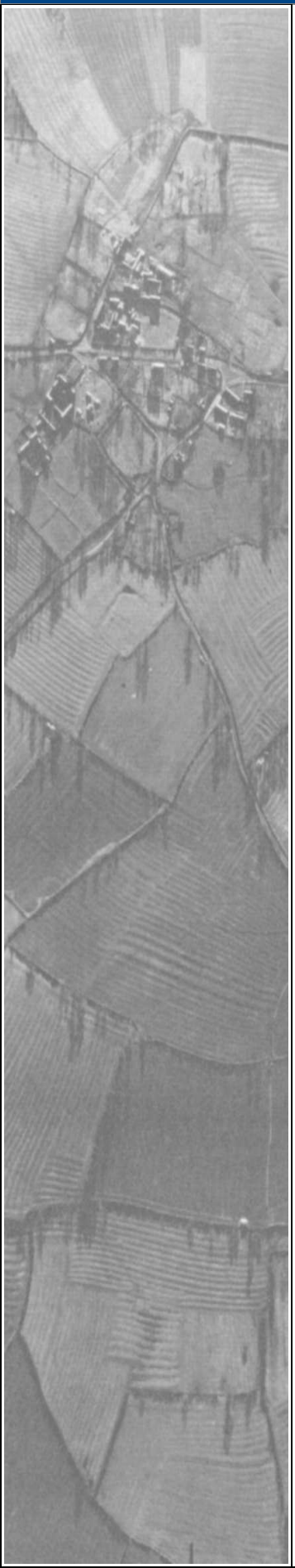

Land at Templecombe
Somerset

MAGNETOMETER SURVEY REPORT

for

RPS Heritage

Kerry Donaldson & David Sabin

July 2019

Ref. no. J795

ARCHAEOLOGICAL SURVEYS LTD

Land at Templecombe
Somerset

MAGNETOMETER SURVEY REPORT

for

RPS Heritage

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

Survey dates – 9th July 2019
Ordnance Survey Grid Reference – **ST 71092 22109**

Somerset HER no. 41408

Archaeological Surveys Ltd
1 West Nolands, Nolands Road, Yatesbury, Calne, Wiltshire, SN11 8YD
Tel: 01249 814231 Fax: 0871 661 8804
Email: info@archaeological-surveys.co.uk
Web: www.archaeological-surveys.co.uk

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SUMMARY

Detailed magnetometry was carried out by Archaeological Surveys Ltd, at the request of RPS Heritage, over an area of land at Templecombe in Somerset. The site is associated with the medieval Preceptory of the Knights Templar and later Commandery of the Knights Hospitallers and contains a number of rectilinear earthworks, although these are believed to be associated with post-medieval features. The results of the survey indicate a number of potential features in the northern part of the site that could pre-date the extant earthworks. In the south eastern part of the site, discrete positive responses appear to cluster and could relate to pit-like features of archaeological potential, although this is uncertain. In the southern part of the site, a number of weakly positive linear anomalies are likely to relate to former ditch-like features and may also be of archaeological potential.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by RPS Heritage to undertake a magnetometer survey of an area of land Templecombe in Somerset. The site has been outlined for a proposed residential development and the survey forms part of an archaeological assessment.

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2019). It was also carried out as Somerset HER no. 41408.

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 line formats, and broken or fragmented lines used in interpretive plots may well correspond closely with truncation of archaeological features.

1.4 Site location, description and survey conditions

1.4.1 The site is located within pasture land at Manor Farm on the south eastern edge of Templecombe in Somerset. It is centred on Ordnance Survey National Grid Reference (OS NGR) ST 71092 22109, see Figs 01 and 02.

1.4.2 The geophysical survey covers approximately 2.7ha within three small pasture fields and a small area adjacent to the farm access track. The survey areas are label from 1 – 4 for the purposes of this report.

1.4.3 Area 1 forms the northern part of the site, land rises to the west and south and several linear earthworks were noted. The southern part of the area has clearly been raised with modern waste material, such as fragmented concrete, which could be seen protruding from the soil. This make-up is related with the modern barns and other agricultural features to the south.

