STRATASCAN

Geophysical Survey Report

LIVERPOOL AIRPORT RECONNAISSANCE SURVEY

for

SCOTT WILSON

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J2060

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1 SUMMARY OF RESULTS

A magnetic susceptibility survey was carried out over land near Liverpool Airport. The survey has identified several areas of high susceptibility that may represent areas of archaeological activity. There is a larger number of high susceptibility values present in the south of the survey area. Although a number of these responses can be attributed to modern and agricultural activity, these anomalies may represent areas of archaeological activity with a number possibly associated with clay mining and prehistoric and medieval find scatters identified by the Sites and Monuments Record (SMR) and/or from historic Ordnance Survey maps.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned by Scott Wilson to undertake a geophysical survey as part of a pre-determination survey prior to ground and construction works associated with the redevelopment of Liverpool Airport.

2.2 Site location

The site is located near to Speke and Liverpool Airport at OS ref. SJ 445 823.

2.3 Description of site

The survey area is approximately 100ha. The survey area comprises of a number of large regular fields. The fields to the east consist of grassland or recently sown winter wheat and the fields in the south consist of crops of root vegetables close to harvesting. The topography is relatively flat with occasional north to south undulations. The underlying geology is Permain and Triassic sandstones (British Geological Survey South Sheet, Fourth Edition Solid, 1979). The overlying soils are un-surveyed, but the drift geology is likely to be wind blown sand (Soil Survey of England and Wales, Sheet 3 Midlands and Western England).

2.4 Site history and archaeological potential

The following information has been taken from the archaeological and historical background information gathered by Scott Wilson (Liverpool John Lennon Airport. Magnetic Susceptibility Mapping. Specification. Ref: K/D108175/Specification. September 2005 p 3-4) (see Appendix):

To the south of the existing runway is evidence for the prehistoric period, preserved in the form of flint scatters (as seen in Figure 3). Field walking has also revealed possible sherds of prehistoric date, although the quantity found does not suggest significant occupation and/or settlement activity. Prehistoric evidence is lacking within the immediate vicinity of the eastern access route.

Within the proposed development areas there is limited evidence for the Roman period. The only indication of activity is from finds of metalwork fragments found to the south

of the existing runway. Sherds of possible Roman pottery were found immediately to the north of the western extent of the runway, however, their date has not been confirmed.

Documentary evidence suggests that those villages which lie within close proximity to the proposed development have medieval origins. Located near to the village of Speke is Speke Hall which dates to the 15th/16th century. The hall is designated as a Grade I listed building.

A concentration of medieval activity is also apparent to the south of the runway. The evidence primarily consists of a number of medieval artefact scatters which were found during field walking in the 1980s (as seen in Figure 3). These may be associated with the medieval settlement of Oglet.

The character of the proposed development changed during the post-medieval period, with evidenced by the enclosure of medieval fields, the management of woodland, the expansion of some settlements and the decrease in size of others. Analysis of various sources including a number of Ordnance Survey maps indicates that during this period there was a marked rise in industrial activity particularly from quarrying and that associated with salt manufacture (as seen in Figure 3). These features are marked on the 1848 1st edition Ordnance Survey map.

During the 19th and 20th centuries the landscape gradually started to change, evidenced by the significant expansion of settlements such as Speke. This was partly influenced by improvements to communications and the arrival of the railways in the early 19th century. The area saw further change due to the construction of Speke Airport in the 1930s and Liverpool Airport in the 1960s.

2.5 Survey objectives

The objective of the survey was to locate any areas of high magnetic enhancement that may be associated with areas of archaeological activity.

2.6 Survey methods

A reconnaissance technique, soil magnetic susceptibility measurement, was employed over the whole of the survey area.

3 METHODOLOGY

3.1 Date of fieldwork

The fieldwork was carried out over 5 days from 27/9/05 to 3/10/05 when the weather was dry.

3.2 Grid locations

The location of the survey grids has been plotted in Figure 1.

3.3 Description of techniques and equipment configurations

3.3.1 Magnetic Susceptibility

Alteration of iron minerals in topsoil through biological activity and burning can enhance the magnetic susceptibility (MS) of that soil. Measuring the MS of a soil can therefore give a measure of past human activity and can be used to target the more intensive and higher resolution techniques of Magnetometry and Resistivity. Measurements of MS were carried out using a field coil which provides a rapid scan and has the benefit of allowing "insitu" readings to be taken.

The equipment used on this contract was an MS2 Magnetic Susceptibility meter manufactured by Bartington Instruments Ltd. A field coil known as an MS2D was used to take field readings. This assessed the top 200mm or so of topsoil. To overcome the problem of ground contact all readings were taken 4 or 5 times and an average taken. All obvious localised "spikes" were ignored.

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

3.4.1 Sampling interval

Data was collected at 20m centres along transects 20m apart. The node positions were located using the Leica GS50 Global Positioning System (GPS); the OS grid location of each survey point was uploaded onto the GPS from data points established from the OS base mapping. The average value was then logged and recorded using the Leica GS50.

3.4.2 Depth of scan and resolution

The MS2D coil assesses the average MS of the soil within a hemisphere of radius 200mm. This equates to a volume of some $0.016m^3$ and maximum depth of 200mm. As readings are only at 20m centres this results in a very coarse resolution but adequate to pick up trends in MS variations.

