

98/21

CITY OF  
◇ LINCOLN ARCHAEOLOGY ◇  
U N I T



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**Proposed Development  
East Road, Sleaford,  
Lincolnshire**

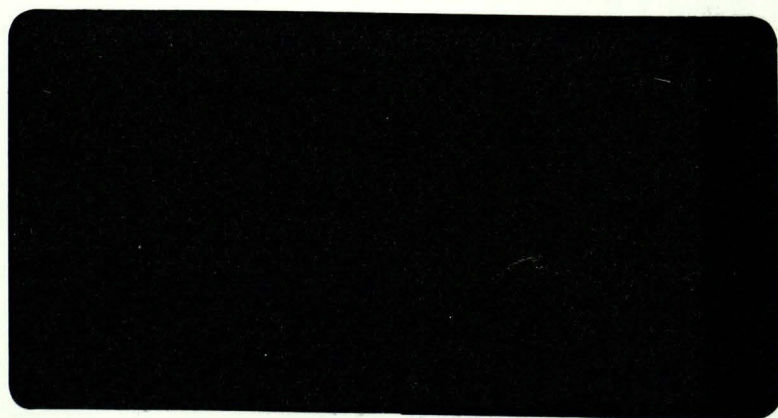
Geophysical Survey

CLAU ARCHAEOLOGICAL REPORT NO: 366

Lincolnshire County Council  
Archaeology Section

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**A**  
**Report to**  
***Universal Construction Services Ltd,***  
***Civil Engineering Contractors***

**December, 1998**

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**Prepared by**

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**Proposed Development**  
**East Road, Sleaford,**  
**Lincolnshire**

**Geophysical Survey**

CLAU ARCHAEOLOGICAL REPORT NO: 366

**PROPOSED DEVELOPMENT,  
EAST ROAD, SLEAFORD,  
LINCOLNSHIRE**

**GEOPHYSICAL SURVEY**

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Appendix 1: *Lincs Hist and Archaeol note* and Archive details

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# PROPOSED DEVELOPMENT, EAST ROAD, SLEAFORD, LINCOLNSHIRE

## GEOPHYSICAL SURVEY

### **INTRODUCTION**

During October 1998, the City of Lincoln Archaeology Unit (CLAU) was commissioned by Universal Construction Services Ltd (UCS), to carry out a geophysical survey at the above site location.

Site inspection by a CLAU Field Officer, prior to the commencement of the survey, revealed the site to contain an arable crop. Recent rainfall had saturated the site, with several areas of standing water present. A rapid walk of parts of the field revealed a modest quantity of surface finds. Although the majority was thought to be post-medieval in date, some Roman and medieval pottery and roof tile were also noted. Discussions with the geophysical survey contractor (GSB Propection), relating to visible surface finds, further corroborated the presence of Roman and Medieval finds.

**GSB**  
**PROSPECTION**

*Specialising in Shallow  
and  
Archaeological Prospection*

- *Consultancy* •
- *Project Design* •
- *Rapid Assessment* •
- *Detailed Survey* •
- *Integrated Research* •

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Kipping Lane, Thornton,  
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GSB\_Prospection@Compuserve

**GEOPHYSICAL SURVEY  
REPORT 98/126**

**EAST ROAD  
Sleaford**

Client:

**LINCOLN**  
 **archaeology**

For the site of Lincoln's Archaeology

**SITE SUMMARY SHEET**

**98 / 126 East Road, Sleaford**

NGR TF 078 467

**Location, topography and geology**

The area under investigation lies between the A153 road and the Sleaford-Lincoln railway, 1km northeast of Sleaford, Lincolnshire. The topography of the field is flat and it contained a short cereal crop at the time of the survey. The site lies at a junction between two soil types both seasonally affected by groundwater; Ruskington (512c), coarse and fine loamy sands and Curdridge (841a), Jurassic sand and clay (SSEW, 1983).

**Archaeology**

There is little information regarding the presence of archaeological remains within the development area itself. However, excavations and cropmark surveys indicate that there is a wealth of evidence for extensive prehistoric and Roman settlement in Sleaford and the immediate vicinity. A Roman road runs 100m to the east of the application area. Consequently, it is possible that archaeological remains are present within the proposed development.

**Aims of Survey**

Gradiometry was undertaken, with the aim of locating and determining the nature of any archaeological remains that might be present within the application area. This geophysical survey forms part of a wider evaluation being undertaken by the **City of Lincoln Archaeology Unit** in advance of proposed industrial development.

**Summary of Results \***

Except for scatters of modern ferrous debris in the topsoil the site was found to be magnetically quiet. Few responses thought to be of archaeological interest have been identified and they consist mainly of weak linear trends and a number of pit type anomalies. The most promising archaeological type responses appear to be a pair of linear anomalies that may indicate the course of a trackway. However, it should be noted that the magnetically weak linear trends may have been produced by subsurface ploughing disturbance and/or pedological variations. The pit anomalies were located amid a number of small scale ferrous anomalies that cast doubt on their archaeological interpretation.

\* It is essential that this summary is read in conjunction with the detailed results of the survey.

## SURVEY RESULTS

98 / 126 East Road, Sleaford

### 1. Survey Area

- 1.1 A total of 2.7ha of detailed gradiometer survey was carried out within the application area. For the purpose of display the survey area has been divided into two parts, A and B, though the results will be discussed as a whole in the text of the report. Figure 1 shows the position of the survey area.
- 1.2 The survey grid was set out and tied in to existing boundaries and buildings by *GSB Prospection* and detailed tie in information has been lodged with the client.

### 2. Display

- 2.1 Figures 2 and 3 are a summary greyscale image and interpretation of the survey results produced at a scale of 1:1250. Figures 4 to 9 are XY traces, dot density plots, and interpretation diagrams of the data from the individual survey areas at a scale of 1:625.
- 2.2 These display formats are discussed in the *Technical Information* section at the end of the text.

### 3. General Considerations - Complicating factors

- 3.1 Conditions for survey were reasonably good, the field being flat and free of major obstructions. Parts of the site were waterlogged and standing water was present in several locations. The resulting soft surface made walking difficult in some instances though this has not adversely affected the results.
- 3.2 The waterlogging of the site would adversely affect the preservation of magnetic enhancement within the archaeological deposits, if any are present at the site. However, it was hoped that core settlement areas, where magnetic enhancement is likely to have been at its strongest, would be detected by the gradiometer.

