Summary

A geophysical survey was undertaken on agricultural land at Glebe Lodge Farm, Gonerby, Allington, Lincolnshire by Grid Nine Geophysics, in partnership with Allen Archaeological Associates. The survey was undertaken for Mr Simon Walsh, on the behalf of his client, Mr Norman Oley. The work was undertaken in advance of a planning application to excavate a series of new fishing lakes, and associated landscaping and infrastructure.

The survey revealed several anomalies that may possibly be of archaeological origin, and there is a general linear trend that is likely to represent former ploughing.

A number of anomalies may be associated with a former field boundary that ran across the site. There are also many dipole responses which are likely to have been caused by highly fired material or ferrous detritus.

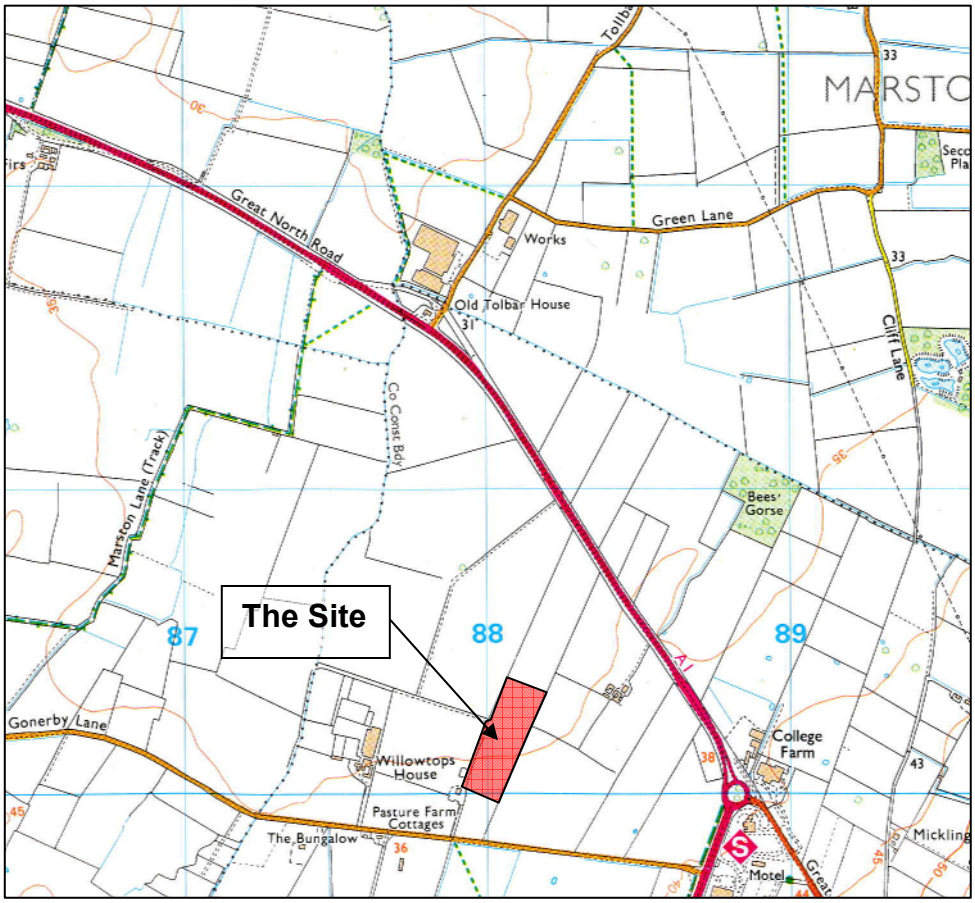

Figure 1: Site location in red at scale 1:25,000

1.0 Introduction

1.1 Allen Archaeological Associates, in partnership with Grid Nine Geophysics, were commissioned by Mr Simon Walsh on behalf of his client, Mr Norman Oley to carry out a detailed gradiometer survey in advance of a planning application for the excavation of a series of new fishing lakes and associated infrastructure.

