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

SREP 14/2004

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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, between the Autumn of 2001 and Summer of 2003. It specifies the survey methodology together with an interpretation and discussion of the survey results. The surveys were 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 October 2001 and September 2003, 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.

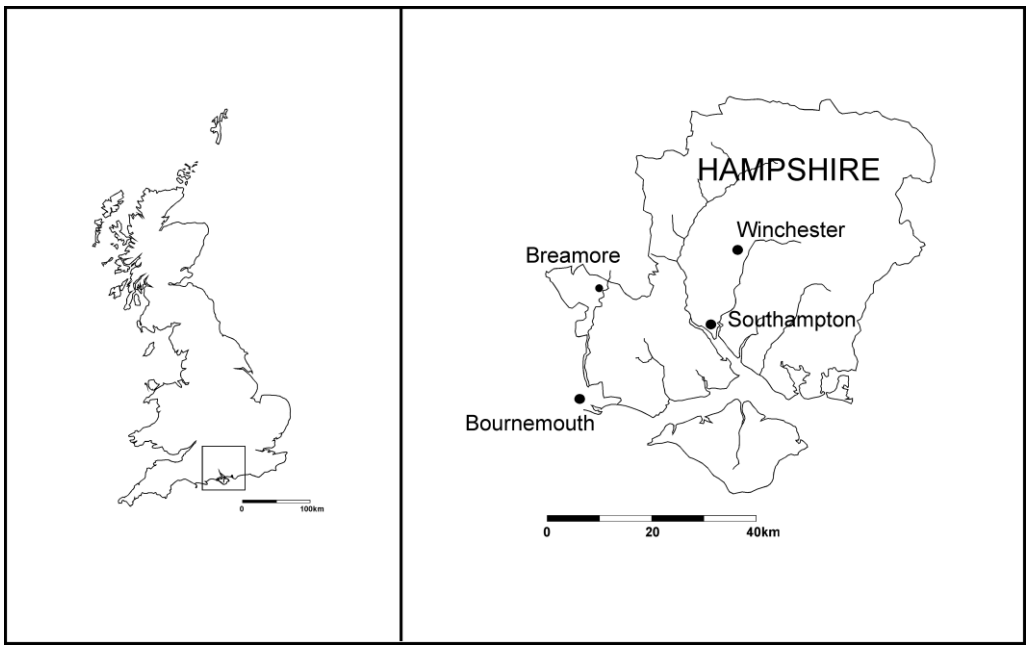


Fig. 1 Location map of Breamore, north of the New Forest, Hampshire

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.

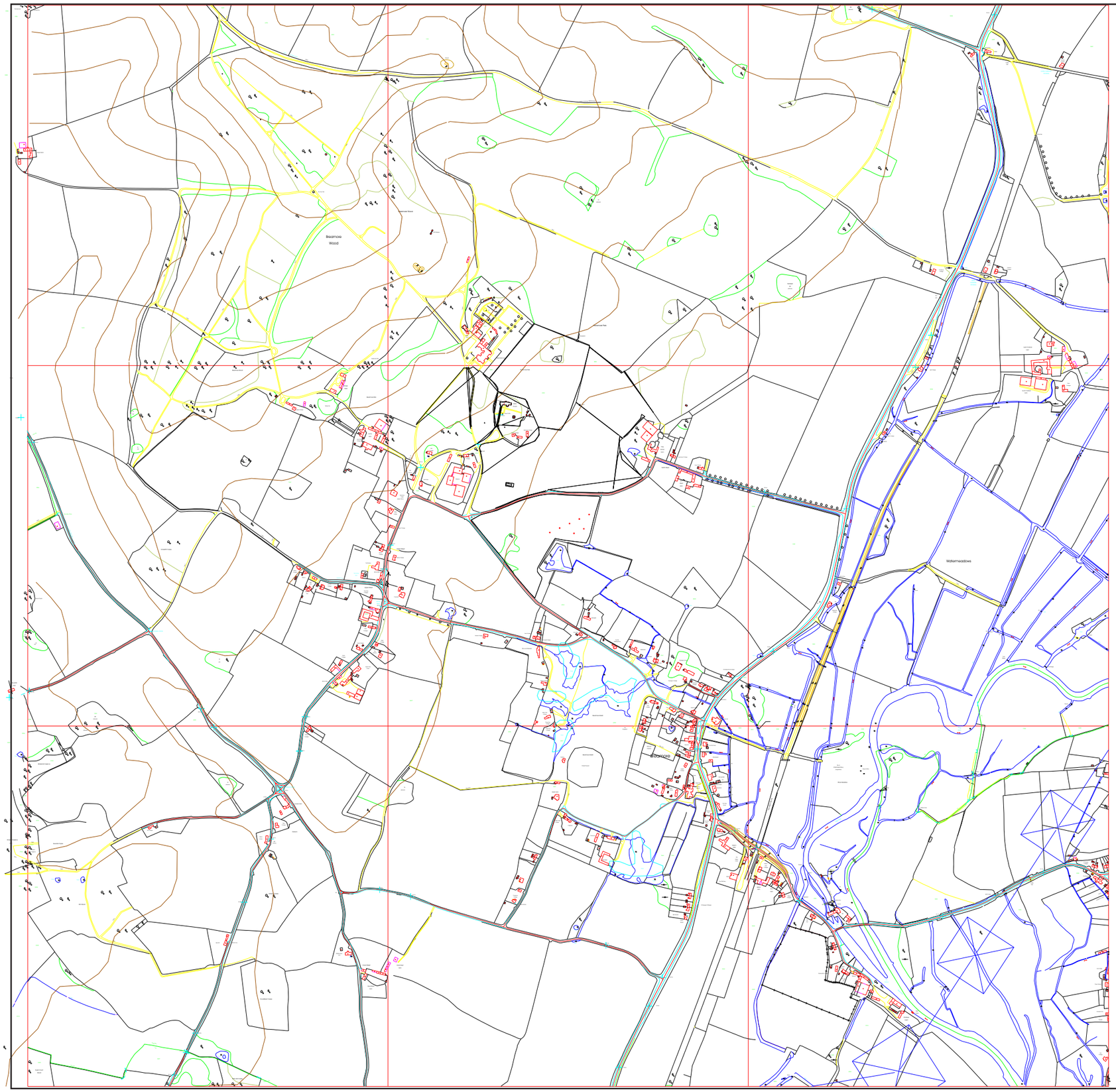
The initial magnetometer survey in the Shallows was conducted on behalf of Hampshire County Council in 2001. This was followed by a major season of work between March 2002 and April 2003, funded by the British Academy. A further season of work was conducted in August 2003, and was funded by the ACI Strategic Research Initiative of the French Ministry of Research, via CNRS laboratoire Archéologie et territoires, University of Tours (projet: *la dynamique des paysages et sociétés préindustrielles*).

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; Plate 1). 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



Breamore Parish, Hampshire

Fig. 2 The study area for the Breamore Settlement and Landscape Project

N

0 500m

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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. Work concentrated predominantly 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.

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 (Plate 3). 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). It was also decided to compliment the rapid magnetometer survey with resistivity prospection across areas of the landscape which produced a successful response to magnetometry (Plate 4). Finally, magnetic susceptibility survey was employed by undergraduate students of the University of Southampton in the Shallows (Plate 5), to test the application of the method in relation to the more intensive methods of resistivity and magnetometry.

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 georeferenced 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.

The resistivity survey was carried out using a Geoscan Research RM15 Resistance Meter. Readings were recorded at 1m intervals along 1m traverses. To optimise the integration of the different sets of results, the same survey grids were utilised for each method, and recording was initiated in the same direction for magnetometry and resistivity. In addition, a multiplexer survey was undertaken in one of the 30 by 30m grids in the Rally Field, using multiple twin electrode arrays, with readings taken at six different levels on 1m traverses, at 0.5m intervals. Readings at each point were taken sequentially at 0.25m, 0.50m, 0.75m, 1.00m, 1.25m and 1.50m probe separations.

The total station was also used to record a series of spot heights within each survey area at approximately 8m intervals, and on the breaks of slope. This provided a topographic survey of the areas around Breamore church, the Shallows and in the Bullcroft Field, where buried remains were indicated in the geophysical survey results.

3. Survey Results

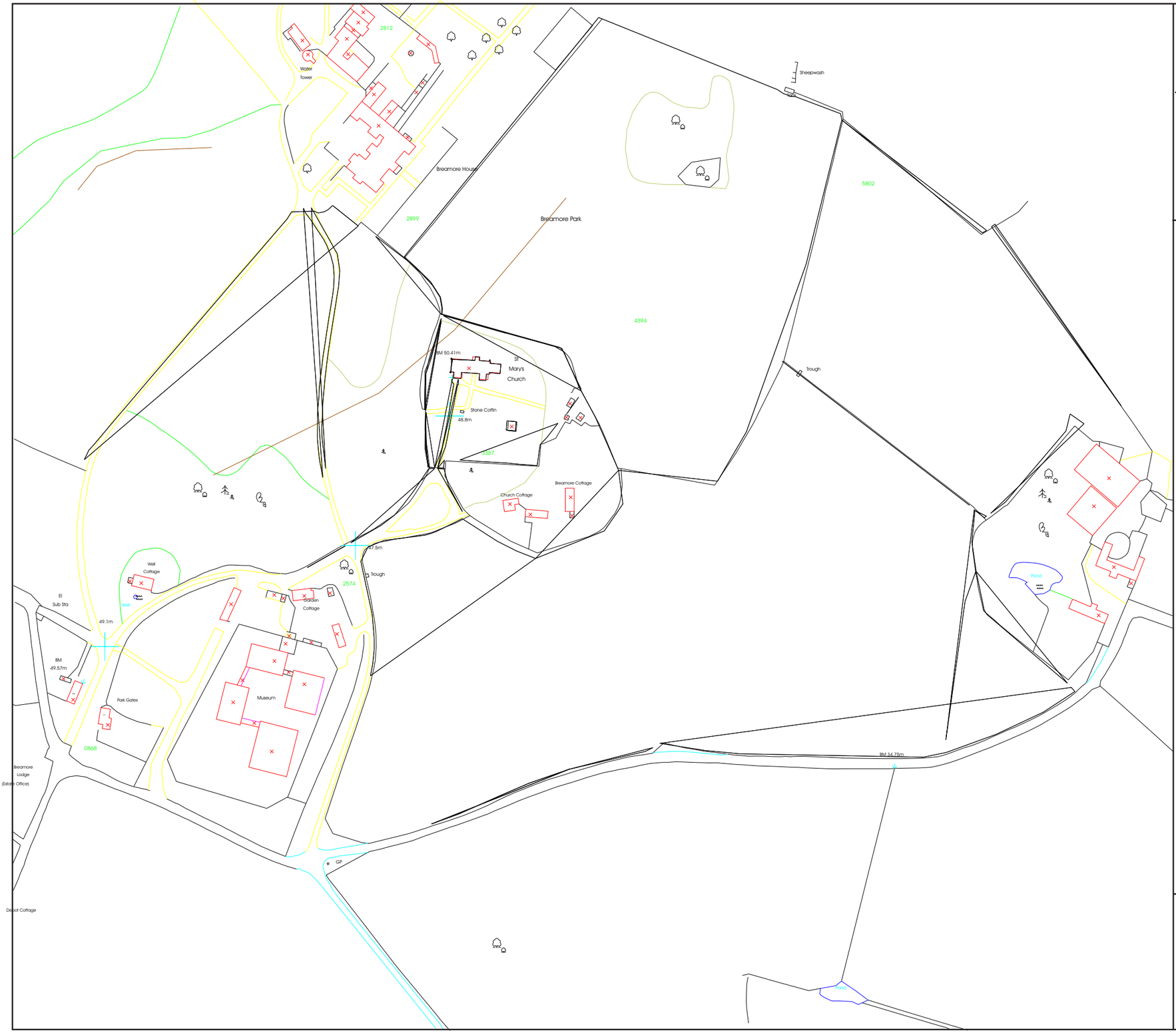
In total, an area of approximately 38 hectares have been completed using magnetometry across the landscape at Breamore. This has been complemented by 11 hectares of resistivity, and 23 hectares of topographic survey. The largest zone of magnetometry was conducted in Breamore Park, in the vicinity of Breamore Parish church (Fig. 3), with further surveys to the east of North Street Farm in the Bullcroft Field, and further to the south in the Shallows.

3.1 Breamore Manor and Church

Breamore Park comprises the 18th century parkland situated around Breamore House and Breamore Parish Church (Figs 4 and 11).Work was conducted using magnetometry and resistivity in a number of fields surrounding the 11th century church; to the west in the parkland leading to the House, to the north-east in Breamore Park, and to the south in the Rally Field. An area of the Duckpond Field further to the south was also surveyed.

