ST BREOCK WINDFARM
CORNWALL

Report on Archaeological Geophysical Survey 2011

A.D.H. Bartlett

Surveyed by:

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St Breock Windfarm, Cornwall

Report on Archaeological Geophysical Survey 2011

Introduction

This geophysical survey forms part of an archaeological evaluation of the route of a proposed road which is to provide access to the St Breock windfarm site. The survey was commissioned from Bartlett Clark Consultancy (BCC), Specialists in Archaeogeophysics of Oxford, by CgMs Consulting of Cheltenham. Fieldwork for the survey was done between 13-15 December 2011.

The Site

Brief notes on site conditions were previously included in the method statement for this project [submitted to CgMs by BCC, and dated 7 December 2011]. The following summary is reproduced in part from this document.

The new road is approximately 3.1 km in length, and is to be constructed across farmland between the A39 and St Breock, about 5km SW of Wadebridge (from NGR 194440, 69450 to 196800, 68395). The western section of the road is to follow the line of an existing track for a length of 1.3km, but the remaining eastern part of the route (1.8km) is to follow a new alignment across fields.

The route was investigated by means of a magnetometer survey across a strip of ground 30m wide along the route. The survey strip was centred on the proposed route alignment where possible. Part of the proposed corridor along the western section of the route is obstructed for surveying purposes by the existing track, and the survey of that section was therefore be located alongside the track. The strip is also offset as necessary where the route is located near to field boundaries.

Geology

The route is on a bedrock of Devonian mudstone and slate, and appears to be free of drift deposits. Previous magnetometer surveys on similar geology in Cornwall have usually responded well, and on various occasions have provided clear evidence for the presence of archaeological sites and features. It is possible in this geological context that magnetic disturbances caused by igneous dykes or intrusions might also be detected, and geological magnetic effects were in fact observed in the western part of the survey (fields 1 and 2 below).

Archaeological background

A number of archaeological sites and findings have been recorded in the vicinity of the route, as indicated on figure 1 (based on a plan supplied to us by CgMs). Most of them are at some distance from the proposed alignment, with the exception of a possible cropmark enclosure, which is intersected by the route. The map also indicates a group of burial mounds nearby in fields to the south of the route.

Survey Procedure

The procedure employed for the survey is based on recorded magnetometer coverage of a continuous sample strip along the route, supplemented by magnetic susceptibility readings. A strip 30m wide should be sufficient to meet the recommendations in the English Heritage geophysical guidelines *[Geophysical Survey in Archaeological Field Evaluation; EH, 2008; p17]*, where it is stated that a road alignment should be surveyed to its full width, and with sufficient breadth for any features detected by the survey to be placed within their context. Similar procedures have been used successfully as part of the archaeological assessment process on numerous previous road and pipeline projects.

Fieldwork Procedure

The survey was carried out using Bartington 1m fluxgate magnetometers, with readings plotted at 25cm intervals along transects 1m apart. The results are presented as grey scale plots in figures 2-6 (at 1:2000 scale), and as graphical or x-y data plots in figures 7-8. [Comparison of the two sets of data plots allows detected magnetic anomalies to be examined in plan and profile respectively.] The initial site plan (figure 1) shows the locations of the 1:2000 figures.

Magnetic susceptibility readings were collected during the survey. These sometimes detect local magnetic enhancement in the vicinity of archaeological sites, but also provide evidence of local magnetic conditions, as determined by geology and soil type, and therefore inform the interpretation of the magnetometer survey. We collected the susceptibility readings along the centre line of the route using Bartington susceptibility meters with a field detector loop.

The survey was positioned in each field by reference to OS co-ordinates measured from the digital mapping supplied by the client, and located with a 10cm accuracy differential GPS system.

Presentation and reporting

The survey plots show the readings after standard processing operations including adjustments to the line spacing to correct for variations in the instrument zero setting, and numerical smoothing to reduce background noise levels.

The grey scale plots in figures 2-6 show the position of the 30m wide survey strip in relation to a digital plan of the road route. [Field boundaries have been traced approximately on to figures 2-6 from the OS map reproduced in figure 1.] The OS coordinates of detected features can be read directly from digital copies of the Autocad plans.

