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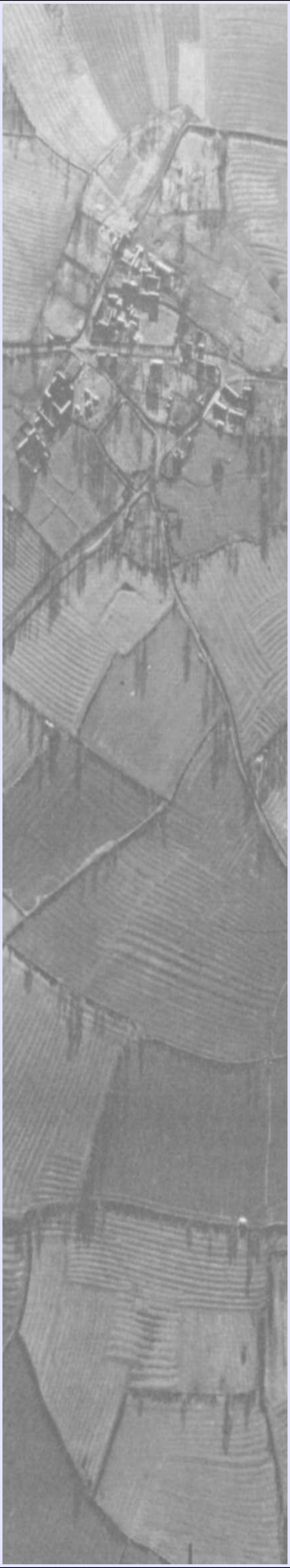

Little Lype Farm, Moor Lane
Charlton, Malmesbury

MAGNETOMETER SURVEY REPORT

for

Michael Goff

on behalf of

S D Withers & Son

David Sabin and Kerry Donaldson

November 2011

Ref. no. 382

ARCHAEOLOGICAL SURVEYS LTD

Little Lype Farm, Moor Lane, Charlton, Malmesbury

Magnetometer Survey

for

Michael Goff

on behalf of

S D Withers & Son

Fieldwork by David Sabin
Report by David Sabin BSc (Hons) MIFA and Kerry Donaldson BSc (Hons)

Survey date - **22nd November 2011**
Ordnance Survey Grid Reference – **ST 97735 88860**

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

SUMMARY

A magnetometer survey was undertaken by Archaeological Surveys Ltd at Charlton near Malmesbury in Wiltshire. The work was commissioned by Michael Goff on behalf of SD Withers & Son of Little Lype Farm. The survey was carried out as part of a planning application for the development of slurry storage facilities and associated landscaping.

Several negative linear anomalies and a discrete positive anomaly were located to the north of an undated square enclosure recorded on the Wiltshire SMR. The linear anomalies may relate to former ridge and furrow cultivation. However, the anomalies are located well beyond the area outlined for development.

Magnetic disturbance was widespread within the survey area due to the presence of buried services and farm machinery although there was no evidence for magnetic anomalies of archaeological potential within magnetically quieter parts of the site. In addition, observation of the subsurface along an open water pipeline trench, running adjacent to the core part of the development, did not indicate the presence of archaeological features or cultural material.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Michael Goff, on behalf of SD Withers & Son, to undertake a magnetometer survey of an area of land at Little Lype Farm, Charlton, near Malmesbury, Wiltshire. The site has been outlined for the proposed development of slurry storage facilities and associated landscaping. The survey forms part of an archaeological assessment of the site.

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2011) and approved by Wiltshire Council Archaeologist Melanie Pomeroy-Kellinger prior to commencing the fieldwork.

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.

1.2.2 The methodology is considered an efficient and effective approach to archaeological prospection. The survey and report generally follow the recommendations set out by: English Heritage, 2008, *Geophysical survey in archaeological field evaluation;* Institute for Archaeologists, 2002, *The use of*

Geophysical Techniques in Archaeological Evaluations.

1.3 Site location, description and survey conditions

1.3.1 The site is located at Little Lype Farm, Moor Lane, Charlton near Malmesbury in Wiltshire and centred on Ordnance Survey National Grid Reference (OS NGR) ST 97735 88860, see Figures 01 and 02.

