Savages Wood Primary School
Savages Wood Road,
Bradley Stoke,
South Gloucestershire

SGSMR 13429

Archaeological Desktop Study and Geophysical Survey

On behalf of:

South Gloucestershire Council
Property Consultancy

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GeoQuest Associates

Avon Archaeological Unit

February 2000

Desktop Study J G P Erskine January 2000

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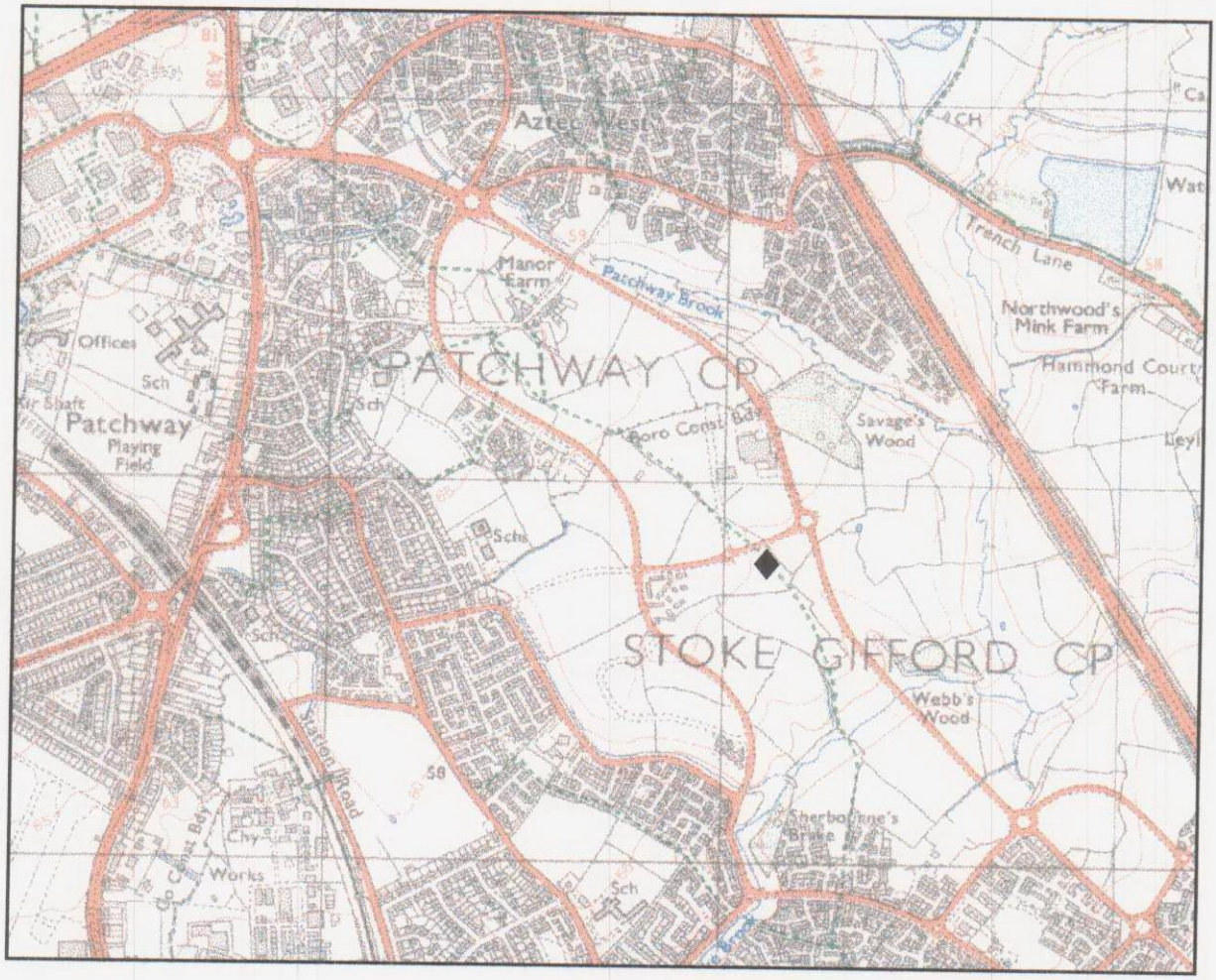

