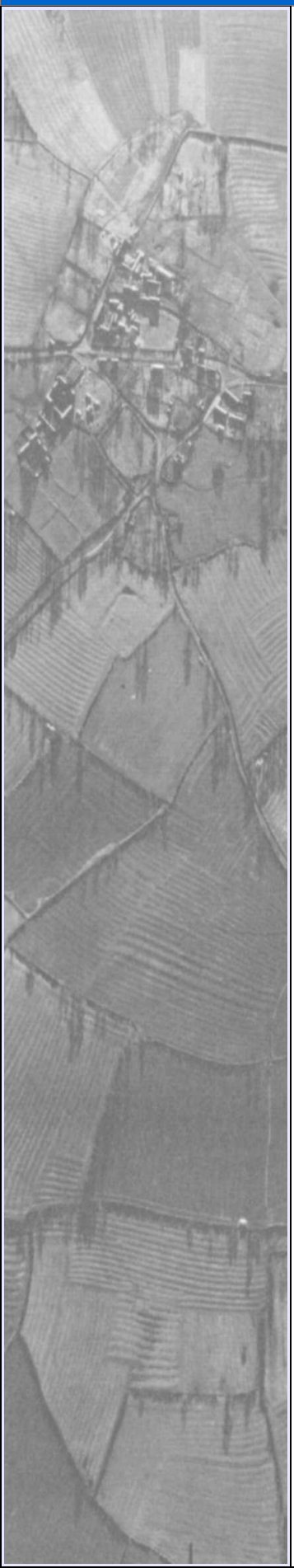

Barrus Development – D1 & D4
Graven Hill Land Transfer Area 2
Bicester
Oxfordshire

MAGNETOMETER SURVEY REPORT

for

Waterman Infrastructure & Environment Ltd

Kerry Donaldson & David Sabin

October 2018

Ref. no. J762

ARCHAEOLOGICAL SURVEYS LTD

Barrus Development – D1 & D4
Graven Hill Land Transfer Area 2
Bicester
Oxfordshire

Magnetometer Survey Report

for

Waterman Infrastructure &
Environment Ltd

Fieldwork by David Sabin BSc (Hons) MCIfA and Kerry Donaldson BSc (Hons)
Report by Kerry Donaldson
Report checked by David Sabin
Primary archive location - Archaeological Surveys Ltd, Yatesbury, Wiltshire

Survey date – 26th September 2018
Ordnance Survey Grid Reference – **SP 59080 19820**

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SUMMARY

Magnetometry was carried out by Archaeological Surveys Ltd, on behalf of Waterman Infrastructure & Environment Ltd, over an area of land outlined for transfer to the Graven Hill Village Development, Bicester in Oxfordshire. Six small survey areas of grass were covered in the vicinity of Buildings D1 & D4 within the current MoD Bicester storage depot. The results demonstrate the presence of high magnitude magnetic anomalies associated with services and above ground structures with widespread magnetic debris relating to ferrous material within the soils. No anomalies could be attributed to features pre-dating the WWII construction of the site, and it is likely that the majority of the areas have been subject to some degree of landscaping.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Waterman Infrastructure & Environment Ltd to undertake a magnetometer survey of an area of land at D site within the military storage depot of MoD Bicester which is due to be transferred to Graven Hill Village Development Company. Graven Hill has been a military site since WWII and much of the land to the north has already been transferred to the Graven Hill Village Development Company for residential development within Land Transfer Area 1 (LTA1).

1.1.2 The land surrounding buildings D1 and D4 is the first part of Land Transfer Area 2 (LTA2) and will entail the construction of new roads, a pedestrian route and a new office as part of a commercial development by E.P. Barrus Ltd. The survey forms part of an archaeological assessment of the development area.

1.1.3 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2018).

1.2 Survey objectives and techniques

1.2.1 The objective of the survey was to use magnetometry to locate geophysical anomalies that may be archaeological in origin so that they may be assessed prior to development of the site. The methodology is considered an efficient and effective approach to archaeological prospection.

1.2.2 Geophysical survey can provide useful information on the archaeological potential of a site; however, the outcome of any survey relies on a number of factors and as a consequence results can vary. The success in meeting the aims and objectives of a survey is, therefore, often impossible to predetermine.

