Ancient Monuments Laboratory
Report 50/98

LANERCOST PRIORY, CUMBRIA. REPORT ON GEOPHYSICAL SURVEY, MAY 1992

A W Payne

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Summary

Geophysical survey was carried out at Lanercost Priory to inform the preparation of an analytical record of the monastic remains, partly in the care of English Heritage. Resistivity survey was employed in four separate areas of the monastic precinct, and a more limited magnetometer survey was carried out over a test area to the east of the remains of the Chapter House. There are wide differences in the background resistance over the site and this undulating response probably reflects variability of the local drift geology (conditioned by the river valley location in a heavily glaciated zone of the country) rather than the presence of archaeological features (which would be expected to produce anomalies of a less irregular form). More promising indications of buried walls, flooring or rubble were found extending south from the east claustral range and the cellarium (with refectory over) on the south side of the Priory. These anomalies may represent missing buildings of the monastic layout such as the kitchens and latrines. In addition, various low resistance anomalies were mapped within the Outer Court area, some of which relate to modern paths, while others may represent archaeological features of uncertain form possibly associated with the medieval Priory. Sections of a possible boundary defining the limit of the monastic precinct have perhaps been detected as high and low resistance linear anomalies in the far western and eastern areas of the survey. The magnetometer data suggests the possible presence of small-scale industrial activity in the south-eastern area of the monastic precinct, although to what period this belongs is unknown.

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Lanercost Priory, Cumbria

Report on geophysical survey, May 1992

INTRODUCTION

Lanercost Priory, founded by the Augustinian order in the 12th century, is situated on the northern edge of the floodplain of the River Irthing north east of Brampton, Cumbria at NGR NY 556 637. The scheduled remains of the Priory (SAM Cumbria 301) are well preserved, having been allowed during the centuries following the Dissolution to survive relatively complete. The monument is thus one of rare value and considerable historic importance.

In the 18th-century, part of the Priory church was restored and converted into the present parish church of St Mary Magdalene, which occupies the former nave and north aisle of the original Priory church, leaving the remainder of the original church building (including the crossing, transepts and choir) roofless and open to the elements. Immediately to the south of the church are the remains of the conventual buildings (including the cloister, chapter house, dormitory, refectory and Prior's House). These structures (with the exception of part of the privately owned west range) are all now in the care of English Heritage. The eastern range of the cloister is today represented only by foundations (which appear to extend below the surface at the south end of the range). To the north and west of the church is open land (the former outer court of the Priory) known as the Garth and now used for grazing livestock, whilst to the west of the cloister is the present vicarage and Abbey Farm. The wall of the monastic precinct is largely intact on the north side of the Garth and a gatehouse (of which only the inner arch survives) is present on the western side of the Garth.

A geophysical survey of the immediate environs of the Priory was carried out by the Ancient Monuments Laboratory in 1992 at the request of D Sherlock (English Heritage, Historic Properties (North Region)) in order to broaden understanding of the Priory layout and inform future site management and interpretation. It was hoped that geophysical survey would be able to provide information on the presence of any previously unrecognised elements of the monastic plan surviving in the form of archaeological features (such as the reredorter, great drain, infirmary, and farm related structures) beyond the standing remains of the Priory. Further specific reasons for carrying out the survey were to :

i) attempt to resolve the extent of the gatehouse on the western side of the monastic precinct

ii) determine if any hitherto unsuspected building remains or traces of earlier settlement pre-dating the Priory are present in the Outer Court area and

iii) help inform decisions over the siting of a potential programme of limited excavation in the area aimed at enhancing understanding of the site

The geology underlying the site is very mixed, consisting of well drained coarse loamy and sandy soils of the Wick 1 association over Holocene river terrace drift and Pleistocene glacial deposits of sand, gravel and boulder clay (glacial Till). These drift deposits are formed on top of Lower Carboniferous Limestone bedrock of the Birdoswald Limestone Group (British Geological Survey, 1980). This far from uniform geology would be expected to give rise to considerable variability in the earth resistance measured across the site.

METHOD

The main geophysical technique employed was resistivity (see Appendix A), in the expectation that buried stone wall footings and other masonry features would be the primary target of the survey. As resistance anomalies are predominantly dependant on contrasts in the water content of features and surrounding deposits, the most striking variation will generally occur between a masonry structure containing little or no water, and a water retentive subsoil. The use of magnetometry (more suited to general purpose large scale archaeological prospecting including the detection of buried ditches, pits and burnt structures) was restricted to a relatively small trial area (60x60m) east of the chapter house in order to determine the potential of this technique to provide additional information to complement the results of the resistivity. Modern service trenches often give a low resistance response similar to buried ditches leading to incorrect interpretation as archaeological features. Magnetometer survey can more reliably differentiate the two as it generally detects the strongly magnetic effect of the pipe or cable buried in the service trench. Magnetometry is therefore a useful aid to verifying the interpretation of any low resistance linear anomalies encountered within the grounds of historic properties which often contain modern services such as sewers and water pipes.

The survey covered a total area of 2.03 ha extending from the standing remains of the Priory to the assumed boundaries of the former Priory precinct. Due to the obstacles presented by the Priory buildings, the survey was divided up into four main areas (A-D, see Figure 1) where survey could be carried out continuously without interruption from standing structures : the Garth to the north-west of the Priory (Area A), the field to the east of the Priory south of the Parish grave-yard (Area B) and two small areas south of the Priory, one of which (Area D) was among the standing ruins. Each separate survey area was divided up in to a grid of 30m squares set out using an electronic theodolite and tape measures and aligned to best fit the individual land parcel to be surveyed. The positions of the survey grids were subsequently measured to corners of standing buildings and field boundaries. The geophysical measurements were recorded along traverses set out along the ground using the 30m grid as a base. All the areas surveyed were under pasture or short mown grass at the time of the survey.

Resistivity

Each grid square was surveyed using a Geoscan RM15 (combining a resistivity meter and datalogger) connected in the Twin Electrode configuration with a mobile probe separation of 0.5m. Readings were recorded at 1.0m intervals along successive 30m-long traverses, spaced 1.0m apart. The resulting data represents the lateral variation in the electrical resistance of the near surface up to a depth approaching 1.0m. For control purposes, in Area C, a 1.0m probe spacing was also used to target a greater depth below the surface (up to 2.0m). However the shallower penetrating 0.5m probe spacing appears to match the depth of burial of the features in the test area better than the deeper probe spacing (which did not provide any additional archaeological detail), therefore the results of the former are not included in this report.

The combined resistivity data from Areas A-D are presented in the form of :

i) plots of the data enhanced by the Wallis Algorithm[1] image processing technique related to the OS 1:2500 plan of the site (Figure 2)
ii) a set of greyscale plots of the raw data at 1:1000 scale (Figure 4),
iii) a set of trace plots of the raw data at 1:1000 scale (Figure 5),
iv) a set of greyscale plots of the Wallis enhanced data at 1:1000 scale (Figure 6)
v) a colour plot of the raw data from Areas A-D at 1:1500 (Figure 7)
vi) an annotated interpretation of the resistivity data from Areas A-D in the form of an overlay on a set greyscale plots of the raw data at 1:1500 scale (Figures 8/9).

In addition larger scale plots of the data from the two smaller survey areas (C and D) are included in Figure 3, showing the results in more detail than is possible in the smaller scale plans of the overall survey and the relationship of possible archaeological anomalies to the ground plan of the Priory. A detailed interpretation of the data from Areas C and D in relation to the Priory remains is also included in Figure 10.

Blank spaces in the data correspond with areas which could not be surveyed due to surface obstructions such as tree plantations, roads and standing masonry.

Magnetometry

Magnetometry was carried out over four survey grid squares (14, 15, 19 and 20) in Area B using a Geoscan FM36 fluxgate gradiometer. Instrument measurements were recorded with 0.1 nT sensitivity at 0.25m intervals along successive 30m parallel traverses placed 1m apart. The resulting data is presented on Figure 11 in the form of trace and grey-scale plots after the initial elimination of the effects of instrument drift (by equalising the mean of each line of readings) and reduction of extreme values in the data caused by iron objects.

RESULTS

Resistivity

General resistance trends

It can be observed from the data that the site is geophysically very complex with a very variable range of resistivity values recorded across the site. The majority of the middle of the Garth (Area A) is divided up into large blocks of very high resistance showing some

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[1] This process (Scollar *et al* 1990, 175) enhances contrast in the image where the more extreme values in the data range occur (ie. the areas of highest and lowest resistance) thus revealing more potential archaeological detail in anomalous areas of the survey.

regularity/rectilinearity separated by linear zones of moderately high resistance. This higher resistance in the middle of the Garth appears to be bounded around the edges of the survey area by much lower resistance trends. Area B to some extent shows a similar pattern, although there is more local variability between high and low resistances and the high resistance areas are less regular in appearance. The high resistance trends in Area B appear to extend westwards into Area C where they appear to have a more certain relationship with the layout of the surviving buildings of the Priory. Much of the resistivity variation throughout the survey can probably be attributed to natural causes. Both in the Garth, and elsewhere across the site, the broad but contrasting changes in background resistance which characterise the response over the site may reflect underlying geological variation or geomorphological effects of the river flood-plain location. However, there has to be a measure of uncertainty in this interpretation, as it is difficult to reliably separate responses caused by natural geological variation from some types of archaeological feature which may be found in the environment of a monastery. For example deposits of natural gravel and extinct drainage patterns associated with the floodplain location may produce similar responses to man-made structures such as rubble spreads, building platforms, and water features, particularly where the latter are irregular in plan.