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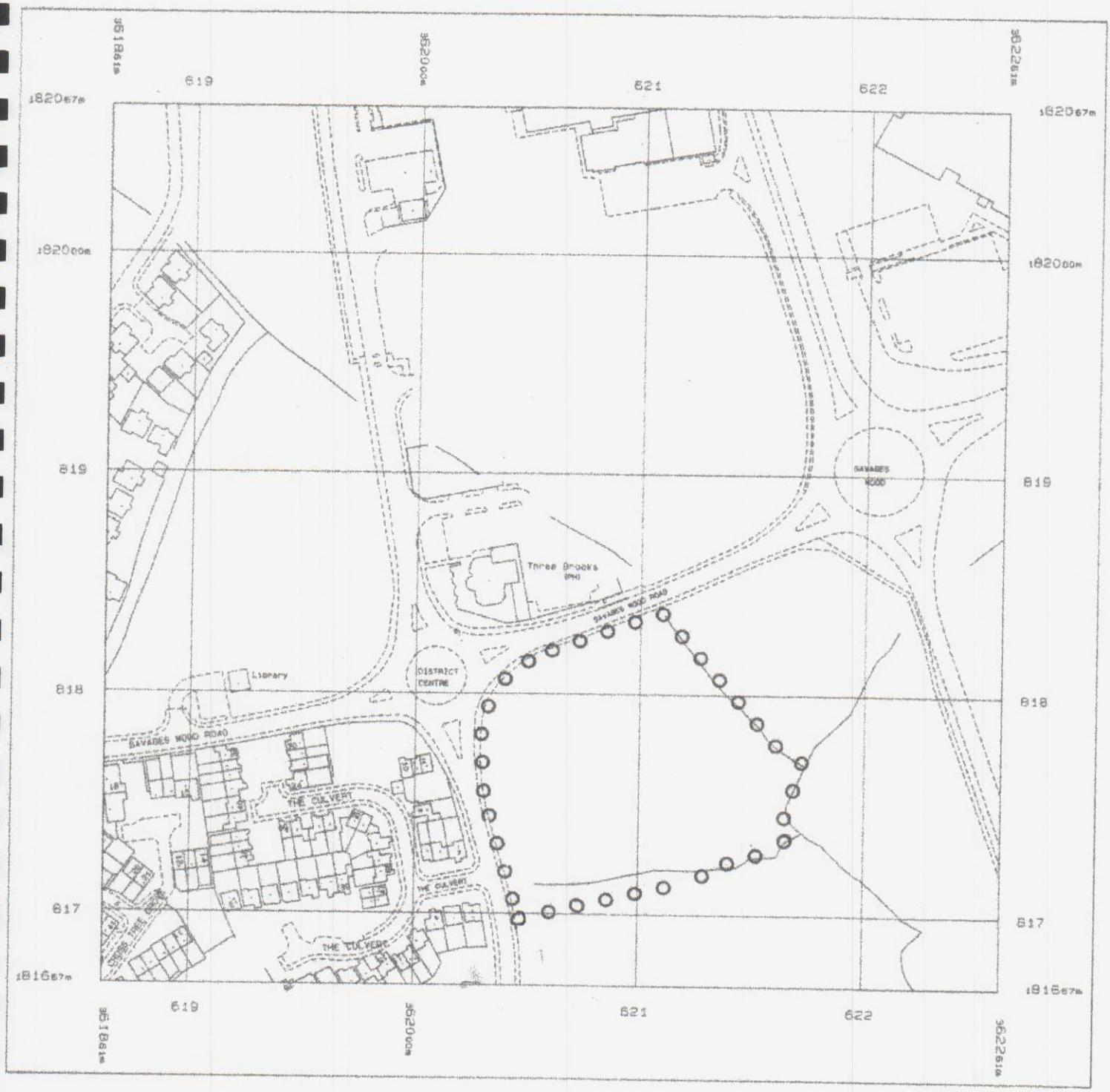
Savages Wood School

Figure 2

Site Location

Scale 1:2500



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ABSTRACT

The Study Area is closely adjacent to major finds of Prehistoric (Bronze Age and possibly Neolithic settlement), and also Romano-British occupation. In the Post-Medieval period, it formed a pasture or hay meadow area on the margins of Little Stoke Farm (part of the Berkeley and Beaufort Estates), and the southern boundary of the present field was occupied by a hollow way or trackway leading to the east which had been abandoned before 1880. The usual regime was pasture, although there are indications that it was ploughed during World War II. The surface has been damaged to an indeterminable extent by anti-squatter procedures in the 1990s.

