Substrata
Archaeological Geophysical Surveyors

An archaeological magnetometer survey

Land at Venn Farm
Cullompton, Devon

Centred on NGR (E/N): 303157,108399 (point)

Report: 1606CUL-R-1

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12 July 2016

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Final data processing data plots and metadata .... DW Consulting TerraSurveyor 3 formats
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- 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:	14 to 16 June 2016
Area:	4ha
Lead surveyor:	Mark Edwards BA
Author:	Ross Dean BSc MSc MA MIfA with contributions from Mark Edwards BA

1.2 Clients

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

1.3 Location

Site:	Land at Venn Farm
Civil Parish:	Cullompton
District:	Mid Devon
County:	Devon
Nearest Postcode:	EX15 1QN
NGR:	ST 03157 08399 (point)
Ordnance Survey NGR (E/N):	303157,108399 (point)

1.4 Archive

OASIS number:	substrat1-257423
Archive:	At the time of writing, the archive of this survey will be held by Substrata.

1.5 Introduction

This report presents the results of an archaeological magnetometer survey at the above site, hereafter referred to as the survey area. It has been prepared for AC Archaeology Ltd on behalf of clients. The survey area location is shown in Figure 1.

1.6 Summary

Three magnetic anomaly groups were mapped as possibly representing archaeological deposits. One coincides with a known field boundary, mapped between 1841 and at least 1988. The other two groups represent possible linear deposits. The anomalies relating to the known field boundary indicate that only relatively recent iron or steel fragments and some sporadic rubble remain. This implies that any earlier expressions of the boundary have been lost. Further, the Cullompton 1841 Tithe map shows four other field boundaries within the survey area, all of which are absent from the survey data. This suggests that the survey area has been subjected to deep ploughing, significant flooding or similar sub-surface disturbance which has removed any magnetic contrast across the survey area.

2 Survey aims and objectives

2.1 Aims

To establish the presence or absence, extent and character of any archaeological features and deposits within the survey area.

2.2 Survey objectives

1. Complete a magnetometer survey across agreed parts of the survey 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 survey area 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 Historic England (2010). The codes of approved practice that were followed are those of the Chartered Institute for Archaeologists (2014b) and Archaeology Data Service (undated).

4 Site description

4.1 Landscape and land use

The survey area comprises one relatively flat field lying at approximately 50m AOD. An industrial park boarders the south and east of the site across Kings Mill road. Venn Farm lies on the northwest corner. A branch of the river Culm borders the western side of the survey area and the northern side is bordered by a track and agricultural fields. At the time of the survey the field was under grass pasture.

4.2 Geology

The survey area has a solid geology of reddish-brown silty mudstone and clayey siltstone of the Triassic Aylesbeare Mudstone Group. Clayey fine-grained sandstone occurs locally, and less commonly, clean, fine- to medium-grained sandstone. The superficial geology is not recorded across the majority of the site. Quaternary alluvium is present along the western edge by the Culm river. Typically this comprises soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel (British Geological Survey, undated).

5 Archaeological background

5.1 Definitions

5.1.1 Heritage assets

Archaeological sites, buildings, historic parks and gardens, conservation areas, registered battlefields and other aspects of the historic environment that are significant because of their historic, archaeological, architectural or artistic interest are considered heritage assets. Designated heritage assets are afforded protection as either scheduled monuments, listed buildings or through their inclusion within conservation areas. Non-designated heritage assets are potential archaeological remains and historic landscapes.

5.1.2 Historic Environment Records (HERs) are sources of, and signposts to, information relating to landscapes, buildings , monuments, sites, places, areas and archaeological finds spanning more than 700,000 years of human endeavour. Based mainly in local authorities, they are used for planning and development control but they also fulfil an educational role (Historic England, undated b).

5.1.2 Archaeological periods

Archaeological periods use in this report are defined as follows:

Prehistoric: before AD 43

Palaeolithic: 500,000 BC to 10,000 BC

Mesolithic:10,000 BC to 4,000 BC

Neolithic: 4,000 BC to 2,200 BC

Bronze Age: 2,200 BC to 700 BC

Iron Age: 00 BC to AD 43

Romano-British: AD 43 to AD 410

Early Medieval: AD 410 to AD 1066

Medieval: AD 1066 to AD 1540

Post-Medieval: AD 1540 to AD 1901
Modern: AD 1901 onwards

5.1.3 Grid references, distances and bearings

The centre of the survey area is provided in Section 1 as a twelve figure National Grid easting/ northing (E/N) and as a ten figure National Grid reference (NGR), both of which define a 1m square with its south-western corner on the reference point. Eight figure NGRs define a 10m square. Six figure NGRs a 100m square and so on. The distances and bearings provided below are relative to the south-western corner of the square defined by the NGR quoted.

