2499

Ancient Monuments Laboratory
Report 17/95

HOE HILLS, DOWSBY, LINCOLNSHIRE. REPORT ON GEOPHYSICAL SURVEYS, OCTOBER 1994 AND MARCH 1995

M Cole

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Summary

Geophysical survey was undertaken at Hoe Hills, Dowsby, Lincolnshire in response to a request from the Fenland Management Project (FMP). An initial magnetometer survey was carried out in October 1994 to assist with the interpretation of multi-period activity revealed by FMP excavations already under way at the site. Acting on the results of this survey the magnetometer coverage was extended during a second visit in March 1995 to encompass crop mark activity to the north of the excavations. Additionally, this visit provided an opportunity to investigate the relationship between the archaeology and a former river channel also evident in the APs. The site conditions proved ideal for magnetometer survey and results of rare clarity were obtained. Widespread settlement activity was mapped and the former river course was also detected clearly. Unfortunately the results do not allow any confident conclusions to be drawn with regard to the relationship between the channel and the buried archaeology.

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HOE HILLS, DOWSBY, LINCOLNSHIRE.

Report on Geophysical Surveys, October 1994 & March 1995.

INTRODUCTION

Geophysical survey was undertaken at Hoe Hills, Dowsby, Lincolnshire in response to a request from the Fenland Management Project (FMP). Crop marks revealed in aerial photographs (APs) of the area suggested the presence of extensive, predominantly Iron Age, activity in the vicinity of known ploughed-down barrows (perhaps of various periods; Lane & Trimble 1995). The former course of a river channel was also identified in the APs. The relationship between the archaeological activity and the river channel was unclear, however. Fieldwalking had also revealed surface scatters of Early Saxon material.

Two areas were selected by the FMP for excavation, the first over a predominantly Saxon scatter and the second over one of the barrows. Geophysical survey was requested in an attempt to place the exposed archaeological features in their wider context and to investigate the crop marks themselves in more detail. It was also hoped that the survey might shed some light on the relationship between the former river course and the archaeological activity.

The geophysical survey at Dowsby was centred on NGR TF 117 304. The underlying geology consists of Fenland gravels overlying Oxford Clay.

METHOD

The geophysical survey was conducted during two separate visits to the site. An initial magnetometer survey was carried out while the excavations were in progress and covered an area immediately adjacent to these and extended nearly 100m beyond to the south (see area A on Fig 1).

A second visit was made in order to extend the magnetometer survey into the fields to the north of the excavations where the crop marks were more pronounced. Access to these areas had not been possible during the first visit.

During the initial visit a grid of 30m squares was laid out by extending the FMP excavation grid and was thereby aligned to OS grid north (see Fig 1, area A). During the second visit a separate grid, again of 30m squares, was arranged on a roughly northwest-southeast alignment (see Fig 1, area B). A third grid, on the same axes as the second but 150m to the west, ensured that the course of the former river channel would be included within the survey area (see Fig 1, area C).

Each of the above squares was then surveyed using Geoscan FM36 fluxgate gradiometers. Measurements were recorded at 0.25m intervals along traverses 1.0m apart and the data was periodically down-loaded to a microcomputer in the field. The resulting data is illustrated in this report using both greyscale and graphical trace plots (see Figs 2-6).

The positions of three strong, positive magnetic anomalies (in grid square 39) were relocated and augered during the first visit in order to retrieve soil samples for magnetic susceptibility (MS) measurement. The measurements were made in the laboratory using a Bartington MS1 meter and MS2B bench sensor. During the second visit a traverse of topsoil samples was collected at 15m intervals (see Fig 1) so that their MS could also be measured. The measurements were made using the same equipment as for the augered samples. The results are displayed in figure 7.

RESULTS

Magnetometer Survey

The site conditions proved well suited to magnetometry and a wealth of buried features were located over a very wide area. Indeed such is the clarity of the response in some areas that a detailed discussion of individual features is perhaps unnecessary.

Most striking on the plots is the array of annular and penannular ditches, some not previously known from APs, which has been detected to the northeast of area A (surrounding the eastern FMP excavation), throughout area B and also, to a limited extent, within area C (see Fig 2, 3 & 4). These features appear alongside, and sometimes overlap with, an assortment of rectangular and sub-rectangular enclosures. The majority of this activity appears to be concentrated in an area approximately 200m E-W by 150m N-S within areas A and B, bounded to the north by a linear ditch running almost exactly E-W. This area of activity is also apparently bounded to the west, east and south by areas of markedly more subdued response to the magnetometer, although annular ditches are still being detected at the very eastern edge area B.

The eastern FMP excavation (see Fig 1) revealed, among other things, a series of super-imposed Iron Age ring gullies showing six phases and two remodellings (Lane & Trimble 1995). Acting on the results of the magnetometer survey short extensions of this excavation, both to the east and west, enabled sections to be cut through the enclosures detected in squares 40 and 41. Both contained material dating from the Iron Age with the easterly trench also revealing Late Bronze Age pottery and salt making debris from its lower levels. Whilst pits and postholes of Neolithic and Saxon date were also uncovered, it can be speculated that the majority of the enclosures located by the magnetometer in areas A and B date from the Late Bronze Age onwards.

Throughout the survey area a large number of discrete positive anomalies have been detected which are likely to represent pits. Indeed the response to some of these features is so strong (see squares 2, 20 & 39 for example) as to suggest that they may be associated with some form of industrial or semi-industrial activity. Three such anomalies were relocated and augered.

