THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

SOUTH WEST

Land at St Ann's Chapel, Bigbury, Devon

Geophysical Survey (Magnetic)

by Marta Buczek and Tim Dawson

Site Code: SCB 13/03

(SX 6650 4709)

Land at St Ann's Chapel, Bigbury
Devon

Geophysical Survey (Magnetic) Report

For Bigbury Parish Council

by Marta Buczek and Tim Dawson

Thames Valley Archaeological Services Ltd

Site Code SCB 13/03

January 2013

Summary

Site name: Land at St Ann's Chapel, Bigbury, Devon

Grid reference: SX 6650 4709

Site activity: Magnetometer survey

Date and duration of project: 14th January 2013

Project manager: Steve Ford

Site supervisor: Tim Dawson

Site code: SCB 13/03

Area of site: 1.2ha

Summary of results: Several linear anomalies have been identified within the survey area, locating part of a field system or partial enclosure of unknown date, along with four possible discrete anomalies. Part of the survey has been affected by parallel vehicle rutting at regular intervals across the survey and the edges have been disrupted by ferrous disturbance within the field boundaries.

Location of archive: The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

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Land at St. Ann's Chapel, Bigbury, Devon
A Geophysical Survey (Magnetic)

by Marta Buczek and Tim Dawson

Report 13/03

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at land at St Ann's Chapel, Bigbury, Devon (SX 6650 4709) (Fig. 1). The work was commissioned by Cllr Stuart Watts of Bigbury Parish Council.

Planning permission is to be sought from South Hams District Council for the construction of affordable homes at the site on the south-eastern edge of the village. A geophysical survey was commissioned at this pre-planning permission stage. The field investigation was carried out to a brief prepared by the Inspector of Ancient monuments at English Heritage and Devon County Council's Historic Environment Service. The fieldwork was undertaken by Marta Buczek and Tim Dawson on 14th January 2013 and the site code is SCB 13/03.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Location, topography and geology

The site is located on the southeastern edge of the village of St Ann's Chapel, *c*.1.65km northwest of the River Avon, 3km northeast of the south Devon coast and 7km west of Kingsbridge. The field in which the sub-rectangular site is located is currently arable (Plates 1 and 2) with the survey area being bordered by hedgerows to the northeast and southwest, a post-and-wire fence to the northwest and the open field to the southeast (Fig. 2). The landscape at this point slopes downhill from north to south with the site being at an average of *c*.118m above Ordnance Datum. The underlying geology is described as Dartmouth Slate (BGS 2001).

At the time of the survey the site was largely bare earth with patches of wheat stubble and minimal plant cover. The ground was predominantly smooth with wheel ruts at intervals. General conditions were wet with heavy rain falling throughout the survey period although this did not affect the survey itself.

Site history and archaeological background

The proposed area for development is in an archaeologically sensitive location. It is less than 70m from the Scheduled Monument of 'Long barrow and two bowl barrows, 200m south east of Chapelcombe' (number

1019239). The long barrow, probably dating to the Earlier Neolithic, is one of only seven recorded in the in Devon historic environment record (the majority being on the fringes of Dartmoor). The round barrows are assumed to date to the Bronze Age though round monuments of neolithic date have also been recorded. The site also lies less than 60m east of a sub-rectangular enclosure and linear features. These are presumed to be the remains of prehistoric settlement or agricultural land division, and were recorded from the air as a cropmark in 1992. It is thought that medieval occupation developed around a holy well known as St Ann's Well (also a Scheduled monument) with the settlement also containing the remains of a 15th century chapel.

Methodology

Sample interval

Data collection required a temporary grid to be established across the survey area using wooden pegs at 30m intervals with further subdivision where necessary. Readings were taken at 0.25m intervals along traverses 1m apart. This provides 3600 sampling points across a full 30m × 30m grid (English Heritage 2008), providing an appropriate methodology balancing cost and time with resolution. The initial plan had the grid extending northwest and northeast of an origin in the southern corner of the site according to the Ordnance Survey superplan. However, due to the thickness of the hedgerow to the southwest the origin had to be moved *c*.5m to the northeast (Fig. 2). The grid extended across the entire survey area with the only obstructions being the thickness of the field boundaries on the north-western and north-eastern sides which had the effect of reducing the size of the survey area to 1.11ha.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to 10^{-9} Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations set out by both English Heritage (2008) and the Institute for Archaeologists (2002).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for fast yet detailed survey of an area.

