GEOPHYSICAL SURVEY REPORT G1438

Ightenhill Manor House
Burnley

Client:

Ightenhill Parish Council

GSB PROSPECTION Ltd

Celebrating over 25 years
at the forefront of
Archaeological Geophysics

sumo Survey Services

GSB Survey Report No. G1438

Ightenhill Manor House

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Survey Personnel

Field Co-ordinator: James Lawton BSc MSc

Report Author: Emma Brunning BSc MIfA

Project Assistants: Joe Perry BA

Dates

Fieldwork: 2 - 5 June 2014
Report: 10 July 2014

Report Approved: Dr John Gater MIfA FSA

Background Project Details

NGR	SD 818 340
Location	Site is located approximately 3km to the northwest of Burnley within a field north of Manor House and east of Top o' th' Close Farm.
HER/SMR	Lancashire
District	Burnley
Parish	Ightenhill
Topography	Hilltop
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 geology consists of the Pennine lower coal measures formation – sandstone. No superficial deposits have been recorded (BGS 2014).
Archaeology	Ightenhill Manor was a medieval manor house that was in ruins by the 16th century. Ightenhill is first mentioned in a charter by John de Lacy to Monk Bretton Priory dated 1238. To the north of the manor house lie the foundations of a possible chapel and to the west a D-shaped enclosure (LCAS 2014).
Survey Methods	Detailed magnetometer survey (fluxgate gradiometer) and earth resistance.
Study Area	1ha

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 **Ightenhill Parish Council**.

Summary of Results

Anomalies associated with Ightenhill Manor House have been detected in both the magnetic and resistance techniques; unfortunately there is no clear pattern of wall foundations. Anomalies have also been detected associated with the D-shaped earthworks in the magnetic data. The location of the possible chapel has been recorded in the resistance data. The trackway associated with the coal pits has also been located.

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 Mastermap. 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
Resistance	Geoscan Research RM85 (0.5m twin array)	1m	1m

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 in-house and commercial software packages (GeoSuB and Geoplot) as outlined below.

Magnetic Data

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

Resistance Data

Despike, High Pass Filter, Interpolation (on both X & Y axes).

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

The site cover consisted of long pasture with nettles and was on a hilltop. At the time of survey the weather was rain showers.

1.0 Survey Results - Magnetometer Survey

1.1 A number of responses have been detected that are likely to be associated with the manor remains and correspond to the site of the house as depicted on the first edition Ordnance Survey map dated 1848 (LHER 2014). Some of these anomalies match the resistance data (see Paragraph 2.1 below).

1.2 To the north of the manor house a group of discrete anomalies and an area of increased response are situated within and surrounding the 'D shaped' earthwork. These responses are likely to be associated with demolition, including burnt materials.

1.3 A linear response running on a southeast to northwest alignment relates to the remains of a trackway, shown on the 1848 map. The trackway is associated with coal pits (LHER 2014).

1.4 Responses that have been interpreted as *Uncertain Origin* may be associated with the manor house but are equally likely to be of a topographical nature due to the slopes of the site.

1.5 Ferrous responses surround the survey area which are due to metal fencing. Smaller scale responses are due to iron debris within the topsoil or on the surface and are best seen in the XY trace plot which can be found on the Archive CD.

2.0 Survey Results - Resistance Survey

2.1 Areas of high resistance in the southern section of the data relate to the manor house and possible spreads of demolition rubble. No definite wall foundations can be seen, even when the data are filtered.

2.2 In the north of the data an area of high resistance *?Archaeology* is in the approximate position of the possible chapel; again, no defining wall lines can be seen, but there is a hint of an east – west alignment in the response.

2.3 The trackway, as clearly seen in the magnetic data, is only just discernable as a strip of slightly higher resistance values. The rubble spread from the manor house is masking the majority of track response.

