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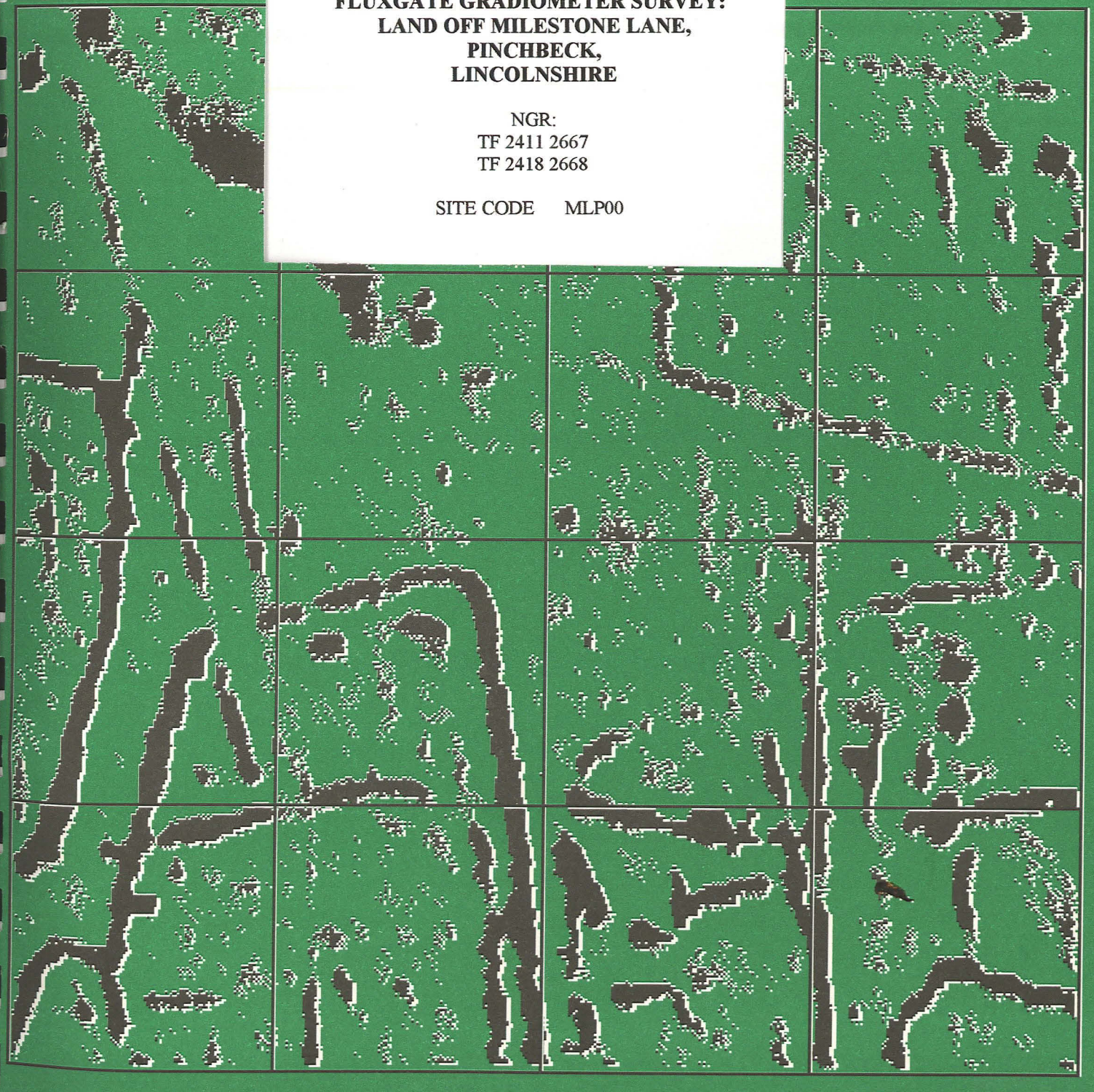
PRE-CONSTRUCT GEOPHYSICS

FLUXGATE GRADIOMETER SURVEY: LAND OFF MILESTONE LANE, PINCHBECK, LINCOLNSHIRE

NGR:
TF 2411 2667
TF 2418 2668

SITE CODE MLP00



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Report prepared for R Longstaff & Co.
by Jim Rylatt & David Bunn