### 4. Results of Gradiometer Survey

- 4.1 The data set is framed by a band of magnetic disturbance along the boundaries of the survey area caused by adjacent fences, buildings, pipes, drains and other iron objects. In some places disturbed magnetic responses extend into the area from field boundaries and modern brick fragments were visible at the time of the survey. In addition there are numerous small scale responses produced by individual ferrous objects in the plough soil.



- 4.2 Despite this interference the data are magnetically quiet and a number of possible archaeological anomalies have been detected. The majority comprise weak linear trends, barely visible above background noise levels. Of these, two parallel linears aligned approximately east-west in the centre of the survey area are the most promising. These anomalies diverge in the west and may have been produced by ditches indicating the course of a trackway.
- 4.3 Other linear responses are shown on the interpretation diagram and may reflect a pattern of field divisions or parts of enclosures. It should be noted that the linear responses are very weak, ill defined and at the limit of the instruments' detection, therefore, the interpretation of such anomalies is tentative. They may have been produced by ploughing disturbance or natural soil variations. However, due to the dense concentration of prehistoric and Roman remains nearby, an archaeological interpretation cannot be entirely dismissed.
- 4.4 A number of pit type anomalies have also been detected, confined mainly to the southern part of the survey area. It is possible that these responses have been produced by features that are the remains of occupation activity. However, these anomalies coincide with a scatter of ferrous responses and, therefore, may also have been produced by modern debris.

## 5. Conclusions

- 5.1 The site was found to be magnetically quiet except for occasional ferrous responses from debris in the topsoil. A number of linear trends and pit type anomalies were recorded. They are mainly confined to the southern part of the development area and include two parallel linear responses that may indicate the course of a trackway.
- 5.2 However, despite the archaeological evidence from the vicinity the interpretation is cautious. The linear trends are magnetically weak, being barely discernible above background noise levels. It is possible that these responses are due to ploughing disturbance and/or pedological variations. In addition, the pit type anomalies were located amid a number of small scale ferrous anomalies and this casts doubt on their archaeological interpretation.

**Project Co-ordinator:** D Shiel  
**Project Assistants:** C Martinez & A Shields

**Date of Survey:** 9th November 1998  
**Date of Report:** 24th November 1998

## References

- SSEW 1983. *Soils of England and Wales. Sheet 4, Eastern England.* Soil Survey of England and Wales.

## TECHNICAL INFORMATION

The following is a description of the equipment and display formats used in **GSB Prospection (GSB)** 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 **GSB**.

*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.*

### 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. Readings are normally logged at 0.5m intervals along traverses 1.0m apart.

#### (b) Resistance Meter - Geoscan RM4 or RM15

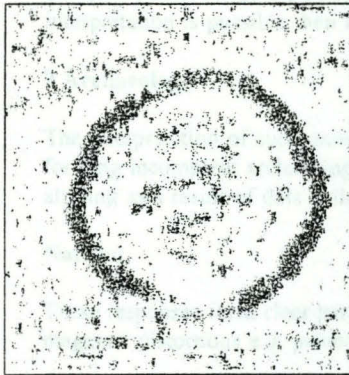
This measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity. The "Twin Probe" arrangement involves the pairing 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". In area survey readings are typically logged at 1.0m x 1.0m intervals.

#### (c) Magnetic Susceptibility

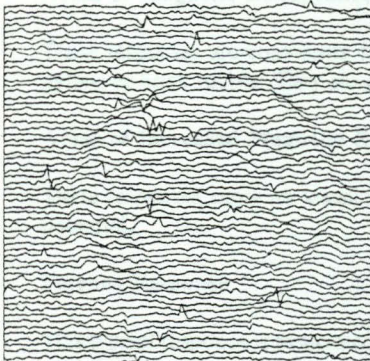
Variations in the magnetic susceptibility of subsoils and topsoils occur naturally, but greater enhanced susceptibility can also be a product of increased human/anthropogenic activity. This phenomenon of susceptibility enhancement can therefore be used to provide information about the "level of archaeological 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. Sampling intervals vary widely but are often at the 10m or 20m level.

## 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.

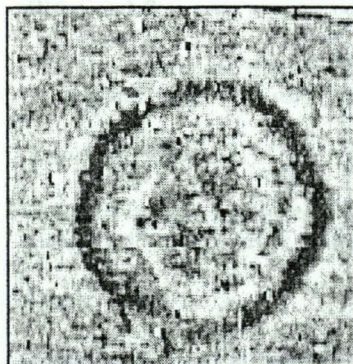


(a) **Dot-Density** In this display, minimum and maximum cut-off levels are chosen. Any value that is below the minimum will appear white, whilst any value above the maximum will be black. Any value that lies between these two cut-off levels will have a specified number of dots depending on the relative 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 individual anomalies. Results are produced on a flatbed plotter.

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.



### (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.

**Terms commonly used in the graphical interpretation of gradiometer data**

**Ditch / Pit**

This category is used only when other evidence is available that supports a clear archaeological interpretation e.g. cropmarks or excavation.

**Archaeology**

This term is used when the form, nature and pattern of the response is clearly archaeological but where no supporting evidence exists. These anomalies, whilst considered anthropogenic, could be of any age. If a more precise archaeological interpretation is possible then it will be indicated in the accompanying text.

**? Archaeology**

The interpretation of such anomalies is often tentative, with the anomalies exhibiting either weak signal strength or forming incomplete archaeological patterns. They may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.

**Natural**

These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions e.g. palaeochannels or magnetic gravels.

**? Natural**

These are anomalies that are likely to be natural in origin i.e geological or pedological.

**Areas of Magnetic Disturbance**

These responses are commonly found in places where modern ferrous or fired materials are present e.g. fencelines, pylons or brick rubble. They are presumed to be modern.

**Areas of Increased Magnetic Response**

These responses show no visual indications on the ground surface and are considered to have some archaeological potential.

**Ferrous Response**

This type of response is associated with ferrous material and may result from small items in the topsoil or larger buried objects such as pipes. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

**Ridge and Furrow**

These are regular and broad linear anomalies that are presumed to be the result of ancient cultivation. In some cases the response may be the result of modern activity.

**Ploughing Trend**

These are isolated or grouped linear responses. They are normally narrow and are presumed modern when aligned to current field boundaries or following present ploughing.

