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REPORT ON GEOPHYISCAL SURVEY

WEST MOOR FARM
CAISTOR

Report number 95/30

Work commissioned by :

WA

WARDELL ARMSTRONG

95/3 S2699 5700

SITE SUMMARY SHEET

95 / 30 West Moor Farm, Caistor

NGR: TA 095 013

Location, topography and geology

The site lies approximately 2km due west of Caistor, Lincolnshire and a short distance to the south of a minor road linking Caistor with the village of North Kelsey. Of the four fields investigated with the gradiometer, the southernmost two were set aside at the time of the survey, the northwestern field was under pasture and the northeastern field contained a short cereal crop. The soils are of the Blackwood Association and are deep sandy and coarse loamy soils formed over glaciofluvial sands.

Archaeology

The minor road lying approximately 0.5km to the north of the site follows the course of a Roman road, which extends eastward from the Roman town of Caistor. Other than a flint scatter recorded in a field adjacent to the southeastern part of the site, there is no information regarding the archaeology of the application area.

Aims of Survey

A fluxgate gradiometer survey was undertaken as part of an archaeological assessment being carried out by **Wardell Armstrong**. The work was carried out in advance of a proposal to extend an existing sand quarry lying immediately to the west of the site. The aim of the survey was to try to locate any archaeological remains which may survive within the application area.

Summary of Results *

In general, the scan of the application area found the site to be magnetically quiet, apart from occasional small scale ferrous responses. However, the scan identified clusters of strong responses of archaeological potential in three locations. These and other smaller scale anomalies were subsequently investigated by detailed recorded survey. The results of the detailed survey suggest that the magnetically strong anomalies identified by the scan were likely to be natural in origin. However, one group of anomalies close to the southern edge of the application may be archaeologically significant.

*** It is essential that this summary is read in conjunction with the detailed results of the survey.**

 For the use of Wardell Armstrong

SURVEY RESULTS

95 / 30 West Moor Farm, Caistor

1. Survey Area

1.1 An area of approximately 7ha was examined with a fluxgate gradiometer in scanning mode. Five survey areas, Areas A to E, totalling 1ha, were subjected to detailed recorded survey following the scan.

1.2 The extent of the scanned area and the position of the detailed surveys are shown in Figure 1, at a scale of 1:2500.

1.3 The survey grid was set out by **Geophysical Surveys of Bradford** and tie-in information has been lodged with the client.

2. Display

2.1 The results are displayed as X-Y traces, dot density plots and grey scale images. These display formats are discussed in the *Technical Information* section, at the end of the text.

2.2 Figures 2 to 6 are data plots and interpretation diagrams of the survey results, produced at a scale of 1:500.

3. General Considerations - Complicating factors

3.1 Ground conditions were generally suitable for survey, the fields were relatively level and free of obstructions. However, it was noted that in the southern part of the area is pock marked by rabbit burrows, indicating considerable disturbance to the topsoil. However, there does not appear to have any significant effect on the results of the survey.

3.2 Small scale responses from ferrous debris were recorded by the gradiometer survey. It is considered that these have been produced by objects in the plough soil and are likely to be modern in origin.

Results of Survey

4. Results of Scan

4.1 An initial examination of the entire site was carried out with the gradiometer in scanning mode. The variation in magnetic response was observed whilst walking with the instrument along traverses spaced approximately 10m apart. Anomalies encountered by the scan were investigated by a more detailed scan to determine their archaeological potential. The position of any responses considered to be of archaeological interest were marked for recorded survey.

4.2 In general, the application area was found to be magnetically very quiet, apart from responses from a scatter of small ferrous objects.

4.3 The scan identified three areas producing anomalies which were significantly above the low background noise levels. In addition, several small scale responses were also encountered. It was noted that the anomalies were confined mainly to the central and eastern parts of the site and these areas were targeted for detailed survey.

5. Results of Detailed Survey

5.1 Area A (Figure 2)

5.1.1 The results show a spread of broad anomalies, on the northern edge of the site, which do not appear to form a coherent pattern that is recognisably archaeological in character. The scan suggests that the features producing these anomalies do not continue beyond the sample. It was noted that they lie in a visible hollow in the field. They would appear to be natural in origin, possibly representing subsurface irregularities and/or possibly responses from a post glacial/fluvial deposits.

5.2 Area B (Figure 3)

5.2.1 Similar, but less substantial, responses to those recorded in Area A were detected in this area, though their full extent could not be determined by the scan. It is possible that these anomalies indicate the presence of archaeological features though, as with Area A, a pattern suggestive of anthropogenic activity is not apparent in the detailed sample. Therefore a geological origin is a possibility for these responses.

5.3 Areas C and D (Figures 4 and 5)

5.3.1 Areas C and D were positioned over small scale anomalies considered to be of archaeological potential identified during the initial scan.

5.3.2 The detailed survey results show a scatter of small responses most of which are thought to have been produced by ferrous debris. Some have been interpreted as being of possible archaeological interest, though they are in apparent isolation and lack any archaeological context. It is possible that they represent responses produced by ferrous objects also.

5.3.3 The results from these two areas serve to indicate the low level of magnetic activity noted by the scan over the majority of the survey area.

5.4 Area E (Figure 6)

5.4.1 Area E was positioned over a group of strong magnetic responses identified on the southern edge of the survey and overlooking a stream.

5.4.2 A comparison of X-Y trace plots shows that the responses are stronger in this area than those recorded in Areas A and B. The anomalies are more discreet in appearance than the broader anomalies recorded in these previous areas. They are also of a strength that is consistent with responses produced by features such as kilns or hearths. However, the soils in the area are severely disturbed by rabbits and no waste material is present that might indicate industrial activity. Although, the interpretation remains inconclusive, the results would suggest that these anomalies are more likely to be archaeological than geological.