The former landuse history of the site (as far as can be known) is a further complicating factor that needs to be taken into account in the geophysical interpretation in addition to the natural geology. Landuse and vegetation changes - particularly horticultural activity - will have locally altered the soils present on the site in turn influencing the geophysical response. 18th and 19th century engravings of the site (providing that these are not overly romanticised) suggest that the landscape around the Priory has altered considerably in the last 300 years. Buck's 1739 engraving of Lanercost Priory viewed from the south-east depicts a flat walled terraced area immediately south of the Priory remains with lines of formal tree-planting. This would seem to represent a garden area in a part of the site where possible remains of additional buildings of the Priory layout have been detected (see below). There is therefore obviously some uncertainty over whether the features detected here are 18th century garden features or medieval remains of the Priory. The engraving also suggests that the site was considerably more wooded than it is now. Large areas of former tree planting could give rise to considerable soil disturbance.

In the following discussion of the results from each of the survey areas (A-D), numerals in bold type refer to the location of specific anomalies on the interpretation diagram supplied in Figure 8.

Area A - The Garth

There is very little recognisable structural patterning to the resistance results in the Garth, and with the exception of low resistance alignments (**1** and **2**) relating to modern pathways (running from the north-east corner of grid square 5 down to the southern edge of grid squares 9 and 10), only a few anomalies of obvious artificial appearance can be distinguished. A pronounced low resistance linear anomaly (**3**) has been detected running east-west through grid squares 7-9. A low resistance linear anomaly such as this would typically indicate the presence of a buried ditch, pipe-trench or an extensively robbed-out wall foundation trench, but a number of less obvious alternative interpretations are possible which may be applicable at Lanercost (these are discussed in the concluding section of the report). Anomaly (**3**) may well be related to the monastic remains, as it shares a similar alignment to the east-west axis of the Priory church. Immediately north of (**3**), in grid square 9, a localised circular area of low resistance *c.* 5m in diameter has been detected (**4**). The origin of this curious anomaly is uncertain, but it could possibly represent a filled in pond or well, or perhaps a tree planting hole. One of a set of 19th century engravings of the Priory viewed from the west (artist Thomas Allom, engraved by W. Miller) published in Rose (1835) does in fact show a pond used for watering cattle in approximately the same location as anomaly (**4**). However the pond is omitted from a second otherwise identical engraving by the same artists suggesting that the pond may have been added as an imaginary feature for artistic effect. In grid squares 7 and 8, further vague low resistance anomalies forming an L-shape have been detected (**5**) which may also represent ditches - perhaps forming part of a stock enclosure or other features associated with the farm buildings of the outer monastic court (now Abbey Farm). It is also quite possible that some of the features in the Garth are unrelated to the Priory and adjacent farm buildings and instead may belong to an earlier period. The possibility of Roman activity in the area should not be ignored (the line of Hadrian's Wall lies less than a kilometre to the north of the site and there is a Roman fort (SAM Cumbria 238) on the south bank of the Irthing just over a kilometre to the south-west near Great Easby (NY 545630)). A southern continuation of (**5**) has perhaps been detected south of the approach road at (**6**). A broad north-south linear band of low resistance in the north-west of the Garth (**7**) might indicate the former presence of a boundary feature (such as a broad flat-bottomed ditch) enclosing the Priory grounds. In the latter case this feature may also have been detected on the far eastern side of survey area B (see below).

Few distinguishable linear anomalies compatible with buried buildings are present within the survey area, but several roughly rectangular areas of high resistance (for example at **8** and **9**) could result from scatters of building rubble or building platforms (although a geological explanation is far more likely given that the alignment of the anomalies is clearly out of keeping with the Priory complex). The nature of these features may nevertheless merit confirmation by test excavation.

Low resistance areas around the standing masonry of the Gatehouse may relate to buried features associated with this incomplete structure (perhaps robbed-out wall foundations) continuing into the Outer Court of the Priory. Although it is not clear precisely what the low resistance in the Gatehouse area represents, the anomalous readings appear to link up with the feature (anomaly **7**) tentatively identified as the western boundary of the monastic precinct.

Area B - east of chapter house

The response in this area is so variable that the results are generally confused. With the exception of a high resistance N-S linear anomaly (**10**) near the eastern edge of the area bounded by low resistance (possibly part of the hypothetical boundary to the monastic precinct discussed above), this area has no other anomalies that can confidently be ascribed an archaeological origin. A linear feature (**11**) crossing the area diagonally from SW-NE is probably a trace of a former path.

There is no apparent correlation between the resistivity data and the magnetometer data from Area B suggesting that the resistivity variation could be purely natural in origin.

Area C - south of the Priory (see Figures 3 and 10 for detailed plans)

This small field contains a linear high resistance anomaly some 20m long aligned east-west - probably a major wall (**12**). This feature is also possibly visible as a raised linear earthwork (although this will need to be checked on the ground). To the north and east of (**12**) is a zone of extremely high resistance (**13**), from which a further linear high resistance anomaly (**14**) extends north at a 90 degree angle. It seems likely that these anomalies could represent the location of wall foundations, deposits of collapsed building material and floor surfaces suggesting a continuation of the east range (perhaps the expected kitchen or reredorter area) as far as a possible boundary wall at (**12**). Further linear high resistance anomalies visible in the far western part of the survey area at (**15**) may relate to the same general building layout. Immediately south of the east-west aligned anomaly (**12**) a group of three very localised (2-3m in diameter) but pronounced low resistance anomalies has been located (**16**) which could represent a series of pits or tree-root holes. The latter interpretation ties in well with the line of trees shown in this area on Buck's 1739 engraving (see above). A sub-rectangular area of lower resistance approximately 15 metres across (**17**) located to the north in the angle between the high resistance linears (**12 and 15**) may also be of archaeological significance although it is uncertain what this anomaly might represent. It could derive from a relatively recent horticultural feature such as a flower-bed - a Cambridge University aerial photograph of the Priory published in Platt (1984, Plate 180) indicates a garden in this area, although the date of the photograph is not given. Former flower-beds are known from elsewhere to produce similar low resistance anomalies (see Cole *et al* 1997).

Area D - immediately south of undercroft and east of Prior's tower

The survey coverage in Area D is really too limited for the recognition of clear resistivity contrasts, however an extension of the extant wall running east from the Prior's tower has been located as a high resistance anomaly (**18**). To the north and east of this other less clearly defined short linear high resistance anomalies are probably indicative of further wall foundations and buttresses in the area between (**18**) and the south side of the undercroft. It is therefore likely that additional features could be uncovered by excavation in this area for display to the public.

Trial magnetometer survey in Area B (Figure 11)

The portion of field B surveyed with the magnetometer is generally magnetically quiet except for occasional localised anomalies of potential archaeological significance, suggesting that archaeological activity in the area is limited and mainly confined to the south-eastern corner of the survey. Approximately 5m south-east of the centre of the survey, a strong isolated positive (high magnetic gradient) anomaly (marked **K** on Figure 11) has been located, around which are clustered several other smaller localised positive anomalies. The main anomaly has a maximum positive magnitude of 36 nT and is surrounded by a slight negative anomaly both indicative of a possible substantial kiln some 3-4m in cross-section or similar type of thermally magnetised industrial feature such as an oven, hearth or furnace. The other anomalies that appear to cluster around (**K**) could represent pits containing waste material from the main feature or lesser burnt features. Near the western edge of the field (grid quare 14) there is a short narrow curvi-linear positive anomaly which might represent a small ditch or gully filled with magnetic sediment (perhaps burnt material) possibly associated with the building remains to the west.

CONCLUSIONS

The alluvial and glacial drift geology has made reliable interpretation of the geophysical response difficult over much of the site. Nevertheless, a number of potentially archaeological features have been identified, most notably a possible extension of the buildings in the east range in Area C. Unfortunately the results are insufficiently clear to enable detailed reconstruction, but excavation in areas C and D would undoubtably result in the recovery of a more complete ground plan of the monastic complex.

Remains of other former structures associated with the Abbey are more elusive. No obvious remains of formerly unrecognised buildings were located in Areas A and B, and therefore these areas may have been left clear of construction to enhance the natural setting of the Priory church (much as it is today) or might have been reserved for agricultural use.

Although lacking evidence for remains of additional out-buildings, Area A does contain several low resistance anomalies which are strongly suggestive of artificial features. Some of these are clearly not archaeological but derive from modern paths (which produce a low resistance anomaly because the reduced surface area and erosion of the surface vegetation decreases evapotranspiration resulting in a localised increase in soil moisture, (Clark 1990, 56)). Others (although difficult to interpret precisely) are more likely to represent archaeological features such as infilled ditches, ponds or drainage features formerly associated with the Medieval Priory.

The low resistance anomalies only appear well defined where they cross through areas of higher background resistance. This seems to suggest that the high resistance areas have been disturbed or cut by the construction of the features that have caused the low resistance anomalies (as would be the case where natural deposits of well drained coarse grained material such as sand and gravel are cut by a ditch silted with more moisture retentive fine grained silts). Another possibly that should at least be considered is that the low resistance features within the areas of higher resistance relate to buried masonry. It is unusual but not unknown for buried masonry to produce a low resistance anomaly instead of the characteristic high resistance response normally associated with buried stone structures (see Clark 1990, 55-6 for examples). Such reverse anomalies can result where the surrounding soil is very well drained as in the case of sands and gravels. On sand or gravel subsoils buried masonry can prevent drainage and cause moisture to collect in the vicinity of the feature thus causing a low resistance anomaly. Brick and some porous types of building stone can also absorb and store moisture better than sand and gravel substrates (particularly immediately after wet weather as was the case at Lanercost). Low resistance anomalies can also occur over walls buried just beneath the surface where the lines of current flow cannot pass between the surface and the structure and are thus constrained to pass under the wall. The result is a drop in current density at the surface and a negative anomaly when the quadripole is centred over the resistive structure (Scollar *et al* 1990, 351, Fig. 6.32).

