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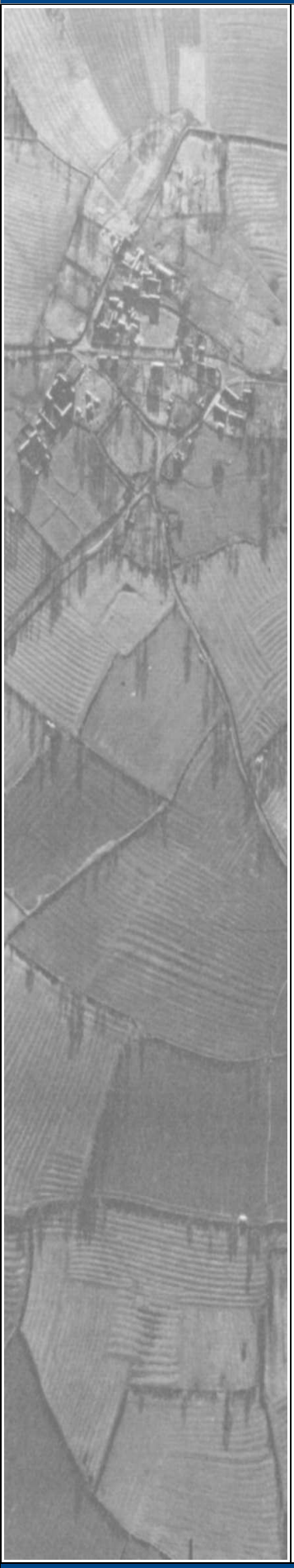

# Chesterton Farm Foul Water Pipeline
# Hills Quarry Route
# Siddington
# Gloucestershire

## MAGNETOMETER SURVEY REPORT

for

## Cotswold Archaeology

Kerry Donaldson & David Sabin

January 2020

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ARCHAEOLOGICAL SURVEYS LTD

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## MAGNETOMETER SURVEY REPORT

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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 to 13th December 2019
Ordnance Survey Grid Reference – **SU 02114 99883 to SU 03268 97264**

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

A geophysical survey, comprising detailed magnetometry, was carried out by Archaeological Surveys Ltd at the request of Cotswold Archaeology. The survey was undertaken along a 3.7km long corridor outlined for a new sewer pipe between Cirencester and the sewage treatment works near South Cerney. The results indicate the presence of quarrying within two areas in the northern part of the corridor along with nearby pit-like anomalies, which could be of archaeological potential. Evidence for more recent quarrying is also evident in the southern part of the pipeline route. Throughout the survey corridor, a number of short, weakly positive linear and discrete anomalies can be seen, but the majority lack a coherent morphology. In the central part of the survey corridor, within a dry valley, there are a number of discrete, pit-like responses, some of which appear in a line or ring. While such responses can relate to natural features, an anthropogenic origin should be considered. In the southern part of the survey corridor there are a number of positive responses, but it is not clear if they relate to natural or anthropogenic features.

# 1 INTRODUCTION

## *1.1 Survey background*

1.1.1 Archaeological Surveys Ltd was commissioned by Cotswold Archaeology to undertake a magnetometer survey of a corridor of land between Chesterton Farm, on the south western edge of Cirencester, and the Cirencester Sewage Treatment Works to the west of South Cerney in Gloucestershire. The site has been outlined for a proposed new foul water pipeline by Thames Water.

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) prepared by AECOM (2019) and a Geophysical Survey Method Statement produced by Archaeological Surveys (2019).

## *1.2 Survey objectives and techniques*

1.2.1 A written scheme of investigation has been produced by AECOM (2019) which outlines that the aim of the survey is to use non-intrusive geophysical techniques to establish the location and extent of any archaeological features within the area, and, where possible, to characterise the archaeology thus located. The objectives are:

- to investigate the archaeological potential of the schemes footprint;
- to assess the presence/absence of potential archaeological anomalies;
- to determine the level of risk that the development presents to the known and potential archaeological resource; and
- to provide information for trial trenching through the identification of

geophysical anomalies.

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 pipeline route lies east and west of Spratsgate Lane, between the southern edge of Cirencester and the Cirencester Sewage Treatment Works

in Siddington, Gloucestershire. The survey corridor is approximately 3.7km long in total, comprising a corridor either 20m, 25m or 30m wide, and including acces roads, a laydown area and a work compound. The northern end of the pipeline route, and a section at Dryleaze Farm in the southern part of the route, have been previously subject to survey and/or other archaeological works and have not been included in the present survey. The corridor extends from SU 02114 99883 in the north to SU 03268 97264 in the south and covers 11.65ha of mainly arable land, with two areas of pasture.

1.4.2 The ground conditions across the site were generally very poor due to waterlogged clayey soil. Weather conditions during most of the survey were frequently very wet and windy.

### *1.5 Site history and archaeological potential*

1.5.1 A written scheme of investigation for geophysical survey and trial trench evaluation has been prepared by AECOM (2019), which includes a desk-based assessment of the archaeological potential of the site. Previous archaeological investigations at Dryleaze Farm, in the southern part of the site, have located a number of possible Neolithic or Bronze Age ring ditches, as well as a number of Bronze Age pits, post holes, cremations, roundhouses and mounds. Iron Age ring ditches indicative of settlement have also been recorded as well as a Roman trackway. To the north west of the site, further Bronze Age features have also been recorded at Chesterton Farm, with Iron Age pottery and a large rural Roman settlement also identified.

1.5.2 The majority of the survey corridor appears to cover what was part of an agricultural hinterland in the medieval period. Changes in the post medieval period include the construction of the Cirencester branch of the Severn and Thames Canal in 1787, which closed in 1911 and was abandoned in 1933, and also the construction of the Cheltenham and Great Western Union Railway in the 1840s which closed in the 1960s; both are located in the northern part of the site.

### *1.6 Geology and soils*

1.6.1 The underlying solid geology across the majority of the survey corridor is alternating Forest Marble mudstone and limestone beds, with Cornbrash limestone and Kellaways Clay mudstone at the southern end of the route. There are also some alluvial deposits within the dry valley in Areas 5 to 8. (BGS, 2017).

1.6.2 The soil overlying the Forest Marble is from the Evesham 1 association and is a typical calcareous pelosol. It consists of a slowly permeable, calcareous, clayey soil associated with shallow, well drained, brashy calcareous soils over limestone. The Cornbrash is overlain by the Elmton 1 association, which is a brown rendzina and consists of a shallow, well drained, brashy, calcareous fine loamy soil (Soil Survey of England and Wales, 1983).

1.6.3 Magnetometry survey carried out across similar soils 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 (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 or ±2nT. 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 in the form of high pass filtering for Areas 1-5 and 9-10. This effectively removes low frequency variation along a traverse that has been caused by large magnetic bodies, cultivation or rapid temperature change. Low pass filtering has been carried out for Areas 5, 6, 7 and 8. This effectively removes high frequency variation along a traverse that has been caused by uneven ground and associated vibration. Data treated to additional processing have 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. 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.