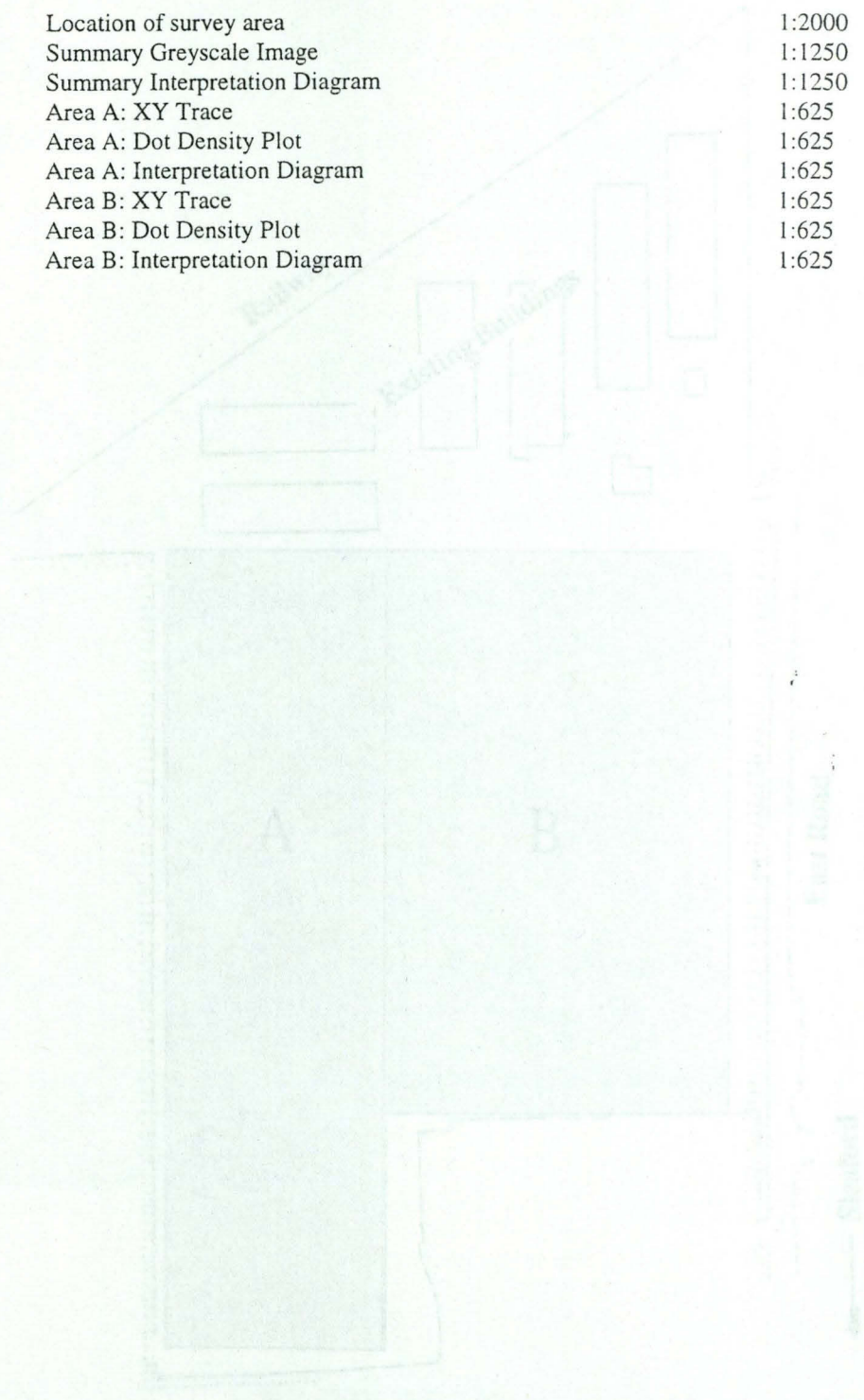
**Linear Trend**

This is usually a weak isolated linear anomaly of unknown cause or date.

Location of Survey Area

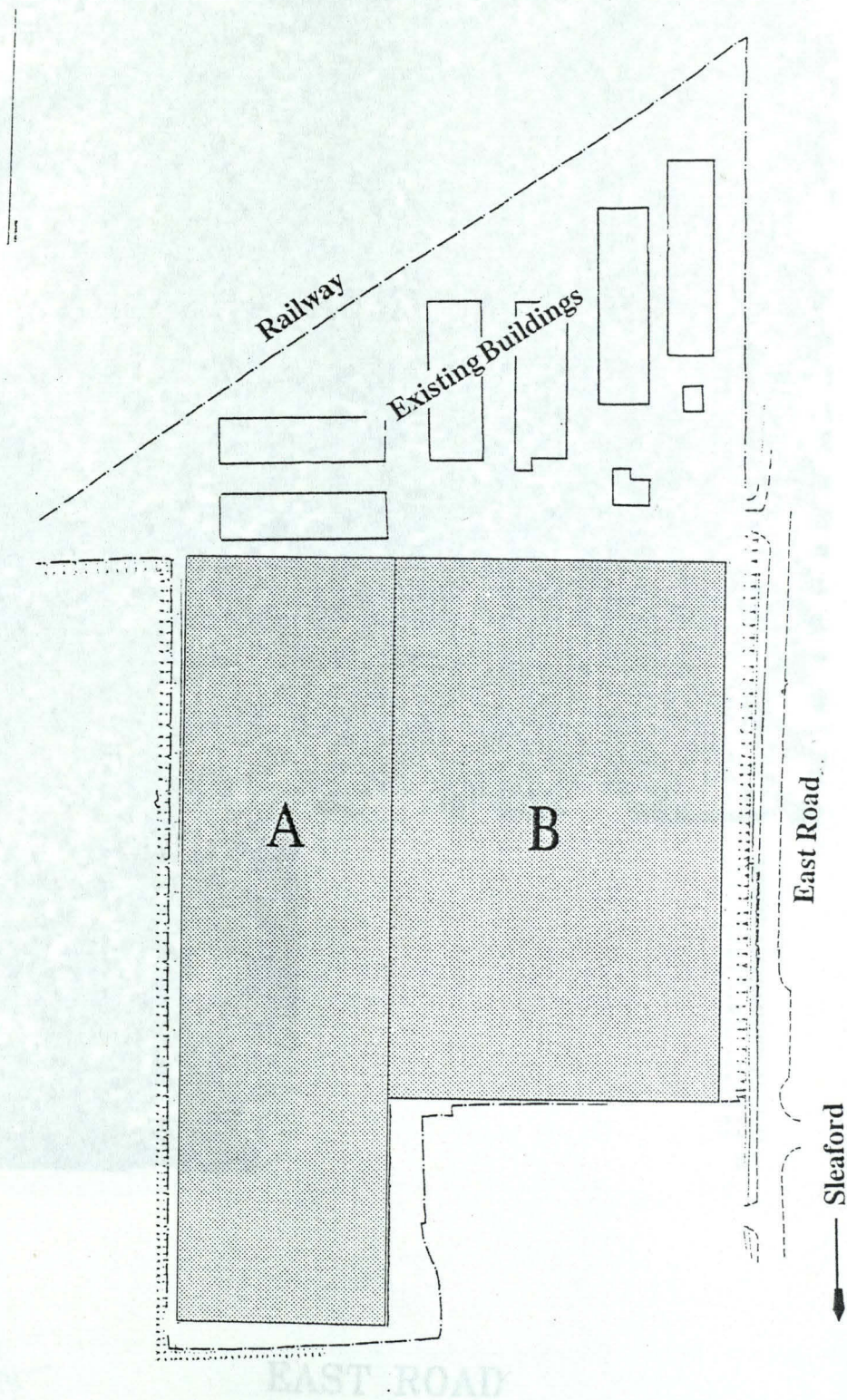
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# EAST ROAD