1.2 The site works and reporting conform to current national guidelines, as set out in the Institute for Field Archaeologists '*Standards and guidance for archaeological evaluations*' (IFA 2001) and the English Heritage document '*Geophysical Survey in Archaeological Field Evaluation*' (David 1995), procedures that are set out in the Lincolnshire County Council publication '*Lincolnshire Archaeological Handbook: A Manual of Archaeological Practice'* (LCC 1998), and a specification prepared by this company (Allen Archaeological Associates 2008).

2.0 Site location and description

2.1 Allington is in the administrative district of South Kesteven, in the parish of Great Gonerby, approximately 5.5km north-west of Grantham, at NGR SK 8812 4042. The proposed development area comprises a broadly sub-rectangular block of land of approximately 4 hectares, to the south of the A1, and to the north of Gonerby Lane.

2.2 The local solid geology comprises Jurassic Brant Mudstone, with two faults running across the site in an east – west direction (British Geological Survey 1996). Soils are slowly permeable, seasonally wet and are acidic with a loamy/clayey main surface texture classification (National Soil Research Institute 2007).

3.0 Planning background

3.1 A planning application was submitted for the 'excavation of new fishing lakes including pathways, fishing points and landscaping' (Planning Application Reference S07/1271/37). The application was subsequently withdrawn to allow for further information to be obtained in advance of the planning application.

3.2 At this stage the South Kesteven Planning Archaeologist has requested the undertaking of a geophysical survey in advance of the resubmission of a planning application as the site lies within a landscape of archaeological interest/importance (Young 2007). The results of this survey will be used to inform the local planning authority on the suitability of the proposed development with regard to archaeology, and whether any further work, in the form of trial trenching for example, will be required.

4.0 Archaeological and historical background

4.1 The site lies within an area of archaeological interest. Fieldwalking has recovered large quantities of Roman pottery from adjacent fields, suggesting a settlement in the immediate vicinity, and there is evidence for the presence of Roman villas and other settlements in the wider landscape (Young 2007).

5.0 Methodology

5.0.1 A Level II magnetometer survey (Gaffney and Gater 1993) using a fluxgate gradiometer was chosen as the most appropriate geophysical technique to use. This was due to the nature of the potential archaeology likely to be exposed within the survey area and the sedimentary geology of the site (David 1995).

5.0.2 The combination of superficial loamy/clayey soils and a mudstone solid geology are known to give mainly average to good results from magnetic surveying. Loam and clay deposits can give variable results depending on the depth and nature of the anomaly, and the response over mudstone is usually average, which is true of most sedimentary parents (Gaffney and Gater 2003; Clark 1996).

5.0.3 Although no reported surveys could be found in the public domain from the general area around the site; the geology, being mudstone and clay, is common and results from magnetic surveys over these geologies are well documented. Many survey reports encountering these types of geologies are held by the English Heritage Geophysical Survey Database (EHGSD). A cursory, but specific search of the EHGSD for surveys over mudstones and clays resulted in at least twenty surveys which encountered both geologies.

5.0.4 Magnetic surveying measures very small changes in the Earth's magnetic field which can be created by man-made or geological changes in the magnetic properties of the soil and/or underlying geology.

5.0.5 Magnetic surveying can usually detect magnetically enhanced features such as areas of occupation, pits, ditches, hearths and kilns, but also will react to buried 'modern' items such as nails, agricultural equipment fragments, wire fences and generally any ferrous material in the immediate area. The geology of the site can play an important role in how successful a magnetic survey will be. If the local geology is inherently magnetic then it may not be practicable or possible to undertake a magnetic survey. Similarly, buried services can have an adverse effect on the data. Magnetic surveying is non-destructive and non-intrusive.

