

Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer survey

**Land at Battens Farm and Watton Farm
Halburton, Devon**

Centred on NGR (E/N): 302420,113230

Report: 1801BAT-R-1

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Client
Tiverton Archaeology Group

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1 Introduction

This report presents the results of an archaeological geophysical survey at the site listed below, hereafter referred to as the Site. It has been prepared for the Tiverton Archaeology Group and is the third phase of a survey designed to further a research project undertaken by the Tiverton Archaeology Group in the area and, in particular, to follow up the results of field walking surveys. This phase was funded by the Tiverton Archaeology Group with assistance from the Devon County Council Environment Group.

The survey of Area 1 (Figure 1) was commissioned and funded by Devon County Council Historic Environment Service, now part of the Devon County Council Environment Group, in July 2012. The survey of part of Area 2 (Figures 1 and 10) was commissioned by the Tiverton Archaeology Group in February 2013 and was funded by a grant from Devon County Council Historic Environment Service.

Both these phases were the subject of a Substrata report (Dean, 2013) which is now replaced by this report. The data sets from the earlier phases were re-processed for this report. The earlier interpretations were re-assessed resulting in the removal of three magnetic anomaly groups from the set assessed as possibly representing buried archaeology as discussed in Section 9.3.

The survey and report were completed in compliance with a Survey Method Statement (Dean, 2018). The Site location is shown in Figure 1.

2 Survey description

2.1 Survey

Method:	magnetometry
Instrument:	twin-sensor fluxgate gradiometer
Date:	Area 1: July 2012 Area 2 (part): February 2013 Area 2 (remainder): 22 to 23 February 2018 Area 3: 20 to 21 February 2018
Area:	Area 1: 1.5ha Area 2: 5.6ha Area 3: 1.7ha

2.2 Location

Site name:	Land at Battens Farm and Watton Farm, Halburton
Civil Parish:	Halburton
District:	Mid Devon
County:	Devon
Nearest Postcode:	EX16 7EE
NGR:	ST 02420 132303 (point)
NGR (E/N):	302420,113230 (point)
Historic environment designation:	None

2.3 Client

Tiverton Archaeology Group and Devon County Council Historic Environment Service.

3 Summary

A magnetometer survey was selected to provide a relatively fast and cost-effective evaluation of any buried archaeology across the Site (see Section 12). 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 4.

The differences in magnetic responses across the Site were sufficient to be able to differentiate between anomalies representing possible buried archaeology and background magnetic responses. It is not clear whether the patterns of archaeologically significant anomaly

distribution shown in Area 2 are related to the known geological variation across the Site, are related to associated known changes in soil and near-surface sediment depth or reflect a real distribution of buried archaeology as recorded by the survey technique.

Eighty-one magnetic anomaly groups were mapped as representing potential buried archaeology. Of these, seven groups coincide with, and likely represent, field boundaries recorded by on historic maps. A further seven groups are typical of anomalies representing deposits deriving from former craft and/or industrial activities; either in-situ deposits derived directly from production or processing, or secondary deposits of materials such as tile or pottery. Eight anomaly groups possibly representing heated material lie within two of these groups which further supports the view that these groups indicate production and/or deposition of materials derived from industrial or craft activities. The remaining anomaly groups across the Site have characteristics typical of anomalies representing linear and curvilinear archaeological deposits. These are most likely to represent small enclosure boundaries and fragments of field boundaries although, given the presence of the possible industrial/craft related anomaly groups and the distribution of Roman tile, slate and tesserae recorded during field walking surveys undertaken by the Tiverton Archaeological Group, some may represent building footings.

4 Aims and objectives

4.1 Aims

Within the framework set out in Chartered Institute for Archaeologists (2014a), complete an archaeological geophysical survey and report to:

1. As far as possible inform on the presence or absence, character, extent and in some cases, apparent relative phasing of buried archaeology, in order to make an assessment of its merit in the appropriate context, which may lead to one or more of the following:
 - a. The formulation of a strategy to ensure further recording, preservation or management of the resource
 - b. The formulation of a strategy to mitigate a threat to the archaeological resource
 - c. The formulation of a proposal for further archaeological investigation within a programme of research (ibid, 2014a: 4).

4.2 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 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 is sufficiently detailed to inform any subsequent development on the survey area about the location and possible archaeological character of the recorded anomalies.

5 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).

6 Methodology

The magnetometer survey was undertaken in accordance with a Survey Method Statement (Dean, 2018) to achieve the aims and objectives set out in Section 4 using the standards and guidance specified in Section 5. The survey method was selected to provide a relatively fast and cost-effective evaluation of any buried archaeology across the Site (see Section 12).

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 conformed to the Chartered Institute for Archaeologists standard for geophysical survey (CIfA, 2014a).

7 Site

7.1 Land use

The Site comprises two complete agricultural fields (Areas 2 and 3) and part of a further agricultural field (Area 1) lying to the south of Sampford Peverell (Figure 1). Area 1 is bounded by hedges and lanes to the west and north, a hedge and field to the east and the rest of the field in which the area is situated to the south. Area 2 is bounded by an access lane to Battens Farm to the north, by a fence and partial hedge with a drain and a field beyond to the east, and by hedges and lanes to the south and west. Area 3 is hedged and bounded to the west by the Grand Western Canal, to the north and east by a lane and to the south by an agricultural field.

At the times of the surveys, Area 1 was under grass pasture (2012), Area 2 was under stubble after crop harvesting (2013 and 2018) and Area 3 was under grass pasture (2018).

7.2 Topology

The Site is on a gentle slope descending from approximately 90m (AOD) on the western side of Area 3 to approximately 77m AOD on the eastern side of Area 2.

7.3 Geology

The site is located on geological boundary with breccia of the Permian Halberton Breccia Formation on the western side of the survey area (Area 3 and the western edge of Areas 2 and 1) and reddish-brown silty mudstone and clayey siltstone of the Triassic Aylesbeare Mudstone Group over the remaining area to the east. Within the Aylesbeare Group there are local occurrences of reddish-brown silty mudstone and clayey siltstone and, less commonly, clean fine- to medium-grained sandstone. The superficial geology is not recorded in the source used (British Geological Survey, undated).

7.4 Soils

The soils approximately follow the geological division described above with very stony loamy typical brown earths of the Crediton Association to the west (massive structure or cemented breccia between 0.7m and 1m depth) and seasonally waterlogged reddish fine loamy or fine silty over clayey soils of the Whimple 3 Association to the east (depths not given) (Soil Survey of England and Wales, 1983; Findley et al, 1983: 128 and 306-7).

8 Archaeological background

8.1 Historic Environment Status

None.

8.2 Historic landscape characterisation (Devon County Council, undated)

Area 1: Medieval enclosures based on strip fields

This area was probably first enclosed with hedge-banks during the later middle ages. The curving form of the hedge-banks suggests that earlier it may have been farmed as open strip-fields.

Area 2: Modern enclosures

These modern fields have been created out of probable medieval enclosures which were probably first enclosed with hedge-banks during the later middle ages and prior to that may have been farmed as open strip-fields. The sinuous medieval boundaries survive in places.

Area 3: Modern enclosures

Modern enclosures that have been created by adapting earlier fields of probable post-medieval date.

8.3 Statement of research

The Devon Council Historic Environment Record (HER) 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 comprehensive and publication of the information in commercial reports is not permitted.

9 Results

9.1 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 changes in the magnetism 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.

Magnetic anomalies cannot be regarded as physical 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 buried archaeology.

9.2 Analysis

Figures 2 to 5 show the interpretation of the survey data and include the anomaly groups identified as possibly relating to archaeological deposits along with their identifying numbers. Tables 1a and 1b are extracts of the detailed analysis of the survey data sourced from the attribute tables of the GIS project provided in the project archive.

Figures 2 to 5 along with Tables 1a and 1b comprise the analysis of the survey data.

Figures 3 to 9 are plots of processed data as specified in Tables 3 and 5. Figure 10 is a plot of minimally processed data as specified in Tables 4 and 6. Figure 11 shows the location of the survey grid.

Figure 12 to 14 are plots of the survey interpretation for archaeology only over maps of Roman field walking finds recorded by the Tiverton Archaeology Group between 2012 and 2015. The find distributions and possible relationships to anomaly group patterns are discussed in Section 10.4.

9.3 Anomaly mapping

The magnetic anomaly group nomenclature from the original analysis (Dean 2013) has been retained and the anomaly groups identified in the new data set follow on in sequence across Areas 2 and 3. Groups 31, 33 and 42 from the original analysis have been re-assessed as not relating to buried archaeology and have been removed without renumbering the remaining groups.

The magnetic anomaly groups assessed as possibly relating to buried archaeology can be located as follows:

groups 1 to 27 (2012 survey): Area 1, Figures 2 and 3, Table 1a
groups 28 to 44 (2013 survey): Area 2, Figures 2 and 4, Table 1a
groups 45 to 70 (2018 survey): Area 2, Figures 2 and 4, Table 1b
groups 71 to 81 (2018 survey): Area 3, Figures 2 and 5, Table 1b

10 Discussion

10.1 General points

10.1.1 Discussion scope

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

10.1.2 Data collection

Data collection along the survey area edges was restricted as shown in the figures due to the presence of magnetic materials within and adjacent to boundaries. Strong magnetic responses mapped close to the boundaries are likely to relate to these materials except where otherwise indicated in Figures 2 to 5 and Tables 1a and 1b.