## Location of Survey Area



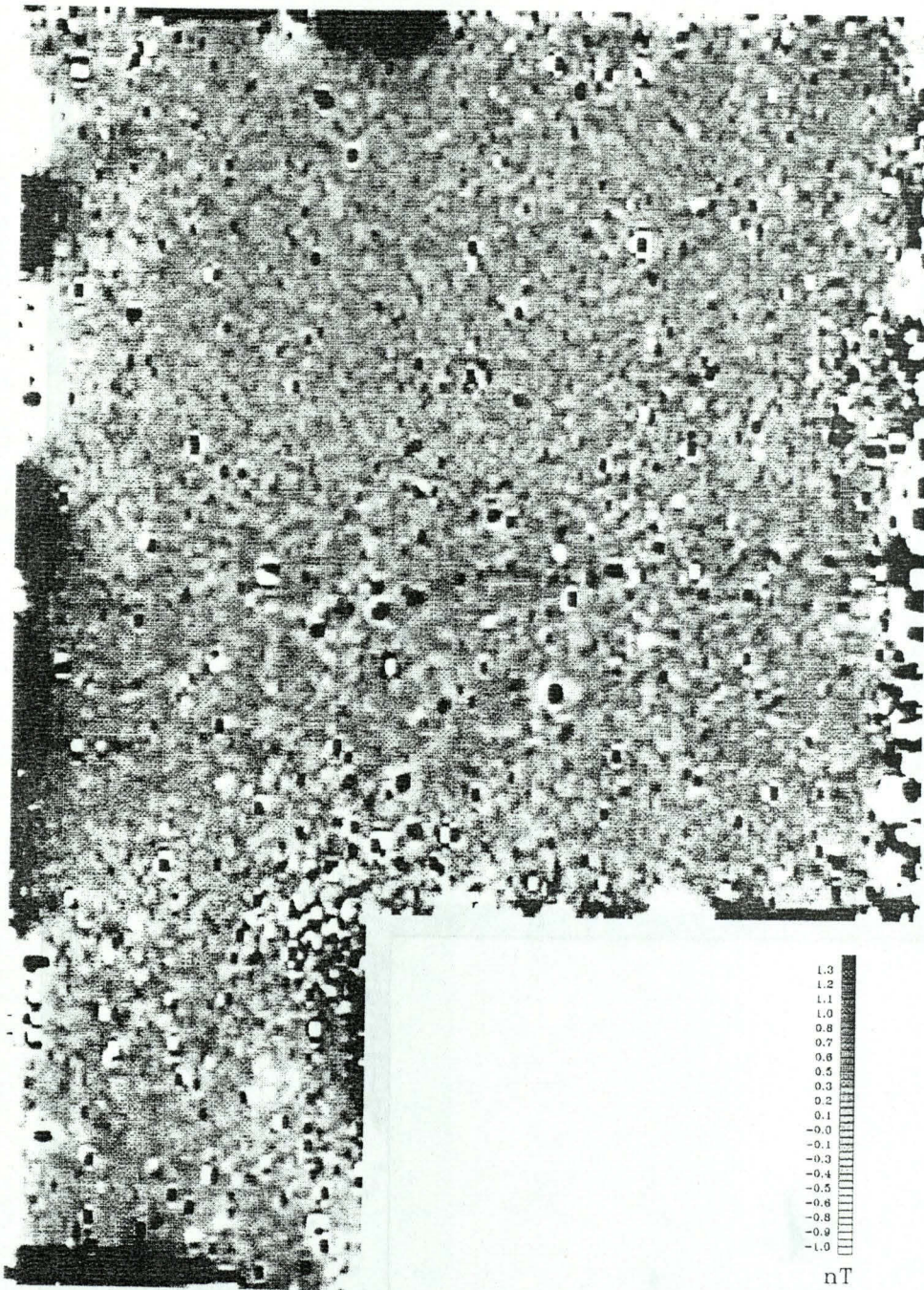
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of Lincoln Archaeology Unit



