

Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer survey

**Staverton hydroelectric cable
Dartington, Devon**

NGR: 279256,063600 to 279350,062517

Report: 1806STA-R-1

Ross Dean BSc MSc MA MCifA
Mark Edwards BA

28 June 2018

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

Client
AC Archaeology Ltd
4 Halthaies Workshops
Bradinch
Nr Exeter
Devon EX5 4QL
Tel: 01392 882410

Substrata Limited

Company number: 10348811

Registered office: Unit 6 Bude Business Centre, Kings Hill Industrial Estate, Bude, Cornwall, England EX23 8QN

Contents

1. Introduction	1
2. Survey description	1
3. Summary	1
4. Aims and objectives	1
5. Standards	2
6. Methodology	2
7. Survey Area	2
8. Archaeological background	3
9. Results	4
10. Discussion	4
11. Conclusions	6
12. Disclaimer	6
13. Copyright	6
14. Archive	4
15. Acknowledgements	7
16. Bibliography	7
Appendix 1 Figures	8
Appendix 2 Tables	25
Appendix 3 Project archive contents	30

Figures

Figure 1: location map	9
Figure 2: survey interpretation, all plots	10
Figure 3: survey interpretation, Plot 1	11
Figure 4: survey interpretation, Plot 2	12
Figure 5: survey interpretation, Plot 3	13
Figure 6: survey interpretation, Plot 4	14
Figure 7: survey interpretation, Plot 5	15
Figure 8: shade plot of processed data, all plots	16
Figure 9: shade plot of processed data, Plot 1	17
Figure 10: shade plot of processed data, Plot 2	18
Figure 11: shade plot of processed data, Plot 3	19
Figure 12: shade plot of processed data, Plot 4	20
Figure 13: shade plot of processed data, Plot 5	21
Figure 14: shade plot of minimally processed data, Plots 1 and 2	22
Figure 15: shade plot of minimally processed data, Plots 3 to 5	23
Figure 16: survey grid plan and location	24

Tables

Table 1: data analysis	26
Table 2: methodology information	27
Table 3: processed data metadata	28
Table 4: minimally processed data metadata	29

1 Introduction

This report presents the results of an archaeological geophysical survey at the site listed in Section 2 and shown in Figure 1, hereafter referred to as the 'Survey Area'. It was commissioned by AC Archaeology Limited, on behalf of the Totnes Renewable Energy Society (TRESOC), to provide information in support of a forthcoming planning application for a proposed hydroelectric cable route installation.

The survey and report were completed in compliance with a Survey Method Statement (Dean, 2018).

2 Survey description

2.1 Survey

Method: shallow depth magnetometer survey
Instrument: twin-sensor fluxgate gradiometer
Date: 18 and 19 June 2018
Area: 3.09ha

2.2 Location

Survey Area name: Staverton hydroelectric cable
Civil parish: Dartington
District: South Hams
County: Devon
Nearest Postcode: TQ9 6NZ to TQ9 6EB
NGR: SX 79256 63600 to SX 79350 62517 (points)
NGR (E/N): 279256,063600 to 279350,062517 (points)
Relevant historic environment designations: Plot 1: HER MDV16729 - Staverton ford
Plots 1, 2, 3: MDV8134, Dartington Hall Deerpark
Plot 3: HER MDV76130, Scheduled Monument 1020553, Woodbanks in Chacegrove Wood

2.3 Client

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

3 Summary

A magnetometer survey was selected to provide a relatively fast and cost-effective evaluation of any buried archaeology across the Survey Area (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 Survey Area were sufficient to be able to differentiate between anomalies representing possible buried archaeology and background magnetic responses.

Twenty-nine magnetic anomaly groups have been characterised as representing potential buried archaeology. Of these, one group represents a western extension of an extant, scheduled medieval woodbank (Historic Environment Record (HER) MDV76130, Scheduled Monument 1020553). This extension was mapped as a field boundary on historic maps up to 1906-7. Three groups coincide with, and likely represent, field boundaries recorded on historic maps until 1906-7. One group may represent a ditched track in the vicinity of the prehistoric trackway known as Goatpath which fords the river Dart at Staverton Ford Island to the north of this anomaly group. Four groups represent curvilinear deposits that are not typical of the field and agricultural boundaries often mapped during geophysical surveys. They are situated in what may be a generally wetter area of ground. Three groups, if archaeologically associated with each other, are also not typical of agrarian field and enclosure boundaries and may represent an archaeological feature. The remaining anomaly groups have characteristics that often define fragments of field boundaries and enclosures of unknown origin and date.

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 which will, as far as possible, establish the presence or absence, extent and character of any buried archaeology within the survey area.

4.2 Survey objectives

1. Complete a magnetometer survey across the Survey Area.
2. Identify any magnetic anomalies that may be related to buried archaeology.
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 Survey Area (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 conform to the Chartered Institute for Archaeologists standard for geophysical survey (CIfA, 2014a).

7 Survey Area

7.1 Location

The Survey Area is a 30m wide corridor across five fields on land between Town Mills, Staverton and Upper Drive within the Dartington Hall Estate (Figure 1).

7.2 Geology

The bedrock across the Survey Area varies as follows:

- | | |
|-------------------------------------|--|
| Plot 1: | slate of the Devonian Nordon Formation. |
| Plot 2: | limestone of the Devonian Dartington Limestone Member. |
| Plot 3 (grids 24 to 26, Figure 16): | limestone of the Devonian Dartington Limestone Member. |
| Plot 3 (grids b19 to b23): | microgabbro of an unnamed Devonian to Carboniferous igneous intrusion. |
| Plots 3 (grids b17 and b18): | slate of the Devonian Nordon Formation. |
| Plot 4 and Plot 5 | |

The superficial deposits across the Survey Area are not recorded in the source used (British Geological Survey, undated).

7.3 Soils and near-surface deposits

‘Freely draining slightly acid loamy soils’ (Cranfield, undated).

No site-relevant geotechnical reports and no borehole logs of near-surface deposits were

available at the time of writing.

7.4 Topography

All heights are approximate and given as metres AOD.

Plot 1: crosses the eastern side of a hill sloping approximately west to east with the northern end lying at 25m and the southern end lying between 25m and 30m, near the head of a southwest-northeast descending valley.

Plot 2: crosses the above valley from between 25m and 30m at the northern end to 40m at the southern end.

Plot 3: crosses a gently rising slope from 40m at the north-western end to 55m at the south-eastern end.

Plots 4 and 5: cross the side of a hillside with the northern end of Plot 4 at 60m and the southern end of Plot 5 at 55m:

7.5 Land use

Plot 1: grass

Plot 2: grass

Plot 3: freshly cut nettles and grass

Plot 4: young, low, hemp

Plot 5: grass

8 Archaeological background

8.1 Historic Environment Status

The northern side of Plot 3 is a scheduled, medieval woodbank (Scheduled Monument 1020553) discussed in Section 8.4 below. This bank was excluded from the survey.

8.2 Historic landscape characterisation

Plots 1, 2 and 3: 'Modern enclosures.' Modern enclosures that have been created by adapting earlier fields of probable post-medieval date. In this case the adapted fields were likely to have been Barton Fields.

Plots 4 and 5: 'Barton fields.' These relatively large, regular enclosures seem likely to have been laid out between C15th-C18th. Some curving boundaries may be following earlier divisions in the pre-existing medieval fields.

(Devon County Council, undated).

8.4 Archaeological summary

AC Archaeology Limited have produced a Statement of Archaeological Survival, Impact and Mitigation (Costen 2018) which includes a summary of the recorded archaeology within 500m of the proposed cable route. Elements of the Statement thought relevant to the geophysical survey were assessed with the following being of particular note.

A prehistoric trackway known as Goatpath passes east of Staverton parish church and fords the Dart at Staverton ford island (HER MDV16729) which lies to the north of Plot 1.

Dartington Hall Deerpark includes the area in which Plots 1, 2 and 3 are situated. In the early 14th century, a chase of about 90 acres was enclosed in North Wood, being extended to the east several times to create a complex park of approximately 315 acres. At its greatest extent there were two wooded chases, a semi-wooded coursing par.

On the northern side of Plot 3 are extant woodbanks in Chacegrove Wood (MDV76130 and Scheduled Monument 1020553). The scheduled monument also includes a hilltop enclosure also situated in the wood. The woodbanks are substantial medieval and post-medieval boundaries enclosing the south and south-east sides of Chacegrove Wood, forming an internal division of the medieval Dartington deer park, with a wooded chase to the north east and open ground to the south west.

The medieval woodbank is sinuous in shape and survives for a distance of 245m, enclosing the south side of Chacegrove Wood. It is 3m wide, slopes up 1.6m from the interior of Chacegrove Wood on the north side and falls vertically into the field to its south in which the survey area of Plot 3 is situated. A post-medieval woodbank runs along the south east side of the wood, south east of the medieval woodbank. It is constructed of stone rubble enclosing an earth bank 2m wide and up to 1.6m high. A rock cut ditch to its north west measures 5m wide and up to 1m deep and provided the limestone facing for the bank.

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 variations 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.

The dimensions of magnetic anomalies mapped as representing potential buried archaeology 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 7 show the interpretation of the survey data and include the anomaly groups identified as possibly relating to archaeological deposits along with their identifying numbers. Table 1 is an extract of the detailed analysis of the survey data sourced from the attribute tables of the GIS project provided in the project archive.

Figures 2 to 7 along with Table 1 comprise the analysis of the survey data.

Figures 8 to 13 are plots of the processed data as specified in Table 3. Figures 14 and 15 are plots of minimally processed data as specified in Table 4. Figure 16 shows the location of the survey grid and grid data files.

