# The Breamore Settlement and Landscape Project
# Geophysical Survey Report
# April 2005

**SREP 12/2005**

Compiled by K. Strutt

**Archaeological Prospection**
**Services of Southampton**

University
of Southampton

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# The Breamore Settlement and Landscape Project: Geophysical Survey Report March 2004

*Summary*

*This report presents the results of geophysical surveys undertaken at Breamore, to the north of the New Forest, in March and early April 2004. It specifies the survey methodology together with an interpretation and discussion of the survey results. The survey was successful in locating a large number of features across the landscape, including evidence of Bronze Age burial activity and Roman and early medieval settlement.*

## 1. Introduction

Between March and April 2004, a series of geophysical and topographic surveys were conducted at Breamore in Hampshire (Fig. 1), by the Department of Archaeology at the University of Southampton. The survey represented several phases of work for the Breamore Settlement and Landscape Project, an initiative directed by Prof. David Hinton and Dr Chris Loveluck, aimed at the full study of the settlement of Breamore and its environs.

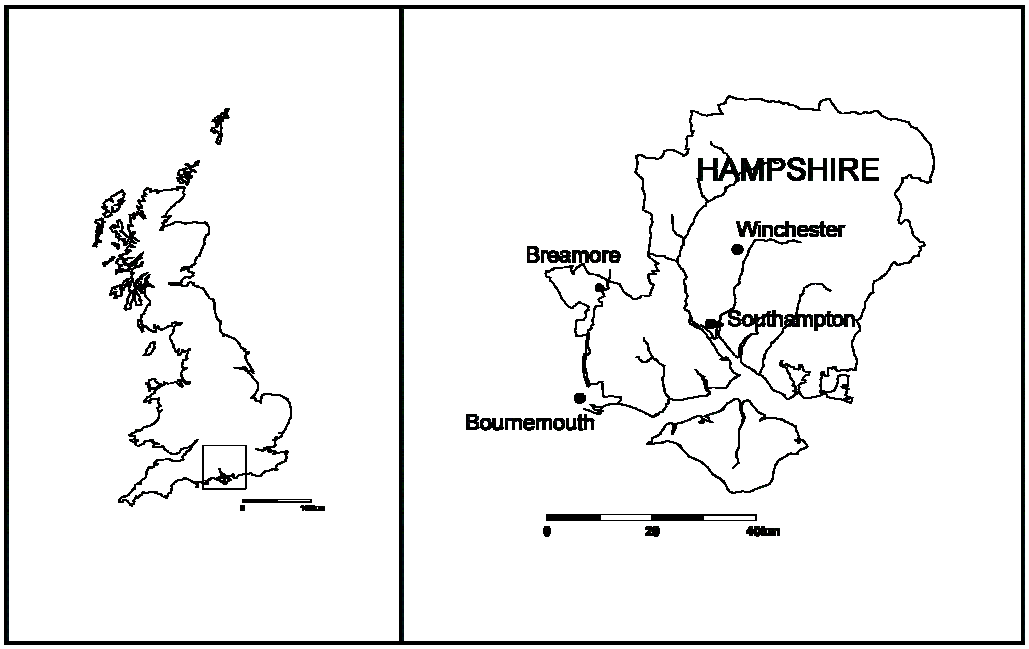



Fig. 1 Location map of Breamore, north of the New Forest, Hampshire

The aims of the project are to build on the results of the Middle Avon survey (Light et al. 1994), and more recently discovered evidence housed in the Hampshire SMR, to investigate the history of land use and settlement development in the Middle Avon valley within the environs of Breamore, over an area of 9 square km (Fig. 2); and to enhance the value of the more general information provided by the wider surface collection survey.

This survey, together with that carried out on the Priory site to the south (Strutt 2004b), marked the final phase of work in the landscape as part of the initial project. It continued the work conducted in the Bullcroft field in 2003 that had been successful in identifying a prehistoric cemetery and Roman-British and early medieval settlement (Strutt 2004a).

