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**South Witham Quarry (Phase X)  
South Witham, Lincolnshire**

**Report on Archaeological Geophysical Survey 2010**

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## South Witham Quarry (Phase X)

### Report on Archaeological Geophysical Survey 2010

#### Introduction

The geophysical survey forms part of an archaeological evaluation which is required to be undertaken as a planning condition in advance of mineral extraction at this site. The permitted area for future extension at the South Witham Quarry (Phase X) covers c. 23ha, and forms a northern extension to the existing quarry workings.

The site has previously been the subject of an Archaeological Desk Based Assessment (DBA) by Phoenix Consulting Archaeology Ltd [1], and the geophysical survey represents an initial stage in subsequent field investigations. The survey was commissioned by Phoenix Consulting Archaeology on behalf of Mick George Ltd, and fieldwork was done between 10-17 March 2010.

#### The Site

A full account is given in the DBA of the topography of the site, and of previously recorded archaeological sites and findings in the vicinity. The following notes are summarised from the information presented in the DBA.

#### *Topography*

The proposed extension area extends across two arable fields centred at NGR SK 912191. The site is located immediately to the north of Mill Lane, and of the existing South Witham Quarry plant site, and 1km west of South Witham village. The site is undulating, and divided by a north-south hedge line. The elevation varies from c 123m OD adjacent to Mill Lane in the south to 110m at the River Witham in the north. The northern part of the site slopes slightly down towards the river, and to a copse which occupies the north eastern corner of the extension area.

#### *Geology*

The solid geology of the site is Lower Lincolnshire Limestone (Inferior Oolite) overlain by Glacial Boulder Clay. Soils on Jurassic limestone usually provide favourable conditions for the detection of archaeological features by magnetic surveying, as was confirmed here by topsoil magnetic susceptibility readings taken at the time of the survey (and which are shown inset in figure 6). The readings are relatively high (mean =  $33 \times 10^{-5}$  SI; standard deviation = 20), indicating the soil should be magnetically responsive. The susceptibility values also reflect the topography. The readings are particularly high on the higher ground in the southern half of the site, which probably suggests the soil here contains a greater proportion of limestone. They are lower towards the north of the site where there is likely to be a greater depth of silt and clay. It is mentioned in the DBA that the topsoil contains a

high proportion of limestone fragments, and overlies a frost-shattered limestone subsoil.

One difficulty in interpreting a magnetometer survey on a responsive soil is that minor or superficial variations in the depth or distribution of the topsoil can give rise to detectable magnetic anomalies, in addition to any archaeological features which may be present.

### *Archaeological Background*

It is noted in the DBA that a number of nearby archaeological sites and findings are recorded in the County Historic Environment Record. These are located particularly to the south and west of the extension site, where previous archaeological evaluations have been undertaken in advance of and near to the existing quarry workings. Findings include mid and late Bronze Age pits or postholes immediately to the south of Mill Lane, and close to the southern boundary of the present survey (site 04 as numbered in the DBA). There are also Iron Age ditches and pits about 200m south of Mill Lane (sites 06 and 07). Pottery of Roman date was also found in this area (site 10). In 2007 a geophysical survey 500m southwest of the extension site found probable Iron Age and Roman enclosures and a ring ditch (site 08), together with ridge and furrow (site 19). Field walking in this area produced medieval and later pottery, as well as slag (site 20).

Excavations in 1922 found 25 burials in a Romano British cemetery to the southeast of the extension area, and the foundations for a square building (site 11). Medieval pits and ditches, together with iron slag, have been found in South Witham village (site 13).

The only archaeological site previously recorded within the extension area is some former ridge and furrow in the northeast corner (site 1). This is no longer visible on the surface. Features which can be identified within the extension area from historic maps include former field boundaries, and a 19<sup>th</sup> C farm which is shown on maps between 1886 and 1983.

The DBA concludes (on the basis of Iron Age and Roman activity nearby) that there is a moderate potential for the recovery of archaeological findings from within the extension area.