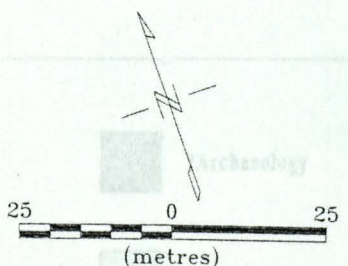
GSB Prospection 98/126

1:2000

Figure 1



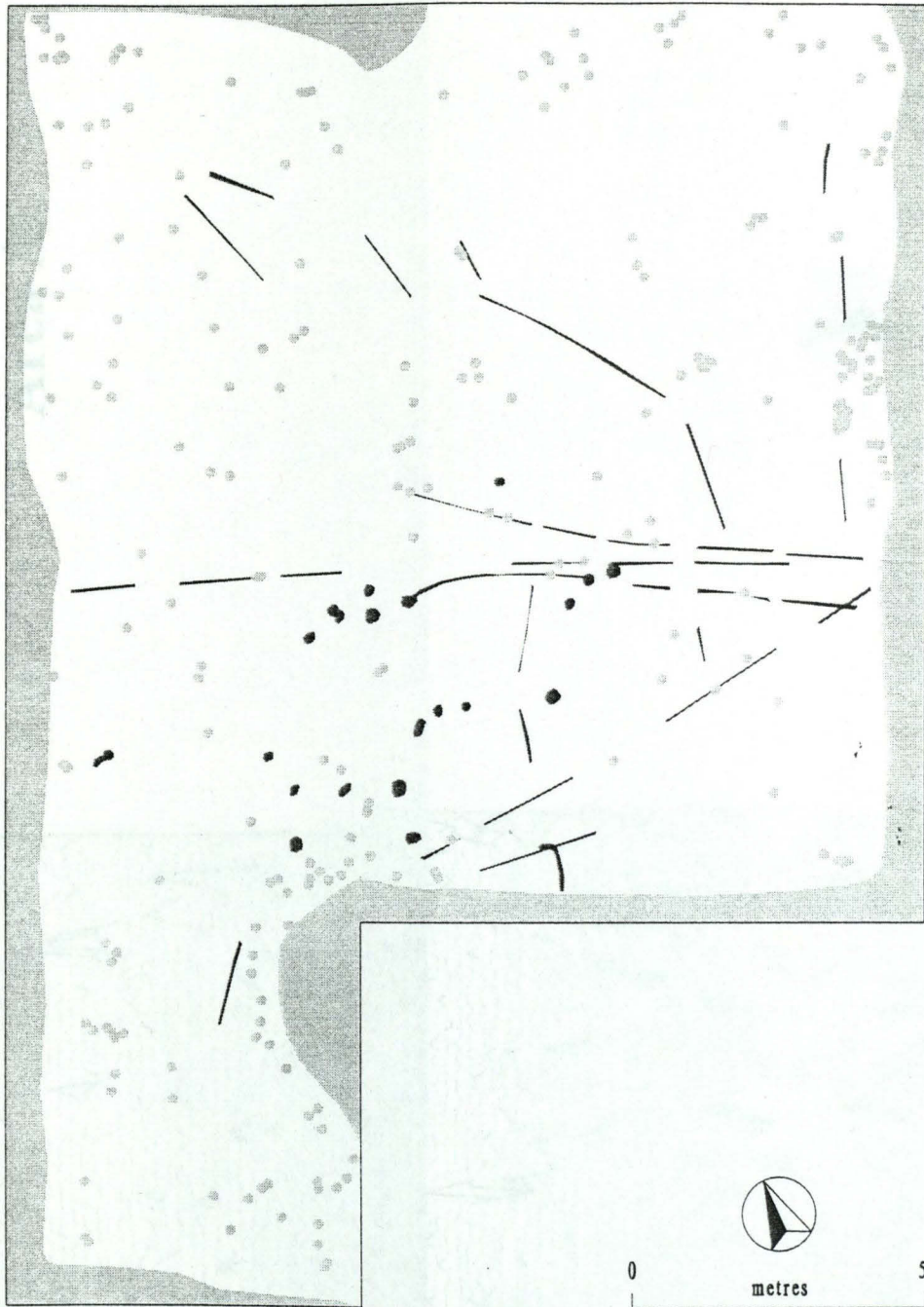
EAST ROAD





GSB Prospection 98/126

Figure 2

EAST ROAD



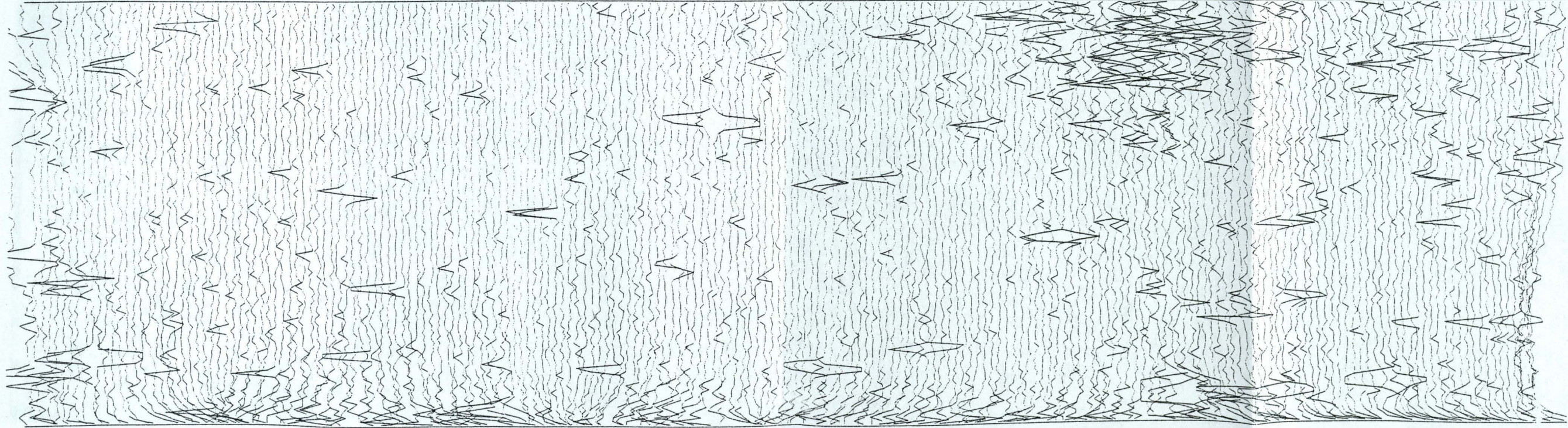
-  ?Archaeology
-  Ferrous

GSB PROSPECTION
PROJECT: 98/126 EAST ROAD
TITLE: Summary Interpretation

Figure 3



**EAST ROAD  
Area A**