1.3.2 The geophysical survey covers approximately 1.5ha of land used as pasture and for storage of agricultural machinery. The core development area was heavily disturbed and contained dumped stone, concrete etc. Survey was, therefore, restricted across this part of the site although clear observations of the subsurface were possible due to the construction of a service trench.

Plate 1: Core part of the development area

1.4 Site history and archaeological potential

1.4.1 The Wiltshire Sites and Monuments Record lists that the site contains cropmark evidence for an undated square enclosure (SMR No ST98NE604). Although several pipelines and services cross the field, there is some potential for the geophysical survey to locate anomalies that may relate to archaeological features.

1.5 Geology and soils

1.5.1 The underlying solid geology across the site is Kellaways Clay (BGS, 2011). . The overlying soil is from the Wickham 3 association and is a typical stagnogley (Soil Survey of England and Wales, 1983).

1.5.2 Although stagnogley soils can produce low magnetic contrast, magnetometry survey carried out across similar soils in the region has produced good results. 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 Bartington Grad 601-2 gradiometer. The instrument effectively measures a magnetic gradient between two fluxgate sensors mounted vertically 1m apart. Two sets of sensors are mounted on a single frame 1m apart horizontally.

2.2.2 The instrument is extremely sensitive and is able to measure magnetic variation to 0.01nanoTesla (nT), with an effective resolution of 0.03nT. The data are limited to ±100nT when surveying with the highest sensitivity. All readings are saved to an integral data logger for analysis and presentation.

2.2.3 The instrument is operated according to the manufacturer's instructions with consideration given to the local conditions. An adjustment procedure is required, prior to collection of data, in order to balance the sensors and remove the effects of the Earth's magnetic field; further adjustment is required during the survey due to instrument drift often associated with temperature change.

2.2.4 It can be very difficult to obtain optimum balance for the sensors due to localised magnetic vectors that may be associated with large ferrous objects, geological/pedological features, 'magnetic debris' within the topsoil and natural temperature fluctuations. Imperfect balance results in a heading error often visible as striping within the data; this can be effectively removed by software processing and generally has little effect on the data unless extreme.

2.2.5 The Bartington gradiometer undergoes regular servicing and calibration by the manufacturer. A current assessment of the instrument is shown in Table 1 below.

Sensor type and serial numbers	Bartington Grad - 01 – 1000 Nos. 084, 085
Date of certified calibration/service	Sensors 084 and 085 - 6th August 2010 (due Aug 2012)
Bandwidth	12Hz (100nT range) both sensors
Noise	<100pT peak to peak
Adjustable errors	<2nT

Table 1: Bartington fluxgate gradiometer sensor calibration results

The instrument was considered to be in good working order prior to the survey, with no known faults or defects.

2.2.6 Data were collected at 0.25m centres along traverses 1m apart. The survey area was separated into 30m by 30m grids (900m²) giving 3600 recorded measurements per grid. This sampling interval is very effective at locating archaeological features and is the recommended methodology for archaeological prospection (English Heritage, 2008).

2.2.7 The survey grids were set out to the Ordnance Survey OSGB36 datum using a Penmap RTK GPS. The GPS is used in conjunction with Leica's SmartNet service, where positional corrections are sent via a mobile telephone link. Positional accuracy of around 10 – 20mm is possible using the system. The instrument is regularly checked against the ETRS89 reference framework using Ordnance Survey ground marker C1ST7784 (Horton).

2.2.8 The fixed orientation of survey grids based on the OSGB36 datum was considered appropriate given that the orientation of land boundaries was variable and consequently partial survey grids were unavoidable. In addition, there is an optimum north – south traverse direction for magnetic survey (English Heritage, 2008). Survey in this direction can produce anomalies with a higher contrast when compared to other orientations; this is a function of their presence within the Earth's magnetic field. A fixed grid across the site also simplifies its relocation should that be required.