### **Survey Procedure**

The site was investigated by means of a recorded magnetometer survey. Readings were collected along transects 1m apart using Bartington 1m fluxgate gradiometers, and are plotted at 25cm intervals along each transect. The results of the survey are presented at 1:2000 scale as a grey scale plot (figure 2), and as a graphical (x-y trace) plot in sections at 1:1250 (figures 3-5). An interpretation of the findings is shown superimposed on figures 3-5, and is reproduced separately to provide a summary of the findings (figure 6).

The graphical plot shows the magnetometer readings after minimal pre-processing which includes adjustment for irregularities in line spacing caused by variations in the instrument zero setting, and slight linear smoothing. Additional 2D low pass filtering has been applied to the grey scale plot to reduce background noise levels.

Colour coding has been used in the interpretation to try and distinguish different effects. The interpretation is intended to be schematic and illustrative, and not to reproduce the detail of the grey scale plots. A number of magnetic anomalies of potential archaeological interest are outlined in red.

Other magnetic anomalies which appear to be of natural or geological origin are lightly outlined in brown. Stronger disturbances which are likely to be of recent origin, or which relate to former field boundaries, are shown in shades of darker brown. Some selected distinct narrow magnetic anomalies which must represent iron objects are in blue, and cultivation effects in green.

A number of topsoil magnetic susceptibility readings were recorded at the time of the survey as previously noted, and are displayed on a plot inset in figure 6.

#### *Survey location*

The survey grid was set out and tied to the OS grid using a differential GPS system. The plans are therefore geo-referenced, and OS co-ordinates of map locations can be read from the AutoCAD version of the plans which can be supplied with this report.

### **Results**

The survey has produced a number of potentially significant findings, but there is no widespread evidence for concentrated or conspicuous archaeological activity. Many of the findings are in the southern half of the survey area, and are therefore relatively close to the Bronze Age and other sites to the south of Mill Lane. This distribution may also in part reflect the variation in soil magnetic properties between the north and south of the site.

One clearly marked survey finding is a slightly elliptical ditched feature about 15m across in the southwest corner of the west field (as labelled A on figure 6). This is probably a ring ditch, but is isolated, and no other similar features appear to have been detected.

The significance of a cluster of magnetic anomalies at B in the east field is more difficult to assess. This feature is not associated with any strong magnetic anomalies which would suggest it is recent, other than a line of single peaks (representing iron objects) as marked in blue and extending north and south from B. This alignment could perhaps be fortuitous (given that ferrous anomalies, as indicated by spikes in the graphical plots, are numerous in the southern half of the field), but could also perhaps indicate a former line of fence posts, or metal joints in a non-ferrous pipe. This perhaps suggests the possibility that the magnetic anomalies at B could represent compressed ground around a water or feeding trough, if the field was ever used for pasture. A further possibility is that they could be archaeological. The archaeological feature, if so, must be defined by broad silted hollows (as outlined in red) rather than a narrow ditch (as seen at A). The positive (red) magnetic anomalies are also enclosed by a band of negative readings (indicated in blue). Such a distinct negative effect is unusual (except when immediately adjacent to a strong positive peak), but may be caused by such factors as an extant hollow (causing a reduced depth of

topsoil) or by a buried structure which is less magnetic than the soil it displaces (such as a stone wall footing). The pattern of magnetic anomalies at B could on this argument represent a depression or structure surrounding an earth-filled mound, but the evidence is highly inconclusive. Given the high soil magnetic susceptibility in this area it is also remains a possibility that the disturbances giving rise to B are superficial and non-archaeological.

A further group of strong magnetic anomalies further to the east at C is not wholly dissimilar in strength and extent to the feature at B. The disturbance at C are, however, adjacent to a line of magnetic anomalies detected along one of the now-removed field boundaries. This perhaps reinforces the possibility that C relates to a former trough or feeding area at the edge of the former field, and consequently that a similar explanation could apply to B.

The variation in background magnetic activity across the site is indicated by the distribution of small (and probably mainly natural) magnetic anomalies, some of which have been outlined in light brown. The main concentrations of these disturbances are located towards the southern boundary, and are included in the interpretation. This distribution probably relates mainly to the presence of near-surface bedrock on the higher ground, but the possibility also remains of an archaeological contribution to the magnetic activity, given the presence of archaeological sites to the south. A few individual magnetic anomalies have been outlined in red because (in terms of strength and profile) they show characteristics which could indicate such features as silted pits. There is a slight cluster at D, and perhaps another larger one at E, but they are otherwise sparsely scattered.

