

**ARCHAEOLOGICAL EVALUATION REPORT:  
GEOPHYSICAL SURVEY BY MAGNETOMETRY ON LAND AT GOODS FARM, REEPHAM, LINCOLNSHIRE**

NGR: TF 0396 7415  
Planning Reference: 138041  
AAL Site Code: REGF 18  
Museum Accession Code: LCNCC: 2018.146  
OASIS Reference Number: allenarc1-330531



Report prepared for Globe Consultants

By  
Allen Archaeology Limited  
Report Number AAL2018146

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Allenarchaeology



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*Cover image: View across the survey area from the southeast corner, looking north*

## **Executive Summary**

- Allen Archaeology Limited was commissioned by Globe Consultants to undertake a geophysical survey using magnetometry on land at Good's Farm, Reepham, Lincolnshire, prior to determination of planning consent for a residential development.
- A preceding desk-based assessment identified some archaeological potential, with evidence for prehistoric activity in the vicinity of the site, as well as possible medieval and later settlement activity in the southern part of the site.
- The survey has identified significant amounts of magnetic noise, which may potentially mask earlier activity. However, few other features of potential interest were identified, with the results largely characterised by drainage and cultivation trends.
- A small number of linear features in the western part of the site may be of anthropogenic origin, but a geological response is also possible.
- Overall, the evidence suggests a low archaeological potential for the proposed development area.

## 1.0 Introduction

- 1.1 Allen Archaeology Limited was commissioned by Globe Consultants to undertake a geophysical survey using magnetometry on land at Goods Farm, Reepham, Lincolnshire, prior to determination of a planning application for a residential development.
- 1.2 The site works and reporting conform to current national guidelines as set out in '*Geophysical Survey in Archaeological Field Evaluation*' (English Heritage 2008), '*The Use of Geophysical Techniques in Archaeological Evaluations*' (Gaffney *et al.* 2002), the Chartered Institute for Archaeologists '*Standard and guidance for archaeological geophysical survey*' (CIfA 2014) and a specification by this company (AAL 2018).
- 1.3 The project archive will be submitted to The Collection museum in Lincoln, where it will be stored under the museum accession code LCNCC 2018.146. The agreed date of deposition is February 2019.

## 2.0 Site Location and Description

- 2.1 The proposed development area is located in the village of Reepham, in the administrative district of West Lindsey District Council. It is situated 8km northeast of the city of Lincoln. The site is to the northwest of the village and extends to approximately 2.3ha and presently comprises agricultural land and a farmyard. The site is centred at NGR TF 0396 7415 and is between 12–17m above Ordnance Datum.
- 2.2 The bedrock geology comprises Kellaways Formation Sandstone, Siltstone and Mudstone sedimentary bedrock, with no superficial deposits recorded (<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>).

## 3.0 Planning Background

- 3.1 A planning application has been submitted for '*erection of 25no. dwellings, including the reconstruction of the existing barn and boundary walls to facilitate its use as a single dwelling, associated garaging, car parking, access roads, landscaping, public open space and footpaths*' (Reference 138041). Prior to determination of the application, the Historic Environment Team at Lincolnshire County Council has advised for a programme of archaeological evaluation of the proposed development area, in the first instance comprising geophysical survey, in order to provide further information concerning the archaeological potential of the site. Dependent upon the results of the geophysical survey, further evaluation work may be required prior to determination of the application, in order and to allow the planning authority to establish appropriate measures to mitigate the effect of the proposed development upon the archaeological resource.
- 3.2 The approach adopted is consistent with the recommendations of the current National Planning Policy Framework (NPPF), with the particular chapter of relevance being '*Section 16. Conserving and enhancing the historic environment*' (Ministry of Housing, Communities and Local Government 2018).

## 4.0 Archaeological and Historical Background

- 4.1 A desk-based assessment has been prepared for the site (AAL 2016), the results of which are summarised below.
- 4.2 Prehistoric activity in the vicinity of the site is represented by cropmarks of pits, ring ditches and enclosures to the west and north of the site, as well as a range of finds including flint scatters, Neolithic and Bronze Age axes, and an Iron Age silver coin.
- 4.3 Roman evidence is limited, but a Roman ditch is recorded to the northeast, as well as several findspots along Fiskerton Road to the southeast.
- 4.4 Physical evidence for the early medieval period is lacking, but some form of settlement activity in the area is likely, as the village appears in the Domesday Book and the place name is of Old English origin.
- 4.5 Several medieval finds have been made in the vicinity of the site, and ridge and furrow has also been recorded nearby. The southern part of the site is occupied by a working farmyard but historic mapping indicates cottages in this part of the site in the mid 19<sup>th</sup> century.