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Contents

Illustrations

Summary

- *A fluxgate gradiometer survey was undertaken on 0.45 hectares of land off Milestone Lane, Pinchbeck, Spalding, Lincolnshire*
- *The survey identified significant levels of magnetic variation across the site, and this variability can be resolved into a series of magnetic anomalies*
- *Some of the anomalies are associated with modern agricultural activities, such as ploughing and drainage*
- *Other anomalies possibly reflect sub-surface archaeological features, though these have proved difficult to resolve due to their poor magnetic signature and the masking effects of later disturbance, coupled with the relative smallness of the areas that were surveyed*
- *Small discrete anomalies distributed across the site suggest the presence of ferrous and ceramic debris in the topsoil*

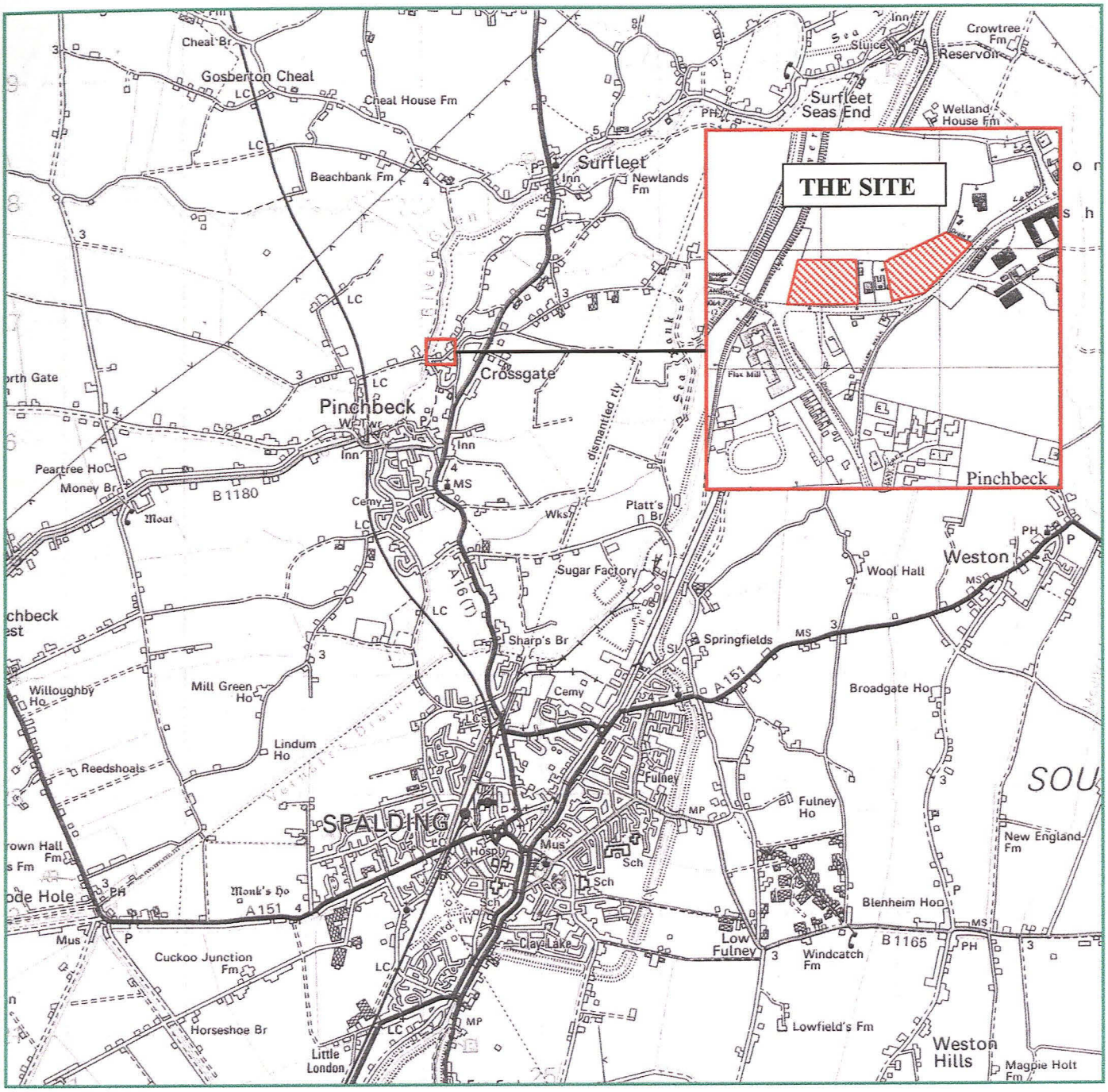

Fig.1: Location of site. **Scale 1:50000 (Inset 1:5000)**

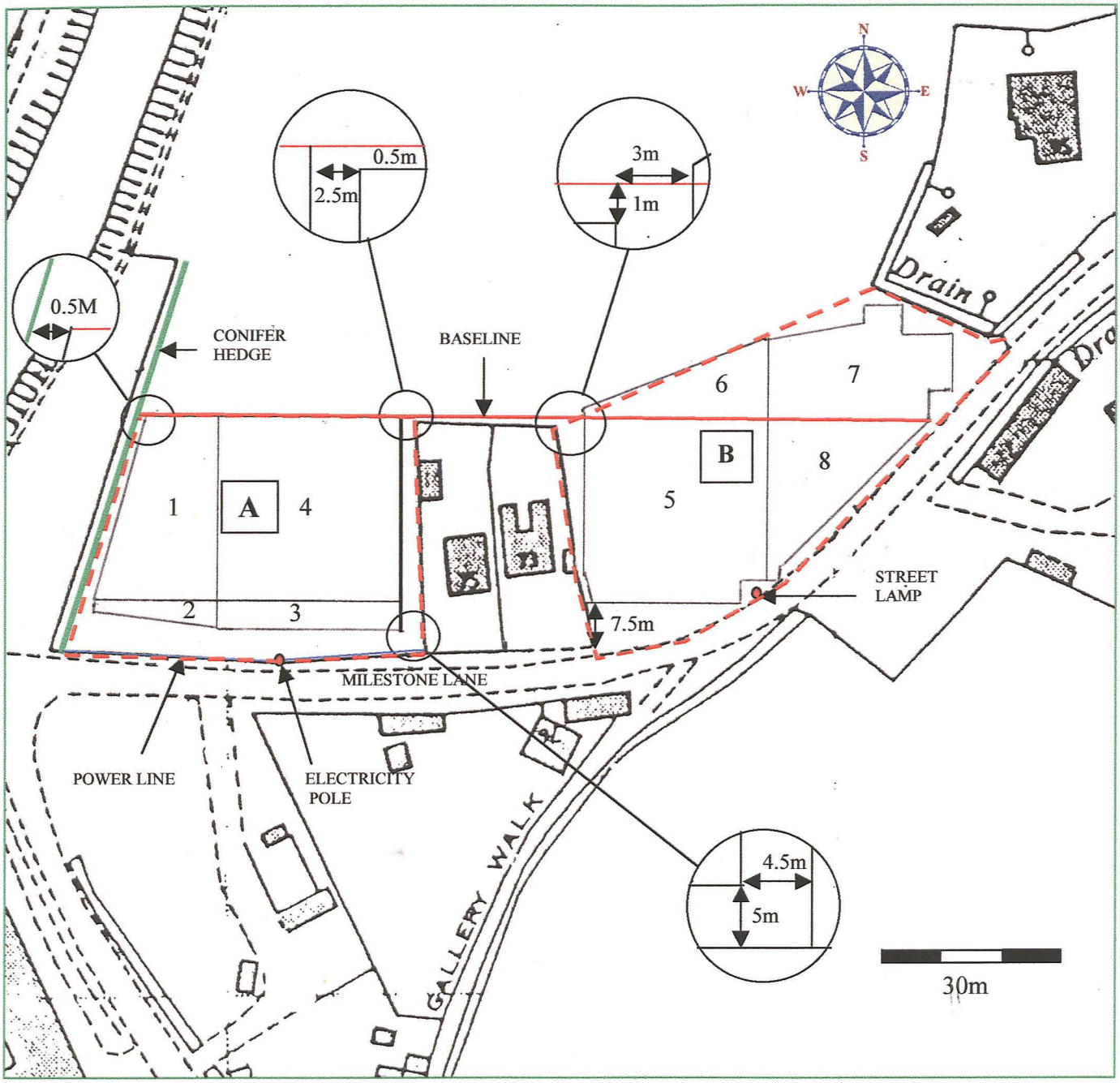

Fig.2: Location of survey grids. **Scale 1:1000**

1.0 Introduction

R. Longstaff & Co. commissioned Pre-Construct Archaeology (Lincoln) to undertake an archaeological evaluation of c. 0.45 ha of land off Milestone Lane, Pinchbeck, Spalding. This programme of works will be completed in advance of a residential development, and the initial component of the evaluation comprises the fluxgate gradiometry survey that is documented in this report.

The survey was undertaken by Pre-Construct Geophysics, in accordance with a written specification prepared by Pre-Construct Archaeology (Palmer-Brown, 2000).

The gradiometer survey methodology was based upon guidelines set out in the English Heritage document *'Geophysical Survey in Archaeological Field Evaluation'* (David, 1995).

