

Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer survey

**Land at Croft Farm
West Charleton, Devon**

Centred on NGR (E/N): 275710,042420 (point)

Report: 1604CRO-R-1

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26 April 2016

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Project archive

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: 12 April 2016
Area: 0.93ha
Lead surveyor: Mark Edwards BA
Author: Ross Dean BSc MSc MA MifA

1.2 Client

Oakford Archaeology, 44 Hazel Road, Exeter, Devon EX2 6HN

1.3 Location

Site: Land at Croft Farm, West Charleton
Civil Parish: Charleton
District: South Hams
County: Devon
Nearest Postcode: TQ7 2AL
NGR: SX 757 424
Ordnance Survey NGR (E/N): 275710,042420 (point)

1.4 Archive

OASIS number: substrat1-249807
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 application area. It has been prepared for Oakford Archaeology on behalf of clients as supporting information for a forthcoming planning application concerning the above site. The application area location is shown in Figure 1.

1.6 Summary

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

Seventeen magnetic anomaly groups were mapped as representing possible archaeological deposits or structures. Of these, two are likely to represent former field boundaries recorded on historical maps. One group may represent archaeological deposits, possibly a large pit or other sub-circular deposit although a natural origin cannot be ruled out. The remainder are typical of anomalies representing former field and enclosure boundaries of unknown origin and possibly of more than one phase of land enclosure. One anomaly group was mapped as representing a palaeochannel of a former stream as this is the most likely explanation of its presentation in the survey data but the possibility that it represents an archaeological deposit cannot be entirely ruled out.

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 application area. The results of the survey and any subsequent trial trenching will be reviewed and used to inform any ensuing mitigation.

2.2 Survey objectives

1. Complete a magnetometer 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 application 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/Digital Antiquity Guides (undated).

4 Site description

4.1 Landscape and land use

The application area comprises part of a large field situated to the southeast of the village of West Charleton as shown in Figure 1. It is bound to the west by a lane and to the south by a field lane. The land is situated on the northern side of an approximately east to west trending valley which descends to the west. The land slopes from approximately 30m AOD in the north-eastern corner of the application area to just over 20m AOD in the south-western corner. At the time of the survey the land was under a young crop.

4.2 Geology

The application area has a solid geology of Devonian Meadfoot Group which comprises dark shales and siltstones with sporadic grey-brown sandstones and beds of decalcified shell debris. The upper part exhibits red coloration in places. The superficial geology is not recorded in the source consulted (British Geological Survey, undated).

5 Archaeological background

5.1 Historic landscape characterisation

Modern enclosures adapting post-medieval Barton fields.

Modern enclosures that have been created by adapting earlier Barton fields which themselves were relatively large, regular enclosures that are likely to have been laid out between the fifteenth and eighteenth centuries (Devon County Council, undated).

5.2 Historical and archaeological background

The following is a short summary of information obtained from the Devon Historic Environment Record (HER) within 500m of the proposed development area and relevant to the understanding of the magnetometer survey. Except where specifically cited, this information was obtained using the Heritage Gateway (English Heritage, undated).

The reader is advised that this summary should not be used outside the context of this report and is referred to the Devon HER for informed provision of the record.

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.

Figure 5 shows the location of the heritage assets discussed below.

5.2.1 Heritage assets within the application area

No designated or undesignated assets are recorded within the application area on the Devon HER.

5.2.2 Heritage assets within 500m of the application area

There are two designated assets in the form of Scheduled Monuments within 500m of the proposed development site. Together with other Scheduled Monuments outside this area to the north, they form a round-barrow cemetery which contained at least 12 barrows in all. Some of the barrows are no longer considered to be of national importance as they are ploughed flat. The remaining are recorded as entries in the Devon Historic Environment Record (HER). The barrows within 500m of the proposed development site are within Scheduled Monuments 1019788 *Three bowl barrows 310m west of Home Farm, forming part of a round barrow cemetery*, and 1019790 *Bowl barrow 400m south of Home Farm, forming an outlying part of a round barrow cemetery*.

1019788 includes three late neolithic to bronze age bowl barrows, scattered across a south facing slope on a south-south-east to north-north-west alignment, with local views across the Kingsbridge Estuary to the east and west. The eastern mound measures 43m in diameter and survives up to 1.5m high with an encircling ditch 10m wide and 0.2m deep. The central mound measures 35m in diameter and up to 0.2m high, and the western barrow is 28m in diameter and up to 0.5m high. Both of these mounds have encircling quarry ditches which survive as buried features.