1.4.4 Area 2 covers sloping ground to the south east of Area 1. The land falls from

south west to north east and there is also evidence of modern ground make-up along the western edge of the site adjacent to the modern barns etc. There is also evidence for burning of waste material in the western part of the area.

1.4.5 Area 3 forms the bulk of the southern part of the site to the south of Area 2. The field is generally flat and more elevated than other parts of the site, with extensive views to the east and south east. A low linear bank was noted in the southern part of the area. Area 4 is a very small patch of grass and gravel track forming the extreme southern part of the site.

1.4.6 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data. Modern sources of magnetic disturbance were observed within or adjacent to the survey areas and these include steel wire mesh fencing, steel gates, water troughs, steel-framed barns, made ground and burnt waste. Weather conditions during the survey were fine and hot.

Plate 1: Area 1 looking north east

Plate 2: Area 3 looking east

1.5 Site history and archaeological potential

1.5.1 An Archaeological Desk-Based Assessment has been carried out for the site (Gailey, 2019). It outlines that the site lies close to, or possibly contains the remains of, a medieval Preceptory of the Knights Templar and later commandery of the Knights Hospitallers. Several wall footings were located during former evaluations just to the north west of the survey area, but these appear to date from the post medieval period. Earthwork remains within the survey area appear to relate to 17th-19th century garden features associated with the Manor House.

1.6 Geology and soils

1.6.1 The underlying solid geology across the northern part and far south eastern corner of the site is limestone from the Cornbrash Formation with mudstone from the Forest Marble Formation across the majority of the southern half (BGS, 2017).

1.6.2 The overlying soil across the survey area is from the Elmton 1 association and is a brown rendzina. It consists of a shallow, well drained, brashy, calcareous, fine loamy soil over limestone (Soil Survey of England and Wales, 1983).

1.6.3 Magnetometry carried out over similar geology and soil has produced good results. The site is, therefore, considered suitable 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 (also known as thermoremanence) are factors associated with the formation of localised fields.

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). Additional details are set out in 2.2 below and within Appendix A.

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 20Hz. 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 ±8000nT. They are linked to a Leica GS10 RTK GNSS 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 <100s.

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 the 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 ±8000nT and clipped for display at ±3nT. Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track.

2.3.4 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.

2.3.5 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. In addition, traceplots cannot be meaningfully plotted against base mapping and in areas of complexity traces may be lost or highly confused. Traceplots may be used to demonstrate characteristic magnetic profiles across discrete features where it is considered beneficial.

2.3.6 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 GNSS, resection method, etc.

2.3.7 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.

2.3.8 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. Where further interpretation is possible, or where a number of possible origins should be considered, more subjective discussion is set out in Section 4.

2.3.9 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 4 survey areas covering approximately 2.7ha.

3.1.2 Magnetic anomalies located can be generally classified as positive and negative responses of archaeological potential, anomalies associated with land management, positive and negative anomalies of an uncertain origin, areas of magnetic debris and disturbance and strong discrete dipolar anomalies relating to ferrous objects.

3.1.3 Anomalies located within each survey area have been numbered and are described in 3.4 below with subsequent discussion in Section 4.

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 Anomalies within the northern part of the site demonstrate moderate magnetic contrast with potentially weaker contrast in the south. It is possible that the Forest Marble mudstone is associated with somewhat impeded drainage and associated suppression of soil magnetic susceptibility.

3.2.3 All survey areas contain magnetic debris that has been caused by modern ferrous material. It is associated with ground make-up, ground consolidation along tracks, burning and dumping and it has the potential to obscure weaker anomalies of archaeological potential in small zones within the site. Magnetic disturbance has also been caused by modern ferrous material, e.g. steel fencing, gates and water troughs, and this also has some potential to obscure weak anomalies within some very small zones. The most notable area of disturbance is located along the northern edge and close to the north western corner of Area 1, and it is likely that it relates to services, fencing and structures immediately adjacent to the survey area.