2.0 Location and description

Pinchbeck is situated in the Fens of south Lincolnshire, approximately 2km north of Spalding.

The site is located approximately 0.5km to the north of the village core, in an area known as Crossgate; immediately to the north of Milestone Lane (Figs.1 and 2). Currently in agricultural use, the site forms the southern part of a ploughed field that has recently supported a crop of sugar beet. Consequently, the area is unbounded along its northern edge.

The development area consists of two units (Fig.2: **A** and **B**), which are separated by existing housing.

Area A: A sub-rectangular unit (c. 0.23ha) that is the western part of the site. Conifer hedging and a residential property bound the western and eastern sides respectively. A power line runs along the southern edge. The ground surface is predominately level, but at the time of survey the western edge was significantly rutted by the passage of heavy farm machinery.

Area B: An irregular unit of c. 0.22ha, bounded to the east and west by residential properties. Heavy rainfall had resulted in partial flooding of the lower, eastern, end of the site, and this has compromised the survey to some extent.

The area is typified by drift deposits, up to 20m in depth, that were laid down during the Quaternary era. Uppermost of these are the Terrington Beds, a series of sandy silts, sands and clays; representing younger marine alluvium, salt marsh, tidal creek and river deposits (B.G.S., 1992). The complex nature of these deposits is highlighted by the Geological Survey, which estimates that the later Saxon coastline lay within 100m of the site, running north to south perpendicular to Milestone Lane. The easterly continuation