The detailed magnetometry survey was carried out using a dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometer. The instrument consists of two fluxgates mounted 1m vertically apart with a second set positioned at 1m horizontal distance. This enables readings to be taken of both the general background magnetic field and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches, can be seem from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

A Trimble GeoXH 6000 handheld GPS system with sub-decimetre accuracy was used to tie the site grid into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the ArcheoSurveyorLite software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

Process	**Effect**
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
Range match (area: top 90, left 0, bottom 149, right 359) to top edge	Equalises the range of values between areas surveyed by different operatives, correcting for differences in setup.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.
Clip from -10.00 to 10.00 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.

Once processed, the results are presented as a greyscale plot shown in relation to the site (Fig. 3), followed by a second plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are

shown as colour-coded lines, points and polygons. The grid layout and georeferencing information (Fig. 2) is prepared in EasyCAD v.7.22.01, producing a .FC7 file format, and printed as a .PDF for inclusion in the final report.

The greyscale plot of the processed data is exported from ArcheoSurveyorLite in portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is rotated to orientate it to north and combined with grid and site plans in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised they are exported in .PDF format for inclusion within the finished report.

Results

The survey shows a moderate number of anomalies which are believed to be archaeological in origin, such as pits, as well as linear anomalies which may represent cut features such as ditches.

Three linear features **[Fig. 4: 1, 2, 3]** with strong magnetic signatures are located in the western part of the surveying area and represent ditch-type anomalies, probably archaeological in origin. Of these anomalies, one **[1]** is aligned northeast-southwest forms 90-degree corners with the other two **[2, 3],** which are both aligned northwest-southeast. These **[1, 3]** anomalies suggest ditch-type features and may form the northern part of a bigger enclosure which is not fully seen within surveyed area.

Two positive linear anomalies with slightly weaker signatures **[7, 8]** are possibly of archaeological origin and may represent ditch-type features. Aligned approximately east-west located in the centre of the field; these are parallel to one another. The magnetic signature of these features is stronger to the southwest and then appears to weaken towards the northeast. Anomaly **[8]** appears to intersect positive anomaly **[3]** to the southwest. The relationship between **[8] and [3]** is uncertain due to the weak magnetic signal but it is possible that these anomalies form further enclosures.

Three discreet positive anomalies **[4, 5, 6]** have been identified to the north of the surveyed field which are most likely to represent pits or depressions possibly of archaeological origin.

Another weak negative anomaly **[9]** which can be identified within the survey area, best observed in the south, is aligned north-south. It may be of archaeological origin (earthwork) or more likely modern (pipe).

A patchy irregular weak positive anomaly **[10]** aligned northwest-southeast may be caused by infilled cut features (these may include pits of archaeological origin, possible tree boles or other naturally occurring depressions in the ground) or may be of geological origin.

Several magnetic spikes can be identified across the whole survey area; these appear to be relatively sparse scatters of ferromagnetic objects, either archaeological or modern in origin.

Aside from the anomalies described above, the distinctive features of the surveys are series of parallel lines suggesting vehicle tracks, as identified on the ground surface during the survey, which can be seen around the field edges and also running parallel to each other along the field's long axis.

The survey was affected by magnetic disturbance along the edges of the site where they coincided with the field boundaries. This is most likely caused by the metal fences which bordered the area on these sides. These areas of magnetic disturbance may mask any nearby anomalies of possible archaeological origin.

Conclusion

Several linear anomalies have been identified within the survey, locating part of a field system or partial enclosure of unknown date, along with a four possible discrete anomalies. Part of the survey has been affected by parallel vehicle rutting at regular intervals across the survey and the edges have been disrupted by ferrous disturbance within the field boundaries.

References

BGS, 2001 *British Geological Survey*, 1:50,000, Special Sheet 355-356, Solid and Drift Edition, Keyworth

English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*, English Heritage, Portsmouth (2nd edn)

IFA, 2002, *The Use of Geophysical Techniques in Archaeological Evaluation*, IFA Paper No. 6, Reading

Appendix 1. **Survey and data information**

Raw data

COMPOSITE
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: Marta Buczek, Tim Dawson on 14/01/2013
Assembled by: Marta Buczek on 14/01/2013
Direction of 1st Traverse: 315 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32000

Dimensions
Composite Size (readings): 360 x 150
Survey Size (meters): 90 m x 150 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 95.98
Min: -100.00
Std Dev: 8.17
Mean: 0.61
Median: 1.11
Composite Area: 1.35 ha
Surveyed Area: 1.1151 ha

