



An archaeological gradiometer survey

**Land at Penns Mount, Kingsteignton
Teignbridge, Devon**

Centred on NGR (E/N): 287660,072910 (point)

Report: 1509PEN-R-1

Ross Dean BSc MSc MA MCifA

29 October 2015

Substrata
Office 1, 5 Mill Street
Bideford, Devon EX39 2JT
Tel: 01273 273599
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
Web: acarchaeology.co.uk

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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: 19 October 2015
Area: gradiometer survey: 4.5ha
Lead surveyor: Mark Edwards BA
Author: 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 Penns Mount
Town and Civil Parish: Kingsteignton
District: Teignbridge
County: Devon
Nearest Postcode: TQ12 3BA
NGR: SX 876 729
Ordnance Survey NGR (E/N): 287660,072910 (point)

1.4 Archive

OASIS number: substrat1-228410
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 Stutchbury Associates Ltd. It is part of a programme of archaeological works undertaken in preparation for a planning application for a proposed residential development at the above site. The site location is shown in Figure 1.

1.6 Summary

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

Eighteen magnetic anomaly groups were mapped as possibly representing archaeological deposits or features. One group represents what is likely to be a double-ditched, rectangular enclosure that extends beyond the south-eastern corner of the site. One group represents a former field boundary mapped in 1840 and removed prior to 1885. Five groups may represent former field boundaries also mapped in 1840 and removed prior to 1885 and/or agricultural lynchets or leats. It may be that the mapped field boundaries followed pre-existing lynchets or leats. A further three groups are most likely to represent former agricultural lynchets or leats. The remaining anomaly groups characterised as representing potential archaeological deposits or features are relatively dispersed and form no clear pattern. They are most likely to represent fragments of linear deposits such as ditches. Three of these may reflect archaeological deposits or field drains.

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 site. 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 gradiometer survey across agreed parts of the site.

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 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). 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 application area is irregularly-shaped and situated to the east of the historic core of Kingsteignton and to the south of the A383 at Ware Cross. The A380 (Kingsteignton Bypass) passes about 150m to the east of the site. It lies at a height of between approximately 30m and 45m AOD. The area of the proposed development extends to around 4.56 hectares and comprises agricultural land.

4.2 Geology

To the north and east the rocks are slate and mudstone of the Carboniferous and Devonian Whiteway Mudstone Formation. They comprise predominantly red and purple mudstone with subordinate green and grey-black, locally laminated mudstone. Thin units of basaltic (spilitic) lava are sparsely present in thicker developments. To the south the rocks are sand, sandstone and fine-grained silt of the Cretaceous Upper Greensand Formation. The superficial geology is not recorded in the source used (British Geological Survey, undated).

5 Archaeological background

5.1 Historic landscape characterisation

Northern fields:

Modern settlement: This is an area of modern settlement that was developed during the twentieth century (Devon County Council, undated). In fact, this field remains undeveloped and is more aptly described as Modern enclosures adapting Medieval fields (see below).

Southern field:

Modern enclosures adapting Medieval fields: These modern fields have been created out of probable Medieval enclosures. The sinuous medieval boundaries survive in places (ibid).

5.2 Historical and archaeological background

The following is a short summary of information obtained from an Historic Environment Assessment produced by AC Archaeology Ltd (Weddell, 2013) and from the Devon Historic Environment Record (HER) via the Heritage Gateway (Historic England, undated). The heritage assets discussed below are within approximately 500m of the site and relevant to the understanding of the geophysical survey.

Archaeological sites, buildings, historic parks and gardens, conservation areas, registered battlefields and other aspects of the historic environment that are considered 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.

5.2.1 Heritage assets within the site

Fifteen Prehistoric (before 43 AD) lithics were collected during archaeological work on a pipeline construction in the northern-most field (HER entry MDV52086, SX 877 730).

5.2.2 Heritage assets within 500m of the site

Late Neolithic to Bronze Age (3000 BC to 600 BC) lithics were found during excavations at Berry Meadow to the west of the site (MDV41991, SX 871 729). One Bronze Age (2300 BC to 701 BC) socketed bronze axe was found and an oval enclosure of unknown date identified in the marshes at Hackney to the south of the site (MDV80857, SX 877 723)

Romano-British pottery and glass were found in the excavations at Berry Meadow which is suggestive of a nearby settlement dating to the first or second century AD (MDV41992, SX 871 729). A Roman road from Exeter into South Devon is believed to form part of the northeast boundary of the parish and crossed the Teign at Teignbridge. It passes the site some 700m east of the site (MDV62488 SX 8834 7315, MDV52688 SX 884 7272 and MDV52688 SX 8844 7272).