## 5.0 Methodology

- 5.1 The geophysical survey consisted of a detailed gradiometer survey of as much of the development areas as was suitable for surveying, totalling approximately 2.1 hectares. The survey was undertaken in a series of 30m grids across the site.
- 5.2 The fieldwork was carried out by the author on Wednesday 12<sup>th</sup> September 2018. The survey areas were located using a Leica GS08 RTK NetRover GPS. This accurately 3D plotted the area of investigation and tied it into the National Grid.
- 5.3 The geophysical survey was carried out using a Bartington Grad601-2 Dual Fluxgate Gradiometer with an on-board automatic DL601 data logger. This instrument is a highly stable magnetometer which utilises two vertically aligned fluxgates, one positioned 1m above the other. This arrangement is then duplicated and separated by a 1m cross bar. The 1m vertical spacing of the fluxgates provides for deeper anomaly detection capabilities than 0.5m spaced fluxgates. The dual arrangement allows for rapid assessment of the archaeological potential of the site. Data storage from the two fluxgate pairs is automatically combined into one file and stored using the on-board data logger.
- 5.4 Data collection was undertaken in a zigzag traverse pattern, using a sample interval of 0.25m and a traverse interval of 1m.

### *Summary of Survey Parameters*

#### 5.5 Fluxgate Magnetometer

Instrument:	Bartington Grad601-2 Dual Fluxgate Gradiometer
Sample Interval:	0.25m
Traverse Interval:	1.00m
Traverse Separation:	1.00m
Traverse Method:	Zigzag

Resolution:	0.01nT
Processing Software:	3.0.33.6
Surface Conditions:	Stubble
Area Surveyed:	2.09 hectares
Date Surveyed:	Wednesday 12 <sup>th</sup> September 2018
Surveyor:	Robert Evershed BSc (Hons)
Data Interpretation:	Robert Evershed BSc (Hons)

### **Data Collection and Processing**

5.6 The grids were marked out using pre-programmed grids on the Leica GS08 Net rover. A north-south alignment is preferable as the fluxgate gradiometer is set up and balanced with respect to the cardinal points. Since the data is plotted as north-south traverses there is considerable merit sampling the north-south response of a magnetic anomaly with as many data points as is possible, this is accomplished as the density collected along the traverse line is greater than that between traverses (Aspinall *et al.* 2008). On this occasion the area to be surveyed was divided into three separate areas and the grids for all three areas were roughly aligned between north to south and northeast to southwest, due to the orientation of the development area.

5.7 The data collected from the geophysical survey has been analysed using Terrasurveyor 3.0.33.6. The resulting data set plots are presented with positive nT/m values and high resistance as black and negative nT/m values and low resistance as white.

The data sets have been subjected to processing using the following filters:

- De-stripping
- Clipping
- De-staggering

5.8 The de-stripe process is used to equalise underlying differences between grids or traverses. Differences are most often caused by directional effects inherent to magnetic surveying instruments: instrument drift, instrument orientation (for example off-axis surveying or heading errors) and delays between surveying adjacent grids. However, the de-stripe process is used with care as it can sometimes have an adverse effect on linear features that run parallel to the orientation of the process.

5.9 The clipping process is used to remove extreme data point values which can mask fine detail in the data set. Excluding these values allows the details to show through.

5.10 The de-staggering process compensates for data correction errors caused by the operator commencing the recording of each traverse too soon or too late. It shifts each traverse forward or backwards by a specified number of intervals.

5.11 Plots of the data are presented in processed linear greyscale (smoothed) with any corrections to the measured values or filtering processes noted, and as separate simplified graphical interpretations of the main anomalies detected.