5.0.6 The magnetic ‘signature’ from certain anomalies, for example from a ditch or kiln, is often very characteristic to that type of known feature. This can assist with providing an informed, but quantative rather than qualitative interpretation to certain anomalies.

5.0.7 The survey was carried out 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.

5.0.8 Following discussions with staff at the Heritage Trust of Lincolnshire, it was accepted that 50% coverage of the site by magnetometer survey was acceptable (Figure 2). This was undertaken in three transects of fifteen 20m x 20m grids.

5.1 Summary of survey parameters

Instrument:	Bartington Grad601-2 Fluxgate Gradiometer
Sample interval:	0.25m
Traverse interval:	1.00m
Traverse separation:	1.00m
Traverse method:	Zigzag
Resolution:	0.1 nT
Processing software:	ArchaeoSurveyor 2.2.0.X
Weather conditions:	Sunny, dry and cold (temperature approximately 0^0 Centigrade)
Surface conditions:	Short grass
Area surveyed:	1.8 hectares (approximately 50% site coverage as specified)
Surveyors	David Charles Hibbitt PIFA and Angela Hazel Hibbitt
Data interpretation:	David Charles Hibbitt PIFA and Mark Allen MIFA
Date of survey:	16th February 2008

5.2 Data collection and processing

5.2.1 The site was marked out with a series of 20m x 20m grids aligned broadly NNE – SSW. The grid orientation was aligned with the eastern boundary of the site. This gave an orientation of roughly 24^0 from magnetic north. Any enhancement 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 (Scollar et al. 1990). Data was collected by making successive parallel traverses across each grid in a zigzag pattern, as close to a magnetic north – south alignment as practicable.

5.2.2 The data collected from the survey has been analysed using the current version of ArchaeoSurveyor 2 (2.2.0.X). The resulting data set plot is presented with positive nT mapped as black and negative nT mapped as white. The data has been subjected to processing using the following filters:

- De-spike
- De-stripe (also known as Zero Mean Traverse or ZMT)

5.2.3 The de-spike process is used to remove spurious or extreme high intensity anomalies or datapoint values. These are often caused by small ferrous objects (such as modern surface or sub-surface 'rubbish', ferrous fence posts, buried services etc) which may affect subsequent filter use, data enhancement and interpretation.

5.2.4 Due to the magnetic interference from what is likely to be a buried service towards the southern limit of the survey, the data was subjected to de-spiking using a uniform weighted window interval size of 21 on both the x and y axis with a threshold setting of 1.0 based on the mean centre value which was subsequently replaced with the median value.

5.2.5 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 (such as off-axis surveying or heading errors) and delays between surveying adjacent grids. The destripe 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. The filter was applied globally to all the traverses on the x axis only.

5.2.6 Plots of the data are presented in raw linear greyscale, processed linear greyscale and trace plot form with any corrections to the measured values or filtering processes noted,

and as a separate (David 1995) simplified graphical interpretation of the main magnetic anomalies detected.

6.0 Results (See Figures 3 – 10; numbered anomalies in bold are shown on Figure 6)

6.1 There appears to be evidence of former ridge and furrow ploughing visible in the data as broad but faint positive and negative striations running roughly north-west to south-east through the survey **[1]**. This ploughing trend appears to follow a single alignment, although its apparent truncation to the north and south within all three transects may suggest the division of the land into separately worked fields. Another possible explanation for the apparent truncation is recent consolidation of several smaller fields into one larger field. This activity can be traced through former Ordnance Survey maps of the area which do show a former field boundary passing through the northern end of the survey up to at least 1950. Several discrete positive and negative anomalies **[2]** may correlate with this former boundary.

6.2 Two areas of intense magnetic disturbance **[3]** and **[4]** have been recorded to the south and west. Linear anomaly **[3]** is almost certainly a buried service, probably a pipe, as the resulting linear response with significant magnetic gradients alternating regularly between positive and negative are characteristic of this type of feature. The intense response from anomaly **[3]** has masked the magnetometer results from the majority of this area. Magnetic disturbance **[4]** coincides with the entrance to the site, and is also in the vicinity of several items of discarded agricultural equipment and a row of lamp posts supplying lighting to the adjacent track and yard to the west of the site.