The results from area C, whilst not as dramatic as those from areas A and B, are nevertheless of particular interest. The former river channel itself appears in the data as a fairly distinct band of amorphous, positive magnetic anomalies which are clearly unlikely to be of archaeological origin. This unusual but not unprecedented response (see for example the geophysical survey at Yarnton, Oxon - Linford 1994) is presumably brought about by accumulations of sediment of anomalously high MS within the channel (perhaps an iron rich sand) alongside deposits with a much lower MS (silt for example).

To the south of the channel the magnetic response to buried features is more muted than in areas A and B. This effect is unlikely to be due to a greater depth of burial as the crop marks are as clear in area C as they are in areas A and B. A more probable explanation for the weak magnetic contrast may be that the settlement activity was less intensive in this area, or, alternatively, that magnetic minerals in the soil have been leached during episodic flooding of the river channel. Whatever the cause, this result is somewhat disappointing and less light has been shed on the relationship between the former channel and the buried archaeology than had been hoped. Some notable features have been detected nonetheless: these include an entranced enclosure and neighbouring ringditch (in squares 72 & 76) and further south three discrete concentrations of pit-type features (in squares 76, 77, 80 & 85). It is possible that the latter may represent the remains of barrow mounds that have been bull-dozed at some stage. A square enclosure is also just visible (in square 83 & 84) which has a possible entrance to the south and the suggestion of internal features.

A brief comparison of the magnetometer results with the crop mark evidence is well worthwhile. It is apparent from the magnetometer data that, whilst much of the activity evident in the APs (particularly that related to the LBA/IA occupation) and indeed much that is not in the APs (especially within area A) has been detected, little evidence of the barrow cemetery is present. A likely explanation for this is that, whereas crop marks are caused by variations in crop growth brought about by moisture and/or nutrient contrasts between cut features and the surrounding soil, magnetic anomalies are caused by contrasts in soil magnetic susceptibility[1]. It is perhaps unsurprising, therefore, that features related to a funerary landscape (with brief and only occasional use unlikely to enhance soil MS) are not detected, while those associated with a settlement (displaying multi-phased occupation and possible industrial activity) are detected clearly.

In addition to the wealth of archaeological information provided by the survey some modern features have also been detected. The most obvious of these is the strong response to the abandoned railway line (now a farm track) running roughly north-south through area B and continuing along the eastern edge of area A. A similarly intense response, this time to a ferrous site-hut, can be seen in squares 31 and 36. The effect of modern ploughing is also apparent in the data, particularly in areas A and B, in the form of narrow, parallel negative magnetic anomalies (running roughly north-south in area A and east-west in area B).

Magnetic Susceptibility

Three strong positive magnetic anomalies (in grid square 39) were relocated and augered so that soil samples could be retrieved and their MS measured in the hope of identifying

[1] For a detailed description of the creation of crop marks and the scientific principles governing magnetic susceptibility see Scollar et al (1990).

anthropogenic enhancement. All three auger holes produced soil exhibiting reasonably strong MS values especially when compared to those from the topsoil MS traverse. One hole (auger hole 3 on Fig 7) yielded particularly strongly enhanced soil (with a maximum MS of 139 SI $x10^{-8}Kg^{-1}$ at a depth between 80 and 100cm) and suggests, in combination with the strength of the measured magnetic anomaly (approximately 100nT), that some form of industrial activity (eg a hearth or kiln) has been located.

The results of the topsoil MS traverse show low values of MS to the west over the former river channel (10-12 SI $x10^{-8}Kg^{-1}$) with these values rising steadily towards the east (to a maximum of 54 SI $x10^{-8}Kg^{-1}$) over the settlement activity located by the magnetometer survey. These results clearly reflect the distribution of settlement activity located by the magnetometer.

CONCLUSIONS

The potential for successful and highly informative magnetometer survey over Fenland gravels has been clearly demonstrated and an abundance of archaeological detail recorded. The results from Hoe Hills also provide an excellent example of the complementary nature of geophysical and aerial photographic surveys.

Widespread activity apparently of both Late Bronze Age and Iron Age origin has been mapped. This activity clearly extends beyond the limits of the surveyed area, particularly to the east. A number of features not previously known from APs have also been detected, particularly within area A.

In contrast to the excellent response to the settlement activity, the survey has not been particularly successful in mapping the funerary features. The magnetometer has, however, succeeded in detecting the former river channel. The results allow little to be concluded about the relationship between the archaeology and this channel except perhaps that, as no archaeological features are apparent over the channel, it is probable that the channel was still active during the Late Bronze Age/Iron Age occupation. Further survey allied to trial trenching would help resolve this uncertainty.

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Dates: 10-13 October 1994
27-30 March 1995

Reported by: M Cole

12th May 1995

Archaeometry Branch
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References

Institute of Geological Sciences, 1972 1" map *Geological Survey of Great Britain, Sheet 143, Bourne - Drift*.

Lane, T & Trimble, D 1995 Fenland Management Project, Lincolnshire. Excavations 1994, *Fenland Research 9*, in press.

Linford, N T, 1994 Mineral Magnetic Profiling of Archaeological Sediments, *Archaeological Prospection 1*.