All distances and bearings provided below are relative to the Ordnance Survey NGR centre point of the site recorded in Section 1.

5.2 Historic landscape characterisation

Modern enclosures

These modern fields have been created out of probable Medieval enclosures most likely to have been first enclosed with hedge-banks during the Middle Ages. The sinuous Medieval boundaries survive in places Devon County Council (undated).

5.3 Historical and archaeological background

The following is a short summary of information obtained from the Devon HER within approximately 500m of the survey area and relevant to the understanding of the geophysical survey. Except where specifically cited, this information was obtained using the Heritage Gateway portal (Historic England, undated a).

5.3.1 Heritage assets within the survey area

There are no heritage assets recorded in the HER within the survey area.

5.3.2 Heritage assets within 500m of the survey area

Former field boundaries of potential Medieval date are visible 302m on the bearing Grid North (N)8 degrees from the site as a series of earthwork ditches on aerial photographs from 1947 onwards (Historic Environment Record MDV107998, National Grid Reference ST 032 087). The earthwork ditches remain visible on digital images derived from LiDAR data captured during 2005.

Other evidence of Early Medieval/Medieval activity in the area has been recorded at Lower King's Mill 616m from the site on N216, first recorded as Kyngesmill in 1291 (MDV61497, ST 028 079). During the Post-Medieval period Lower King's Mill comprised corn mills and tucking mills and, in the later 17th century, a paper mill. Documentary evidence suggests similar milling work occurred at Higher Kings Mill 256m from site on the bearing N218, which comprised of two tucking mills dating to Medieval/Post Medieval period (MDV1415, ST 030 082).

Four Post-Medieval orchard banks are located at 396m on N319 from site (MDV108012, ST 029 087), 372m on N285 from the site (MDV108013, ST 028 085), 278m on N249 from the site (MDV108005, ST 029 083) and 328m on N232 (MDV108001, ST 029 082). The banks are visible as a series of linear earthwork banks on aerial photographs from 1947 onwards. The banks remain visible on digital images derived from LiDAR data captured in 2005, apart from MDV108013 which was levelled by 1977 following groundworks associated with construction of the M5 motorway.

6 Results, discussion and conclusions

6.1 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 variations in the chemistry or magnetism of 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 terms archaeological deposit, structure and feature refer to any artefacts, material deposits or disturbance of natural deposits thought to be the result of human activity, excluding recent land maintenance and farming.

Magnetic anomalies cannot be regarded as actual archaeological deposits, structures or features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeology.

The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to archaeological deposits, structures and features (see also Section 7).

6.2 Results

Figure 2 shows the interpretation of the survey data. It 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 processed data as specified in Table 3. Figure 5 is a plot of the unprocessed data.

6.3 Discussion

6.3.1 General points

<u>Discussion scope</u>
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 the survey archive.

<u>Data collection</u>
Data collection along the survey area edges was restricted as shown in the figures due to the presence of magnetic materials adjacent to the survey area. Strong magnetic responses mapped close to survey boundaries are likely to relate to these materials except where otherwise indicated in Figure 2. Strong magnetic responses were a significant factor on the southern edges of the survey area because of the proximity of factory buildings (Figure 4). As is shown in Figures 3 and 4, however, the anomaly recorded as representing potential archaeological deposits within this area was clear in the data.

<u>Anomaly characterisation and mapping</u>
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 only mapped as potential archaeology if they are clustered in groups or otherwise form recognisable patterns.

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.

Anomalies thought to relate to natural features were not mapped.

Numerous dipole magnetic anomalies are scattered across the data set. Except where indicated below, these are likely to represent recent ferrous objects.

6.3.2 Data relating to historic maps and other records

Magnetic anomaly group **3** coincides with a former field boundary mapped between 1841 and at least 1988. It is likely that the group represents a later version of the field boundary as discussed in Table 1.

6.3.3 Data with no previous archaeological provenance

Groups **1** and **2** represent possible linear deposits of unknown period.

6.4 Conclusions

Three magnetic anomaly groups were mapped as possibly representing archaeological deposits. One coincides with a known field boundary, mapped between 1841 and at least 1988. The other two groups represent possible linear deposits. The anomalies relating to the known field boundary indicate that only relatively recent iron or steel fragments and some sporadic rubble remain. This implies that any earlier expressions of the boundary have been lost. Further, the Cullompton 1841 Tithe map shows four other field boundaries within the survey area, all of which are absent from the survey data. This suggests that the survey area has been subjected to deep ploughing, significant flooding or similar sub-surface disturbance which has removed any magnetic contrast across the survey area.

