LAND ADJACENT TO No.1 ST JOHNS STREET, BECK ROW, MILDENHALL, SUFFOLK

DETAILED MAGNETOMETER SURVEY

Report Number: 1092

April 2015

LAND ADJACENT TO NO.1 ST JOHNS STREET, BECK ROW, MILDENHALL, SUFFOLK

Detailed Magnetometer Survey

Prepared for:
Dr Rhodri Gardner MCIfA
Suffolk Archaeology CIC
Unit 5, Plot 11
Maitland Road
Lion Barn Industrial Estate
Needham Market
Suffolk, IP6 8NZ

By:
Timothy Schofield HND BSc PCIfA

Britannia Archaeology Ltd
115 Osprey Drive
Stowmarket, Suffolk,
IP14 5UX
T: 01449 763034
info@britannia-archaeology.com
www.britannia-archaeology.com
Registered in England and Wales: 7874460

April 2015

Site Code	MNL 718	**NGR**	TL 696 772
Planning Ref.	-	**OASIS**	britanni1-207071
Approved By	Martin Brook	**DATE**	April 2015

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ABSTRACT

On Monday 30th March 2015 Britannia Archaeology Ltd undertook a detailed fluxgate gradiometer survey over c.2.20 hectares of land adjacent to No.1 St Johns Street, Beck Row, Mildenhall, Suffolk, in three small agricultural fields over the footprint of a proposed housing estate.

The background magnetic signature was found to be relatively high, with large areas of magnetic disturbance prospected across the survey area. Despite this the detailed fluxgate gradiometer survey was successful in recording anomalies of a potential archaeological origin.

Isolated dipolar responses and large areas of magnetic disturbance were predominant across the fields, with extant areas of burning and large wheel ruts providing evidence of modern site activity.

Seven positive linear anomalies were prospected, the majority of which are indicative of remnant field boundaries. One area of magnetic disturbance located where a complex of buildings are recorded on the OS map of 1882, may be of archaeological significance. Seven thermoremnant responses may provide evidence of former backyard industrial activity, potentially hearths, furnaces or kilns.

1.0 INTRODUCTION

On Monday 30th March 2015 Britannia Archaeology Ltd (BA) undertook a detailed fluxgate gradiometer survey over *c.*2.20 hectares of land adjacent to No.1 St Johns Street, Beck Row, Mildenhall, Suffolk (NGR TL 696 772) in three small agricultural fields, over the footprint of a proposed housing estate (Figure 1).

This survey was commissioned by Dr Rhodri Gardener of Suffolk Archaeology CIC in response to a brief (Abraham, R. dated 6th March 2015) for the geophysical survey. The weather was predominantly sunny following a period of precipitation.

2.0 SITE DESCRIPTION

The site is located on agricultural fields to the north of St Johns Street in Beck Row, Suffolk at a height of *c.*5m aOD. It is bounded to the south by St Johns Street and to the north, east and west by housing estates.

The bedrock geology is described as Grey Chalk Subgroup from the Cretaceous Period, when the local environment was dominated by warm chalk seas with little sediment input from land, often consisting of calcareous plankton ooze (BGS, 2015).

Superficial deposits are described as river terrace deposits, sand and gravel formed up to 3 million years ago in the Quaternary Period when the local environment was dominated by rivers depositing mainly sand and gravel detrital material in channels to form river terrace deposits, with fine silt and clay from overbank floods forming floodplain alluvium, and some bogs depositing peat (BGS, 2015).

3.0 PLANNING POLICIES

The archaeological investigation is to be carried out on the recommendation of the local planning authority, following guidance laid down by the National Planning and Policy Framework (NPPF, DCLD 2012) which replaces Planning Policy Statement 5: Planning for the Historic Environment (PPS5, DCLG 2010). The relevant local planning policy is the *Forest Heath Local Plan; (Policy 8.20, 1995)*.

3.1 National Planning Policy Framework (NPPF, DCLG March 2012)

The NPPF recognises that 'heritage assets' are an irreplaceable resource and planning authorities should conserve them in a manner appropriate to their significance when considering development. It requires developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner

proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible. The key areas for consideration are:

- The significance of the heritage asset and its setting in relation to the proposed development;
- The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance;

- Significance (of the heritage asset) can be harmed or lost through alteration or destruction, or development within its setting. As heritage assets are irreplaceable, any harm or loss should require clear and convincing justification;

- Local planning authorities should not permit loss of the whole or part of a heritage asset without taking all reasonable steps to ensure the new development will proceed after the loss has occurred;

- Non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to scheduled monuments, should be considered subject to the policies for designated heritage assets.

3.2 Forest Heath Local Plan, (Policy 8.20, 1995)

Forest Heath's local plan development plan was adopted in 1995 and has undergone some revision since. A Core Strategy was released in 2010 and an updated assessment of their Heritage Policy is pending. The Council's position on heritage assets is summarised as follows:

- The District Council will seek provision to be made for the evaluation of archaeological sites of unknown importance and areas of high potential prior to the determination of development proposals. Where nationally or locally important sites, whether scheduled or not, and their settings, are effected by proposed development, there will be a presumption in favour of their preservation. On sites where there is no overriding case for preservation, development will not normally be permitted unless agreement has been reached to provide either for their preservation or for their recording and, where desirable, their excavation prior to development.

4.0 ARCHAEOLOGICAL BACKGROUND

The site is located on the edge of the historic settlement area of Beck Row, Holywell Row and Kenny Hill (recorded in the County Historic Environment Record as MNL 675), as a result there is a high potential for encountering early occupation deposits in this location. A systematic archaeological investigation has never been undertaken on this site before (Brief, Section 2.1).

5.0 PROJECT AIMS

A non-intrusive geophysical survey is required of the development; this is likely to lead to a programme of trial trenching to enable the archaeological resource, both in quality and extent, to be accurately quantified. However, any decision about the need for, and extent of, trial trenching will be taken following the geophysical survey (Brief Section 3.1).

6.0 METHODOLOGY

6.1 Instrument Type Justification

Britannia Archaeology Ltd employed a Bartington Dual Grad 601-2 fluxgate gradiometer to undertake the survey, because of its high sensitivity and rapid ground coverage. The surveyors noted that that the background magnetic susceptibility signature was relatively high, however a suitable zero station was successfully located.

6.2 Instrument Calibration

One hour was allowed in the morning for the magnetometers sensors to settle before the start of the first grid. The instrument was zeroed after every three to five grids to minimise the effect of sensor drift. An area with a relatively low magnetic reading was chosen to calibrate the instrument; this same point was used to zero the sensors throughout the survey providing a common zero point. The survey was undertaken during sunny periods which caused a degree of sensor drift and the characteristic parallel traverse 'striping' that is prevalent throughout the raw dataset (Figure 2).

