3 The results and interpretation *by Paul G Johnson*

3.1 Introduction

The areas of survey were as follows (Illus 2, above): the cemetery and church area; the Bu Lawn, which corresponds to the rest of the Guardianship area; the West Field which is the area adjacent to the western boundary of the Guardianship Area; the East Field, lying to the east of the burn which runs along the eastern side of the Scheduled Area, slightly down-slope from the Guardianship Area.

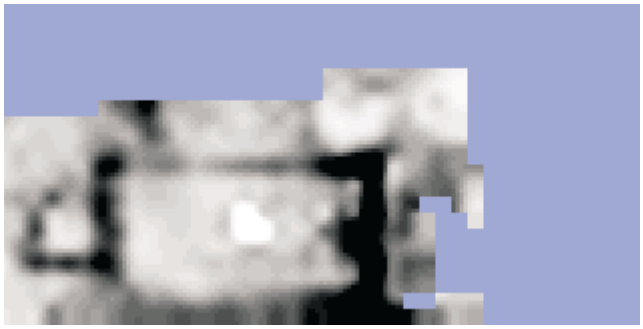
In addition, survey was also undertaken at Lavacroon and in the North Field, and will be presented as a separate report (Johnson and Batey forthcoming); only the work in the North Field, which indicates the line of a potential water-source from the mill dam to the Norse mill may be associated with events taking place adjacent to the Guardianship site. Although it is worth pointing out that the site of Lavacroon is clearly a metal-working complex, which may have supplied the material for the metalwork identified in the earlier excavations at the Bu (discussed in Batey 2003). All these areas form part of the same Earl's Bu, or farm estate complex.

3.2 The cemetery area

The cemetery contains the partial remains of the Round Church, and until relatively recently contained the 19th-century parish church for Orphir built in 1829. This has now been demolished and the present parish church is sited some distance inland of the Bu. The 18th-century predecessor of the 19th-century church was situated a small distance to the south, built in 1705 and repaired in 1756 and was demolished at the time of the building of the replacement. The results of the gradiometer and resistivity surveys undertaken within the confines of the cemetery adjacent to the remains of the Earl's Bu are shown in Illus 3 and 4. It is possible that remains of this earlier church may be visible in the resistivity plot (Illus 4), at its southern edge. The new church was partially built upon the remains of the Round Church, dated to the 12th-century, the act of construction most probably resulting in the further ruination of the latter. Despite the fact that the only visible remains within the cemetery are those of the Round Church, it is still an active cemetery and as a consequence the space available in which to attempt geophysical survey is very restricted.

Both surveys were designed as an attempt to detect any subsurface remains that might be attributable to the Round Church, and both have failed in that objective. However both surveys did detect the remains of the 19th-century church with clarity, the site of the altar even being visible in the resistivity graphic (Illus 4). The survey's failure to detect any remains of the Round Church might be the result of one or other of two factors. The remains might be situated at a depth effectively out of the range of the two survey techniques used, or the stone of the western portion of the Round Church may have been completely robbed out during the construction of the 19th-century church. In support of either hypothesis, A W Johnston, who partially excavated the remains in 1900–01, observed that the floor of the apse of the round church was situated at a depth of 3 feet (0.9m) below the then ground surface (Johnston 1903, 28). This depth is greater than the maximum depth of sensitivity of either of the devices used in the less-than-ideal conditions of this survey. In addition it would seem more than likely that the foundations of the 19th-century church would have exceeded this depth anyway thus completely removing the western half of the remains.