10 Discussion

10.1 General points

Scope

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

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 Figure 2 and Table 1.

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 are mapped as potential archaeology when they are associated with other significant anomaly groups or otherwise formed recognisable patterns as listed in Table 1.

Anomalies thought to relate to natural features and recent man-made objects such as manholes, water management equipment, drains, cables and other services are only mapped where they comprise significant magnetic responses across the dataset that need 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.

Data trends

Plot 1 (Figure 9): has a lower magnetic response in the central area compared to the northern and southern ends: this may reflect geological variations but it is often the case that a magnetically quiet area is, on average, wetter than the surrounding ground.

Plot 2 (Figure 10): the northeast to southwest parallel, closely spaced lines are likely to represent relatively recent ploughing disturbance.

Plot 3 (Figure 11): has a central area with relatively high magnetic responses which are most likely to be geological in origin and represent near-surface Devonian to Carboniferous microgabbro (Section 7.2).

Plot 4 (Figure 12): the parallel, north-north-east to south-south-west trending closely spaced lines are likely to represent recent ground disturbance from ploughing and/or vehicle movements.

Plot 5 (Figure 13): The parallel, west to east parallel, closely spaced lines are likely to represent relatively recent ploughing disturbance.

10.2 Data relating to historic maps and other records

Magnetic anomaly group **6** (Plot 1), **18** (Plot 3) and **20** (Plot 3) coincide with, and likely represent, field boundaries recorded on historic maps as show in Table 1.

Group **15** (Plot 2) represents a western extension of an extant field boundary. On the south side of Chacegrove Wood (Figure 2) this field boundary is a medieval woodbank (MDV76130, Scheduled Monument 1020553) which was an internal division of the medieval Dartington deer park. The woodbank is 3m wide, sloping up 1.6m from the interior of Chacegrove Wood on the north side and falling vertically into the field to its south. A post-medieval woodbank runs along the south east side of the wood, south east of the medieval woodbank. It is constructed of stone rubble enclosing an earth bank 2m wide and up to 1.6m high. A rock cut ditch to its north west measures 5m wide and up to 1m deep and provided the limestone facing for the bank. The magnetic signature of group 15 (Figure 10) suggests that it is more likely to have a structure similar to that of the post-medieval woodbank.

10.3 Data with no previous archaeological provenance

Anomaly group **1** (Plot 1, Figure 3) represents a pair of parallel linear deposits and may represent a ditched track. The prehistoric trackway known as Goatpath passes east of Staverton parish church and fords the river Dart at Staverton Ford Island, to the north of this anomaly group (HER MDV16729). Whilst not heading to towards the ford, if the anomaly group does represent a track then there is a possibility that it has archaeological significance in the context of the Goatpath.

Groups **2, 5, 7 and 8** (Plot 1, Figure 3) represent curvilinear deposits that are not typical in the field and agricultural boundaries often mapped during geophysical surveys. Group 2 marks the northern boundary of a magnetically relatively quiet area compared to the northern and southern ends of the survey in Plot 1 (Figure 9). Such quiet areas often denote wetter areas of ground.

Groups **24 to 26** (Plot 5, Figure 7), if archaeologically associated with each other, are also not typical of agrarian field and enclosure boundaries and may represent an archaeological feature.

The remaining anomaly groups have characteristics that most often represent fragments of field boundaries and enclosures of unknown origin and date.

11 Conclusions

The differences in magnetic responses across the Survey Area were sufficient to be able to differentiate between anomalies representing possible buried archaeology and background magnetic responses.

Twenty-nine magnetic anomaly groups have been characterised as representing potential buried archaeology. Of these, one group (15 in Plot 2) represents an western extension of an extant, scheduled medieval woodbank (Historic Environment Record (HER) MDV76130, Scheduled Monument 1020553). This extension was mapped as a field boundary on historic maps up to 1906-7. Three groups (6 in Plot 1, 18 in Plot 3 and 20 in Plot 3) coincide with, and likely represent, field boundaries recorded on historic maps until 1906-7. One group (1 in Plot 1) may represent a ditched track in the vicinity of the prehistoric trackway known as Goatpath which fords the river Dart at Staverton Ford Island to the north of this anomaly group (HER MDV16729). Four groups (2, 5, 7 and 8 in Plot 1) represent curvilinear deposits that are not typical of the field and agricultural boundaries often mapped during geophysical surveys. They are situated in what may be a generally wetter area of ground. Three groups (24, 25 and 26 in Plot 5), if archaeologically associated with each other, are also not typical of agrarian field and enclosure boundaries and may represent an archaeological feature. The remaining anomaly groups have characteristics that often define fragments of field boundaries and enclosures of unknown origin and date.

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 work and analysis. It must be presumed that more archaeological features will be found than those specified in this report.

13 Copyright

Substrata Ltd will assign copyright to the client upon written request but retains the right to be identified as the author of all project documentation and reports as defined in the Copyright, Designs and Patents Act 1988 (Chapter IV, s.79). This report contains material that is non-Substrata Limited copyright or the intellectual property of third parties. Such material is labelled with the appropriate copyright and is non-transferrable by Substrata Ltd.

14 Archive

14.1 Online Access to the Index of archaeological investigationS (OASIS)

OASIS ID: substrat1-321146

The OASIS entry has been completed and the boundary file and report uploaded with six months 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

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

16 Bibliography

Archaeology Data Service (undated) *Archaeology Data Service/Digital Antiquity Guides to Good Practice: Geophysical Data in Archaeology, 2nd Edition* [Online], Available: http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_Toc [March 2018]

British Geological Survey (undated) *Geology of Britain viewer, 1:50000 scale data* [Online], Available: <http://www.bgs.ac.uk/discovering-Geology/geologyOfBritain/viewer.html> [June 2018]

Chartered Institute for Archaeologists (2014a) *Standard and guidance archaeological geophysical survey* [Online], Available: http://www.archaeologists.net/sites/default/files/CIfAS&GGeophysics_1.pdf [March 2018]

Chartered Institute for Archaeologists (2014b) *Code of conduct* [Online], Available <http://www.archaeologists.net/sites/default/files/CodesofConduct.pdf> [March 2018]

Clark, A. (2000) *Seeing Beneath the Soil, Prospecting methods in archaeology*, London: Routledge

Costen D. (2018) *Staverton Hydroelectric Cable, Dartington, Devon (NGR SX 79414 63644 - SX 79277 62509) Statement of Archaeological Survival, Impact and Mitigation*, AC Archaeology Limited unpublished report ACD18598/1/0

Cranfield (undated) *Cranfield Soil and Agrifood Institute Soilscales* [Online], Available <http://www.landis.org.uk/soilscales/#> [June 2018]

Dean, R. (2018) *Magnetometer survey method statement, Staverton hydroelectric cable, Dartington, Devon*, Substrata Ltd unpublished document 1806STA-M-1

Devon County Council (undated) *Historic Environment* [Online], Available: <https://new.devon.gov.uk/historicenvironment/> [June 2018]

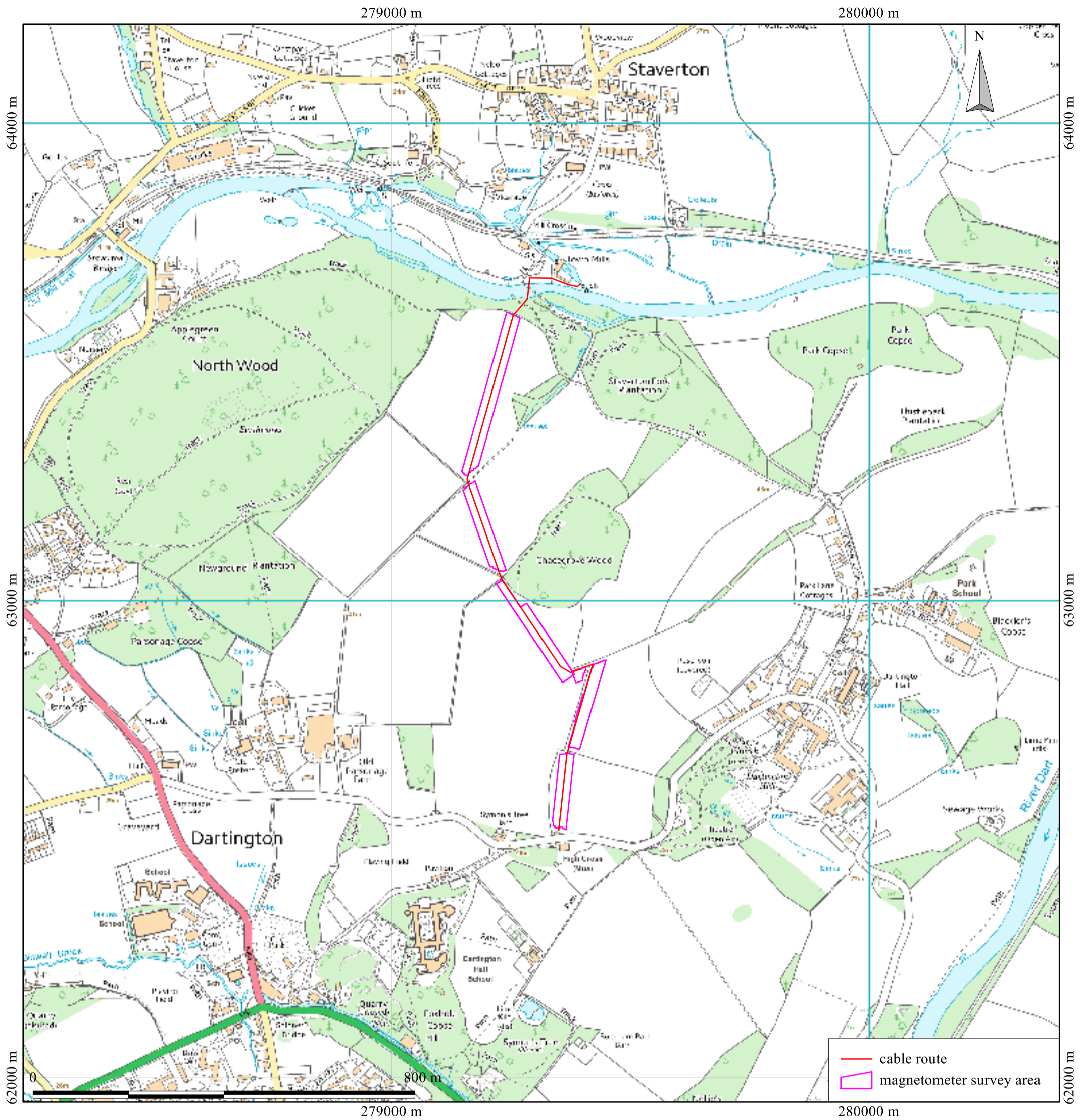
Historic England (2008) *Geophysical Survey in Archaeological Field Evaluation* [Online], Available: <https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/> [March 2018]