2.3.7 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 GNSS, 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. In order to comply with the Gloucestershire Archaeological Archive Standards (Paul, 2017) the data will be archived with the Archaeology Data Service (ADS) and the report uploaded to Online AccesS to the Index of archaeological investigationS (OASIS).

# 3 RESULTS

## *3.1 General assessment of survey results*

3.1.1 The detailed magnetic survey was carried out over a total of ten survey areas covering approximately 11.65ha.

3.1.2 Magnetic anomalies located can be generally classified as positive responses of archaeological potential, positive anomalies of an uncertain origin, anomalies associated with land management, anomalies associated with quarrying, linear anomalies of an agricultural 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 in 3.4 below.

## *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. Severe magnetic disturbance, caused by steel pipelines and other modern ferrous objects, has been suppressed with the use of additional data filtering. Both filtered and unfiltered data are analysed in order to ensure no significant anomalies are removed by the filtering.

3.2.2 Magnetic contrast appears moderate to strong with areas of lower contrast relating to comparatively low magnetic susceptibility over areas of mudstone. Areas of strong contrast exist towards the southern end of the corridor and probably relate to better drained soils on Cornbrash, although there may also be a thin overlying layer of unmapped sand and gravel belonging to the Northmoor Sand and Gravel Member which is mapped further to the south.

3.2.3 Ground conditions during the survey were frequently extremely poor due to waterlogged clayey soil impeding progress. However, due to the positioning of data with RTK GNSS and the stability of the sensors mounted to the cart system, erratic progress along survey traverses has not added noise or distorted anomalies.

## *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 with an agricultural origin*** | The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. Where the response is broad, former ridge and furrow is likely; narrow response is often related to modern ploughing. This category does not include agricultural features of early date or considered to be of archaeological potential (e.g. animal stockades, enclosures, farmsteads, etc). |
| ***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. |
| ***Anomalies associated with quarrying*** | Magnetically variable anomalies which may be negative indicating a response to geology/drift deposits and/or positive indicating an increased depth of topsoil. Very strongly magnetic anomalies are a response to |

| | |
|---|---|
| | highly magnetic material of modern origin which can be used to infill a quarry depression. It should be considered that former quarry pits may be of archaeological potential. |

Table 1: List and description of interpretation categories

### *3.4 List of anomalies - Area 1*

Area 1 between OS NGR 402114 199883 & 402368 199890, see Fig 03.

3.4.1 Area 1 contains a small number of weakly positive linear and discrete anomalies, but they lack a coherent morphology preventing confident interpretation.

### *3.5 List of anomalies - Area 2*

Area 2 between OS NGR 402359 199839 & 402345 199533, see Fig 04.

Area 2 contains a small number of weakly positive linear and discrete anomalies, but again they lack a coherent morphology for them to be confidently interpreted as cut features. Ridge and furrow and former parallel field boundaries have also been located. Magnetic disturbance is from an adjacent gas pipeline.

### *3.6 List of anomalies - Area 3*

Area 3 between OS NGR 402342 199530& 402336 199294 see Fig 05.

Similar to Areas 1 & 2, Area 3 contains a small number of positive responses of uncertain origin. Magnetic debris at the southern end is a response to magnetic material used to infill the canal. Magnetic disturbance is from the adjacent gas pipeline.

### *3.7 List of anomalies - Area 4*

Area 4 between OS NGR 402329 199283 & 402316 198968 see Fig 06.

*Anomalies of archaeological potential*

(1) - An irregularly shaped magnetically variable response appears to relate to quarrying; however, there is no extant surface expression. It is, therefore, possible that this is of some age and may be of archaeological potential.

(2) - A number of discrete positive responses can be seen to the west and south of anomaly (1). It is possible that they are associated with (1) and an archaeological origin should be considered.

*Anomalies with an uncertain origin*

(3) - A small number of weak, discrete, positive responses can be seen elsewhere within the survey area. It is possible that they relate to further cut features, but this is uncertain.

(4) - A magnetically variable response is located at the far southern end of the survey area and corresponds to a depression in the ground surface. It is possible that this is associated with quarrying.

*Anomalies with an agricultural origin*

(5 & 6) - Evidence for ridge and furrow (5) and possibly more recent ploughing (6).

*Anomalies with a modern origin*

(7) - A gas pipeline extends to the east of the main survey corridor and has been crossed by an additional access area. This has caused widespread magnetic disturbance.

## *3.8 List of anomalies - Area 5*

Area 5 between OS NGR 402433 199195 & 402541 198773 see Figs 07 & 08.

*Anomalies of archaeological potential*

(8) - A large pit-like feature situated 30m south east of anomaly (1) seen in Area 4 (see Fig 06). It has a similar response, but there is no surface depression and it is possible this also relates to former quarrying.

*Anomalies with an uncertain origin*

(9) - A number of discrete, positive responses are situated to the south and north of anomaly (8). It is possible that they relate to further pits, similar to anomalies (2) located 30m to the west.

(10 & 11) - A weakly positive, broad linear band (10) extends to the north east and south east of anomaly (8). It is not possible to determine if it is associated, but a similar response (11) can be seen in the dry valley base 60m to the south. It is not clear if this has an anthropogenic or natural origin.

*Anomalies associated with magnetic debris*

(12) - The survey area contains widespread magnetic debris, with concentrations in the northern part. This appears to relate to dumped material and possibly magnetically contaminated green waste.

### *3.9 List of anomalies - Area 6*

Area 6 between OS NGR 402544 198770 & 402610 198537, see Figs 09 – 11.

*Anomalies with an uncertain origin*

(13) - Area 6 contains a number of weakly positive linear anomalies.

*Anomalies associated with land management*

(14) - The survey area contains a number of positive linear anomalies that relate to mapped former field boundaries.

### *3.10 List of anomalies - Area 7*

Area 7 between OS NGR 402608 198532 & 402499 198193, see Fig 12.

*Anomalies with an uncertain origin*

(15) - The survey area contains a small number of pit-like anomalies. They have a response of 6-9nT which indicates a moderate level of magnetic enhancement. They are situated in the base of the dry valley and this type of response could relate to naturally formed features; however, an anthropogenic and possible archaeological origin should also be considered.

*Anomalies associated with land management*

(16) - Positive linear anomalies relate to formerly mapped field boundaries.

### *3.11 List of anomalies - Area 8*

Area 8 between OS NGR 402496 198187 & 402663 197806, see Figs 13 & 14.

*Anomalies with an uncertain origin*

(17) - The survey area contains a number of discrete, positive, pit-like anomalies, similar to (15) seen in Area 7 to the north. It is possible that they relate to naturally formed features; however, there are a group, spaced approximately 17-27m apart, that appear to be either in a linear formation or possible ring. It is, therefore, possible that these have an anthropogenic origin, and their archaeological potential should be considered.

