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WILLINGHAM, CAMBS
REPORT ON GEOPHYSICAL SURVEY, SEPTEMBER 1996

M Cole

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Summary

This report summarises the results of a geophysical survey undertaken over a group of barrows near Willingham, Cambridgeshire, in September 1996. The group lies immediately adjacent to a tract of land threatened by mineral extraction and as such falls within the study zone of the Willingham Gravel Quarry Hydrological Monitoring Project. The aim of the survey was to confirm the presence and size of the barrows and to attempt to locate any internal structures. It was also hoped that the survey might identify any archaeological features lying in the spaces between them. The site conditions proved well suited to resistivity survey and four barrows each of similar size were clearly identified, three of them surrounded by a single ring ditch. The results over the fifth (and superficially least substantial) mound were inconclusive leaving this feature more open to interpretation. A network of linear ditches of uncertain date was also identified in the area between the barrows.

Author's address :-

M Cole

Archaeometry Branch
Ancient Monuments Laboratory
ENGLISH HERITAGE
Fortress House
23 Savile Row
London W1X 1AB

WILLINGHAM, CAMBRIDGESHIRE.

Report on geophysical survey, September 1996.

INTRODUCTION

Geophysical survey was undertaken over a group of barrows, near Willingham, Cambridgeshire, in September 1996. The barrows lie immediately adjacent to an area threatened by gravel extraction and as such fall within the limits of the long-term hydrological monitoring project at Willingham (French & Davis 1994). The latter aims to examine the effects of large-scale mineral extraction on an apparently well preserved and potentially waterlogged archaeological landscape over a period of up to 25 years by combining archaeological excavation and prospection with long-term environmental monitoring.

The main aim of this geophysical survey was to elucidate as much information as possible relating to the barrows by revealing their size and number of encircling ditches as well as attempting to locate any surviving internal features. In addition, it was hoped that any archaeological features present in the spaces between the barrows might be identified. An outlier of the group (to the east of Long Drove), which will be included in the first take of land, has already been successfully mapped using resistivity (Roberts 1994). This barrow has recently been trial trenched by the Cambridge Archaeological Unit (CAU) as part of an archaeological assessment (funded by ARC Quarries Ltd) of the first take of land. The initial observations from these excavations have informed the interpretation of the results discussed in this report.

The barrow group (centred on TL 371 719) is located some 400m east of the Great Ouse in an area of alluviated river and fen-edge gravels. The barrows survive as low mounds protruding through a superficial cover of alluvium. As such they have been protected to some extent from the damaging effects of arable cultivation, although the tops of the mounds are now being eroded.

METHOD

A grid of 30m squares, oriented on the National Grid, was established over the barrow group (see Fig 1) by members of the project team. As resistivity survey had already been deployed successfully in the vicinity (Roberts 1994) each of these squares was surveyed using a Geoscan RM15 resistance meter. The Twin Electrode configuration was employed with a mobile probe spacing of 0.5m to collect readings at 1.0m intervals along traverses spaced 1.0m apart. The resultant data is illustrated in this report using greyscale images. Due to the broad variation in background resistivity encountered across the site, a range of contrast enhancing filters[1] has been applied to the data, the most expressive of which are presented alongside the raw data in Figure 3. A combined plot of the raw data and a topographic survey (produced by Hunting Land and Environmental Ltd) has also been included for comparison (see Fig 2).

A limited number of grid squares were also surveyed using Geoscan FM36 fluxgate gradiometers to assess the efficacy of the technique at the site. Readings were collected at 0.25m intervals along north-south traverses spaced 1.0m apart. The resultant data is presented here in the form of greyscale and graphical trace plots (see Fig 4).

