APPENDIX V

A Report for

ENVIRONMENT ARCHAEOLOGICAL CONSULTANTS

on a

Geophysical Survey

carried out at

Welton-Le-Wold, Lincolnshire

June 2002

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CONTENTS

1 SUMMARY OF RESULTS

A ground conductivity survey at Welton-Le-Wold, Lincolnshire has revealed low conductivity anomalies possibly associated with a gravel bench or quarry face. Less well defined low conductivity anomalies may also relate to areas of gravel.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned by Environment Archaeological Consultants to undertake a survey of a former gravel quarry that ceased operations in the 1970s and has been partially backfilled.

2.2 Site location

The site is located to the north east of the village of Welton-Le-Wold in Lincolnshire at NGR OS ref. TF 282 881.

2.3 Description of site

The quarry contains important sequences of ice age deposits and has been designated a geological Site of Special Scientific interest (SSSI) and a Regional Important Geological Site (RIGS). Glacial tills overlie silts, sands and gravels preserving a stratigraphic sequence of Pleistocene deposits.

2.4 Site history and archaeological potential

In the late 1960s to early 1970s Acheulean type hand axes and faunal remains were collected from gravels lying below the tills. At the time this material was assigned to the Hoxnian interglacial but more recent advances in Pleistocene research may have implications on the dating of material from this site.

2.5 Survey objectives

The objective of the survey was to locate the gravel section that was abandoned in the 1970s. This is believed to exist as a bench now buried by partial backfilling.

2.6 Survey methods

Ground conductivity was employed using the Geonics EM31 instrument. This survey method was considered the most effective technique when considering the probable depth of the gravel bench. The conductivity of the gravel is significantly lower to that of clay and is likely to produce good definition if a bench or edge exists. More information regarding this technique is included in the Methodology section below.

3 METHODOLOGY

3.1 *Date of fieldwork*

The fieldwork was carried out on 17th June when the weather was overcast.

3.2 *Grid locations*

The survey grid has been plotted in Figure 2 together with the referencing information.

3.3 *Description of techniques and equipment configurations*

The EM data acquisition system was the Geonics EM31 which uses induced current to generate a response from the sub-surface. A small loop antenna at one end of a 3.66m boom transmits a magnetic field which interacts with the ground and induces electric currents to flow in the ground. The induced currents in turn generate secondary magnetic fields that are detected by a small receiver loop at the opposite end of the boom. The receiver loop also “sees” the primary transmitted field, but internal circuitry separates the received signal into primary and secondary fields.

The secondary field is separated into the inphase response and the quadrature component. The inphase response is essentially the same as that from a metal detector and is expressed as units of parts per thousand of the primary transmitted field. In the absence of significant amounts of metal, the inphase mode is generally small and variable but can be sensitive to ground disturbance and small amounts of metal. The quadrature response measures the bulk electrical properties of the site. The electrical properties, expressed as an apparent electrical conductivity in millisiemens per metre (mS/m), are sensitive to ground disturbance and can help delineate buried pits.

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

3.4.1 *Sampling interval*

Readings were taken at 2m stations at centres along lines 2m apart with the boom across the survey line. Vertical dipole readings were taken at each station together with inphase ("metal detecting or susceptibility mode") and quadrature (“conductivity mode”).

3.4.2 *Depth of scan and resolution*

The depth of scan for the vertical dipole is approximately 6m. The resolution is approximately a fifth of the coil separation thus giving 0.7m.

3.4.3 *Data capture*

Data is recorded in a DL600 data logger on a station by station basis for downloading. The data is transferred to a portable computer for storing, processing and presentation.

3.5 *Processing of data, presentation of results and interpretation*

3.5.1 *Processing*

Raw data is converted into xyz format using *DAT31* software. Processing was carried out using specialist software known as *Geoplot 3* and involved the 'despiking' of high contact conductivity readings and the passing of the data though a high pass filter.

The following schedule shows the processing carried out on the processed EM31 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*

The data is presented in Figures 3 and 4 for the inphase response and Figures 5 and 6 for the quadrature component. Anomalies have been identified and plotted onto Figure 7.

4 RESULTS

Analysis of the results is focussed on the quadrature component. Inphase responses do not appear to show significant correlation with the quadrature component and are expected to relate more to ground disturbance and metals within the backfill of the quarry.

From Figures 5 and 6 areas of relatively low conductivity occur towards the northern and eastern sides of the survey area. The contrast between areas of high and low conductivity appears well defined along the northern edge of the survey area suggesting an anomaly having approximate dimensions of 45m by 9m. The low conductivity towards the eastern side of the area is less well defined.

A small area of high contrast conductivity measured centrally within the survey area probably relates to material used in the backfill of the quarry.

5 CONCLUSIONS AND RECOMMENDATIONS

The low conductivity anomalies towards the northern boundary of the survey area represent a likely target for the location of the gravel bench. Low conductivity areas towards the east of the area should also be considered as possible areas of gravel. The less well-defined edge to these areas may indicate a rather more irregular or slumped gravel face.