

Quarr Abbey
Geophysical Survey Report
November 2002



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**Archaeological Prospection
Services of Southampton**



**University
of Southampton**

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Frontispiece *Detail of Percy Stone's plan of the abbey of St Mary, 1891 (Stone 1891, pl. XXVI).*

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Summary

This report presents the results of a geophysical and topographic survey undertaken at Quarr Abbey, near Fishbourne, on the Isle of Wight, in the summer of 2002. It specifies the survey methodology together with an interpretation and discussion of the survey results. The integrated resistivity and magnetometer survey across the site, combined with a survey of the topography, was successful in locating and mapping the buried remains of the Cistercian abbey of St Mary. The cloisters, undercroft and chapter house of the order were all clearly visible in the resistivity survey results, and these were augmented by the limited success of the magnetometer survey.

1. Introduction

Between the 25th July and 14th August 2002, a geophysical survey was undertaken at Quarr Abbey, Isle of Wight (fig. 1), by the Department of Archaeology at the University of Southampton. The survey marked a phase of the ongoing Isle of Wight Medieval Settlement Project, directed by Mr. Timothy Sly of the University of Southampton. It was carried out with the aim of locating buried archaeological remains in the area of 19th century excavations, which had uncovered sections of the Cistercian monastic complex.

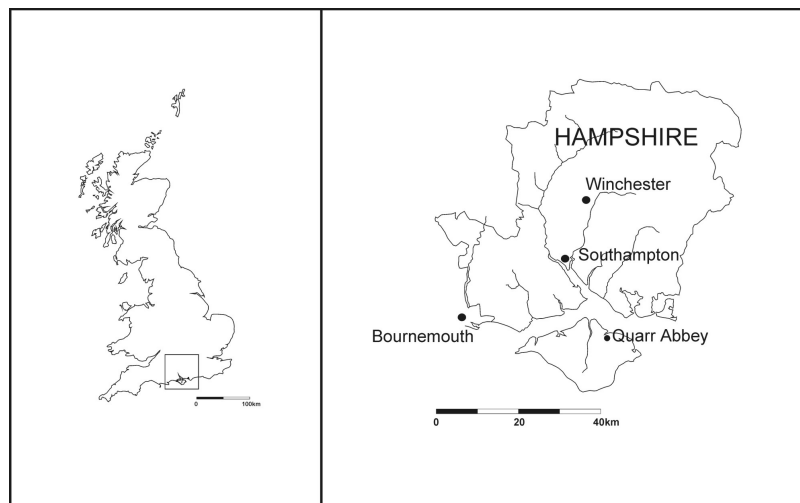


Fig. 1 Location map of Quarr Abbey, the Isle of Wight

1.1 Location and Background

The site of the pre-Dissolution abbey at Quarr, a major house of the Cistercian order, lies within the environs of the later Benedictine complex inaugurated in the 19th century. The abbey of St Mary was founded by Baldwin de Redvers in 1131, and dedicated to the Blessed Virgin (Stone 1891, 31). The first monks to inhabit the abbey came from a monastery at Savigny, Normandy, and throughout the 12th and 13th centuries the abbey grew in importance, generating estates, tithes and rents from the surrounding countryside and in Normandy (ibid, 31).

It appears that St Mary's rose to absolute power on the Isle of Wight, and severed contact with Savigny in 1238, when a bull of pope Gregory IX allowed the abbey at Quarr to chose its own confessor from the monastic community (Stone 1891, 32). In this period, the monastery was favoured by Royalty, including Henry III, and was granted a licence in 1340 to fortify itself using walls and towers (see Plate 3). This work appears to have involved the fortification of the abbey and the coastline to the north (ibid, 32).

In the 16th century, during the Dissolution, Quarr fell into the hands of the Crown. Many of the buildings of the monastic complex were then demolished for sale of building material. By 1781, the account of Sir Richard Worsley stated of Quarr that 'the refectory or Common Hall is the only building remaining entire: it is now a barn...' (Stone 1891, 34). This tradition of reuse has continued, and the surviving remains of the earlier abbey can still be seen incorporated within the later farmhouse and farm buildings (Plate 1). The stretches of the precinct wall to the north, east and south-east, together with a preserved length on the west in the garden of Quarr Lodge, are the only other signs of extant masonry (Clark & Sly, 1998: 45; Plate 2). Although antiquarian interest was shown in the history and remains of the complex, the only archaeological investigation undertaken at Quarr was initiated by Percy Stone at the end of the 19th century. This work involved some excavation of the abbey remains, and while a plan of the complex was derived from the work (see Fig. 9 below; Stone 1891, Plate XXVI), many of the conclusions were extrapolated from the limited areas of excavation, inferring the location of walls, courtyards and features associated with the abbey.

1.2 Aims of Survey

The primary aim of the survey was to determine the exact location of the inner precinct buildings, in particular the abbey church, cloisters and service buildings that had previously been excavated. Therefore, much of the work was centred on the area which was subject to Stone's investigations (referred to here as the 'Excavation Field'). It was also hoped to locate important features associated with the abbey to the east and west. A geophysical survey of the western and south-western regions of the precinct had been conducted by Dr Kate Clark & Timothy Sly in 1997, and had successfully mapped a series of enclosures (Clark and Sly 1998, 45). In 2002, two programs of survey were carried out (Fig. 2). The first was to the east of the abbey in a field separated from the complex by a stream, supposedly the location of a fishpond attached to the monastic

complex (the 'Fishpond Field'). In the summer work was conducted in the field of Stone's 19th century excavations and the field immediately to the north (hereafter referred to as the 'North Field').

