Substrata
Archaeological Geophysical Surveyors

An archaeological gradiometer and resistance survey

Wooston Castle, Mortonhampstead, Teignbridge, Devon

Centred on NGR (E/N): 276588,089575 (point)

Report: 1508WOO-R-1

Ross Dean BSc MSc MA MCIfA

31 July 2017

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

Client
James Parry
National Trust Archaeologist
On behalf of the Woodland Trust
and the National Trust.

Substrata Limited
Company number: 10348811
Registered office: Unit 6 Bude Business Centre, Kings Hill Industrial Estate, Bude, Cornwall, England EX23 8QN

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Project archive

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:	magnetometer; twin-sensor fluxgate gradiometer twin-probe resistance
Dates:	magnetometer survey: between 23 March and 25 April 2017 resistance survey: between 28 April and 29 June 2017
Area:	magnetometer survey: 4.55ha resistance survey: 4.48ha
Lead surveyor:	Mark Edwards
Author:	Ross Dean

1.2 Client

James Parry, Archaeologist (Devon and Cornwall), National Trust, Cornwall Office, Lanhydrock, Bodmin, Cornwall PL30 4DE, on behalf of the Woodland Trust and the National Trust.

1.3 Site information

Site:	Wooston Castle
Civil Parish:	Mortonhampstead
District:	Teignbridge
County:	Devon
NGR:	SX 76588 89575 (point)
NGR E/N:	276588,089575 (point)
Post code:	EX6 6QA
Scheduled Monument:	List entry Number: 1003822 Wooston Castle
Historic Environment Entry:	MDV8292

1.4 Archive

OASIS number:	substrat1-290185
Archive:	At the time of writing, the archive of this survey will be held by Substrata. Depending on local authority policy, an archive of the unprocessed data may be deposited with the Archaeological Data Service

1.5 Introduction

This report was commissioned by James Parry, Archaeologist (Devon and Cornwall) on behalf of the Woodland Trust and the National Trust. It presents the results of an archaeological magnetometer survey and resistance survey at Wooston Castle hillfort. It primary purpose was to achieve a better understanding of the internal structure of the monument to inform future conservation and archaeological investigations. The survey area location is shown in Figure 1.

1.6 Summary

The magnetic and resistance responses were sufficient to be able to differentiate anomalies representing possible archaeological features.

A total of sixty-six magnetic anomaly groups and fifty-four resistance anomaly groups were mapped as representing archaeological deposits and features. The anomalies from both surveys recorded on the extant earthworks suggested that they were constructed with a relatively stony inner component and a relatively earthen outer component. Further, an inner earthen component was demonstrated for one extant bank and this pattern was hinted at for the other banks surveyed.

Numerous possible internal linear sub-divisions were recorded across the largest enclosure (Area A, Figure 2) and there may be a semi-circular structure in the southwestern corner of this enclosure. A potential sub-circular surface and a group of possible pits were recorded close by this potential structure. Further south there is some evidence for former earthworks that may have once enclosed Area B. There may also have been an earlier phase of earthworks

in Area C. There was good evidence for internal divisions in Area D along with possible craft or industrial activities such as metal working.

2 Survey aims and objectives

2.1 Aims

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

2.2 Objectives

1. Complete magnetometer and resistance surveys across the agreed survey areas.
2. Identify any anomalies that may be related to archaeological deposits, structures or artefacts.
3. Within the limits of the techniques and dataset, archaeologically characterise any such anomalies or patterns of anomalies.
4. Accurately record the location of the identified anomalies.
5. Produce a report based on the survey that is sufficiently detailed to inform any subsequent development on the survey area about the location and possible archaeological character of the recorded anomalies.

3 Methodology

The work was undertaken in accordance with the survey methodology statement (Dean, 2017).

The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system (Table 4).

Data processing was undertaken using appropriate software (Table 4), 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.

4 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).

5 Site description

5.1 Landscape and land use

The monument lies within the Dartmoor National Park and is situated in woodland on a prominent ridge on the southern side of the steep valley of the River Teign, Mortonhampstead, Teignbridge, Devon (Figure 1). The survey area was cleared of bracken, scrub and some woodland in preparation for the survey.

5.2 Geology

The solid geology across the survey area and surrounds is metamudstone of the Carboniferous Ashton Mudstone Member and Crackington Formation (undifferentiated). The superficial geology is not recorded in the source used (British Geological Society undated).

6 Archaeological background

6.1 Historic landscape characterisation (Devon County Council, undated)

Area A: ‘Rough ground with prehistoric remains’

Earthworks in this rough grazing ground, heathland or moorland preserve the remains of a prehistoric landscape. In this instance, this area is derived from

'Ancient woodland' that may date back to the medieval period.

Areas B to E: 'Other woodland'
Broad-leaved plantations, re-planted ancient woodland or secondary woodland that has grown up from scrub. In this instance, these woods are derived from 'Ancient woodland' that may date back to the medieval period.

6.2 Archaeological background

This section is not designed to provide a comprehensive understanding of the historic environment of the surrounding area and should not be used as a source for further work.

The Devon County Council Historic Environment Record (DHER) 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 (Table 1).

Referring to Table 1, Wooston Castle is referred to as a 'multivallate hillfort' in the DHER entry and as a 'slight univallate hillfort with extensive outworks' in the Scheduled Listing. A multivallate hillfort is a hilltop enclosure with defences composed of more than one bank and ditch whereas a univallate hillfort is a hilltop enclosure bounded by a single rampart usually accompanied by a ditch (Historic England, undated c). The reality is that the monument is complex and varies across its extent so far as adjacent banks are concerned.

Wooston Castle is a scheduled monument (1003822) and the following is adapted from the scheduling listing (Historic England, undated b):

The monument includes a slight univallate hillfort with extensive outworks. The hillfort survives as an oval inner enclosure measuring 160m long by 140m wide internally defined by a rampart. To the south the rampart is ditched externally and extends beyond the eastern side of the enclosure. There is an in-turned entrance to the south. 80m to the south is a second rampart and ditch connected to the first by a bank. The second rampart also has a south facing in-turned entrance. A rock cut hollow way meanders to the south east from this entrance. The hollow way is partially flanked on both sides by banks and extends through a third rampart and ditch. 220m to the south east is a fourth rampart and ditch with an in-turned entrance at the western end.

Slight univallate hillforts are defined as enclosures of various shapes, generally between 1ha and 10ha in size, situated on or close to hilltops and defined by a single line of earthworks, the scale of which is relatively small. They date to between the Late Bronze Age and Early Iron Age (eighth - fifth centuries BC), the majority being used for 150 to 200 years prior to their abandonment or reconstruction. Slight univallate hillforts have generally been interpreted as stock enclosures, redistribution centres, places of refuge and permanent settlements. The earthworks generally include a rampart, narrow level berm, external ditch and counterscarp bank, while access to the interior is usually provided by either simple gaps in the earthwork or an in-turned rampart. Outworks are limited to only a few examples.

The conclusion of an RCHM earthworks survey (Royal Commission for the Historical Monuments of England, 1981) states:

'The initial phase of development of Wooston Castle appears to have been the main enclosure and probably the hollow way, and versions of the outworks, all of which have traces of secondary work … The entrance gap of the enclosure appears to be original but if the hollow way formerly entered the enclosure here it must have been adjacent and curtailed at the time of the re-building.'

7 Methodology, results, discussion and conclusions

7.1 Scope and definitions

The two surveys were designed to record magnetic anomalies and resistance anomalies. The analysis of the data sets was designed to highlight anomalies and reflection patterns judged indicative of archaeological deposits, structures, features or past human activity.

The terms ‘archaeological deposit’, ‘structure’ and ‘feature’ refer to any artefacts, material deposits or disturbance of natural deposits thought to be the result of human activity, excluding recent land maintenance and farming.

The reader is referred to section 8.

7.1.1 Magnetometer survey

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

7.1.2 Resistance survey

A resistance anomaly is a local variation in the electrical resistance of a soil and is related to its porosity, permeability, saturation, and chemical nature of entrapped fluids (Heimmer and De Vore, 1995:30), all of which can be altered by past human activities. Higher concentrations of ions allow electrical current to pass more easily through the soil, creating a lower electrical resistance.

7.2 Results

The survey area was split into five sub-areas A to E to aid description (Figure 2).

The interpretations of the magnetometer and resistance surveys are summarised together in Figure 3 and individually in Figures 4 and 7. Figures 5 and 6 show the magnetometer interpretation at a more detailed scale and include the designations of the anomaly groups identified as possibly relating to archaeological and other deposits. Figures 8 and 9 do the same for the resistance survey. Tables 2 and 3 are extracts of the detailed analysis of the magnetometer and resistance survey data sourced from the attribute tables of the GIS project provided in the project archive.

Figure 3 to 9, Table 2 and Table 3 comprise the analysis of the survey data.

Various plots of the processed data as specified in Tables 5 to 7 are provided in Figures 10 to 13.

Figures 14 and 15 are plots of the unprocessed magnetometer data and the unprocessed resistance data respectively.

7.3 Discussion

7.3.1 General points

Discussion scope

Not all magnetic and resistance anomaly groups or radar reflection patterns identified in the figures and tables specified in Section 7.2 are necessarily discussed below. All identified anomaly groups are recorded in the GIS project held the survey archive.

Data collection

Although much of the ground had been cleared in preparation for the survey, the nature of the ground made it inevitable that data collection was occasionally restricted by trees and thick vegetation.

Data collection during the magnetometer survey was restricted as shown in the relevant figures due to the presence of relatively modern magnetic materials along boundaries and elsewhere within the survey area. Strong magnetic responses are likely to relate to these materials except where otherwise indicated in Figures 4 to 6.

Anomaly characterisation and mapping

There are a number of magnetic and resistance 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.

Anomalies thought to relate to natural features and recent man-made objects were only mapped where they comprised significant magnetic responses across the dataset that needed clarification.

Numerous dipole magnetic anomalies are scattered across the magnetometer data set. 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.

Data trends

A number of data trends were recorded in both the magnetometer and resistance data. Refer to Figure 2 for area designations, Figures 10 and 11 for the magnetometer data plots and Figures 12 and 13 for the resistance data plots.

There is a distinct northwest to southeast trend in both the magnetometer and resistance datasets across the western side of Area A and in Areas B, C and D. This trend is most likely to relate to underlying geology. There is also a west-south-west to east-north-east trend in both datasets on the western side of Area A which may relate to past cultivation. This latter trend is also visible in both the datasets for areas B and D. Area A also has a clear north-north-west to south-south-east trend in the magnetometer and resistance data on the eastern side which is likely to reflect former cultivation traces.

