GEOPHYSICAL SURVEY REPORT G15131

Land at Little Eriswell

Client:

On Behalf Of:

Elveden Farms

GSB PROSPECTION Ltd

Celebrating over 25 years at the forefront of Archaeological Geophysics

sumo Survey Services

GSB Survey Report No. G15131

Land at Little Eriswell, Suffolk

Contents

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Digital Content (CD)

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Survey Personnel

Field Co-ordinator: Leanne Swinbank BA

Report Author: Claire Stephens BA MA

Project Assistants: Alistair Galt BA MSc, Mai-Ly Dubreuil, James Lawton BSc MSc, Charlotte Palmer Craggs BA, Dan Shiel BSc, Ed Price

Dates

Fieldwork: 26 October - 6 November 2015
Report: 20 November 2015

Report Approved: Dr John Gater MCIfA FSA

Background Project Details

NGR	TL 719 798
Location	The site is located between Cambridge and Thetford. It is bounded by the B1112 to the east, the Eriswell Lode (Dyke) to the west, a woodland to the north and Eriswell Road to the south.
HER/SMR	Suffolk
District	Forest Heath DC
Parish	Eriswell CP
Topography	Variable: flat / undulating
Current Land Use	Pasture
Soils	Adventurers' 2 (1024b.): deep peat over sands and gravels (SSEW 1983)
Geology	Grey Chalk with superficial deposits of peat and alluvium in the west (following the line of the dyke) and river terrace deposits of sand and gravel in the east (BGS 2015).
Archaeology	Prehistoric (Neolithic, Bonze Age, Iron Age) and Roman spot finds and artefact scatters recorded in the central and southern parts of the study area (information provided by CgMs).
Survey Methods	Detailed magnetometer survey (fluxgate gradiometer)
Study Area	45.1ha
OASIS Ref.	Gsbprosp1-227027
HER Parish Code	ERL 239
HER Event No.	ESF23260

Aims

To locate and characterise any anomalies of possible archaeological interest within the study area. The work forms part of a wider archaeological assessment being carried out by **CgMs** on behalf of **Elveden Farms Ltd**.

Written Scheme of Investigation (WSI)

This project was carried out in accordance with a WSI submitted to the Local Planning Archaeologist (LPA) at Suffolk CC and is included as Appendix 2.

Summary of Results

Numerous probable and possible archaeological anomalies have been detected, forming a series of rectangular enclosures that extends along the eastern edge of the study area for almost its entire length. The strength and pattern of the responses suggests possible Iron Age/RB settlement activity.

A poorly defined circular enclosure, measuring 50m in diameter has been identified in the central part of the site, close to a zone where several prehistoric (Neolithic, Bronze Age) artefact scatters are noted in the HER. A very weak possible circular trend (11m in diameter) is noted in Area 7; an archaeological interpretation for this is highly cautious. Aside from these, the western half of the study area is devoid of obvious archaeological-type responses.

Method

All survey grid positioning was carried out using Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS equipment. The geophysical survey areas are georeferenced relative to the Ordnance Survey National Grid by tying in to local detail and corrected to the OS mapping provided by the client. These tie-ins are presented in Figure 2. Please refer to this diagram when re-establishing the grid or positioning trenches.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

All survey work is carried out in accordance with the current English Heritage and Chartered Institute for Archaeology guidelines (IfA 2002, EH 2008, CIfA 2014).

Data Processing

Data processing was performed as appropriate using in-house software (GeoSuB) as outlined below.

Magnetic Data
Zero Mean Traverse, Step Correction (De-stagger) and Interpolation (on the Y axis).

Limitations

Magnetic survey is an effective technique for site evaluation, providing fast data acquisition and responding, to some degree, to the majority of archaeological site-types. The technique relies upon enhancement of naturally occurring iron-bearing compounds in the soil through anthropogenic activity. Detection rates can be poor where archaeological sites have only seen temporary and/or sporadic occupation or where there is insufficient activity to drive the enhancement; this is often true of Lithic-era sites. Success may also be limited over soils which are naturally deficient in iron compounds. Conversely, soils overlying (or derived of) naturally magnetic geological units, for example igneous formations, will produce strong responses which may mask subtler archaeological enhancement within.

The presence of ferrous structures above or below ground (buildings, pylons, fences, pipes etc.) will produce very strong magnetic fields extending far beyond their physical footprint. The strength of these magnetic 'shadows' is such that it will mask practically any archaeological anomalies. Similarly, later features and demolition spreads or imported consolidation material can produce areas of magnetic disturbance that will mask underlying features.

As a general rule, the Bartington Grad 601 sensors allow for a depth of investigation of approximately 1.0m, depending on the strength of the field produced by the buried feature; below this depth only particularly enhanced material will be detected with any kind of confidence.

Interpretation

When interpreting the results several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to very specific known features documented in other sources, this is done (for example: *Abbey Wall*, *Roman Road*). For the generic categories levels of confidence are indicated, for example: *Archaeology – ?Archaeology*. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification *?Archaeology*. Details of the data plot formats and interpretation categories used are given in the Appendix: Technical Information at the end of the report.

General Considerations

Conditions for survey were variable: some areas comprised short pasture, while in others the grass was taller and denser, presenting hindrances to walking with the instruments. In places, dense bushes, weeds or trees precluded data collection.

1.0 Survey Results - Magnetometer Survey

Potential Archaeology

1.1 Numerous anomalies of likely and possible archaeological interest have been identified within the study area; most are confined to the eastern half of the site and primarily form patterns of rectilinear enclosures. The clarity of the responses varies considerably and this has affected the levels of confidence in the interpretation; well defined anomalies forming obvious and/or complete patterns are classed as *Archaeology*, while less distinct responses with incomplete patterning are categorised as *?Archaeology*. In places, there are anomalies and trends depicted as *Uncertain Origin*, whose form and linearity suggest an anthropogenic cause (of undetermined antiquity) but do not have sufficient patterning to permit a classification of *?Archaeology*. The wider context means that some of these too, might be of archaeological interest and where this is the case they are mentioned in the text. A brief description of the archaeological anomalies for each area is outlined below.

Area 1A (Figures 3 & 4)

1.2 A relatively strong linear has been recorded along the eastern grid edge together with a few shorter and weaker responses forming hints of enclosures. North of these *?Archaeology* responses are some strong linear *Uncertain Origin* anomalies which may be of interest, though little more can be said of them.

Area 5 (Figures 3 & 4)

1.3 As with Area 1A, most of the potential archaeology in this area is located in the eastern half of the grid (and extending to the eastern field edge). Rectilinear anomalies and trends [**1**] are sufficiently distinct to enable a confident archaeological interpretation. Extending west of this is a hint of a larger rectangular enclosure [**2**]; the interpretation is less confident because one of the trends is weakly negative (not typical of a ditch). North of [**1**] the archaeological patterning becomes less obvious, in part due to areas of ferrous disturbance which have masked any underlying responses in the data. A few anomalies in this part of the site are of a magnitude that indicates burnt/fired material. It is unclear whether these represent burnt features or simply highly magnetic fills within a section of ditch or pit. They may be of archaeological interest, but could merely reflect deeply buried modern ferrous debris. Similarly inconclusive is the interpretation of a few amorphous linears south of [**1**] and [**2**] which are classified as *Uncertain Origin*.

1.4 Away from this main group of anomalies, a possible "D"-shaped enclosure [**3**] has been highlighted as *?Archaeology*, lying within a zone of increased response of *Uncertain Origin*.

