

**ARCHAEOLOGICAL EVALUATION REPORT:
GEOPHYSICAL SURVEY BY MAGNETOMETRY
ON LAND AT POACHERS LANE, SUDBROOKE, LINCOLNSHIRE**

Planning Reference: 128675

Oasis ID: allenarc1-158965

NGR: TF 0360 7634

AAL Site Code: SUPL 13



Report prepared for Truelove Property & Construction Limited

By
Allen Archaeology Limited
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Allenarchaeology



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Cover image: View of site taken from the south looking northeast

Executive Summary

- A geophysical survey by magnetometer was undertaken by Allen Archaeology Limited on behalf of Truelove Property & Construction Limited on land off Poachers Lane, Sudbrooke, Lincolnshire to support a planning application for a residential development.
- The site is situated in an area of significant archaeological potential, particularly for the Roman period. The site lies adjacent to the site of a high status Roman building, which appears to have been established in the later 1st century AD, and was in use throughout the Roman period. The main focus of identified activity was located c. 100m to the northeast of the survey area, although associated agricultural enclosures extended across much of the surrounding field.
- The magnetometer survey has identified an area of potential archaeological activity represented by an area of magnetic noise and several discrete anomalies which may represent archaeological features.
- A large area of magnetic noise may be indicative of demolished structures represented by tile or other ceramic materials and possibly areas of burning that may include sites of hearths, ovens or industrial use.
- There are also further geophysical anomalies which may also represent industrial activity as well as a number of pit-like anomalies. A double linear feature running across the site may also be of archaeological origin and may represent a double ditched trackway.
- Scattered randomly throughout the site are a number of strong and weak dipolar responses. The characteristic dipole response of pairs of positive and negative 'spikes' suggests near-surface ferrous metal or other highly fired material.
- The survey results generally suggest there is significant archaeological potential for the site, with activity possibly relating to the adjacent Roman buildings which have been recorded in the field to the north.

1.0 Introduction

- 1.1 Allen Archaeology Limited was commissioned by Truelove Property & Construction Limited to undertake a geophysical survey by magnetometry on land off Poachers Lane, Sudbrooke, Lincolnshire. The works were commissioned by to support 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*' (IFA Paper 6), the Institute for Archaeologists '*Standard and guidance for archaeological geophysical survey*' (IfA 2011) and a specification prepared by this company (AAL 2013).
- 1.3 The site is archaeologically sensitive, lying in an area of archaeological interest and potential.

2.0 Site Location and Description (Figures 1 and 2)

- 2.1 The site is located to the north of the village of Sudbrooke, which lies in the administrative district of West Lindsey District Council, approximately 7 km northwest of central Lincoln (Figure 1). The proposed development site itself (hereafter referred to as 'the site') is c.0.9 hectares in area and is located to the north of the village, and to the north of Poachers Lane (Figure 2). The site is currently under short grass, and is centred on NGR TF 0360 7634. At the time of the survey the proposed development area had a fence running north – south across the western part of the site. The south-eastern part of the area was not available for survey due to it being fenced and containing large quantities of dumped material. The northern part of the site was also unavailable due to undergrowth and the presence of a small orchard.
- 2.2 The site is situated on a geological boundary of bedrock geologies, with Cornbrash Formation limestone to the west and Kellaways Formation sandstone and mudstone to the east. In the eastern part of the site there is an overlying superficial geology of River Terrace Deposits of loam, sand and gravel (British Geological Survey 1999).

3.0 Planning Background

- 3.1 A planning application has been submitted '*for proposed development of 6no. detached dwellings with associated garages, plots and infrastructure including new passing places to Poachers Lane, new bridge crossing Sudbrooke beck and necessary works to existing road. Also, proposed new cycle pedestrian pathway to parish boundary with Nettleham adjoining Church Lane*' (Planning Reference 128675). During pre-planning consultation the Historic Environment Team at Lincolnshire County Council advised for a programme of geophysical survey followed by trial trenching, in order to provide further information concerning the archaeological potential of the proposed development area, and to allow the planning authority to establish appropriate measures to mitigate the effect of the proposed development upon the archaeological resource. This approach was agreed with the Historic Environment Officer, advising West Lindsey District Council, and the first stage of these investigations is the current non-intrusive geophysical survey.
- 3.2 The approach adopted is consistent with the recommendations of the National Planning Policy Framework (NPPF), with the particular chapter of relevance being '*Chapter 12: Conserving and*

enhancing the historic environment' (Department for Communities and Local Government 2012).