## 1.1 Location and Background (C. Loveluck and K. Strutt)

The modern village of Breamore is situated on the valley floor and gravel terraces of the River Avon (Fig. 2). The area was subject to archaeological survey by surface collection within the Middle Avon Valley survey, carried out under the co-ordination of Stephen Shennan, then of the Department of Archaeology, University of Southampton, and Tony Light of the Avon Valley Archaeological Society, between 1979 and 1986. The discoveries made during this survey (Light *et al*. 1994) provided extensive evidence of activity from the Mesolithic to the post-Medieval period. The scatters of surface material comprised lithics, pottery and metalwork. Alongside the results of this fieldwalking, surviving earthworks and monuments, protected as scheduled sites or within registered 'historic parkland', and further work by the Avon Valley Archaeological Society indicates the many diverse elements contributing to the settlement and landscape history of the Breamore area. These include a dense scatter of material from the Neolithic/Bronze Age; a series of Iron Age to Late Roman settlement foci of different sizes; at least four Anglo-Saxon pottery and artefact scatters, which probably reflect settlement sites, and two sites of early Anglo-Saxon cemeteries; and numerous later medieval pottery concentrations (Light *et al*. 1994; Gifford 1997).

The evidence from the ploughsoil and earthworks is augmented by some exceptional standing remains, in the form of a large Late Saxon church (Rodwell and Rouse 1984; Plate 2); the remains of an Augustinian priory from the medieval period; and Breamore House, built in the 1580s, amongst other post-medieval buildings in the vicinity. Documentary evidence concerning Breamore and its nearby hamlets begins with the Domesday survey. In 1066, Breamore was a royal estate of Edward the Confessor, linked with Rockbourne to the west. Other hamlets are also mentioned as the foci of smaller estates held from Edward. Consequently, the whole area appears to have been royal land in 1066. As a directly administered royal estate, Rockbourne-Breamore was not assessed for taxation like the surrounding smaller estates, providing an intriguing documentary lacuna upon which only archaeological investigation might shed light.

The place-name Breamore is Old English for 'broom – marsh' (Coates 1989, 40), and the Domesday Book also makes clear the different ecological resources available in the locality, namely well-drained chalk land in the north, arable land on the river gravel terrace, marshy heath land on the river alluvium and woodland to the south (Munby 1982, ref. 39b). Further extant documentation relates to the Augustinian priory, dedicated

to St Michael and founded in the early 1130s, and medieval manorial accounts. Recent historical and morphological studies of medieval settlement in the Avon valley and Hampshire, have also emphasized the unusually dispersed nature of the settlement pattern, with only very limited nucleation until the post-Medieval period (Lewis 1997, 81; Roberts and Wrathmell 2000).

### 1.2 Aims of Survey

The geophysical survey was initiated with the aim of locating and mapping the remains of sub-surface archaeological features within a transect of the Avon valley running from the chalk downs, through gravel terraces to the alluvial floodplain (Fig. 3), on a north-west to south-east axis. This strategy was designed to make optimum use of both topographic recording and geophysical survey techniques. Previous work has concentrated on the pasture fields of Breamore Park, the Bullcroft Field to the east of North Street Farm, and on the gravels and alluvial deposits of the Shallows. This survey marked a continuation of that work (Fig. 4) in a field to the west of the Bullcroft (the North Street field), and survey on a strip of land to the east of the Salisbury to Ringwood road.

## 2. Methodology

### 2.1 Survey Method

Although a number of different geophysical survey techniques could have been applied at Breamore (Appendix 2), the previous work in 2001 had shown that use of a fluxgate gradiometer was successful in recording the remains of sub-surface archaeological structures. Magnetometer survey was chosen as a relatively time-saving and efficient survey technique (Gaffney *et al*. 1991, 6), suitable for detecting kilns, hearths, ovens and ditches, but also walls, especially when ceramic material has been used in construction. This technique has been applied successfully over large areas in other studies of the archaeological landscape (Lyall and Powlesland 1996).

### 2.2 Survey Strategy

For the survey, grids of 30m by 30m were set out using a Leica TC(R) 307 total station. The grids were located and orientated differently during the survey, and the survey areas for each season were geo-referenced to the Ordnance Survey maps for the area.

The magnetometer survey was conducted using a Geoscan Research FM36 Fluxgate Gradiometer. In all cases, readings were taken on 1m traverses, at 0.5m intervals. Due to the open nature of the terrain, an automatic trigger was used with the gradiometer to record measurements.

