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REPORT ON GEOPHYISCAL SURVEY

AXHOLME PRIORY
Humberside

Report number 95/12

Work commissioned by :

ROYAL COMMISSION ON THE HISTORICAL MONUMENTS OF ENGLAND

SITE SUMMARY SHEET #

95 / 12 Axholme Priory, South Humberside

NGR: SE 806 019

Location, topography, and geology

Axholme Priory is situated approximately 1 km south of Epworth village in South Humberside. The position of the former priory buildings is located in the grounds of Low Melwood Farm, on the eastern side of the Epworth to Owston Ferry road. The areas available for survey are under permanent pasture. The land lies between 5m and 12m AOD and the underlying geology consists of Triassic Keuper Marls.

Archaeology

The Carthusian Priory at Axholme was founded in 1396 by Thomas Mowbray, Earl of Nottingham and Marshal of England. The house was dissolved in 1539. No upstanding remains of the priory survive apart from a cellar beneath the post medieval farmhouse. It is thought that the majority of the earthworks at the site are associated with post-dissolution houses and relict garden features. The latter may in part reflect the underlying monastic alignments. Part of the latest post-dissolution house survives incorporated into modern farm buildings.

The site is a scheduled ancient monument, Humberside 119.

Aims of Survey

The geophysical survey of Axholme Priory forms part of a wider **Royal Commission on the Historical Monuments of England (RCHME)** project to investigate all former Carthusian monastic houses in England. A resistivity survey was undertaken in the hope of obtaining a detailed ground plan of the original priory complex. This could then be compared to **RCHME**'s topographical survey and also to the results from other Carthusian sites throughout the country.

Summary of Results

The resistance technique has responded extremely well at the site and provided remarkably clear results of the surviving wall foundations. Individual cells within the cloister range have been identified, together with further buildings to the north of the cloisters. The presumed western arm of the moat is also visible, though the line of a northern arm is still conjectural. A building in the north-western corner of the survey is tentatively interpreted as a former gatehouse. The detailed resistance plan and the earthworks survey should help significantly with the archaeological interpretation of the site.

Background information supplied by **RCHME** (Keele)

SURVEY RESULTS

95 / 12 Axholme Priory, South Humberside

1. Survey Area

1.1 The resistance survey area totalled more than 3 hectares and its location is shown in Figure 1 at a scale of 1:1250.

1.2 The survey grids were set out by **Geophysical Surveys of Bradford** and tied in by **RCHME** staff.

2. Display

2.1 The results are displayed as greyscale images and this display format is discussed in the *Technical Information* section at the end of the text.

2.2 Figure 2 shows the summary interpretation of the results superimposed on the earthwork survey at a scale of 1:1000 and Figure 8 the summary interpretation at a scale of 1:1250.

2.3 Greyscale / colour images using differing plotting levels and a variety of display formats are included in Figures 3 to 7. The varying scales are shown on each diagram.

3. General Considerations - Complicating Factors

3.1 In general, survey conditions were favourable, the ground being generally flat and under short grass. Modern fencelines hampered survey in the north-eastern area of the site, but fortunately these have not affected the results.

3.2 A modern trackway (see Section 4.6) resulted in spurious anomalies and a cattle grid and water trough, marked in Figure 2, could not be surveyed.

4. Results

Letters in parentheses in the following text refer to Figure 2.

4.1 Ground conditions at the site were extremely wet and as a consequence the background resistivity level of the clayey soils was very low. By contrast building foundations were much drier and hence strong contrasts in resistance levels were recorded across the site.

4.2 The highest resistance readings were measured in the area surrounding a modern barn (A). This is thought to be the site of one of the post-dissolution houses and many of the wall lines visible in the resistance data are likely to be associated with such a building. However, given the layout of the cloister range (see Section 4.3) it would seem probable that this area also coincides with the location of the priory church. Unfortunately, there appears to be a large amount of rubble which is masking the results and, as a consequence, it is difficult to be certain about this interpretation.

4.3 The anomalies defining the cloister and the cloister ranges are very clear. It is possible to identify individual monk cells and their gardens; in places, the corridor walls are also visible. A total of eight cells are well defined while others are more conjectural. Paradoxically, where the earthworks are better preserved along the western arm of the cloister range, the resistance results are less clear. It is likely that the resistance meter is registering topographic changes as well as the surviving foundations and this is confusing the picture. In addition, excavations thought to have been carried out in this area, will have added to the background noise.

4.4 Within the cloister range is a rectangular block of high readings (B) aligned north-south and measuring approximately 10 metres by 30 metres. The results could be interpreted as being the foundations of a former building or, alternatively, they may represent garden features. The relationship between the features and the cloisters remains unclear.