Area 6 (Figures 5 & 6)

1.5 Numerous archaeological-type responses have been recorded in this area; most of them form a pattern of rectilinear enclosures (of varying dimensions) running alongside the existing road. The clearest patterning is grouped around [**4**]; most of these anomalies have a strength that is suggestive of core activity (settlement) rather than peripheral features (e.g. field systems). At the other end of the confidence spectrum, many of the *Uncertain Origin* responses at [**5**], although relatively strong, are somewhat broad and amorphous and the rectangular patterning is far less obvious; any archaeological potential is assigned largely on the basis of their immediate context. They could reflect badly damaged/disturbed archaeological deposits, but modern or natural origins cannot be dismissed.

1.6 Anomaly [**6**] is different in nature from all the other archaeological-type responses in the data. It comprises a relatively broad amorphous band of increased responses which forms a circle roughly 50m in diameter. The pattern is suggestive of an enclosure ditch, though the poor anomaly definition precludes a firm archaeological interpretation. Although some discrete anomalies can be discerned within it (including some strong, potential burnt/fired responses) none can be interpreted with any confidence. It lies within a wider zone of increased magnetic response, the cause of which cannot be properly determined. It may arise from damaged archaeological deposits or might reflect localised natural magnetic enhancement of the soils.

Areas 7 and 8 (Figures 7 & 8)

1.7 With one exception, all the possible archaeological anomalies in these areas are located along the eastern edge of the site, and form rectangular patterns, although the density of responses is reduced. The anomalies at [**7**] (*?Archaeology* and *Uncertain Origin*) may represent a continuation of the enclosure group [**3**] to the north, though some of the *Uncertain Origin* responses are very poorly defined; absent a wider archaeological context it is doubtful they would be considered significant. There is then a small gap in the archaeological responses (between 30 and 50m), south of which a new group of responses is noted, apparently extending southwards from Area 7 into Area 8. In this group the patterning in generally less well defined and fewer definitive archaeological anomalies have been identified.

1.8 A weak, incomplete circular trend [**8**] has been highlighted, measuring approximately 11m in diameter. Barely visible above background levels, a possible archaeological interpretation is assigned largely on the wider documentary context (HER evidence for potential prehistoric activity at the site).

Other non-ferrous anomalies

1.9 Anomalies relating to former field boundaries have been identified in Areas 1B, 2, 6 and 7. They vary in form: some are discrete linear responses, others are apparent as weaker trends and, in Area 7, a broad band of increased response may represent a former boundary.

1.10 A few weak broad sinuous responses have been recorded which are consistent with natural soil variations, possibly bands of magnetic gravel deposits.

1.11 Aside from the specific *Uncertain Origin* responses described in the ***Potential Archaeology*** section above, a fair number of other short linear anomalies, trends and small pit-type responses have been identified in all the survey areas. While the wider context (documentary and geophysical evidence for archaeology) means that an archaeological origin for any of these cannot be entirely dismissed, on balance a combination of natural deposits, agricultural and modern factors are more likely to be responsible.

Ferrous

1.12 Small scale ferrous responses ("iron spikes") are present throughout the survey. These are characteristic of small pieces of iron and other strongly magnetic debris scattered in the topsoil and are not considered to be archaeologically significant. Only the most prominent of these are highlighted on the interpretation. Some denser concentrations of iron spikes, depicted as *Magnetic Disturbance* may be indicative of deliberate spreads of (modern) debris. More substantial ferrous anomalies, located primarily at the grid edges, have been produced by modern buried and surface features (former pylon footings, adjacent fencing and buildings).

2.0 Conclusions

2.1 Most of the potential archaeological anomalies identified by the survey are located along the eastern edges of the study area, adjacent to the existing road. The strength and patterning of the anomalies suggests Iron Age/RB settlement. Some very strong responses are consistent with burnt/fired deposits and might indicate industrial activity. The greatest concentration of responses is in the central portion of the site (Area 6) and they peter out to the north (Area 1A).

2.2 In the western half of the site there is an absence of clear archaeological anomalies with two notable exceptions. The more convincing of these is a poorly defined large circular enclosure (50m in diameter) located in Area 6. The precise nature and function of this response cannot be determined but on the basis of the documentary evidence an earlier prehistoric origin (?Neolithic, ?Bronze Age) is postulated. The second of these is a very indistinct circular trend (11m in dimeter) for which the archaeological interpretation is tentative at best.

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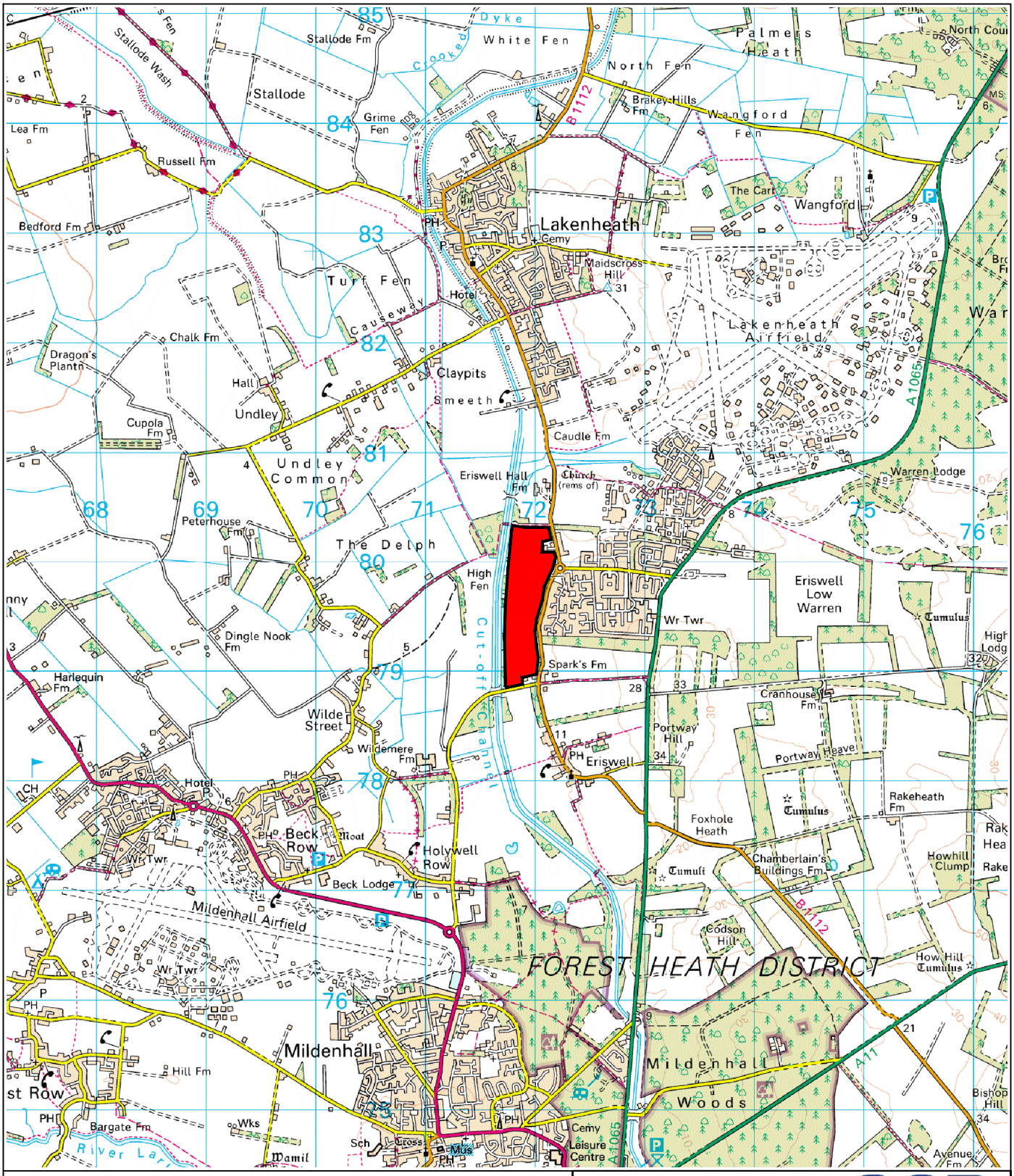
OS 2015 *http://www.oldmapsonline.org,* centred on 571900,279600. Accessed 17/11/2015.

