Tonedale Farm, Wellington, Somerset

Geophysics Survey Report

Client: MINERVA HERITAGE LTD

AB Heritage Project No: 10551

Date: 08/05/2015

Tonedale Farm, Wellington , Somerset

Geophysical Survey

Client	**Minerva Heritage LTD**
Project Number	**10551**
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1. INTRODUCTION

1.1 Project Background

1.1.1 AB Heritage has been asked to undertake a geophysical survey on behalf of Minerva Heritage Ltd at Tonedale Farm, Somerset.

1.1.2 The purpose of this work is to identify any potential surviving archaeological remains.

1.2 Site Location & Description

1.2.1 The proposed development site covers an area of approximately 10 hectares, centred on ST 1199 2091, directly north west of Tonedale farm itself and c.500m north west of Westford.

1.3 Geology & Topography

1.3.1 The underlying solid geology comprises Budleigh Salterton Pebble Beds Formation. This is a Conglomerate of Sedimentary Bedrock formed 246-251 million years ago in the Triassic period, and the local environment would have been previously dominated by rivers. No superficial geology is noted within the site on the mapping examined (BGS 2015). This form of geology is not known to result in likely major variations within geophysical data;

1.3.2 The site has an undulating topography with a height variation of between 3 meters north to south, with a maximum height of 85m AOD within the northern limits of the site.

2. AIMS AND METHODOLOGY

2.1 Aims of Survey Works

2.1.1 Geophysical survey is a programme of non-intrusive archaeological work. The aims of this geophysical survey were to:

- Identify any geophysical anomalies of possible archaeological origin within the specified survey area;
- Accurately locate these anomalies and present the findings in map form; and
- Provide recommendations for any further archaeological work(s) necessary to contribute to the mitigation of the impacts of proposed development on these potential features.

2.2 Methodology of Survey Works Summary

Site Specific Information

2.2.1 A magnetometry survey was undertaken covering an area of c. 10ha hectares.

2.2.2 The AB Heritage staff members who undertook the works were Tom Cloherty (Archaeological Technician) and Sam Burns (Data Collection Technician).

2.2.3 The weather conditions for the work were variable from sunny to rainy; however this did not cause any problem with data collection.

Equipment

2.2.4 The magnetic survey equipment used comprised two Bartington Grad-601 (fluxgate magnetometers). Please see Appendix A, which contains a detailed methodology for the works undertaken; however, briefly, Table 1, below, shows site specific information on how the magnetometer was set up:

Table 1: Setting Parameters of Magnetometer

Grid Size	30 x 30 metres
Data Capture Distances	1m x 0.25m
Sensors	2
Sensitivity	0.1nT

2.2.5 A GPS was used to setup the geophysical survey was a Trimble GeoXR has a sub-centimetre accuracy suitable for this survey.

2.3 Known Constraints

2.3.1 The known constraints that are likely to inhibit the geophysical survey were metallic vehicles located within the south eastern side of the site, likely to create a large magnetic disturbance within c.10m - 15m of the vehicles.

2.3.2 The undulating ground is likely to create a small amount of stagger (i.e. distortion) within the data.

3. RESULTS & INTERPRETATIONS

3.1 Geophysical Survey Results

3.1.1 The raw and processed results of the geophysical survey data have been plotted on Figures 2 and 3 (respectively), with the interpretation of these result recorded on Figures 4 and 5. For cross-referencing the results have been labelled with **[GP]** numbers and split into Fields (1-3), which are discussed below.

Field 1

3.1.2 Varying negative results [**GP 5**] are situated throughout the field, with the majority located within the southern half of the field. A sporadic pattern of Di-polar anomalies [**GP 7**] are also located throughout the northern half of the field.

Field 2

3.1.3 Two positive linears [**GP 1**] run in a north west to south east direction, each with a length of c. 25m and a reading of 1-4 nt (nanoteslas). Also a circular positive [**GP 1**] feature is situated within the south eastern side of the field, with a diameter of c. 5m

3.1.4 A positive linear [**GP 3**] runs in a north east to south west direction from the north eastern boundary of the field, with a reading of between 0 -1nt and a length of c.75m. Another linear running in a north west to south east direction from the north western boundary of the site, with similar reading and a length of c. 50m.