4.5 To the west of the cloister is a range of high resistance readings (C) which is paralleled on both sides by a low resistance band, presumed to be the western arm of the later moat (D). Although wall foundations appear to be surviving within (C) it is not possible to envisage any ground plans of the buildings; the high readings may indicate a rubble fill of the former moat.

4.6 Immediately north of the buildings at (A) is a further complex of wall lines associated with elements of the priory. Unfortunately the presence of a modern track (E) obscures some of the results, and in particular the anomalies at (F), which are associated with a substantial wall or possible track (see Section 4.8). Although there are suggestions of features lying to the north of this line, the priory buildings are concentrated to the south.

4.7 In the north-east corner of the survey area it is interesting to note that the modern track curves northwards and then southwards for no apparent reason. The resistance results, however, indicate a possible building (G) that may account for the course followed.

4.8 The results from the north-west indicate another possible building (H). Given its position and apparent relationship with the linear anomalies (J), the high readings (H) could be interpreted as indicating a former gatehouse. If such an assumption was correct, then the linear band of high readings (J), flanked by low anomalies, could be a track with drains or ditches running alongside, a continuation of the anomalies (G). Unfortunately there is a further complication with any interpretation because the linear anomalies (F and J) also coincide with the line that a northern arm of the moat, if it existed, would follow.

4.9 Ditches and / or drains of unknown date are highlighted in the interpretation plans Figures 2 and 8.

5. Conclusions

5.1 The resistance survey has succeeded in most of its aims and produced a remarkably clear plan of the remains of Axholme Priory. The results suggest good preservation of the foundations and lower wall levels. The cloister range and monks' cells are readily identifiable, as are other buildings to the north of the cloisters. A tentative gatehouse has been interpreted as lying in the north-west corner of the survey area. Unfortunately the question of the moat has not been totally resolved. However, the survey should help in understanding the layout of the Carthusian monastic house and the later remains.

Project co-ordinator:
J Gater

Project Assistants:
Dr C R Adam, M Copley, Dr C Gaffney, N Nemcek, A Shields & C Stephens

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

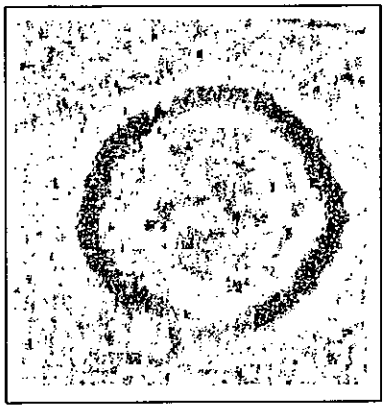
This measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity. 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.

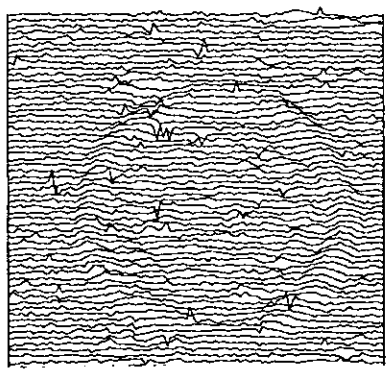
Display Options

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.



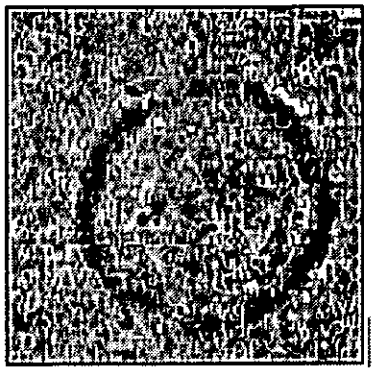
(a) Dot-Density

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.



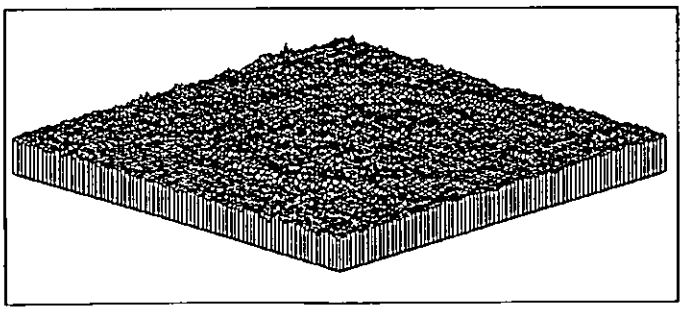
(c) Grey-Scale

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.