Berry Meadow is located in the centre of Kingsteignton, a settlement whose distinctive circular plan is thought to have been laid out by the beginning of the tenth century. The excavations on Berry Meadow mentioned above found evidence for a sequence of ditches and gullies relating to enclosures and trackways, the earliest of which is dated to the seventh to tenth centuries AD (MDV9186, SX 871 729 and MDV63781, SX 8724 7283). Medieval strip field were recorded on nineteenth century Ordnance Survey maps 350m northeast of the site (MDV9247, SX 8764 7337).

Possible faint lynchets of unknown date were recorded in an adjacent field to the east of the site (MDV14463, SX 878 729). Curvilinear fields, implying a Medieval origin but of unknown date, were recorded on late nineteenth century Ordnance Survey maps and lynchets were visible in 1977 some 80m southeast of the site (MDV14461, SX 877 726).

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.

Archaeological structures, features and 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

Figures 2 and 3 show the interpretation of the survey data. They include the anomaly groups identified as relating to archaeological deposits along with their numbers. Table 1 is an extract of the detailed analysis of the survey data which is provided in the attribute tables of the GIS project on the accompanying CD-ROM and in the project archive.

Figures 2 and 3 along with Table 1 comprise the analysis of the survey data.

Figures 4 to 6 are plots of processed data as specified in Table 3. These plots represent different views of the data that were each 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 site edges was restricted as shown in Figures 4 to 6 due to the presence of magnetic materials adjacent to the site. Strong magnetic responses mapped close to survey boundaries are likely to relate to these materials except where otherwise indicated in Figures 2 and 3.

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 not mapped.

General data trends

A northwest to southeast trend in the data in the two northern fields may represent field drains (Figure 6).

6.2.2 Data relating to historical maps and other records

Magnetic anomaly group **1** coincides with a field boundary mapped on the 1840 Kingsteignton tithe map but not on later maps.

Groups **12**, **13**, **16**, **17** and **18** may represent agricultural lynchets, leats or former field boundaries mapped on the 1840 Kingsteignton tithe map but not on later maps. These groups have similar characteristics to others recorded in the dataset that may represent lynchets or leats and it could be that the field boundaries mapped in 1840 follow older terracing. Agricultural lynchets are recorded close to the site (see Section 5.2)

6.2.3 Data with no previous archaeological provenance

Groups **5**, **7** and **8** are most likely to represent former agricultural lynchets or leats.

Group **11** represents what is likely to be a double-ditched rectangular enclosure that extends beyond the south-eastern corner of the site.

Groups **9**, **14** and **15** may reflect archaeological deposits such as ditches but their orientation and distribution suggest that they may represent field drains.

All of the remaining anomaly groups characterised as representing potential archaeological deposits or features are relatively dispersed and form no clear pattern. They are most likely to represent fragments of linear deposits such as ditches.

6.3 Conclusions

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

Eighteen magnetic anomaly groups were mapped as possibly representing archaeological deposits or features. One group represents what is likely to be a double-ditched, rectangular enclosure that extends beyond the south-eastern corner of the site. One group represents a former field boundary mapped in 1840 and removed prior to 1885. Five groups may represent former field boundaries also mapped in 1840 and removed prior to 1885 and/or agricultural lynchets or leats. It may be that the mapped field boundaries followed pre-existing lynchets or leats. A further three groups are most likely to represent former agricultural lynchets or leats. The remaining anomaly groups characterised as representing potential archaeological deposits or features are relatively dispersed and form no clear pattern. They are most likely to represent fragments of linear deposits such as ditches. Three of these may reflect archaeological deposits or field drains.

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 John Valentin of AC Archaeology Ltd for commissioning us to complete this survey.