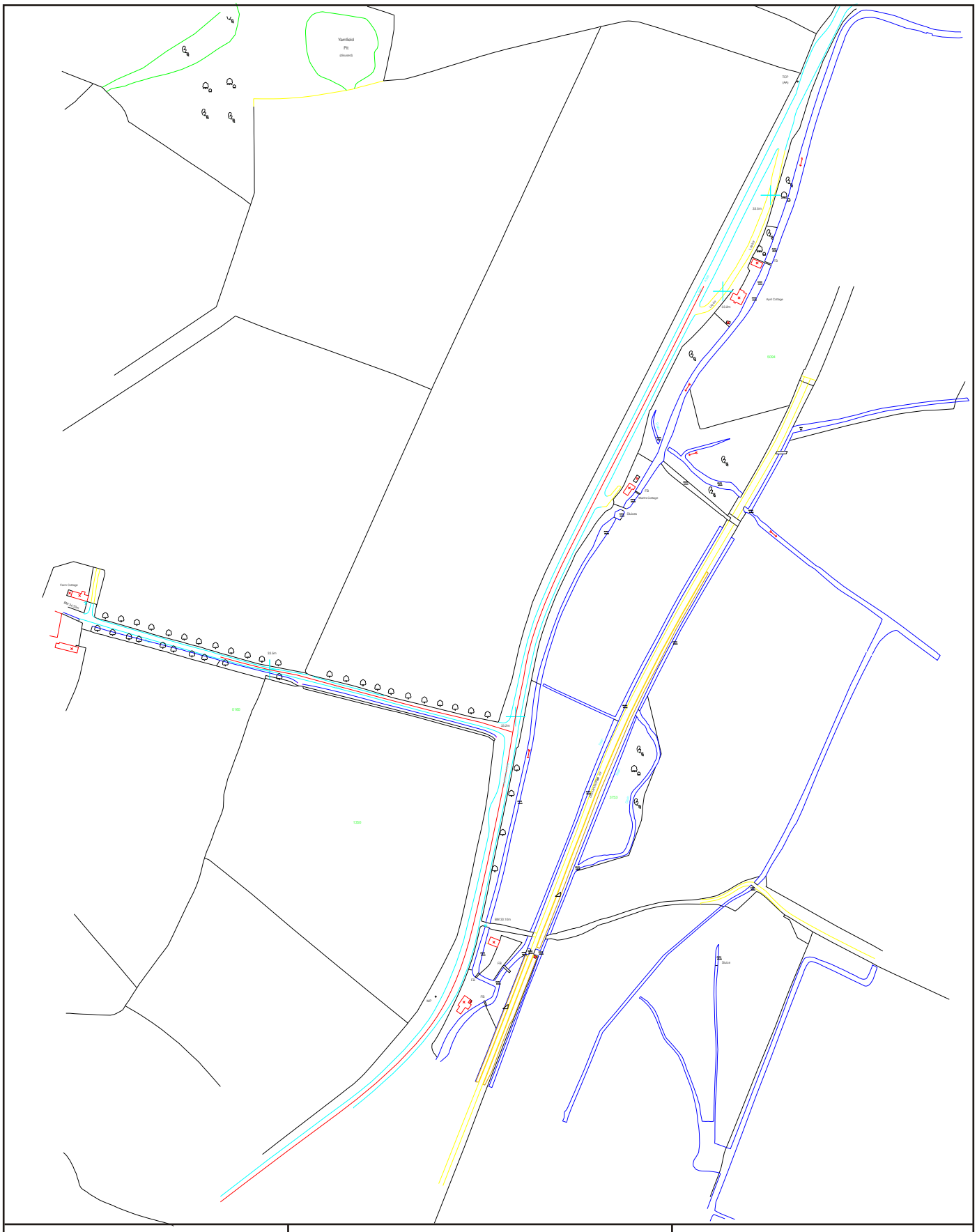
## 3. Survey Results

A large part of the 2004 magnetometer survey was conducted to the west of the Bullcroft field (Fig. 4) to augment the work originally conducted there in 2003. The topography of the area, and a sample of aerial photography provided by the NMR had suggested a concentration of archaeological material in this area that continued along the gravel terrace above the river Avon. Both topographic and magnetometer surveys were conducted over the North Street field.

