STRATASCAN

Geophysical Survey Report

Someries Castle, Hyde, Bedfordshire

for

Terence O'Rourke Ltd.

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J2126

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Client:	**Terence O'Rourke**
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Techniques:	**Detailed magnetic survey (gradiometry)** **Detailed resistance survey**
National Grid Ref:	**TL 118 201**

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1 SUMMARY OF RESULTS

The geophysical survey undertaken at Someries Castle, Cheshire was successful in locating a number of anomalies of possible archaeological origin. Positive linear anomalies within the gradiometer data indicate the presence of cut features, as do negative area anomalies within the resistance data. A number of the anomalies relate directly to the earthworks whereas others may be related to earlier activity on the site.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned by Terence O'Rourke to undertake a geophysical survey of an area outlined for the proposed development of the local airport.

2.2 Site location

The site is located at Someries Castle, Luton, Bedfordshire at OS ref. TL 118 201.

2.3 Description of site

The survey area consists of approximately 8ha of pasture and contains the Scheduled Ancient Monument of Someries Castle (HER 360). The underlying geology is chalk, including red chalk (British Geological Survey, Fourth Edition Solid, 2001). The overlying soils are known as Batcombe soils which are a type of plateau drift and clay with flints. These consist of Fine silty over clayey and fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging (Soil Survey of England and Wales, Sheet 4 Eastern England).

2.4 Site history and archaeological potential

The site contains the Scheduled Ancient Monument of Someries Castle. The gatehouse and chapel of the castle survive in a ruinous state. Earthworks relating to the residence survive to the south east of the remains. Garden earthworks are present to the southwest (*Brief for a Geophysical Survey of land at Someries Castle, Hyde, Bedfordshire*: Heritage and Environment Section, Culture and Environment Group, Bedfordshire County Council).

2.5 Survey objectives

The objective of the survey was to locate any anomalies that may be of archaeological significance prior to trenching.

2.6 Survey methods

Detailed magnetometry and resistivity surveys were carried out across the site in order to assess the area with complementary techniques. More information regarding these techniques is included in the Methodology section below.

3 METHODOLOGY

3.1 Date of fieldwork

The fieldwork was carried out over 22 days from the 18th April 2006 when the weather was dry.

3.2 Grid locations

The location of the survey grids has been plotted in Figure 2 together with the referencing information.

3.3 Description of techniques and equipment configurations

3.3.1 Magnetometer

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTesla (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The instrument consists of two fluxgates very accurately aligned to nullify the effects of the Earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each sensor has a 1m separation between the sensing elements giving a strong response to deep anomalies.

3.3.2 Resistance Meter

This method relies on the relative inability of soils (and objects within the soil) to conduct an electrical current, which is passed through them. As resistivity is linked to moisture content, and therefore porosity, hard dense features such as rock will give a relatively high resistivity response, while features such as a ditch which retains moisture give a relatively low response.

The resistance meter used was an RM15 manufactured by Geoscan Research incorporating a mobile Twin Probe Array. The Twin Probes are separated by 0.5m and the associated remote probes were positioned approximately 15m outside the grid. The instrument uses an automatic data logger, which permits the data to be recorded as the survey progresses for later downloading to a computer for processing and presentation.

Though the values being logged are actually resistances in ohms they are directly proportional to resistivity (ohm-metres) as the same probe configuration was used through-out.

3.4 Sampling interval, depth of scan, resolution and data capture

3.4.1 Sampling interval

Magnetometer
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

Resistivity
Readings were taken at 1.0m centres along traverses 1.0m apart. This equates to 900 sampling points in a full 30m x 30m grid. All traverses were surveyed in a "zigzag" mode. Readings over the earthworks were taken at 0.5m centres along traverses 0.5m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

3.4.2 Depth of scan and resolution

Magnetometer
The Grad 601 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. The collection of data at 0.5m centres provides an appropriate methodology balancing cost and time with resolution.

Resistivity
The 0.5m probe spacing of a twin probe array has a typical depth of penetration of 0.5m to 1.0m. The collection of data at 1m centres with 0.5m probe spacing provides an appropriate methodology balancing cost and time with resolution for the areas outside of the earthworks. 0.5m centres were used over the earthworks for greater resolution.

3.4.3 Data capture

The readings from both techniques are logged consecutively into the appropriate data loggers which are in turn daily down- loaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

3.5 Processing, presentation of results and interpretation

3.5.1 Processing

Magnetometer
Processing is performed using specialist software known as *Geoplot 3.* This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all processed magnetometer data used in this report:

Zero mean grid	*Threshold = 0.25 std. dev.*
Zero mean traverse	*Last mean square fit = off*
Despike	*X radius = 1 Y radius = 1*
	Threshold = 3 std. dev.
	Spike replacement = mean

Resistivity
The processing was carried out using specialist software known as *Geoplot 3* and involved the 'despiking' of high contact resistance readings and the passing of the data though a high pass filter. This has the effect of removing the larger variations in the data often associated with geological features. The nett effect is aimed at enhancing the archaeological or man-made anomalies contained in the data.

The following schedule shows the processing carried out on the processed resistance plots.

