



Archaeological Services
University of Durham

Land at Leckhampton, Cheltenham, Gloucestershire

geophysical surveys

on behalf of

CgMs Consulting

Report 1522

August 2006

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1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted in advance of a proposed development on land at Leckhampton, Cheltenham, Gloucestershire. The works comprised of three gradiometer surveys over an area totalling 13ha.
- 1.2 The works were commissioned by CgMs Consulting and conducted by Archaeological Services in accordance with a Written Scheme of Investigation provided by Archaeological Services.

Results

- 1.3 Magnetic anomalies reflecting a significant archaeological resource have been detected.
- 1.4 In Area 1, ring ditches, ditches and pits may indicate prehistoric settlement activity.
- 1.5 A complex of large rectilinear enclosures spans Areas 1 and 2. Internal features can be distinguished in the westernmost enclosures of this complex.
- 1.6 A rectilinear enclosure has been detected in the northeast corner of Area 1. This feature, although disturbed by ridge and furrow cultivation, encloses curvilinear and linear ditches, pits and postholes.
- 1.7 Linear and rectilinear ditches found in Area 3 may be the remains of further enclosures, possibly extending beyond the study area.
- 1.8 Clusters of large positive magnetic anomalies have been detected in Areas 1, 2 and 3. These arrangements of anomalies may be groups of pits or large postholes, and their intensity suggests that they may contain burnt material. The rectangular arrangement of some of these anomalies may indicate structural associations.
- 1.9 Remains of ridge and furrow cultivation typical of medieval agriculture have been found throughout the study area. These remains are evidently later than several of the enclosure features identified.

2. Project background

Location (Figures 1 and 2)

- 2.1 The study area is located on land at Leckhampton, Cheltenham, Gloucestershire (NGR: SO 935 193). The proposed development area covers 15.5ha, comprising four fields of pasture, and is bounded to the north by the rear of properties on the modern estate roads Brizen Lane and Nourse Close, to the east by Farm Lane, to the west by open fields and to the south by Leckhampton Lane.

Development proposal

- 2.2 The proposed development is being promoted for residential allocation in the Tewkesbury Local Plan.

Objective

- 2.3 The principal aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in advance of development.

Methods statement

- 2.4 The surveys have been undertaken in accordance with a Written Scheme of Investigation provided by Archaeological Services.

Dates

- 2.5 Fieldwork was undertaken between the 31st July and the 4th August 2006. This report was prepared between 7th and 18th August 2006.

Personnel

- 2.6 Fieldwork was conducted by Bryan Atkinson, Jill Inglis and Sam Roberts. This report was prepared by Sam Roberts, with illustrations by Janine Fisher. The Project Manager was Duncan Hale.

Archive/OASIS

- 2.7 The site code is **LCG06**, for **Leckhampton, Cheltenham, Gloucestershire 2006**. The project archive is currently held by Archaeological Services Durham University. Archaeological Services is registered with the **Online AccesS to the Index of archaeological investigationS** project (OASIS). The OASIS ID number for this project is **archaeol3-17248**.

3. Archaeological and historical background

- 3.1 A desk-based assessment conducted on the study area found no evidence of any significant archaeological remains within the study area itself, although settlement within the wider vicinity indicated the potential for a previously unidentified and undisturbed archaeological resource (Hunter 2001).

- 3.2 The study area is overlooked by Leckhampton Hill, part of the Cotswold escarpment, which is situated approximately 950m to the south. Excavations on Leckhampton Hill have established the presence of an Iron Age hill fort, together with later Romano-British and Saxon activity.
- 3.3 Roman deposits have been found 350m to the northwest of the present study area. Finds included Roman pottery, brooches and coins.
- 3.4 Leckhampton village is likely to have medieval or early medieval origins. Leckhampton church is of Norman date, and an earthwork complex interpreted as manor grounds located next to the church may indicate a shrunken settlement. A moated site and fish ponds lie over 300m east of the present study area. This site was occupied from the 12th to 16th century. Leckhampton Court, a Grade II* listed building located just outside the village to the southeast of the present study area, contains 14th century elements.
- 3.5 Cartographic evidence implies the study area was in agricultural use throughout the post-medieval period. An early tithe map shows the study area in 1835 as open land, and it has apparently remained undisturbed since.

4. Landuse, topography and geology

- 4.1 At the time of survey the proposed development area comprised four fields of pasture, subdivided by wide, mature, hedgerows.
- 4.2 The survey area was gently rolling farmland, descending to a level plateau in the northwest.
- 4.3 The underlying solid geology of the area comprises Jurassic Lower Lias, which is overlain by river terrace deposits.

5. Geophysical survey

Standards

- 5.1 The surveys and reporting were conducted in accordance with English Heritage Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation* (David 1995); the Institute of Field Archaeologists Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2001).

Technique selection

- 5.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features within landscapes and can involve a variety of complementary techniques such as magnetometry, electrical resistivity, ground-penetrating radar and electromagnetic survey. Some techniques are more suitable than others in particular situations,

depending on a variety of site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.

- 5.3 In this instance, it was considered possible that cut features, such as ditches and pits, could be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.
- 5.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting each of the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record minute anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

- 5.5 A 30m grid was established across each survey area and their positions recorded using a Trimble Pathfinder Pro XRS global positioning system (GPS) with subsequent RINEX calibration.
- 5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 fluxgate gradiometers with automatic datalogging facilities. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was set to 0.1nT, the sample interval to 0.25m and the traverse interval to 1.0m, thus providing 3600 sample measurements per 30m grid unit.
- 5.7 Data were downloaded on-site into laptop computers for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

- 5.8 Geoplot v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw data. The greyscale images and interpretations are presented in Figures 2-11; the trace plots are provided in Appendix 1. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.
- 5.9 The following basic processing functions have been applied to each dataset:

Clip – clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.

Zero mean traverse – sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities.

Destagger – corrects for displacement of anomalies caused by alternate zig-zag traverses.

Despike – locates and suppresses random iron spikes in gradiometer data.

Low pass filter – is useful for enhancing larger weak features.

Interpolate – increases the number of data points in a survey to match sample and traverse intervals. In this instance the gradiometer data have been interpolated to 0.25 x 0.25m intervals.

Interpretation: anomaly types

- 5.10 Colour-coded geophysical interpretation plans are provided for each survey area. Two types of geomagnetic anomaly have been distinguished in the data:

positive magnetic regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches.

dipolar magnetic paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths.