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.

8 Acknowledgements

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

9 Bibliography

Archaeology Data Service (undated) *Archaeology Data Service/Digital Antiquity Guides to Good Practice: Geophysical Data in Archaeology* [Online], Available: http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_Toc [May 2016]

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Historic England (undated b) *Historic Environment Records* [Online], Available: https://www.historicengland.org.uk/advice/hpg/heritage-assets/hers/ [July 2016]

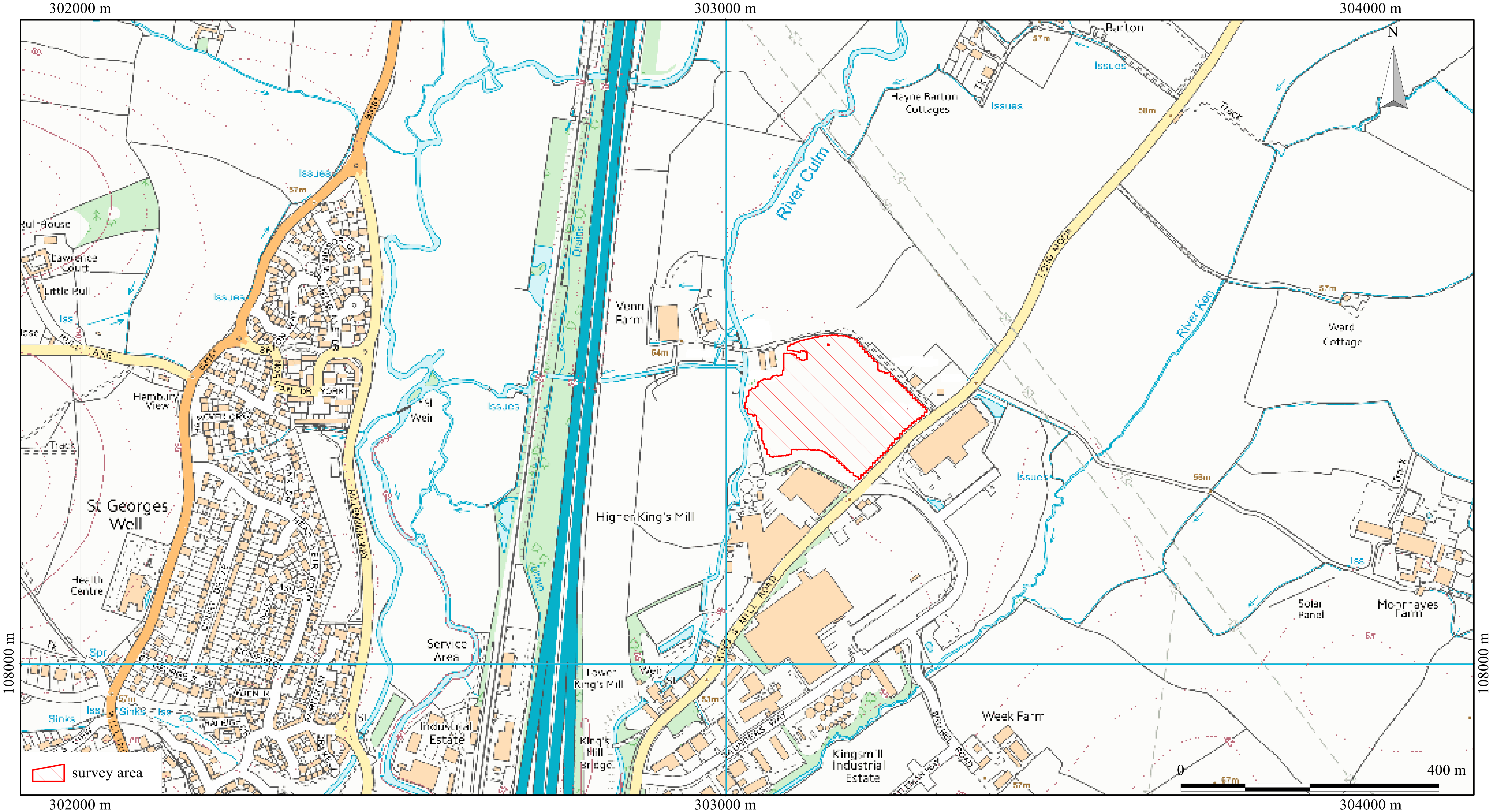
Historic England (2010) *Geophysical Survey in Archaeological Field Evaluation*, [Online], Available: https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/ [April 2016]

Appendix 1 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 (see Section 6.1).