The results of the magnetometry indicate complicated phases of settlement in the area (Figs 5 and 12). A series of modern field drains **[m1]**, **[m2]**, **[m3]** and **[m4]** are the most prominent features in the results. The line of a telecommunications cable is also visible running from Breamore House **[m5]**, south into the Rally Field **[m6]** and onward into the duckpond field, heading for the telephone exchange in Breamore village. To the west of Breamore Church, two parallel linear anomalies are visible **[m7]**, running for a distance of 90m, then turning to the east **[m8]** and continuing to the edge of the churchyard. The same features re-appear to the north of the churchyard in Breamore Park **[m9]** and **[m10]**, and continue back into the adjoining field. They delineate a settlement enclosure around the church. A large number of positive magnetic maculae are present on the exterior **[m11]** and interior **[m12]** of the enclosure. The area of Breamore Park to the south of the House is dominated by a series of linear features, aligned with the front of the Manor. Two rectilinear features **[m13]** and **[m14]** are situated adjacent to one another, with a linear dipolar anomaly aligned centrally on **[m14]**, and a double-linear feature **[m16]** aligned on **[m13]**. A further linear anomaly **[m17]** also extends south from the edge of **[m13]** for a distance of 100m. These features represent two garden terraces associated with the Manor, with a number of features, possibly ponds or fountains, extending to the south.

Between the edge of the terrace features and North Street Farm to the south east, the survey results show a number of route-ways cutting across the landscape. Two parallel linear anomalies **[m18]** curve from the east end of the churchyard and run to the north east for a distance of 200m. Two trackways converge on this route **[m19]** and **[m20]**, most probably running from a similar route visible to the south **[m21]**. The remains of a possible structure **[m22]** are visible on the southern edge of this route. A further route-way can be seen in the results **[m23]**, cutting across the Rally Field and joining the line of



Breamore Parish, Hampshire

Fig. 4 The survey area around Breamore Park

N

0 120m

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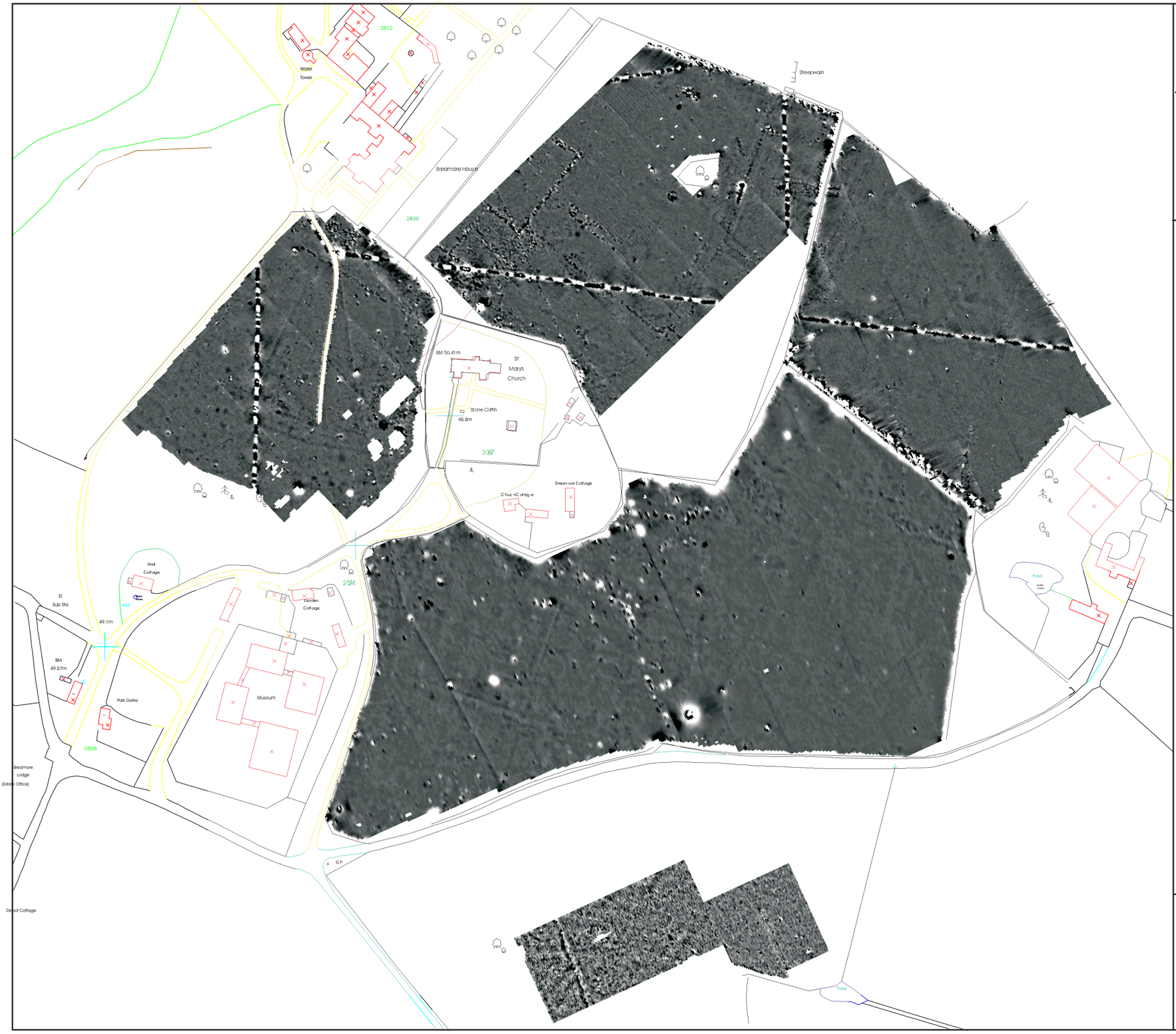

Breamore Parish, Hampshire

Fig. 5 Greyscale image of the magnetometer survey results from Breamore Park

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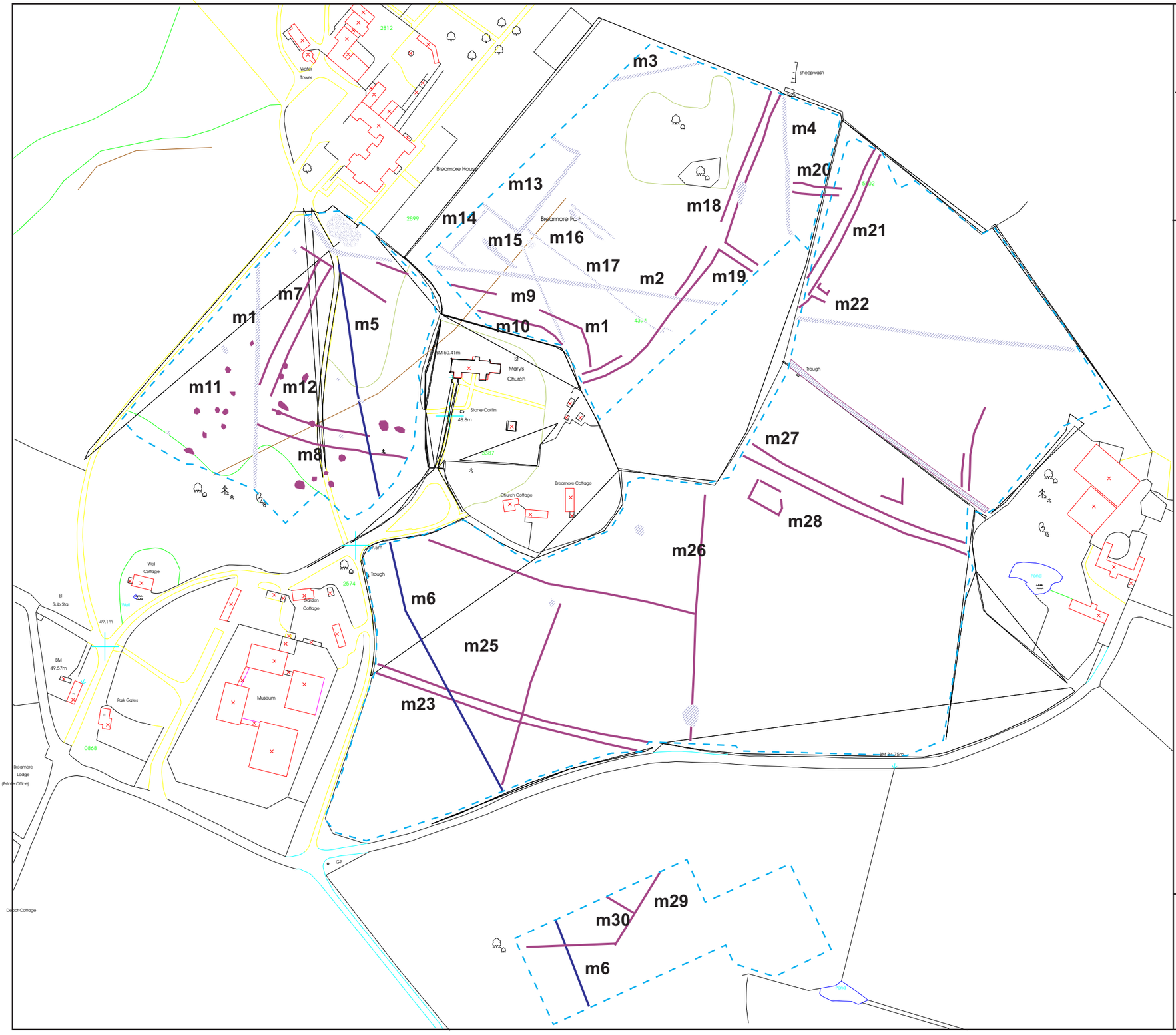

Breamore Parish, Hampshire

Fig. 6 Interpretation plan derived from the magnetometer survey results from Breamore Park

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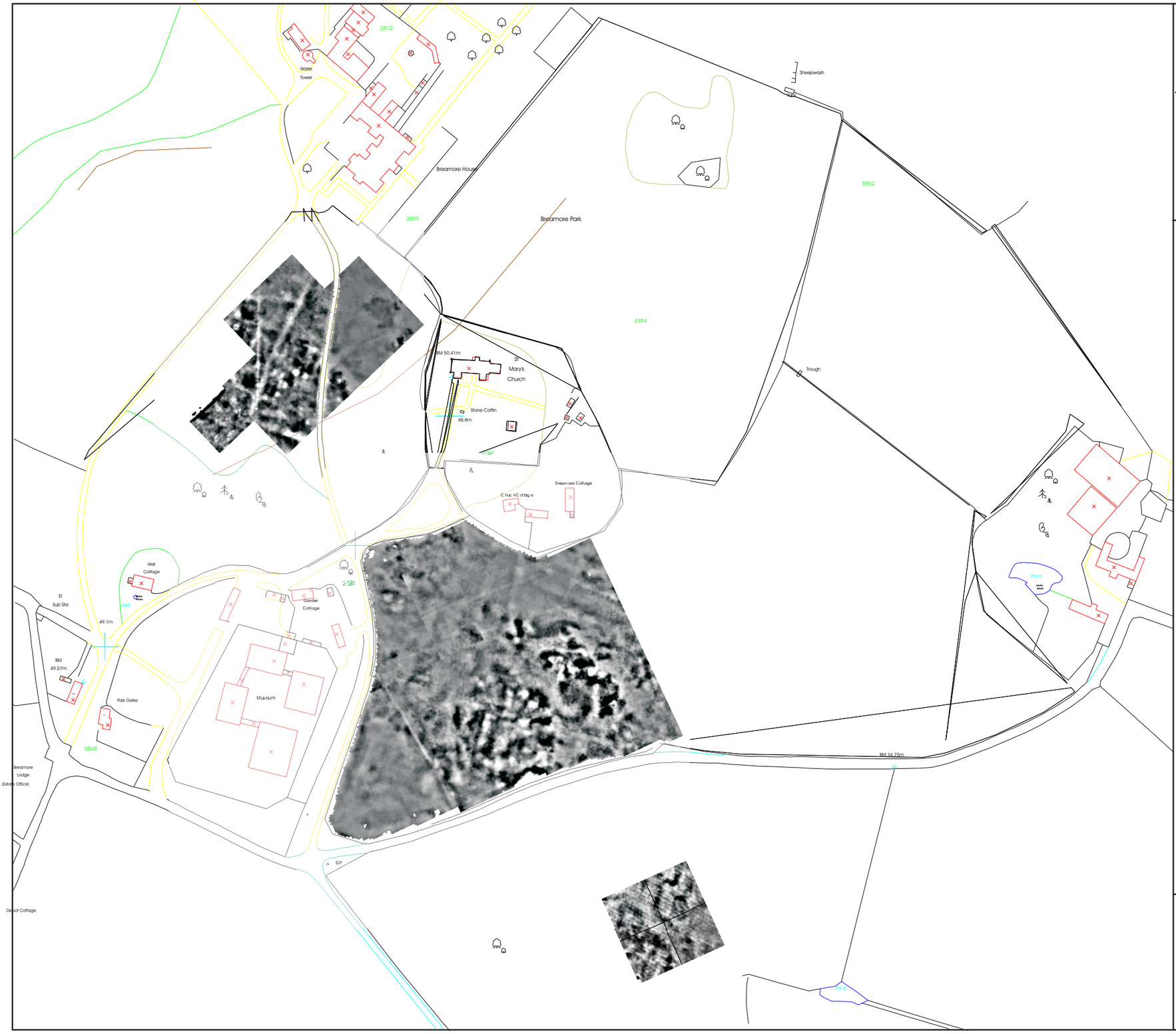