6.3 Sampling Interval and Grid Size

The sampling interval was set at 0.25m along 1m traverse intervals, providing 4 readings a metre, the magnetometer survey was undertaken within 20 x 20m grids.

6.4 Survey Grid Location

The survey grid was set out to the Ordnance Survey OSGB36 datum to an accuracy of ±0.1m employing a Leica Viva Glonnass Smart Rover GS08 real time kinetic (RTK) survey system. Data were converted to the National Grid Transformation OSTN02 and the instrument was regularly tested using stations with known ETRS89 coordinates. The grids were positioned on a north-east to south-west alignment (Figure 1).

6.5 Data Capture

Instrument readings were recorded on an internal data logger that were downloaded to a laptop at midday followed by a second download at the end of the survey. The grid order was recorded on a BA pro-forma to aid in the creation of the data composites.

Data were filed in job specific folders. These data composites were checked for quality on site by BA, allowing grids to be re-surveyed if necessary. The data were backed up onto an external storage device in the office and finally a remote server at the end of the day.

6.6 Data Presentation and Processing

Data are presented in both raw and processed data plots in greyscale format (Figures 2 and 3). An XY trace plot of the processed data has also been included (Figure 4).

The raw data plots are presented with no processing, and were clipped to produce a uniform greyscale plot, processed data schedules are also displayed below.

Raw Data:
Data Clipping: -10 to +10nT;
Display Clipping: +/- 3 standard deviations.

Processed Data:
De-stripe: Median Sensors: All;
Data Clipping: -4 to +4nT;
Display Clipping: +/- 3 standard deviations.

An interpretation plan characterising the anomalies recorded can be found at Figure 5, drawing together the evidence collated from both greyscale and XY trace plots (Figures 2, 3 and 4). Digitised features recorded on Ordnance Survey Maps from 1882 until 1958/59 are also included in Figure 5 (green lines). All figures are tied into the National Grid and printed at an appropriate scale.

6.7 Software

Raw data were downloaded using DW Consulting's Archeosurveyor v2.5.16.0 and will be stored in this format as raw data. The software used to process the data and produce the composites was also DW Consulting's Archeosurveyor v2.5.16.0. Datasets were exported into AutoCAD and placed onto the local survey grid. Interpretation plots were then produced using AutoCAD.

6.8 Grid Restoration

Britannia Archaeology Ltd did not position any reference stations within the field, three virtual geo-referenced survey stations are presented in Figure 1 that will allow the survey grid and anomalies to be accurately targeted.

7.0 RESULTS & DISCUSSION

Isolated dipolar ('iron spike') responses (yellow hatched circles) were present throughout the dataset, they are more likely to record the presence of ferrous material deposited within the topsoil rather than buried archaeological artefacts.

Four narrow weak positive curvilinear anomalies have been recorded in locations that contained extant wheel ruts.

Nine areas of magnetic disturbance (yellow hatching) were recorded, some of which are large in nature. Those prospected on the sites periphery are likely to be caused by magnetic material associated with the buildings and boundaries. The smaller more discrete areas of magnetic disturbance are indicative of modern rubbish pits containing ferrous debris. Of particular note is the area of magnetic disturbance (orange hatching) located in the central field and to the north of the existing farm, where a complex of buildings (green lines) are recorded on the Ordnance Survey (OS) Maps from 1882 until at least 1904. These structures are not present on the OS map of 1952. It is likely that these magnetic readings were caused during the habitation and subsequent demolition of the building complex.

Four thermoremnant responses (blue hatching) were recorded where the extant remains of recent fires are located. A further seven thermoremnant responses (magenta hatching) were recorded in two distinct locations. Four are clustered in the south-western corner of the central field and within the confines of a former enclosure recorded on the OS map of 1882, to the immediate west of the former building complex. Two other thermoremnant responses have been recorded in the southern-most field that are also of similar character. These readings may provide evidence of former backyard industrial activity associated with the firing of material; potentially hearths, furnaces or kilns.

Seven positive linear anomalies (red hatching) have been recorded in all three fields, two of which show a slight correlation with backfilled remnant field boundaries present on the OS maps. The first and southern-most linear trend (orientated north-south) correlates well with a boundary recorded on the 1904 to 1958-59 OS map; it is not recorded on the 1979 OS map. The second is located in the northern field (orientated east to west), it correlates with the boundary recorded on the 1882 to 1958-1959 OS Maps; this boundary is not recorded on the 1979 OS map. Two positive linear trends (orientated east to west before turning perpendicular) located in the central field have been interpreted as the corner of a remnant field boundary ditch that is not recorded on the OS maps; its course continues into the northern field where it appears to terminate. Its alignment and location appear to respect the layout of the surrounding field boundaries (north-south and perpendicular) and it is therefore likely to be contemporary. To the west lies a weaker broad positive, slightly curving linear anomaly, that could be the remains of another boundary sub-division; its broad and comparatively weak nature however may prove it is of geological derivation. To the west of this broad linear anomaly is a short narrow linear trend of unknown origin.

8.0 CONCLUSION

The background magnetic signature was found to be relatively high over the site with large areas of magnetic disturbance prospected across the survey area. Despite this the detailed fluxgate gradiometer survey was successful in recording a range of anomalies of potential archaeological origin.

Isolated dipolar responses and large areas of magnetic disturbance were recorded across the survey area, with extant areas of burning and wheel ruts providing evidence of modern site activity.

It may be prudent to target the discrete areas of magnetic disturbance during any subsequent archaeological investigations to determine an origin. One area of magnetic disturbance, located where a complex of buildings is recorded (dating from at least 1882) should be further investigated to ascertain whether any features have been masked by these highly magnetic readings.

Perhaps the most intriguing anomalies are the seven thermoremnant responses that may provide evidence of former backyard industrial activity, all of which should be further investigated. The positive linear anomalies should also be ground-tested, in particular those that are not recorded on the cartographic sources.

The full range of anomalies recorded by the fluxgate gradiometer should be ground-truthed, to assess the interpretations given within this report. A particular focus should be placed on investigating those anomalies interpreted as being of an archaeological derivation.

9.0 PROJECT ARCHIVE AND DEPOSITION

A full archive will be prepared for all work undertaken in accordance with guidance from the *Selection, Retention and Dispersion of Archaeological Collections,* Archaeological Society for Museum Archaeologists, 1993. Arrangements will be made for the archive to be deposited with the relevant museum/HER Office.

10.0 ACKNOWLEDGEMENTS

Britannia Archaeology Ltd would like to thank Dr Rhodri Gardener of Suffolk Archaeology CIC for commissioning the survey and Rachael Abraham of SCCAS/CT for her input throughout the project.