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: 279313.77 m, centre Y: 63077.72 m

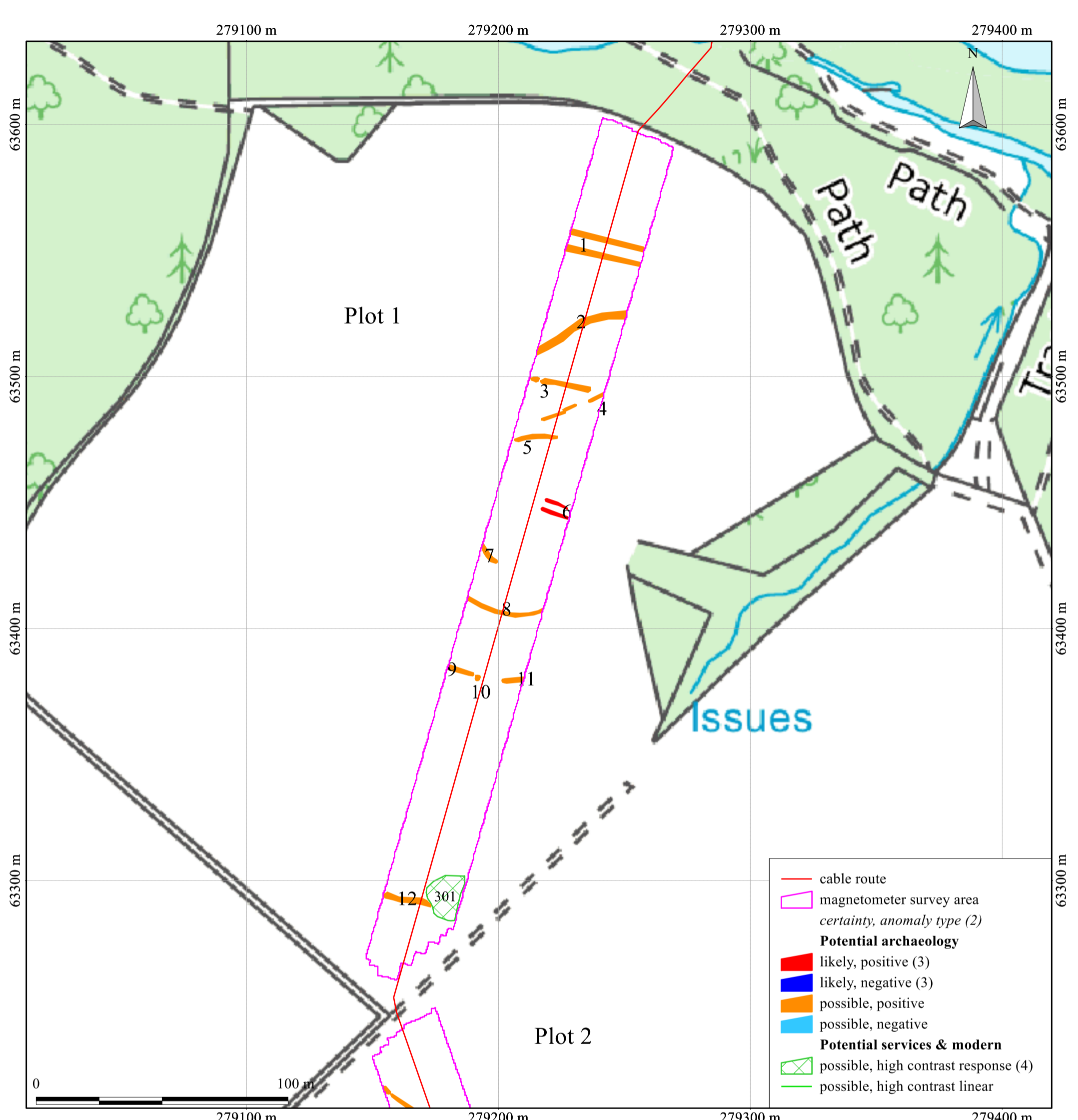
Geophysical survey: Copyright Substrata Limited.
 Base map: Contains Ordnance Survey data
 © Crown copyright and database right 2018

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

An archaeological magnetometer survey
 Staverton hydroelectric cable, Dartington, Devon
 NGR: 279256,063600 to 279350,062517
 Report: 1806STA-R-1

Figure 1: location map

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



British Grid
 centre X: 279216.09 m, centre Y: 63421.32 m

Geophysical survey: Copyright Substrata Limited.
 Base map: Contains Ordnance Survey data
 © Crown copyright and database right 2018

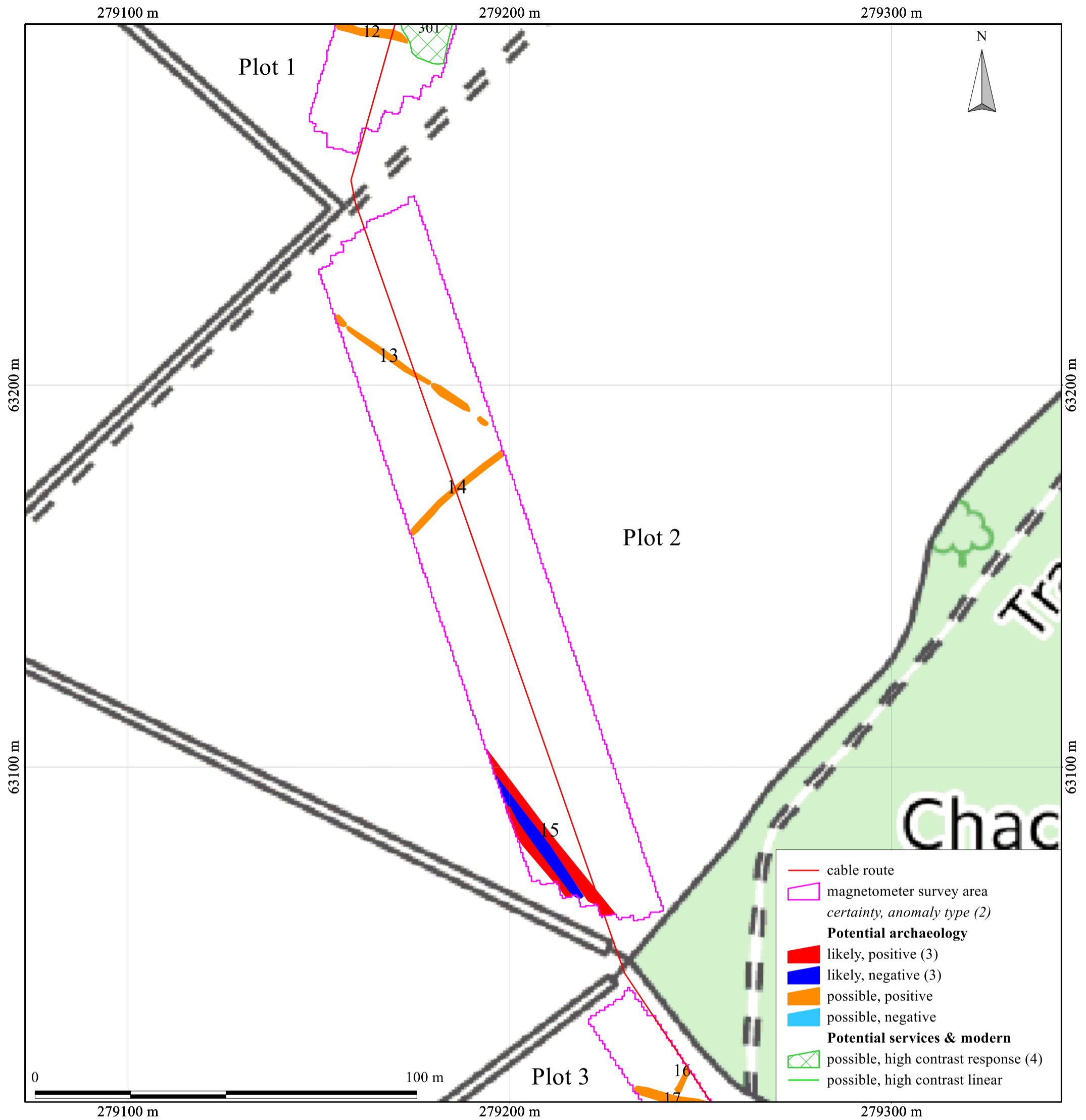
Scale: 1:1500 @ A3. Spatial Units: Meter. Do not scale off this drawing