1.3 Standards, guidance and recommendations for the use of this report

1.3.1 The survey and report generally follow the recommendations set out by: European Archaeological Council (2015) *Guidelines for the Use of Geophysics in Archaeology;* Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations*. The work has been carried out to the Chartered Institute for Archaeologists (2014) *Standard and Guidance for Archaeological Geophysical Survey.* Note: currently Historic England (2018) no longer support the guidelines set out in English Heritage (2008) *Geophysical survey in archaeological field evaluation* and there are currently no plans to update the document. As a consequence other sources of written guidance referring to this document may be out of date and/or contain unsupported information (e.g. Chartered Institute for Archaeologists, 2014).

1.3.2 Archaeological Surveys Ltd provide a detailed geophysical survey report and it is recommended that where possible the contents should be considered in full. The Summary provides a brief overview of the results with more detail available in the Discussion and/or Conclusion. The *List of anomalies* within the Results provides a detailed assessment of the anomalies within separate categories which can be useful in inferring a level of confidence to the interpretation. Quality and factors influencing the interpretation of anomalies is also set out within the results.

1.3.3 It is recommended that the full report should always be considered when using data and interpretation plots; where this is not possible, in the field for example, the abstraction and interpretation plots should retain their colour coding and be used with a corresponding legend.

1.3.4 Where targeting of anomalies by excavation is to be carried out, care should be taken to place trenches over solid lines or features visible on the abstraction and interpretation plots. Archaeological Surveys abstraction and interpretation avoids the use of dashed or dotted lines; broken or fragmented anomalies may well correspond closely with subsurface truncation.

1.4 Site location, description and survey conditions

1.4.1 The site is located towards the southern edge of the Graven Hill Village Development. It is centred on Ordnance Survey National Grid Reference (OS NGR) SP 59080 29820, see Figs 01 and 02.

1.4.2 The geophysical survey covers approximately 1.2ha over six separate survey areas. Area 1 (0.15ha) lies in the north eastern part of the site adjacent to water tanks and buildings. Area 2 (0.17ha) contains a number of extant but disused munitions stores and a number of bases of removed munitions stores. Area 3 (0.06ha) is a very small area that lies to the south of Area 2. Area 4 (0.15ha) is situated to the south of Building D1. Area 5 (0.6ha) is the largest

open space to the south of Area 4 and Area 6 (0.1ha) lies to the north of Area 5.

1.4.3 The development boundary also includes several areas of hardstanding. These were scanned with the magnetometer to observe the magnitude of anomalies and the extremely high values indicate that they contain ferrous material likely to relate to reinforcing. The areas were, therefore, not considered suitable for detailed magnetometer survey.

1.4.4 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data due to short grass cover. Weather conditions during the survey were fine.

1.5 Site history and archaeological potential

1.5.1 Previous archaeological investigations have been carried out over the wider Graven Hill site outlined for LTA1 to the north of the present survey area. These include two geophysical surveys (Archaeological Surveys, 2010 & 2011) as well as trial trench evaluation across much of the LTA1 site (Oxford Archaeology, 2016).

1.5.2 The nearest previous geophysical survey area (Area G) from the 2011 survey lies just to the north east of the present development boundary, and a number of positive and negative linear and possible rectilinear anomalies were previously located. The area had been used as a sports field and magnetic debris and disturbance was encountered. It was, therefore, not certain if the weaker, positive and negative anomalies were directly associated with the sports field or if they related to possible cut features. This area was not evaluated by Oxford Archaeology. Elsewhere within the wider Graven Hill site many of the anomalies did relate to archaeological features, including the Roman road of Akeman Street lying approximately 650m north east of the current survey area.

1.5.3 The site has been in military use since WWII when it was first established as the Central Ordnance Depot in 1941 and supplied equipment for the D-Day Normandy landings. It is still widely used as a military storage depot. It contains numerous buildings, services, roads, railway lines and other infrastructure, with associated landscaping works. This is likely to result in widespread magnetic contamination but also possible truncation and/or deeper burial of earlier features within some areas.

1.6 Geology and soils

1.6.1 The underlying solid geology across the site is Jurassic mudstone from the Peterborough Member (formerly Lower Oxford Clay Member) (BGS, 2017).

1.6.2 The overlying soil across the survey area is from the Denchworth association and is a pelo-stagnogley soil. It consists of a slowly permeable, seasonally

waterlogged, clayey soil (Soil Survey of England and Wales, 1983).