It is likely that there are buried subsoil features masked by later activity, and therefore it is suggested that sample excavation should be used to assess this aspect. The area of the hollow way should also be a target for a small scale investigation to assess its date, proposed to be of either Romano-British or medieval date.

ACKNOWLEDGEMENTS

Avon Archaeological Unit wish to acknowledge the assistance given by the following in the production of this report. GeoQuest Associates of Co. Durham especially Andrew Newton who carried out the survey, Mr David Evans, Sites and Monuments Record Officer of South Gloucestershire Council. Mr Patrick Casey and Mr Richard Pitts of South Gloucestershire Council, and the staff of the Gloucestershire and Bristol Record Offices. The staff of Yate and the Bristol Central libraries also helped in obtaining relevant details. John Davey's University of Bristol Certificate dissertation also provided must important summary background detail. David Haigh, Archaeological Officer of South Gloucestershire Council, also provided much useful guidance.

ABBREVIATIONS

BAA **Bristol and Avon Archaeology (annual periodical)**
BRO **Bristol Record Office**
GRO **Gloucester Record Office**
BCL **Bristol Central Reference Library**
NGR **National Grid Reference**
NMR **National Monuments Record Office, Swindon (Aerial Photographs and Library)**
MRL **Museum of Rural Life, Reading**

NOTE

Whereas Avon Archaeological Unit have taken all care to produce a comprehensive summary of the known and recorded archaeological evidence, no responsibility can be accepted for any omissions of fact or opinion, however caused.

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1. INTRODUCTION

1.1 South Gloucestershire Council (The Property Consultancy) are proposing to construct a new primary school and playing field on a site at Savages Wood Road/ Three Brooks Lane, Bradley Stoke, South Gloucestershire, situated at NGR ST 621818. The site totals 1.4 ha in maximum extent. As the site is in close proximity to sites of prehistoric and Romano-British date known from previous archaeological investigations (See Section 5, below), the South Gloucestershire Council Archaeological Officer has required a staged archaeological investigation to be produced before determination of the Planning Application. In accordance with the proposals of PPG16 (DoE 1990) and the Council's Local Plan an Archaeological Brief was drawn up and this report represents the first stages of the Investigation, namely 1) a Desktop Study reviewing all archaeological information of the site and its immediate environs and 2) a geophysical survey of approximately 1ha, representing the majority of the area suitable for such a survey.

2. METHODOLOGY

- **Desktop Study**

2.1 Searches were made of all indices of information held by the Bristol and the Gloucestershire Record Offices (including the catalogue of the Stoke and Berkeley Estates of the Beaufort family (Ref. GRO D2277/9 and D 2299) and the information held by the South Gloucestershire Council Sites and Monuments Record. Indices and collections were also consulted at Yate library and Bristol Central Reference library. The total collections of relevant aerial photographs were consulted at the National Monuments Record in Swindon, together with their collection of published material.

2.2 All information was collated, summarised and presented in the report below. All photocopies, Mss. copies and notes including photographs are preserved in the project archive to be stored at Avon Archaeological Unit. It is no longer the policy of Bristol City Museum and Art Gallery to store material which can be later reproduced by similar or related research activities. A copy of this Report is, however, stored at the Museum.

- **Geophysics**

2.3 Approximately 1 ha of the site was survey using a magnetometer by GeoQuest Associates of Co. Durham. Full details of the procedure are to be found in the Section 4, below.

- **Site Visits**

2.4 The Site was visited and walked over to record any above ground features and to assess the suitability for Geophysical survey. No records were made beyond general photographs and the following paragraph.

2.5 The ground was overgrown with rough grass but, as it was winter, the surface was reasonable clear. The surface was very uneven, having been ploughed to discourage squatters. The original 19th century hedge boundaries, although overgrown, survived to the east and south but the west and north boundaries of the original large field had been separated from the Study Area by previous development, including a road and roundabout. The western boundary to the new Three Brooks Lane had been reinforced by earth banks.

3. TOPOGRAPHY, GEOLOGY AND CURRENT LANDUSE

3.1 The Study area lies on a wide low plateau with the Stoke Brook to the east in a deep cut valley. It also lies some three to four kilometres east of the steep scarp dropping to the low-lying land fringing the River Severn. The area of the Bradley Stoke New Town, with Stoke Gifford to the south, is bounded by the M4 motorway to the north east and the railway to the south and the A38 to the west.