Breamore Parish, Hampshire

Fig. 7 Greyscale image of the resistivity survey results from Breamore Park

10 -12

0 120m

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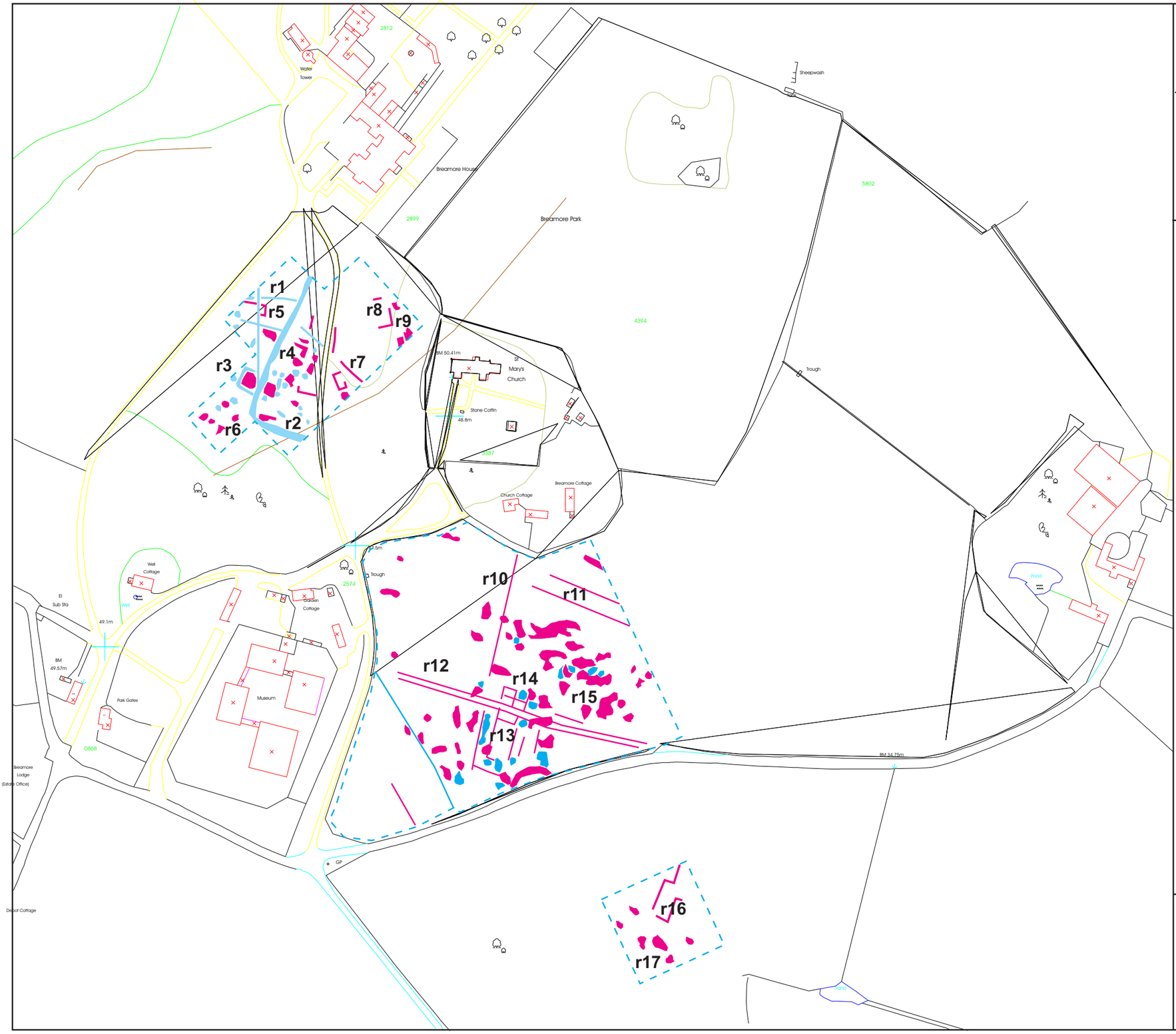

Breamore Parish, Hampshire

Fig. 8 Interpretation plan derived from the resistivity survey results from Breamore Park

N

0 120m

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Breamore Parish, Hampshire

Fig. 9 The survey area around Breamore church

N

0 60m

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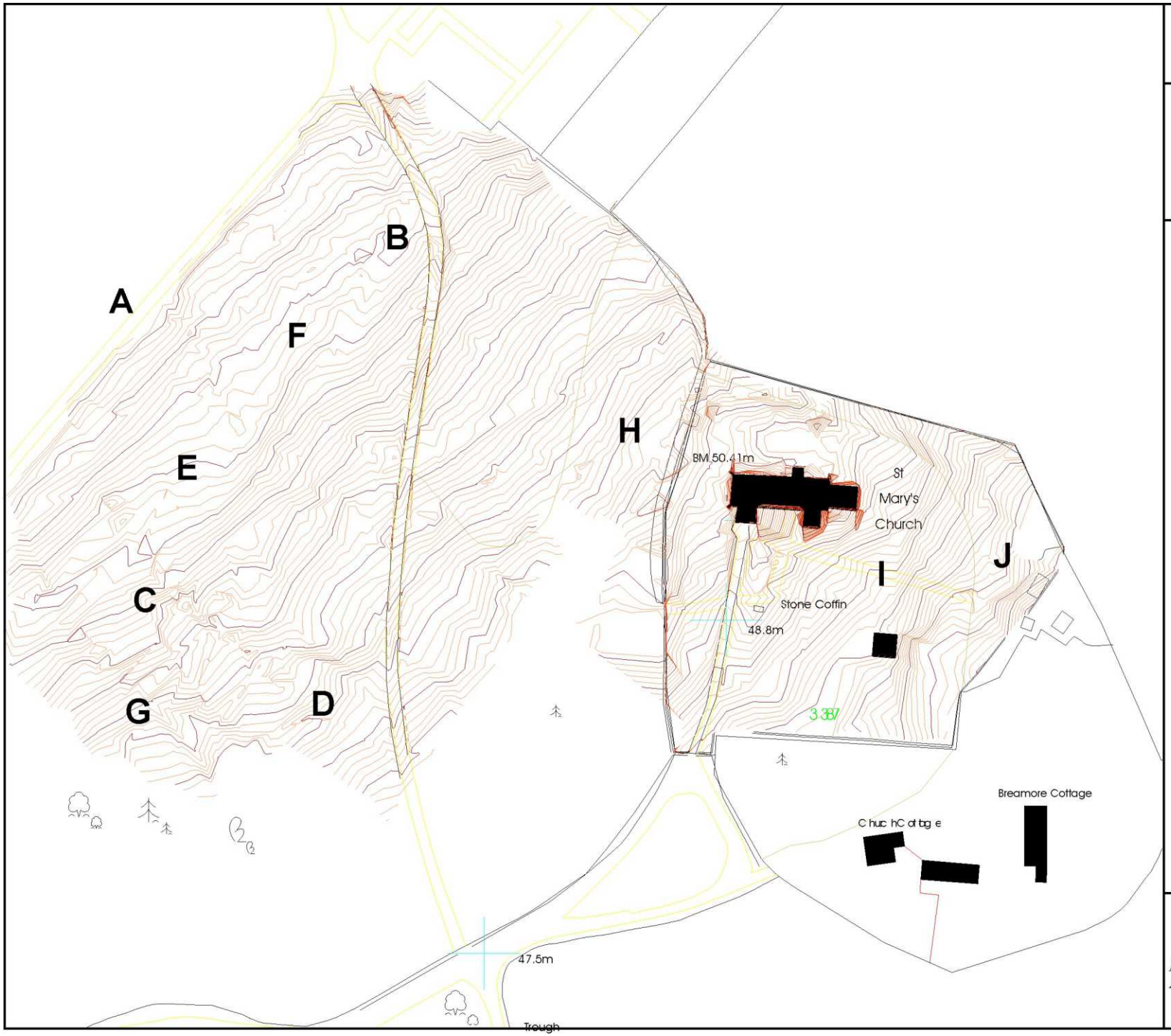

Breamore Parish, Hampshire

Fig. 10 Contour survey results from around Breamore church

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0 60m

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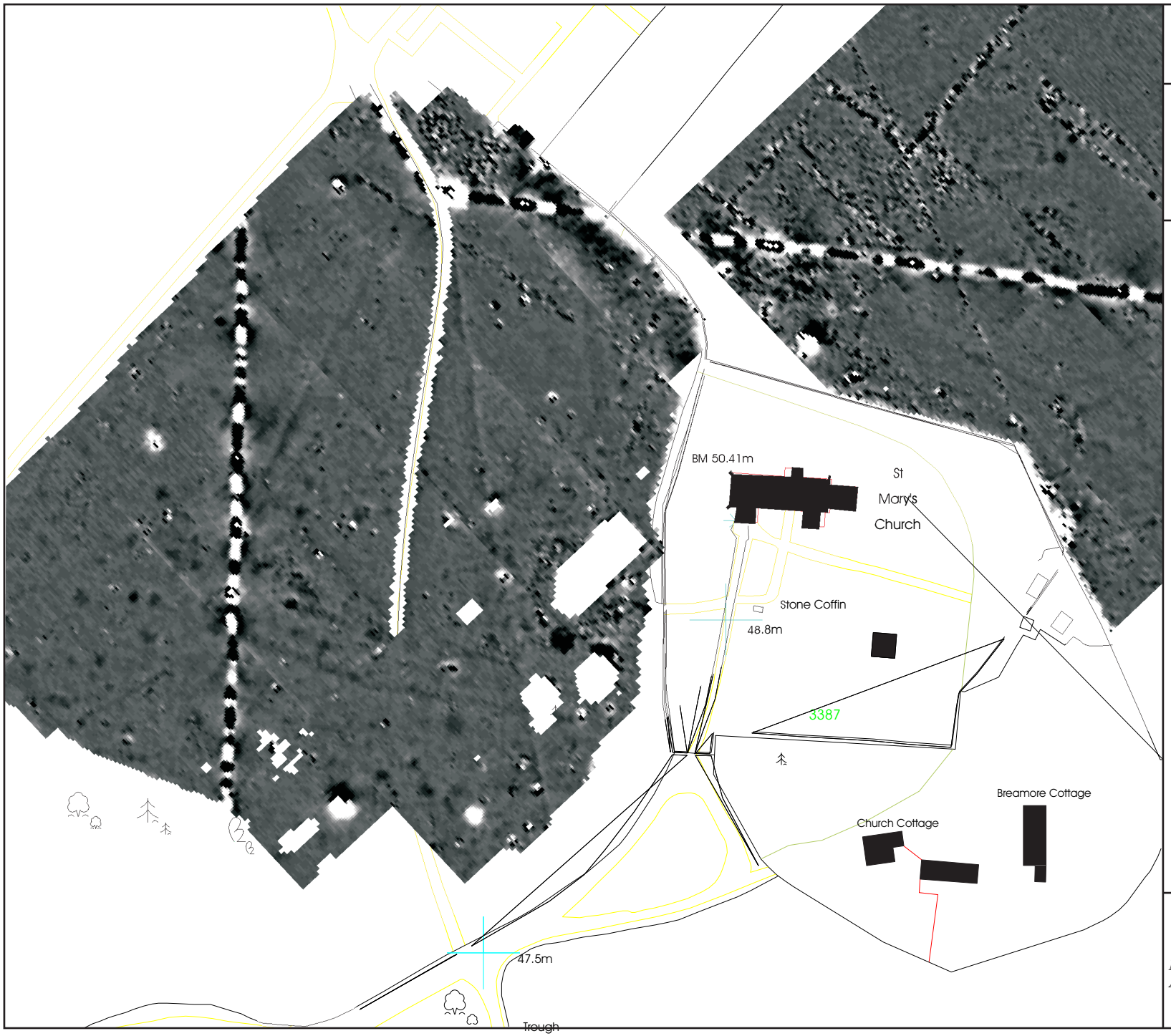

Breamore Parish, Hampshire

Fig. 11 Greyscale image of the magnetometer survey results from around Breamore church