6. Conclusions

6.1 The examination of the application area with the gradiometer in scanning mode found the site to be magnetically quiet. However, a number of responses were identified which were considered to be of archaeological potential.

6.2 Subsequent detailed recorded survey suggested that the anomalies identified by the scan in the northern part of the survey were produced by underlying geological/pedological variations. However, a group of anomalies on the southern limit of the site may be of archaeological interest.

6.3 It is not possible to determine the origin of the features producing the strong magnetic anomalies identified by the survey. The source of these responses will remain unclear unless they are subjected to further investigation by augering or trial trenching.

Project Co-ordinator: D Shiel
Project Assistants: M Copley, N Nemcek & A Shields.

TECHNICAL INFORMATION

The following is a description of the equipment and display formats used in **GEOPHYSICAL SURVEYS OF BRADFORD** reports. It should be emphasised that whilst all of the display options are regularly used, the diagrams produced in the final reports are the most suitable to illustrate the data from each site. The choice of diagrams results from the experience and knowledge of the staff of **GEOPHYSICAL SURVEYS OF BRADFORD**.

All survey reports are prepared and submitted on the basis that whilst they are based on a thorough survey of the site, no responsibility is accepted for any errors or omissions.

Magnetic readings are logged at 0.5m intervals along one axis in 1m traverses giving 800 readings per 20m x 20m grid, unless otherwise stated. Resistance readings are logged at 1m intervals giving 400 readings per 20m x 20m grid. The data are then transferred to portable computers and stored on 3.5" floppy discs. Field plots are produced on a portable Hewlett Packard Thinkjet. Further processing is carried out back at base on computers linked to appropriate printers and plotters.

Instrumentation

(a) Fluxgate Gradiometer - Geoscan FM36

This instrument comprises of two fluxgates mounted vertically apart, at a distance of 500mm. The gradiometer is carried by hand, with the bottom sensor approximately 100-300mm from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is conventionally measured in nanoTesla (nT) or gamma. The fluxgate gradiometer suppresses any diurnal or regional effects. Generally features up to one metre deep may be detected by this method.

(b) Resistance Meter - Geoscan RM4 or RM15

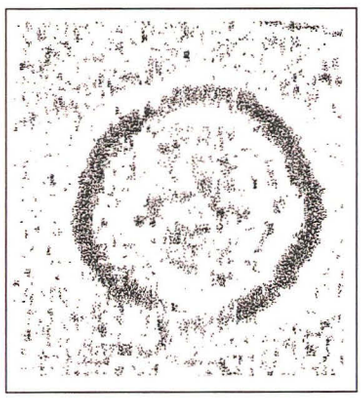
This measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity. The "Twin Probe" arrangement involves the paring of electrodes (one current and one potential) with one pair remaining in a fixed position, whilst the other measures the resistance variations across a fixed grid. The resistance is measured in Ohms and the calculated resistivity is in Ohm-metres. The resistance method as used for area survey has a depth resolution of approximately 0.75m, although the nature of the overburden and underlying geology will cause variations in this generality. The technique can be adapted to sample greater depths of earth and can therefore be used to produce vertical "pseudo sections".

(c) Magnetic Susceptibility

Variations in the magnetic susceptibility of subsoils and topsoils occur naturally, but greater enhanced susceptibility can also be a product of increased human/anthropogenic activity. This phenomenon of susceptibility enhancement can therefore be used to provide information about the "level of archaeological activity" associated with a site. It can also be used in a predictive manner to ascertain the suitability of a site for a magnetic survey. The instrument employed for measuring this phenomenon is either a field coil or a laboratory based susceptibility bridge. For the latter 50g soil samples are collected in the field.

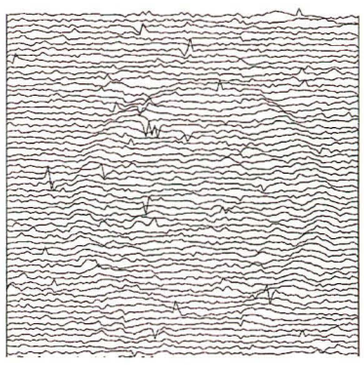
Display Options

The following is a description of the display options used. Unless specifically mentioned in the text, it may be assumed that no filtering or smoothing has been used to enhance the data. For any particular report a limited number of display modes may be used.



(a) Dot-Density

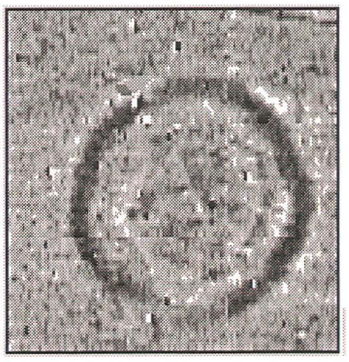
In this display, minimum and maximum cut-off levels are chosen. Any value that is below the minimum cut-off value will appear white, whilst any value above the maximum cut-off value will appear black. Any value that lies between these two cut-off levels will have a specified number of dots depending on the relative position between the two levels. The focus of the display may be changed using different levels and a contrast factor (C.F.). Usually the C.F. = 1, producing a linear scale between the cut-off levels. Assessing a lower than normal reading involves the use of an inverse plot, This plot simply reverses the minimum and maximum values, resulting in the lower values being presented by more dots. In either representation, each reading is allocated a unique area dependent on its position on the survey grid, within which numbers of dots are randomly placed. The main limitation of this display method is that multiple plots have to be produced in order to view the whole range of the data. It is also difficult to gauge the true strength of any anomaly without looking at the raw data values. This display is much favoured for producing plans of sites, where positioning of the anomalies and features is important.



(b) X-Y Plot

This involves a line representation of the data. Each successive row of data is equally incremented in the Y axis, to produce a stacked profile effect. This display may incorporate a hidden-line removal algorithm, which blocks out lines behind the major peaks and can aid interpretation. Advantages of this type of display are that it allows the full range of the data to be viewed and shows the shape of the indiviual anomalies. Results are produced on a flatbed plotter.