7.3.2 Area A (Figures 5 and 8, Tables 2 and 3)

The resistance data shows a clear structure of the extant monument banks comprising a stony inner component (resistance anomaly groups r1, r21, r23 and r31, possibly also r23) and a more earthen external component (anomaly groups r24, r26, r32 and r33). The same structure is recorded in the magnetometer data collected in the north of Area A with the stony element represented by magnetic anomaly group m2 and the earthen element by m1. It is not clear whether magnetic groups m5 and m6 are associated with the extant bank as a structural element, represent a different phase of construction or represent deposits built up against the sides of the extant bank since its construction.

The external earthen bank is recorded in the south of Area A by groups m40 and r22. Whilst resistance anomaly r21 clearly records the stony inner component on the southern bank of Area A, no equivalent is recorded in the magnetometer data. This is not unusual when comparing magnetometer and resistance data and it is prudent to consider the evidence of both datasets, if available, when deducing structural components of potential archaeological features. Resistance anomaly groups r20 and r28 are most likely to represent two ditches or parts or a single ditch but it is not clear whether they are part of the structure of the extant bank or separate archaeological deposits.

The southwestern section of Area A has a series of clear linear trends likely to represent stony deposits (groups m34, r3, r8, r10 and r18) and earthen deposits (m35, m37, m38, m39,r4, r7, r9, r17 and r20). It is not clear whether these deposits can be understood as banks and ditches or banks with stony and earthen components as discussed above.

The resistance data collected in the southwest of Area A appears to have a semi-circular set of deposits (groups r14 and r15) which may be archaeological deposits. Additionally, the

adjacent group of low resistance anomaly group r19 may reflect either archaeological pits or tree boles. Group r11 may relate to a large pit or a sub-circular surface.

On the eastern side of Area A, magnetic anomaly groups m17 to m20 reflect a set linear deposits, possibly of more than one phase of construction. Groups m23 and m24 represent a similar, if simpler, set of deposits. Neither sets are represented in the resistance data. These two sets of anomaly groups may represent internal structures associated with the monument, earlier phases of the monument external bank or agricultural terracing.

A possible and unmapped bank with a stony inner and earthen outer elements may be represented by magnetic anomaly groups m44 and m45. An inner earthen element, either structural or resulting from soil build up against the proposed bank, may be represented by m46.

7.3.3 Area B (Figures 6 and 9, Tables 2 and 3)
Magnetic anomaly groups m51 to m53 along with group m50 may represent an earlier phase of earthworks than that reflected by the extant earthworks in the vicinity. If so, then the implication is that some enclosure earthworks once turned north-east at this point. An alternative and prosaic explanation for these anomalies is that they represent relatively recent ground disturbance by vehicles.

Resistance anomaly groups r34 and r35 represent relatively earthen and stony deposits respectively an, as such, may represent a ditch and either a bank or up cast from the ditch construction. Equally, they could represent an earlier phase of the adjacent modern track. The origins and archaeological potential of resistance groups r36 to r38 are not clear and groups r37 and r38 may reflect natural deposits.

7.3.4 Area C (Figures 6 and 9, Tables 2 and 3)
The pair of magnetic anomaly groups m64 and m65 and may represent fragments of a linear archaeological deposit such as a ditch. Group m66 may represent a similar deposit.

Resistance anomaly groups r39, r40, r44 and r45 may represent natural deposits but feasibly could represent an earlier phase of the extant earthworks in this area. Groups r41, r42 and r43 are more likely to represent such an earlier phase of earthwork construction.

7.3.4 Area D (Figures 6 and 9, Tables 2 and 3)
Magnetic groups m54 and m55 and resistance groups r47, r48 and r49 represent deposits associated with the extant bank. The resistance anomalies here show a clear stony core (r48) with earthen external components (r47 and r49) of the bank. It is likely that group r46 represents a deposit within the modern track.

Elsewhere within Area D the magnetic and resistance anomaly groups show different elements of the potential archaeology. The magnetic data points towards craft or industrial activities with possible strongly heated, in-situ deposits represented by m60 and m62. If these indeed represent such deposits, they are likely to be derived from metal working. The enhanced magnetic responses of anomaly groups m56 and m63 may also highlight areas of archaeological activity.

In contrast with the magnetic data, the resistance data displays a bias towards potential structural archaeological deposits with two possible ditches (groups r50/r53 and group r54) and possible bank footings (groups r51 and r52).

7.3.5 Area E (Figures 6 and 9, Tables 2 and 3)
No anomaly groups relating to potential archaeological deposits were recorded in Area E.

7.4 Conclusions

The magnetic and resistance responses were sufficient to be able to differentiate anomalies representing possible archaeological features.

A total of sixty-six magnetic anomaly groups and fifty-four resistance anomaly groups were mapped as representing archaeological deposits and features. The anomalies from both surveys recorded on the extant earthworks suggested that they were constructed with a relatively stony inner component and a relatively earthen outer component. Further, an inner earthen component was demonstrated for one extant bank and this pattern was hinted at for the other banks surveyed.

Numerous possible internal linear sub-divisions were recorded across the largest enclosure (Area A, Figure 2) and there may be a semi-circular structure in the southwestern corner of this enclosure. A potential sub-circular surface and a group of possible pits were recorded close by this potential structure. Further south there is some evidence for former earthworks that may have once enclosed Area B. There may also have been an earlier phase of earthworks in Area C. There was good evidence for internal divisions in Area D along with possible craft or industrial activities such as metal working.

8 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.

9 Acknowledgements

Substrata would like to thank James Parry, Archaeologist (Devon and Cornwall), National Trust, Cornwall Office for managing the project and all the National Trust staff and volunteers who helped clear the ground and otherwise made our survey possible.

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Appendix 1 Figures

British Grid
centre X: 276560.51 m, centre Y: 89711.60 m

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

An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead
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Figure 1: location map

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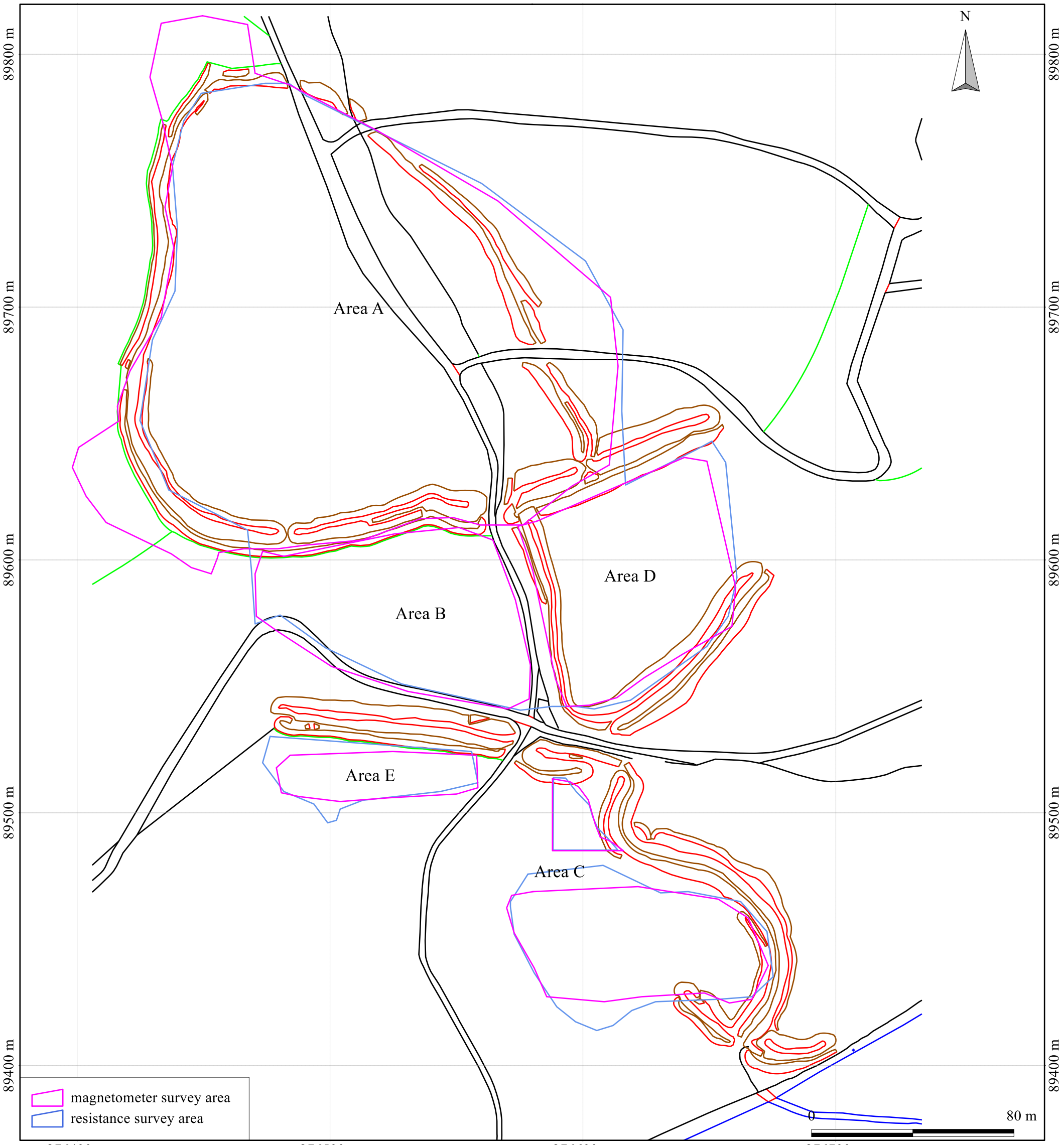
Langstrath, Goodleigh
Barnstaple, Devon EX32 7LZ
Tel: 01271 342721
Email: geophysics@substrata.co.uk
Web: substrata.co.uk



British Grid
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An archaeological magnetometer and resistance survey
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Figure 2: survey areas A to E