2.3 Data processing and presentation

2.3.1 Magnetometry data downloaded from the Grad 601-2 data logger are analysed and processed in specialist software known as ArcheoSurveyor. The software allows greyscale and trace plots to be produced for presentation and display. Survey grids are assembled to form an overall composite of data (composite file) creating a dataset of the complete survey area. Appendix C contains specific information concerning the survey and data attributes and is derived directly from ArcheoSurveyor; this should be used in conjunction with information provided by Figure 02.

2.3.2 Only minimal processing is carried out in order to enhance the results of the survey for display. Raw data are always analysed, as processing can modify anomalies. The following schedule sets out the data and image processing used in this survey:

- clipping of the raw data at ±30nT to improve greyscale resolution,
- clipping of processed data at ±3nT to enhance low magnitude anomalies,
- edge match is used for grids containing magnetic disturbance in order to match adjacent grids
- zero median/mean traverse is applied in order to balance readings along each traverse.

Reference should be made to Appendix B for further information on the specific processes carried out on the data. Appendix C metadata includes details on the processing sequence used.

2.3.3 An abstraction and interpretation is offered for all geophysical anomalies located by the survey. 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.

2.3.4 The main form of data display prepared for this report is the greyscale plot. Both 'raw' and 'processed' data have been shown followed by an abstraction and interpretation plot. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing.

2.3.5 Graphic raster images in bitmap format (.BMP) are initially prepared in ArcheoSurveyor. Regardless of survey orientation, data captured along each traverse are displayed and processed by ArcheoSurveyor from left to right; this corresponds to a direction of south to north in the field. Prior to displaying against base mapping, raster graphics require a rotation of 90° anticlockwise to restore north to the top of the image. Greyscale images are rotated by AutoCAD.

2.3.6 The raster images are combined with base mapping using ProgeCAD

Professional 2009 and AutoCAD LT 2007, creating DWG file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. Quality can be compromised by rotation of graphics in order to allow the data to be orientated with respect to grid north; this is considered acceptable as the survey results are effectively georeferenced allowing relocation of features using GPS, resection method etc.. A digital archive, including raster images, is produced with this report allowing separate analysis if necessary, see Appendix D below.

3 RESULTS

3.1 General overview

3.1.1 The detailed magnetic survey was carried out over approximately 1.5ha. Geophysical anomalies located can be generally classified as positive and negative linear anomalies of an uncertain origin, discrete positive 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. Anomalies located within each survey area have been numbered and are described below.

3.1.2 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, a basic key is indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files (.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading CAD layer names and plot colour	Description and origin of anomalies
Anomalies with an uncertain origin AS-ABST MAG NEG LINEAR UNCERTAIN AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE UNCERTAIN	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. 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 AS-ABST MAG DEBRIS AS-ABST MAG STRONG DIPOLAR	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. It often occurs where there has been dumping or ground make-up and is 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, or hearths 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 AS-ABST MAG DISTURBANCE AS-ABST MAG SERVICE	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 such 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 and with hysteresis adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 2: List and description of interpretation categories

3.2 List of anomalies

Anomalies with an uncertain origin

(1) – A series of negative linear anomalies and an associated positive linear anomaly are located close to the north western edge of the survey area. The negative response indicates material that is less magnetically enhanced than the surrounding soils. The fact that they are parallel and regularly spaced may indicate that they relate to former ridge and furrow.

(2) – Adjacent to the northern edge of the survey area is a discrete positive anomaly. This may indicate an infilled pit or depression. A pond or depression is marked on old Ordnance Survey mapping just to the north and appears to have been removed sometime between 1960 and 1980.

Anomalies associated with magnetic debris

(3) – A linear zone of magnetic debris relates to magnetically thermoremnant material used within the consolidation of a farm track.

(4) – A patch of magnetic debris is located in the vicinity of part of a cropmark feature. Although this contains a number of strong ferrous responses, much of the response is relatively low, possibly indicating a spread of magnetically thermoremnant material such as brick or tile.

(5) – The survey area contains numerous strong discrete dipolar anomalies which indicate the presence of ferrous objects within the topsoil.

Anomalies with a modern origin

(6 & 7) – A strong multiple dipolar linear anomaly extends across the central part of the survey area and is a response to a buried water pipe. A similar response can be seen to the north (7) and relates to a buried gas pipeline.