*Illus 3 EB89 Cemetery Gradiometer survey. Survey Area: 20 × 40m N^*

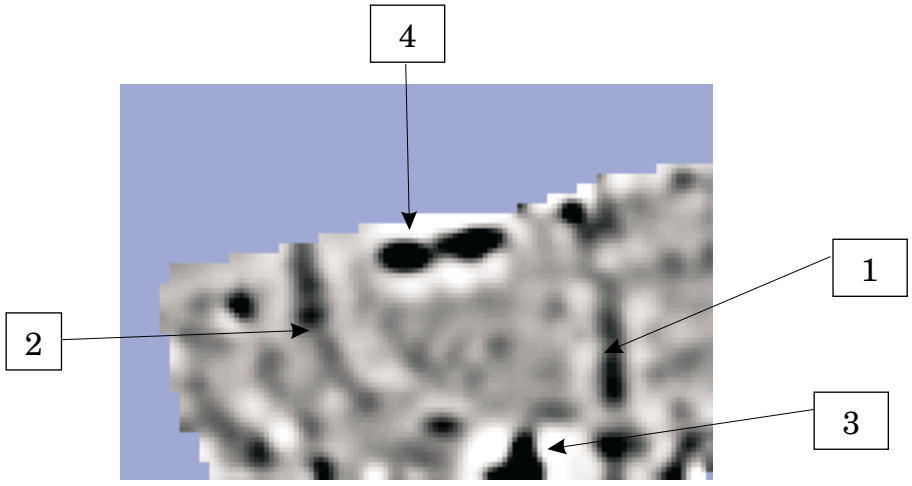


*Illus 4 EB89 Cemetery Resistivity survey. Survey Area: 20 × 40m N^*

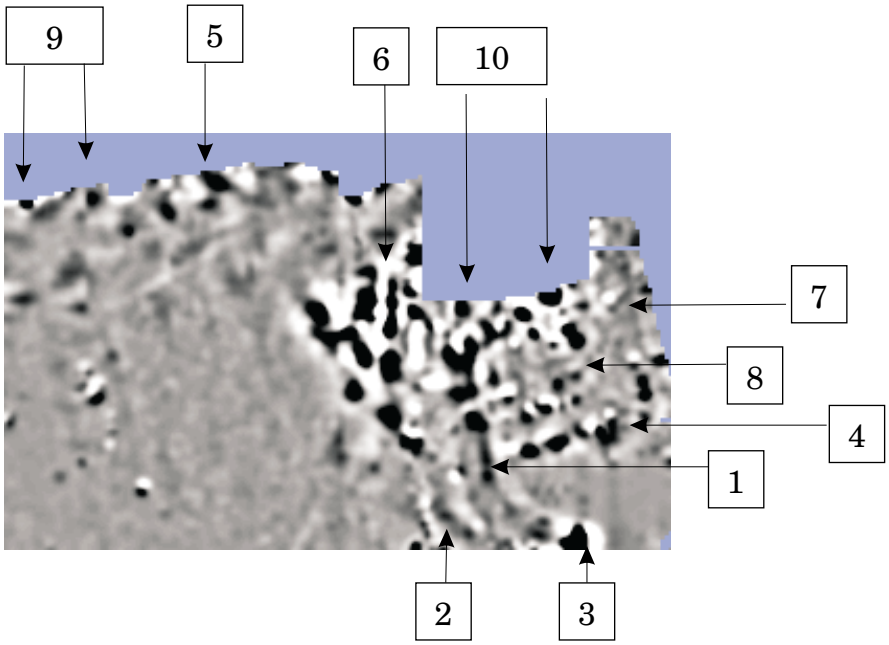
3.3 The Bu Lawn

The Bu Lawn is a small plot of ground situated immediately to the west of the consolidated remains of the Earl's Bu. At the time of survey, the area was extremely restricted and bounded on two sides by wire fences. The third and fourth sides are bounded by the cemetery wall and the footpath leading from Gyre Road to the cemetery. The Bu Lawn was surveyed with both resistivity and gradiometry equipment in 1989 but the area coverage was so restricted and the relatively coarse sampling regime employed rendered the interpretation of anything tangible in the results of these surveys impossible. As a result, an area of 30 × 20 metres of the Bu Lawn was surveyed in 1990 using the gradiometer only at a uniform density of 0.5m. The survey attempted to identify subsurface features that may indicate further remains associated with the structures of the Earl's Bu. That such remains exist are hinted at in the reports produced by A W Johnston (Johnson 1903, fig 1, 23) and in the plan drawn by D Wilson recording structures discovered in excavations undertaken in 1939 (this last is the only surviving record of this period of work at the site: see illus 9–11 in Batey 2003).