1.6.3 Magnetometry survey carried out across similar soils has produced good results, although there can be lack of magnetic contrast between the fill of cut features and the material into which they are cut. The underlying geology and soils are, therefore, considered acceptable for magnetic survey.

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance are factors associated with the formation of localised fields. Additional details are set out below and within Appendix A.

2.1.2 Iron minerals within the soil may become altered by burning and the break down of biological material; effectively the magnetic susceptibility of the soil is increased, and the iron minerals become magnetic in the presence of the Earth's magnetic field. Accumulations of magnetically enhanced soils within features, such as pits and ditches, may produce magnetic anomalies that can be mapped by magnetic prospection.

2.1.3 Magnetic thermoremnance can occur when ferrous minerals have been heated to high temperatures such as in a kiln, hearth, oven etc. On cooling, a permanent magnetisation may be acquired due to the presence of the Earth's magnetic field. Certain natural processes associated with the formation of some igneous and metamorphic rock may also result in magnetic thermoremnance.

2.1.4 The localised variations in magnetism are measured as sub-units of the Tesla, which is a SI unit of magnetic flux density. These sub-units are nano Teslas (nT), which are equivalent to 10^{-9} Tesla (T).

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using a SENSYS MAGNETO®MXPDA 5 channel cart-based system. The instrument has 5 fluxgate gradiometers (FGM650) spaced 0.5m apart with readings recorded at 20 Hz. The cart is pushed at walking speed and not towed. Each sensor is not zeroed in the field as the vertical axis alignment is precisely fixed leaving sensor offsets that are removed during data processing. The fixing of the vertical alignment ensures the sensors are not unduly influenced by localised magnetic fields and that the vertical component of a magnetic anomaly is measured. The gradiometers have a range of recording data between ±0.1nT and ±10,000nT. They are linked to a Leica GS10 RTK GPS with data recorded by SENSYS MAGNETO®MXPDA software on a rugged PDA computer system.

2.2.2 Due to the fixed offsets within the fluxgate sensors, as a result of the manufacturing and tensioning process, the survey data do not provide a visually useful dataset until a zero median traverse algorithm is applied. It is recognised that this has the potential to affect some anomalies detrimentally by removing linear features orientated parallel to survey transects. However, this has not been noted as a particular problem with the system due to the high resolution data collection, generally long length of traverses and variability within the magnetic characteristics of a linear anomaly.

2.2.3 Data are collected along a series of parallel survey transects to achieve 100% coverage of the surveyable land. The length of each transect is variable and relates to the size of the survey area and other factors including ground conditions. A visual display allows accurate placing of transects and helps maintain the correct separation between adjacent traverses. Data are not collected within fixed grids and data points are considered to be random even though the data are collected in a systematic manner covering all accessible areas (Aspinall, Gaffney and Schmidt, 2009).

2.2.4 Fluxgate sensors are highly sensitive to temperature change and this manifests as drift during the course of a survey. This can be particularly noticeable during the morning as temperatures rise and the equipment warms or cools. Sensor drift within the course of a traverse will appear as a line trending from negative to positive after processing with a zero median traverse algorithm. To remove the potential for temperature drift, data were collected after a 20 minute stabilisation period and traverses were limited to a time of generally <30s.

2.3 Data processing and presentation

2.3.1 Magnetic data collected by the MAGNETO®MXPDA cart-based system are initially prepared using SENSYS MAGNETO®DLMGPS software. The software effectively allocates a geographic position for each data point and can compensate for fixed offsets present within the FGM650 sensors. The offsets are positive or negative values present on all fluxgate gradiometer sensors. Some systems use manual or electronic balancing to effectively zero the sensors; however, this is a short term measure that is prone to drift through temperature changes and vibration and can easily be incorrectly set due to localised magnetic fields. The FGM650 sensors are very accurately aligned to the vertical magnetic gradient and are highly stable showing negligible drift on long traverses. The offset values are removed using TerraSurveyor software.

2.3.2 Survey tracks are analysed and georeferenced raw data (UTM Z30N) are then exported in ASCII format for further analysis and display within TerraSurveyor. The removal of offset values (compensation) of the sensors is also carried out in TerraSurveyor using a zero median traverse function. Data are then considered to be minimally processed. Note: without the zero median traverse function it is not possible to create a meaningful data plot as all sensors have a different offset value. Although a zero median traverse algorithm can remove

anomalies aligned with the survey tracks, in practice this rarely occurs due to the use of long traverses, high resolution measurement and variability within the magnetic susceptibility of long linear features.