The magnetic susceptibility readings are presented in the form of a graph of readings superimposed on the interpretation plans.

The interpretation of the magnetometer survey which is shown in the lower half of each survey plan includes a selection of magnetic anomalies, but not all the features indicated are archaeologically significant. The interpretation as marked is intended to be schematic and illustrative, and not to reproduce the detail of the grey scale plots. Features are indicated by coloured outlines, or sometimes by broken lines. Broken lines are used to permit a simplified representation of complex features, or to represent features which are too fragmented to form a satisfactory outline.

Colour coding has been used to distinguish different effects. Magnetic anomalies of possible archaeological, or at least non-geological, origin are outlined in red, with potential geological disturbances in a light brown. (These are marked selectively to indicate areas of particularly strong or concentrated magnetic activity.) Disturbances which appear to be of recent (rather than geological) origin are outlined in a dark brown. Possible cultivation effects are shown in green, and pipes in blue.

Results

Fields within the survey area have been numbered for reference (1-10) from west to east along the route (as indicated on the enclosed plans).

The survey has detected a number of subsurface features and disturbances, but they are seen in part against a variable background of natural or non-archaeological magnetic activity. The survey has detected one finding (a probable ring ditch in field 8) which is of clear archaeological interest, but the significance of others (particularly in field 1 at the west of the route) is more difficult to assess.

Findings are described by fields in sequence.

Fields 1-2

The soil magnetic properties in these two fields are clearly different from those along the remainder of the route. This is indicated by the magnetic susceptibility readings, which are much higher here (100+ SI, as indicated by the readings plotted in blue on the interpretative plans), than in fields 3-10 (where they are usually < 20 SI). There is also a high level of background magnetic activity, as is visible particularly in the grey scale

plot, and is represented by magnetic anomalies outlined in light brown in the interpretation.

Overall randomly distributed magnetic activity usually indicates the presence of igneous or metamorphic bedrock, perhaps at shallow depth, or the presence in the subsoil of stones derived from such sources. Various linear markings are visible against this disturbed background, but there is difficulty in determining whether they are archaeologically significant. The most clearly defined of them is a strong ditch-like magnetic anomaly at A (as labelled on figure 2) in field 1. This, together with a more fragmentary feature (B) could indicate part of a ditched enclosure. Such an interpretation cannot, however, be relied upon, given that minor or superficial variation in the depth or displacement of topsoil in these conditions could give rise to strong magnetic anomalies.

Another linear marking (C) alongside A aligns with the field boundary, and could perhaps relate to the existing track. It is perhaps therefore also possible that A could indicate a previous alignment of the track.

Other possible findings in fields 1 and 2 are less distinct. Some of the linear features form parallel patterns, and so have been marked in green as possible cultivation effects, but others (red) could represent pit-like features or fragments of ditches. Alternatively, it is sometimes the case that natural striations in the surface of a shallow magnetic bedrock can give rise to linear magnetic anomalies (as we have seen in various surveys in Wales). It therefore remains uncertain whether linear markings (as at D, E) could be archaeologically significant. The disturbances at F (field 2) correspond to a former field boundary (which is shown on the OS map in figure 1, but is not extant).

Fields 3-4

The susceptibility readings here (and along the remainder of the route) are much lower than in fields 1-2, and there is a corresponding reduction in the level of background magnetic activity. Findings are limited to disturbances along the edge of the existing track in field 3, and pipes (blue) in field 4.

Fields 5-7

The survey in field 5 was offset to the south of the proposed track because the ground to the north is overgrown. There is a weak fragmentary linear feature at G, but the surrounding magnetic anomalies do not form an interpretable plan or pattern.

The same is true of the clusters of stronger magnetic anomalies (around J) in field 7, which could be caused by clusters of naturally magnetic stones (or perhaps recent debris). Parallel linear markings (green) in fields 6-7 could again be cultivation effects (but do not align with present field boundaries).

