M3/8

# GSB
PROSPECTION

*Specialising in Shallow and Archaeological Prospection*

• *Consultancy* •

• *Project Design* •

• *Rapid Assessment* •

• *Detailed Survey* •

• *Integrated Research* •

**Cowburn Farm**
**Market Street, Thornton**
**Bradford, BD13 3HW**
**Tel: (01274) 835016**
**Fax: (01274) 830212**
**E-mail: gsbprospection@btconnect.com**
**Web: www.gsbprospection.com**

## GEOPHYSICAL SURVEY REPORT 2003/54

## SPRINGFIELD PARK
## Grantham

**Client:**

**CgMs**

EVENTS MI 4345 MAGNETOMETRY SCANNING SURVEY
MI 4346 MAGNETOMETRY SYSTEMATIC SURVEY

SOURCE MI 8913 NEGATIVE

**SITE SUMMARY SHEET**

**2003 / 54 Springfield Park, Grantham**

**NGR:** SK 910 344

**Location, topography and geology**

The site lies on a northwest facing slope, adjacent to Springfield Industrial Park on the southern edge of Grantham. The field is bound to the north and west by houses along Buckminster Gardens and Denton Avenue respectively. A small wood plantation lies to the south and Springfield Industrial Park forms the eastern boundary. The site was generally level, sloping gently up in the southern third of the field. At the time of survey the ground cover consisted of long pasture. The soils can be characterised as brown rendzinas of the Marcham association (343e). These comprise calcareous coarse and fine loams formed from a parent of Jurassic limestone (SSEW 1983).

**Archaeology**

No archaeology is known to exist within the survey area. However, Grantham dates back to the 6th century and a Saxon cemetery lies approximately 1km to the east. The Roman road, Ermine Street also lies to the east and two Roman coins were found *c.*500m to the north of the application area. A prehistoric double ditched round enclosure is visible as a cropmark *c.*500m to the south of the study site and quernstones and carbonised grains have been found in the area.

**Aims of Survey**

The aim of the survey was to determine whether detectable archaeological remains exist within the proposed expansion of Springfield Industrial Park and to define their nature and extent. This survey forms part of a wider investigation being carried out by **CgMs**.

**Summary of Results ***

Scanning suggested the background levels of response over the majority of the site were quite high. This could be due to either demolition rubbish from two buildings or magnetic material which has washed down the slope and accumulated on the flat area. The southern, sloped area was magnetically quieter.

Detailed survey revealed the sloped area to the south was magnetically quiet with several trends of archaeological potential. The other two areas may also include trends of archaeological significance, however, they may have been partially masked by the magnetic disturbance that covers the majority of both these areas.

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

# SURVEY RESULTS

## 2003 / 54 Springfield Park, Grantham

## 1. Survey Area

1.1 An area of *c.*3.5ha was investigated by scanning. Following this, 1ha of detailed survey was undertaken. The extent of scanning and the position of the detailed survey areas are indicated on Figure 1 at the scale of 1:2000.

1.2 The survey grid was set out by ***GSB Prospection*** using an EDM system and tied in to existing field boundaries. Details of the tie-in information have been lodged with the client.

## 2. Display

2.1 Figures 2 and 3 show summary greyscales and interpretations respectively of the data at a scale of 1:1500.

2.2 Figures 4-8 display the results as X-Y traces, dot density plots and accompanying interpretation diagrams all at a scale of 1:500.

2.3 The display formats and the interpretation categories used are discussed in the *Technical Information* section at the end of the text. Letters in parentheses in the text refer to specific anomalies noted on the interpretations.

## 3. General Considerations - Complicating factors

3.1 Conditions for survey were generally acceptable, the ground sloped gently up to the south in the southern third of the field. The field was under long pasture with a small number of cattle contained in the southern portion by an electric fence.

3.2 The background levels of response were found to be quite high (see Paragraph 4.2 below). Accordingly, small isolated ferrous-type responses which are apparent in the data are not highlighted on the interpretation diagram as they are presumed to reflect modern debris in the topsoil.

## 4. Results of Scanning

4.1 With gradiometers in scanning mode, the evaluation area was examined along traverses spaced at intervals of approximately 10m. During this operation, fluctuations in magnetic signal were observed on the instruments' display panel. Any significant variations were investigated more closely to determine their likely origin and those anomalies considered to have archaeological potential were marked with canes for detailed recorded survey.

4.2 Scanning found the background levels of noise to be high. An area in the north-western portion of the site was found to be significantly magnetically enhanced. However, it is thought to coincide with the site of an annual bonfire (Miles, *pers.comm.*) and, therefore, it was not subjected

to detailed survey. The sloping, southern, portion of the field was generally quieter. A block of detailed survey was placed in this area in order to investigate this phenomenon. Two other areas of detailed survey were situated to give a good spatial coverage across the site and to investigate the high levels of background response.

## 5. Results of Detailed Survey

**Area 1**

5.1 Two main areas of magnetic disturbance are visible in this area. (A) is well defined and, despite the ferrous nature of the anomaly, may be of interest. However, it is possible that this area has encroached onto the site of an annual bonfire (see Paragraph 4.2 above) and therefore it is considered to be modern in origin. (B) is more diffuse in nature and may be caused by a spread of bricks and rubble. An old stable block was supposed to exist in the north-eastern part of the field and it is likely that this anomaly is associated with the debris from its destruction.