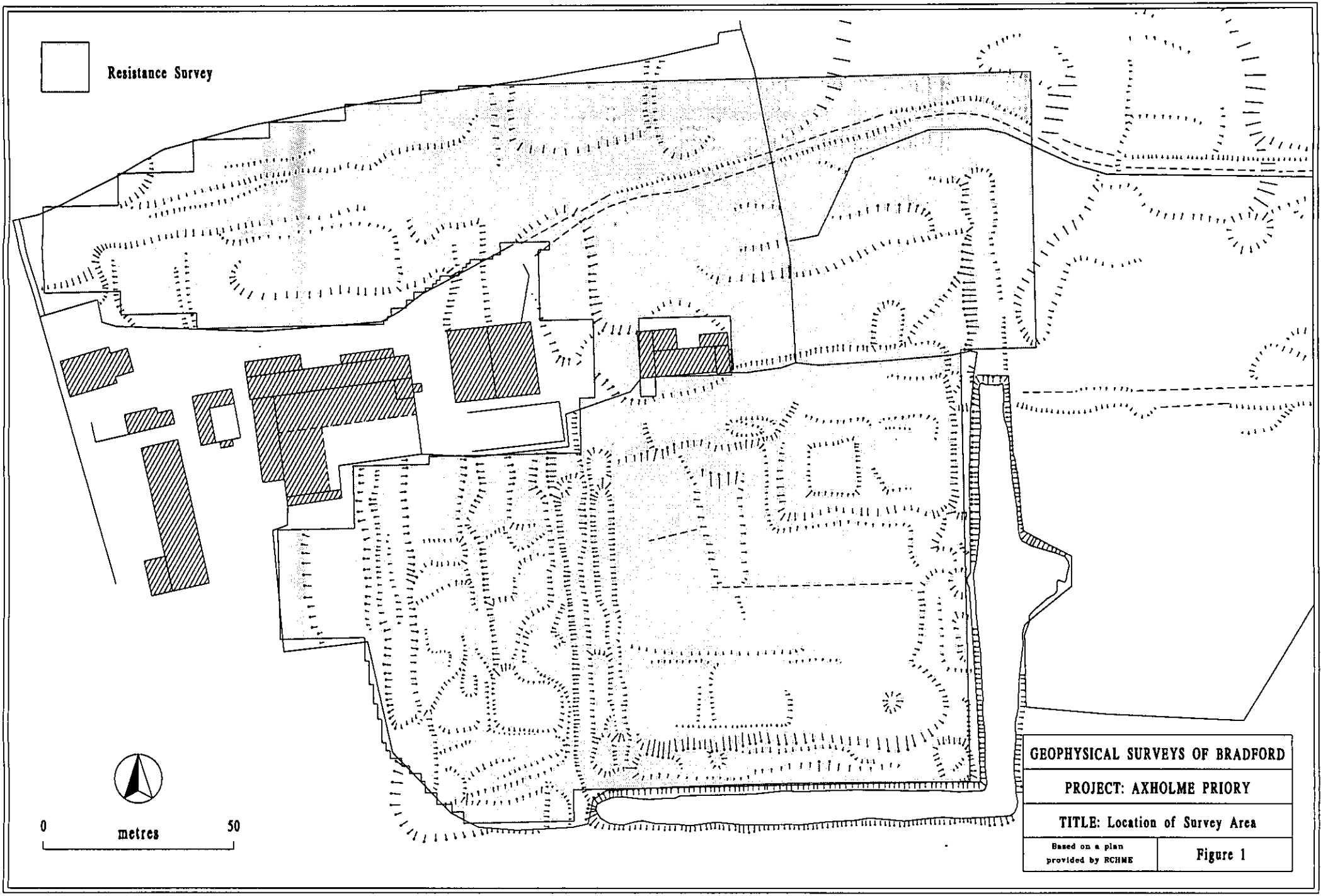
(d) Contour

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).