Display Options cont'd



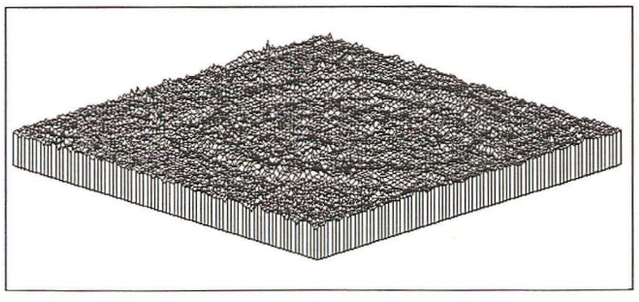
(c) Grey-Scale

This format divides a given range of readings into a set number of classes. These classes have a predefined arrangement of dots or shade of grey, the intensity increasing with value. This gives an appearance of a toned or grey scale.

Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. While colour plots can look impressive and can be used to highlight certain anomalies, grey-scales tend to be more informative.

(d) Contour

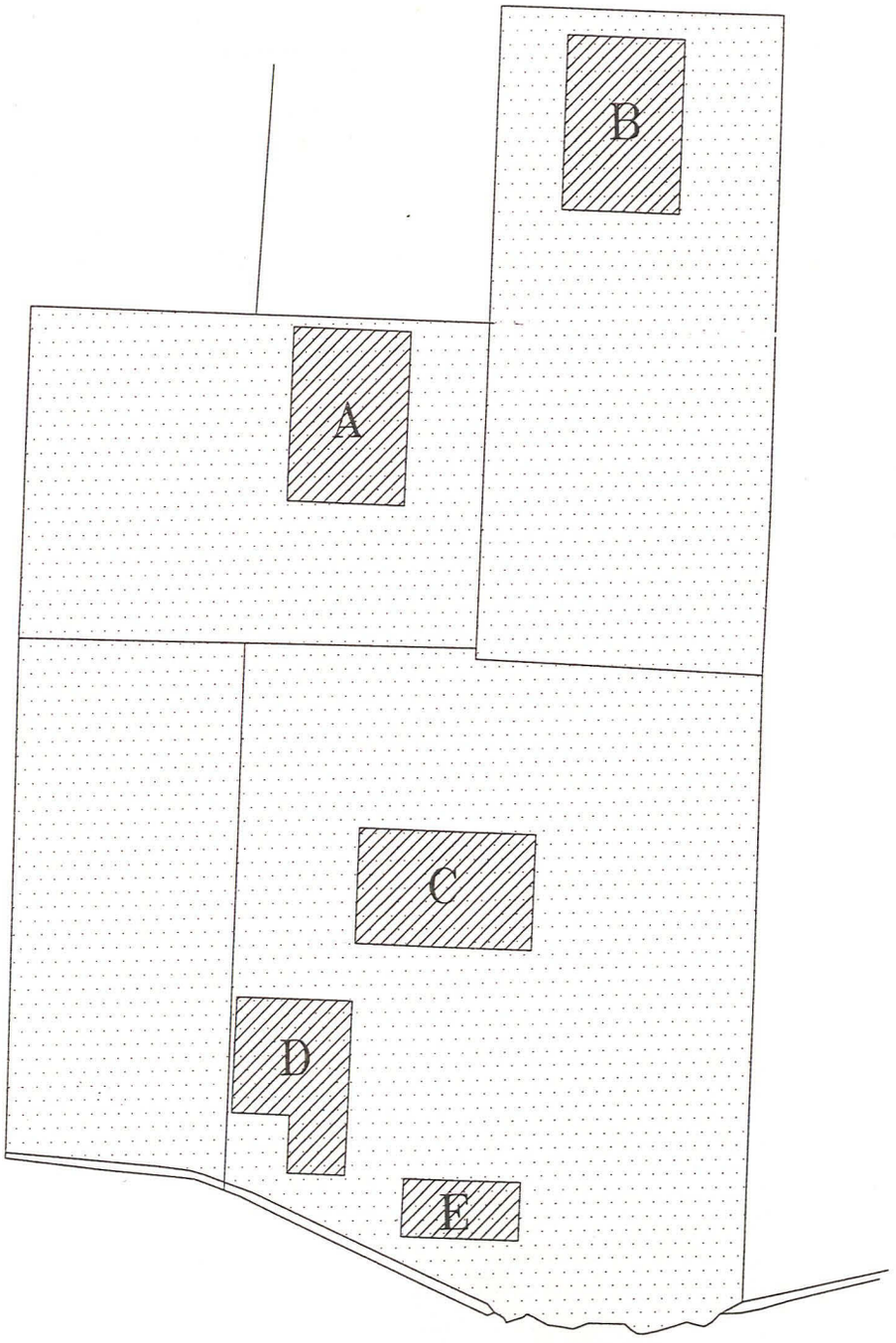
This display format is commonly used in cartographic displays. Data points of equal value are joined by a contour line. Closely packed contours indicate a sharp gradient. The contours therefore highlight an anomalous region. The range of contours and contour interval are selected manually and the display is then generated on the computer screen or plotted directly on a flat bed plotter / inkjet printer.



(e) 3-D Mesh

This display joins the data values in both the X and Y axis. The display may be changed by altering the horizontal viewing angle and the angle above the plane. The output may be either colour or black and white. A hidden line option is occasionally used (see (b) above).