3.2 The geology of the area consists of the lower lias and rhaetic beds (Kellaway and Welch 1948). The lower lias is mainly clay with white and blue lias (mainly limestone) overlying clay and shale. The uppermost beds are horizontally bedded and approximately 450 mm thick, overlying some 1.0 m of clay. It is a shelly limestone with fossils up to 20 mm visible in hand specimen. The soil cover is thin and sparse.

3.3 The site is at present derelict with rough grass and brambles. Some rubbish has been dumped especially towards the west side, and ditches and banks have been excavated to discourage squatters.

4. GEOPHYSICAL SURVEY REPORT

This report follows as a separate, incorporated section.

GEOPHYSICAL SURVEY ON THE SITE OF PROPOSED NEW SCHOOL BUILDINGS SAVAGES WOOD, BRADLEY STOKE

A programme of research carried out
on behalf of

The Avon Archaeological Unit

by

GeoQuest Associates

4.1 INTRODUCTION

4.1.1 This report presents the results of a programme of geophysical research which has been carried out on an area of pasture between the villages of Bradley Stoke and Little Stoke, about 7km NNW of Bristol city centre. An area of approximately one hectare was examined with the aim of providing information concerning the likely extent and character of subsoil archaeological features.

4.1.2 The research was carried out by GeoQuest Associates on behalf of the Avon Archaeological Unit (AAU), according to instructions supplied by Mr J. Erskine of the AAU. Results of the geophysical survey were intended to inform a programme of archaeological evaluation prior to the proposed construction of new buildings, a football pitch and access roads for Savages Wood School.

4.1.3 Figure 1 shows the location of the survey area on a plan digitised from a drawing prepared by The Property Consultancy. The geophysical survey took place on 1st February 2000.

4.2 LAND USE, TOPOGRAPHY AND GEOLOGY

4.2.1 The study area comprises a small field of derelict pasture adjoining Savages Wood Road which was heavily overgrown at the time of the site investigation. A network of N-S oriented anti-camping trenches, 30-60cm deep, spaced at 2m intervals, had been excavated across most of the site, while an area of rubbish dumping and dense brambles was located inside the northern boundary of the area (Figure 4.1). Hence ground conditions were not optimum for deploying shallow geophysical survey methods.

4.2.2 Topographic survey by The Property Consultancy indicates that the mean elevation of the site is 58.5m AOD, with a gentle gradient descending in an easterley direction. The site contains a number of mature trees which will be retained as part of the new development (Figure 4.1).

4.2.3 The solid geology underlying the study area comprises Upper Devonian sedimentary rocks which do not outcrop locally, presumably owing to a cover of drift material. It is likely that soils derived from weathering of these rocks will have low to moderate magnetic susceptibilities, providing a favourable environment for the development of geomagnetic field anomalies over cut features infilled with topsoil. Following discussion with the AAU it was therefore decided that the technique of geomagnetic survey, using a fluxgate gradiometer, would be appropriate in this instance.

4.2.4 The site's archaeological interest stems from its proximity to a site on the north side of Savages Wood Road where an archaeological evaluation encountered evidence for Roman occupation.

4.3 THE GEOPHYSICAL SURVEY

Field Methods

4.3.1 Readings of vertical geomagnetic field gradient were made over all accessible parts of the site, at 1.0x0.5m gridded intervals, using a Geoscan FM36 instrument. A zig-zag traverse scheme was employed and data were logged in grid units of 20x20m. Appendix A provides further information about the technique.

4.3.2 Data were downloaded on-site into an IBM Thinkpad computer for processing, printing and storage. These data were subsequently transferred to a laboratory computer for further processing, interpretation and archiving.

Data Processing

4.3.3 The GeoQuest **InSite®** software was used to process the geophysical data and to produce a continuous tone grey-scale image of the raw data at a scale of 1:500 (Figure 4.2). Figure 2 includes a key which relates the grey-scale intensities to anomaly values in nano Tesla per metre.

4.3.4 The following processing steps were applied to the data:

Removal of striping artifacts in the geomagnetic images caused by alternating changes in level between zig-zag traverses.