Unfortunately, the interpretation of the results in archaeological terms was problematic due to the restricted area available for study. Feature **1** in the gradiometer plot (Illus 5) is a positive linear anomaly, while Feature **2** is a curvilinear positive anomaly. Both these features could be real cuts and/or fills, although they could equally be the after-effects of any of the periods of excavation in that area as trenching



*Illus 5 EB90 Bu Lawn Gradiometer Survey. Survey Area: 20 × 20m N^*



*Illus 6 EB 91 Bu Lawn / West Field Gradiometer survey. Survey Area: 50 × 70m N^*

in the Bu Lawn is indicated in the records of both the Johnston and the Grant fieldwork.

Feature **3** is a large dipolar anomaly indicative of a large fragment of ferrous material and Feature **4** is similar. Meanwhile the plot of the resistivity data does not really contribute anything further to the interpretation of this part of the site.

The 1991 surveys covered areas which had already been examined as a group of discrete surveys in 1989, as well as an area which had previously been unavailable. This was made possible by the removal of a number of fences separating the West Field from the Bu Lawn and a new area adjacent to a substantial barn (now demolished). The gradiometer and resistivity surveys were undertaken at a uniform sampling density of 0.5m.

This area is characterised by large clusters of dipoles (Illus 6), some of which were identified in earlier surveys (e.g. Features **3** and **4**). In contrast, some features identified in earlier surveys do not appear at all in this survey (e.g. traces of cultivation, see Illus 8), or only as ephemeral features (eg Feature **5**, which appears as a weak slightly negative linear feature in this survey [Illus 6], but as a strong dipolar linear feature in Illus 8 [feature 26]) despite the increase in sampling density in comparison with the earlier surveys. This is unfortunately an artefact of the processing regimes used upon the data, and the plotting parameters employed in the production of the graphic. All of the missing or weak features do exist within the dataset, but are so weak in comparison to the dipolar features as to appear insignificant in this graphic. It would be possible to remove all of the dipolar readings from the data and replace them with null readings in order to elucidate the weaker features, but that would result in a highly fragmented illustration of the magnetic qualities of the site. As it stands the 1991 gradiometer survey of the West Field/Bu Lawn (Illus 6) depicts a patterned distribution of dipolar activity interspersed with some identifiable linear and curvilinear features which may be of some antiquity, or else the result of very recent agricultural and land division practices.

Feature **6** is a possible ferrous dipole. Viewed in totality, this feature appears to be very similar in nature to a feature on Illus 10 (feature 32). Feature **7** is a weak linear feature which appears to link a number of small dipoles at the southern end of its course. It is possible that this then turns westward towards Feature 4 and intersects a northward extension of Feature 1. Such combination of features is suggestive of an enclosure of some description but this interpretation is offered only with extreme caution. Feature 7 runs near-parallel to the modern footpath leading to the cemetery, and Feature 4 is extremely close to a recent fence line; therefore this combination of feature might be of very recent origin. However, Feature 1 does cut that fence midway along its length.