WEST MOOR FARM, CAISTOR
Location of Survey Areas



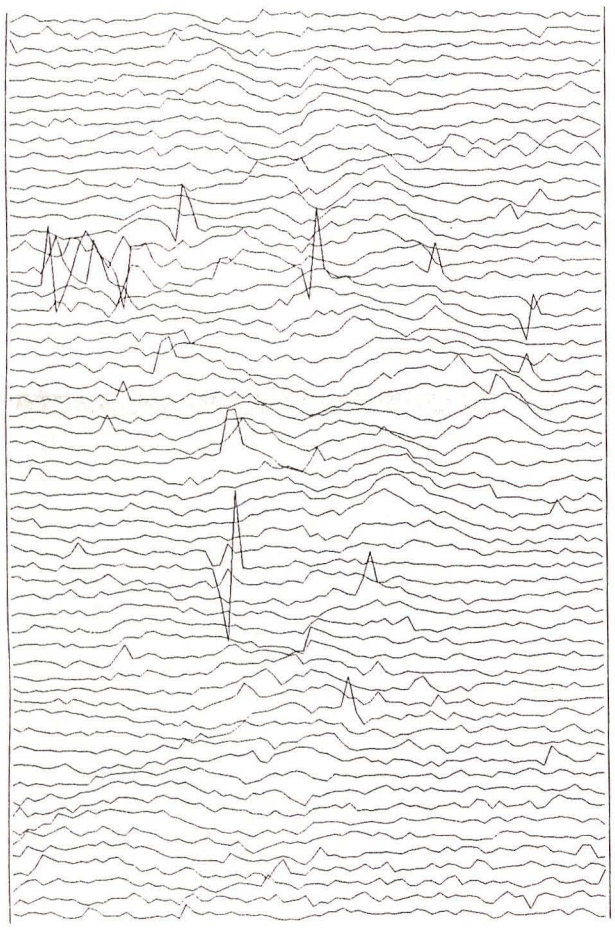
Scanned Area

Survey Area

1:2500

Figure 1

WEST MOOR FARM
CAISTOR
Area A



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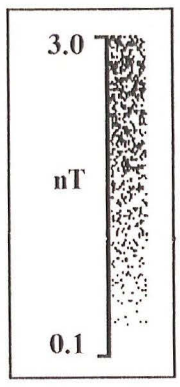
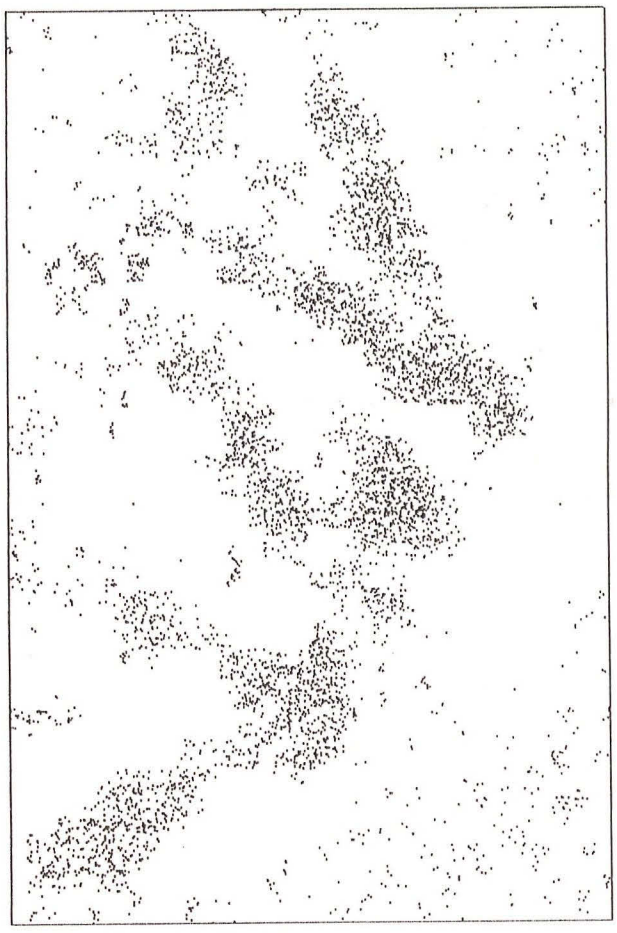
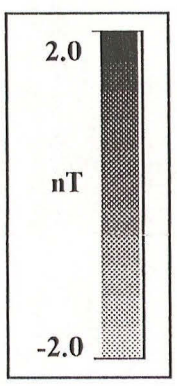
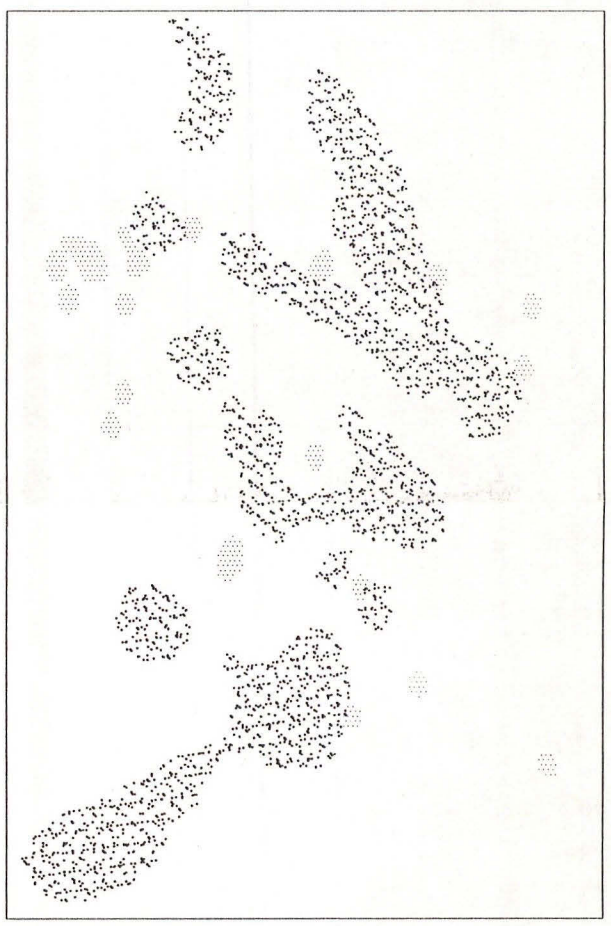