The apparent cropmark enclosure in field 6 (as indicated on figure 1) was not detected. There is a susceptibility anomaly (at H in field 6, as indicated on figure 5), but there are

no identifiable linear features to suggest that it is located within a ditched enclosure, or of archaeological origin. The cropmark is centred on a track (as marked by a broken grey line) which approaches from the south. It may therefore be the case that the cropmark relates to ground disturbances in the vicinity of a field entrance, rather than to an archaeological feature.

Fields 8-10

Findings include linear markings, which again could be cultivation effects, but might also be natural. There remains one other feature which can be identified as of probable archaeological significance on the basis of its distinctive shape. This is the circular outline (about 20m in diameter) marked in red at K in field 8 (figure 6). This is about 400m to the east of the nearest of the tumuli indicated on figure 1. It is represented by a weak negative magnetic anomaly (white in the grey scale plot), which suggests it may be defined by a shallow extant hollow rather than a deep silted ditch. This feature appears to be isolated. There are various magnetic anomalies nearby, but they are not clearly distinguishable from the general level of background activity.

Conclusions

Ground conditions along the route appear to be generally favourable for magnetic investigation, but it is possible that some of the detected magnetic activity may be of geological or non-archaeological origin, particularly in fields 1-2 at the western end of the survey.

The only clearly identifiable finding of clear archaeological significance is the circular feature (K), which may indicate a burial mound in field 8. The survey did not produce any evidence for a ditched enclosure corresponding to the cropmark feature in field 6.

Other findings include a number of linear markings, particularly in fields 1-2 and 7-10. Some of these could be cultivation effect, but others could be natural. Magnetic anomalies A and B in field 1 could together indicate part of a ditched enclosure, but the presence here of strong natural background magnetic activity and a magnetically responsive soil could mean these features are minor or superficial. The presence here of archaeological findings cannot therefore be confirmed on the basis of the survey results alone.

Report by:

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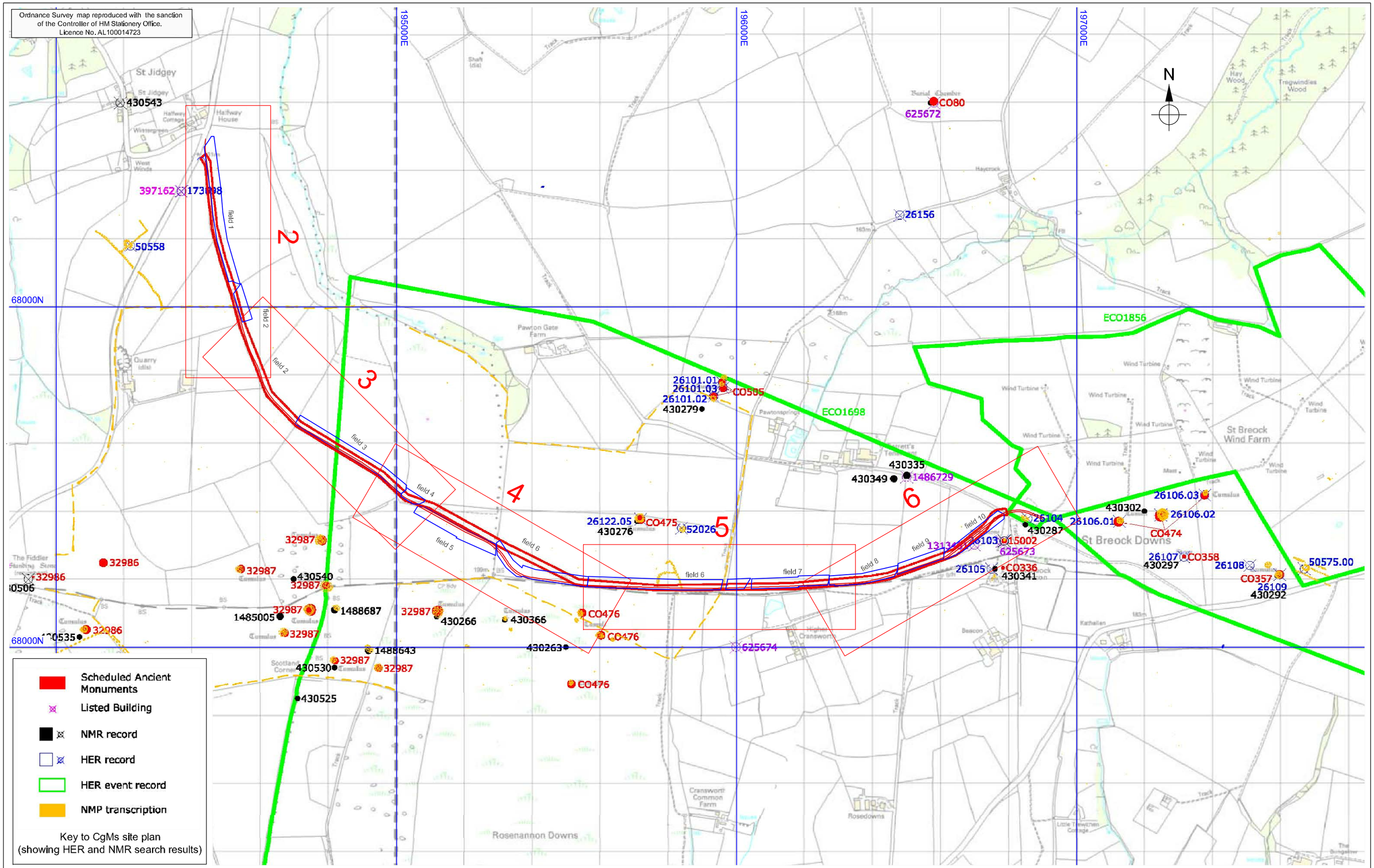
27 December 2011