- 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
 Staverton hydroelectric cable, Dartington, Devon
 NGR: 279256,063600 to 279350,062517
 Report: 1806STA-R-1

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

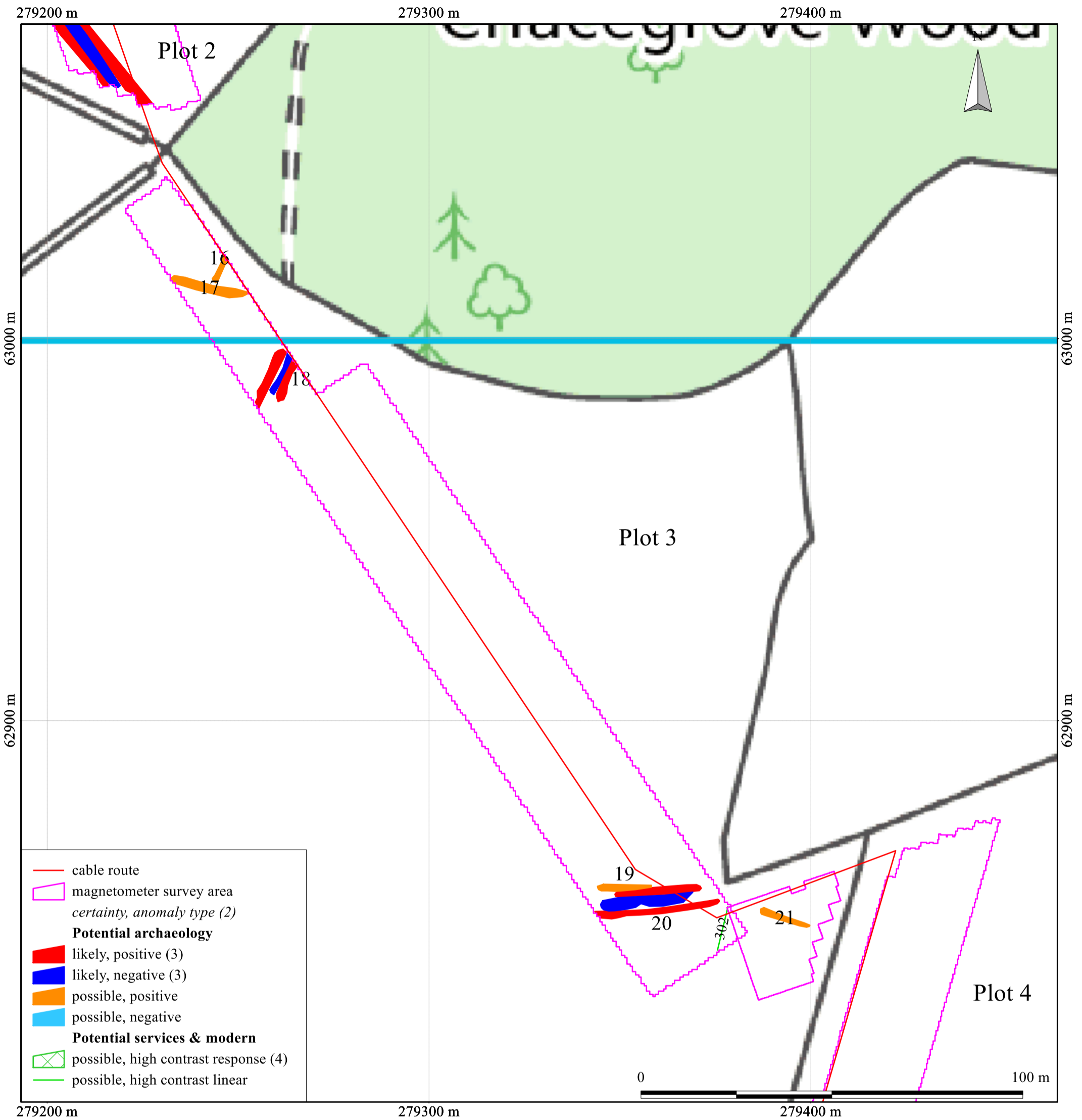
Figure 3: survey interpretation, Plot 1

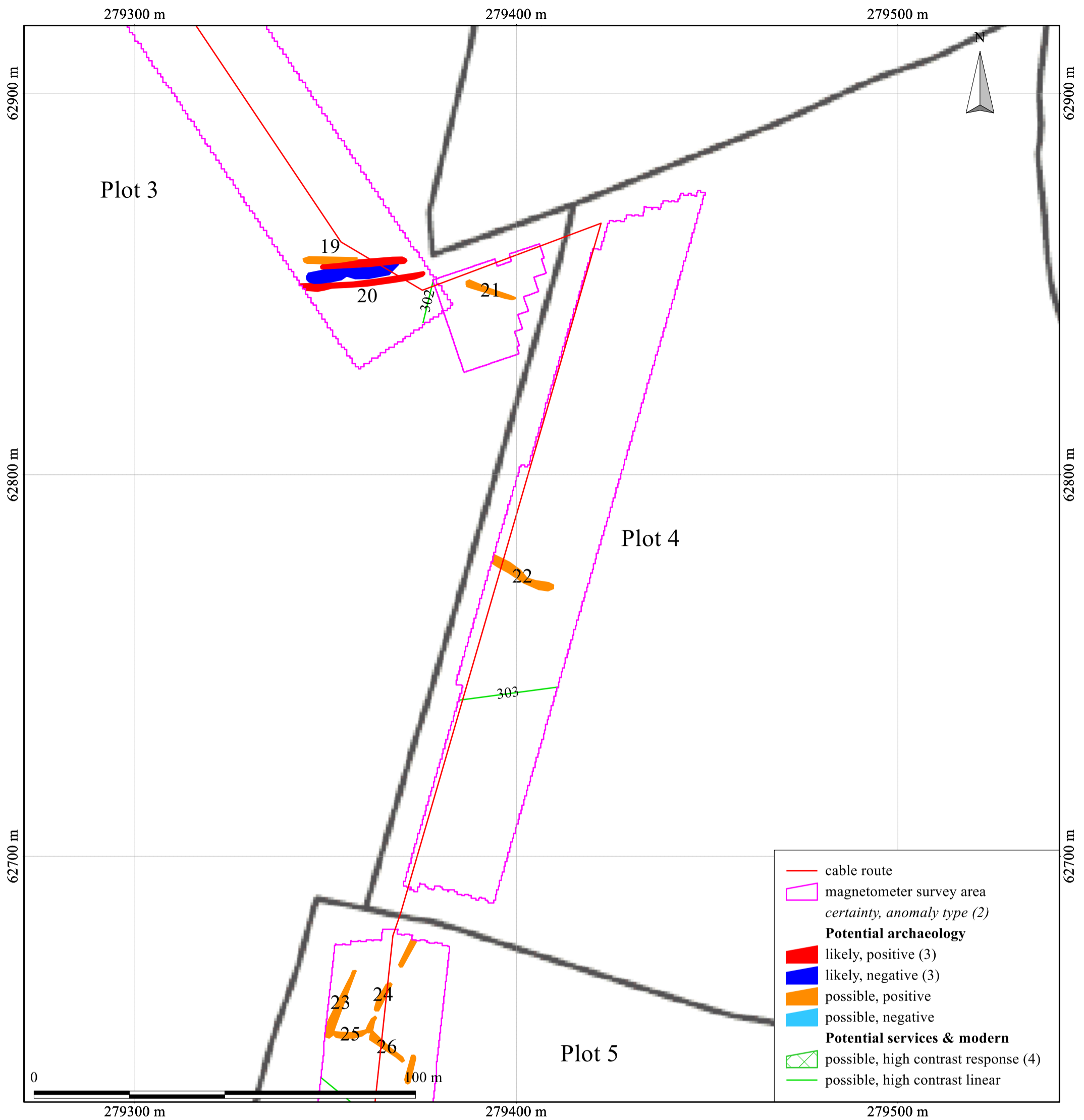


An archaeological magnetometer survey
Staverton hydroelectric cable, Dartington, Devon
NGR: 279256,063600 to 279350,062517
Report: 1806STA-R-1

Figure 4: survey interpretation, Plot 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: 279406.65 m, centre Y: 62776.66 m

Geophysical survey: Copyright Substrata Limited.
Base map: Contains Ordnance Survey data
© Crown copyright and database right 2018