PROGRAMME
Name: ArcheoSurveyor
Version: 2.5.19.6

Source Grids: 15
1 Col:0 Row:0 grids\01.xgd
2 Col:0 Row:1 grids\06.xgd
3 Col:0 Row:2 grids\07.xgd
4 Col:0 Row:3 grids\12.xgd
5 Col:0 Row:4 grids\13.xgd
6 Col:1 Row:0 grids\02.xgd
7 Col:1 Row:1 grids\05.xgd
8 Col:1 Row:2 grids\08.xgd
9 Col:1 Row:3 grids\11.xgd
10 Col:1 Row:4 grids\14.xgd
11 Col:2 Row:0 grids\03.xgd
12 Col:2 Row:1 grids\04.xgd
13 Col:2 Row:2 grids\09.xgd
14 Col:2 Row:3 grids\10.xgd
15 Col:2 Row:4 grids\15.xgd

Processed data

Stats
Max: 10.00
Min: -10.00
Std Dev: 4.07
Mean: -0.07
Median: 0.05

Processes: 5
1 Base Layer
2 DeStripe Median Sensors: All
3 Range Match (Area: Top 90, Left 0, Bottom 149, Right 359) to Top edge
4 De Stagger: Grids: All Mode: Both By: -1 intervals
5 Clip from -10.00 to 10.00 nT