Removal of Random 'Spikes' present in the geomagnetic data due to small ferrous objects or fired stone on or near the ground surface. This process replaces spikes with the mean of near-neighbours.

Correction for drift in magnetometer calibration with time.

Adjustment of grid mean values to achieve an optimum match along the lines of contact between data grids.

Interpolation of the data, using a bilinear function, to generate a regular mesh of values at 0.25 x 0.25m intervals.

4.3.5 The geophysical image was printed on a Hewlett Packard HP650C Designjet plotter with 256 grey shades and 600 dpi resolution. A sigmoid function was used to map the data to printed grey tones since this provides a measure of contrast equalisation. Appendix B provides more information about data processing and itemises the algorithms that were applied to produce the grey-scale image in Figure 4.2.

Geophysical Interpretation

4.3.6 Figure 4.3 presents a geophysical interpretation of the survey results using coded colours and patterns. The following types of anomaly have been distinguished:

Green Significant regions of anomalously high or positive magnetic field gradient which might be associated with high susceptibility, soil-filled structures such as pits and ditches.

Blue Areas of anomalously low or negative magnetic field gradient, corresponding to features of low magnetic susceptibility, such as concentrations of limestone rubble.

No significant dipolar style magnetic anomalies, that might be attributed to areas of burning, were detected by the geophysical survey.

4.3.7 An archaeological interpretation plan at 1:500 is presented in Figure 4.4 and is discussed below.

4.4 ARCHAEOLOGICAL INTERPRETATION

4.4.1 Geophysical anomalies within the study area display a pronounced N-S texture owing to the topographic effects of the anti-camping trenches. Unfortunately these anomalies may have obscured more subtle geophysical disturbances of archaeological or geotechnical interest.

4.4.2 A set of extremely diffuse N-S and E-W oriented positive magnetic lineations have been detected within the northern and central parts of the study area which may reflect soil filled ditches (Figure 4.4). However, owing to the high level of noise in the data (due to the ground disturbances), only a low level of confidence can be assigned to this interpretation.

4.4.3 No further anomalies of archaeological interest have been mapped by the geophysical survey.

4.5 SUMMARY AND CONCLUSIONS

4.5.1 A portable magnetometer was used to carry out a detailed geophysical survey of a site at Savages Wood School where it is proposed to construct new buildings, a football pitch and access roads. The aim of the investigation was to locate and characterise subsoil features of archaeological interest.

4.5.2 Owing to the presence of deep anti-camping trenches over much of the study area the resulting geophysical data are unfortunately of poor quality. Hence, only a low confidence level can be assigned to features inferred from the geophysical data. Moreover, it is possible that more subtle geophysical anomalies of archaeological or geotechnical interest have been masked by effects of the surface disturbances.

4.5.3 The geophysical data provide tentative evidence for the presence of several N-S and E-W oriented soil-filled ditches which may warrant further investigation via trial trenching. Further trenching may also be required to test for the presence of subsoil features elsewhere in the area of proposed development.

4.6 CREDITS

Survey: A. Newton BA, MA & A. Roger BSc
Report: M. J. Noel PhD, FRAS
Date: 15th February 2000

APPENDIX A

PRINCIPLES OF GEOMAGNETIC SURVEYING

Geomagnetic prospecting detects subsurface features in terms of the perturbations or 'anomalies' that they induce in the Earth's magnetic field. In contrast to resistivity, seismic or electromagnetic surveying, no energy is injected into the subsoil and hence this is one of a class of *passive* geophysical techniques that includes gravity and thermal surveying. In an archaeological setting two types of magnetic anomalies can be distinguished:

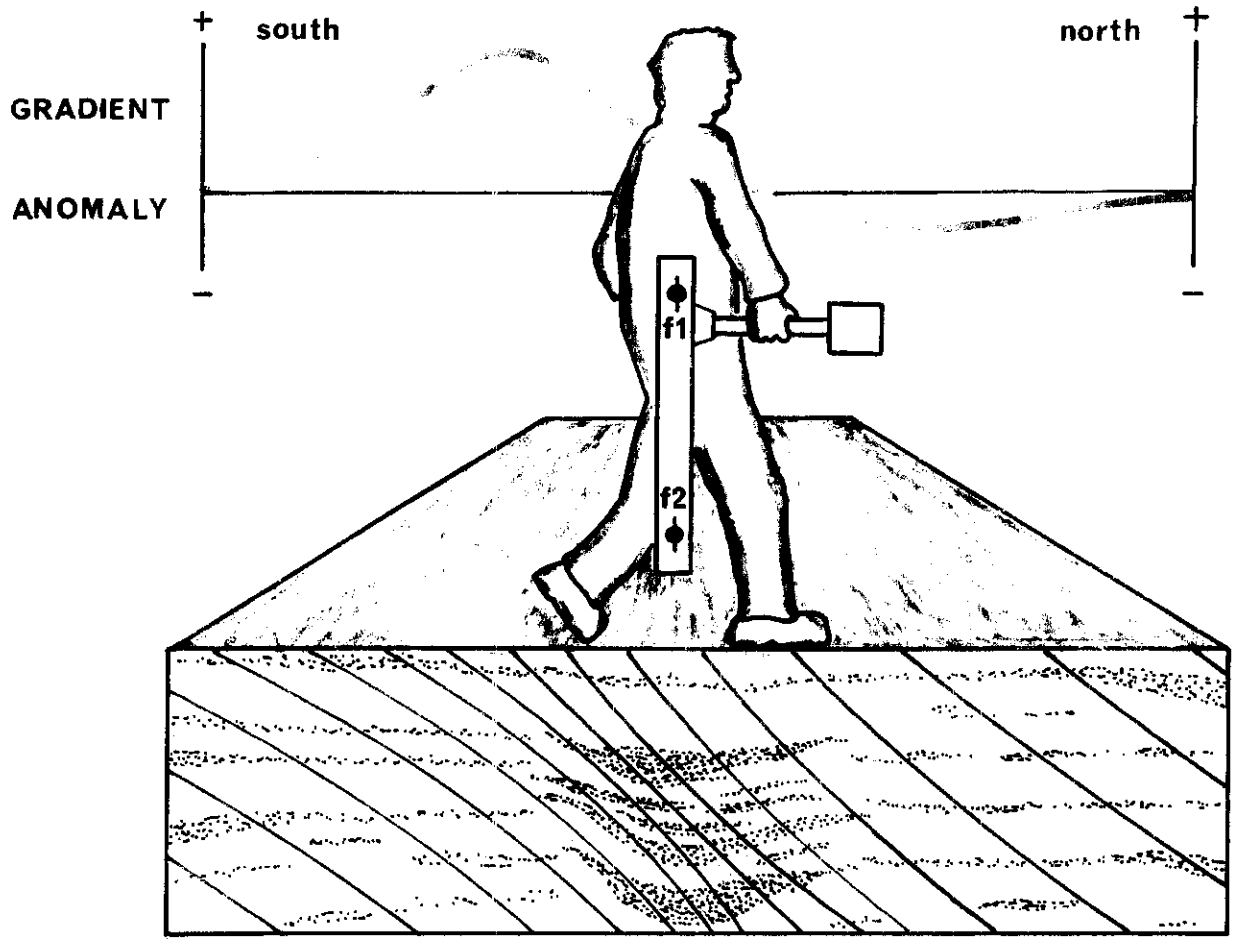
1 Anomalies arising from variations in *magnetic susceptibility* which will modulate the component of magnetisation *induced* in the subsurface by the Earth's magnetic field. For most archaeological sites, this is the dominant factor giving rise to geomagnetic anomalies. In general, susceptibility is relatively weak in sediments, such as sandstones and enhanced in igneous rocks and soils, especially those which have been burnt or stratified with organic material.

2 Anomalies due to large, *permanently magnetised* structures. Such permanent magnetisation or 'remanence' arises when earth materials are heated to above ~600°C and cooled in the geomagnetic field. Thus kilns and hearths are often detected as strong permanent magnets causing highly localised anomalies that dominate effects due to background susceptibility variations. Remanence can result from other physical and chemical processes but these give rise to anomalies that are usually unimportant for geophysical prospecting.

There are several approaches towards the practical measurement of geomagnetic anomalies. In this study measurements were made using a Geoscan FM36 fluxgate gradiometer which records the change with height in the vertical component of the Earth's magnetic field, as shown overleaf. This method has the advantage of being insensitive to diurnal variations while the Geoscan instrument also benefits from an integrated data logger. Note that in mid northern latitudes the magnetic anomaly will be asymmetric with the main peak displaced to the south of the archaeological feature. Thus, a ditch filled with a soil of enhanced susceptibility, for example, will generate a positive anomaly to the south, mirrored by a weak negative anomaly north of the feature. When portrayed as an area map of grey tones this gives rise to a 'shadowing' or pseudo relief effect which must be borne in mind when making an archaeological interpretation.