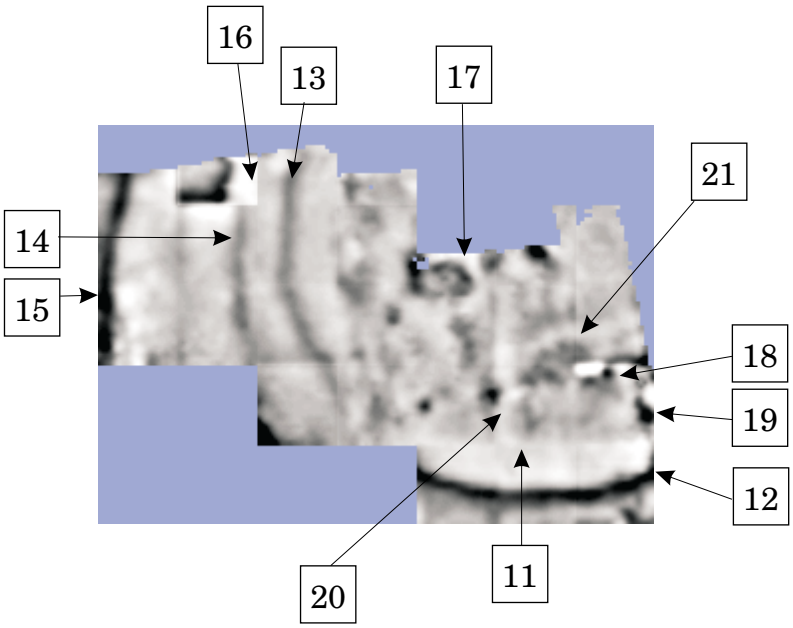
Feature **8** is a weak negative anomaly with a cluster of small dipoles at its western extremity. Feature **9** is an area cluster of dipoles situated close to the boundary fence of the West Field and Gyre Road, probably the result of ferrous material contained within that boundary. Feature group **10** is a cluster of strong dipoles of such magnitude to be unequivocally interpreted as of ferrous origin. They are located adjacent to the barn which was converted into the Saga Centre *c*1995.

The 1991 resistivity survey of the Bu Lawn/West Field area (Illus 7) is extremely interesting from a geophysical as well as an archaeological perspective. There are several problems with this data-set, and although exactly the same area was covered by both survey techniques, it became necessary to omit several of the resistivity grids from the final presentation of the data. The problems encountered in this data-set were not a product of the survey methodology but rather lay in the choice of instrument and electrode configuration. Under normal conditions, performing an electrical resistivity survey with a 'Twin Electrode' configuration is quicker than with most other electrode configurations. This is because the mobile element of the 'Twin Electrode' system is independent of orientation and the data collection process can be undertaken in a zigzag fashion rather than in parallel traverses.

In extremely rare circumstances, resistivity data can be anisotropic (i.e. the ground exhibits a directional bias in its resistive qualities) This appears to have been the case with certain grids of the 1991 survey and it is essential to point out that no trace of this effect was noted in 1989. In 1989, the survey traverses were perpendicular to those employed in 1991, a tactic deliberately deployed in order to use the earlier data set as a control for the 1991 survey, and the instrument used was the RM4 resistivity meter rather than the RM15 of 1991. There are differences in the manner in which these two devices evaluate the electrical qualities of sites and this may have contributed to the effect, along with a change of survey direction and the undoubted geological quirkiness of the Earl's Bu site.

Feature **11** is an area of anisotropic data, the effects of which have been lessened by processing. In its raw form, the data was badly striped. The effect does not cover the entirety of the survey grids concerned but is restricted to an area to the north of Feature 12. Feature **12** is a well-defined curvilinear band of high readings and appears to be one a series of concentric features of similar nature (Features **13**, **14** and **15**). It is these features that seem to be causing anisotropy in the data; as long as the mobile electrodes of the 'Twin' were on the same side of the feature as the remote electrodes, the effect did not occur but as soon as the mobile electrodes had passed over the high resistance bands, they appear to have become directionally dependant. Sometimes the striping effect was contained within the features, at other times it was to the outside depending upon the position of the remote electrodes at the time of the survey.