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



N

0 metres 2000

1:50,000 @ A4

Site Location

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Cowburn Farm, 21 Market Street
Thornton
Bradford
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+44 (0)1274 835016

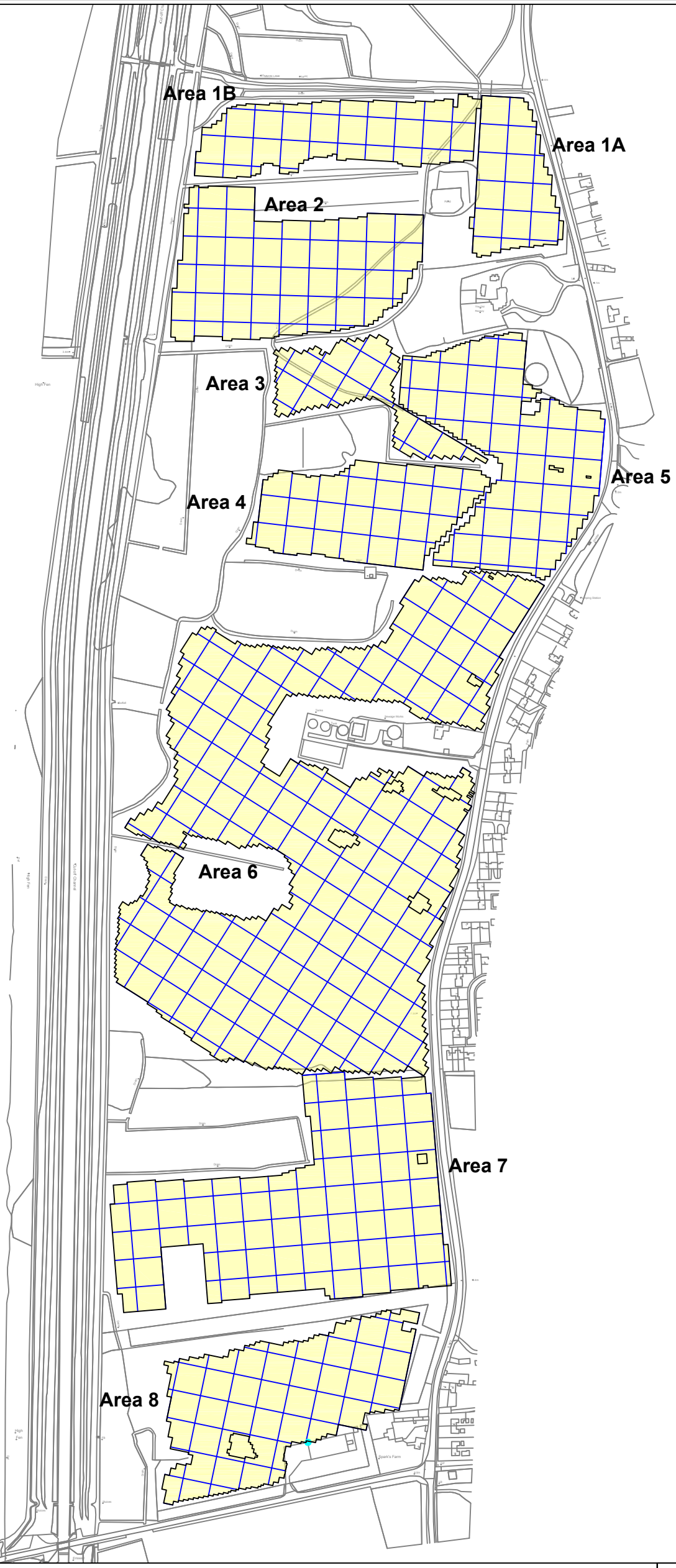
GSB PROSPECTION Ltd

Project: G15131 Land at Little Eriswell

Title: Site Location Diagram

Drawn by: JMT

Figure 1



N

0 metres 200

1:5000 @ A3

Magnetometer survey with 30m grid divisions

Control point (shed corner):
571931.846E 278907.974N

GSB Prospection Ltd
Cowburn Farm, 21 Market Street
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Title: Location of Survey Areas

Drawn by: CES

Figure 2

N

0 metres 80

1:2000 @ A3

3
nT
-2

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Title: Magnetometer Survey Areas 1 to 5 - Greyscale Plots

Drawn by: CES

Figure 3

Area 1B

Area 1A

Area 2

Area 3

Area 4

Area 5

COMMON LANE (Track)

Track

Pond

The Old Rectory

Pumping Station

B1112

N

0 metres 80

1:2000 @ A3

- Archaeology (discrete anomaly / trend)
- ?Archaeology (discrete anomaly / trend)
- Burnt/fired - ?Archaeology
- Uncertain Origin (discrete anomaly / trend / increased reponse)
- Old Field Boundary (trend)
- ?Natural
- Ferrous / Magnetic Disturbance

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Title: Magnetometer Survey Areas 1 to 5 - Interpretation

Drawn by: CES

Figure 4

N

0 metres 80

1:2000 @ A3

3

nT

-2

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Title: Magnetometer Survey Area 6 - Greyscale Plot

Drawn by: CES

Figure 5

Area 4

Area 6

1

2

4

5

6

7

Drain

Outfall

Cut-off Channel

Tanks

Tank

Sewage Works

Path

7.4m

7.5m

N

0 metres 80

1:2000 @ A3

Archaeology (discrete anomaly / trend)

?Archaeology (discrete anomaly / trend / increased reponse)

Burnt/fired - ?Archaeology

Uncertain Origin (discrete anomaly / trend / increased reponse)

Old Field Boundary (discrete anomaly / trend)

Ferrous / Magnetic Disturbance

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Title: Magnetometer Survey Area 6 - Interpretation