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

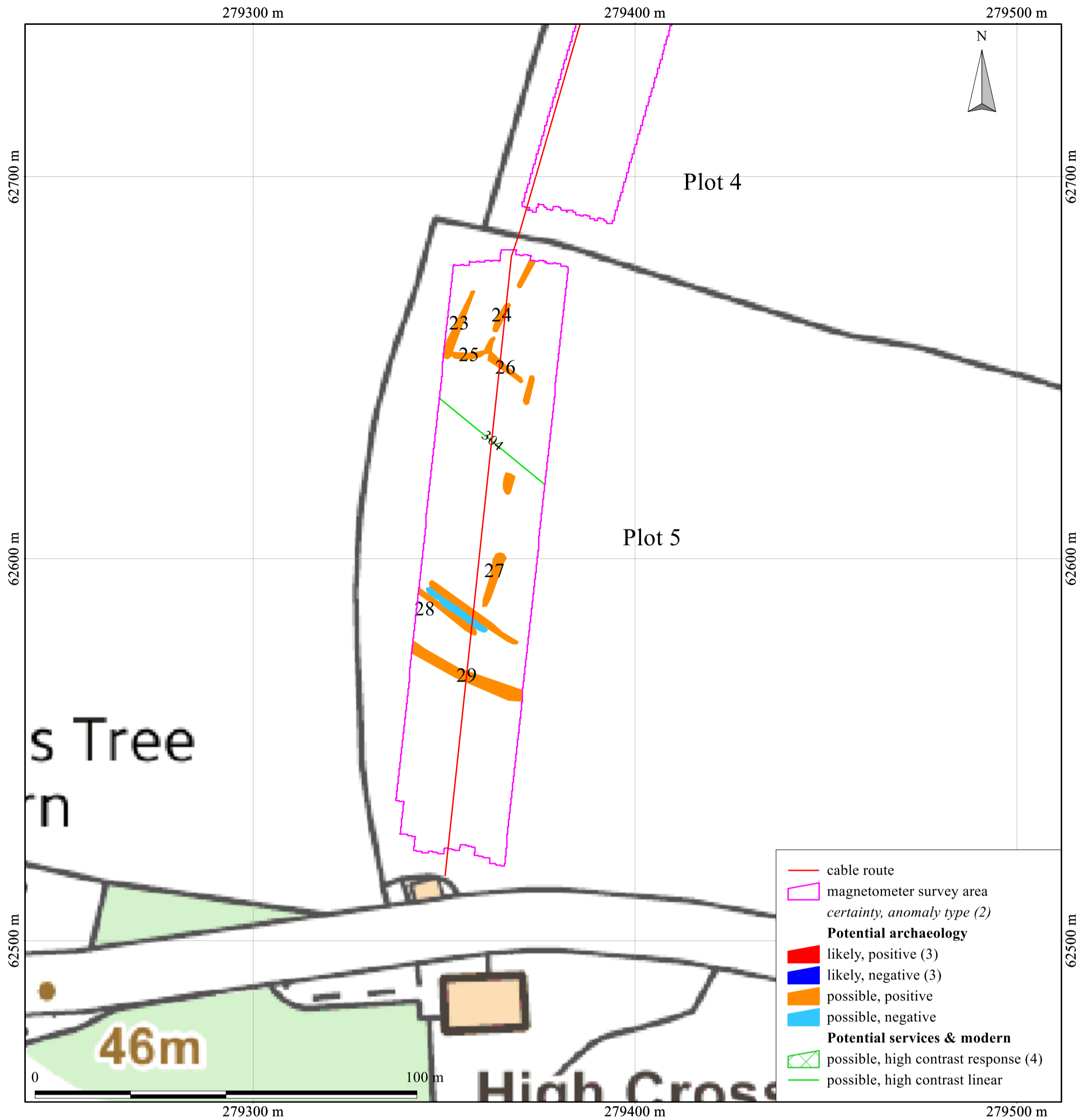
Notes:

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 recent deposits or ground disturbance, or geological and other natural deposits are not mapped unless relevant to potential buried archaeology.

An archaeological magnetometer survey
Staverton hydroelectric cable, Dartington, Devon
NGR: 279256,063600 to 279350,062517
Report: 1806STA-R-1

Figure 6: survey interpretation, Plot 4

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

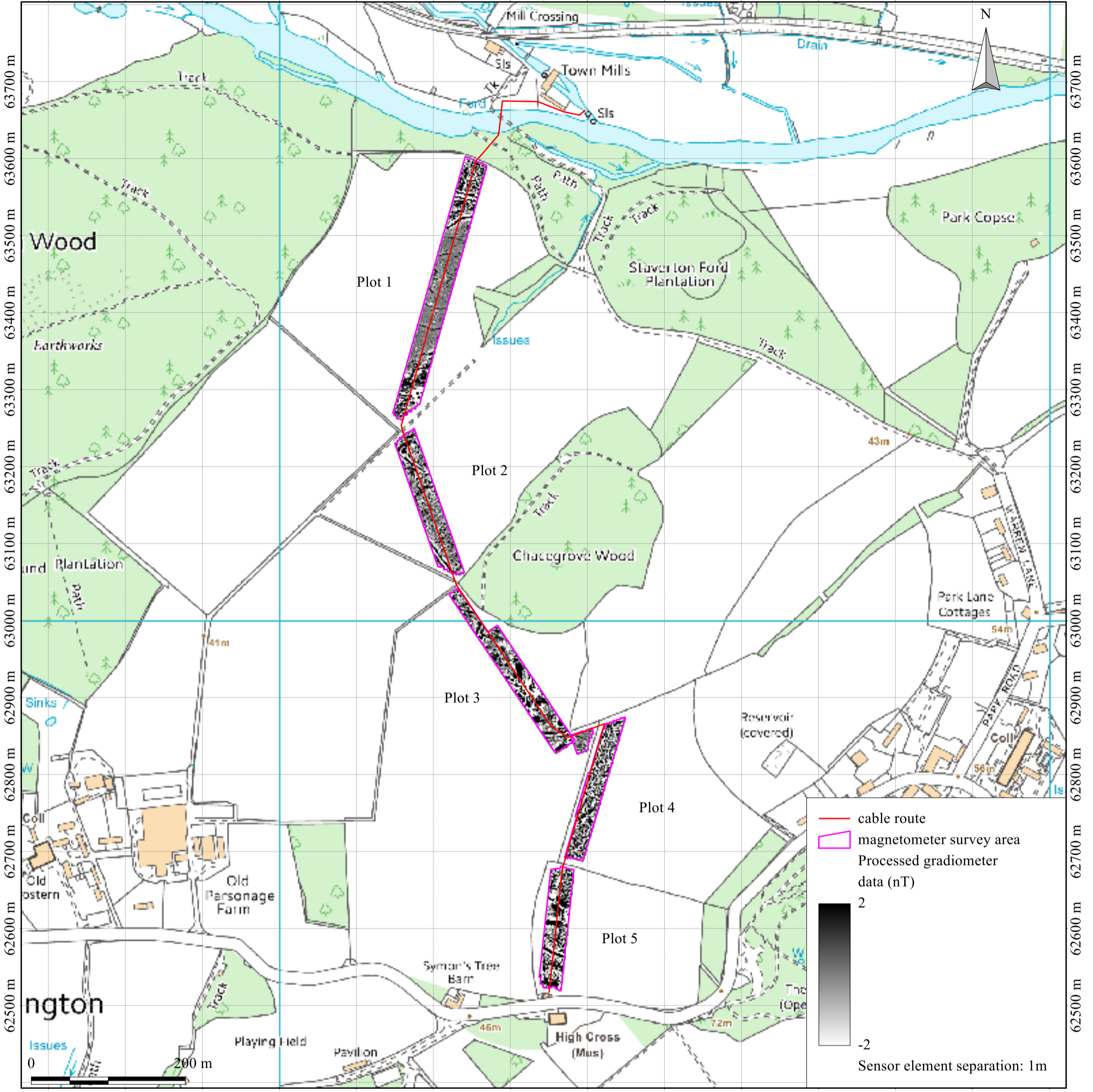


An archaeological magnetometer survey
Staverton hydroelectric cable, Dartington, Devon
NGR: 279256,063600 to 279350,062517
Report: 1806STA-R-1

Figure 7: survey interpretation, Plot 5

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

278700 m 278800 m 278900 m 279000 m 279100 m 279200 m 279300 m 279400 m 279500 m 279600 m 279700 m 279800 m 279900 m 280000 m



British Grid
centre X: 279343.24 m, centre Y: 63098.10 m

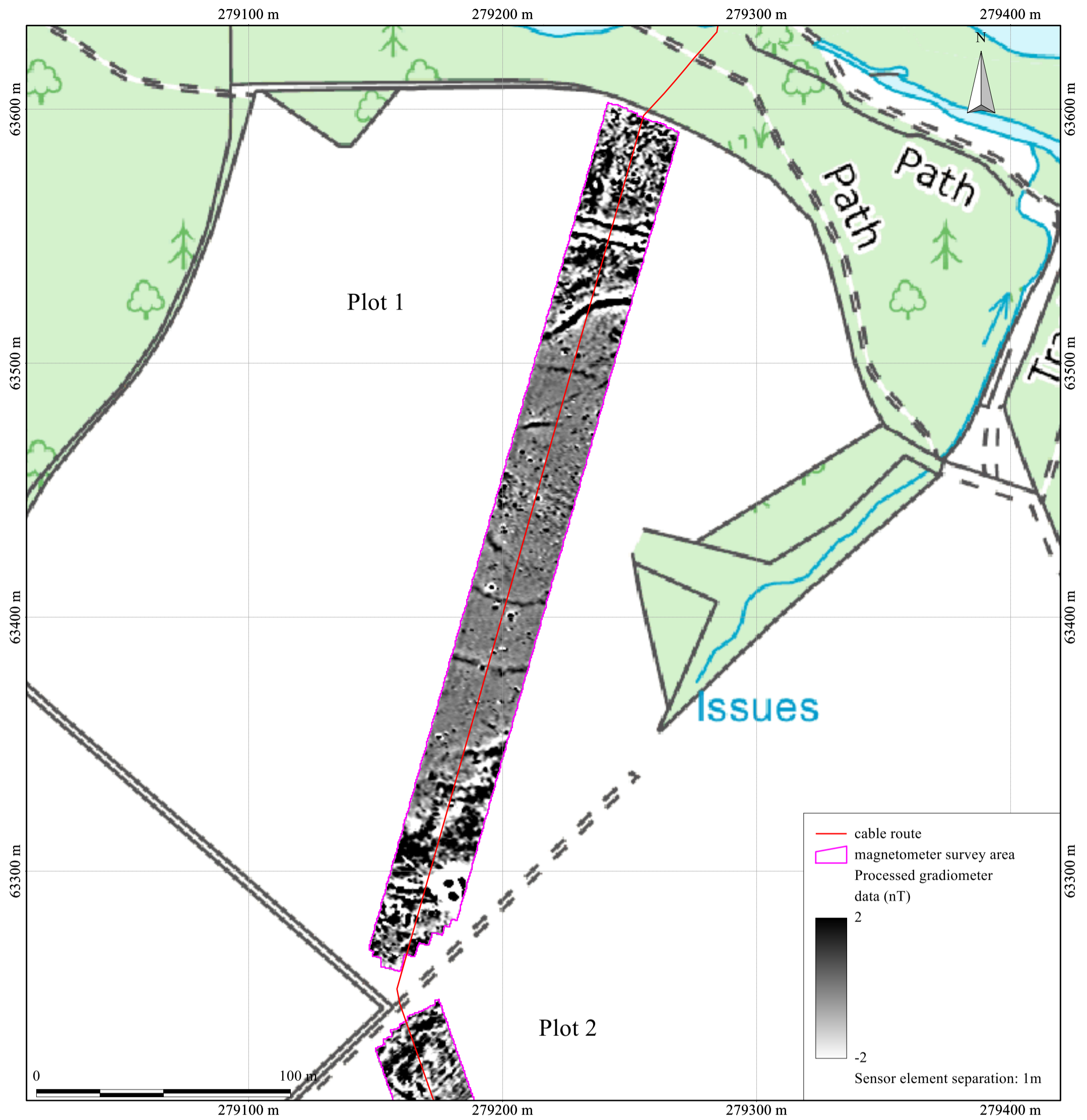
Geophysical survey: Copyright Substrata Limited.
Base map: Contains Ordnance Survey data
© Crown copyright and database right 2018

