STRATASCAN

Interim Report on a geophysical survey at

Bungay Road, Poringland, Norfolk

for

Archaeological Solutions Ltd

December 2011

Job ref. 3009

Bryony P Marsh BA

Document Title: **Geophysical Survey Report**
Bungay Road, Poringland, Norfolk

Client: **Archaeological Solutions Ltd**

Stratascan Job No: **J3009**

Techniques: **Detailed magnetic gradiometry and earth resistance**

National Grid Ref: **TG 2584 0374**

Plate 1: The survey area viewed from the centre, looking north west.

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Figure 1	1:25 000	General location plan
Figure 2	1:1000	Site plan showing location of grids and referencing
Figure 3	1:1000	Plot of raw gradiometer data in greyscale and colour plots
Figure 4	1:1000	Plot of processed gradiometer data and abstraction and interpretation of gradiometer anomalies
Figure 5	1:1250	Plot of raw and processed earth resistance data
Figure 6	1:1250	Abstraction and interpretation of earth resistance anomalies and abstraction plot of cropmarks identified through aerial photography
Figure 7	1:1250	Combined abstraction and interpretation of magnetometer & earth resistance anomalies

1 SUMMARY OF RESULTS

A magnetic gradiometer survey was carried out over approximately 2.7ha of agricultural land in Poringland, Norfolk. The data collected has identified a scattering of discrete positive anomalies indicative of former cut features such as pits evident across the site. Also noted are negative linear responses probably of agricultural origin and possible thermoremanent features which may be of archaeological interest. A weak linear trend is also seen in the north of the site and is of uncertain origin.

Earth resistance data was also collected over the north of the survey area and has identified a series of low resistance anomalies indicative of former cut features of probable archaeological origin which correlate with the location of cropmarks identified though aerial photography. Also noted is a zone of high resistance possibly indicating areas of compacted ground and a region of low resistance in the south which is probably of geological origin.

Earth resistance data collected from the south of the site will be included in the final report.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by Archaeological Solutions Ltd.

2.2 Site location

The site is located to the west of Bungay Road, Poringland, Norfolk at OS NGR TG 2584 0374.

2.3 Description of site

The site consists of approximately 2.7ha of agricultural land. An area in the east has been divided from the main site by a bank and is currently in use as a car park and storage area. At the time of survey, a dense, knee high crop was present across much of the site which hampered data collection and affected its quality.


Plate 2 & 3: The car park area in the east of the site, viewed from the south (left) and the site viewed from the north west, looking south east (right).

The underlying geology is Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation and Culver Chalk Formation (British Geological Survey website). The drift geology is Lowestoft Formation – Diamicton. The overlying soils are known as Beccles 1, which are typical Stagnogley soils. These consist of slowly permeable seasonally waterlogged fine loamy over clayey soils (Soil Survey of England and Wales, Sheet 4 Eastern England).

2.4 Site history and archaeological potential

The following is taken from the 'Brief for Archaeological Evaluation by Geophysical Survey at Land at Bungay Road, Poringland' Prepared by Wayne Arnold, Assistant Archaeologist (Planning), Norfolk County Council.

The development proposal affects a site at which cropmarks of undated and Roman boundary ditches and a possible Roman road have previously been recorded. Consequently there is a high potential that important heritage assets with archaeological interest are present at the site and that their significance would be adversely affected by the development.

2.5 Survey objectives

The objective of the survey was to locate any anomalies that may be of archaeological significance prior to trenching.

2.6 Survey methods

A combined approach of both magnetic gradiometry and earth resistance techniques was selected as the most efficient and effective methodology for this site.

More information regarding these techniques is included in the Methodology section below.

3 METHODOLOGY

3.1 Date of fieldwork

The fieldwork was carried out over five days from 21st November 2011 when the weather was wet.

3.2 Grid locations

The location of the survey grids has been plotted in Figure 2 together with the referencing information. Grids were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site.

3.3 Description of techniques and equipment configurations

Gradiometer
Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTesla (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The instrument consists of two fluxgates very accurately aligned to nullify the effects of the Earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each gradiometer has a 1m separation between the sensing elements so enhancing the response to weak anomalies.

Earth resistance
This method relies on the relative inability of soils (and objects within the soil) to conduct an electrical current which is passed through them. As earth resistance is linked to moisture content, and therefore porosity, hard dense features such as rock will give a relatively high earth resistance response, while features such as a ditch which retains moisture give a relatively low response
The resistance meter used was an RM15 manufactured by Geoscan Research incorporating a mobile Twin Probe Array. The Twin Probes are separated by 0.5m and the associated remote probes were positioned approximately 15m outside the grid. The

instrument uses an automatic data logger which permits the data to be recorded as the survey progresses for later downloading to a computer for processing and presentation.

Though the values being logged are actually resistances in ohms they are directly proportional to earth resistance (ohm-metres) as the same probe configuration was used through-out.

3.4 Sampling interval, depth of scan, resolution and data capture

3.4.1 *Sampling interval*

Gradiometer
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid. All traverses were surveyed in a "zigzag" mode.

Earth resistance
Readings were taken at 1.0m centres along traverses 1.0m apart. This equates to 400 sampling points in a full 20m x 20 grid. All traverses were surveyed in a "zigzag" mode.

3.4.2 *Depth of scan and resolution*

Gradiometer
The Grad 601 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. The collection of data at 0.5m centres provides an optimum methodology for the task balancing cost and time with resolution.

Earth resistance
The 0.5m probe spacing of a twin probe array has a typical depth of penetration of 0.5m to 1.0m. The collection of data at 0.5m centres with a 0.5m probe spacing provides an optimum resolution for the task.