RESULTS

<u>Resistivity Survey</u>

Despite broad changes in the background apparent resistivity across the survey area (presumably due to variations in soil moisture content and undulations in the underlying gravels) the resistivity survey has successfully mapped considerable evidence of buried archaeological features. Most evident amongst these are the circular zones of high resistance recorded over four of the five barrow mounds. In addition, a reasonably well defined zone of relatively lower resistance readings has been detected at the centres of both the westernmost and northernmost barrows which may represent the remains of an internal structure. It is worth noting, however, that the uppermost parts of the barrow mounds will have suffered the most damage due to cultivation, making it difficult to draw any confident conclusions here. Although the previous resistivity survey of an outlying barrow (Roberts 1994) detected a possible revetment surrounding its mound, no comparable feature appears to have been detected over any of the barrows reported upon here.

Figure 2 demonstrates that, in general, the topographic survey correlates very well with the resistance data. An exception to this is the mound located within grid squares 17 and 22 (on Fig 1) which does not appear to have been detected by the resistivity survey. This is the least substantial of the group standing only about 30cm above its surroundings. Significantly, CAU trial trenching of a similarly insubstantial mound in the field to the east revealed this to be a natural undulation in the underlying gravel (C Evans *pers comm*) and a corresponding interpretation is possible, therefore, in this case.

The comparison of the resistivity and topographic surveys illustrates the masking effect of the alluvial cover by demonstrating that, despite their apparently differing sizes on the ground (see Fig 2), the barrows are all in fact of a similar size each having a central mound of just under 20m in diameter. The presence of a single ring ditch is clearly evident around three of the barrows. This differs slightly from the outlying barrow (see above) the central mound of which is closer to 26m in diameter.

In the areas between the barrows, an arrangement of linear anomalies has been detected which represents a system of former field boundaries. Distinct gaps are visible in these which are almost certainly entrances: some particularly clear examples are evident in grid square 23. Eastward continuations of some of the ditches have been identified in a CAU trench

[1]For a detailed description of these image enhancement filters see Scollar et al (1990).

excavated parallel to and just to the east of Long Drove. Initial observations of their primary fills suggest an early (?Neolithic) date although no artefacts have, as yet, been discovered to allow these features to be tied confidently to any particular period. Although the boundaries appear to respect the barrows, it is not clear from the geophysical evidence how these features relate to each other. The CAU excavations have revealed that the tops of the ditches are covered by at least 0.6m of peat and flood clay alluvium, demonstrating both their antiquity and the suitability of the site conditions to their detection.

Also evident in the centre of the surveyed area is a scatter of discrete low resistance anomalies. Whilst it is possible that some or all of these represent archaeological features, they may also simply portray localised variations in soil moisture content. This cautious interpretation is supported by the findings of the excavations which have revealed some isolated archaeological pits situated amongst scatters of natural anomalies (tree root boles etc). Once again, however, these features are sealed beneath a thick blanket of sediment underlining the remarkable effectiveness of resistivity survey at the site.

At the northernmost edge of the surveyed area, a curvilinear low resistance anomaly has been detected of approximately 8m in width. This intersects with a low resistance linear anomaly, apparently bounded to either side by a narrow strip of relatively higher resistance, at the northern edge of grid square 1. Any interpretation of these features is hampered by their proximity to the edge of the survey area. As yet, no continuation of either feature has been revealed in the excavations to the east.

In the south-eastern corner, a strip of anomalous disturbance has been detected as a result of the uneven surface in this area. Unfortunately, this edge of the field had not been harrowed prior to the survey.

Magnetometer Survey

As can be seen on Figure 4, the magnetic response at the site was very subdued and the majority of the readings fall within only 0.8 nT. The area surveyed included the southernmost barrow but the magnetometer has failed to detect the barrow ditch. Clearly there is an insufficient magnetic contrast between the archaeological features and their surroundings, an effect which will be exacerbated by their depth of burial. A possible explanation for such a lack of magnetic contrast is that the funerary environment in which the barrows were constructed was not associated with any significant enhancement of topsoil magnetic susceptibility. Alternatively, the ditches of the barrow may be largely silted with magnetically sterile alluvium.

The magnetometer has, however, managed to reveal a very subtle positive linear anomaly which is an apparent continuation of a low resistance linear anomaly mapped by the resistivity survey (see Fig 4). Intriguingly, where this feature has been successfully detected by the magnetometer coincides with an area in which the resistivity survey has notably failed to do so.