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Websites

The British Geological Survey, 2013, (Natural Environment Research Council) – Geology of Britain Viewer - www.bgs.ac.uk/opengeoscience/home.html?Accordion2=1#maps

Cartographic Sources

1882 Ordnance Survey County Series, Suffolk	1:2500
1890-1892 Ordnance Survey County Series, Suffolk	1:10,560
1903-1905 Ordnance Survey County Series, Suffolk	1:10,560
1904 Ordnance Survey County Series, Suffolk	1:2500
1952 Ordnance Survey County Series, Suffolk	1:10,560
1958-1959 Ordnance Survey County Series, Suffolk	1:10,560
1979 Ordnance Survey County Series, Suffolk	1:10,560
1990 Ordnance Survey County Series, Suffolk	1:2500

APPENDIX 1 METADATA SHEETS

Raw Data

Filename	Beck Row R.xcp
Description	
Instrument Type	Grad 601-2 (Gradiometer)
Units	nT
Surveyed by	TPS on 3/30/2015
Assembled by	TPS on 4/1/2015
Direction of 1st Traverse	135 deg
Collection Method	ZigZag
Sensors	2 @ 1.00 m spacing.
Dummy Value	32702.00
Dimensions	
Composite Size (readings)	560 x 220
Survey Size (meters)	140.00m x 220.00 m
Grid Size	20.00 m x 20.00 m
X Interval	0.25 m
Y Interval	1.00 m
Stats	
Max	10.00
Min	-10.00
Std Dev	4.70
Mean	-0.32
Median	-0.06
Composite Area	3.08 ha
Surveyed Area	1.33 ha
Program	
Name	ArcheoSurveyor
Version	2.5.16.0

Processed Data

Filename	Beck Row P.xcp
Description	
Instrument Type	Grad 601-2 (Gradiometer)
Units	nT
Surveyed by	TPS on 3/30/2015
Assembled by	TPSon 4/1/2015
Direction of 1st Traverse	135 deg
Collection Method	ZigZag
Sensors	2 @ 1.00 m spacing.
Dummy Value	32702.00
Dimensions	
Composite Size (readings)	560 x 220
Survey Size (meters)	140.00m x 220.00 m
Grid Size	20.00 m x 20.00 m
X Interval	0.25 m

Y Interval	1.00 m
Stats	
Max	4.00
Min	-4.00
Std Dev	2.50
Mean	-0.09
Median	-0.03
Composite Area	3.08 ha
Surveyed Area	1.33 ha
Program	
Name	ArcheoSurveyor
Version	2.5.16.0

Source Grids: 45
1 Col:0 Row:0 grids\01.xgd
2 Col:0 Row:1 grids\02.xgd
3 Col:1 Row:0 grids\03.xgd
4 Col:1 Row:1 grids\04.xgd
5 Col:1 Row:2 grids\05.xgd
6 Col:1 Row:3 grids\06.xgd
7 Col:1 Row:4 grids\07.xgd
8 Col:1 Row:5 grids\26.xgd
9 Col:1 Row:6 grids\27.xgd
10 Col:2 Row:0 grids\08.xgd
11 Col:2 Row:1 grids\09.xgd
12 Col:2 Row:2 grids\10.xgd
13 Col:2 Row:3 grids\11.xgd
14 Col:2 Row:4 grids\12.xgd
15 Col:2 Row:5 grids\28.xgd
16 Col:2 Row:6 grids\29.xgd
17 Col:3 Row:0 grids\13.xgd
18 Col:3 Row:1 grids\14.xgd
19 Col:3 Row:2 grids\15.xgd
20 Col:3 Row:3 grids\16.xgd
21 Col:3 Row:4 grids\17.xgd
22 Col:3 Row:5 grids\30.xgd
23 Col:3 Row:6 grids\31.xgd
24 Col:4 Row:0 grids\18.xgd
25 Col:4 Row:1 grids\19.xgd
26 Col:4 Row:2 grids\20.xgd
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32 Col:4 Row:8 grids\35.xgd
33 Col:4 Row:9 grids\36.xgd
34 Col:4 Row:10 grids\37.xgd
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41 Col:5 Row:10 grids\41.xgd
42 Col:6 Row:7 grids\42.xgd
43 Col:6 Row:8 grids\43.xgd
44 Col:6 Row:9 grids\44.xgd
45 Col:6 Row:10 grids\45.xgd

APPENDIX 2 – TECHNICAL DETAILS

Magnetometer Survey

The magnetometer differs from the 'active' magnetic susceptibility meter by being a 'passive' instrument. Rather than injecting a signal into the ground it detects slight variations in the Earth's magnetic field caused by cultural and natural disturbance (Clark).

Thermoremanent magnetism is produced when a material containing iron oxides is strongly heated. Clay for example has a high iron oxide content that in a natural state is weakly magnetic, when heated these weakly magnetic compounds become highly magnetic oxides that a magnetometer can detect.

The demagnetisation of iron oxides occurs above a temperature known as the Curie point; for example haematite has a Curie point of 675 Celsius and magnetite 565C. At the time of cooling the iron oxides become permanently re-magnetised with their magnetic properties re-aligned in the direction of the Earth's magnetic field (Gaffney and Gater). The direction of the Earth's magnetic field shifts over time and these subtle alignment differences can be recorded. Kilns, hearths, baked clay and ovens can reach Curie point temperatures, and are the strongest responses apart from large iron objects that can be detected. Other cultural anomalies that can be prospected include occupation areas, pits, ditches, furnaces, sunken feature buildings, ridge and furrow field systems and ritual activity (David, 2011). Commonly recorded anomalies include modern ferrous service pipes, field drainage pipes, removed field boundaries, perimeter fences and field boundaries.

Fluxgate Gradiometers

Fluxgate gradiometers are sensitive instruments that utilise two sensors placed in a vertical plane, spaced 1 metre apart. The sensor above reads the Earth's magnetic (background) response while the sensor below records the local magnetic field. Both sensors are carefully adjusted to read zero before survey commences at a 'zeroing' point, selected for its relatively 'quiet' magnetic background reading. When differences in the

magnetic field strength occur between the two sensors a positive or negative reading is logged. Positive anomalies have a positive magnetic value and conversely negative anomalies have a negative magnetic value relative to the site's magnetic background. Examples of positive magnetic anomalies include hearths, kilns, baked clay, areas of burning, ferrous material, ditches, sunken feature buildings, furrows, ferrous service pipes, perimeter fences and field boundaries. Negative magnetic anomalies include earthwork embankments, plastic water pipes and geological features.

The instruments are usually held approximately 0.30m to 0.50m above the ground surface and can detect to a depth of between 1-2metres. Best practice dictates that the optimal direction of traverse in Britain is east to west.