It is difficult fully to exclude the possibility that pits, postholes or slag (as seen at DBA sites 04, 08, 20 and elsewhere) could contribute to the magnetic anomalies seen at E, and elsewhere at the south of the extension area on the basis of the geophysical evidence alone. The detected magnetic activity is not, however, very distinct, and not clearly distinguishable from the (probably natural) background variation. It is often the case that ancient settlement or industrial sites will be defined by concentrations of magnetic anomalies in clear association with nearby enclosing ditches or boundaries, and such combinations of findings appear to be lacking here.

A few more pit-like features are seen near the northern limit of the survey (as at F), where they are on lower ground near the river. Natural pit-like features (which appear to be caused by variations in the depth of silt) are often seen near watercourses in locations of this kind. There are no clearly identifiable findings in a small area of open ground which was surveyed within the copse near the northern site boundary.

Widespread cultivation effects (some of which are indicated by green lines) are visible across much of the survey (particularly in the grey scale plot). They are most distinct on the more magnetic soil to the south, but continue faintly to the north. There appears to be a superimposition of two linear patterns. Some lines curve towards the northeast, and continue into the northeast corner of the site where ridge and furrow is recorded (G on figure 6). Others, particularly in the western field, run north to south and align with present field boundaries. These are perhaps more likely to be caused by modern ploughing. One linear feature is marked by green outlines near the western survey boundary at H. It is unusually strong, but otherwise conforms to the overall cultivation

pattern.

A few other weak linear markings follow different alignments, and are indicated in red. One appears to cross the west field (at J), and continues across the centre of the survey at K. Another similar feature may be present in the southeast corner at L. These markings could perhaps indicate traces of large enclosures or a field system pre-dating the ridge and furrow, but their weak and fragmentary appearance suggests, if so, that the enclosure ditches are heavily eroded. They also do not appear to be closely associated with the possible groups of smaller features (D and E) mentioned above.

Other survey findings include dense magnetic disturbances at the site of the 19<sup>th</sup> C farm at M. This is approached by an iron pipe along the former track from the south. Other disturbances (N, P) correspond to former buildings as identified from historic maps. The disturbances at M and P also correspond to visible brick and stone scatters on the ground.

The strong magnetic anomalies of the line of former field boundaries at Q and R probably indicate that ditches were backfilled in part with imported modern debris.

## Conclusions

The potentially most significant finding in the survey is the probable ring ditch in the southwest corner of the survey at A. Other findings include traces of ridge and furrow towards the east of the survey. This appears to merge with modern cultivation towards the west.

Some faint linear markings could perhaps indicate eroded traces of former enclosures or field systems (as at J, K, L), but the evidence is not fully conclusive. Some groups of individual magnetic anomalies could perhaps represent archaeological features (as at D, E), but the features do not conform to any clearly interpretable plan, as would be expected at an ancient settlement or industrial site.

The groups of large magnetic anomalies at B and C are particularly difficult to interpret. They do not conform to any readily identifiable category of archaeological feature, and could perhaps be relatively superficial ground disturbances which give rise to detectable magnetic anomalies on an unusually responsive soil.

**Report by:**

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14 April 2010  
[Revised 19 April 2010]

The fieldwork for this project was done by F. Prince and P. Cottrell.

**References**

- [1] Desk Based Assessment: South Witham Quarry (Phase X); South Witham, Lincolnshire. Report PC346a by Phoenix Consulting Archaeology for Mick George Ltd. 16 March 2010.

## South Witham Quarry (Phase 10): Geophysical Survey

### Appendix : Inventory of Selected Findings

This list notes the more significant findings from the magnetometer survey of this site. The grading (1-4) given alongside each entry refers to the reliability of the geophysical evidence rather than the archaeological significance of the findings.

- Grade 1: Distinct magnetic anomalies of probable archaeological origin.
- Grade 2: Magnetic anomalies possibly including natural or recent disturbances, but which could in part be archaeologically significant.
- Grade 3: Weak or isolated features; not necessarily archaeologically significant.
- Grade 4: Magnetic anomalies of probably non-archaeological origin.