CONCLUSIONS

Whilst the site conditions were certainly unfavourable for magnetic survey, they proved extremely well suited to resistivity. Four of the barrow mounds have been mapped clearly as distinct zones of high resistance (~20m in diameter), with ring ditches evident around three of these. However, the fifth mound within the surveyed area has not produced conclusive evidence of the presence of a barrow leaving this feature more open to interpretation. Although there is some indication in the data of internal structuring within most of the barrow mounds, it is not possible to elucidate with any certainty whether interment features exist.

Comparison of these results with those of the earlier resistivity survey indicates that there are subtle differences between the outlying barrow and those of the main group. The outlier has a mound which is more than 25m in diameter whilst those within the main group are all less than 20m across. In addition, no indication of revetments has been detected by this survey.

In the areas between the barrows a network of enclosure ditches has been mapped, some of which have clear entrances, as well as a number of other discrete anomalies of archaeological potential. Excavation evidence suggests that these barrows are early features, possible even Neolithic. No information is as yet forthcoming from either the survey of the excavation as to how these features relate to each other.

Comparison of the resistivity results with the CAU excavation trenches to the east underline the remarkable effectiveness of this technique at the site. Clearly, these results indicate that further, targeted survey within the threatened area would in all probability prove to be most profitable.

Surveyed by: N Linford
M Cole

Dates: 9-12 September 1996

Reported by: M Cole

3 October 1996

Archaeometry Branch
Ancient Monuments Laboratory

References

French, C A I, and Davis, M J 1994 The Long-term Hydrological Monitoring of Relict Landscapes at the Willingham Gravel Quarry, Cambridgeshire, (unpublished project design).

Roberts, K, 1994 The archaeological application of geophysical survey techniques, PhD dissertation, University of Cambridge, (unpublished).

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

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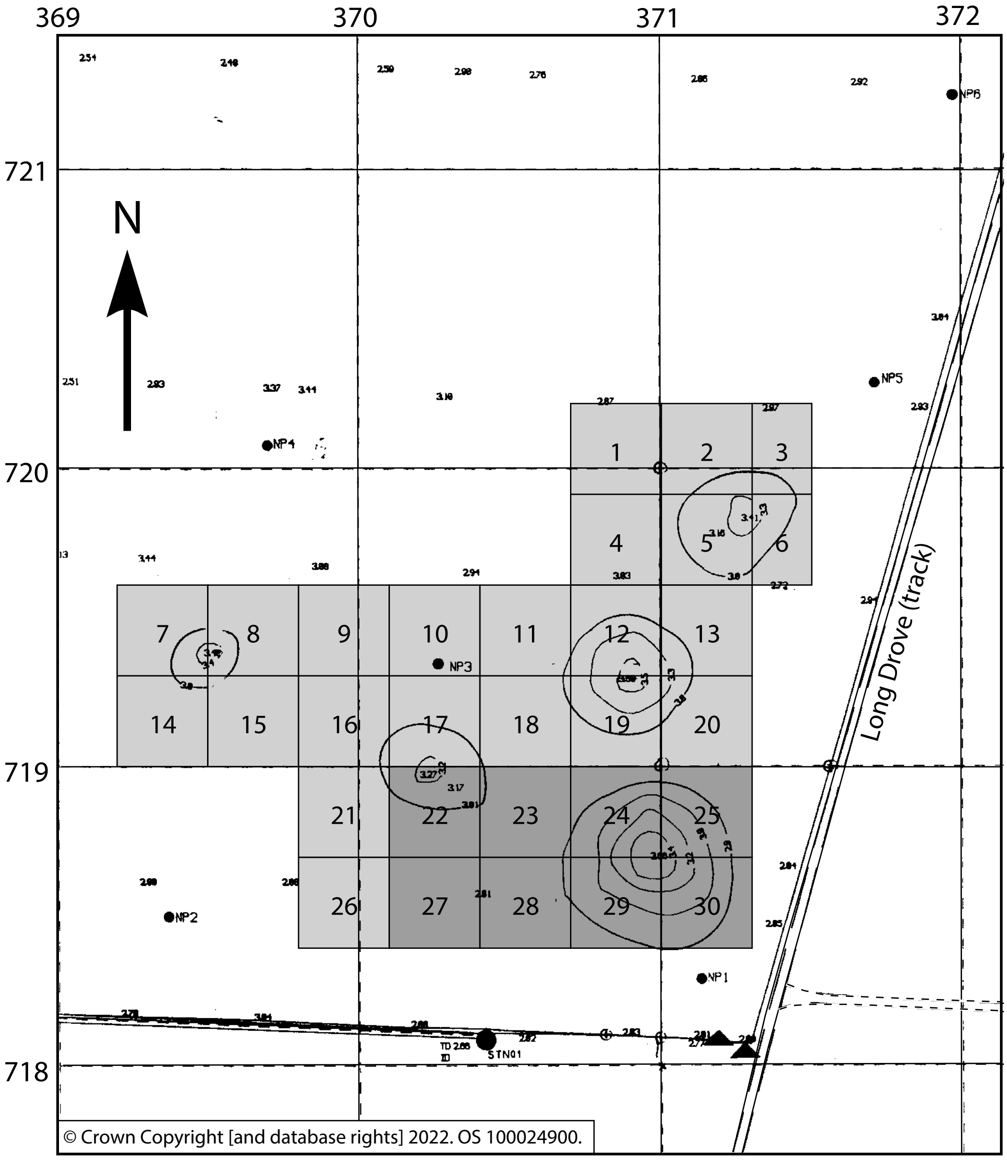
FIGURE 1.