5.2 Other trends within the data may have archaeological potential but they are weak and incoherent in nature and the strong response from the magnetic disturbance has hampered the interpretation therefore, an archaeological explanation is speculative.

**Area 2**

5.3 The data from this area also contain a substantial amount of magnetic disturbance. The scanning suggested that this is the background level of response across the majority of the site, however, a small portion of the data (C) in the west of this area is not affected by these responses. This would suggest this is the true background level of response and these areas of magnetic disturbance have been caused by imported material spread across the site; due to the ferrous nature of these anomalies it is possible that this has been a fairly recent occurrence.

5.4 Trends in the data fall into two groups, those which are quite strong and ferrous in nature and those which are very weak. It is possible that some of these trends have some archaeological significance, such as (D), (E) or (F) which form potential enclosures. However, the majority do not form coherent patterns and given the lack of corroborating evidence it is unlikely that they are of archaeological importance.

**Area 3**

5.5 This area was situated on the slope to cover an area which was thought to be magnetically quieter during the scanning, and this has proved to be the case. There is a small amount of magnetic disturbance (H) in the southern corner which corresponds to a bank and steep drop visible on the ground.

5.6 Trends in the data are weak; however, two of these (G) form a right angle, which is unlikely to occur naturally and therefore may be archaeologically significant. It is possible that these trends are visible because they have not been masked by the highly magnetic material present in the other areas. Other trends across the site may have been obscured by this magnetic debris which has either been spread across the northern half of the site or has washed down the slope to accumulate on the flat portion.

## 6. Conclusions

6.1 Scanning suggested that the majority of the site was affected by a large quantity of magnetic disturbance. Two areas where buildings had been demolished and an area regularly used for a bonfire were also noted to be magnetically enhanced. These areas were avoided for detailed investigation as the strong modern magnetic responses would mask any weaker archaeological anomalies in the vicinity.

6.2 Detailed survey confirmed that a large portion of the site was covered by a quantity of magnetic disturbance. This may be due in part to the spreading of demolition rubble from two old stable blocks, one in the north-eastern and one in the south-eastern corner of the field. It is also apparent that the southern part of the field is magnetically quieter than the northern portion, therefore, it is possible that the magnetic debris has washed down the slope from a source outside the field and has accumulated at the base of the slope on the flat area.

6.3 Trends are visible in the data and it is possible that more have been obscured by the strong responses caused by the magnetic disturbance. Some of these trends, particularly a right angle in Area 3, may have an archaeological origin, however, the majority are weak and incoherent and therefore such an interpretation is tentative.

**Project Co-ordinator:** F Robertson
**Project Assistants:** B Urmston and E Wood

**Date of Survey:** 14th - 15th July 2003
**Date of Report:** 18th July 2003

**References:**

CgMs 2000 *Land at Springfield Park, Grantham*. Archaeological Desk Based Assessment

SSEW 1983. *Soils of England and Wales. Sheet 1, Northeast England.* Soil Survey of England and Wales.

# TECHNICAL INFORMATION

The following is a description of the equipment and display formats used in **GSB Prospection Ltd (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 / FM256 and Bartington *Grad*601-2

Both the Geoscan and Bartington instruments comprise of two fluxgate magnetometers mounted vertically apart at a distance of 500mm and 1000mm, respectively. The gradiometers are 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 logged at 0.25 or 0.5m intervals along traverses 1.0m apart, unless stated otherwise in the report. Having two gradiometer units mounted laterally with a separation of 1.0m, the Bartington instrument can collect two lines of data per traverse. The *Grad*601-2 has marginally greater sensitivity afforded by the increased fluxgate separation, unfortunately this also increases the instrument's susceptibility to external sources of interference.

### (b) Resistance Meter - Geoscan RM15

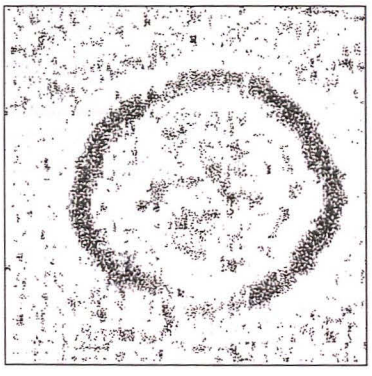
This measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity.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

### (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. Sampling intervals vary widely but are often at the 10m or 20m level. The instrument employed for measuring this phenomenon is either a field coil or a laboratory based susceptibility bridge. The field coil measures the susceptibility of a volume of soil. The laboratory procedure determines the susceptibility of a specific mass of soil. For the latter 50g soil samples are collected in the field. These are then air-dried, ground down and sieved to exclude the coarse earth (>2mm) fraction. Readings are made using an AC-coil and susceptibility bridge, with results being expressed either as SI/kg x $10^{-8}$ or $m^3/kg$.

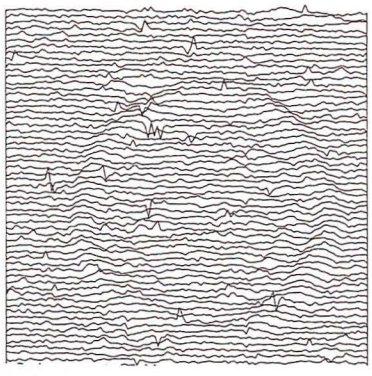
## Display Options

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.



