

**Fluxgate Gradiometer Survey**  
**for**  
**Pre-Construct Archaeology (Lincoln)**  
**at**  
**Thurlby, Lincolnshire**  
**Survey by the**  
**Landscape Research Centre Ltd**  
**The Old Abbey**  
**Yedingham**  
**North Yorkshire**  
**YO17 8SW**  
**carried out on the**  
**25, 28 February and 1 March, 1996**  
**Phone & Fax 01723 859759**

**Summary**

A fluxgate gradiometer and resistivity survey were carried out by the Landscape Research Centre Ltd. for Pre-Construct Archaeology (Lincoln), as part of an archaeological assessment of a proposed estuarine development at Thurlby, Lincolnshire. The proposed development area was of a medium to good magnetic susceptibility, and a number of magnetic anomalies were noted, and are discussed in detail below.

**Report**

The subject of this report is the interpretation and discussion of the results of a fluxgate gradiometer survey carried out on behalf of Pre-Construct Archaeology (Lincoln). The site in question is a proposed estuarine development in land to the east of South Farm, Thurlby, Lincolnshire. The survey was conducted using a *Geoscan Research* fluxgate gradiometer (model FM36). The zigzag traverse method of survey was used. The survey was conducted by taking readings every 25cm along the north/south axis and every metre along the east/west axis (thus 3600 readings for every 30m grid). The data has been processed and presented using the programs GeoImage (a program dealing with the processing of geophysical data) and GSys (a program which can display, process and present digitised plans and images).

The survey was carried out on the 25<sup>th</sup>, 28<sup>th</sup> February and the 1st March, 1996. The personnel involved were James Lyall and Heather Clemence. The proposed survey areas were 2 hectares in total area, and consisted of 4 areas, all of which were adjacent to the river bank on the west bank of the river..