2.3.3 The minimally processed data are collected between limits of ±10000nT and clipped for display at ±20nT for Areas 1, 5 & 6 and ±100nT for Areas 2, 3 & 4.. In order to show the extreme magnitude of the responses, areas have been shown clipped at ±100nT with values over 75nT in red and under -75nT in blue (Fig 04).Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track.

2.3.4 Additional data processing has been carried out for Area 5 in the form of high pass filtering. This effectively removes low frequency variation along a traverse that has been caused by large magnetic bodies, cultivation or rapid temperature change. Data treated to additional processing has been compared to unprocessed data to ensure that no significant anomalies have been removed.

2.3.5 Appendix C contains metadata concerning the survey and data attributes and is derived directly from TerraSurveyor. Reference should be made to Appendix B for further information on processing.

2.3.6 A TIF file is produced by TerraSurveyor software along with an associated world file (.TFW) that allows automatic georeferencing (OSGB36 datum) when using GIS or CAD software. The main form of data display used in the report is the minimally processed greyscale plot. With regard to the Sensys MXPDA, minimally processed data are considered by the manufacturer to be data that are compensated by SENSYS MAGNETO DLMGPS software, see 2.3.1 and 2.3.2. Note: traceplots are not considered to be appropriate as they do not provide an accurate or useful assessment of the magnetic anomalies due to the very high density of data collection.

2.3.7 The raster images are combined with base mapping using ProgeCAD Professional 2016, creating DWG (2010) file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. The CAD plots are effectively georeferenced facilitating relocation of features using GPS, resection method, etc.

2.3.8 An abstraction and interpretation is drawn and plotted for all geophysical anomalies located by the survey. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing. Appendix E sets out CAD layer names with colour and graphic content for each interpretation category, see 3.3.

2.3.9 A brief summary of each anomaly, with an appropriate reference number, is set out in list form within the results (Section 3) to allow a rapid and objective assessment of features within each survey area.

2.3.10 A digital archive is produced with this report, see Appendix D below. The

main archive is held at the offices of Archaeological Surveys Ltd.

3 RESULTS

3.1 General assessment of survey results

3.1.1 The detailed magnetic survey was carried out over a total of six survey areas covering approximately 1.2ha.

3.1.2 Magnetic anomalies located can be generally classified as positive linear anomalies of an uncertain origin, areas of magnetic debris and disturbance, strong discrete dipolar anomalies relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried services or pipelines.

3.2 Statement of data quality and factors influencing the interpretation of anomalies

3.2.1 Data are considered representative of the magnetic anomalies present within the site. There are no significant defects within the dataset.

3.2.2 Numerous high magnitude magnetic anomalies were located by the survey and these are associated with services and both above and below surface ferrous objects. Any features of archaeological potential within the vicinity of these anomalies may not be visible within the dataset as a consequence.

3.2.3 The site has clearly been subject to landscaping and levelling which has the potential to truncate subsurface archaeological features or increase the depth of soil cover preventing their location if they are magnetically weak. In addition, soil spreads contaminated with small ferrous objects add a significant level of magnetic 'noise' which may also obscure weakly magnetic features.

3.3 Data interpretation

3.3.1 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the survey. A basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, see Table 1.

Interpretation category	Description and origin of anomalies
Anomalies with an uncertain origin	The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Morphology may be unclear or uncharacteristic and there may be a lack of additional supporting information. Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning

	may also produce positive anomalies. Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.
Anomalies associated with magnetic debris	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. They often occur where there has been dumping or ground make-up and are related to magnetically thermoremnant materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, hearths and nail spreads from former wooden structures or rooves and may, therefore, be archaeologically significant. It is also possible that the response may be caused by natural material such as certain gravels and fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
Anomalies with a modern origin	The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc.. Often a significant area around these features has a strong magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are present. Fluxgate sensors may respond erratically adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 1: List and description of interpretation categories

3.4 Assessment of anomalies

3.4.1 All of the survey areas contain a number of services, the majority of which are of steel/iron construction and very strongly magnetic. The results also demonstrate the presence of widespread magnetic debris which is likely to indicate the presence of waste ferrous material within the soil. Within Area 2, a number of extant and partly removed munitions stores have steel/iron reinforcing that has caused widespread magnetic disturbance. Only a small number of positive linear anomalies can be seen in Area 5, but these bound zones of magnetic debris and are likely to be associated.