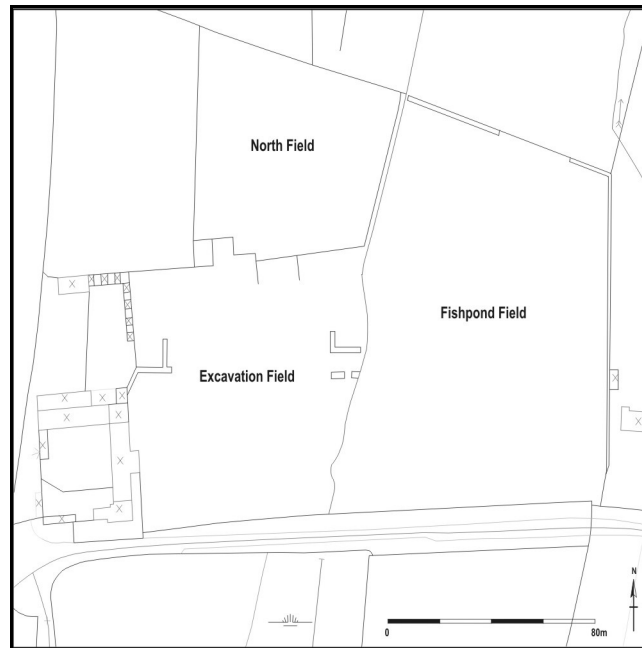


Fig. 2 Location of the survey at Quarr Abbey, showing the Excavation Field, North Field and Fishpond Field.

2. Methodology

2.1 Survey Method

For the survey at Quarr Abbey, two types of geophysical survey techniques were applied, resistance survey, and fluxgate gradiometer survey. Many other methods of geophysical survey could have been used, but previous geophysical survey work conducted at Quarr Abbey had shown that the use of both a resistance survey and a fluxgate gradiometer survey to be successful. 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 (Geoscan Research 1996a; Scollar *et al.* 1990, 362ff). Resistance survey was chosen as the primary technique for locating the medieval monastic buildings uncovered by the excavations of Stone in 1891, as it consistently yields good results when performing surveys of this type (David 1995, 9).

2.2 Survey Strategy

For the survey, grids of 10m by 10m were set out in the Excavation and North fields using a Leica TC(R) 307 total station. The grid was located to Ordnance Survey north, with transects running in a west-east direction. This was the case in both the excavation and northern fields. For the Fishpond Field, a larger grid of 20m by 20m was established on the same alignment.

The magnetometer survey was conducted using a Geoscan Research FM36 Fluxgate Gradiometer. In all cases, readings were taken on 0.5m traverses, at 0.5m intervals. This meant that each grid was registered with dimensions of 5m by 10m, after which the zero drift was logged. Due to the relatively 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 0.5m intervals along 0.5m 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.

The total station was also used to record a series of spot heights within each survey areas at approximately 4m intervals, and on the breaks of slope. This provided a topographical survey of the areas where buried remains indicated in the geophysical survey results.

3. Results of Survey

An area of approximately 2.6 hectares was surveyed at Quarr during 2002. All areas were covered by magnetometer and resistivity survey, and a micro-topography survey was also carried out. Survey covered three fields to the east of the modern Benedictine monastery; the so-called Excavation Field, the site of Stone's excavations in the 19th century (Stone 1891), the adjacent field to the north (the 'North Field'), and the field to the east across a small stream, referred to here as the Fishpond Field. Coverage was designed to map the extent of the Cistercian abbey, and locate any associated structures and enclosures to the north and east of the main building complex.







Magnetometry	
	Positive linear anomaly (walls, foundations etc)
	Discrete dipolar anomaly (ferrous material)
	Discrete positive anomaly (building material, pit etc)
Resistivity	
	High resistance linear anomaly (walls, foundations etc)
	Area of high resistance readings (banks, building debris, occupation layers etc)
	Area of low resistance readings (occupation layers, ditches etc)

Table 1 Key to geophysical anomalies represented in the maps (Figs 5-8)

3.1 Topographic Survey

The data collected during the topographic survey were used to produce a relief map of the area, with contours spaced at 10cm intervals, and major contours marked at 0.5m intervals (Fig. 3). The final map illustrates the variable nature of the topography across the site (Fig. 4). In the western part of the area, the ground slopes gently from a height of 7m a.s.l. (A) between the field boundary and farm outbuildings, towards the Excavation Field. This slope evens out at a small plateau (B), adjacent with the eastern edge of the farm buildings. An acute gully is marked running across the field from north to south (C),

then the ground slopes steadily towards the stream, from the level of the farm outbuildings (**D**), towards the north east. The field flattens out considerably in its centre (**E**), and a complicated series of small rises and dips mark the eastern part of the field (**F**), almost at the level of the stream. These appear to be associated with the buried remnants of the monastic complex. To the north, a small gully cuts the ground (**G**), running to meet with the line of the stream. The northernmost part of the Excavation Field is more level, particularly where it borders the North Field (**H**). Indeed, the nature of the ground changes considerably in the North Field itself, with a smooth, slightly undulating ground survey (**I**), falling steadily to the north east corner of the field (**J**).

In the Fishpond Field to the east, the topography rises steeply from the level of the stream (**K**) to a height of 9.5m in the south east corner of the field. Much of the ground is featureless. However, a series of earthworks are situated immediately to the east of the stream (**L**), adjacent to the main monastic complex, in close proximity to the point at which the chapel crossed the line of the watercourse. To the east, a slight depression indicates the area of the fishpond (**M**), from which the ground rises sharply to the south and east (**N**). The northern part of the field is marked by a small gully (**O**), possibly the line of a field drain which runs to meet the line of the stream. The ground to the north east levels out slightly (**P**), before rising to a height of 7.5m a.s.l.