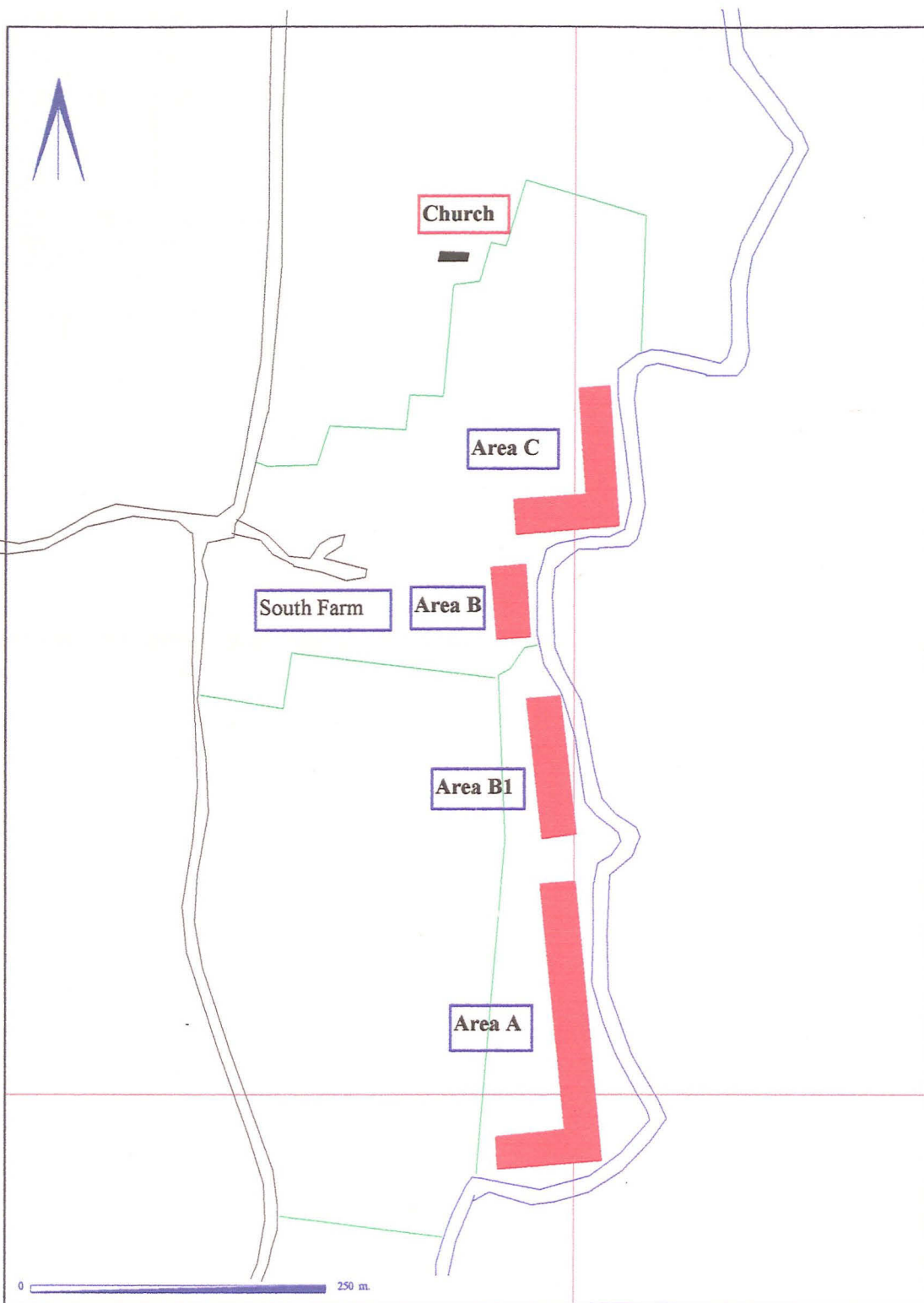


Figure One

This plan gives the location of the 4 survey areas. Plastic pegs have been left at the corners of each grid. The plan also shows the position of South Farm and the route of the river.

#### The Fluxgate Gradiometer Data

The fluxgate gradiometer data is displayed both as a number of greyscale images (Figures 2, 4, 6 and 8) and as a number of digitised interpretations (Figures 3, 5, 7 and 9). The anomalies are the areas of lighter and darker grey, which indicate areas of higher and lower magnetic susceptibility. The results from the survey are discussed in detail below. The survey area was covered in