3.4.3 *Data capture*

Gradiometer
The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

Earth resistance
The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

3.5 Processing, presentation of results and interpretation

3.5.1 *Processing*

Gradiometer
Processing is performed using specialist software known as *Geoplot 3* and in-house software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all processed gradiometer data used in this report:

1. *Destripe* (Removes striping effects caused by zero-point discrepancies between different sensors and walking directions)

2. *Destagger* (Removes zigzag effects caused by inconsistent walking speeds on sloping, uneven or overgrown terrain)

Earth resistance
The processing was carried out using specialist software known as *Geoplot 3* and in-house software and involved the 'despiking' of high contact resistance readings and the passing of the data though a high pass filter. This has the effect of removing the larger variations in the data often associated with geological features. The nett effect is aimed at enhancing the archaeological or man-made anomalies contained in the data.

The following schedule shows the processing carried out on the processed resistance plots.

Despike	*X radius = 1*
	Y radius = 1
	Spike replacement
High pass filter	*X radius = 10*
	Y radius = 10
	Weighting = Gaussian

3.5.2 *Presentation of results and interpretation*

Gradiometer
The presentation of the data for the survey involves a print-out of the raw data both as grey scale and colour plots (Figure 3), together with a grey scale plot of the processed data and the abstraction and interpretation of magnetic anomalies (Figure 4).

Earth resistance
The presentation of the data for the site involves a print-out of the raw and processed data as grey scale plots (Figure 5). Anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing (Figure 6), alongside an abstraction of cropmarks identified through aerial photography.

4 RESULTS

The following list of numbered anomalies refers to numerical labels on the interpretation plots (Figure 4).

Gradiometer

Probable Archaeology

None of the anomalies identified in the gradiometer data have been classified as of probable archaeological origin.

Possible Archaeology

1. A positive area anomaly has been identified in the north western corner of the survey area. This anomaly type is indicative of a former cut feature and may be of archaeological origin.

2. Further positive discrete anomalies are seen across much of the site. These are similar in characteristics to Anomaly 1, but are smaller and therefore interpreted as possible former pits. These responses may also be of natural origin and we would recommend sampling of several features to establish their nature.

3. A weak positive linear trend has also been identified in the north of the survey area. This anomaly is of uncertain origin however may be associated with a former cut feature.

4. Several moderate strength discrete anomalies have also been noted alongside the western boundary and in the north east of the site. These responses may be associated with thermoremanent features of possible archaeological interest.

5. A number of magnetic 'spikes' (strong focussed values with associated antipolar response) indicate ferrous metal objects. Although most of these are likely to be modern rubbish, some may be of archaeological interest. Particular attention may

be paid to those found in association with other potentially archaeological anomalies.

Other Anomalies

6. Three negative linear anomalies have been identified in the north of the site and alongside the western field boundary. These anomalies are probably associated with former agricultural activity on the site.

7. Areas of magnetic disturbance are the result of substantial nearby ferrous metal objects such as fences and underground services. These effects can mask weaker archaeological anomalies, but on this site have not affected a significant proportion of the area.

8. Several areas of scattered magnetic debris have also been identified and are likely to be of modern origin.

Earth Resistance

9. Several low resistance linear anomalies have been identified in the earth resistance data collected in the north of the Bungay Road site. These responses are indicative of former cut features which may be of archaeological origin. It is interesting to note the close correlation between these responses and crop marks identified through aerial photography and noted in the HER.

10. Three low resistance area anomalies have also been noted in the data and are also likely to be associated with former cut features of possible archaeological interest. These anomalies also correlate well with the cropmarks.

11. A zone of high resistance has been identified in the centre of the site and is indicative of a region of compacted ground. These responses may also indicate structural remains, however in this instance the response is rather amorphous but an archaeological origin should not be discounted.

12. A defined change in earth resistance can be seen between the north and south of the site. The south showing significantly lower resistance and lesser activity in the data plots. This change is likely to be of geological / pedological origin probably due to an increase in the depth of soils in the south of the survey area. It is again interesting to note that the boundary between the two areas can clearly be identified through aerial photography of the site.

5 CONCLUSION

The magnetic gradiometry data collected over 2.7ha of land at Poringland in Norfolk has identified a number of positive area anomalies indicative of former cut features such as pits. Three negative linear responses have also been identified and are probably associated with agricultural activity. A weak positive linear trend and possible thermoremanent features have also been noted. Areas of magnetic disturbance and debris are present especially in the region of the southern site boundary.

The earth resistance data collected in the north of the site indicates a series of low resistance area and linear anomalies indicative of former cut features which correlate well with the location of cropmarks listed in the HER as of probable Roman or Medieval origin. A zone of high conductivity is also noted in the centre of the survey area and is probably associated with an area of compacted ground which may be of archaeological origin. A distinct change in resistance is also noted between the north and south of the site with increased activity and general higher resistance seen in the north and a probable increase in soil depth in the south.

6 REFERENCES

British Geological Survey, n.d., *website* (http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)

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

APPENDIX A – Basic principles of magnetic survey

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremnant* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremnance is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremnant archaeological features can include hearths and kilns and material such as brick and tile may be magnetised through the same process.