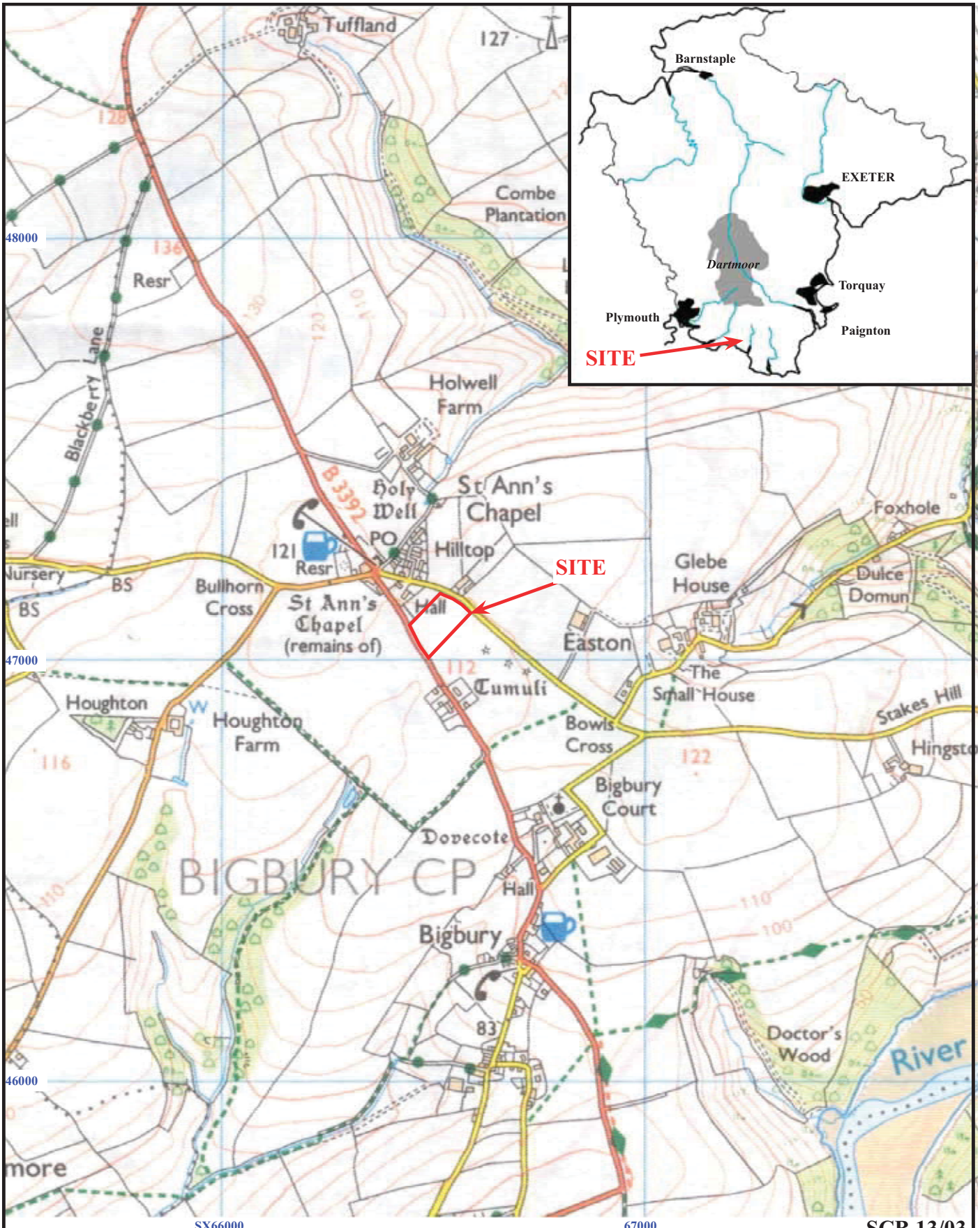

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Figure 1. Location of site in relation to St Ann's Chapel, Bigbury and within Devon.

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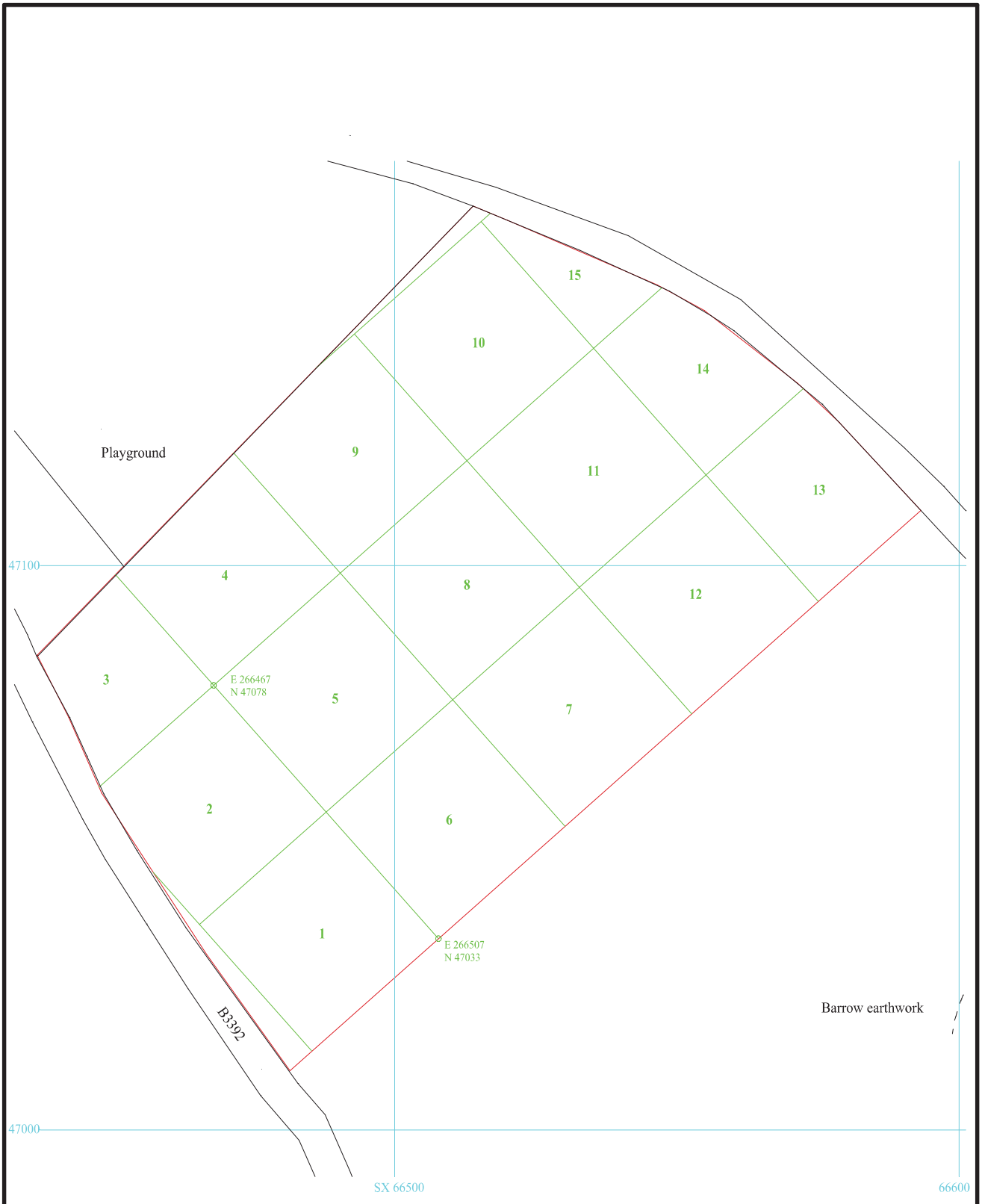

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N

Land at St Ann's Chapel, Bigbury, Devon, 2013
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Figure 2. Grid layout.