short grass, with a number of linear earthworks visible on the ground in Areas C, B1 and A. Due to the proximity of the river it is likely that many of these earthworks are banks to protect against flooding. Because of the

sinuous nature of the river and the position of metal fences, it proved impractical to survey the areas using one grid system. Each area will thus be discussed in turn, with the northernmost area (Area C), being the first.

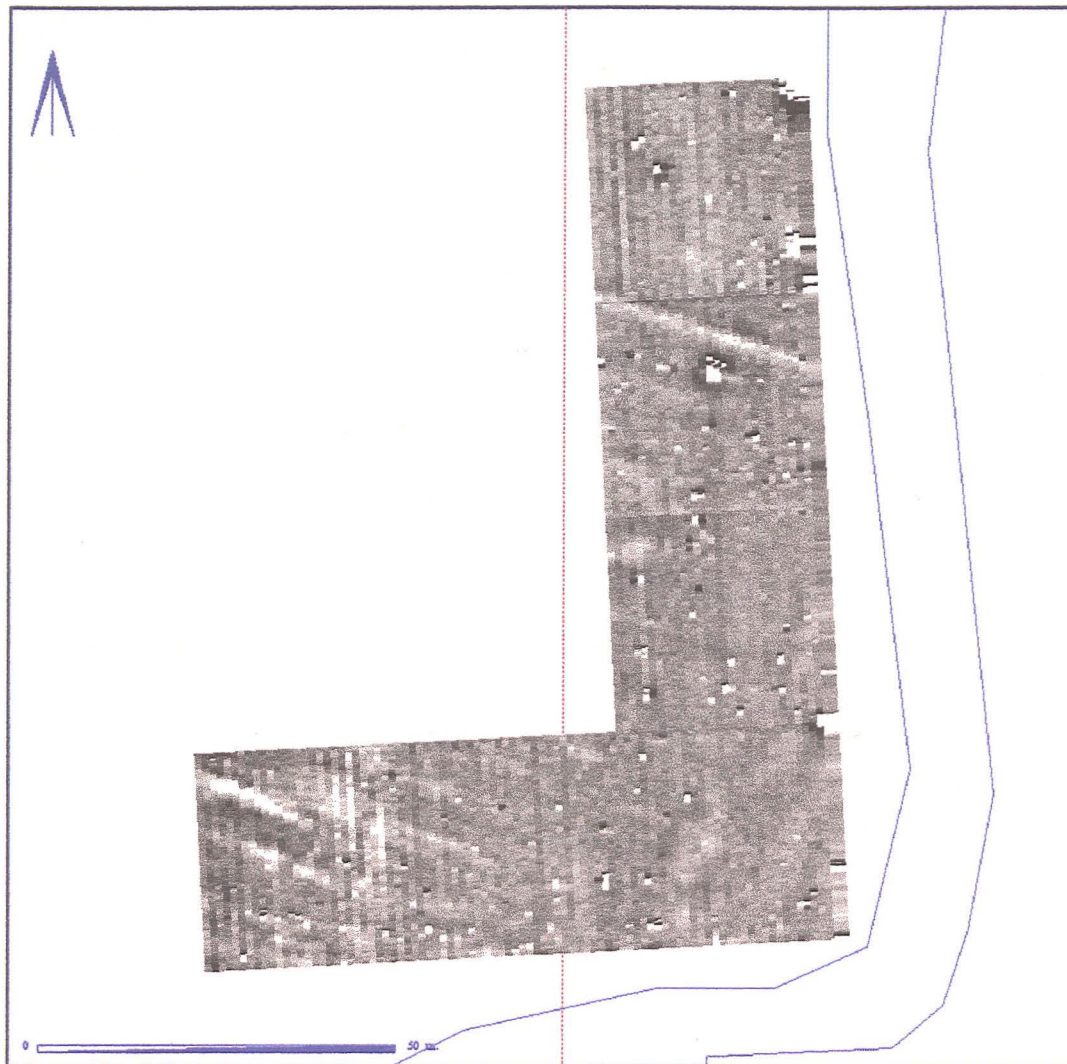


Figure Two

This plan shows the results of the gradiometer survey of Area C displayed as a greyscale image. The survey area consists of 6 30m grids, thus 0.45 hectares.