10.1.3 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 were mapped as potential archaeology when they were associated with other significant anomaly groups or otherwise formed recognisable patterns as listed in Tables 1a and 1b.

Anomalies thought to relate to natural features and 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.

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.

10.2 Data relating to historic maps and other records

10.2.1 Area 2

Magnetic anomaly groups **30, 34, 35, 39, 45, 46** and **50** coincide with, and likely represent, field boundaries recorded by on historic maps as shown in Tables 1a and 1b. The anomaly pattern of group 35 has characteristics often associated with Devon Banks which comprise a hedged, stone-faced earthen bank with a flanking ditch on each side. Anomaly groups **47 to 49** may represent rubble associated with group 46.

10.3 Data with no previous archaeological provenance

10.3.1 Area 1

Magnetic anomaly groups **7, 9** and **10** display a greater contrast than is normal across the survey area and are typical of anomalies representing deposits deriving from former craft and/or industrial activities; either in-situ deposits derived directly from production or processing, or secondary deposits of materials such as tile or pottery (see Section 10.4).

Group **14** is most likely to represent an archaeological deposit containing stony material, a deposit of rubble or near-surface bedrock

Group **15** may derive from ferrous material but is orientated in such a way that suggests it may represent an in-situ heated archaeological deposit derived from, for example, a hearth, kiln or metal smelting.

Anomaly groups **16 to 23** have relatively high positive values and may represent the presence of burnt material. That they all lie within the high contrast anomaly groups 9 and 10 further supports the view that these groups indicate industrial or craft production and/or deposition of materials derived from such activities.

Groups **4**, **12**, **13** and **27** are well defined anomalies that could represent archaeological deposits such as filled pits although natural origins cannot be ruled out.

The remaining magnetic anomaly groups in Area 1 are typical of anomalies representing linear deposits and are most likely to represent small enclosure boundaries and fragments of field boundaries although, given the presence of the possible industrial/craft related anomaly groups 7, 9 and 10, some may represent building footings. This possibility is supported by the fact that concentrations of Roman tile and slate found in field walking surveys across Area 2 (discussed in Section 10.4 below) show a close correlation with anomaly groups similar to groups 7, 9 and 10.

10.3.2 Area 2

There are apparent concentrations of anomaly groups mapped as representing potential buried archaeology in Area 2 with other areas that are relatively empty of such groups. There is a geological boundary running through the western side of Area 2 and an approximately corresponding change in soil types as discussed in Sections 7.3 and 7.4 above. It is not clear whether the patterns of archaeologically significant anomaly distribution shown in Area 2 are related to these geological variations, to changes in soil and near-surface sediment depth or reflect a real distribution of buried archaeology.

Magnetic anomaly group **29** may be associated with group **72** in Area 3.

Group **32** may represent a curvilinear archaeological deposit. Its southern end is obscured by interference from a highly magnetic service which is likely to be a ferrous cable or pipe.

Magnetic anomaly groups **37**, **38**, **43** and **44** are similar to groups 7, 9 and 10 in Area 1 (Section 10.3.1) in that they display a greater contrast than is normal across the survey area and, as with the Area 1 anomalies, are typical of anomalies representing deposits deriving from former craft and/or industrial activities; either in-situ deposits derived directly from production or processing, or secondary deposits of materials such as tile or pottery (see Section 10.4). Group 37 appears to have a curvilinear anomaly (group **36**) along its western side which may indicate, speculatively, a ditch defining an area of past industrial or craft activity. Group **70** may also represent a deposit of heated material although the magnetic response is slightly different and the group could equally relate to natural deposits associated with a spring.

The remaining magnetic anomaly groups in Area 2 are typical of anomalies representing linear deposits. A number of the anomaly groups are concentrated in the southern part of Area 2 and appear to represent a complex area of small enclosures, possibly with building footings as may be implied by the distribution of Roman tile and slate discussed in Section 10.4 below.

10.3.3 Area 3

The magnetic anomaly groups in Area 3 are typical of anomalies representing linear and curvilinear archaeological deposits and are most likely to represent enclosure and field boundaries, possibly from more than one phase of land management. As with similar anomaly groups in Areas 1 and 2, the possibility that some of these anomalies represent elements of former buildings cannot be ruled out without further archaeological investigation.

10.4 Field walking finds distributions in relation to anomaly group patterns

Tiverton Archaeological Group (TAG) carried out field walking surveys across Areas 2 and 3 of the Site between 2012 and 2015 and it was the distribution of Roman finds recorded during these surveys that led to the commissioning of the three phases of geophysical survey presented in this report.

Figure 12 shows the distribution of Roman tile fragments recorded during the field walking surveys along with the interpretation of this geophysical survey. Figure 13 shows the

distribution of Roman slate fragments over the geophysical survey interpretation and Figure 14 that of Roman tesserae. Although some concentrations of tile and slate fragments appear in an area relatively free of magnetic anomalies characterised as representing potential buried archaeology, high concentrations of tile and slate coincide with the anomaly groups characterised as representing industrial- or craft-derived deposits or fired material (groups 37, 38, 43 and 44 in Figures 2 and 4). The distribution of Roman tesserae has one area of high concentration coinciding closely with two of these anomaly groups (37 and 38).

From Figures 12 to 14, it is clear that there is a general correlation between the recorded Roman field walking finds and the distribution of anomaly groups in the southern half of Area 2 and in Area 3.

11 Conclusions

The differences in magnetic responses across the Site were sufficient to be able to differentiate between anomalies representing possible buried archaeology and background magnetic responses. It is not clear whether the patterns of archaeologically significant anomaly distribution shown in Area 2 are related to the known geological variation across the Site, are related to associated known changes in soil and near-surface sediment depth or reflect a real distribution of buried archaeology.

Eighty-one magnetic anomaly groups were mapped as representing potential buried archaeology (Figures 2 to 5). Of these, seven groups (groups 30, 34, 35, 39, 45, 46 and 50 in Area 2) coincide with, and likely represent, field boundaries recorded by on historic maps. A further seven groups (7, 9 and 10 in Area 1 and 37, 38, 43 and 44 in Area 2) are typical of anomalies representing deposits deriving from former craft and/or industrial activities; either in-situ deposits derived directly from production or processing, or secondary deposits of materials such as tile or pottery. Eight anomaly groups (16 to 23) possibly representing heated material lie within two of these groups (9 and 10) in Area 1 which further supports the view that these groups indicate production and/or deposition of materials derived from industrial or craft activities. The remaining anomaly groups across the Site have characteristics typical of anomalies representing linear and curvilinear archaeological deposits. These are most likely to represent small enclosure boundaries and fragments of field boundaries although, given the presence of the possible industrial/craft related anomaly groups and the distribution of Roman tile, slate and tesserae recorded during field walking surveys undertaken by the Tiverton Archaeological Group, some may represent building footings.

12 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. The programme of archaeological work 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 found than those specified in this report.

13 Copyright

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14 Archive

- 14.1 Online Access to the Index of archaeological investigationS (OASIS)
OASIS ID: substrat1-314451

The OASIS entry has been completed and the boundary file and report uploaded with no delay in publication.

14.2 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.

14.3 Archaeological Data Service (ADS)

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

14.4 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.

15 Acknowledgements

This project has been completed in three phases between 2012 and 2018. Substrata would like to thank Bill Horner, County Archaeologist, Devon County Council Environment Group and the Tiverton Archaeological Group (TAG) for commissioning us to complete this survey. We would also like to thank Isabel Richardson of TAG for her tireless project management. Finally, our thanks to the Ron Venner of Battens Farm and Peter Grabham of Watton Farm for their patience, cooperation and interest in this work.