Interpretation: features

- 5.11 Colour-coded archaeological interpretation plans are provided for each survey area.
- 5.12 Small, discrete dipolar magnetic anomalies have been detected in all of the survey areas. Most of these almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments. Larger dipolar anomalies in Areas 1 and 2 correspond to the location of service pylons.
- 5.13 Linear dipolar magnetic anomalies along the boundaries of the survey areas reflect wire fencing or ferrous objects within the hedgerows. An intense linear dipolar magnetic anomaly aligned northwest-southeast in the northern part of Area 1 may reflect service cables. Two discrete dipolar anomalies detected in the northeastern corner of Area 3 on the same alignment may also reflect services.
- 5.14 Magnetic anomalies reflecting the remains of ridge and furrow cultivation have been detected in all of the survey areas, but these are particularly prominent in Areas 2 and 3. Three main alignments of ridge and furrow are evident, running north-south, northwest-southeast and east-west, and together creating the characteristic ‘patchwork quilt’ effect.

Area 1 (Figs 3-5)

- 5.15 In the southeastern corner of Area 1 a series of curvilinear, linear and discrete positive magnetic anomalies have been detected. These anomalies are likely to reflect ring-ditches, ditches and pits. Groups of such features are often associated with prehistoric settlement.
- 5.16 Rectilinear positive magnetic anomalies detected along the western boundary of the southern half of Area 1 almost certainly reflect enclosure ditches, part of a complex of rectilinear enclosures which has also been detected in Area 2. A linear positive magnetic anomaly leads from the northeast corner of these enclosures and may reflect a ditch.
- 5.17 To the north of these ditches in the western part of Area 1, arrangements of fairly strong discrete positive magnetic anomalies are likely to reflect pits or large postholes. The intensity of these anomalies may indicate some association with burnt material.
- 5.18 A curvilinear positive magnetic anomaly on the western boundary of Area 1 is likely to reflect a ditch.
- 5.19 Weak, linear positive magnetic anomalies aligned northwest-southeast and northeast-southwest in the western part of Area 1 reflect soil-filled features, possibly land drains.
- 5.20 In the northwestern corner of Area 1, rectilinear positive magnetic anomalies have been detected together with discrete positive magnetic anomalies. The features giving rise to these anomalies appear to have been disturbed by ridge and furrow cultivation but appear to form a rectilinear enclosure with internal features comprising a possible circular or sub-rectangular arrangement of postholes, linear and curvilinear ditches as well as pits within and outside the enclosure.

Area 2 (Figs 6-8)

- 5.21 Positive magnetic anomalies indicating a large complex of rectilinear enclosures have been detected in the southern part of Area 2, and these extend into Area 1. Curvilinear, linear and discrete positive magnetic anomalies detected within the westernmost enclosures are likely to reflect ditches and pits.
- 5.22 In the northern part of Area 2 discrete positive magnetic anomalies detected may reflect pits. Rectilinear positive magnetic anomalies and associated features may reflect a ditched enclosure.
- 5.23 Distinctive 'herring-bone' formations of positive magnetic anomalies almost certainly reflect systems of field drains. Two weak linear positive magnetic anomalies, aligned roughly east-west, are also likely to reflect land drains.

Area 3 (Figs 9-11)

- 5.24 Linear and rectilinear positive magnetic anomalies detected along the western edge of Area 3 are likely to reflect ditches. These may be the remains of further enclosures.
- 5.25 Small and large discrete positive magnetic anomalies detected in the southwestern corner of Area 3 are likely to reflect pits and postholes.
- 5.26 A weak linear positive magnetic anomaly traversing Area 3, aligned northwest-southeast, is likely to reflect a field drain. To the east of this anomaly, weak positive magnetic linear anomalies reflect soil filled features such as ditches or gullies; these may also be associated with land drainage.
- 5.27 A rectilinear positive magnetic anomaly detected in the northeastern corner of Area 3 may reflect a ditch, or be associated with the services traversing Area 1.

6. Conclusions

- 6.1 Geophysical surveys have been carried out over land at Leckhampton, Cheltenham, Gloucestershire.
- 6.2 Magnetic anomalies reflecting a significant archaeological resource have been detected.
- 6.3 In Area 1, ring ditches, ditches and pits suggest the survival of features associated with prehistoric settlement activity.
- 6.4 A complex of large rectilinear enclosures spans Areas 1 and 2. Internal features can be distinguished in the westernmost enclosures of this complex.
- 6.5 A rectilinear enclosure has been detected in the northeast corner of Area 1. This feature, although disturbed by ridge and furrow cultivation, encloses curvilinear and linear ditches, pits and postholes.
- 6.6 Linear and rectilinear ditches found in Area 3 may be the remains of further enclosures, possibly extending beyond the study area.
- 6.7 Clusters of large positive magnetic anomalies have been detected in Areas 1, 2 and 3. These arrangements of anomalies may be groups of pits or large postholes, and their intensity suggests that they may contain burnt material. The rectangular arrangement of some of these anomalies may indicate structural associations.
- 6.8 Remains of ridge and furrow cultivation typical of medieval agriculture have been found throughout the study area. These remains are evidently later than several of the enclosure features identified.

7. Sources

- David, A, 1995 *Geophysical survey in archaeological field evaluation*, Research and Professional Services Guideline **1**, English Heritage
- Gaffney, C, Gater, J & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*, Technical Paper **6**, Institute of Field Archaeologists
- Hunter, J, 2001 *Land west of Farm Lane, Leckhampton: desk-based assessment*, unpublished report for Barton Willmore Planning on behalf of David Wilson Estates, CgMs Consulting
- Schmidt, A, 2001 *Geophysical Data in Archaeology: A Guide to Good Practice*, Archaeology Data Service, Arts and Humanities Data Service