#### Area C survey results

Sixteen anomalies were noted in area C.

C1 and C8-16 are all linear anomalies with the same ESE-WNW alignment. It is quite possible that these anomalies relate to the position of field drains, although the different magnetic response of some of the anomalies may relate to the date of the drains.

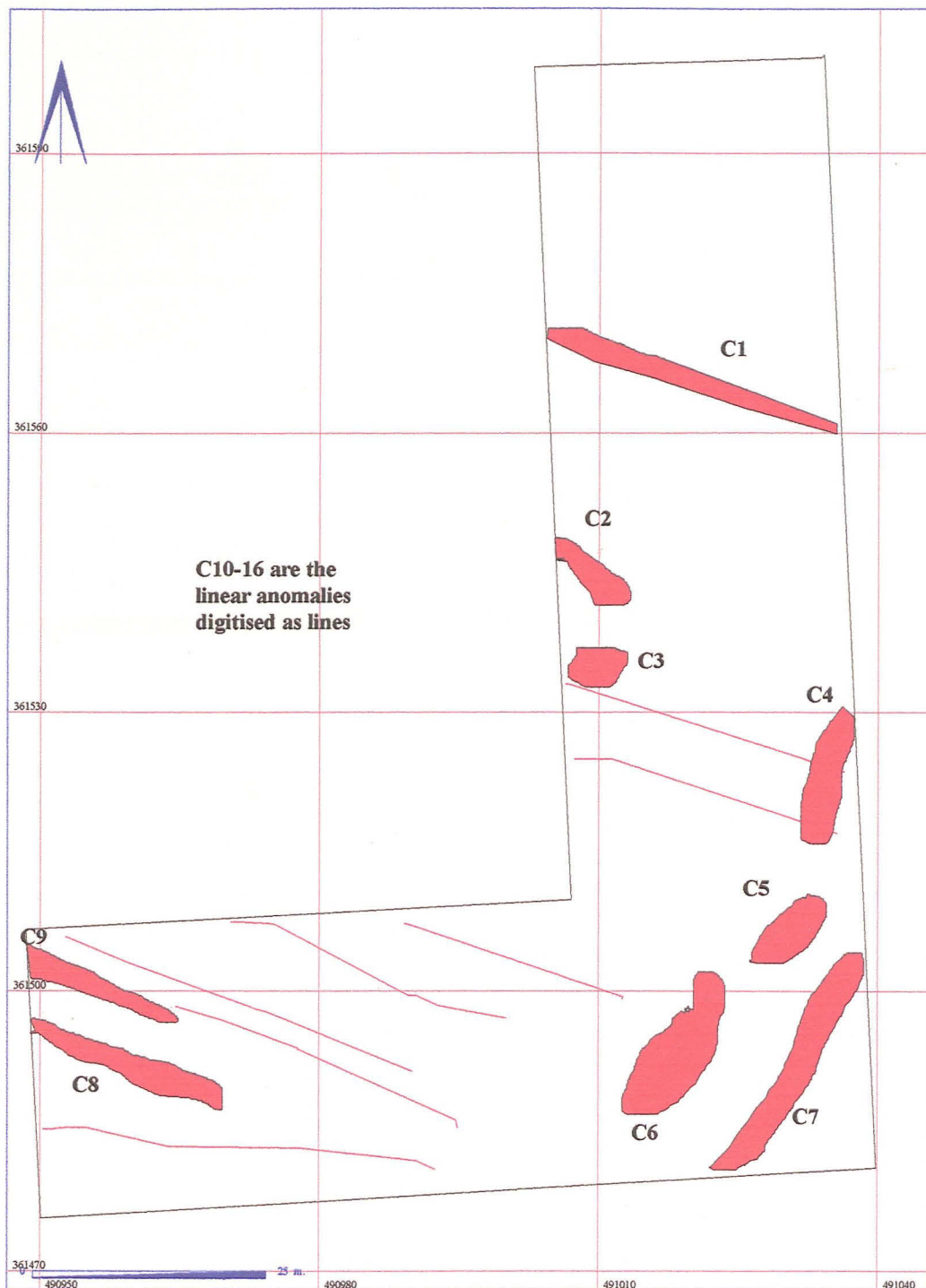


Figure Three

This plan shows the positions of the digitised interpretation of the magnetic anomalies in Area C with the letters and used in the text below. Note that these are the digitised outlines of magnetic signals and need not necessarily equate with the true size of the feature, which might be either larger or smaller than the extent of the magnetic signal.

Anomalies C4-C7 all have the same NE-SW alignment. It is possible that these anomalies may relate to a different course of the river, and thus may be geomorphological in origin.