3.2.4 Linear and discrete anomalies were located across the site but often their morphology is uncharacteristic and they cannot be confidently interpreted; such anomalies are categorised as of uncertain origin, but their archaeological potential should still be considered.

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 general 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 archaeological potential	Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc. The category is used where there is a high level of confidence which may be due to additional supporting information where morphology is unclear or uncharacteristic.

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 relating to land management	Anomalies are mainly linear and may be indicative of the magnetically enhanced fill of cut features (i.e. ditches). The anomalies may be long and/or form rectilinear elements and they may relate to topographic features or be visible on early mapping. Associated agricultural anomalies (e.g. headlands, plough marks and former ridge and furrow) may support the interpretation. Land drains can appear in a classic herringbone pattern of interconnected multiple dipolar linear anomalies, or as parallel linear anomalies. The multiple dipolar response indicates ceramic land drains.
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 List of anomalies - Area 1

Area centred on OS NGR 371033 122185, see Figs 03 – 06.

Anomalies of archaeological potential

(1) - A positive rectilinear anomaly appears to relate to an enclosure ditch that has been truncated or overlain by later features. It also appears to be associated with a negative anomaly in the north east, which could suggest and internal bank.

(2) - A fragmented, positive linear anomaly extends across the survey area with a north west to south east orientation. It is not clear if it extends into Area 2 as anomaly (15), but it does appear to have been truncated by extant rectilinear

boundary feature (4).

Anomalies relating land management

(3) - Positive and negative rectilinear anomalies are associated with an extant earthwork bank and ditch.

(4) - A T-shaped, broad, negative linear anomaly, with a partial positive response on the north edge, also relates to an extant earthwork feature. The linear element of it that extends towards the west south west, however, is not represented by an earthwork feature, but does appear to be associated.

Anomalies with an uncertain origin

(5) - A weak, narrow, positive linear anomaly could be an eastward continuation of anomaly (3), but it is poorly defined.

(6) - Extending along the northern part of the survey area is a linear zone with amorphous positive and negative responses. It is not clear what has caused these responses, whether they are geological or anthropogenic, but an archaeological origin should also be considered.

(7) - The survey area contains a number of discrete, positive anomalies with a response of 2-3nT that appear to relate to pit-like features. They lie randomly across the survey area and do not appear to have a coherent pattern, grouping or layout; however, it is not possible to determine if these relate to natural features, such as tree throw pits, if they are anthropogenic, such as being associated with the deliberate removal of trees, or if they have archaeological potential.

(8) - A negative linear anomaly appears to truncate positive linear anomaly (2). It is possible that it is associated with anomaly (1).

(9) - A line of discrete, negative responses, may relate to a former fence, but this is uncertain.

Anomalies associated with magnetic debris

(10) - A large zone of highly magnetic debris seen in the southern part of the survey area relates to modern ground make-up which contains ferrous and other magnetically thermoremnant material.

Anomalies with a modern origin

(11) - Magnetic disturbance is caused by ferrous material and fencing within the field margins.

3.5 List of anomalies - Area 2

Area centred on OS NGR 371134 122117, see Figs 03 – 06.

Anomalies with an uncertain origin

(12) - Groups of discrete positive responses have been located within the survey area. Although such anomalies could relate to natural features or be associated with tree removal, they could also relate to pits or burials and, therefore, should be considered as of archaeological potential.

(13 & 14) - Broad, weak, positive linear responses relate to magnetically enhanced material. Anomaly (13) appears to extend north westwards from a linear band of magnetic debris; however, if the line of anomaly (13) is projected towards the north west, it lines up with the long axis of the rectilinear boundary feature (4) and so an association is possible. It is not clear if anomaly (14) is associated. Other positive responses can also be seen to the north, but they are poorly defined.

(15) - Weakly positive linear anomalies could be a continuation of positive linear anomaly (1) seen just to the west.

Anomalies associated with magnetic debris

(16) - The survey area contains several zones of magnetic debris. These relate to modern magnetic material used within areas of made-ground and dumped material within tracks; they have partially obscured weaker anomalies.