3.2 Geophysical Survey

3.2.1 The Excavation Field

Results of the resistivity survey indicated clearly the extent and complexity of the monastic buildings at Quarr (Fig. 5). In fact the arrangement of features is remarkable similar to those presented in Stone's plan of 1891 (Fig. 6; also see Table 1). To the west the complex is concentrated around a cloister [**r1**], some 30m across. Further to the east features are located around a similar open area [**r2**], organised into a series of rectilinear features indicating rooms, aligned in a north-south direction. In the north west corner of [**r1**] there is a sub-circular anomaly some 8m in diameter [**r3**], possibly the remains of a baptistery, a large font or even a dovecote. The northern edge of the cloister is delineated by a high resistance linear feature [**r4**], and runs for a distance of almost 20m, before turning to the south. The south east angle of the cloister is similarly marked [**r5**]. Two parallel high resistance linear features run to the north for a distance of 30m [**r6**], divided by a number of internal features, marking a series of rooms.

The southern side of the complex is defined by two parallel high resistance linear features [**r7**], spaced 10m apart, running for a distance of 70m. These demarcated a corridor, with buttressed walls showing the north aisle of the nave choir on the map of Percy Stone. A small area of complicated rectilinear anomalies is located immediately to the north [**r8**], traces of a series of rooms. A more articulate number of anomalies is present further to the north, demarcating a corridor [**r9**] running approximately 30m from west to east, abutting a small chamber [**r10**]. Traces of further features are just visible to the north [**r11**]. In the central portion of the Excavation Field, and to the north, a series of linear and rectilinear features demarcate the north west corner of a courtyard [**r12**], and its

associated chambers and aisles [r13]. As will be discussed below, many of the features marked on Stone's plan are readily visible in the resistivity results of the same area.

The magnetometer survey of the Excavation Field (Fig. 7) was partially successful in locating some of the archaeological features associated with the site (Fig. 8). There are a large number of dipolar and positive magnetic anomalies located across the field, but they have no apparent orientation, and are of mixed sizes, ranging from 0.5m to 1m in diameter. The dipolar anomalies appear to be concentrated around the central area of the field [m1], although there are others towards the north end of the field [m2]. The positive magnetic anomalies do not appear to have any particular focal point. Towards the north of the field there is an ephemeral rectilinear feature which may represent one of the original abbey buildings [m3]. The feature is approximately 20m by 10m, and is aligned cardinally. To the west of this feature there is a series of ephemeral linear features which could also represent a building from the original abbey. This feature is slightly smaller than [m3], and also appears to be aligned cardinally. However, the possible northern wall of this feature does not align with the southern and eastern walls, and it is therefore difficult to make an accurate prediction as to the exact nature of this feature. Further dipolar and positive anomalies are situated to the west [m4].

3.2.2 The North Field

Resistivity survey in the North Field demonstrated the worth of extending the survey area beyond the immediate area of the monastic complex (Fig. 5). A number of linear resistance features were mapped associated with the plan of the abbey (Fig. 6). To the west, a linear feature runs from north to south for a distance of 60m [r14], parallel to, and located 5m from the western boundary of the field. Similar anomalies shadow the field boundaries to the north and east. To the north, the linear feature is positioned 15m from the boundary [r15], and to the east it is 5m from the boundary [r16]. These features seem to indicate pathways or borders to a garden associated with the abbey.

The magnetometer survey successfully located features similar in dimensions to those in the resistivity (Figs 7 and 8). From the survey of the North Field, a series of three adjoining linear features can be seen on the north, east and west sides of the field, [m5], [m6] and [m7], all respecting the field walls. It is understood that this field may have previously been a kitchen garden, although there is some debate as to whether this may have been during the time of the monastery, or post-dissolution (Brother Gregory pers. Comm.). If this is indeed the case, then this set of linear features could represent paths around the edge of the garden. On the western side of the field, a circular feature with a radius approximating 4m can be clearly seen [m8], although a definitive explanation for this is unclear. One possibility could be remains of a garden bed used for growing vegetables or other garden plants. Running along the northern edge of the field, in close relation to the possible path, are a series of 11 dipolar anomalies [m9]. The dipoles are of differing sizes ranging between 0.5m and 1m in diameter and have no apparent

orientation. There are large amount of positive anomalies with similar characteristics to the dipoles, and the main concentration of these also appears to be focused along the northern path line. To the east, another linear feature runs approximately 15m to the west of the field boundary [m10]. Another linear anomaly is visible in the south-central portion of the field [m11], together with a concentration of positive and dipolar anomalies [m12] and [m13].

3.2.3 The Fishpond Field

The results of the geophysical survey in the Fishpond Field were less impressive than those produced from the areas to the west of the stream. The probability of locating substantial structural remains seemed unlikely bearing in mind the change in topography, with a steep hillside overlooking the abbey complex. Nevertheless a number of intriguing features were located.

In the resistivity survey, a large high resistance curvilinear anomaly was mapped, extending from the stream in the south [r17], it runs for a distance of 60m before tapering off at the field edge. The feature continues to the east in the form of a high resistance curve [r19], doubling back on itself and heading towards the stream [r18]. This feature most probably delineated the fishpond associated with the abbey at Quarr. In the centre of the field a series of parallel linear anomalies [r20], in an area of overall higher resistance, show ploughmarks cut into the subsoil of the hillside. In the north east corner of the field a number of ephemeral and inarticulate linear features show the possible existence of further buried structural remains [r21].

Results of the magnetometry were even more inarticulate than those of the resistivity (Figs 7 and 8). Close to the stream a linear anomaly was located [m15], possibly associated with the continuation of the structures at this point from across the stream (see the plan of Percy Stone below). In the south of the field, two broad bands of low positive readings, [m16] and [m17], form an ovate shape, contiguous with the noticeable hollow in the topography, and the location of the supposed fishpond. To the east side of the field, a number of discrete linear and dipolar anomalies are visible [m18].