Despike	*X radius = 1*
	Y radius = 1
	Spike replacement
High pass filter	*X radius = 10*
	Y radius = 10
	Weighting = Gaussian

3.5.2 Presentation of results and interpretation

Magnetometer
The presentation of the data for the survey involves a print-out of the raw data both as grey scale (Figures 3 and 4) and trace plots (Figures 5 and 6), together with a grey scale plot of the processed data (Figures 7 and 8). Magnetic anomalies have been identified

and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site (Figure 9).

Resistivity
The presentation of the data for the site involves a print-out of the raw data as a grey scale plot (Figures 10, 12, 13), together with a grey scale plot of the processed data (Figures 11, 14, 15). Anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing (Figure 16).

4 RESULTS

4.1 Magnetometry

The gradiometer survey undertaken at Someries Castle, Bedfordshire was successful in locating a number of anomalies of possible archaeological potential.

Positive area anomalies are evident across the survey area. These anomalies indicate the presence of cut features of possible archaeological origin. The majority of these features are located in the south of the site; however they can also be noted within and to the north of the castle earthworks.

Positive linear anomalies are also present across the entire survey area. These cut features may represent ditches of archaeological origin. A set of parallel positive linear anomalies can be noted within the earthworks. It is possible that these represent part of the castle's defence system. Further investigation would be required in order to ascertain as to whether the positive linear anomalies outside the earthworks are related to the castle site.

Discrete positive anomalies are evident spread across the survey area. These have been interpreted as possible pits and may be of an archaeological origin.

Negative linear and area anomalies can be noted in the south of the survey area. These anomalies may indicate the presence of former banks or earthwork systems.

Modern activity is represented on site by the presence of a number of pipes or cables. The magnetic enhancement associated with these services may mask any subtle features of archaeological origin in that area. A great deal of magnetic disturbance as a result of modern activity is evident to the east of the survey area which may have saturated any anomalies caused by archaeological features. A number of bipolar anomalies can also be noted across the site and are likely to represent buried ferrous objects.

4.2 Resistance

The data collected during the resistance survey is dominated by area anomalies, however a number of linear anomalies have also been identified within the survey area.

A number of high resistance area anomalies are evident within the area of the earthworks. These anomalies may indicate sub surface rubble or the compacted earth relating to the floor level of former structures. The majority of high resistance area anomalies are located to the north of the castle site. These anomalies may indicate areas of sub surface rubble or compacted earth. Alternatively these features may have a geological/pedological origin.

Low resistance area anomalies are evident across the entire survey area. The two, large areas of low resistance in the southern limits are likely to be of a geological origin. However, a number of low resistance area anomalies over the earthworks must relate to the castle's defensive ditch system. Other negative anomalies within the survey area represent cut features which may relate to the castle and therefore may be of archaeological origin.

A number of positive linear anomalies are evident within the earthworks of Someries Castle. These anomalies may indicate the presence of buried wall foundations and other structural remains. Other positive linear anomalies can be noted to the south of the site. These may represent structural remains, however further investigation is required in order to understand how they relate to the castle.

A number of both high and low resistance linear anomalies correspond with modern services indicated within the gradiometer data.

5 CONCLUSION

The geophysical survey undertaken at Someries Castle, Bedfordshire was successful in locating a number of anomalies of possible archaeological origin. The gradiometer survey located a number of positive area anomalies. These may indicate the presence of cut features such as large pits and may be of archaeological origin. The fact that the majority of these anomalies are located to the south of the site may suggest a concentration of activity in this area. The lack of isolated patches of low resistance indicates a low correlation between the data sets in this area. It must be noted, however, that this part of the site has been used recently to house pig sties, therefore there is a possibility that a number of anomalies may be caused by modern agricultural activity.

Positive linear gradiometer anomalies are evident over the entire survey area. A parallel set of these anomalies, representing ditches, can be noted within the earthworks and may be related to the castle's defence system. There is a good correlation between these anomalies and an area of low resistance, providing further evidence for a former ditch in this area. Other positive linear anomalies within and around the earthworks indicate cut features of possible archaeological origin. Further investigation may determine as to whether these anomalies are related to the castle site.

A large number of discrete positive anomalies can be noted across the survey area. These have been interpreted as possible pits and may be of an archaeological origin.

The gradiometer data highlighted a number of negative linear and area anomalies in the south of the site. These may indicate the presence of former banks or earthworks. The resistivity data in this area has produced high resistance anomalies in this area, however these do not correlate directly with those in the gradiometry data. Further investigation is required in order to ascertain how these features tie in with the sequence of the site.

The resistance survey undertaken over Someries Castle highlighted a number of high and low resistance area anomalies. High resistance area anomalies located within and around the earthworks indicate areas of subsurface rubble or compacted earth from former buildings.

Two large areas of low resistance evident on the eastern limits of the earthworks may indicate the position of the castle's defensive ditches. The low resistance within the western limits of the earthworks correspond with positive linear anomalies in the gradiometer data which supports the cut feature interpretation. The low resistance linear anomaly running approximately north to south in the northern limits of the survey area can also be seen in the gradiometer data as a positive linear anomaly. The two large areas of low resistance in the southern limits of the site may be of a geological rather than archaeological origin.