(17) - Strong, discrete, dipolar anomalies are responses to widespread ferrous and other magnetically thermoremnant objects within the topsoil.

3.6 List of anomalies - Area 3

Area centred on OS NGR 371085 122023, see Figs 03 – 06.

Anomalies of archaeological potential

(18) - A number of positive linear anomalies have been located in the southern part of Area 3. They appear to relate to cut features, although they are weak and appear fragmented.

Anomalies with an uncertain origin

(19) - A number of weakly positive linear anomalies are located in the vicinity of (18). They are very weak (<1nT), indistinct and poorly defined, but could relate to further cut features with archaeological potential.

Anomalies relating land management

(20) – A multiple dipolar linear anomaly possibly caused by a ceramic land drain or other service.

Anomalies associated with magnetic debris

(21) – A linear zone of magnetic debris probably relates to modern ferrous material used to consolidate a farm track.

Anomalies with a modern origin

(22) – Magnetic disturbance within the northern part of the survey area has been caused by adjacent steel-framed agricultural buildings.

3.7 List of anomalies - Area 4

Area centred on OS NGR 371069 121968, see Figs 03 & 04.

The survey area contains widespread magnetic debris which has the potential to obscure other anomalies.

4 DISCUSSION

4.1.1 Within Area 1, in the northern part of the site, there are a number of extant rectilinear earthwork features. They generally have a corresponding geophysical anomaly, either as a positive or negative linear/rectilinear response (3 & 4). However, the positive response can be associated either with the bank where it is extant or with the ditch where it has been infilled. Equally, the negative response is associated with extant ditches, but can also be associated with the banks in places. The results indicate that some of the earthwork boundary features appear to extend beyond their limits defined by the earthworks in the northern part of the site, but could continue further south east into Area 2 (13). These rectilinear boundary features appear to possibly overlie another rectilinear enclosure (1) and a linear ditch (2), although this is not clear. A broad band of positive and negative amorphous responses in the northern part of the site (6), could relate to archaeological features; however, a natural origin is also possible. A number of pit-like responses (7) have also been located in this part of the site, but it is not clear if they are of natural origin or associated with tree removal, or if they are of archaeological potential.

4.1.2 Area 2 contains a group of at least 12 discrete positive responses, with another group of at least 7 situated 15m to the south west. Although this type of response could relate to tree throw pits or be associated with the removal of

trees, they are clustered and have a response of 8-10nT which may indicate enhanced magnetic susceptibility caused by anthropogenic activity. They range in size and shape but several have dimensions of 2.3m by 1.1m which could indicate an association with burials and, therefore, their archaeological potential should be considered.

4.1.3 In the southern part of the site, Area 3, there are a number of positive linear anomalies (18). They appear to relate to weak and fragmented linear ditches, possibly enclosures, but they are generally poorly defined. Further even weaker anomalies (19) may well be associated.

4.1.4 The site contains magnetic debris primarily around the edges and used for ground make-up and consolidation. However in places it has obscured weaker anomalies.

5 CONCLUSION

5.1.1 The geophysical survey has located a number of anomalies with archaeological potential. In the northern part of the site a positive linear anomaly, representing a former ditch-like feature, and a rectilinear anomaly, that may indicate a former enclosure, could underlie extant rectilinear earthworks. In the south eastern part of the site there are clusters of discrete positive responses that although may relate to natural features, may also be consistent with moderately enhanced pit-like features of archaeological potential. The distribution and grouping of these discrete anomalies may also infer an archaeological origin. In the southern part of the site several very weakly positive linear anomalies also appear to relate to ditch-like features with archaeological potential.

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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. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Despike

Removal of data points that exceed the mean/median/threshold by selecting a window size of data points and replace by mean/median/threshold. Magnetic spikes can be caused iron objects on the surface or within the topsoil. Despike can improve the appearance of data and remove extreme readings that may affect further processing.