4 CONCLUSION

4.1.1 The detailed magnetometer survey was affected by strongly magnetic debris and disturbance from modern services, infrastructure and ferrous objects within the ground make-up surrounding Buildings D1 & D4. A small number of positive linear anomalies were located in Area 5 to the south of D1, but these bound zones of magnetic debris and are likely to be directly associated. No anomalies could be attributed to features pre-dating the WWII construction of the site.

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Appendix A – basic principles of magnetic survey

Iron minerals are always present to some degree within the topsoil and enhancement associated with human activity is related to increases in the level of magnetic susceptibility and thermoremnant material. Magnetic susceptibility is an induced magnetism within a material when it is in the presence of a magnetic field. This can be thought of as effectively permanent due to the presence of the Earth's magnetic field. Thermoremnant magnetism occurs when ferrous material is heated beyond a specific temperature known as the Curie Point. Demagnetisation occurs at this temperature with re-magnetisation by the Earth's magnetic field upon cooling.

Enhancement of magnetic susceptibility can occur in areas subject to burning and complex fermentation processes on biological material; these are frequently associated with human settlement. Thermoremnant features include ovens, hearths, and kilns. In addition thermoremnant material such as tile and brick may also be associated with human activity and settlement.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil can create an area of enhancement compared with surrounding soils and subsoils into which the feature is cut. Mapping enhanced areas will produce linear and discrete anomalies allowing an assessment and characterisation of hidden subsurface features.

It should be noted that areas of negative enhancement can be produced from material having lower magnetic properties compared to the topsoil. This is common for many sedimentary bedrocks and subsoils which were often used in the construction of banks and walls etc. Mapping these 'negative' anomalies may also reveal archaeological features.

Magnetic survey or magnetometry can be carried out using a fluxgate gradiometer and may be referred to as gradiometry. The SENSYS gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 65cm apart. The instrument is carried about 10-20cm above the ground surface and the upper sensor measures the Earth's magnetic field as does the lower sensor but this is influenced to a greater degree by any localised buried magnetic field. The difference between the two sensors will relate to the strength of the magnetic field created by the buried feature.

There are a number of factors that may affect the magnetic survey and these include soil type, local geology and previous human activity. Situations arise where magnetic disturbance associated with modern services, metal fencing, dumped waste material etc., obscures low magnitude fields associated with archaeological features.

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. It has been found that clipping data to ranges between ±5nT and ±3nT often improves the appearance of features associated with archaeology. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Zero (destripe) Median/Mean Traverse

The median (or mean) of each traverse is calculated ignoring data outside a threshold value, the median (or mean) is then subtracted from the traverse. The process is used to equalise differences between the baseline value of gradiometer sensors.

High Pass Filtering

A mathematical process used to remove low frequency anomalies relating to survey tracks, modern agricultural features and other large magnetic bodies within or adjacent to survey areas.

Low Pass Filtering

A mathematical process used to remove high frequency anomalies relating to uneven ground, vibration, etc.

Appendix C – survey and data information

Area 1

Filename: J762-mag-Area1.xcp
Description: Imported as Composite from: J762-mag-Area1.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 459083.56, 219990.40 m
Southeast corner: 459218.71, 219919.0 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702
Source GPS Points: 91900
Dimensions
Composite Size (readings): 901 x 476
Survey Size (meters): 135 m x 71.4 m
Grid Size: 135 m x 71.4 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 22.10
Min: -22.00
Std Dev: 11.22
Mean: 0.16
Median: -0.04
Composite Area: 0.96497 ha
Surveyed Area: 0.3173 ha
PROGRAM
Name: TerraSurveyor
Version: 3.0.23.0
GPS based Proce6
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -20.00 to 20.00 nT

Area 2

Filename: J762-mag-Area2.xcp
Description: Imported as Composite from: J762-mag-Area2.asc
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 459093.49, 219931.46 m
Southeast corner: 459134.14, 219849.56 m
Source GPS Points: 63300
Dimensions
Composite Size (readings): 271 x 546
Survey Size (meters): 40.7 m x 81.9 m
Grid Size: 40.7 m x 81.9 m
X Interval: 0.15 m
Y Interval: 0.15 m

Stats
Max: 110.50
Min: -110.00
Std Dev: 62.65
Mean: 0.72
Median: 1.49
Composite Area: 0.33292 ha
Surveyed Area: 0.2007 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -100.00 to 100.00 nT