Western mound: NGR SX 75707 42684, HER MDV63931 (approximately 250m northeast)

Central mound: NGRSX 75867 42608, HER MDV63930, (approximately 250m north),

Eastern barrow: NGRSX 75968 42568, HER MDV36662, (approximately 200m east-north-east)

1019790 includes a bowl barrow forming an outlier to a round barrow cemetery of the late neolithic to early bronze age, located on the northern edge of a hilltop overlooking a shallow valley with local views across the Kingsbridge estuary to the south and east. This barrow survives as an earthen mound 23m in diameter and up to 0.8m high with an encircling quarry ditch 8m wide and 0.15m deep (HER MDV63166, NGR SX 76196 42210 (point) approximately 500m southeast).

A field to the north of the A379, approximately 200m north of the proposed development site at NGR SX 757 426 (point), was subject to a geophysical survey by Substrata for Oakford Archaeology on behalf of clients (Dean, 2014). The results of that survey were subsequently included in the Devon HER. In addition to anomalies likely to represent a late neolithic to bronze age barrow (MDV63931 above), two anomaly groups were recorded during that survey that may have represented ploughed-out barrows (MDV113650). Two groups may have related to deposits of strongly heated material and, as such, reflected past craft, industrial or funerary activities. A further two groups could have related to in-situ highly heated deposits such as those left by furnaces and kilns. Thirteen groups may have indicated the presence of pits or large postholes although natural origins could not be ruled out (MDV113649). One group probably reflected a Devon bank field boundary not recorded on any historical Ordnance Survey map (MDV113651). Two groups may have represented a curvilinear bank-and-ditch structure (MDV113652). There is the possibility that one anomaly group represented a sub-circular structure (MDV113653). The remaining anomalies identified as potential archaeological deposits are linear and curvilinear anomalies that may relate to former fields or other enclosure boundaries not recorded on historical Ordnance Survey maps and likely to represent more than one phase of past land use (MDV113654).

Two post-medieval to modern quarries are recorded at NGR SX 760 421 (HER MDV19162) and at NGR SX 759 421 (HER MDV44950), both some 500m southwest of the proposed development site.

Approximately 200m southwest of the proposed development site a complex of linear features of unknown period were recorded as a crop mark in 1984 to the south of West Charleton (HER MDV36922, NGR SX 754 422).

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, structures and features.

The terms archaeological deposits, structures and features 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 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. These plots represent different views of the data that were used to assess potential archaeology.

6.2 Discussion

6.2.1 General points

Discussion 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 the survey archive.

Data collection

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

Anomaly characterisation and mapping

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 only mapped where they comprised significant magnetic responses across the dataset that needed clarification.

Numerous dipole magnetic anomalies are scattered across the data set. These are likely to represent recent buried ferrous objects and such patterns are frequently found in close proximity to settlements.

Data trends

The parallel, repeated linear trends running approximately north-north-west to south-south-east are likely to represent recent ploughing.

Sets of parallel double lines running approximately west-north-west to east-south-east are likely to represent recent vehicle tracks.

6.2.2 Data relating to historic maps and other records

Magnetic anomaly groups **5** and **6** coincide with, and likely represent, field boundaries recorded on historic Ordnance Survey maps as listed in Table 1.

6.2.3 Data with no previous archaeological provenance

Magnetic anomaly groups **10** may represent archaeological deposits, possibly a large pit or other sub-circular deposit although a natural origin cannot be ruled out.

Group **201** is most likely to reflect a palaeochannel of a former stream but the possibility that it represents an archaeological deposit cannot be entirely ruled out.

The remaining magnetic anomalies mapped as possible archaeological deposits or structures are typical of anomalies representing former field and enclosure boundaries of unknown origin and possibly of more than one phase of land enclosure.

6.3 Conclusions

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

Seventeen magnetic anomaly groups were mapped as representing possible archaeological deposits or structures. Of these, two are likely to represent former field boundaries recorded on historical maps. One group may represent archaeological deposits, possibly a large pit or other sub-circular deposit although a natural origin cannot be ruled out. The remainder are typical of anomalies representing former field and enclosure boundaries of unknown origin and possibly of more than one phase of land enclosure. One anomaly group was mapped as representing a palaeochannel of a former stream as this is the most likely explanation of its presentation in the survey data but the possibility that it represents an archaeological deposit cannot be entirely ruled out.

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). This report contains material that is non-Substrata copyright or the intellectual property of third parties. Such material is labelled with the appropriate copyright and is non-transferrable by Substrata.

8 Acknowledgements

Substrata would like to thank Marc Steinmetzer of Oakford Archaeology for commissioning us to complete this survey.