Drawn by: CES

Figure 6

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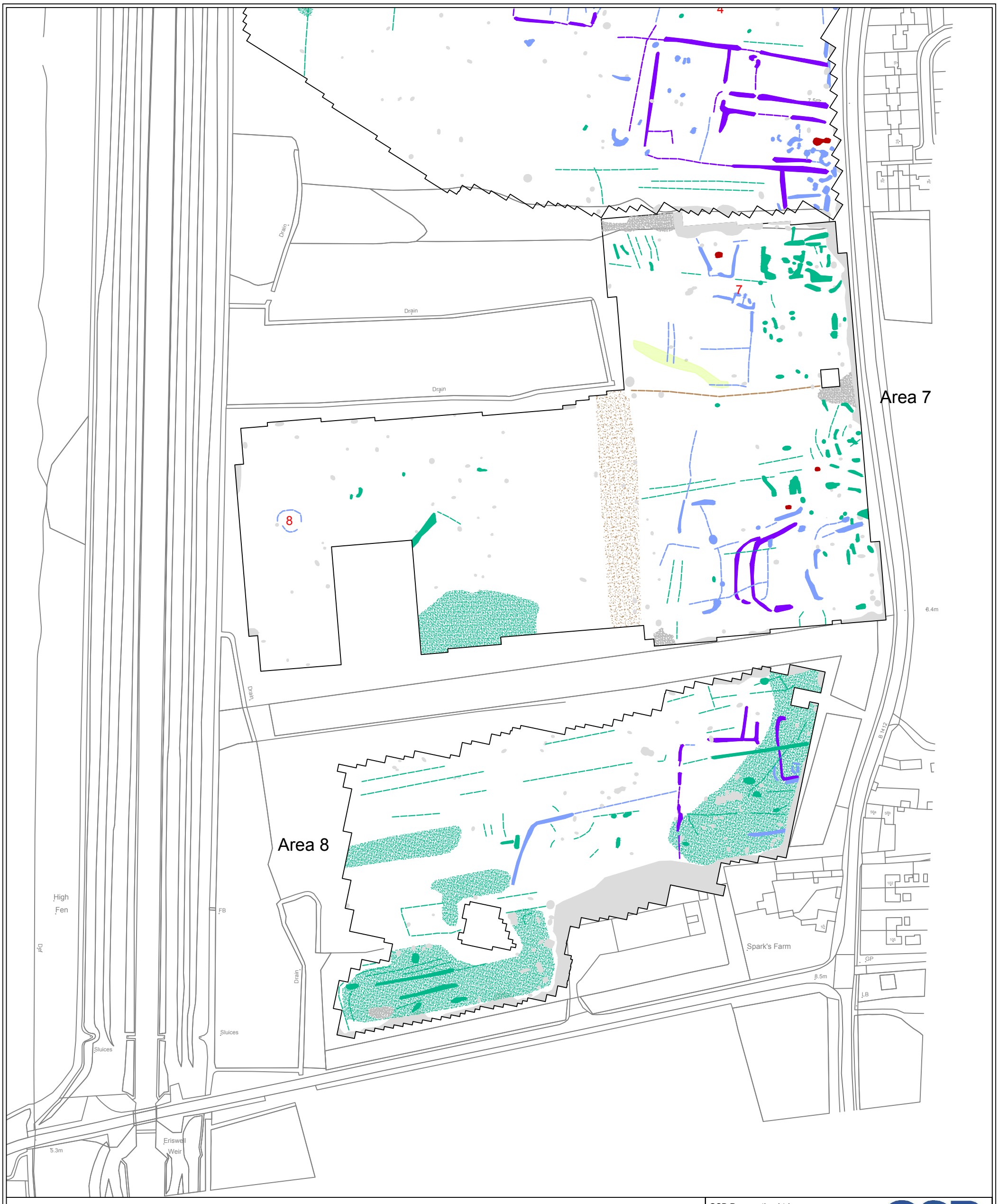
Title: Magnetometer Survey Areas 7 and 8 - Greyscale Plots

Drawn by: CES

Figure 7



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Title: Magnetometer Survey Areas 7 and 8 - Interpretation

Drawn by: CES

Figure 8

N

0 metres 200

1:5000 @ A3

2
nT
-1

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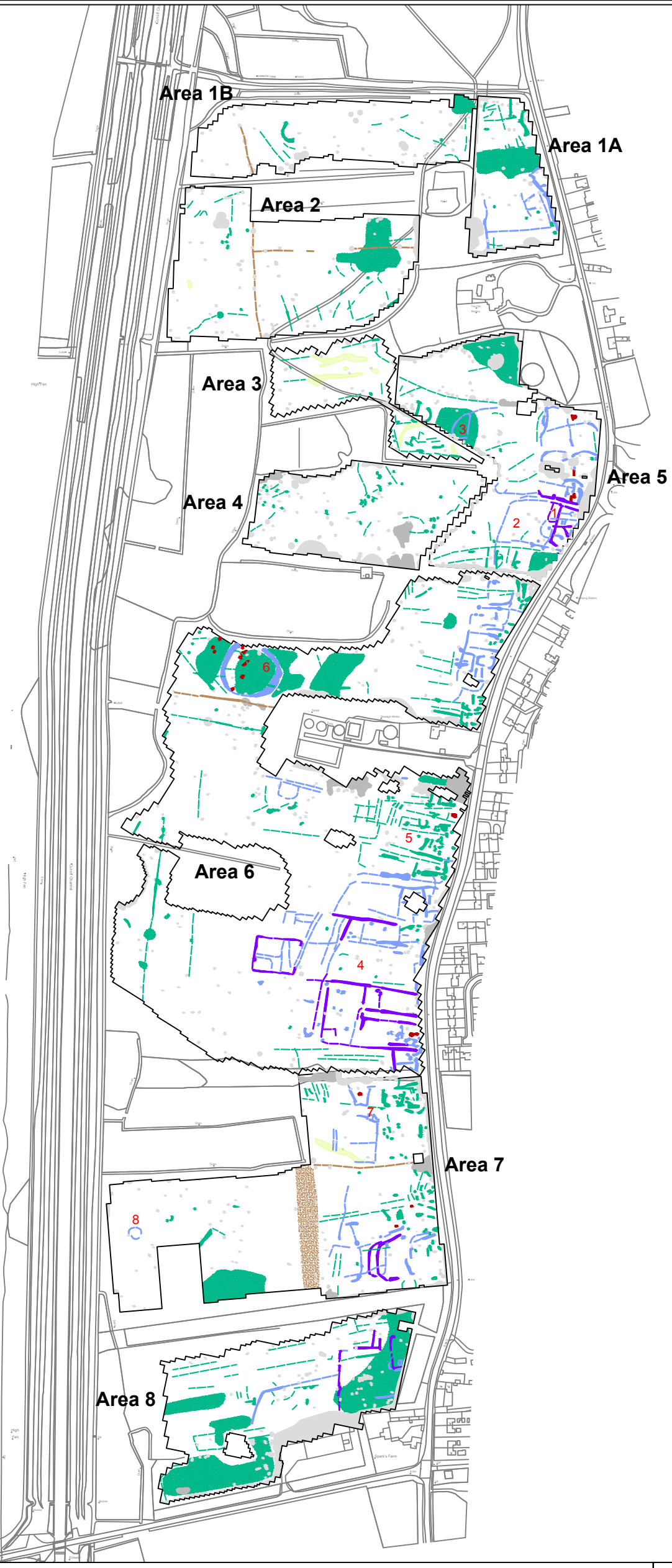
Title: Magnetometer Survey All Areas - Greyscale Plots

Drawn by: CES

Figure 9



N

0 metres 200

1:5000 @ A3

- Archaeology (discrete anomaly / trend)
- ?Archaeology (discrete anomaly / trend / increased reponse)
- Burnt/fired - ?Archaeology
- Uncertain Origin (discrete anomaly / trend / increased reponse)
- Old Field Boundary (discrete anomaly / trend / increased reponse)
- ?Natural
- Ferrous / Magnetic Disturbance

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Project: G15131 Land at Little Eriswell

Title: Magnetometer Survey All Areas - Interpretation

Drawn by: CES

Figure 10

Appendix - Technical Information: Magnetometer Survey

Instrumentation: Bartington *Grad*601-2 / GSB CARTEASY^{N} Cart system

Both the Bartington and CARTEASY^{N} instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The CARTEASY^{N} system has four gradiometer units mounted at 0.75m intervals across its frame – rather than working in grids, the cart uses an on-board survey grade GNSS for positioning. The cart system allows for the collection of topographic data in addition to the magnetic field measurements.

Data Processing

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (Destagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.
Interpolation	When geophysical data are presented as a greyscale, each data point is represented as a small square. The resulting plot can sometimes have a 'blocky' appearance. The interpolation process calculates and inserts additional values between existing data points. The process can be carried out with points along a traverse (the x axis) and/or between traverses (the y axis) and results in a smoother greyscale image.