Area 3

Filename: J762-mag-Area3.xcp
Description: Imported as Composite from: J762-mag-Area3.asc
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 459110.97, 219850.93 m
Southeast corner: 459160.62, 219820.33 m
Source GPS Points: 20100
Dimensions
Composite Size (readings): 331 x 204
Survey Size (meters): 49.7 m x 30.6 m
Grid Size: 49.7 m x 30.6 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 110.50
Min: -110.00
Std Dev: 49.64
Mean: 0.46
Median: 0.18
Composite Area: 0.15193 ha
Surveyed Area: 0.070686 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -100.00 to 100.00 nT

Area 4

Filename: J762-mag-Area4.xcp
Description: Imported as Composite from: J762-mag-Area4.asc
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 459002.47, 219830.33 m
Southeast corner: 459125.475, 219800.48 m
Source GPS Points: 40000
Dimensions
Composite Size (readings): 820 x 199
Survey Size (meters): 123 m x 29.9 m
Grid Size: 123 m x 29.9 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 110.50
Min: -110.00
Std Dev: 59.37
Mean: 1.40
Median: -0.25
Composite Area: 0.36716 ha
Surveyed Area: 0.16499 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -100.00 to 100.00 nT

Area 5

Filename: J762-mag-Area5.xcp
Description: Imported as Composite from: J762-mag-Area5.asc
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 458907.33, 219796.73 m
Southeast corner: 459095.43, 219713.78 m
Dummy Value: 32702
Source GPS Points: 157100
Dimensions
Composite Size (readings): 1254 x 553
Survey Size (meters): 188 m x 83 m
Grid Size: 188 m x 83 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 22.10
Min: -22.00
Std Dev: 11.13
Mean: -0.38
Median: 0.03
Composite Area: 1.5603 ha
Surveyed Area: 0.59147 ha
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 High pass Uniform (median) filter: Window dia: 300
5 Clip from -20.00 to 20.00 nT

Area 6

Filename: J762-mag-Area6.xcp
Description: Imported as Composite from: J762-mag-Area7.asc
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 458916.14, 219798.40 m
Southeast corner: 458987.84, 219775.30 m
Source GPS Points: 26800
Dimensions
Composite Size (readings): 478 x 154
Survey Size (meters): 71.7 m x 23.1 m
Grid Size: 71.7 m x 23.1 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 22.10
Min: -22.00
Std Dev: 14.61
Mean: -0.01
Median: 0.61
Composite Area: 0.16563 ha
Surveyed Area: 0.09173 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -20.00 to 20.00 n

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their offices in Wiltshire. Data are backed-up onto an on-site data storage drive and at the earliest opportunity data are copied to CD ROM for storage on-site and off-site.

A draft copy will be supplied to the Waterman Infrastructure & Environment Heritage Consultant for comment and review. The Consultant will then submit a copy to the county archaeologist for comment and the agreed final copy will be supplied in PDF format to the Oxfordshire Historic Environment Record on the understanding that it will become a public document after an appropriate period of time (generally not exceeding six months).. The report will also be uploaded to the Online AccesS to the Index of archaeological investigationS (OASIS).

Archive contents:

File type	Naming scheme	Description
Data	J762-mag-**[area number/name]**.asc J762-mag-**[area number/name]**.xcp J762-mag-**[area number/name]**-proc.xcp	Raw data as ASCII CSV TerraSurveyor raw data TerraSurveyor minimally processed data
Graphics	J762-mag-**[area number/name]**-proc.tif	Image in TIF format
Drawing	J762-**[version number]**.dwg	CAD file in 2010 dwg format
Report	J762 report.odt	Report text in Open Office odt format

Table 2: Archive metadata

Appendix E – CAD layers for abstraction and interpretation plots

The table below sets out Archaeological Surveys Ltd CAD layer names with associated colours and graphical content. Where CAD files are available layers may be extracted for further CAD/GIS use. Note: hatched polygon boundaries are contained within layers with the RGB colour code 254, 255, 255 (near white) in order to prevent their visibility.