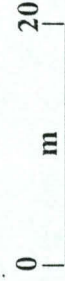
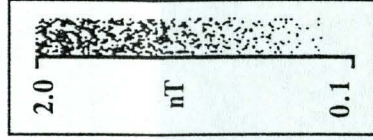
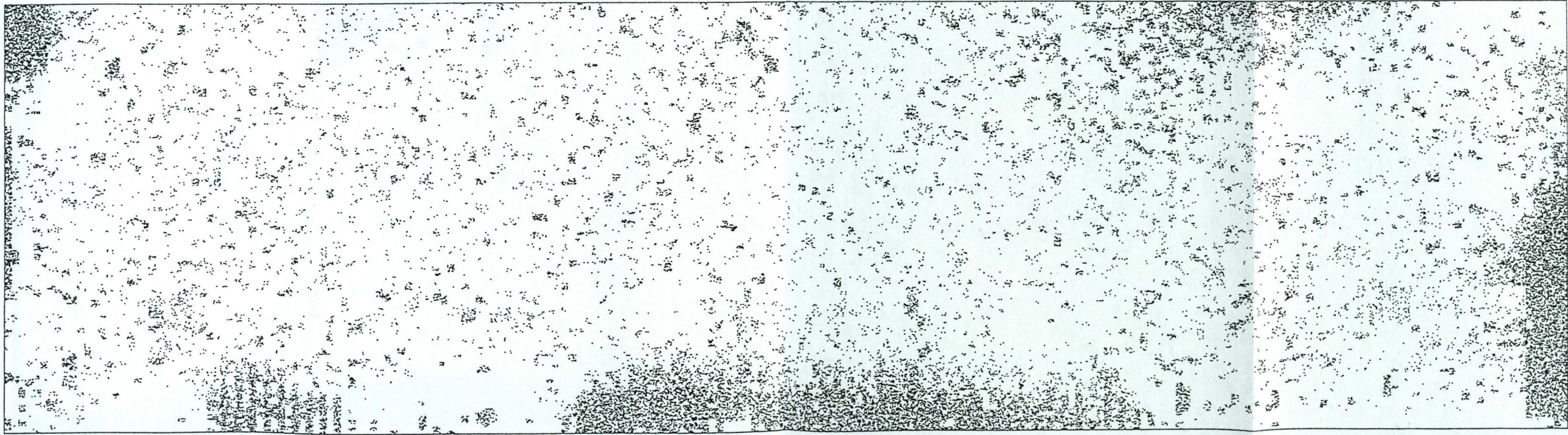


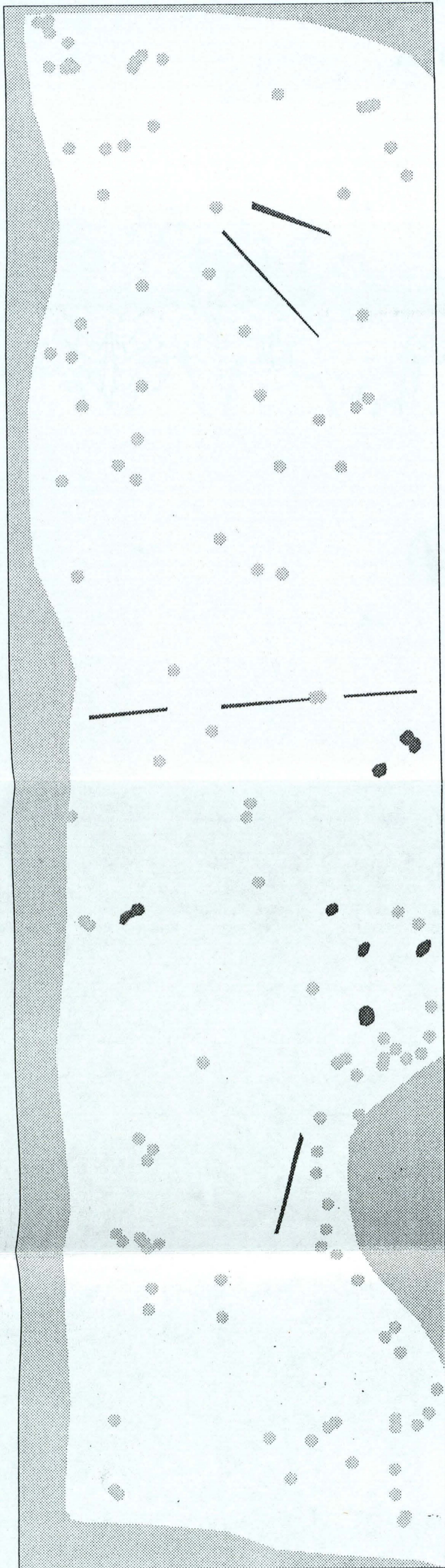
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**EAST ROAD  
Area A**





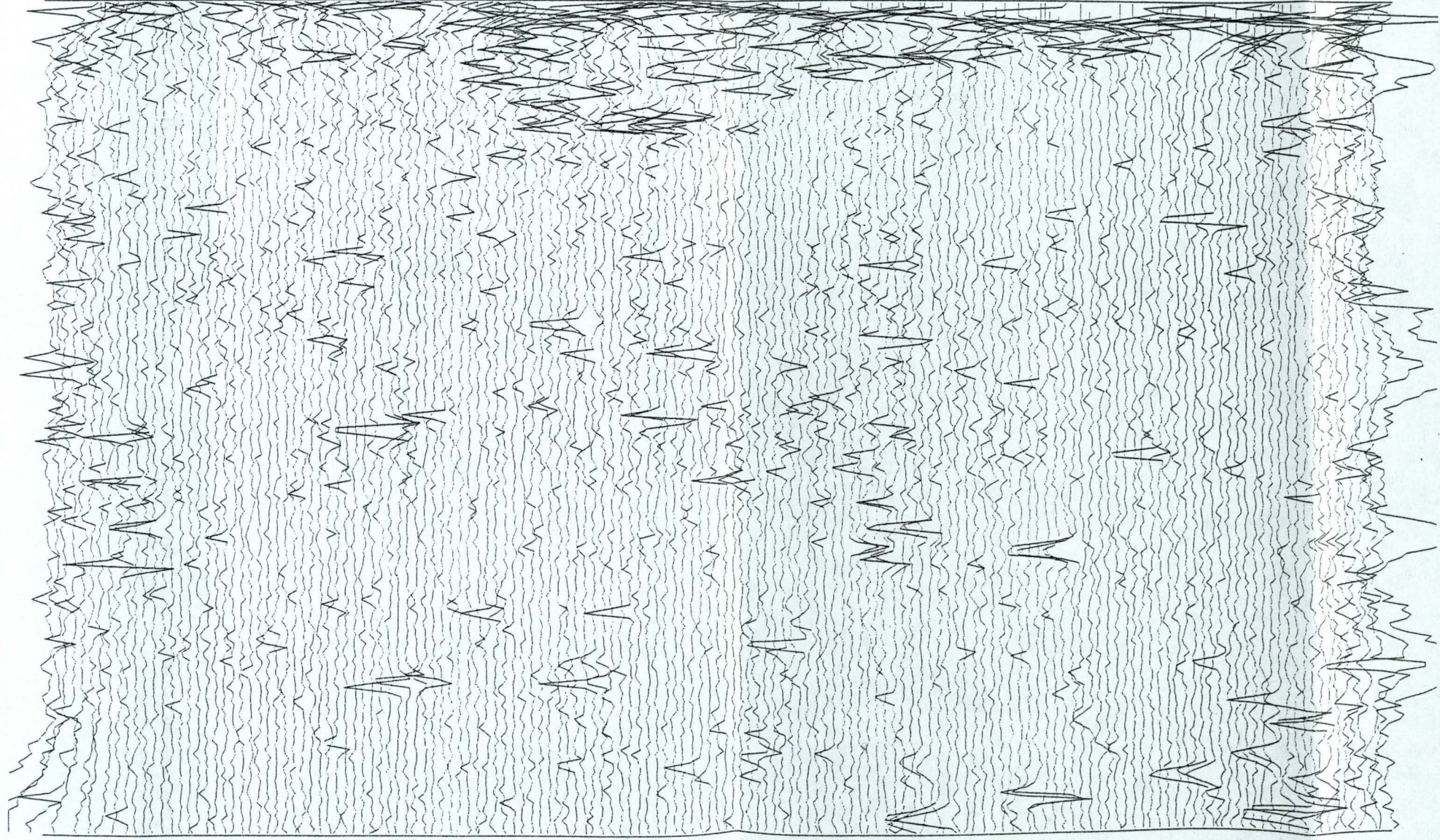
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Area A**