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This summary list includes only selected magnetic findings, particularly those which may be of potential archaeological interest. Magnetic disturbances which may be mentioned in the text or indicated on plans are not necessarily included if they appear to be of natural or non-archaeological origin.

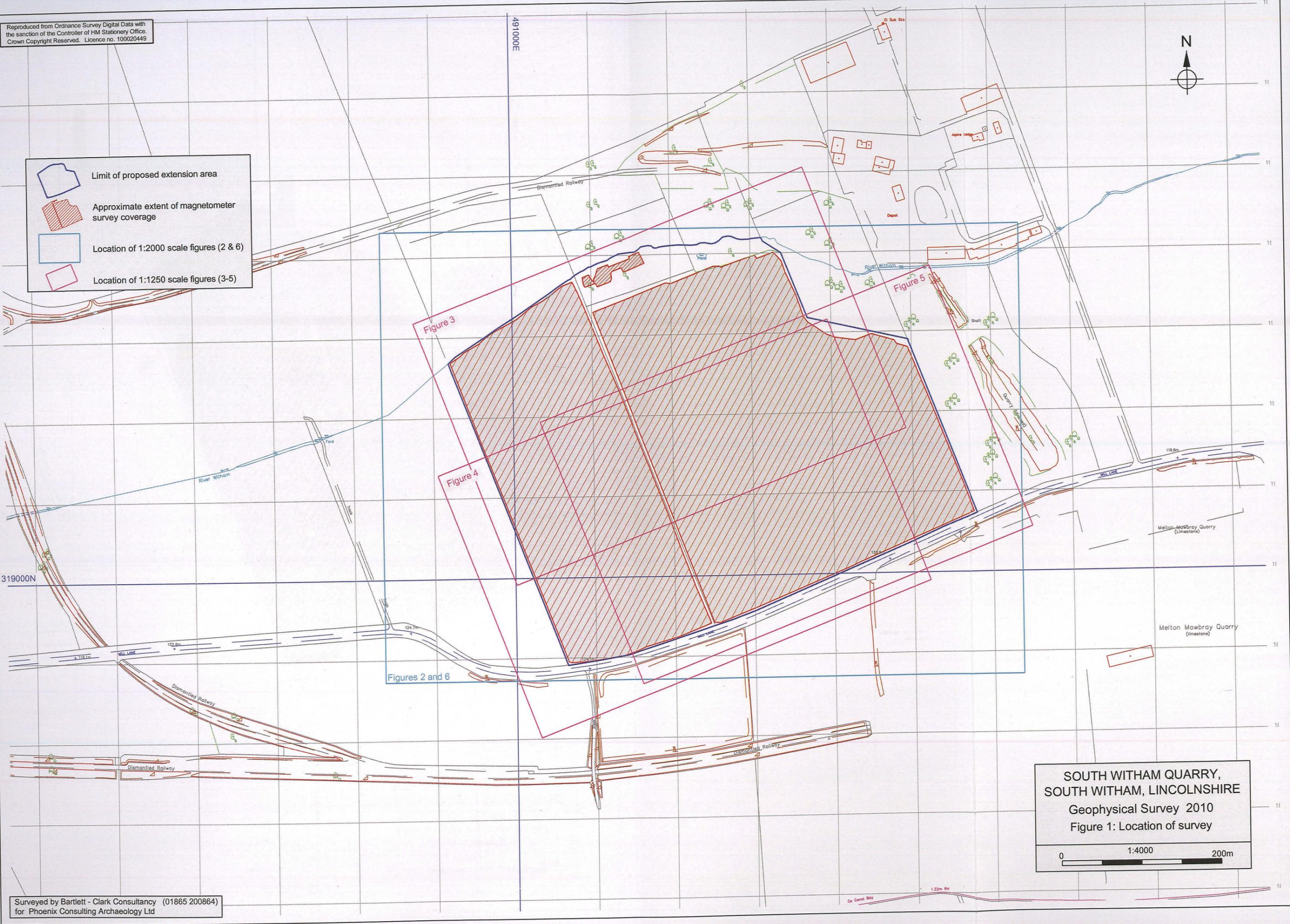
<u>Feature</u>		<u>Grade</u>
A	Probable ring ditch.	1
B, C	Possible earthwork features, but may be superficial or recent.	2-3
D, E	Possible clusters of silted pits.	2
F	Pit-like features near river: may be natural.	3
G	Linear features in area of recorded ridge and furrow.	1
H	Linear feature adjacent to western field boundary: possible headland or cultivation effect.	3
J, K, L	Weak linear features: perhaps traces of ditches, enclosures.	2
M, N, P	Sites of buildings as shown on 19 <sup>th</sup> - 20 <sup>th</sup> C maps.	4
Q, R	Disturbances at former field boundaries.	4

