GEOPHYSICAL SURVEY REPORT G1324

Land to the West of Whalley Road, Barrow, Lancashire

Client:

GSB PROSPECTION Ltd

Celebrating over 25 years at the forefront of Archaeological Geophysics

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CgMs CONSULTING

GSB Survey Report No. G1324

Land to the West of Whalley Road, Barrow, Lancashire

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Survey Personnel

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Report Author: Graeme Attwood MSc

Project Assistants: Emma Watson BSc, Finnegan Pope-Carter BSc Msc

Dates

Fieldwork: 11 - 13 March 2013
Report: 2 April 2013

Report Approved: Dr John Gater MIfA FSA

Background Project Details

NGR	SD 735 383
Location	The site lies approximately 12km northeast of Blackburn and 12km northwest of Burnley, 1km west of the A59 and to the immediate east of Whalley Road south of Barrow.
HER/SMR	Lancashire HER
District	Ribble Valley District (B)
Parish	Wiswell CP
Topography	Flat
Current Land Use	Pasture
Soils	Brickfield 3 (713g): Slowly permeable seasonally waterlogged fine loamy, fine loamy over clayey and clayey soils. (SSEW 1983)
Geology	Bedrock - Clitheroe Limestone Formation And Hodder Mudstone Formation (Undifferentiated) - Mudstone Superficial - Till, Devensian - Diamicton (BGS 2013)
Archaeology	The Desk-Based Assessment prepared by CgMs (2012) provides a thorough account of the archaeological context of the site and should be referred to for a detailed account of the site's historical development.
Survey Methods	Detailed magnetometer survey (fluxgate gradiometer)
Study Area	*c.* 18 ha

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 Consulting.**

Summary of Results

The survey at Barrow successfully detected both mapped and unmapped old-field boundaries; associated former ridge and furrow regimes were also identified. Ferrous anomalies were detected across the survey area relating to pipes, ferrous debris, farm outbuildings, fences and gates.

No responses of archaeological interest were identified.

Method

All survey grid positioning was carried out using Trimble R8 Real Time Kinematic (RTK) VRS Now equipment. The geophysical survey areas are georeferenced relative to the Ordnance Survey National Grid by tying in to local detail and corrected to the site survey plan provided by the client. These tie-ins are presented in Figure T1. 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 guidelines (EH 2008).

Data Processing

Data processing was performed as appropriate using both an in-house software package as outlined below.

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

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 so (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

Site conditions were generally good, areas to the north and southwest corner of Area 1 were unsurveable, being deeply rutted. An area between areas 1 and 2 was in use as allotments and therefore unavailable for survey. Finally a small area to the north of area 2 was unsuitable for survey as it contained numerous man-hole covers and was surrounded by wire fences.

1.0 Survey Results - Magnetometer Survey

Archaeology / ?Archaeology

1.1 There where no anomalies of an archaeological nature nor any that had any potential to be of an archaeological origin.

Uncertain Origin

1.2 A number of discrete anomalies and linear-trends have been identified across all survey areas; while these are most likely due to slight magnetic changes within the soils, the slight possibility of an archaeological origin cannot be ruled entirely.

Agricultural

1.3 Three parallel old-field boundaries have been identified in Area 1 on a northeast-southwest alignment. Evidence of these boundaries appear on the historic mapping (OS 2013).

1.4 Area 1 also contains evidence of historic agricultural regimes in the form of Ridge and Furrow; these have been detected on two alignments. Ridge and furrow is also in evidence in Area 5.

1.5 Trends attributed to more recent ploughing have also been identified.

Natural and Ferrous

1.6 A pipe has been detected running through areas 1,3 and 5. A second pipe has been identified at the eastern end of fields 2, 3, 5, and 7, and follows the line of Whalley Road.

1.7 An area of magnetic disturbance has been detected at the western end of Area 3, this corresponds to a pond denoted on the historic mapping (OS 2013). A similar area of disturbance was detected in Area 4 and although there is no corresponding pond on the historic mapping, the similarities between the two anomalies would certainly point towards this also being a pond.

1.8 Small-scale ferrous responses, most obvious as sharp 'spikes' in the XY trace plots (see Archive CD) are typically deemed to be iron-rich debris within the topsoil and most likely to be of modern origins. The most prominent of these have been highlighted on the interpretation diagram by way of example. There are also some ferrous responses at the field edges where the survey grid came close to wire fencing.

2.0 Conclusions

2.1 No anomalies of archaeological origin have been detected throughout the survey area; some anomalies have been assigned to the *Uncertain Origin* category but these are most likely to be of an agricultural or natural origin.

2.2 Anomalies pertaining to former agricultural practices have been detected in Areas 1 and 5, in the form of old-field boundaries and ridge and furrow. Two probable former ponds where also identified.

References

BGS 2013	British Geological Survey, Geology of Britain Viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html 1:50,000 scale geology, centred on 373510,438126. Accessed 28/03/2013
CgMs 2012	*Land to the west of Whalley Road, Barrow, Lancashire.* Unpublished Desk Based Assessment.
EH 2008	*Geophysical Survey in Archaeological Field Evaluation.* English Heritage, Portsmouth.
OS 2013	http://www.old-maps.co.uk 1893, 1912, 1932 1:2500, Lancashire and Furness, centred on 373510,438126. Accessed 25/03/2013
SSEW 1983	*Soils of England and Wales. Sheet 1, Northern England*. Soil Survey of England and Wales, Harpenden.