Anomalies C2 and C3 are the only anomalies in this area which may be archaeological in origin. It is difficult to categorise archaeological features when only a 30 metre wide strip has been surveyed, although anomaly C2 appears to be a linear anomaly, and C3 appears to be localised.

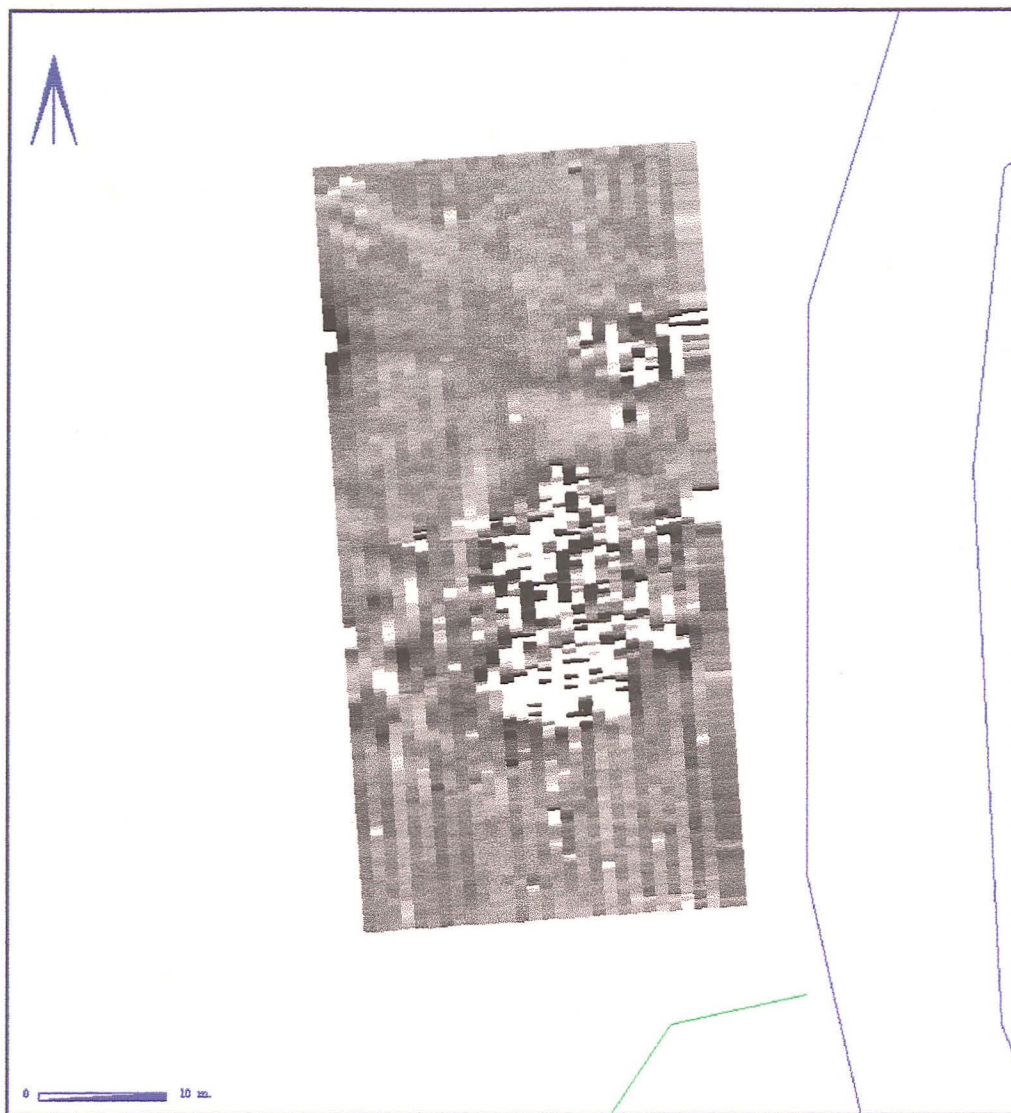


Figure Four

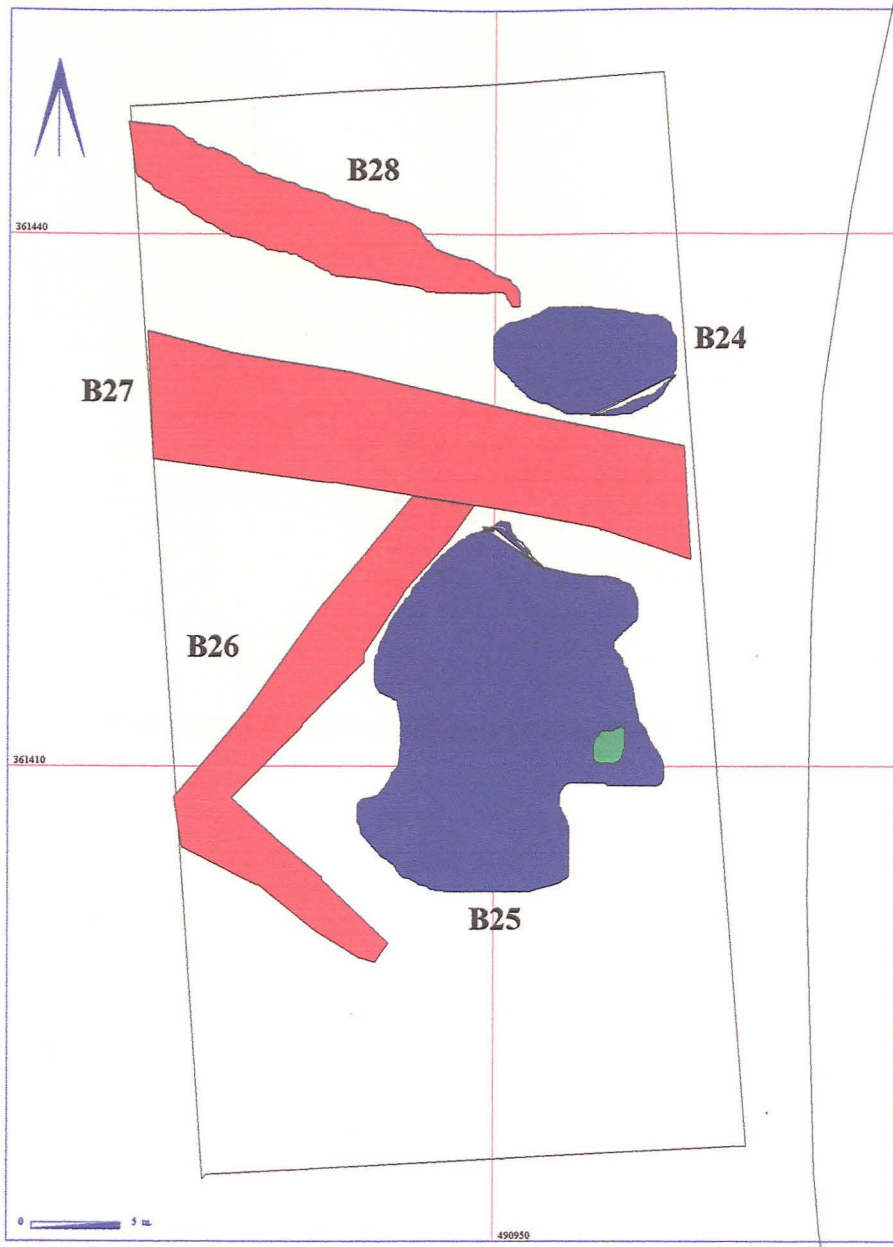
This plan shows the results of the gradiometer survey of Area B1 displayed as a greyscale image. North is to the top of the page. The area covered consists of 2 30m grids, thus 0.18 hectares.

#### Area B1 survey results

Anomalies B24 and B25 are strong magnetic anomalies almost certainly caused by modern action. A number of bricks were noted in this part of the survey area, and these almost certainly caused the strong magnetic signals.

Anomalies B27 and B28 relate to a raised area running across this part of the site.

Anomaly B26 may be archaeological in origin, although the proximity of the electricity pole and the areas of modern disturbance make this difficult to ascertain.



**Figure Five**  
This plan shows the positions of the digitised interpretation of the magnetic anomalies in Area B1 with the letters and used in the text. The green area marks the position of an electricity pole.