## 6.0 Results

- 6.1 For the purposes of interpreting the anomalies, the survey data has been processed to the values of -3 to 3 nT/m (Figure 3). This enhances faint anomalies that may otherwise not be noted in the data, with a number of anomalies identified across the data set, and these are discussed in turn and noted as single or double digit numbers in square brackets.
- 6.2 The area of magnetic noise [1], producing readings of -100 to 100 nT/m, is likely the effect of the farm building adjacent to the field and immediately to the south of this area.
- 6.3 The large amount of magnetic noise [2], -100 to 100 nT/m, is likely related to a large amount of modern waste buried in this area and clearly visible within the topsoil. The OS map from 1970, Figure 6, shows a track running roughly along the eastern edge of the area of magnetic noise, and appears to form a boundary for the spread of waste within the field.
- 6.4 The area of magnetic noise [3], -100 to 100 nT/m, likely represents modern farming equipment on the edge of the survey area immediately to the east, as well as possible buried modern waste.
- 6.5 The roughly sub-rectangular area of magnetic noise [4], -100 to 100 nT/m, represents the infilling of a former pond seen on historic mapping (Figure 6).
- 6.6 The linear dipolar feature running roughly northeast to southwest across the site [5], -100 to 100 nT/m, represents a modern service, likely a modern drain.
- 6.7 The parallel potential positive linear features [6], 1 to 2 nT/m, probably represent modern field drains.
- 6.8 The linear parallel positive features aligned roughly northwest to southeast [7], 1 to 2 nT/m, may represent modern field drainage, or cultivation trends, running parallel to a former field boundary immediately to the north.
- 6.9 The potential positive linear features [8], 2 to 4 nT/m, may represent modern field drainage. One feature in this group runs broadly northeast towards the infilled pond and may be associated. The group of features however display several different alignments and could represent natural geological variation or have an anthropogenic origin.
- 6.10 A pair of short parallel positive anomalies in the northern part of the site, [9], 1 to 2 nT/m, most likely represent vehicle tracks.
- 6.11 The large dipolar spikes [10] and [11], -100 to 50 nT/m and -100 to 100 nT/m respectively, likely represent buried ferrous or highly fired material, most probably modern.
- 6.12 Scattered randomly throughout the site are a number of strong and weak dipolar responses, examples of which are highlighted as [12]. The characteristic dipolar response of pairs of positive and negative 'spikes' suggest near-surface ferrous metal or other highly fired material in the ploughsoil.

## 7.0 Discussion and Conclusions

- 7.1 The survey has identified very few features of potential archaeological interest. There is a large amount of magnetic noise within the site, and it is possible that this is masking any ephemeral archaeological features that might be present.
- 7.2 There are a number of positive linear features that most likely represent modern field drainage and cultivation trends, however on the western side of the surveyed area there are a number of features on several different alignments that may have an earlier origin, although a geological interpretation cannot be discounted.
- 7.3 The survey also identified the route of a modern service pipe, likely a drain, which runs northwest to southeast across the centre of the site.
- 7.4 Overall, the survey indicates a low archaeological potential for the proposed development area.

## 8.0 Effectiveness of Methodology

- 8.1 The non-intrusive survey methodology employed was appropriate to the scale and nature of the site to be surveyed, but the presence of large amounts of magnetic noise across parts of the site has meant that potential buried archaeological features may well have been masked in these areas.