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1 nT -1

0 60m

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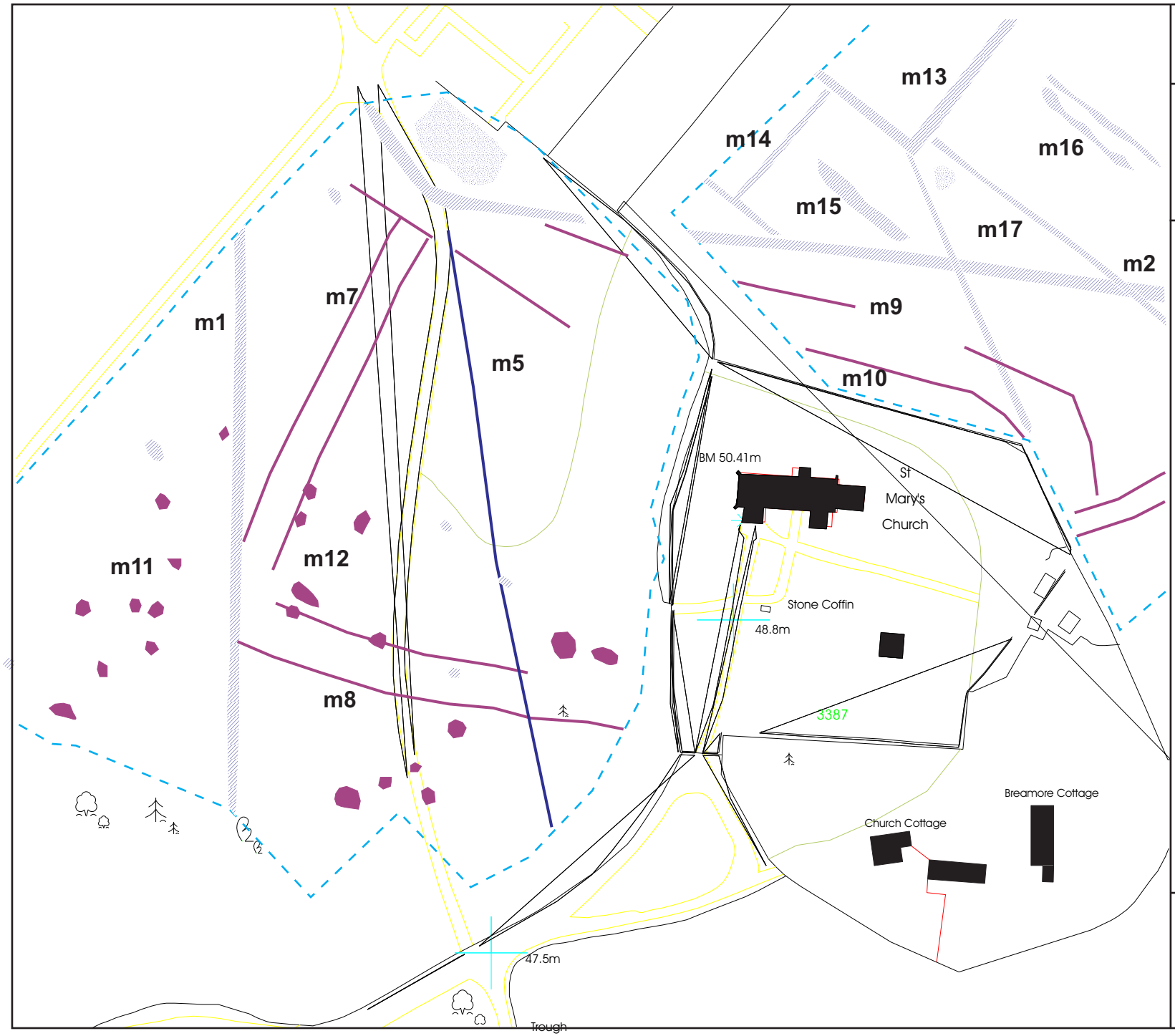

Breamore Parish, Hampshire

Fig. 12 Interpretation plan derived from the magnetometer survey results from around Breamore church

N

0 60m

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the modern road at its eastern end. This feature cuts through a series of ephemeral linear anomalies **[m25]**, marking possible land divisions or allotments. The central part of the Rally Field is divided by a linear feature **[m26]**, probably an earlier field boundary. To the east of this division, the line of an early route-way is visible in the results **[m27]**, and a rectilinear feature immediately to the south **[m28]** suggests the remains of a building.

A small area of magnetometry was conducted in the Duckpond Field to the south of the Rally Field. Here a number of features were noted. They include the continuation of the telecommunications cable from the north **[m6]**, but also two fainter linear anomalies, the first running south west **[m29]**, then turning towards the west, and the second abutting **[m29]** from the north **[m30]**. Although these features may indicate evidence of settlement in the Duckpond Field, the origin of thelinear anomalies is uncertain.

From the results of the magnetometry, it was possible to define three areas as possible targets for resistivity survey (Figs 7 and 13). Primarily, the areas to the west of Breamore church and the west part of the Rally Field were chosen for closer investigation. A small area of resistivity was also conducted in the Duckpond Field, during a season of excavations in September of 2002.

From the results of the resistivity survey, it was possible to identify some phasing of the settlement around Breamore church (Figs 8 and 14). The modern field drain is visible as a low resistance anomaly **[r1]** running across the area. The line of the enclosure ditch is also well-defined **[r2]** curving around to the west of the church. This ditch appears to cut the high resistance plan of a house platform **[r3]**, surrounded by a low resistance band of readings. The ditch also cuts further high resistance features to the north **[r4]** and **[r5]**, suggesting other house platforms across the area. A series of high and low resistance maculae are located to the west **[r6]**. A number of high resistance features are also situated within the curtailage of the ditch. These include a rectilinear feature **[r7]**, representing a possible structure, and another possible building to the east **[r8]**, with a small number of high resistance maculae **[r9]** located close to the modern edge of the churchyard.

In the Rally Field, a large number of resistance anomalies were located. The field is sub-divided by two linear features, one running from the north to the south **[r10]**, with two parallel linear features running to the east **[r11]**. Two similar parallel features cut across the centre of the field **[r12]** from west to east, bissecting a series of rectilinear anomalies. These consist of a large rectilinear feature **[r13]**, measuring some 50m by 40m, with what appears to be an internal rectangular area, and a secondary smaller rectilinear feature **[r14]** to the north. At first these features were interpreted as a structure, possibly suggesting the existence of a Roman villa, although excavation of the site in 2002 yielded no evidence of a habitation in this part of the field. These features are surrounded by a large number of broad high and low resistance maculae **[r15]**, caused by pockets of compaction in the gravel of the terrace.

The features located in the Duckpond Field are less convincing. They consist of a faint high resistance rectilinear feature **[r16]**, and a number of high resistance maculae **[r17]**, probably associated with a badly truncated ditch found in the excavations.

3.2 The Bullcroft Field

As part of the intensive survey transect across the Avon valley, a large area was surveyed using magnetometry on the gravel terrace above the river alluvium, in the area of the Bullcroft Field, to the east of North Street Farm (Fig. 15). 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.

In terms of topography (Fig. 16), the field to the north of North Street has a shallow gravel ridge running from its northern end **(A)** to the south **(B)**. The edge of this ridge falls away to the east **(C)**, levelling out across a purported palaeo-channel. The ground continues to rise to the west **(D)**, reaching its highest point along the western perimeter fence of the field.

To the south of North Street, the overall level of the field appears to be significantly lower than all of the surrounding terrain. The topography suggests a shallow basin **(E)** extending over the western half of the field, with a slight rise **(F)** in the centre. The southern and eastern parts of the field **(G)** and **(H)** all have the same elevation as the shallow basin.

Results of the magnetometer survey indicate a large expanse of settlement activity in the area, with a probable barrow cemetery to the north (Figs 17 and 18). A series of prominent sub-circular features are located in the northern field, starting in the south west corner **[m1]**, and situated in the centre **[m2]** and north **[m3]** of the survey area. In addition, two concentric circular features are also visible **[m4]** and **[m5]**. Each of these features ranges between 15m and 25m in diameter, and all may possibly represent barrows. The entire area around these features is marked with small positive maculae, in particular between features **[m1]** and **[m2]**, with a concentration of small anomalies **[m6]**, also further to the north **[m7]**, and on the northern confines of the survey area **[m8]** and **[m9]**. The eastern edge of the survey is marked by two broad parallel linear anomalies **[m10]**, which disappear after a distance of 40m. The westernmost line then reappears some 15m further to the north **[m11]**. The features indicate the line of the palaeo-channel, cutting a course to the east of the gravel ridge. A number of linear anomalies also intersect the other features, all running approximately east to west across the field, across the centre **[m12]**, south **[m13]** and north **[m14]** of the survey area. These all probably represent field boundaries from the 19th century or later.

To the south of North Street, there is a marked difference in the form of anomalies represented in the magnetometer data. Traces of the palaeo-channel can be seen in the north west part of the field **[m15]**, but a large part of the area is sub-divided by boundary ditches. Two parallel ditches are visible running from north-south, **[m16]** and **[m17]**, separated by a distance of around 25m. The area to the east of **[m17]** is again sub-divided into blocks by boundary ditches in the north **[m18]**, centre **[m19]** and south **[m20]** and **[m21]**. The central block of land is also internally sub-divided by a further ditch **[m22]**. This area is marked by a large number of positive maculae **[m23]** and **[m24]** indicating pits and small trenches. These features are also present to the east **[m25]** and **[m26]**.

In the south west corner of the field, the survey results indicate a small enclosure **[m27]** with a possible outer ditch **[m28]** and internal features **[m29]**. This is cut by the field boundary, with an estimated 50% of the entire enclosure covered by the survey.

A small area of resistivity survey was conducted in the Bullcroft field, to compliment the magnetometer survey results (Fig. 19). The results attest to the existence of a series of boundary ditches, including the main north-south ditch **[r1]**, and sub-divisions in the south east corner of the field **[r2]** and **[r3]**. In addition, some other low resistance anomalies are present, including a ditch **[r4]** cutting the earlier boundary, and a broadening of the main boundary ditch [r1] at one point in its length **[r5]**. The results also suggest a large number of high and low resistance features within the enclosed area, including the sides of a possible structure **[r6]**, a series of external pits **[r7]**, and a further area of disturbance, possibly evidence of structures to the south **[r8]** and **[r9]**.

3.3 The Shallows

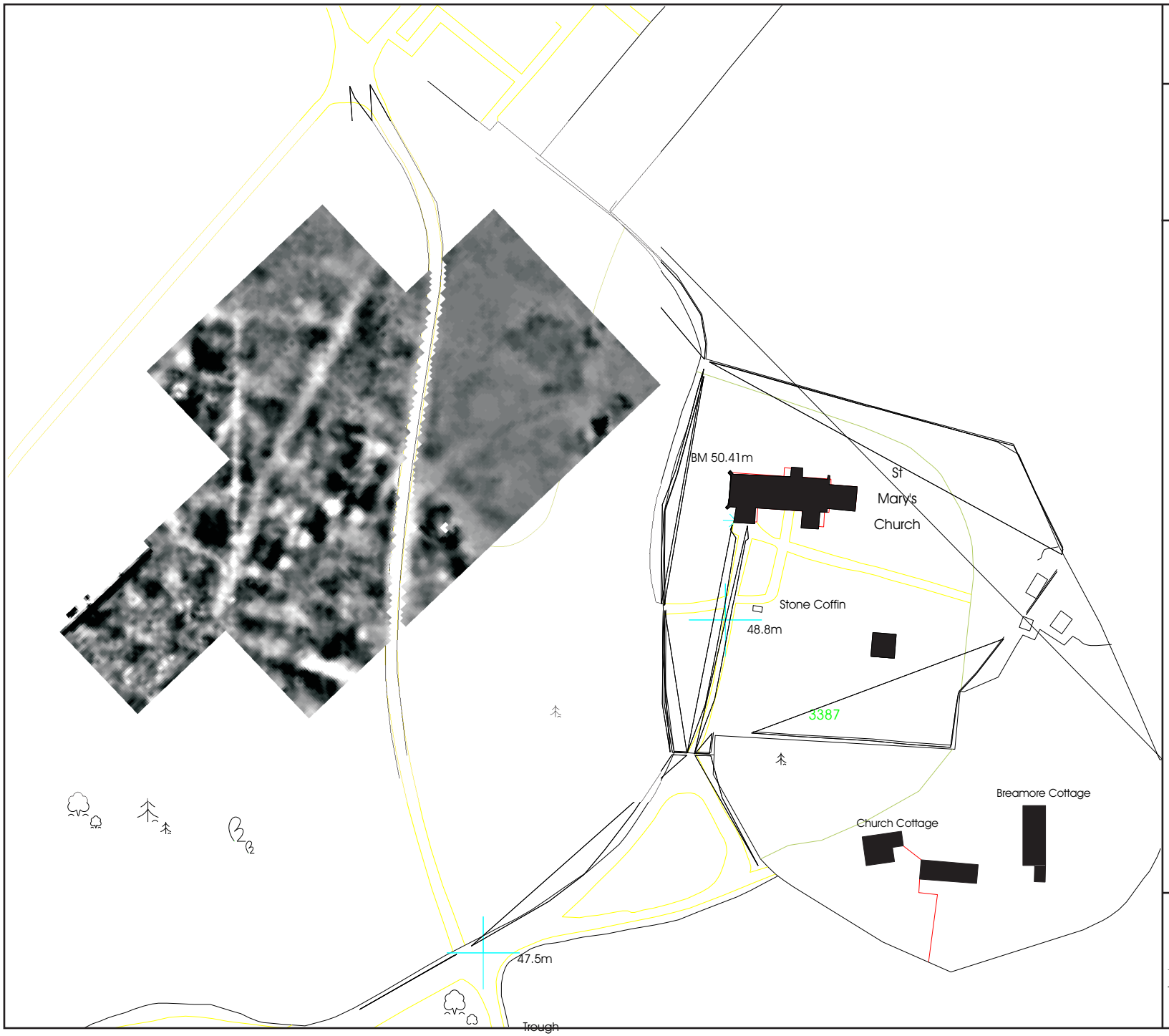
The field in the Shallows (Fig. 21) formed the focus of student activities in the Spring of 2003. The aim of the survey was to map the extent and features of the Saxon cemetery which had been the subject of excavation and preliminary survey by various groups between 2000 and 2001. Efforts were concentrated in the pasture to the north.