WILLINGHAM, CAMBS.
Geophysical Survey, Sept 1996.

Location of survey.

TL3772



Magnetometer coverage 0 90m

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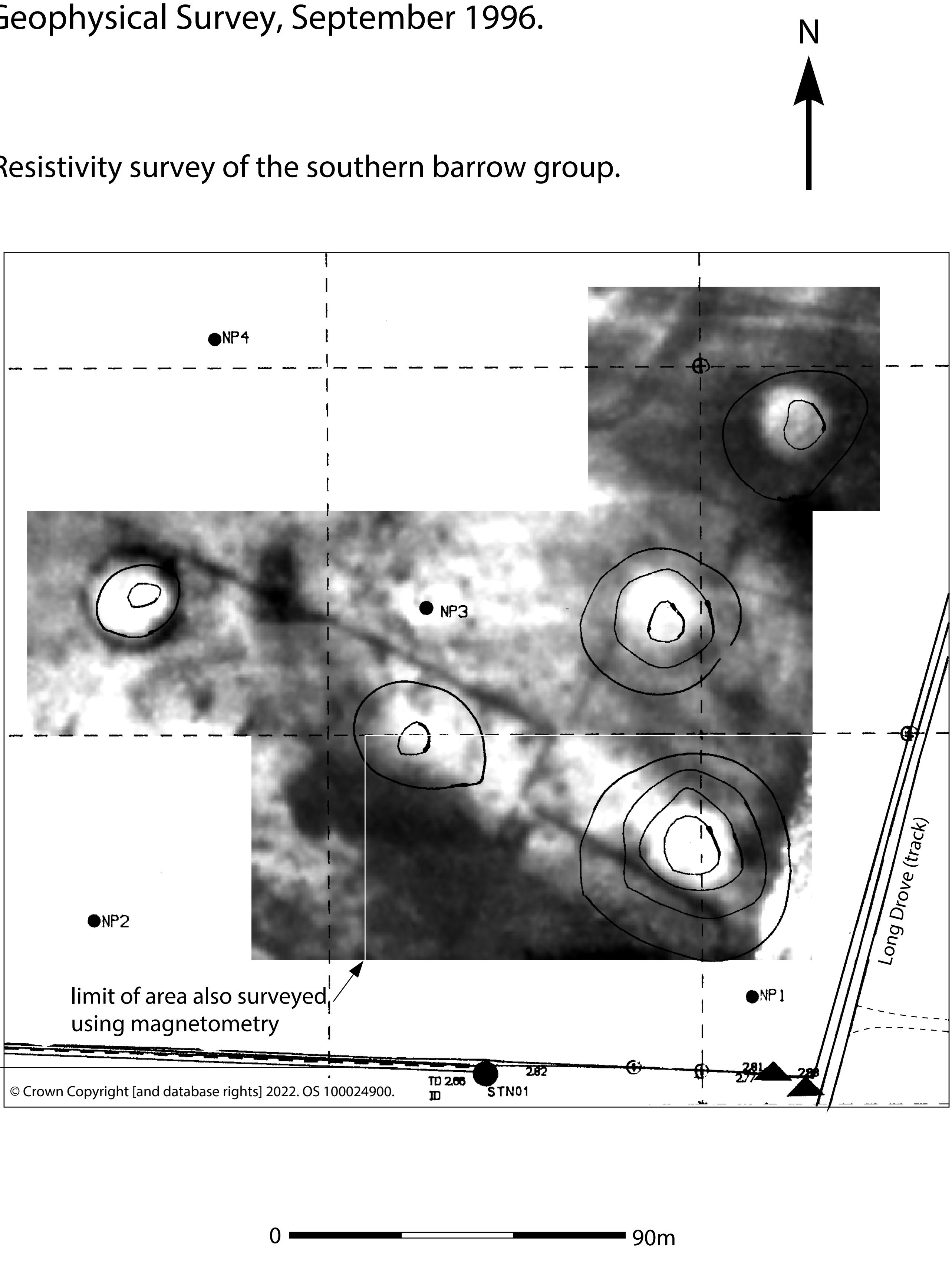
FIGURE 2.