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Figure 1
Location map

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proposed development area

0 1km



scale 1:25 000 - for A4 plot





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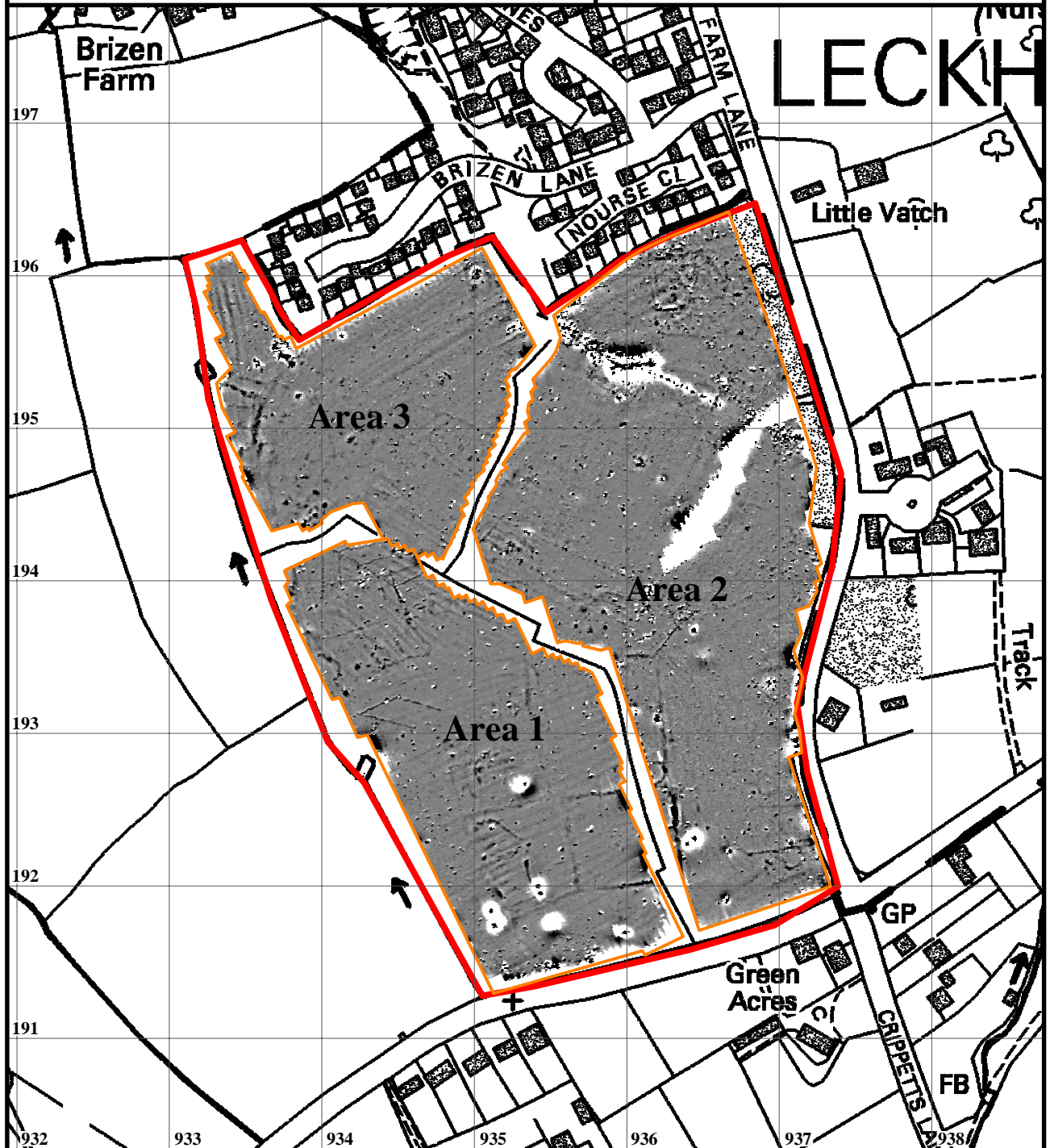
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Figure 2
Location of surveys

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proposed development area



scale 1:4000 - for A4 plot



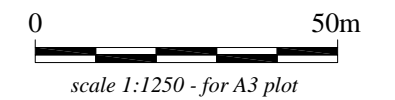
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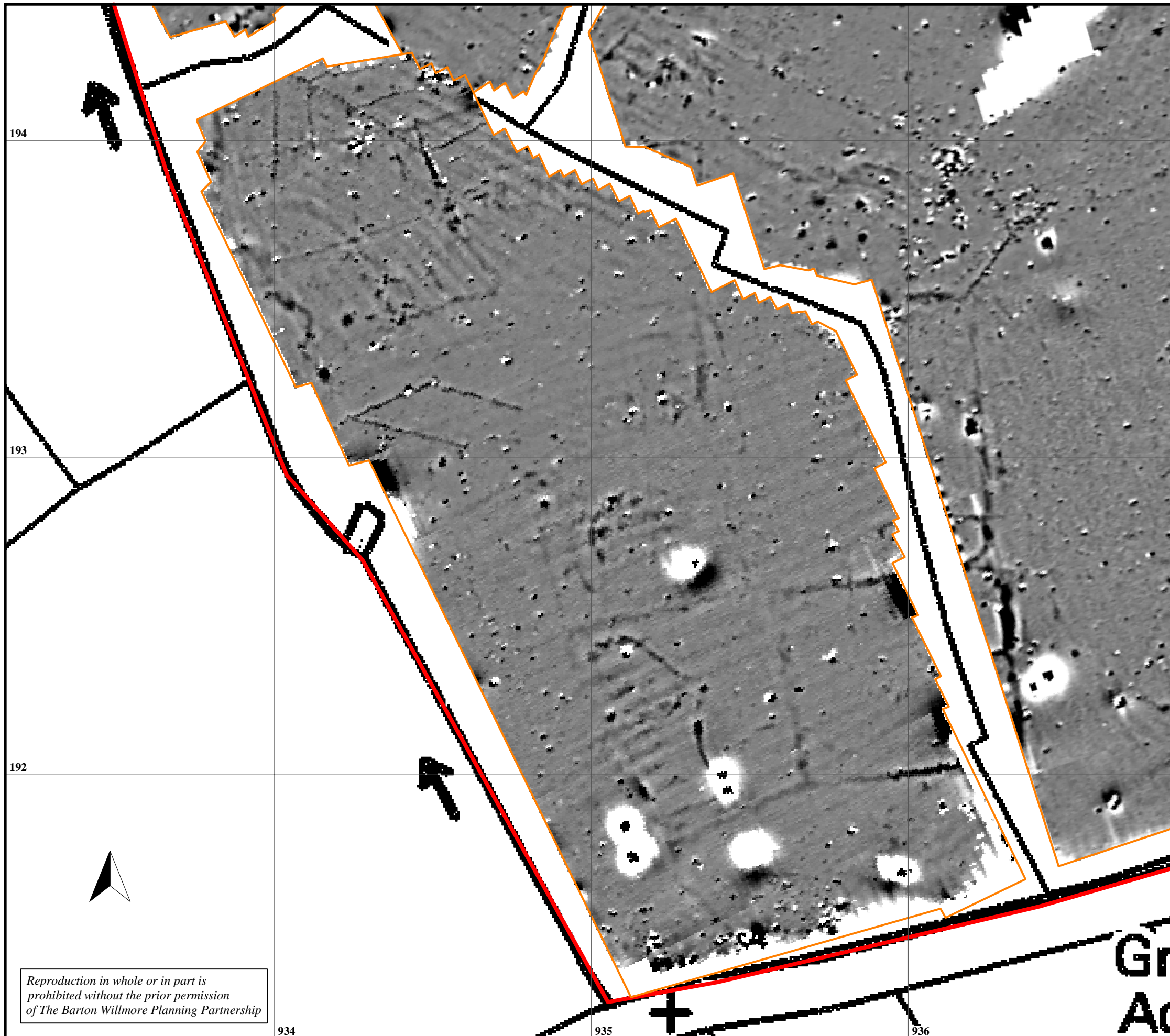
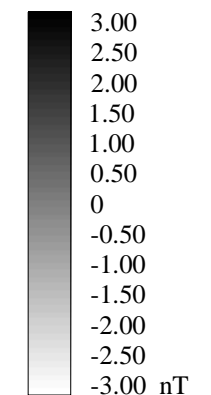
Figure 3