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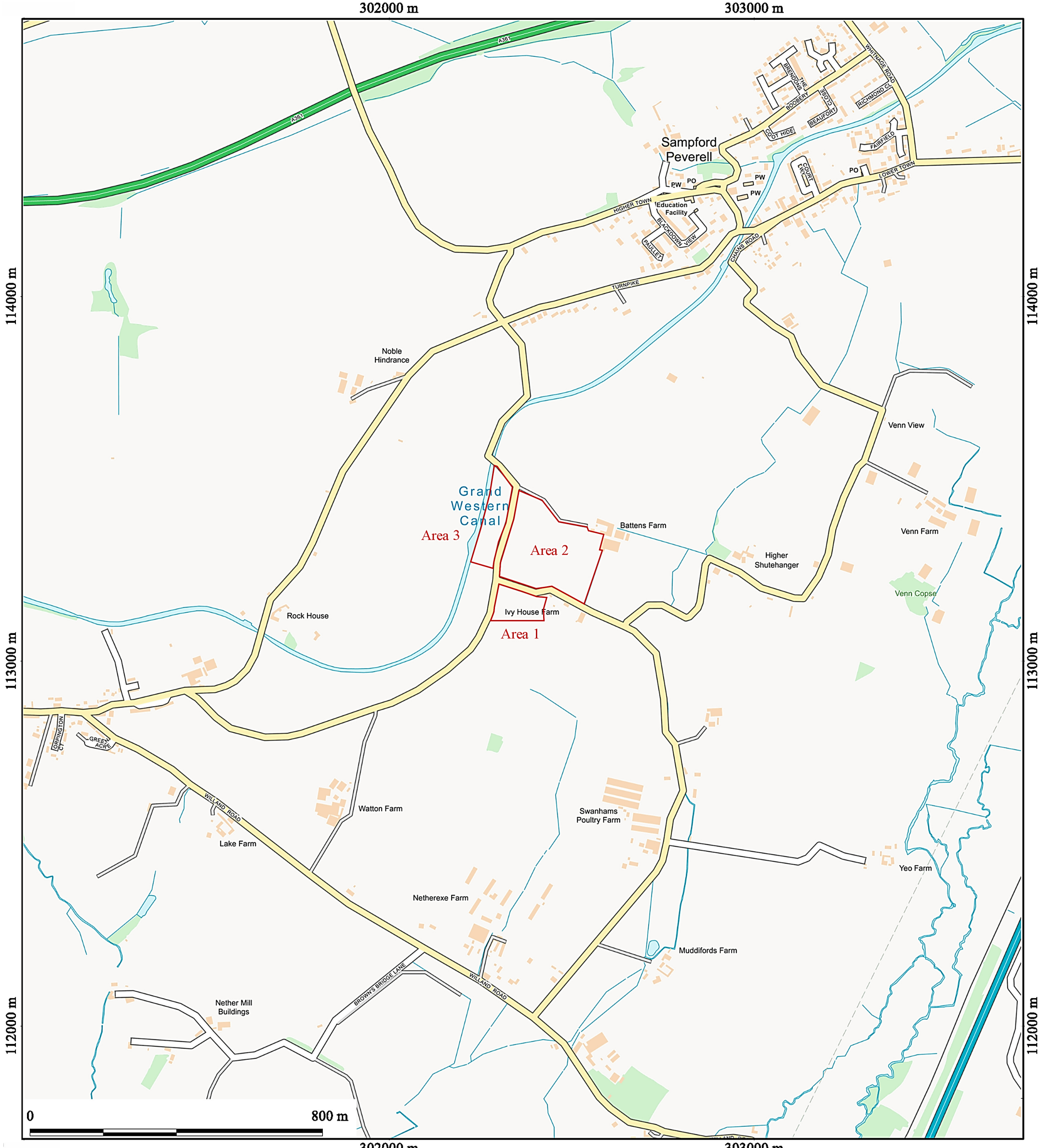
Soil Survey of England and Wales (1983) *Soils of South West England Sheet 5* 1:250 000, Southampton: Ordnance Survey

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.



British Grid
 centre X: 302365.96 m, centre Y: 113225.57 m

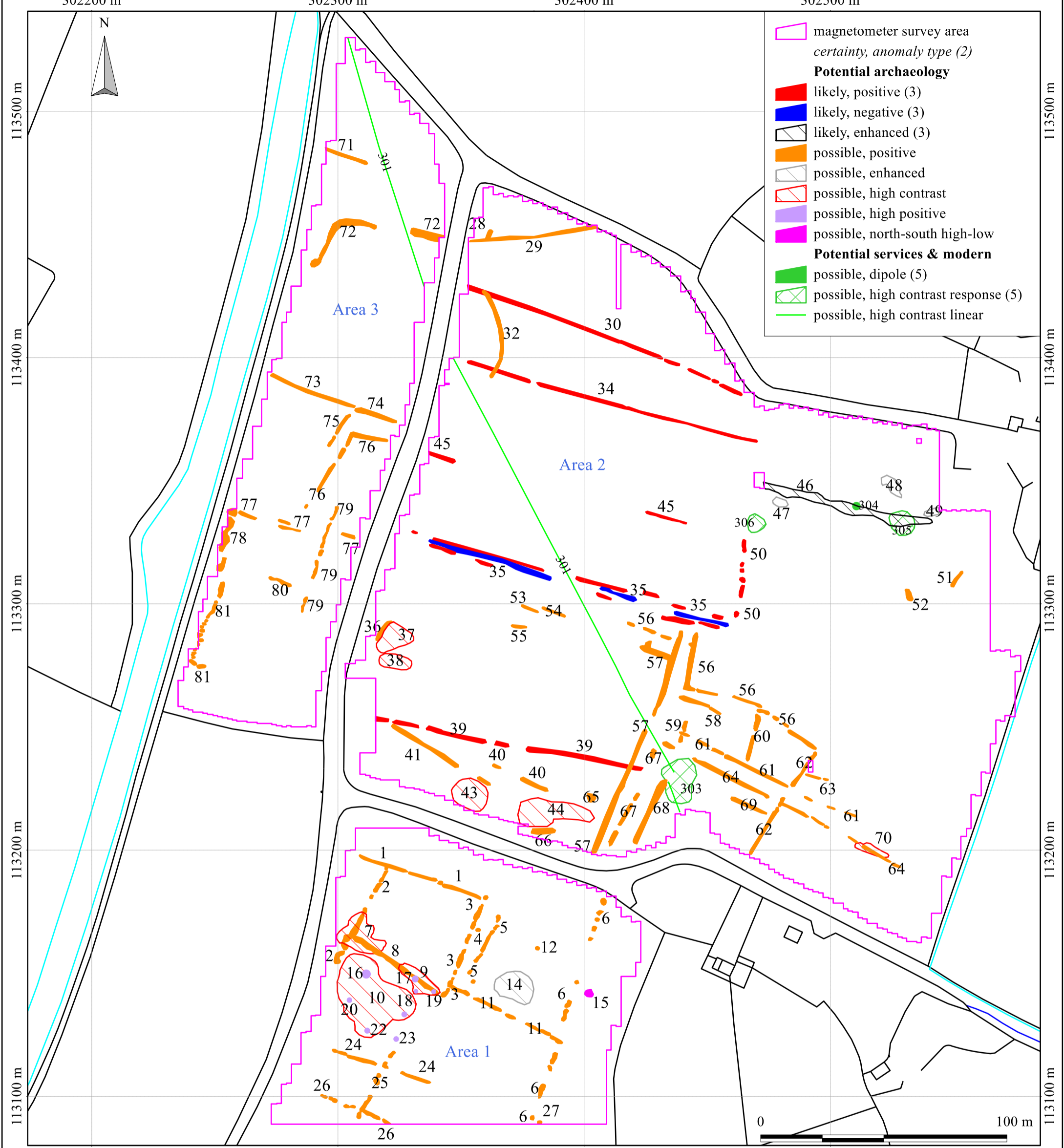
Geophysical survey: Copyright Substrata Limited.
 Base map: Ordnance Survey (c) Crown Copyright 2018.
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Scale: 1:10000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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 Report 1801BAT-R-1

Figure 1: location map

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British Grid
 centre X: 302379.64 m, centre Y: 113310.36 m

Geophysical survey: Copyright Substrata Limited.
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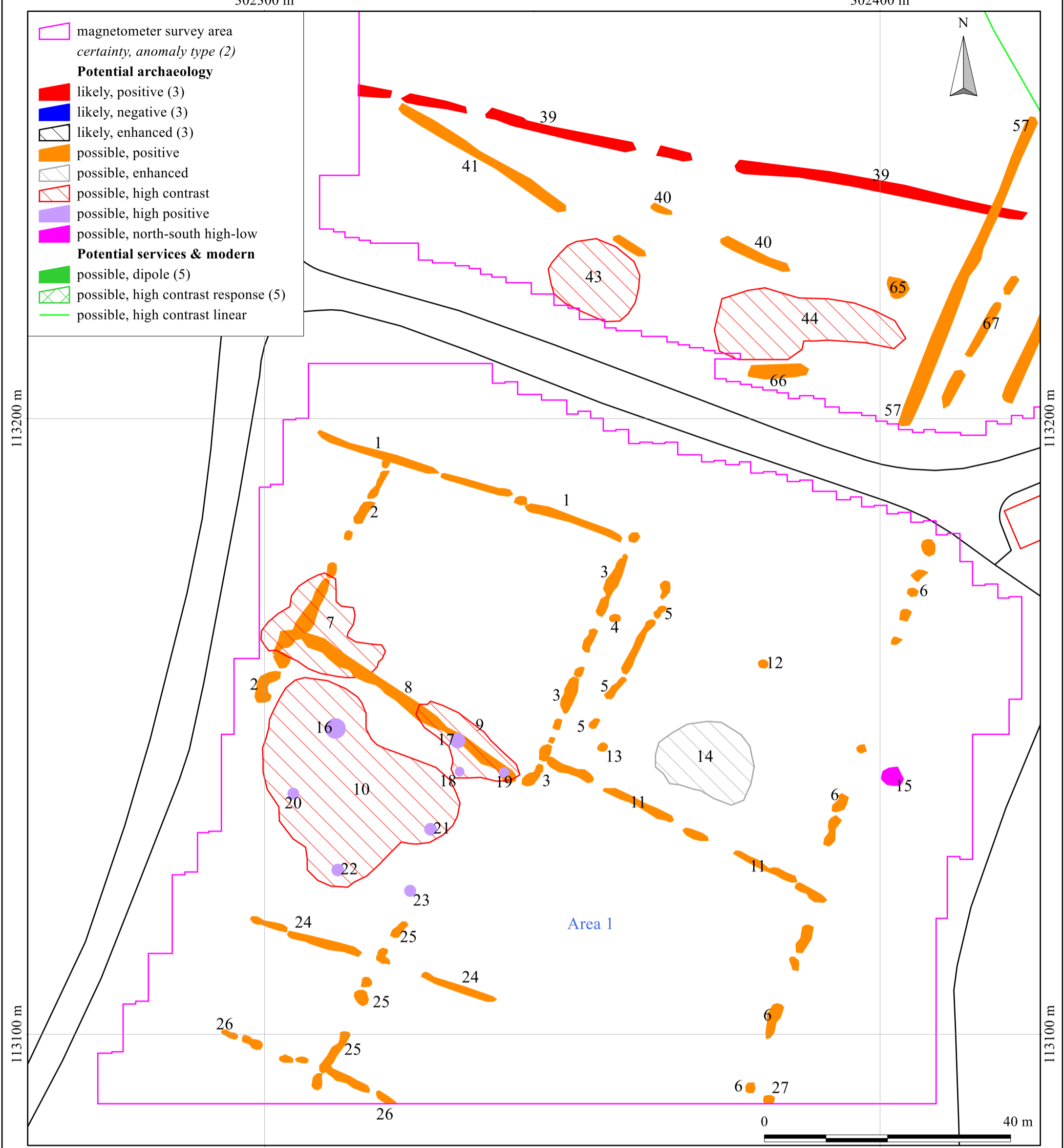
Scale: 1:1500 @ A3. Spatial Units: Meter. Do not scale off this drawing

- Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
 2. '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.

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Figure 2: survey interpretation, all areas

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British Grid
 centre X: 302343.78 m, centre Y: 113174.05 m

Geophysical survey: Copyright Substrata Limited.
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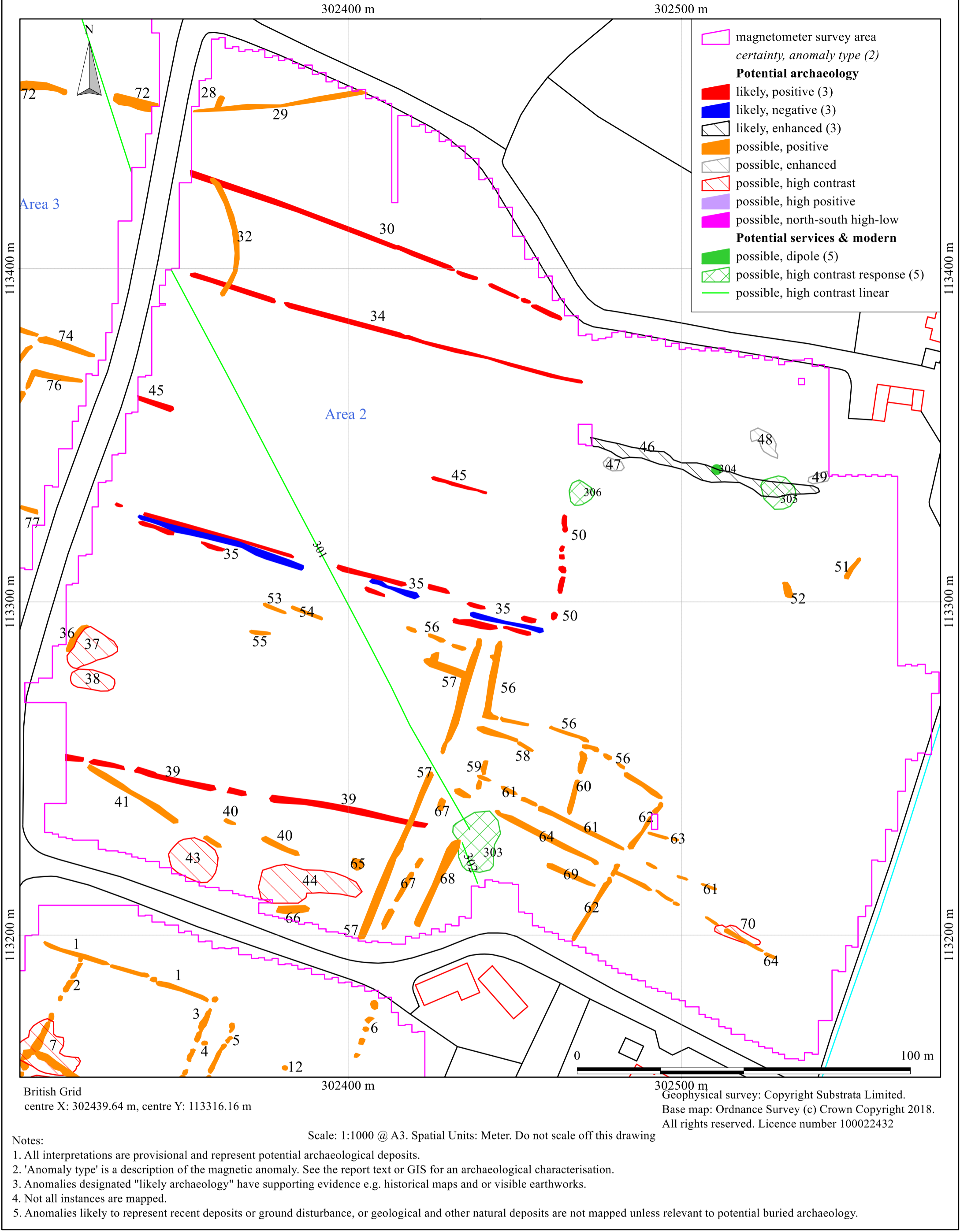
Scale: 1:600 @ A3. Spatial Units: Meter. Do not scale off this drawing

- 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.
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Figure 3: survey interpretation, Area 1

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British Grid
centre X: 302439.64 m, centre Y: 113316.16 m

302500 m
Geophysical survey: Copyright Substrata Limited.
Base map: Ordnance Survey (c) Crown Copyright 2018.
All rights reserved. Licence number 100022432

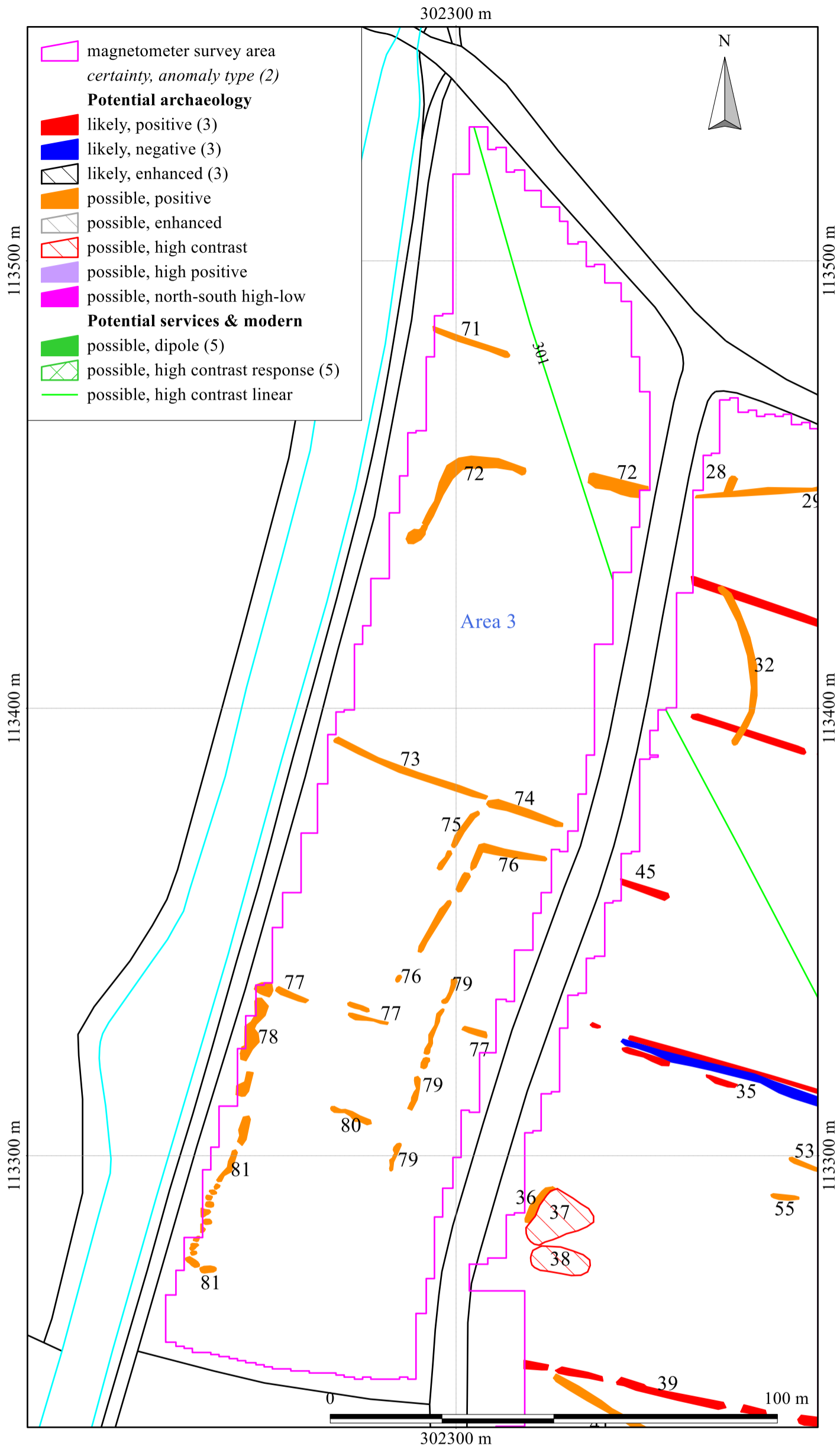
Notes: Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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.
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An archaeological magnetometer survey
Land at Battens Farm and Watton Farm, Halburton, Devon
Centred on NGR (E/N): 302420,113230
Report 1801BAT-R-1