WILLINGHAM, CAMBS.
Geophysical Survey, September 1996.

Resistivity survey of the southern barrow group.



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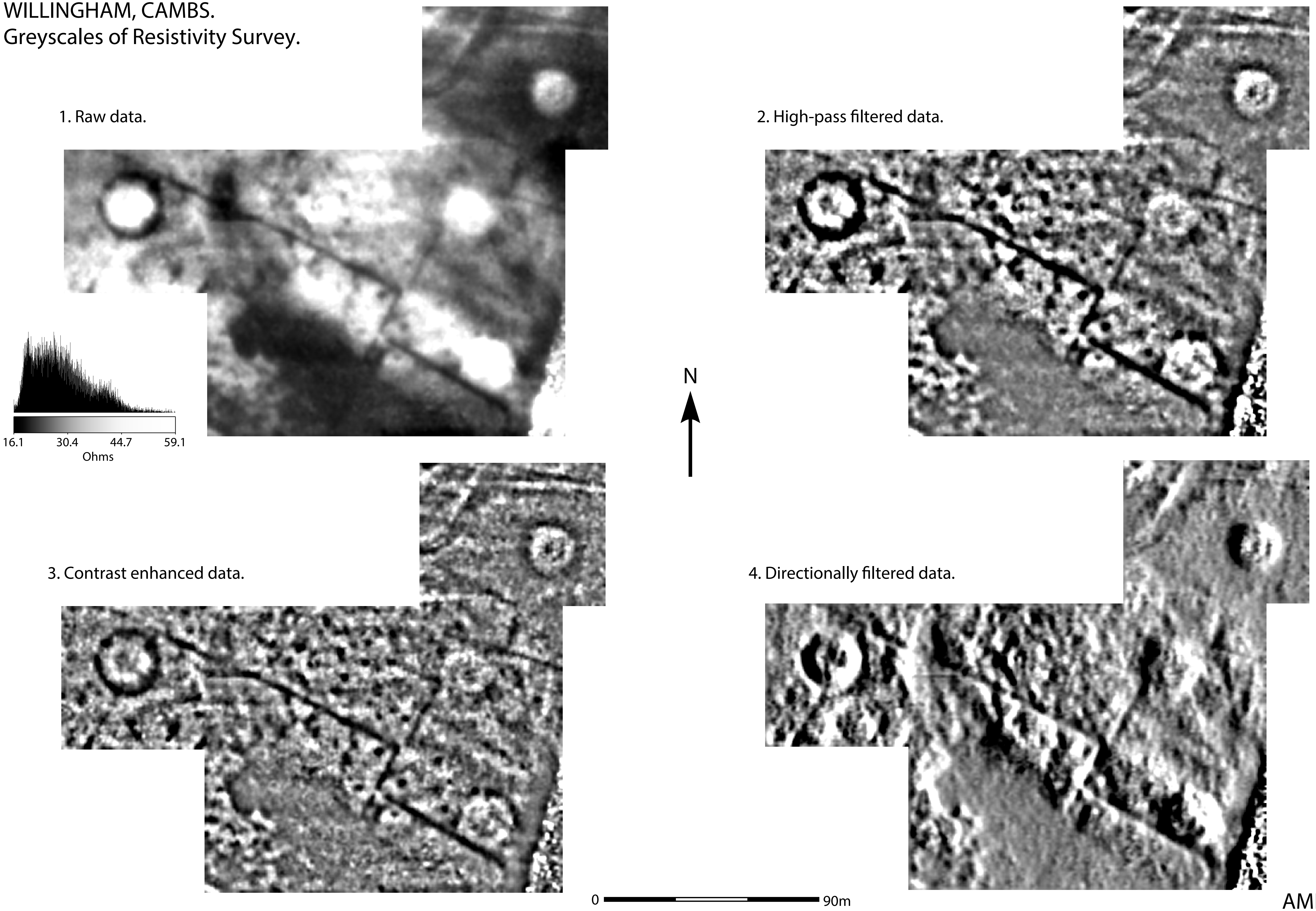
Greyscales of Resistivity Survey.



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Geophysical Survey, September 1996.

FIGURE 4.