4.0 Archaeological and Historical Background

- 4.1 The site is situated in an area of significant archaeological potential, particularly for the Roman period. Several phases of archaeological investigation have been undertaken in the field to the north, comprising geophysical survey, fieldwalking, evaluation trenching and excavation. The works have identified a high status Roman building, which appears to have been established in the later 1st century, and was in use throughout the Roman period. The main focus of identified activity was located c. 100m to the northeast of the survey area, although associated agricultural enclosures extended across much of the surrounding area (Lincolnshire Historic Environment Record (LHER) Reference 50991). Small quantities of mid to late Iron Age pottery were recovered from the site, indicating the potential for a precursor to the Roman phase of activity (LHER Reference 56521).
- 4.2 The place name is Old English, meaning 'the brook to the south' so named in relation to Scothern (Cameron 1998). In the Domesday Book of 1086 AD, there were two manors listed, in the ownership of Peterborough Abbey and Kolsveinn. There was a population of 50 villagers of varying status, along with their dependents, and a mill is also listed in the parish (Morgan and Thorn 1986).

5.0 Methodology

- 5.0.1 The geophysical survey consisted of a detailed magnetometry survey of the entirety of the proposed development area that was available for survey, totalling approximately 0.9 hectares. There were constraints which prevented the survey of the total area; a fence ran north – south across the western part of the site, a 10m strip along the northern part of the site was unsurveyable due to the presence of undergrowth and fruit trees, and an area in the southeast had been fenced off and used for dumping of material.
- 5.0.2 The fieldwork was carried out by a team of two experienced geophysicists from AAL over a period of one working day, Thursday 5th September 2013. The site was divided into 30m by 30m grids, established on site with reference to local fixed boundaries and accurately tied into the National Grid using Ordnance Survey base mapping.
- 5.0.3 The survey was undertaken using a Bartington Grad601-2 Dual Fluxgate Gradiometer with an onboard 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 onboard data logger.
- 5.0.4 Data collection was undertaken in a zigzag traverse pattern, using a sample interval of 0.25m and a traverse interval of 1m.

5.1 Summary of Survey Parameters

5.1.1 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:	0.1 nT
Processing software:	Terrasurveyor 3.0.22.1
Surface conditions:	Pasture
Area surveyed:	0.9 ha
Date surveyed:	Thursday 5 th September 2013
Surveyor:	Edward Oakley
Survey assistants:	Bill Baker
Data interpretation:	Edward Oakley

5.2 Data Collection and Processing

5.2.1 The grids were marked out using a Leica GS08 Net rover receiving RTK corrections. The collection of magnetic data using a north – south traverse pattern is preferable for a magnetic survey, as enhancements to the magnetic field caused by buried features is mapped increasingly stronger the closer the traverse direction can get to a magnetic north – south direction (Breiner 1999). On this occasion magnetic data was collected close to the preferred alignment due to the orientation of the survey grids. Data was collected by making successive parallel traverses across each grid in a zigzag pattern. Several key points of the survey grids were accurately tied into the National Grid with Ordnance Survey base mapping using a Leica GS08 Net rover receiving RTK corrections.

5.2.2 The data collected from the survey has been analysed using the current version of Terrasurveyor 3.0.22.1. 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-stripe (also known as Zero Mean Traverse or ZMT)
- Clipping

5.2.3 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. The de-stripe process is used with care however as it can sometimes have an adverse effect on linear features that run parallel to the orientation of the process.

5.2.4 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.

5.2.5 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 Magnetometer Survey Results (Figures 3 – 5)