4. Discussion

The results of the geophysical survey have successfully located a large number of features related to the medieval abbey at Quarr. In the excavation Field, the results indicate that substantial areas of the complex survive, maintaining in most parts the plan produced by Percy Stone (Fig. 9). The central cloisters, nave choir, chapter house, even the infirmary hall and court are visible, confirming the features located by Stone in the excavations (Plate 4). Variations in the strength of anomalies attest to the differences in depth of surviving remains from the modern ground surface. In the magnetometer results, a rectangular room is visible which was not recorded in the resistivity. Bearing in mind the depth of response in the resistivity of between 30 and 50cm below the ground surface, it is feasible that there are deeper deposits which may allude to cellars and foundations of the abbey. It would thus be worthwhile to record the different depths of structures in this field using resistance tomography.

In the North Field, it is impossible to say whether any of the features actually date to the period of the medieval abbey. As I have stated above, there is some speculation over the history of the North Field, and as a result, it is unreasonable to make any firm predictions as to the origin of these features. However, they are aligned with the abbey complex and define an open area to the north of the buildings. The only way in which this will be resolved is by inserting a series of trial trenches over the main listed features. A resistance survey of the same area has confirmed the presence of the linear perimeter feature, but it has still not been possible to draw any accurate conclusions about their origin.

The other main area of interest in the North Field concerns the two possible structures in the eastern half of the field. Both of these possible structures coincide with other linear features and it is uncertain if these are both on the same level. A possible explanation is that these structures do in fact date to the time of the medieval abbey, and the linear features are paths dating from a post-dissolution garden. This is only speculation however, and in order to clarify the situation, the same area should be subjected to a detailed resistance survey with the use of a multiplexer, or if possible a ground penetrating radar survey in order to gain a better understanding of the relative depths of these features. The survey of the North Field has also uncovered a circular feature towards the west of the field. The resistance survey of the same area has confirmed a feature of some description, although it is again highly debatable as to the correct origin of this feature.

As for the Fishpond Field, it is probable that the location of the fishpond and its channel have been recorded in the south of the field, together with heavily truncated remnants of structures associated with the main abbey buildings along the line of the stream. Some evidence of structural remains are also visible in the north east corner of the field, although it is impossible to infer any exact structural form in the results.

The magnetometer survey of the Excavation Field has produced results which offer easier interpretations. The feature to the north is probably one of the buildings belonging to the

medieval monastery. It is likely that this is also the case for the feature to the north west of the field. The resistance survey of this field produced spectacular results and confirmed the presence of the two features mentioned. The resistance survey also served to highlight a vast array of features which are almost certainly the inner buildings of the medieval abbey, and those excavated by Stone in 1891.

As suspected, the resistance survey has produced better results than the magnetometer survey in the Excavation Field. There are a few reasons for this; the most obvious is that a resistance survey is better suited to this type of target where there are a series of ecclesiastical and masonry foundation features. Magnetometer survey results tend to be less favourable than other techniques on clay geology, and combined with the depth at which the features in the Excavation Field lie, it is not surprising that results were disappointing.

5. Conclusion

The geophysical surveys conducted at Quarr Abbey located a large number of features associated with the monastery. In the North Field, a series of potential linear features has indicated the possible remains of garden paths around the northern perimeter of the field. Two potential rectilinear features also indicate the possible remains of buildings, although the ephemeral nature of these features makes an exact interpretation difficult. In the Excavation Field, a series of rectilinear features has indicated the presence of at least two buildings believed to be the remains of the medieval abbey. The magnetometer survey also uncovered a large number of smaller features scattered across the site, although the origin of these features is unknown. Many could be due to modern agricultural debris, whereas others may relate to the archaeology of Quarr Abbey.

6. Recommendations

- Magnetometry has proved to be moderately successful at Quarr Abbey for the identification of likely archaeological remains. It is recommended that this method should be used in future survey work conducted in and around Quarr Abbey.
- Resistivity survey has proved to be very successful in locating sub-surface remains of substantial monumental structures, in particular associated with the Excavation Field. It is therefore recommended that resistivity survey is used as part of an integrated strategy of magnetometry and topographic survey to record and map the location of other deposits at Quarr Abbey.
- The results of resistivity survey from the Excavation Field demonstrate an incredibly clear and excellent response to the method. It is apparent in the results that the remains are situated at different depths in relation to the present ground surface. It would be advantageous to use resistance tomography across this area to provide more information on the relative depths of deposits. A future survey implementing a resistance meter and configured multiplexer array is therefore recommended.

7. 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.

Acknowledgements

We would like to thank the community of the modern Quarr Abbey (Benedictine), in particular Brother Francis and Mark Proctor, for allowing us to work on the ruins of Quarr Abbey (Cistercian) and for being incredibly helpful and hospitable. I would also like to thank the staff of the Isle of Wight County Archaeology & Historic Environment Service for their advice and assistance, particularly Frank Basford. Finally I would like to thank the staff, students and volunteers who undertook the fieldwork at Quarr Abbey (2002) or assisted in other ways: Neil Edmonds, Adam Jackson, Richard Mcewan, Ross Webster, John Whinder, Paul Jenner, Pat Barber.