Scale: 1:5000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
Staverton hydroelectric cable, Dartington, Devon
NGR: 279256,063600 to 279350,062517
Report: 1806STA-R-1

Figure 8: shade plot of processed data, all plots

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



British Grid
 centre X: 279216.09 m, centre Y: 63421.32 m

Geophysical survey: Copyright Substrata Limited.
 Base map: Contains Ordnance Survey data
 © Crown copyright and database right 2018

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

An archaeological magnetometer survey
 Staverton hydroelectric cable, Dartington, Devon
 NGR: 279256,063600 to 279350,062517
 Report: 1806STA-R-1

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

Figure 9: shade plot of processed data, Plot 1



British Grid
 centre X: 279208.74 m, centre Y: 63153.43 m

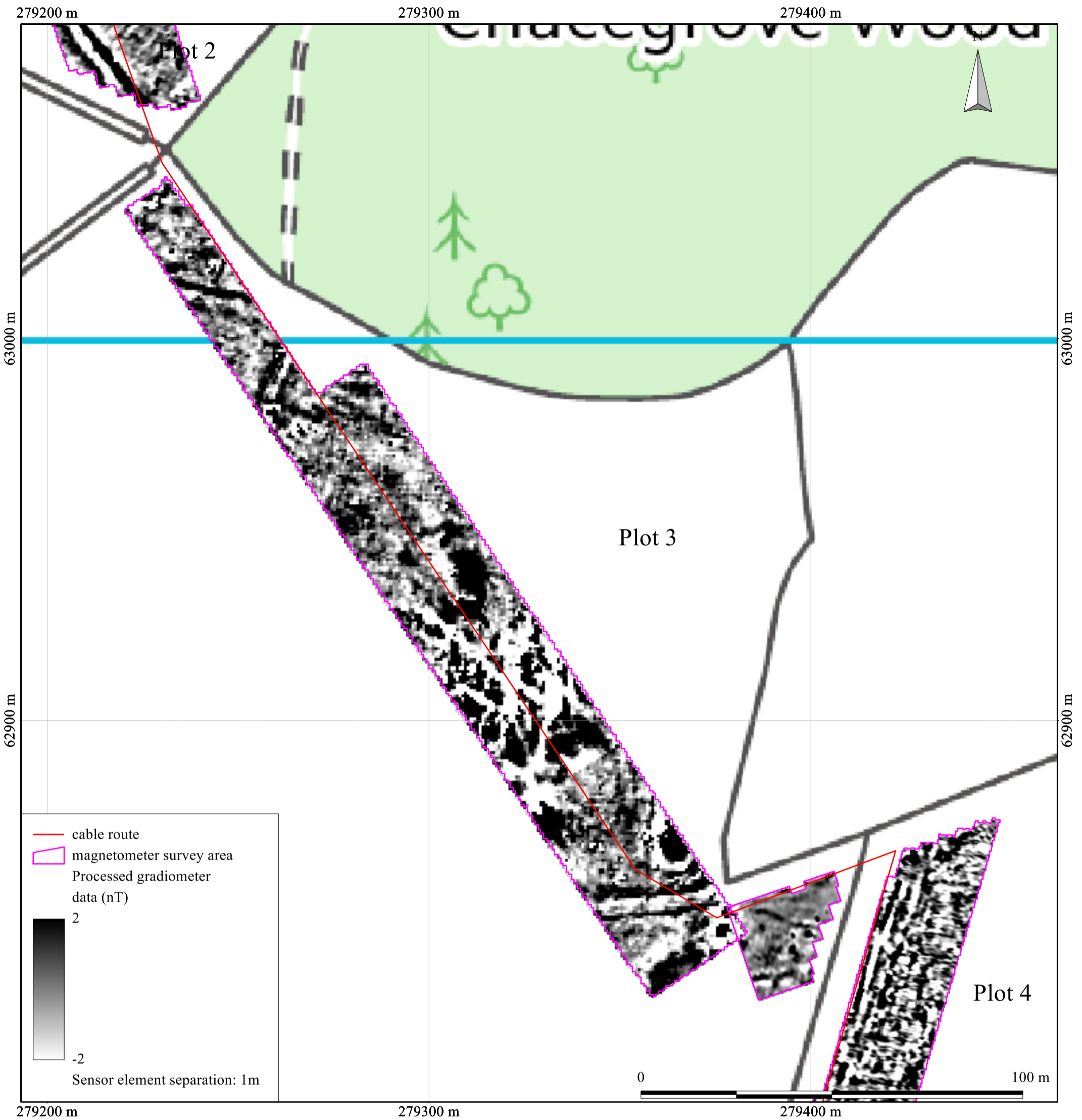
Geophysical survey: Copyright Substrata Limited.
 Base map: Contains Ordnance Survey data
 © Crown copyright and database right 2018

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

An archaeological magnetometer survey
 Staverton hydroelectric cable, Dartington, Devon
 NGR: 279256,063600 to 279350,062517
 Report: 1806STA-R-1

Figure 10: shade plot of processed data, Plot 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: 279328.86 m, centre Y: 62941.23 m

Geophysical survey: Copyright Substrata Limited.
 Base map: Contains Ordnance Survey data
 © Crown copyright and database right 2018

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

An archaeological magnetometer survey
 Staverton hydroelectric cable, Dartington, Devon
 NGR: 279256,063600 to 279350,062517
 Report: 1806STA-R-1

Figure 11: shade plot of processed data, Plot 3

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



British Grid
 centre X: 279406.65 m, centre Y: 62776.66 m

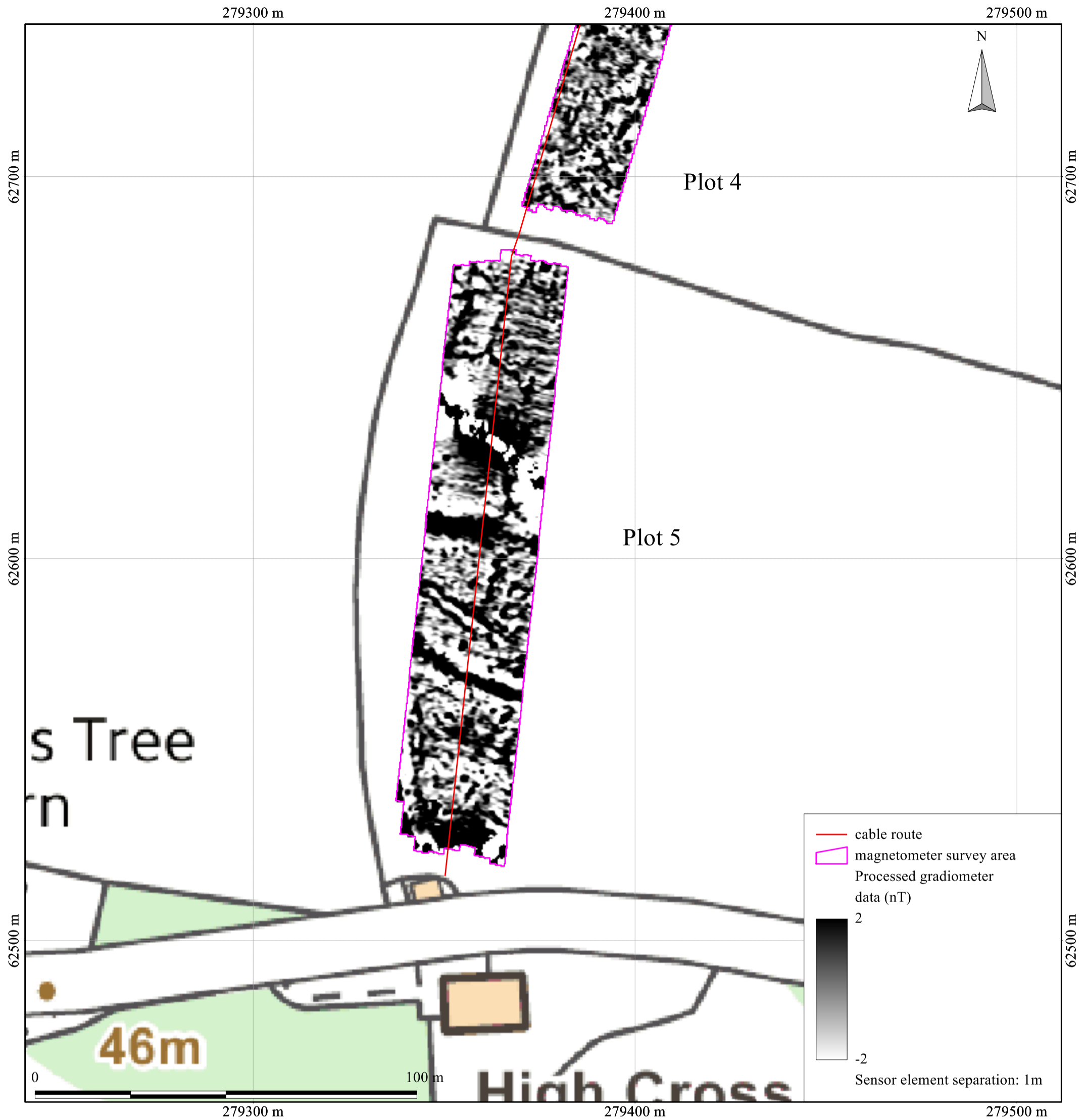
Geophysical survey: Copyright Substrata Limited.
 Base map: Contains Ordnance Survey data
 © Crown copyright and database right 2018