of the latter, beyond this hypothesised interface, is thought to run along a bank constructed between c.1000 and 1300 AD., to reclaim land from the sea. The 'Roman Bank', which runs along the edge of the River Welland, c.2km to the east, marks the limit of reclamation by c. 1300 AD.

Beneath the Terrington Beds are further drift deposits, possibly including Devensian Abbey Sand and Gravel, and beds of Glacial Sand and Gravel of Anglian age. These cover the upper beds of the solid geology, which locally consist of the mudstones of the Oxford Clay Series, deposited during the Upper Jurrasic era.

Central National Grid Reference TF 2426 2526.

3.0 Archaeological and historical background

This low-lying area has been subject to sustained periods of inundation, linked to changes in sea level. At these times, it is likely that much of the region was unsuited to permanent human occupation, a theory supported by the punctuated nature of the archaeological record. Much of this knowledge is based upon the work conducted by The Fenland Survey, which has produced a range of evidence for occupation of the Fenland Basin from the prehistoric to Romano-British periods (Hayes and Lane, 1992).

The etymology of the place name suggests that the origins of the settlement, recorded as *Pincebec* in the *Domesday Book*, date to the late Saxon period. While 'beck' clearly refers to a stream, 'pinch' may be derived from the Old English, *pinc,* meaning minnow, or *pink,* meaning linnet/finch (Mills, 1993).

Despite successful efforts to reclaim land from the sea, pushing the coastline eastwards during the later Saxon and medieval periods (see 2.0), the western side of the parish became flooded and developed into a freshwater fen (Hayes and Lane, 1992).