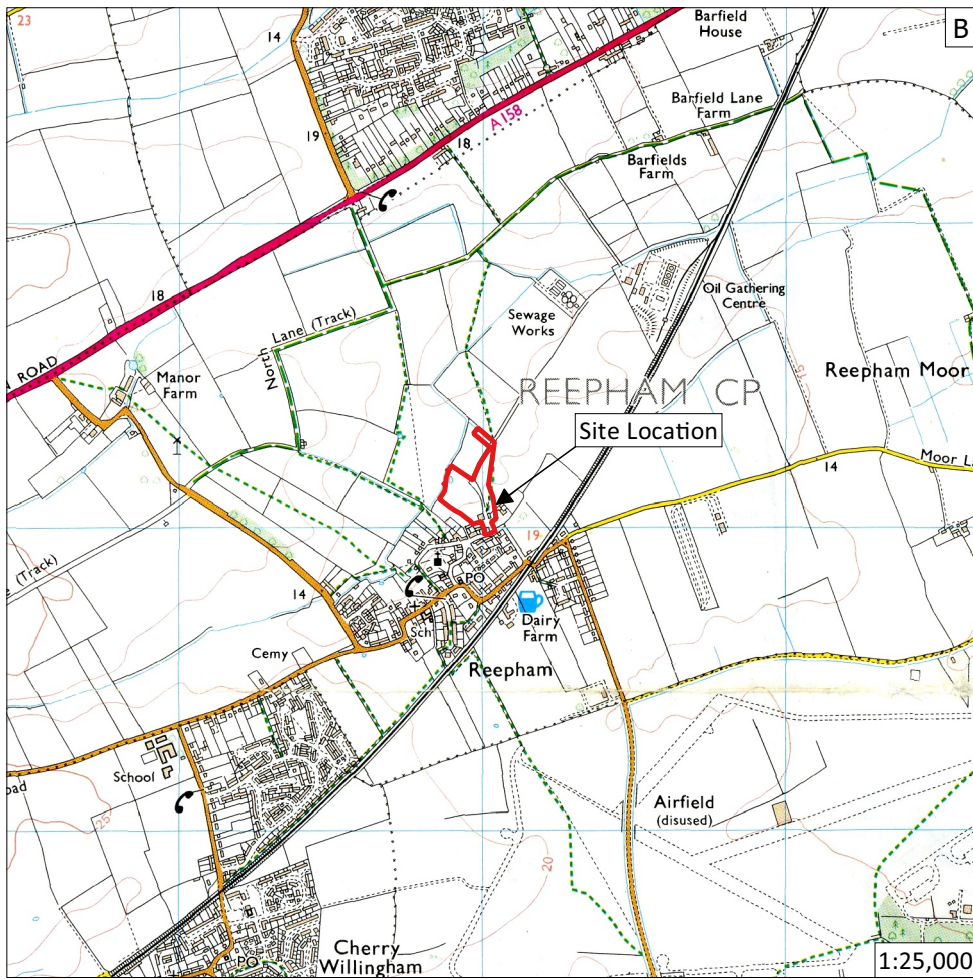
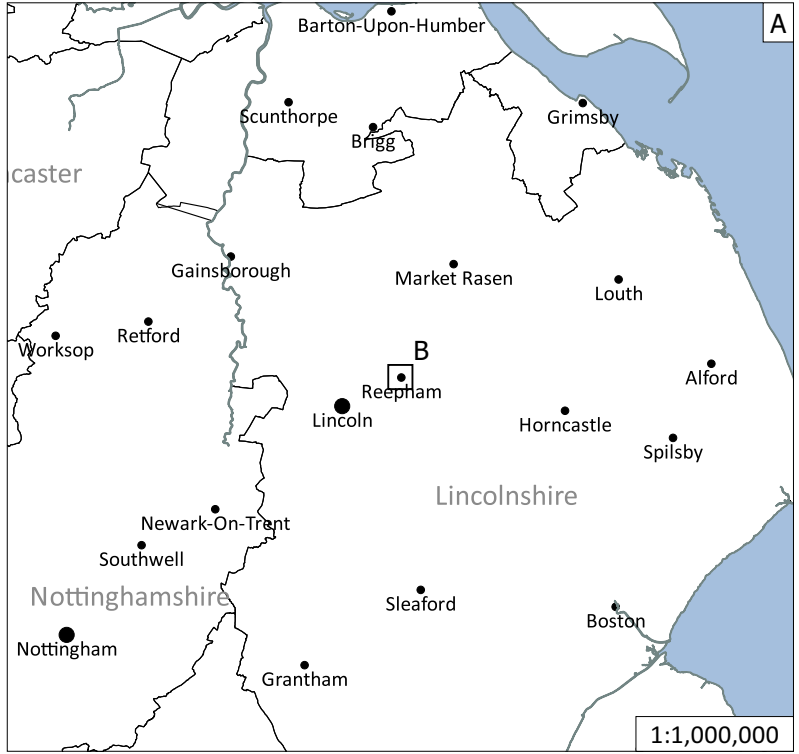
## 9.0 Acknowledgements

- 9.1 Allen Archaeology Limited would like to thank Globe Consultants for this commission.