9 Bibliography

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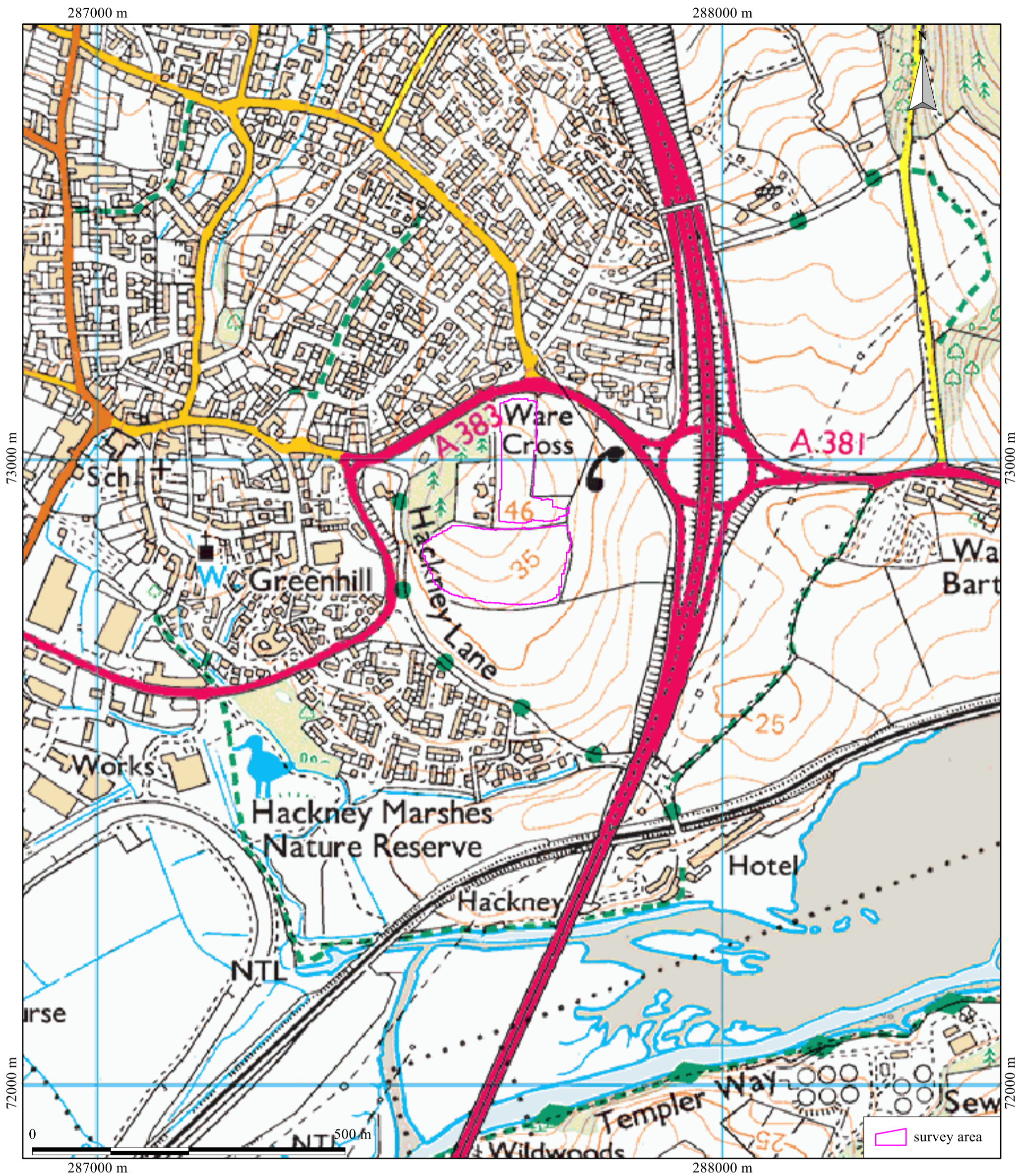
Weddell, P. (2013) *Land at Penns Mount, Kingsteignton, Teignbridge, Devon, Centred on SX 8766 7291, Historic Environment Assessment*, AC Archaeology Ltd unpublished report ACD723/1/0

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: 287662.55 m, centre Y: 72786.99 m