Area 1, geophysical survey

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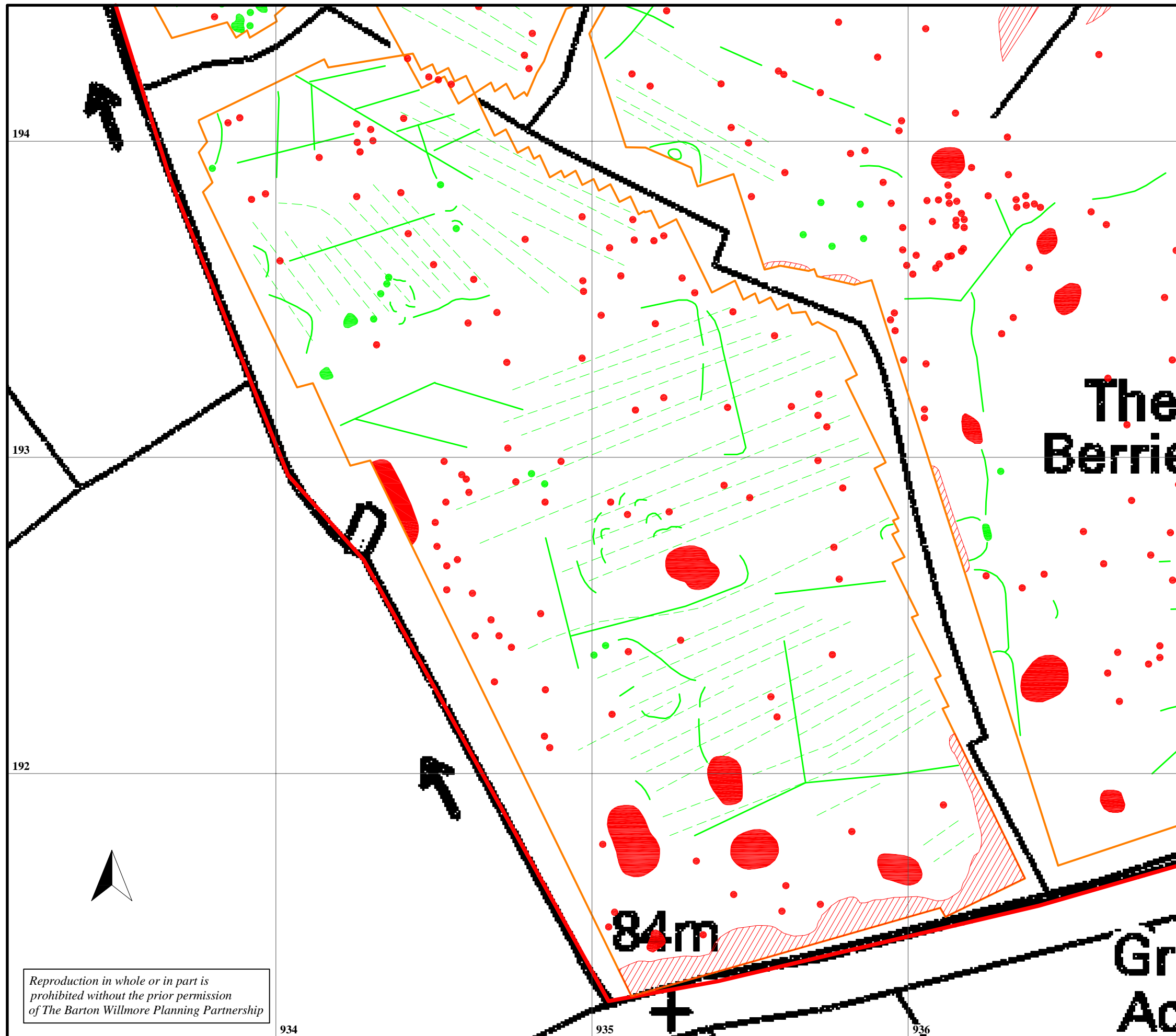
 outline of survey area



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0 50m
scale 1:1250 - for A3 plot

-  outline of survey area
-  positive magnetic anomalies
-  dipolar magnetic anomalies



