Centre for Archaeology Report 78/2001

The West Kennet Long Barrow, Wiltshire; Report on Geophysical Survey, January 2001.

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ISSN 1473-9224

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Summary

A magnetometer survey of approximately 3.5 hectares was carried out around West Kennet long barrow, Wiltshire. It was hoped that the ditches and any associated features would be defined and located. The survey successfully identified the barrow ditches, but no other directly related responses. Some possible pits were located in dispersed groups to the east of the mound, and a large anomaly was recorded some 45m to the south of the barrow. The relationship of these various features to the barrow remains uncertain but would be worth further investigation.

Keywords

Geophysics

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WEST KENNET LONG BARROW, Wiltshire.

Report on geophysical survey, January 2001.

Introduction

A geophysical survey of approximately 3.5 ha was conducted around the West Kennet long barrow, Wiltshire (National Monument Number: 21708), as an initial phase of the proposed English Heritage West Kennet Long Barrow project (Gibson 2000). Previous work on the site includes excavation of the chambered eastern end of the barrow by Thurnam in 1859; a resistance survey of the ditches in 1955 by Atkinson (Piggott 1962;ix), and further excavation work by Piggott and Atkinson in 1955-6, including a section of the northern ditch (Piggott 1962). In addition, the Ancient Monuments Laboratory undertook an earth resistance, magnetometer and electro-magnetic survey of the ditches in 1991 (unpublished) and the RCHME conducted an earthwork survey in 1992.

The aim of this renewed survey was to 'define the archaeological limits of the monument' (Gibson 2000, 3) by extending the area covered and refining the imaging of the ditches. It was hoped that this would help gain a greater understanding of the monument, its extent, and any associated features or deposits. Such information might inform the future management of the site, for instance by indicating the extent of any additional fencing required for the adequate protection of the ditches. Fresh survey data might also inform on the suggestion that a possible 'kink' in the definition of the ditches in the original (1955) resistivity survey (corresponding with a topographic depression across the mound) might be indicative of phasing in the monument construction (*ibid*).

The West Kennet long barrow (SU 104 677) lies on well drained calcareous silty soils of the Andover 1 association (Soil Survey of England and Wales 1983) developed over Upper and Middle Chalk (Institute of Geological Sciences 1974). The fields surrounding the barrow were all in arable cultivation.

Method

Magnetometry was chosen as the most appropriate survey technique to use on this occasion to define the barrow ditches as well as any associated features. Time did not allow for any resistivity survey to be attempted. The survey was conducted over all the numbered grid squares (Figure 1) using the standard method outlined in note 2 of Annex 1. A linear greyscale of the data is superimposed over the base OS map in Figure 2. Plots of the data-set are presented as both an X-Y traceplot and a linear greyscale, at a scale of 1:1250 on Plan A. The only corrections made to the measured values displayed in the plots were to zero-mean each instrument traverse to remove heading errors and to 'despike' the data through the application of a 2m by 2m thresholding median filter (Scollar *et al* 1990: 492) to reduce the detrimental effects produced by surface iron objects. In addition the lower and upper values have been trimmed for presentation as a traceplot on Plan A. On Plan B a false colour plot of the same data is presented over the RCHME earthwork survey.

Results

A graphical summary of the anomalies discussed in the following text is provided on Plan C.

The general background response to this site is very slight (< ±1nT). The most extreme responses [1-2] relate to field boundaries visible on the OS map (see Figures 1 and 2). The fencing at [2] has been removed, perhaps explaining the spread of disturbance here. A more subdued area of noise can be seen at [3], also probably relating to a former fence line. There is, however, no similar response to the previous boundary extending to the east of the barrow (see Figure 2).

The direction of modern ploughing can be seen at [4]. At the time of the survey, only this land to the south of the barrow was seeded.

The barrow ditches have been located at [5] and [6], both situated well outside the fenced area. Due to the disturbance [1] from the fence it is not clear whether [5] extends around the eastern end of the barrow.

A distinct positive magnetic anomaly [7], measuring approximately 12m x 18m at its widest points and up to 3nT in strength, has been located 45m to the SW of the barrow. The anomaly is amorphous in shape and has no physical connection with the monument.

Also recorded are a number of pit-type anomalies [8-10] east of the barrow. Much more tentative are a few linear anomalies [11-15]. Due to the dispersed nature of the latter it is not possible to place any particular interpretation on them, such as any possible relationship to the barrow.