The topography of the area (Fig. 5), when combined with that of the previous season, indicates clearly the gravel ridge that runs north to south through the fields to the north of North Street. The ridge continues for a distance of over 600m along the valley bottom. The area to the west of this, in the North Street field, is marked by the western edge of the ridge, and a low, broad depression in the topography. The ground then rises up in the north-west corner of the field towards the area of Breamore church and the higher gravel terraces of the valley.

Results of the magnetometer survey indicate a large expanse of settlement activity in the area, with a probable barrow cemetery to the north (Figs 6 and 7). The continuation of the survey in 2004 shows the cemetery clinging to the gravel terrace above the alluvial plain of the Avon. In addition to the features located in 2003, a number of related anomalies are present in the results from the North Street field. A large concentric circular feature is visible on the eastern boundary of the field **[m30]**, measuring some 35m in diameter. Thia marks the start of a long linear positive anomaly **[m31]**, that stretches for over 200m to the north west, where it leaves the survey area. Faint traces of a parallel linear feature **[m32]** and **[m33]** are visible 20-25m to the north east of this line. In addition to this, a series of curvilinear **[m34]** and linear features **[m35]**, **[m36]** and **[m37]** cut the area to the north east. The area is also marked by numerous small pit features **[m38]**, **[m39]** and **[m40]**, measuring between 3 and 5m in diameter.

The area to the south west of **[m31]** is also marked by a series of pits and linear anomalies. Three large pits **[m41]** curve around part of the site, with a line of similar features **[m42]** and **[m43]** running to the south east. A line of three more features are visible to the west **[m44]**. The area close to the modern buildings in the west of the field is dominated by three features, all produced by modern material. Feature **[m45]** is caused by an overhead powerline, with **[m46]** and **[m47]** caused by modern field drains. Overall the main concentration of archaeological features is situated over the gravel terrace, with a reduction in features to the west. The area surveyed to the east of the Salisbury to Ringwood road was devoid of archaeological features, and was also extremely waterlogged, in some areas bordering on marshland. This suggests that the settlement and cemetery in the Bullcroft extended to the eastern edge of the gravel, which is also incidentally where the line of modern road is situated.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Farm Cottage
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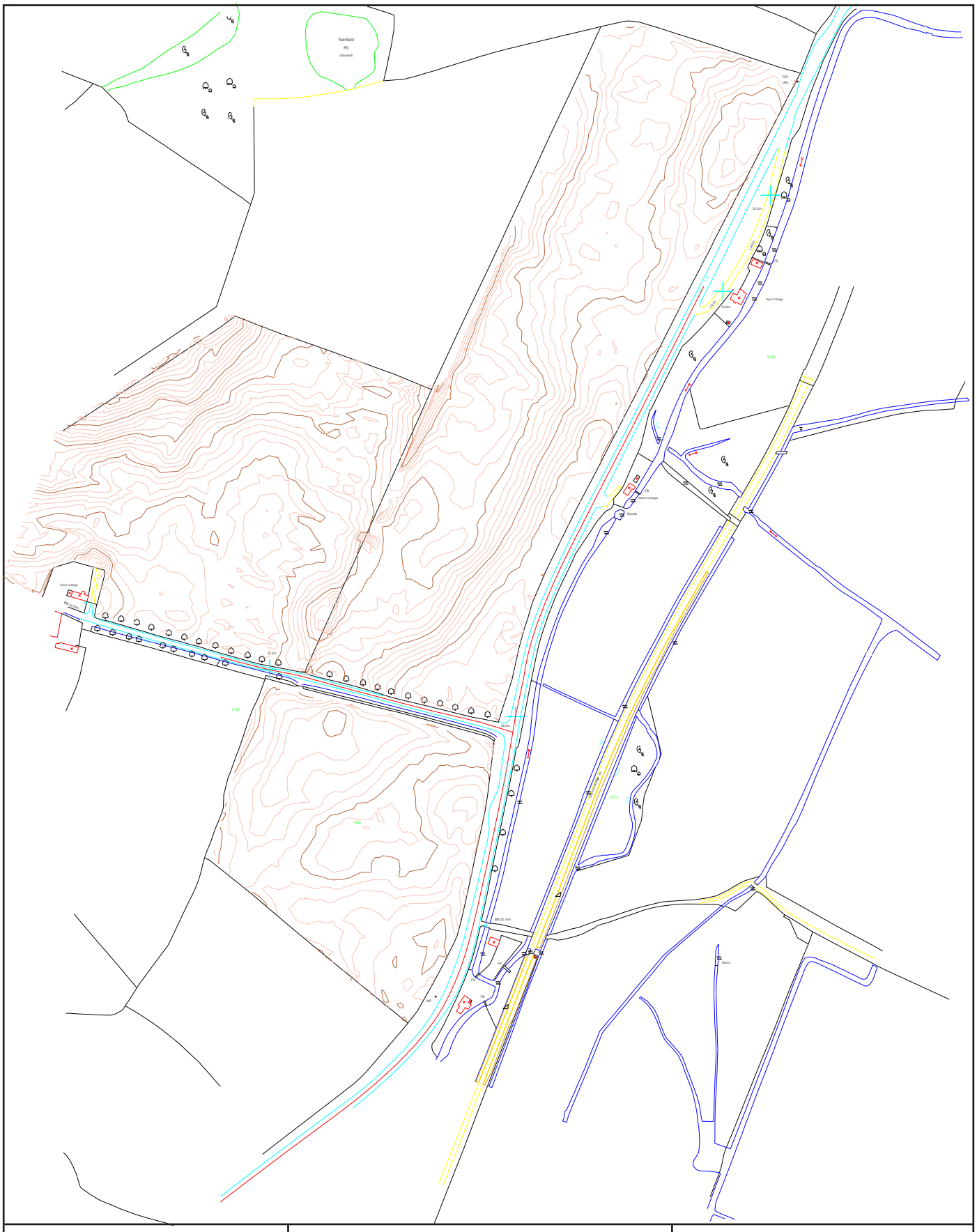