Figure 4: survey interpretation, Area 2

Substrata Limited
Langstrath, Goodleigh
Barnstaple, Devon EX32 7LZ
Tel: 01271 342721
Email: enquiries@substrata.co.uk
Web: substrata.co.uk



British Grid
centre X: 302292.53 m, centre Y: 113395.80 m

Geophysical survey: Copyright Substrata Limited.
Base map: Ordnance Survey (c) Crown Copyright 2018.
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Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing



British Grid
 centre X: 302379.64 m, centre Y: 113310.36 m

Geophysical survey: Copyright Substrata Limited.
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Scale: 1:1500 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
 Land at Battens Farm and Watton Farm, Halburton, Devon
 Centred on NGR (E/N): 302420,113230
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Figure 6: shade plot of processed data, all areas

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British Grid
 centre X: 302343.78 m, centre Y: 113174.05 m

Geophysical survey: Copyright Substrata Limited.
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Scale: 1:600 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
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 Centred on NGR (E/N): 302420,113230
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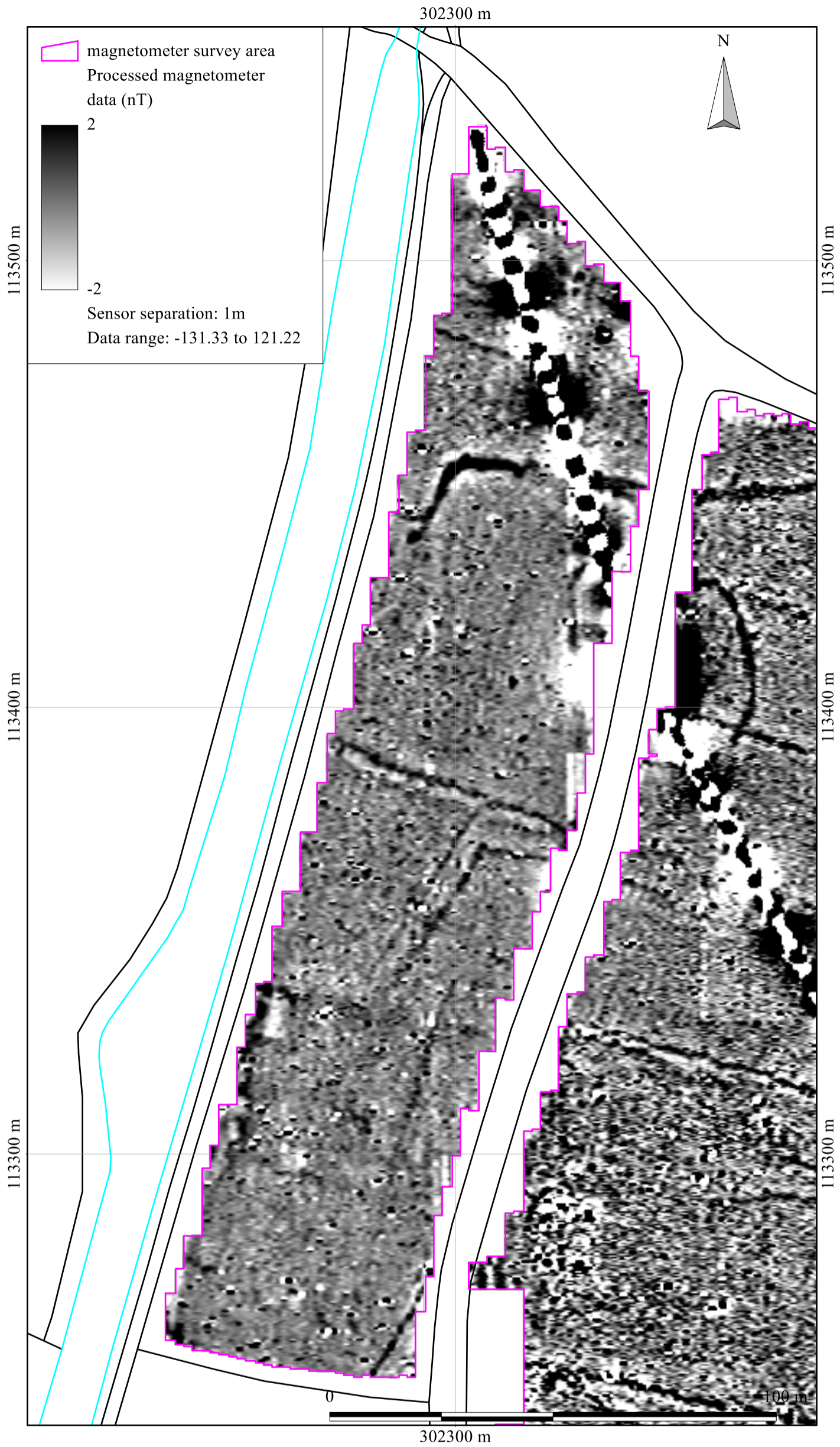
Figure 7: shade plot of processed data, Area 1



An archaeological magnetometer survey
Land at Battens Farm and Watton Farm, Halburton, Devon
Centred on NGR (E/N): 302420,113230
Report 1801BAT-R-1

Figure 8: shade plot of processed data, Area 2

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British Grid
centre X: 302292.53 m, centre Y: 113395.80 m

Geophysical survey: Copyright Substrata Limited.
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Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing



British Grid
 centre X: 302379.64 m, centre Y: 113310.36 m

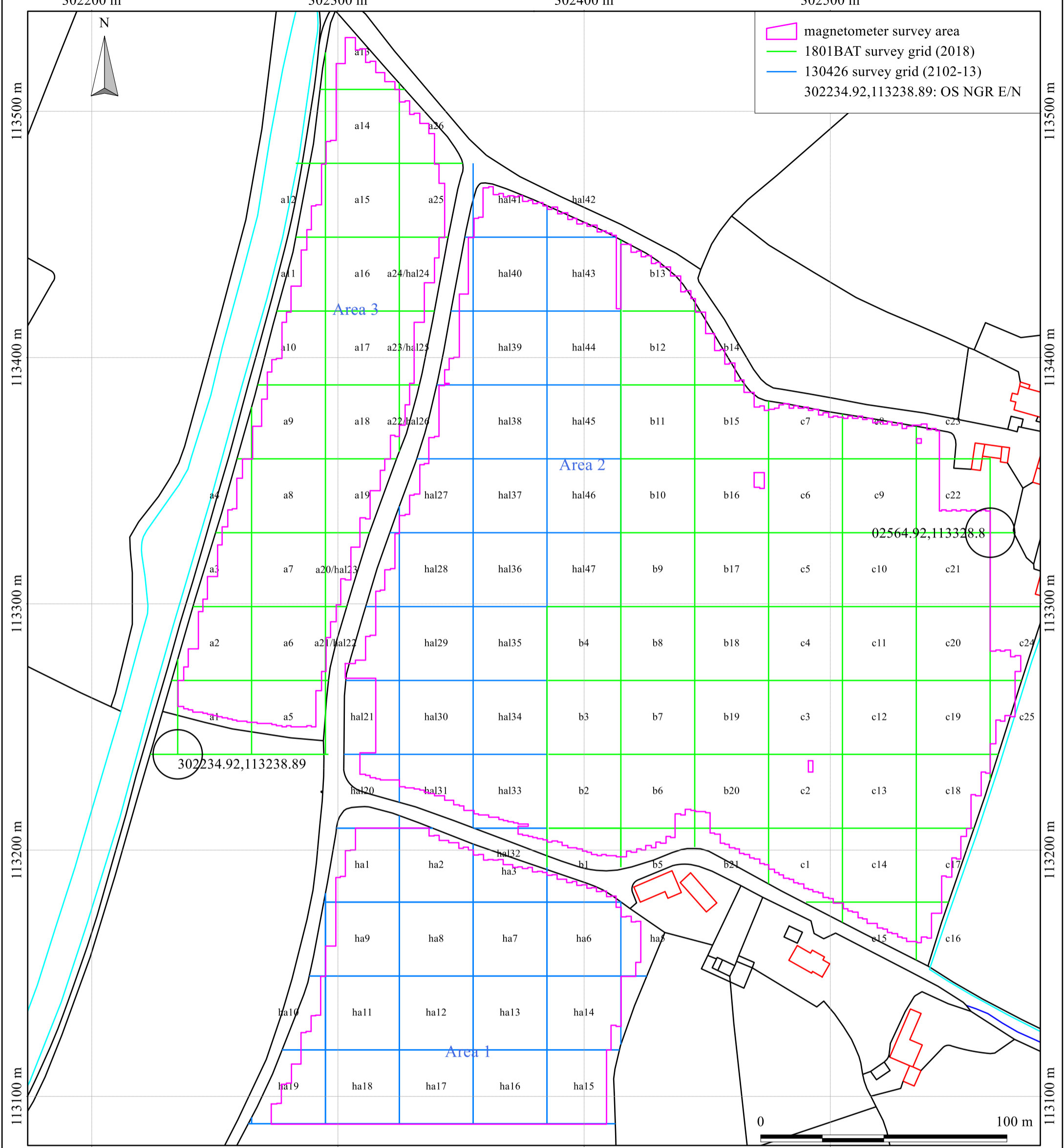
Geophysical survey: Copyright Substrata Limited.
 Base map: Ordnance Survey (c) Crown Copyright 2018.
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Scale: 1:1500 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
 Land at Battens Farm and Watton Farm, Halburton, Devon
 Centred on NGR (E/N): 302420,113230
 Report 1801BAT-R-1