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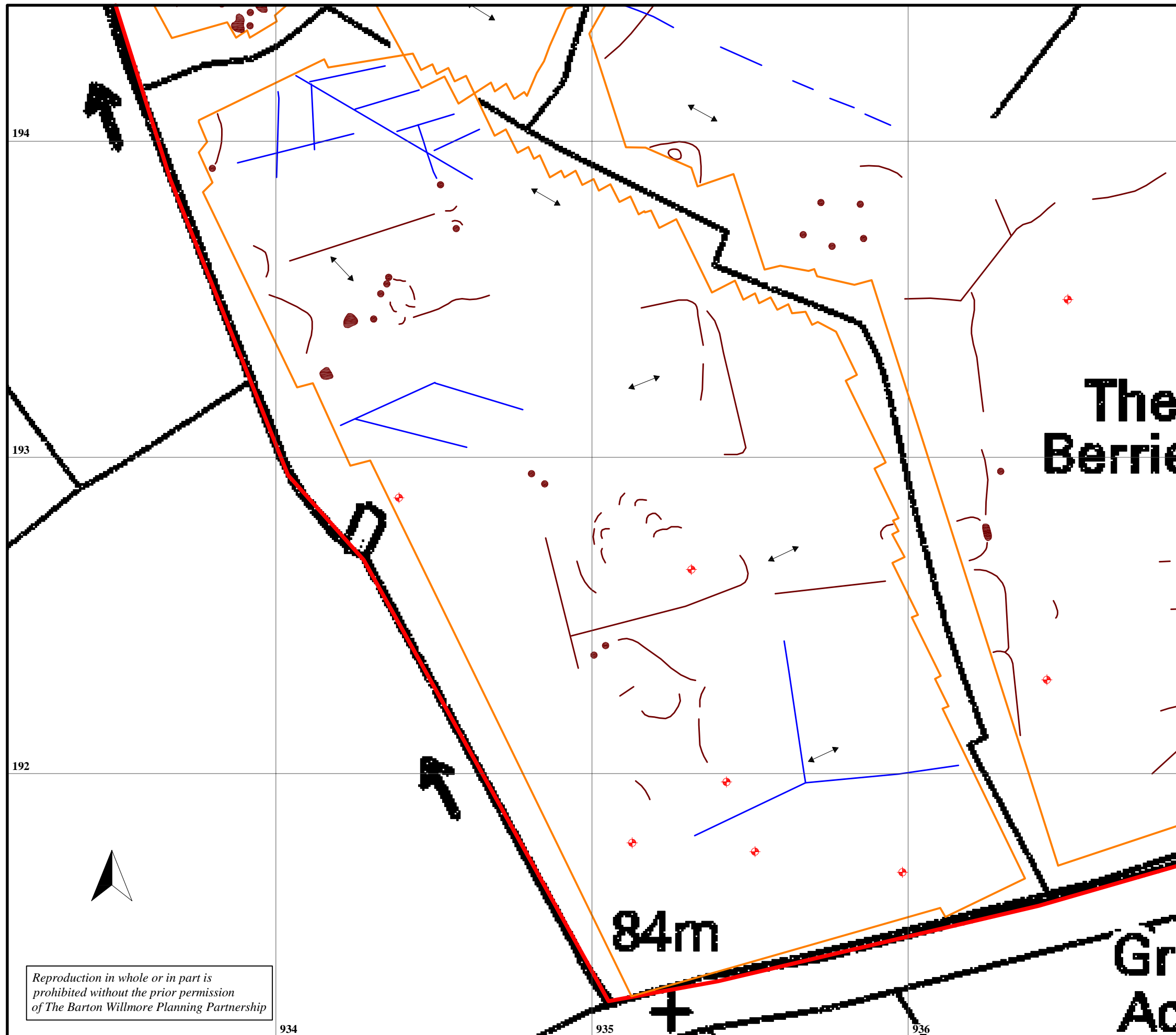
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- outline of survey area
- soil-filled features
- pylons
- orientation of ridge and furrow
- possible land drain