?Geology

Ferrous



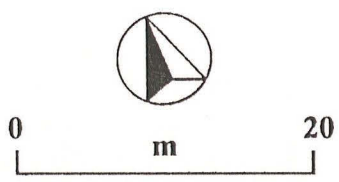
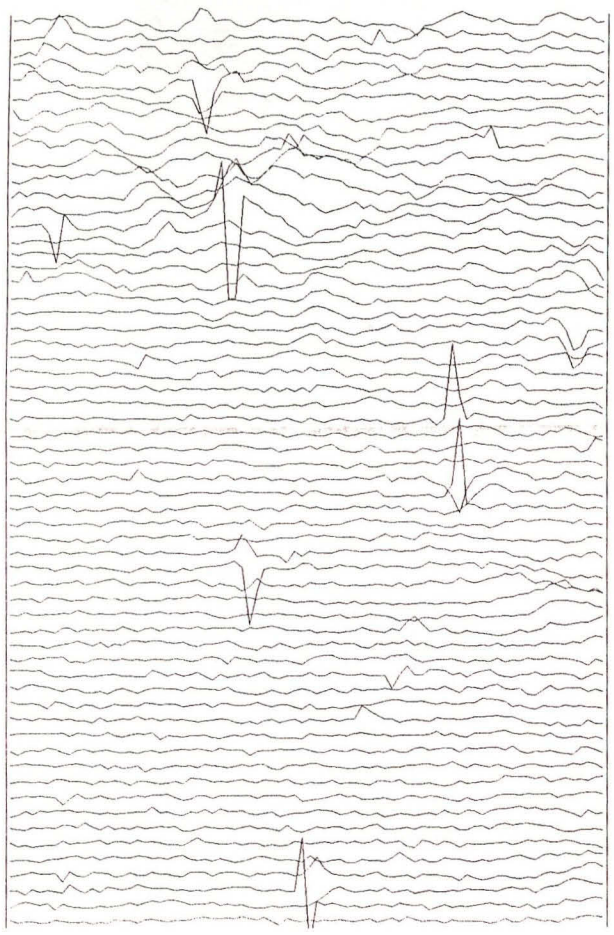


Figure 2

WEST MOOR FARM
CAISTOR
Area B



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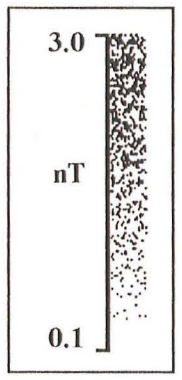
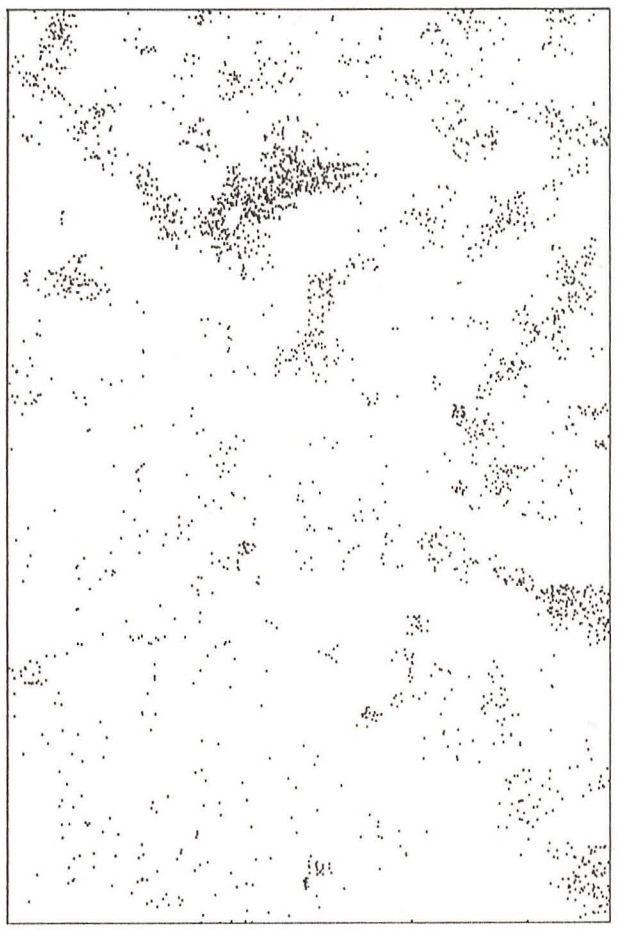
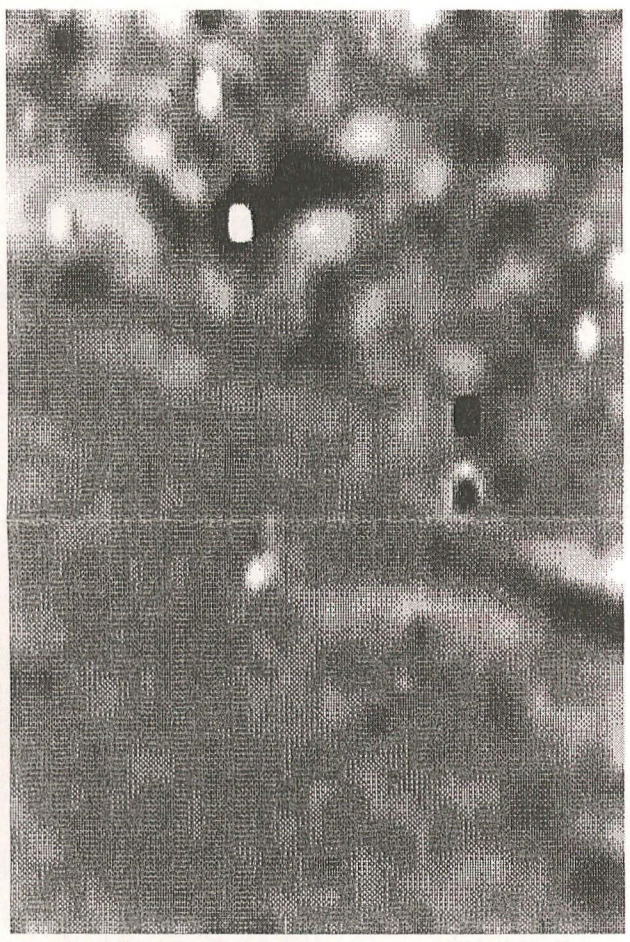
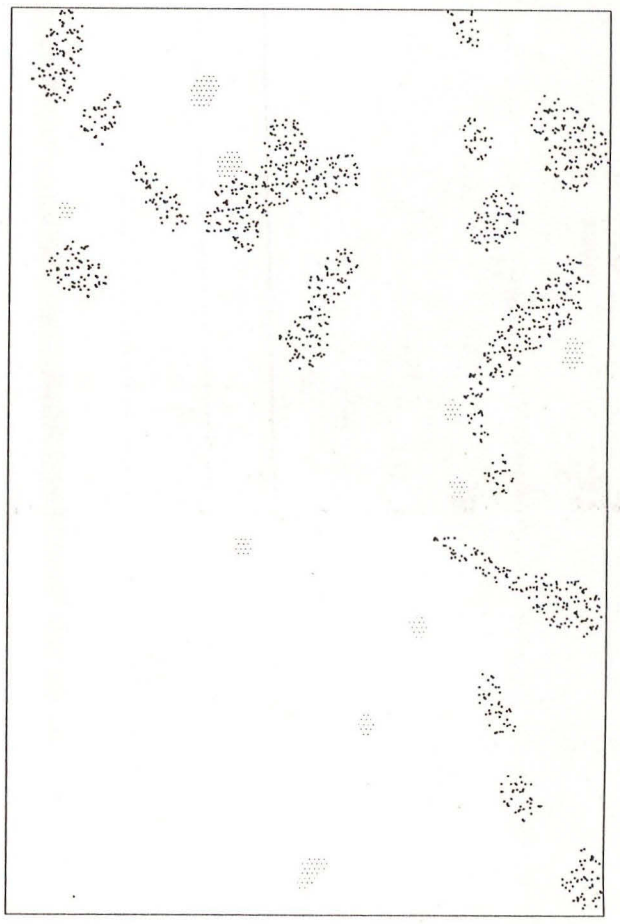