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Legend:

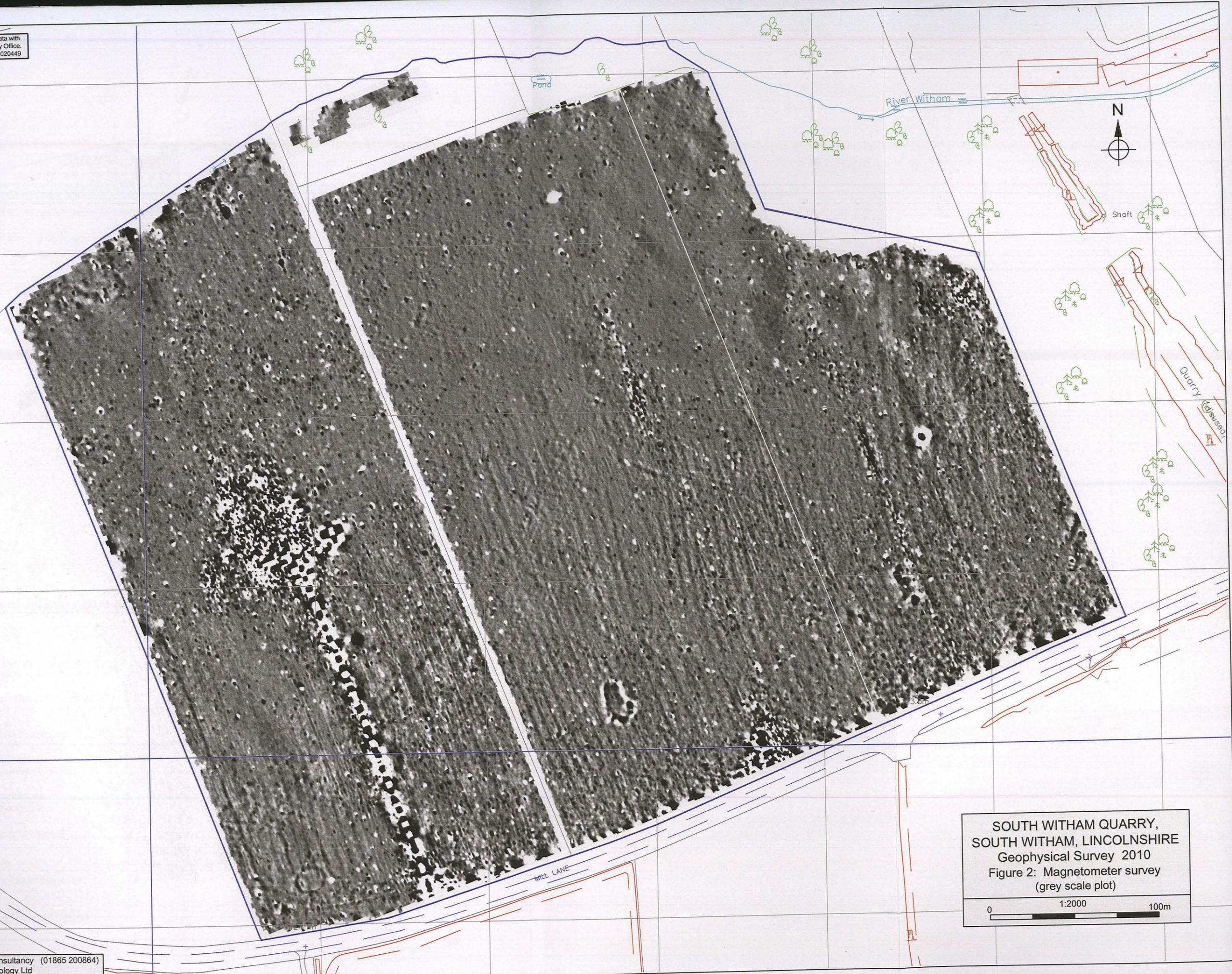
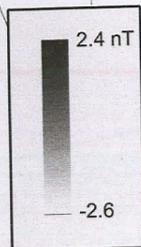
- Limit of proposed extension area
- Approximate extent of magnetometer survey coverage
- Location of 1:2000 scale figures (2 & 6)
- Location of 1:1250 scale figures (3-5)