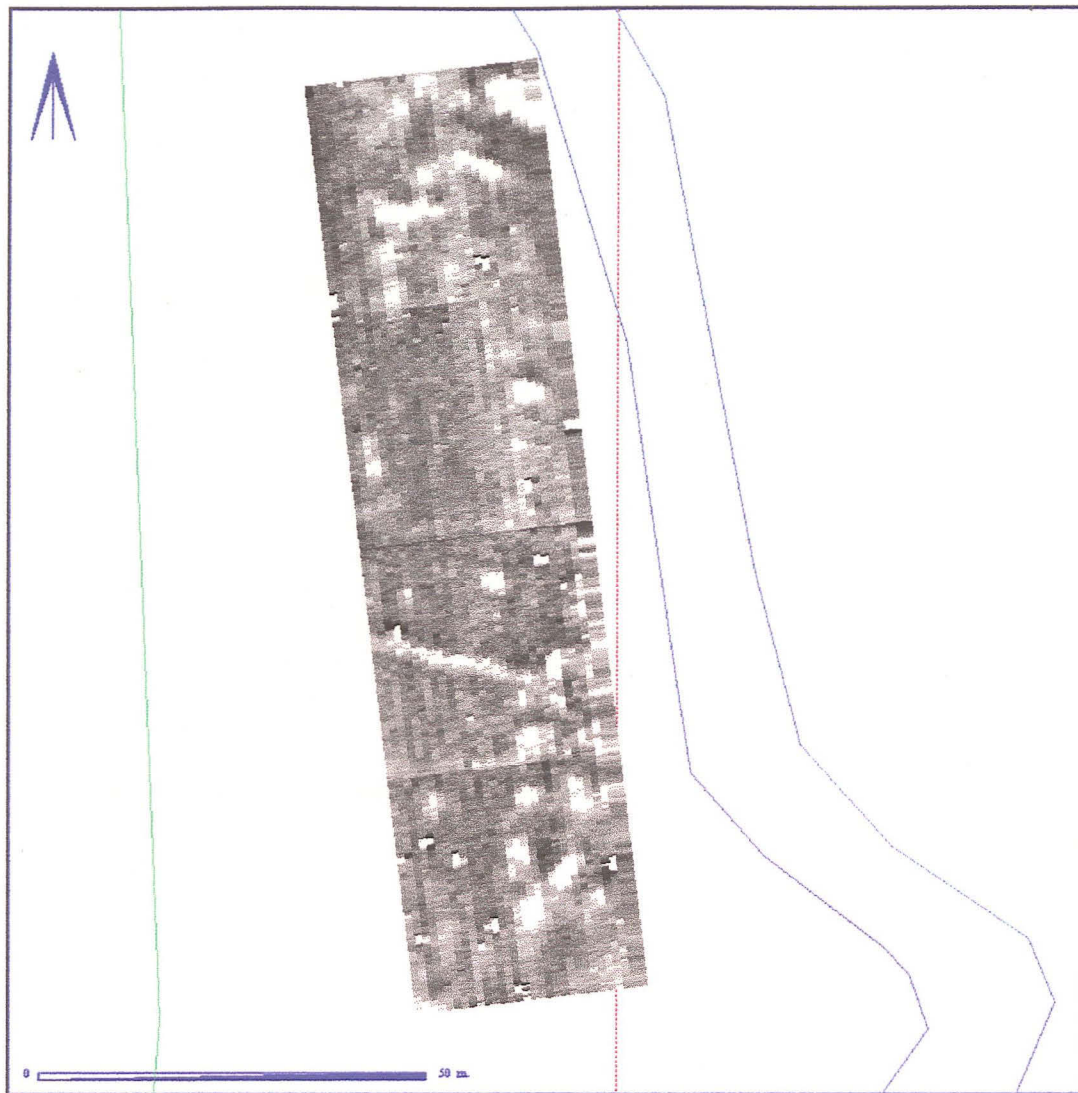


Figure Six

This plan shows the results of the gradiometer survey of Area B2 displayed as a greyscale image. North is to the top of the page. The area covered consists of 4 30m grids, thus 0.36 hectares.

#### Area B2 survey results

This area proved to be the most productive in terms of anomalies found. Anomaly B23 is the area where a test pit was located. Anomaly B1 may well be another field drain.

Anomalies B2-B5 are all localised linear anomalies in the north-east of survey area B2. It is possible that these anomalies consist of more than one localised anomaly close together, and that they are of a similar nature to the other anomalies in this survey area.

Anomalies B6-B22 are all localised anomalies. It is possible that they may be a number of pits. The position of a number of these anomalies is of note, in particular in the south-east of the survey area. The anomalies appear to form a roughly north-south alignment. It is not possible to say whether this alignment has some structural significance, because the survey area is only 30 metres wide, although it would seem likely that more of these anomalies would occur to the east.