- 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 4). This enhances faint anomalies that may otherwise not be noted in the data; however it also includes all ferrous and other magnetically enhanced material within the study area, making the resulting greyscale image particularly 'noisy'. The survey results revealed a number of anomalies across the data set, and these are discussed in turn and noted as two digit numbers in square brackets.
- 6.2 Immediately noticeable in the data set is a large area of magnetic noise in the northwestern part of the site [01]. This area produced a varied magnetic response producing a range of readings from -4 to +5 nT/m, including a large number of small amorphous positive anomalies up to +5 nT/m, and a notable area of dipolar response [02] with readings between -5 and +20 nT/m. The anomalies may in part reflect geological variation; however the most likely cause is anthropogenic activity, and may represent possible pit-like anomalies and structural remains. Overall the area of noise potentially denotes the presence of demolished structures represented by brick, tile or other ceramic materials, and possibly areas of burning which may include sites of domestic hearths and ovens or industrial use.
- 6.3 To the south of this is a further area of varied magnetic response [03], albeit giving weaker responses than [01], between -2 to +4 nT/m. This may be further evidence for human activity of a similar nature.
- 6.4 To the west of this is a strong dipolar anomaly, [04], giving readings between -40 to +40 nT/m which may represent a strong thermomagnetic anomaly characteristic of possible industrial activity, such as a kiln. The readings are strong and may represent disturbance from the field boundary although they are not as strong as would be expected from modern disturbance from the field boundary such as a fence post, as these commonly give readings of over 100 nT/m. Also, the fence along here was of wooden post construction with no sign of metal fittings which may have caused such a response.
- 6.5 An area to the north of the site contains a series of positive sub-circular magnetic anomalies which may represent pits [05], producing readings up to +4 nT/m. Two further curious positive anomalies are indicated in the central and southern portion of the site, [06] and [07]. These consist of small sub-circular positive anomalies giving a reading of +2.5 nT/m with a positive spike in the centre giving a reading of +3.5 nT/m. It is unclear what these anomalies represent although are likely to be of archaeological interest.
- 6.6 Running roughly west-northwest to east-southeast across the survey area is a double linear positive anomaly [08], which may represent a double ditched trackway or boundary, giving readings of up to +2.5 nT/m. Similarly there are two parallel positive linear anomalies in the southern part of the site, [09], also giving readings of up to + 2.5 nT/m which may represent components of a former ditched enclosure or boundary features.

- 6.7 Around the edge of the site are areas of magnetic noise, giving readings between – 177 nT/m and +50 nT/m, which are associated with modern features such as gates or fences as well as modern detritus accumulating around the field margins.
- 6.8 A number of dipolar responses were detected across the remainder of the survey area, with some examples highlighted as yellow circles on the interpretative plot (Figure 4). These are likely to be associated with ferrous waste or highly fired material within the ploughsoil.

7.0 Discussion and Conclusions

- 7.1 The site conditions proved receptive to geophysical surveying, and evidence for likely archaeological activity was forthcoming from across the survey area.
- 7.2 The two large areas of magnetic noise [01] and [03] may be indicative of demolished structures represented by brick, tile or other ceramic materials and possibly areas of burning which may include sites of hearths or ovens or industrial use. A further large dipolar anomaly may also be of industrial origin.
- 7.3 There are also a number of positive magnetic anomalies, particularly concentrated in the northern part of the site, which may represent pits, and a double linear feature running across the site may represent a trackway, heading into the area of varied magnetic response [01].
- 7.4 These features may relate to the known high status Roman site located 100m to the northeast. Here geophysical survey and fieldwalking followed by intrusive investigations revealed a high status Roman building sitting within a wider system of enclosures. The geophysical survey anomalies for the Roman building were of a similar signature to those discovered during the current survey; being represented by an area of mixed magnetic ‘noise’ albeit set within a more structured area of enclosures (Bunn 2005). It is possible that the results here may represent a related part of the system, possibly a different phase of buildings or, perhaps more likely, an industrial area, as represented by the numerous signatures suggesting areas of burning.
- 7.5 Scattered randomly throughout the site are a number of strong and weak dipolar responses. The characteristic dipole response of pairs of positive and negative ‘spikes’ suggests near-surface ferrous metal or other highly fired material.
- 7.6 The proposed development consists of the construction of six houses with associated access from Poachers Lane to the south. The proposed dwellings are mainly restricted to the southern part of the site, and the majority of the potential archaeological features area located in the northern part of the area, which is proposed to be garden areas. However, there is likely to be some impact upon the potential archaeological resource as a result of the proposed development.

8.0 Effectiveness of Methodology

- 8.1 The non-intrusive evaluation methodology employed was particularly appropriate to the scale and nature of the site to be surveyed. Magnetometry surveying was the prospection technique best suited to the identification of archaeological remains on the site. Other techniques would have required justification and may have proved too time consuming or cost-prohibitive.