(18) - A positive linear anomaly is located in the southern part of Area 8. It is not clear if it crosses or is crossed by the ridge and furrow (19).

*Anomalies with an agricultural origin*

(19) - Ridge and furrow is evident in the southern part of the survey area.

*Anomalies associated with magnetic debris*

(20) - Strongly magnetic debris is situated along the northern edge of the southern section of the survey area. It relates to an agricultural track.

## *3.12 List of anomalies - Area 9*

Area 9 between OS NGR 403040 197767 & 403191 197525, see Figs 15 – 17.

*Anomalies with an uncertain origin*

(21) - A positive linear anomaly is parallel with the adjacent pipeline (25) and could relate to agricultural activity, although this is not certain.

(22) - The southern part of the survey area contains a number of short positive linear and discrete anomalies. While such anomalies can relate to cut features with archaeological potential, it is possible that they are associated with natural, soil filled cracks and pits within the underlying Cornbrash geology.

*Anomalies with an agricultural origin*

(23) - A series of parallel linear anomalies appear to relate to former ridge and furrow.

*Anomalies associated with quarrying*

(24) - A large zone of magnetically variable responses in the northern part of the survey area corresponds to an extant shallow depression in the ground surface caused by former quarrying. The area is called "Quarry Field" on the 1840 enclosure map.

*Anomalies with a modern origin*

(25) - A strong, multiple dipolar, linear anomaly relates to an existing sewer pipe. It is not visible in the data to the north of the northern inspection chamber as this part is likely to be constructed of a non-magnetic material.

## *3.13 List of anomalies - Area 10*

Area 10 between OS NGR 403208 197468 & 403268 197264, see Fig 18.

*Anomalies with an uncertain origin*

(26) - Parallel linear anomalies are located in the northern part of the survey area. It is possible that they relate to agricultural activity, but this is not certain.

(27) - A number of positive curvilinear and discrete anomalies have been located towards the central, southern part of the survey area. While it is possible that they relate to natural soil-filled joints and cracks within the underlying Cornbrash, they do have an appearance similar to those of ring-ditch and pit-like features, and an archaeological origin should be considered.

(28) - A broad, weakly positive linear band lies adjacent to anomalies (27). A similar response can be seen just on the edge of the north western part of the survey area. While such responses could relate to natural features, it does appear to bound the western edge of anomalies (27) and an association is possible.

# 4 CONCLUSION

4.1.1 The detailed magnetometry survey located evidence for possible quarrying within Areas 4 and 5 in the northern part of the survey corridor. These do not correspond to any surface depressions and appear to be associated with other discrete pit-like anomalies. Although it is not possible to determine the age of the quarrying or the pits, their archaeological potential should be considered.

4.1.2 Elsewhere, the majority of the survey areas contains weak, positive linear and discrete anomalies, but the majority do not appear to have any coherent pattern or morphology preventing confident interpretation. Within Areas 7 and 8, in a dry valley base, there are several moderately enhanced pit-like features, with some appearing in a linear or ring formation. While such anomalies can relate to natural features, an anthropogenic origin is possible.

4.1.3 In the southern part of the survey corridor, Area 9 contains evidence for quarrying which corresponds to depressions in the field. Areas 9 and 10 also contains a number of positive linear, curvilinear and discrete responses, but it is not possible to determine if they relate to natural or cut features.

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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 minimally processed data

Filename: J808-mag-Area1-proc.xcp
Description: Imported as Composite from: J808-mag-Area1.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 402114.85, 199947.83m
Southeast corner: 402388.45, 199856.33 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702
Source GPS Points: 367700
Dimensions
Composite Size (readings): 1824 x 610
Survey Size (meters): 274 m x 91.5 m
Grid Size: 274 m x 91.5 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 0.98
Mean: 0.06
Median: 0.01
Composite Area: 2.5034 ha
Surveyed Area: 0.76379 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 nT

Area 1 filtered data

Filename: J808-mag-Area1-proc-hpf.xcp
Stats
Max: 3.25
Min: -3.30
Std Dev: 0.88
Mean: 0.05
Median: 0.00
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 -3.00 to 3.00 nT

Area 2 minimally processed data

Filename: J808-mag-Area2-proc.xcp
Northwest corner: 402238.85, 199851.20 m
Southeast corner: 402375.35, 199529.00 m
Source GPS Points: 317000
Dimensions
Composite Size (readings): 910 x 2148
Survey Size (meters): 137 m x 322 m
Grid Size: 137 m x 322 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.71
Mean: -0.02
Median: -0.02
Composite Area: 4.398 ha
Surveyed Area: 1.2248 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 nT

Area 2 filtered data

Filename: J808-mag-Area2-proc-hpf.xcp
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.14
Mean: 0.01
Median: -0.02
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 -3.00 to 3.00 nT

Area 3 minimally processed data

Filename: J808-mag-Area3-proc.xcp
Northwest corner: 402282.76, 199537.66 m
Southeast corner: 402359.71 199287.01 m
Source GPS Points: 252600
Dimensions
Composite Size (readings): 513 x 1671
Survey Size (meters): 77 m x 251 m
Grid Size: 77 m x 251 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.62
Mean: -0.02
Median: 0.00
Composite Area: 1.9288 ha
Surveyed Area: 0.72882 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 nT

Area 3 filtered data

Filename: J808-mag-Area3-proc-hpf.xcp
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.25
Mean: 0.02
Median: -0.01
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 -3.00 to 3.00 nT

Area 4 minimally processed data

Filename: J808-mag-Area4-proc.xcp
Northwest corner: 402302.05, 199292.00 m
Southeast corner: 402364.75, 198965.60 m
Source GPS Points: 416300
Dimensions
Composite Size (readings): 418 x 2176
Survey Size (meters): 62.7 m x 326 m
Grid Size: 62.7 m x 326 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.36
Mean: -0.01
Median: 0.05
Composite Area: 2.0465 ha
Surveyed Area: 0.97438 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 nT

Area 4 filtered data

Filename: J808-mag-Area4-proc-hpf.xcp
Stats
Max: 3.32
Min: -3.30
Std Dev: 0.93
Mean: 0.00
Median: -0.01
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 -3.00 to 3.00 nT

Areas 5 & 6 minimally processed data
Name: J808-mag-Areas5-6-proc.xcp
Northwest corner: 402322.77, 199198.98 m
Southeast corner: 402665.22, 198532.83 m
Source GPS Points: 956700
Dimensions
Composite Size (readings): 2283 x 4441
Survey Size (meters): 342 m x 666 m
Grid Size: 342 m x 666 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.80
Mean: 0.00
Median: 0.00
Composite Area: 22.812 ha
Surveyed Area: 2.9651 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -2.00 to 2.00 nT