Conclusion

The magnetometer survey has successfully located the barrow ditches. No 'kink' has been recorded along the length of either ditch, both of which are located in the field well outside the fenced off area (slightly offset to the south side of the barrow). It has not been possible to determine satisfactorily the nature of the west terminal of the northern ditch due to ferrous disturbance from the fence.

There is little difference in the information recorded by the 1991 magnetometer survey and the current data for the enlarged area. Although this survey extends at least 60 metres out from each side of the barrow mound (compared to 30m in 1991) it does not reveal any additional and obviously associated features, other than the quarry ditches. However, the presence of apparent pits [8-10], along with the feature at [7], would bear further investigation.

The recorded position of the ditches, from both this and the 1991 surveys, does not correspond to the location suggested by the RCHME plan. It would appear that both ditches are ~100m long with the outer edge ~15m out from the barrow (not the fenced off area as this is not central to the barrow). They also extend slightly beyond the western end of the barrow and just short of the front façade at the eastern end.

The enigmatic magnetic response at [7] cannot be interpreted without excavation. Despite its very clear definition, the magnetic anomaly is weak and suggestive of an area of burning, or perhaps a tightly constrained group of pits. In either case it is a temptation to speculate that it may be related to the long barrow in some way, perhaps as a subsidiary structure. If the monument were two phase, with the original mound being the unchambered western end (Thomas and Whittle 1986, 136; Thomas 1999, 204), this anomaly could have been related to a mortuary chamber or ossuary, such as those discussed by Piggott (1962, 75-6). Alternatively such an 'offering house' could have been the store for ritual material (*ibid* 75) prior to its incorporation into the "charcoal-stained occupation soil" (*ibid* 68) used to seal the tomb. For the time being, however, it probably remains more realistic to propose that the feature is relatively modern.

Surveyed by: A Payne
L Martin

Date of survey: 15-19/01/2001

Reported by: L Martin

Date of report: 19/06/2001

Archaeometry Branch,
Centre for Archaeology,
English Heritage.

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List of enclosed figures.

Annex 1: Notes on standard procedures

1) **Resistivity Survey:** Each 30 metre grid square is surveyed by making repeated parallel traverses across it, all aligned parallel to one pair of the grid square's edges, and each separated by a distance of 1 metre from the last; the first and last traverses being 0.5 metres from the nearest parallel grid square edge. Readings are taken along each traverse at 1 metre intervals, the first and last readings being 0.5 metres from the nearest grid square edge.

   Unless otherwise stated the measurements are made with a Geoscan RM15 earth resistance meter incorporating a built-in data logger, using the twin electrode configuration with a 0.5 metre mobile electrode separation. As it is usually only relative changes in resistivity that are of interest in archaeological prospecting, no attempt is made to correct these measurements for the geometry of the twin electrode array to produce an estimate of the true apparent resistivity. Thus, the readings presented in plots will be the actual values of earth resistance recorded by the meter, measured in Ohms (Ω). Where correction to apparent resistivity has been made, for comparison with other electrical prospecting techniques, the results are quoted in the units of apparent resistivity, Ohm-m (Ωm).

   Measurements are recorded digitally by the RM15 meter and subsequently transferred to a portable laptop computer for permanent storage and preliminary processing. Additional processing is performed on return to the Centre for Archaeology using desktop workstations.

2) **Magnetometer Survey:** Each 30 metre grid square is surveyed by making repeated parallel traverses across it, all parallel to that pair of grid square edges most closely aligned with the direction of magnetic North. Each traverse is separated by a distance of 1 metre from the last; the first and last traverses being 0.5 metre from the nearest parallel grid square edge. Readings are taken along each traverse at 0.25 metre intervals, the first and last readings being 0.125 metre from the nearest grid square edge.

   These traverses are walked in so called 'zig-zag' fashion, in which the direction of travel alternates between adjacent traverses to maximise survey speed. However, the magnetometer is always kept facing in the same direction, regardless of the direction of travel, to minimise heading error.

   Unless otherwise stated the measurements are made with a Geoscan FM36 fluxgate gradiometer which incorporates two vertically aligned fluxgates, one situated 0.5 metres above the other; the bottom fluxgate is carried at a height of approximately 0.2 metres above the ground surface. The FM36 incorporates a built-in data logger that records measurements digitally; these are subsequently transferred to a portable laptop computer for permanent storage and preliminary processing. Additional processing is performed on return to the Centre for Archaeology using desktop workstations.