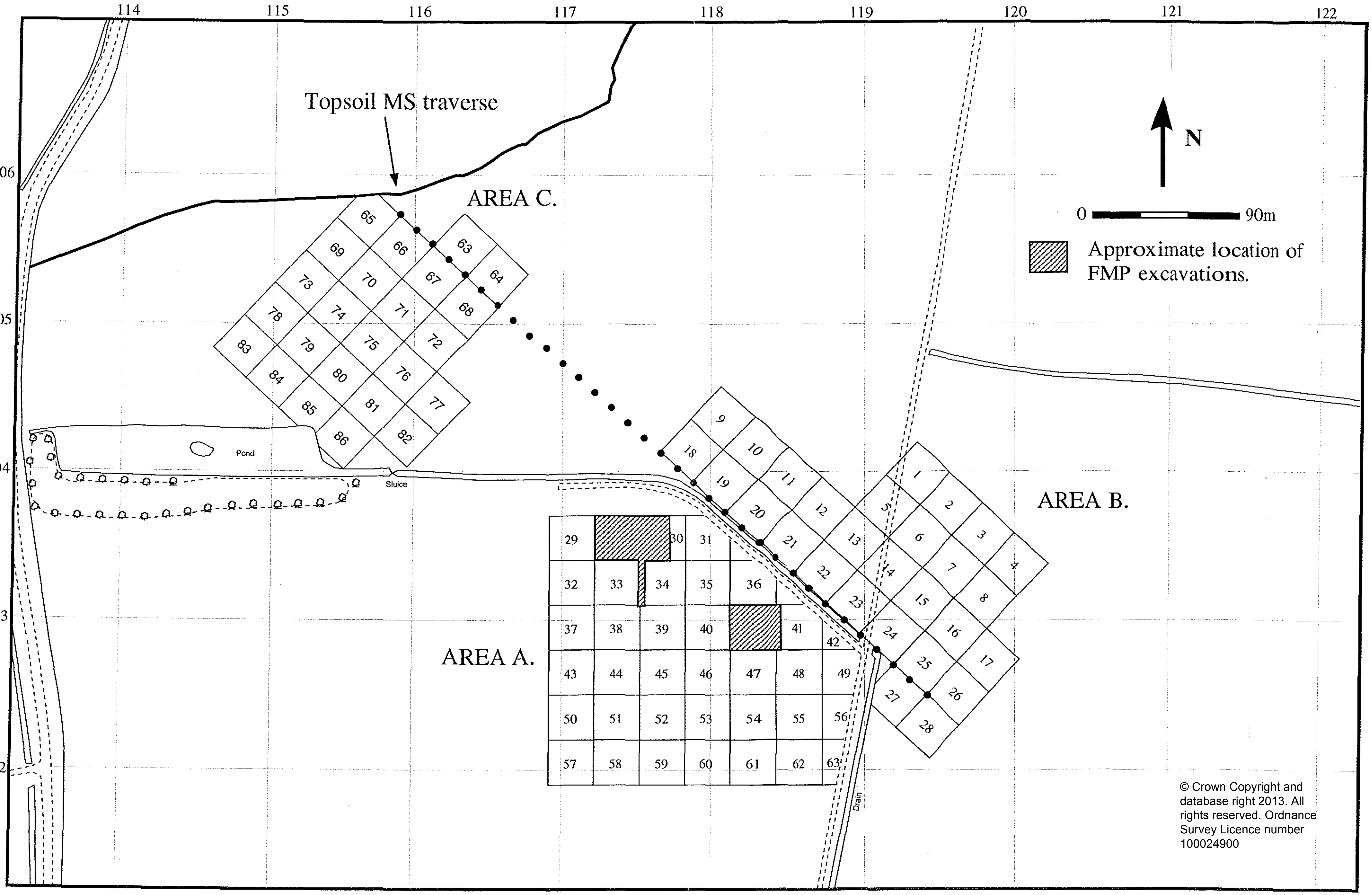
Scollar, I et al 1990 *Topics in Remote Sensing 2: Archaeological Prospecting and Remote Sensing*, Cambridge.

Plans Enclosed

HOE HILLS, DOWSBY, LINCOLNSHIRE.
Location plan of geophysical survey.

Figure 1.