Fig. 5 Contour survey results from the Bullcroft Field and North Street

N

0 250m

**Breamore Parish, Hampshire**

*Survey data © Archaeological Prospection Services of Southampton*

*Map Data ©Crown Copyright/database right 2005. An Ordnance Survey/EDINA supplied service*

## 4. Discussion and Conclusions

The results of the geophysical survey at Breamore in 2004 successfully located and mapped a large number of buried archaeological remains probably associated with the prehistoric cemetery in the area of the Bullcroft. The area itself is dominated by later prehistoric features associated with a barrow cemetery, and a probable Roman to early medieval settlement immediately to the south (Strutt 2004a). A large number of possible barrows are situated to the north of North Street, concentrated on the high ground of the gravel terrace, above a drainage channel that curves between the cemetery, and the settlement to the south. Although the features suggest a Bronze Age cemetery, a large number of pit features are associated with the barrows. These features, and the location of the site indicate the possibility both of Neolithic, Roman and early medieval activity on the site. The pits may be linked to prehistoric activity pre-dating the Bronze Age cemetery, and may also suggest re-use of the burial ground in the early medieval period. This argument is more convincing when the settlement stretching to the south of the cemetery is considered. The cemetery seems to continue to the west in the North Street field, with a number of associated pits and features, one possibly demarcating an avenue running north-west to south east, up to the westernmost barrow.

The cemetery, as with the settlement to the south, seems to be situated entirely on the gravel terrace immediately above the floodplain of the river Avon, with no archaeological features present on the alluvium to the east. This may be due to masking of features with sediment from the river, but is more likely to reflect the settled nature of the higher ground along the valley bottom, with a lack of similar features in the marshy areas to the east.

The surveys from 2003 and 2004 have located a large portion of the settlement and cemetery in the Bullcroft area. However, it is certain that both settlement and cemetery continue beyond the bounds of the present survey, most probably to the south and north alongside the Salisbury to Ringwood road. Future geophysical investigation of these areas would be beneficial to our understanding of the entire complex. Research into these features would also benefit from targeted excavation of both the settlement and cemetery. Excavation or borehole evidence from the marshy area to the east may also provide significant environmental sequences in relation to the archaeology of the river valley.