The topography of the area indicates a gravel terrace (Fig. 22), which forms a high point **(A)** in the centre of the survey area, with the line of a low gravel ridge or tongue running to the north east, culminating in another slight rise **(B)**. The ground falls away steadily to the north west **(C)** and to the south east **(D)**, where a number of slight depressions in the terrain mark the remnants of trial trenches excavated in the field by the Berkshire Archaeological Trust (BAT) and Time Team. The ground then falls away more steeply towards the River Avon **(E)**, before levelling out on the alluvial plain of the river **(F)**.

Magnetometry in the Shallows suggests a large amount of activity associated with the cemetery (Figs 23 and 24). The features focus on a circular anomaly **[m1]**, with a break in the readings along its south eastern edge. This may represent a barrow ditch. Other readings comprise a number of maculae across the gravel ridge to the south west **[m2]** and close to the barrow ditch in the north east **[m3]** and **[m4]**.

The form of these anomalies matches some of the results from the magnetometer survey on the Shallows in 2001 (Strutt 2002), where a large number of maculae were located **[m5]** and **[m6]** along the fence-line on the gravel, together with some rectilinear features thought to possibly represent structural remains **[m7]** and **[m8]**. The weak readings from the magnetometry are not always convincing, however, and it was necessary to utilise resistivity survey across the parts of the site that suggested the highest concentration of archaeological evidence.

Results of the resistivity survey provided a set of more comprehensive data for the Shallows (Figs 25 and 26). As with the magnetometry, the barrow feature in the north east of the field remains a focal point of the cemetery area **[r1]**, with a number of low resistance pit or grave features in the vicinity **[r2]** and **[r4]**. In addition, the line of a



Breamore Parish, Hampshire

Fig. 13 Greyscale image of the resistivity survey results from around Breamore church

N

0 60m

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Breamore Parish, Hampshire

Fig. 14 Interpretation plan derived from the resistivity survey results from around Breamore church

N

0 60m

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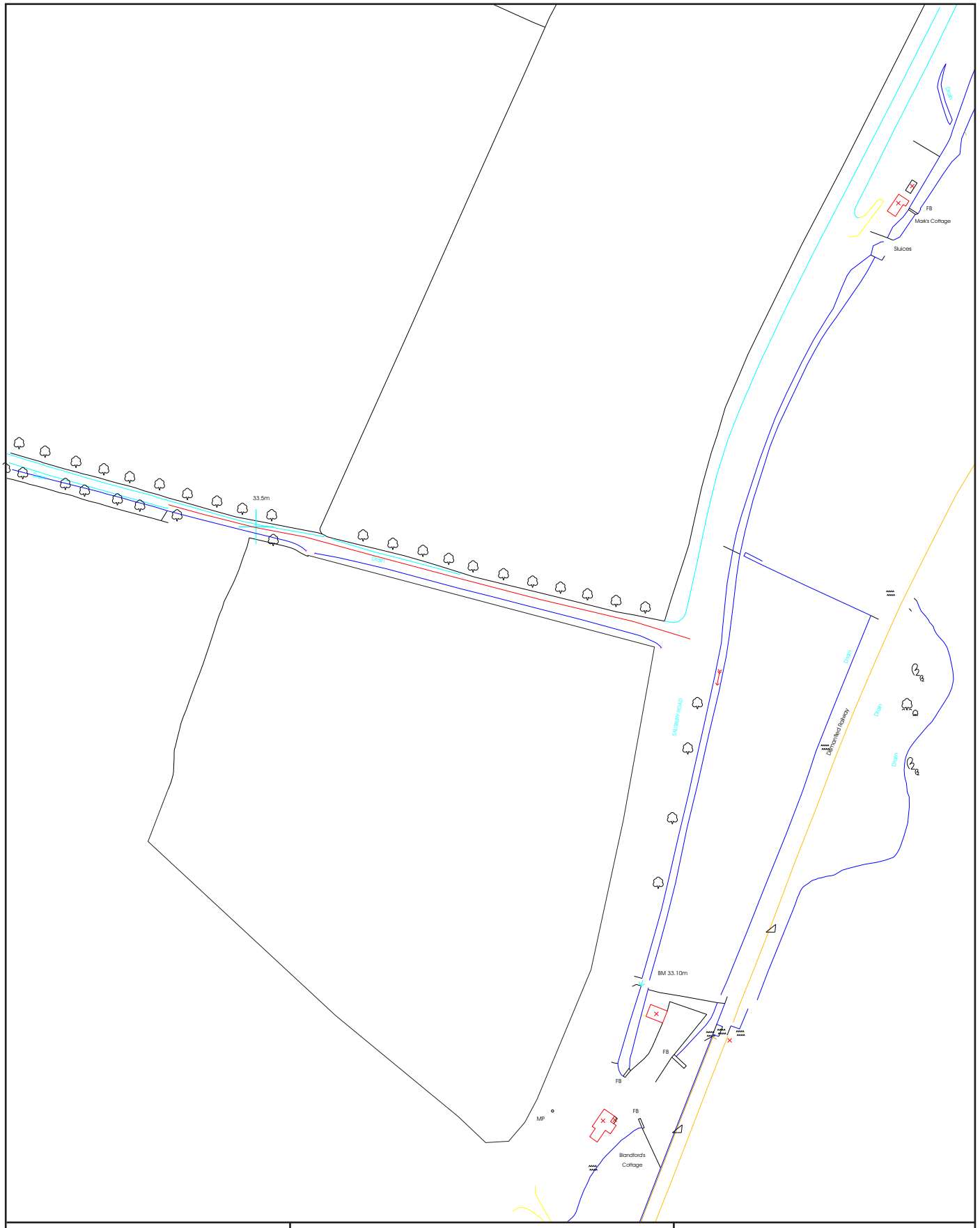

Fig. 15 The survey area at the Bullcroft Field

N

0 60m

Breamore Parish, Hampshire

Survey data © Archaeological Prospection Services of Southampton

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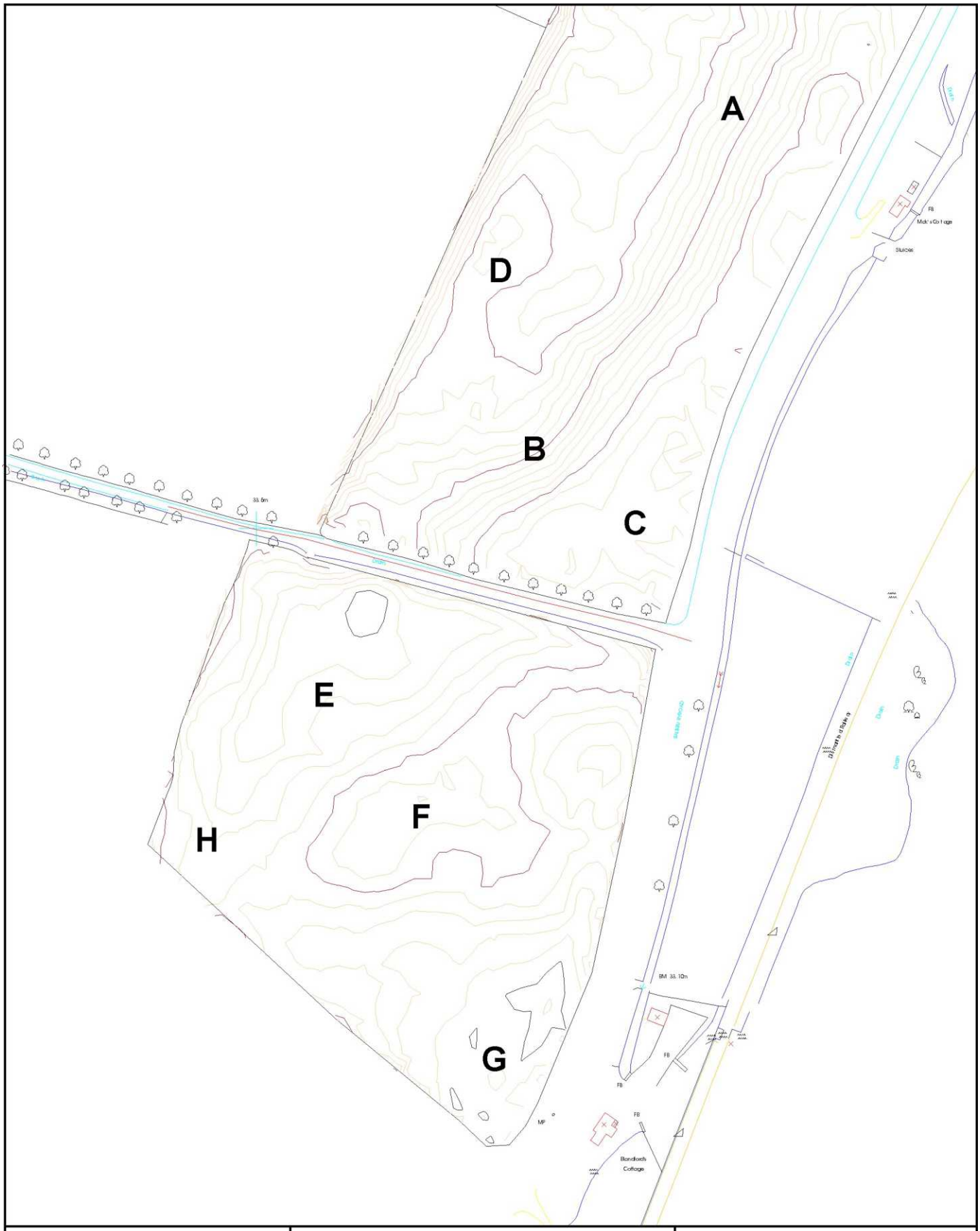

Fig. 16 Contour survey results from the Bullcroft Field

N

0 60m

Breamore Parish, Hampshire

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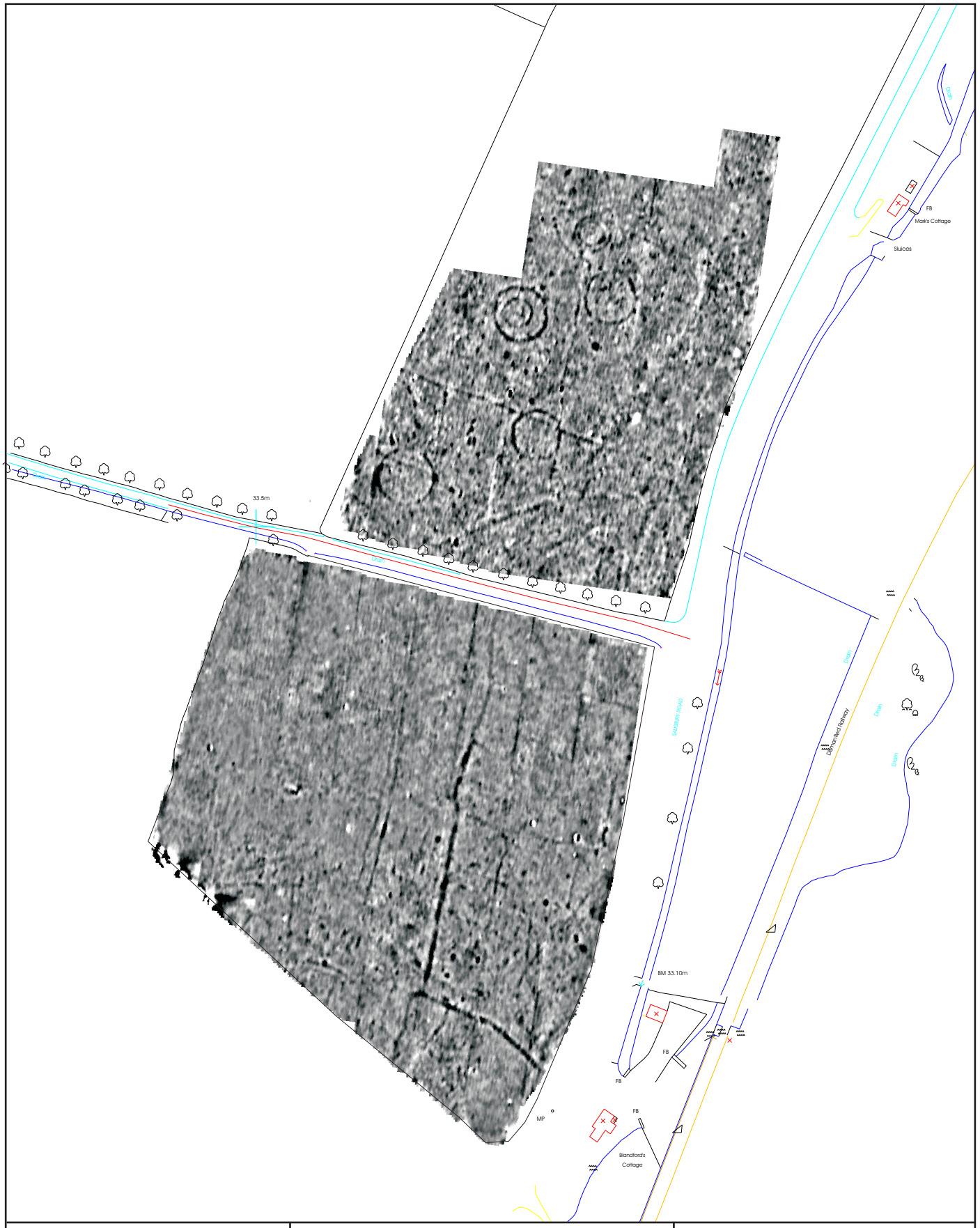