3.1.5 A positive curvilinear [**GP 4**] runs across the field in a south west to north east direction to a length of c.175m with a variation of readings between 2-9nt.

3.1.6 Magnetic disturbance [**GP 5**] and di polar anomalies [**GP 7**] are located throughout the fields and situated within the corner of the field covering a small area.

3.1.7 One low Positive curvilinear [**GP 6**] is located within south eastern boundary with a reading of between 0 and 3nt.

Field 3

3.1.8 A low negative linear [**GP 1**] runs north east to south west with a length of c.175m and average of 0.5nt across the linear.

3.1.9 Low negative linears [**GP 2**] run in a north west to south east direction up to a length of c.150m.

3.1.10 Multiple negative linear outlined by positive linears [**GP 3**] run through the majority of the field in different direction running to the boundary of the site.

3.1.11 Di-Polar [**GP 7**] anomalies run through the majority of the field in an amorphous pattern.

3.2 Geophysical Survey Interpretation

3.2.1 Interpretation of the results of geophysical survey is based on professional judgement as to the likely/probable cause of an anomaly or reading. For example, strong dipolar discrete anomalies of small size are often associated with ferrous debris or similarly magnetic debris. In addition, where a positive linear anomaly is recorded, which has a negative anomaly associated alongside either side of it, is often likely to relate to the line of a modern service

Table 2: Interpretation of Geophysical Anomalies

AB No	Appearance	Potential Cause
GP 1	Positive Linear and circular Features	Possible Archaeology
GP 2	Low negative linears with positive outlines	Possible Field Boundaries
GP 3	Low negative linears with positive outlines	Known Field boundaries
GP 4	Positive curvilinear	Known former Road
GP 5	Negative Debris	Strong metallic objects
GP 6	Positive curvilinear	Geological features/possible addition to road line [**GP 4**]
GP 7	Negative associated with a positive	Magnetic debris

3.2.2 The majority of archaeological features identified, relate to likely field boundaries [**GP 1 -3**]. The only differing feature is likely to be a possible pit [**GP 1**] located in the south west of Field 2.

3.2.3 The majority of known field boundaries [**GP 3**] are related to identification on the 1841 Tithe map of Wellington, with a few known field boundaries[**GP 3**] relating to post 1946 OS mapping. A known road [**GP 4**] is also identified as the previous Winders Lane which ran through the site, and can be seen clearly within the geophysical data. Also geological features identified [**GP 6**] could possibly relate to a previous route for the road [**GP 4**], or a change in the topography in this area.

3.2.4 Magnetic disturbance [**GP 5**] (predominately within the south eastern limits) is mainly associated with vehicles and modern structures. There are also a few di-polar anomalies [**GP 7**] spread throughout out the site that show a limited distribution of magnetic debris.

4. CONCLUSION

4.1.1 A geophysical survey was undertaken by AB Heritage Limited at Tonedale farm, Wellington. The purpose of this work was to understand the potential for any archaeological remains to survive undisturbed and, where possible, identify the form, function and extent of any potential remains.

4.1.2 A lot of features identified within the site have already been identified on previous maps of the site, with multiple field boundaries [**GP 3**] and a road [**GP 4**] re-identified within the geophysical survey.

4.1.3 The geophysical survey identified possible archaeological features [**GP 1**] within Fields 2 and 3. The majority of these features are linear in nature, and most likely related to former field boundaries within the site.

4.1.4 Further recommendations for work have been approved with Steven Membery of South West Heritage and the County archaeologist for Somerset, this includes a 30m trench across the possible archaeological feature located within Field 3.

5. ARCHIVE

5.1.1 The Site Archive will contain the following, as a minimum:

Table 3: Site Archive Data

Archive	Format
Raw Geophysical Data files	XYZ and Text
Processed geophysical data files	JPEG, BMAP
Archaeological Interpretation	Shape Files ARC GIS
Final Report	PDF
Final Images	PDF

5.1.2 A physical and digital archive will be stored in a suitable format at AB Heritage Limited offices in Taunton, Somerset.

6. REFERENCES

BGS (British Geological Society) 2015.*Geology of Britain viewer.* http://mapapps.bgs.ac.uk/geologyofbritain/home.html.

IFA, 2011.Standard and Guidance for archaeological geophysical survey.