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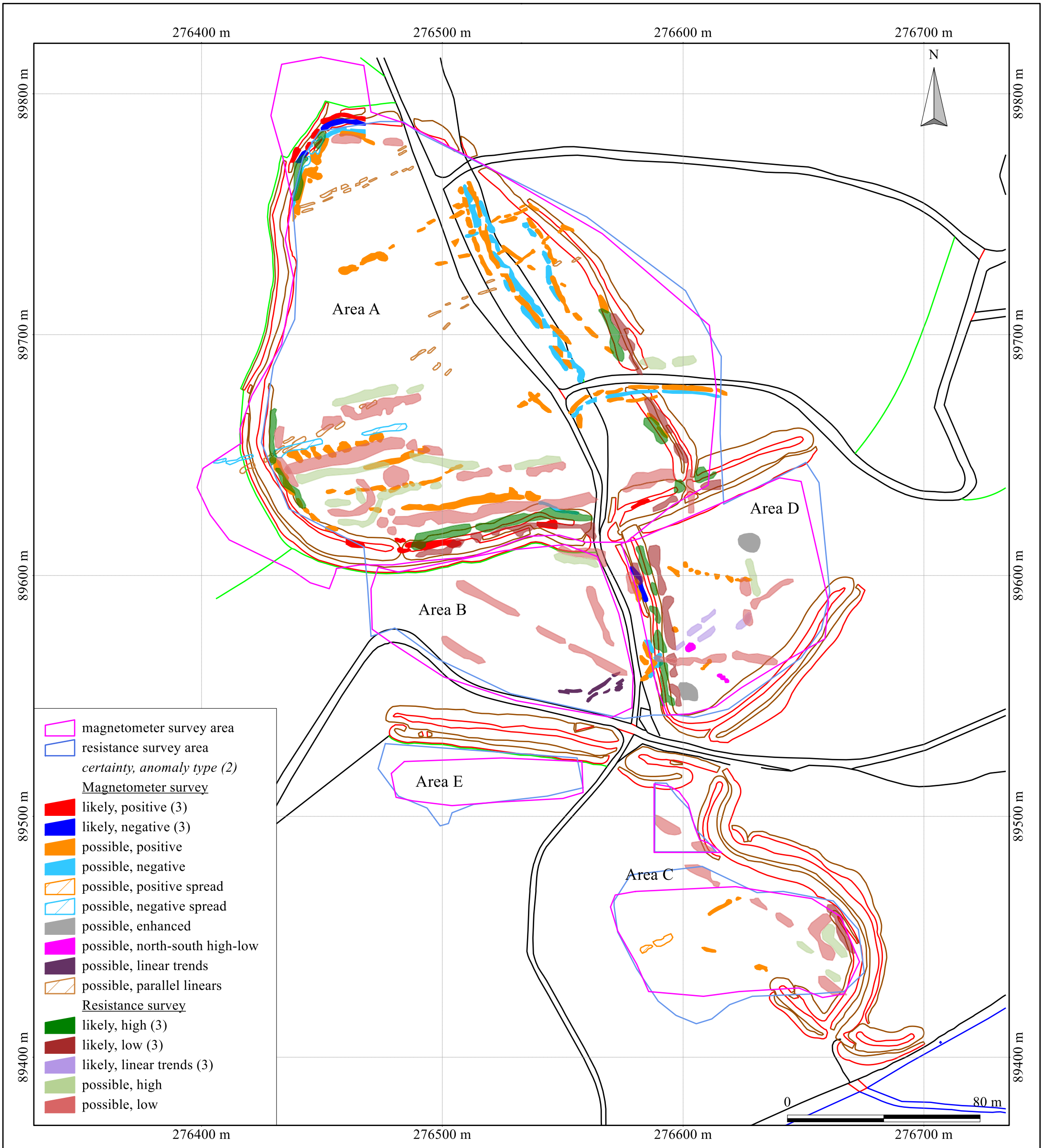

British Grid
centre X: 276532.88 m, centre Y: 89596.34 m

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 geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

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Figure 3: magnetometer and resistance survey interpretation (archaeology only)

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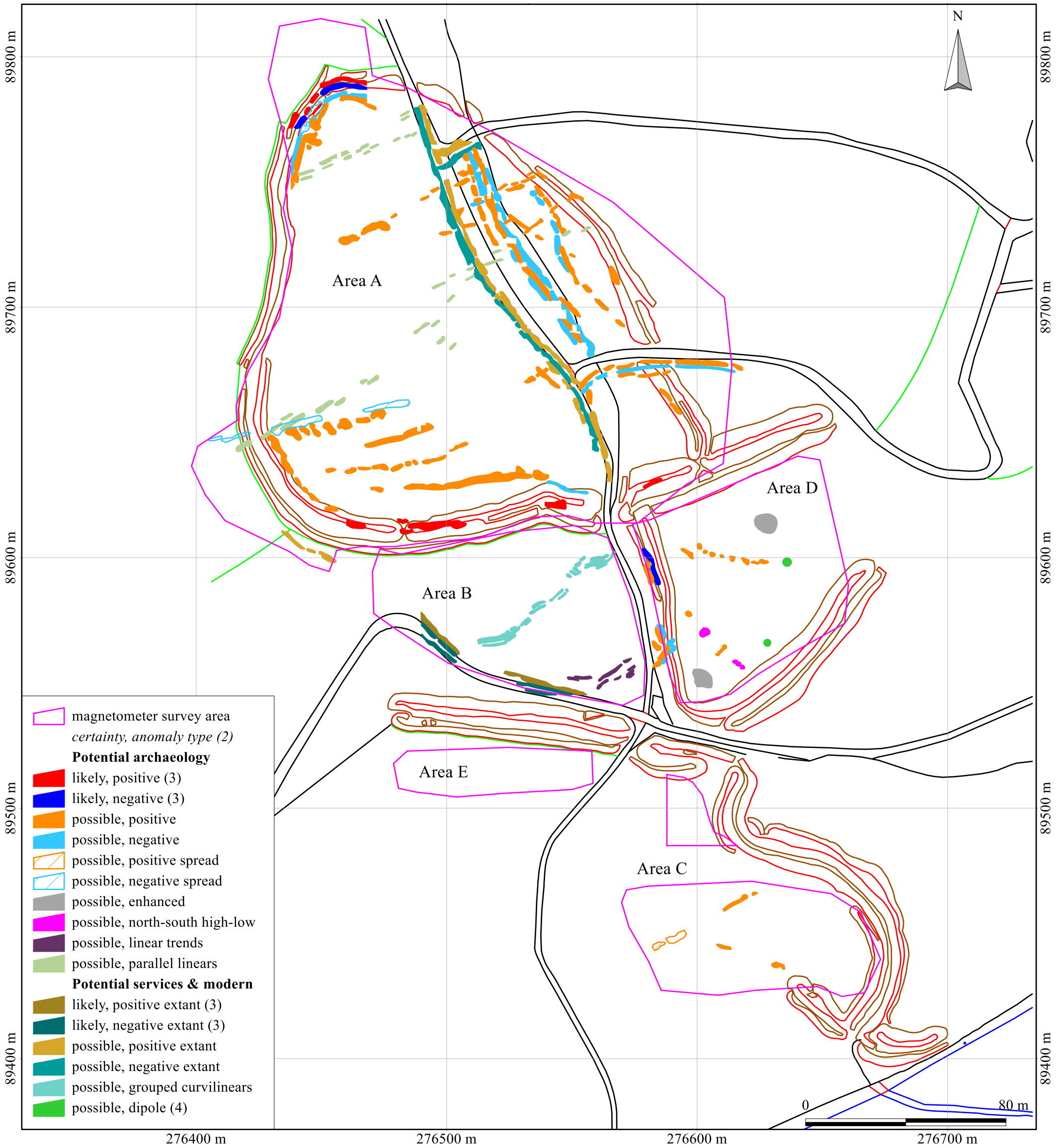

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Figure 4: magnetometer survey interpretation

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Tel: 01271 342721
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Web: substrata.co.uk

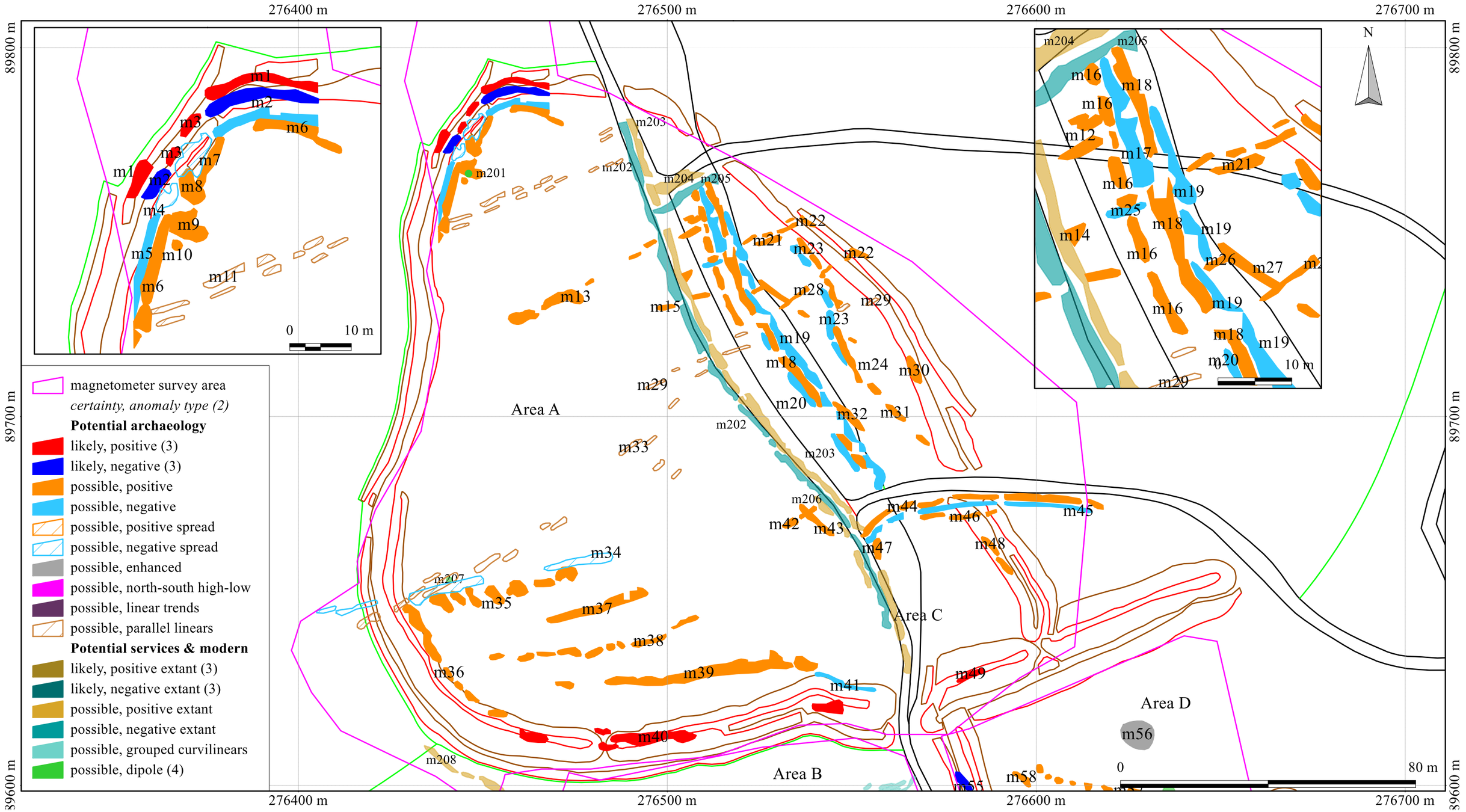

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Figure 5: magnetometer survey interpretation, Area A