If the low resistance anomalies in the outer court at Lanercost are in fact masonry features, anomaly (**3**) could represent a stone-lined culvert or drain, a former surfaced path or track or even a major wall foundation, while anomaly (**4**) could indicate a feature such as a stone footing for some small structure or perhaps a capped well. The presence of a major drain or water conduit passing through the grounds of the Priory fits with a reference in the 13th-century Lanercost Cartulary (ed. John Todd 1997, entry 214, Part 9) recording the grant of a spring to the Priory by Matilda de Vaux, lady of Gilsland and the right to lead water through her land to the Priory by an underground conduit (the text however does not state unequivocally that this scheme was actually put into operation). Although it is tempting to equate anomaly (**3**) with such an underground conduit, the data is unfortunately too inconclusive to enable such detailed interpretation. Limited excavation will probably be the only solution to resolving the specific nature of the anomalies in the Garth and their relationship to the Medieval Priory.

Surveyed by :	S Fear A Payne	12-15 May 1992
Reported by :	A Payne	14th February 1997

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APPENDIX A : Resistivity survey

The ability of a soil mass to conduct electricity depends on the presence of salts and humic acids, which dissolve in water into +ve and -ve ions, allowing electrolytic current flow through the soil. The resistance of soils to the passage of an electric current differs according to the concentration of salts and acids in solution they contain and their relative dampness. The latter is determined by the granulometric composition of the soil and climatic factors. The grain size composition of soils determines their porosity and water holding capacity and therefore soils of varying grain size absorb and retain water at different rates; for example coarse well drained soils such as sands and gravels will generally have a higher resistance compared to close-textured water retaining soils such as clays. The development of localised changes in moisture content in archaeological features is similarly due to differences in the grain size of features and surrounding deposits. Moisture tends to collect in fine-grained ditch and pit silting resulting in lower resistivity particularly in cases where the features are cut into rocky subsoil. In contrast non-porous stone wall footings will not absorb water and will therefore be much dryer than the damper soil around them. Buried stonework will thus generally give rise to high resistance anomalies.

These variations are detectable by resistivity survey which involves the measurement of sub-surface changes in the resistance of the soil to the passage of an electric current injected through the surface of the ground using probes or electrodes. One pair of electrodes is used to measure the potential gradient set up by the passage of current between two others, enabling the resistance to be derived from Ohm's Law. Variations in the measured resistance reflect the presence of buried archaeological structures such as walls and ditches. Although resistivity is slower than other archaeological prospecting techniques (such as magnetometer survey) due to the requirement to place electrodes in the ground, it is the most suitable and favoured technique for location of buried stonework.

Unless otherwise stated in the main report text, resistivity measurements are made with a Geoscan RM15 constant current earth resistance meter incorporating a built in data-logger, using the Twin Electrode probe configuration (or array) normally with a 0.5m mobile probe separation. The mobile probe separation conditions the depth of investigation, and therefore in circumstances where deeper buried remains are suspected a 1.0m probe spacing can be used. The wider probe separation gives deeper ground penetration of the current flowing into the soil allowing a greater depth of investigation (in the region of 1.5 - 2.0m compared to 0.75 - 1.0m for a 0.5m probe separation).

The Twin Electrode array is particularly well suited to archaeological targets and measures the earth resistance of the volume of ground immediately below the mobile current-potential probes with the addition of a constant, and thus negligible contribution from the remote current-potential electrodes. The Twin Electrode system is a variant of the Wenner array, whereby one current-potential pair of electrodes (C1P1 - the "mobile" probes) - mounted rigidly on a movable frame - are separated from the other pair (C2P2 - the "remote" probes) by a factor of 30a when a is the spacing between C1 and P1. At this distance, the contribution from C2P2 is insignificant in relation to changes in resistance which are measured by moving the C1P1 electrode pair. This enables two electrodes (the remote C2P2 pair) to remain stationary while the other two mobile probes (C1P1) are moved over the survey grid from one measuring station to the next, enabling a more rapid rate of survey than traditional arrangements (eg. Wenner, Double Dipole arrays) where both sets of electrodes have to be moved each time a reading is made. The method takes advantage of the steep potential gradient and consequent enhanced sensitivity between each current/potential pair. By minimising the movement of electrodes the method combines ease of operation with speed of data acquisition and it is therefore particularly well adapted to carrying out large area surveys of archaeological sites for mapping purposes. The Twin Electrode array also has the advantage of clarity/unambiguity of response over other electrode arrays.

It is generally necessary to relocate the remote (C2P2) probes to a new position during the course of a survey and also to normalise for differences between the two locations (because of differences in the depth of subsoil for instance) by altering the spacing between C2 and P2, so that P2 is measuring the same potential as it previously was. Such adjustments alter the geometry factor of the array, and in combination with inhomogeneity of the ground beneath the fixed electrodes and the inclusion in the readings of deep geology, produces resistance readings (measured in Ohms or Ω) of quite arbitrary absolute values which cannot be converted to true apparent resistivity values (measured in units of Ohm-m or Ω-m). Such relative changes in resistance are perfectly adequate for the purpose of searching for anomalies, but mean that Twin Probe readings can only be regarded as comparative within the bounds of a single survey.