Jones, D.M. (ED) 2008. Geophysical Survey in Archaeological Field Evaluation. English Heritage.

Schmidt, A. 2002. Geophysical Data in Archaeology*: a Guide to Good* Practice. Oxford. Oxbow.

1841 Tithe Map of Wellington

Appendix 1 Technical Information on Geophysical Survey

FLUXAGTE MAGNETOMETRY SURVEY

The magnetic survey is carried out using a fluxgate gradiometer, which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field, whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

Survey equipment

The Bartington Grad 601-2 dual magnetic gradiometer is capable of surveying to an accuracy of 0.1 nanotesla (nT).

Sample interval and depth of scan

The magnetometer data is collected in 30mx30m grids at a resolution of 1m x 0.25m. This sample density is recommended for site evaluation (English Heritage, 2008). This equates to 3600 points per 30mx30m grid. The magnetometer has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects are buried within the site.

Data capture and processing

The readings are logged continually by the data logger during the survey, which is then downloaded on site to a site laptop. At the end of each job, data is transferred to the office PC's for processing and presentation.

This 'regular xy' data is then downloaded into specialist data processing software, at user defined sample intervals (in this case 1 m by 0.25 m). This is processed as standard magnetometer data.

GPS METHODOLOGY

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to sub-cm accuracy, a far greater accuracy than a standard GPS unit. An RTK system uses a base station receiver and a number of mobile units (rovers). The base station takes measurements from satellites in view and then broadcasts them along with its known position to the rover receivers. The rover receiver also collects measurements from the satellites in view and processes them with the base station data. The rover then computes its location relative to the base.

During such a survey a Trimble GeoXR Differential Global Positioning System (dGPS), capable of Real Time Kinematic (RTK) is used to set out a nominal grid prior to the survey. This increases the accuracy and efficiency of the survey. The data is then downloaded from the unit on the day, using a USB stick.

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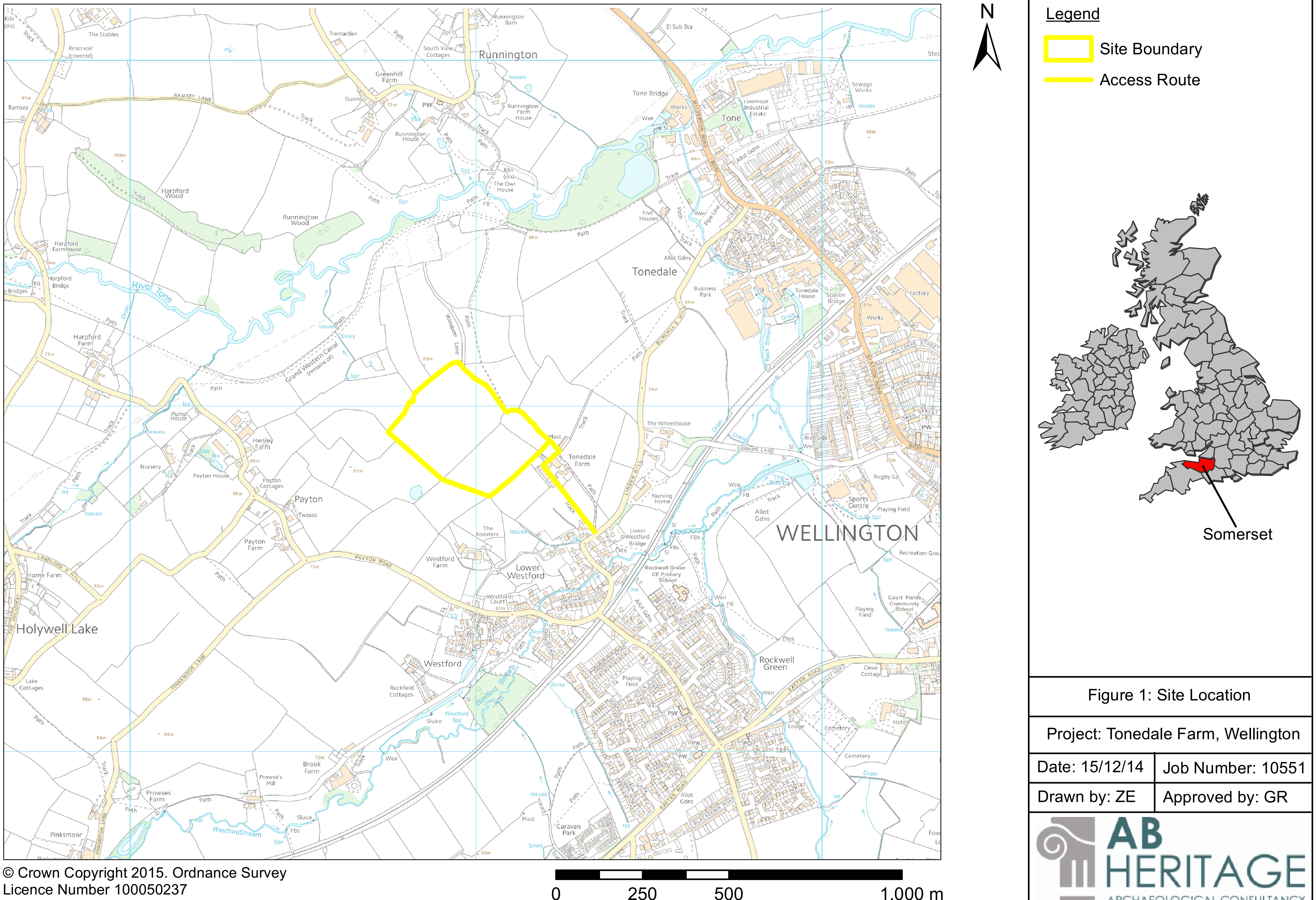