Display

XY Trace 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.
Greyscale/ Colourscale Plot	This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly all values below the given range are represented by the minimum intensity shade. 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. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.
3D Surface Plot	This is similar to the XY trace, but in 3 dimensions. Each data point of a survey is represented in its relative position on the x and y axes and the data value is represented in the z axis. This gives a digital terrain, or topographic effect.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall,* etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

Archaeology	This term is used when the form, nature and pattern of the response are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
?Archaeology	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
Increased Magnetic Response	An area where increased fluctuations attest to greater magnetic enhancement of the soils, but no specific patterns can be discerned in the data and no visual indications on the ground surface hint at a cause. They may have some archaeological potential, suggesting damaged archaeological deposits.
Industrial / Burnt-Fired	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.
Old Field Boundary	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions.
Ridge & Furrow	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases the response may be the result of more recent agricultural activity.
Ploughing	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions. Smaller, isolated responses which do not form such obviously 'natural' patterns but which are, nonetheless, likely to be natural in origin may be classified as *?Natural*.
Uncertain Origin	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *?Archaeology* and *?Natural* or (in the case of linear responses) *?Archaeology* and *?Ploughing*; occasionally they are simply of an unusual form.
Magnetic Disturbance	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present. They are presumed to be modern.
Ferrous	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 fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

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Geophysical Survey: Written Scheme of Investigation

G15131 Land at Little Eriswell, Suffolk

19 October 2015

Contents

1.0 Introduction

This document has been produced to describe the Archaeological Geophysical Survey required at Little Eriswell, Suffolk (NGR TL 7192 7981). The site is located between |Cambridge and Thetford. It is bounded by the B1112 to the east, the Eriswell Lode (Dyke) to the west, a woodland to the north and Eriswell Road to the south.

The underlying geology within the survey area consists of Grey Chalk with superficial deposits of peat and alluvium in the west (following the line of the dyke) and river terrace deposits of sand and gravel in the east.

2.0 Scope of Works and Archaeological Background

The work will be carried out with the aim of identifying sites of archaeological potential not previously recorded.

There are no designated heritage assets recorded at the site but a number of non-designated archaeological assets. There is a concentration of prehistoric activity recorded in the HER in the centre of the site (BA hoard of 4 palstaves, artefact scatter, Neolithic axe and further flints and pottery) and isolated prehistoric finds to the south. Roman material is recorded in the south-east; a single sherd of Saxon pottery in the south-west and large scatters of Medieval pottery in the south.

3.0 Method

Given that remains from any period could exist within the site, magnetometer survey has been selected as the most suitable geophysical technique. This is the best first choice technique for the size of the survey area, the local geology and the potential wide range of archaeological features which might be present.

Prior to commencement of fieldwork, an OASIS reference number and a Suffolk HER event number will be obtained.

3.1 Detailed Recorded Survey - Grid Establishment / Relocation Data

All recorded survey data are collected with reference to a site survey grid or survey baselines. For hand-held instruments gradiometer survey this grid consists of individual 20mx20m or 30mx30m squares. A broader grid is sufficient if using a cart based system with an RTK GPS feed: all recorded survey data are collected with reference to survey baselines. Data are collected along regularly spaced traverses between baselines set out at *c.*100m centres.

The survey grid is marked out by means of red plastic tent-pegs or brightly coloured/flagged canes and grid nodes are set out with a positional accuracy of at least 10cm (0.1m) as per EH guidelines.

As standard the survey grid will be established using Real Time Kinematic (RTK) differential GPS equipment. On rare occasions where this is not practical, a combination of Total Station, optical square, ranging rods and tape measures may be used.

Data are collected along regularly spaced traverses within the grid. These traverses are marked by "intermediate" plastic pegs or canes, set out using tape measures.

Either at this stage, or after data collection is complete, measurements will be taken which allow the re-location of the survey area. This is necessary for the production of maps in the report and for any subsequent re-establishment of the survey grid by other workers. Tie-in measurements are made to clear features (such as boundaries and buildings) *which appear on the mapping*.

If required, markers (pegs, canes, stakes or fluorescent spray-paint) can be left *in situ* at boundaries to mark grid baselines and assist in the subsequent re-establishment of the

grid. The client should advise of any special arrangements/preferences in advance of survey.

On completion of the survey (i.e. when all data have been collected, downloaded to computer, visually examined, and backed up to an external device) all pegs/canes and any other temporary markers will be removed from the evaluation area, with the exception of any baseline markers specifically requested by the client (see above).

Data may be collected by hand-held instruments or a cart system or a combination of both.

3.2 Detailed Recorded Survey - Data Collection: Gradiometer Survey

Standard Instrument: Bartington Grad 601-2
Standard sample interval (along traverse): 0.25m
Standard traverse interval: 1.00m
Total data points: 1600 readings per 20m x 20m grid square (3600 per 30m x 30m).

- Data are stored within the instrument's memory.
- For optimum data quality, it is imperative that the operator is able to walk at an even pace whilst holding the instrument steady. It is for this reason that the survey area needs to be free of obstructions such as dense vegetation.
- Data are typically displayed as greyscale or colourscale images (where a given palette is applied to a defined range of data values) or XY trace plots (where each traverses is plotted as a continuous line with data values represented by a vertical offset from the centreline).

3.3 Detailed Recorded Survey - Data Collection: Cart Gradiometer Survey

Standard cart Cart EasyN Mk 1
Standard Instrument: Bartington Grad 601-2 sensors
Standard sample interval (along traverse): 10Hz (approx. 0.125m)
Standard traverse interval: 0.75m

- All data points are located using RTK GPS to a sub-10cm accuracy.
- Data are stored within the instrument's memory.
- Data are typically displayed as greyscale or colourscale images (where a given palette is applied to a defined range of data values) or XY trace plots (where each traverses is plotted as a continuous line with data values represented by a vertical offset from the centreline).

Data are stored remotely using cloud computing**.**

4.0 Reporting

4.1 General Data Handling

All data files (survey data and grid tie-in data) are transferred to the GSB server immediately upon returning to the office. Nightly off-site backups are made of all project work in progress. On completion of a project the entire archive is written to two CDs and an external hard disk drive, held at separate off-site locations. As described above, all data is stored remotely via cloud computing when using a cart system.

4.2 Data Processing and Analysis

The interpretation is based on a variety of plotting formats and a range of data displays; it is undertaken by the PC. Wherever possible, account is taken of the nature of the prevailing archaeological, pedological, geological, and land use conditions. These interpretations are independently checked by either the Senior Geophysicist or the Director.

For cart-collected data, GSB use a bespoke CartEasyN system to both collect and process GNSS positioned Magnetometer data. This process ensures the data collected does not suffer from the same data collection artefacts that affect traditional gridded magnetometer data. Due to the GPS based data collection method images cannot be produced without minimal processing of the data. This is limited to correcting for slight variations in sensor electronics and projecting the data onto a grid. Data from cart based systems is not suitable for processing within traditional grid based data processing software's such as Geoplot.

In-house templates and guidelines and standard reference texts (e.g. English Heritage Thesaurus of Monument Types) are used to assist in the analysis of results.

The data will be interpreted and presented at suitable scales and located on *Ordnance Survey* base maps as appropriate, and will include location plans, greyscale plots and interpretation diagrams.

The survey methodology, report and any recommendations will comply with guidelines outlined by *English Heritage* (EH 2008) and by the *Institute of Field Archaeologists* (IfA 2002) and *Standard and Guidance for Archaeological Geophysical Survey* (IfA 2013). All figures reproduced from *Ordnance Survey* mapping are with the permission of the controller of Her Majesty's Stationery Office © Crown copyright Licence No. 100018665.