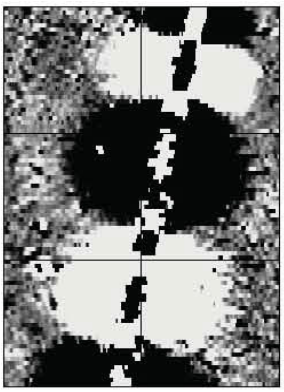
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically either 0.5 or 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

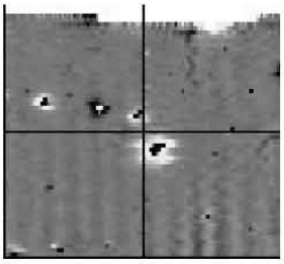
APPENDIX B – Glossary of magnetic anomalies

Bipolar



A bipolar anomaly is one that is composed of both a positive response and a negative response. It can be made up of any number of positive responses and negative responses. For example a pipeline consisting of alternating positive and negative anomalies is said to be bipolar. See also dipolar which has only one area of each polarity. The interpretation of the anomaly will depend on the magnitude of the magnetic field strength. A weak response may be caused by a clay field drain while a strong response will probably be caused by a metallic service.

Dipolar

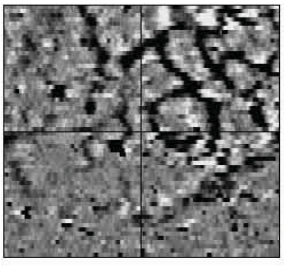


This consists of a single positive anomaly with an associated negative response. There should be no separation between the two polarities of response. These responses will be created by a single feature. The interpretation of the anomaly will depend on the magnitude of the magnetic measurements. A very strong anomaly is likely to be caused by a ferrous object.

Positive anomaly with associated negative response

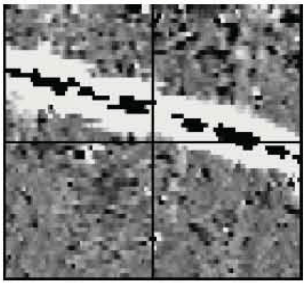
See bipolar and dipolar.

Positive linear



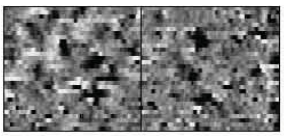
A linear response which is entirely positive in polarity. These are usually related to infilled cut features where the fill material is magnetically enhanced compared to the surrounding matrix. They can be caused by ditches of an archaeological origin, but also former field boundaries, ploughing activity and some may even have a natural origin.

Positive linear anomaly with associated negative response



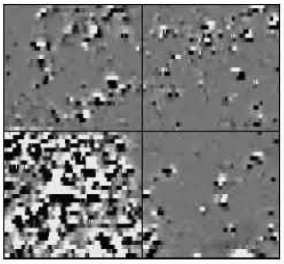
A positive linear anomaly which has a negative anomaly located adjacently. This will be caused by a single feature. In the example shown this is likely to be a single length of wire/cable probably relating to a modern service. Magnetically weaker responses may relate to earthwork style features and field boundaries.

Positive point/area



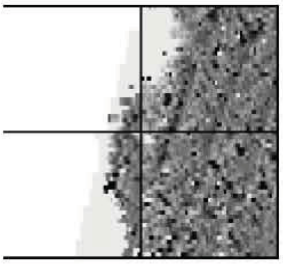
These are generally spatially small responses, perhaps covering just 3 or 4 reading nodes. They are entirely positive in polarity. Similar to positive linear anomalies they are generally caused by infilled cut features. These include pits of an archaeological origin, possible tree bowls or other naturally occurring depressions in the ground.

Magnetic debris



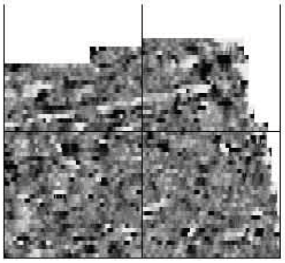
Magnetic debris consists of numerous dipolar responses spread over an area. If the amplitude of response is low (+/-3nT) then the origin is likely to represent general ground disturbance with no clear cause, it may be related to something as simple as an area of dug or mixed earth. A stronger anomaly (+/-250nT) is more indicative of a spread of ferrous debris. Moderately strong anomalies may be the result of a spread of thermoremnant material such as bricks or ash.

Magnetic disturbance



Magnetic disturbance is high amplitude and can be composed of either a bipolar anomaly, or a single polarity response. It is essentially associated with magnetic interference from modern ferrous structures such as fencing, vehicles or buildings, and as a result is commonly found around the perimeter of a site near to boundary fences.

Negative linear

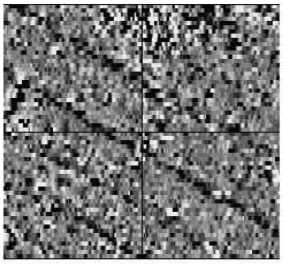


A linear response which is entirely negative in polarity. These are generally caused by earthen banks where material with a lower magnetic magnitude relative the background top soil is built up. See also ploughing activity.

Negative point/area

Opposite to positive point anomalies these responses may be caused by raised areas or earthen banks. These could be of an archaeological origin or may have a natural origin.

Ploughing activity



Ploughing activity can often be visualised by a series of parallel linear anomalies. These can be of either positive polarity or negative polarity depending on site specifics. It can be difficult to distinguish between ancient ploughing and more modern ploughing, clues such as the separation of each linear, straightness, strength of response and cross cutting relationships can be used to aid this, although none of these can be guaranteed to differentiate between different phases of activity.

Polarity

Term used to describe the measurement of the magnetic response. An anomaly can have a positive polarity (values above 0nT) and/or a negative polarity (values below 0nT).

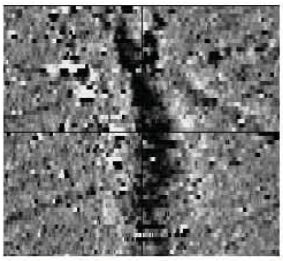
Strength of response

The amplitude of a magnetic response is an important factor in assigning an interpretation to a particular anomaly. For example a positive anomaly covering a $10m^2$ area may have values up to around 3000nT, in which case it is likely to be caused by modern magnetic interference. However, the same size and shaped anomaly but with values up to only 4nT may have a natural origin. Colour plots are used to show the amplitude of response.