Figure 1: Site Location

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Drawn by: ZE | Approved by: GR

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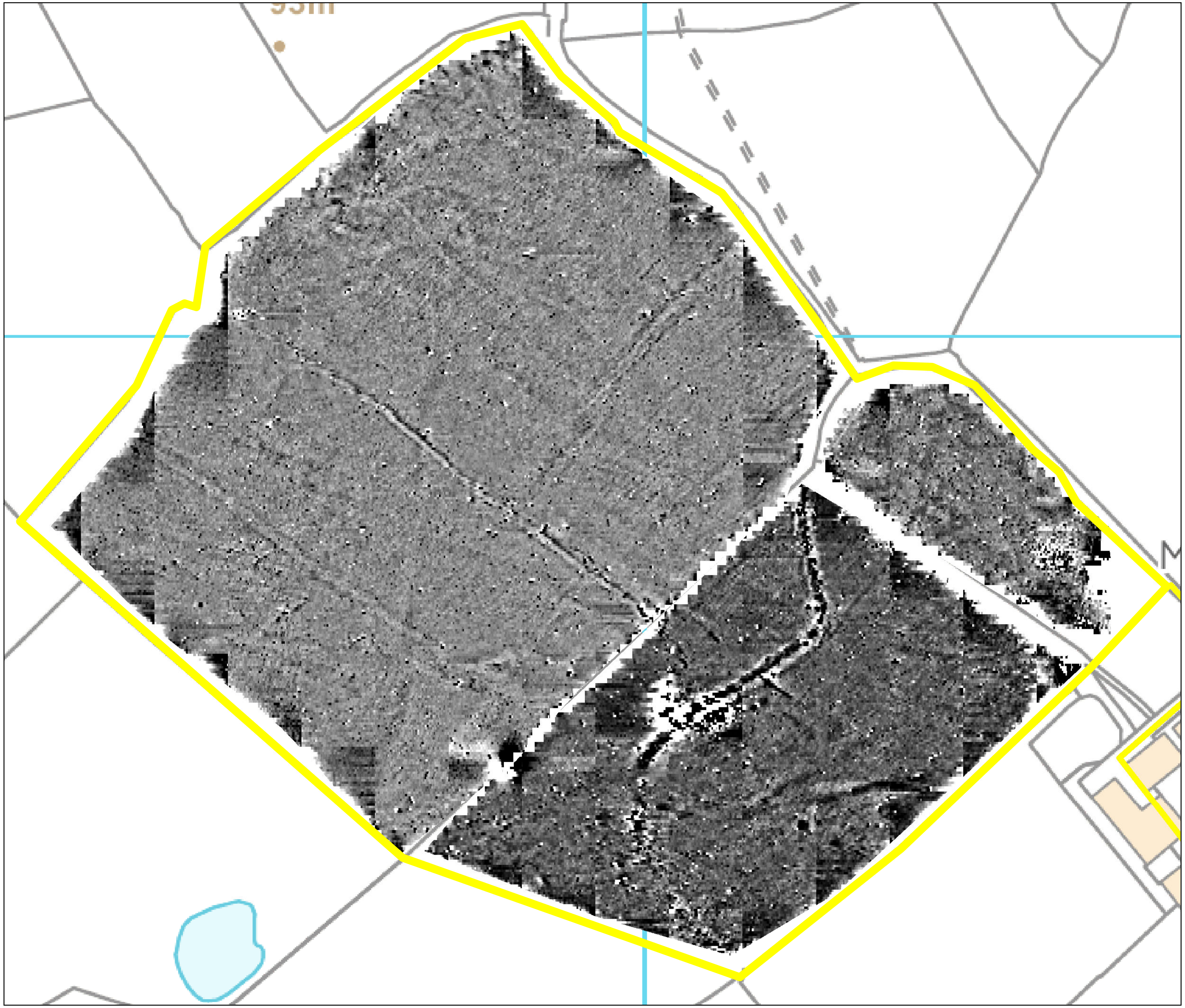