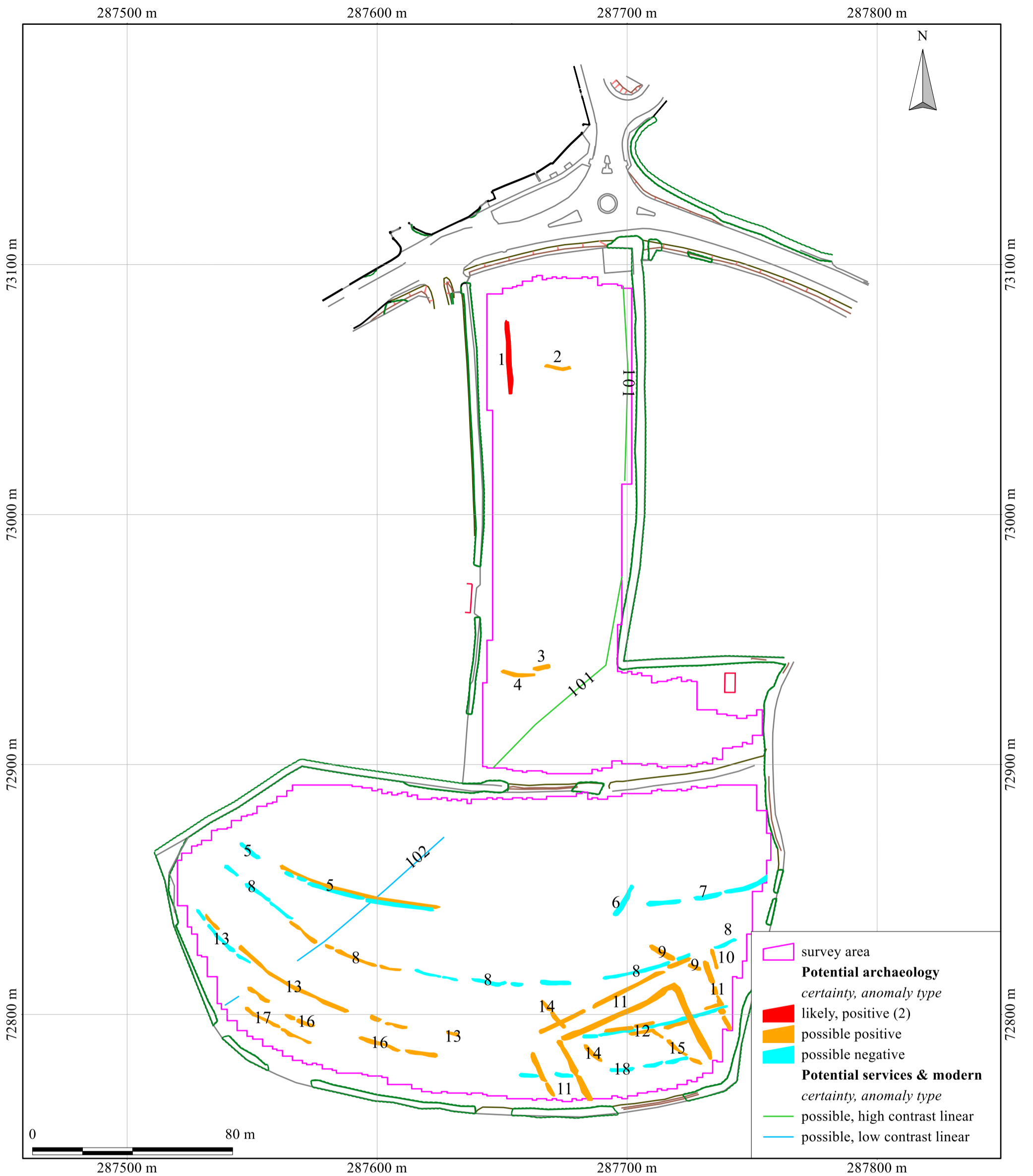
Geophysical survey: Copyright Substrata 2015.
 Base map: Ordnance Survey (c) Crown Copyright 2015.
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Scale: 1:6000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer survey
 Land at Penns Mount, Kingsteignton, Teignbridge, Devon
 Centred on NGR (E/N): 287660,072910 (point)
 Report: 1509PEN-R-1

Figure 1: location map

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 Bideford, Devon EX39 2JT
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British Grid
 centre X: 287653.86 m, centre Y: 72969.31 m

Geophysical survey: Copyright Substrata 2015.
 Base map: Lewis Brown Chartered Surveyors (c) Copyright 2012.
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Scale: 1:1500 @ A3. Spatial Units: Meter. Do not scale off this drawing