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.



302000 m 303000 m 304000 m

British Grid
centre X: 303033.54 m, centre Y: 108396.84 m

Scale: 1:6000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
Land at Venn Farm, Cullompton, Devon
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Figure 1: location map

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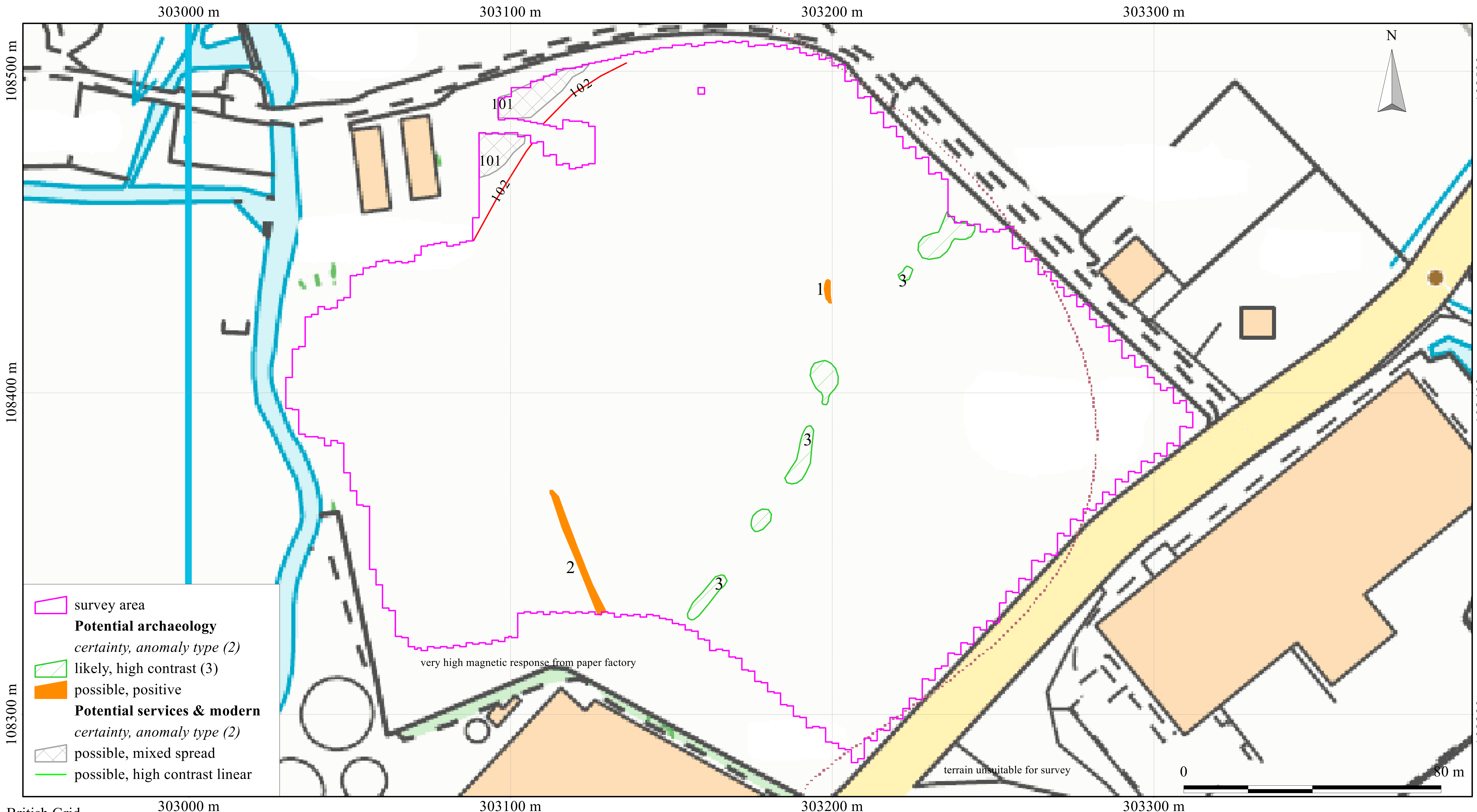

British Grid
centre X: 303173.68 m, centre Y: 108394.67 m

Scale: 1:1200 @ 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. Representative; not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer survey
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Figure 2: survey interpretation