?Geology

Ferrous



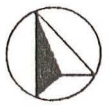
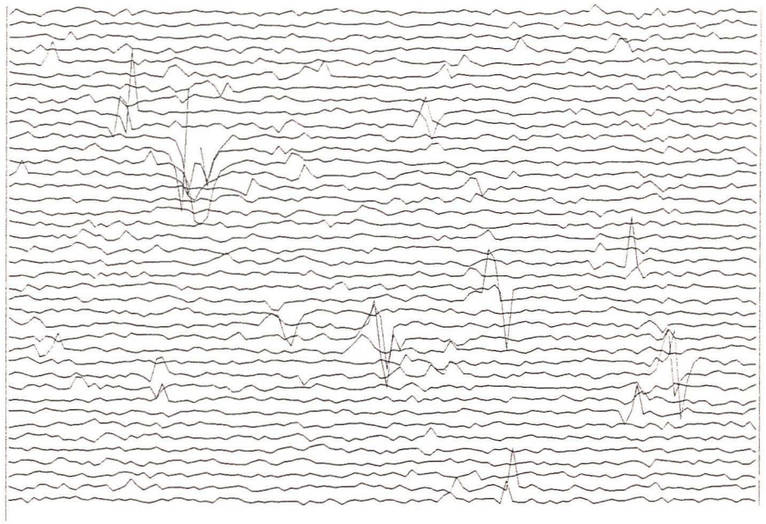


Figure 3

WEST MOOR FARM
CAISTOR
Area C



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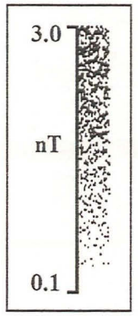