High Pass Filter

Removes low frequency anomalies within the data that are not considered to be archaeologically significant and may be natural in origin. A window passes over the data, the mean of all the data within the window is subtracted from the centre value. The size of the window is adjusted as is the weighting which may be uniform or Gaussian. The process is used to improve the visibility of anomalies of interest.

Low Pass Filter

Removes high frequency anomalies or 'noise' within datasets and provides a smoother output. A window passes over the data, the mean of all the data within the window is used to replace the centre value. The size of the window is adjusted as is the weighting. The process is used to improve the visibility of anomalies of interest.

Zero Median/Mean Traverse

The median (or mean) of data from 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 offset values of the gradiometer sensors. The process can remove archaeological features that run along a traverse but with the high resolution datasets created by the Sensys FGM650 sensors and the method of data collection this has not been a notable problem. In fact, the removal of offsets using software avoids carrying out a balancing procedure on site, which inevitably can never be done in magnetically clean conditions and results in improperly aligned fluxgate sensors and/or electronic adjustment values.

Appendix C – survey and data information

Area 1
Filename: J795-mag-Area1-proc.xcp
Description: Imported as Composite from:
Instrument Type: Sensys DLMGPS
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 370977.22, 122256.32 m
Southeast corner: 371091.37, 122117.42 m
Collection Method: Randomised
Sensors: 5
Source GPS Points: 318996
Dimensions
Composite Size (readings): 761 x 926
Survey Size (meters): 114 m x 139 m
Grid Size: 114 m x 139 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.63
Mean: 0.00
Median: -0.03
Composite Area: 1.5855 ha
Surveyed Area: 0.94223 ha
PROGRAM
Name: TerraSurveyor
Version: 3.0.23.0
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00

Area 2

Filename: J795-mag-Area2-proc.xcp
Description: Imported as Composite from:
Instrument Type: Sensys DLMGPS
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB35
Northwest corner: 371067.76, 122193.93 m
Southeast corner: 371200.36, 122034.18 m
Source GPS Points: 327700
Dimensions
Composite Size (readings): 884 x 1065
Survey Size (meters): 133 m x 160 m
Grid Size: 133 m x 160 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.51
Mean: -0.02
Median: 0.00
Composite Area: 2.1183 ha
Surveyed Area: 0.98213 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00

Area 3

Filename: J795-mag-Area3-proc.xcp
Description: Imported as Composite from:
Instrument Type: Sensys DLMGPS
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 371023.14, 122071.20 m
Southeast corner: 371152.74, 121974.90 m
Source GPS Points: 219997
Dimensions
Composite Size (readings): 864 x 642
Survey Size (meters): 130 m x 96.3 m
Grid Size: 130 m x 96.3 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.20
Mean: 0.00
Median: 0.00
Composite Area: 1.248 ha
Surveyed Area: 0.65697 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 High pass Uniform (median) filter: Window dia: 203
4 Clip from -3.00 to 3.00

Area 4

Filename: J795-mag-Area4-proc.xcp
Description: Imported as Composite from:
Instrument Type: Sensys DLMGPS
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 371056.00, 121987.72 m
Southeast corner: 371080.60, 121952.62m
Source GPS Points: 13100
Dimensions
Composite Size (readings): 164 x 234
Survey Size (meters): 24.6 m x 35.1 m
Grid Size: 24.6 m x 35.1 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 2.37
Mean: 0.15
Median: 0.27
Composite Area: 0.086346 ha
Surveyed Area: 0.036799 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00

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 PDF copy will be supplied to the Somerset Historic Environment Record. The report will also be uploaded to the Online AccesS to the Index of archaeological investigationS (OASIS). A summary of the survey will also be supplied to the Somerset Archaeology 2019 section of the Somerset Archaeological and Natural History transactions once in the public domain.