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

An archaeological magnetometer survey
 Staverton hydroelectric cable, Dartington, Devon
 NGR: 279256,063600 to 279350,062517
 Report: 1806STA-R-1

Figure 12: shade plot of processed data, Plot 4

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



British Grid
 centre X: 279375.96 m, centre Y: 62598.86 m

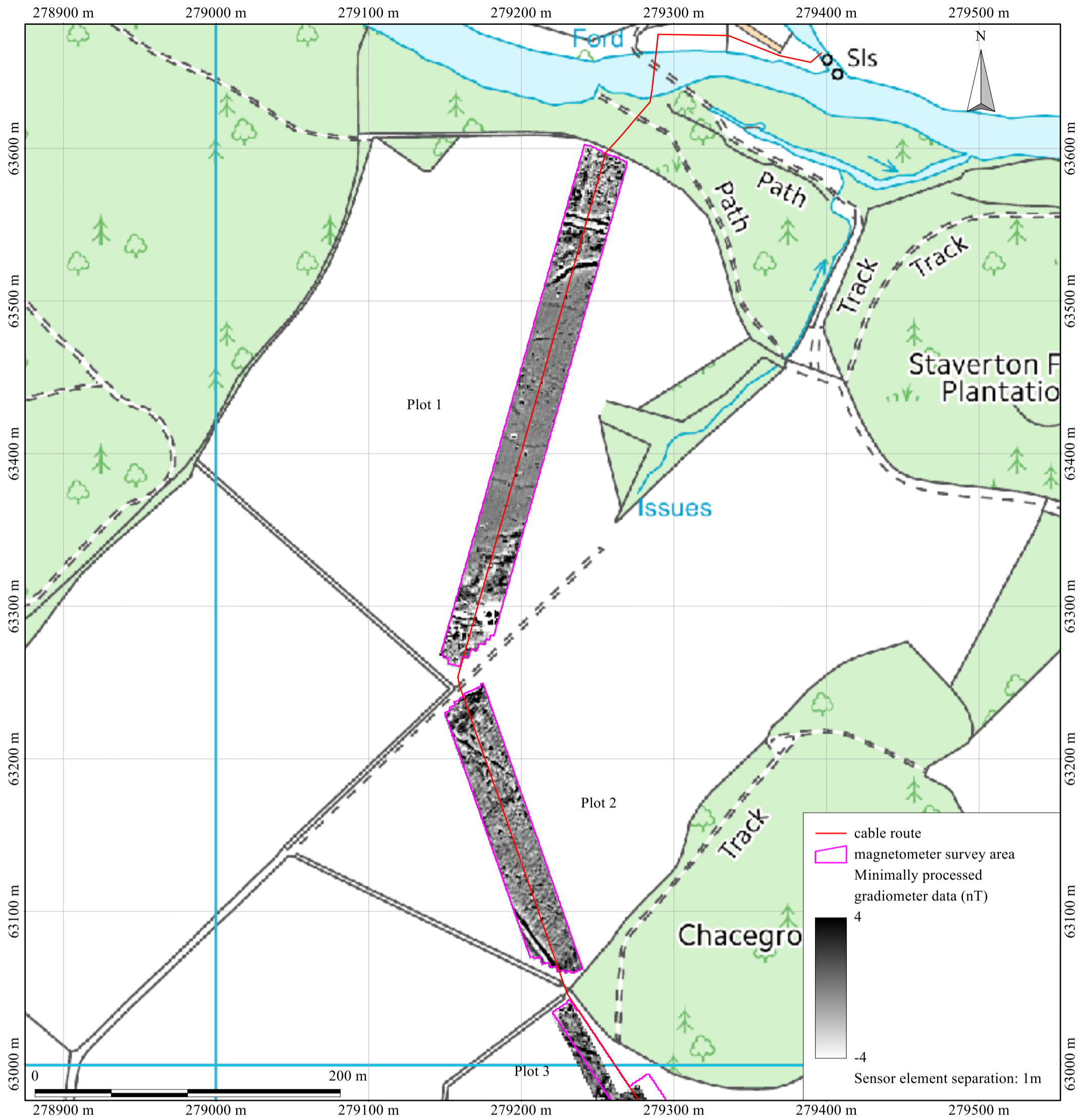
Geophysical survey: Copyright Substrata Limited.
 Base map: Contains Ordnance Survey data
 © Crown copyright and database right 2018

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

An archaeological magnetometer survey
 Staverton hydroelectric cable, Dartington, Devon
 NGR: 279256,063600 to 279350,062517
 Report: 1806STA-R-1

Figure 13: shade plot of processed data, Plot 5

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



British Grid
 centre X: 279214.05 m, centre Y: 63328.80 m

Geophysical survey: Copyright Substrata Limited.
 Base map: Contains Ordnance Survey data
 © Crown copyright and database right 2018

Scale: 1:2500 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
 Staverton hydroelectric cable, Dartington, Devon
 NGR: 279256,063600 to 279350,062517
 Report: 1806STA-R-1

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

Figure 14: shade plot of minimally processed data, Plots 1 and 2

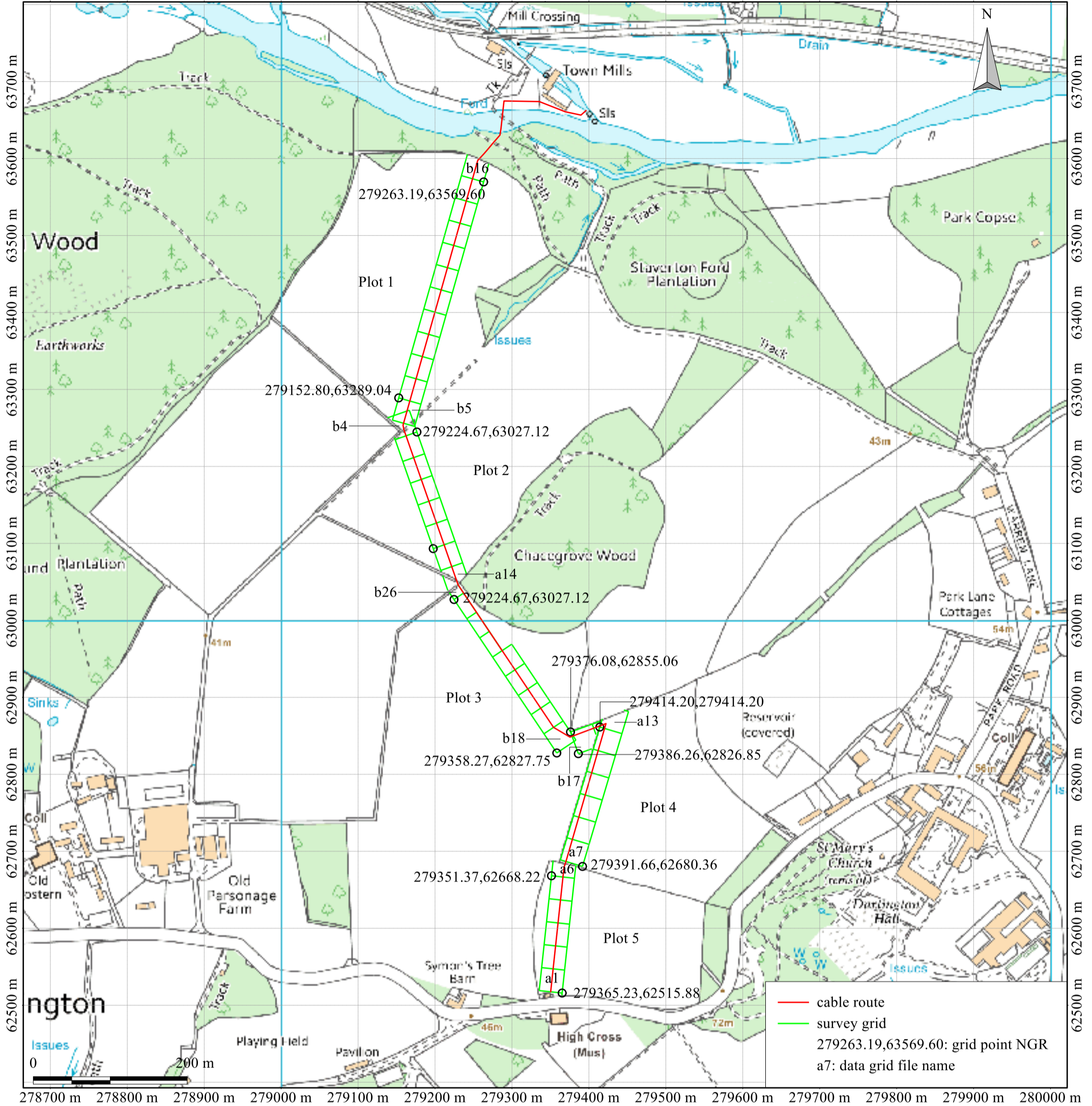


An archaeological magnetometer survey
Staverton hydroelectric cable, Dartington, Devon
NGR: 279256,063600 to 279350,062517
Report: 1806STA-R-1