Areas 5 & 6 filtered data

Filename: J808-mag-Areas5-6-proc-hpf.xcp
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.69
Mean: 0.02
Median: 0.01
GPS based Proce6
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 Lo pass Uniform (median) filter: Window dia: 13
6 Clip from -2.00 to 2.00 nT

Area 7 minimally processed data

Filename: J808-mag-Area7-proc.xcp
Northwest corner: 402481.48, 198538.37 m
Southeast corner: 402626.68, 198191.87 m
Source GPS Points: 359500
Dimensions
Composite Size (readings): 968 x 2310
Survey Size (meters): 145 m x 347 m
Grid Size: 145 m x 347 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 0.86
Mean: -0.02
Median: -0.01
Composite Area: 5.0312 ha
Surveyed Area: 1.3492 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 nT

Area 7 filtered data

Filename: J808-mag-Area7-lpf.xcp
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.63
Mean: 0.00
Median: 0.01
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Lo pass Uniform (median) filter: Window dia: 13
5 Clip from -2.00 to 2.00 nT

Area 8 minimally processed data

Filename: J808-mag-Area8-proc.xcp
Northwest corner: 402475.12, 198188.68 m
Southeast corner: 402666.97, 197775.88 m
Source GPS Points: 748300
Dimensions
Composite Size (readings): 1279 x 2752
Survey Size (meters): 192 m x 413 m
Grid Size: 192 m x 413 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.05
Mean: -0.02
Median: 0.00
Composite Area: 7.9196 ha
Surveyed Area: 1.7008 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 nT

Area 8 filtered data

Filename: J808-mag-Area8-lpf.xcp
Stats
Max: 2.21
Min: -2.20
Std Dev: 0.81
Mean: 0.00
Median: 0.01
GPS based Proce6
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 Lo pass Uniform (median) filter: Window dia: 13
6 Clip from -2.00 to 2.00 nT

Area 9 minimally processed data

Filename: J808-mag-Area9-proc.xcp
Northwest corner: 403043.25, 197786.52 m
Southeast corner: 403206.00, 197517.57 m
Source GPS Points: 398400
Dimensions
Composite Size (readings): 1085 x 1793
Survey Size (meters): 163 m x 269 m
Grid Size: 163 m x 269 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.88
Mean: 0.02
Median: -0.02
Composite Area: 4.3772 ha
Surveyed Area: 1.1553 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 nT

Area 9 filtered data

Filename: J808-mag-Area9-proc-lpf.xcp
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.79
Mean: 0.01
Median: -0.02
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 -3.00 to 3.00 nT

Area 10 minimally processed data

Filename: J808-mag-Area10-proc.xcp
Northwest corner: 403182.34, 197482.49 m
Southeast corner: 403285.69, 197261.39 m
Source GPS Points: 403400
Dimensions
Composite Size (readings): 689 x 1474
Survey Size (meters): 103 m x 221 m
Grid Size: 103 m x 221 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.83
Mean: 0.01
Median: -0.02
Composite Area: 2.2851 ha
Surveyed Area: 0.77424 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 nT

Area 10 filtered data

Filename: J808-mag-Area10-proc-hpf.xcp
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.66
Mean: 0.01
Median: -0.02
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 -3.00 to 3.00 nT**

# 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 copy of the report in PDF/A format will be supplied to the Gloucestershire Historic Environment Record, together with a DXF of the survey boundary. In order to comply with the Gloucestershire Archaeological Archive Standards (SWMDP, 2017) the data will be archived with the Archaeology Data Service (ADS) and the report uploaded to Online AccesS to the Index of archaeological investigationS (OASIS) in the formats stated below for archiving:

Archive contents:

| File type | Naming scheme | Description |
|---|---|---|
| Data | J808-mag-**[area number/name]**.asc<br>J808-mag-**[area number/name]**.xcp<br>J808-mag-**[area number/name]**-proc.xcp<br>J808-mag-**[area number/name]**-proc-hpf.xcp | Raw data as ASCII CSV<br>TerraSurveyor raw data<br>TerraSurveyor minimally processed<br>TerraSurveyor filtered data |
| Graphics | J808-mag-**[area number/name]**-proc.tif | Image in TIF format |
| Drawing | J808-**[CAD]**.dwg | CAD file in 2010 dwg format |
| Report | J808 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 DISCRETE ARCHAEOLOGY | | Red 255,0,0 | Solid donut, point or polygon (solid) |
| AS-ABST MAG POS ARCHAEOLOGY | | Red 255,0,0 | Polygon (cross hatched ANSI37) |
| ***Anomalies with an uncertain origin*** | | | |
| AS-ABST MAG POS LINEAR UNCERTAIN | | 255,127,0 | Line, polyline or polygon (solid) |
| AS-ABST MAG POS DISCRETE UNCERTAIN | | 255,127,0 | Solid donut, point or polygon (solid) |
| AS-ABST MAG POS UNCERTAIN | | 255,127,0 | 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 with an agricultural origin*** | | | |
| AS-ABST MAG AGRICULTURAL | | Green 0,255,0 | Line or polyline |
| AS-ABST MAG RIDGE AND FURROW | | 0,127,63 | Line, polyline or polygon (cross hatched ANSI37) |
| ***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 |
| ***Anomalies with a natural origin*** | | | |
| ***Anomalies associated with quarrying*** | | | |
| AS-ABST MAG QUARRYING/ | | 255,255, 127 or 255,223,127 | Polygon (net) |