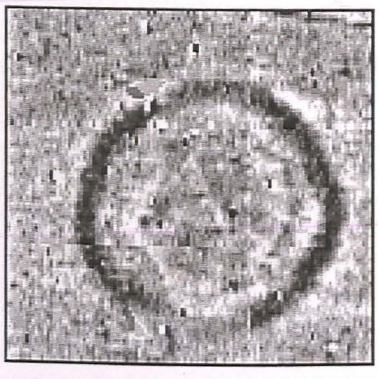
**(a) Dot Density**

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. Values that lie between these two cut-off levels are depicted with a specified number of dots depending on their relative position between the two levels. Assessing a lower than normal reading involves the use of an inverse plot that 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. However, this display is favoured for producing plans of sites, where positioning of the anomalies and features is important.



**(b) XY 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. The 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. The display may also 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) Greyscale**

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, greyscales 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 or very probably 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.

**Areas of Increased Magnetic Response**
These responses show no visual indications on the ground surface and are considered to have some archaeological potential.

**Industrial**
Strong magnetic anomalies, that due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.

**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.

**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.

**Trend**
This is usually an ill-defined, weak, isolated or obscured linear anomaly of unknown cause or date.

**Areas of Magnetic Disturbance**
These responses are commonly found in places where modern ferrous or fired materials are present e.g. brick rubble. They are presumed to be modern.

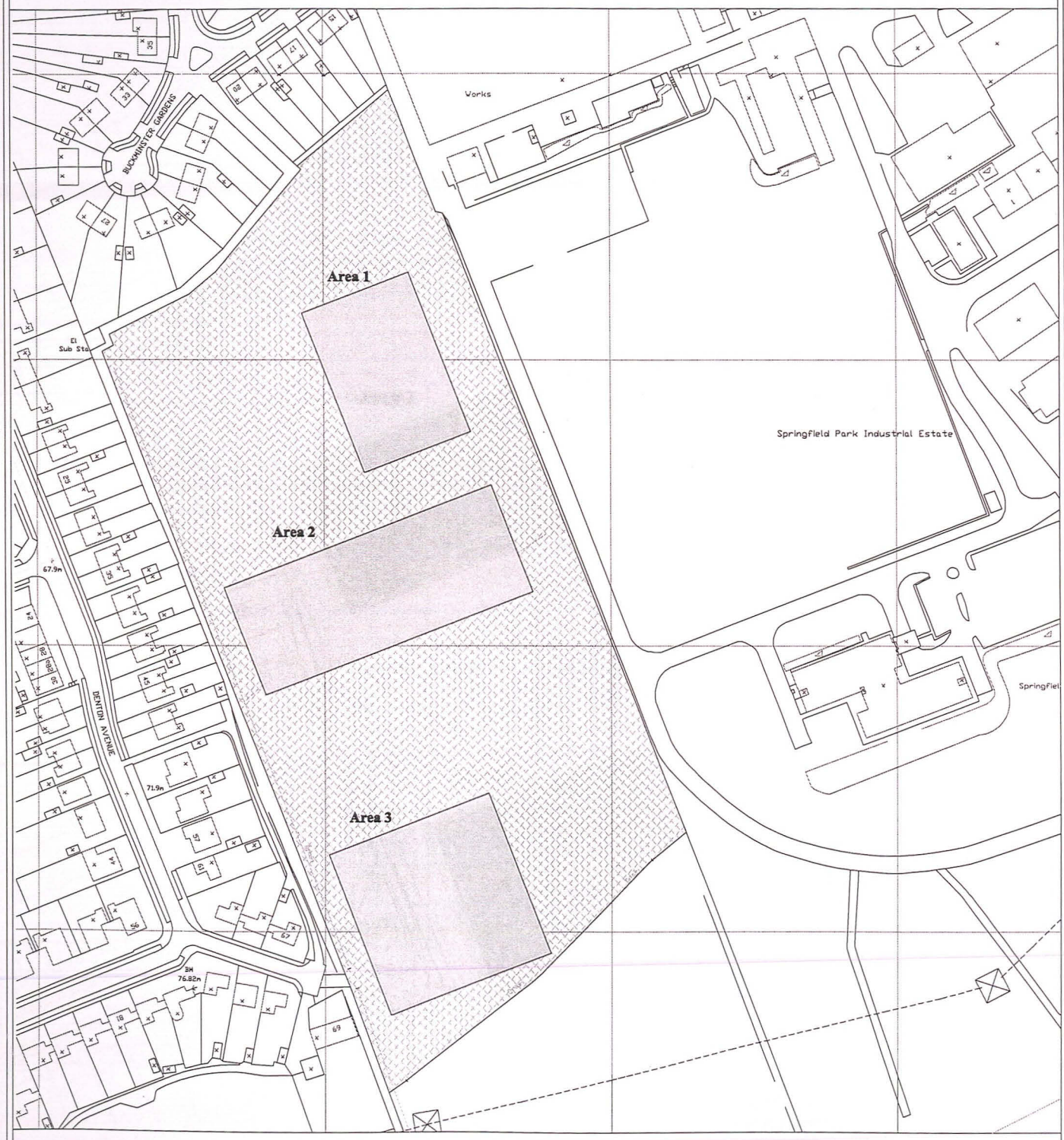
**Ferrous Response**
This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes or above ground features such as fencelines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks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