N

Legend

Site Boundary

+2

Plotting
Parameters

-2

Field Identification

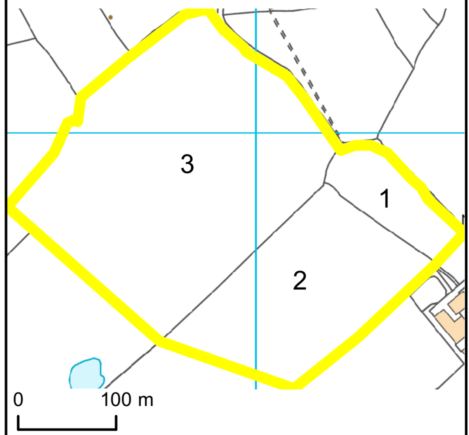

Figure 2: Raw Geophysical Data

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0 50 100 200 m

Legend

Site Boundary

+5
Plotting Parameters
-5

Field Identification

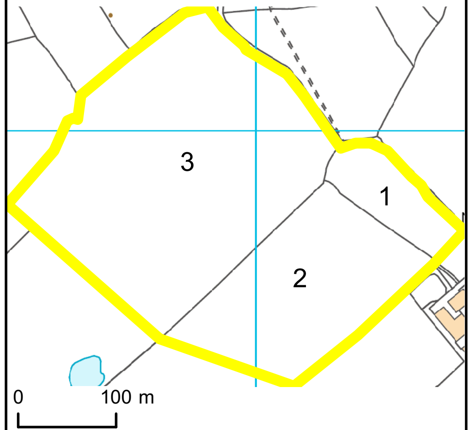

Figure 3: Processed Geophysical