## 10.0 References

- AAL, 2016, *Archaeological desk-based assessment. Land off The Green, Reepham, Lincolnshire*, Allen Archaeology Limited report number 2016130
- AAL, 2018, *Specification for a fluxgate magnetometer geophysical survey: Land at Goods Farm, Reepham, Lincolnshire*, AAL report number 2018146
- Aspinall, A, Gaffney, C, and Schmidt, A, 2008, *Magnetometry for Archaeologists*, Plymouth: Altamira Press
- CIfA, 2014, *Standard and guidance for archaeological geophysical survey*, Reading: Chartered Institute for Archaeologists
- English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*, English Heritage
- Gaffney, C, Gater, J, and Ovenden, S, 2002, *The Use of Geophysical Techniques in Archaeological Evaluations, IFA Paper No. 6*, Reading: The Institute for Archaeologists
- Ministry of Housing, Communities and Local Government, 2018, *National Planning Policy Framework*. London: HMSO





**Figure 1:** Site location outlined in red

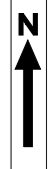
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Site Code	REGF 18
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Drawn by	H Tesseyman
Date	12/10/2018

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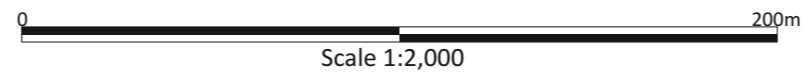
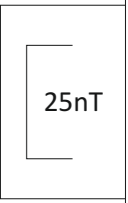
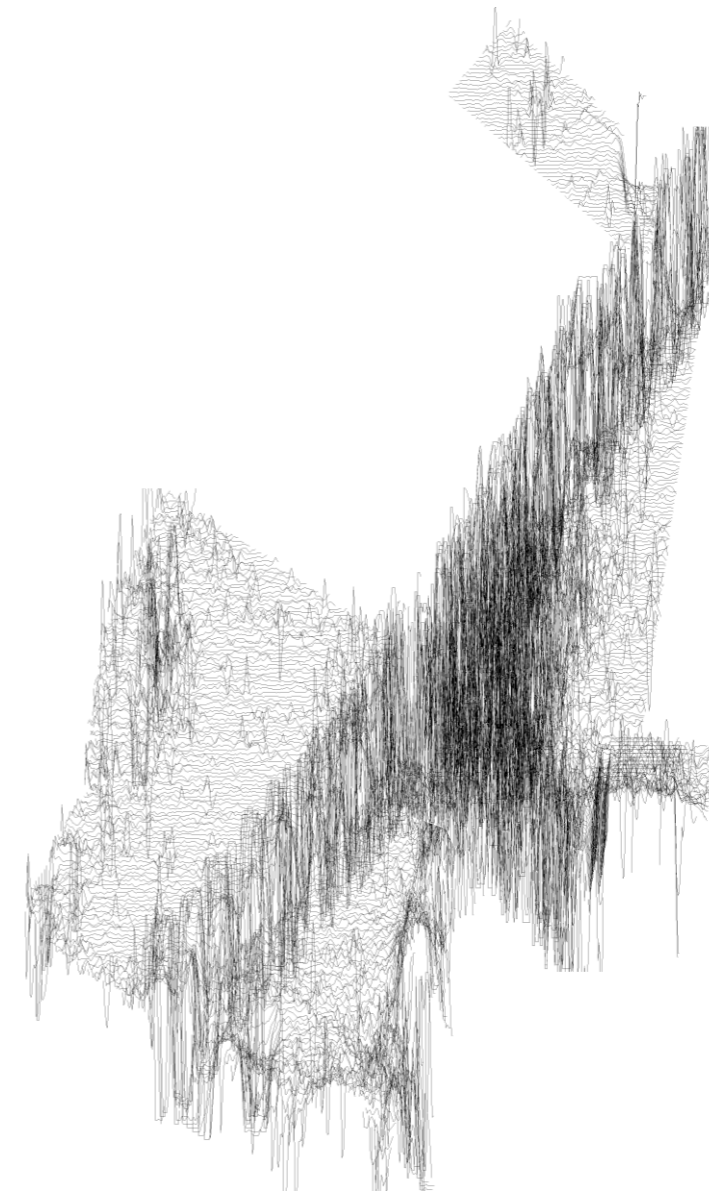
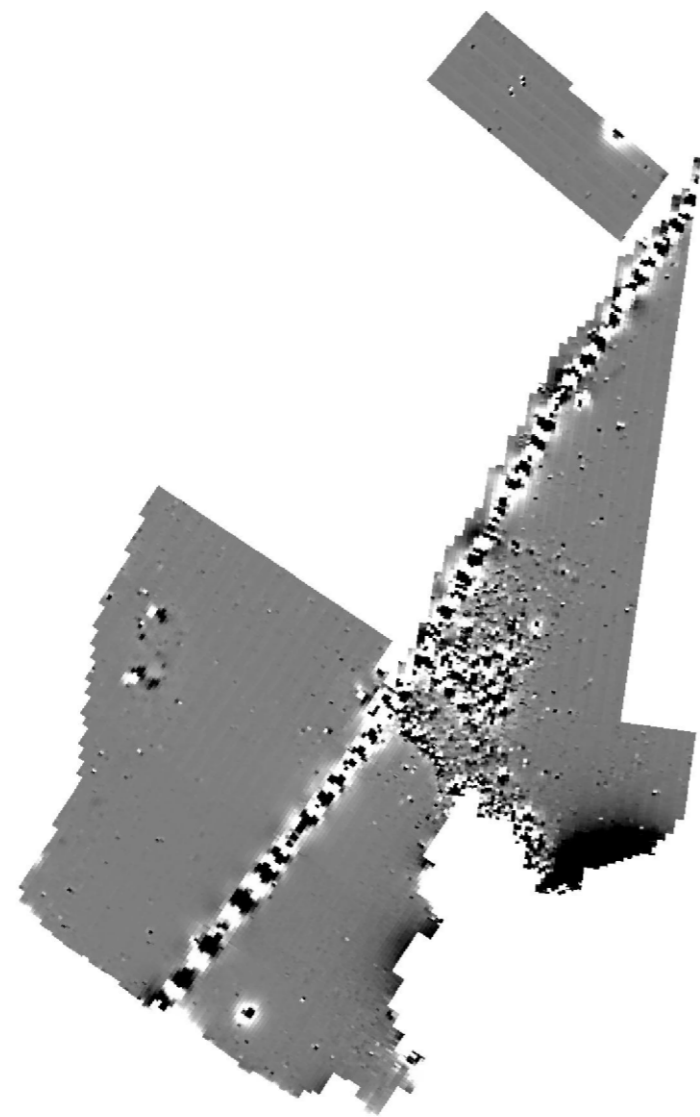
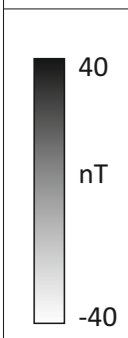
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Raw data (clipped to +/- 40 nT)