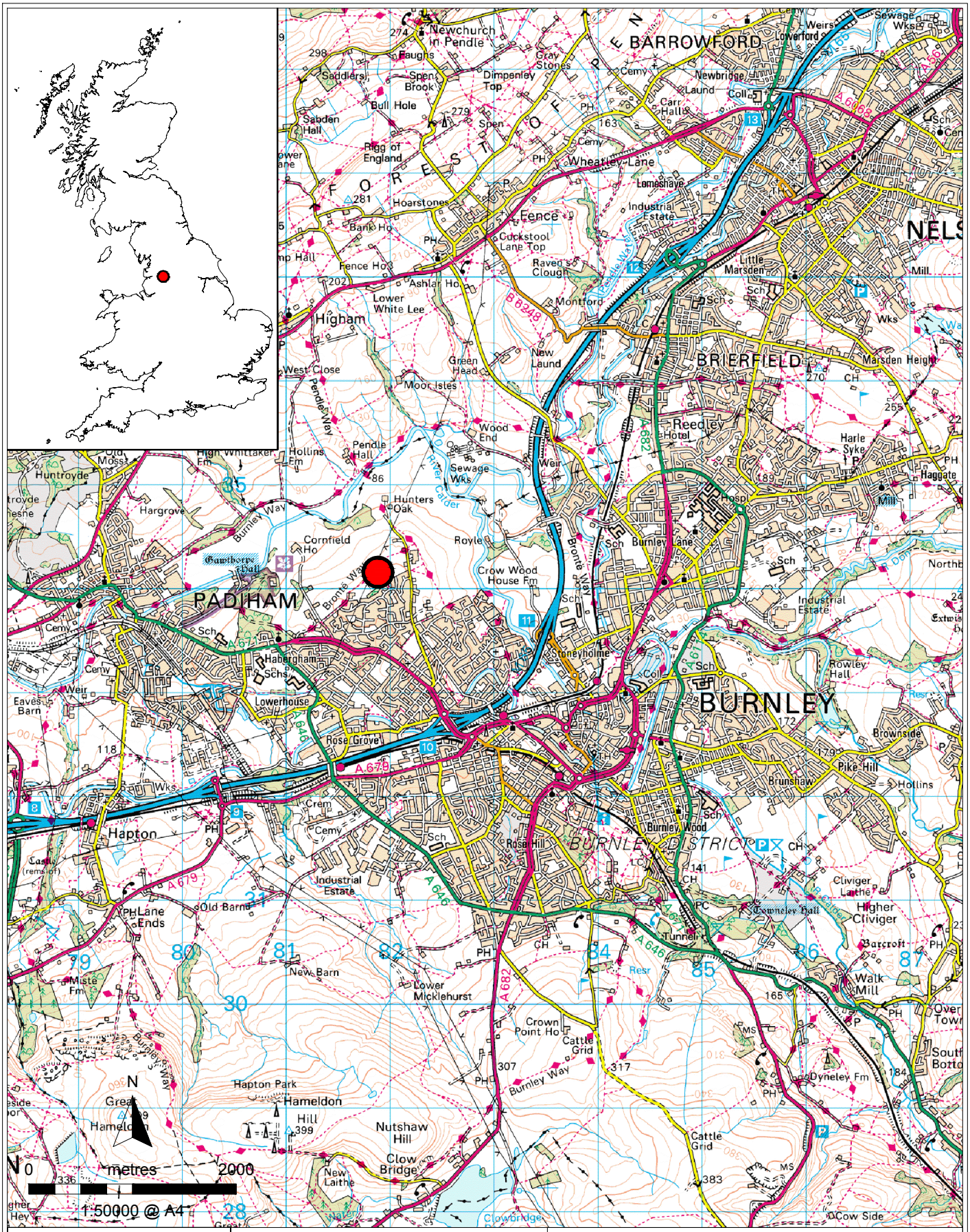
2.4 A zone of low resistance in the east of the survey area is likely to be due to the topography of the field.

3.0 Conclusions

3.1 Both the magnetic and resistance data have detected anomalies associated with Ightenhill Manor House; unfortunately there is no clear pattern of wall foundations. The magnetic data also shows anomalies associated with the D-shaped enclosure, whilst the resistance data shows the possibility of the chapel. A trackway associated with the coal pits has also been located.