Substrata
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Site: An archaeological magnetometer survey
Land at Venn Farm, Cullompton, Devon
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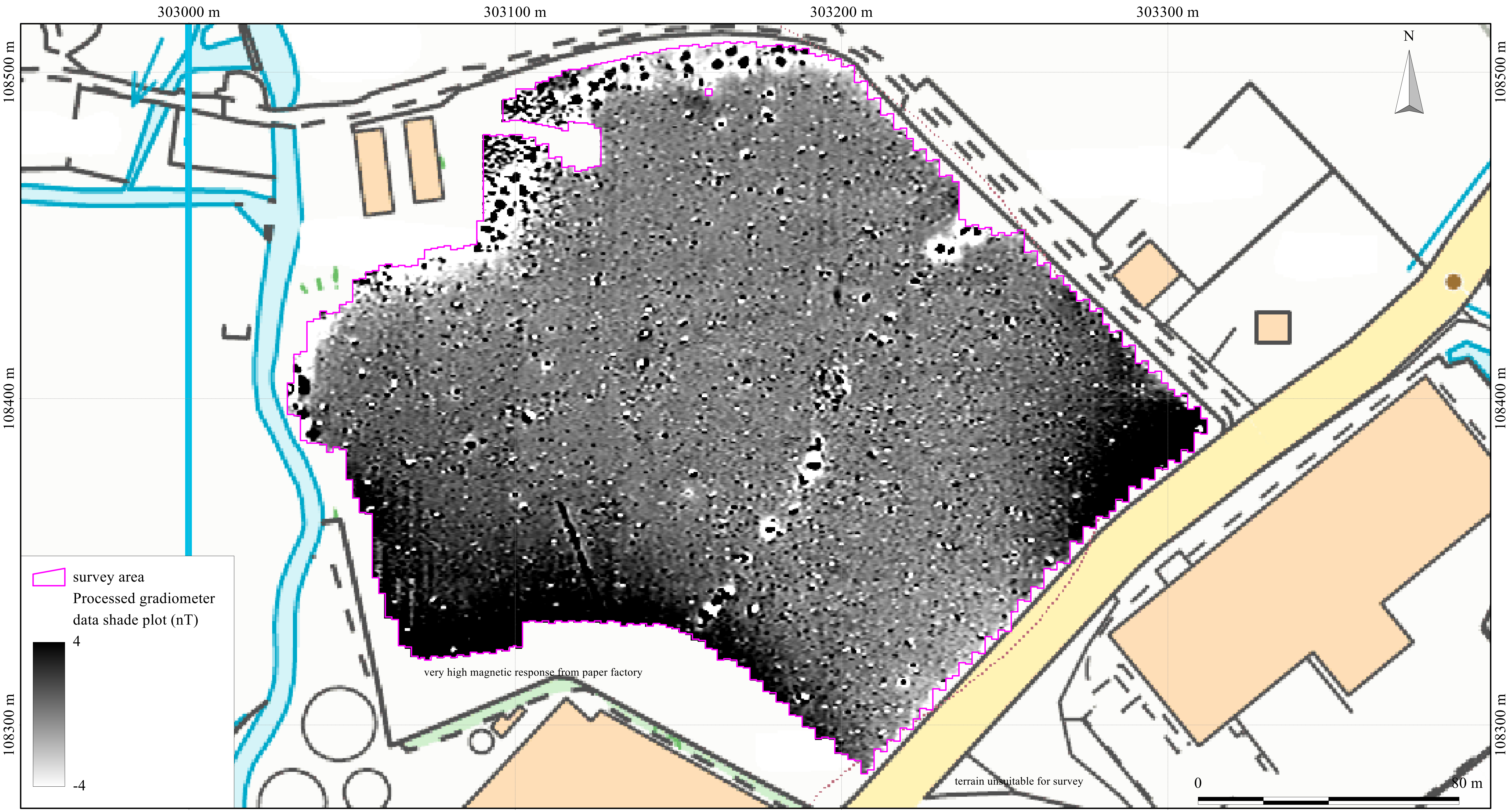
anomaly group	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1	possible, positive	linear			
2	possible, positive	linear			
3	likely, high contrast	disrupted curvilinear	field boundary remnants comprising ferrous material with some rubble	anomaly groups coincide with a former field boundary mapped between 1841 and at least 1988; the anomalies indicate mainly ferrous material with some rubble suggesting that the field boundary remnants are fragments of iron or steel components which in turn suggests that a relatively late version of the boundary is partially preserved	1841 Cullompton Tithe map, Ordnance Survey maps 1889 1:2500 to 1988 1:10000