Plate 1 View of Quarr abbey from the south west, showing the extant abbey remains and farm outbuildings on the site, and the Excavation Field



Plate 2 A more detailed view of the house and remains of the abbey complex shown in Plate 1



Plate 3 The fortified wall and gun ports of the abbey, facing the coast



Plate 4 19th century photograph showing the excavations of Percy Stone

Appendix 1 – Details of Survey Strategy

Date of Survey: 25th July to 14th August 2002

Site: Quarr Abbey, Isle of Wight

District Parish:

County: Isle of Wight

Grid Reference: SZ 661 266

Surveyor: University of Southampton

Personnel: Neil Edmonds, Adam Jackson, Richard McEwan, Tim Sly, Ross Webster, John Whinder

Geology: Clay

Survey Type: Magnetometer

Approximate Area: 2.6 hectares

Grid Size: 10m (Excavation Field, North Field), 20m (Fishpond Field)

Traverse Interval: 0.5m (Excavation Field, North Field), 1m (Fishpond Field)

Reading Interval: 0.5m

Instrument: Geoscan Research FM36

Resolution: 0.1 nT

Trigger: Encoder

Survey Type: Resistance

Approximate Area: 2.6 hectares

Grid Size: 10m (Excavation Field, North Field), 20m (Fishpond Field)

Traverse Interval: 0.5m (Excavation Field, North Field), 1m (Fishpond Field)

Reading Interval: 0.5m (Excavation Field, North Field), 1m (Fishpond Field)

Instrument: Geoscan Research RM15

Resolution: 1 Ω

Configuration: Twin Electrode

Appendix 2 - Archaeological Prospection Techniques Utilised by APSS

The following appendix presents a summary of prospection methods, implemented by the University of Southampton and 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 0.1 Ω , 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, APSS utilise the Geoscan Research FM36. 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 emphasise 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 are 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.

Appendix 3 – Greyscale, Trace and Colour Shade Plots of the Survey Results

App 3.1 Greyscale image of the resistivity survey results for the Excavation Field, with the survey grid superimposed.

App 3.2 – Colour shade plot of the resistivity survey results for the Excavation Field.

App 3.3 – Relief shade plot of the resistivity survey results for the Excavation Field.

App 3.4 – Greyscale image of the magnetometer survey results for the Excavation Field, with the survey grid superimposed.

App 3.5 - Colour shade plot of the magnetometer survey results for the Excavation Field.

App 3.6 – Relief shade plot of the magnetometer survey results for the Excavation Field.

App 3.7 – Greyscale image of the resistivity survey results for the North Field, with the survey grid superimposed.

App 3.8 – Colour shade plot of the resistivity survey results for the North Field.

App 3.9 – Relief shade plot of the resistivity survey results for the North Field.

App 3.10 – Greyscale image of the magnetometer survey results for the North Field, with the survey grid superimposed.

App 3.11 – Colour shade plot of the magnetometer survey results for the North Field.

App 3.12 – Relief shade plot of the magnetometer survey results for the North Field.

App 3.13 – Greyscale image of the resistivity survey results for the Fishpond Field, with the survey grid superimposed.

App 3.14 – Colour shade plot of the resistivity survey results for the Fishpond Field.

App 3.15 – Relief shade plot of the resistivity survey results for the Fishpond Field.

App 3.16 – Greyscale image of the magnetometer survey results for the Fishpond Field, with the survey grid superimposed.

App 3.17 – Colour shade plot of the magnetometer survey results for the Fishpond Field.

App 3.18 - Relief shade plot of the magnetometer survey results for the Fishpond Field.

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Fig. 3 Results of the topographic survey from the 2002 season