Fig. 17 Greyscale image of the magnetometer survey results from the Bullcroft Field

N

1 nT -1

0 60m

Breamore Parish, Hampshire

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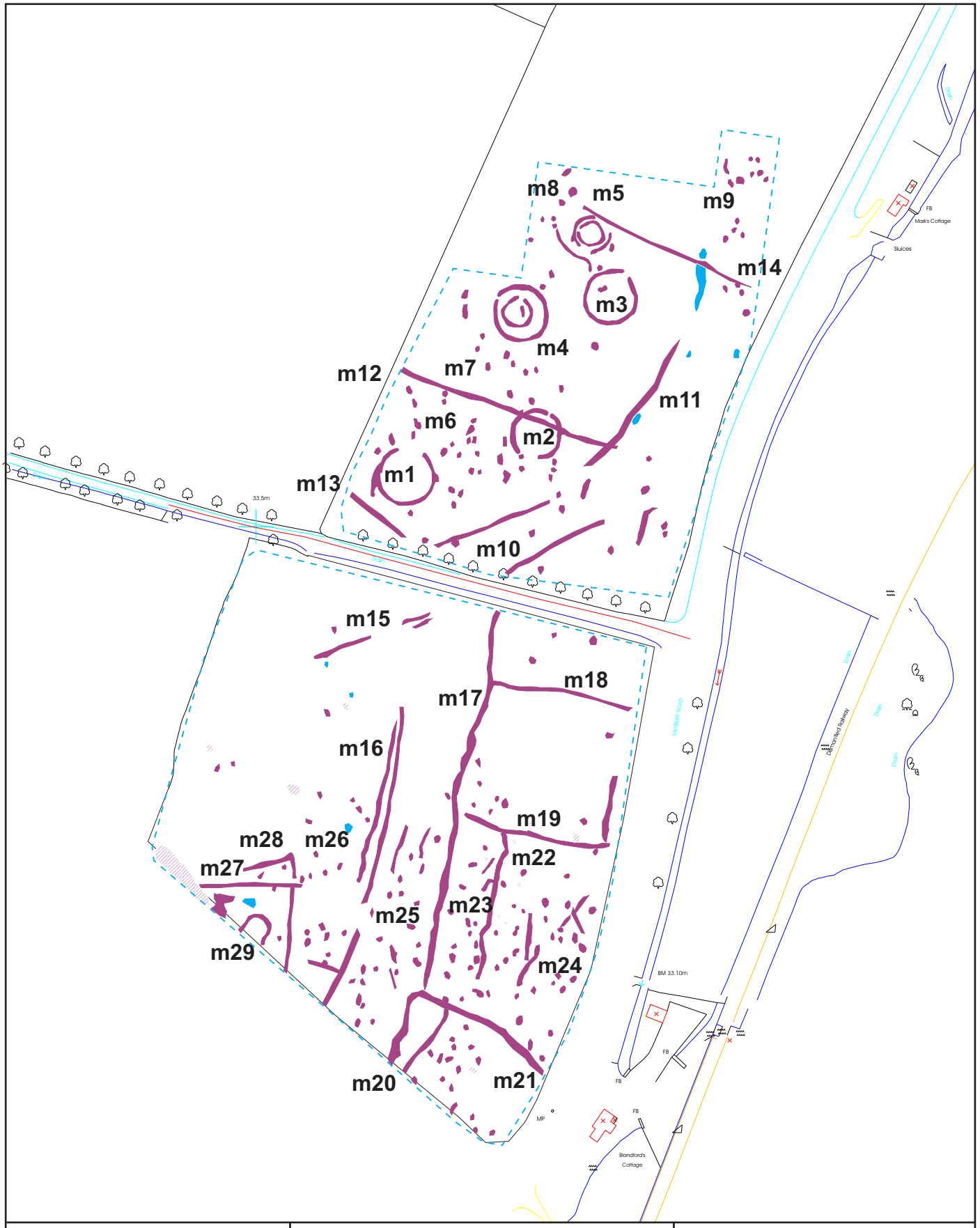

Fig. 18 Interpretation plan derived from the magnetometer survey results from the Bullcroft Field

N

0 60m

Breamore Parish, Hampshire

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trackway is plainly visible in the results **[r3]**, together with a more substantial route-way, cutting across the field from east to west, represented by two parallel high resistance linear anomalies **[r5]**. This is masked at its eastern extent by a large low resistance feature **[r6]**. A number of low resistance maculae on the highest part of the ridge indicate the existence of BAT and Time Team evaluation trenches, but more significantly, the background responses to the resistivity survey do appear to indicate a hypothetical boundary to the gravel ridge, and the possible cemetery **[r7]**.

In addition to the geophysical survey, the students also collected magnetic susceptibility measurements at 10m intervals across the Shallows (Fig. 27). Although the resolution of this survey was insufficient to show small archaeological features, the results do give a clear indication of the area of most intense human activity across the field. The higher magnetic susceptibility readings all correlate with the land on top of the gravel ridge, orientated on a south west to north east axis across the higher terrain, and incorporating the location of the barrow ditch and other burials.

Fig. 19 Greyscale image of the resistivity survey results from the Bullcroft Field

N

10 -12

0 60m

Breamore Parish, Hampshire

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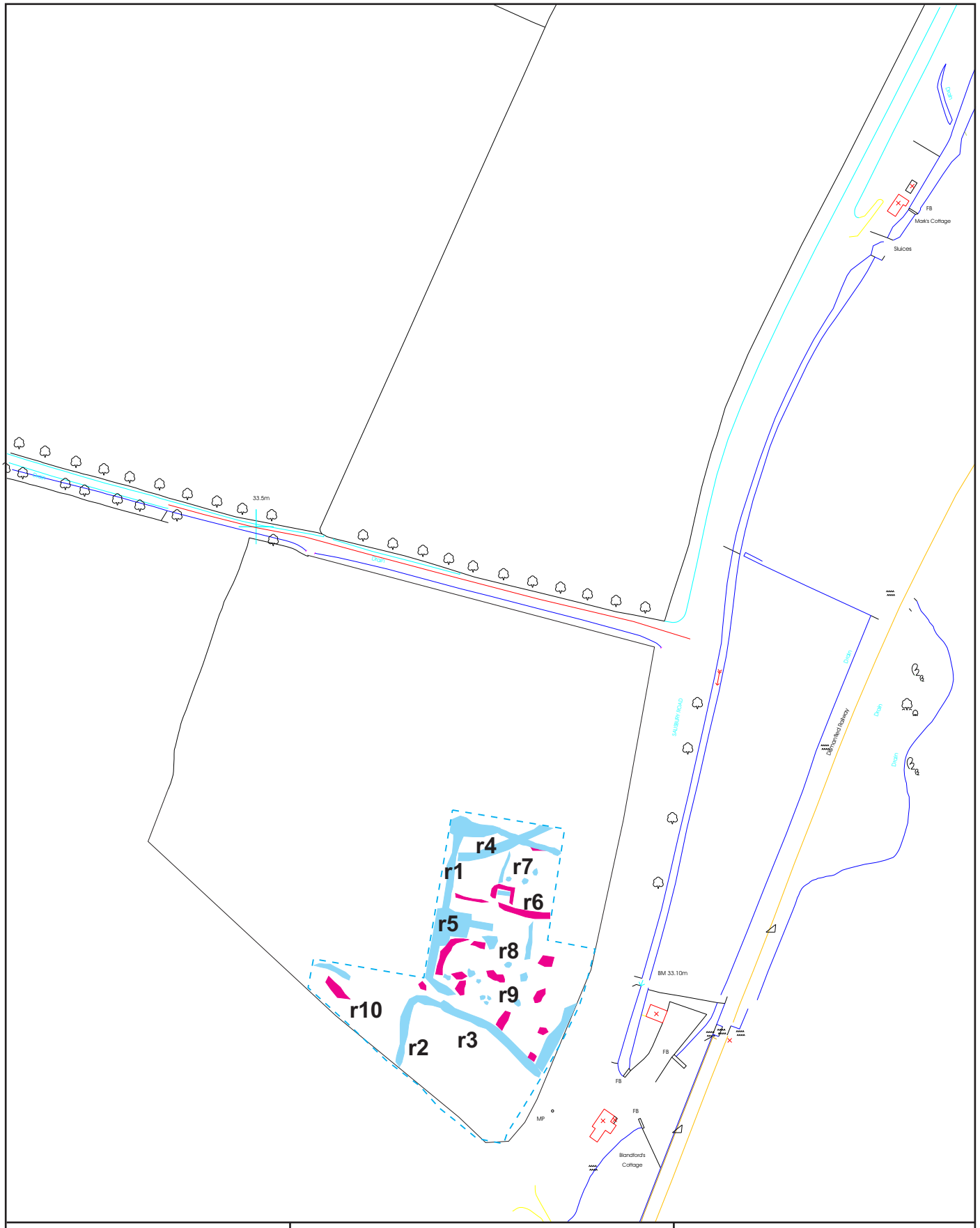

Fig. 20 Interpretation plan derived from the resistivity survey results from the Bullcroft Field

N

0 60m

Breamore Parish, Hampshire

Survey data © Archaeological Prospection Services of Southampton

Map data © Crown Copyright Ordnance Survey. An EDINA Digimap/JISC supplied service.