N

0 metres 2000

1:50,000 @ A4

Site Location

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SUMO

Project: G1324 Land to the west of Whalley Road, Barrow, Lancashire

Title: Site Location Diagram

Drawn by: JMT

Figure 1

N

0 metres 100

1:2500 @ A3

Detailed Magnetometer Survey

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Project: G1324 Land to the west of Whalley Road, Barrow, Lancashire

Title: Location of Survey Areas

Drawn by: JMT

Figure 2

N

0 metres 80

1:2000 @ A3

2
nT
-1

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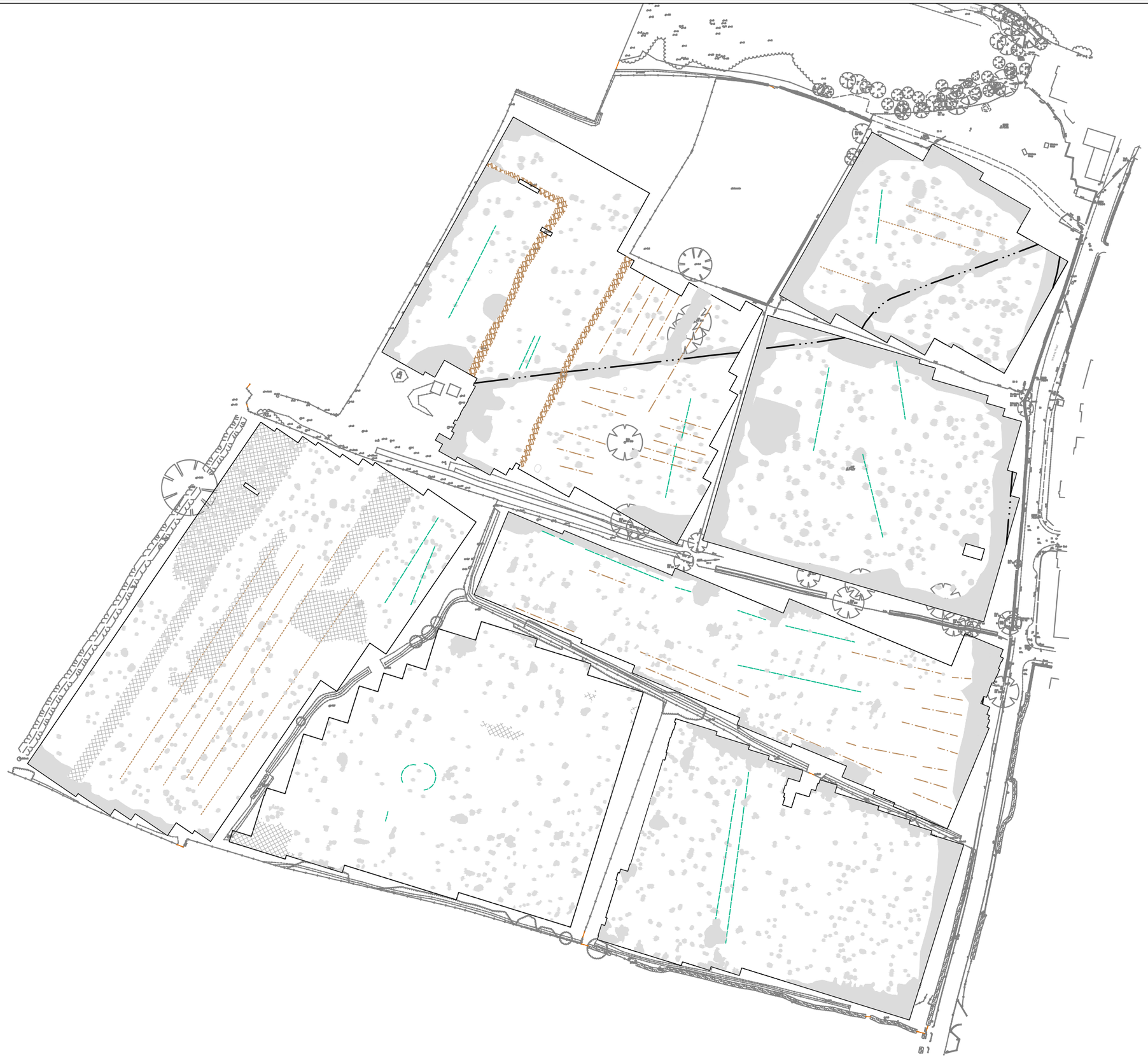
Project:	G1324 Land to the west of Whalley Road, Barrow, Lancashire
Title:	Magnetometer Survey [Areas 1 to 7] - Greyscale Plots

Drawn by: JMT

Figure 3



N

0 metres 80

1:2000 @ A3

- Uncertain Origin
- Old Field Boundary
- ?Ridge and Furrow
- Ploughing
- Pipe
- Magnetic Distubance/Ferrous

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Project: G1324 Land to the west of Whalley Road, Barrow, Lancashire

Title: Magnetometer Survey [Areas 1 to 7] - Interpretation

Drawn by: EW

Figure 4

Appendix - Technical Information: Magnetometer Survey

Instrumentation: Geoscan FM36/256 and Bartington *Grad*601-2

Both the Geoscan and Bartington instruments operate in a gradiometer configuration which comprises two fluxgate sensors mounted vertically a set distance apart; on the Geoscan instruments this is 0.5m, on the Bartington, 1m. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried by hand, 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. Having two gradiometer units mounted laterally with a separation of 1000mm, the Bartington instrument can collect two lines of data per traverse.

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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