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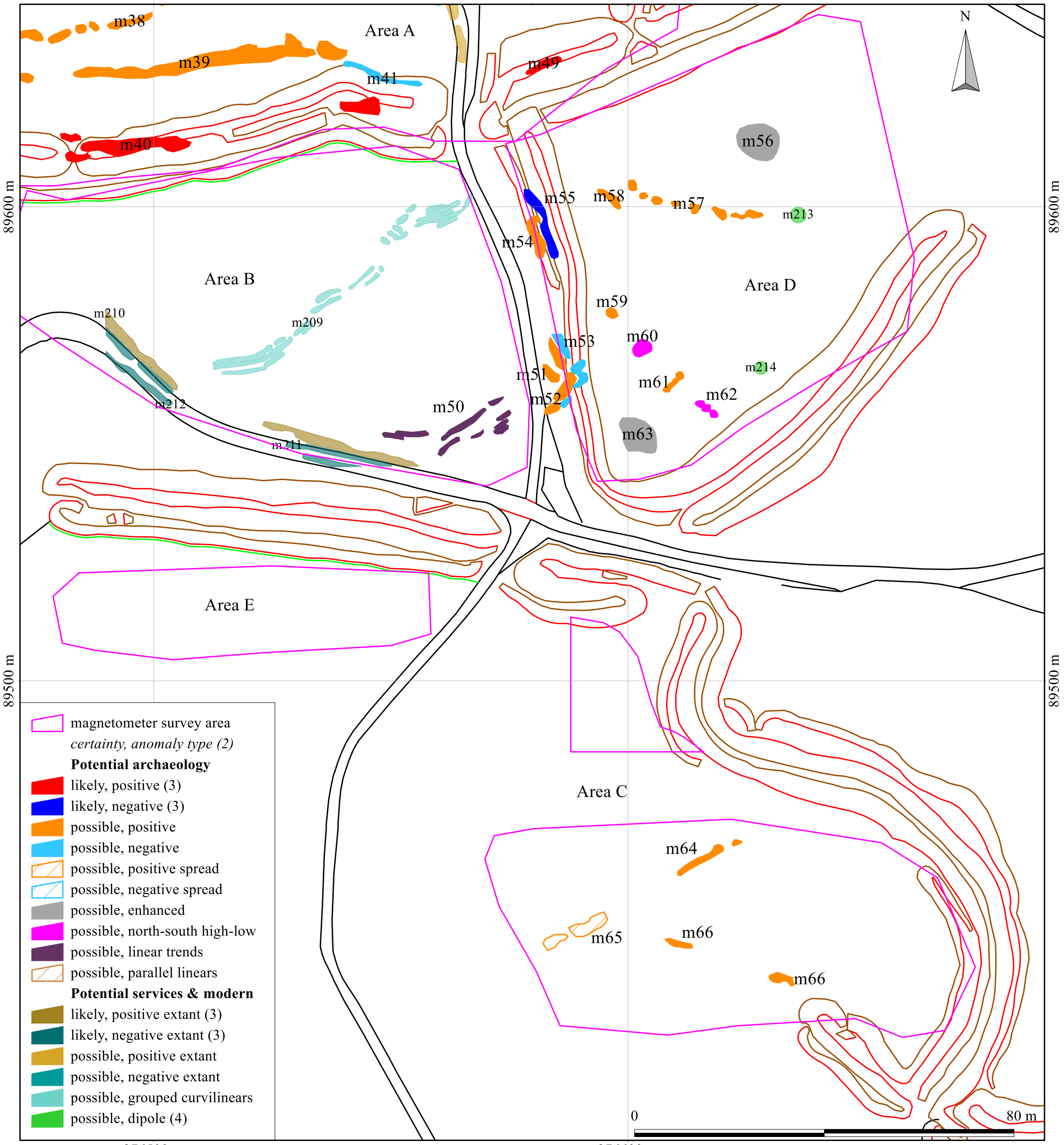
Barnstaple, Devon EX32 7LZ
Tel: 01271 342721
Email: geophysics@substrata.co.uk
Web: substrata.co.uk



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Notes:
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Figure 6: magnetometer survey interpretation, Areas B, C, D and E

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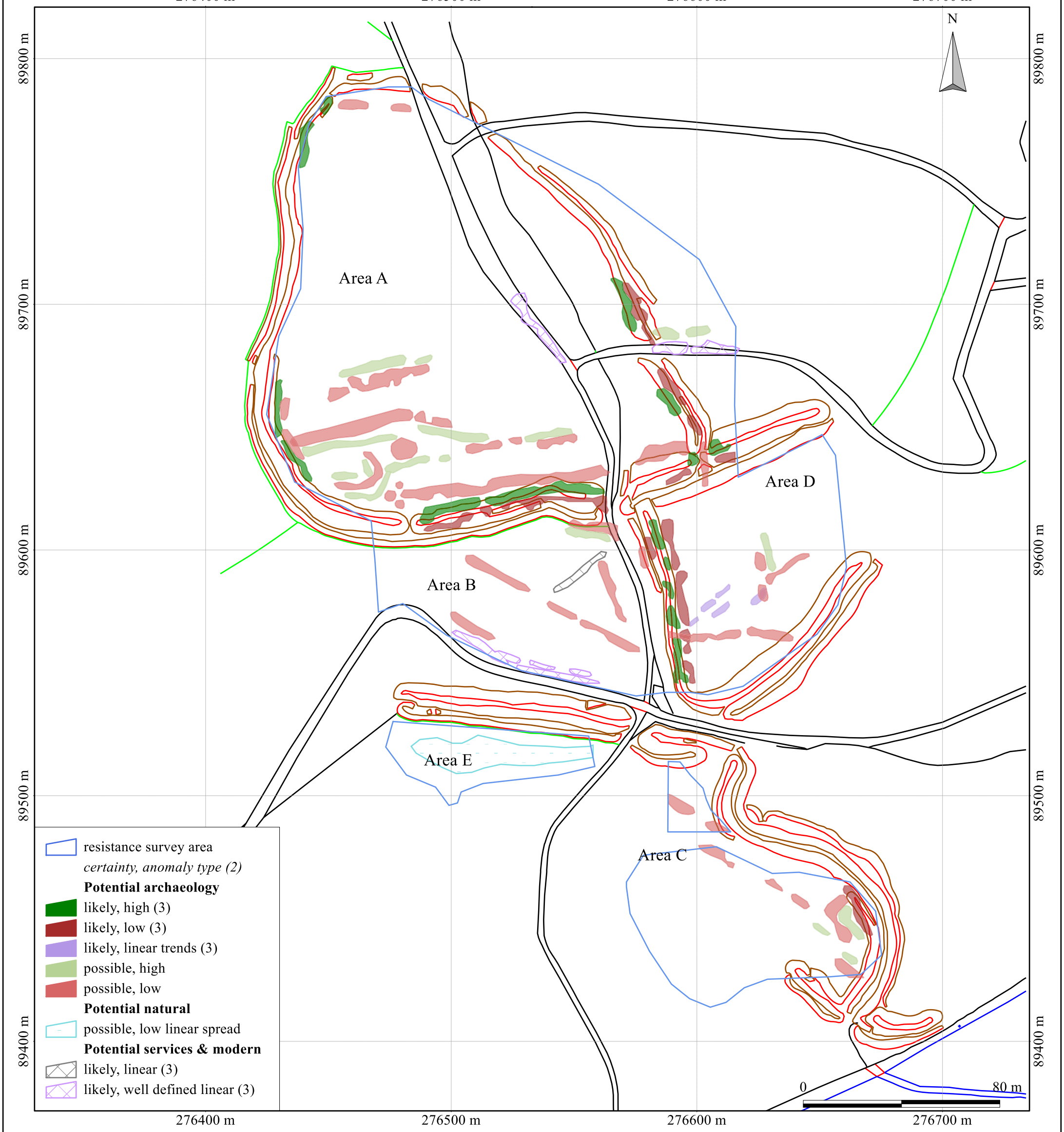
Email: geophysics@substrata.co.uk
Web: substrata.co.uk



British Grid
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Figure 7: resistance survey interpretation

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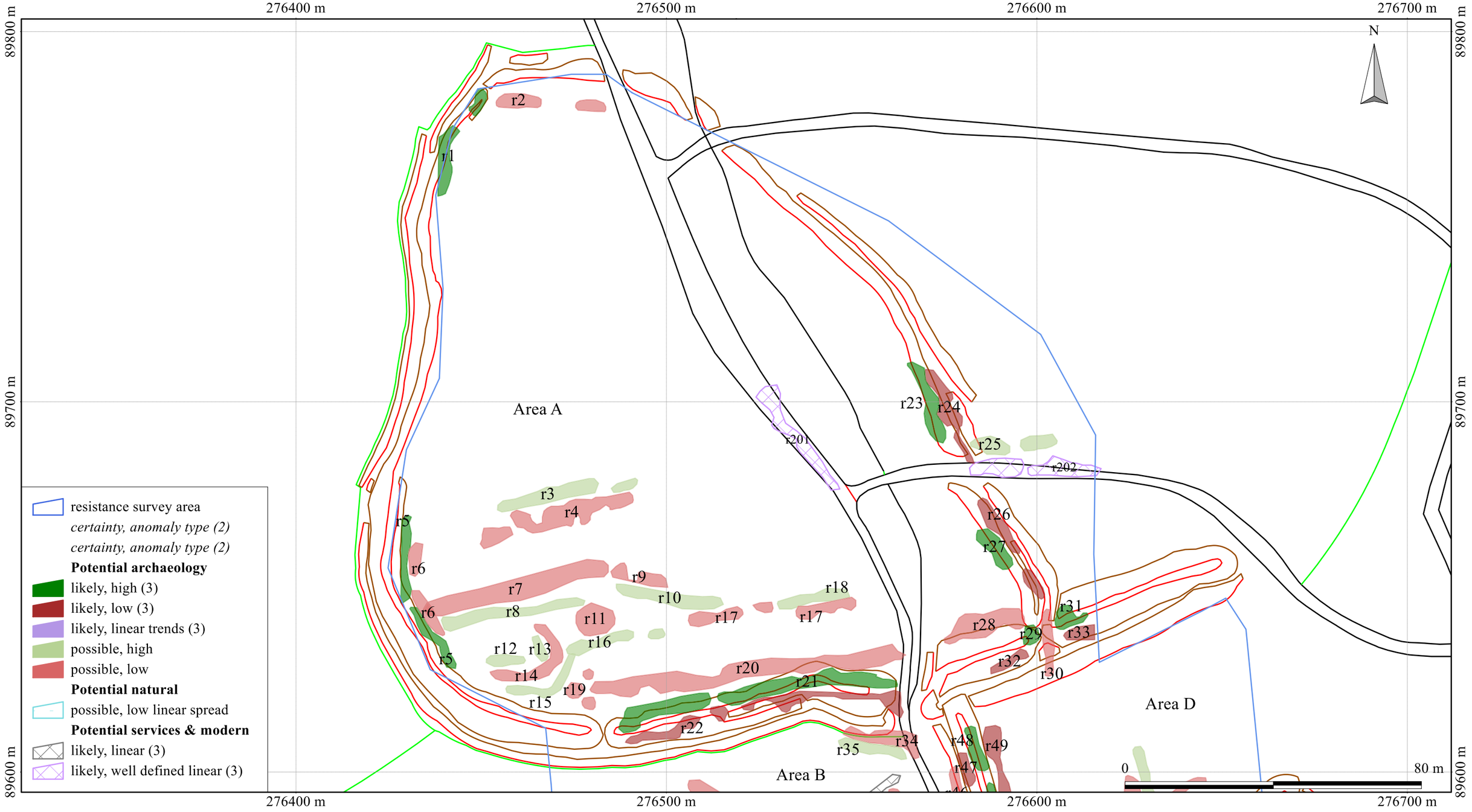
Email: geophysics@substrata.co.uk
Web: substrata.co.uk