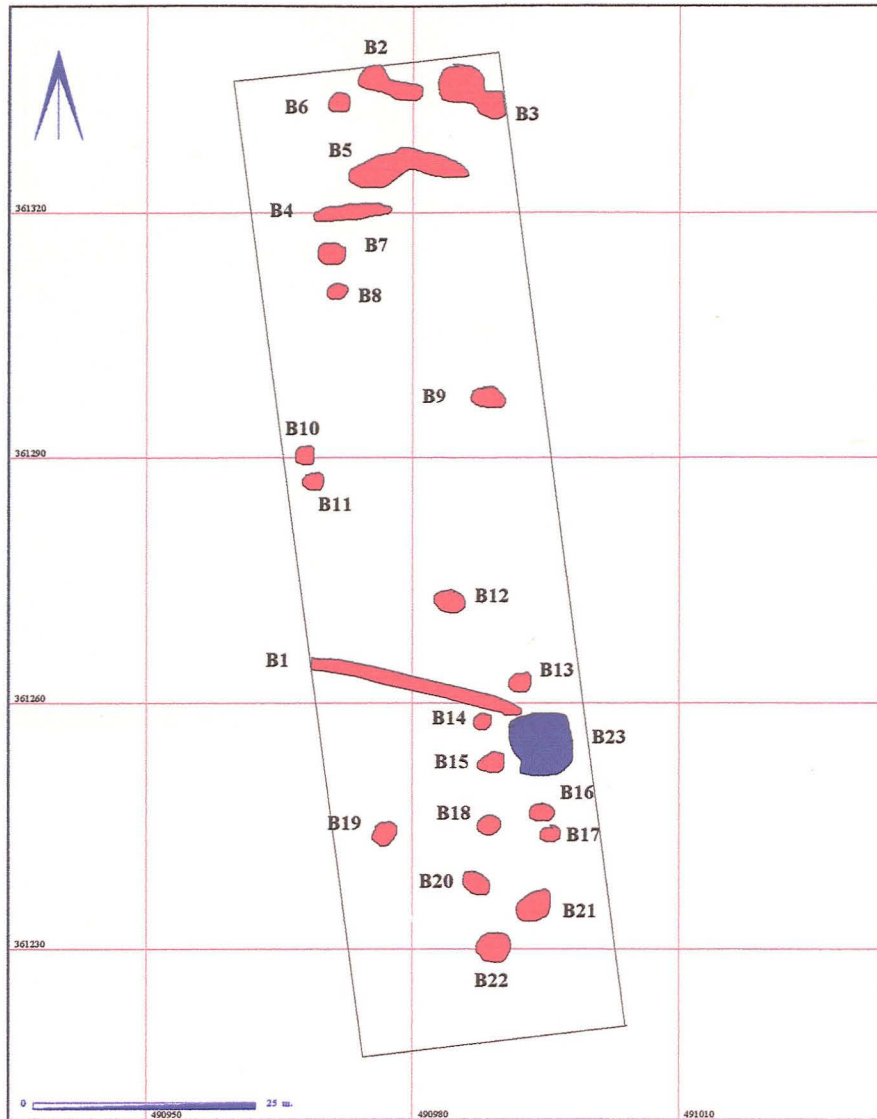


Figure Seven  
This plan shows the positions of the digitised interpretation of the magnetic anomalies in Area B2 with the letters and used in the text.

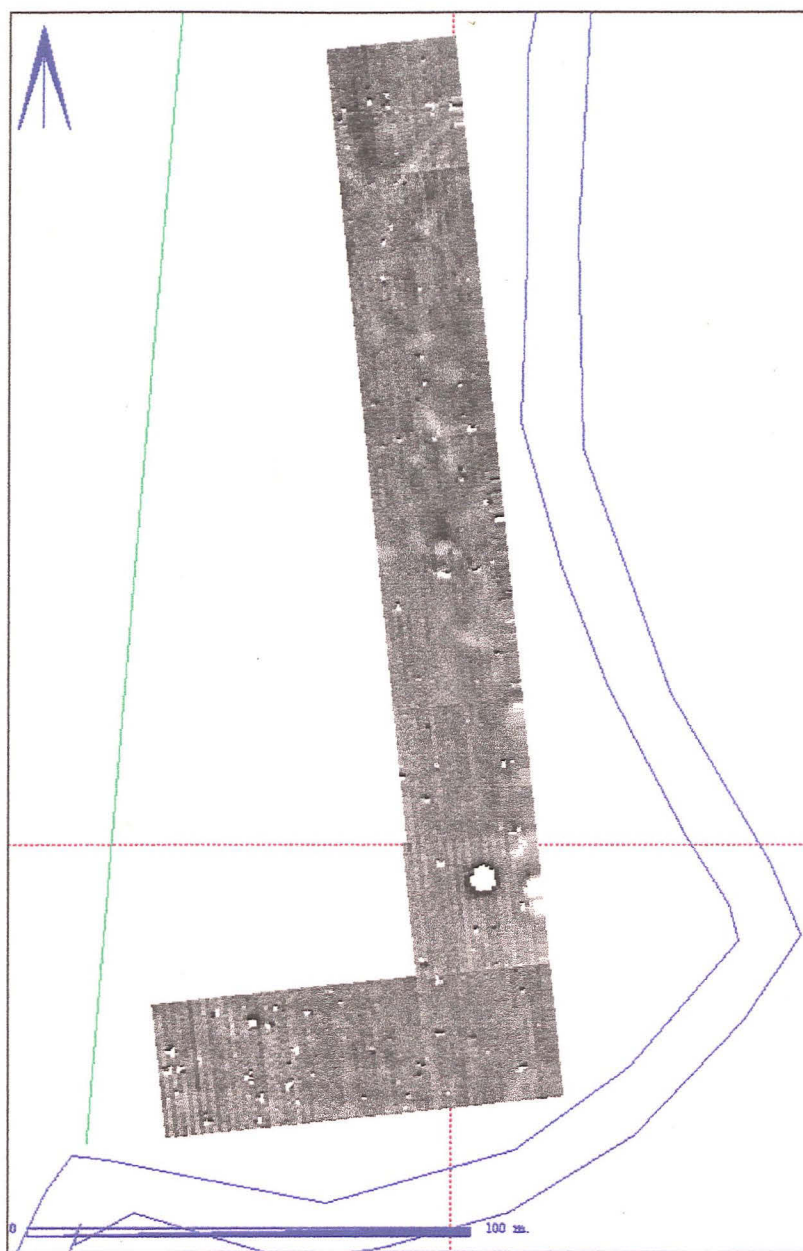


Figure Eight

This plan shows the results of the gradiometer survey of Area A displayed as a greyscale image. North is to the top of the page. The area covered consists of 10 30m grids, thus 0.9 hectares.

#### Area A survey results

Anomalies A1 and A2 are linear anomalies in the north of the survey area. It is possible that they relate to drainage, although anomaly A1 has a different alignment to all other linear anomalies in the surveyed areas.