The fieldwork for this project was done by P. Cottrell and F. Prince.



5

1:2000 survey plans

1:10000

0 500m

magnetometer survey

proposed road

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Figure 1: Location of survey plans (figures 2 - 6)

< Halfway House

Includes map data from site survey by Scott Wilson, Plymouth

N

field 1

field 2

muddy

muddy

pile of rocks/concrete blocks

cattle feeder and mud

Magnetometer survey

Field boundaries are traced from 1:10000 plan (figure 1), and are illustrative only

N

field 1

field 2

muddy

muddy

A

B

C

D

E

pile of rocks/concrete blocks

cattle feeder and mud

Magnetometer survey interpretation (with magnetic susceptibility survey)

St Breock Downs >

Location of magnetometer survey

Volume susceptibility (x 10^{-5}SI) (high readings in blue)

Magnetometer survey:

-2.0 nT 2.2 nT

1:2000

0 100m

Magnetic anomalies: interpretation

possisibly archaeological

mainly geological

probably recent

pipe ?

cultivation

ferrous

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Figure 2: Magnetometer and Magnetic Susceptibility Surveys with Interpretation

< Halfway House

Includes map data from site survey by Scott Wilson, Plymouth

pile of rocks/concrete blocks

cattle feeder and mud

N

field 2

field 3

pile of boulders

field 4

Magnetometer survey

Field boundaries are traced from 1:10000 plan (figure 1), and are illustrative only

pile of rocks/concrete blocks

cattle feeder and mud

N

field 2

F

field 3

pile of boulders

field 4

Magnetometer survey interpretation (with magnetic susceptibility survey)

St Breock Downs >

Location of magnetometer survey

Volume susceptibility (x 10^{-5}SI)
(high readings in blue)

Magnetometer survey:
-2.0 nT 2.2 nT

1:2000
0 100m

Magnetic anomalies: interpretation

possibly archaeological

mainly geological

probably recent

pipe ?