-  ?Archaeology
-  Ferrous

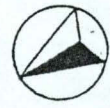


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**EAST ROAD  
Area B**

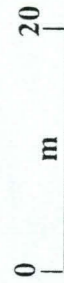
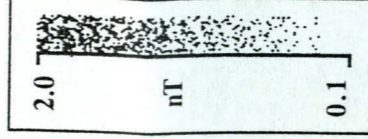
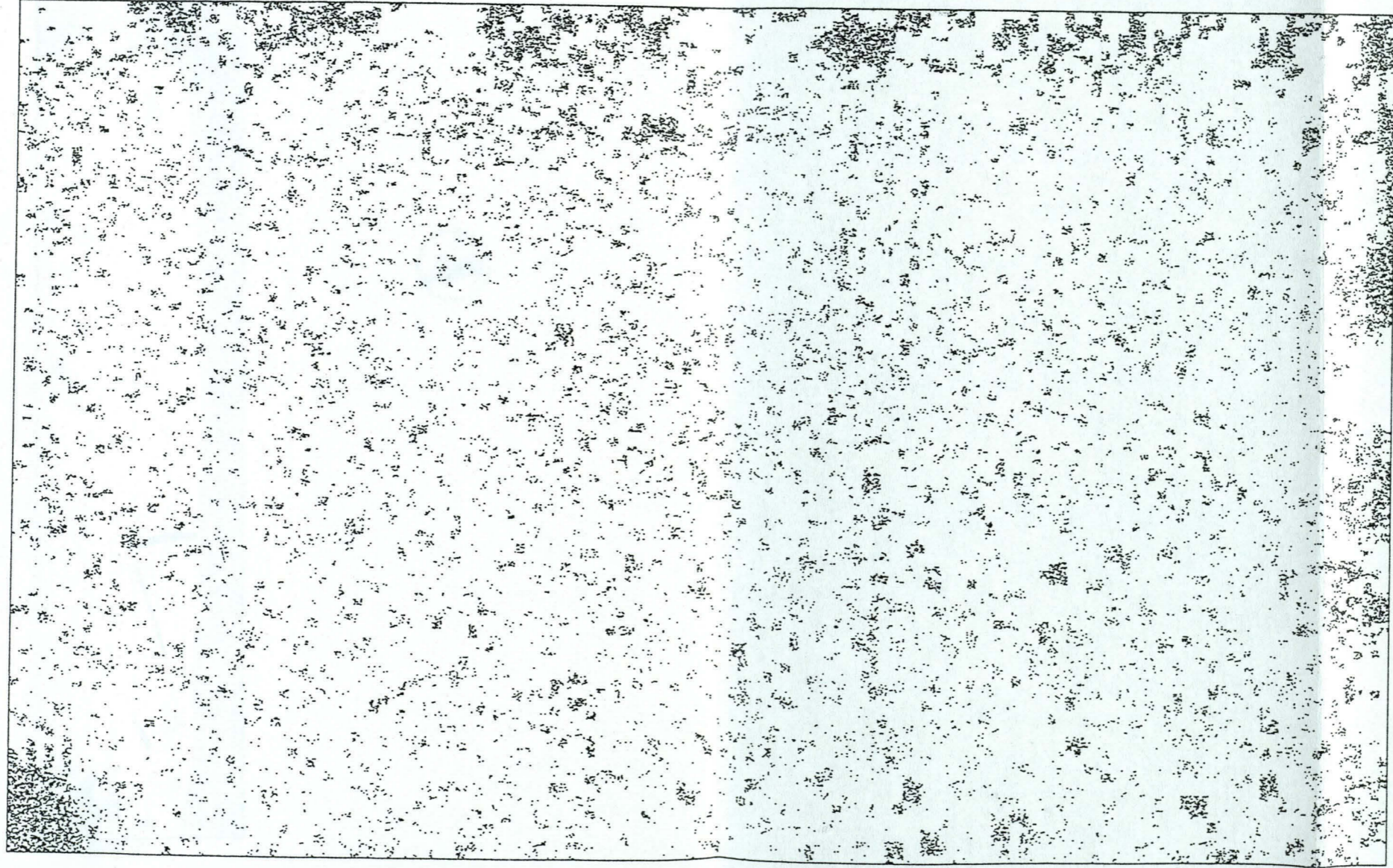