   It is the opinion of the manufacturer of the Geoscan instrument that two sensors placed 0.5 metres apart cannot produce a true estimate of vertical magnetic gradient unless the bottom sensor is far removed from the ground surface. Hence, when results are presented, the difference between the field intensity measured by the top and bottom sensors is quoted in units of nano-Tesla (nT) rather than in the units of magnetic gradient, nano-Tesla per metre (nT/m).

3) **Resistivity Profiling:** This technique measures the electrical resistivity of the subsurface in a similar manner to the standard resistivity mapping method outlined in note 1. However, instead of mapping changes in the near surface resistivity over an area, it produces a vertical section, illustrating how resistivity varies with increasing depth. This is possible because the resistivity meter becomes sensitive to more deeply buried anomalies as the separation between the measurement electrodes is increased. Hence, instead of using a single, fixed electrode separation as in resistivity mapping, readings are repeated over the same point with increasing separations to investigate the resistivity at greater depths. It should be noted that the relationship between electrode separation and depth sensitivity is complex so the vertical scale quoted for the section is only approximate. Furthermore, as depth of investigation increases the size of the smallest anomaly that can be resolved also increases.

Typically a line of 25 electrodes is laid out separated by 1 or 0.5 metre intervals. The resistivity of a vertical section is measured by selecting successive four electrode subsets at increasing separations and making a resistivity measurement with each. Several different schemes may be employed to determine which electrode subsets to use, of which the Wenner and Dipole-Dipole are typical examples. A Campus Geopulse earth resistance meter, with built in multiplexer, is used to make the measurements and the Campus Imager software is used to automate reading collection and construct a resistivity section from the results.