3.4.3 Data capture

The data is logged as an attribute to the relevant GPS point within the Leica GS50. The GPS data was then downloaded using Leica Survey Office.

3.5 Processing, presentation of results and interpretation

3.5.1 Processing

No processing of the data has been undertaken.

3.5.2 Presentation of results and interpretation

The presentation of the data for the survey involves a colour scale plot of the field measurements overlain onto a site plan (see Figure 3). The colour plots were created

using Surfer imaging software. Areas of enhancement are highlighted as potential targets for detailed surveying with a small area of low magnetic susceptibility selected in order to allow an assessment of the suitability of the technique.

4 RESULTS

The survey detected a range of values across the entire survey area, with a higher concentration situated in the south. A number of high susceptibility areas may be caused by modern and agricultural activity, however a number of targeted areas situated in the eastern 'corridor' and south of the survey area may be associated with archaeological activity. The magnetic susceptibility anomalies identified have been separated into the following categories (Figure 3):

- Areas of high susceptibility of possible archaeological origin
- Areas of moderate high susceptibility of possible archaeological origin
- Areas of high susceptibility values possibly caused by field ground cover or localised activity
- Areas of high susceptibility values possibly associated with nearby roads or field boundaries
- Areas of low susceptibility values caused by long grass interfering with the contact between the MSD2 coil and the soil surface.
- Areas of moderately low susceptibility values

Areas of high susceptibility of possible archaeological origin

Anomaly 2 in the north eastern area contains very high susceptibility readings and may indicate an area of archaeological activity. Anomaly 3 is sited in the north eastern area between two clay mine sites and may be associated with clay mining activity; however this anomaly may also be of archaeological origin.

Anomaly 6 in the eastern part of the survey appears to be linear in form and is likely to be associated to a trackway present on the first edition Ordnance Survey.

Anomalies 13, 27, and 30 are located towards the northern edge of the southern section of the survey area and again could be linked with the clay pits indicated on the Ordnance Survey maps; however these anomalies may also be associated with archaeological activity. Anomalies 21 and 23a are probably associated with a number of clay pits located in the area. Anomalies 27 and 30 may also be associated with nearby field boundaries.

Areas of moderate high susceptibility of possible archaeological origin

Anomaly 1 at the northern most part of the survey area is located close to the high value anomaly 2 and may be an extension of this area and indicate a possible area of archaeological activity. Anomalies 9, 11, 12, 15, 16, 23, 24, 26, 29 and 31 are spread across the southern area of the survey. Most of them are located adjacent to former clay pits and may represent activity resulting from clay extraction. Anomaly 12 is situated

very close to the boundary of the airport and may be associated with its construction. Anomaly 15 has a linear shape that is aligned with the existing field boundaries and could be of agricultural origin.

Areas of high susceptibility values possibly caused by field ground cover or localised activity

Anomalies 10 and 25 appear to be confined to present field boundaries. These anomalies may be caused by recent agricultural activities that have increased the magnetic susceptibility levels; however the high level readings may also be the result of earlier activities of possible archaeological origin.

Areas of high susceptibility values possibly associated with nearby roads or field boundaries

Anomalies 4, 7, 7a, 14, 17, 19, 20 and 22 are all located adjacent to modern roads or field boundaries. These anomalies are possibly caused by these modern and agricultural features.

Areas of low susceptibility values caused by long grass preventing contact between the MSD2 coil and the soil surface

Anomalies 5 and 8 located at the southern end of the northern section of the survey within fields of long grass. The vegetation has reduced the contact of the MSD2 sensor with the soil surface producing low susceptibility values. Anomaly 32 is also situated in an area of mature crop and may represent a reduction in sensor to surface contact. These occurrences may have masked any underlying archaeology and therefore should be considered for further investigation.

Areas of moderately low susceptibility values

Two areas of moderate low susceptibility have been identified in the south of the survey area (anomalies 18 and 28). These anomalies may represent areas of reduced archaeological or industrial activity.

5 CONCLUSION

The survey has produced varying levels of susceptibility readings with a concentration of high values in the southern portion of the survey area. Information from the SMR and clay mining sites identified from the Ordnance Survey support that the high values recorded in the southern extent of the survey may represent areas of archaeological and previous industrial activity. A number of high susceptibility anomalies present within the eastern survey 'corridor' may indicate further areas of archaeological activity, however, a number may be associated with previous clay mining, modern or agricultural activity.

Recommendations for further investigation would involve detailed magnetometry over targeted magnetic susceptibility anomalies possibly associated with archaeological activity. This would attempt to identify the extent and nature of these anomalies. The high susceptibility areas identified along the eastern survey corridor and within the southern survey area would be targeted.

A small area of targeted detailed survey is also recommended over a low susceptibility area to test the null value. Targeted surveying may be suggested over the areas where the magnetic susceptibility had difficulty in achieving contact with the ground, therefore producing 'false' low readings, possibly masking areas of archaeological origin.

6 APPENDIX

Scott Wilson
Liverpool John Lennon Airport. Magnetic Susceptibility Mapping. Specification. Ref: K/D108175/Specification. September 2005