9.0 Acknowledgements

9.1 Allen Archaeology would like to thank Truelove Property & Construction Limited for this commission.

10.0 References

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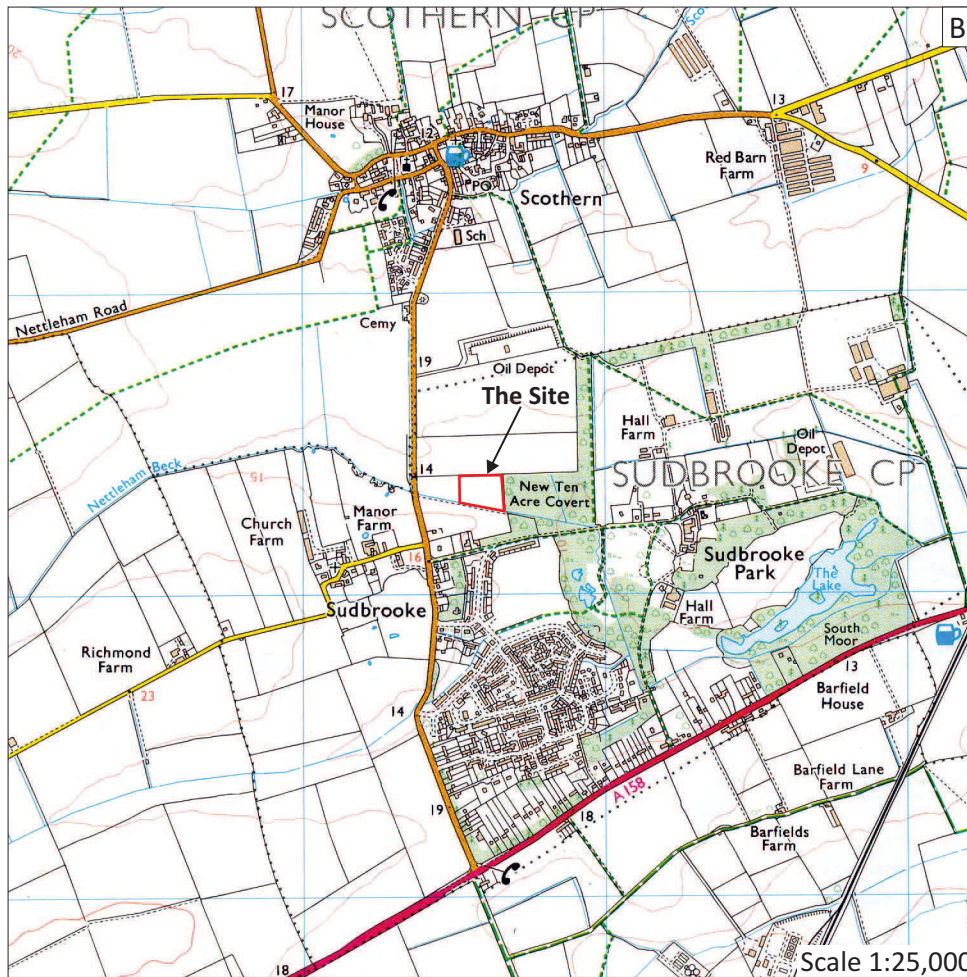
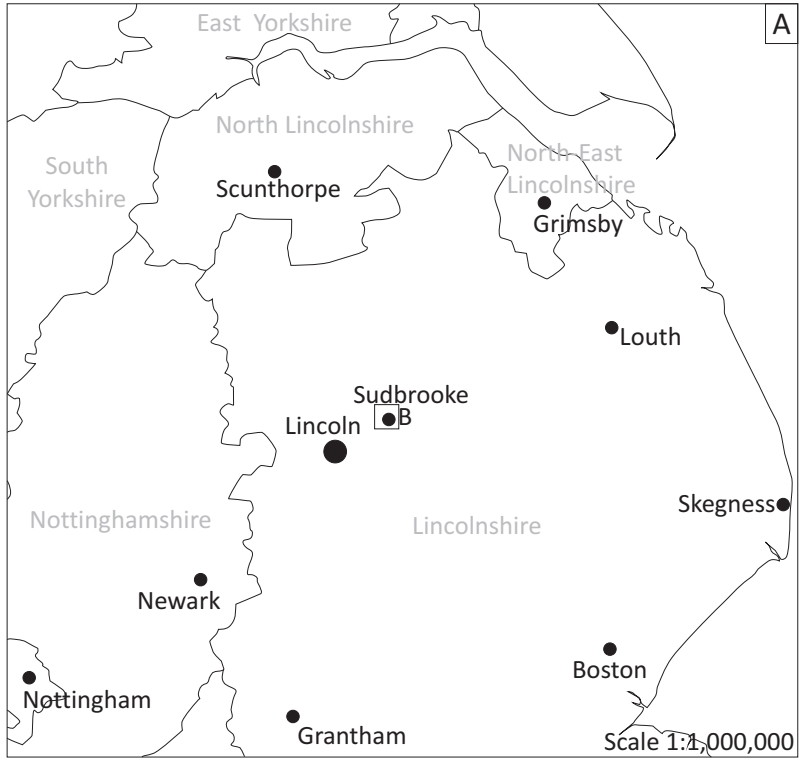
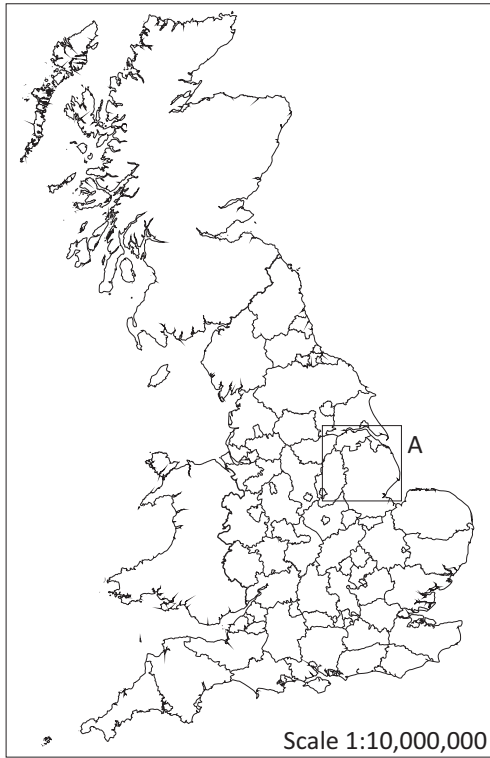