9 Bibliography

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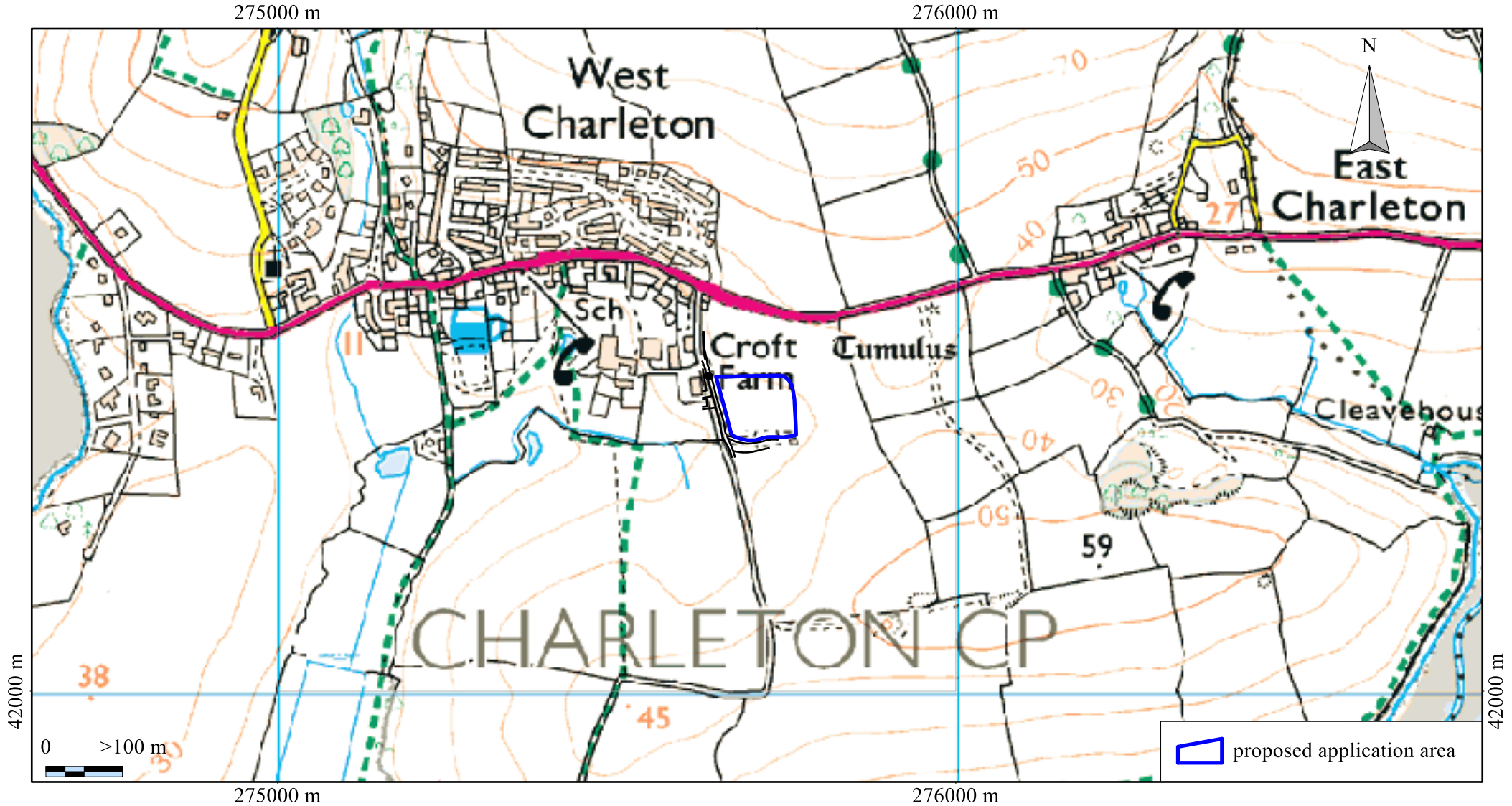
Historic England (2010) *Geophysical Survey in Archaeological Field Evaluation*, [Online], Available: <https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf> [April 2016]

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.

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: 275706.97 m, centre Y: 42421.29 m