Feature **16** is a part-grid of anisotropic data which has not yielded to processing and is included for



*Illus 7 EB 91 Bu Lawn / West Field Resistivity survey. Survey Area: 50 × 70m N^*

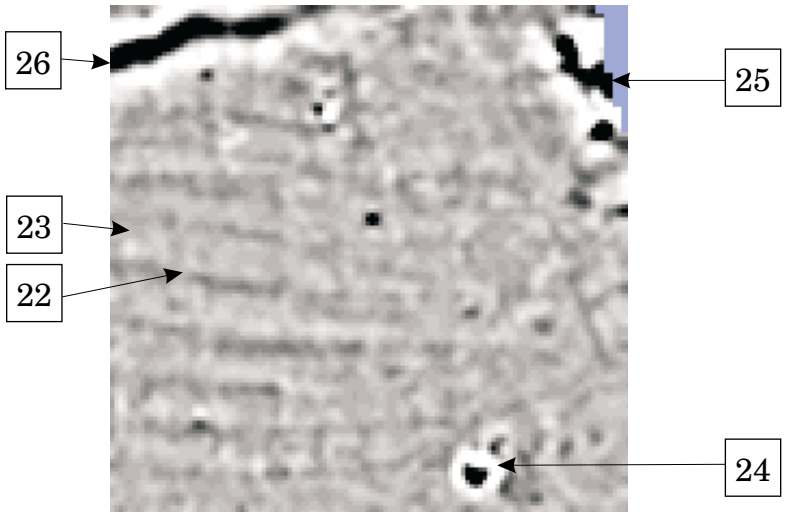
demonstration purposes only. As can be seen in Illus 7, it appears as disturbance of Feature 14. Feature **17** appears to be structural. It is a combination of high and low readings situated very close to the (then) extant barn and where the presence of archaeological features had been demonstrated during the construction of the barn (see Batey 2003). Feature **18** is a band of low readings combined with the odd patch of high readings. Its regularity might indicate the existence of a fairly recent cut feature, such as an excavation trench. Feature **19** is an isolated area of high and low readings and a similar interpretation to Feature 18 may be offered.

Feature **20** is a linear band of low readings, probably a cut feature, which corresponds to the northern extension of gradiometer feature 2. It vanishes completely when it enters the area of anisotropic data, Feature 11, but possible re-emerges as a feature to the south of Feature 12. Feature **21** is similar but near-perpendicular to Feature 20 . Once again this feature is probably a cut.

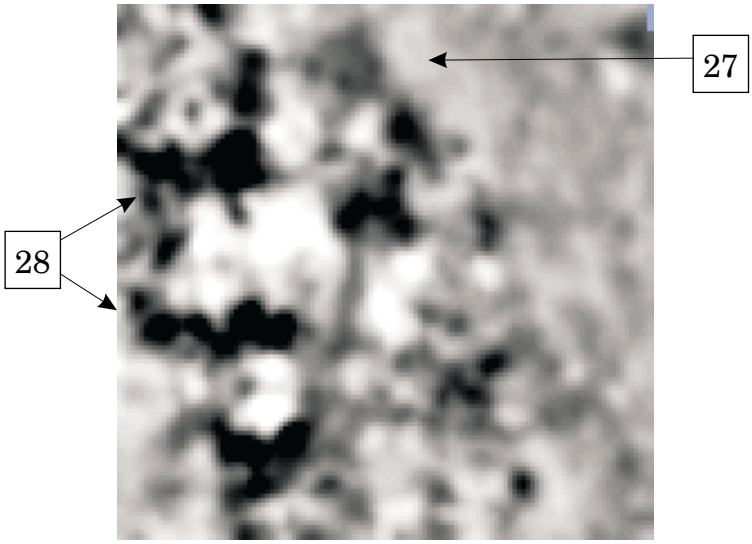
3.4 The West Field

The West Field is situated immediately to the west of the Bu Lawn and Cemetery sites. Work here did not suffer from the space restrictions which compromised the surveys of those sites, enabling a larger area to be examined. Several features were detected in the gradiometer survey (Illus 8), some of which can be categorised by group.