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

Survey location

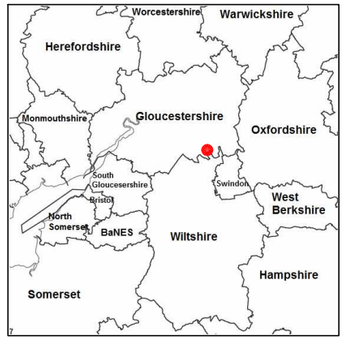

N

# Archaeological Surveys

Specialist Geophysical Surveyors

## Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Map of survey area




Survey location

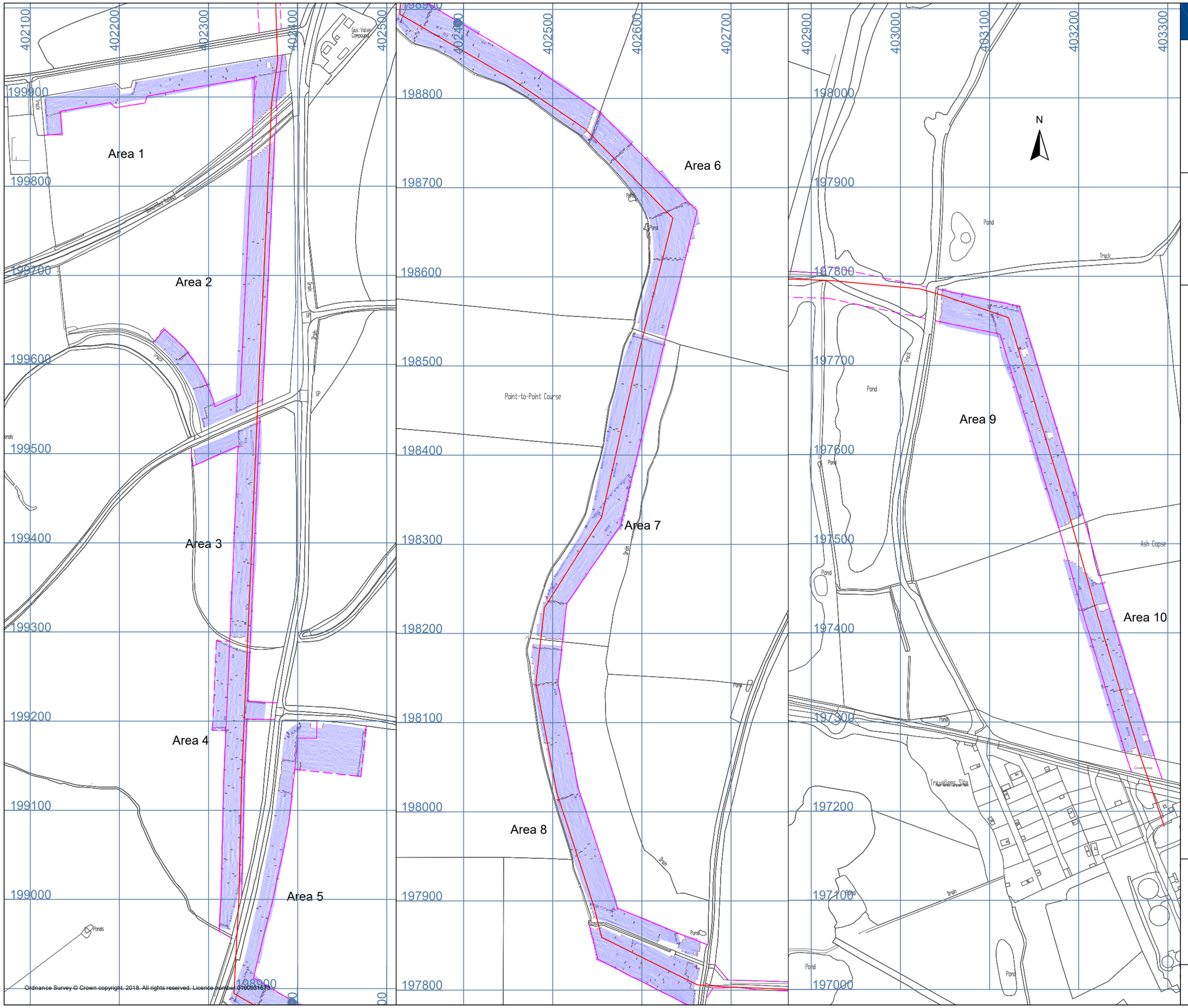
Survey located between OS NGR SU 02114 99883 to SU 03268 97264

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 01 |






Archaeological Surveys
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# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Referencing information