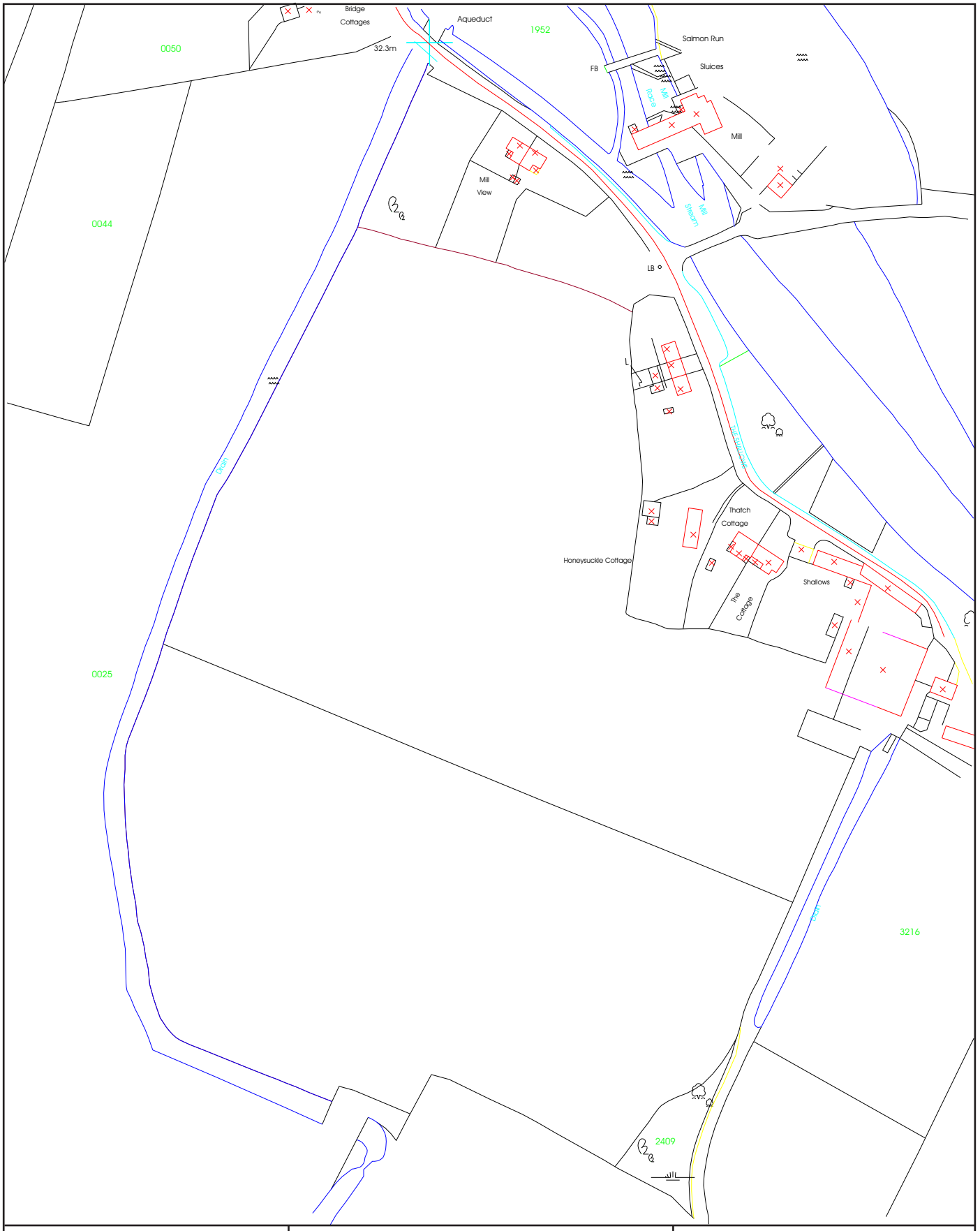

Fig. 21 The survey area at the Shallows

N

0 60m

Breamore Parish, Hampshire

Survey data © Archaeological Prospection Services of Southampton

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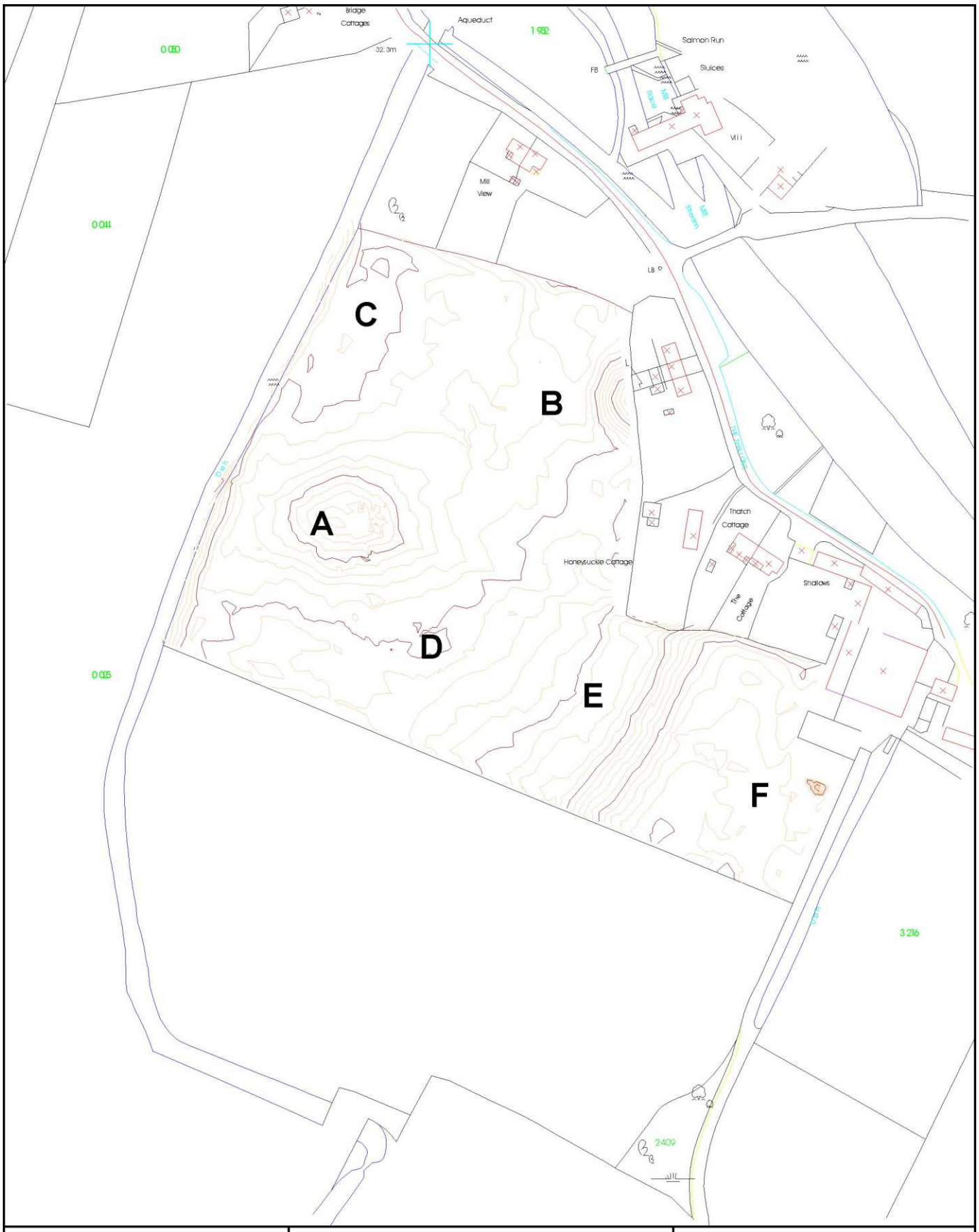

Fig. 22 Contour survey results from the Shallows

N

0 60m

Breamore Parish, Hampshire

Survey data © Archaeological Prospection Services of Southampton

Map data © Crown Copyright Ordnance Survey. An EDINA Digimap/JISC supplied service.

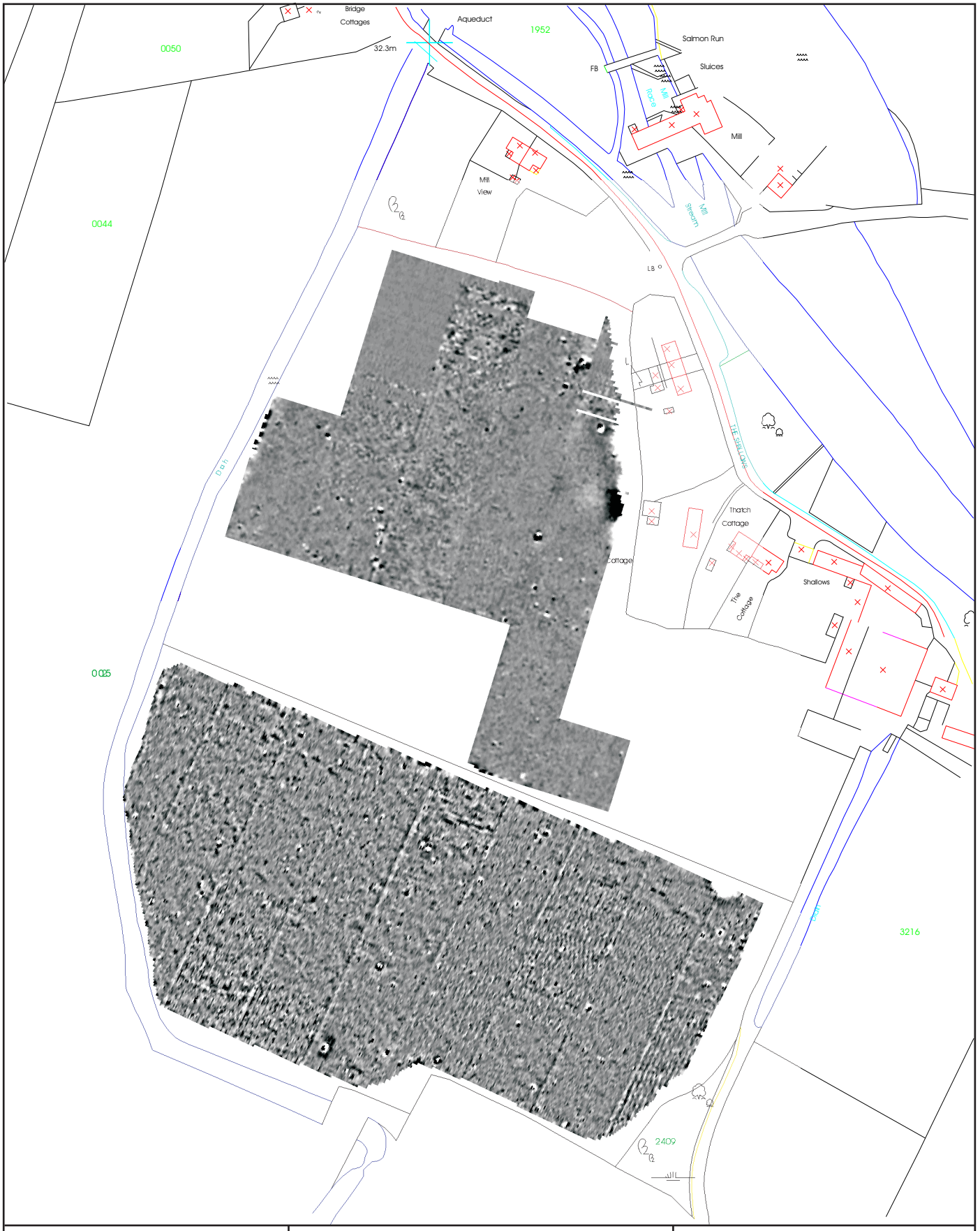

Fig. 23 Greyscale image of the magnetometer survey results from the Shallows

N

1 nT -1

0 60m

Breamore Parish, Hampshire

Survey data © Archaeological Prospection Services of Southampton

Map data © Crown Copyright Ordnance Survey. An EDINA Digimap/JISC supplied service.

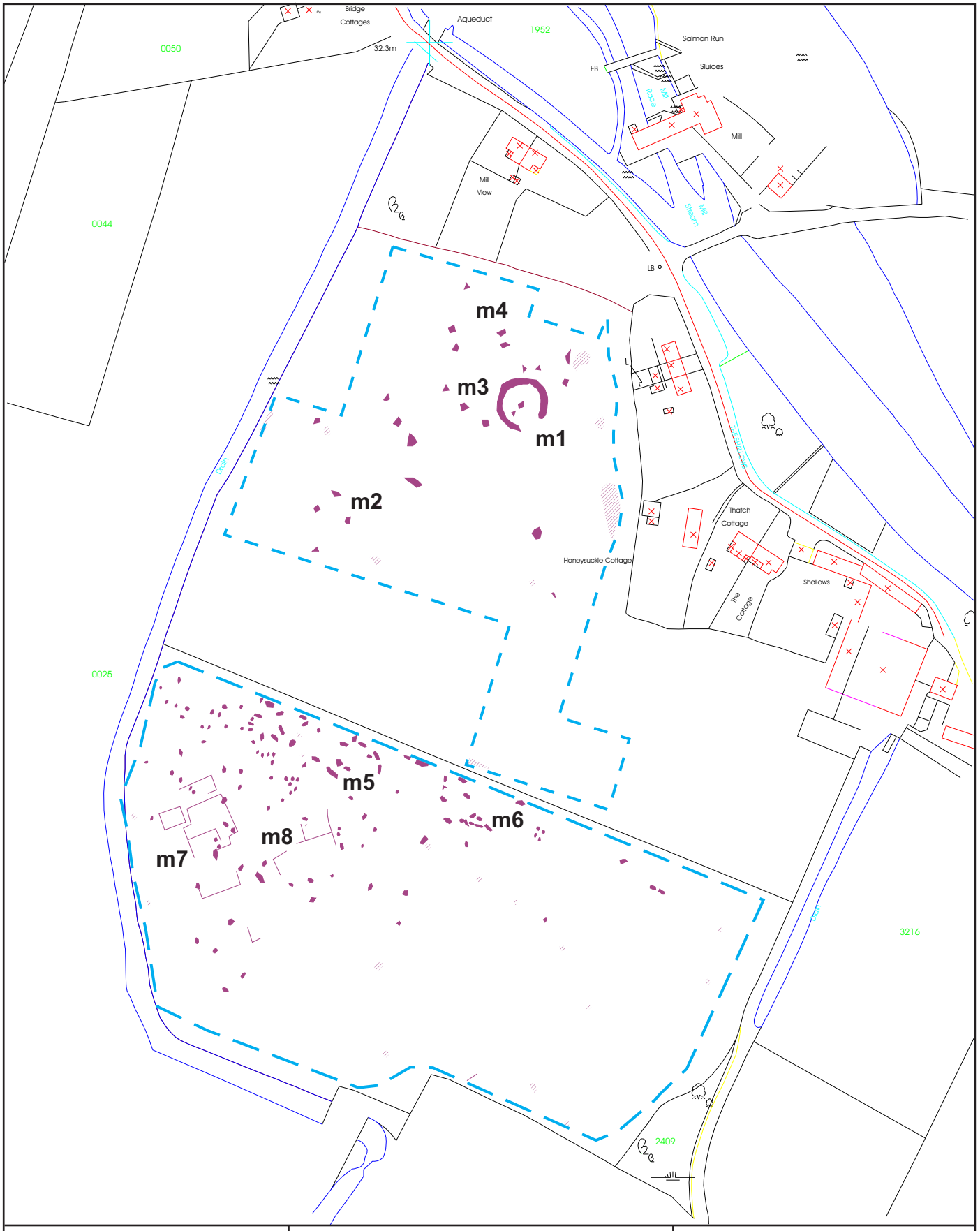

Fig. 24 Interpretation plan derived from the magnetometer survey results from the Shallows