Thermoremnant response

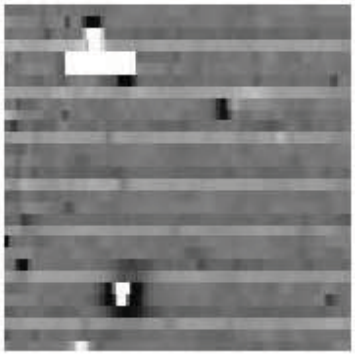
A feature which has been subject to heat may result in it acquiring a magnetic field. This can be anything up to approximately +/-100 nT in value. These features include clay fired drains, brick, bonfires, kilns, hearths and even pottery. If the heat application has occurred insitu (e.g. a kiln) then the response is likely to be bipolar compared to if the heated objects have been disturbed and moved relative to each other, in which case they are more likely to take an irregular form and may display a debris style response (e.g. ash).

Weak background variations

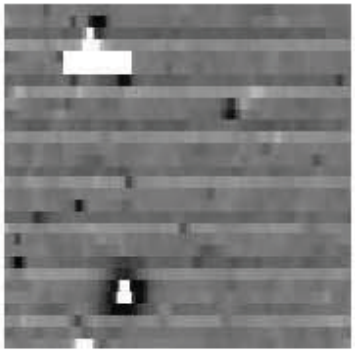


Weakly magnetic wide scale variations within the data can sometimes be seen within sites. These usually have no specific structure but can often appear curvy and sinuous in form. They are likely to be the result of natural features, such as soil creep, dried up (or seasonal) streams. They can also be caused by changes in the underlying geology or soil type which may contain unpredictable distributions of magnetic minerals, and are usually apparent in several locations across a site.

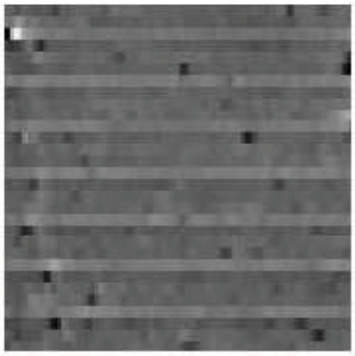
APPENDIX C – Gradiometer Data Recollection



Grid 1 (Original).
+/- 5nT
Surveyed AM 22nd November 2011
30m x 30m
1m x 0.25m
Data Collected by Sean Parker
Using Stratascan Bartington Grad 601-2



Grid 1 (Re-collect).
+/- 5nT
Surveyed PM 22nd November 2011
30m x 30m
1m x 0.25m
Data Collected by Sean Parker
Using Stratascan Bartington Grad 601-2



Grid 20 (Original).
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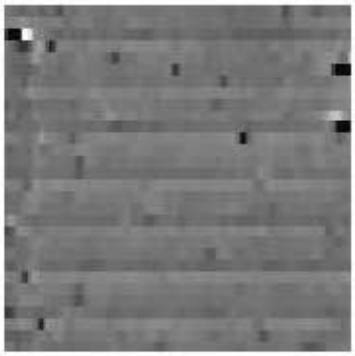
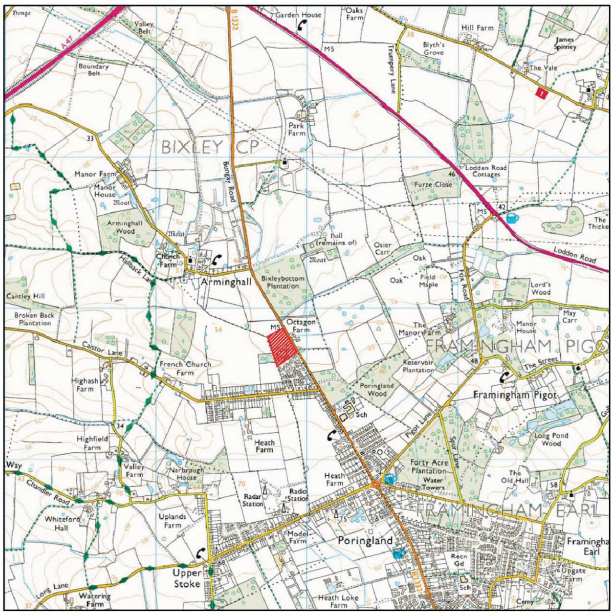
1m x 0.25m
Data Collected by Sean Parker
Using Stratascan Bartington Grad 601-2



Grid 20 (Re-collect).
+/- 5nT
Surveyed PM 23nd November 2011
30m x 30m
1m x 0.25m
Data Collected by Sean Parker
Using Stratascan Bartington Grad 601-2

INTERIM



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Amendments

Issue No.	Date	Description
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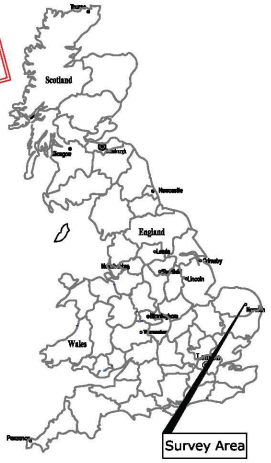