Fig. 4 Interpretation plan of the topographic survey

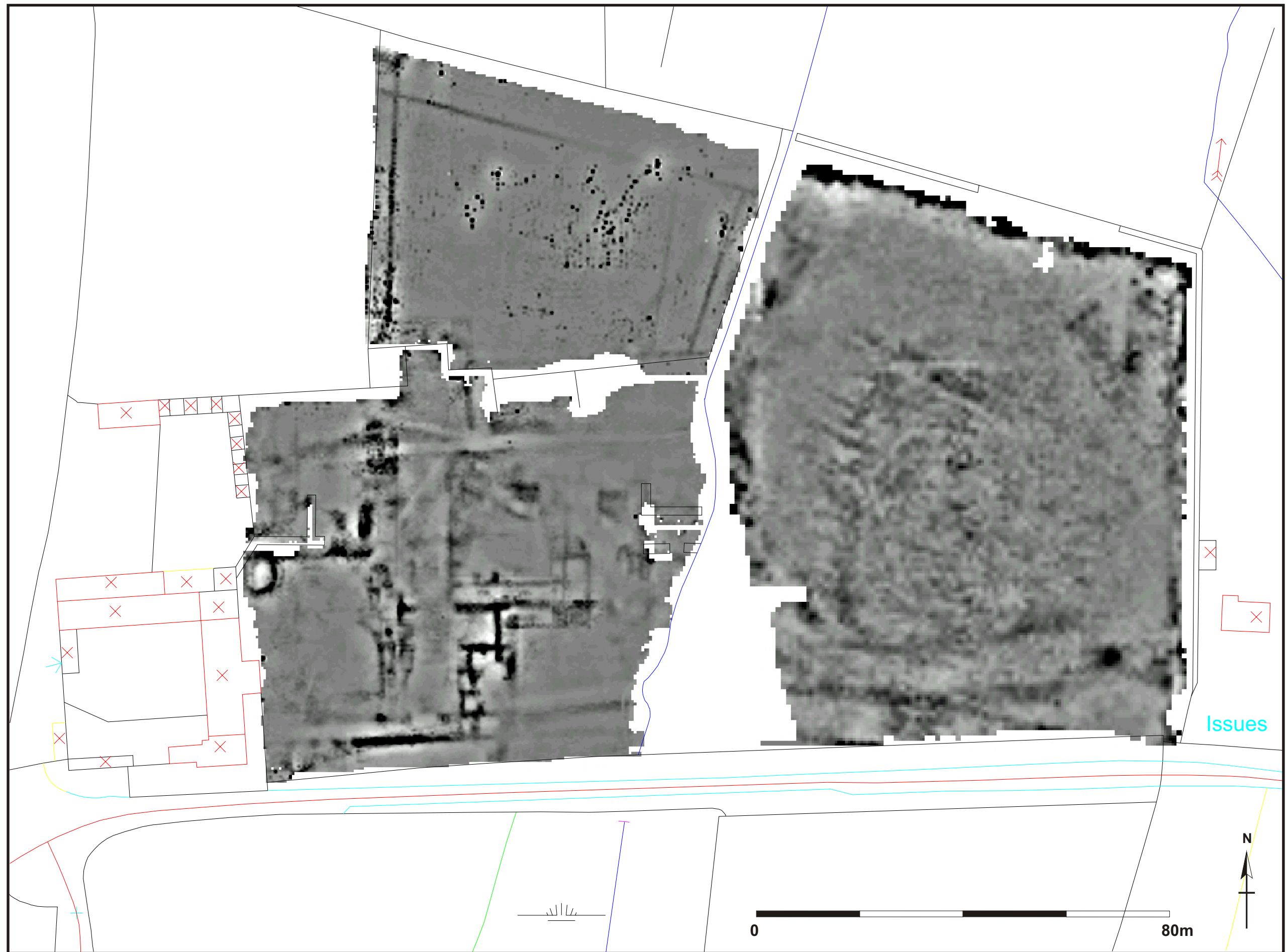


Fig. 5 Results of the resistivity survey from the 2002 season

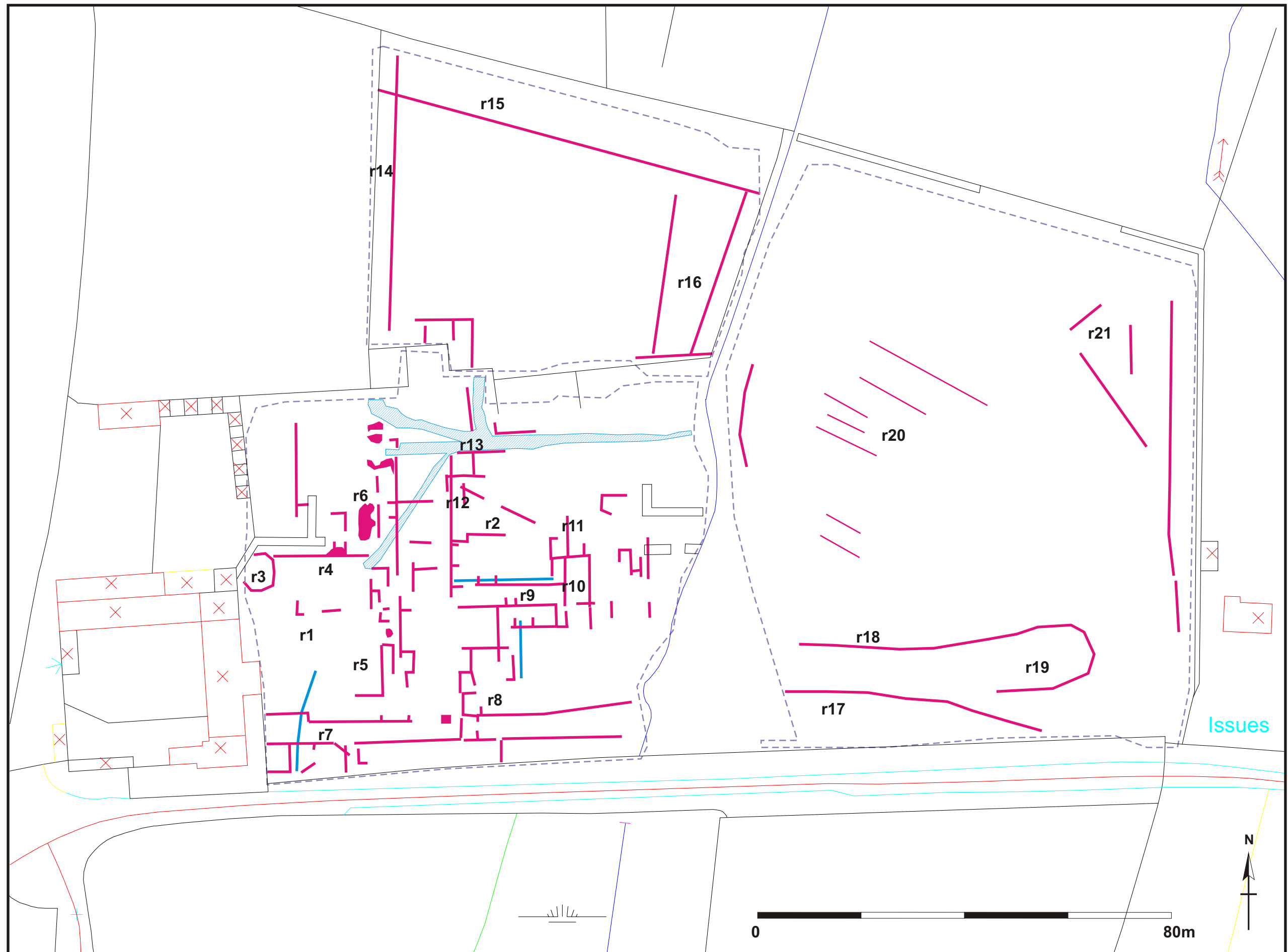