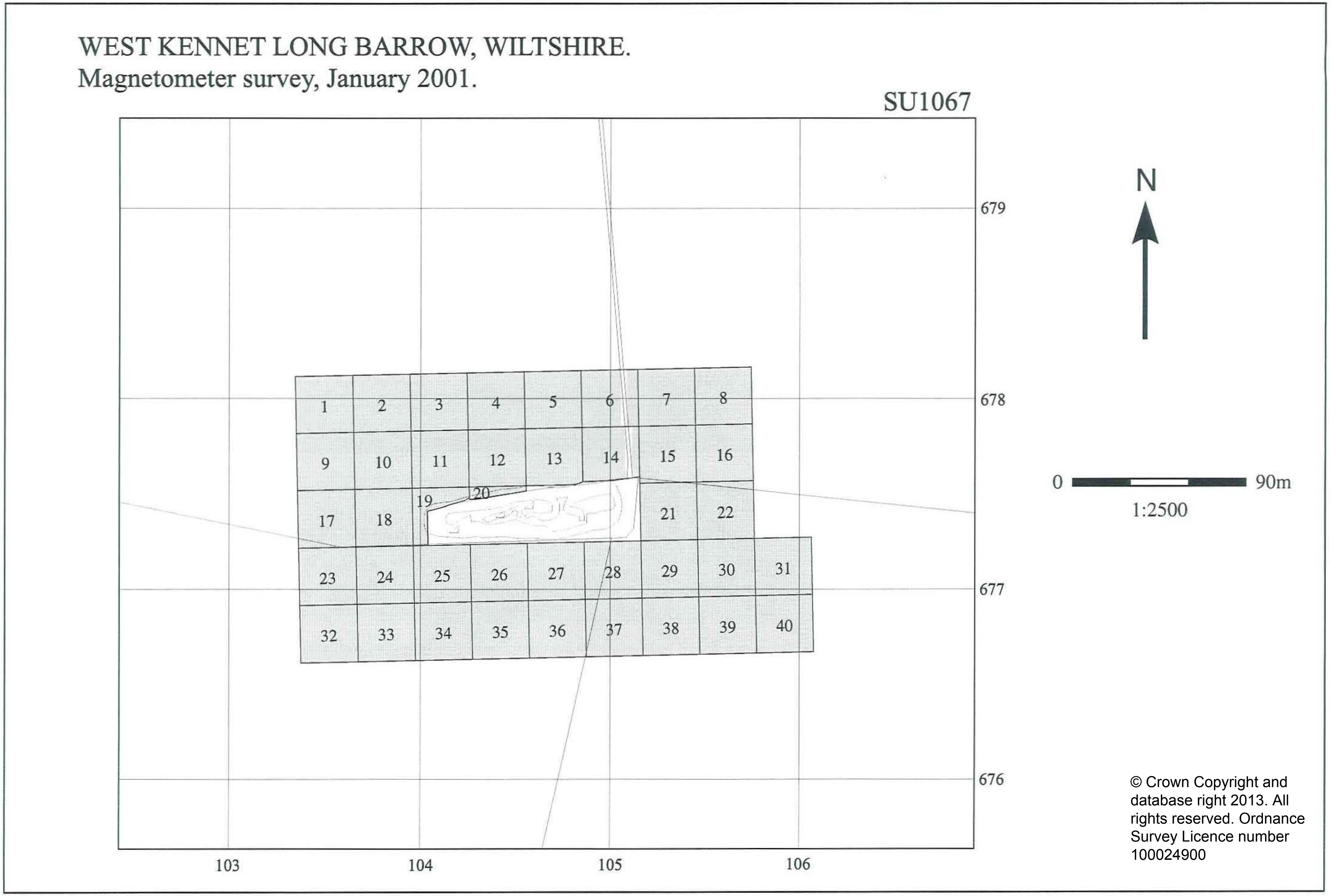


Figure 1; West Kennet long barrow, Wiltshire; Location of geophysical survey, January 2001.