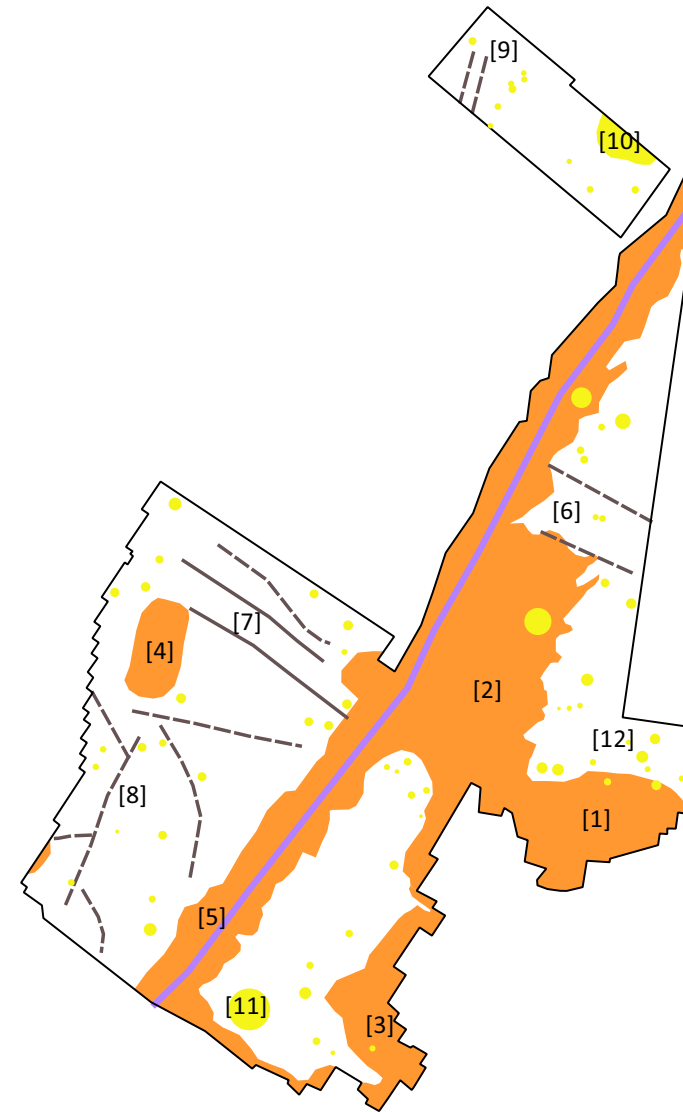
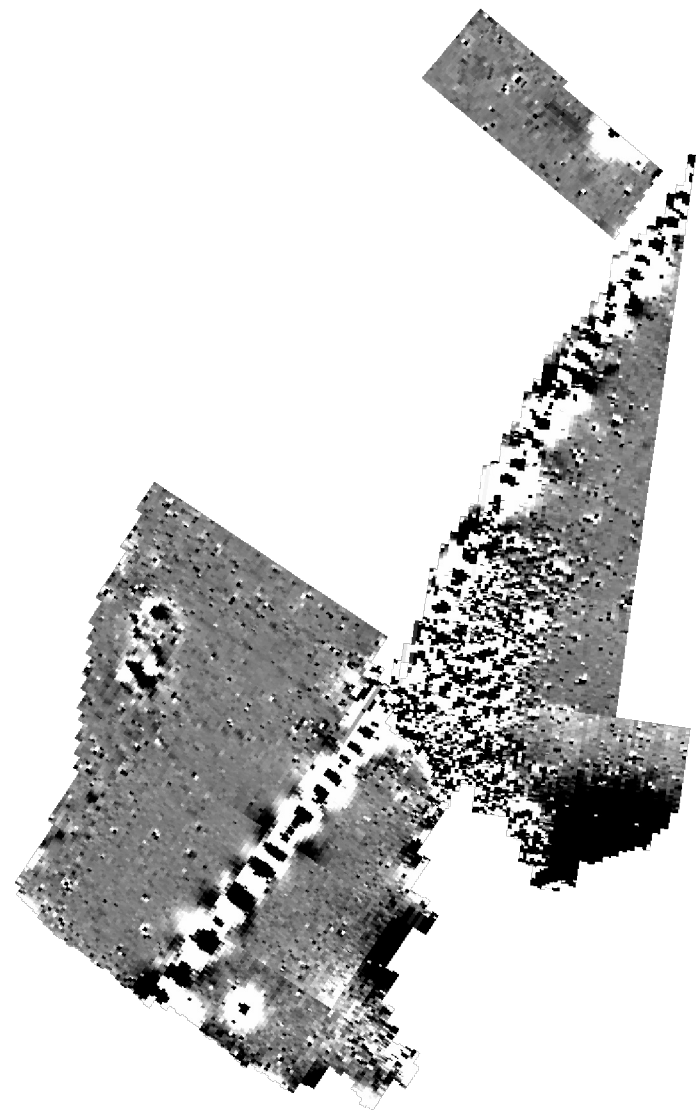
Trace Plot (ZMT and clipped to +/- 25nT)