(8) – Widespread magnetic disturbance has been caused by ferrous objects and material within the survey area.

4 CONCLUSION

4.1.1 The magnetometry survey located a number of negative linear anomalies and a discrete positive anomaly in the northern part of the area. It is possible that the linear anomalies relate to former ridge and furrow whilst the discrete positive response may be associated with an infilled pond. A small zone of magnetic debris (anomaly 4) was located in the vicinity of a rectangular cropmark feature (SMR No ST98NE604) and it is possible that this has been caused by magnetically thermoremnant material such as brick or tile. Site observations indicated the presence of some shallow depressions and patches of nettles in this area also, and it is possible that there has been some recent ground make-up and landscaping, particularly given the close proximity of a gas pipeline.

4.1.2 Although widespread magnetic disturbance was caused by the presence of a water pipe, gas pipeline and farm machinery, there is no evidence for anomalies of archaeological potential within the less disturbed parts of the proposed development area. In addition, no cultural remains or features of archaeological potential were visible within a recently excavated water pipe trench crossing through the site in the immediate vicinity of the development.

5 REFERENCES

Archaeological Surveys, 2011. *Little Lype Farm, Moor Lane, Charlton, Malmesbury, Geophysical Survey Written Scheme of Investigation.* Unpublished typescript document.

British Geological Survey, 2010. *Geology of Britain viewer, 1:50 000 scale [online]* available from http://maps.bgs.ac.uk/geologyviewer/ [accessed 21/11/2011].

English Heritage, 2008. *Geophysical survey in archaeological field evaluation. Research and Professional Service Guideline No.1.* 2nd ed. Swindon: English Heritage.

Institute for Archaeologists, 2002. *The use of Geophysical Techniques in Archaeological Evaluations*. IFA Paper No. 6. IFA, University of Reading.

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 5 South West England.*

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 gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 1m apart. The instrument is carried about 30cm 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 field. The difference between the two sensors will relate to the strength the magnetic field created by the buried feature. If no enhanced feature is present the field measured by both sensors will be similar and the difference close to zero.

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 ±1nT 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 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 slight differences between the set-up and stability of gradiometer sensors and can remove striping. The process can remove archaeological features that run along a traverse so data analysis is also carried out prior its application.

De-stagger

Compensates for small positional errors within data collection by shifting the position of the readings along each traverse by a specified amount. Data lost at the end of each traverse are extrapolated from adjacent value in the same row.

Deslope

Corrects for striping and distortion caused by metal objects/services etc.. The process calculates a curve based on a polynomial best fit mathematical function for each traverse. This curve is then subtracted from the actual data.

Edge Match

Calculates the mean of the 2 lines (rows or columns) of data either side of the edge to match. It then subtracts the difference between the means from all datapoints in the selected area.

FFT (Fast Fourier Transform) spectral filtering

A mathematical process used to determine the frequency components of a traverse. Repetitive features, such as plough marks, produce characteristic spectral zones that can be suppressed allowing greyscale images to appear clearer.

Appendix C – survey and data information

Raw data

COMPOSITE
Filename: J382-mag-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 22/11/2011
Assembled by: on 22/11/2011
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 600 x 240
Survey Size (meters): 150 m x 240 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 15.49
Mean: -3.36
Median: -0.87
Composite Area: 3.6 ha
Surveyed Area: 1.5488 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 26
1 Col:0 Row:3 grids\01.xgd
2 Col:0 Row:4 grids\02.xgd
3 Col:0 Row:5 grids\03.xgd
4 Col:1 Row:3 grids\04.xgd
5 Col:1 Row:4 grids\05.xgd
6 Col:1 Row:5 grids\06+07.xgd
7 Col:2 Row:1 grids\11.xgd
8 Col:2 Row:2 grids\12.xgd
9 Col:2 Row:3 grids\08+13.xgd
10 Col:2 Row:4 grids\09+14.xgd
11 Col:2 Row:5 grids\10+15.xgd
12 Col:3 Row:1 grids\16.xgd
13 Col:3 Row:2 grids\17.xgd
14 Col:3 Row:3 grids\18.xgd
15 Col:3 Row:4 grids\19.xgd
16 Col:3 Row:5 grids\20.xgd
17 Col:3 Row:6 grids\21.xgd
18 Col:3 Row:7 grids\22.xgd
19 Col:4 Row:0 grids\23.xgd
20 Col:4 Row:1 grids\24.xgd
21 Col:4 Row:2 grids\25.xgd
22 Col:4 Row:3 grids\26.xgd
23 Col:4 Row:4 grids\27.xgd
24 Col:4 Row:5 grids\28.xgd
25 Col:4 Row:6 grids\29.xgd
26 Col:4 Row:7 grids\30.xgd