Anomalies A6 and A7 relate to two raised banks running east-west across the south of the survey area. Anomaly A3 is an exceptionally strong magnetic anomaly, almost certainly caused by the presence of a large lump of metal or pipe in the area. Anomalies A4 and A5 are located just to the south-east of A3, and are localised anomalies of a similar nature to the anomalies noted in area B2.

The area in between anomalies A2 and A3 has a number of weak, amorphously shaped anomalies (See greyscale image Figure 8). While it is possible that some of these anomalies are pits, it is likely that these anomalies are geological in origin, caused by periodic flooding of the area.

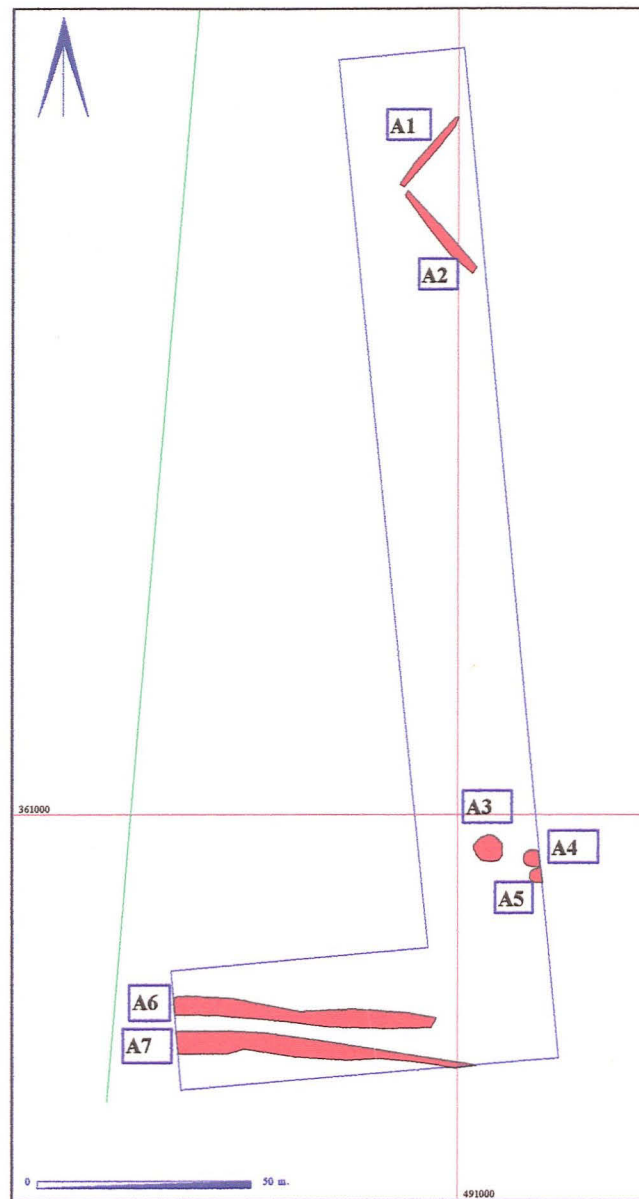


Figure Nine

This plan shows the positions of the digitised interpretation of the magnetic anomalies in Area A with the letters and used in the text below.

### Conclusion

In conclusion, the site at Thurlby proved to be of a medium to good magnetic susceptibility, with area B2 in particular providing good results. A number of magnetic anomalies were found in all four areas, some of which are modern in origin, as well as the position of a number of field drains. The most likely area to have archaeological features is area B2, which has a number of discrete anomalies, some of which appear to have a north-south alignment.

The plans should allow any archaeological investigation (if such is deemed to be necessary) of the area to concentrate in the specific areas believed to be significant. To assist in this, plastic pegs have been left in the corners of all the survey areas. Note that the field boundary to the west of area B2 has apparently been moved to the east since the OS maps were drawn. The United Kingdom latitudes are such that there can be a distortion of up to half a metre in position between the magnetic anomalies shown and the position of the actual features themselves.

Report by James Lyall

Landscape Research Centre Ltd.

## APPENDIX ONE

GRID NO	MINIMUM	MAXIMUM	RANGE	AVERAGE	STD. DEVIATION
C1	-222	164	386	2	10
C2	-19	65	84	-2	3
C3	-38	390	428	-3	8
C4	-29	115	144	-3	3
C5	-87	107	194	-5	4
C6	-27	34	61	-8	4
B1	-267	234	501	-8	14
B2	-324	404	728	-5	33
B3	-306	55	361	0	7
B4	-55	180	235	-1	4
B5	-28	265	293	4	7
B6	-256	340	596	1	11
A1	-308	345	653	-1	10
A2	-131	36	167	0	3
A3	-22	23	45	-1	2
A4	-44	60	104	-1	2
A5	-37	43	80	-2	2
A6	-23	75	98	-1	2
A7	-143	400	543	-3	14
A8	-288	150	438	0	7
A9	-43	23	66	0	2
A10	-290	318	608	-3	11

**TABLE ONE**

The table gives the raw data and statistics in nanoTesla for each of the 22 grids of the gradiometer survey. Values shown are the minimum value, maximum value, range, average value and the standard deviation of each grid. The grids are numbered from the north to the south of the area.