Fig. 6 Interpretation plan derived from the resistivity survey results

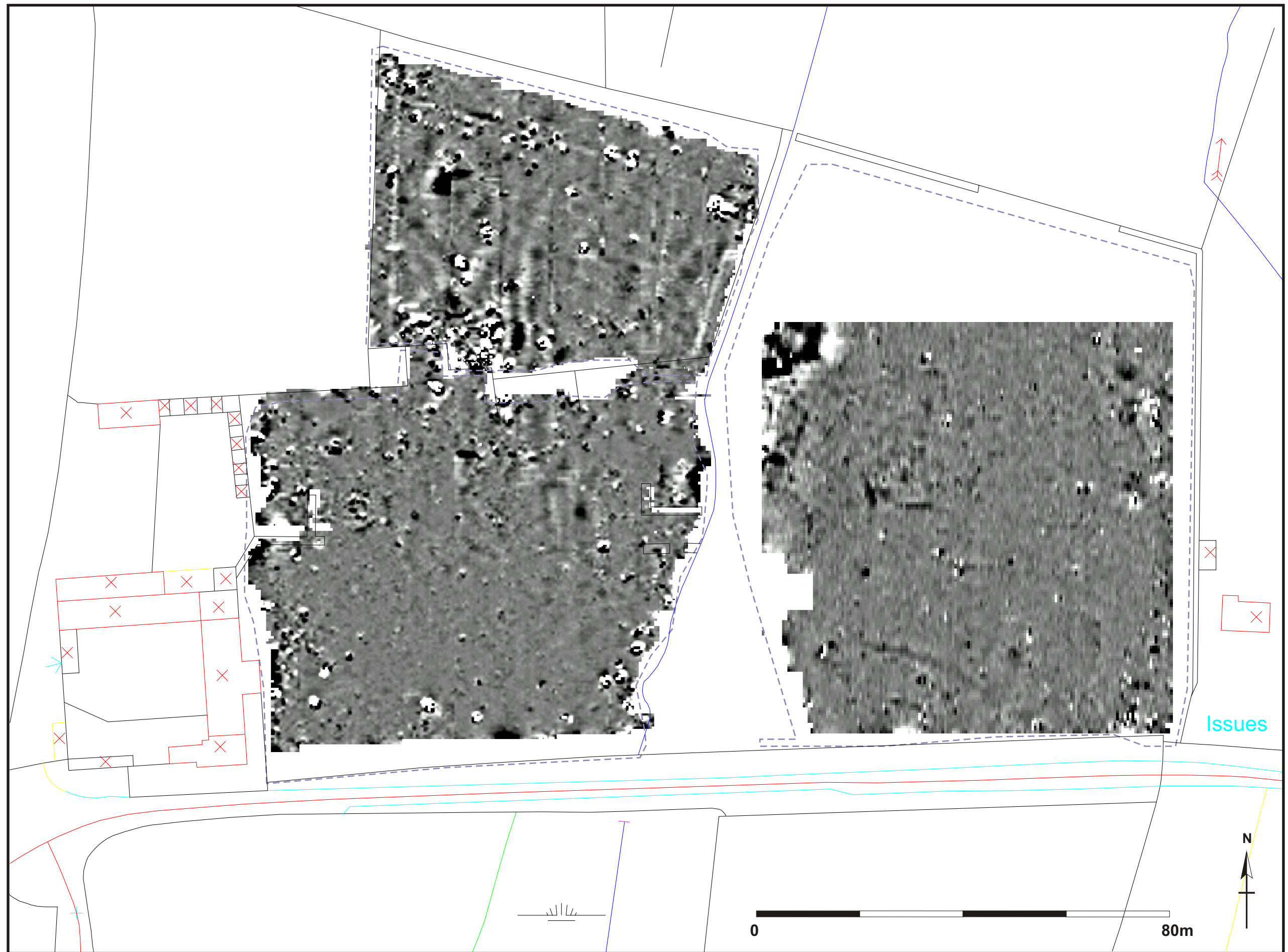


Fig. 7 Results of the magnetometer survey from the 2002 season

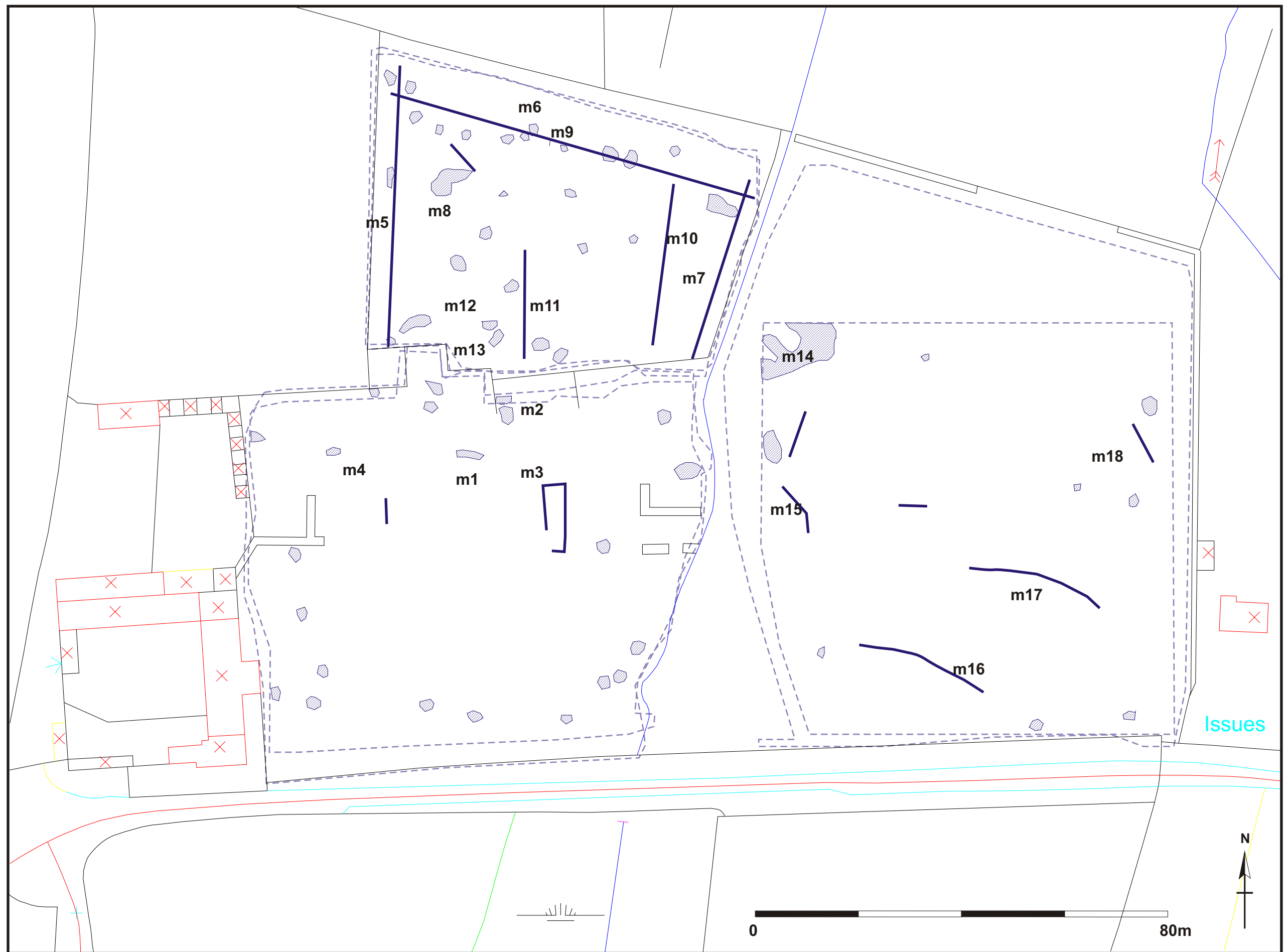