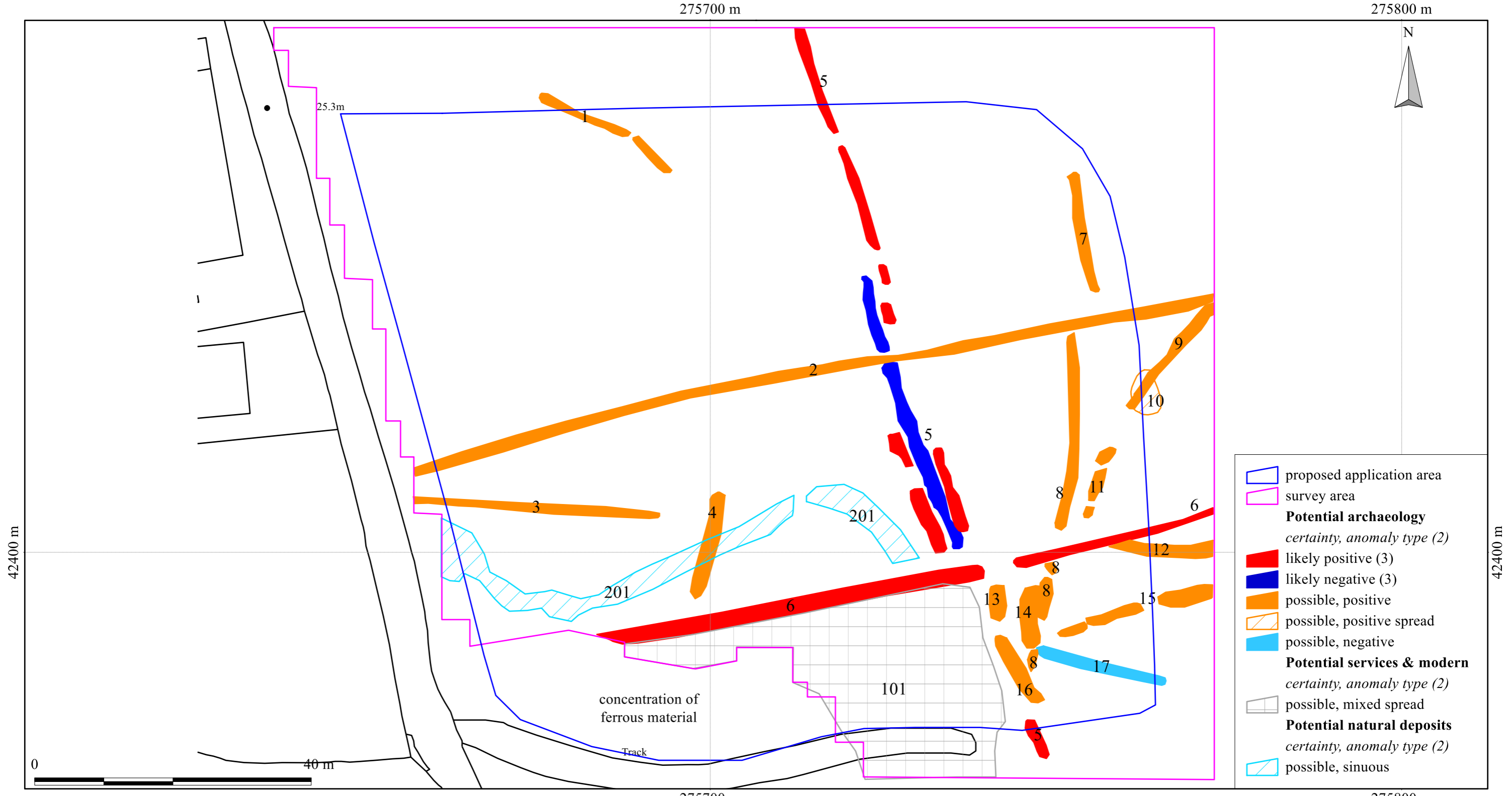
Scale: 1:8000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Base map: Crown Copyright & Database Right 2016

An archaeological magnetometer survey
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Report: 1604CRO-R-1

Figure 1: location map

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British Grid
 centre X: 275706.65 m, centre Y: 42421.38 m

Scale: 1:550 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata 2016.
 Base map: © Crown copyright 2016. Supplied by mapserve.co.uk
 a licensed Ordnance Survey partner number 100053143