4.3 Project Report

A standard GSB project report will be printed and bound and will contain the following sections: report text; list of figures; report figures; appendix detailing technical information. A CD is affixed to the inside front cover of the report. This will contain a pdf version of the printed report, additional reference plots of data in pdf format and the tie-in information. Depending on the client's specifications, AutoCAD (dwg or dxf) versions of the report figures may also be included.

The report text will:
- Describe the site and situation of a survey area and the prevailing local topography, land use, soils and geology.

- Provide a brief description of any known archaeological remains in the vicinity, and their relevance to the survey results, will be made as necessary.

- List and explain the display formats adopted.

- Describe any general factors or complications which must be considered when viewing the data. These include any local factors which may hinder the collection or interpretation of the results.

- Assess the results in accordance with the aims of the survey. In the majority of cases, the anomalies are interpreted from the perspective of their archaeological potential.

- Provide the names of the project co-ordinator and all project assistants together with the dates of the survey and report.

- All reports are proof read by at least two other qualified members of staff to ensure: completeness and quality of data interpretation, clarity and accuracy of expression; consistency of format; good spelling and grammar; that references to figures and tables are complete, and that any external references are as full as possible.

- The report figures will present the results of the survey accurately positioned on the site mapping. They are produced in AutoCAD and will include:

- A diagram showing the location of the survey areas (with key, scale and north arrow).

- Greyscale or colour plot(s) of the data-set(s) (with plotting levels, scale and north arrow).

- Digitised interpretation(s) of the results (with key, scale and north arrow).

The scale of the above printed figures will vary depending on survey size but the scale of the data plots and interpretations will not exceed 1:2500.

The report will include the OASIS reference number and the Suffolk HER event reference number obtained before survey commencement (see 3.0 above). A copy of the online OASIS record will be included as an appendix to the report, together with a copy of the approved WSI.

The reference data plots on the CD are not positioned on the mapping and are presented at a scale of 1:500 unless otherwise indicated. These will include at least one XY trace plot and one greyscale image of minimally processed data for each complete survey area/data-set.

The survey methodology, report and any recommendations will comply with guidelines outlined by *English Heritage* (*Geophysical Survey in Archaeological Field Evaluation*, Research and Professional Services Guidelines No 1, compiled by A David, April 2008), the (then) *Institute for Archaeologists* (*The Use of Geophysical Techniques in Archaeological Evaluations*, IFA Paper No 6, C Gaffney, J Gater and S Ovenden, 2002) and *Standard and Guidance for Archaeological Geophysical Survey* (CIfA 2014).

5.0 Programme

The geophysical survey will start w/c 26th October 2015 and will take approximately two weeks. Normal working hours will be between 9.00am & 5.30pm.

GSB Projects Co-ordinator will liaise with Suzanne Gailey (CgMs) regarding the progress of the survey.

6.0 Resourcing

The Geophysical Surveyors will be from:

James Lawton
BSc Archaeology (Bradford University 2006)
MSc Archaeological Prospection (Bradford University 2008)
Present Position Geophysicist - GSB Prospection Ltd

Joe Perry
BA Archaeology (University of Bradford 2013)
Present Position Assistant Geophysicist - GSB Prospection

Claire Stephens
BA Ancient History & Archaeology (Manchester University 1986).
MA Scientific Methods in Archaeology (Bradford University 1992).
Present Position Geophysicist - GSB Prospection Ltd

Leanne Swinbank
BA Archaeology (University of York 2013)
Present Position Assistant Geophysicist - GSB Prospection

Kimberley Teale
BSc Archaeology and Geology (Birmingham University 2009)
Present Position Assistant Geophysicist - *GSB Prospection Ltd*

Alistair Galt
BA Archaeology (Durham Archaeology 2013)
MSc Archaeological Computing (Southampton University 2014)
Present Position Assistant Geophysicist - *GSB Prospection Ltd*

Rachel Brown
BA Archaeology (Bradford University 2015)
Present Position Assistant Geophysicist - *GSB Prospection Ltd*

Mai-Ly Dubreuil
Reading Archaeology (Bradford University)
Present Position Trainee Geophysicist - *GSB Prospection Ltd*

Dan Shiel
Education
BSc Archaeology (University of Bradford)
Present Position Geophysicist - GSB Prospection Ltd

Jon Tanner PCIfA
Education
BSc Archaeology (Bradford University 2006)
MSc Archaeological Prospection (Bradford University 2008)
Present Position Geophysicist and Projects Co-Ordinator- GSB Prospection Ltd

7.0 Equipment

Trimble R8 Real Time Kinematic (RTK) VRS Now dGPS equipment / tapes / ranging poles / optical squares / plastic survey pegs.

Bartington Grad 601-2 handheld gradiometers

CartEasyN Mk 1 multiple magnetometer cart system

Laptop and netbook computers

Mobile telephones nos. 07740 110058/059/061 (tbc)

Transport will be by car. Vehicles shall be parked in such a way so as to ensure that they do not obstruct any existing accesses, pathways or the highway. The parking of vehicles and all access to fields to be agreed in advance of the survey. One or more of the following vehicles will be used:

Mitsubishi L200: YF57 BLN or YF64XDU, or Yellow VW Transporter YG63YVR

8.0 Supervision

The survey team will report their progress daily to the Projects Co-ordinator or Director of GSB Prospection Ltd.

9.0 Environmental

Geophysical survey has little potential to effect the environment; however the following precautions will be taken:

Field gates to be secured & left in the same condition as found.
Litter to be removed from site
Noise to be kept to a minimum.

10.0 Insurance

GSB holds Public Liability Insurance & Employees Liability Insurance to a limit of £10,000,000; Professional Indemnity of £5,000,000. No claims have been made or are pending.

11.0 Archiving

GSB follows normal industry practice and maintains both hard and digital copies of all reports and survey data. All data files (survey data and grid tie-in data) are transferred to the GSB server immediately upon the return of a survey team to the office. Nightly off-site backups are made of all project work in progress. On completion of a project the entire archive is written to two CDs and held at separate off-site locations: all data is automatically backed-up nightly to a remote facility. All GSB reports include an "Archive CD" containing all report documents in both PDF and their native formats, and the reference plots. Copies of survey reports will be issued to the respective Local Authority Planning Archaeologist / HER by the client, together with all relevant archaeological documents, at the appropriate stage.

Prior to commencement of fieldwork, an OASIS reference number and a Suffolk HER event number will be obtained, and a copy of the report will be uploaded to OASIS.

GSB has advised ADS regarding geophysical archiving. GSB are committed to long-term storage of data and reports and are working towards full implementation of the '*ADS Guide to Good Practice*' (Schmidt, 2001). Our document will be updated when full implementation is achieved.

12.0 Health & Safety

It should be noted that we cannot wear or carry any metal objects whatsoever as these affect the instruments used on survey.

Several staff members are qualified First Aid representatives and at least one will be a member of the survey team for this project.

A Risk Assessment will be carried out for every project, in addition to the GSB Generic Risk Assessment. The former is in part informed by a Questionnaire sent to the client (or commissioning body) before commencement. It identifies potential hazards & the control measures required to minimize the potential for harm to our personnel. The Risk Assessment will be issued to the survey team and they will be briefed on its contents prior to the start of works. A Dynamic Risk Assessment proforma is provided with the Project Information Sheet, which all team members are required to read and sign their acknowledgment.

All GSB field personnel hold current CSCS Health & Safety Passports.

Welfare

Surveyors will make use of local amenities as there are no welfare facilities on site. The location of the nearest toilet facilities will be identified in a Project Information Sheet provide to the field team for every project, every week.

Emergency Procedures

In the event of an accident, the Geophysical survey team will follow the procedure established for the site. Any accident or near miss is to be reported as soon as possible to the Director or Office Manager, GSB Prospection Ltd. Details will be entered in GSB's Accident Book.