Fig. 8 Interpretation plan derived from the magnetometer survey results

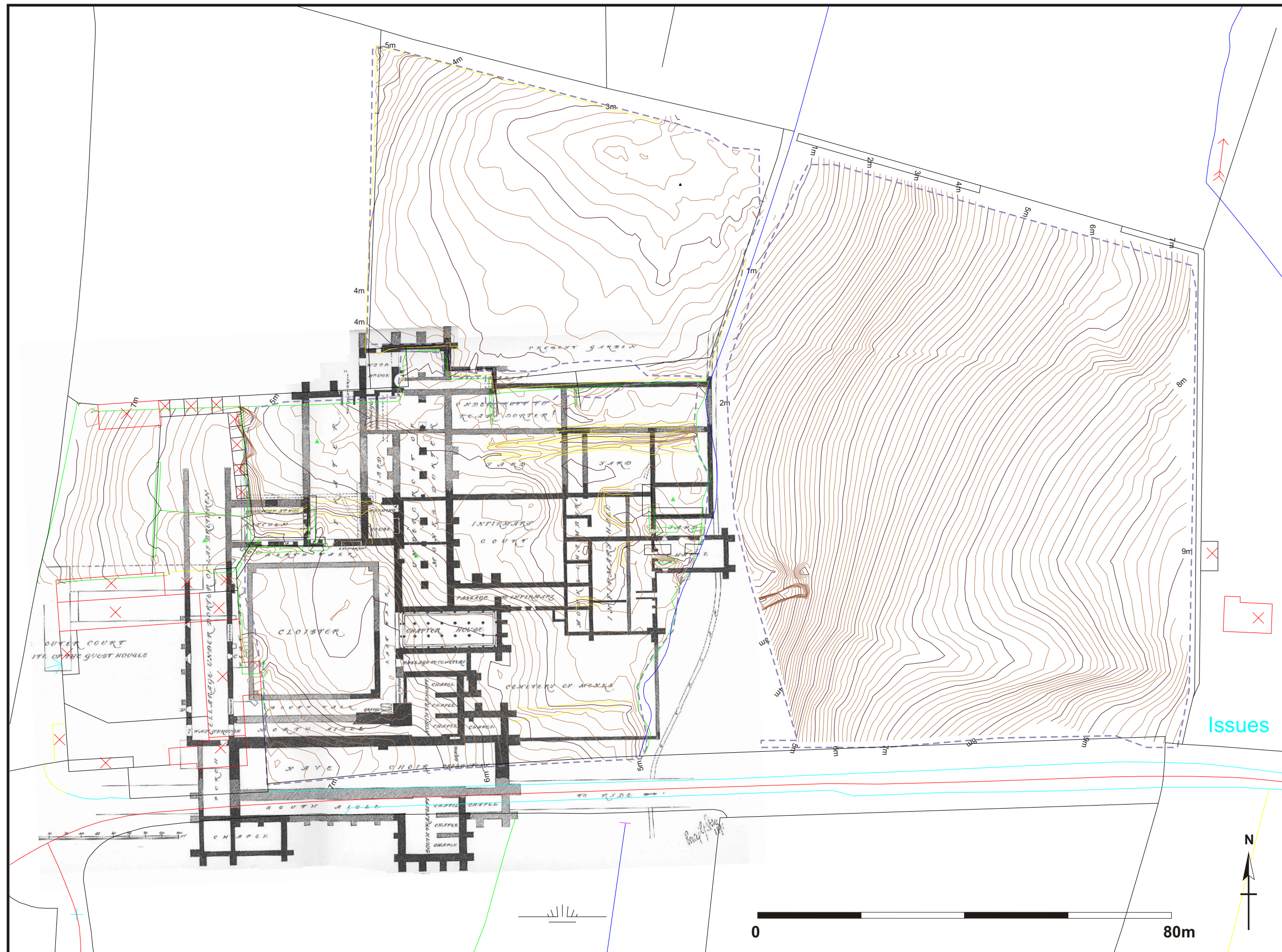


Fig. 9 Map showing the approximate location of the 1891 plan of Percy Stone in relation to the modern topography