British Grid
centre X: 276518.86 m, centre Y: 89698.99 m

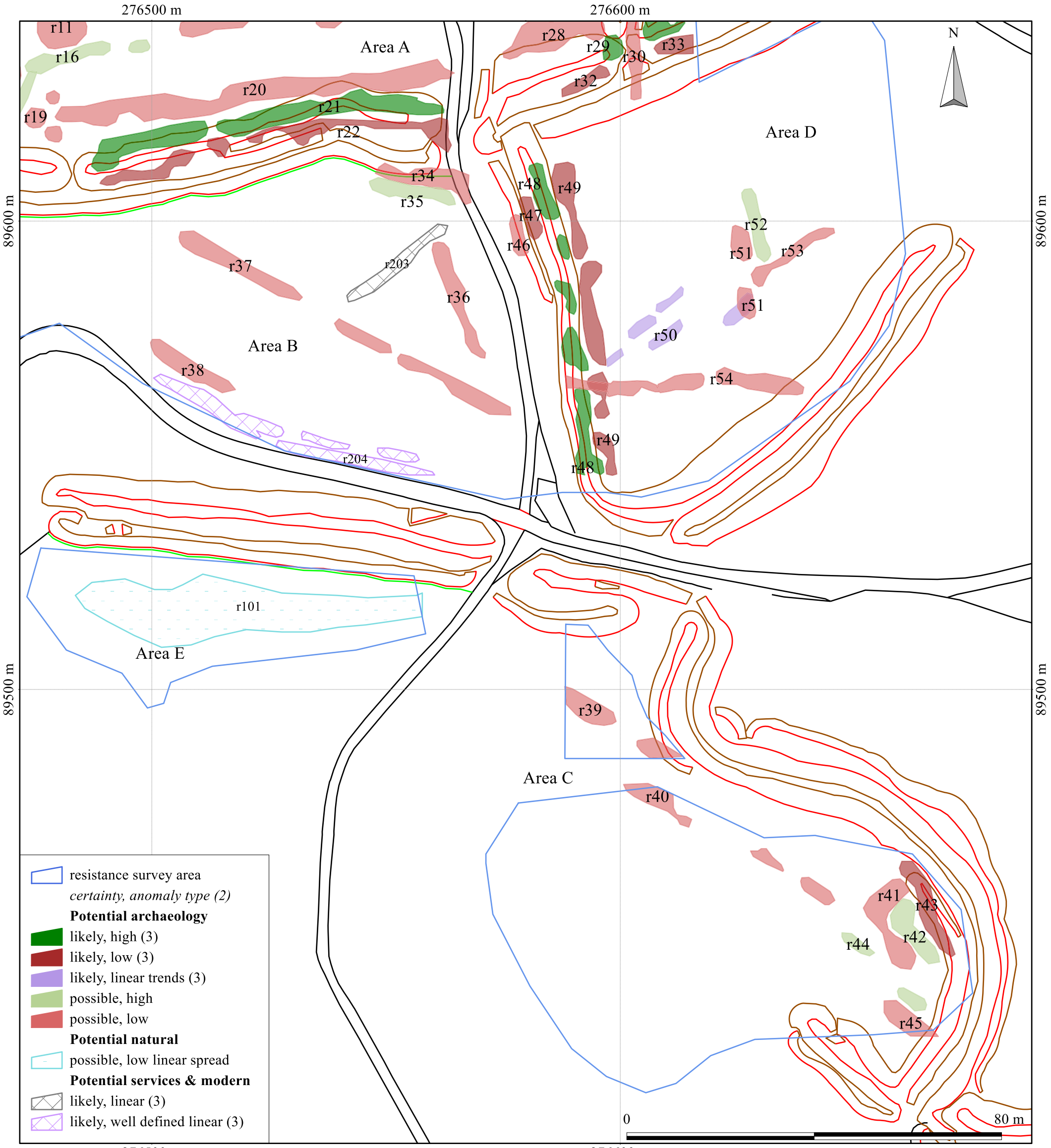
Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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 geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead
Teignbridge, Devon
Centred on NGR (E/N) 276588,089575
Report: 1508WOO-R-1

Figure 8: resistance survey interpretation, Area A

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



British Grid
centre X: 276579.82 m, centre Y: 89522.89 m

Scale: 1:800 @ 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 geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead
Teignbridge, Devon
Centred on NGR (E/N) 276588,089575
Report: 1508WOO-R-1

Figure 9: resistance survey interpretation, Areas B, C, D and E

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

276400 m
276500 m
276600 m
276700 m
89800 m
89700 m
89600 m
89500 m
89400 m
N
Processed magnetometer data (nT)
3
-3
0
80 m

British Grid
centre X: 276532.88 m, centre Y: 89596.34 m

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

An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead
Teignbridge, Devon
Centred on NGR (E/N) 276588,089575
Report: 1508WOO-R-1

Figure 10: shade plot of processed magnetometer data

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

276400 m 276500 m 276600 m 276700 m

89800 m 89700 m 89600 m 89500 m 89400 m

N

Processed magnetometer data
(nT)
> 8.00
4.00 - 8.00
2.00 - 4.00
1.00 - 2.00
-1.00 - 1.00
-2.00 - -1.00
-4.00 - -2.00
-8.00 - -4.00
< -8.00

0 80 m

British Grid
centre X: 276532.88 m, centre Y: 89596.34 m

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

An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead
Teignbridge, Devon
Centred on NGR (E/N) 276588,089575
Report: 1508WOO-R-1

Figure 11: contour plot of processed magnetometer data

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

276400 m
276500 m
276600 m
276700 m
89800 m
89700 m
89600 m
89500 m
89400 m
N
Processed resistance data (ohms)
852
535
0
80 m

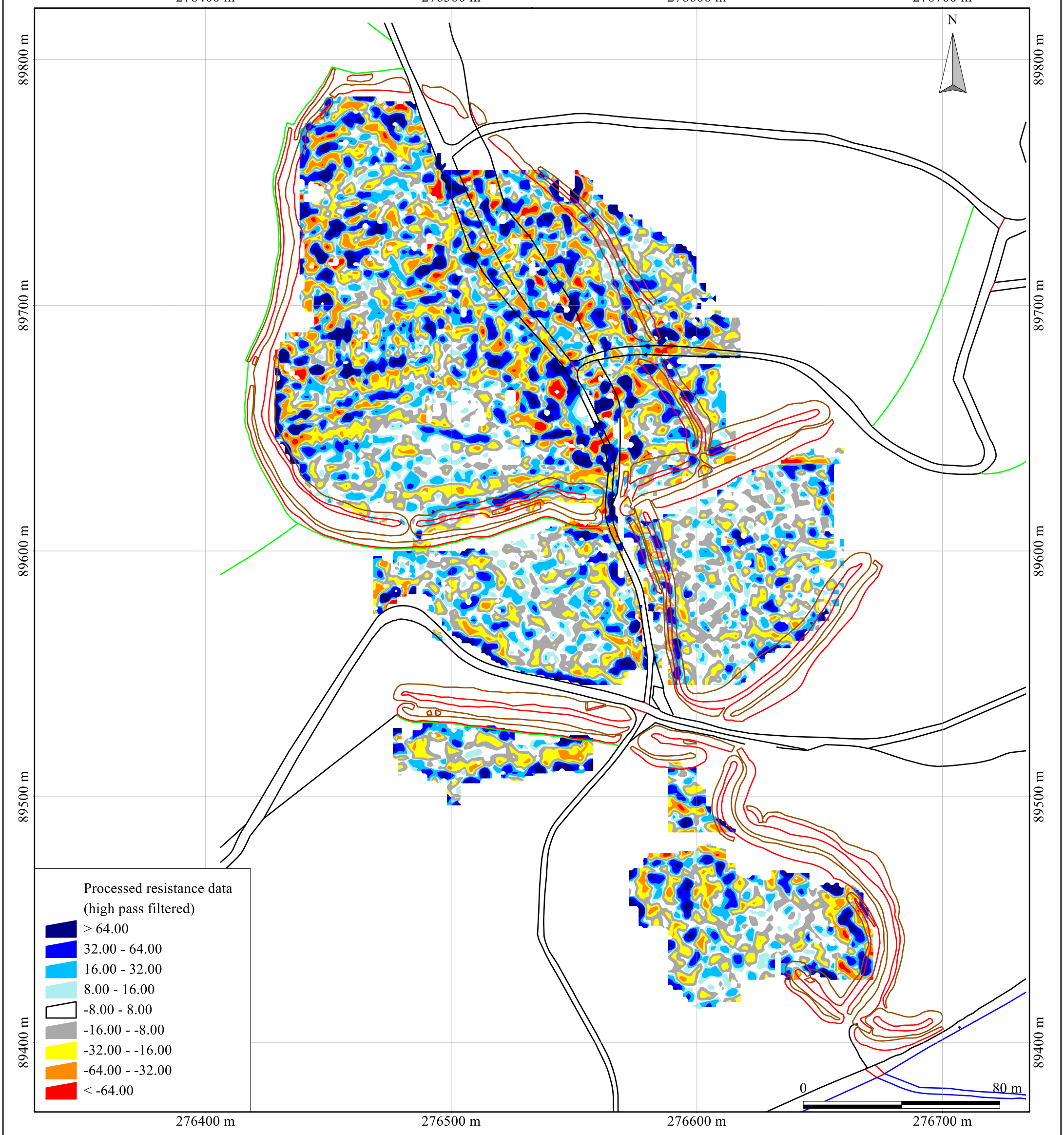
British Grid
centre X: 276532.88 m, centre Y: 89596.34 m

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

An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead
Teignbridge, Devon
Centred on NGR (E/N) 276588,089575
Report: 1508WOO-R-1