Magnetic Anomalies

Linear trends
Linear trends can be both positive and negative magnetic responses. If they are broad, relatively weak or negative in nature they may be of agricultural or geological origin, for example periglacial channels, land drains or ploughing furrows. If the responses are strong positive trends they are more likely to be of archaeological origin. Archaeological settlement ditches tend to be rich in highly magnetic iron oxides that accumulate in them via anthropogenic activity and humic backfills. Conversely surviving banks will be negative in nature, the material is derived from subsoil deposits that is less likely to be positively magnetic. Curvilinear trends can also be recorded and are indicative of archaeological structures such as drip-gullies.

Discrete anomalies
Discrete anomalies appear as increased positive responses present within a localised area. They are caused by a general increase in the amount of magnetic iron oxides present within the humic back-fill of for example a rubbish pit.

'Iron spike' anomalies
These strong isolated dipolar responses are usually caused by ferrous material present in the topsoil horizon. They can have an archaeological origin but are usually introduced into the topsoil during manuring.

Areas of magnetic disturbance
An area of magnetic disturbance is usually associated with material that has been fired. For example areas of burning, demolition (brick) rubble or slag waste spreads. They can also be caused by ferrous material, e.g. close proximity to barbwire or metal fences and field boundaries, buried services, pylons and modern rubbish deposits.

APPENDIX 3 OASIS FORM

OASIS ID: britanni1-207071

Project details

Project name	Land Adjacent to No.1 St Johns Street, Beck Row, Mildenhall, Suffolk; Detailed Magnetometer Survey
Short description of the project	On Monday 30th March 2015 Britannia Archaeology Ltd undertook a detailed fluxgate gradiometer survey over c.2.20 hectares of land adjacent to No.1 St Johns Street, Beck Row, Mildenhall, Suffolk, in three small agricultural fields over the footprint of a proposed housing estate. The background magnetic signature was found to be relatively high, with large areas of magnetic disturbance prospected across the survey area. Despite this the detailed fluxgate gradiometer survey was successful in recording anomalies of a potential archaeological origin. Isolated dipolar responses and large areas of magnetic disturbance were predominant across the fields, with extant areas of burning and large wheel ruts providing evidence of modern site activity. Seven positive linear anomalies were prospected, the majority of which are indicative of remnant field boundaries. One area of magnetic disturbance located where a complex of buildings are recorded on the OS map of 1882, may be of archaeological significance. Seven thermoremnant responses may provide evidence of former backyard industrial activity, potentially hearths, furnaces or kilns.
Project dates	Start: 30-03-2015 End: 30-03-2015
Previous/future work	No / Yes
Any associated project reference codes	P1100 - Contracting Unit No.
Any associated project reference codes	R1092 - Contracting Unit No.
Any associated project reference codes	MNL 718 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Grassland Heathland 4 - Regularly improved
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"

Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology (other)	Grey Chalk Subgroup
Drift geology	RIVER TERRACE DEPOSITS
Techniques	Magnetometry

Project location

Country	England
Site location	SUFFOLK FOREST HEATH BECK ROW, HOLYWELL ROW AND KENNY HILL Land Adjacent to No.1 St Johns Street, Beck Row, Mildenhall, Suffolk
Study area	2.20 Hectares
Site coordinates	TL 696 772 52.366134529 0.491297889963 52 21 58 N 000 29 28 E Point
Height OD / Depth	Min: 5.00m Max: 5.00m

Project creators

Name of Organisation	Britannia Archaeology Ltd
Project brief originator	Local Planning Authority (with/without advice from County/District Archaeologist)
Project design originator	Timothy Schofield
Project director/manager	Timothy Schofield
Project supervisor	Timothy Schofield
Type of sponsor/funding body	Archaeological Contractor
Name of sponsor/funding body	Suffolk Archaeology CIC

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Suffolk HER
Digital Contents	"Survey"
Digital Media available	"Geophysics","Survey","Text"
Paper Archive recipient	Suffolk HER
Paper Contents	"Survey"

Paper Media available	"Plan","Report","Survey ","Unpublished Text"
Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
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Entered on	10 April 2015

APPENDIX 4 WRITTEN SCHEME OF INVESTIGATION

LAND AT ST JOHNS STREET, BECK ROW, SUFFOLK

WRITTEN SCHEME OF INVESTIGATION
DETAILED MAGNETOMETER SURVEY

Project Number: 1100 23rd March 2015

LAND ADJACENT TO NO.1 ST JOHNS STREET, BECK ROW, MILDENHALL, SUFFOLK

Written Scheme of Investigation
Detailed Magnetometer Survey

Prepared for:
Dr Rhodri Gardner MCIfA
Suffolk Archaeology CIC
Unit 5, Plot 11
Maitland Road
Lion Barn Industrial Estate
Needham Market
Suffolk, IP6 8NZ

By:
Timothy Schofield HND BSc PCIfA

Britannia Archaeology Ltd
115 Osprey Drive
Stowmarket, Suffolk,
IP14 5UX
T: 01449 763034
info@britannia-archaeology.com
www.britannia-archaeology.com
Registered in England and Wales: 7874460

23rd March 2015

Site Code	tbc	**NGR**	TL 696 772
Planning Ref.	tbc	**OASIS**	britanni1-207071
Approved By	Matthew Adams	**DATE**	March 2015

Project Number: 1100

CONTENTS

1.0 INTRODUCTION

This Written Scheme of Investigation (WSI) has been prepared by Britannia Archaeology Ltd (BA) on behalf of Dr Rhodri Gardener of Suffolk Archaeology CIC, in response to a brief (Abraham, R. dated 6th March 2015) for a geophysical survey over the footprint of a proposed housing estate (2.2ha) on land adjacent to No.1 St Johns Street, Beck Row, Mildenhall, Suffolk (NGR TL 696 772).

2.0 SITE DESCRIPTION

The site is located on agricultural fields to the north of St Johns Street in Beck Row, Suffolk at a height of *c.*5m aOD. Bounded to the south by St Johns Street and to the north, east and west by a housing estate.

The bedrock geology is described as Grey Chalk Subgroup from the Cretaceous Period, when the local environment was dominated by warm chalk seas with little sediment input from land, often consisting of calcareous plankton ooze (BGS, 2015).

Superficial deposits are described as river terrace deposits sand and gravel formed up to 3 million years ago in the Quaternary Period when the local environment was dominated by rivers depositing mainly sand and gravel detrital material in channels to form river terrace deposits, with fine silt and clay from overbank floods forming floodplain alluvium, and some bogs depositing peat (BGS, 2015).

3.0 PLANNING POLICIES

The archaeological investigation is to be carried out on the recommendation of the local planning authority, following guidance laid down by the National Planning and Policy Framework (NPPF, DCLD 2012) which replaces Planning Policy Statement 5: Planning for the Historic Environment (PPS5, DCLG 2010). The relevant local planning policy is the *Forest Heath Local Plan; (Policy 8.20, 1995)*.