Figure 1: Site location outlined in red
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Site Code	SUPL 13
Scales	1:10,000,000 1:1,000,000 1:25,000 @ A4
Drawn by	E Oakley
Date	09/09/13

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Figure 2: Site location outlined in red, showing proposed development layout

Site Code	SUPL 13
Scale	1:1,250 @ A4
Drawn by	C Clay
Date	09/09/2013

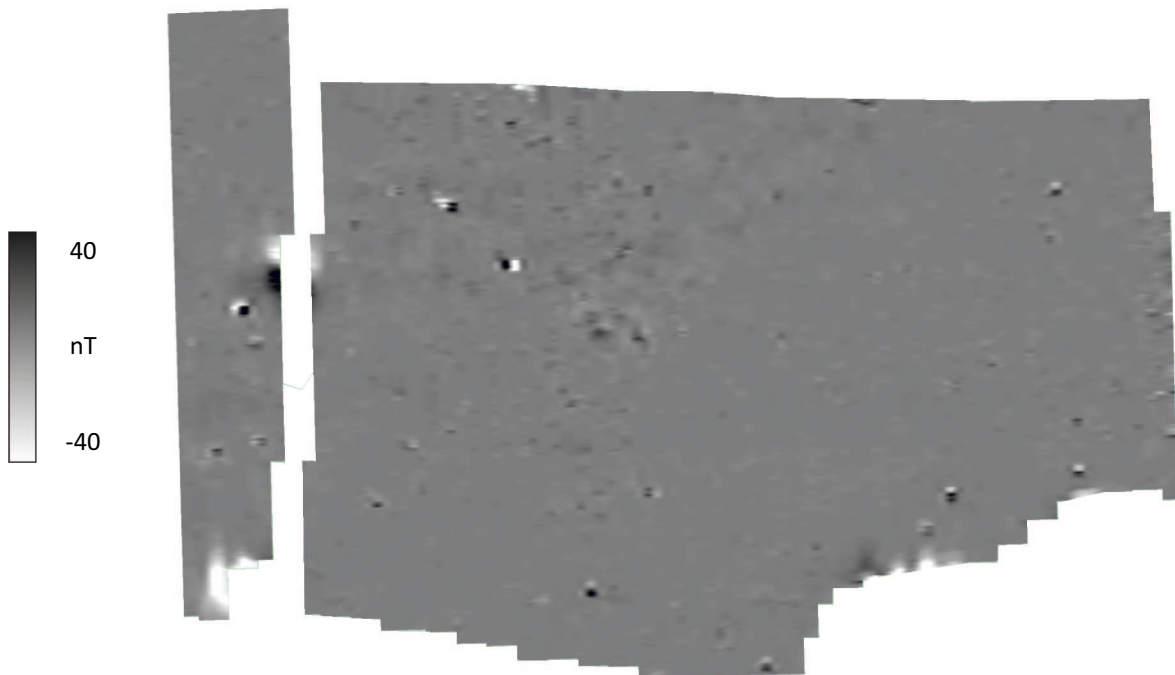
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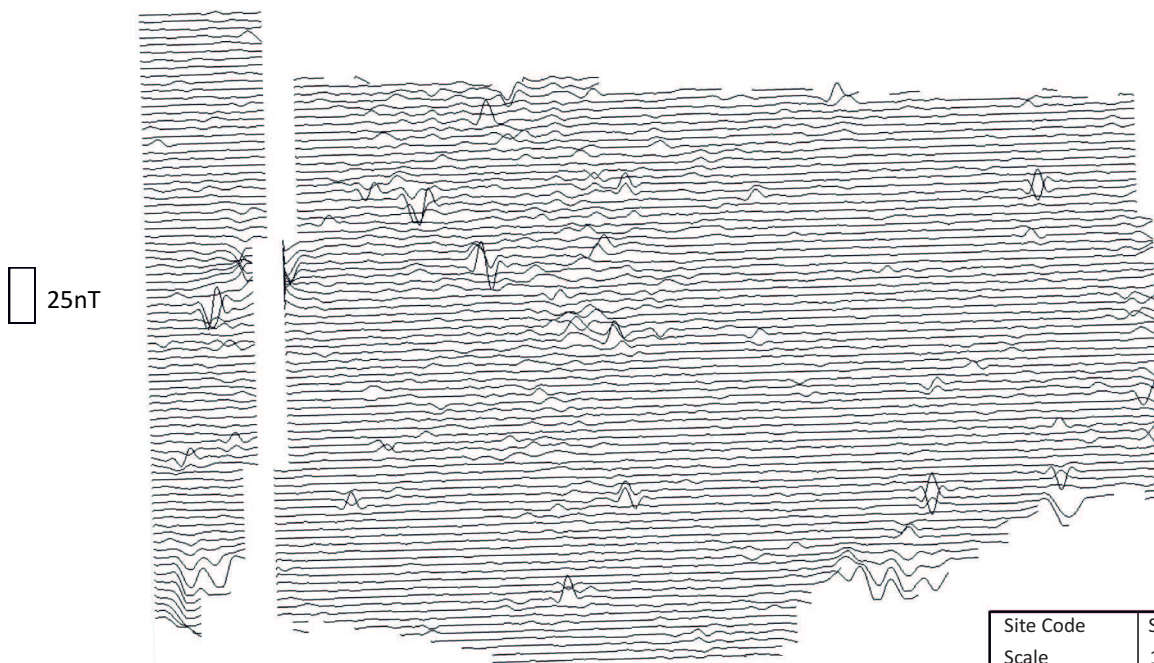
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Raw data (clipped to +/- 40nT)



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



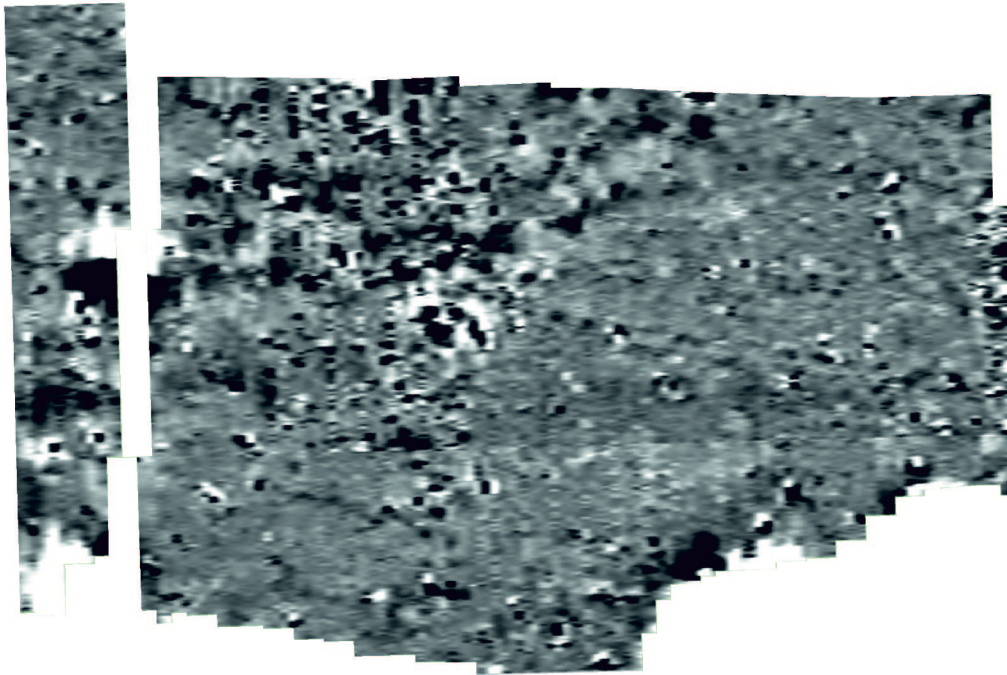
Site Code	SUPL 13
Scale	1:1000 @ A4
Drawn by	E Oakley
Date	06/09/13