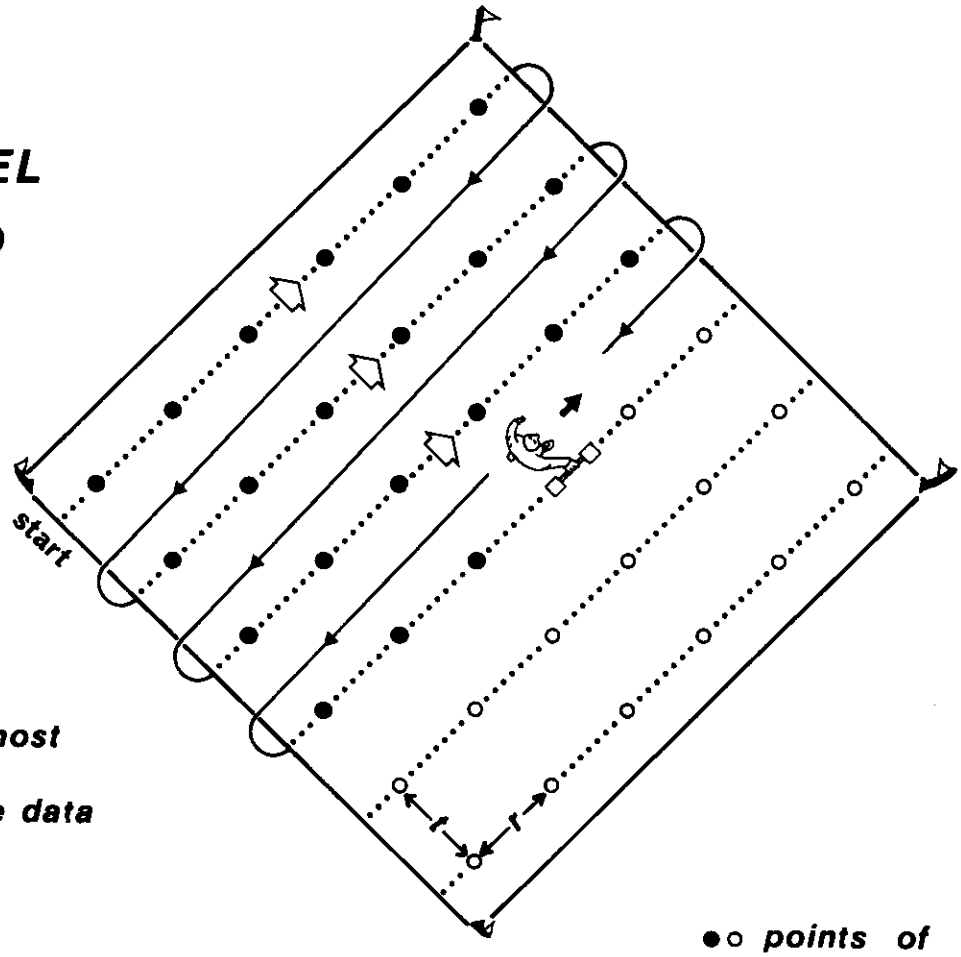
Two techniques can be used to survey gridded areas using the fluxgate magnetometer. In the parallel method the instrument is used to scan the area along traverses which are always in the same direction. This method minimises 'heading errors' due to operator and instrument magnetisation but is time consuming. The alternative zig-zag method is significantly faster and suitable for areas where anomalies are large compared to these and other sources of error.