Processed data

COMPOSITE
Filename: J382-mag-proc.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 22/11/2011
Assembled by: on 22/11/2011
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 600 x 240
Survey Size (meters): 150 m x 240 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 3.00
Min: -3.00
Std Dev: 2.28
Mean: -0.43
Median: -0.32
Composite Area: 3.6 ha
Surveyed Area: 1.5488 ha

Processes: 14
1 Base Layer
2 DeStripe Mean Traverse: Grids: All Threshold: 0.1 SDs
3 Clip from -5.00 to 5.00 nT
4 Edge Match (Area: Top 210, Left 360, Bottom 239, Right 479) to Right edge
5 Edge Match (Area: Top 180, Left 360, Bottom 209, Right 479) to Right edge
6 Edge Match (Area: Top 150, Left 360, Bottom 179, Right 479) to Right edge
7 Edge Match (Area: Top 90, Left 360, Bottom 119, Right 479) to Right edge
8 Edge Match (Area: Top 60, Left 360, Bottom 89, Right 479) to Right edge
9 Edge Match (Area: Top 60, Left 240, Bottom 89, Right 359) to Right edge
10 Edge Match (Area: Top 90, Left 240, Bottom 119, Right 359) to Right edge
11 Edge Match (Area: Top 150, Left 0, Bottom 179, Right 119) to Right edge
12 Edge Match (Area: Top 120, Left 0, Bottom 149, Right 119) to Right edge
13 Edge Match (Area: Top 120, Left 360, Bottom 149, Right 479) to Left edge
14 Clip from -3.00 to 3.00 nT

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at Castle Combe, Wiltshire (see inside cover for address). 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. Digital data may be supplied on CD ROM, see below.

Surveys are reported on in hardcopy (recycled paper) using A4 for text and A3 for plots (all plots are scaled for A3). The distribution of both hardcopy report and digital data is considered the responsibility of the Client unless explicitly stated in the survey Brief, Written Scheme of Investigation or other contractual agreement.

This report has been prepared using the following software on a Windows XP platform:

- ArcheoSurveyor version 2.5.14.0 (geophysical data analysis),
- ProgeCAD Professional 2009 (report graphics),
- AutoCAD LT 2007 (report figures),
- OpenOffice.org 3.0.1 Writer (document text),
- PDF Creator version 0.9 (PDF archive).

Digital data are supplied on CD ROM which includes the following files:

- ArcheoSurveyor grid and composite files for all geophysical data,
- CSV files for raw and processed composites,
- geophysical composite file graphics as Bitmap images,
- AutoCAD DWG files in 2000 and 2007 versions,
- report text as OpenOffice.org ODT file,
- report text as Word 2000 doc file,
- report text as rich text format (RTF),
- report text as PDF,
- PDFs of all figures.

The CD ROM structure is formed from a tree of directories under the title J382 Charlton – CD. Directory titles include Data, Documentation, CAD and PDFs. Multiple directories exist under Data and hold Grid, Composite and Graphic files with CSV composite data held in Export.

The CAD file contains externally referenced graphics that are rotated with separate A3 size layouts for each figure. Layouts are fixed using frozen layers and named views allowing straightforward plotting or analysis on screen. (Note – CAD files are prepared using AutoCAD's e Transmit function to produce a directory containing the digital drawing along with any externally referenced graphics which may need reloading).