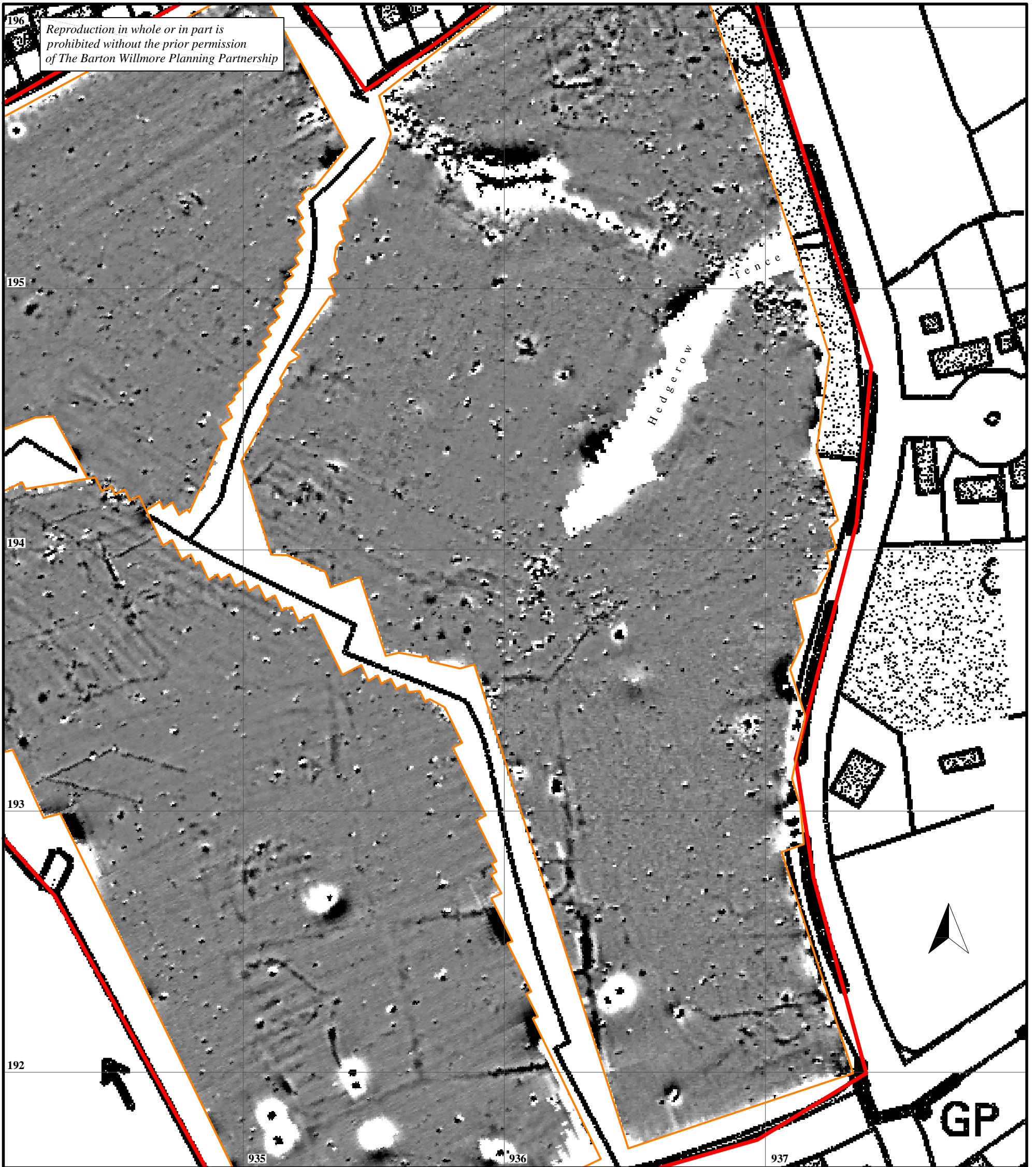


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Figure 6

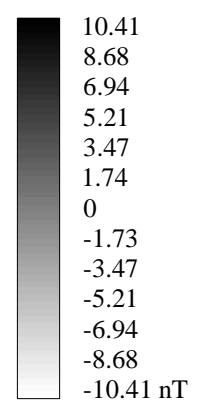
Area 2, geophysical survey

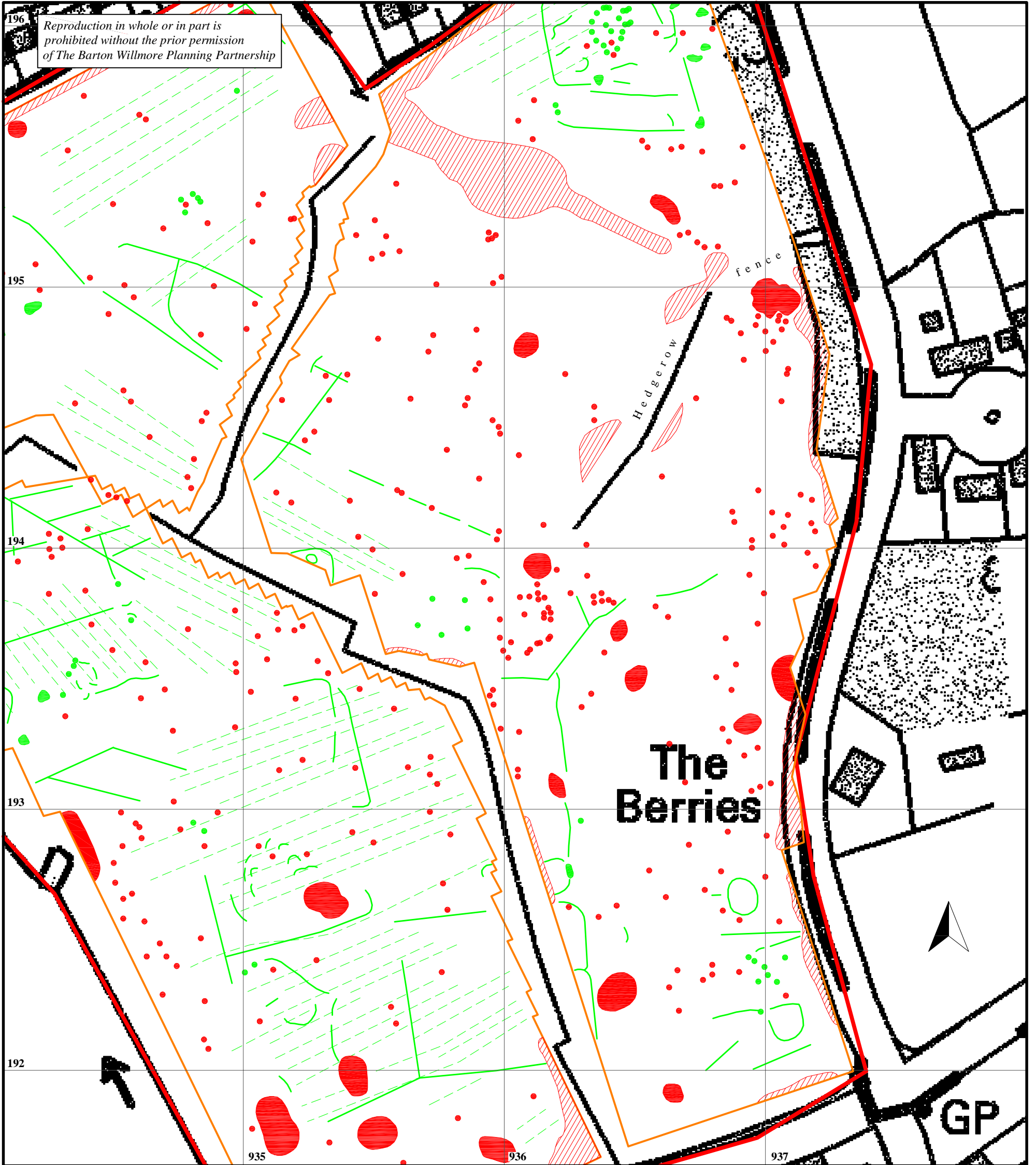
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scale 1:1500 - for A3 plot