**NB** This is by no means an exhaustive list and other categories may be used as necesssary.

## List of Figures

| GSB PROSPECTION |
| --- |
| PROJECT: 2003/54 Springfield Park |
| TITLE: Location of Survey Areas |
| Reproduced from the Ordnance Survey Map with the permission of the Controller of HMSO © Crown Copyright (AL100018665) |

0 metres 80




Area of Scanning

Areas of Detailed Survey

Figure 1

| GSB PROSPECTION |
| --- |
| PROJECT: 2003/54 Springfield Park |
| TITLE: Summary Greyscales |
| Reproduced from the Ordnance Survey Map with the permission of the Controller of HMSO © Crown Copyright (AL100018665) |

0 metres 60


Area 1 8 nT -5

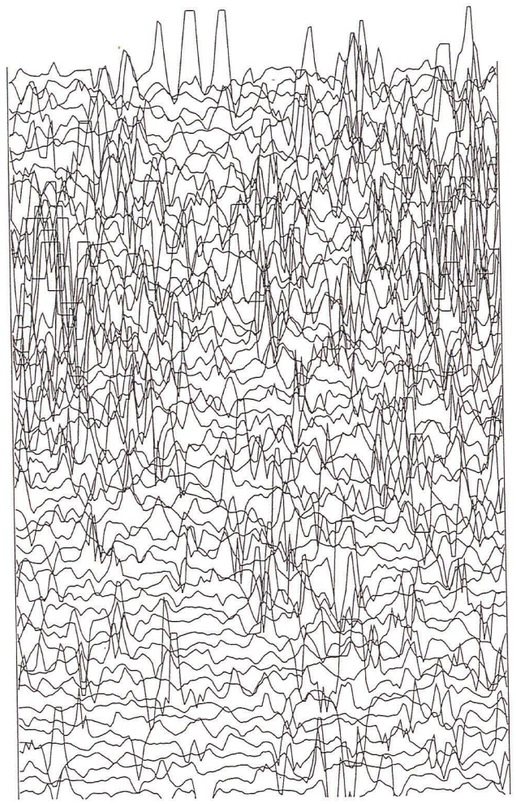
Areas 2 & 3 3 nT -2

Figure 2

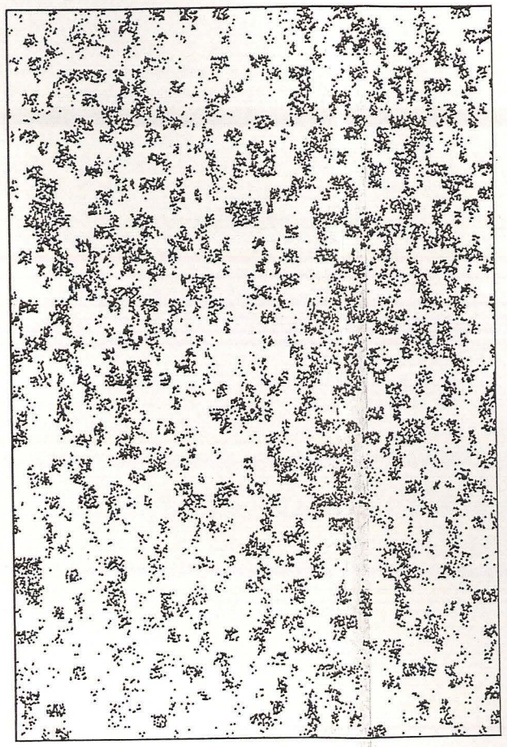

GSB PROSPECTION
PROJECT: 2003/54 Springfield Park
TITLE: Summary Interpretation
Reproduced from the Ordnance Survey Map with the permission of the Controller of HMSO © Crown Copyright (AL100018665)
0
metres
60
Area 1
Area 2
Area 3
A
B
C
D
E
F
G
H
El Sub Sta
DENTON AVENUE
67.9m
71.9m
BM 76.82m
Trend
Area of Magnetic Disturbance
Ferrous

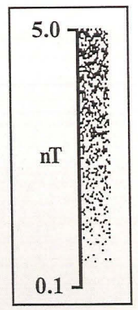
Figure 3

# SPRINGFIELD PARK
## Area 1



25 nT





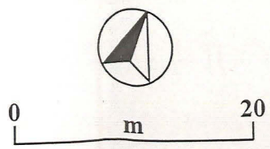
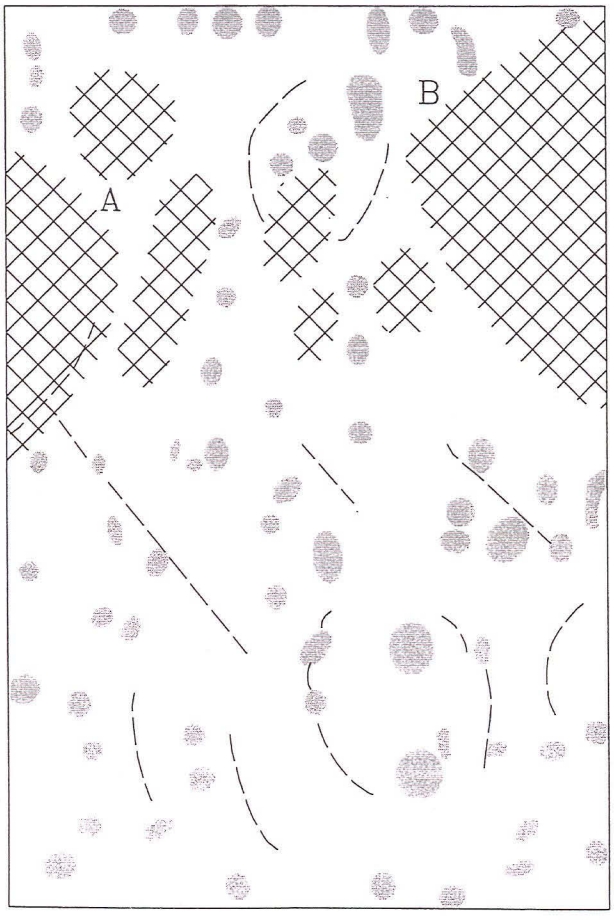