Feature group **22** is a series of parallel linear anomalies best interpreted as the product of past



*Illus 8 EB89 West Field Gradiometer survey. Survey Area: 60 × 60m N^*



*Illus 9 EB89 West Field Resistivity survey. Survey Area: 60 × 60m N^*

cultivation. Feature group **23** is similar but almost perpendicular to Feature group 22. Feature **24** is a single strong dipole indicative of ferrous material.

Feature group **25** is a small group of dipoles also of possible ferrous origin, or else suggestive of a discrete area of thermo remnant magnetism.

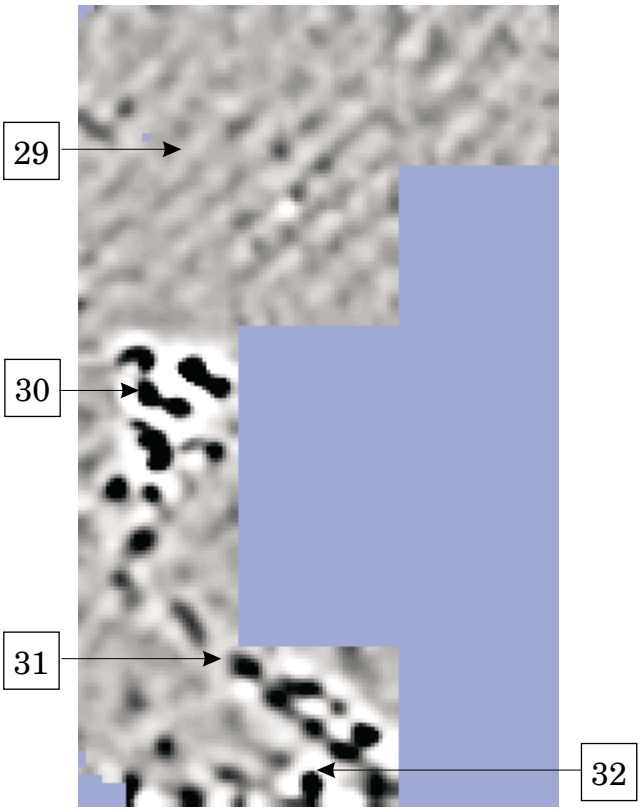
Feature **26** is odd. It appears, in Illus 8, as a strongly dipolar linear feature, but this is misleading. Feature 26 also appears in a survey of 1991 as a relatively weak linear anomaly (Illus 6, feature 5) and its apparent strength here is a product of the plotting parameters employed in the production of this particular graphic. It is probably an archaeological feature but its position at the edge of the survey area precludes credible interpretation, although it may be the old kirk road.

Little of archaeological interest was detected in the West Field during the course of the electrical resistivity survey (Illus 9).

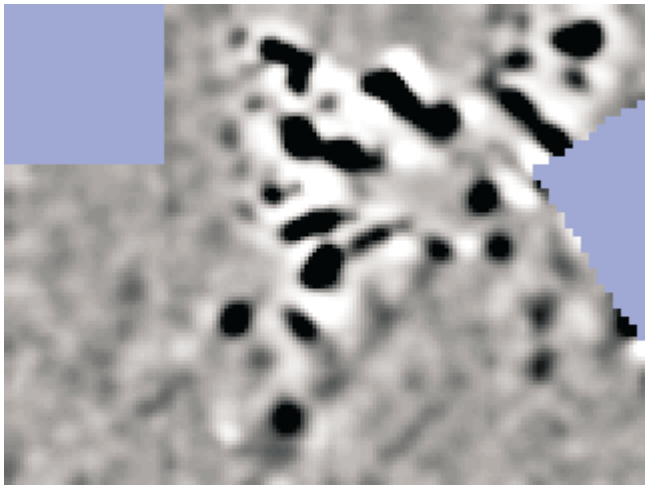
Feature **27** is a diagonal boundary separating areas of relatively uniform resistivity from a noisier area to the west. This latter area corresponds with the crest of a slight ridge which runs the entire length of the West Field towards the sea. Feature group **28** comprises broad bands of high resistivity readings. They may represent structural remains but are too badly defined to offer definitive archaeological interpretation. It is possible that Feature group 28 represents spreads of rubble but there are no corresponding gradiometer anomalies in the vicinity. Perhaps the most plausible interpretation is that Feature group 28 is natural, a product of the drift geology of the area.