Resistance Survey
0
metres
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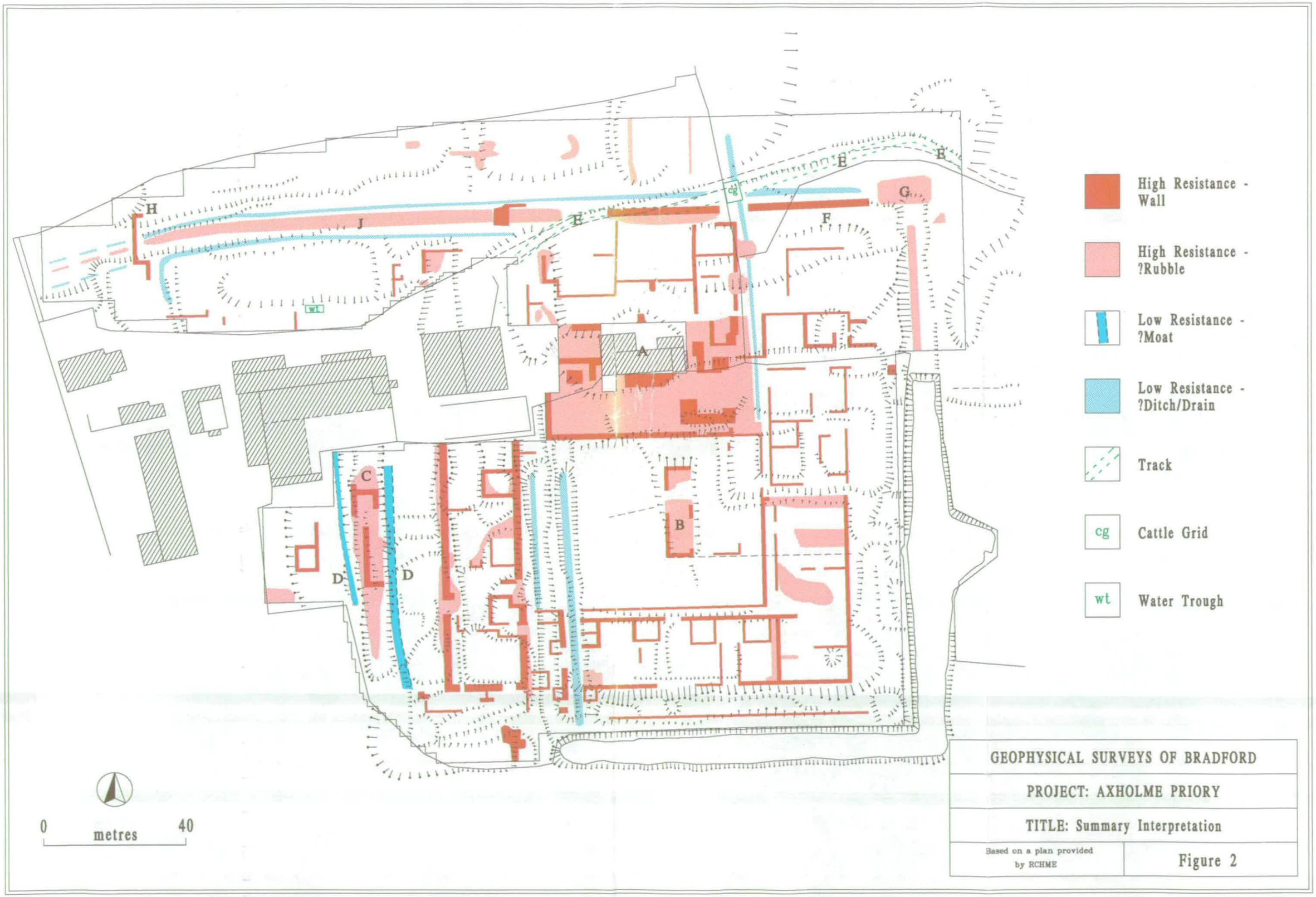
GEOPHYSICAL SURVEYS OF BRADFORD
PROJECT: AXHOLME PRIORY
TITLE: Location of Survey Area
Based on a plan provided by RCHME
Figure 1