Site centred on NGR: TG 258 037

Client: ARCHAEOLOGICAL SOLUTIONS LTD

Project Title: GEOPHYSICAL SURVEY - BUNGAY ROAD, PORINGLAND, NORFOLK

Job No. 3009

Subject: LOCATION PLAN OF SURVEY AREA

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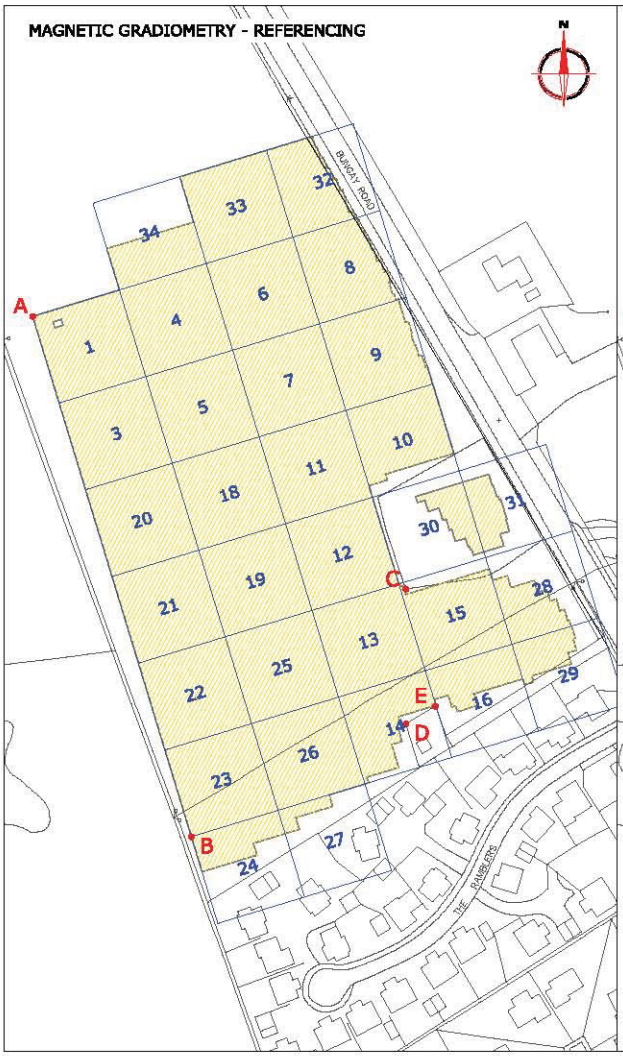
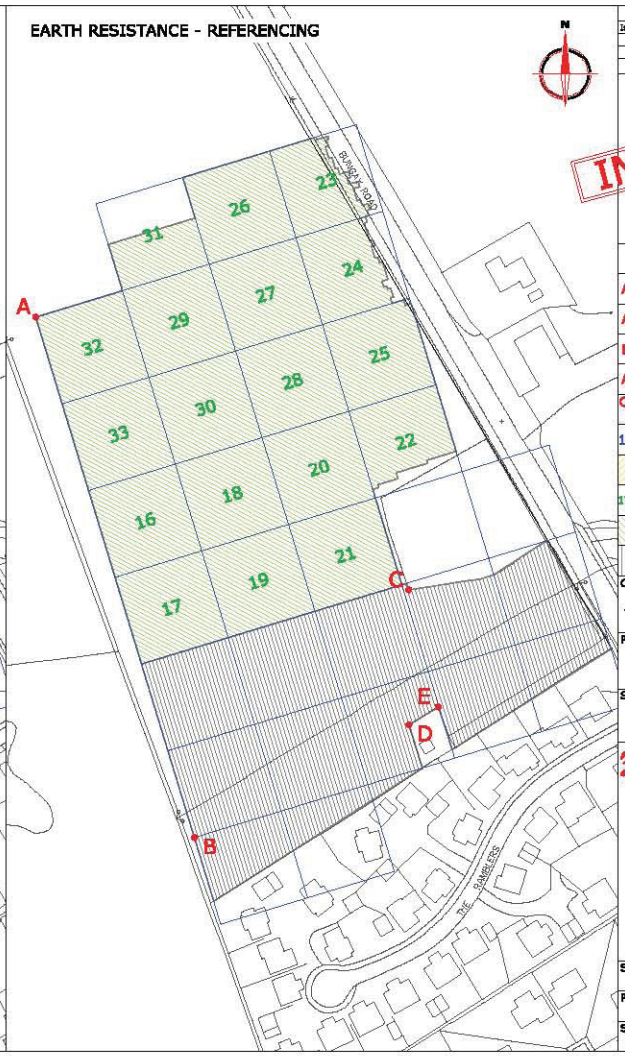
SUMO GROUP MEMBER

Scale: 1:25000 (0m 500 1000m)

Plot	Checked by	Issue No.
A3	PPB	01
Survey date	**Drawn by**	**Figure No.**
NOV 2011	BPM	01





Amendments

Issue No.	Date	Description
-	-	-
-	-	-

INTERIM

REFERENCING INFORMATION

A-B	180.0m	A-C	153.2m	A-D	182.3m
A-E	185.0m	B-C	107.9m	B-D	80.1m
B-E	91.5m				

A-B	Base line
C,D, E	Referencing points
1-34	Grid numbers - magnetic gradiometry
	Survey area - magnetic gradiometry
17-33	Grid numbers - earth resistance
	Survey area - earth resistance
	Outstanding survey area - earth resistance

Client
ARCHAEOLOGICAL SOLUTIONS LTD

Project Title — Job No. 3009
GEOPHYSICAL SURVEY - BUNGAY ROAD, PORINGLAND, NORFOLK

