

**Bexhill to Hastings Link Road
East Sussex**

CENTRED ON NGR TQ 756 108

GEOARCHAEOLOGICAL GEOPHYSICAL SURVEY

FOR

EAST SUSSEX COUNTY COUNCIL

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NGR TQ 756 108

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Introduction

The geoarchaeological site investigation was designed to deploy a rapid spatial survey (utilising electromagnetic surveys) to characterise the bulk geoelectrical properties of the near surface sediments within the study area. This information was to be used to investigate the distribution of geomorphological features buried beneath the floodplain of the river and subsequently by the staff at OA for locating evaluation trenches in advance of construction activity. The work was undertaken from the 3rd to 6th March by Dr. Richard Bates and Dr. Martin Bates under the guidance from OA staff geoarchaeologist Mr Carl Champness.

Objectives

The survey was designed to characterise the sub-surface deposits and in particular to identify the location and distribution of any areas of gravel highs ('islands') within the floodplain. Additionally the edge of the floodplain was to be mapped and located where possible.

Methodology

The methodology was developed in order to provide a rapid, cost effective, evaluation of the floodplain sediments in order to supply the client with information useful for archaeological prospection (in particular the siting of evaluation trenches during subsequent phases of the project). A surface ground conductivity survey was conducted using a Geonics EM31. The Geonics EM31 uses a varying electromagnetic field to measure changes in near surface conductivity. For example clays and silts are more conductive to electrical currents than sands and gravels. From a measure of changes in ground conductivity on a grid of continuous recording stations across the site it is possible to produce a 2D map as a proxy for the distribution of sands, gravels and finer grained sediments in the near surface zone (i.e. top 3m). Such techniques are ideal for locating buried channels as well as identifying the surface expression of buried sand and gravel islands within the alluvium. Ground truthing the geoelectric survey was not undertaken during the survey but OA staff had previously undertaken boreholes and trial pits that may be used to ground truth the geophysical data.

The Geonics EM 31 Ground Conductivity meter was chosen for the geoelectrical survey because at low electrical induction numbers the terrain conductivity is directly proportional to instrument reading (of secondary to primary magnetic field). The ground conductivity is a function of the electrical conductivity of the material (soil or rock), the fluid content and the thickness or depth of individual layers within the ground (Geonics, 1980a). Because the instrument uses an electromagnetic field maps of geologic variations and subsurface features associated with the changes in ground conductivity can be produced without the recourse to directly placing electrodes into the ground. In the field ground conductivity measurements were directly recorded together with a DGPS location for real time spatial positioning. Some advantages of the Geonics EM31-MK2 over conventional resistivity methods are the speed with which surveys can be performed, the precision with which small changes in conductivity can be measured and the continuous readout and data collection while traversing the survey area.

The results of the EM31 survey are presented in Figure 1.

Geophysical survey results

The results of the geophysical survey are shown in Figure 1. Ground conductivity values were contoured using ArcGIS 8.2 and are plotted with high values (blue or cool colours) and low values (red or hot colours). Values varied between 0 and 200MmS.

The results of the survey clearly indicate varying ground conductivity values across the survey area. Survey depth using the EM31 ground conductivity meter summarises conductivity values for 1-3m depth. The resulting contour plot clearly shows bands of high conductivity (green/yellow/brown colours) probably indicative of main channel zones. 'Islands' of low conductivity (blue cool colours) can be noted within the channel zones. Finally zones of low conductivity (blue cool colours) can be traced around the margins of much of the route corridor. These marginal zones mark the edge of the floodplain (probably buried in some instances by thin spreads of alluvium).

A number of noticeable points are apparent from the survey:

1. Areas of green/yellow/brown colours (conductivity values in excess of 24mS) probably equate to areas of extensive alluvial sediment accumulation (these may include both minerogenics sediments as well as organic sediments). The distribution of these geoelectric units across the study area follows the main trend of the valleys within the area further substantiating this interpretation.
2. Areas of low conductivity (light blue) occurred around the margins of the study area close to the edge of the floodplain. These areas are likely to be those areas of the floodplain in which thin sequences of alluvium rest on the rising bedrock surface of the valley margins.

3. Areas of low conductivity (dark blues/purples, <18mS) represent the areas of valley side with near surface bedrock.

4. Areas of lower conductivity (marked 1-3 on Figure 1) within the channel like forms exhibiting higher conductivity values are also noted. These have an island like form at least in two cases (1 and 2) suggesting the presence of coarser sediments near the surface (sands or gravels perhaps) or near surface bedrock highs. In either scenario these are locations that may have remained drier within the floodplain longer in the past.

5. An area of complex interest was also noted within an area of generally low conductivity marked A on Figure 1. Although probably near surface bedrock through much of this area a small channel like feature has been identified across this zone.

Discussion

The evidence from the geophysical survey indicates that channel and island patterns consistent with those known to exist in lowland river situations in the UK and Europe (Lewin *et al.*, 2005; Macklin *et al.*, 2006) exist in the study area. The distribution of different ground conductivity values (Figure 1) is strongly reminiscent of patterns of floodplain topography varying between linear areas of channel and larger, more diffuse areas of relatively higher topography describing islands in the floodplain. At present it is difficult to ascertain precisely the temporal framework for the development of the patterns seen in the combined survey results. The results mapped are likely to be a complex of features of differing ages preserved within the envelope of the top c.3m of alluvium surveyed by the EM31 equipment. The interpretation of the results is also limited by the distribution of the survey areas (fuller interpretation of the nature of the sequences within the route corridor would be possible if adjacent parts of the valley floor, beyond the route corridor, could be surveyed for mapping purposes). However, the survey has successfully demonstrated that coherent patterns reflecting buried geomorphology exist within the study area and these patterns may form the basis for decision making for later phases of the archaeological investigation.

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