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

Figure 15: shade plot of minimally processed data, Plots 3 to 5

278700 m 278800 m 278900 m 279000 m 279100 m 279200 m 279300 m 279400 m 279500 m 279600 m 279700 m 279800 m 279900 m 280000 m



British Grid
centre X: 279343.24 m, centre Y: 63098.10 m

Geophysical survey: Copyright Substrata Limited.
Base map: Contains Ordnance Survey data
© Crown copyright and database right 2018

Scale: 1:5000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
Staverton hydroelectric cable, Dartington, Devon
NGR: 279256,063600 to 279350,062517
Report: 1806STA-R-1

Figure 16: survey grid plan and location

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

Appendix 2 Tables

An archaeological magnetometer survey
 Staverton hydroelectric cable, Dartington, Devon
 NGR: 279256,063600 to 279350,062517
 Report: 1806STA-R-1

anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1		possible, positive	parallel, double linears			
2		possible, positive	curvilinear			
3		possible, positive	disrupted linear			
4		possible, positive	disrupted linear	archaeological linear deposit or field drain		
5		possible, positive	curvilinear			
6		likely, positive	parallel, double linears	field wall - possible Devon Bank	anomaly group coincides with and is likely to represent a field boundary recorded on historic maps	1843 Staverton tithe map, Ordnance Survey maps 1888-9 1:2500 to 1906-7 1:10560
7		possible, positive	curvilinear			
8		possible, positive	curvilinear			
9	10? 11?	possible, positive	linear			
10	9? 11?	possible, positive	oval	pit		
11	9? 10?	possible, positive	linear			
12		possible, positive	linear			
301		possible, high contrast response		ferrous material (iron or steel)	anomaly group is close to a man hole cover and may reflect a pipe, cable or similar	surveyor observation
13		possible, positive	disrupted linear			
14		possible, positive	linear			
15		likely, positive/negative/positive	linear	field boundary - Devon bank - possibly an extension of an extant and scheduled medieval woodbank	anomaly group coincides with and is likely to represent a field boundary recorded on historic maps, part of which is a scheduled medieval woodbank	1843 Staverton tithe map, Ordnance Survey maps 1888-9 1:2500 to 1906-7 1:10560 HER MDV76130, Scheduled Monument 1020553
16		possible, positive	linear			
17		possible, positive	linear			
18		likely, positive/negative/positive	linear	field boundary - Devon bank	anomaly group coincides with and is likely to represent a field boundary recorded on historic maps	Ordnance Survey 1888-9 1:2500 to 1906-7 1:10560
19		possible, positive	linear			
20		likely, positive/negative/positive	linear	field boundary - Devon bank	anomaly group coincides with and is likely to represent a field boundary recorded on historic maps	1843 Staverton tithe map, Ordnance Survey maps 1888-9 1:2500 to 1906-7 1:10560
21		possible, positive	linear	buried archaeology or cultivation trace		
302		possible, high contrast linear		ferrous pipe or cable		
22		possible, positive	linear			
303		possible, high contrast linear		ferrous pipe or cable		
23		possible, positive	linear			
24	25? 26?	possible, positive	disrupted linear			
25	24? 26?	possible, positive	curvilinear			
26	24? 25?	possible, positive	linear			
27		possible, positive	disrupted linear			
28		possible, positive/negative/positive	linear	field boundary - possible Devon bank		
29		possible, positive	linear			
304		possible, high contrast linear		ferrous pipe or cable		

1: data analysis

<p>Grid <i>Method of Fixing:</i> DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates. <i>Composition:</i> 30m by 30m grids <i>Recording:</i> Geo-referenced and recorded using digital map tiles. <i>DGPS used:</i> Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program.</p>	
<p>Equipment <i>Instrument:</i> Bartington Instruments grad601-2 <i>Firmware:</i> version 6.1</p>	<p>Data Capture <i>Sample Interval:</i> 0.25m <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN12</p>
<p>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</p>	

Table 2: methodology information

Instrument	
Type:	Bartington Grad-601 gradiometer
Units:	nT
Direction of 1st Traverse:	see below
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing, each with 1m separation
Dummy Value:	32702
Program	
Name:	TerraSurveyor
Version:	3.0.33.6
Plot 1	
<u>Statistics</u>	<u>Processing</u>
Max:	120.57
Min:	-107.85
Std Dev:	7.95
Mean:	0.14
Median:	0.00
	1 Base Layer
	2 Clip at 1.00 SD
	3 DeStripe Median Sensors: Grids: All
	4 Interpolate: Match X & Y Doubled.
	5 Interpolate: X & Y Doubled (to compensate for poor resolution with rotated data composite in the GIS)
Plot 2	
<u>Statistics</u>	<u>Processing</u>
Max:	10.49
Min:	-12.25
Std Dev:	2.30
Mean:	0.16
Median:	0.00
	1 Base Layer
	2 Clip at 3.00 SD
	3 De Stagger: Grids: All By: 0 intervals, 25.00cm
	4 DeStripe Median Sensors: Grids: All
	5 Interpolate: Match X & Y Doubled.
	6 Interpolate: X & Y Doubled (to compensate for poor resolution with rotated data composite in the GIS)
Plot 3	
<u>Statistics</u>	<u>Processing</u>
Max:	104.69
Min:	-96.81
Std Dev:	7.70
Mean:	0.53
Median:	0.00
	1 Base Layer
	2 Clip at 1.00 SD
	3 DeStripe Median Traverse: Grids: All
	4 Interpolate: Match X & Y Doubled.
	5 Interpolate: X & Y Doubled (to compensate for poor resolution with rotated data composite in the GIS)
Plot 3A	
<u>Statistics</u>	<u>Processing</u>
Max:	145.84
Min:	-16.51
Std Dev:	5.45
Mean:	0.31
Median:	0.00
	1 Base Layer
	2 Clip at 2.00 SD
	3 DeStripe Median Traverse: Grids: All
	4 Interpolate: Match X & Y Doubled.
	5 Interpolate: X & Y Doubled (to compensate for poor resolution with rotated data composite in the GIS)
Plot 4	
<u>Statistics</u>	<u>Processing</u>
Max:	59.06
Min:	-49.41
Std Dev:	4.67
Mean:	0.12
Median:	0.00
	1 Base Layer
	2 Clip at 2.00 SD
	3 De Stagger: Grids: All By: 0 intervals, 50.00cm
	4 DeStripe Median Traverse: Grids: All
	5 DeStripe Median Traverse: Grids: All (vertical)
	6 Interpolate: Match X & Y Doubled.
	7 Interpolate: X & Y Doubled (to compensate for poor resolution with rotated data composite in the GIS)
Plot 5	
<u>Statistics</u>	<u>Processing</u>
Max:	586.86
Min:	-423.78
Std Dev:	47.56
Mean:	-0.21
Median:	0.01
	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.
	6 Interpolate: X & Y Doubled (to compensate for poor resolution with rotated data composite in the GIS)

Table 3: processed data metadata

Instrument	
Type:	Bartington Grad-601 gradiometer
Units:	nT
Direction of 1st Traverse:	see below
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing, each with 1m separation
Dummy Value:	32702
Program	
Name:	TerraSurveyor
Version:	3.0.33.6
Plot 1	
<u>Statistics</u>	<u>Processing</u>
Max:	3000.00
Min:	-2872.70
Std Dev:	111.27
Mean:	3.20
Median:	-0.20
	1 Base Layer
	Interpolate match x & y double is imposed on export to the GIS
Plot 2	
<u>Statistics</u>	<u>Processing</u>
Max:	61.60
Min:	-22.10
Std Dev:	2.75
Mean:	0.10
Median:	-0.10
	1 Base Layer
	Interpolate match x & y double is imposed on export to the GIS
Plot 3	
<u>Statistics</u>	<u>Processing</u>
Max:	3000.00
Min:	-3000.00
Std Dev:	93.07
Mean:	1.86
Median:	0.80
	1 Base Layer
	Interpolate match x & y double is imposed on export to the GIS
Plot 3A	
<u>Statistics</u>	<u>Processing</u>
Max:	2956.10
Min:	-17.70
Std Dev:	68.69
Mean:	1.52
Median:	-0.50
	1 Base Layer
	Interpolate match x & y double is imposed on export to the GIS
Plot 4	
<u>Statistics</u>	<u>Processing</u>
Max:	93.40
Min:	-2729.80
Std Dev:	23.95
Mean:	-0.35
Median:	-0.10
	1 Base Layer
	Interpolate match x & y double is imposed on export to the GIS
Plot 5	
<u>Statistics</u>	<u>Processing</u>
Max:	3000.00
Min:	-3000.00
Std Dev:	366.63
Mean:	-2.44
Median:	0.00
	1 Base Layer
	Interpolate match x & y double is imposed on export to the GIS

Table 4: minimally processed data metadata

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 2)

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.