Figure 10: shade plot of minimally processed data, all areas

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British Grid
centre X: 302379.64 m, centre Y: 113310.36 m

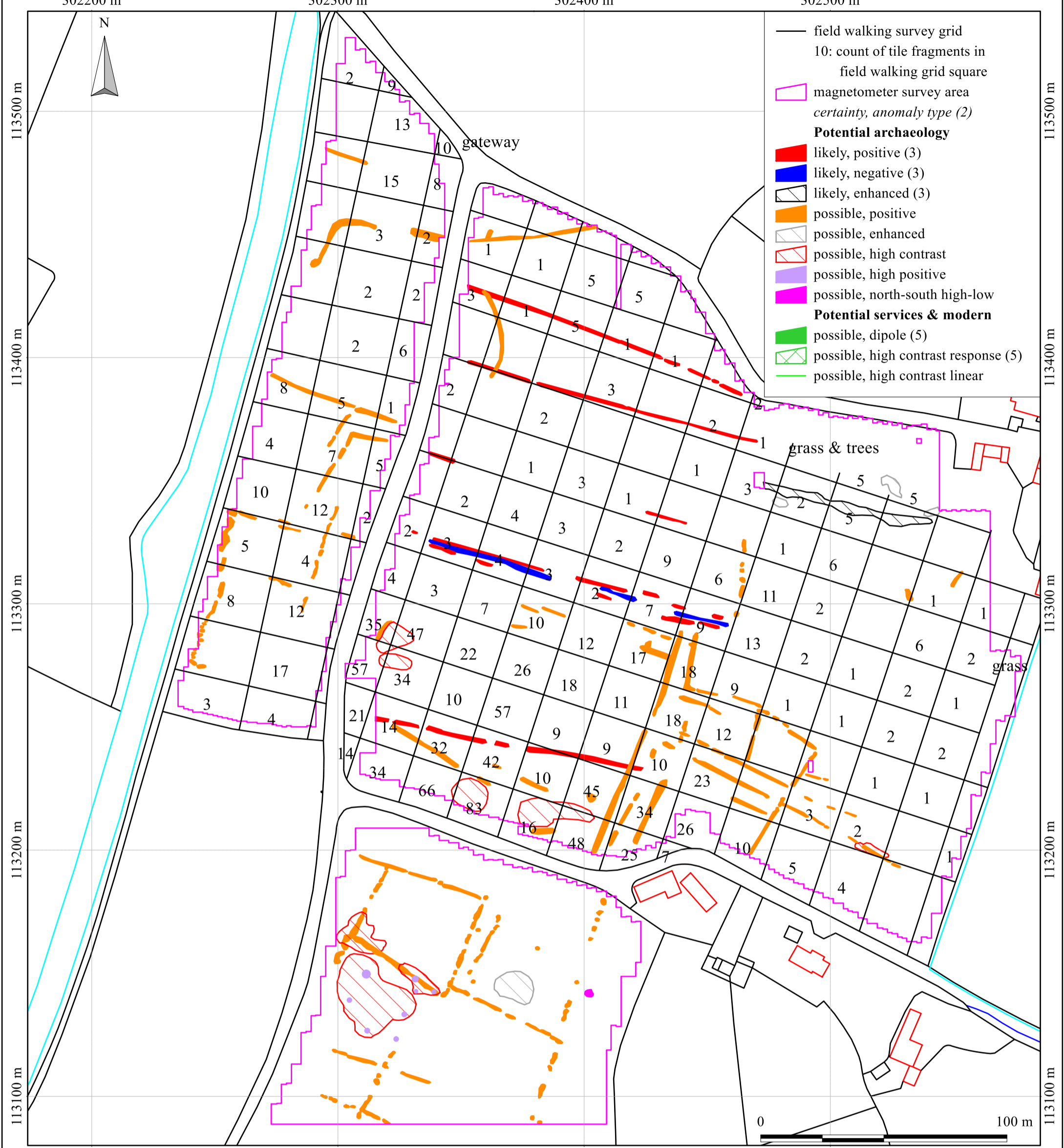
Geophysical survey: Copyright Substrata Limited.
Base map: Ordnance Survey (c) Crown Copyright 2018.
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Scale: 1:1500 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
Land at Battens Farm and Watton Farm, Halburton, Devon
Centred on NGR (E/N): 302420,113230
Report 1801BAT-R-1

Figure 11: survey grid plan and location (2012-13 and 2018)

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British Grid
 centre X: 302379.64 m, centre Y: 113310.36 m

Geophysical survey: Copyright Substrata Limited.
 Base map: Ordnance Survey (c) Crown Copyright 2018.
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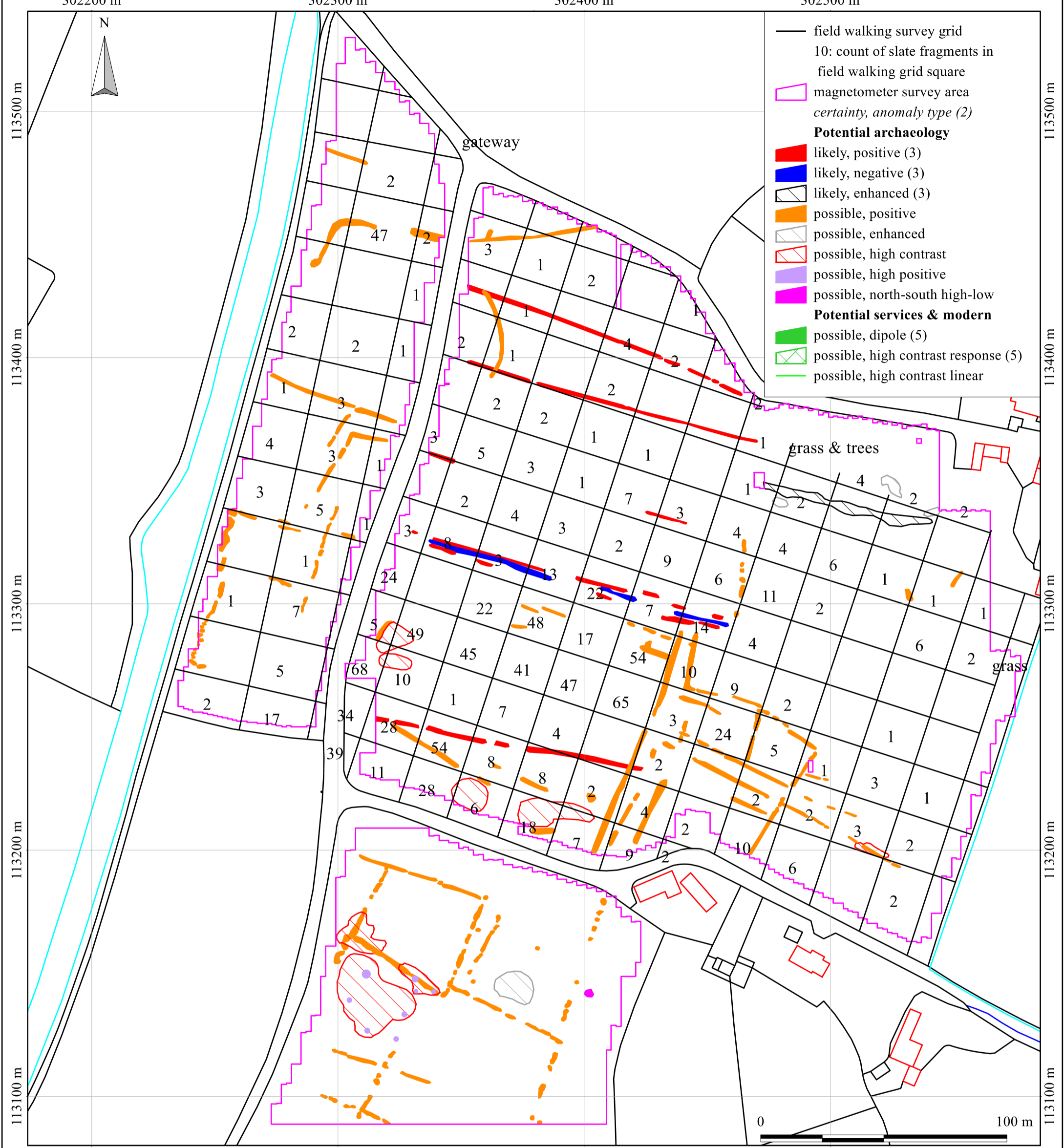
Scale: 1:1500 @ A3. Spatial Units: Meter. Do not scale off this drawing

- Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
 2. '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 Battens Farm and Watton Farm, Halburton, Devon
 Centred on NGR (E/N): 302420,113230
 Report 1801BAT-R-1

Figure 12: survey interpretation over a map of Tiverton Archaeology Group's field walking finds of Roman tile 2012-15

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British Grid
centre X: 302379.64 m, centre Y: 113310.36 m

Geophysical survey: Copyright Substrata Limited.
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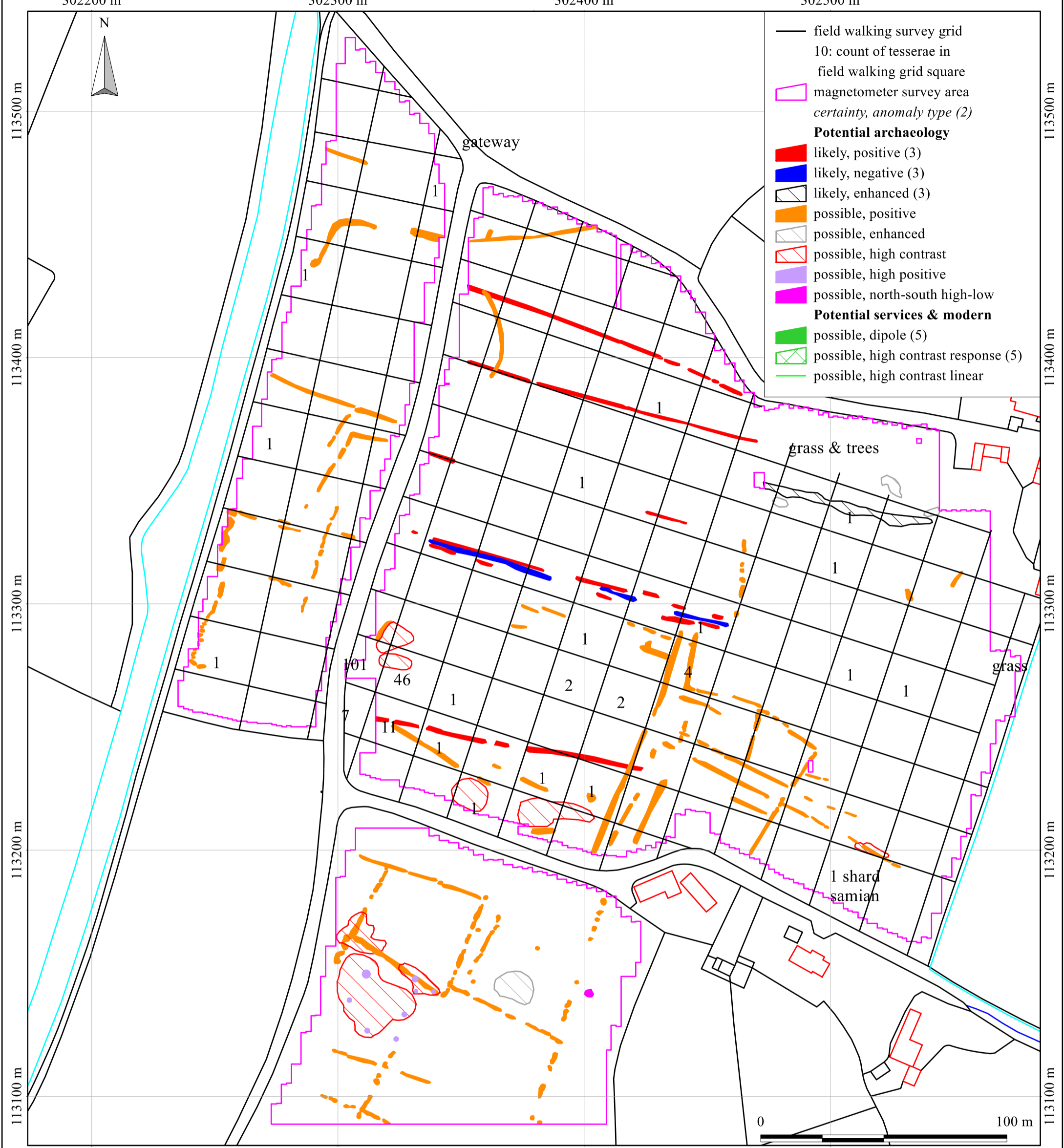
Scale: 1:1500 @ A3. Spatial Units: Meter. Do not scale off this drawing

- Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
 2. '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 Battens Farm and Watton Farm, Halburton, Devon
Centred on NGR (E/N): 302420,113230
Report 1801BAT-R-1

Figure 13: survey interpretation over a map of Tiverton Archaeology Group's field walking finds of Roman slate 2012-15

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- field walking survey grid
- 10: count of tesserae in field walking grid square
- magnetometer survey area
- certainty, anomaly type (2)*
- Potential archaeology**
- likely, positive (3)
- likely, negative (3)
- ▨ likely, enhanced (3)
- possible, positive
- ▨ possible, enhanced
- ▨ possible, high contrast
- possible, high positive
- possible, north-south high-low
- Potential services & modern**
- possible, dipole (5)
- ▨ possible, high contrast response (5)
- possible, high contrast linear

British Grid
 centre X: 302379.64 m, centre Y: 113310.36 m

Geophysical survey: Copyright Substrata Limited.
 Base map: Ordnance Survey (c) Crown Copyright 2018.
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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. '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 Battens Farm and Watton Farm, Halburton, Devon
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 Report 1801BAT-R-1

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Figure 14: survey interpretation over a map of Tiverton Archaeology Group's field walking finds of Roman tesserae 2012-15

Appendix 2 Tables

Site: An archaeological magnetometer survey
Land at Battons Farm, Halburton, Devon
Centred on NGR (E/N): 302420,113230
Report 1801BAT-R-1

area number	anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1	1		possible, positive	disrupted linear			
	2		possible, positive	disrupted linear			
	3		possible, positive	disrupted linear			anomaly disrupted by ploughing and strongly affected by high contrast magnetic anomaly groups
	4		possible, positive	oval	pit		anomaly is relatively strong and well defined in the data set
	5		possible, positive	disrupted linear			anomaly group has similar alignment to remnant ploughing but represents a possible feature
	6		possible, positive	disrupted linear			
	7		possible, high contrast	irregular	industrial/craft deposits and/or fired material		
	8		possible, positive	disrupted linear			anomaly disrupted by ploughing and strongly affected by high contrast magnetic anomaly groups
	9		possible, high contrast	irregular	industrial/craft deposits and/or fired material		
	10		possible, high contrast	irregular	industrial/craft deposits and/or fired material		
	11		possible, positive	disrupted linear			
	12		possible, positive	oval	pit		anomaly is relatively strong and well defined in the data set
	13		possible, positive	oval	pit		anomaly is relatively strong and well defined in the data set
	14		possible, enhanced	irregular	archaeological deposit, rubble or bedrock		
	15		possible, north-south high-low		in-situ heated deposits		may be ferrous material but anomaly pattern indicated possible heated deposits
	16		possible, high positive	ovoid	ferrous & burnt deposits		anomalies with very high positive values indicating presence of ferrous material and possibly burnt material
	17		possible, high positive	ovoid	ferrous & burnt deposits		anomalies with very high positive values indicating presence of ferrous material and possibly burnt material
	18		possible, high positive	ovoid	ferrous & burnt deposits		anomalies with very high positive values indicating presence of ferrous material and possibly burnt material
	19		possible, high positive	ovoid	ferrous & burnt deposits		anomalies with very high positive values indicating presence of ferrous material and possibly burnt material
	20		possible, high positive	ovoid	ferrous & burnt deposits		anomalies with very high positive values indicating presence of ferrous material and possibly burnt material
	21		possible, high positive	ovoid	ferrous & burnt deposits		anomalies with very high positive values indicating presence of ferrous material and possibly burnt material
	22		possible, high positive	ovoid	ferrous & burnt deposits		anomalies with very high positive values indicating presence of ferrous material and possibly burnt material
	23		possible, high positive	ovoid	ferrous & burnt deposits		anomalies with very high positive values indicating presence of ferrous material and possibly burnt material
	24		possible, positive	disrupted linear			
	25		possible, positive	disrupted linear			
	26		possible, positive	disrupted linear			western side is sketchy and anomalies here may be the result of fortuitously aligned natural deposits
	27		possible, positive	oval	pit		anomaly is relatively strong and well defined in the data set
2	28		possible, positive	linear			
	29	72	possible, positive	linear			
	30		likely, positive	linear	field boundary		anomaly group corresponds to a field boundary mapped between 1838 and 1890
	31		removed				
	32		possible, positive	curvilinear			
	33		removed				
	34		likely, positive	disrupted linear	field boundary		anomaly group corresponds to a field boundary mapped in 1838
	35		likely, positive/negative/positive	disrupted linear	field boundary - possible Devon Bank		anomaly group correspond to a field boundary mapped between 1838 and 1962
	36		possible, positive	curvilinear			1838 Halburton tithe map and Ordnance Survey maps 1889 1:2500 to 1962 1:2500
	37		possible, high contrast	irregular	industrial/craft deposits and/or fired material		
	38		possible, high contrast	irregular	industrial/craft deposits and/or fired material		
	39		likely, positive	disrupted linear	field boundary		anomaly group corresponds to a field boundary mapped between 1838 and 1980
	40		possible, positive	linear			1838 Halburton tithe map and Ordnance Survey maps 1889 1:2500 to 1980 1:10000
	41		possible, positive	linear			
	42		removed				
	43		possible, high contrast	irregular	industrial/craft deposits and/or fired material		
	44		possible, high contrast	irregular	industrial/craft deposits and/or fired material		