Fig. 6 Greyscale image of the magnetometer survey results from the Bullcroft field and North Street

N

1 nT -1

0 250m

**Breamore Parish, Hampshire**

*Survey data © Archaeological Prospection Services of Southampton*

*Map Data ©Crown Copyright/database right 2005. An Ordnance Survey/EDINA supplied service*

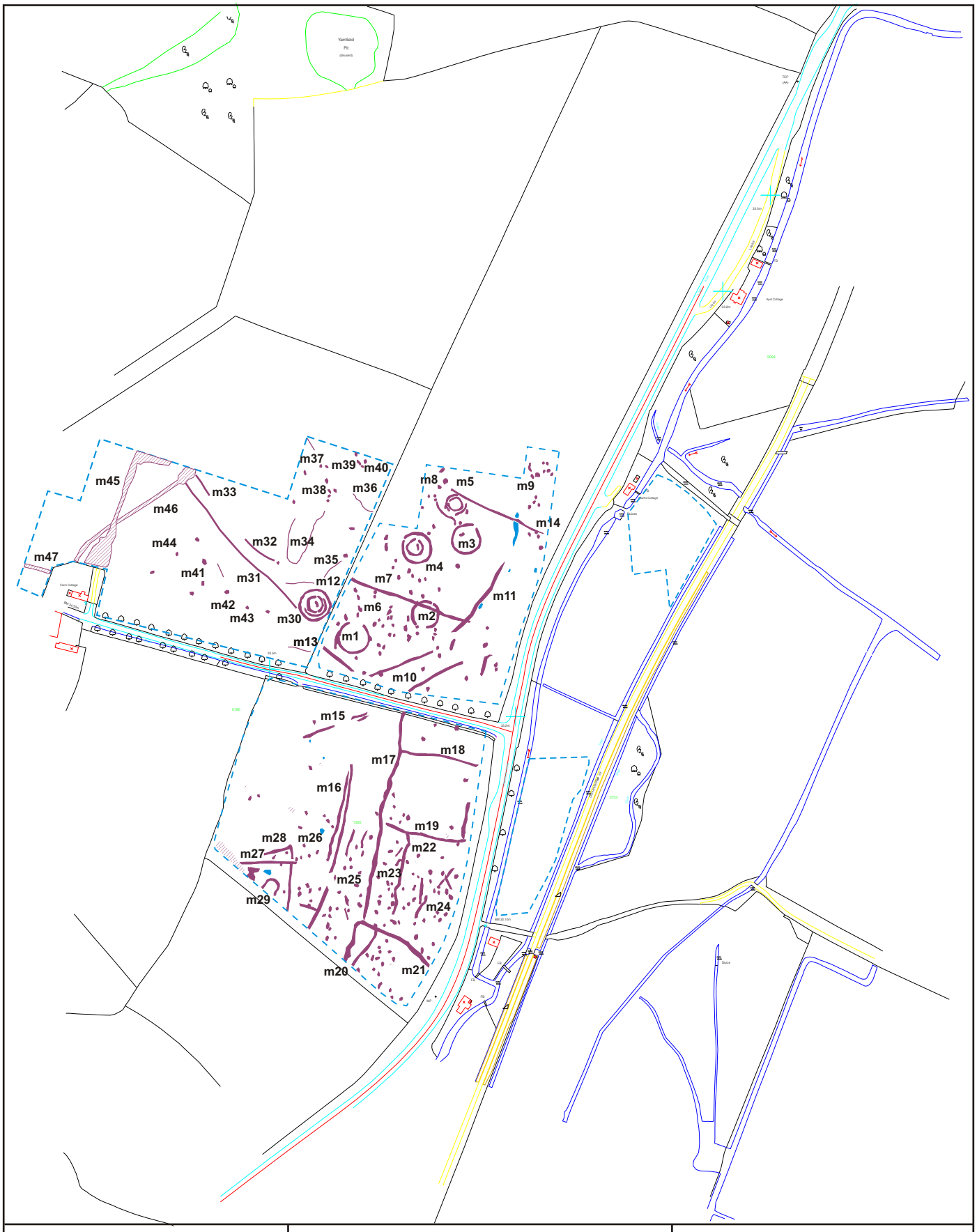


Fig. 7 Interpretation plan derived from the magnetometer survey results for the Bullcroft and North Street fields

N

0 250m

**Breamore Parish, Hampshire**

*Survey data © Archaeological Prospection Services of Southampton*

*Map Data ©Crown Copyright/database right 2005. An Ordnance Survey/EDINA supplied service*

## 5. Statement of Indemnity

Whilst every effort has been made to ensure that interpretation of the survey presents an accurate indication of the nature of sub-surface remains, any conclusions derived from the results form an entirely subjective assessment of the data. Geophysical survey facilitates the collection of data relating to variations in the form and nature of the soil. This may only reveal certain archaeological features, and may not record all the material present.