**SOUTH WITHAM QUARRY,  
SOUTH WITHAM, LINCOLNSHIRE**  
Geophysical Survey 2010  
Figure 1: Location of survey

0 1:4000 200m

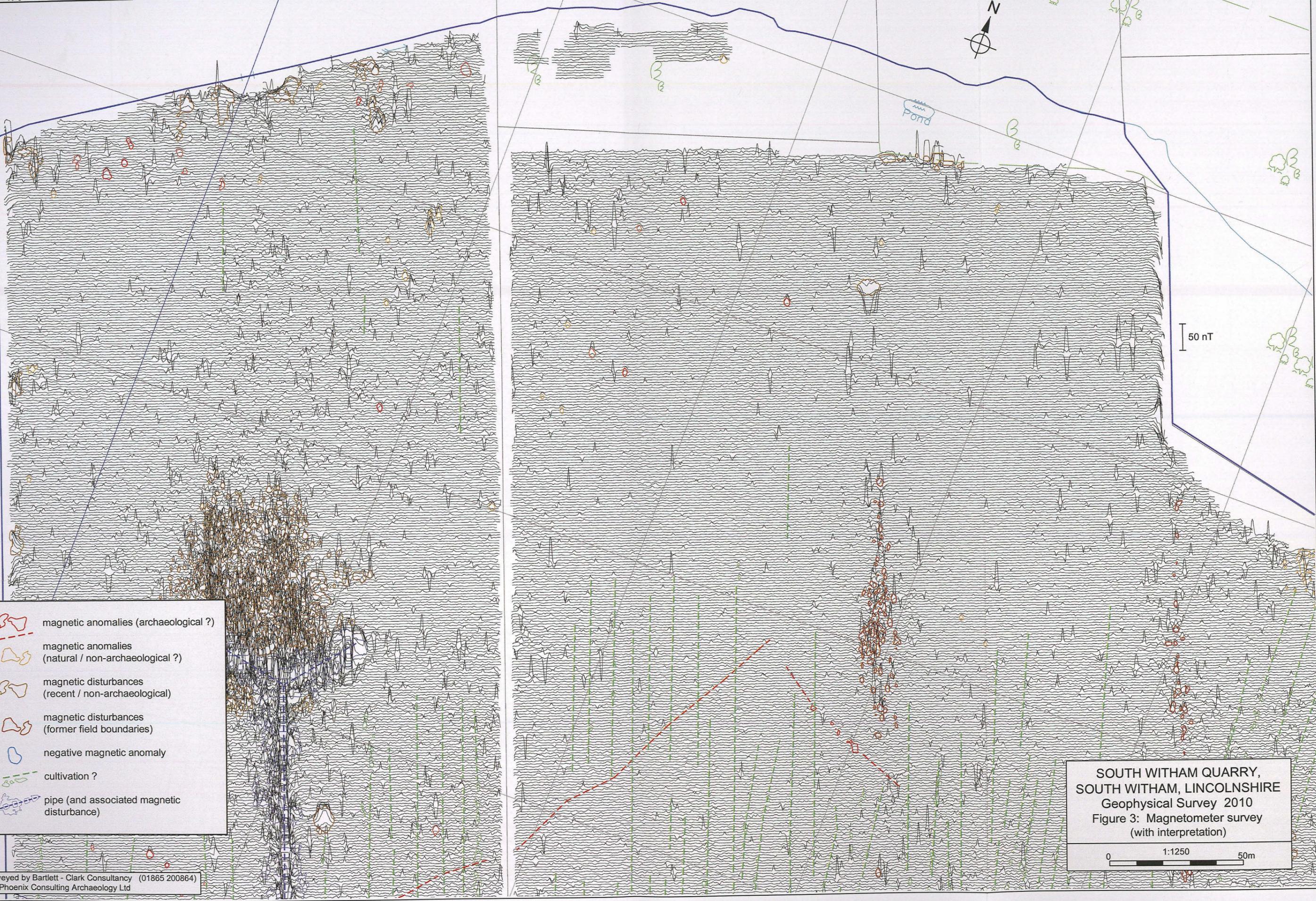
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SOUTH WITHAM QUARRY,  
SOUTH WITHAM, LINCOLNSHIRE  
Geophysical Survey 2010  
Figure 2: Magnetometer survey  
(grey scale plot)