Figure 12: shade plot of processed resistance data

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



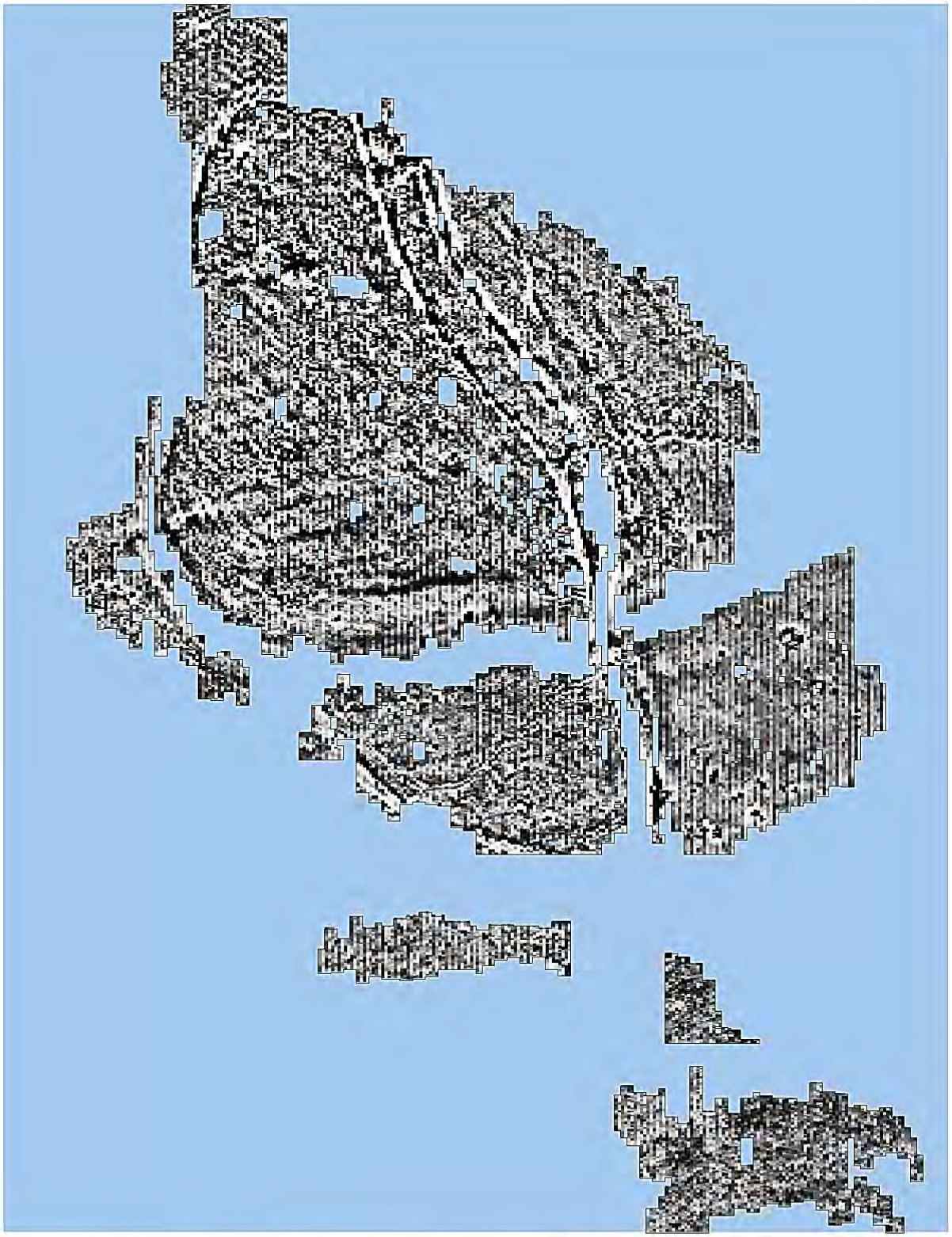
British Grid
centre X: 276532.88 m, centre Y: 89596.34 m

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

An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead
Teignbridge, Devon
Centred on NGR (E/N) 276588,089575
Report: 1508WOO-R-1

Figure 13: contour plot of processed resistance data

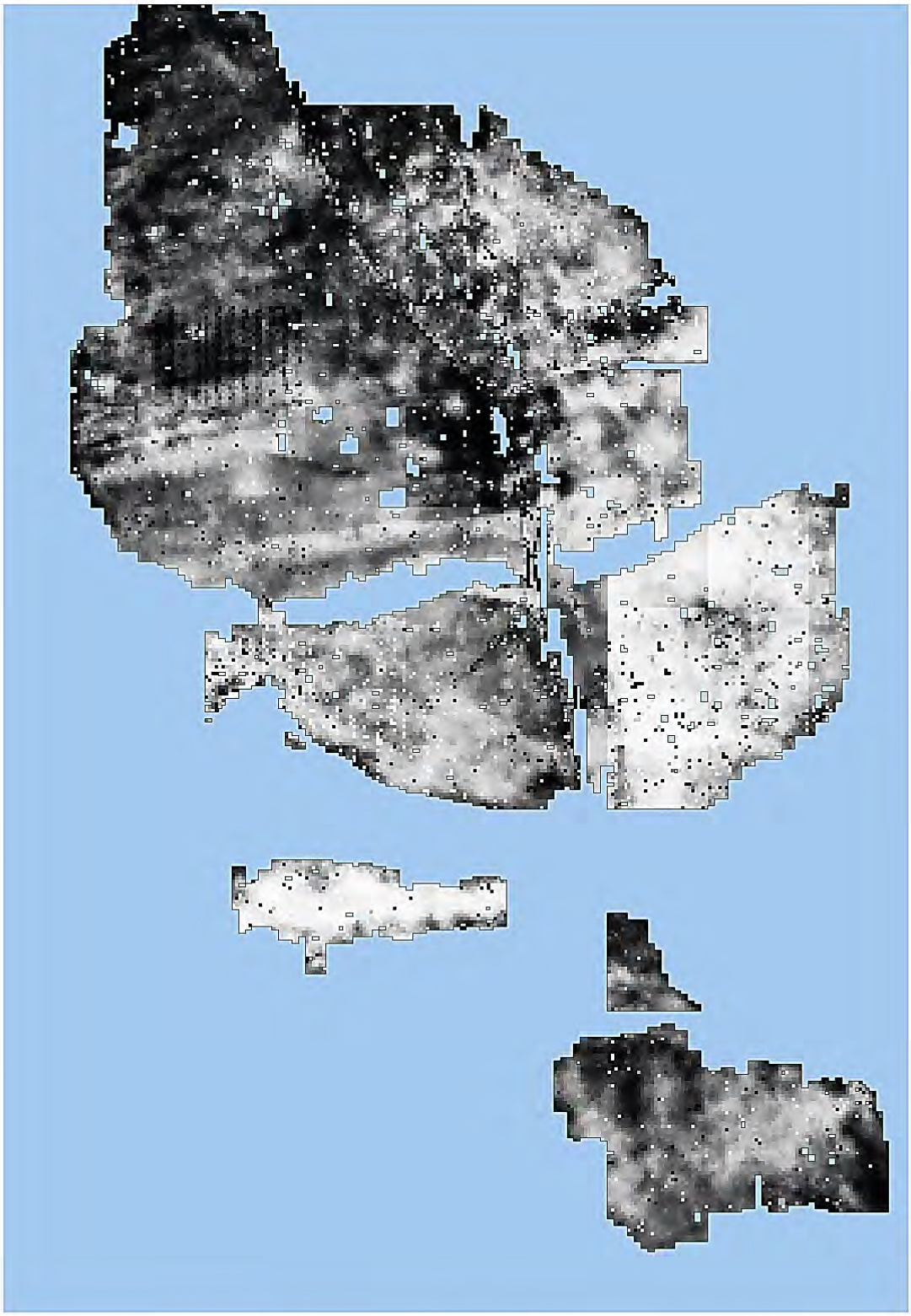
Substrata Limited
Langstrath, Goodleigh
Barnstaple, Devon EX32 7LZ
Tel: 01271 342721
Email: geophysics@substrata.co.uk
Web: substrata.co.uk



Instrument Type: Bartington Grad 601
Units: nT
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 0.00 m spacing.
Dummy Value: 2047.5
Dimensions
Grid Size: 30 m x 30 m
X Interval: 0.125 m
Y Interval: 1 m
Stats
Max: 3000.00
Min: -3000.00
Std Dev: 49.54
Mean: 0.12
Median: 0.00
PROGRAM
Name: TerraSurveyor
Version: 3.0.31.0

Processes: 1
1 Base Layer

Figure 14: shade plot of unprocessed magnetometer data



Instrument Type:	GeoScan (Resistance)	Processes:	1
Units:	Ohm	1	Base Layer
Direction of 1st Traverse:	0 deg		
Collection Method:	ZigZag		
Sensors:	1		
Dummy Value:	2047.5		
Dimensions			
Grid Size:	30 m x 30 m		
X Interval:	1 m		
Y Interval:	1 m		
Stats			
Max:	2297.20		
Min:	-2047.50		
Std Dev:	206.10		
Mean:	654.23		
Median:	631.00		
PROGRAM			
Name:	TerraSurveyor		
Version:	3.0.31.0		

Figure 15: shade plot of unprocessed resistance data

Appendix 2 Tables

An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead
Teignbridge, Devon
Centred on NGR (E/N) 276588,089575
Report: 1703WOO-R-1

County: Devon
District: Teignbridge
Parish: Mortonhampstead
Source: Heritage Gateway