outline of survey area





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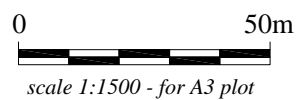
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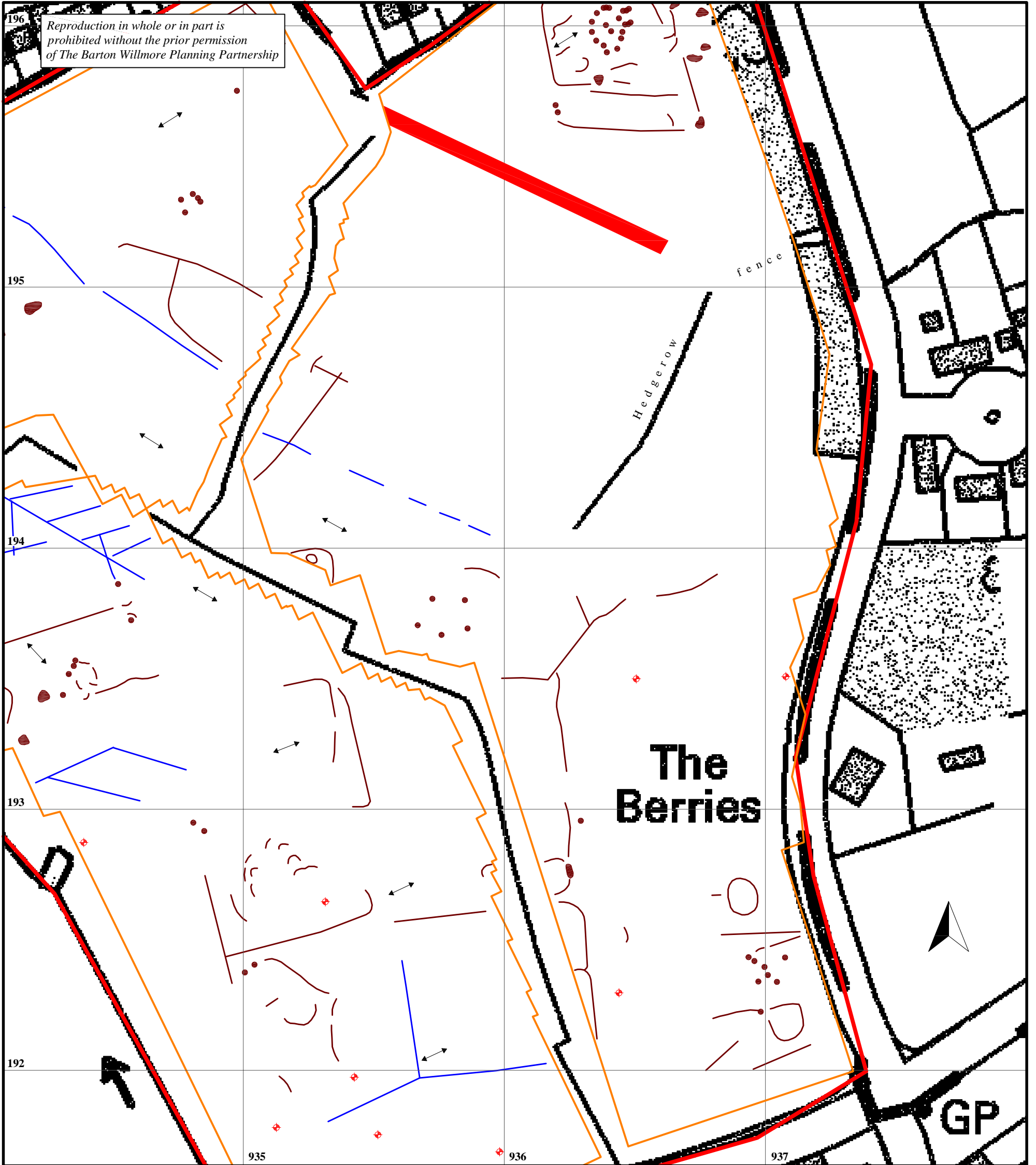
Figure 7

Area 2, geophysical interpretation

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-  outline of survey area
-  positive magnetic anomalies
-  dipolar magnetic anomalies



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


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Figure 8

Area 2, geophysical interpretation

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0 50m
scale 1:1500 - for A3 plot

-  outline of survey area
-  soil-filled features
-  service pipes
-  orientation of ridge and furrow
-  pylons
-  possible land drain

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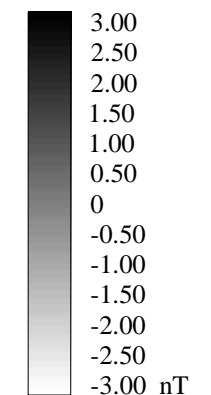
Figure 9

Area 3, geophysical survey

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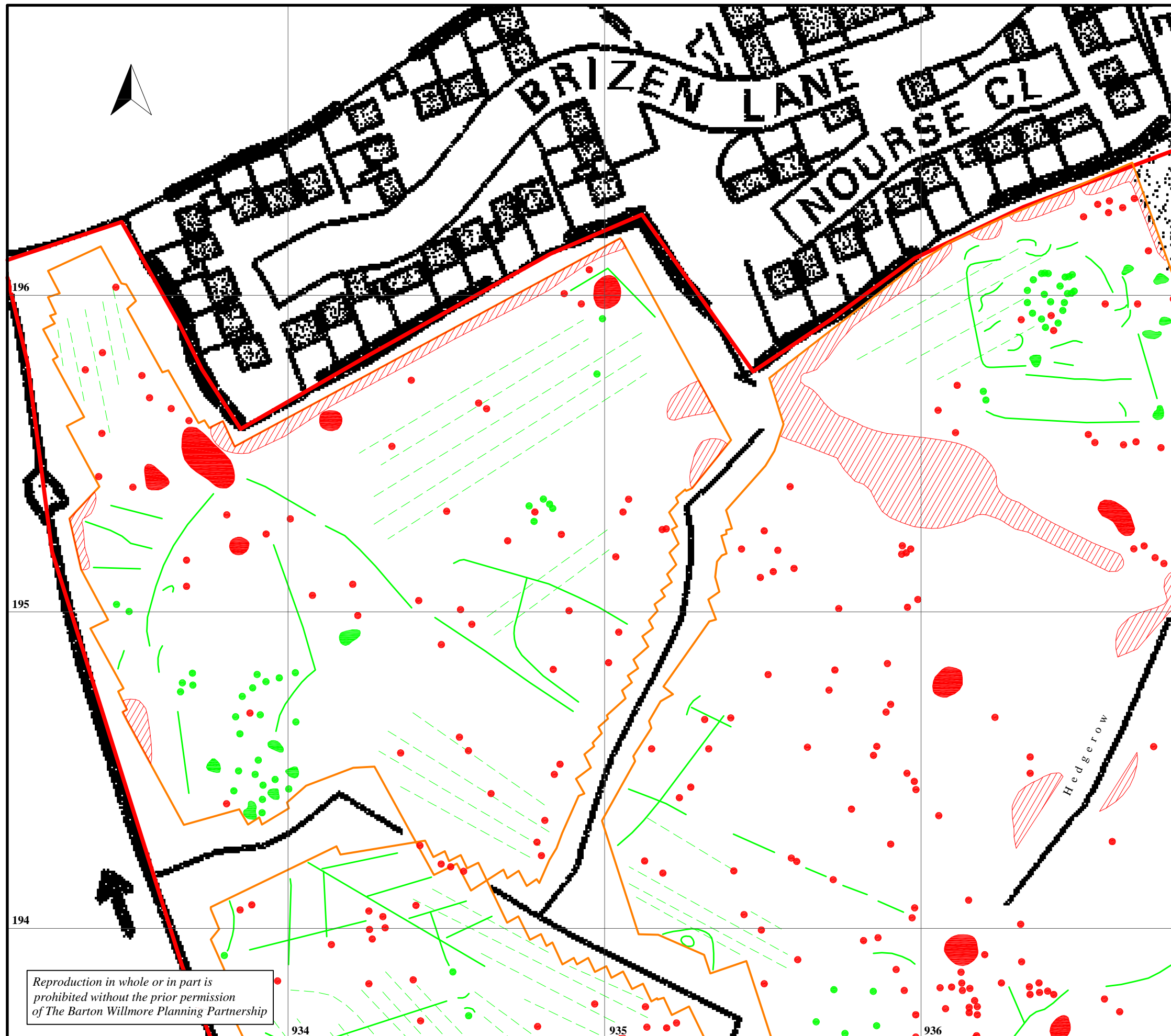
 outline of survey area