cultivation

ferrous

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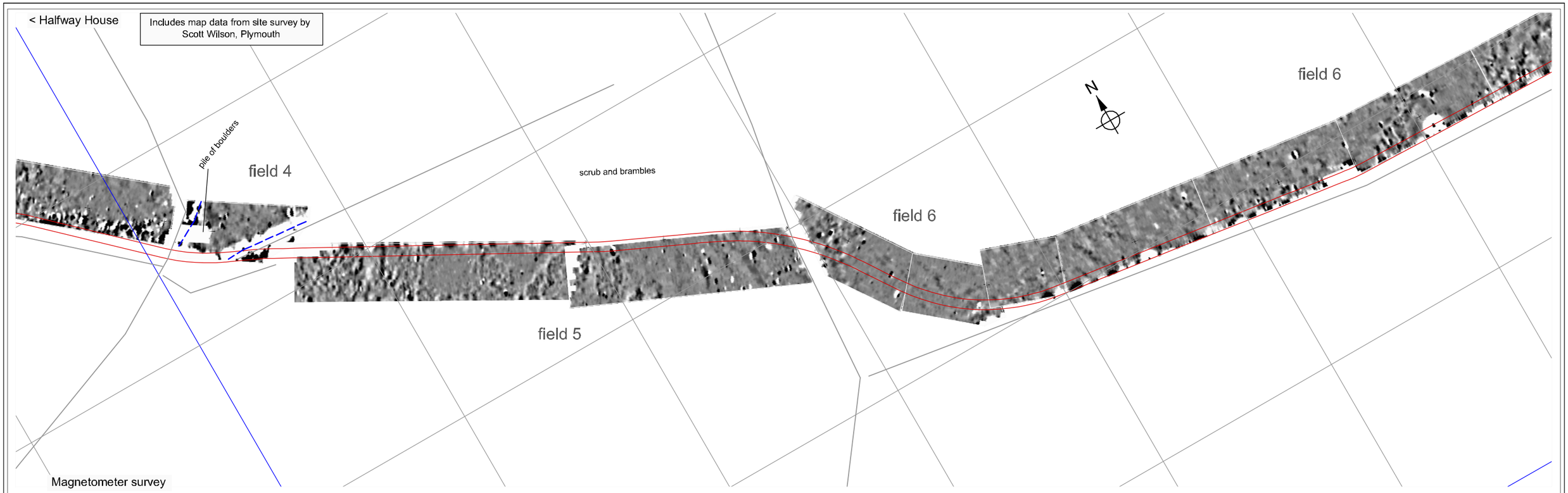
Figure 3: Magnetometer and Magnetic Susceptibility Surveys with Interpretation



Location of magnetometer survey

Volume susceptibility (x 10^{-5}SI) (high readings in blue)

Magnetometer survey: -2.0 nT 2.2 nT

1:2000

0 100m

Magnetic anomalies: interpretation

possisibly archaeological

mainly geological

probably recent

pipe ?

cultivation

ferrous

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Figure 4: Magnetometer and Magnetic Susceptibility Surveys with Interpretation

< Halfway House

Includes map data from site survey by Scott Wilson, Plymouth

field 6

field 6

gorse bushes

boggy/spring?

field 7

N

Magnetometer survey

Field boundaries are traced from 1:10000 plan (figure 1), and are illustrative only

field 6

field 6

H

gorse bushes

boggy/spring?

field 7

J

N

Magnetometer survey interpretation (with magnetic susceptibility survey)

St Breock Downs >

Location of magnetometer survey

Volume susceptibility (x 10 $^{-5}$SI)
(high readings in blue)

Magnetometer survey:
-2.0 nT 2.2 nT

1:2000

0 100m

Magnetic anomalies: interpretation

possibly archaeological

mainly geological

probably recent

pipe ?

cultivation

ferrous

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Figure 5: Magnetometer and Magnetic Susceptibility Surveys with Interpretation

< Halfway House

Includes map data from site survey by Scott Wilson, Plymouth

field 8

field 9

field 10

concrete tank

N

Magnetometer survey

Field boundaries are traced from 1:10000 plan (figure 1), and are illustrative only

field 8

K

field 9

field 10

concrete tank

N

Magnetometer survey interpretation (with magnetic susceptibility survey)

St Breock Downs >

Location of magnetometer survey

Volume susceptibility (x 10^{-5}SI)
(high readings in blue)

Magnetometer survey:
-2.0 nT 2.2 nT

1:2000
0 100m

Magnetic anomalies: interpretation

possibly archaeological

mainly geological

probably recent

pipe ?