HER number	grid reference	designations	type	period	description	distance (m) from site centre	bearing (GN) from site centre
MDV8292	SX 766 895	Scheduled Monument 1003822: Wooston Castle	MULTIVALLATE HILLFORT (MDV8292) Slight univallate hillfort with extensive outworks (1003822)	Iron Age - 700 BC to 42 AD (Between)	200 metres from east to west. From south to north the whole complex covers some 500 metres, at the northern extremity the defences lie within 50 metres of a precipitous drop to the River Teign.	76	171
MDV77552	SX 764 903		FARMSTEAD	XVIII to XIX - 1750 AD to 1900 AD (Between)	Historic farmstead	749	345
MDV29261	SX 765 898			XVIII to Unknown - 1750 AD (Between)	In woodland.2.5m diameter. May be small charcoal burners' hearth or natural features.	242	339
			CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland 4m x 2m. May be small charcoal burners' hearth or natural features.		
MDV29462	SX 765 898		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland 6m diameter.	242	339
MDV29463	SX 765 898		PLATFORM	Unknown	In woodland.2.5m diameter. May be small charcoal burners hearth or natural features. In woodland at	242	339
MDV29464	SX 765 898		PLATFORM	Unknown	In woodland at sx76578980 4m x 2m a platform which could be small charcoal burners' hearth or natural features. In woodland at sx76638978 3m x 2m, could be small charcoal burners' hearth or natural features.	242	339
MDV29465	SX 766 897		PLATFORM	Unknown	In woodland.2.5m diameter. Could be small charcoal burners' hearth or natural features.	126	5
MDV29263	SX 766 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 6m diameter.	126	5
MDV29265	SX 766 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	126	5
MDV29266	SX 766 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 5m diameter.	126	5
MDV29268	SX 766 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 5m diameter.	126	5
MDV29269	SX 768 898		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 5m diameter.	309	43
MDV29270	SX 768 898		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 5m x 3m - damaged by forestry track.	309	43
MDV29332	SX 768 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 5m diameter.	246	59
MDV29334	SX 768 898		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	309	43
MDV29235	SX 768 898		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 5m x 3m - damaged by forestry track.	309	43
MDV29236	SX 769 898		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	385	54
MDV29237	SX 769 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland.6m x 5m.	336	68
MDV29238	SX 769 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland.6m x 4m.	336	68
MDV29239	SX 770 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 6m diameter.	431	73
MDV29240	SX 770 895		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 7m diameter.	419	100
MDV29241	SX 770 896		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	413	87
MDV29242	SX 771 896		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	513	87
MDV29243	SX 771 898		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	559	66
MDV29244	SX 771 895		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland 5m x 4m	517	98
MDV29245	SX 771 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 5m diameter.	527	76
MDV29246	SX 771 895		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	517	98
MDV29247	SX 771 895		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	517	98
MDV29248	SX 771 896		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	513	87
MDV29249	SX 772 898		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 3m diameter.	652	70
MDV29251	SX 771 896		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	513	87
MDV29313	SX 772 898		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	Charcoal burners hearth measuring 6m in diameter	652	70
MDV29333	SX 769 896		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland.6m x 5m.	313	85
MDV112094	SX 765 889		FARMSTEAD	XVIII to XIX - 1800 AD to 1900	Wooston farmstead shown on 19th century maps as a scattered goup of buildings which had contracted to the west by the early 20th century. It was mentioned in 1333.	681	187
MDV29383	SX 763 893		PLATFORM	Unknown	Platform measuring 7m in diameter, roughly edged by boulders. Situated within the area bounded by the outer earthworks of wooston castle. May be a charcoal hearth or a house platform.	398	226
MDV29253	SX 760 895		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland 5m x 4m	593	263
MDV29254	SX 760 897		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 6m diameter.	601	282
MDV29255	SX 760 893		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	649	245
MDV29256	SX 761 894		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland.6m x 3m.	518	250
MDV29257	SX 761 893		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	560	241
MDV29258	SX 761 894		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland.6m x 3m.	518	250
MDV29259	SX 762 895		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 3m diameter.	395	259
MDV29260	SX 762 896		CHARCOAL BURNING PLATFORM	XVIII to Unknown - 1750 AD (Between)	In woodland. 4m diameter.	389	274
MDV29384	SX 762 896		PLATFORM	Unknown	Small platform. May be small charcoal hearth.	389	274

Table 1: Historical Environment Entries thought relevant to geophysical survey within approximately 500m of survey area edges

Site: An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead, Teignbridge, Devon
Centred on NGR (E/N) 276588,089575
Report: 1508WOO-R-1

area	anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
A	m1		likely, positive	curvilinear	deposits associated with extant earthworks		
	m2	r1 r2?	likely, negative	curvilinear	deposits associated with extant earthworks		
	m3		likely, positive	linear	deposits associated with extant earthworks		
	m4	r1	possible, negative spread	irregular			
	m5		possible, negative	curvilinear	deposits associated with extant earthworks?		
	m6		possible, positive	curvilinear	deposits associated with extant earthworks?		
	m7		possible, positive	linear			
	m8		possible, positive	curvilinear			
	m9		possible, positive	irregular			
	m10		possible, positive	oval	pit or large posthole		
	m11		possible, parallel linears		informal routeway (human or animal)		
	m12		possible, positive	disrupted multi-linear	either archaeological deposit or recent informal track (human or animal)		
	m13		possible, positive	sub-circular			
	m14	m21? m25?	possible, positive	linear			
	m15		possible, positive	disrupted linear	either archaeological deposit or associated with modern path		
	m16		possible, positive	disrupted curvilinear		anomaly group follows the trend of two extant paths	
	m17	m18 m19 m20	possible, negative	linear	rampart or terracing?		
	m18	m17 m19 m20	possible, positive	disrupted curvilinear	rampart or terracing?		
	m19	m17 m18 m20	possible, negative	disrupted curvilinear	rampart or terracing?		
	m20	m17 m18 m19	possible, negative	disrupted curvilinear	rampart or terracing?		
	m21	m14? m25?	possible, positive	disrupted multi-linear	either archaeological deposit or recent informal track (human or animal)		
	m22		possible, positive	disrupted linear	material associated with the adjacent linear earthworks?		
	m23	m24 m31	possible, negative	disrupted curvilinear			
	m24	m 23 m31	possible, positive	disrupted curvilinear			
	m25	m14? m21?	possible, negative	linear			
	m25		possible, positive	linear			
	m26		possible, positive	linear			
	m27		possible, positive	linear			
	m28		possible, positive	disrupted linear			
	m29		possible, parallel linears		informal routeway (human or animal)		
	m30	r24?	possible, positive	linear	deposits associated with extant earthworks?		
	m31	m23 m24	possible, positive	disrupted curvilinear			
	m32		possible, positive	linear			
	m33		possible, parallel linears		informal routeway (human or animal)		
	m34		possible, negative spread	disrupted linear			
	m35	r7?	possible, positive	disrupted linear			
	m36		possible, positive	disrupted curvilinear	deposits associated with extant earthworks and/or with modern track		surveyor observation
	m37		possible, positive	disrupted linear			
	m38	r16?	possible, positive	disrupted linear			
	m39		possible, positive	disrupted linear			
	m40	r22	likely, positive	disrupted curvilinear	deposits associated with extant earthworks		
	m41		possible, negative	curvilinear	deposits associated with extant earthworks?		
	m42		possible, positive	disrupted linear			
	m43		possible, positive	linear			
	m44	m45 m46?	possible, positive	disrupted curvilinear	ditch		
	m45	m44 m46?	possible, negative	disrupted curvilinear	bank		
	m46	m44? m45? m47?	possible, positive	disrupted linear			
	m47	m46?	possible, positive	linear			
	m48	r26	possible, positive	disrupted linear	deposits associated with extant earthworks?	deposits disrupted by later ploughing	
	m49		likely, positive	linear	deposits associated with extant earthworks		
	m201		possible, dipole		ferrous material		
	m202		possible, negative extant	disrupted curvilinear	stony material with possible archaeological deposits	anomaly group is most likely to reflect modern path deposits but some of the local paths have been observed to follow former ditches of likely archaeological origin	surveyor observation
	m203	r201	possible, positive extant	disrupted curvilinear	path material with possible archaeological deposits	anomaly group is most likely to reflect modern path deposits but some of the local paths have been observed to follow former ditches of likely archaeological origin	surveyor observation
	m204		possible, positive extant	linear	path material with possible archaeological deposits	anomaly group is most likely to reflect modern path deposits but some of the local paths have been observed to follow former ditches of likely archaeological origin; anomaly group appears to "cross" a N_S path	surveyor observation
	m205		possible, negative extant	curvilinear	stony material with possible archaeological deposits	anomaly group is most likely to reflect modern path deposits but some of the local paths have been observed to follow former ditches of likely archaeological origin; anomaly group appears to "cross" a N_S path	surveyor observation
	m206		possible, positive extant	disrupted curvilinear		anomaly group is most likely to reflect modern path deposits but some of the local paths have been observed to follow former ditches of likely archaeological origin	surveyor observation
	m207		possible, dipole		ferrous material		
	m208		possible, positive extant	disrupted curvilinear	path material with possible archaeological deposits	anomaly group is most likely to reflect modern path deposits but some of the local paths have been observed to follow former ditches of likely archaeological origin	surveyor observation
B	m50	m51 m52 m53	possible, linear trends	disrupted linears with curvilinear trend	ground disturbance of unknown period or origin	anomaly group may ne a mix of modern vehicle tracks over possible curvilinear archaeological deposits	
	m51	m50 m52 m53	possible, positive	linear			
	m52	m50 m51 m53	possible, positive	return?		anomaly group may represent separate linear deposits or a return	
	m53	m50 m51 m52	possible, negative	return?		anomaly group may represent separate linear deposits or a return	
	m209	r203	possible, grouped curvilinears	disrupted curvilinears	modern vehicle tracks		surveyor observation
	m210	m211 m212 r204	likely, positive extant	linear	modern track edge - modern ditch?		surveyor observation
	m211	m210 m212	likely, negative extant	disrupted linear	modern track edge - modern ditch?		surveyor observation
	m212	m210 m211	likely, negative extant	linear	modern track edge - modern ditch?		surveyor observation
C	m54		possible, positive	linear	deposits associated with extant earthworks		
	m55		likely, negative	linear	deposits associated with extant earthworks		
	m56		possible, enhanced	irregular	area of archaeological deposition		
	m57		possible, positive	curvilinear	curvilinear group of pits or highly disrupted curvilinear deposit		
	m58		possible, positive	linear			
	m59		possible, positive	oval	pit or tree bole		
	m60		possible, north-south high-low		in-situ highly heated deposits		
	m61		possible, positive		linear group of pits or linear deposit		
	m62		possible, north-south high-low		in-situ highly heated deposits	anomaly group suggests up to three closely spaced deposits of in-situ highly heated material	
	m63		possible, enhanced	irregular	archaeological deposits with (recent?) ferrous material		
	m64		possible, positive	linear	anomaly group may represent an archaeological deposit or natural feature		
	m65		possible, positive spread	disrupted linear	anomaly group may represent an archaeological deposit or natural feature		
	m66		possible, positive	disrupted linear	anomaly group may represent an archaeological deposit or natural feature		
D	m213		possible, dipole		modern track edge - modern ditch?		
	m214		possible, dipole		modern track edge - modern ditch?		