TF 1130



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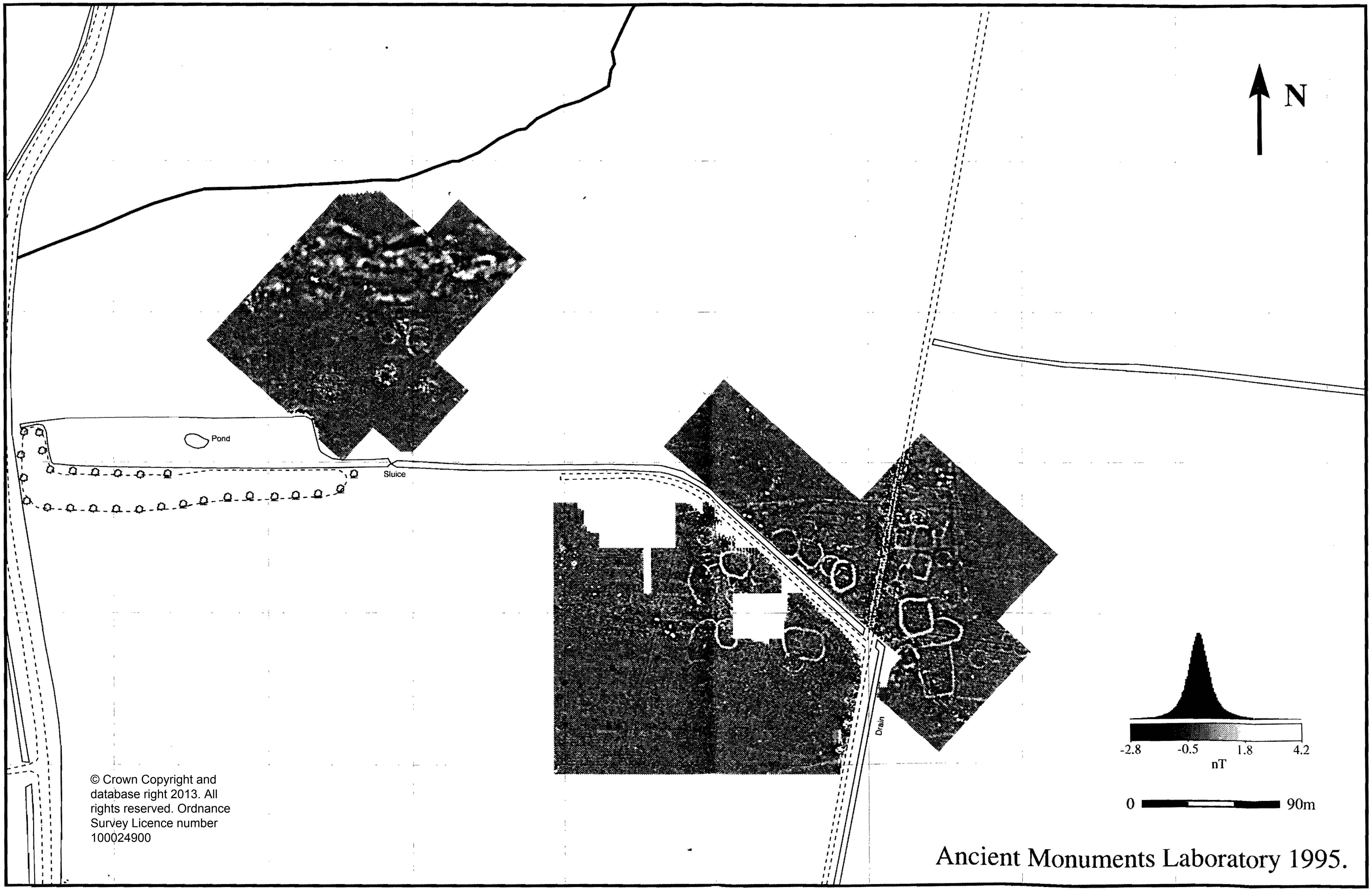
Location plan of magnetometer survey.

Figure 2.



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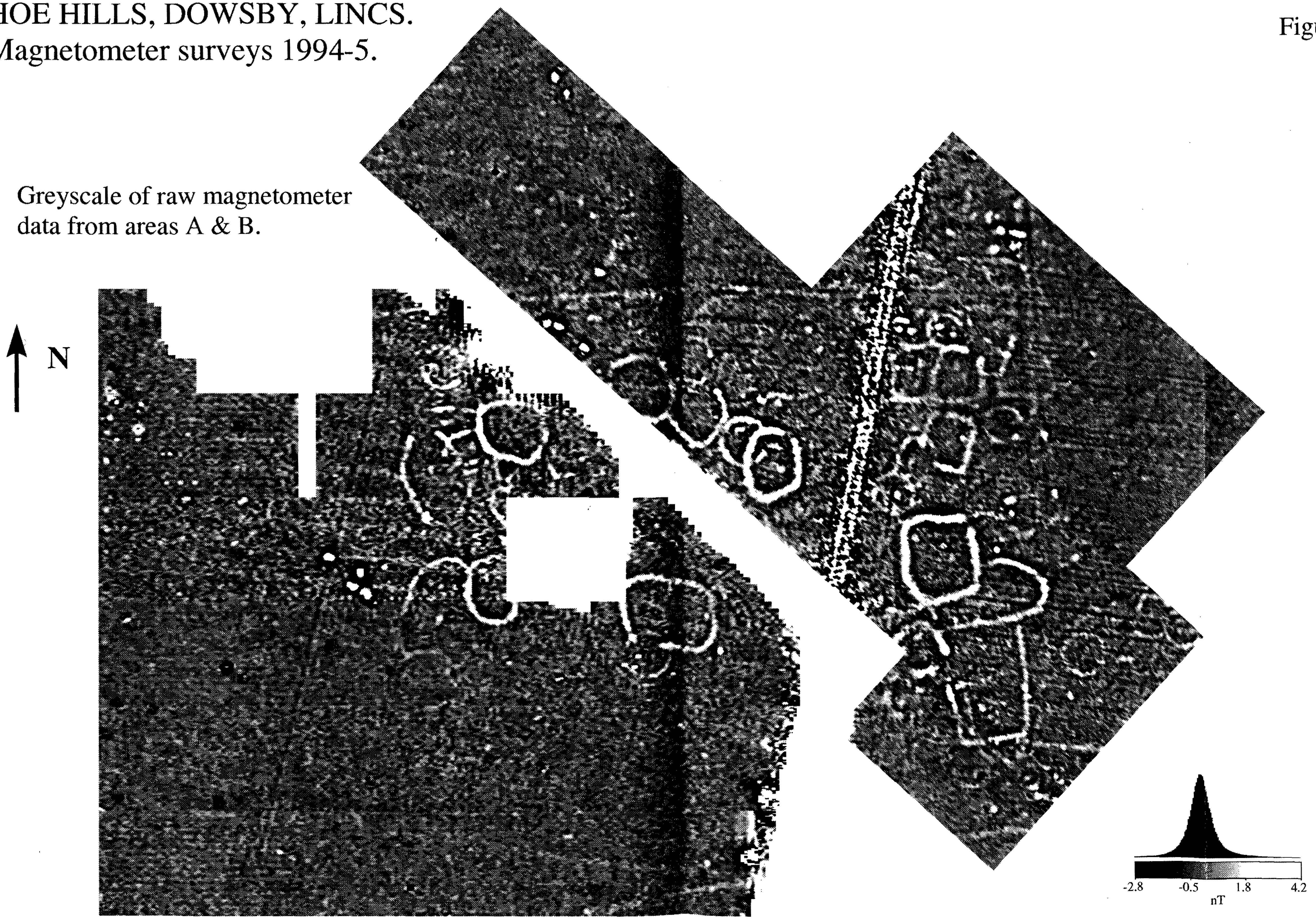
Magnetometer surveys 1994-5.