Referencing grid to OSGB36 datum at 100m intervals

- Survey tracks
- Survey track start
- Survey track stop

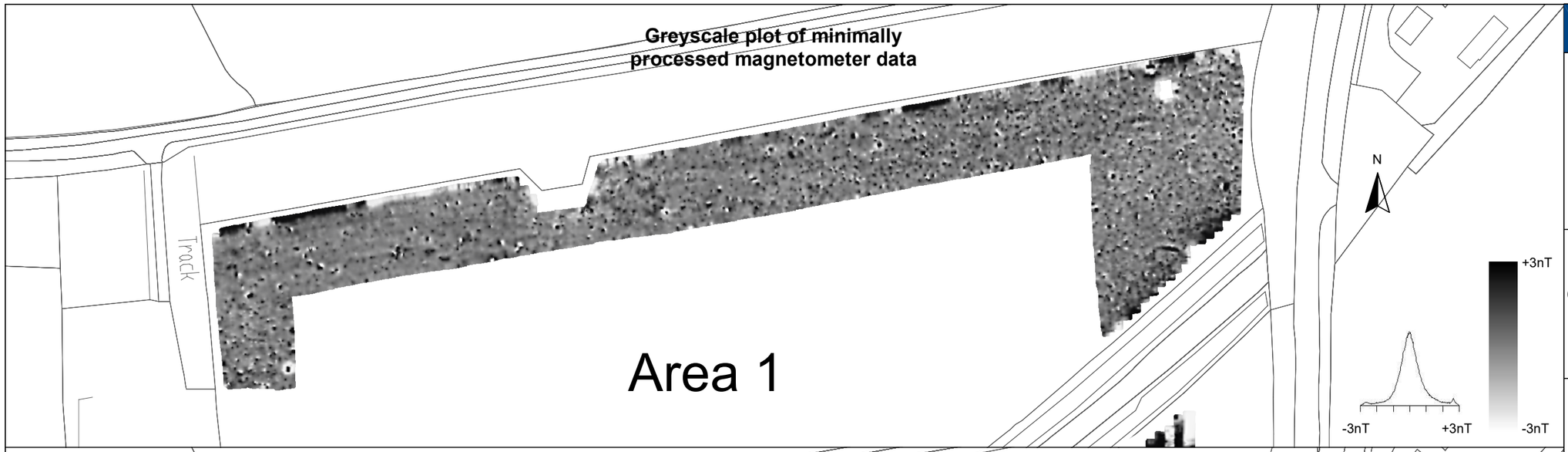
SCALE 1:4000

0m 40 80 120 160 200m

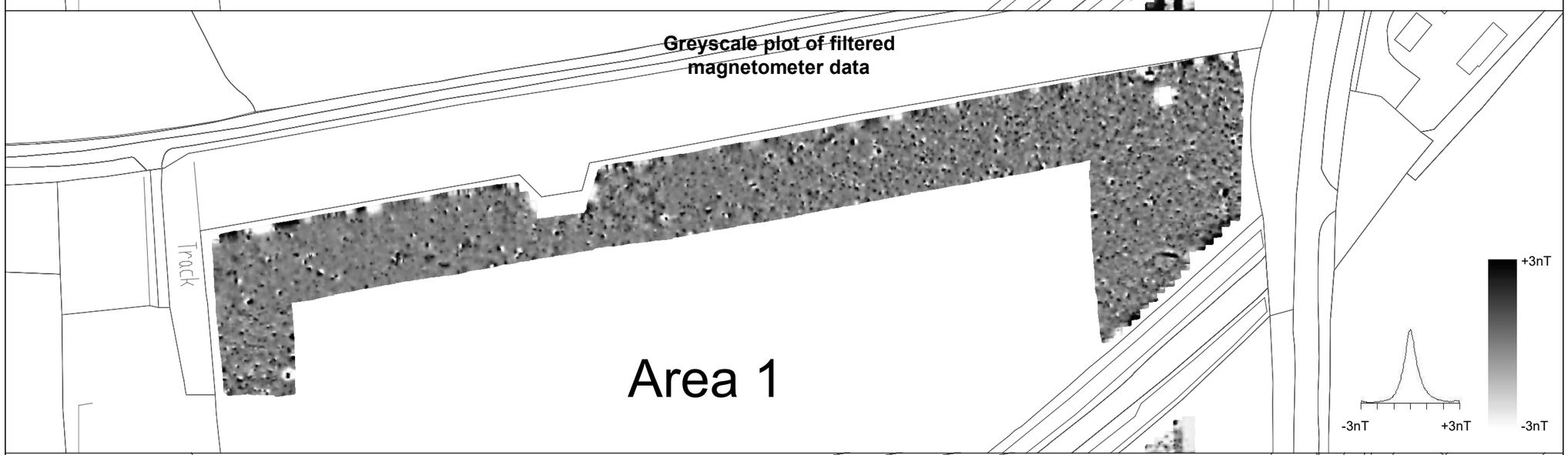
SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 02 |

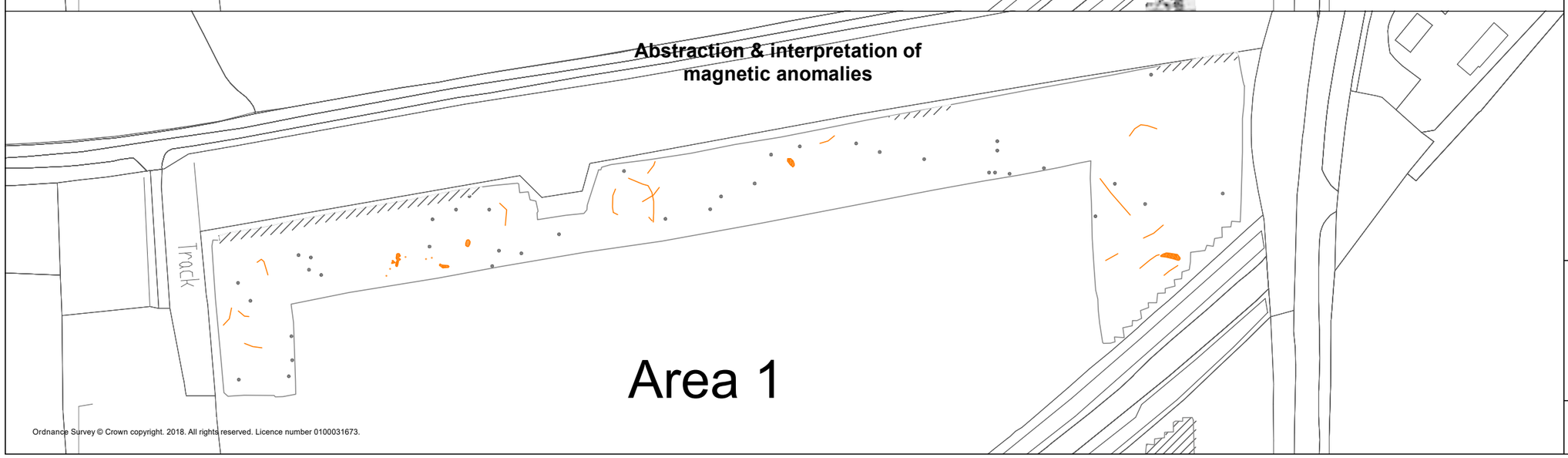
Greyscale plot of minimally processed magnetometer data




Greyscale plot of filtered magnetometer data




Abstraction & interpretation of magnetic anomalies



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# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plot of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 1

- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - possible pit-like feature
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