References

BGS 2014	British Geological Survey, Geology of Britain Viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html 1:50,000 scale geology, centred on 381800, 434000. Accessed 09/07/2014.
EH 2008	*Geophysical Survey in Archaeological Field Evaluation.* English Heritage, Portsmouth.
LCAS 2014	Lancashire County Archaeology Service Monument Full Report. *SMR Number PRN262 – MLA262, Ightenhill Manor.* Dated 07/05/2014.
LHER	Lancashire Historic Environment Record. *Extract from the OS first edition mapping. Sheet – Lancs 56. Published 1848, surveyed 1844.*
SSEW 1983	*Soils of England and Wales. Sheet 1, Northern England.* Soil Survey of England and Wales, Harpenden.



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SUMO

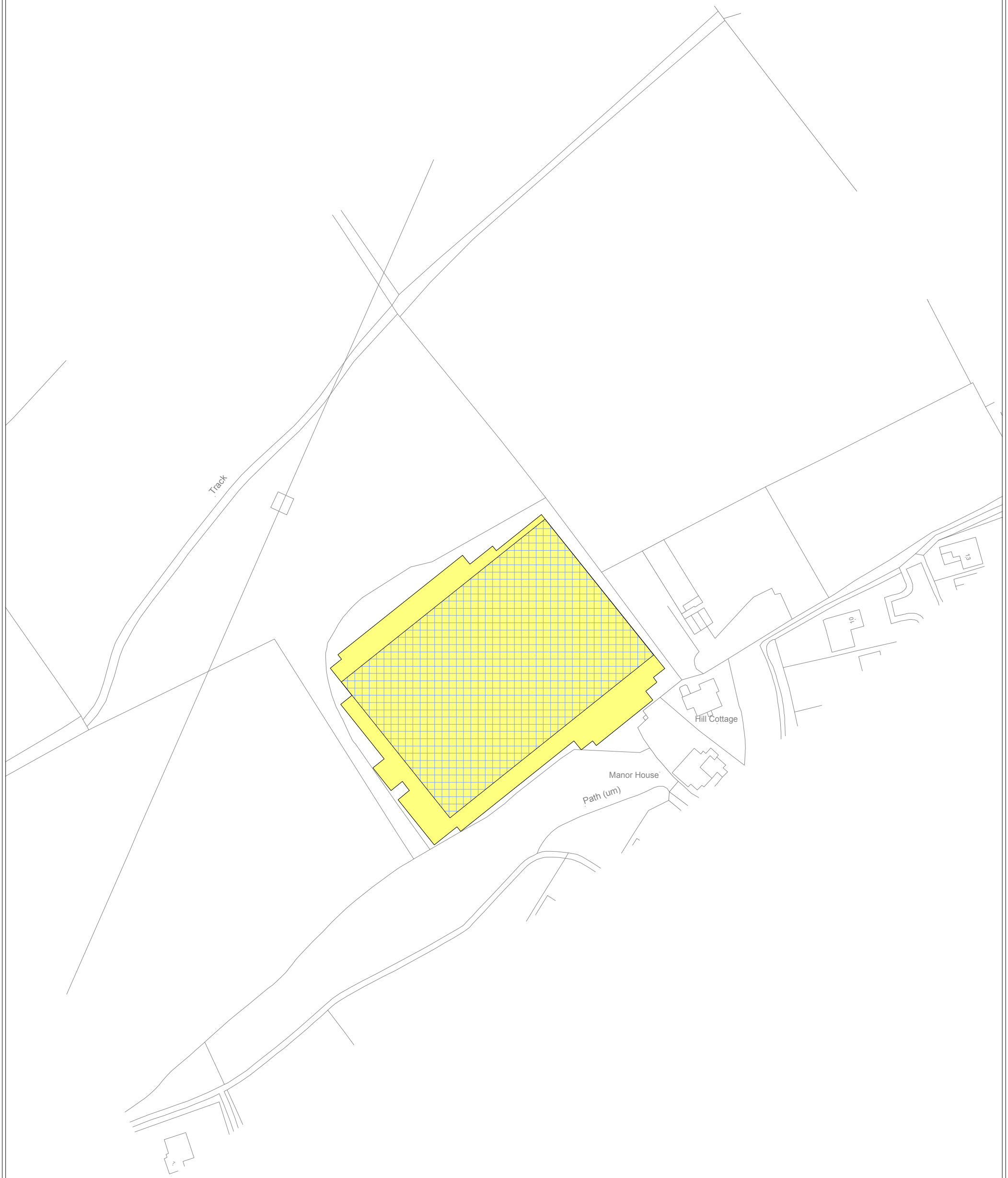
Site Location

Project: G1438 Ightenhill Manor House

Title: Site Location

Drawn by: ELBrunning

Figure 1



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N

0 metres 50

1:1250 @ A3

Gradiometer Survey

Resistance Survey

Project: G1438 Ightenhill Manor House

Title: Location of Survey Areas

Drawn by: ELBrunning

Figure 2

Track

Hill Cottage

Manor House

Path (um)