Figure 1. Location of resistivity surveys, May 1992

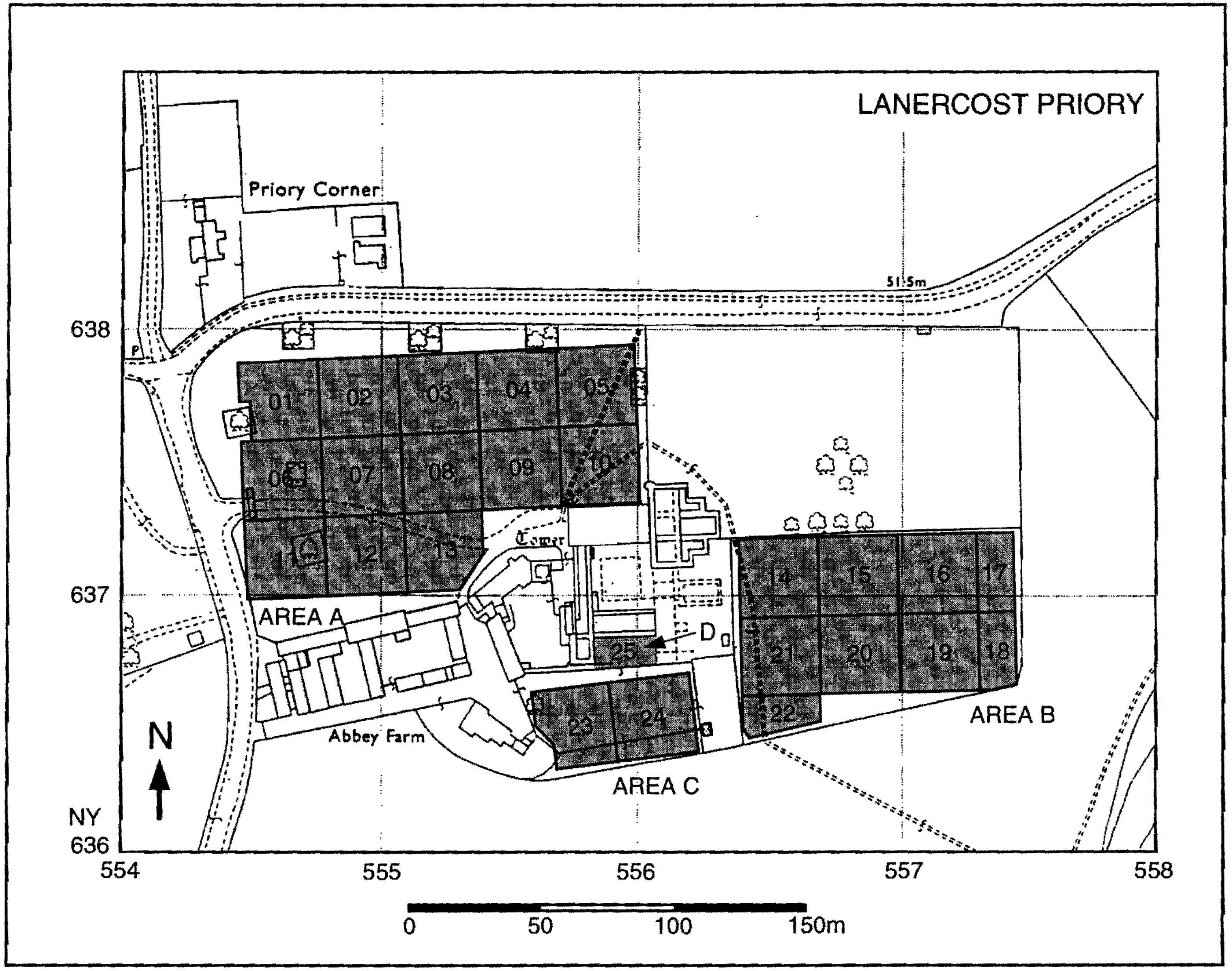
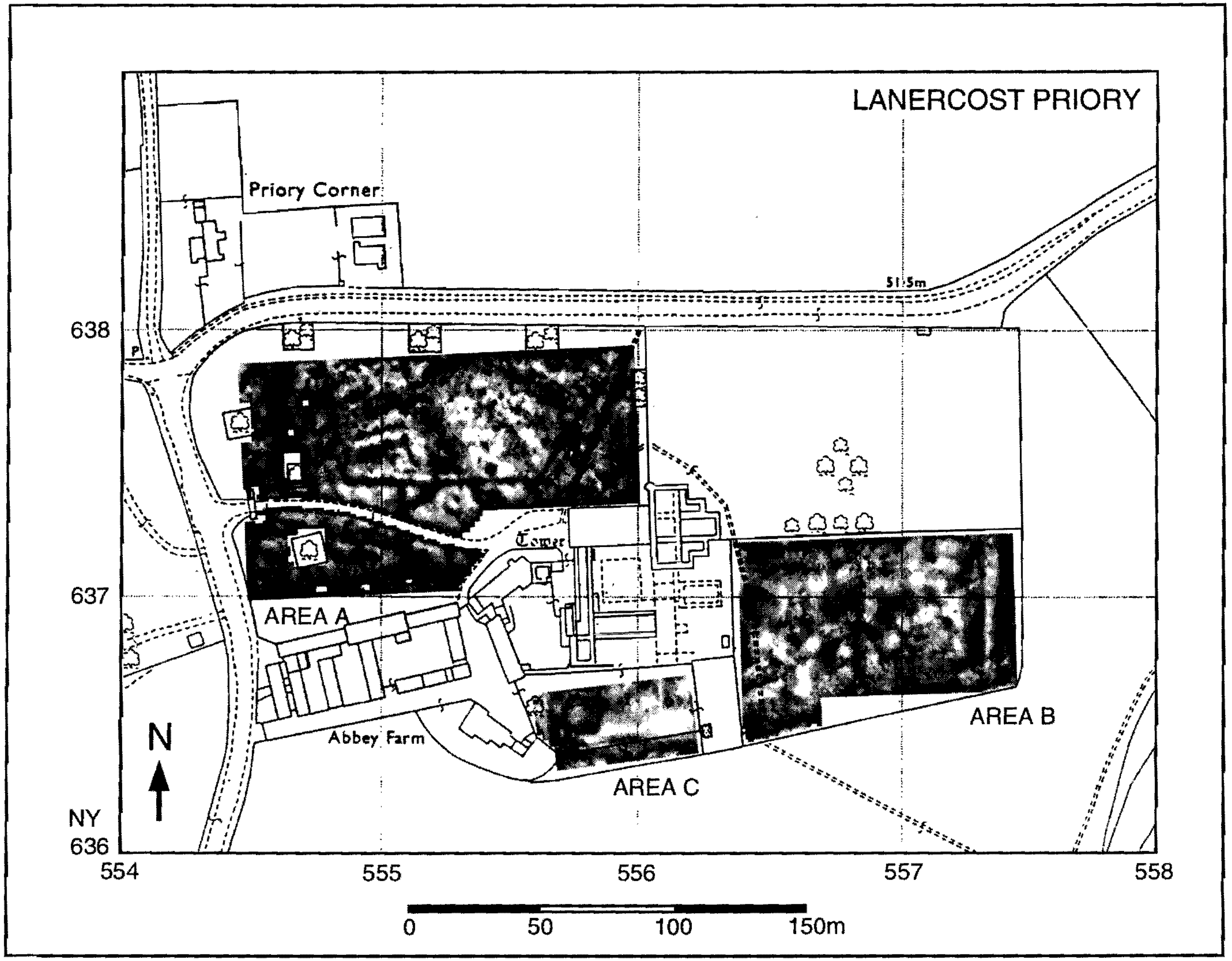


Figure 2. General view of contrast enhanced resistivity data from areas A - C in locational setting



NOTE ON DATA PRESENTATION :

Plot ranges vary between different areas of the survey, the plots of different areas are therefore qualitatively comparable but not numerically comparable. Dark areas of the plot indicate low resistance, white or pale areas higher resistance.

LANERCOST PRIORY, CUMBRIA

Figure 3.

Greyscale plots of enhanced resistivity data
from Areas C and D in relation to Priory remains.

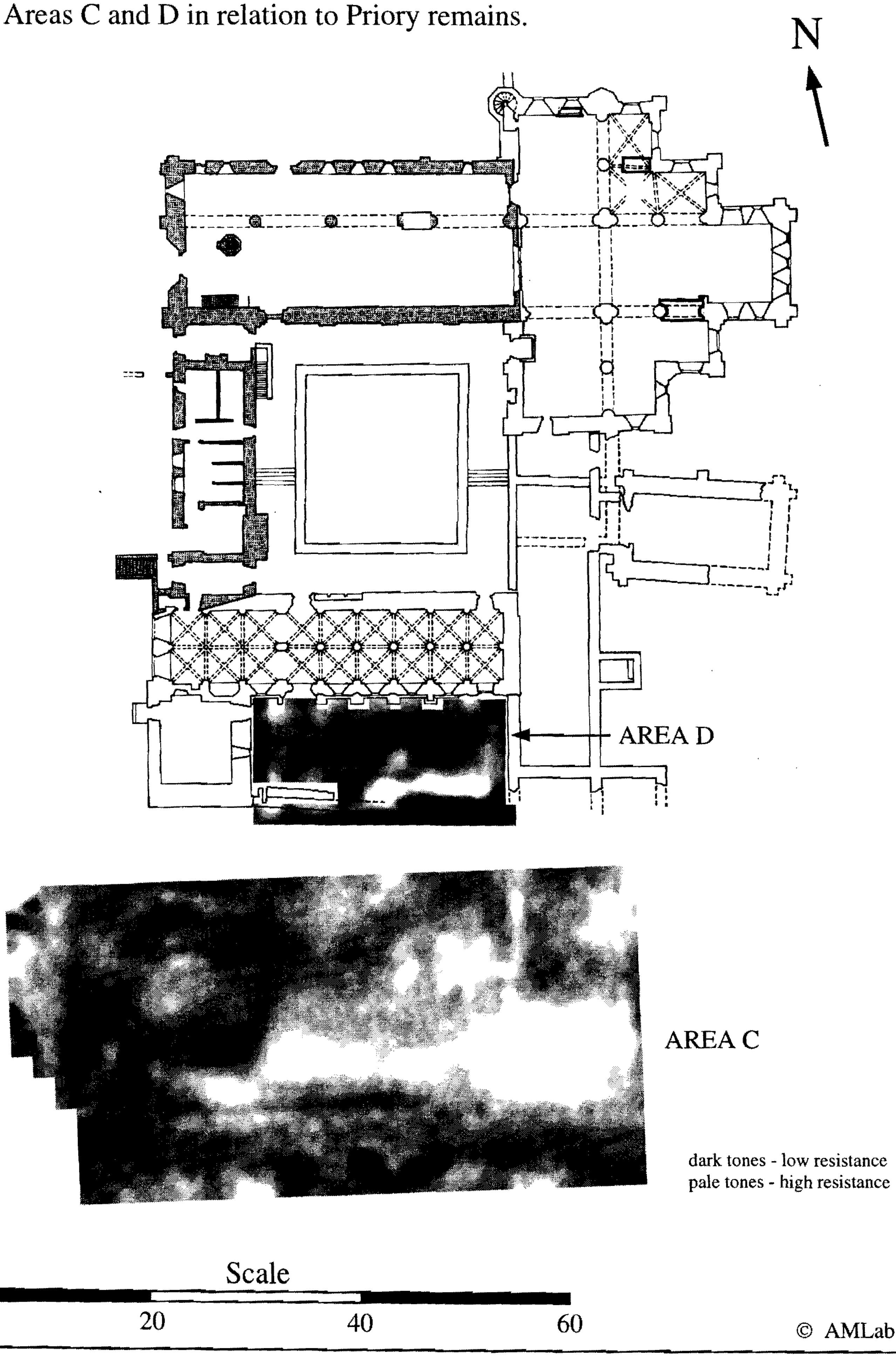


Figure 4.