Subject
LOCATION OF SURVEY GRIDS AND REFERENCING

STRATASCAN™
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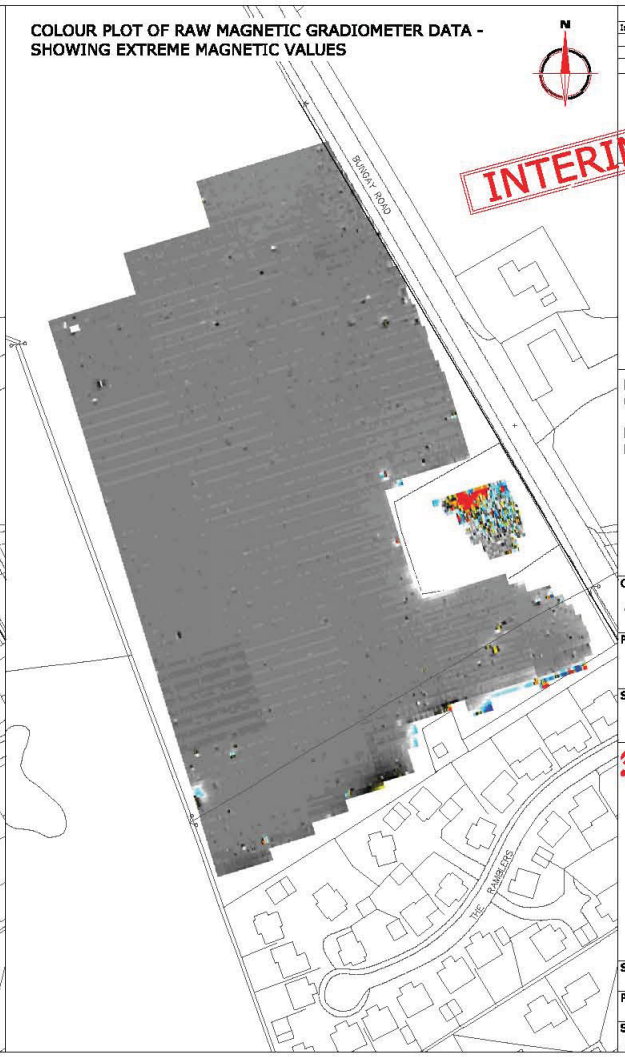
SUMO GROUP MEMBER

Scale 1:1250	0m 50 100m	
Plot A3	Checked by PPB	Issue No. 01
Survey data NOV 2011	Drawn by BPM	Figure No. 02

RAW MAGNETIC GRADIOMETER DATA

COLOUR PLOT OF RAW MAGNETIC GRADIOMETER DATA - SHOWING EXTREME MAGNETIC VALUES



INTERIM

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

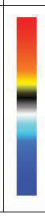
Plotting parameters - Raw

Maximum +5nT (black)
Minimum -5nT (white)

-5nT +5nT

Plotting parameters - Colour

Maximum +250nT (red)
Minimum -250nT (blue)



Client
ARCHAEOLOGICAL SOLUTIONS LTD

Project Title — Job No. 3009
GEOPHYSICAL SURVEY - BUNGAY ROAD, PORINGLAND, NORFOLK

Subject
PLOT OF RAW GRADIOMETER DATA

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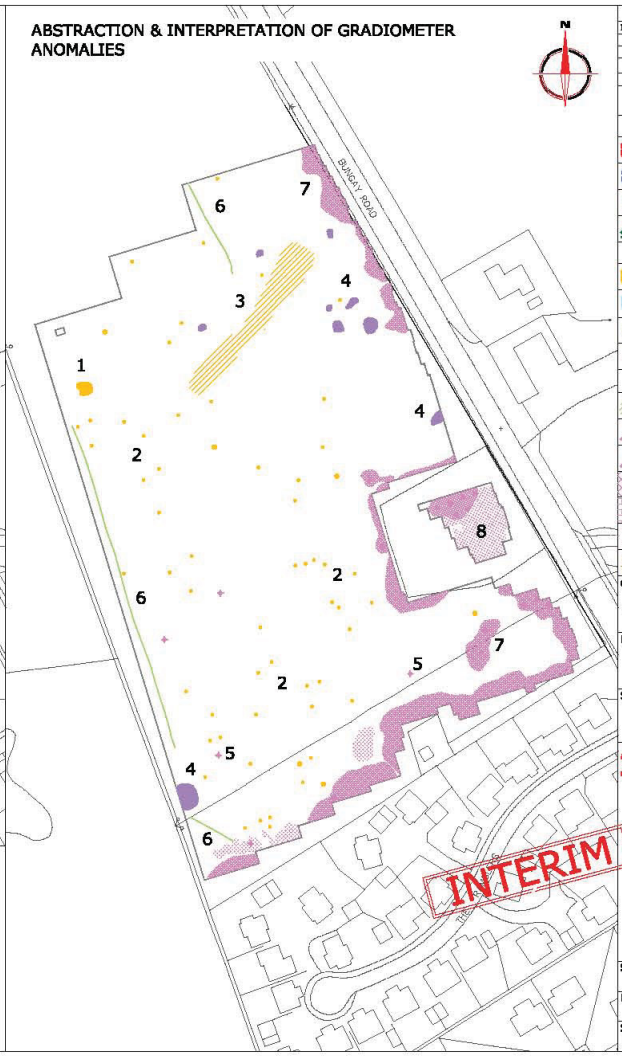
SUMO GROUP MEMBER

Scale 1:1250 — 0m 10 20 30 40 50m

Plot	Checked by	Issue No.
A3	PPB	01
Survey date	Drawn by	Figure No.
NOV 2011	BPM	03

PLOT OF PROCESSED MAGNETIC GRADIOMETER DATA

ABSTRACTION & INTERPRETATION OF GRADIOMETER ANOMALIES



Amendments

Issue No.	Date	Description
-	-	-
-	-	-

KEY

PROBABLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - probable cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - probable bank or earthwork of archaeological origin
- Moderate strength discrete anomaly - probable thermoremanent feature
- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow

POSSIBLE ARCHAEOLOGY

- Positive anomaly / weak positive anomaly - possible cut feature of archaeological origin
- Negative anomaly / weak negative anomaly - possible bank or earthwork of archaeological origin
- Moderate strength discrete anomaly - possible thermoremanent feature
- Magnetic spike - probable ferrous object

OTHER ANOMALIES

- Closely spaced parallel linear anomalies - probably related to agricultural activity such as ploughing
- Linear anomaly - probably related to pipe, cable or other modern service
- Linear anomaly - possibly related to land drain
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin

Client
ARCHAEOLOGICAL SOLUTIONS LTD

Project Title — Job No. 3009
GEOPHYSICAL SURVEY - BUNGAY ROAD, PORINGLAND, NORFOLK

Subject
PLOT OF PROCESSED GRADIOMETER DATA AND ABSTRACTION & INTERPRETATION OF GRADIOMETER ANOMALIES

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SUMO GROUP MEMBER

Scale			
1:1000	0m 10 20 30 40 50		
Plot	A3	Checked by	PPB	Issue No.	01
Survey date	NOV 2011	Drawn by	BPM	Figure No.	04

PLOT OF RAW EARTH RESISTANCE DATA

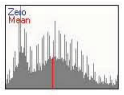
PLOT OF PROCESSED EARTH RESISTANCE DATA

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

Plotting parameters - Raw

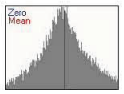
Maximum +130Ω (black)
Minimum +30Ω (white)



+30Ω +130Ω

Plotting parameters - Processed

Maximum +90Ω (black)
Minimum +50Ω (white)



+50Ω +90Ω

Client
ARCHAEOLOGICAL SOLUTIONS LTD

Project Title — Job No. 3009
GEOPHYSICAL SURVEY - BUNGAY ROAD, PORINGLAND, NORFOLK

Subject:
PLOT OF RAW & PROCESSED RESISTANCE DATA

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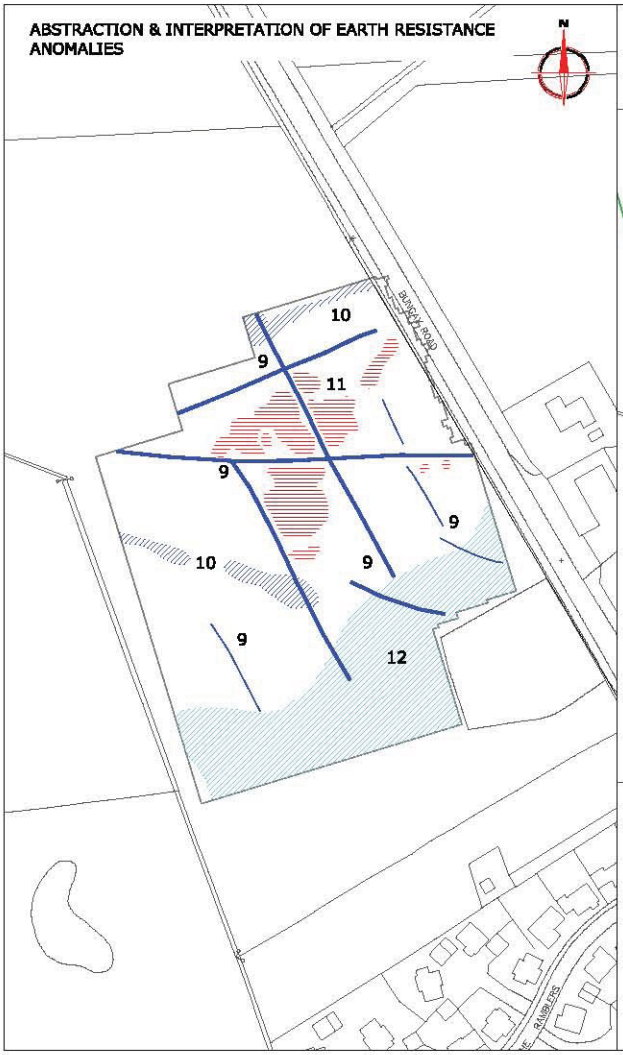
SUMO GROUP MEMBER

Scale		
1:1250	0m 10 20 30 40 50m	
Plot: A3	Checked by: PPB	Issue No.: 01
Survey date: NOV 2011	Drawn by: BPM	Figure No.: 05

ABSTRACTION & INTERPRETATION OF EARTH RESISTANCE ANOMALIES



ABSTRACTION OF CROP MARKS IDENTIFIED THROUGH AERIAL PHOTOGRAPHY

INTERIM

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

The earth resistance data collected across the north of the Bungay Road site has identified a series of low resistance linear anomalies indicative of former cut features of possible archaeological origin. These anomalies appear to correlate with the location of cropmarks identified through aerial photography and listed in the Historic Environment Record as being associated with former field boundaries, ditches or possibly roads. A close correlation is also noted between the area of low resistance of probable geological origin south of the site and a zone of darker cropmarks indicative of deeper or more moist soils.