The archaeological potential of the site is suggested by its close proximity to a bridging point on the River Glen. Evidence of salt production during the medieval period within the parish is recorded as part of the County Sites and Monuments Record for Lincolnshire (SMR Ref.'s: 23633, NGR: 2520 2520).

4.0 Methodology

Detailed area survey using a fluxgate gradiometer is a non-intrusive method of evaluating the archaeological potential of a site. The fluxgate gradiometer detects magnetic anomalies created by areas of high or low magnetic susceptibility. These areas are caused by changes in the composition of the subsoil or the underlying geology. Archaeological features result from man-made changes to the composition of the soil and the introduction of materials such as brick and stone. These features create detectable magnetic anomalies. In addition, activities that involve heating and burning will create magnetic anomalies, as will the presence of ferrous metal objects.

The anomalies detected by a fluxgate gradiometer survey can often be resolved into entities sharing morphological characteristics with features of known archaeological provenance. This enables the formulation of an informed, but subjective interpretation.

Magnetic variation between archaeological or naturally produced features and the natural background level can result from:

- different depth or density of fill, with respect to the depth or density of surrounding soils magnetically similar to the fill
- the magnetic properties of materials introduced as a result of human activity (e.g. rubble, stone, brick/tile, ferrous metal etc.) in contrast to those within surrounding natural deposits
- the magnetic susceptibility of areas of burning, as opposed to unburnt areas
- the magnetic properties of localised, naturally deposited minerals, such as occur in the fill of palaeo-channels, in contrast to those of the surrounding soils.

The area survey was conducted using a *Geoscan Research* fluxgate gradiometer, model FM36, with an electronic sample trigger set to take four readings per metre (a sample interval of 0.25m). The zigzag traverse method of survey was used, with 1m wide traverses across 30m x 30m grids. The sensitivity of the machine was set to detect magnetic variation in the order of 0.1 nanoTesla. An east-west base line was established to the rear of the properties that separate the site. Pegs were placed at all grid corners to facilitate the relocation of the survey.

The data from the survey was processed using *Geoplot* (*v. 3.0*). It was desloped (a means of compensating for sensor drift during the survey) and clipped to reduce the distorting effect of extremely high or low readings caused by discrete pieces of ferrous metal. The results are plotted as greyscale and trace images.

The site was surveyed by David Bunn on the 27th November 2000.

Instrument	Geoscan Research fluxgate gradiometer FM36 Sample trigger ST1
Grid size	30m x 30m
Sample interval	0.25m
Traverse interval	1.0m
Traverse method	Zigzag
Sensitivity	0.1nT
Processing software	Geoplot (*v. 3.0*)
Weather conditions	Cool, overcast, showers
Area surveyed	0.4ha

Table 1: Summary of survey parameters

5.0 **Results** (Figs. 3-6)

The survey detected a number of magnetic anomalies, some of which may signify the presence of archaeological remains.

The raw data is presented in *Figure 3*, with the strongest anomalies depicted in colour.

The strongest magnetic variation, **1**, in **Area A** occurred along the western edge of the site. This probably results from the presence of miscellaneous ferrous and ceramic debris that has accumulated alongside the hedgerow. A number of magnetically similar, discrete, anomalies were detected elsewhere in **Area A**, particularly along the southern boundary, which is hedged.

Many of the strong localised anomalies in **Area B (2)** seem to be contained by a linear feature (Fig.6: **3**) that extends across the south-eastern part of the survey. This runs roughly parallel, and c. 10-15m north of, Milestone Lane, and appears to represent a redundant continuation of an extant ditch that lies to the immediate north-east of the survey (see Fig.2, above grid 7). Consequently, it is suggested that these particular elements (ie **2**) could reflect rubble deposits filling residual depressions in the upper fill of **3**. Similarly, the more scattered elements of **2** may indicate the location of further rubble, or the location of burnt material.

Figure 5 shows the weaker magnetic anomalies, which have been enhanced by clipping the data.

Anomaly group **4** (Fig.6) appears to represent three sides of a sub-rectangular enclosure. The northern extent of this feature lies outside the survey area.