MAGNETIC SURVEYING



SURVEY SCHEMES

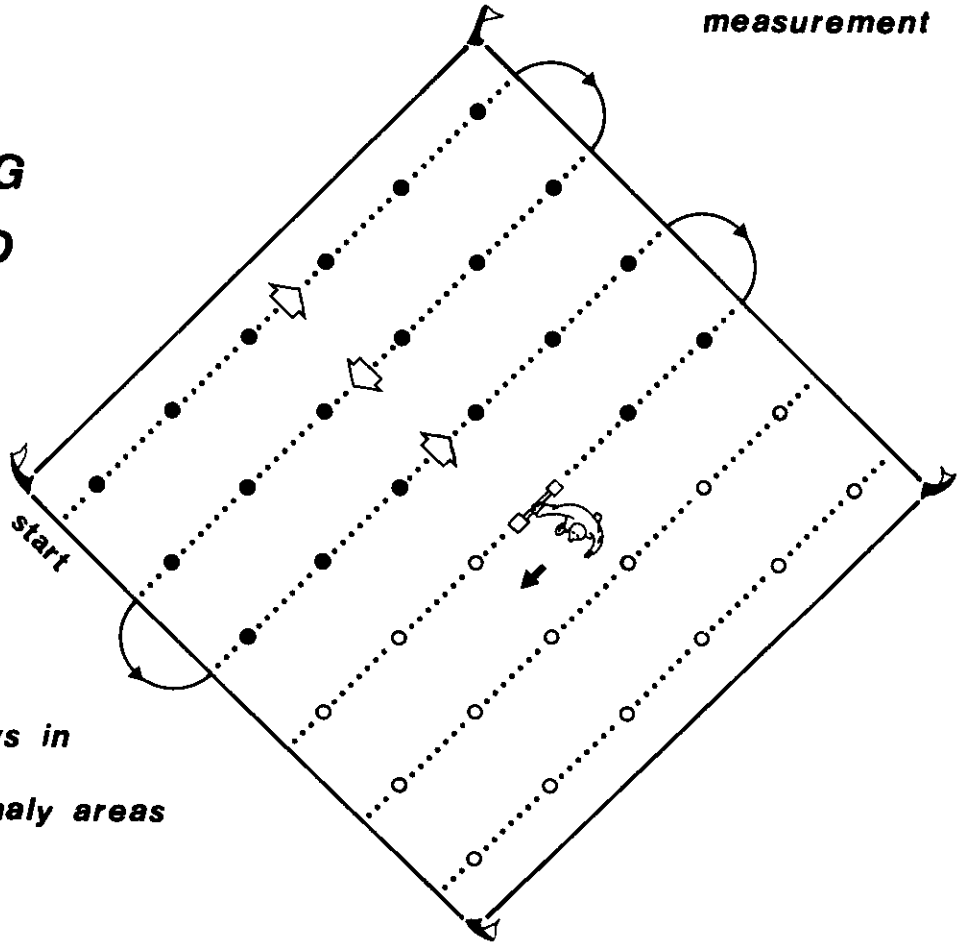
PARALLEL METHOD



slower but minimises most errors in the data

●○ *points of measurement*

ZIG-ZAG METHOD



suitable for rapid surveys in strong anomaly areas

APPENDIX B
DATA PROCESSING

PROCESSING THE SURVEY DATA

The geophysical images contained in this report were prepared within Microsoft Windows® using the **InSite®** program published by GeoQuest Associates. Geophysical images were then placed onto a map which was digitised from the Ordnance Survey, edited and then plotted using a computer aided drafting (CAD) system and colour inkjet printer.

Data were downloaded from the meter to a portable computer in the field for storage, visualisation and quality control (QC) assessment. These data were then transferred to a laboratory computer for final processing, printing and archiving.

A number of process steps have been applied to the geophysical data obtained during the survey and those which have been used are linked to the main flow path by arrows. Steps were applied in the order shown and are designed to reduce artifacts in the data and enhance geophysical features of archaeological interest. The following sections describe each step in more detail.

REMOVE STRIPING

Reduces a data artifact comprising alternating changes in level in readings logged along zig-zag traverses. This artifact is common in fluxgate magnetometer data. InSite uses a proprietary algorithm to reduce this error.

INFILL SMALL BLANK AREAS

Fills isolated blank data cells with the mean of near-neighbours or a suitable approximation entered manually. Small blank areas will have been logged if it was not possible to obtain a geophysical reading over, for example, a manhole cover in the case of a resistivity survey.

REMOVE SPIKES

Replaces isolated, anomalously high or low values with the mean of near neighbours or a suitable approximation entered manually. 'Spike' readings are commonly associated with ferrous litter or poor electrical contact in the case of geomagnetic and resistivity data, respectively.

REDUCE WALK HARMONICS

Reduces a regular oscillation in traverse data caused by walking movements of the operator during a geomagnetic survey. InSite employs a fast Fourier transform to determine the optimum amplitude and phase of the walk-induced harmonic which is then subtracted from each traverse.