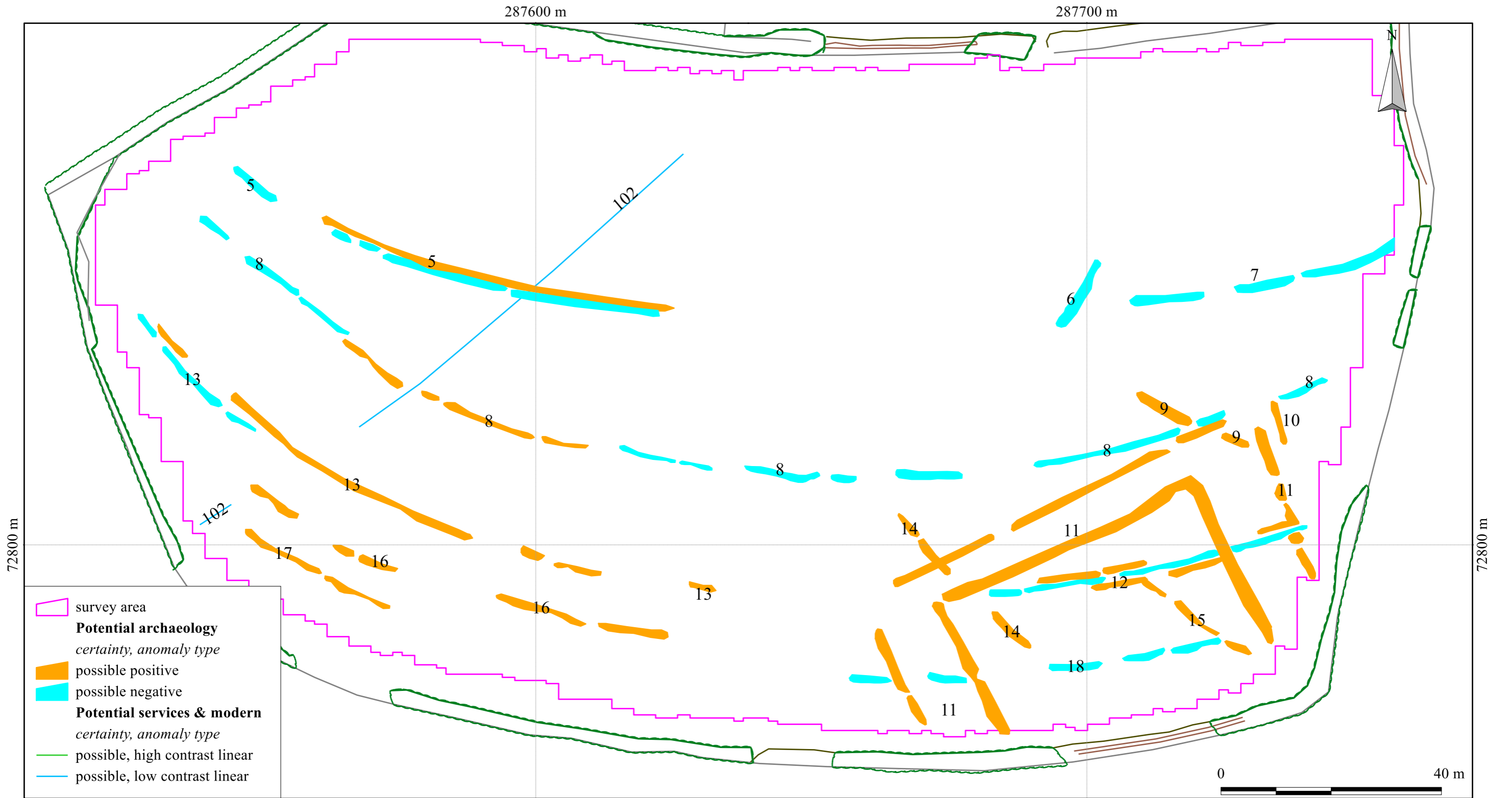
Notes:

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.

An archaeological gradiometer survey
 Land at Penns Mount, Kingsteignton, Teignbridge, Devon
 Centred on NGR (E/N): 287660,072910 (point)
 Report: 1509PEN-R-1

Figure 2: survey interpretation

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 Bideford, Devon EX39 2JT
 Tel: 01273 273599
 Email: geophysics@substrata.co.uk
 Web: substrata.co.uk



British Grid
 centre X: 287638.58 m, centre Y: 72824.34 m

Scale: 1:700 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata 2015.
 Base map: Lewis Brown Chartered Surveyors (c) Copyright 2012.
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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.
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 Report: 1509PEN-R-1