## Acknowledgments

*Considerable advice and assistance was received from a number of sources in the completion of this survey. Primarily, thanks go to Sir Edward Hulse and Michael Hulse, the land-owners and residents at Breamore House, for their kind permission and support throughout the current survey work and excavation. Thanks also go to Mr and Mrs Phillip Hockey, the tenant farmers at Breamore Park and the Bullcroft, for permission to undertake the work. At the University of Southampton the guidance and enthusiasm of the project directors, Prof. David Hinton and Dr Chris Loveluck, is gratefully acknowledged. The successful completion of the surveys would have been impossible without the assistance of the following personnel in executing the survey: Sophie Hay, Pete Klemen, Alice Matcham and Judith White. Finally, sincere and grateful thanks go to the British Academy for funding this research.*

## Appendix 1 - Details of Survey Strategy

Dates of Survey:

Site: Breamore

District Parish: Fordingbridge

County: Hampshire

Grid Reference: SU 1518

Surveyor: University of Southampton

Personnel: Sophie Hay, Pete Klemen, Alice Matcham, Kristian Strutt, Judith White

Geology: Gravels and alluvial deposits

Survey Type 1: Magnetometer

Approximate area: 6 hectares

Grid size: 30m

Traverse Interval: 1m

Reading Interval: 0.5m

Instrument: Geoscan Research FM36

Resolution: 0.1 nT

Trigger: Encoder

Survey Type 2: Topography

Approximate area: 7 hectares

Sample interval: 10m

Instrument: Leica TC 605 total station

## Appendix 2 - Archaeological Prospection Techniques Utilised by APSS

The following appendix presents a summary of prospection methods, implemented by Archaeological Prospection Services of Southampton (APSS) to determine the extent and nature of sub-surface archaeological structures, remains and features. The methodology usually applied by APSS places an emphasis on the integration of geophysical, geochemical and topographic survey to facilitate a deeper understanding of a particular site or landscape.

### Geophysical Prospection

A number of different geophysical survey techniques can be applied by archaeologists to record the remains of sub-surface archaeological structures. Magnetometer survey is generally chosen as a relatively time-saving and efficient survey technique (Gaffney *et al*. 1991, 6), suitable for detecting kilns, hearths, ovens and ditches, but also walls, especially when ceramic material has been used in construction. In areas of modern disturbance, however, the technique is limited by distribution of modern ferrous material. Resistivity survey, while more time consuming is generally successful at locating walls, ditches, paved areas and banks, and the application of resistance tomography allows such features to be recorded at various depths. APSS also implement close contour topographic survey over areas of prospection, to record any important relic of archaeological features in the present topography, but also provide vital information on the changing ground surface for the geophysical prospection results. A summary of the survey techniques is provided below.

### Resistivity Survey

Resistivity survey is based on the ability of sub-surface materials to conduct an electrical current passed through them. All materials will allow the passing of an electrical current through them to a greater or lesser extent. There are extreme cases of conductive and non-conductive material (Scollar et al 1990, 307), but differences in the structural and chemical make-up of soils mean that there are varying degrees of resistance to an electrical current (Clark 1996, 27).

The technique is based on the passing of an electrical current from probes into the earth to measure variations in resistance over a survey area. Resistance is measured in ohms (Ω), whereas resistivity, the resistance in a given volume of earth, is measured in ohm-metres (Ω/m).

Four probes are generally utilised for electrical profiling (Gaffney et al. 1991, 2), two current and two potential probes. Survey can be undertaken using a number of different probe arrays; twin probe, Wenner, Double-Dipole, Schlumberger and Square arrays.

The array used by APSS utilises a Geoscan Research RM15 Resistance Meter in twin electrode probe formation. This array represents the most popular configuration used in British archaeology (Clark 1996; Gaffney et al. 1991, 2), usually undertaken with a 0.5m separation between mobile probes. Details of survey methodology are dealt with elsewhere (Geoscan Research 1996).