Table 1a: data analysis

Site: An archaeological magnetometer survey
 Land at Battons Farm, Halburton, Devon
 Centred on NGR (E/N): 302420,113230
 Report 1801BAT-R-1

area number	anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
2	45	76?	likely, positive	linear	field boundary	anomaly group corresponds to a field boundary mapped in 1838	1838 Halburton tithe map
	46		likely, enhanced	broad linear	field boundary	anomaly group corresponds to a field boundary mapped between 1838 and 1980	1838 Halburton tithe map and Ordnance Survey maps 1889 1:2500 to 1980 1:10000
	47		possible, enhanced	irregular		rubble	
	48		possible, enhanced	irregular		rubble	
	49		possible, enhanced	irregular		rubble	
	50		possible, positive	disrupted linear		anomaly group is reasonably close to the line of a former field boundary recorded on historic maps between 1838 and 1980	1838 Halburton tithe map and Ordnance Survey maps 1889 1:2500 to 1980 1:10000
	51		possible, positive	linear			
	52		possible, positive	broad linear	pit or natural deposit		
	53		possible, positive	linear			
	54		possible, positive	linear			
	55		possible, positive	linear			
	56		possible, positive	multilinear & curvilinear			
	57		possible, positive	multilinear			
	58		possible, positive	disrupted linear			
	59		possible, positive	disrupted linear			
	60		possible, positive	disrupted linear			
	61		possible, positive	disrupted linear			
	62		possible, positive	disrupted linear			
	63		possible, positive	disrupted linear			
	64	70	possible, positive	disrupted linear			
65		possible, positive	ovoid	pit?			
66		possible, positive	linear				
67		possible, positive	disrupted linear				
68		possible, positive	linear				
69		possible, positive	linear				
70	64	possible, high contrast	linear	industrial/craft deposits and/or fired material or spring			
2 3	301		possible, high contrast linear		ferrous pipe or cable		
2	302		possible, high contrast linear		ferrous pipe or cable		
	303		possible, high contrast response		ferrous material probably associated with services		
	304		possible, dipole		ferrous material		
	305		possible, high contrast response		ferrous material		
	306		possible, high contrast response		ferrous material		
3	71		possible, positive	linear			
	72	29	possible, positive	disrupted return			
	73	74	possible, positive	linear		anomaly group may be a continuation of 74	
	74	73	possible, positive	linear	lane?		
	75		possible, positive	disrupted linear	lane?		
	76	45?	possible, positive	disrupted return	lane? field boundary?	anomaly group coincides with a former field boundary mapped on the local tithe map but not on later OS maps	1838 Halburton tithe map
	77		possible, positive	parallel linears	former Devon bank?		
	78		possible, positive	disrupted linear			
	79		possible, positive	disrupted linear			
	80		possible, positive	linear			
	81		possible, positive	disrupted return			

Table 1b: data analysis (continued)

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.	
Equipment <i>Instrument:</i> Bartington Instruments grad601-2 <i>Firmware:</i> version 6.1	Data Capture <i>Sample Interval:</i> Area 1: 0.125m Areas 2 and 3: 0.25m <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> 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, all areas

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: 3.0.33.6	
Statistics Max: 139.29 Min: -122.35 Std Dev: 15.07 Mean: 0.43 Median: 0.00	Processing 1 Base Layer 2 Clip at 1.00 SD 3 De Stagger: Grids: All By: 0 intervals, 25.00cm 4 DeStripe Median Sensors: Grids: All 5 Interpolate: Match X & Y Doubled.

Table 3: processed data metadata, Area 1

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: 3.0.33.6	
Statistics Max: 593.81 Min: -588.67 Std Dev: 33.28 Mean: 1.02 Median: 0.00	Processing 1 Base Layer 2 DeStripe Median Sensors: Grids: All 3 Clip at 5.00 SD (to limit impact of interpolation on range & data) 3 Interpolate: Match X & Y Doubled (during export to the GIS).

Table 4: minimally processed data metadata, Area 1

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:	3.0.33.6
Statistics	Processing
Max:	82.99
Min:	-81.87
Std Dev:	7.10
Mean:	0.05
Median:	0.00
	1 Base Layer
	2 Search & Replace From: -3000 To: 3000 With: Dummy (Area: Top 309, Left 758, Bottom 330, Right 904)
	3 Clip at 1.00 SD
	4 Clip at 4.00 SD
	5 DeStripe Median Sensors: Grids: All
	6 De Stagger: Grids: All By: 0 intervals, 25.00cm
	7 De Stagger: Grids: a9.xgd By: 0 intervals, -25.00cm
	8 De Stagger: Grids: a18.xgd By: 0 intervals, 25.00cm
	9 De Stagger: Grids: a14.xgd By: 0 intervals, 25.00cm
	10 De Stagger: Grids: hal29.xgd hal35.xgd hal28.xgd hal36.xgd hal27.xgd hal37.xgd a22+hal26.xgd hal38.xgd By: 0 intervals, 25.00cm
	11 De Stagger: Grids: hal47.xgd hal46.xgd hal45.xgd hal44.xgd hal43.xgd hal42.xgd By: 0 intervals, 25.00cm
	12 De Stagger: Grids: hal39.xgd hal40.xgd hal41.xgd By: 0 intervals, 25.00cm
	13 De Stagger: Grids: hal40.xgd By: 0 intervals, 25.00cm
	14 De Stagger: Grids: hal28.xgd By: 0 intervals, 25.00cm
	15 De Stagger: Grids: hal36.xgd By: 0 intervals, 25.00cm
	16 De Stagger: Grids: hal29.xgd hal35.xgd By: 0 intervals, 25.00cm
	17 De Stagger: Grids: b1.xgd b2.xgd b3.xgd b4.xgd By: 0 intervals, 25.00cm
	18 De Stagger: Grids: b5.xgd b21.xgd c1.xgd c14.xgd c17.xgd b6.xgd b20.xgd c2.xgd c13.xgd c18.xgd b7.xgd b19.xgd c3.xgd c12.xgd c19.xgd c25.xgd b8.xgd b18.xgd c4.xgd c11.xgd c20.xgd c24.xgd b9.xgd b17.xgd c5.xgd c10.xgd c21.xgd b10.xgd b16.xgd c6.xgd c9.xgd c22.xgd b11.xgd b15.xgd c7.xgd c8.xgd c23.xgd By: 0 intervals, 25.00cm
	19 De Stagger: Grids: b19.xgd b18.xgd b17.xgd b16.xgd b15.xgd b14.xgd By: 0 intervals, -25.00cm
	20 De Stagger: Grids: c10.xgd c9.xgd c8.xgd By: 0 intervals, 25.00cm
	21 De Stagger: Grids: c6.xgd By: 0 intervals, 25.00cm
	22 De Stagger: Grids: b14.xgd By: 0 intervals, 25.00cm
	23 Move (Area: Top 120, Left 120, Bottom 179, Right 1319) to X 4, Y 0
	24 Move (Area: Top 90, Left 240, Bottom 119, Right 959) to X 4, Y 0
	25 Move (Area: Top 60, Left 240, Bottom 89, Right 599) to X 4, Y 0
	26 De Stagger: Grids: b8.xgd By: 0 intervals, -50.00cm
	27 Interpolate: Match X & Y Doubled.

Table 5: processed data metadata, Areas 2 and 3

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:	3.0.33.6
Statistics	Processing
Max:	1036.83
Min:	-1038.45
Std Dev:	74.34
Mean:	-0.14
Median:	0.00
	1 Base Layer
	2 DeStripe Median Sensors: Grids: All
	3 Clip at 5.00 SD (to reduce over-range interpolation of strong magnetic responses)
	4 Interpolate: Match X & Y Doubled (during export to the GIS).

Table 6: minimally processed data metadata, Areas 2 and 3

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 format
Raw grid & composite files:	DW Consulting TerraSurveyor 3 format xyz files
Final data processing composite files: (excluding interpolation processes)	DW Consulting TerraSurveyor 3 format xyz files
GIS project:	GIS project Manifold 8 .map format ESRI shape files
AutoCAD version of the survey interpretation: (if generated)	AutoCAD DXF
All project working files:	various (Table 3)

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

Metadata:	online form
Georeferenced survey boundary file:	ESRI shape file
Report:	Adobe PDF format

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.