Figure 3: survey interpretation, southern area

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 Bideford, Devon EX39 2JT
 Tel: 01273 273599
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Site: An archaeological gradiometer survey
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anomaly group	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1	possible, positive	linear		anomaly group coincides with a field boundary mapped in 1840 but removed prior to 1885	1840 Kingsteignton tithe map, 1885-89 Ordnance Survey 1st edition map
2	possible, positive	curvilinear			
3	possible, positive	linear			
4	possible, positive	curvilinear			
5	possible, positive and negative	disrupted curvilinear	agricultural lynchets or leats		
6	possible, negative	linear			
7	possible, negative	disrupted curvilinear	agricultural lynchets or leats		
8	possible, positive and negative	disrupted curvilinear	agricultural lynchets or leats		
9	possible, positive	disrupted linear	archaeological deposits or field drains		
10	possible, positive	linear			
11	possible, positive and negative	disrupted double rectilinear	double-ditched rectangular enclosure	anomaly group extends outside the survey area but is likely to be rectangular	
12	possible, positive	disrupted curvilinear	field boundary and possibly agricultural lynchet or leat	anomaly groups are similar others within the field that are likely to represent lynchets or leats but these may also or alternatively represent former field boundaries mapped in 1840 and removed prior to 1885	1840 Kingsteignton tithe map, 1885-89 Ordnance Survey 1st edition map
13	possible, positive and negative	disrupted curvilinear	field boundary and possibly agricultural lynchet or leat	anomaly groups are similar others within the field that are likely to represent lynchets or leats but these may also or alternatively represent former field boundaries mapped in 1840 and removed prior to 1885	1840 Kingsteignton tithe map, 1885-89 Ordnance Survey 1st edition map
14	possible, positive	disrupted linear	archaeological deposits or field drains		
15	possible, positive	disrupted linear	archaeological deposits or field drains		
16	possible, positive	disrupted curvilinear	field boundary and possibly agricultural lynchet or leat	anomaly groups are similar others within the field that are likely to represent lynchets or leats but these may also or alternatively represent former field boundaries mapped in 1840 and removed prior to 1885	1840 Kingsteignton tithe map, 1885-89 Ordnance Survey 1st edition map
17	possible, positive	disrupted curvilinear	field boundary and possibly agricultural lynchet or leat	anomaly groups are similar others within the field that are likely to represent lynchets or leats but these may also or alternatively represent former field boundaries mapped in 1840 and removed prior to 1885	1840 Kingsteignton tithe map, 1885-89 Ordnance Survey 1st edition map
18	possible, negative	disrupted curvilinear	field boundary and possibly agricultural lynchet or leat	anomaly groups are similar others within the field that are likely to represent lynchets or leats but these may also or alternatively represent former field boundaries mapped in 1840 and removed prior to 1885	1840 Kingsteignton tithe map, 1885-89 Ordnance Survey 1st edition map
102	possible, low contrast linear		service trench		
101	possible, high contrast linear		ferrous pipe, cable or drain		