Archive contents:

File type	Naming scheme	Description
Data	J795-mag-**[area number/name]**.asc J795-mag-**[area number/name]**.xcp J795-mag-**[area number/name]**-proc.xcp	Raw data as ASCII CSV TerraSurveyor raw data TerraSurveyor minimally processed data
Graphics	J795-mag-**[area number/name]**-proc.tif	Image in TIF format
Drawing	J795-**[version number]**.dwg	CAD file in 2010 dwg format
Report	J795 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 archaeological potential			
AS-ABST MAG POS LINEAR ARCHAEOLOGY		Red 255,0,0	Polyline or polygon (solid)
AS-ABST MAG NEG LINEAR ARCHAEOLOGY		127,0,255	Line, polyline or polygon (solid)
AS-ABST MAG POS ENCLOSURE DITCH		127,0,255	Line, polyline or polygon (solid)
Anomalies with an uncertain origin			
AS-ABST MAG POS LINEAR UNCERTAIN		255,127,0	Line, polyline or polygon (solid)
AS-ABST MAG NEG LINEAR UNCERTAIN		Blue 0,0,255	Line, polyline or polygon (solid)
AS-ABST MAG POS DISCRETE UNCERTAIN		255,127,0	Solid donut, point or polygon (solid)
AS-ABST MAG NEG DISCRETE UNCERTAIN		Blue 0,0,255	Solid donut, point or polygon (solid)
AS-ABST MAG POS UNCERTAIN		255,127,0	Polygon (cross hatched ANSI37)
AS-ABST MAG NEG UNCERTAIN		Blue 0,0,255	Polygon (cross hatched ANSI37)
Anomalies relating to land management			
AS-ABST MAG BOUNDARY		127,0,0	Line, polyline or polygon (solid or cross hatched ANSI37)
AS-ABST MAG LAND DRAIN		Cyan 0,255,255	Line or polyline
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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www.archaeological-surveys.co.uk
info@archaeological-surveys.co.uk
Tel: 01249 814 231

N

Survey location

Archaeological Surveys

Specialist Geophysical Surveyors

Geophysical Survey
Land at Templecombe
Somerset

Map of survey area

Site centred on OS NGR
ST 71092 22109

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 01

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Specialist Geophysical Surveyors

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Land at Templecombe
Somerset

Referencing information

Referencing grid to OSGB36 datum at 50m intervals

371050 122000

Survey tracks

Survey track start

Survey track stop

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 02

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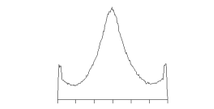
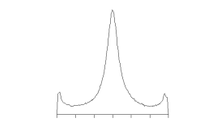
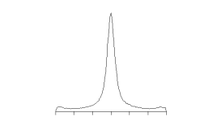
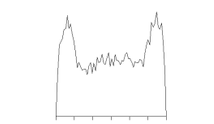
Land at Templecombe
Somerset