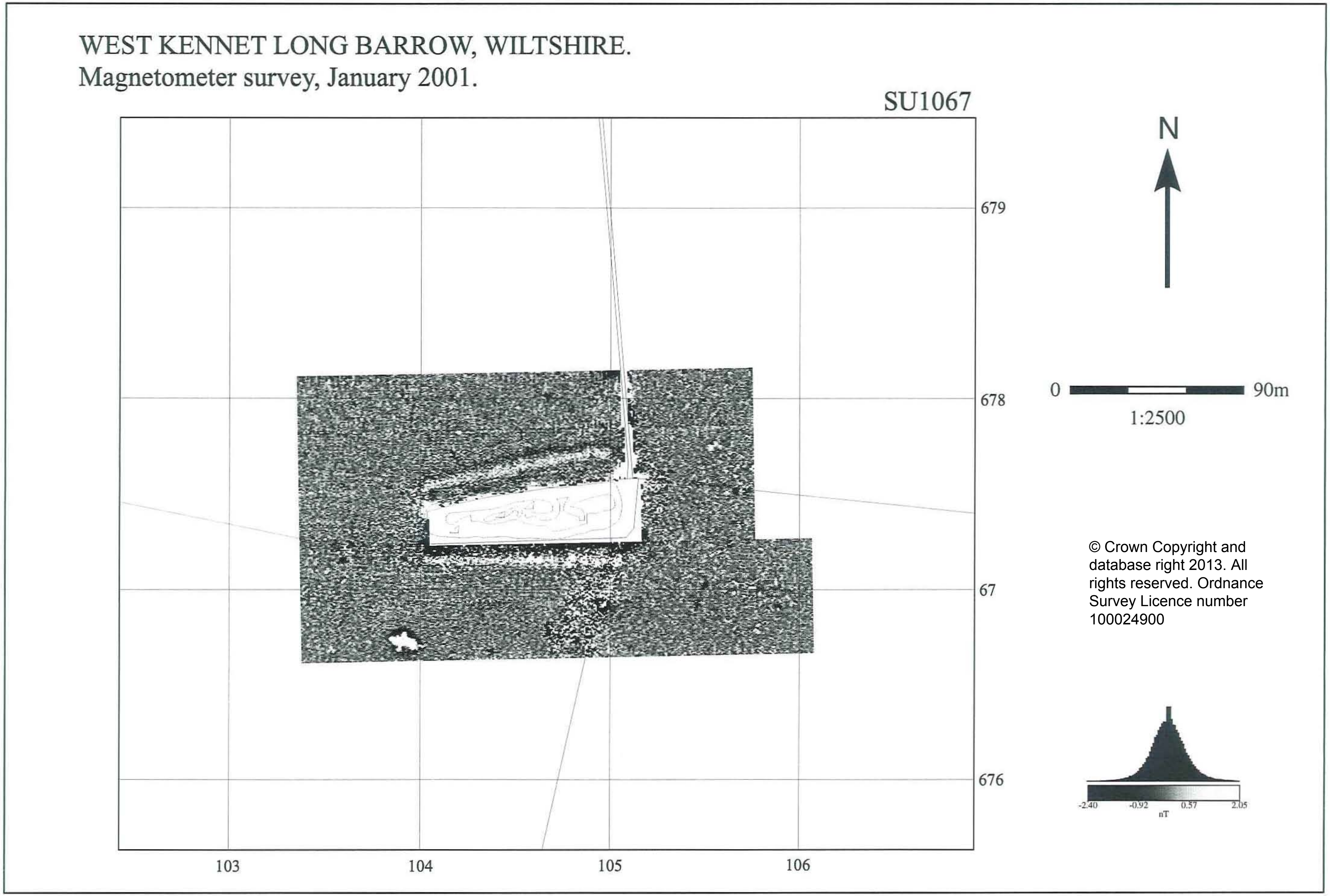


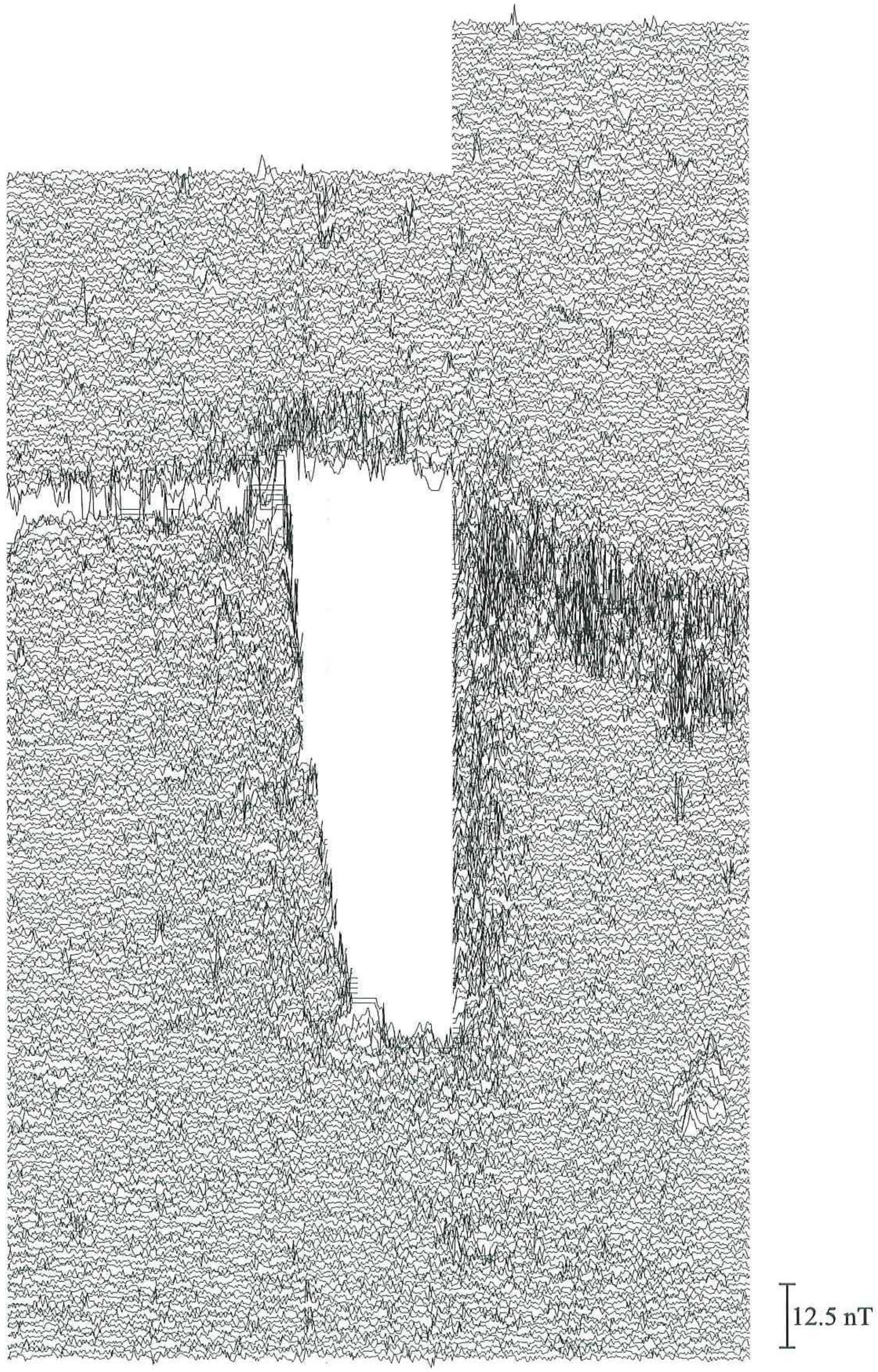
Figure 2; West Kennet long barrow, Wiltshire; Linear greyscale of magnetometer data, January 2001.