0 1:2000 100m

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- magnetic anomalies (archaeological ?)
- magnetic anomalies (natural / non-archaeological ?)
- magnetic disturbances (recent / non-archaeological)
- magnetic disturbances (former field boundaries)
- negative magnetic anomaly
- cultivation ?
- pipe (and associated magnetic disturbance)

SOUTH WITHAM QUARRY,  
SOUTH WITHAM, LINCOLNSHIRE  
Geophysical Survey 2010  
Figure 3: Magnetometer survey  
(with interpretation)

0 1:1250 50m

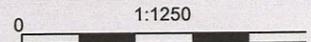


-  magnetic anomalies (archaeological ?)
-  magnetic anomalies (natural / non-archaeological ?)
-  magnetic disturbances (recent / non-archaeological)
-  magnetic disturbances (former field boundaries)
-  negative magnetic anomaly
-  cultivation ?
-  pipe (and associated magnetic disturbance)

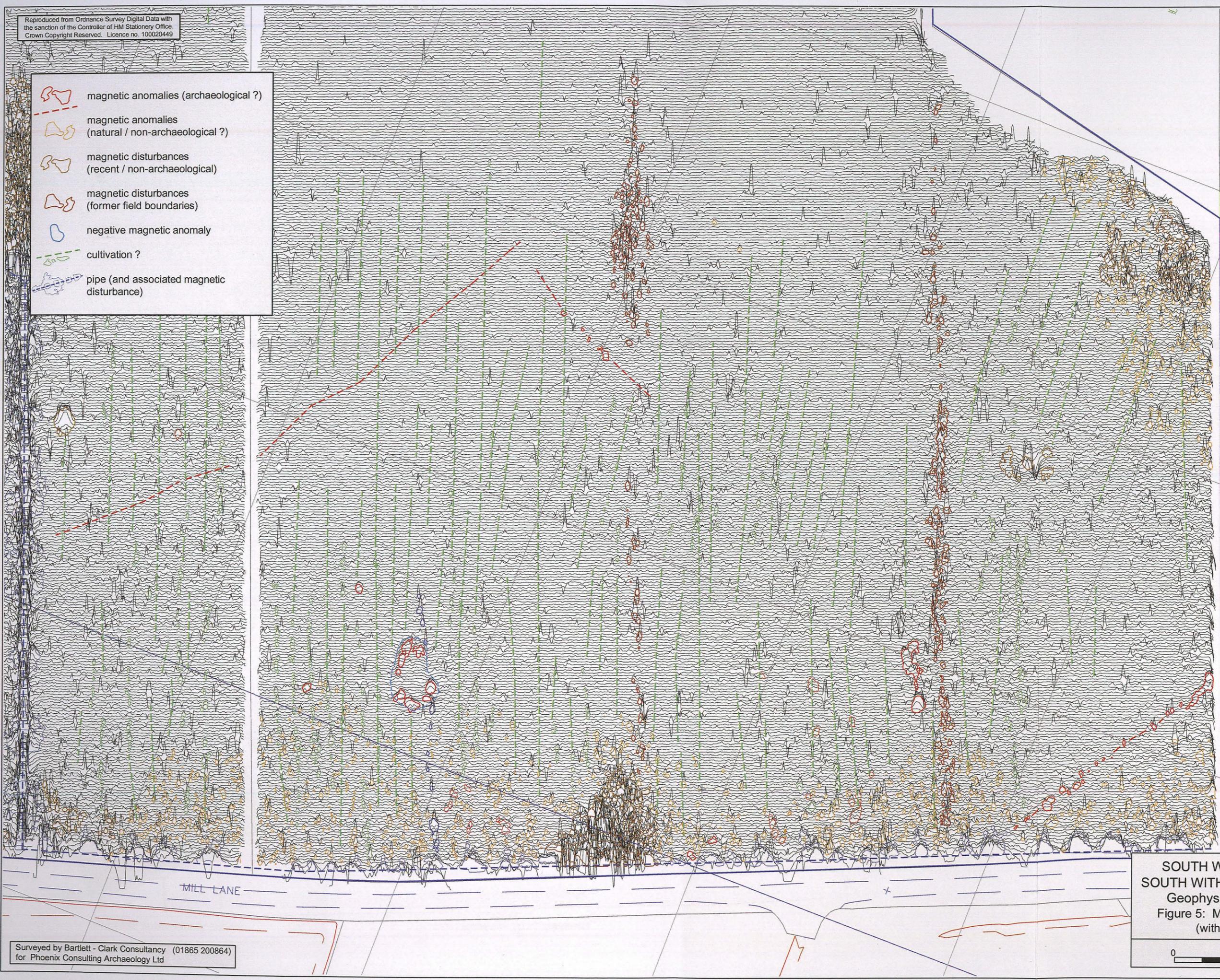
50 nT

MILL LANE

SOUTH WITHAM QUARRY,  
SOUTH WITHAM, LINCOLNSHIRE  
Geophysical Survey 2010  
Figure 4: Magnetometer survey  
(with interpretation)



-  magnetic anomalies (archaeological ?)