cultivation

ferrous

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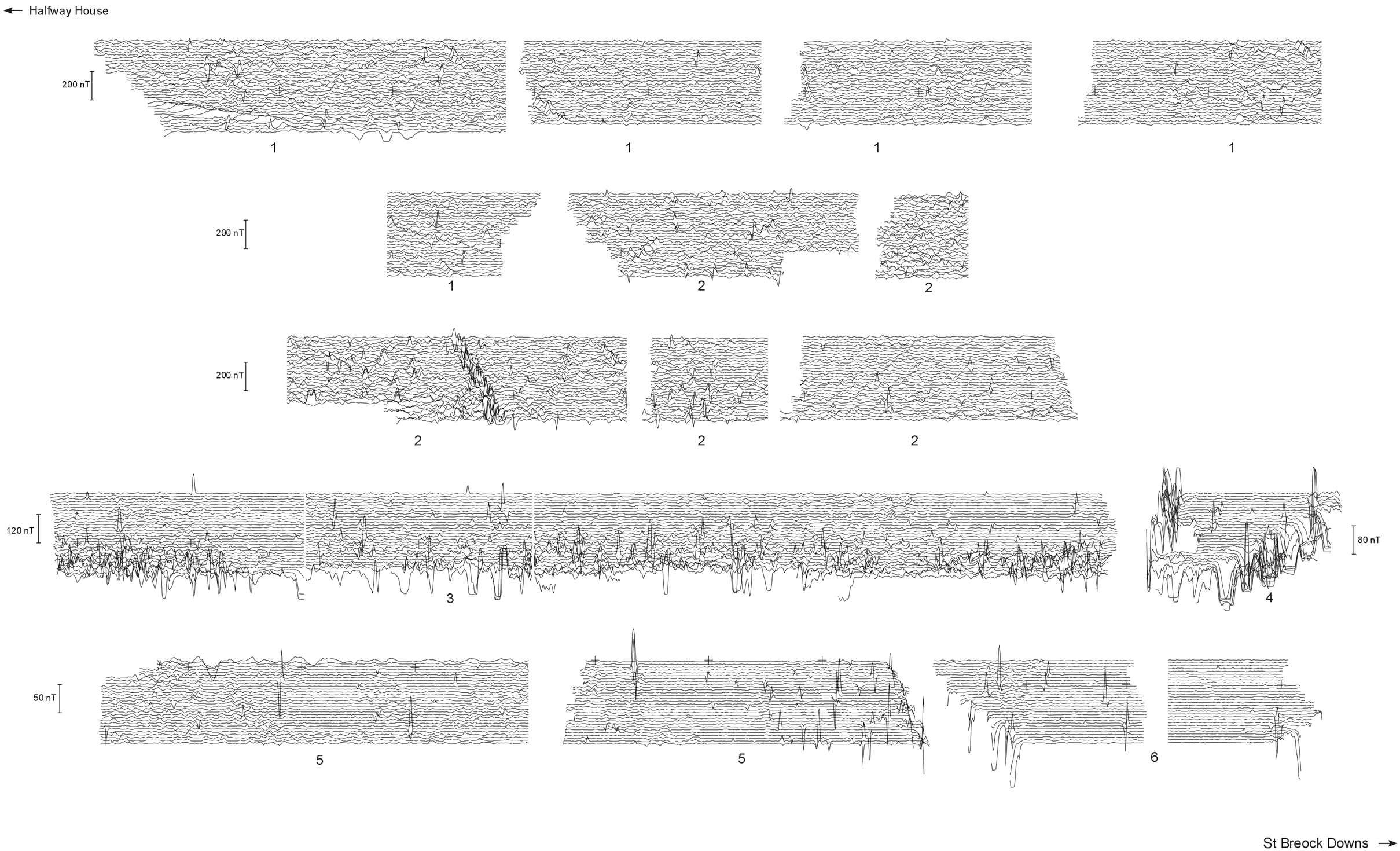
Figure 6: Magnetometer and Magnetic Susceptibility Surveys with Interpretation