WEST KENNET LONG BARROW, WILTSHIRE.
Magnetometer survey, January 2001.

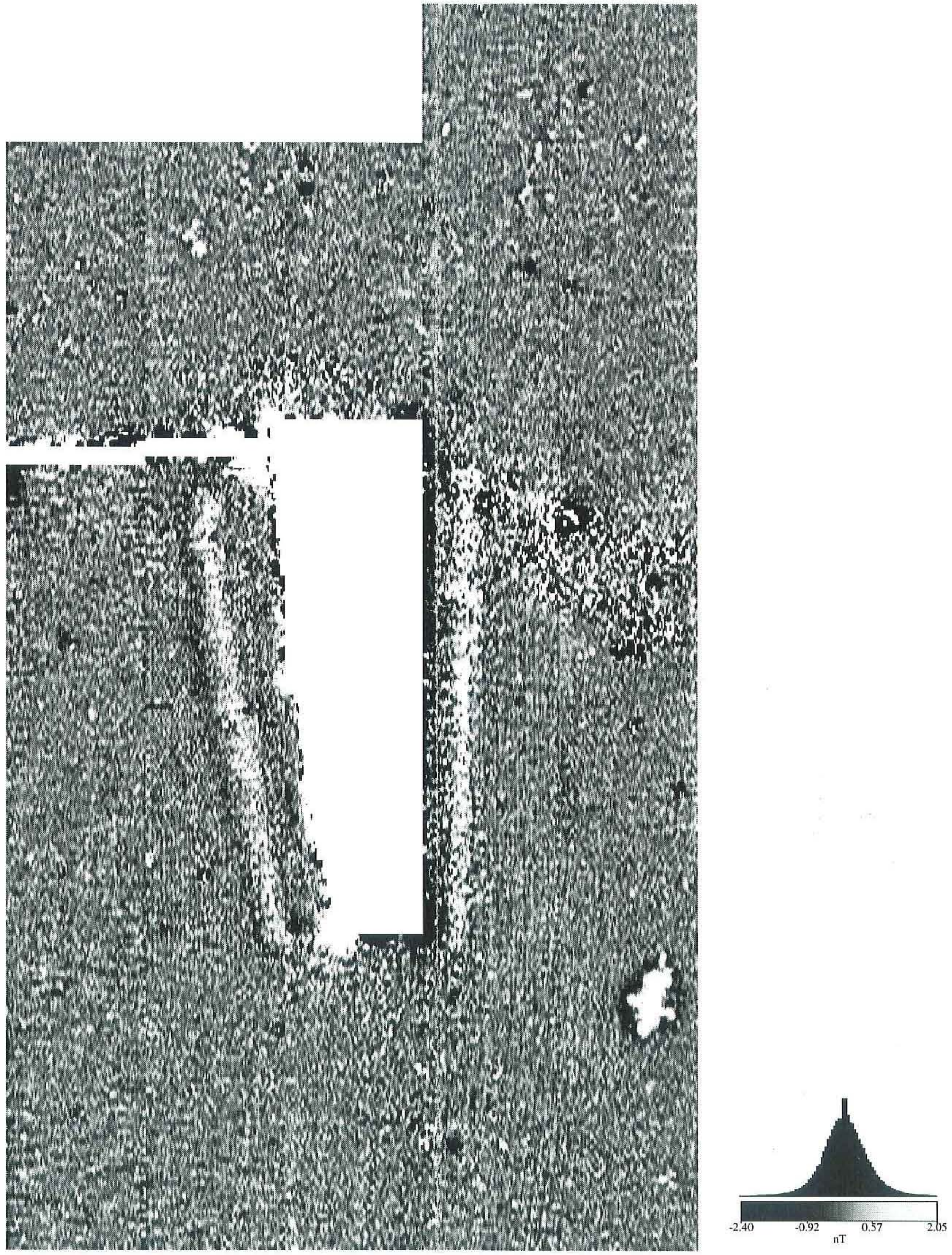
PLAN A

N

1) Traceplot of magnetometer data.