- 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
 Land at Croft Farm, West Charleton, Devon
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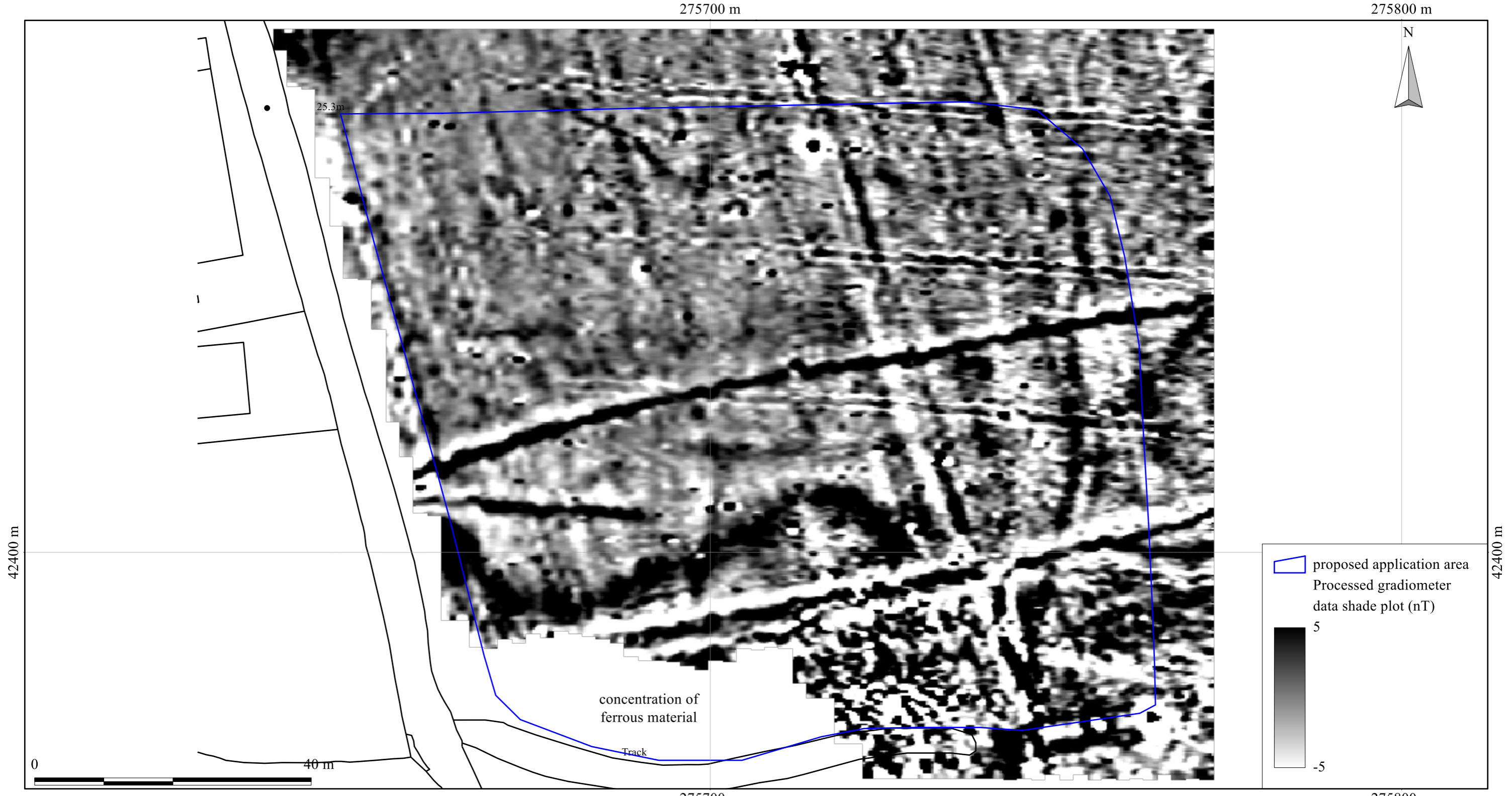
Figure 2: survey interpretation

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Site: An archaeological magnetometer survey
 Land at Croft Farm, West Charleton, Devon
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anomaly group	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1	possible, positive	disrupted curvilinear			
2	possible, positive	linear			
3	possible, positive	linear		anomaly group may represent archaeology or recent ground disturbance	
4	possible, positive	linear			
5	likely, positive/negative/positive	disrupted linear	field wall - possible Devon bank	anomaly group coincides with a field boundary mapped by the Ordnance Survey between 1886 and 1963	Ordnance Survey maps 1886 1:2500 to 1963 1:10560
6	likely, positive	disrupted linear	field wall	anomaly group coincides with a field boundary mapped by the Ordnance Survey between 1886 and 1963	Ordnance Survey maps 1886 1:2500 to 1963 1:10560
7	possible, positive	linear			
8	possible, positive	disrupted linear			
9	possible, positive	linear			
10	possible, positive spread	irregular			
11	possible, positive	disrupted linear			
12	possible, positive	curvilinear			
13	possible, positive	linear			
14	possible, positive	curvilinear			
15	possible, positive	disrupted linear			
16	possible, positive	linear			
17	possible, negative	linear			
101	possible, mixed spread	irregular	landfill and/or rubble		
201	possible, sinuous		palaeochannel	while this anomaly group may reflect archaeological deposits, it is more likely that it relates to a former stream channel	