1 Field numbers

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1:1250

0 60m

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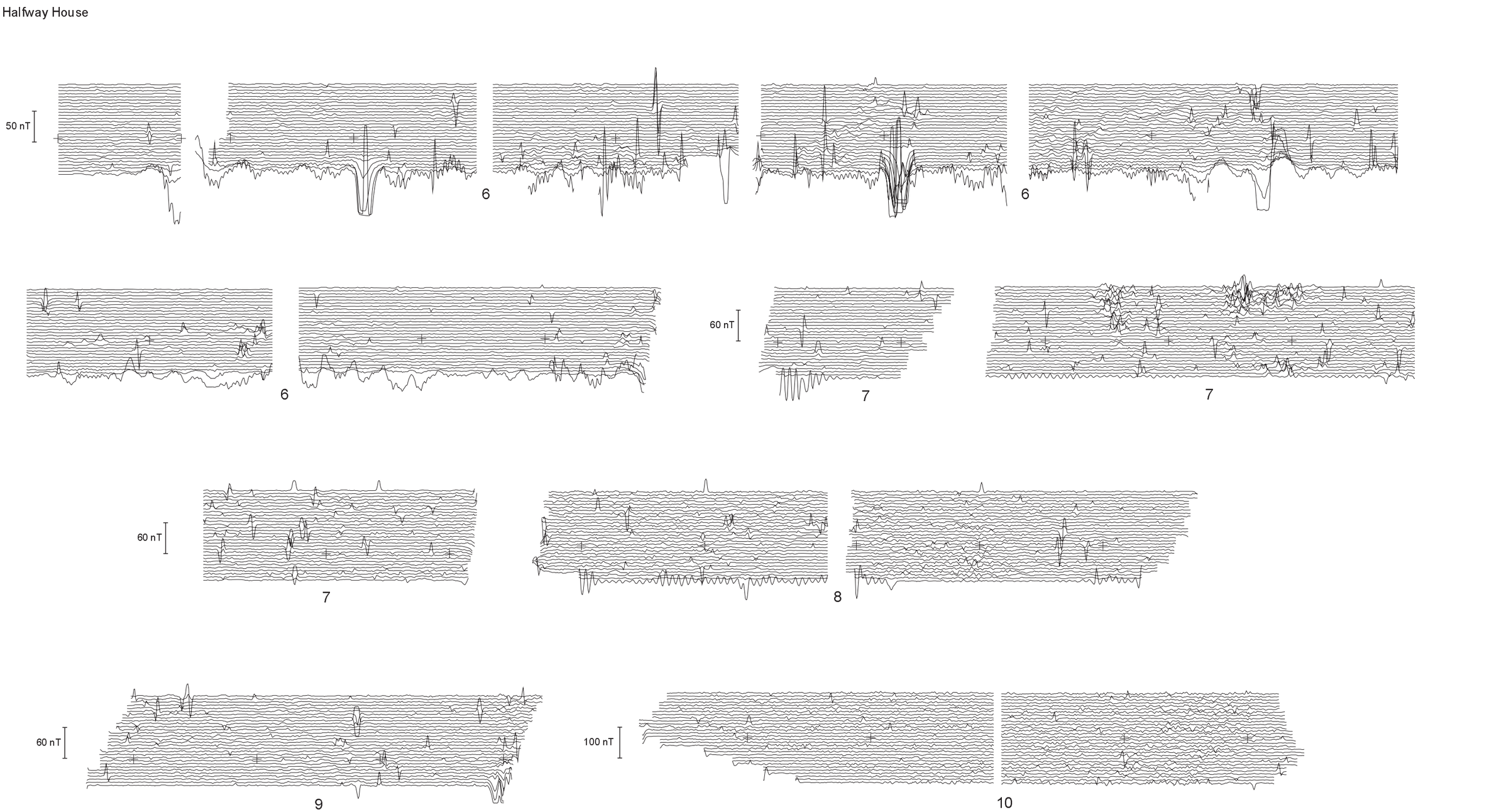
Figure 7: Magnetometer Survey (graphical data plots)



6 Field numbers

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1:1250
0 60m

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Figure 8: Magnetometer Survey (graphical data plots)