2) Linear greyscale of magnetometer data.



0 90m

1:1250

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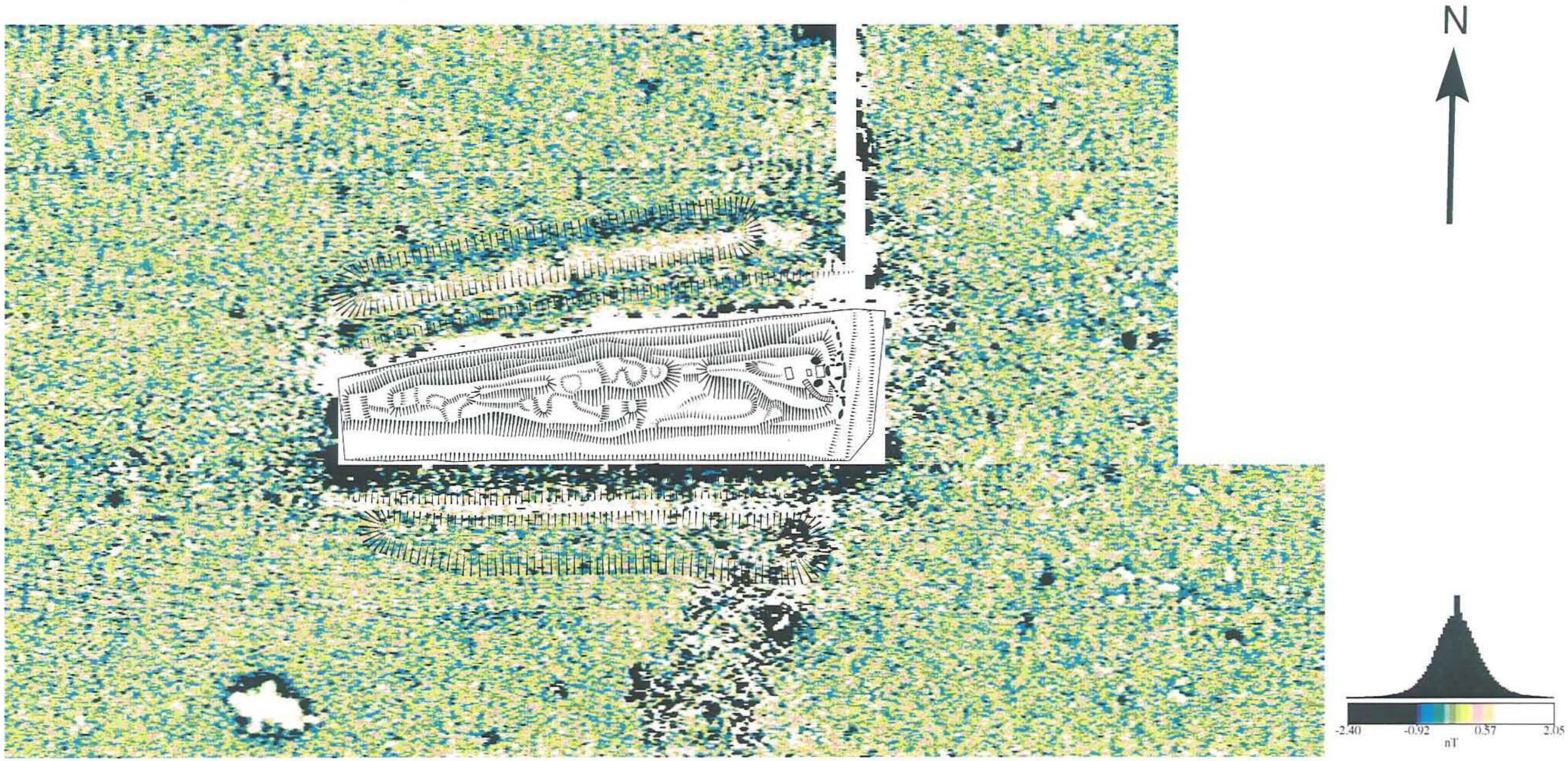
WEST KENNET LONG BARROW, WILTSHIRE. PLAN B

Magnetometer survey, January 2001.