Several staff members are qualified First Aid representatives and at least one will be a member of the survey team for this project. A first aid kit will be carried in the vehicles & made available at all times whilst out on survey in the event of a minor injury.

The nearest accident and emergency department will be identified in a Project Information Sheet provide to the field team for every project, every week.

References

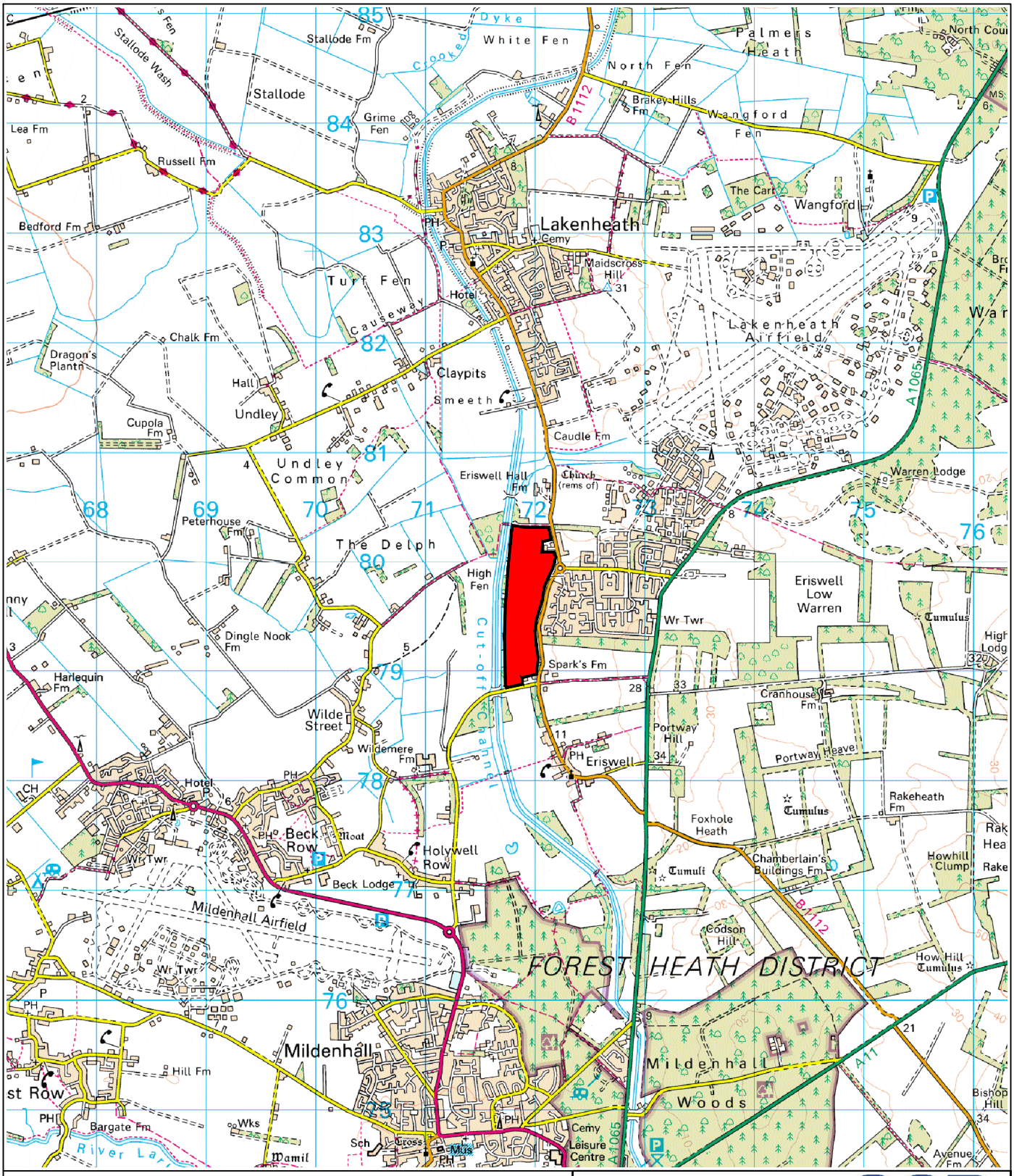
CIfA 2013	*Standard and Guidance for Archaeological Geophysical Survey. C*IfA Guidance note. Institute for Archaeology, Reading
EH 2008	*Geophysical Survey in Archaeological Field Evaluation.* English Heritage, Portsmouth.
IfA 2002	*The Use of Geophysical Techniques in Archaeological Evaluations*, IFA Paper No 6, C. Gaffney, J. Gater and S. Ovenden. Institute for Archaeology,

C

FIELDWORK RISK ASSESSMENT

Project Name: Eriswell, Suffolk					**Project No: G15131**			
Dates of survey: **26 October – 2 weeks**	**Date of Assessment: 13/10/15**				NB high number of drains shown on maps			
Level of Risk is determined by use of the calculator on the right. Risk = Likelihood multiplied by Severity	**Likelihood** 0= zero to very low 1 = very unlikely 2 = unlikely 3 = likely 4 = very likely 5 = almost certain	**Severity** 0 = no injury or illness 1 = First Aid injury or illness 2 = minor injury or illness 3 = illness or injury resulting in 3 or more days absence from work 4 = major injury or illness 5 = fatality, disabling injury etc.						
Hazards	Without control measures				With control measures			
	Possible Effect	L	S	R	Control Measures	L	S	R
Working in remote locations	Unobserved injuries or difficulties. Lack of access for emergency services. Delay in treatment of minor or moderate injuries.	2	5	10	Ensure all staff aware of location details e.g. NGR, access routes. Keep mobile phones to hand. Ascertain nearest A&E dept. All staff to stay within visual proximity of other members of the team.	0	5	0
Working in remote locations	Lack of washing facilities, hot water.	5	3	15	See 'contaminated land' below. Use portable water supply and soap. If not pos, use hand wash	0	3	0
Travel in vehicles	Collision/accident	2	5	10	Ensure vehicle serviced and maintained. Check tyre pressures, oil and water levels. Rotate driver/ensure adequate rest periods. Wear seatbelts. Do not overload vehicle or obstruct driver's view.	0	5	0
Exiting vehicles parked roadside	Severe injury/fatality from collision with passing vehicles	3	5	15	Selecting parking places carefully, park off road, avoid roadside if pos. Look carefully before opening doors. Wear high vis clothing. Use look-outs in unavoidable situations.	0	5	0
Lone working	Unobserved injury or difficulties	2	5	10	Avoid: try to work within sight of another person. If unavoidable, wear high vis clothing and carry mobile phone, set time to return.	0	5	0
Access to survey areas	Injury, tetanus infection from barbed wire fence, trauma injuries jumping ditches etc.	3	3	9	Ascertain access prior to survey. Only use proper access routes, gates etc.	0	3	0
Lightning strike	Severe injury/fatality	1	5	5	Get into vehicle if poss, crouch down if not. Do not work in thunderous conditions.	0	5	0
Wet and cold weather	Hypothermia	3	5	15	Appropriate clothing: layers, waterproofs, hat. Take spare dry clothing. Use weather forecast	0	5	0
Hot weather	Sunburn, dehydration	4	3	12	Appropriate clothing; cover bare skin, wide brimmed hat. Use sun cream. Ensure sufficient water available. Use weather forecast	0	3	0
Survey, grid setting out.	Trip hazards – pegs, tapes, ropes. Impaling injuries on pegs.	2	4	8	Use high-vis plastic pegs. Minimise point-up use, remove if public present. Remove as soon as possible.	0	4	0