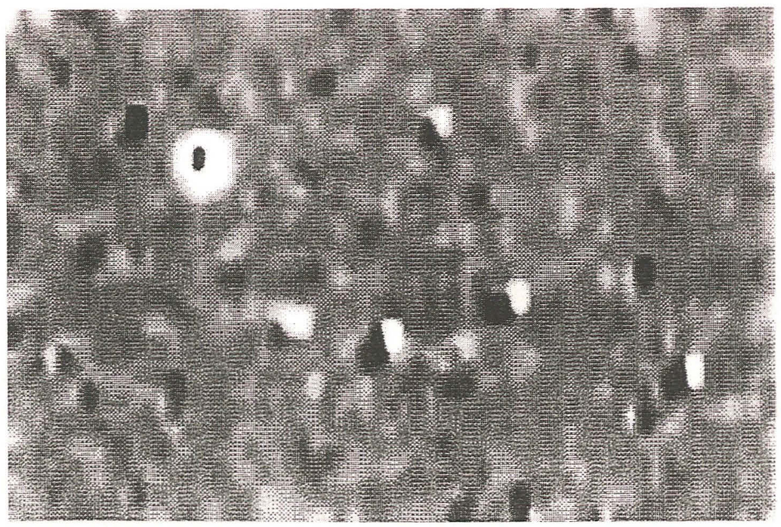

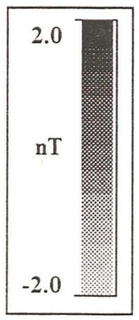

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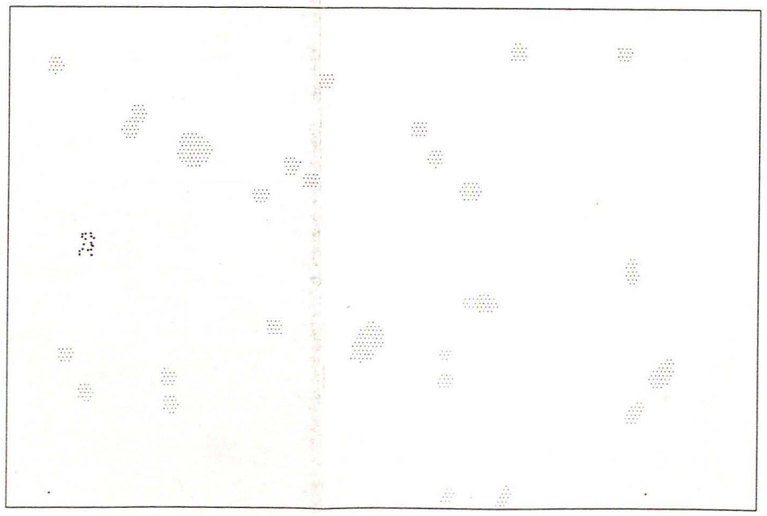

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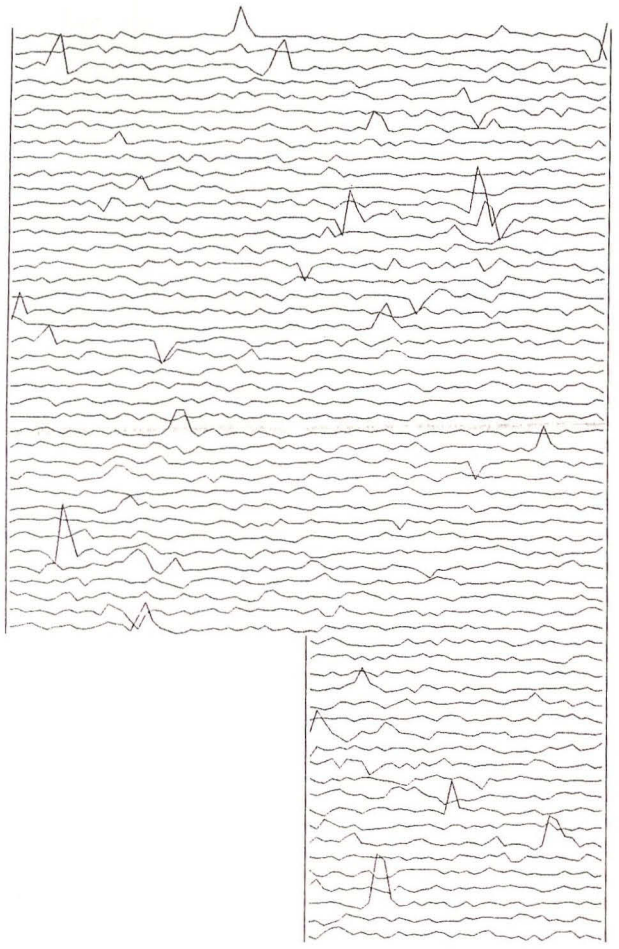
Figure 4

WEST MOOR FARM
CAISTOR
Area D



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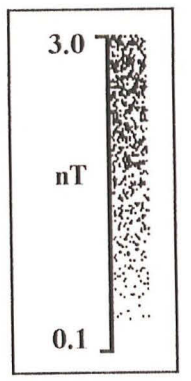