Table 1: data analysis



British Grid
 centre X: 275706.65 m, centre Y: 42421.38 m

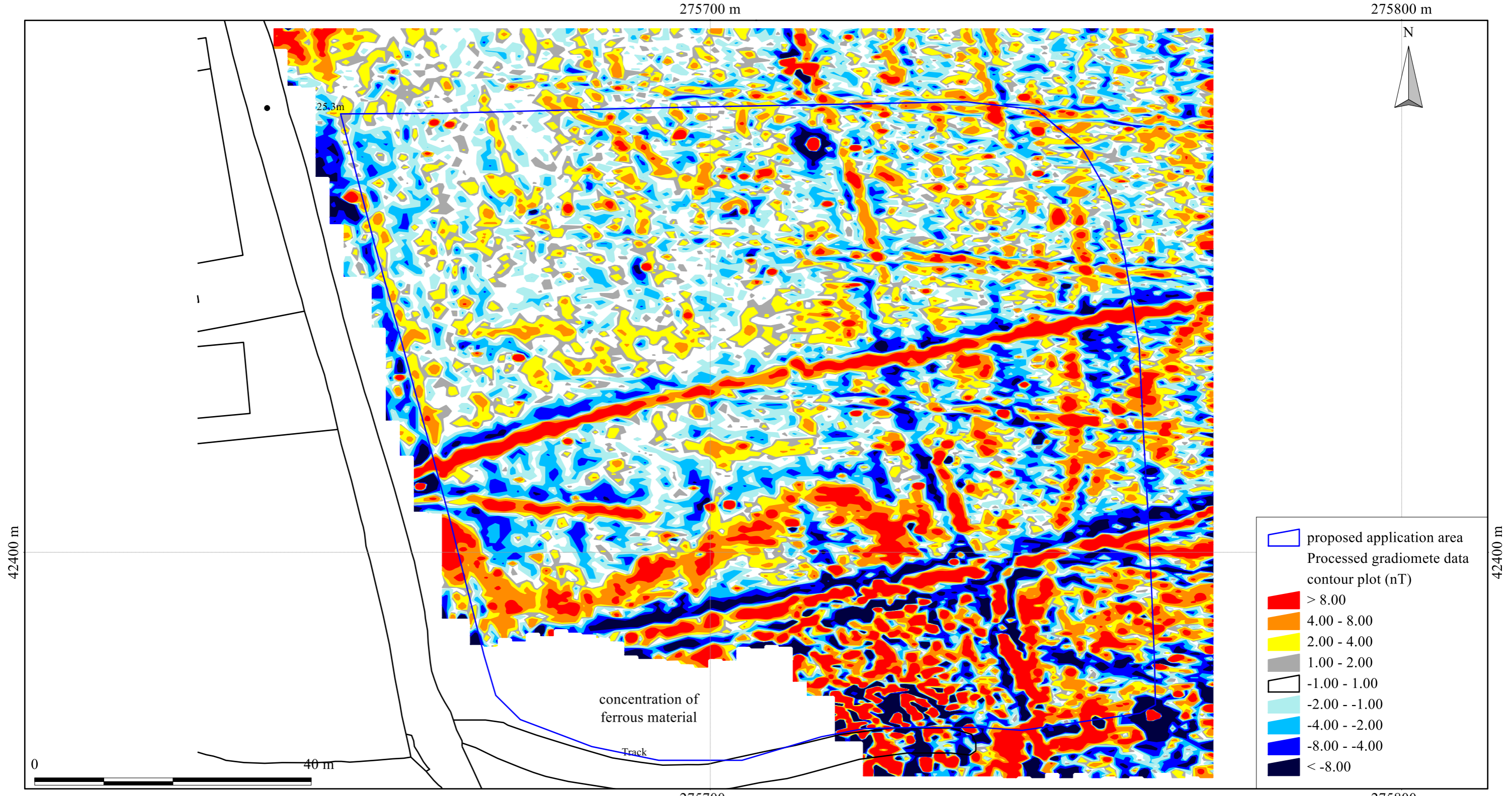
Scale: 1:550 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata 2016.
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Figure 3: shade plot of processed data

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British Grid
 centre X: 275706.65 m, centre Y: 42421.38 m