Table 1: data analysis



British Grid
 centre X: 287653.86 m, centre Y: 72969.31 m

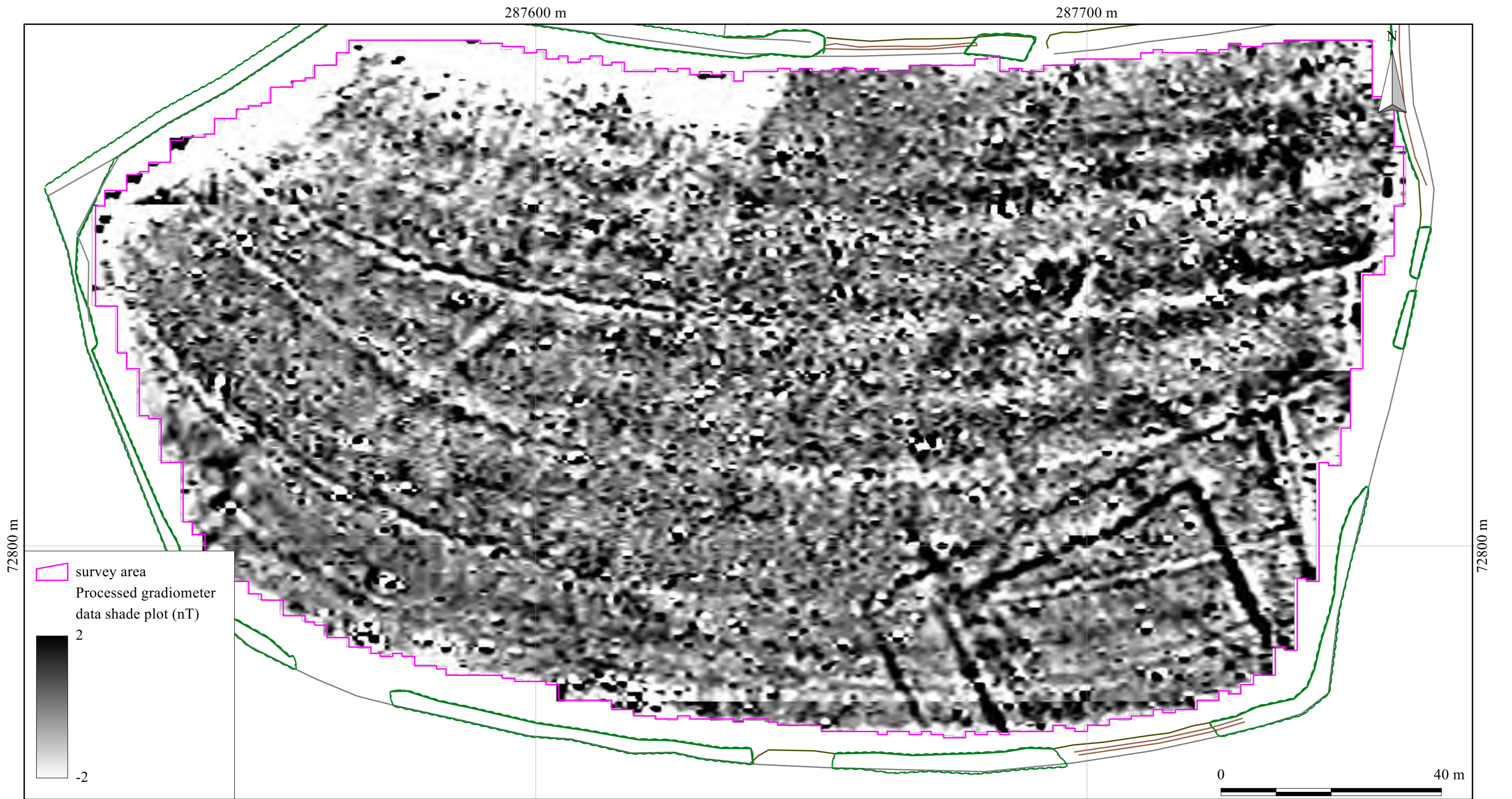
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Scale: 1:1500 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 4: shade plot of processed data

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 Office 1, 5 Mill Street
 Bideford, Devon EX39 2JT
 Tel: 01273 273599
 Email: geophysics@substrata.co.uk
 Web: substrata.co.uk



British Grid
 centre X: 287638.58 m, centre Y: 72824.34 m

Scale: 1:700 @ A3. Spatial Units: Meter. Do not scale off this drawing

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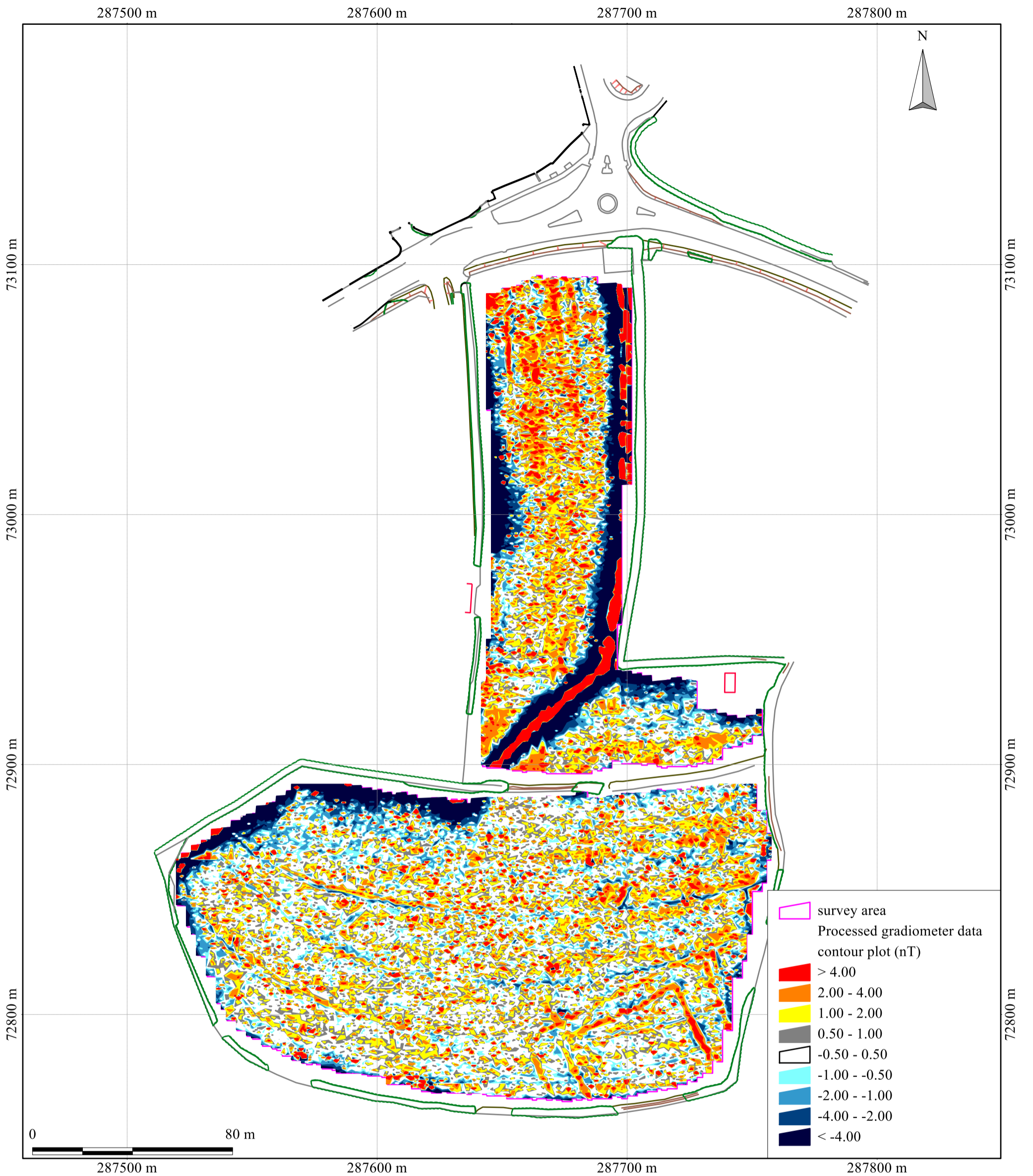
Notes:

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.

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Figure 5: shade plot of processed data, southern area

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 Office 1, 5 Mill Street
 Bideford, Devon EX39 2JT
 Tel: 01273 273599
 Email: geophysics@substrata.co.uk
 Web: substrata.co.uk



British Grid
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Figure 6: contour plot of processed data

Substrata
 Office 1, 5 Mill Street
 Bideford, Devon EX39 2JT
 Tel: 01273 273599
 Email: geophysics@substrata.co.uk
 Web: substrata.co.uk

Appendix 2 Methodology Summary

Table 2: 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> 0.25m <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>	

Appendix 3 Data processing

Table 3: gradiometer survey - processed data metadata	
<p>SITE</p> <p>Instrument Type: Bartington Grad 610</p> <p>Units: nT</p> <p>Direction of 1st Traverse: see below</p> <p>Collection Method: ZigZag</p> <p>Sensors: 2 @ 1.00 m spacing.</p> <p>Dummy Value: 32702</p> <p>PROGRAM</p> <p>Name: TerraSurveyor</p> <p>Version: 3.0.25.0</p>	
<p>Stats</p> <p>Max: 139.04</p> <p>Min: -163.42</p> <p>Std Dev: 9.26</p> <p>Mean: -0.47</p> <p>Median: 0.00</p>	<p>Processes: 16</p> <p>1 Base Layer</p> <p>2 Clip at 3.00 SD</p> <p>3 Clip at 3.00 SD</p> <p>4 DeStripe Median Sensors: All</p> <p>5 De Stagger: Grids: All Mode: Both By: -1 intervals</p> <p>6 De Stagger: Grids: b6.xgd Mode: Both By: -1 intervals</p> <p>7 De Stagger: Grids: b9.xgd Mode: Both By: -2 intervals</p> <p>8 De Stagger: Grids: b10.xgd Mode: Both By: -1 intervals</p> <p>9 De Stagger: Grids: a10.xgd Mode: Both By: -1 intervals</p> <p>10 De Stagger: Grids: a11.xgd Mode: Both By: -1 intervals</p> <p>11 De Stagger: Grids: a6.xgd Mode: Both By: -1 intervals</p> <p>12 De Stagger: Grids: a7.xgd Mode: Both By: -1 intervals</p> <p>13 DeStripe Median Sensors: a4.xgd</p> <p>14 DeStripe Median Traverse: Grids: a4.xgd Threshold: 2 SDs</p> <p>15 De Stagger: Grids: a6.xgd Mode: Both By: -1 intervals</p> <p>16 De Stagger: Grids: b11.xgd Mode: Both By: -1 intervals</p>