Figure 4

# SPRINGFIELD PARK
## Area1




Trend

Area of Magnetic Disturbance

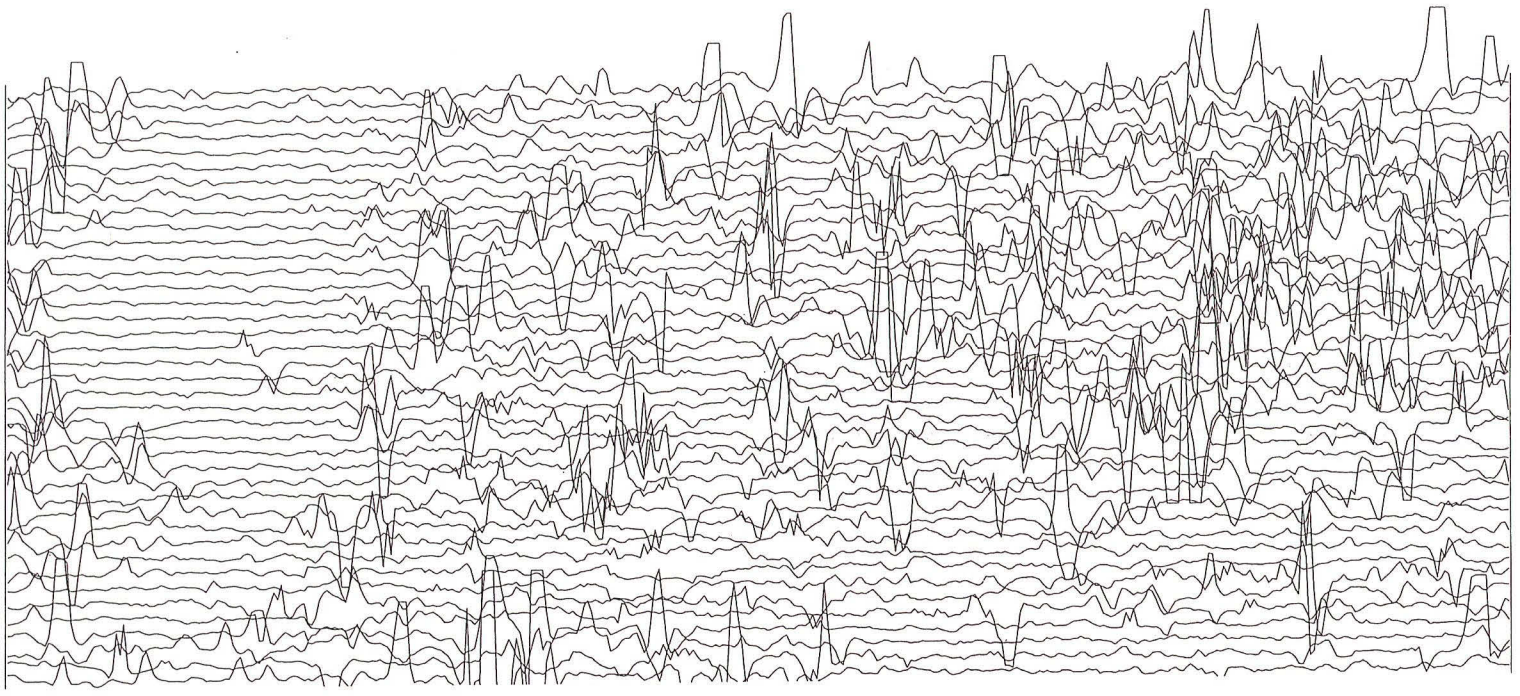
Ferrous

0 m 20

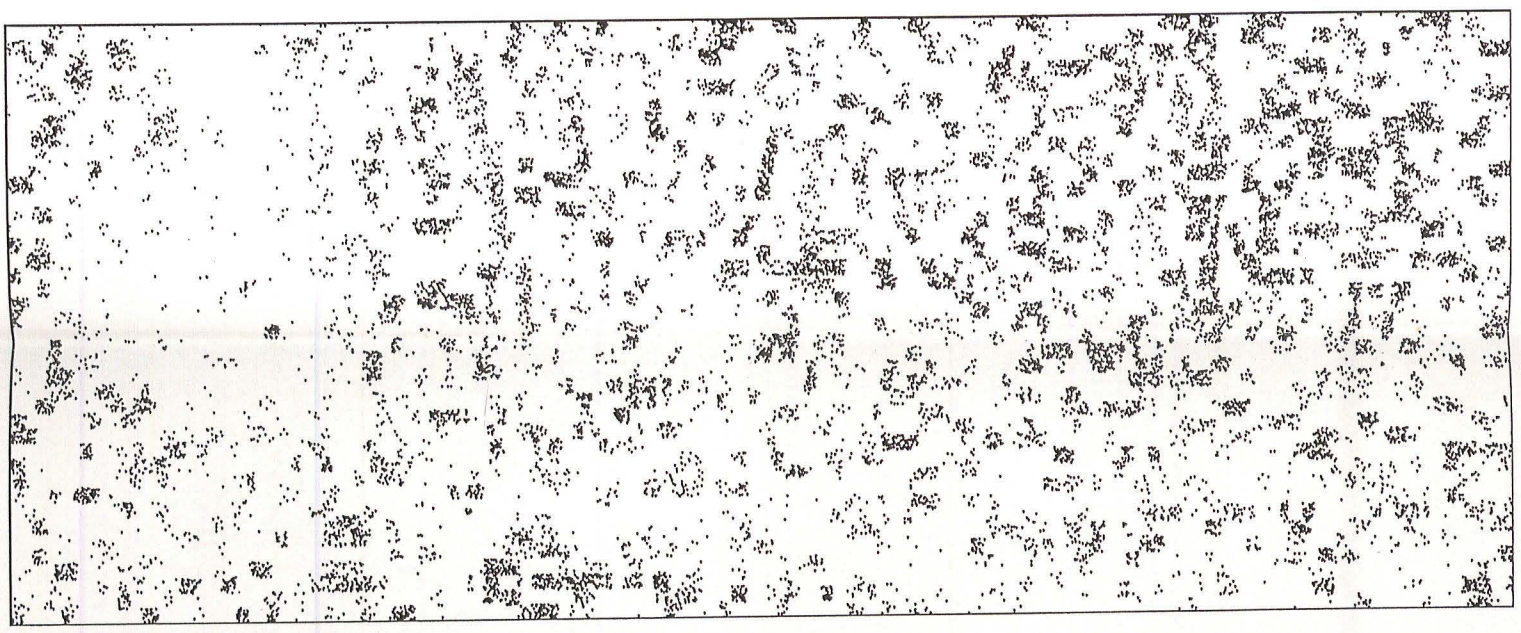
GSB Prospection 2003/54

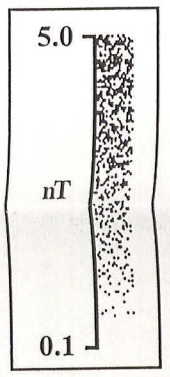
**Figure 5**

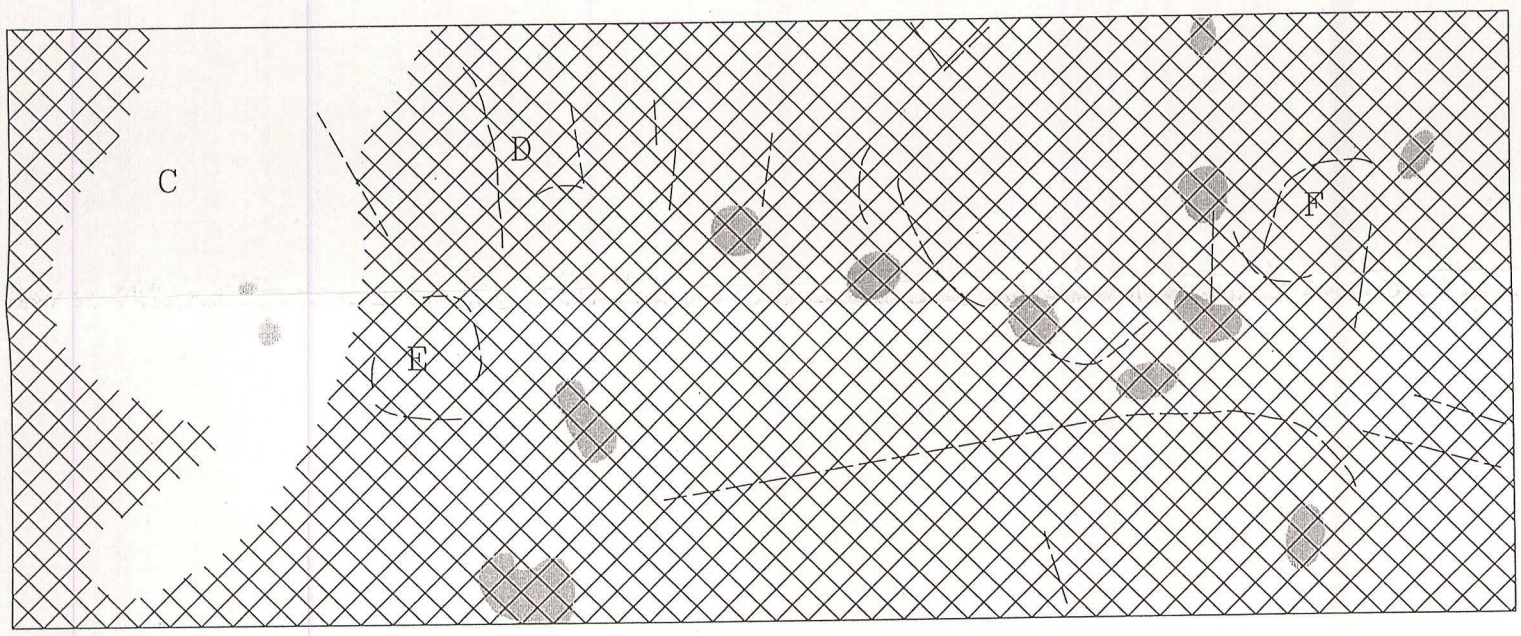
# SPRINGFIELD PARKS
## Area 2



25 nT






Trend

Area of Magnetic Disturbance

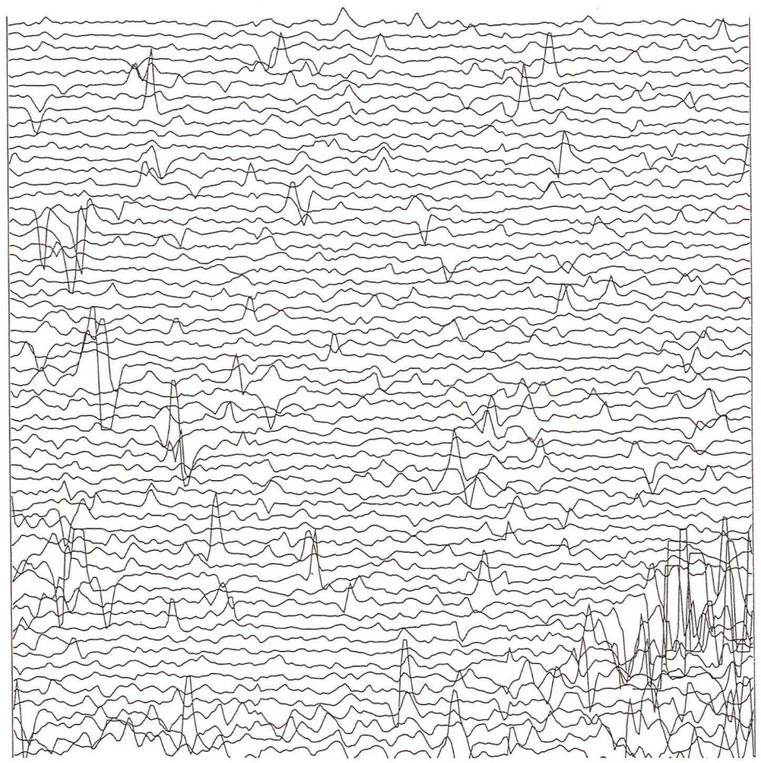
Ferrous

0 m 20

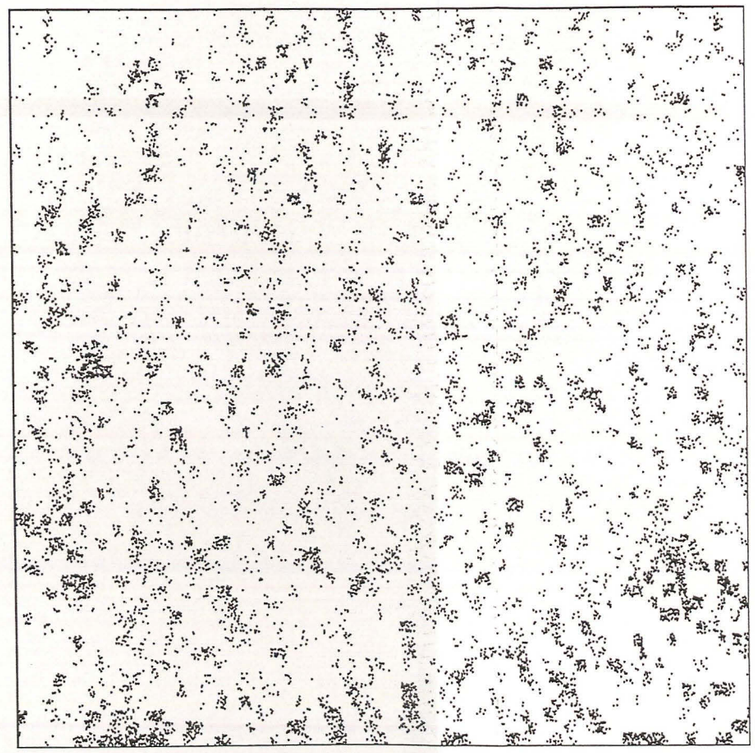
GSB Prospection 2003/54

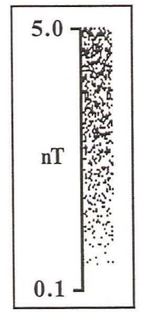
**Figure 6**

# SPRINGFIELD PARK
## Area 3



25 nT





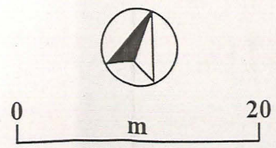
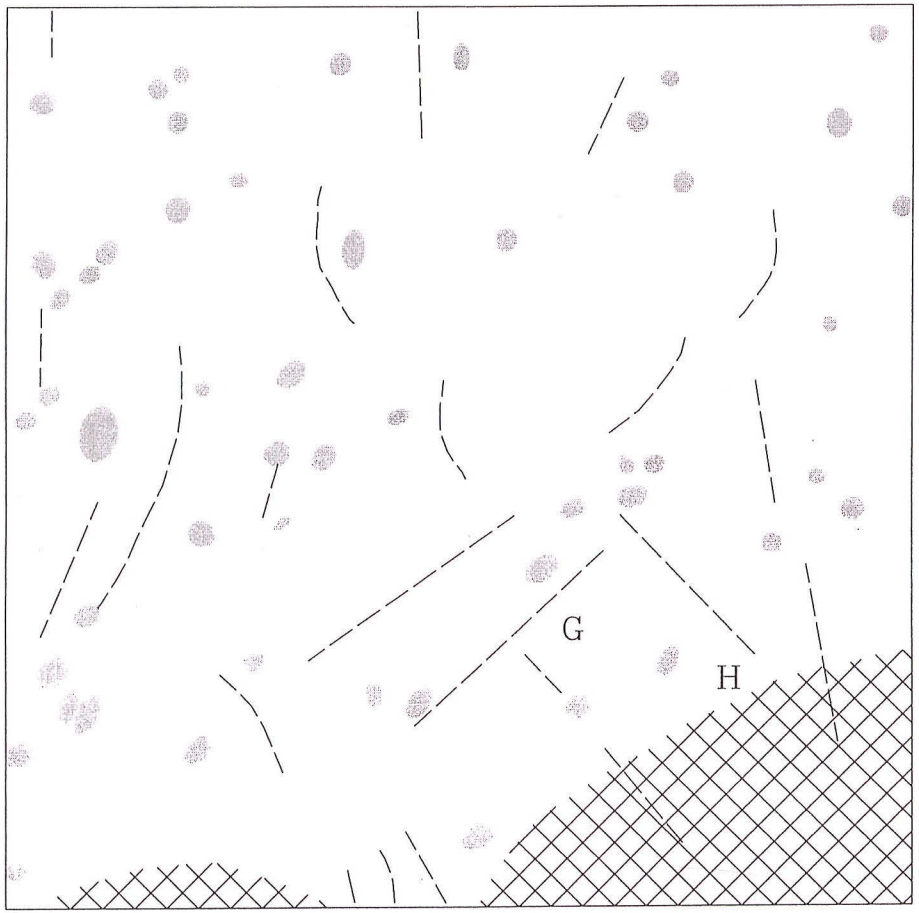






Figure 7

# SPRINGFIELD PARK
## Area 3




Trend

Area of Magnetic Disturbance

Ferrous

0 m 20

GSB Prospection 2003/54

**Figure 8**

EL SMR