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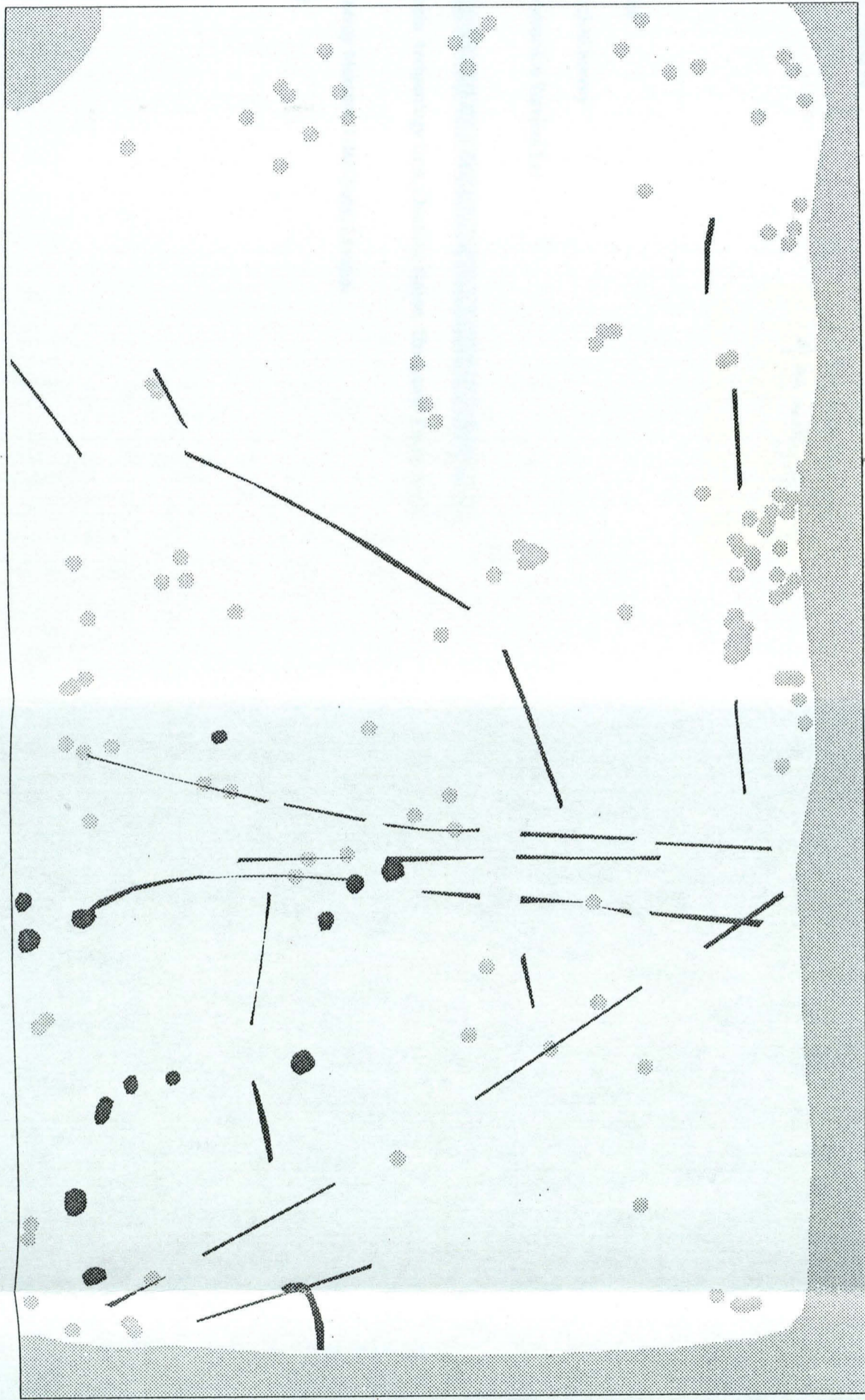


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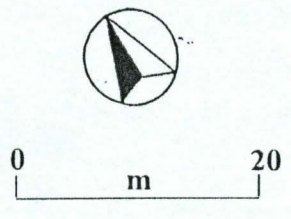
**EAST ROAD**  
**Area B**



# EAST ROAD Area B



- ?Archaeology
- Ferrous



**PROPOSED DEVELOPMENT,  
EAST ROAD, SLEAFORD,  
LINCOLNSHIRE**

**GEOPHYSICAL SURVEY**

*APPENDIX 1*

*LHA NOTE DETAILS*

CLAU CODE: ERS98

CLAU REPORT No.: 366

PLANNING APPLICATION NO.: N/57/596/98

FIELD OFFICER: Michael Jarvis

NGR: TF 507605 346600

CIVIL PARISH: Sleaford

SMR No.: -

DATE OF INTERVENTION: 09/11/98

TYPE OF INTERVENTION: Geophysical Survey

UNDERTAKEN FOR: Universal Construction Services Ltd

*ARCHIVE DETAILS*

PRESENT LOCATION: City of Lincoln Archaeology Unit, Charlotte House, The Lawn, Union Road, Lincoln, LN1 3BL.

FINAL LOCATION: The City and County Museum, Friars Lane, Lincoln.

MUSEUM ACCESSION No.: 264.98

ACCESSION DATE: -

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SMK copy

30 November 1998

Mr R A Walshaw  
Universal Construction Services Ltd  
Rand  
Market Rasen  
Lincoln  
LN8 5NJ

Dear Sir

**Land off East Road, Sleaford, Lincs**  
**Archaeological Geophysical Survey**  
**CLAU Project: ERS98 : Museum Acc No. 264.98**

Please find enclosed a copy of our Archaeological Report No. 366 describing the results of the Archaeological Geophysical Survey carried out at the above site.

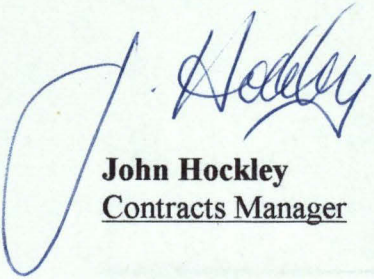
Copies of the report have been forwarded to the North Kesteven Heritage Officer, the local Planning Authority, and the Lincolnshire Sites & Monuments Record Office. A further copy will be lodged with the City & County Museum as part of the project archive in due course.

The report identifies a number of anomalies which might be of archaeological origin.

In accordance with our quotation and your letter of 15 October 1998 our invoice and a copy of the report have been sent directly to G W Padley Poultry Ltd ( a copy is enclosed for your information only).

We would take this opportunity to thank all parties concerned for their interest and co-operation. Should the site require further archaeological investigation we would be pleased to quote for same.

Yours faithfully  
for an on behalf of the  
City of Lincoln Archaeology Unit

  
**John Hockley**  
**Contracts Manager**