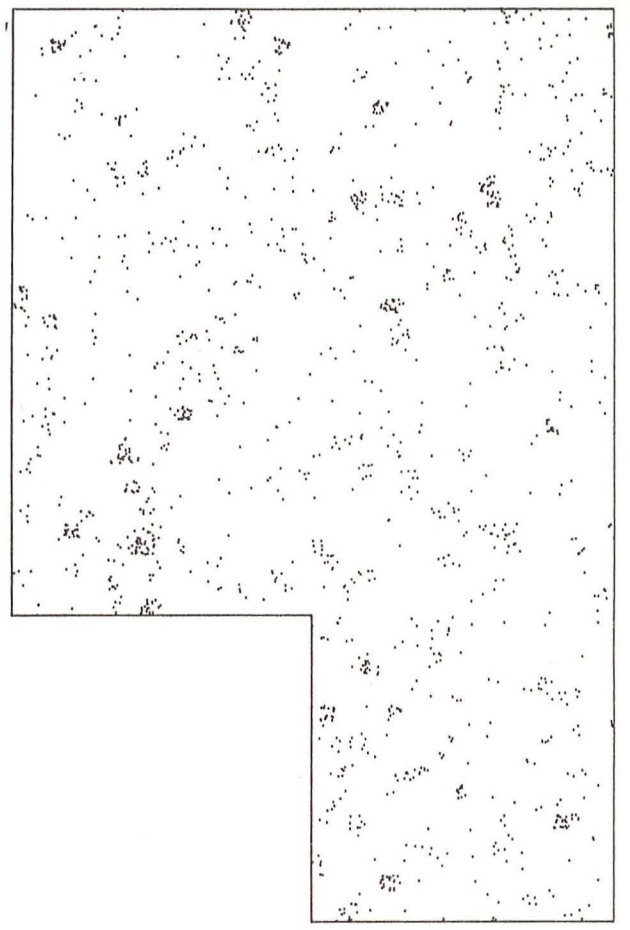

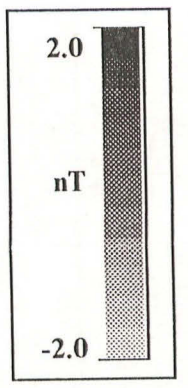

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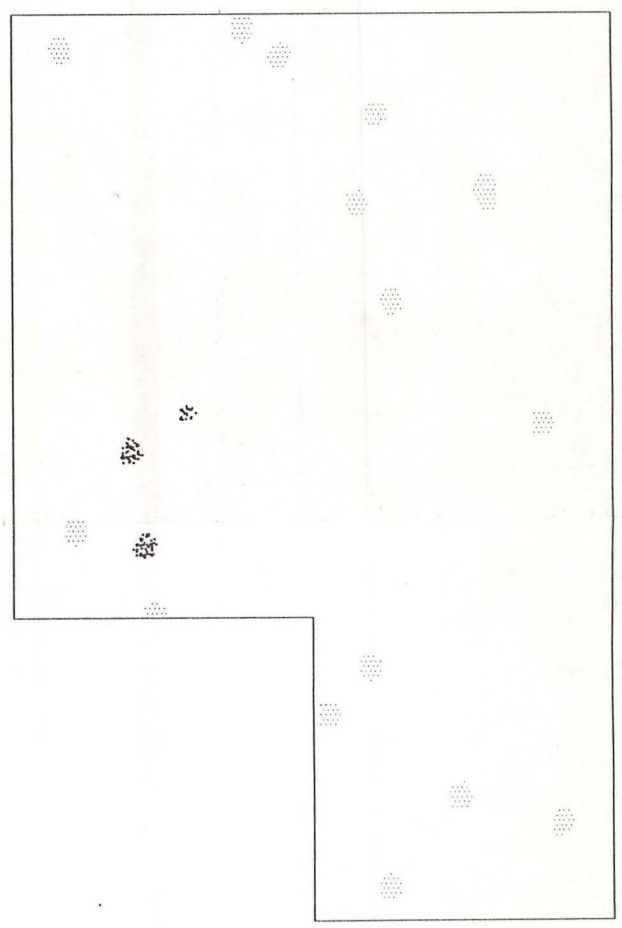


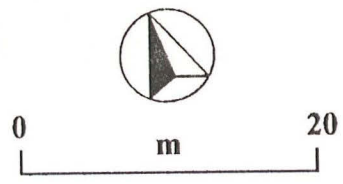
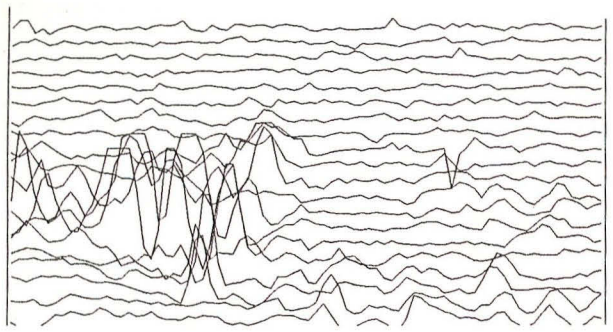


Figure 5

WEST MOOR FARM
CAISTOR
Area E



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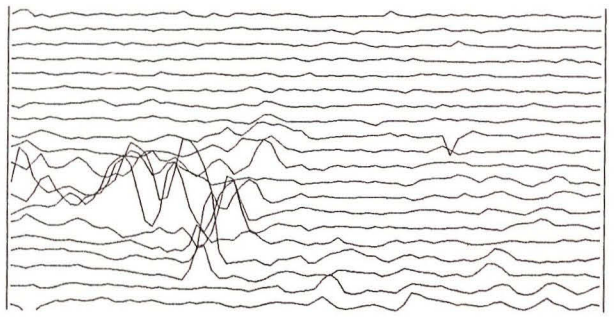

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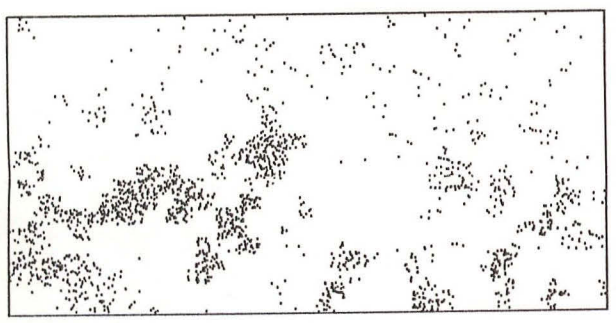

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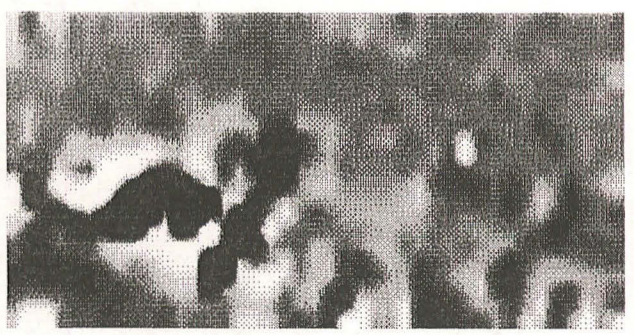

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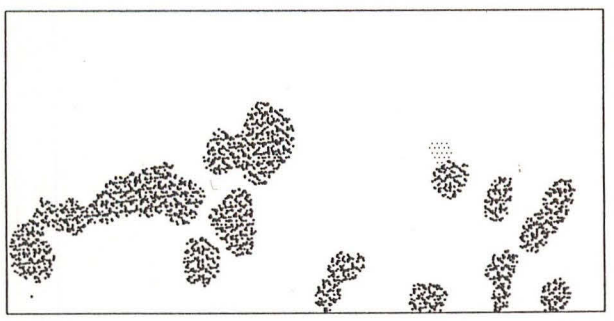

?Geology/Archaeology

Ferrous

0 m 20

Figure 6