It is possible that a similar sub-oval enclosure, **5**, lies to the east of **4**. Interpretation of this is limited by poor magnetic resolution, and it is possible that the southern element merely constitutes one of a number of east-west linear anomalies, **6**, that extend across the site. The latter run parallel to the southern boundary of **Area A** and probably result from plough scoring of the subsoil.

Linear anomaly **7** has a slightly different alignment to **6** and may have a different origin. It is possible that it marks the location of an earlier field boundary. There are slight indications that anomaly **3** turns toward the west at the south-western corner of the survey in **Area B**. This point has close spatial correlation with the projected alignment of the eastern end of **7** in **Area A**. Consequently, it is possible that this corner on Milestone Lane once turned through a more pronounced arc.

A number of discrete anomalies were detected in both survey areas (Fig.6: example **8**, shown in yellow). Such anomalies often mark the location of *in-situ* burning, or burnt materials, the magnetically enhanced fill of pits, or pieces of miscellaneous ferrous and ceramic debris. The latter are often introduced as a result of agricultural activities, such as midden spreading.

A number of diffuse anomalies were detected in **Area B**. However, the south-eastern half of this area is dominated by the magnetic disturbance of linear anomaly **3**, which may be masking weaker signals produced by traces of other features.

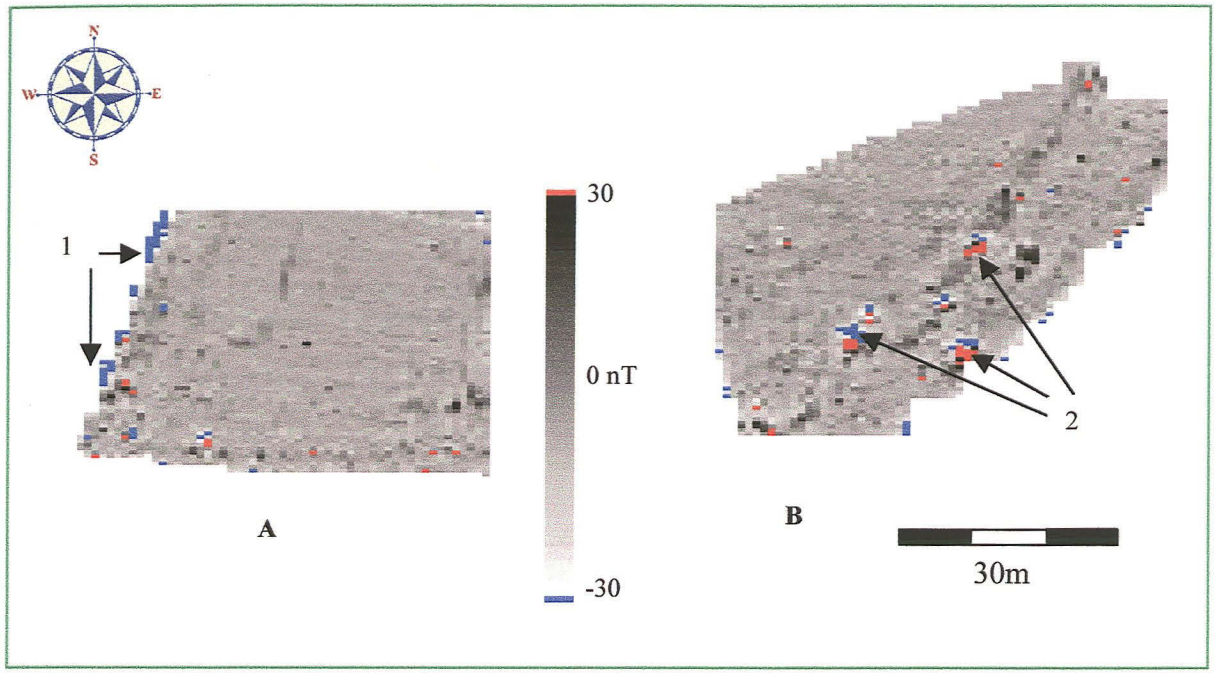

Fig.3: Greyscale of raw data showing strong magnetic anomalies. Scale 1:1000

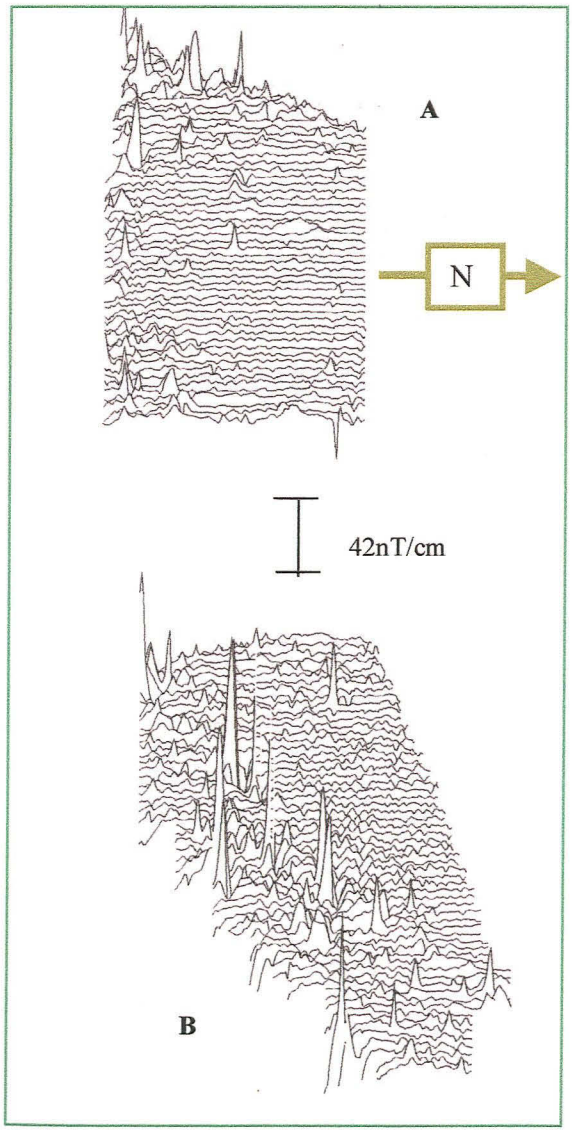

Fig.4: Trace plot of raw data
Scale 1:1000

It is tentatively suggested that the anomalies shown in red (Fig.6: **9**) are components of a curvilinear feature, which appears to be abutted internally by anomaly **10**, implying contemporaneity. However, this interpretation is tempered by the density of local magnetic disturbance, which could be making a continuous feature appear segmental. It is also possible that the spatial relationships of the various elements of **9** are entirely fortuitous, each resulting from a different episode of activity.