-  magnetic anomalies (natural / non-archaeological ?)
-  magnetic disturbances (recent / non-archaeological)
-  magnetic disturbances (former field boundaries)
-  negative magnetic anomaly
-  cultivation ?
-  pipe (and associated magnetic disturbance)



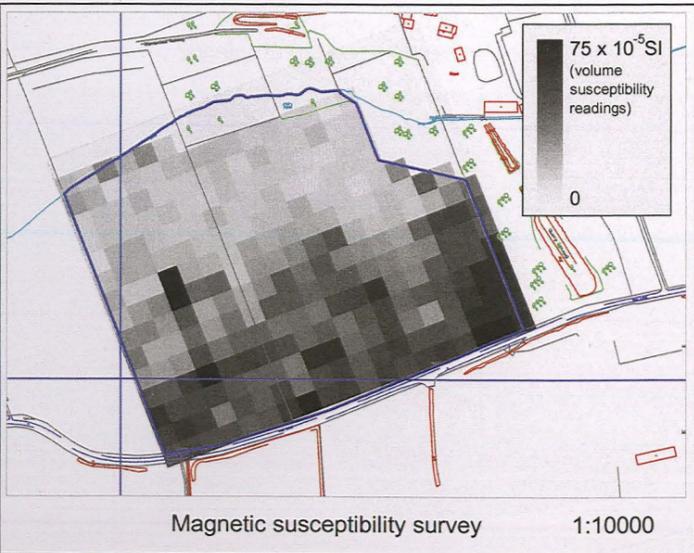
SOUTH WITHAM QUARRY,  
SOUTH WITHAM, LINCOLNSHIRE  
Geophysical Survey 2010  
Figure 5: Magnetometer survey  
(with interpretation)

0 1:1250 50m

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-  magnetic anomalies (archaeological ?)
-  magnetic anomalies (natural / non-archaeological ?)
-  magnetic disturbances (recent / non-archaeological)
-  magnetic disturbances (former field boundaries)
-  negative magnetic anomaly
-  cultivation ?
-  pipe (and associated magnetic disturbance)
-  former boundaries, structures and track traced from 1904 & 1983 maps



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SOUTH WITHAM QUARRY,  
SOUTH WITHAM, LINCOLNSHIRE  
Geophysical Survey 2010  
Figure 6: Summary of findings

0 1:2000 100m