Agricultural equipment	Collision or accident with machinery	2	5	10	Liaise with farmer/landowner. Do not work in fields where machinery is in use. Stay clear of machinery.	0	5	0
Farm animals	Kicking, biting, goring	1	4	4	Liaise with farmer/landowner. Ensure livestock removed from fields. Do not work in fields with large animals present. `	0	4	0
Rivers, streams, ponds	Drowning, Weil's disease	2	5	10	Ascertain presence of rivers, streams and ponds and avoid.	0	5	0
Insects	Lyme's disease	2	4	8	Wear long sleeved garments. Long trousers tucked in. Be aware of symptoms.	0	4	0
Insects	Stings, bites, allergies	3	3	9	Clothing – as above. Record details of any persons with allergies. Ensure anti-histamine and bite cream available.	0	3	0
Animal burrows	Trip hazard	3	3	9	Take great care when walking. Mark known or observed holes.	0	3	0
Slipping	Slip hazard	2	1	2	Wear appropriate footwear. Avoid steep or muddy slopes, especially wet grass.	0	1	0
Deep Ploughed / Freshly ploughed ground	***Tripping, ankle and leg injuries***	***3***	***3***	***9***	***Assess ground conditions before survey. Do not work in unsuitable conditions. (Freshly ploughed & deep ploughed ground is unsuitable for survey because the operator has to hold the instruments vertically whilst walking at a steady/regular pace & observing the instruments LCD. This cannot be achieved if there is a trip hazard or risk of turning an ankle on "rutted" ground.***	**0**	**3**	**0**
Uneven ground	Tripping, ankle and leg injuries	3	3	9	Assess ground conditions before survey. Do not work in unsuitable conditions. Set instruments to speed appropriate for conditions	0	3	0
Contaminated land	Inhalation or ingestion of harmful substances. Poisoning, allergies, skin complaints from fertilizers, insecticides etc	3	5	15	Liaise with farmer/landowner. Do not work in or adjacent to fields where fertilizers or insecticides are in use or have recently been used.	0	5	0
Contaminated land	Poisoning, allergies, skin complaints from industrial or other contaminants	2	5	10	Obtain assurances before survey. Stop work immediately upon suspicion of contamination	0	5	0
Contaminated land	Wild, farm or domestic animals (dogs etc) urine and faeces	2	4	8	Wear gloves, maintain observation. Wash hands before eating, do not touch face when working	0	4	0
Overhanging branches	Cuts, impaling	1	3	3	Do not survey below low trees and bushes	0	3	0
Overhanging power cables	Electrocution	2	5	10	Asses site for presence of power cables. Do not carry long equipment (staff, ranging rods etc) or zero mag sus coils in vicinity of overhead cables.	0	5	0
Plants, vegetation	Stinging, poisoning, allergies	2	3	6	Avoid any unrecognised plants. Wear gloves and long sleeved garments, long trousers.	0	3	0
Carrying heavy equipment	Back injury etc	2	3	6	Follow standard procedures	0	3	0
Magnetometer survey	Back strain, repetitive strain injury	3	3	9	Ensure harness comfortable. Wear gloves if hand strain experienced. Cease survey if back pain experienced.	0	3	0



N

0 metres 2000

1:50,000 @ A4

Site Location

GSB Prospection Ltd
Cowburn Farm, 21 Market Street
Thornton
Bradford
BD13 3HW
+44 (0)1274 835016

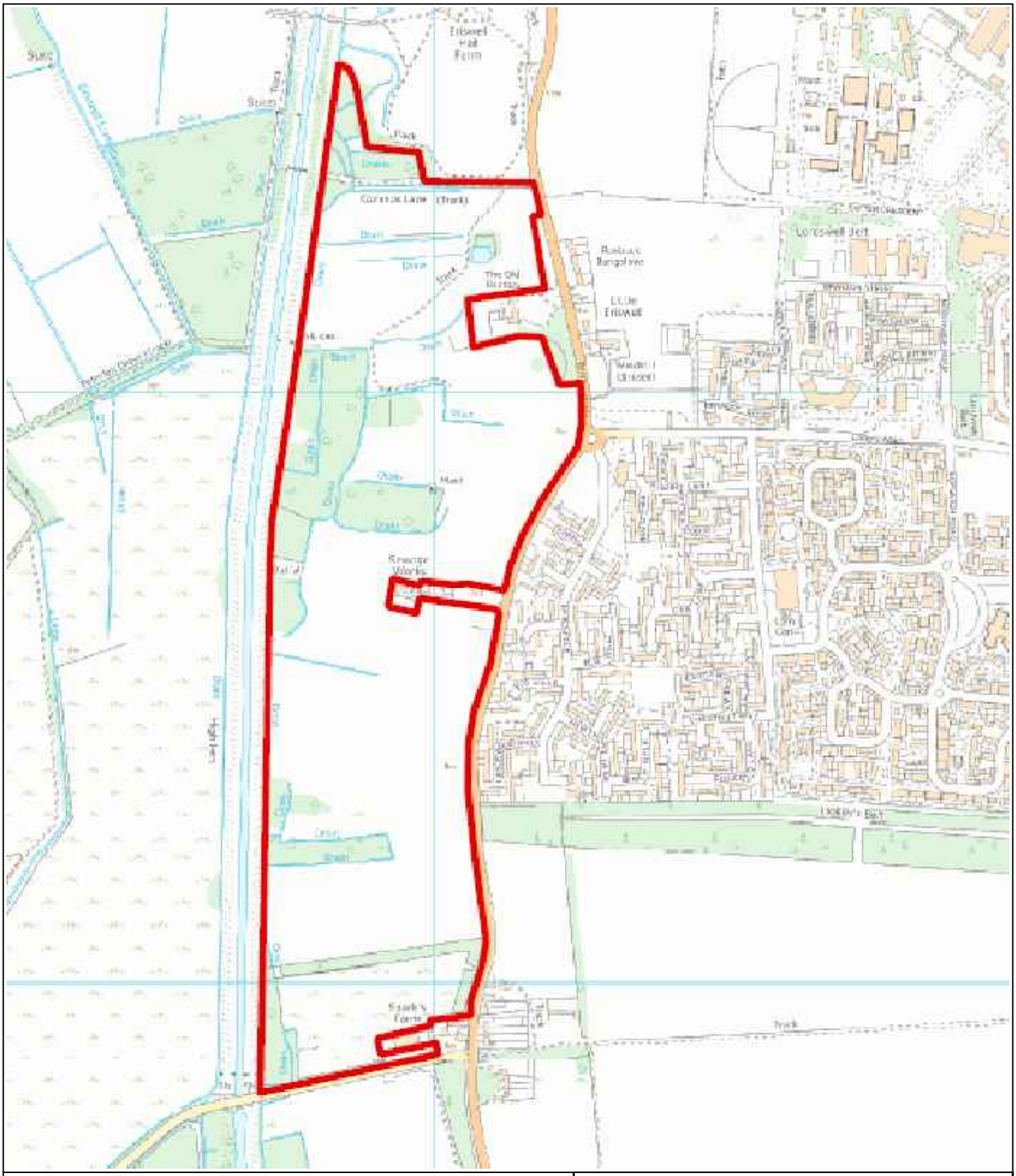
GSB PROSPECTION Ltd

Project: G15131 Land at Little Eriswell

Title: Site Location Diagram

Drawn by: JMT

Figure 1



N

Magnetometer Survey Area

GSB Prospection Ltd
Cowburn Farm, 21 Market Street
Thornton
Bradford
BD13 3HW
+44 (0)1274 835016

Project: G15131 Land at Little Eriswell

Title: Site Location of Survey Area

Drawn by: JMT

Figure 2

GSB PROSPECTION Ltd

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