N

0 60m

Breamore Parish, Hampshire

Survey data © Archaeological Prospection Services of Southampton

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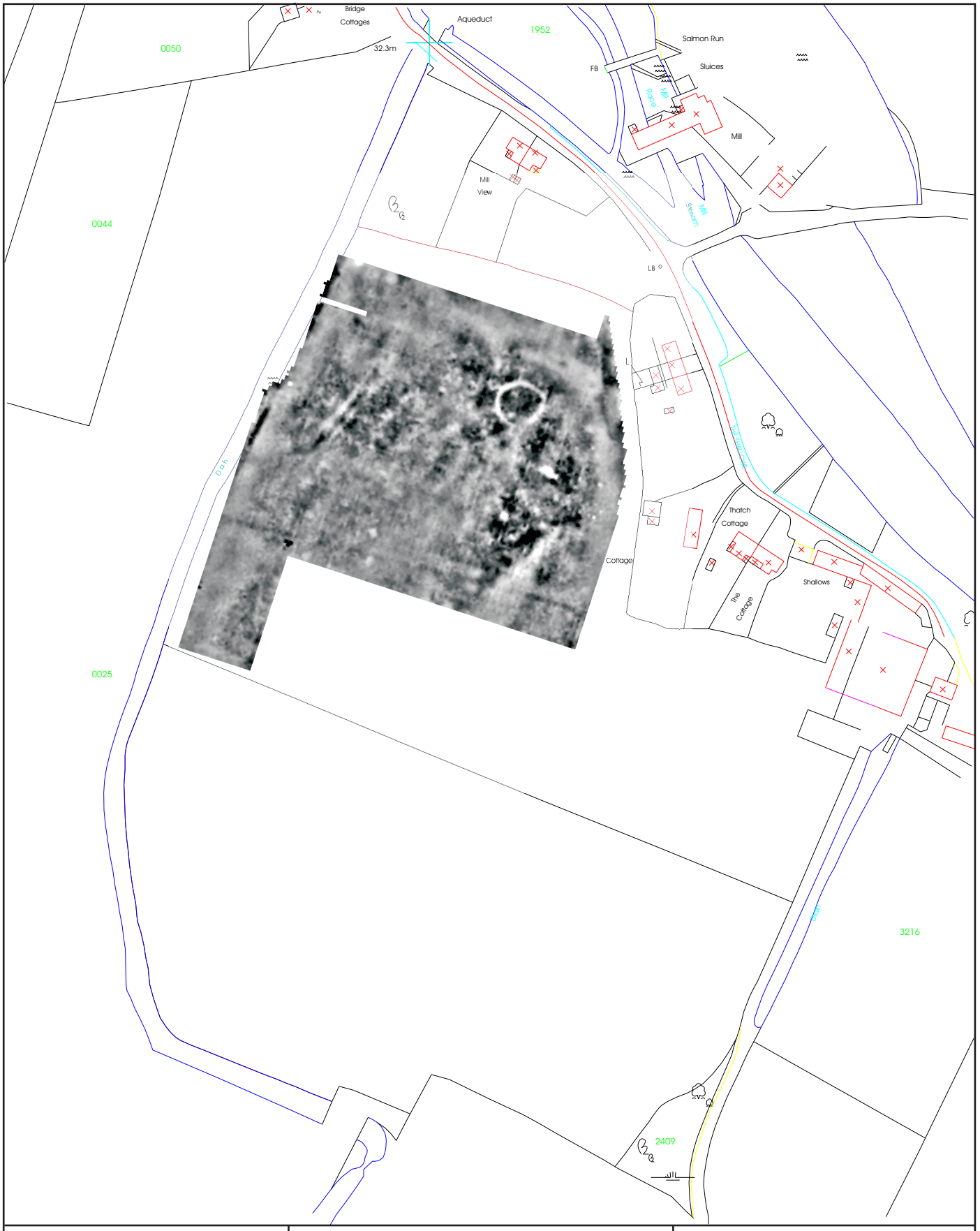

Fig. 25 Greyscale image of the resistivity survey results from the Shallows

N

10 -12

0 60m

Breamore Parish, Hampshire

Survey data © Archaeological Prospection Services of Southampton

Map data © Crown Copyright Ordnance Survey. An EDINA Digimap/JISC supplied service.

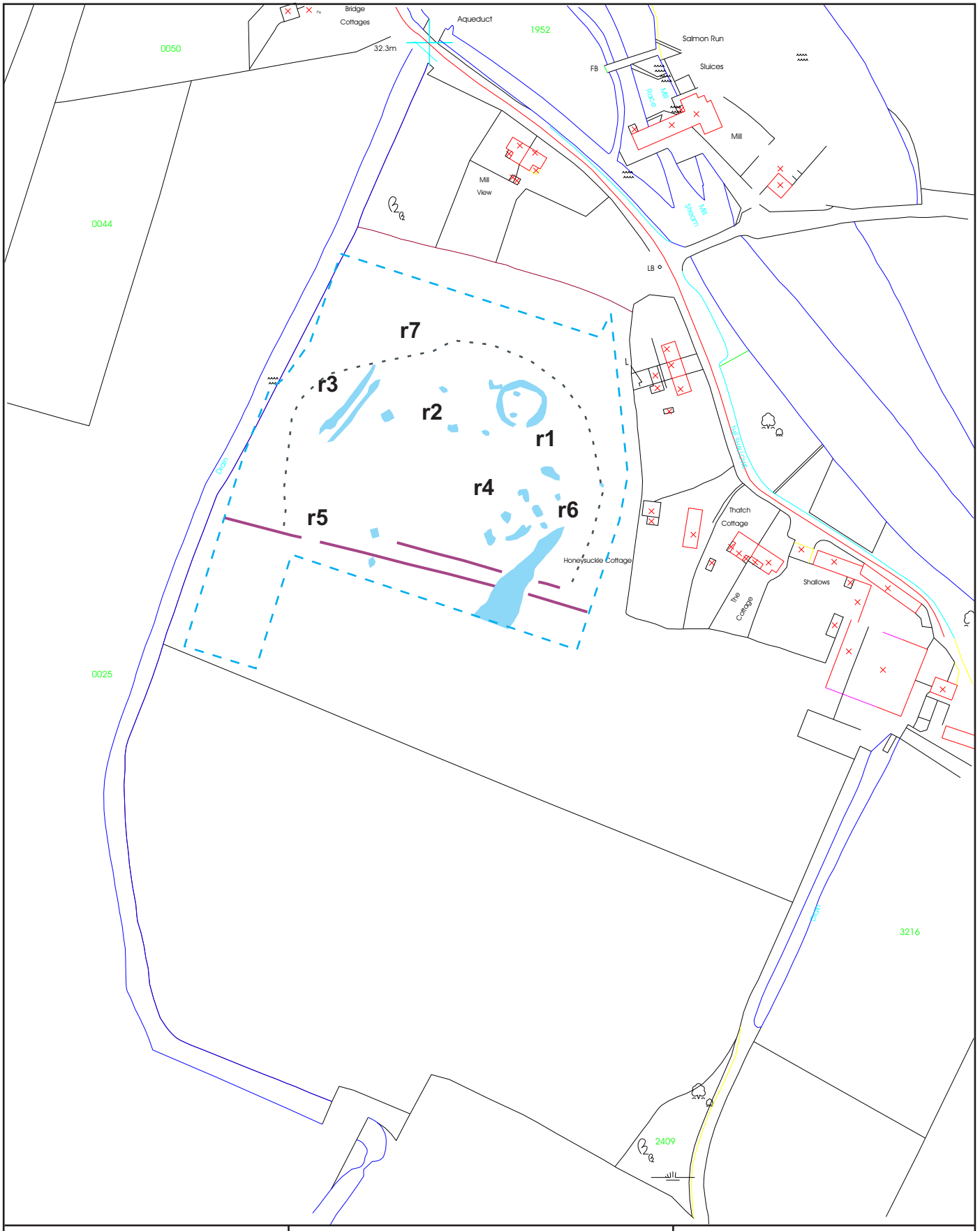

Fig. 26 Interpretation plan derived from the resistivity survey results from the Shallows

N

0 60m

Breamore Parish, Hampshire

Survey data © Archaeological Prospection Services of Southampton

Map data © Crown Copyright Ordnance Survey. An EDINA Digimap/JISC supplied service.

Fig. 27 Magnetic susceptibility survey results from the Shallows

N

0 60m

Breamore Parish, Hampshire

Survey data © Archaeological Prospection Services of Southampton

Map data © Crown Copyright Ordnance Survey. An EDINA Digimap/JISC supplied service.

4. Discussion and Conclusions

The results of the geophysical survey at Breamore between 2001 and 2003 successfully located and mapped a large number of buried archaeological remains probably associated with the prehistoric and medieval habitation of the area. Features in the results are concentrated around three main areas; around the Parish church at Breamore Park, along the gravel terrace in the Bullcroft Field ,and along the gravel ridge above the river in the Shallows. It is thus more expedient to divide the discussion of the results into these three areas.

In Breamore Park, the earliest, and most nucleated, phase of settlement seems to be situated to the west of the 11th century church. Both the magnetometer and resistivity surveys indicate an extensive settlement, possibly middle to late Saxon in date, cut by a later enclosure ditch. The ditch itself is aligned on the much later churchyard walls of the planned estate, suggesting that the enclosure did in fact contain the church and churchyard, and therefore may itself date from the 11th century. This enclosure has in itself been removed, along with any remnant of nucleated settlement in the area, during the phases of building and development of the manor house and park. The results prove beyond doubt that the dispersed settlement pattern which currently exists at Breamore, and has formed the main pattern of settlement for at least the last 500 years, was preceded by a settlement in the vicinity of the church.

The results from the park also indicate the large scale of the later development of the landscape around Breamore House. There is evidence of massive garden terraces to the south of the facade of the manor house. The location of these features in the geophysics suggests at least three terraces overlooking the Avon Valley. From the form of these features, it is probable that they date to the 17th century, together with the features situated in the *vista* to the east. These gardens were most probably replaced by open parkland in the 18th century.

Results from elsewhere in the parkland show the dispersed nature of settlement in the area. This includes a large number of route-ways cutting across the landscape. At least two roads run to Breamore Park from the east, the first towards the entrance to the churchyard, and the second to the south. Further routes run from the lower terraces of the river valley up to Breamore from the south east. A number of discreet features are situated along the line of these routes, suggesting the existence of dispersed medieval and post-medieval dwellings along the pattern of roads, as opposed to any form of settlement directly in the vicinity of the manor.

The area of the Bullcroft Field is dominated by later prehistoric features associated with a barrow cemetery, and a probable Roman to early medieval settlement immediately to the south. 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. From the form of the features, it is probable that the settlement is early medieval in date, and consisted of timber dwellings within an enclosure, with a surrounding field system. The close proximity of this settlement to the cemetery would suggest that the inhabitants knew of its location to the north, and they could have re-used the area. This makes the existence of secondary inhumations in the barrows, and other burials in the area more likely.

The results of the survey in the Shallows indicate a series of features which are probably part of the Saxon cemetery at Shallows Farm. However, the discrete nature and size of many of the anomalies makes interpretation of their exact origin difficult. Many of the small anomalies in the north and west of the field are probably responses to the fill of graves, from the difference in the topsoil used to refill the grave cuts, and ferrous objects deposited in the burials. All of these features seem to be focused on an earlier barrow-like feature on the gravel ridge. This pattern of re-use of a Bronze Age barrow cemetery in the early medieval period is a well attested phenomenon. There exists a significant possibility that the barrows in the Bullcroft Field may also have been re-used for later funerary activity. Some of the responses to resistivity in the Shallows may be misleading, as many of them indicate the location of recent excavation trenches as opposed to burials, even though the trenches were originally located over graves (Berkshire Archaeological Services 2001, 7ff). Neither set of survey results produced any sign of a clear boundary to the cemetery. This may be due to the lack of any such feature, although the resistivity and magnetic susceptibility results do suggest a concentration of activity on the gravel terrace around the funerary monuments.

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, and to Mr Peter Martin and Mrs Fletcher at Shallows Farm for permission to undertake the work. The help of the dairyman Mr Andrew Ayres is also gratefully acknowledged. At Hampshire County Council thanks go to the County Archaeologist for Hampshire Mr David Hopkins, for commissioning the 2001 survey, and to Ms Sally Worrell. 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: Dom Barker, Laura Catlin, Virginia Dellino, Chris Duke, Neil Edmonds, Joe Flatman, Pina Franco, Tom Goskar, Sophie Hay, Pete Klemen, Alice Matcham, Jason Lucas, Edward Oakley, Marcy Rockman, Graham Tait, Julian Jansen van Rensburg and Judith White. Finally, sincere and grateful thanks go to the British Academy, the ACI-TTT of the French Ministry of Research/CNRS UMR 6575 Laboratoire Archéologie et Territoires, University of Tours, and Hampshire County Council for funding this research.

Plate 1 The River Avon to the east of the 2001 survey area.

Plate 2 The late Saxon church at Breamore.

Plate 3 Magnetometer survey being carried out in the Shallows

Plate 4 Multiplexed resistivity survey in the Rally Field, near Breamore church

Plate 5 Magnetic susceptibility survey in the Shallows

Appendix 1 - Details of Survey Strategy

Dates of Survey: 28th to 31st October 2001; 15th March -20th April 2002; 30th August - 15th September 2002; 1st – 20th August 2003

Site: Breamore

District Parish: Fordingbridge

County: Hampshire

Grid Reference: SU 1518

Surveyor: University of Southampton

Personnel: Dom Barker, Laura Catlin, Virginia Dellino, Chris Duke, Neil Edmonds, Joe Flatman, Pina Franco, Tom Goskar, Sophie Hay, Pete Klemen, Christopher Loveluck, Alice Matcham, Jason Lucas, Edward Oakley, Marcy Rockman, Kris Strutt, Graham Tait, Julian Jansen van Rensburg, Judith White

Geology: Gravels and alluvial deposits

Survey Type 1: Magnetometer

Approximate area: 38 hectares

Grid size: 30m

Traverse Interval: 1m

Reading Interval: 0.5m

Instrument: Geoscan Research FM36

Resolution: 0.1 nT

Trigger: Encoder

Survey Type 2: Resistivity

Approximate area: 11 hectares

Grid size: 30m

Traverse Interval: 1m

Reading Interval: 1m

Instrument: Geoscan Research RM15

Resolution: 0.1 Ω

Probe Configuration: Twin electrode

Probe Separation: 0.5m

Survey Type 3: Topography

Approximate area: 23 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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