Figure 3.

Greyscale of raw magnetometer data from areas A & B.



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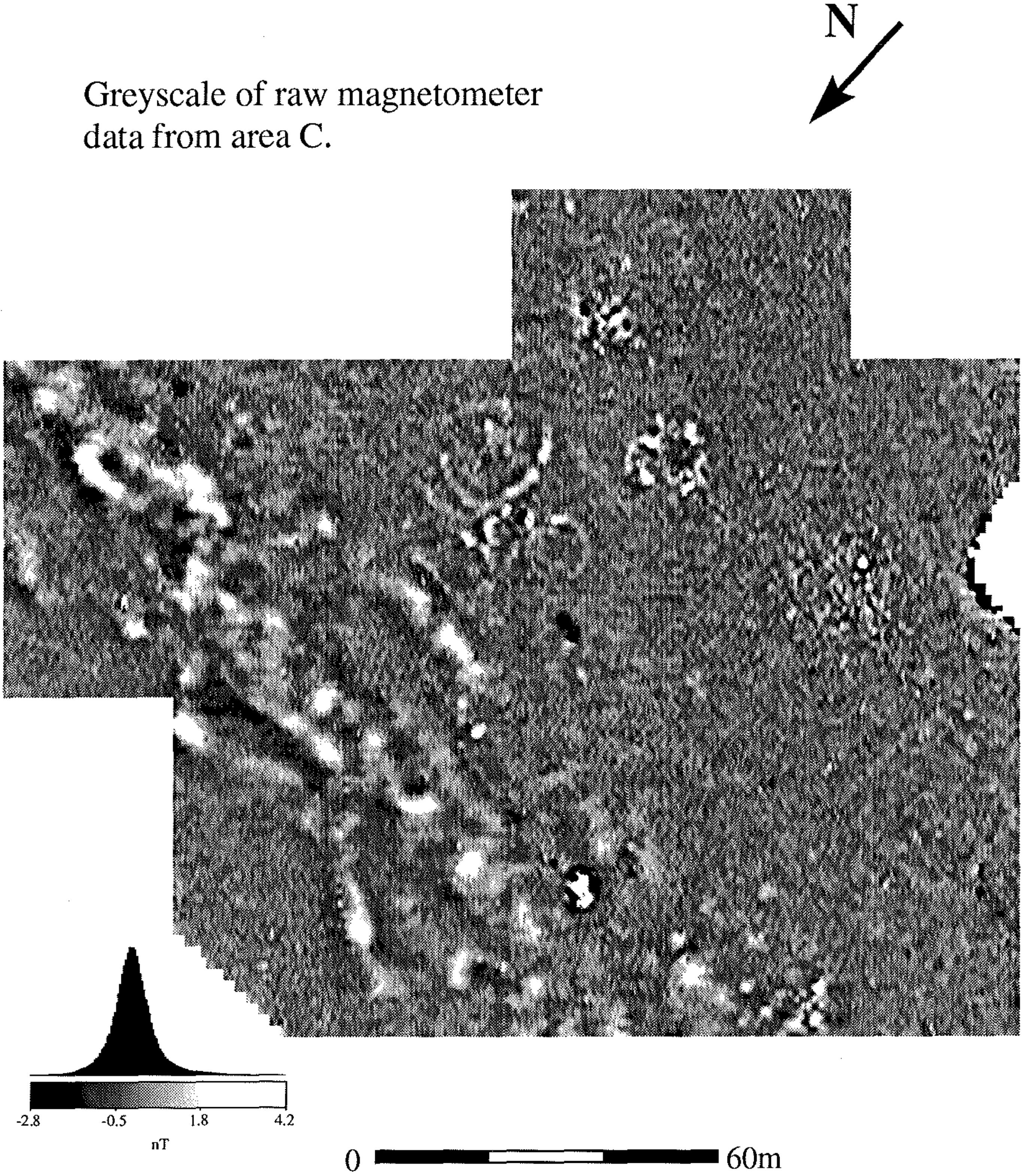
Magnetometer survey 1994-5.

Figure 4.

Greyscale of raw magnetometer data from area C.