6.3 Three notable areas of varying magnetic responses have been detected and highlighted, namely anomalies **[5]**, **[6]** and **[7]**. These responses appear to comprise a number of pit-like and ditch-like positive magnetic anomalies with magnitudes of around 1nT, with many being <0.5nT. An exception to these are several positive anomalies within the areas **[5]** and **[7]** with positive magnitudes of 10nT. These may be of archaeological origin, although it is possible that they are the result of geomorphological action. There is a possibility that the area of varying magnetic responses **[5]** may at least in part be caused by a buried service similar to **[3]**.

6.4 Visible throughout the data are a number of discrete positive magnetic anomalies which may possibly represent pits. The magnitude of these anomalies is generally <5nT, with most being <1nT. Although an archaeological cause should not be ruled out it is possible that the survey has mapped subtle and ephemeral geomorphologic variations rather than true archaeological anomalies. There is one positive magnetic anomaly with a magnitude of 50nT **[7a].** This magnitude is suggestive of a fill of considerably higher magnetic susceptibility than the surrounding soil, possibly the result of habitation or land use.

6.5 Two anomalies, **[8]** and **[9],** may possibly be of archaeological interest. The apparent rectilinear response from **[8]** with a negative magnitude of -20nT and a positive magnitude of 10nT, may suggest that it could be archaeological, but the cause being localised and/or fairly deep ferrous or fired detritus should not be ruled out. Anomaly **[9]** is of similar shape but the magnitudes are considerably less at -3nT to 3nT. It should be noted however that both anomalies lie in close proximity to a former field boundary depicted on the 1892 Ordnance Survey map of the area (See Figures 8 and 11). It is therefore possible that the anomalies relate to material within or adjacent to this former boundary.

6.6 Several faint positive linear anomalies, all with peak magnitudes <1nT, are visible in the data **[10, 10a** and **10b].** The ephemeral nature and low magnitude of these anomalies

would suggest they are not archaeological. Several faint negative anomalies can also be seen in the data, with clear examples noted at **[11** and **11a]**. It is likely that these faint linear anomalies are the result of modern ploughing trends, as several plough ruts were encountered on a similar axis during the survey.

6.7 A number of small, but strong dipolar responses have been recorded scattered randomly throughout the data. The characteristic dipole response of pairs of positive and negative 'spikes' suggests near-surface ferrous or other highly fired material (Clarke 1996).

7.0 Conclusions

7.1 The geophysical survey has shown the development area lies within an area containing some anomalies of possible archaeological origin. At least one trend of former ploughing is evident. A number of faint linear and pit-like anomalies were noted throughout the data set; these may be of archaeological interest, however the ephemeral nature of the results means any interpretation at this stage should be treated with caution.

8.0 Effectiveness of methodology

8.1 The non-intrusive 50% evaluation methodology employed was appropriate to the scale and nature of the proposed development. The survey has shown that some anomalies of potential archaeological interest may exist in the development area.

9.0 Acknowledgements

9.1 Allen Archaeological Associates and Grid Nine Geophysics would like to thank Mr Simon Walsh, and his client Mr Norman Oley for this commission.

10.0 References

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Ordnance Survey maps of the Allington area were viewed on-line at www.old-maps.co.uk:

1882 Ordnance Survey map: Allington, Lincolnshire 1:2,500
1892 Ordnance Survey map: Allington,Lincolnshire 1:10,560
1904 Ordnance Survey map: Allington, Lincolnshire 1:2,500
1905 Ordnance Survey map: Allington, Lincolnshire 1:10,560
1950 Ordnance Survey map: Great Gonerby, Lincolnshire 1:10,560