LANERCOST PRIORY Resistivity Surveys 1992

Greyscale plots of raw resistivity data

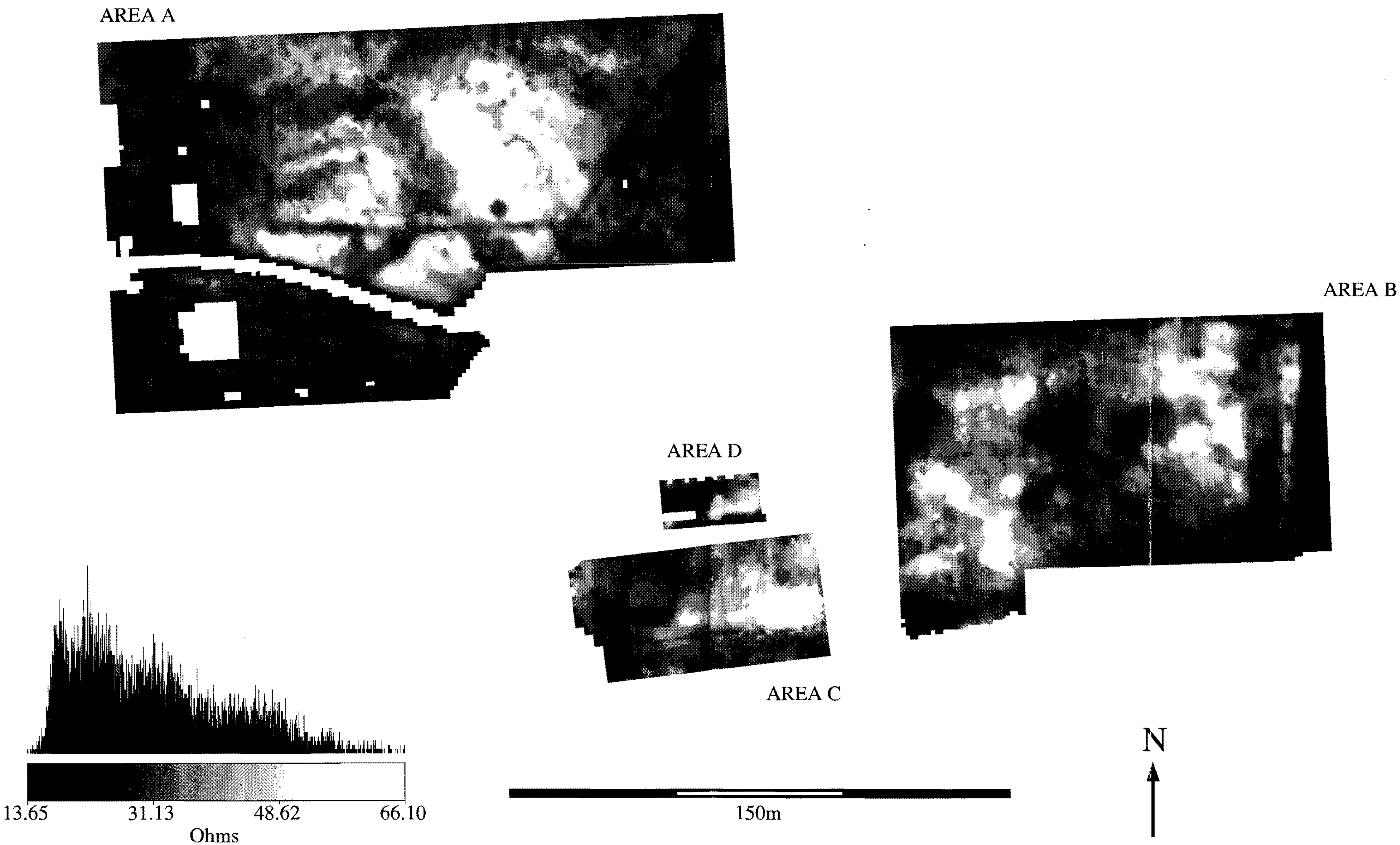


Figure 5.

LANERCOST PRIORY Resistivity Surveys 1992

Traceplots of raw resistivity data

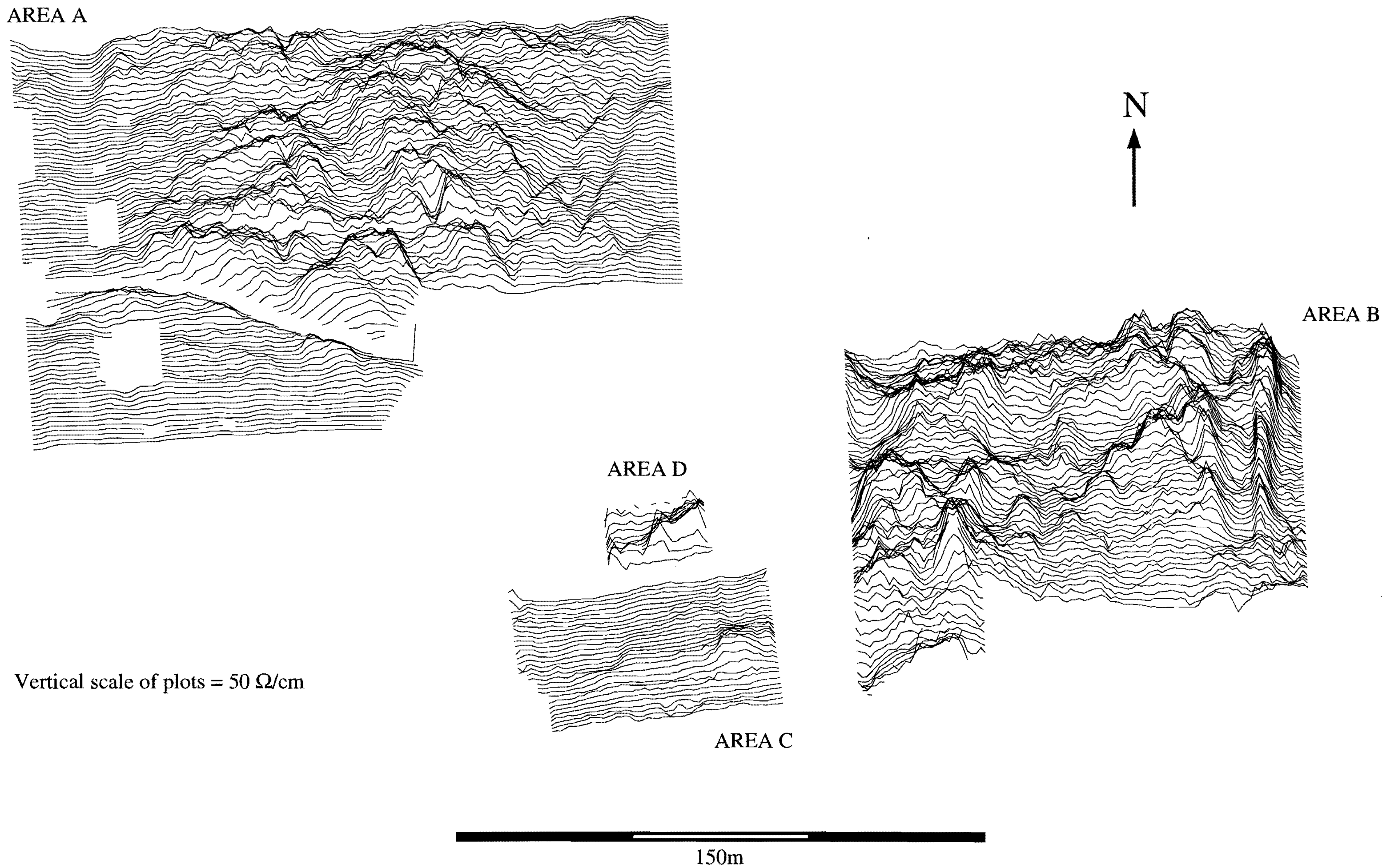
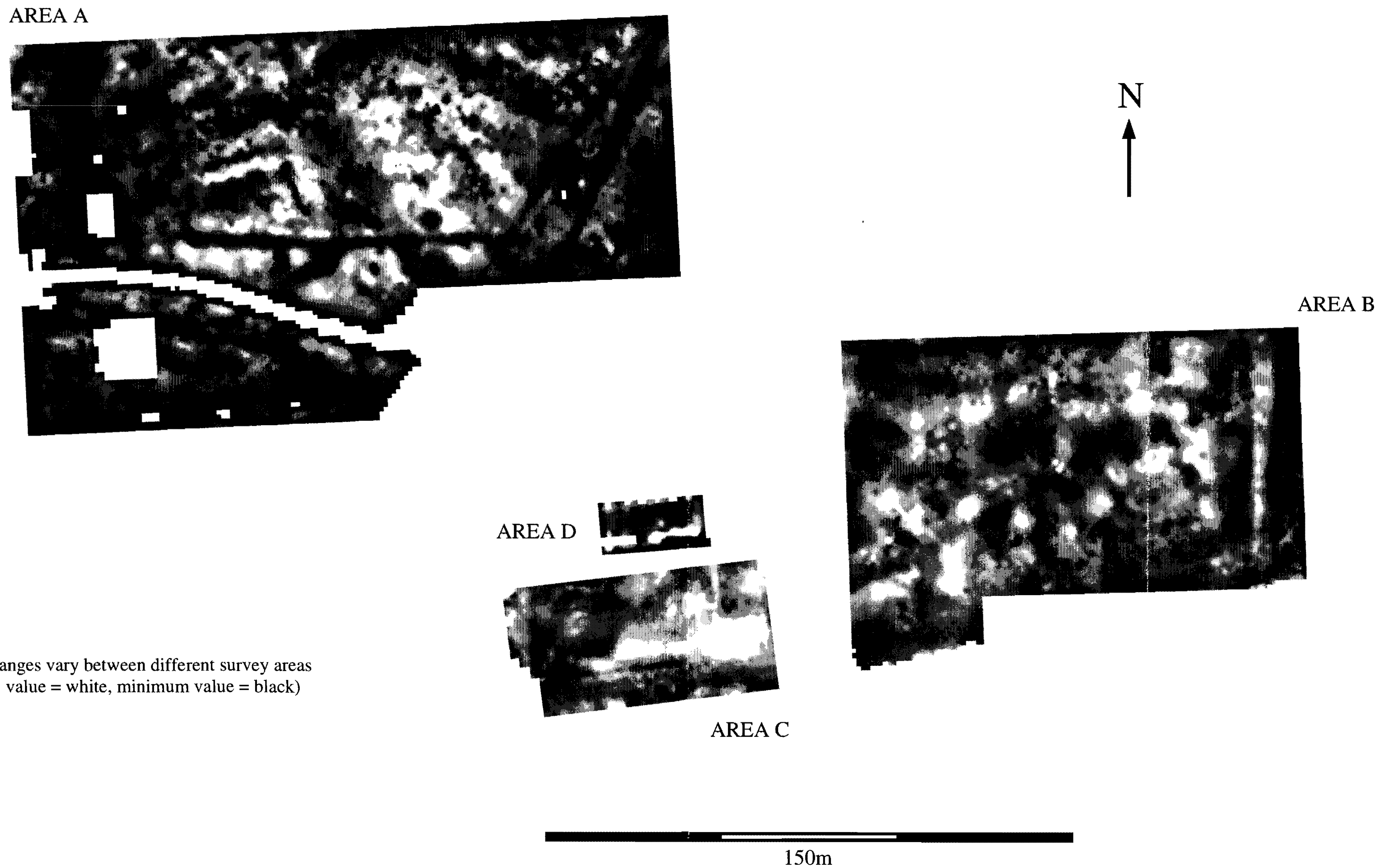


Figure 6.