SMR offices




Planning & Development - Archaeology & Historic Buildings

CgMs
CONSULTING

7th Floor
Newspaper House
8-16 Great New Street
London EC4A 3BN

Tel: 020 7583 6767
Fax: 020 7583 2231

Web Site: www.cgms.co.uk

CgMs
CONSULTING

7th Floor
Newspaper House
8-16 Great New Street
London EC4A 3BN

Tel: 020 7583 6767
Fax: 020 7583 2231

Also at:
Burlington House
Lypiatt Road
Cheltenham
GL50 2SY
Tel: 01242 259290
Fax: 01242 259299

Wykes Farm
Allens Hill
Bozeat
Northamptonshire
NN29 7LW
Tel: 01933 666391
Fax: 01933 664861

Web Site: www.cgms.co.uk

Our Ref: PRC/KB/2072

Jenny Young
Community Archaeologist
Heritage Lincolnshire
The Old School
Cameron Street
Heckington
Lincolnshire NG34 9RW

24th July 2003

Dear Jenny

**REF: SO2/1169/35**
**MIXED RESIDENTIAL AND COMMERCIAL DEVELOPMENT SPRINGFIELD BUSINESS PARK, SPRINGFIELD, GRANTHAM**

GSP Prospection Rept 2003/54

Further to my letter of 3rd June and your subsequent email, I am pleased to enclose a report prepared by Geophysical Surveys of Bradford (GSB) and required by the local planning authority prior to issuing planning permission.

You will see that the geophysical survey located no certain archaeological features or even '?' archaeological features; rather 'trends', which are 'ill-defined, weak… or obscure linear anomalies of unknown cause' have been located.

In the context of the Brief for this project (paragraph 5.1.4) no significant archaeological remains have been located within the application site and these 'trends' would, at best, be considered of local interest.

In these circumstances, I would be grateful if you would now confirm to South Kesteven Planning Services that the required geophysical survey has been satisfactorily completed, that nothing of significance was located and that, accordingly, further archaeological mitigation either by in-situ preservation or archaeological excavation is not required.

I would be grateful for a copy of your response to the planners and in the meantime, via a copy of this letter will forward copies of the geophysical report to the cc's listed below.

Jenny Young
Grantham
24 July 2003

Please do not hesitate to contact me if I can be of further assistance.

Yours sincerely

**Paul Chadwick BA FSA MIFA**
**Director**
e-mail: paul.chadwick@cgms.co.uk

**Direct Dial: 020 7832 1478**
**Direct Fax: 020 7832 1498**

Enc 2 copies (1 for SMR)

cc: Lincolnshire SMR
South Kesteven District Council (Planning Services)
H Casely, Esq (Kimberley)