The 1990 West Field survey was focused around the southern perimeter of the cemetery and sought to identify anomalies which might equate to earlier activity. Two gradiometer surveys were undertaken: the larger of the two at a uniform sampling density of 1.0m in order to locate features of potential interest (Illus 10). This was followed by a survey of a smaller area undertaken at a uniform 0.5m sampling density in an attempt to clarify features detected in the larger survey.

Feature group **29** is a series of parallel striations running almost due north-south the length of the West Field. They are most probably associated with



Illus 10 EB90 West Field Gradiometer survey. Survey Area: 60 × 100m N



Illus 11 EB90 West field Gradiometer survey. Survey Area: 30 × 40m N <

past agricultural activity. Feature group **30** is a cluster of strong dipolar anomalies. These may represent a very large deposit of ferruginous material or may indicate an area of high thermo-remnant magnetism such as those exhibited by burnt mounds (Dockrill 1991, 35). Other examples have been noted in the immediate vicinity. Feature group **31** is composed of a linear series of dipolar anomalies. The feature continues towards the west of the survey area where it appears to turn almost 90 degrees and head towards feature 30. The return is not altogether unequivocal due to the occurrence of examples of the putative agricultural features (Feature group 29) in this area too. The somewhat amorphous nature of Feature group 31 prompted the second gradiometer survey of this area which attempted to increase the resolution of this particular feature. Feature **32** is a large single dipole most likely to be of ferrous origin. Several other examples exist in the area.

The second survey (Illus 11) of the West Field in 1990 was centred upon the dipolar features (Feature group 31) detected in the previous survey. The second survey was undertaken at a uniform sampling density of 0.5m and also covered ground adjacent to the cemetery wall not covered by the 1.0m survey.

This second survey detected further dipolar activity closer to the cemetery but did not really succeed in increasing the resolution of the dipolar features. If these features are the result of areas of high thermo-remnant magnetism, then they appear to exhibit little in the way of the structural integrity demonstrated by Dockrill for the burnt mounds at Shelly Knowe (Dockrill 1991, 37) and Fair Isle (Dockrill 1991, 36). Feature group 31 could still represent the remains of similar activity, albeit badly damaged by later agricultural practices, but otherwise the dipolar activity might have resulted from industrial activity occurring in a later period. Excavation of these dipolar features would seem the most appropriate way of clarifying this issue of interpretation.

3.5 The East Field

The survey of the East Field was designed to examine a small flattish mound that lies in the south of it, and the immediate surroundings (Illus 12). A number of features were detected in the gradiometer survey, some of which can be classified into groups.