3.1 National Planning Policy Framework (NPPF, DCLG March 2012)

The NPPF recognises that 'heritage assets' are an irreplaceable resource and planning authorities should conserve them in a manner appropriate to their significance when considering development. It requires developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible. The key areas for consideration are:

- The significance of the heritage asset and its setting in relation to the proposed development;

- The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance;

- Significance (of the heritage asset) can be harmed or lost through alteration or destruction, or development within its setting. As heritage assets are irreplaceable, any harm or loss should require clear and convincing justification;

- Local planning authorities should not permit loss of the whole or part of a heritage asset without taking all reasonable steps to ensure the new development will proceed after the loss has occurred;

- Non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to scheduled monuments, should be considered subject to the policies for designated heritage assets.

3.2 Forest Heath Local Plan, (Policy 8.20, 1995)

Forest Heath's local plan development plan was adopted in 1995 and has undergone some revision since. A Core Strategy was released in 2010 and an updated assessment of their Heritage Policy is pending. The Council's position on heritage assets is summarised as follows:

- The District Council will seek provision to be made for the evaluation of archaeological sites of unknown importance and areas of high potential prior to the determination of development proposals. Where nationally or locally important sites, whether scheduled or not, and their settings, are effected by proposed development, there will be a presumption in favour of their preservation. On sites where there is no overriding case for preservation, development will not normally be permitted unless agreement has been reached to provide either for their preservation or for their recording and, where desirable, their excavation prior to development.

4.0 ARCHAEOLOGICAL BACKGROUND

The site is located on the edge of the historic settlement area of Beck Row, Holywell Row and Kenny Hill (recorded in the County Historic Environment Record as MNL 675), as a result there is a high potential for encountering early occupation deposits in this location. A systematic archaeological investigation has never been undertaken on this site before (Brief, Section 2.1).

5.0 PROJECT AIMS

A non-intrusive geophysical survey is required of the development; this is likely to lead to a programme of trial trenching to enable the archaeological resource, both in quality and extent, to be accurately quantified. However, any decision about the need for, and

extent of, trial trenching will be taken following the geophysical survey (Brief Section 3.1).

6.0 METHODOLOGY

6.1 Fieldwork

A detailed fluxgate gradiometer survey is required over *c.*2.2 Hectares, scheduled to be undertaken in March 2015.

6.2 Instrument Type Justification

Britannia Archaeology Ltd will employ a Bartington Dual Grad 601-2 fluxgate gradiometer to undertake the survey, because of its high sensitivity and rapid ground coverage. The soils and underlying geology are receptive to magnetometer survey, but good results are heavily dependent on the contrast between the fills of a feature (with humic and charcoal rich deposits providing the best results) and the relative weakness of the local magnetic background field.

6.3 Instrument Calibration

The Magnetometer will be left on for a minimum of 20 minutes in the morning for the sensors to settle before any recorded survey takes place. Sensor heights will be measured and equalised at the start of the first day so that a consistent height above the ground is maintained during the survey. Each sensor shall be positioned on the same side of the instrument throughout the survey. The instrument shall be zeroed after every three grids to minimise the effect of sensor drift. An area shall be chosen with low magnetic susceptibility to calibrate the instruments sensors, this same point shall be used to zero the sensors throughout the survey providing a common zero point.

6.4 Sampling Interval and Grid Size

The sampling interval shall be 0.25m along 1m traverse intervals, within 20 x 20m grids.

6.5 Survey Grid Location

The survey grid shall be set out to the Ordnance Survey OSGB36 datum to an accuracy of ±0.01m employing a Leica Viva Glonnass Smart Rover GS08. Data will be converted to the National Grid Transformation OSTN02, and the instrument will be regularly tested using stations with known ETRS89 coordinates. The grid will be located parallel to the long axis of the proposed development to allow for ease of survey.

6.6 Data Capture

The grid order will be recorded on a BA pro-forma so that the composite plan can be inputted at the close of the day. Instrument readings will be recorded on an internal data logger, downloaded to a laptop at midday and in the evening. Data will be filed in

job specific folders, broken up into daily data sets. All data will then be backed up onto an external storage device and finally a remote server. Raw data composites will be uploaded into an AutoCAD drawing and then printed out daily. This will allow BA to check data quality and to re-survey any grids if necessary.

6.7 Data Presentation and Processing

Only minimal processing of the datasets shall be undertaken, typically de-spike and zero mean traverse. Raw and processed greyscale plots shall be produced for comparison, this ensures that no anomalies are processed out of the original data set. An XY trace plot consisting of raw and processed data will be used in combination with raw and processed greyscale data. An interpretation plan characterising the anomalies shall be produced drawing on the evidence collated from the greyscale and XY trace plots. All figures will be tied into the National Grid and printed at an appropriate scale.

6.8 Software

The software used to process the data and produce the composites will be DW Consulting's Terrasurveyor v2.0. Datasets will be exported into AutoCAD and placed onto their corresponding grid positions. An interpretation plot will then be produced using AutoCAD.

7.0 PRESENTATION OF RESULTS

The prepared client/archive report will be commensurate with the results of the fieldwork, and will be consistent with the principles of the *Management of Research Projects in the Historic Environment* (*MoRPHE*), English Heritage, Edmund Lee, 2006 (minor revisions 2009), *Geophysical Survey In Field Evaluation,* English Heritage, Andrew David *et al*, 2008, and the *Standard and Guidance for Archaeological Geophysical Survey*, Institute for Archaeologists, 2011, containing the following:

- *Summary*. A concise summary of the work undertaken and the results.
- *Introduction*. Introduction to the project including the reasons for work, funding, planning background.
- *Background*. The history, layout and development of the site.
- *Aims and Objectives*.
- *Methodology*. Survey strategy and techniques used.
- *Results*. Detailed description of findings outlining the nature, location and extent of the anomalies.
- *Discussion and Conclusions*. A synopsis interpreting the anomalies, impact assessment, site potential, possible locations of subsequent trial trenches.

- *Bibliography*.
- *Appendices*. Technical Details, Geo-referencing Information, Metadata Sheet, HER/OASIS Summary Sheet.
- *Illustrative Material*. Raw Data Plots, Processed Data Plots, XY Trace Plots, Interpretation Plots, Photographs.

Digital copies will be supplied to the client and the digital version of the final report will be submitted to the Suffolk Historic Environment Record in due course (including a vector plan and AutoCAD .dxf file) and the National Monuments Record (NMR). A .pdf version will be uploaded to the ADS website and an OASIS form will be completed online and sent to the HER.

8.0 PROJECT ARCHIVE AND DEPOSITION

A full archive will be prepared for all work undertaken in accordance with guidance from the *Selection, Retention and Dispersion of Archaeological Collections,* Archaeological Society for Museum Archaeologists, 1993. Arrangements will be made for the archive to be deposited with the relevant museum/HER Office.