2
nT
-1

Track

Ightenhill Manor House
(site of)

Hill Cottage

Manor House

Path (um)

N

0 metres 40

1:1000 @ A3

Manor Remains

?Archaeology (discrete anomaly / increased response)

Track

Uncertain Origin (discrete anomaly / trend)

Ferrous

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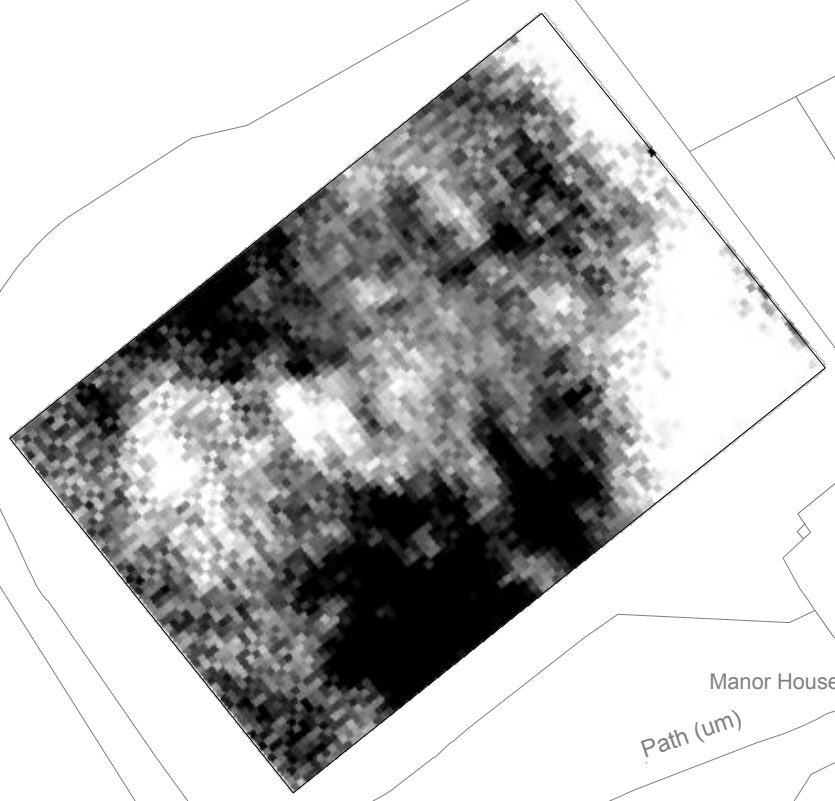
Project: G1438 Ightenhill Manor House