Report sub-heading and associated CAD layer names	Colour with RGB index		Layer content
Anomalies with an uncertain origin			
AS-ABST MAG POS LINEAR UNCERTAIN		255,127,0	Line, polyline or polygon (solid)
Anomalies associated with magnetic debris			
AS-ABST MAG DEBRIS		132, 132, 132	Polygon (cross hatched ANSI37)
AS-ABST MAG STRONG DIPOLAR		132, 132, 132	Solid donut, point or polygon (solid)
Anomalies with a modern origin			
AS-ABST MAG DISTURBANCE		132, 132, 132	Polygon (hatched ANSI31)
AS-ABST MAG SERVICE		132, 132, 132	Line or polyline

Table 3: CAD layering

Appendix F – copyright and intellectual property

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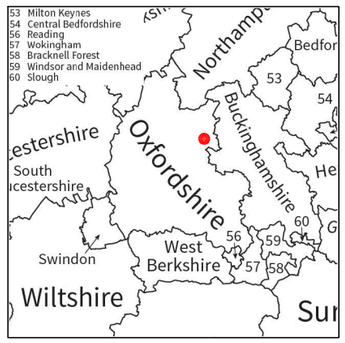
Development boundary

Survey locations

Archaeological Surveys Ltd

Geophysical Survey
Barrus Development - D1 & D4
Graven Hill Land Transfer Area 2
Bicester
Oxfordshire

Map of survey area



Survey location

Site centred on OS NGR
SP 59080 19820

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 01

Archaeological Surveys Ltd

Geophysical Survey
Barrus Development - D1 & D4
Graven Hill Land Transfer Area 2
Bicester
Oxfordshire

Referencing information

Referencing grid to OSGB36 datum at 50m intervals

Data collected at 20Hz and georeferenced to ETRS89 zone 30 with conversion to OSGB36 using OSTN02

458950 219750

Development boundary

SCALE 1:2000

0m 20 40 60 80 100m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 02

458750 458800 458850 458900 458950 459000 459050 459100 459150 459200

220000 219950 219900 219850 219800 219750 219700 219650

N

Area 1
Area 2
Area 3
Area 4
Area 5
Area 6

BUILDING D1
BUILDING D4

Hardstanding - magnetic disturbance
Hardstanding - magnetic disturbance

Water
Water
Water
Water

Pipe Line
Pipe Line
Pipe Line
Pipe Line
Pipe Line

SP
Und
CF

Archaeological Surveys Ltd

Geophysical Survey
Barrus Development - D1 & D4
Graven Hill Land Transfer Area 2
Bicester
Oxfordshire

Greyscale plot of minimally processed magnetometer data

-20nT Area 1 +20nT

-20nT Area 5 +20nT

-20nT Area 6 +20nT

-100nT Area 2 +100nT

-100nT Area 3 +100nT

-100nT Area 4 +100nT

+20nT
-20nT

+100nT
-100nT

SCALE 1:1000

0m 10 20 30 40 50m

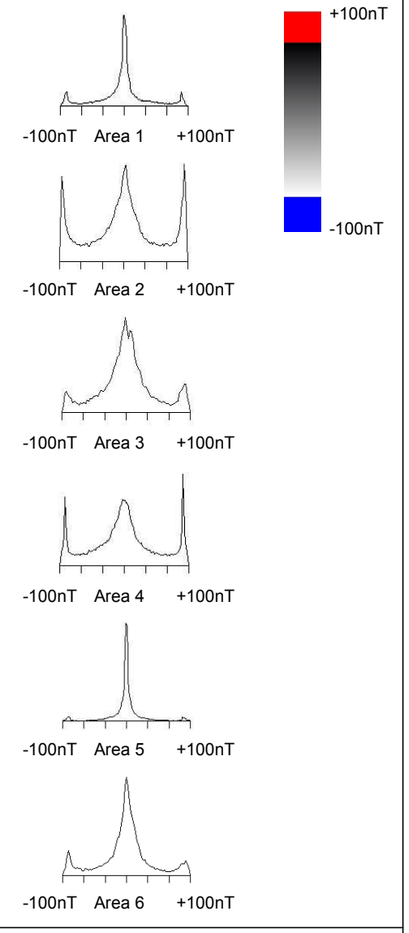
SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 03

Archaeological Surveys Ltd

Geophysical Survey
Barrus Development - D1 & D4
Graven Hill Land Transfer Area 2
Bicester
Oxfordshire

Greyscale plot of minimally processed magnetometer data clipped at ±100nT with extreme values highlighted



SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 04

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Bicester
Oxfordshire

Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - ditch-like feature of uncertain origin
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 05