9.0 HEALTH AND SAFETY

BA operates a comprehensive Health and Safety Policy in accordance with the Health and Safety Executive. BA operates under the Federation of Archaeological Managers and Employers (FAME) *Health and Safety Field Manual*, which is regularly updated by supplements.

BA are covered by employer's liability, public liability and professional indemnity insurance arranged through Towergate Insurance (see Appendix 2).

9.1 Code of Practice, Risk Assessment and Site Induction

BA's Code of Practice covers all aspects of survey work and ensures all risks are adequately controlled. A site visit will be undertaken and an assessment of the potential risks highlighted, a full site risk assessment will be produced based on this information. The assessment of risk is continually monitored and this document can be updated if any change in risk occurs. A copy of the Risk Assessment is kept on site, read and countersigned by all staff and visitors during the BA site induction.

BA will liaise with the contractor or client on arrival and will follow any additional Health and Safety instructions given.

A qualified First Aider will be present on every site.

All BA staff members are CSCS registered.

10.0 RESOURCES

All archaeological projects are undertaken by a team of professional qualified archaeologists, a synopsis can be found at Appendix 3. Full CV's are available on request.

All site work will be undertaken by a Project Officer (with a field team if required) in close communication with a Project Manager. This project officer will also be responsible for post-survey publication.

11.0 TIMETABLE AND PROGRAMME OF WORK

The geophysical survey is scheduled to be undertaken in March 2015 and report production will commence thereafter. Preliminary greyscale and interpretation plots shall be issued at the end of the survey. It is understood that the client is aware of the working methods and provision has been made to allow access to undertake the survey as required.

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APPENDIX 1 TECHNICAL DETAILS

MAGNETOMETER

The magnetometer differs from the 'active' magnetic susceptibility meter by being a 'passive' instrument. Rather than injecting a signal into the ground it detects slight variations in the Earth's magnetic field caused by cultural and natural disturbance (Clark).

Thermoremanent magnetism is produced when a material containing iron oxides is strongly heated. Clay for example has a high iron oxide content that in a natural state is weakly magnetic, when heated these weakly magnetic compounds become highly magnetic oxides that a magnetometer can detect.

The demagnetisation of iron oxides occurs above a temperature known as the Curie point; for example haematite has a Curie point of 675 Celsius and magnetite 565C. At the time of cooling the iron oxides become permanently re-magnetised with their magnetic properties re-aligned in the direction of the Earth's magnetic field (Gaffney and Gater). The direction of the Earth's magnetic field shifts over time and these subtle alignment differences can be recorded. Kilns, hearths, baked clay and ovens can reach Curie point temperatures, and are the strongest responses apart from large iron objects that can be detected. Other cultural anomalies that can be prospected include occupation areas, pits, ditches, furnaces, sunken feature buildings, ridge and furrow field systems and ritual activity (David, 2011). Commonly recorded anomalies include modern ferrous service pipes, field drainage pipes, removed field boundaries, perimeter fences and field boundaries.

Fluxgate Gradiometers

Fluxgate gradiometers are sensitive instruments that utilise two sensors placed in a vertical plane, spaced 1 metre apart. The sensor above reads the Earth's magnetic (background) response while the sensor below records the local magnetic field. Both sensors are carefully adjusted to read zero before survey commences at a 'zeroing' point, selected for its relatively 'quiet' magnetic background reading. When differences in the magnetic field strength occur between the two sensors a positive or negative reading is logged. Positive anomalies have a positive magnetic value and conversely negative anomalies have a negative magnetic value relative to the site's magnetic background. Examples of positive magnetic anomalies include hearths, kilns, baked clay, areas of burning, ferrous material, ditches, sunken feature buildings, furrows, ferrous service pipes, perimeter fences and field boundaries. Negative magnetic anomalies include earthwork embankments, plastic water pipes and geological features.

The instruments are usually held approximately 0.30m to 0.50m above the ground surface and can detect to a depth of between 1-2metres. Best practice dictates that the optimal direction of traverse in Britain is east to west.

Magnetic Anomalies

Linear trends
Linear trends can be both positive and negative magnetic responses. If they are broad, relatively weak or negative in nature they may be of agricultural or geological origin, for example periglacial channels, land drains or ploughing furrows. If the responses are strong positive trends they are more likely to be of archaeological origin. Archaeological settlement ditches tend to be rich in highly magnetic iron oxides that accumulate in them via anthropogenic activity and humic backfills. Conversely surviving banks will be negative in nature, the material is derived from subsoil deposits that is less likely to be positively magnetic. Curvilinear trends can also be recorded and are indicative of archaeological structures such as drip-gullies.

Discrete anomalies
Discrete anomalies appear as increased positive responses present within a localised area. They are caused by a general increase in the amount of magnetic iron oxides present within the humic back-fill of for example a rubbish pit.

'Iron spike' anomalies
These strong isolated dipolar responses are usually caused by ferrous material present in the topsoil horizon. They can have an archaeological origin but are usually introduced into the topsoil during manuring.

Areas of magnetic disturbance
An area of magnetic disturbance is usually associated with material that has been fired. For example areas of burning, demolition (brick) rubble or slag waste spreads. They can also be caused by ferrous material, e.g. close proximity to barbwire or metal fences and field boundaries, buried services, pylons and modern rubbish deposits.

APPENDIX 2 INSURANCE DETAILS

	Employers Liability Insurance	**Public Liability**	**Professional Indemnity**
Insurer	Towergate Insurance	Towergate Insurance	Towergate Insurance
Extent of Cover	£10,000,000	£2,000,000	£2,000,000
Policy Number	000436	000436	201101352/1236

APPENDIX 3 STAFF

The following members of staff have the skills and experience necessary to undertake the supervision of archaeological work as required in the brief. All have a wide range of experience on a variety of site types.

Senior Project Manager Dan McConnell BSc (Hons)

Qualifications: University of Bournemouth, BSc (Hons) Archaeology (1995-1998)

Experience: Dan is a Senior Project Manager at Britannia Archaeology and has sixteen years post-graduation archaeological experience. He took part in several archaeological projects in the north of England from the late 1980's onwards, including the Wharram Percy Research Project and Mount Grace Priory excavations. As a postgraduate he has been involved with many small to large scale archaeological projects in the United Kingdom and Ireland including major infrastructure schemes. Since relocating to East Anglia in 2004 he has carried out and managed several small to large scale excavations. In 2008 Dan became a County Archaeologist for the Cambridgeshire County Council Historic Environment Team before joining Britannia in 2014. His main research interests focus on the early pre-historic period (in particular the Neolithic) of the British-Isles and late post-medieval archaeology.