Title: Magnetometer Survey - Greyscale Plot and Interpretation

Drawn by: ELBrunning

Figure 3

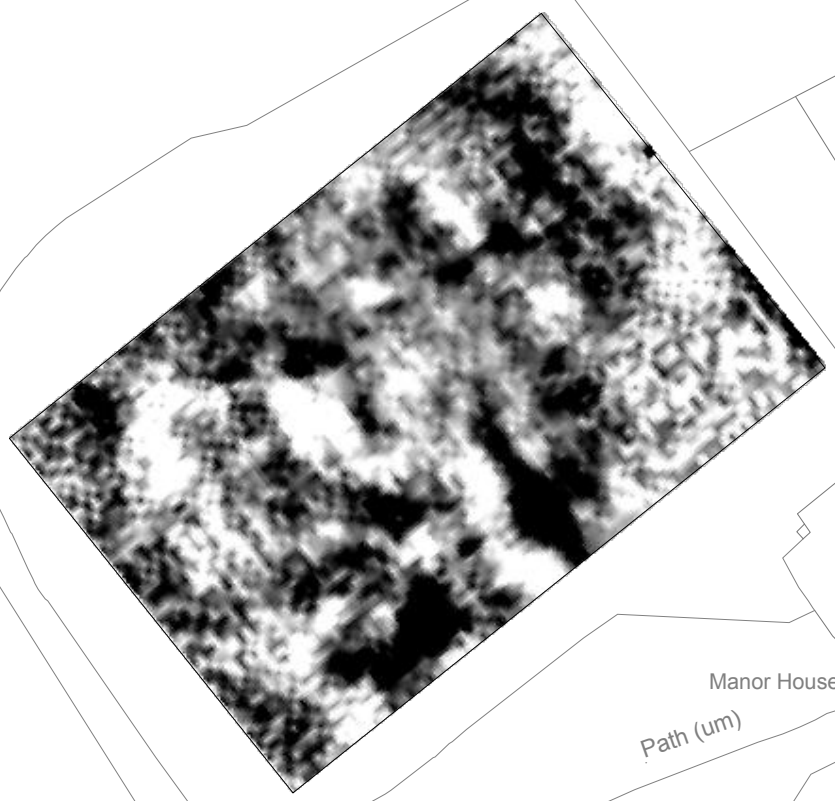
Raw Data



90
ohms
50

Manor House
Path (um)

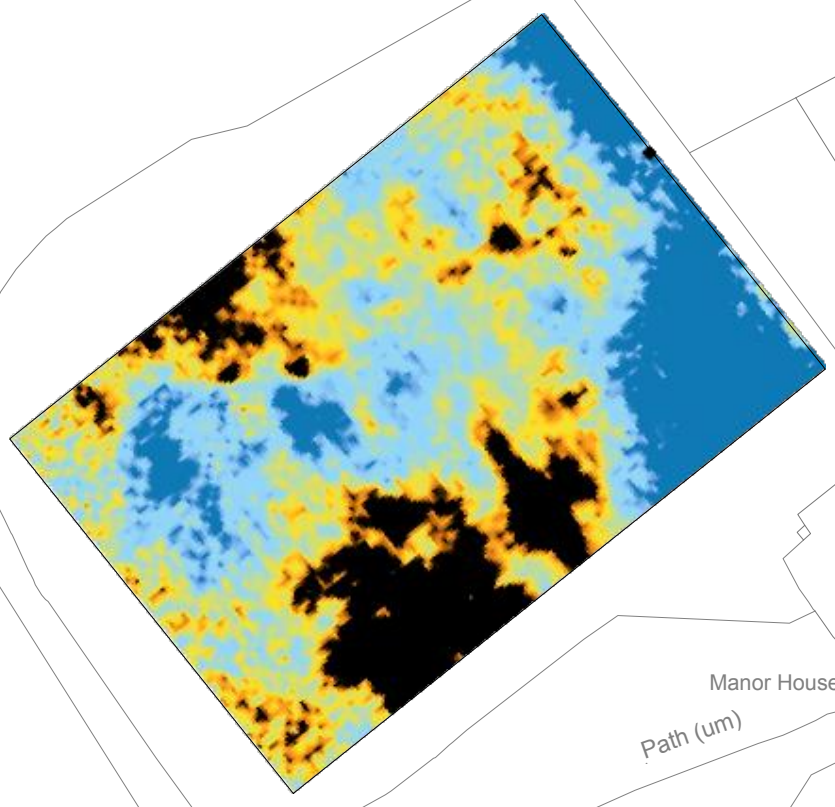
High Pass Filtered Data



1
SD
-1

Manor House
Path (um)