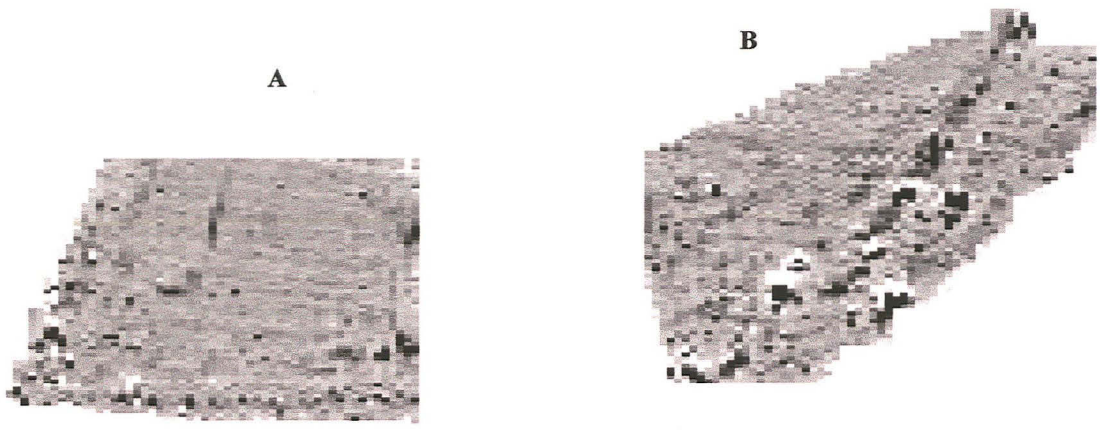

Fig.5: Clipped greyscale image. Scale 1:1000

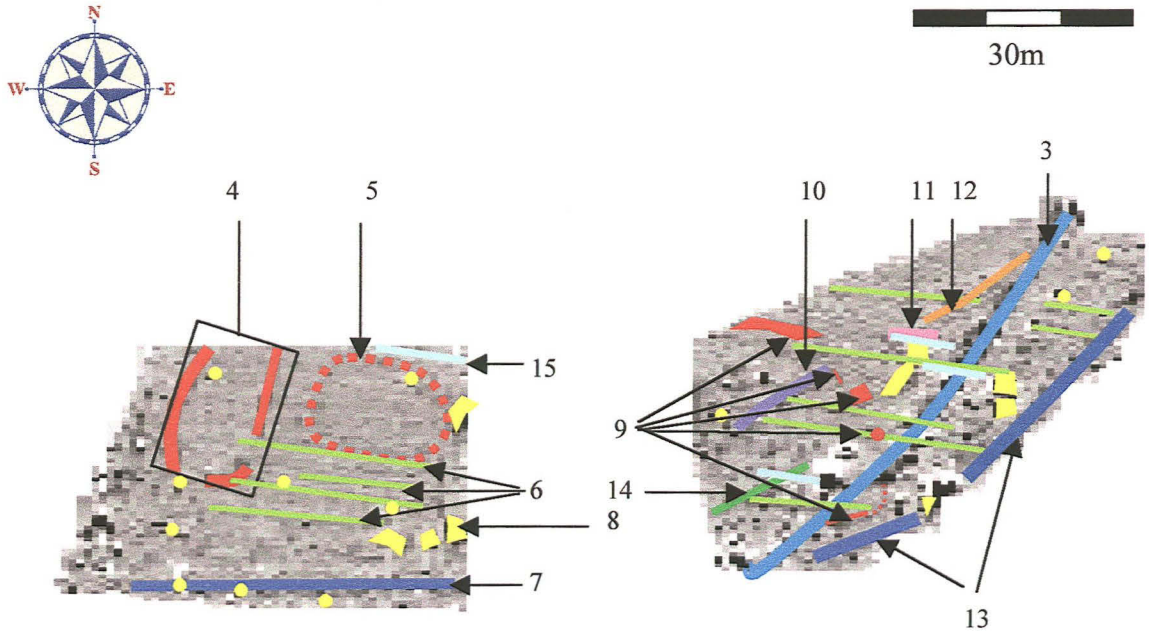

Fig.6: Interpretive image. Scale 1:1000

Linear anomaly **10**, which appears to abut the northernmost component of **9**, shares an alignment with anomaly **12**. Again, it is possible that they represent two sections of the same feature. If this is so, this linear feature may further respect the alignment of Milestone Lane, diverging from **3** near its north-eastern end.

A further diffuse curvilinear anomaly, **13**, runs just inside the southern boundary of **Area B**. This may represent an earlier field boundary, again with a potentially close spatial relationship to **7** in **Area A**. Additionally, **13** runs roughly parallel to the hypothesised composite **10/12**, raising the possibility that the area contained between them represents a discrete plot fronting onto Milestone Lane.

Linear anomaly **14** runs to the south of, and parallel to, **10** and the two could be related. However, an area of strong magnetic disturbance, **2**, has precluded any further interpretation.

Anomaly **15** represents modern deep ruts that are visible on the soil surface; other examples were noted during the survey (Fig.6).

6.0 Conclusions

The survey has recorded significant magnetic variation across the site. Some of this can be related to modern activity by reference to elements of the surrounding landscape, such as existing boundary features.

The most pronounced magnetic disturbance in **Area B** appears to be associated with a linear feature, probably a back-filled drain, **3**. It appears that this corner of Milestone Lane has been subject to several episodes of redefinition (eg.**3**, possibly **10/12**, **13**).

The relative absence of strong magnetic anomalies in **Area A** has assisted the detection of weaker anomalies. It is possible that an enclosure lies close to the western edge of this area, while another may be situated less than 10m to the east of it. However, the poor magnetic signature of the latter renders any interpretation tentative.

7.0 Acknowledgements

Pre-Construct Geophysics would like to extend thanks to R Longstaff & Co. for the help and assistance that was provided during this survey.

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