Table 1: data analysis



British Grid
centre X: 303173.68 m, centre Y: 108394.67 m

Scale: 1:1200 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
Land at Venn Farm, Cullompton, Devon
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Figure 3: shade plot of processed data

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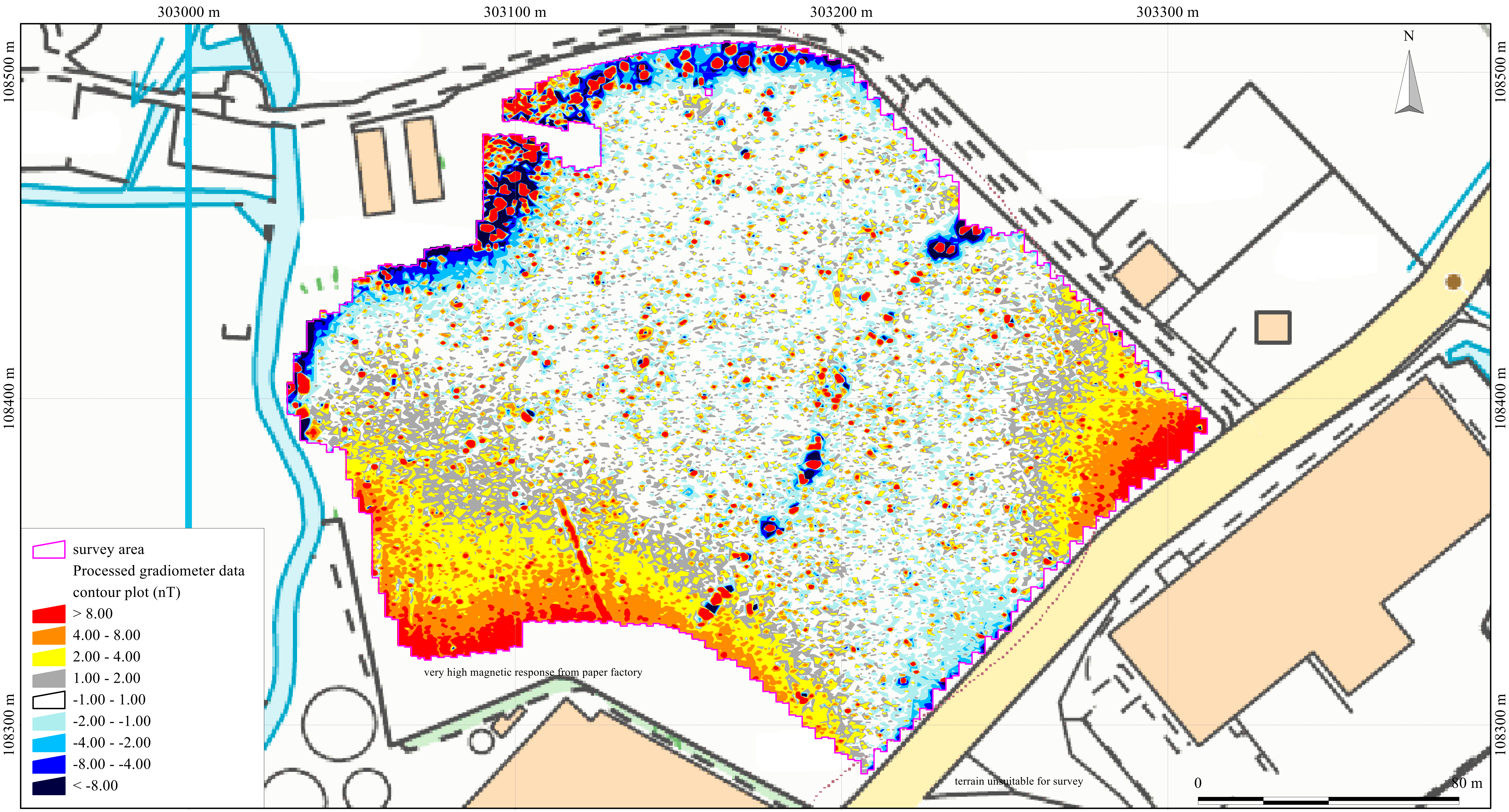

British Grid
centre X: 303173.68 m, centre Y: 108394.67 m

Scale: 1:1200 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
Land at Venn Farm, Cullompton, Devon
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Figure 4: contour plot of processed data

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Appendix 2 Methodology Summary