A number of factors may affect interpretation of twin probe survey results, including the nature and depth of structures, soil type, terrain and localised climatic conditions. Response to non-archaeological features may lead to misinterpretation of results, or the masking of archaeological anomalies. A twin probe array of 0.5m will rarely recognise features below a depth of 0.75m (Gaffney et al 1991). More substantial features may register up to a depth of 1m. With twin probe arrays of between 0.25m and 2m, procedures are similar to those for the 0.5m twin probe array.

Although changes in the moisture content of the soil, as well as variations in temperature, can affect the form of anomalies present in resistivity survey results, in general, higher resistance features are interpreted as structures which have a limited moisture content, for example walls, mounds, voids, rubble filled pits, and paved or cobbled areas. Lower resistance anomalies usually represent buried ditches, foundation trenches, pits and gullies. In addition to the normal twin electrode method of survey, a Geoscan Research MPX15 multiplexer can be utilised with the Resistance Meter, allowing multiple profiles of resistivity to be recorded simultaneously, or resistance tomography to be carried out up to a depth of 1.5m. APSS generally survey, as with the twin electrode configuration, to a resolution of 1 or 0.1Ω, with readings every metre or half metre.

**Magnetic Survey**

Magnetic prospection of soils is based on the measurement of differences in magnitudes of the earth's magnetic field at points over a specific area. Principally the iron content of a soil provides the basis for its magnetic properties. Presence of magnetite, maghaemite and haematite iron oxides all affect the magnetic properties of soils. Although variations in the earth's magnetic field which are associated with archaeological features are weak, especially considering the overall strength of the magnetic field of around 48,000 nanoTesla (nT), they can be detected using specific instruments (Gaffney et al. 1991).

Three basic types of magnetometer are available to the archaeologist; proton magnetometers, fluxgate gradiometers, and alkali vapour magnetometers (also known as caesium magnetometers, or optically pumped magnetometers). Fluxgate instruments are based around a highly permeable nickel iron alloy core (Scollar et al. 1990, 456), which is magnetised by the earth's magnetic field, together with an alternating field applied via a primary winding. Due to the fluxgate's directional method of functioning, a single fluxgate cannot be utilised on its own, as it can not be held at a constant angle to the earth's magnetic field. Gradiometers therefore have two fluxgates positioned vertically to one another on a rigid staff. This reduces the effects of instrument orientation on readings.

Fluxgate gradiometers are sensitive to 0.5nT or below depending on the instrument. However, they can rarely detect features which are located deeper than 1m below the surface of the ground.

Archaeological features such as brick walls, hearths, kilns and disturbed building material will be represented in the results, as well as more ephemeral changes in soil, allowing location of foundation trenches, pits and ditches. Results are however extremely dependent on the geology of the particular area, and whether the archaeological remains are derived from the same materials. For fluxgate gradiometer survey, the Geoscan Research FM36 is used. Survey is carried out at 0.1nT resolution, with readings taken every 1m by 0.5m. Around 1.5 to 2 hectares are surveyed each day.

**Topographic Survey**

The modern ground surface or topography often contains important information on the conditions and nature of an archaeological site, and the potential existence of structures buried beneath the soil (Bowden 1999). The changes in topography can also have a great influence on determining the nature of features in a geophysical survey. Therefore it is vital to produce a detailed and complete topographic survey as part of the field survey of any given site. This generally entails the recording of elevations across a grid of certain resolution, for instance 5 or 10m intervals, but also the recording of points on known breaks of slope, to emphasis archaeological features in the landscape.

Survey is usually undertaken by APSS using a total station or electronic theodolite, although Global Positioning Satellite systems (GPS) are also utilised, to record the survey points. Computer software is then used to produce Digital Elevation Models of the results. Normally, survey is carried out using a Leica total station, with readings taken every 4 metres, and also on the breaks of slope of important topographical features. The resolution can be increased where necessary. Up to 5 hectares per day can be covered.

**Integrated Survey Methodology**

The survey work carried out by Southampton is always produced as part of an integrated survey strategy, designed to affiliate all of the geophysical survey techniques to the same grid system, which would be used for geochemical soil sampling and surface collection. Surveys are normally based on an arbitrary grid coordinate system, tied into a national system or to a series of hard points on the ground corresponding to points on a map. A set of 30m grids are then set out to provide the background for the magnetometry, resistivity, and other survey techniques which will complement the results, for instance fieldwalking and geochemical sampling.

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