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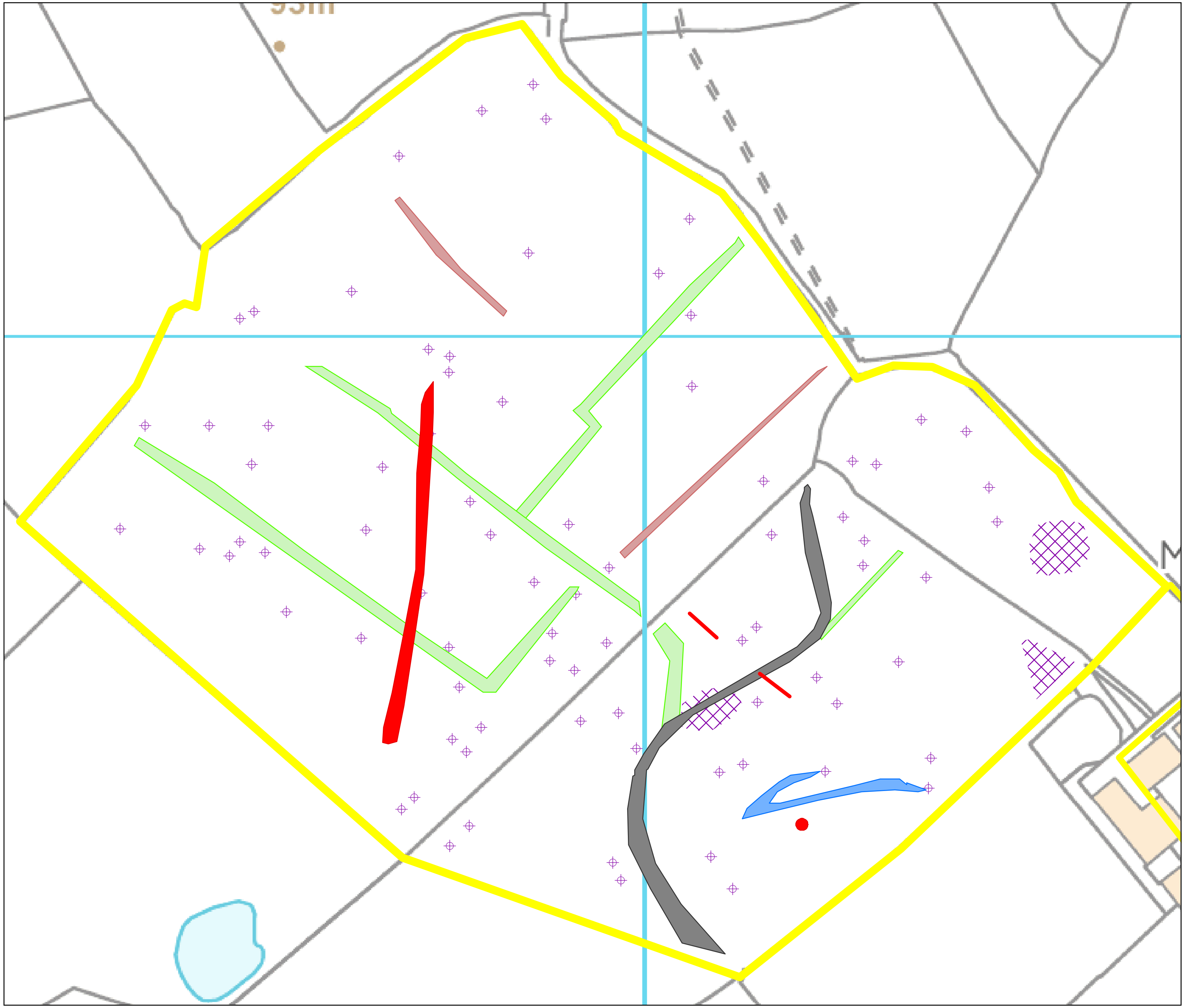

Legend

- Possible Archaelogy [GP1]
- Possible Former Field Boundary [GP2]
- Known Former Field Boundaries [GP3]
- Known Former Road [GP4]
- Magnetic Disturbance [GP5]
- Geological Features [GP6]
- Di-Polar Anomalies [GP7]
- Site Boundary