KEY

- Low resistance linear anomaly - possible cut feature of archaeological origin
- High resistance area anomaly - area of compacted ground or possible structural remains
- Low resistance area anomaly - possibly associated with former cut features of archaeological origin
- Low resistance area anomaly - probable geological/pedological origin
- Linear anomaly identified through crop marks
- Area anomaly identified through crop marks
- Area of darker crop marking indicative of deeper or moister soils

Client: ARCHAEOLOGICAL SOLUTIONS LTD

Project Title: GEOPHYSICAL SURVEY - BUNGAY ROAD, PORINGLAND, NORFOLK

Job No. 3009

Subject: ABSTRACTION AND INTERPRETATION OF RESISTANCE ANOMALIES AND ABSTRACTION OF CROP MARKS

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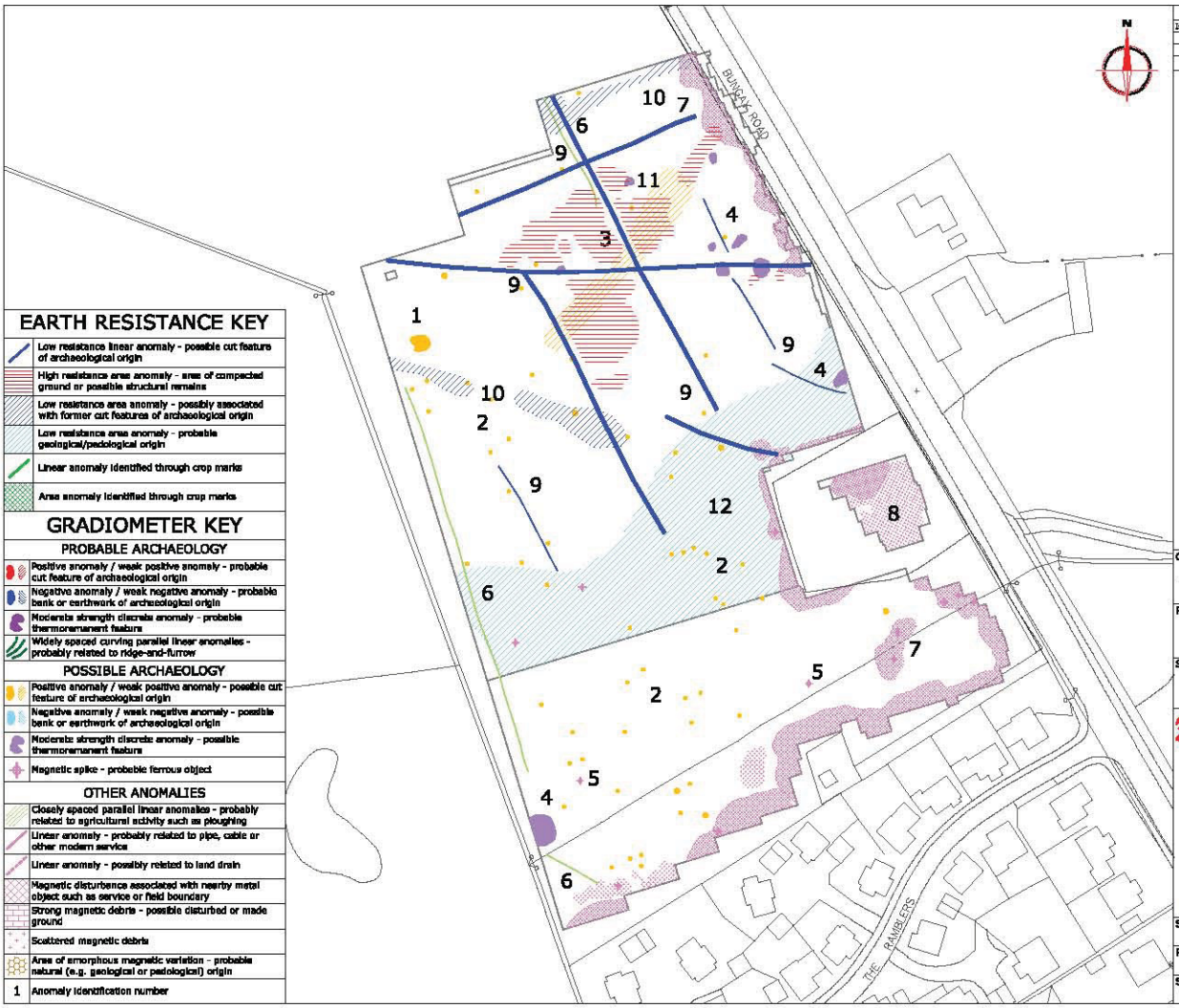
SUMO GROUP MEMBER

Scale		
1:1250	0m 10 20 30 40 50m	
Plot: A3	Checked by: PPB	Issue No.: 01
Survey data: NOV 2011	Drawn by: BPM	Figure No.: 06



EARTH RESISTANCE KEY

- Low resistance linear anomaly - possible cut feature of archaeological origin
- High resistance area anomaly - area of compacted ground or possible structural remains
- Low resistance area anomaly - possibly associated with former cut features of archaeological origin
- Low resistance area anomaly - probable geological/pedological origin
- Linear anomaly identified through crop marks
- Area anomaly identified through crop marks

GRADIOMETER KEY

PROBABLE ARCHAEOLOGY

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- Widely spaced curving parallel linear anomalies - probably related to ridge-and-furrow

POSSIBLE ARCHAEOLOGY

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- Linear anomaly - possibly related to land drain
- Magnetic disturbance associated with nearby metal object such as service or field boundary
- Strong magnetic debris - possible disturbed or made ground
- Scattered magnetic debris
- Area of amorphous magnetic variation - probable natural (e.g. geological or pedological) origin
- 1 Anomaly identification number

Amendments

Issue No.	Date	Description
-	-	-
-	-	-

INTERIM

Client: ARCHAEOLOGICAL SOLUTIONS LTD

Project Title: GEOPHYSICAL SURVEY - BUNGAY ROAD, PORINGLAND, NORFOLK

Job No. 3009

Subject: COMBINED ABSTRACTION AND INTERPRETATION OF RESISTANCE & GRADIOMETER ANOMALIES

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SUMO GROUP MEMBER

Scale		
1:1250	0m 10 20 30 40 50m	
Plot: A3	Checked by: PPB	Issue No.: 01
Survey data: NOV 2011	Drawn by: BPM	Figure No.: 07