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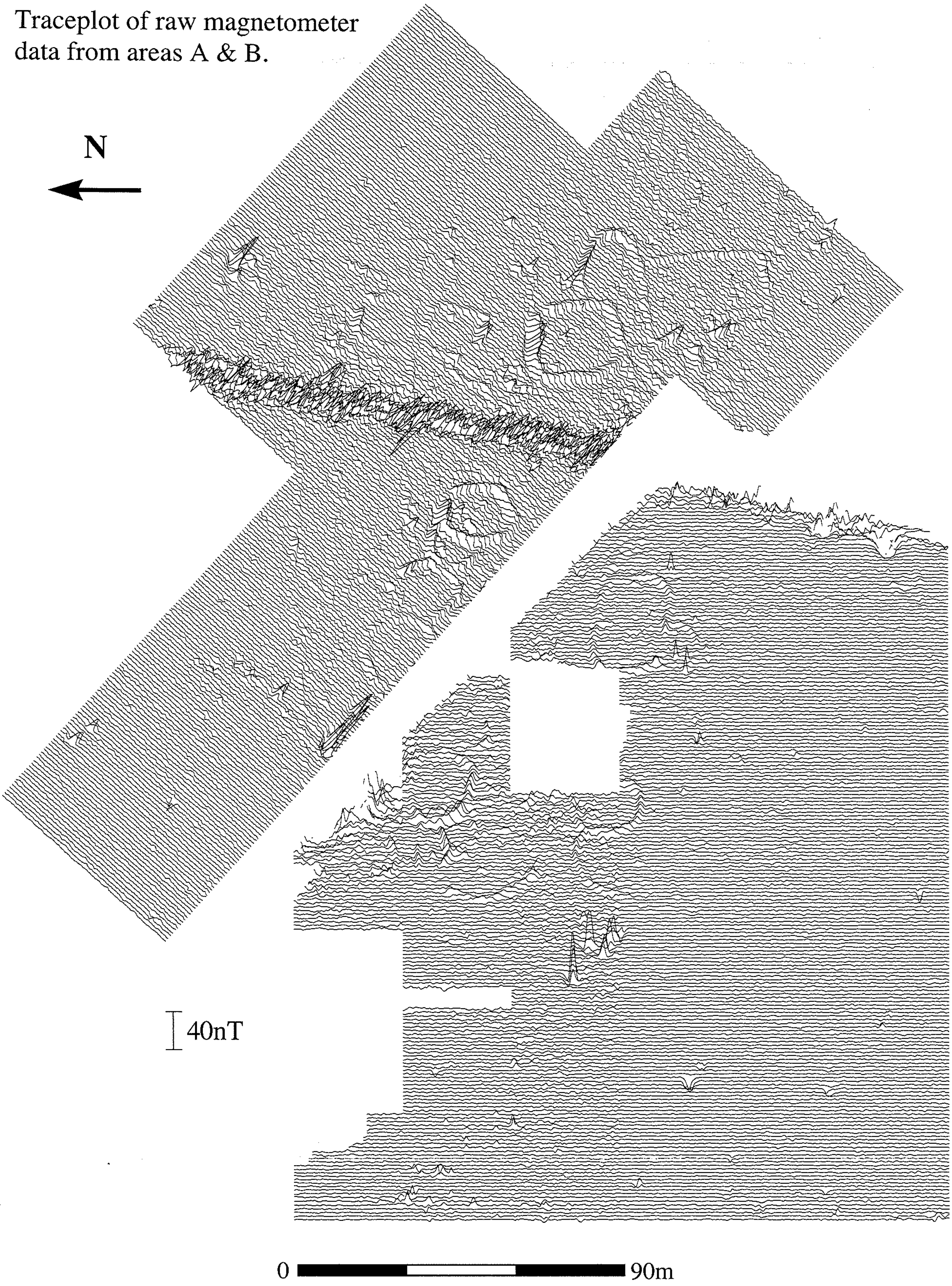
Magnetometer surveys 1994-5.

Figure 5.

Traceplot of raw magnetometer data from areas A & B.



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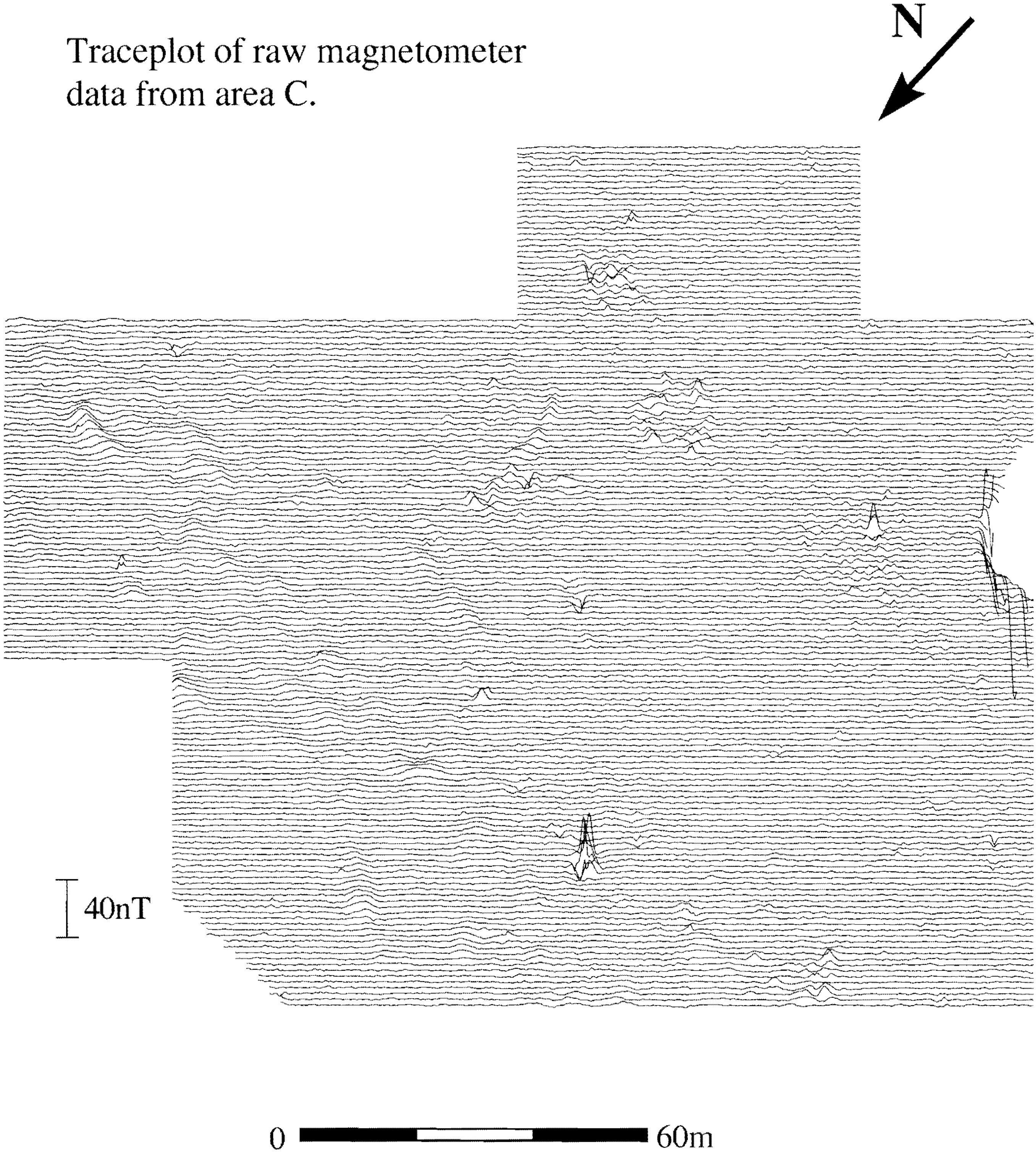
Magnetometer survey 1994-5.