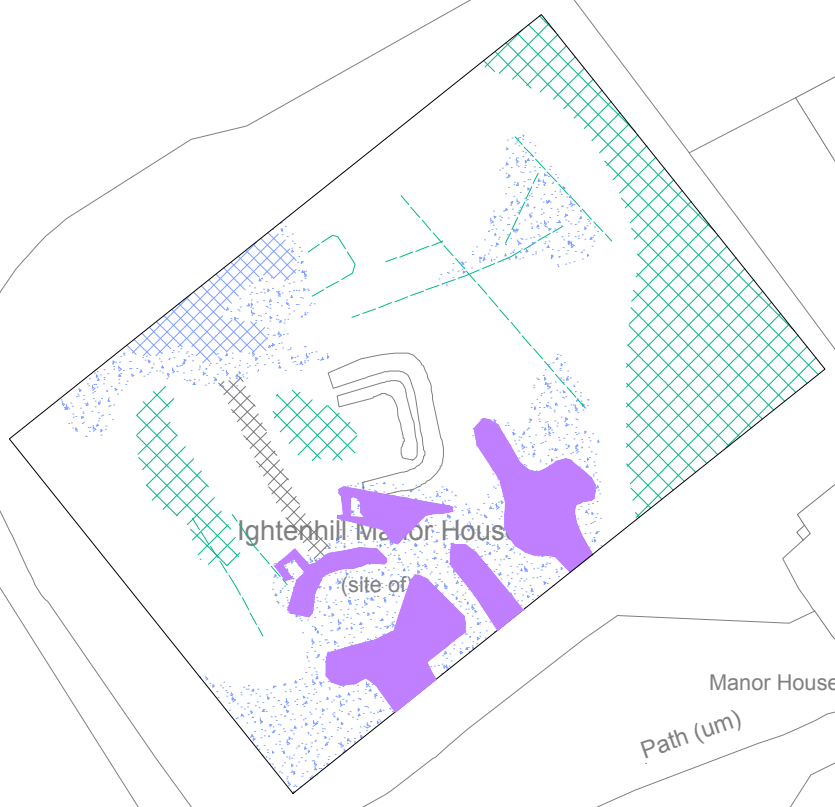
Interpolated Data



1
SD
-1

Manor House
Path (um)

Interpretation



Manor House
Path (um)

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N

0 metres 40

1:1000 @ A3

Manor Remains (high resistance - rubble spread)

?Archaeology (?chapel / zone)

Track

Uncertain Origin (low resistance / trend)

Project: G1438 Ightenhill Manor House

Title: Resistance Survey - Image Plots and Interpretation

Drawn by: ELBrunning

Figure 4

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).

Appendix - Technical Information: Resistance Survey

Instrumentation Geoscan RM85 resistance meter

This instrument 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 most common arrangement is the Twin Probe configuration which involves two pairs of electrodes (one current and one potential): one pair remain in a fixed position, whilst the other measures the resistance variations across a grid. The resistance is measured in ohms and, when calculated, resistivity is in ohm-metres. The resistance method as used for standard area survey employs a probe separation of 0.5m, which samples to a depth of approximately 0.75m. The nature of the overburden and underlying geology will cause variations in this depth.

Data Processing

Despike	In resistance survey, spurious readings can occasionally occur, usually due to a poor contact of the probes with the surface. This process removes the spurious readings, replacing them with values calculated by taking the mean and standard deviation of surrounding data points.
Grid Edge Match	If a twin probe survey is carried out over several sessions it is not always possible to position the remote probes to adequately compensate for broad changes in ground moisture. This can give rise to distinct edges between adjacent grids where data have been collected at different times. The grid edge match function removes these discontinuities.
High Pass Filter	Carried out over a whole resistance data-set, the filter removes low frequency, large scale spatial detail, such as that produced by broad geological changes. The result is to enhance the visibility of the smaller scale archaeological anomalies that are otherwise hidden within the broad ‘background’ change in resistance.
Low Pass Filter	This process removes high frequency, small scale spatial detail, making it useful for smoothing data or enhancing larger weaker features. It can be applied across a whole data-set or limited to a specific area.
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

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.
Relief Plot	This is a method of display that creates a three dimensional effect by directing an imaginary light source on a given data-set. Particular elements of the results are highlighted depending on the angle of strike of the light source. This display method is particularly useful when applied to resistance data to highlight subtle changes in resistance that might otherwise be obscured.