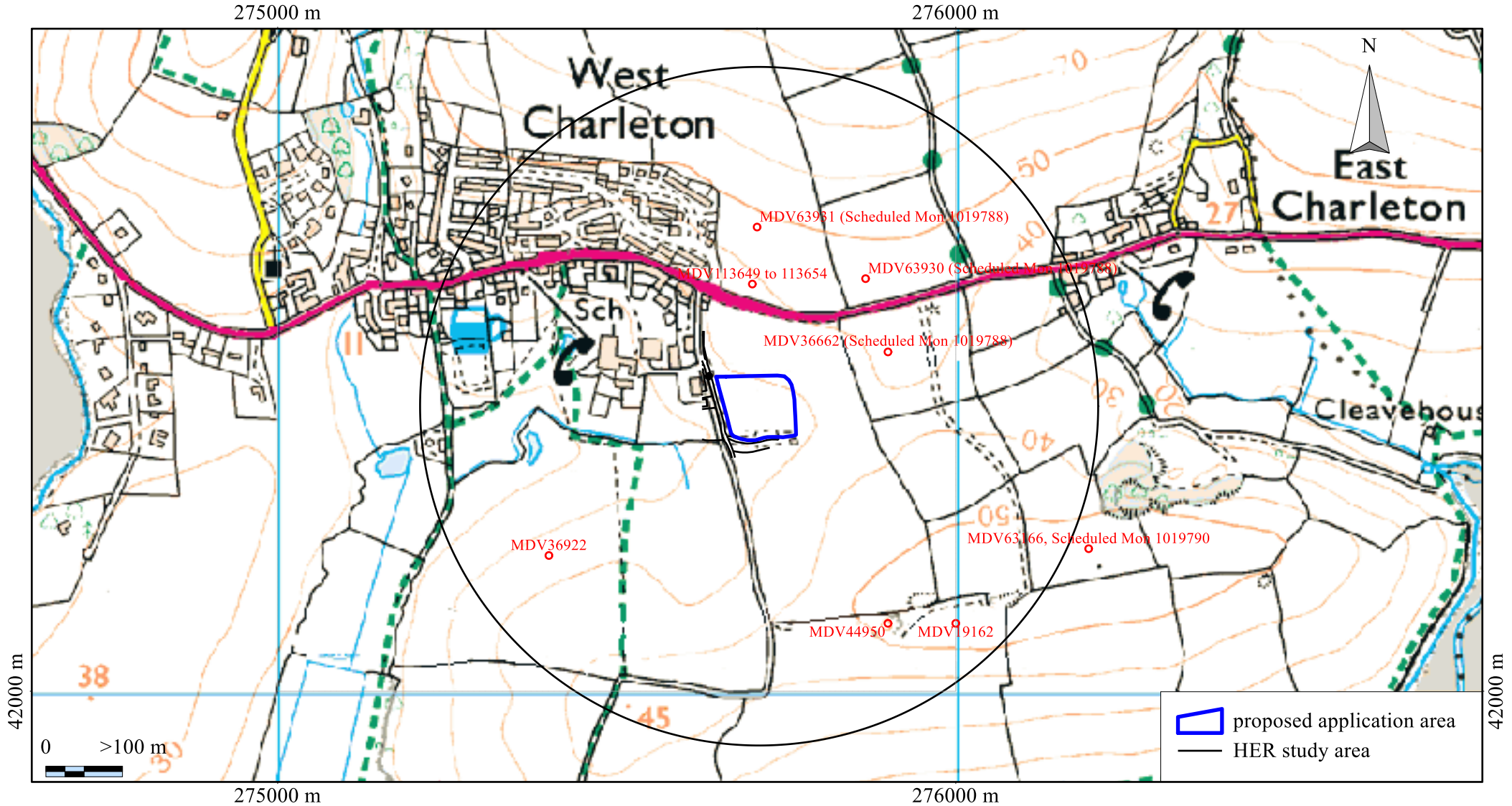
Scale: 1:550 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 4: contour plot of processed data

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British Grid
 centre X: 275706.97 m, centre Y: 42421.29 m

Scale: 1:8000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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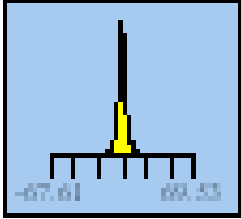
An archaeological magnetometer survey
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 Report: 1604CRO-R-1

Figure 5: survey area and relevant HER entry locations
 (see section 5 in the accompanying report
 for HER entry summaries)

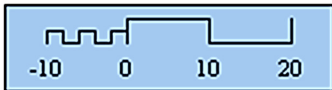
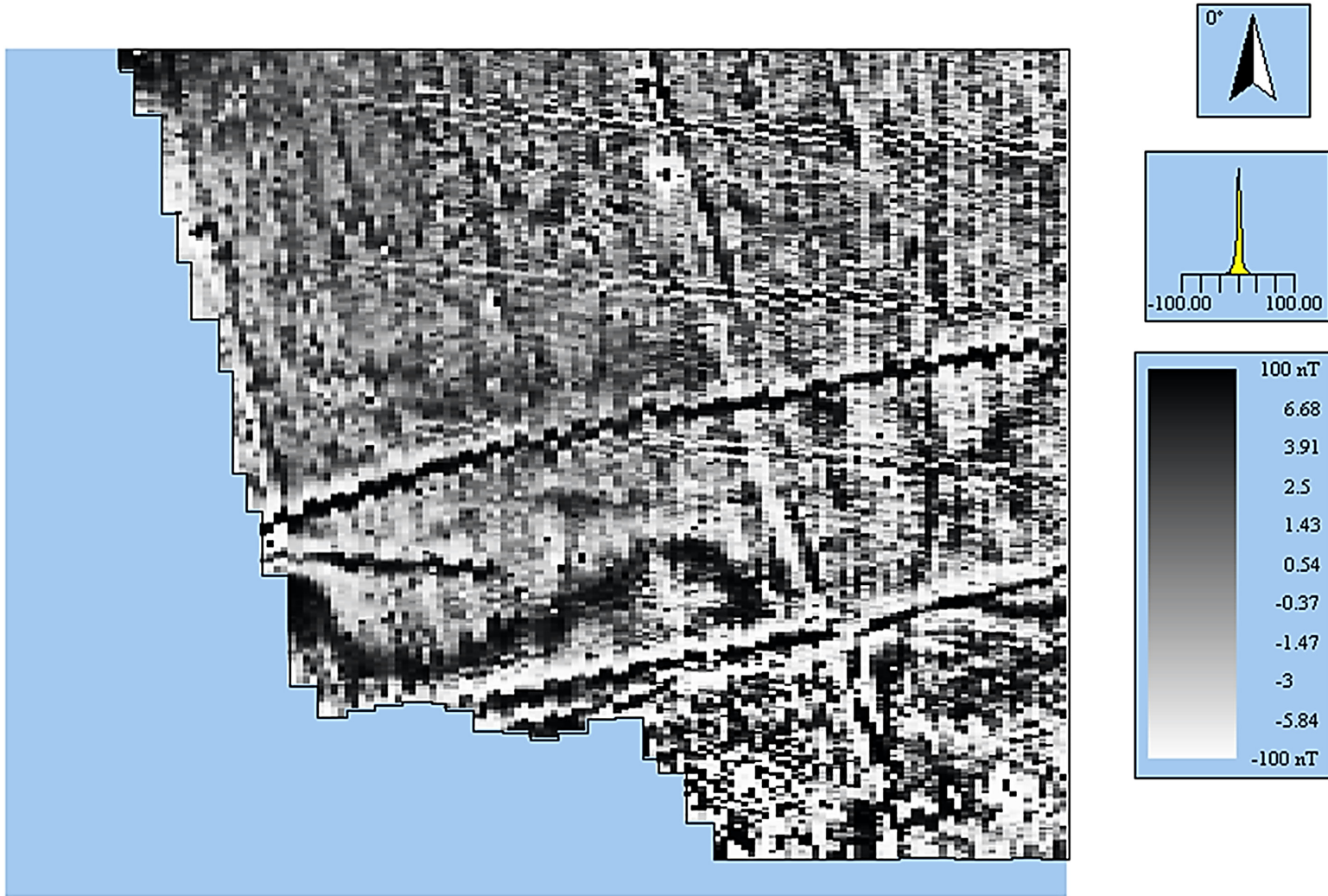
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Appendix 2 Methodology Summary