Greyscale plot of minimally processed magnetometer data







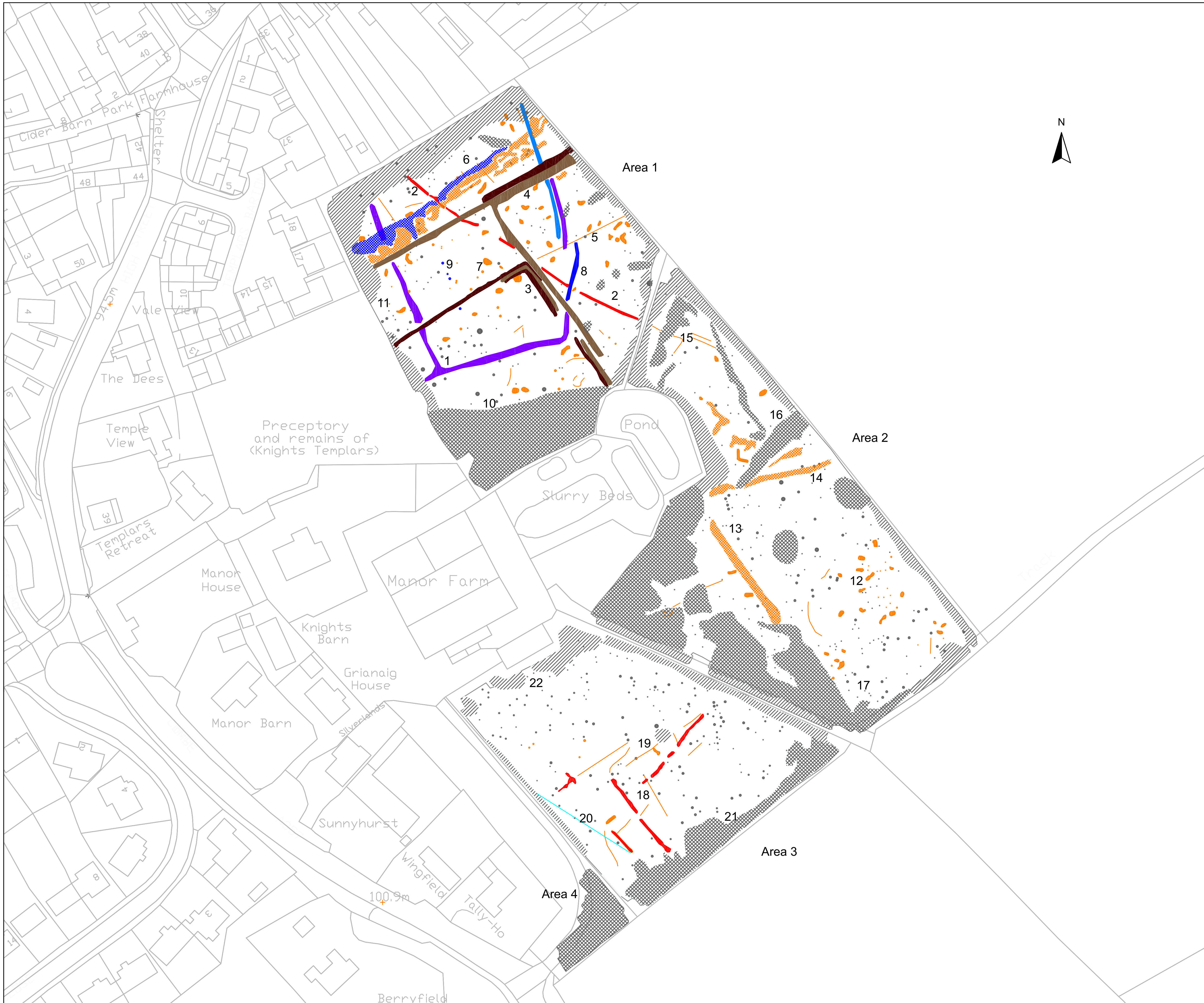


SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 03



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Land at Templecombe
Somerset

Abstraction and interpretation of magnetic anomalies

- Positive linear anomaly - cut feature of archaeological potential
- Negative linear anomaly - of archaeological potential
- Positive curvilinear/rectilinear anomaly - enclosure ditch
- Positive linear anomaly - earthwork boundary feature
- Negative linear anomaly - boundary feature ditch
- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Weak multiple dipolar linear anomaly - land drain
- Discrete positive response - possible pit-like feature
- Discrete negative response - possible fenceline?
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material of low magnetic susceptibility
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 04

Area 1

Area 2

Area 3

Area 4

N

Preceptory and remains of (Knights Templars)

Pond

Slurry Beds

Manor House

Manor Farm

Knights Barn

Grianaig House

Manor Barn

Silverlands

Sunnyhurst

Wingfield

Vale View

Dees

Shelter

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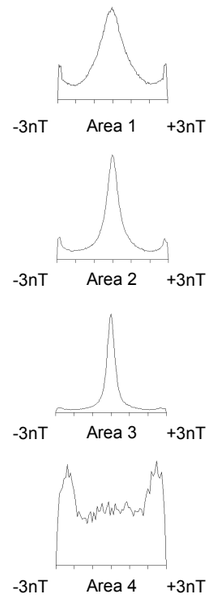
Somerset