Table 2: magnetometer survey data analysis

Site: An archaeological magnetometer and resistance survey
Wooston Castle, Mortonhampstead, Teignbridge, Devon
Centred on NGR (E/N) 276588,089575
Report: 1508WOO-R-1

area	anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
A	r1	m2 m4	likely, high	disrupted curvilinear	deposits associated with extant earthworks		
	r2	m2?	possible, low	disrupted linear	deposits associated with extant earthworks		
	r3	r4	possible, high	linear			
	r4	r3	possible, low	disrupted linear			
	r5	r6	likely, high	disrupted curvilinear	deposits associated with extant earthworks		
	r6	r5	possible, low	disrupted curvilinear	deposits associated with extant earthworks or related to an extant path running round the inside of the earthworks		
	r7	r8 m35?	possible, low	linear			
	r8	r7	possible, high	linear			
	r9	r10	possible, low	linear			
	r10	r9	possible, high	linear			
	r11		possible, low	oval			
	r12	r16 r17 r18	possible, high	linear			
	r13		possible, high	linear			
	r14	r15?	possible, low	sub-circular			
	r15	r14?	possible, high	return			
	r16	r12 r17 r18 m38?	possible, high				
	r17	r12 r16 r18	possible, low	disrupted linear			
	r18	r12 r16 r17	possible, high	linear			
	r19		possible, low	oval	pits or tree boles		
	r20		possible, low				
	r21	r22	likely, high	disrupted linear	deposits associated with extant earthworks		
	r22	r21 m40	likely, low	disrupted linear	deposits associated with extant earthworks		
	r23		likely, high	linear	deposits associated with extant earthworks		
	r24	m30?	likely, low	linear	deposits associated with extant earthworks		
	r25		possible, high	disrupted linear	either archaeological deposits or associated with adjacent modern track		
	r26	r30 m48	likely, low	disrupted linear	deposits associated with extant earthworks		
	r27		likely, high	linear	deposits associated with extant earthworks		
	r28		possible, low	linear		anomaly group may represent deposits associated with adjacent extant earthworks	
	r29		likely, high	oval	deposits associated with extant earthworks	anomaly group may represent bank termination deposits	
	r30	r26	possible, low			anomaly group may represent a southern extension of the adjacent earthworks	
	r31		likely, high	oval	deposits associated with extant earthworks	anomaly group may represent bank termination deposits	
	r32		likely, low	linear	deposits associated with extant earthworks		
	r33		likely, low	linear	deposits associated with extant earthworks		
	r201	m203	likely, well defined linear		deposits associated with extant track		surveyor observation
	r202		likely, well defined linear		deposits associated with extant track		surveyor observation
B	r34	r35	possible, low	linear	deposits associated with extant earthworks		
	r35	r34	possible, high	linear	deposits associated with extant earthworks		
	r36		possible, low	linear			
	r37		possible, low	disrupted linear		anomaly group coincides with a distinct trend in the data and so the associated disturbance may be relatively recent in origin	
	r38		possible, low	linear	either archaeological deposits or associated with adjacent modern track		
	r203	m209	likely, linear		vehicle tack		surveyor observation
	r204	m210	likely, well defined linear		deposits associated with extant track		surveyor observation
C	r39		possible, low	disrupted linear			
	r40		possible, low	disrupted linear		anomaly group has a trend seen elsewhere in the adjacent data and so may represent natural deposits however their spatial association with adjacent earthworks may indicate an archaeological origin	
	r41		possible, low	return		anomaly group has a trend seen elsewhere in the adjacent data and so may represent natural deposits however their spatial association with adjacent earthworks may indicate an archaeological origin	
	r42		possible, high	return		anomaly group has a trend seen elsewhere in the adjacent data and so may represent natural deposits however their spatial association with adjacent earthworks may indicate an archaeological origin	
	r43		likely, low	curvilinear	deposits associated with extant earthworks		
	r44		possible, high	disrupted linear			
	r45		possible, low				
D	r46	r47 r48 r49	possible, low	linear	deposits associated with extant earthworks or with adjacent track		
	r47	r46 r48 r49	likely, low	linear	deposits associated with extant earthworks		
	r48	r46 r47 r49	likely, high	disrupted linear	deposits associated with extant earthworks		
	r49	r46 r47 r48	likely, low	disrupted linear	deposits associated with extant earthworks		
	r50	r50	likely, linear trends		informal modern track	anomaly group leads into a slight earthwork which may be indicative of an archaeological ditch	surveyor observation
	r51	r52	possible, low	linear			
	r52	r51	possible, high	linear			
	r53	r53	possible, low	linear	ditch	anomaly group coincides with a modern track but also with a faint earthwork indicative of an archaeological ditch	surveyor observation
	r54		possible, low	disrupted linear	ditch	anomaly group coincides with a modern track but also with a faint earthwork indicative of an archaeological ditch	surveyor observation
E	r101		possible, low linear spread		alluvium		

Table 3: resistance survey data analysis

<table>
<tr><td colspan="2">Grid
Method of Fixing: DGPS and RTK set-out using pre-planned survey grids and Ordnance Survey coordinates.
Composition: 30m by 30m grids
Recording: Geo-referenced and recorded using digital map tiles.</td></tr>
<tr><td>Magnetometer Equipment
Instrument: Bartington Instruments grad601-2
Firmware: version 6.1</td><td>Magnetometer Data Capture
Sample Interval: 0.125-metres
Traverse Interval: 1 metre
Data capture: automatic data logger
Traverse Method: zigzag
Traverse Orientation: GN</td></tr>
<tr><td>Resistance Equipment
Instrument: Geoscan Research RM15 multi-probe resistance meter
Configuration: twin probe
Mobile probe spacing: 0.5-metres</td><td>Resistance Data Capture
Sample Interval: 1 metre
Traverse Interval: 1 metre
Data capture: automatic data logger
Traverse Method: zigzag
Traverse Orientation: GN</td></tr>
<tr><td colspan="2">Data Processing, Analysis and Presentation Software
QCAD Professional
DW Consulting TerraSurveyor3
Manifold System 8 GIS
Microsoft Corp. Office Excel 2013
Microsoft Corp. Office Publisher 2013
Adobe Systems Inc Adobe Acrobat 9 Pro Extended</td></tr>
</table>

Table 4: methodology information

Instrument

Type:	Bartington Grad 601
Units:	nT
Direction of 1st Traverse:	0 deg
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing.
Dummy Value:	32702

Program

Name:	TerraSurveyor
Version:	3.0.31.0

Figures 10 and 11

Statistics

Max:	16.97
Min:	-16.70
Std Dev:	3.68
Mean:	0.13
Median:	0.00

Processes

1 Base Layer
2 Clip at 1.00 SD
3 De Stagger: Grids: All Mode: Both By: -2 intervals
4 De Stagger: Grids: e2.xgd Mode: Both By: -2 intervals
5 De Stagger: Grids: c1.xgd Mode: Both By: 2 intervals
6 De Stagger: Grids: e2.xgd f2.xgd Mode: Both By: -2 intervals
7 De Stagger: Grids: g6.xgd Mode: Both By: -2 intervals
8 De Stagger: Grids: g10.xgd Mode: Both By: 2 intervals
9 DeStripe Median Traverse: Grids: All
10 Interpolate: Match X & Y Doubled.
11 Clip at 4.00 SD

Table 5: magnetometer survey - processed data metadata

Instrument

Type: Geoscan Research RM15
Units: resistance data (ohms) normalised about a near-zero mean
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

PROGRAM
Name: TerraSurveyor
Version: 3.0.31.0

Figure 12

Statistics

Max:	1086.00
Min:	375.37
Std Dev:	125.19
Mean:	680.73
Median:	662.39

Processes

1 Base Layer
2 Clip from 353.00 to 1086.00 Ohm
3 Despike Threshold: 1 Window size: 3x3
4 Despike Threshold: 1 Window size: 3x3
5 Despike Threshold: 1 Window size: 3x3
6 Edge Match (Area: Top 180, Left 180, Bottom 209, Right 209) to Top edge
7 Edge Match (Area: Top 180, Left 150, Bottom 209, Right 179) to Right edge
8 Edge Match (Area: Top 210, Left 180, Bottom 239, Right 209) to Top edge
9 Edge Match (Area: Top 210, Left 150, Bottom 239, Right 179) to Right edge
10 Edge Match (Area: Top 240, Left 150, Bottom 269, Right 179) to Top edge
11 Edge Match (Area: Top 240, Left 180, Bottom 269, Right 209) to Top edge
12 Edge Match (Area: Top 210, Left 210, Bottom 239, Right 239) to Left edge
13 Edge Match (Area: Top 240, Left 210, Bottom 269, Right 239) to Top edge
14 Edge Match (Area: Top 180, Left 210, Bottom 209, Right 239) to Left edge
15 Add/Subtract 198.97 (Area: Top 173, Left 154, Bottom 179, Right 179)
16 Add/Subtract -175 (Area: Top 180, Left 229, Bottom 197, Right 239)
17 Range Match (Area: Top 90, Left 120, Bottom 119, Right 149) to Right edge
18 Edge Match (Area: Top 90, Left 90, Bottom 119, Right 119) to Right edge
19 Edge Match (Area: Top 60, Left 90, Bottom 89, Right 119) to Bottom edge
20 Edge Match (Area: Top 60, Left 120, Bottom 89, Right 149) to Bottom edge
21 Edge Match (Area: Top 120, Left 90, Bottom 149, Right 119) to Top edge
22 Edge Match (Area: Top 120, Left 120, Bottom 149, Right 149) to Top edge
23 Search & Replace From: -4000 To: 4000 With: Dummy (Area: Top 170, Left 180, Bottom 170, Right 186)
24 Low pass Gaussian filter: Window: 3 x 3

Figure 13

Statistics

Max:	241.00
Min:	-228.60
Std Dev:	32.26
Mean:	0.74
Median:	-1.46

Processes

1 Base Layer
2 Clip from 353.00 to 1086.00 Ohm
3 Despike Threshold: 1 Window size: 3x3
4 Despike Threshold: 1 Window size: 3x3
5 Despike Threshold: 1 Window size: 3x3
6 Edge Match (Area: Top 180, Left 180, Bottom 209, Right 209) to Top edge
7 Edge Match (Area: Top 180, Left 150, Bottom 209, Right 179) to Right edge
8 Edge Match (Area: Top 210, Left 180, Bottom 239, Right 209) to Top edge
9 Edge Match (Area: Top 210, Left 150, Bottom 239, Right 179) to Right edge
10 Edge Match (Area: Top 240, Left 150, Bottom 269, Right 179) to Top edge
11 Edge Match (Area: Top 240, Left 180, Bottom 269, Right 209) to Top edge
12 Edge Match (Area: Top 210, Left 210, Bottom 239, Right 239) to Left edge
13 Edge Match (Area: Top 240, Left 210, Bottom 269, Right 239) to Top edge
14 Edge Match (Area: Top 180, Left 210, Bottom 209, Right 239) to Left edge
15 Add/Subtract 198.97 (Area: Top 173, Left 154, Bottom 179, Right 179)
16 Add/Subtract -175 (Area: Top 180, Left 229, Bottom 197, Right 239)
17 Range Match (Area: Top 90, Left 120, Bottom 119, Right 149) to Right edge
18 Edge Match (Area: Top 90, Left 90, Bottom 119, Right 119) to Right edge
19 Edge Match (Area: Top 60, Left 90, Bottom 89, Right 119) to Bottom edge
20 Edge Match (Area: Top 60, Left 120, Bottom 89, Right 149) to Bottom edge
21 Edge Match (Area: Top 120, Left 90, Bottom 149, Right 119) to Top edge
22 Edge Match (Area: Top 120, Left 120, Bottom 149, Right 149) to Top edge
23 Search & Replace From: -4000 To: 4000 With: Dummy (Area: Top 170, Left 180, Bottom 170, Right 186)
24 High pass Gaussian filter: Window: 10 x 10
25 Low pass Gaussian filter: Window: 3 x 3

Table 6: resistance survey - processed data metadata