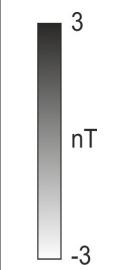
Site Code	REGF 18
Scale	1:2,000 @ A3
Drawn by	R Evershed
Date	08/10/18

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Figure 2: Greyscale raw data and processed trace plot



- Key
- Positive anomaly
  - Magnetic noise
  - Dipolar anomaly
  - Linear dipolar anomaly
  - Survey boundary



Site Code	REGF 18
Scale	1:2,000 @A3
Drawn by	Robert Evershed
Date	08/10/2018

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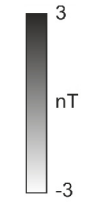
[www.allenarchaeology.co.uk](http://www.allenarchaeology.co.uk)

Figure 3: Processed greyscale plot and interpretation



Key

 Site boundary



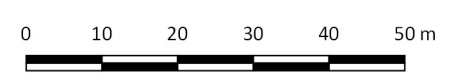
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Scale	1:1,000 @ A3
Drawn By	R Evershed
Date	08/10/2018

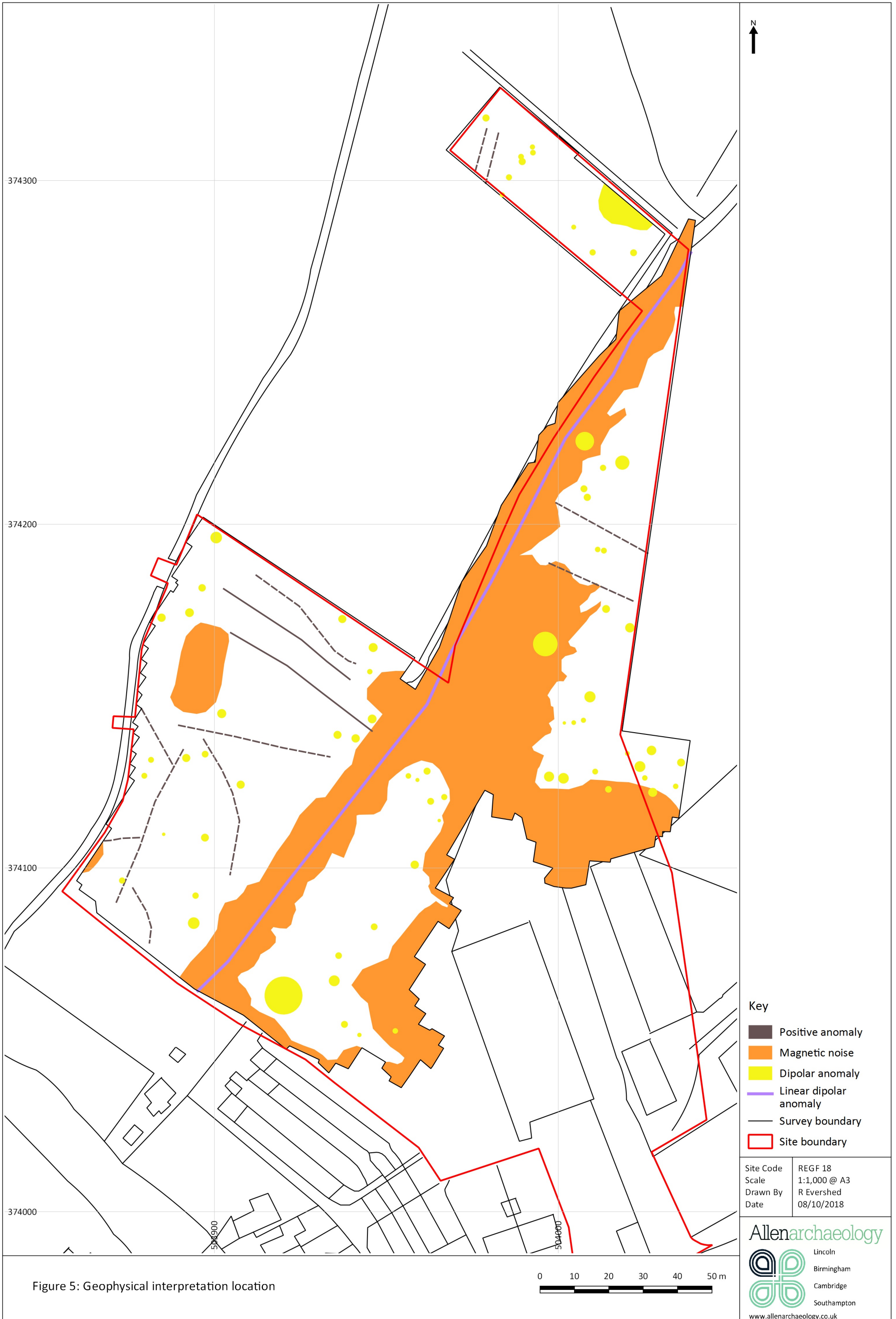
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Figure 4: Geophysics greyscale location







Key

Site boundary

3

nT

-3

Site Code REGF 18  
 Scale 1:2,000 @A3  
 Drawn by Robert Evershed  
 Date 08/10/2018



Figure 6: Processed greyscale location superimposed over 1970 OS map

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