Table 2: methodology summary	
<p>Documents Survey methodology statement: Dean (2016)</p>	
<p>Methodology</p> <ol style="list-style-type: none"> 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/ 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> 0.25m <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN</p>
<p>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</p>	

Table 3: magnetometer survey - processed data metadata	
<p>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</p> <p>PROGRAM Name: TerraSurveyor Version: 3.0.29.1</p>	
<p>Stats Max: 69.53 Min: -67.61 Std Dev: 6.33 Mean: 0.19 Median: 0.01</p> 	<p>Processes: 21</p> <ol style="list-style-type: none"> 1 Base Layer 2 Clip at 4.00 SD 3 De Stagger: Grids: All Mode: Both By: -2 intervals 4 De Stagger: Grids: a12.xgd Mode: Both By: 1 intervals 5 De Stagger: Grids: SubGrid (Area: Top 90, Left 240, Bottom 97, Right 359) Mode: Both By: -2 intervals 6 De Stagger: Grids: a12.xgd a17.xgd Mode: Both By: -1 intervals 7 De Stagger: Grids: a9.xgd a12.xgd Mode: Both By: 1 intervals 8 De Stagger: Grids: a11.xgd Mode: Both By: 1 intervals 9 De Stagger: Grids: SubGrid (Area: Top 120, Left 240, Bottom 149, Right 359) Mode: Both By: 1 intervals 10 De Stagger: Grids: SubGrid (Area: Top 90, Left 240, Bottom 105, Right 359) Mode: Both By: 1 intervals 11 De Stagger: Grids: SubGrid (Area: Top 68, Left 240, Bottom 87, Right 359) Mode: Both By: -1 intervals 12 De Stagger: Grids: a16.xgd Mode: Both By: 1 intervals 13 De Stagger: Grids: a13.xgd Mode: Both By: 1 intervals 14 De Stagger: Grids: SubGrid (Area: Top 62, Left 240, Bottom 87, Right 359) Mode: Both By: -1 intervals 15 De Stagger: Grids: SubGrid (Area: Top 90, Left 240, Bottom 97, Right 359) Mode: Both By: 1 intervals 16 De Stagger: Grids: a9.xgd Mode: Both By: -1 intervals 17 De Stagger: Grids: SubGrid (Area: Top 62, Left 360, Bottom 87, Right 479) Mode: Both By: 1 intervals 18 De Stagger: Grids: SubGrid (Area: Top 36, Left 120, Bottom 59, Right 239) Mode: Both By: -1 intervals 19 De Stagger: Grids: a14.xgd a13.xgd Mode: Both By: 2 intervals 20 DeStripe Median Sensors: All 21 Interpolate: Match X & Y Doubled.

Appendix 4 Unprocessed data plot



Instrument Type: Bartington Grad
610
Units: nT
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing
Dummy Value: 32702

Processes: 1
1 Base Layer

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

Stats
Max: 100.00
Min: -100.00
Std Dev: 8.70
Mean: 0.45
Median: 0.53

PROGRAM
Name: TerraSurveyor
Version: 3.0.29.1

Figure 6: shade plot of unprocessed data