Field Identification

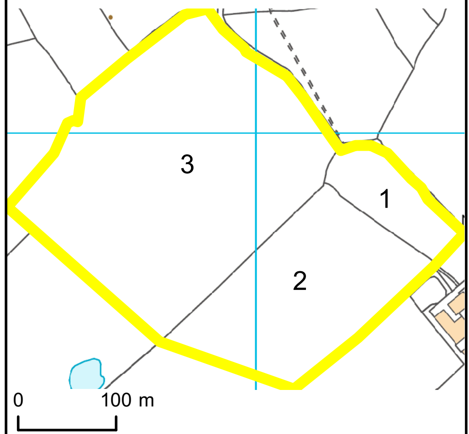

Figure 4: Interpretation of Geophysical Data

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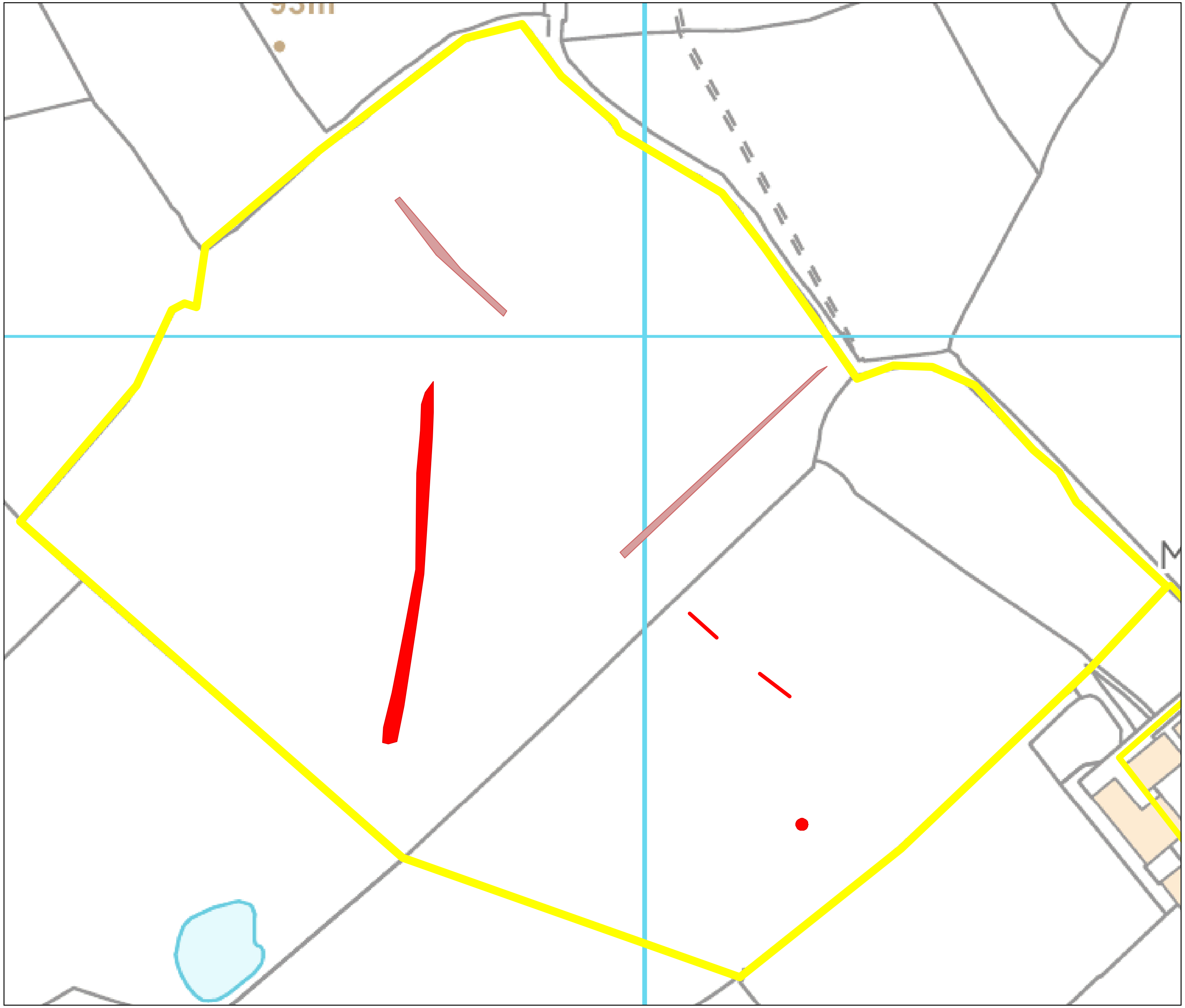

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Legend

Possible Archaelogy [GP1]

Possible Former Field Boundary [GP2]

Site Boundary

Field Identification

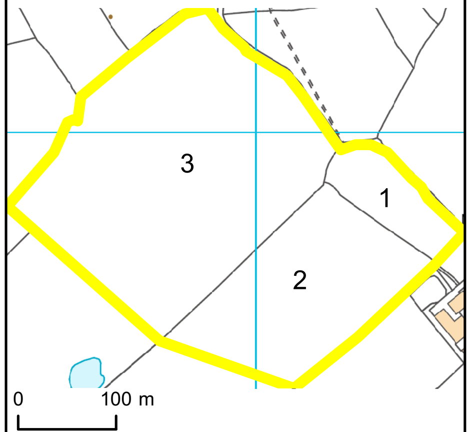

Figure 5: Interpretation of Possible Archaeological Features

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