<table>
<tr><th colspan="2">Table 2: methodology summary</th></tr>
<tr><td colspan="2">Documents
Survey methodology statement: Dean (2016)</td></tr>
<tr><td colspan="2">Methodology
1. The work was undertaken in accordance with the survey methodology statement. The geophysical (magnetometer) survey was undertaken with reference to standard guidance provided by the Chartered Institute for Archaeologists (2014) and Archaeology Data Service (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.</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td>Equipment
Instrument: Bartington Instruments grad601-2
Firmware: version 6.1</td><td>Data Capture
Sample Interval: 0.25m
Traverse Interval: 1 metre
Traverse Method: zigzag
Traverse Orientation: GN</td></tr>
<tr><td colspan="2">Data Processing, Analysis and Presentation Software
IntelliCAD Technology Consortium IntelliCAD 8.0
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</td></tr>
</table>

Appendix 3 Data processing

Table 3: magnetometer survey - processed data metadata

SITE

Instrument Type:	Bartington Grad-601 gradiometer
Units:	nT
Direction of 1st Traverse:	see below
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing.
Dummy Value:	32702

PROGRAM

Name:	TerraSurveyor
Version:	3.0.29.3

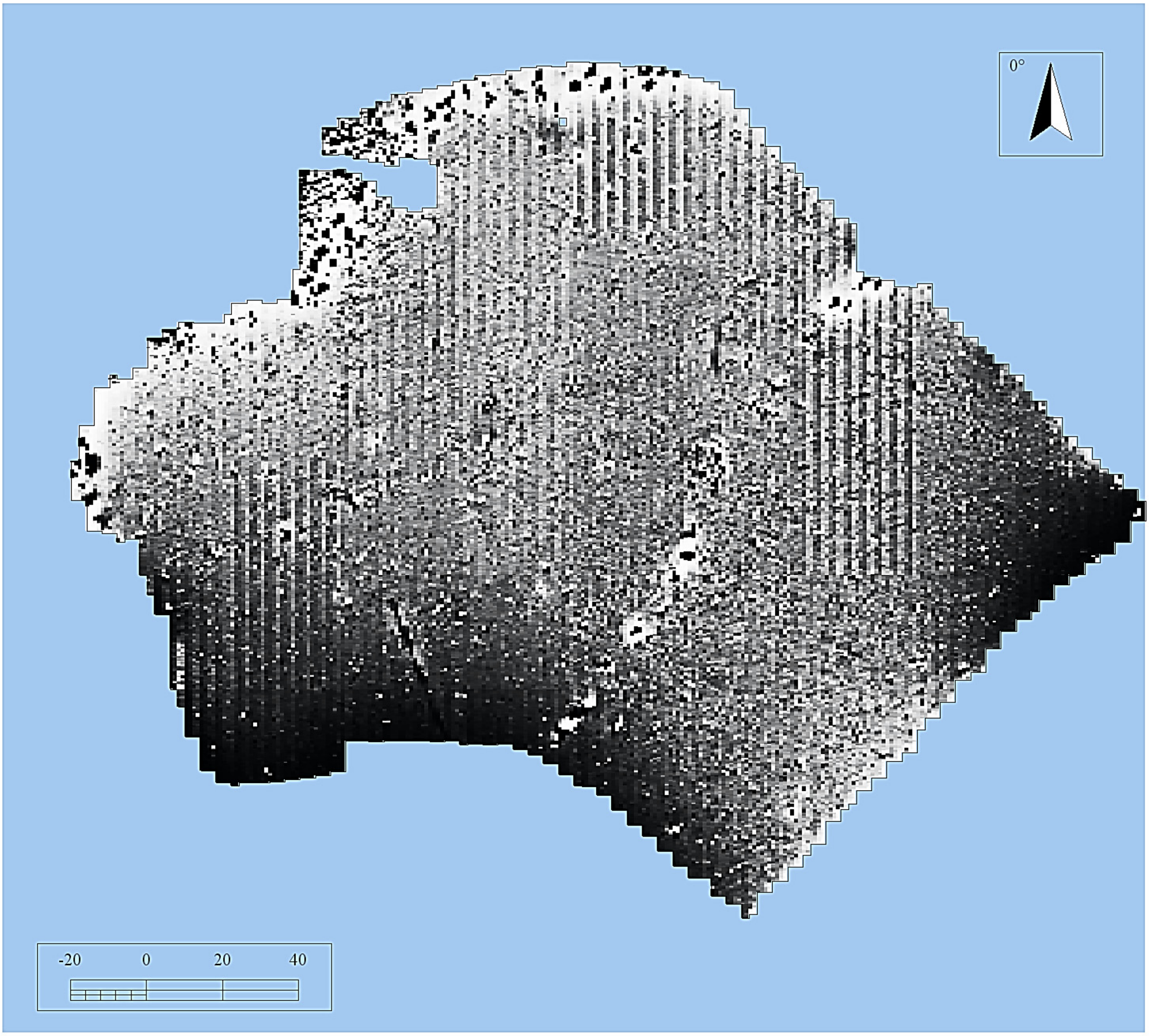
Stats

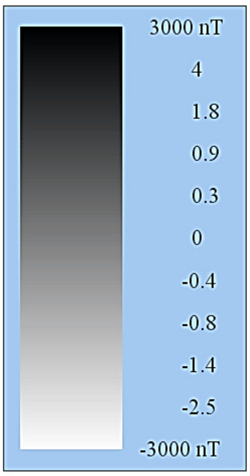
Max:	66.04
Min:	-59.07
Std Dev:	4.10
Mean:	0.65
Median:	0.32

Processes: 38

1 Base Layer
2 Clip at 1.00 SD
3 Clip at 3.00 SD
4 De Stagger: Grids: All Mode: Both By: -1 intervals
5 De Stagger: Grids: All Mode: Both By: -1 intervals
6 DeStripe Median Sensors: Grids: All
7 Edge Match (Area: Top 90, Left 480, Bottom 119, Right 599) to Right edge
8 Edge Match (Area: Top 120, Left 480, Bottom 149, Right 599) to Top edge
9 Edge Match (Area: Top 60, Left 480, Bottom 89, Right 599) to Right edge
10 Edge Match (Area: Top 30, Left 480, Bottom 59, Right 599) to Right edge
11 Edge Match (Area: Top 30, Left 360, Bottom 59, Right 479) to Right edge
12 Edge Match (Area: Top 60, Left 360, Bottom 89, Right 479) to Right edge
13 Edge Match (Area: Top 90, Left 360, Bottom 119, Right 479) to Right edge