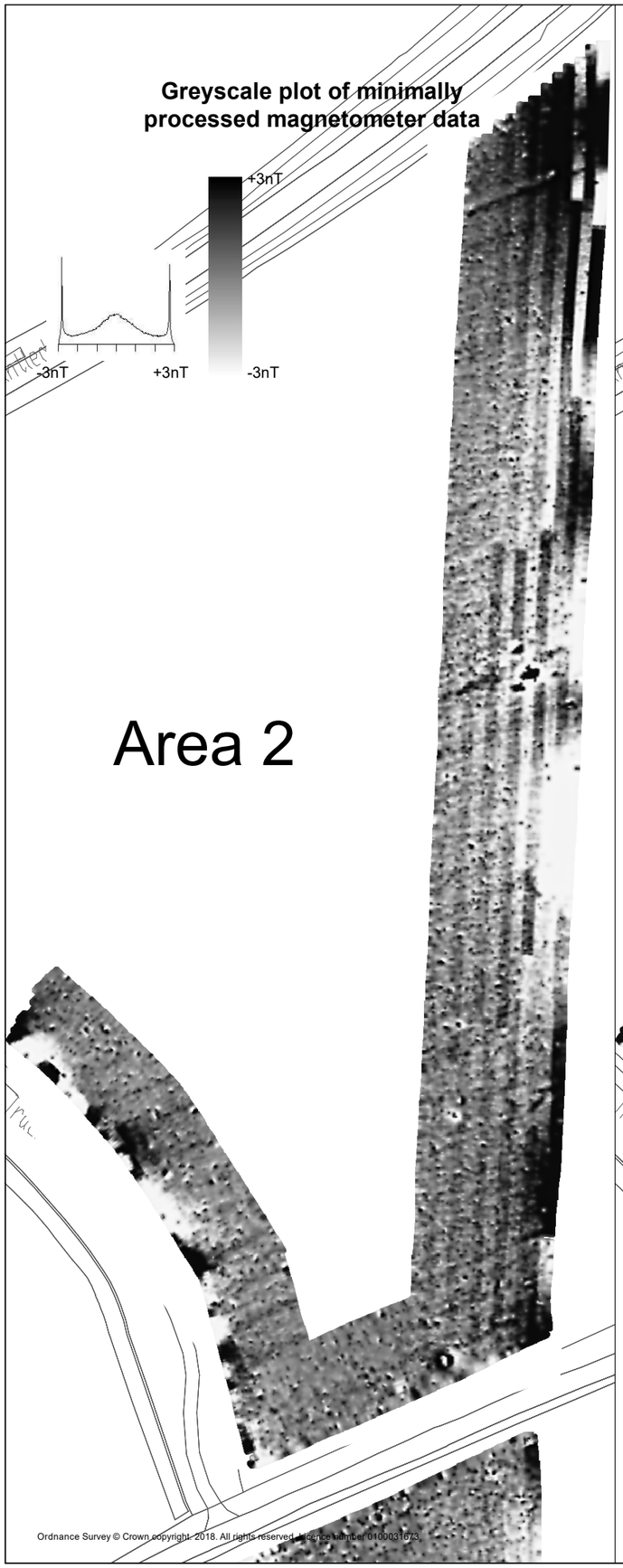
SCALE 1:1250

0m 10 20 30 40 50m

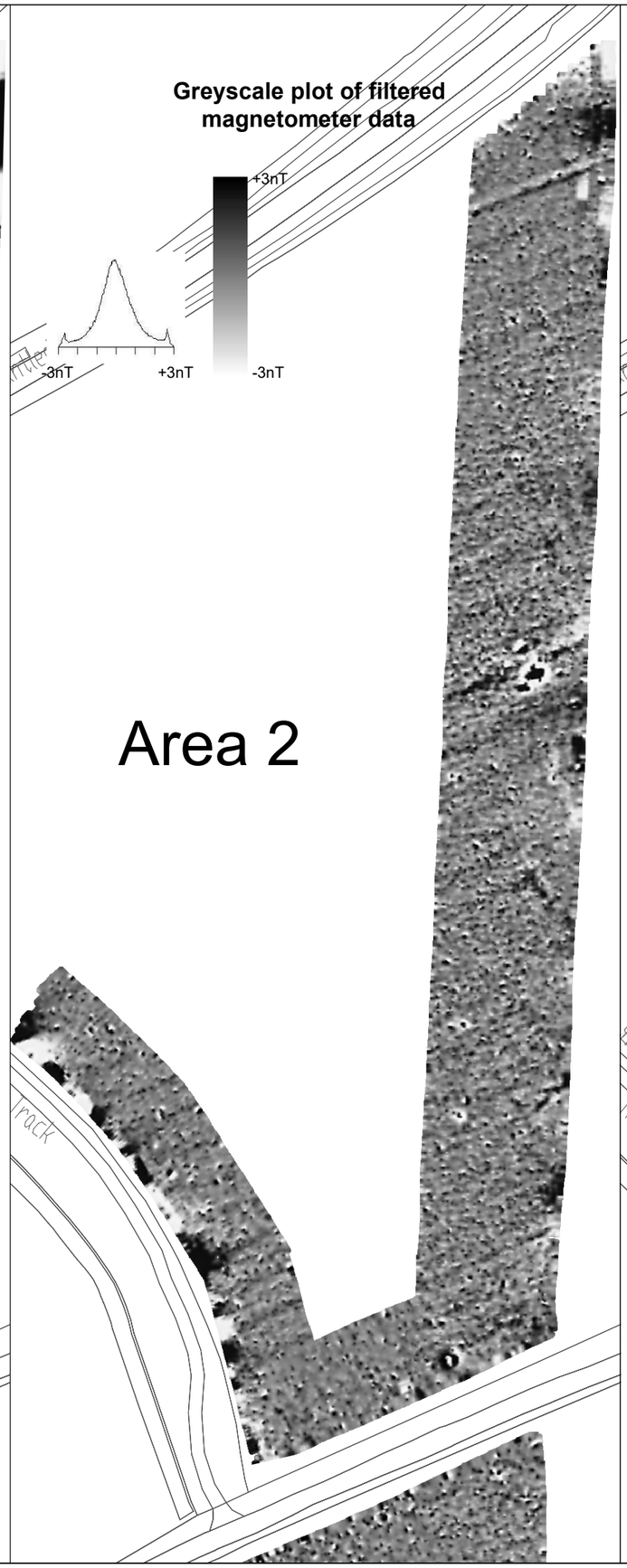
SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 03 |

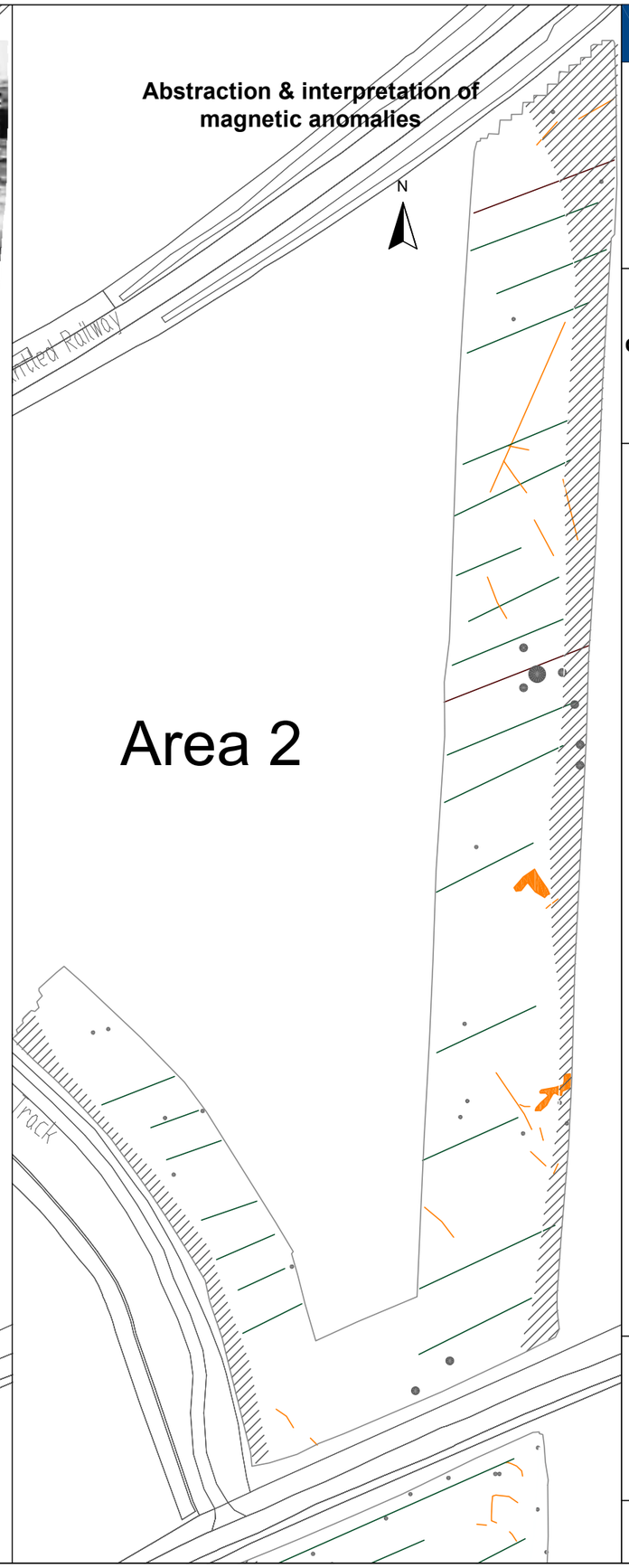
## Greyscale plot of minimally processed magnetometer data