Greyscale plot of minimally processed magnetometer data

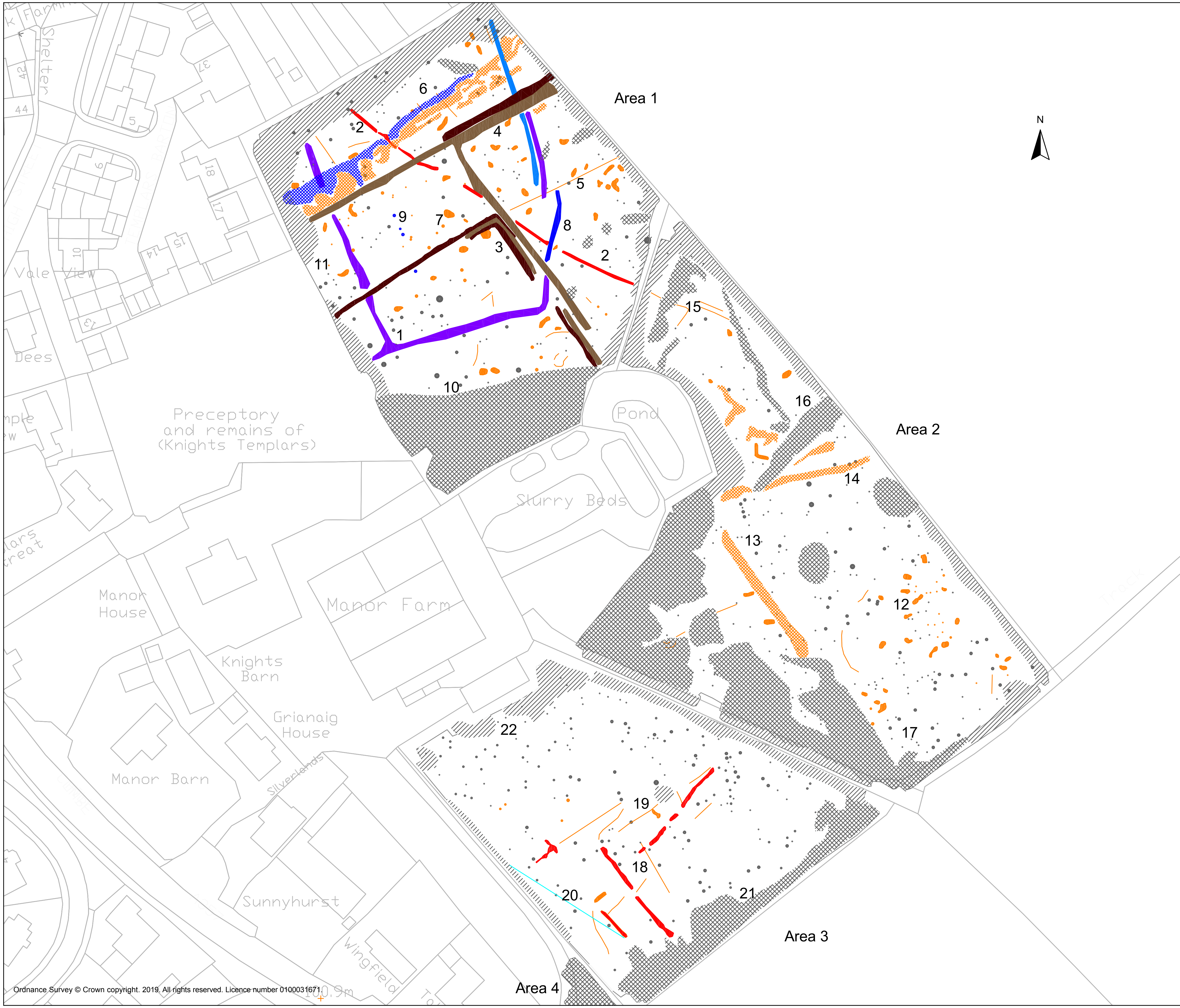


SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 05



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Abstraction and interpretation of magnetic anomalies

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- Positive anomaly - magnetically enhanced material
- Negative anomaly - material of low magnetic susceptibility
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- 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 06