Senior Project Manager Martin Brook BA (Hons) PIfA

Qualifications: University of Leicester, BA (Hons) Archaeology (2003 – 2006)

Experience: Martin is a Project Manager at Britannia Archaeology and has seven years post-graduation archaeological experience. He specialises in logistical project management and archiving. He has carried out numerous excavations and evaluations throughout East Anglia and is familiar with all local museum and county archiving requirements. His research interests are focused on the British Iron age specifically funerary traditions in the south of England and in East Yorkshire. He has developed a keen specialisation in metalwork finds from the period.

Director Timothy Schofield HND BSc PIfA

Qualifications: University of Bournemouth, BSc Archaeological Studies (1999-2000)

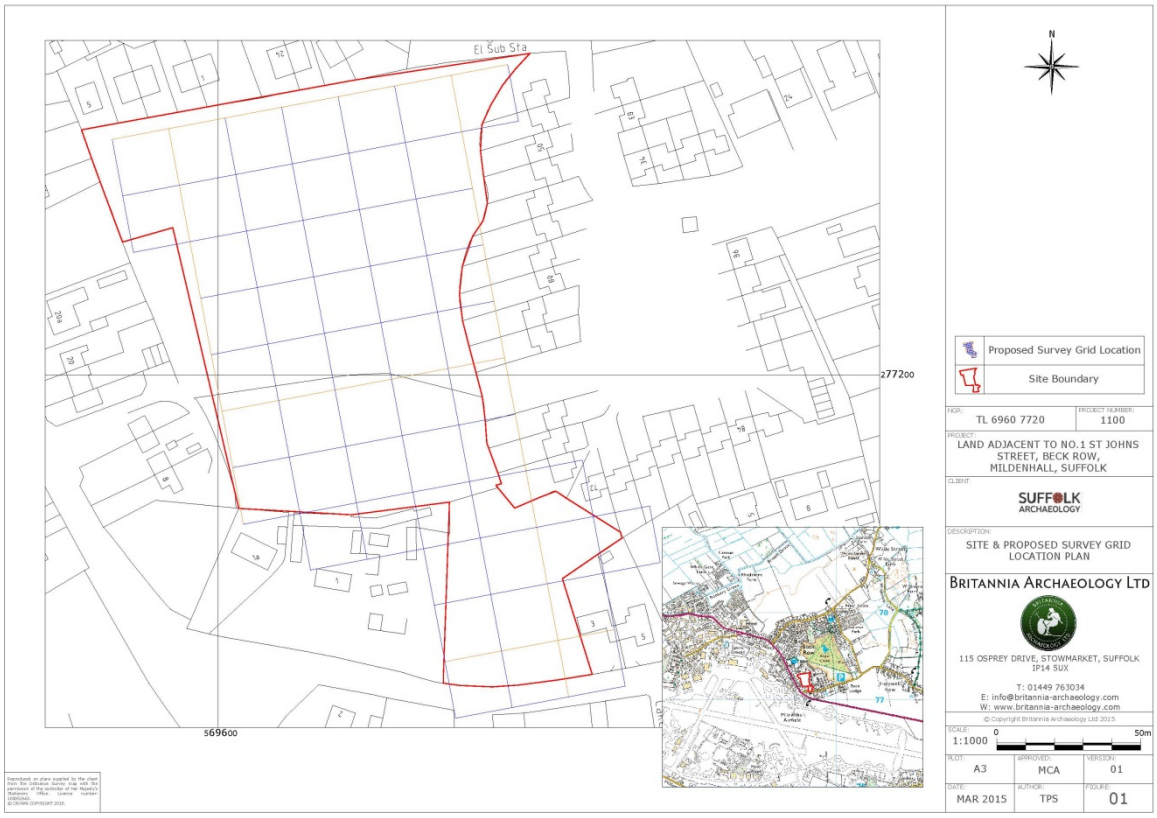
Yeovil College, HND Practical Archaeology, (1997-1999)

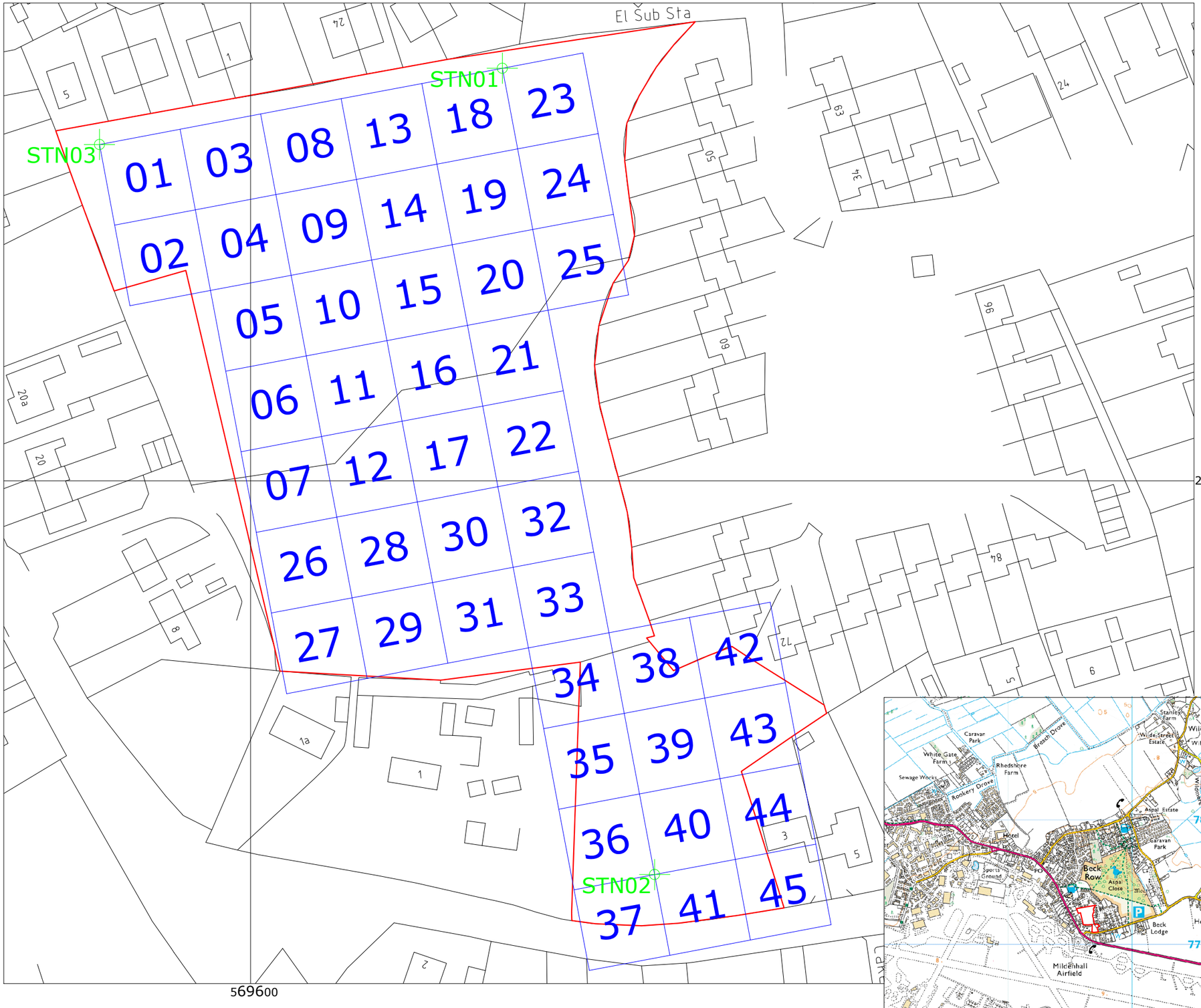
Experience: Tim is the Co-Director of Britannia Archaeology and has twelve years post-graduation archaeological experience. He specialises in geophysical survey, topographic survey, GIS, computer aided design and archaeological excavation. He has carried out numerous surveys and excavations across the UK. His research interests focus mainly on prehistoric and post-Roman archaeology and in the use and application of modern technological advances in archaeology.

