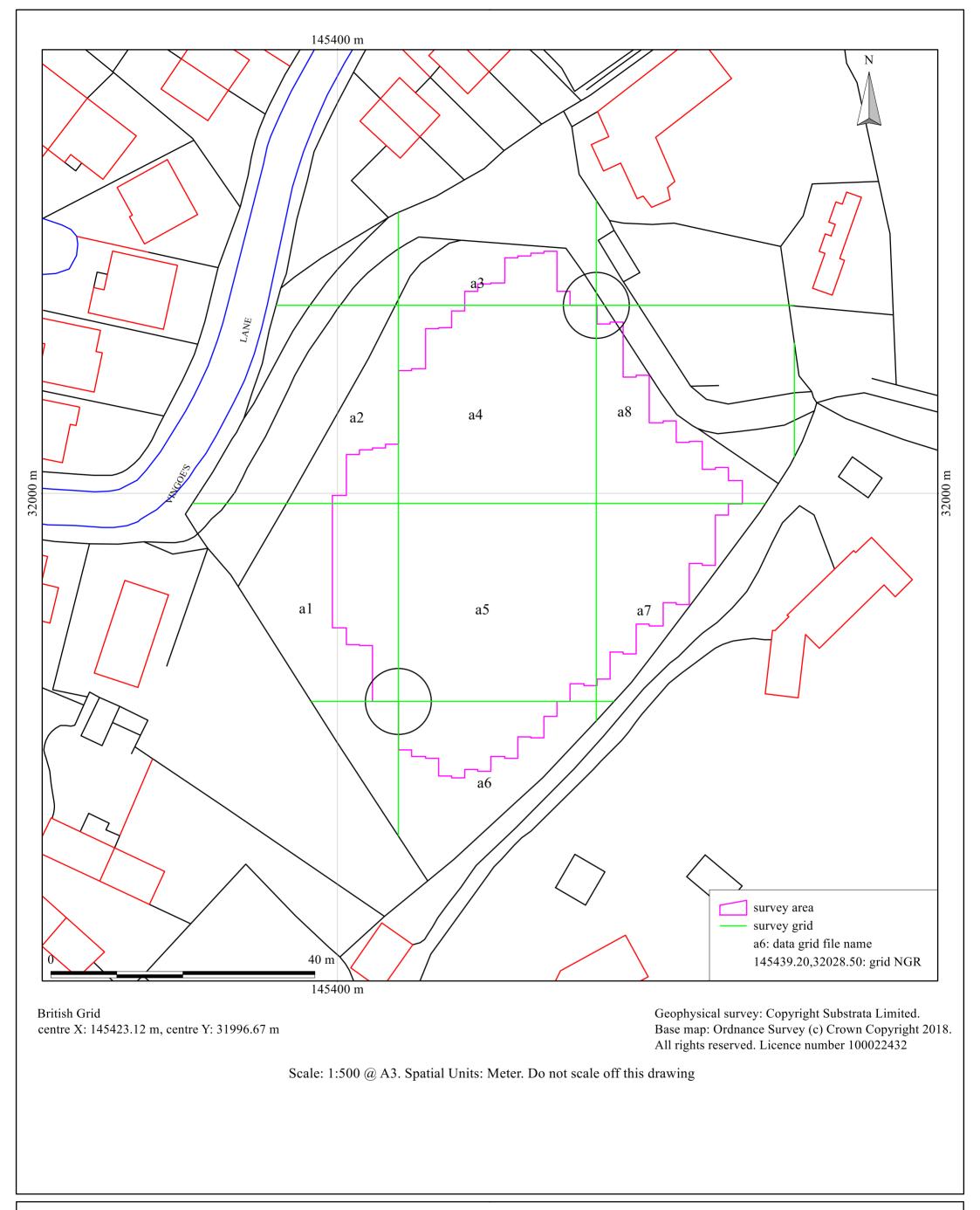


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Figure 5: shade plot of minimally processed data

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Figure 6: survey grid plan and location

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Appendix 2 Tables

Land at Tregoddick, Madron, Cornwall Centred on NGR 145415,032000

anomaly	associated	anomaly characterisation	anomaly form	additional archaeological	comments	supporting evidence
group	anomalies	certainty & class		characterisation		
1		possible, positive	linear	archaeological deposit or recent disturbance		
301		possible, high contrast linear		steel or iron service cable or pipe		
302		possible, high contrast linear		steel or iron service cable or pipe		
303		possible, linear		recent ground disturbance		
304		possible, linear		recent ground disturbance		
305		possible, linear		recent ground disturbance		

Table 1: data analysis

Grid

Method of Fixing: DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates.