LANERCOST PRIORY Resistivity Surveys 1992

Greyscale plots of resistivity data after Wallis algorithim contrast enhancement



Plot ranges vary between different survey areas
(max. value = white, minimum value = black)

Figure 7

LANERCOST PRIORY, CUMBRIA Resistivity Surveys 1992

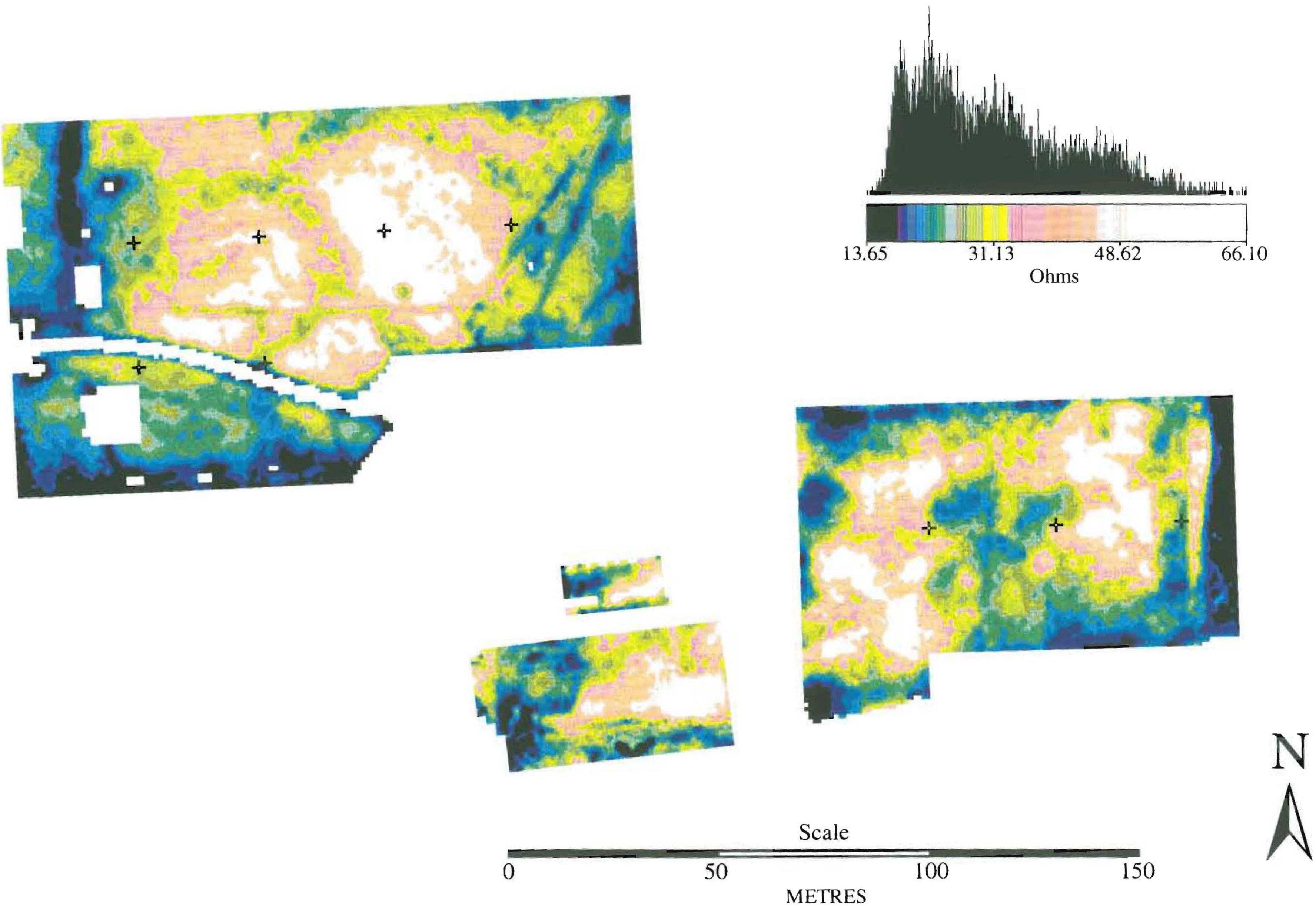


Figure 9

LANERCOST PRIORY Resistivity Surveys 1992

Figure 8 : Interpretation overlay for Figure 9

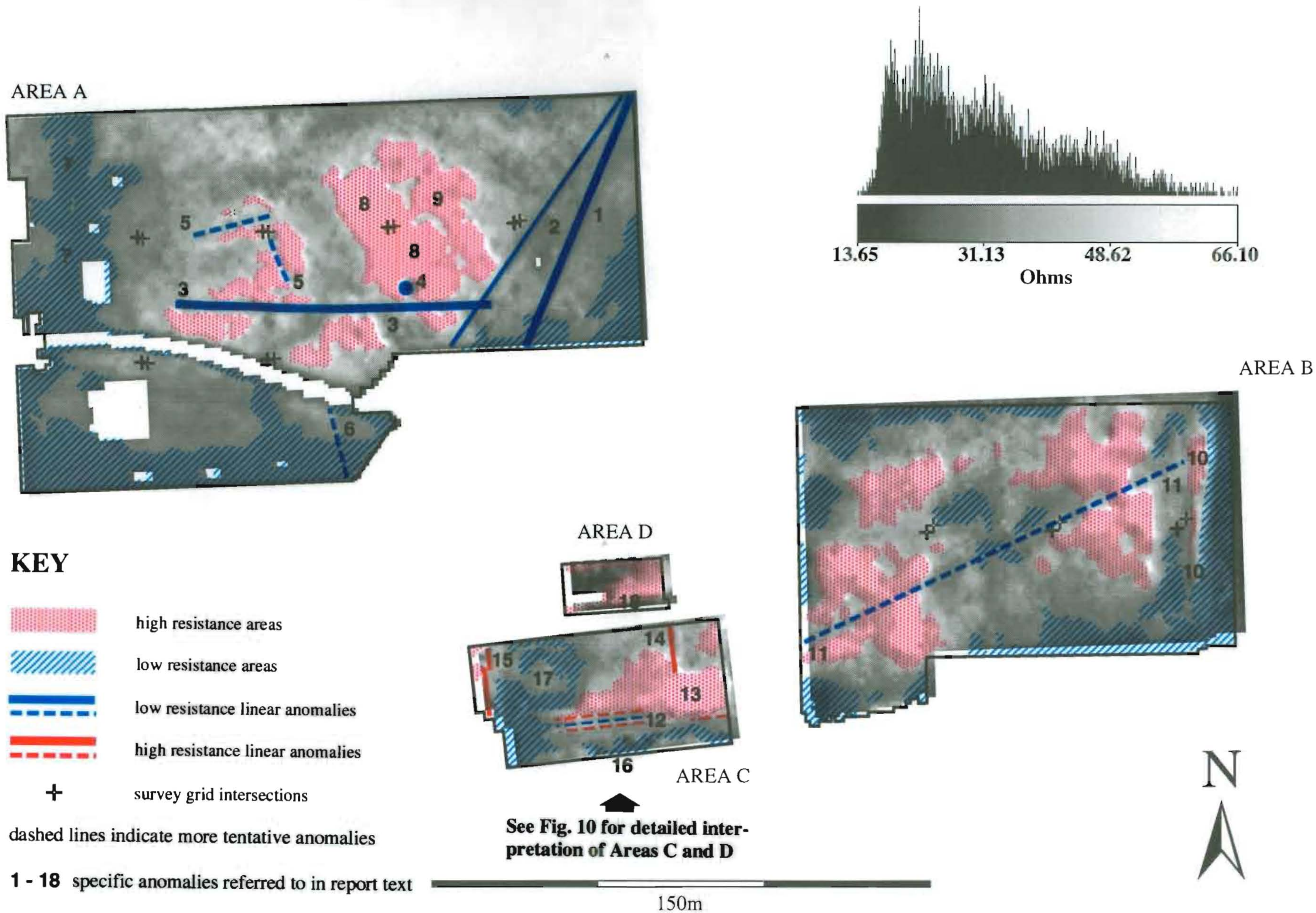


Figure 9

LANERCOST PRIORY Resistivity Surveys 1992

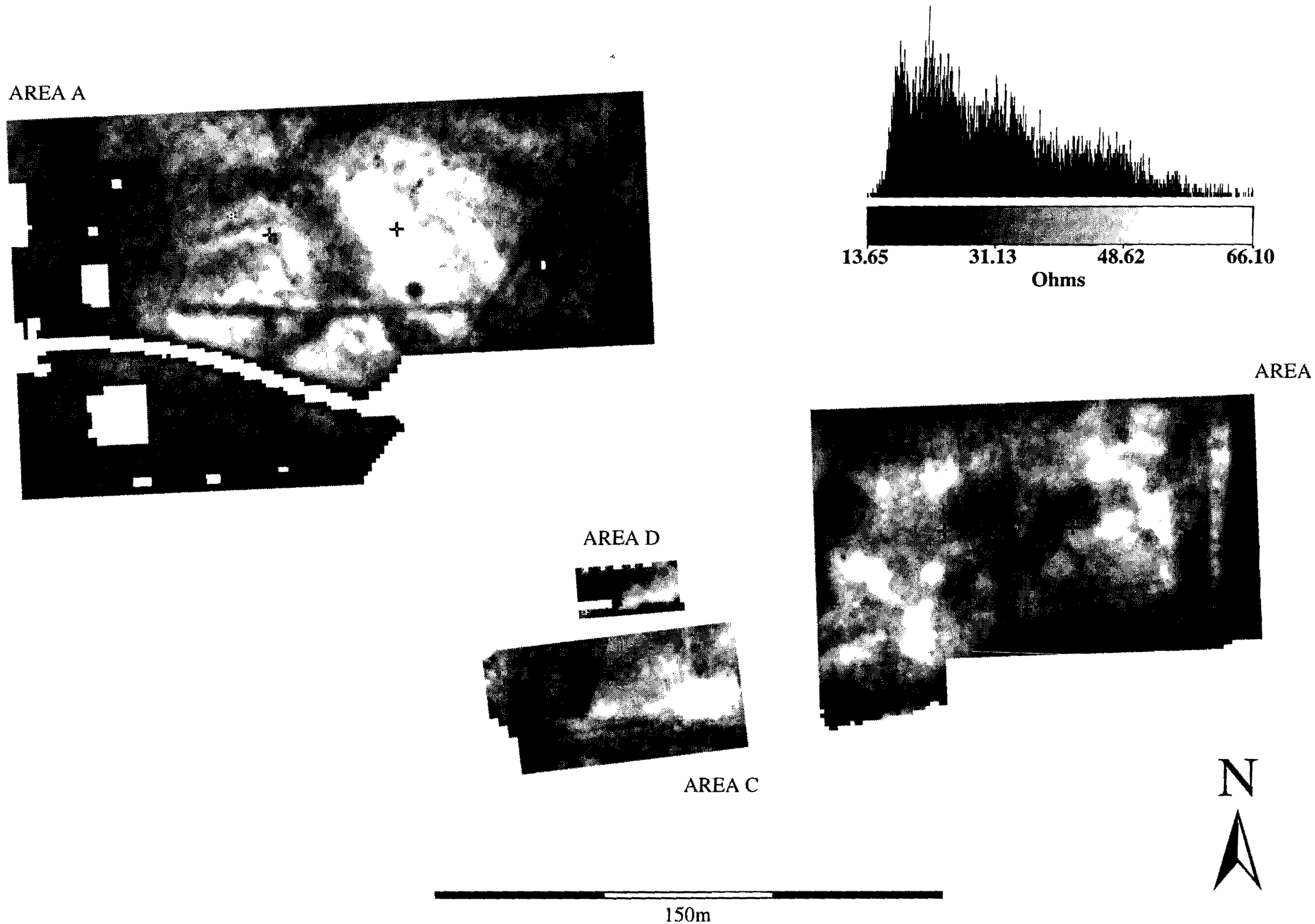
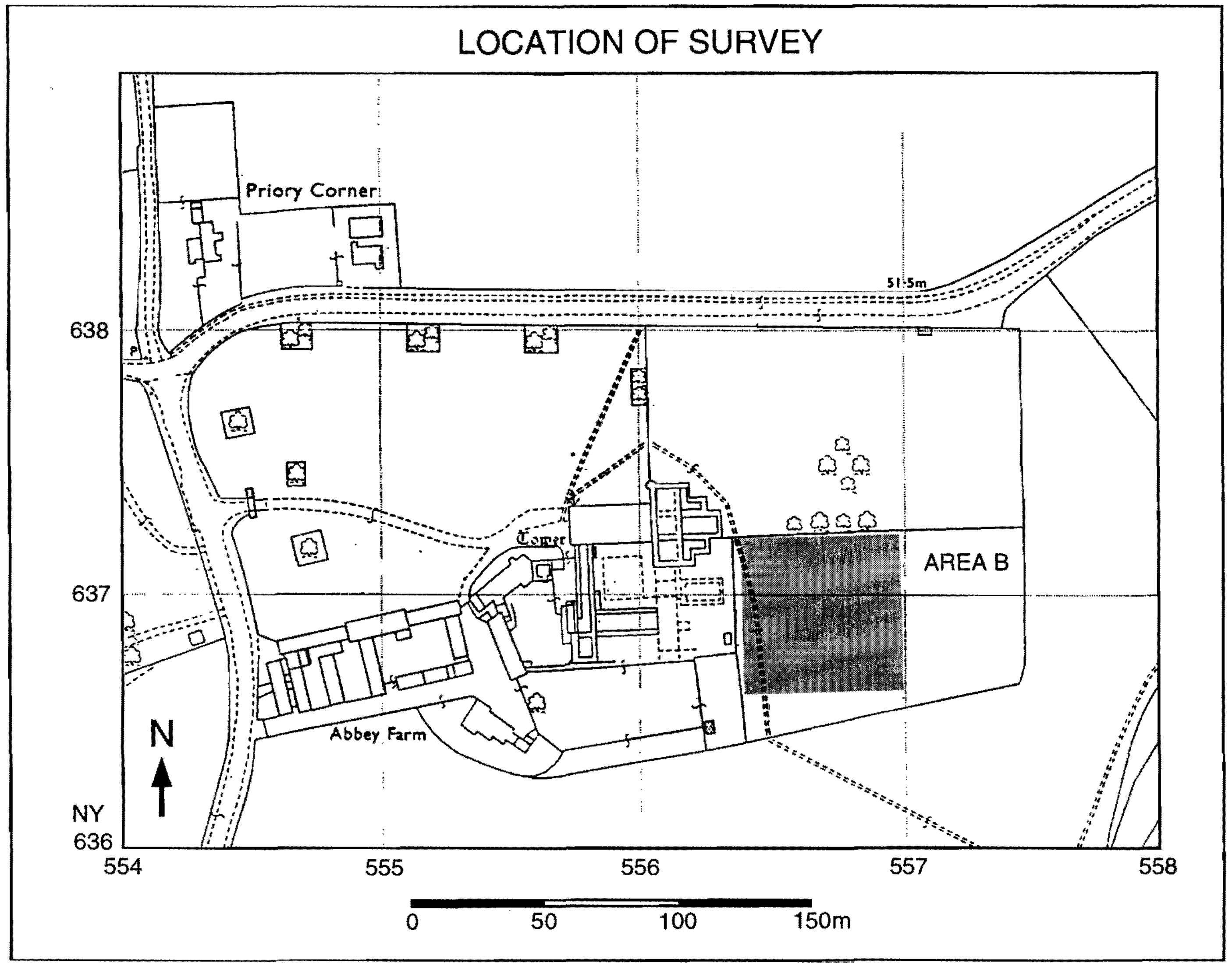