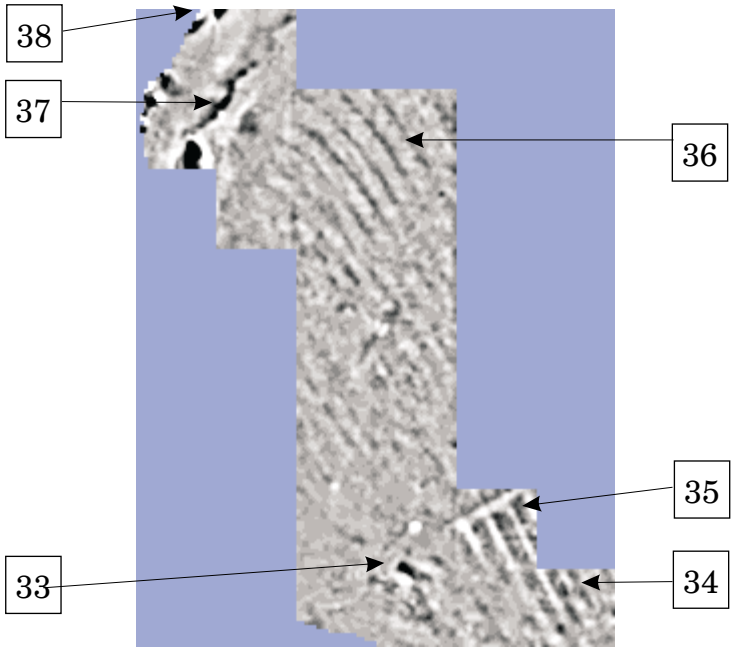
Feature **33** corresponds with the location of the mound. It is a small rectilinear negative feature containing an area of magnetically-enhanced material. It has the appearance of a smallish building and could well be the remains of a croft or similar.

Feature group **34** is a series of negative near-parallel striations, most likely the product of past cultivation. Feature **35** is a single negative linear anomaly which is almost certainly associated with feature group 34 and probably represents a boundary since most (but not all) examples of feature group 34 terminate there. Feature group **36** is a series of long curved striations, probably of agricultural origin, but more likely to be associated with ploughing rather than spade cultivation. Feature **37** is a large dipolar anomaly, probably a significant dump of ferrous material. Feature group **38** is a series of nebulous curvilinear features probably of natural fluvial origin. This group of features lie in the immediate vicinity of a large stream and were probably generated by periodic flooding episodes.

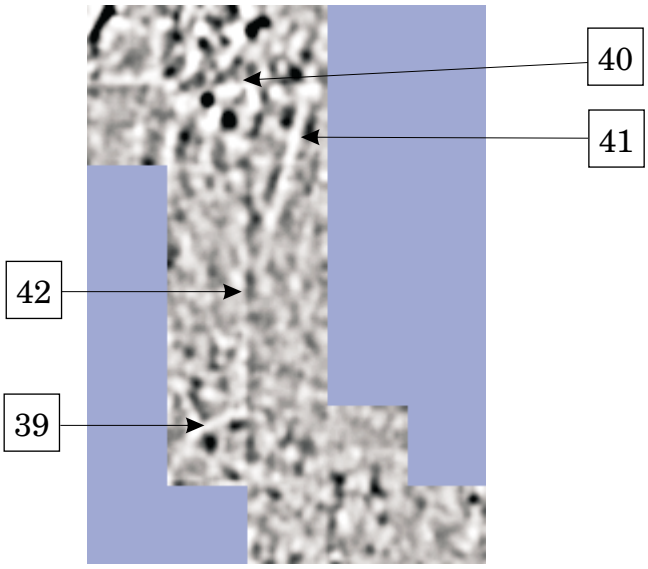
The East Field resistivity survey covered slightly less ground than the gradiometer survey and detected a series of features of a completely different character (Illus 13).

Feature group **39** is a collection of short curvilinear low resistivity anomalies. They equate with cut features but are too amorphous to offer a credible interpretation.

Feature **40** is a linear, low resistivity feature, again probably cut, and may perform some sort of boundary function. Feature group **41** is a series of parallel striations which may have some



Illus 12 EB90 East Field Gradiometer survey. Survey Area: 120 × 160mm N



Illus 13 EB90 East Field Resistivity survey. Survey Area: 100 × 140m N

relationship with feature 40 as they are essentially similar in character. They are located in a generally 'busy' area of the site. Once again they appear to be cut features and are likely to be the result of some past agricultural regime. Feature group **42** consists of weaker parallel striations running at an obtuse angle to Feature group 41. These too appear to have their origins in past agricultural activity.