on behalf of
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0 50m
scale 1:1250 - for A3 plot

- outline of survey area
- positive magnetic anomalies
- dipolar magnetic anomalies

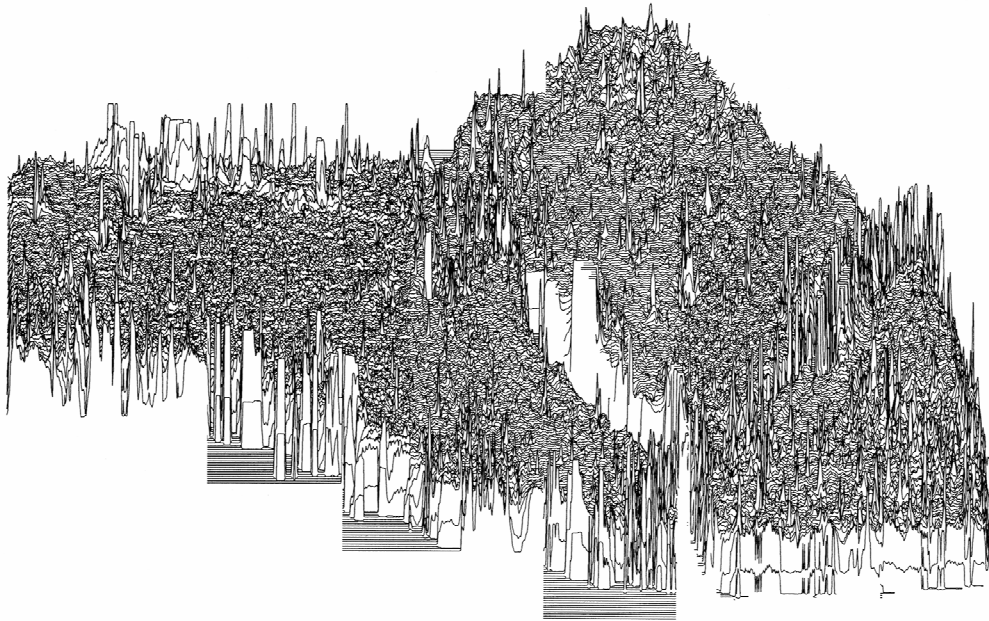
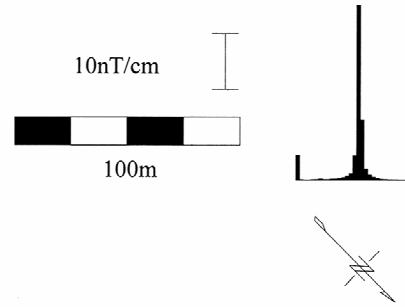


Appendix 1: Trace plots

Land at Leckhampton, Cheltenham

Geomagnetic data

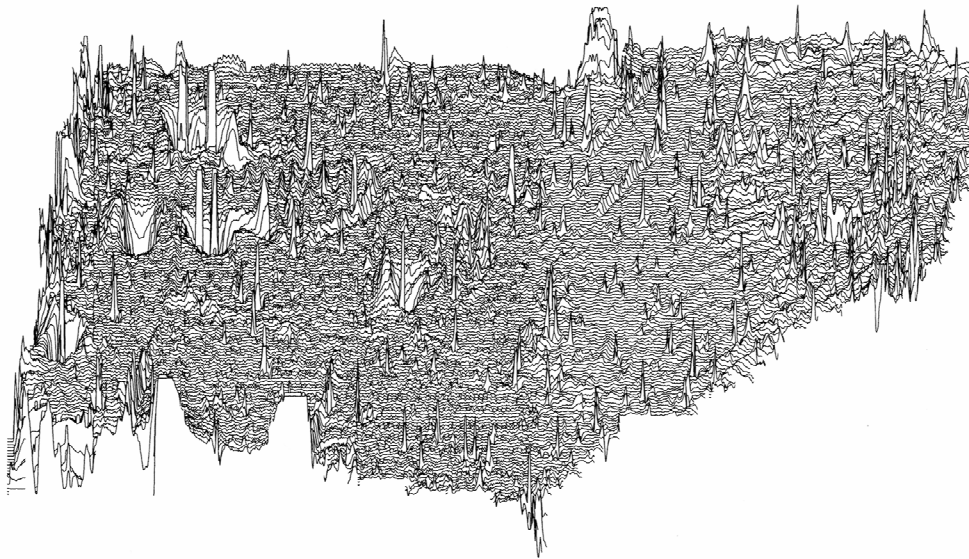
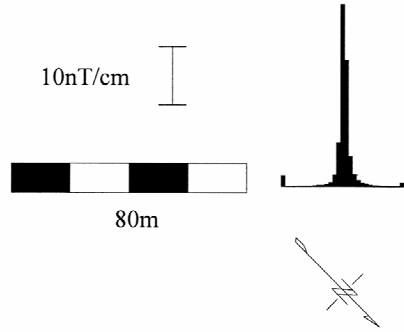
Area 1



Land at Leckhampton, Cheltenham

Geomagnetic data

Area 2



Land at Leckhampton, Cheltenham

Geomagnetic data

Area 3