14 Edge Match (Area: Top 120, Left 360, Bottom 149, Right 479) to Right edge
15 Edge Match (Area: Top 30, Left 240, Bottom 59, Right 359) to Right edge
16 Edge Match (Area: Top 60, Left 240, Bottom 89, Right 359) to Right edge
17 Edge Match (Area: Top 90, Left 240, Bottom 119, Right 359) to Right edge
18 Edge Match (Area: Top 120, Left 240, Bottom 149, Right 359) to Right edge
19 Edge Match (Area: Top 150, Left 240, Bottom 179, Right 359) to Bottom edge
20 Edge Match (Area: Top 150, Left 120, Bottom 179, Right 239) to Bottom edge
21 Edge Match (Area: Top 180, Left 120, Bottom 209, Right 239) to Right edge
22 Edge Match (Area: Top 210, Left 240, Bottom 239, Right 359) to Top edge
23 Edge Match (Area: Top 210, Left 120, Bottom 239, Right 239) to Top edge
24 Edge Match (Area: Top 240, Left 360, Bottom 269, Right 599) to Top edge
25 Edge Match (Area: Top 240, Left 600, Bottom 269, Right 719) to Top edge
26 Edge Match (Area: Top 270, Left 360, Bottom 299, Right 479) to Top edge
27 Edge Match (Area: Top 270, Left 480, Bottom 299, Right 599) to Top edge
28 Edge Match (Area: Top 270, Left 600, Bottom 299, Right 719) to Top edge
29 Edge Match (Area: Top 240, Left 600, Bottom 269, Right 719) to Top edge
30 Edge Match (Area: Top 240, Left 600, Bottom 269, Right 719) to Left edge
31 Edge Match (Area: Top 60, Left 720, Bottom 89, Right 839) to Left edge
32 Edge Match (Area: Top 30, Left 720, Bottom 59, Right 839) to Left edge
33 Edge Match (Area: Top 90, Left 840, Bottom 119, Right 959) to Left edge
34 Edge Match (Area: Top 120, Left 960, Bottom 149, Right 1079) to Left edge
35 Edge Match (Area: Top 150, Left 960, Bottom 179, Right 1079) to Left edge
36 Edge Match (Area: Top 180, Left 960, Bottom 209, Right 1079) to Left edge
37 Edge Match (Area: Top 0, Left 600, Bottom 29, Right 719) to Bottom edge
38 Interpolate: Match X & Y Doubled.

Appendix 4: Unprocessed data plot





Processes: 1
1 Base Layer

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

Dimensions
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 3000.00
Min: -3000.00
Std Dev: 95.97
Mean: 0.59
Median: 0.00

PROGRAM
Name: TerraSurveyor
Version: 3.0.29.3

Figure 5: shade plot of unprocessed data