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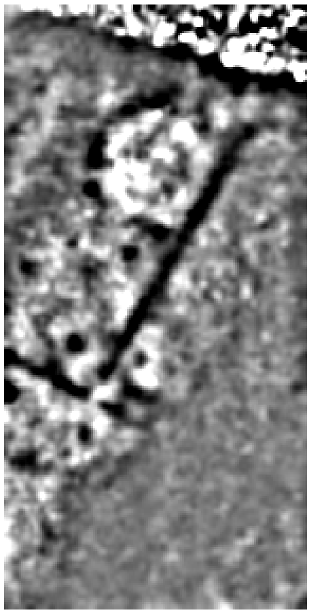
Comparison of resistivity and magnetometer data.

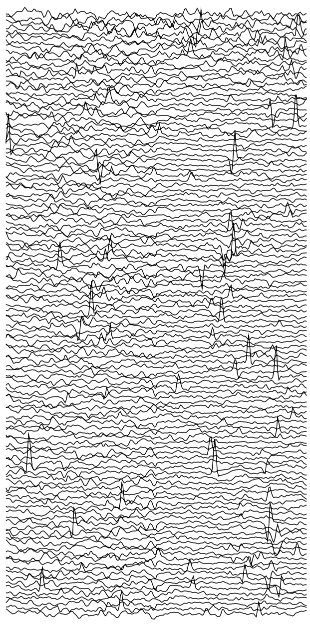
1. Raw resistivity data.

2. High-pass filtered resistivity data.

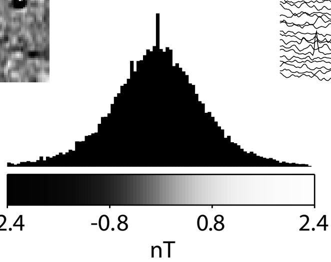


3. Raw magnetometer data.

4. Raw magnetometer data.



30nT



0 45m

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