Interpretation Categories

Wall / Foundation / Drain / Bank	These are (usually) high resistance anomalies forming patterns that clearly indicate that they represent some type of structural remains and there is evidence for such features from other sources (documentary, cropmarks etc).
?Wall / ?Foundation / ?Drain / ?Bank	Other evidence (documentary, cropmarks, other geophysics results etc.) suggests the presence of structural remains but the resistance anomalies themselves are weak, poorly defined and / or form incomplete patterns, thereby reducing confidence in the interpretation. (For example: there is an expectation of a building at a known site; some resistance anomalies are present which clearly indicate wall lines of part of the building but these 'fade out' and become indistinct. The indistinct responses will be classified as ?Wall etc.)
Ditch	These are (usually) low resistance anomalies forming patterns that clearly indicate that they represent some type of archaeological ditch feature (as opposed to drainage ditches or similar) and there is evidence for such features from other sources (documentary, cropmarks etc).
?Ditch	As with the ?Wall category above, a reduced confidence is applied when the response becomes indistinct and / or the pattern is fragmentary.
Archaeology (High/Low Resistance)	Well-defined anomalies forming patterns that indicate archaeology but where no supporting evidence exists. The anomalies are sub-categorised into high and low resistance.
?Archaeology (High/Low Resistance)	Weak / poorly defined anomalies forming incomplete patterns that suggest archaeology might be present. No supporting evidence exists. This is the least confident of the archaeological interpretations.
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 (High/Low Resistance)	These are anomalies (often broad zones of higher or lower resistance) that are probably natural in origin; either caused by the underlying geology, or localised natural variations in soil moisture.
Landscaping / Topography	An interpretation assigned when the topography or other evidence suggests these factors might be responsible.
Modern (High/Low Resistance)	Anomalies which can be directly attributed to known modern features.
Uncertain Origin (High/Low Resistance)	Anomalies which stand out from the background yet show little to suggest an exact origin. Either archaeological, natural or modern factors may be responsible, but it has not been possible to determine the most likely cause. The anomalies are sub-categorised into high and low resistance.

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English Heritage Geophysical Survey Database Questionnaire

Survey Details

Name of Site: Ightenhill Manor House

County: Lancashire

NGR Grid Reference (Centre of survey to nearest 100m): **SD 818 340**

Start Date: 02/06/14 **End Date: 05/06/14**

Geology at site (Drift and Solid): **Pennine lower coal measures**

Known archaeological Sites/Monuments covered by the survey
(Scheduled Monument No. or National Archaeological Record No. if known)

Ightenhill Manor House – monument number - 1005100

Archaeological Sites/Monument types detected by survey
(Type and Period if known. "?" where any doubt).

Medieval manor house
Trackway ?

Surveyor (Organisation, if applicable, otherwise individual responsible for the survey):

GSB Prospection Ltd

Name of Client, if any:

Ms Irene Hardy

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Purpose of Survey:

To locate any remains associated with the manor house.

Location of:

a) Primary archive, i.e. raw data, electronic archive etc:

GSB Prospection Ltd, Cowburn Farm, 21 Market Street, Thornton, BD13 3HW

b) Full Report:

GSB Prospection Ltd, Cowburn Farm, 21 Market Street, Thornton, BD13 3HW

Ms Irene Hardy, Burnley, Pendle & Rossendal Council for Voluntary Service

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Technical Details

(Please fill out a separate sheet for each survey technique used)

Type of Survey (Use term from attached list or specify other):

Magnetometer

Area Surveyed, if applicable (In hectares to one decimal place):

1ha

Traverse Separation, if regular: **Reading/Sample Interval:**

1m **0.25m**

Type, Make and model of Instrumentation:

Bartington Grad 601-2

For Resistivity Survey:

Probe configuration:

Probe Spacing:

Land use at the time of the survey (Use term/terms from the attached list or specify other):

Pasture

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Technical Details

(Please fill out a separate sheet for each survey technique used)

Type of Survey (Use term from attached list or specify other):

Resistivity

Area Surveyed, if applicable (In hectares to one decimal place):

0.8ha

Traverse Separation, if regular: **Reading/Sample Interval:**

1m **1m**

Type, Make and model of Instrumentation:

Geoscan RM85

For Resistivity Survey:

Probe configuration: twin

Probe Spacing: 0.5m

Land use at the time of the survey (Use term/terms from the attached list or specify other):

Pasture

GSB

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forefront of archaeological geophysics

sumo Survey Services

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