GEOPHYSICAL SURVEYS OF BRADFORD

PROJECT: AXHOLME PRIORY

TITLE: Summary Interpretation

Based on a plan provided by RCHME

Figure 2

Axholme Priory

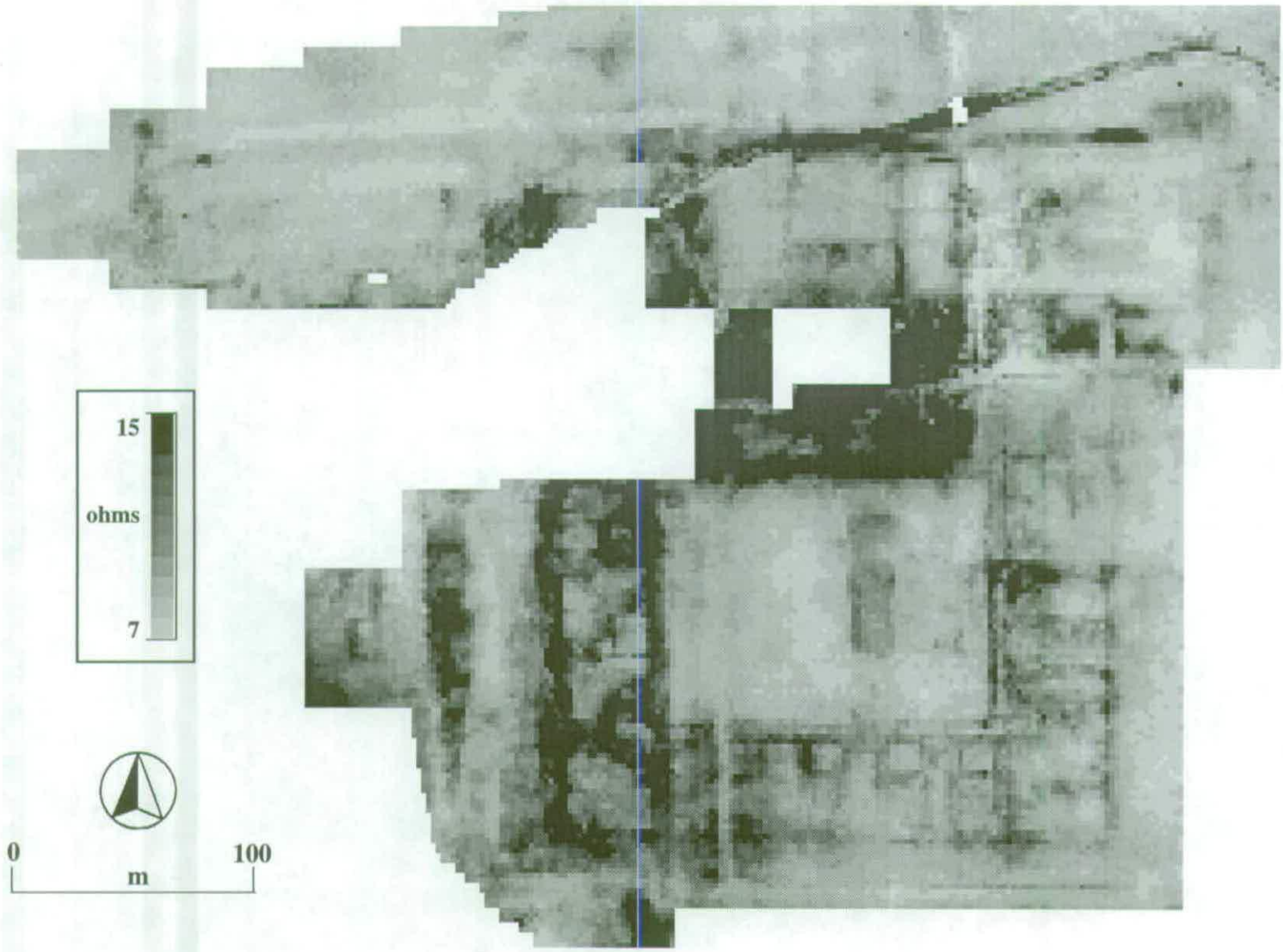