Linear false colour image of magnetometer data over approximate location of earthwork survey.



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1:1250

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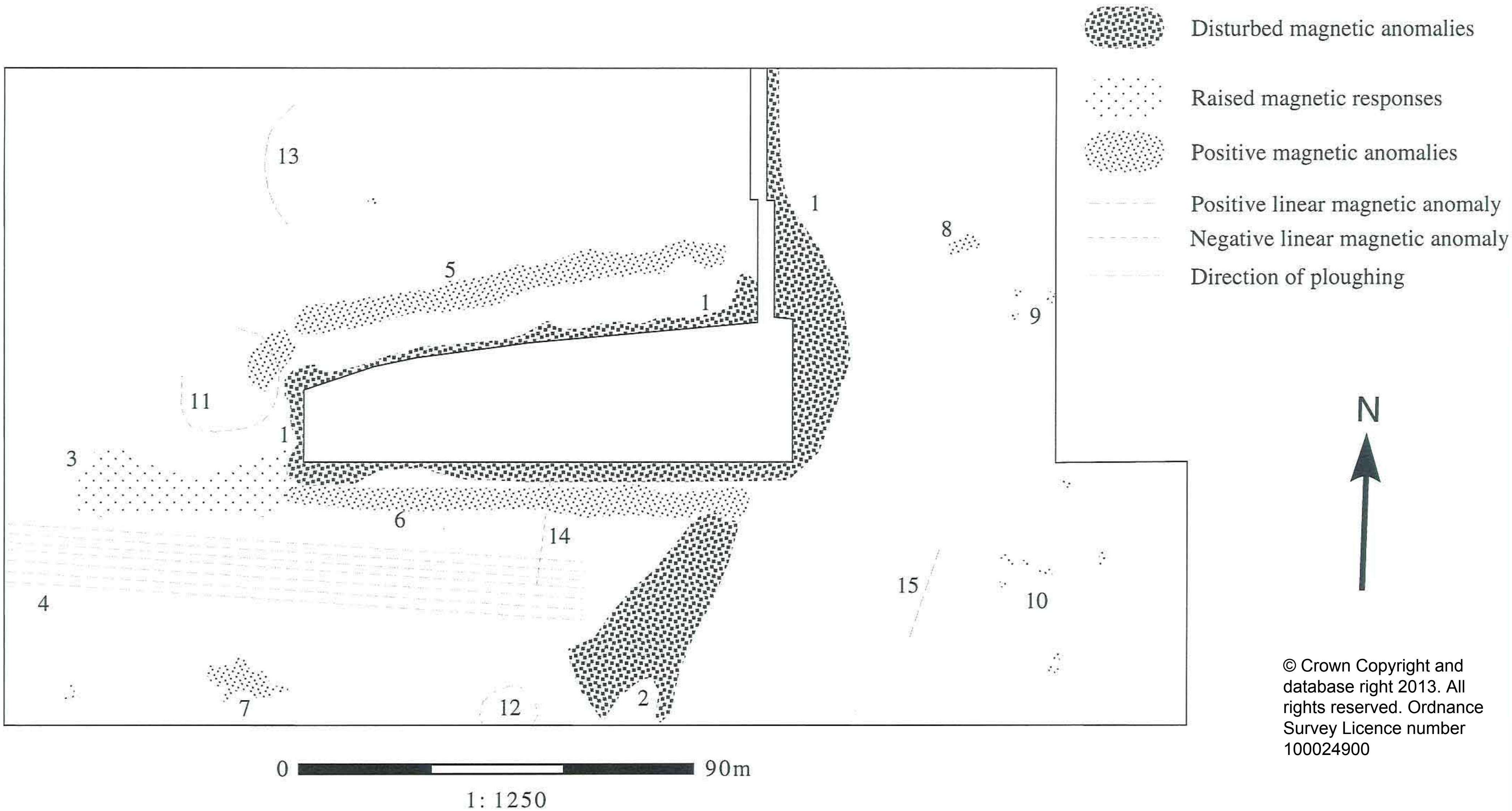
WEST KENNET LONG BARROW, WILTSHIRE.
Graphical summary of significant geophysical anomalies.

PLAN C



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