Figure 11

LANERCOST PRIORY, CUMBRIA

Trial Magnetometer Survey, May 1992



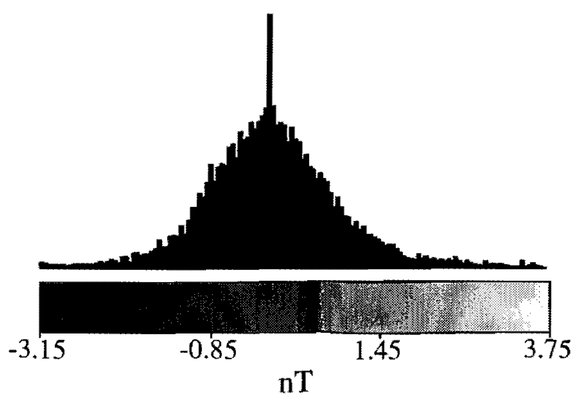
A traceplot of raw data

B greyscale plot of raw data

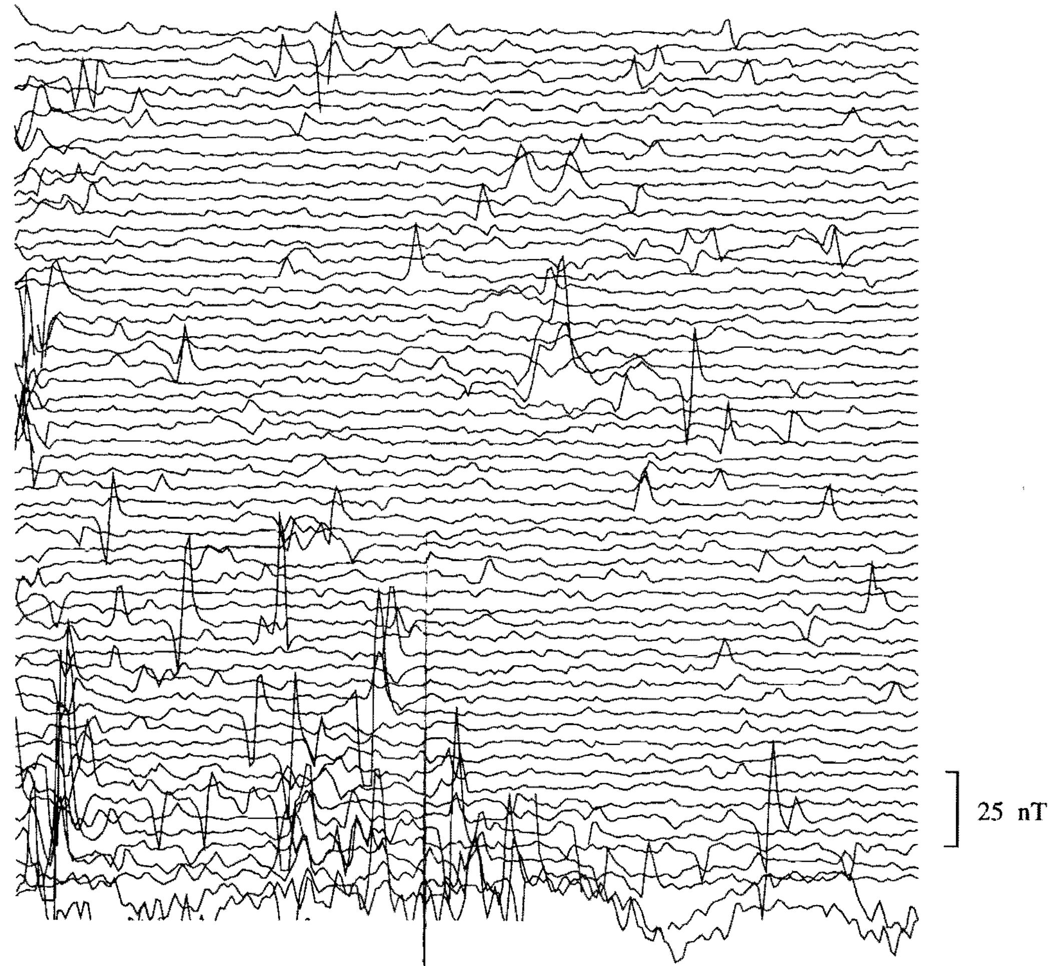
Scale

0 10 30m

N ←



A



B

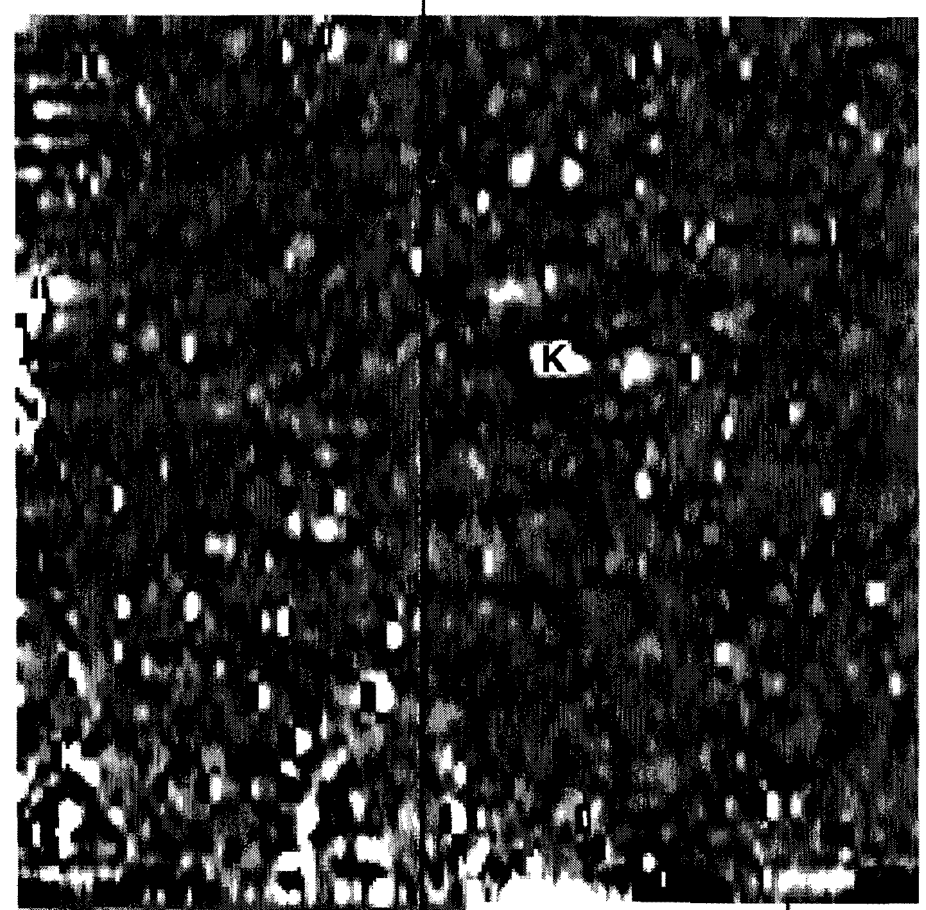


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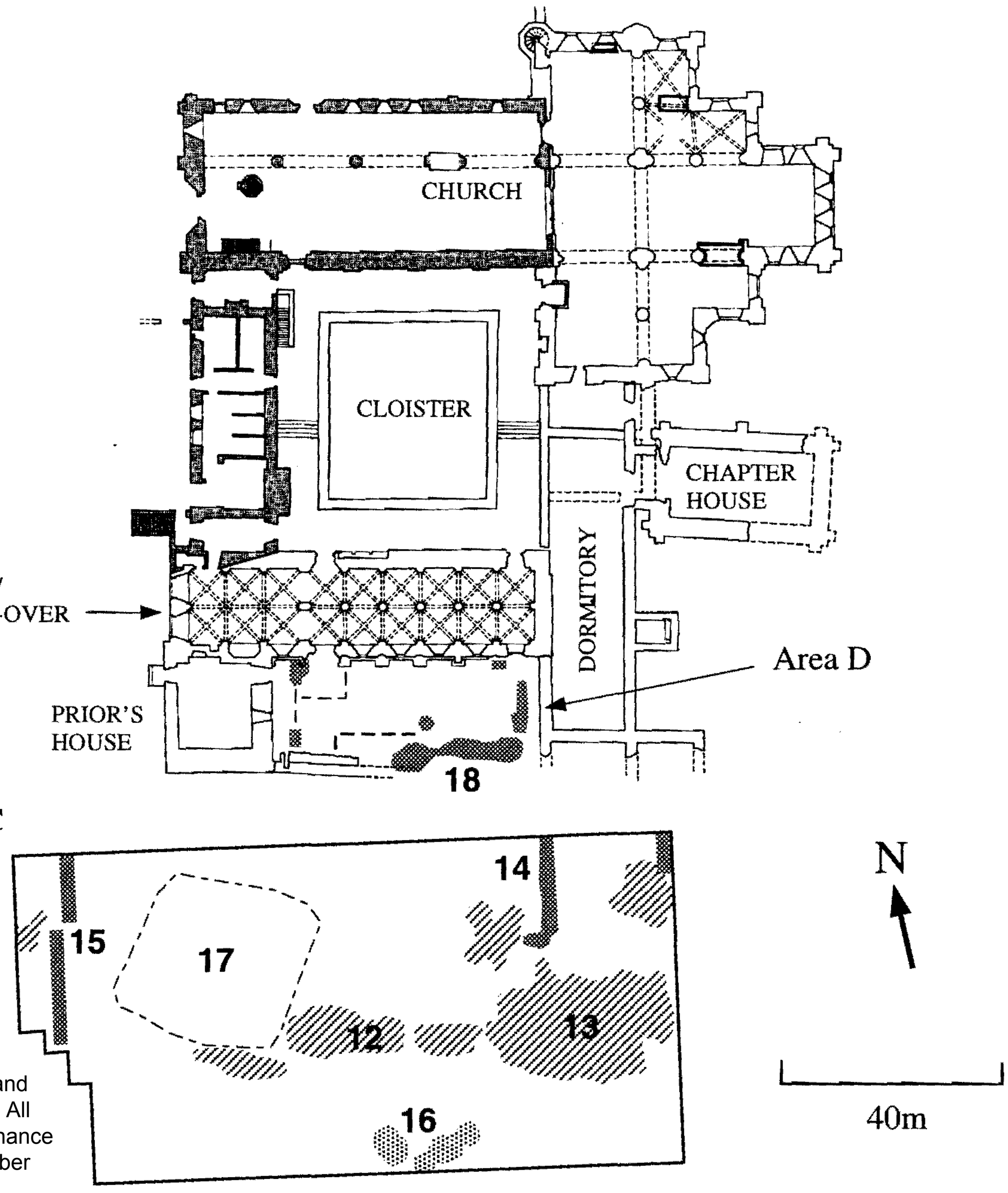
Figure 10.

LANERCOST PRIORY, CUMBRIA

Interpretation of resistivity data from Areas C and D



KEY

high resistance anomalies - possible buried wall footings

---- other less certain buried wall footings

areas of high resistance - possibly representing buried structural remains eg. rubble, floors etc

----· area of low resistance of possible archaeological significance

low resistance anomalies - possible tree-holes or pits