Figure 3

Axholme Priory

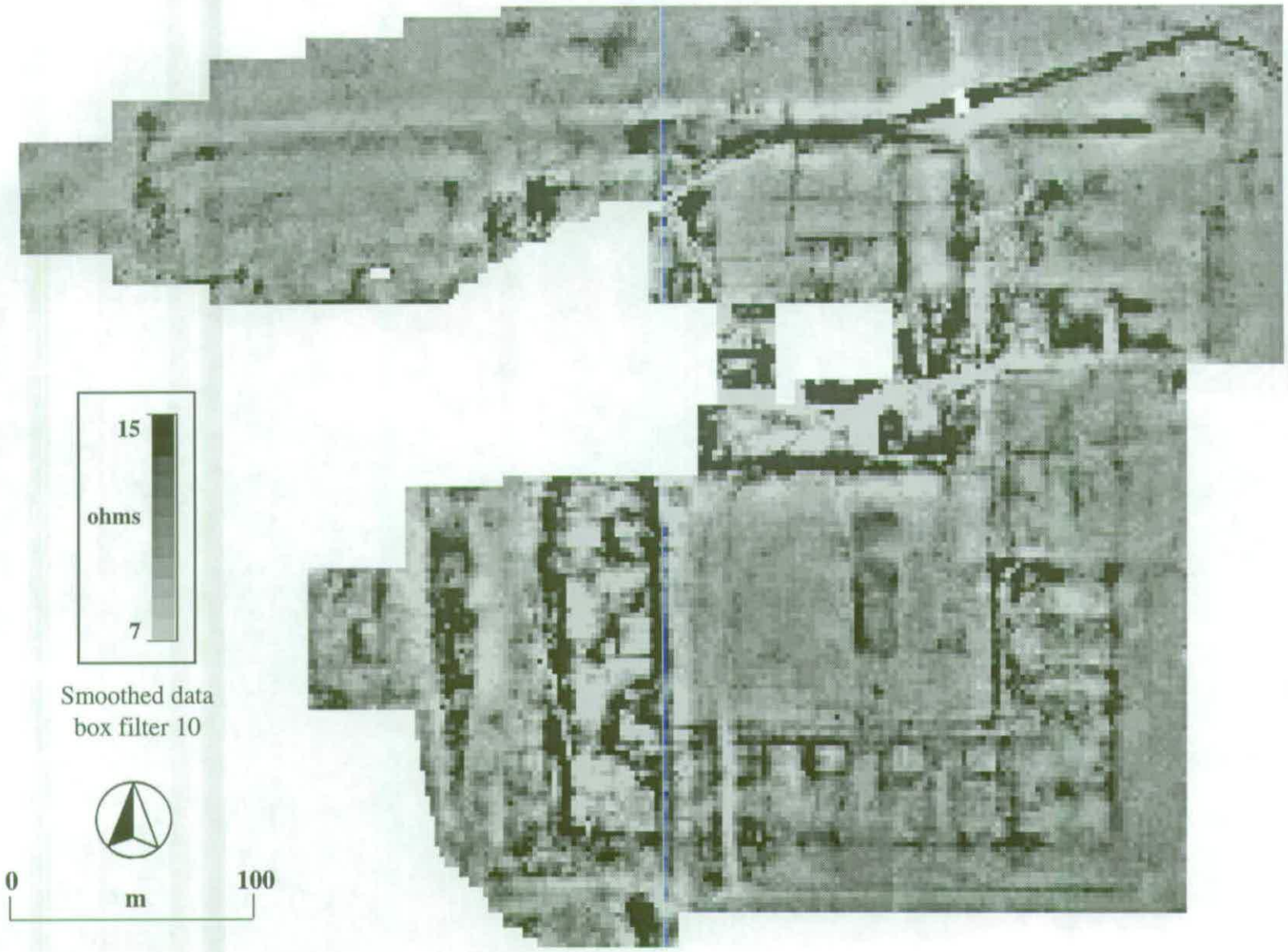
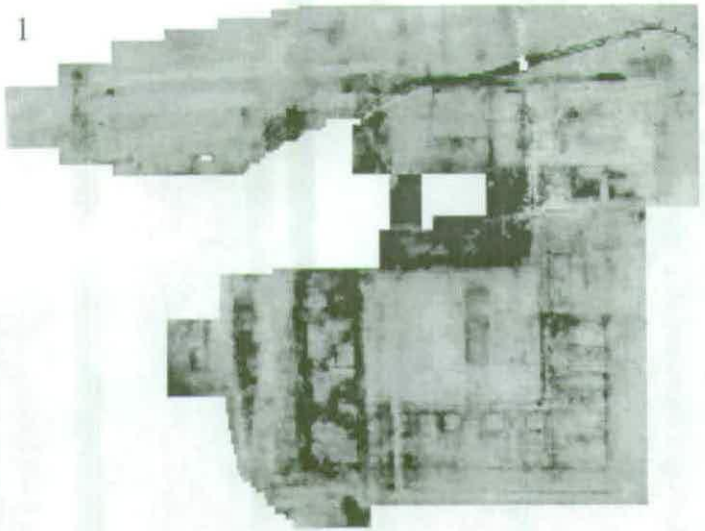
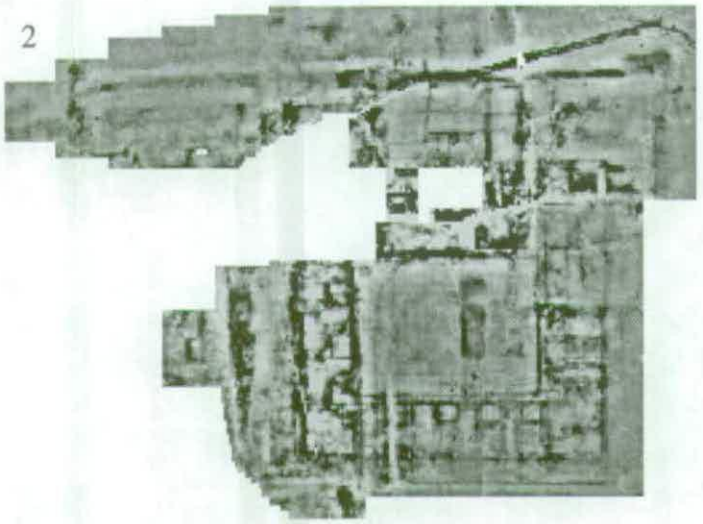
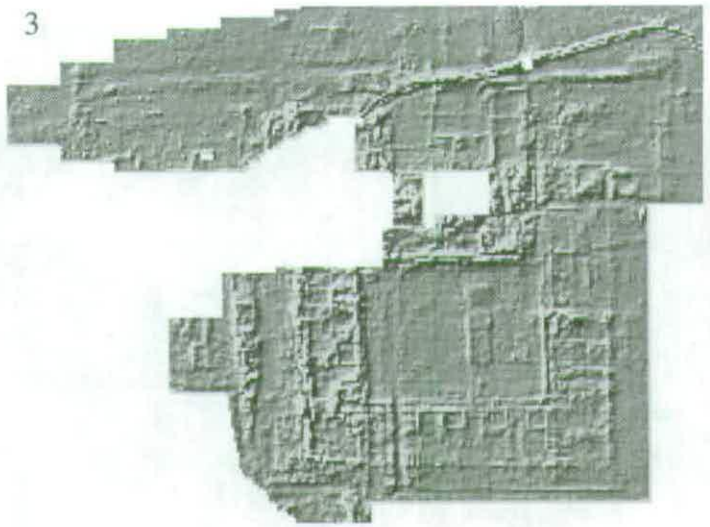