Figure 6.

Traceplot of raw magnetometer data from area C.



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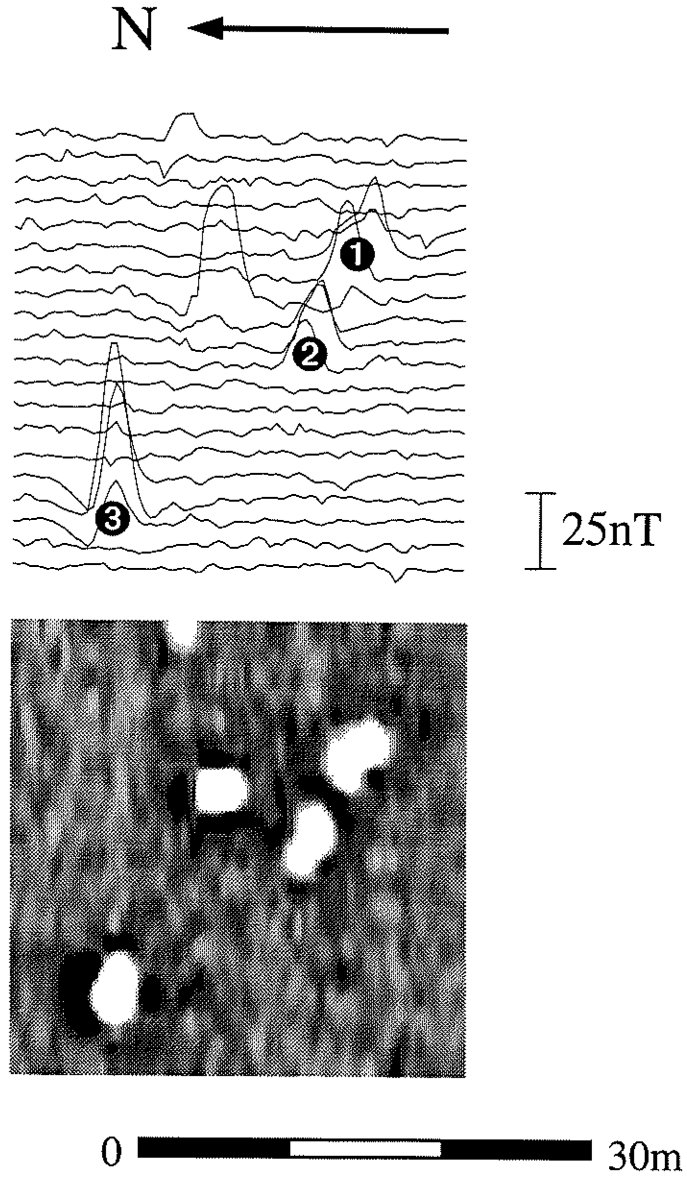
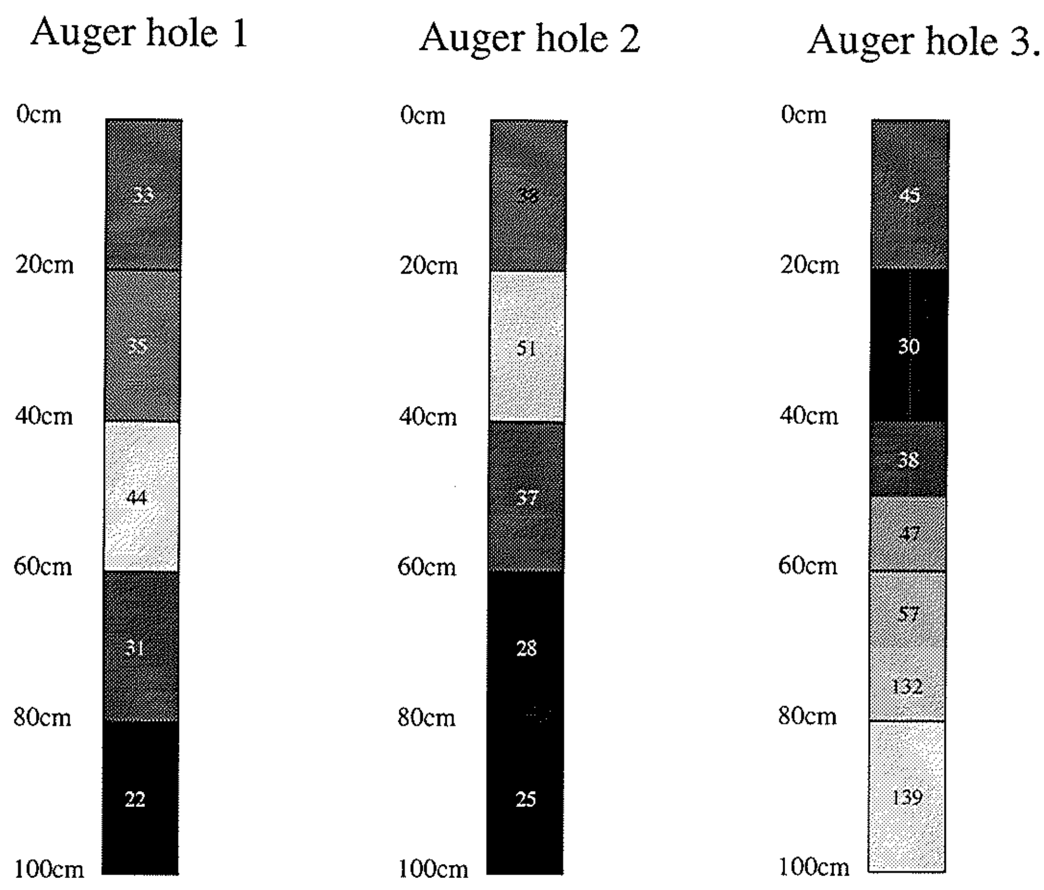
Magnetic Susceptibility Measurements.