0 50m

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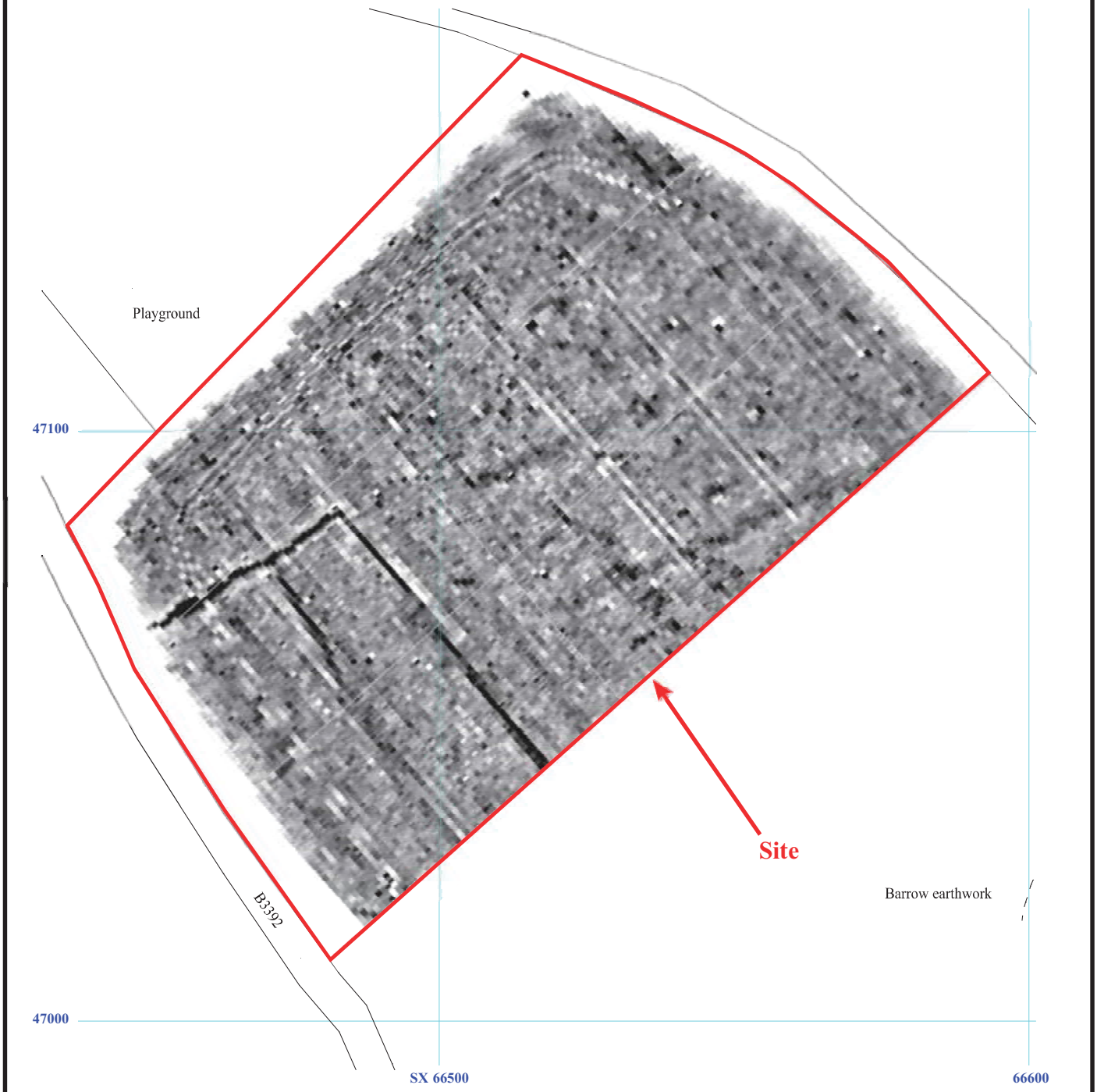

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Figure 3. Plot of minimally processed gradiometer data.