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Figure 3: Greyscale raw data and processed trace plot



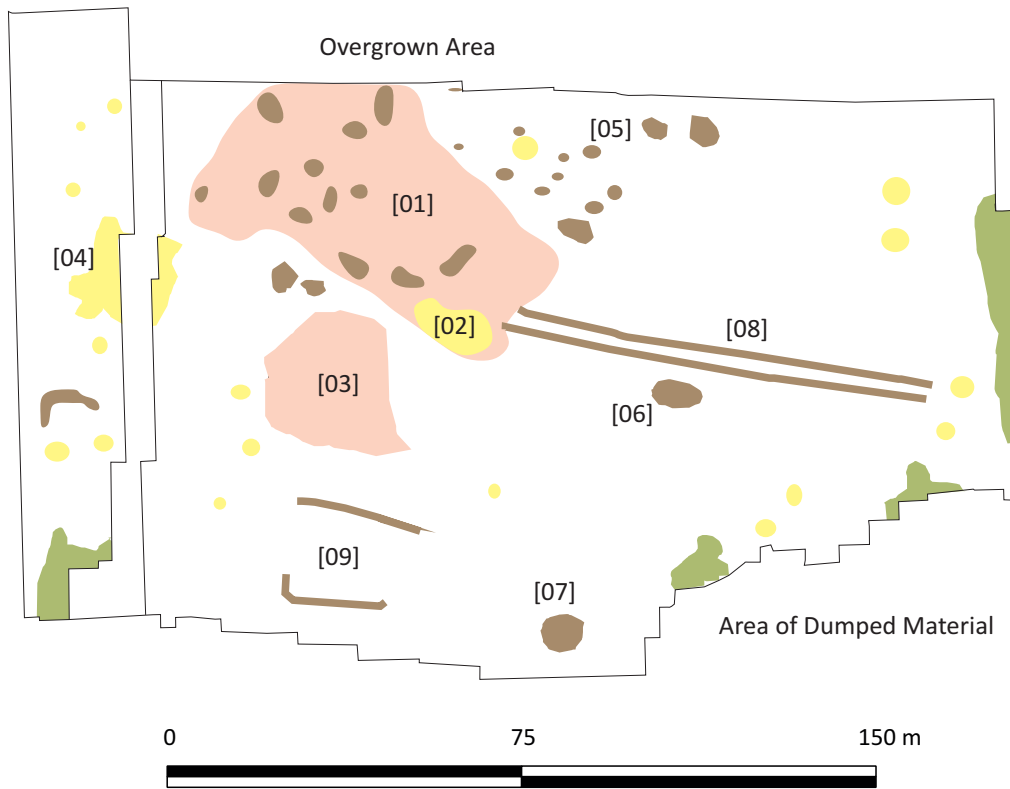
Processed data (clipped to +/- 3nT)



Interpretation Key

-  Positive magnetic anomaly
-  Dipolar anomaly
-  Area of magnetic noise
-  Area of magnetic interference
-  Examples* of individual dipolar responses indicative of ferrous or highly fired material
*smaller responses omitted for clarity

Interpretation Plot



Site Code	SUPL 13
Scale	1:1000 @ A4
Drawn by	E Oakley
Date	06/09/13

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Figure 4: Processed greyscale data and interpretation plot



Figure 5: Processed greyscale plot located in real space



Figure 6: Interpretative plot located in real space with proposed development superimposed



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