Figure 7.

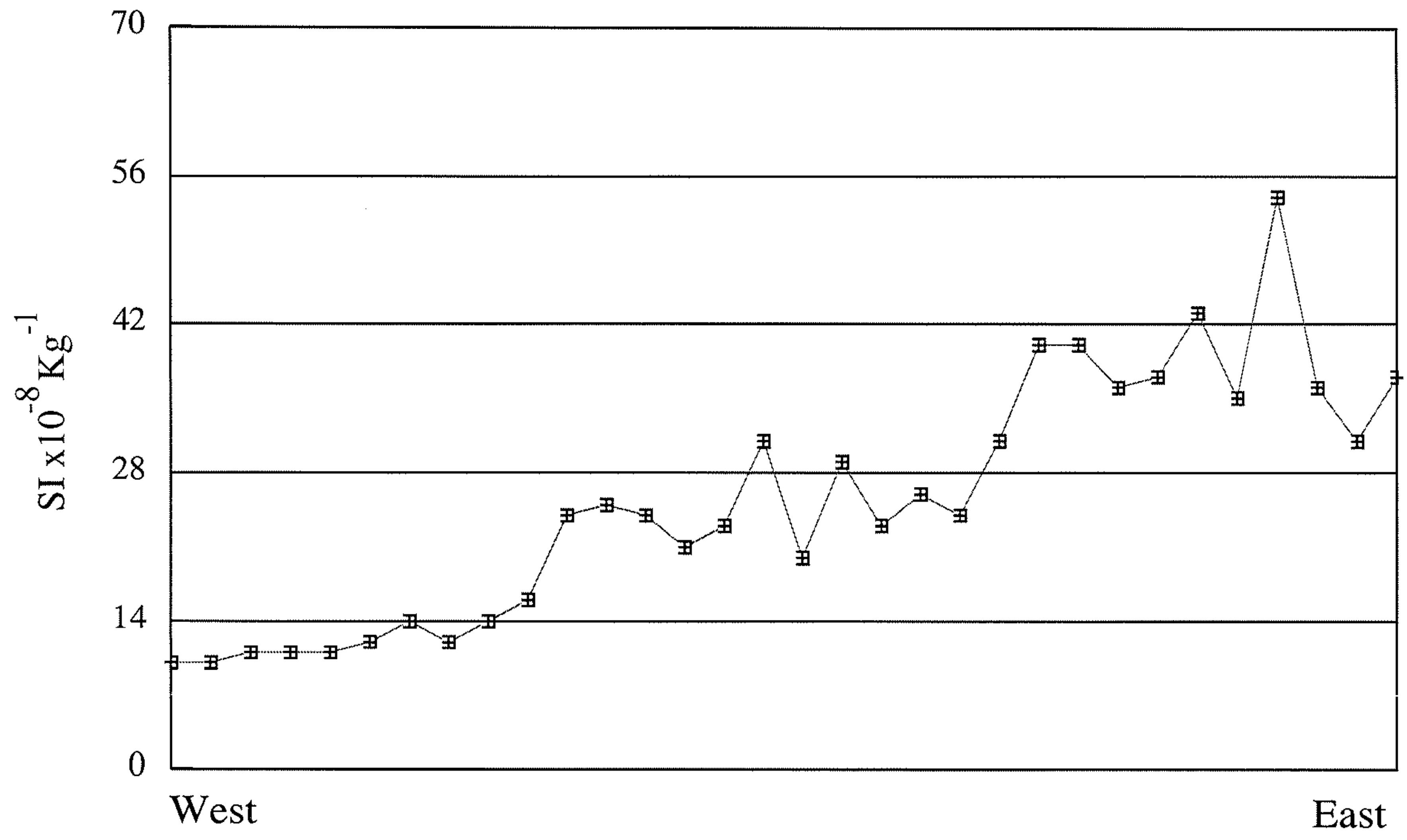
1. MS results from augered anomalies (grid square 39).





All MS measurements quoted in SI $x10^{-8}Kg^{-1}$.

2. MS results from topsoil traverse.



Topsoil samples taken at 15m intervals along an W-E traverse (see Fig 1).

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