Director **Matthew Adams BA (Hons) AIfA**

Qualifications: University of Durham, BA (Hons) Classical Studies (1997-2000)

Experience: Matt is the Co-Director of Britannia Archaeology and has seven years post-graduation archaeological experience. He was involved in several archaeological projects in the North East of England as an undergraduate and has since worked in Lincolnshire and the Midlands. Since 2007 he has been based in East Anglia where he has specialised in all areas of practical field work, running numerous projects both large and small. He is also an experienced surveyor and AutoCAD operator. Matt is an occasional contributor to the popular TV series Time Team and is experienced at presenting talks and seminars to interested organisations. His main research interests focus on 'transitional periods' and include the late Iron Age and early Romano-British period, and the late Roman and early Anglo-Saxon period in Britain.





STATION	EASTING	NORTHING
01	569661.412	277300.553
02	569698.557	277104.033
03	569563.152	277281.980

Survey Grid Location

Site Boundary

NGR: TL 6960 7720

REPORT NUMBER: 1092

PROJECT: LAND ADJACENT TO NO.1 ST JOHNS STREET, BECK ROW, MILDENHALL, SUFFOLK

CLIENT: SUFFOLK ARCHAEOLOGY

DESCRIPTION: SITE, SURVEY GRID & GEOREFERENCING INFORMATION PLAN

BRITANNIA ARCHAEOLOGY LTD

115 OSPREY DRIVE, STOWMARKET, SUFFOLK IP14 5UX

T: 01449 763034
E: info@britannia-archaeology.com
W: www.britannia-archaeology.com

SCALE: 1:1000 (0 – 50m)

PLOT:	APPROVED:	VERSION:
A3	MCA	01
DATE:	AUTHOR:	FIGURE:
APR 2015	TPS	01

N

+10nT

-10nT

Site Boundary

NGR: TL 6960 7720

REPORT NUMBER: 1092

PROJECT: LAND ADJACENT TO NO.1 ST JOHNS STREET, BECK ROW, MILDENHALL, SUFFOLK

CLIENT: SUFFOLK ARCHAEOLOGY

DESCRIPTION: RAW MAGNETOMETER GREYSCALE PLOT

BRITANNIA ARCHAEOLOGY LTD

115 OSPREY DRIVE, STOWMARKET, SUFFOLK
IP14 5UX

T: 01449 763034
E: info@britannia-archaeology.com
W: www.britannia-archaeology.com

SCALE: 1:1000 (0 – 50m)

PLOT: A3

APPROVED: MCA

VERSION: 01

DATE: APR 2015

AUTHOR: TPS

FIGURE: 02

N

+4nT

-4nT

Site Boundary

NGR: TL 6960 7720

REPORT NUMBER: 1092

PROJECT: LAND ADJACENT TO NO.1 ST JOHNS STREET, BECK ROW, MILDENHALL, SUFFOLK

CLIENT: SUFFOLK ARCHAEOLOGY

DESCRIPTION: PROCESSED MAGNETOMETER GREYSCALE PLOT

BRITANNIA ARCHAEOLOGY LTD

115 OSPREY DRIVE, STOWMARKET, SUFFOLK
IP14 5UX

T: 01449 763034
E: info@britannia-archaeology.com
W: www.britannia-archaeology.com

SCALE: 1:1000 (0 – 50m)

PLOT: A3 | APPROVED: MCA | VERSION: 01

DATE: APR 2015 | AUTHOR: TPS | FIGURE: 03

N

40nT/cm	Scale Interval
	Site Boundary

NGR: TL 6960 7720

REPORT NUMBER: 1092

PROJECT: LAND ADJACENT TO NO.1 ST JOHNS STREET, BECK ROW, MILDENHALL, SUFFOLK

CLIENT: SUFFOLK ARCHAEOLOGY

DESCRIPTION: PROCESSED MAGNETOMETER XY TRACE PLOT

BRITANNIA ARCHAEOLOGY LTD

115 OSPREY DRIVE, STOWMARKET, SUFFOLK
IP14 5UX

T: 01449 763034
E: info@britannia-archaeology.com
W: www.britannia-archaeology.com

SCALE: 1:1000 (0 – 50m)

PLOT:	APPROVED:	VERSION:
A3	MCA	01

DATE:	AUTHOR:	FIGURE:
APR 2015	TPS	04

	Positive Linear Anomaly, Archaeology?
	Thermoremnant Response, Areas Of Burning, Industry?
	Magnetic Disturbance, Associated with Demolished Building Complex
	Area of Magnetic Disturbance
	Thermoremnant Response, Extant Areas Of Burning
	Narrow Weak Positive Curvilinear Anomalies, Extant Wheel Ruts
	Isolated Dipolar Responses

	Digitised OS Map Features
	Site Boundary

NGR:	REPORT NUMBER:
TL 6960 7720	1092

PROJECT:
LAND ADJACENT TO NO.1 ST JOHNS STREET, BECK ROW, MILDENHALL, SUFFOLK

CLIENT:
SUFFOLK ARCHAEOLOGY

DESCRIPTION:
INTERPRETATION PLOT OF MAGNETOMETER ANOMALIES

BRITANNIA ARCHAEOLOGY LTD

115 OSPREY DRIVE, STOWMARKET, SUFFOLK
IP14 5UX

T: 01449 763034
E: info@britannia-archaeology.com
W: www.britannia-archaeology.com

SCALE: 1:1000 (0 – 50m)

PLOT:	APPROVED:	VERSION:
A3	MCA	01
DATE:	AUTHOR:	FIGURE:
APR 2015	TPS	05