+10 nT

-10 nT

0m 50m

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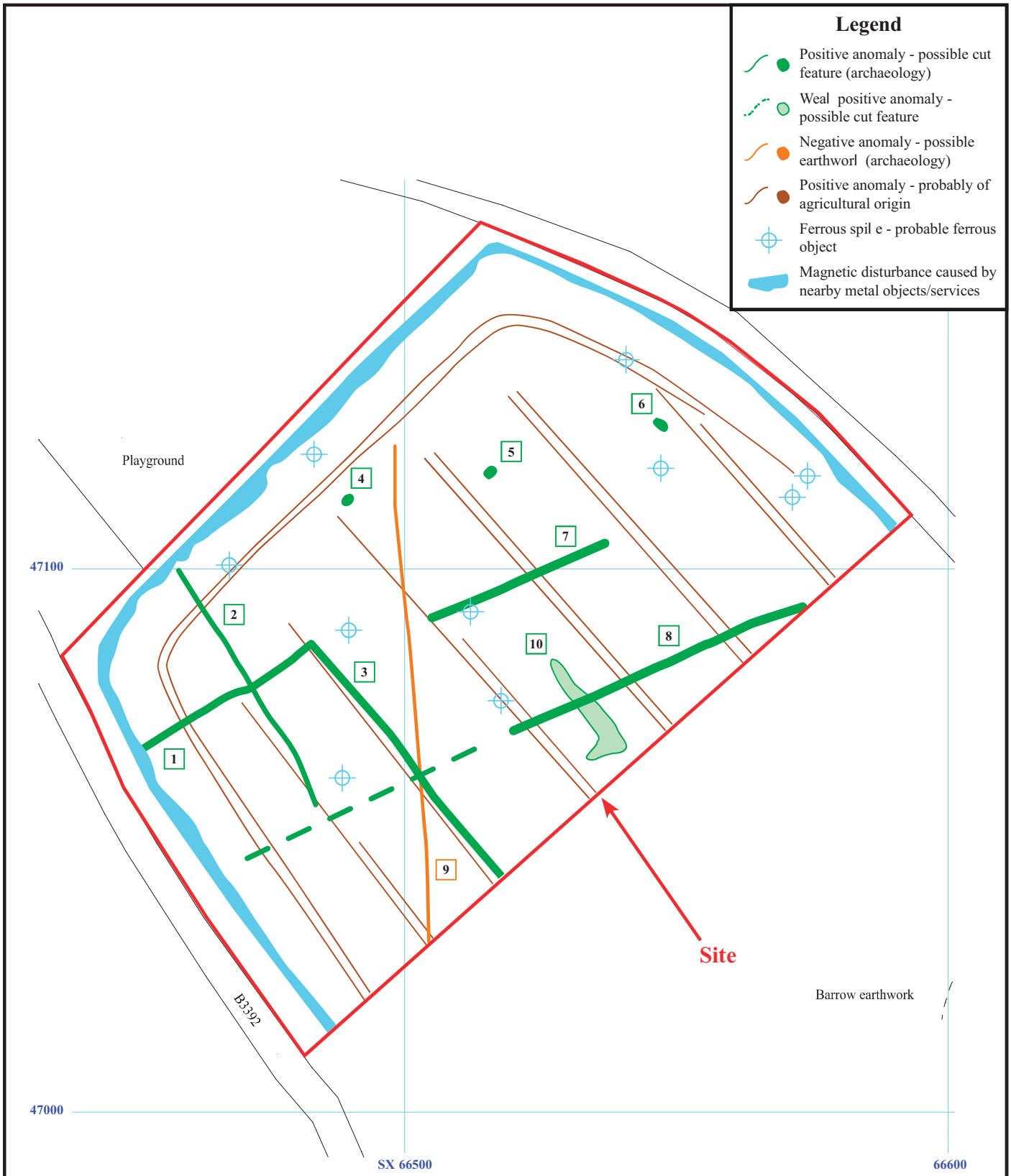

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Land at St Ann's Chapel, Bigbury, Devon, 2012
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Figure 4. Interpretation plot.

0m 50m

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Plate 1. View across the survey area lool ing east towards the barrows.

Plate 2. The southern part of the survey area, lool ing south.

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Land at St Ann's Chapel, Bigbury,
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Plates 1 and 2.

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TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
Iron Age	BC/AD 750 BC
Bronze Age: Late	1300 BC
Bronze Age: Middle	1700 BC
Bronze Age: Early	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC

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