Composition: 30m by 30m grids

Recording: Geo-referenced and recorded using digital map tiles.

DGPS used: Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra

Explorer 7 as the survey control program.

Equipment

Instrument: Bartington Instruments grad601-2

Firmware: version 6.1

Data Capture

Sample Interval: 0.25m Traverse Interval: 1 metre Traverse Method: zigzag Traverse Orientation: GN

Data Processing, Analysis and Presentation Software

IntelliCAD 8.4

DW Consulting TerraSurveyor3

Manifold System 8 GIS

Microsoft Corp. Office 365: Excel, Publisher, Word Adobe Systems Inc Adobe Acrobat 9 Pro Extended

Table 2: methodology information

Units: n Direction of 1st Traverse: s Collection Method: Z Sensors: 2	Grad-601 gradiometer T ee below igZag @ 1.00 m spacing, each with 1m separation 2702
ProgramName:TerraSVersion:3.0.33.	urveyor 6
Statistics Max: 42.76 Min: -46.71 Std Dev: 9.63 Mean: -1.53 Median: -0.57	Processing 1 Base Layer 2 Clip at 1.00 SD 3 Clip at 1.00 SD 4 De Stagger: Grids: All By: 0 intervals, 25.00cm 5 DeStripe Median Sensors: Grids: All 6 Edge Match (Area: Top 60, Left 120, Bottom 89, Right 239) to Top edge 7 Edge Match (Area: Top 30, Left 240, Bottom 59, Right 359) to Left edge 8 Edge Match (Area: Top 60, Left 240, Bottom 89, Right 359) to Left edge 9 Edge Match (Area: Top 60, Left 360, Bottom 59, Right 479) to Left edge 10 Edge Match (Area: Top 30, Left 0, Bottom 59, Right 119) to Right edge Interpolate match x & y double is imposed on export to the GIS

Table 3: processed data metadata

Instrument Type: Bartington Grad-601 gradiometer Units: nT Direction of 1st Traverse: see below Collection Method: ZigZag Sensors: 2 @ 1.00 m spacing, each with 1m separation Dummy Value: 32702 Program Name: TerraSurveyor Version: 3.0.33.6 Processing **Statistics** 1 Base Layer 666.84 Max: -667.12 2 Clip at 2.00 SD Min: Std Dev: 80.38

Interpolate match x & y double is imposed on export to the GIS

Table 4: minimally processed data metadata

Mean:

Median:

0.17

0.30

Appendix 3 Project archive contents

A3.1 Substrata Limited archive

A full archive of this survey will be held by Substrata Limited on cloud and local hard drive storage as follows:

Report: Adobe PDF (.pdf), Microsoft Publisher (.pub)

Raw grid date files: DW Consulting TerraSurveyor 3 (.xgd) and

XYZ (.dat)

Minimally processed data composite files: DW Consulting TerraSurveyor 3 (.xgd) and

ESRI ASCII (.asc)

Final data processing composite files: DW Consulting TerraSurveyor 3 (.xgd) and

ESRI ASCII (.asc)

GIS project: GIS project Manifold 8 (.map)

Survey interpretation: ESRI shape files AutoCAD version of the survey interpretation: AutoCAD (.dwg)

(if generated)

All project working files: IntelliCAD 8.4

Microsoft Corp. Office 365: Excel, Publisher,

Word

Adobe Systems Inc Adobe Acrobat 9 Pro

Extended

A3.2 Online Access to the Index of archaeological investigationS (OASIS)

Metadata: online form
Georeferenced survey boundary file: ESRI shape file
Report: Adobe PDF (.pdf)

A3.3 Archaeological Data Service

Depending on local authority policy, an archive may be deposited with the ADS as follows:

Raw data composite file: XYZ file

Processed data plot: rendered images in TIFF format

Survey grid plot: image in TIFF format
Details of data processing: image in TIFF format

Interpretation plot: rendered images in TIFF format

Metadata: Microsoft Excel format

A3.4 Historic Environment Record (HER)

Subject to any contractual requirements on confidentiality, a PDF copy of the report will be submitted to the appropriate HER within 6 months of the completion of this report via the OASIS process or by other means, depending on the relevant HER process.