Figure 4



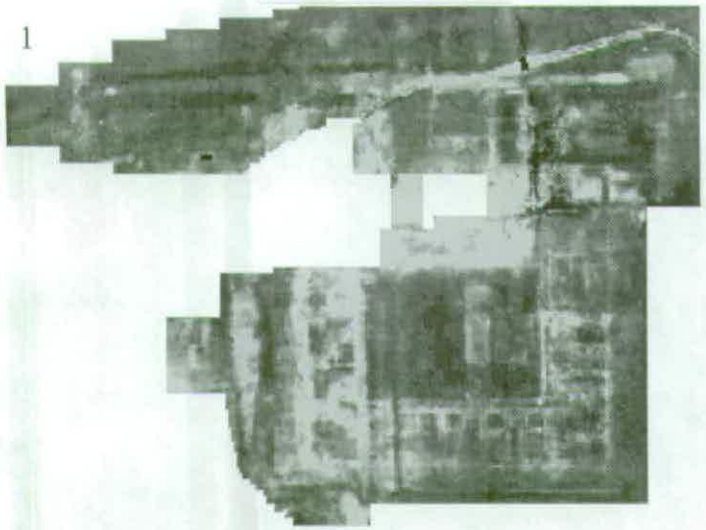


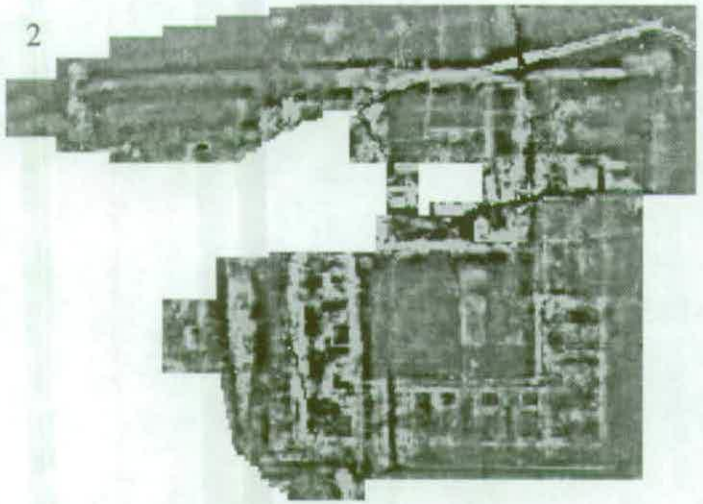


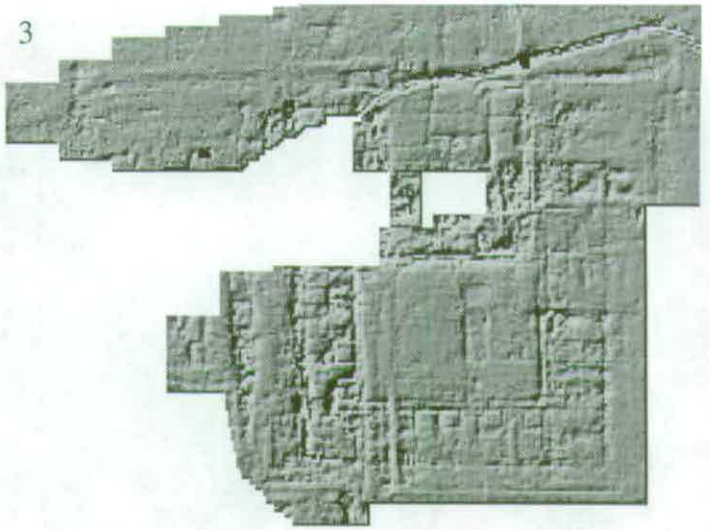
Axholme Priory

1. Raw Data: 7 (white) to 15 (black) ohms
2. Smoothed data (box filter 10)
3. Relief plot - light source NW

Figure 5





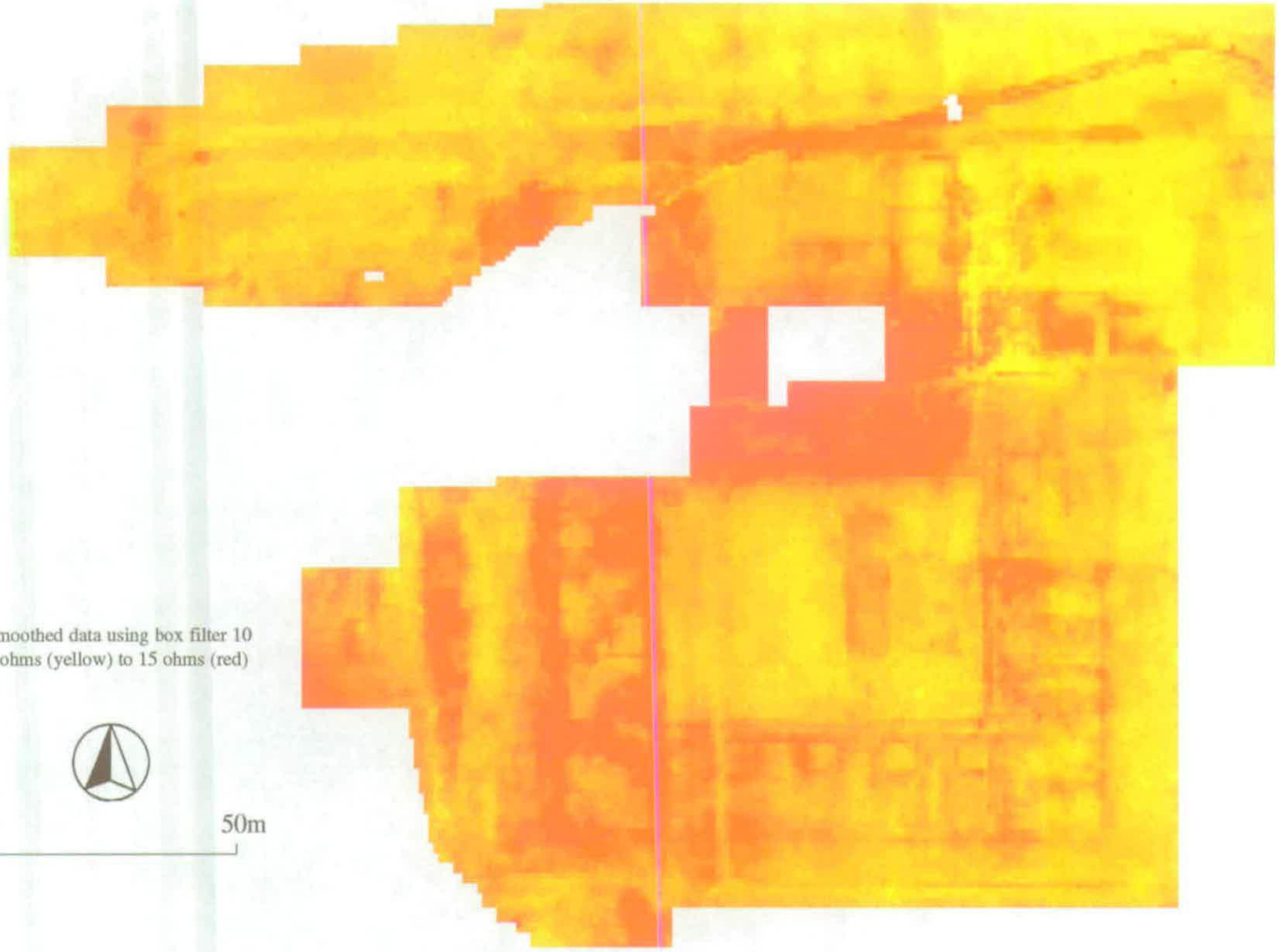


Axholme Priory

1. Raw Data: 7 (black) to 15 (white) ohms
2. Smoothed data (box filter 10)
3. Relief plot - light source NW

Figure 6

Axholme Priory



Smoothed data using box filter 10
7 ohms (yellow) to 15 ohms (red)

0 50m

Figure 7

High Resistance - Wall

High Resistance - ?Rubble

Low Resistance - ?Moat

Low Resistance - ?Ditch/Drain

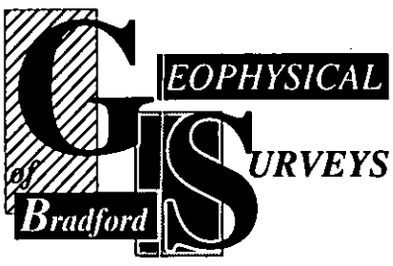
Track

cg Cattle Grid

wt Water Trough

GEOPHYSICAL SURVEYS OF BRADFORD
PROJECT: AXHOLME PRIORY
TITLE: Interpretation Diagram

Figure 8



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