## Greyscale plot of filtered magnetometer data




## Abstraction & interpretation of magnetic anomalies






**Archaeological Surveys**
Specialist Geophysical Surveyors

# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plots of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 2

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - ridge and furrow
- Positive linear anomaly - possible former field boundary
- Discrete positive response - possible pit-like feature
- 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 |

Greyscale plot of minimally processed magnetometer data

Area 3

+3nT
-3nT
-3nT
+3nT

Greyscale plot of filtered magnetometer data

Area 3

+3nT
-3nT
-3nT
+3nT

Abstraction & interpretation of magnetic anomalies

Area 3

N



Archaeological Surveys
Specialist Geophysical Surveyors

# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plots of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 3

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - ridge and furrow
- Positive linear anomaly - possible land drain
- Discrete positive response - possible pit-like feature
- 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 05 |

Greyscale plot of minimally processed magnetometer data

Area 4

+3nT

-3nT

-3nT

-3nT

Greyscale plot of filtered magnetometer data

Area 4

+3nT

-3nT

-3nT

-3nT

Abstraction & interpretation of magnetic anomalies

Area 4

N

5

7

3

6

2

1

8

9

4

10



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# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plots of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 4

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Linear anomaly - ridge and furrow
- Discrete positive response - cut feature of archaeological potential
- Discrete positive response - possible pit-like feature
- Variable magnetic response - quarrying of archaeological potential
- Positive anomaly - magnetically enhanced material
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- 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 06 |

Greyscale plot of minimally processed magnetometer data

Area 5

+2nT

-2nT +2nT -2nT



Greyscale plot of filtered magnetometer data

Area 5

+2nT

-2nT +2nT -2nT

Abstraction & interpretation of magnetic anomalies

N

7

12

8

9

10

Area 5

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# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plots of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 5 north

- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - possible pit-like feature
- Variable magnetic response - quarrying of archaeological potential
- Positive anomaly - magnetically enhanced material
- 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 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 07 |

Greyscale plot of minimally processed magnetometer data

Area 5

+2nT

-2nT

-2nT

+2nT



Greyscale plot of filtered magnetometer data

Area 5

+2nT

-3nT

+3nT

-2nT

Abstraction & interpretation of magnetic anomalies

N

6

2

1

8

9

10

11

Area 5

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# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plots of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 5 south west

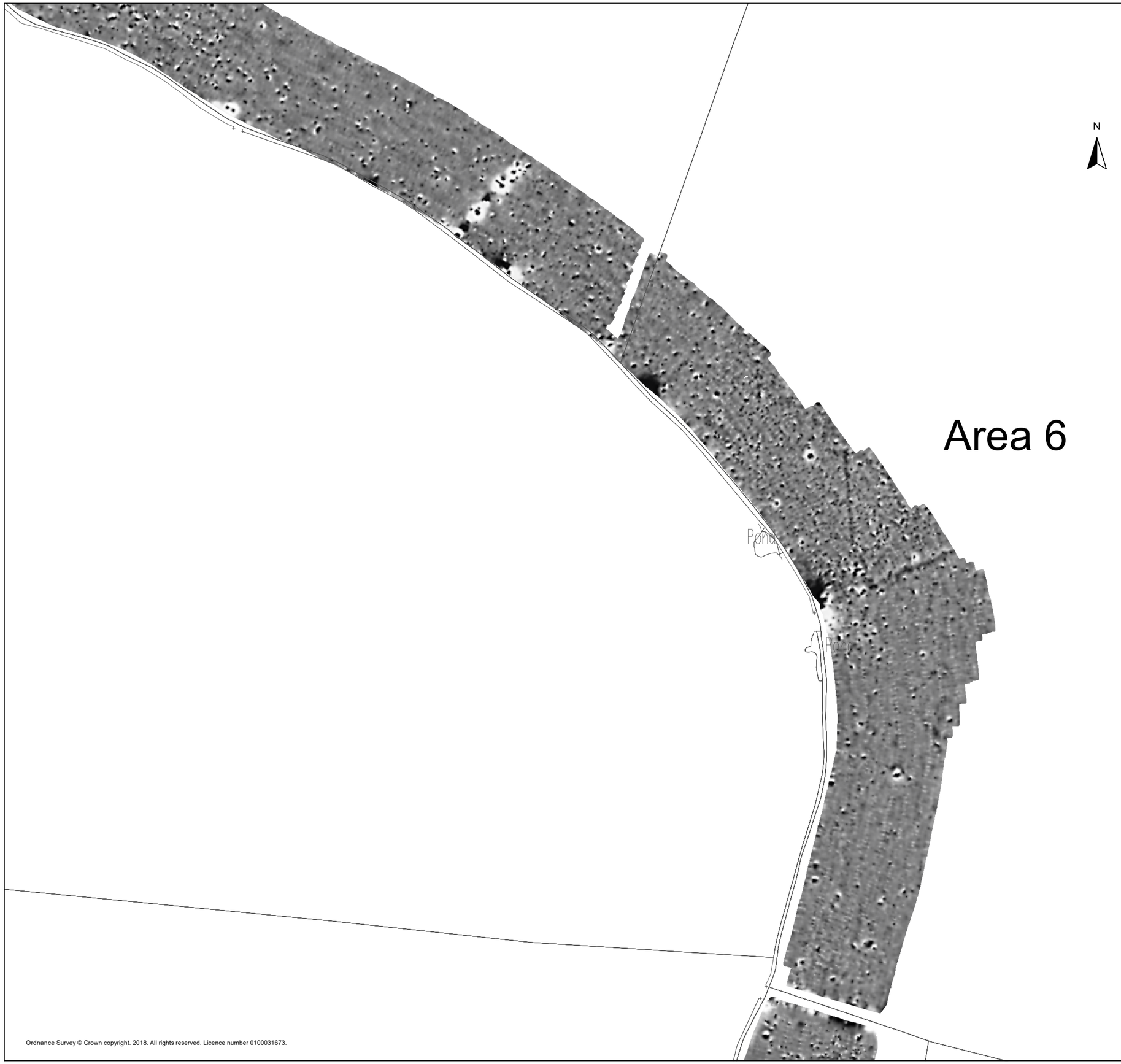
- Positive linear anomaly - possible former field boundary
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Variable magnetic response - quarrying of archaeological potential
- Magnetic debris - spread of magnetically thermoremnant/ferrous 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 08 |

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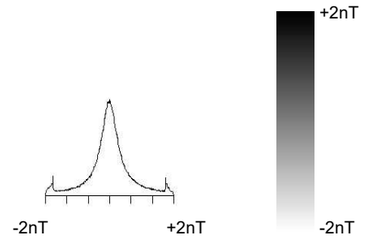
# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plot of minimally processed magnetometer data - Area 5 south east & Area 6

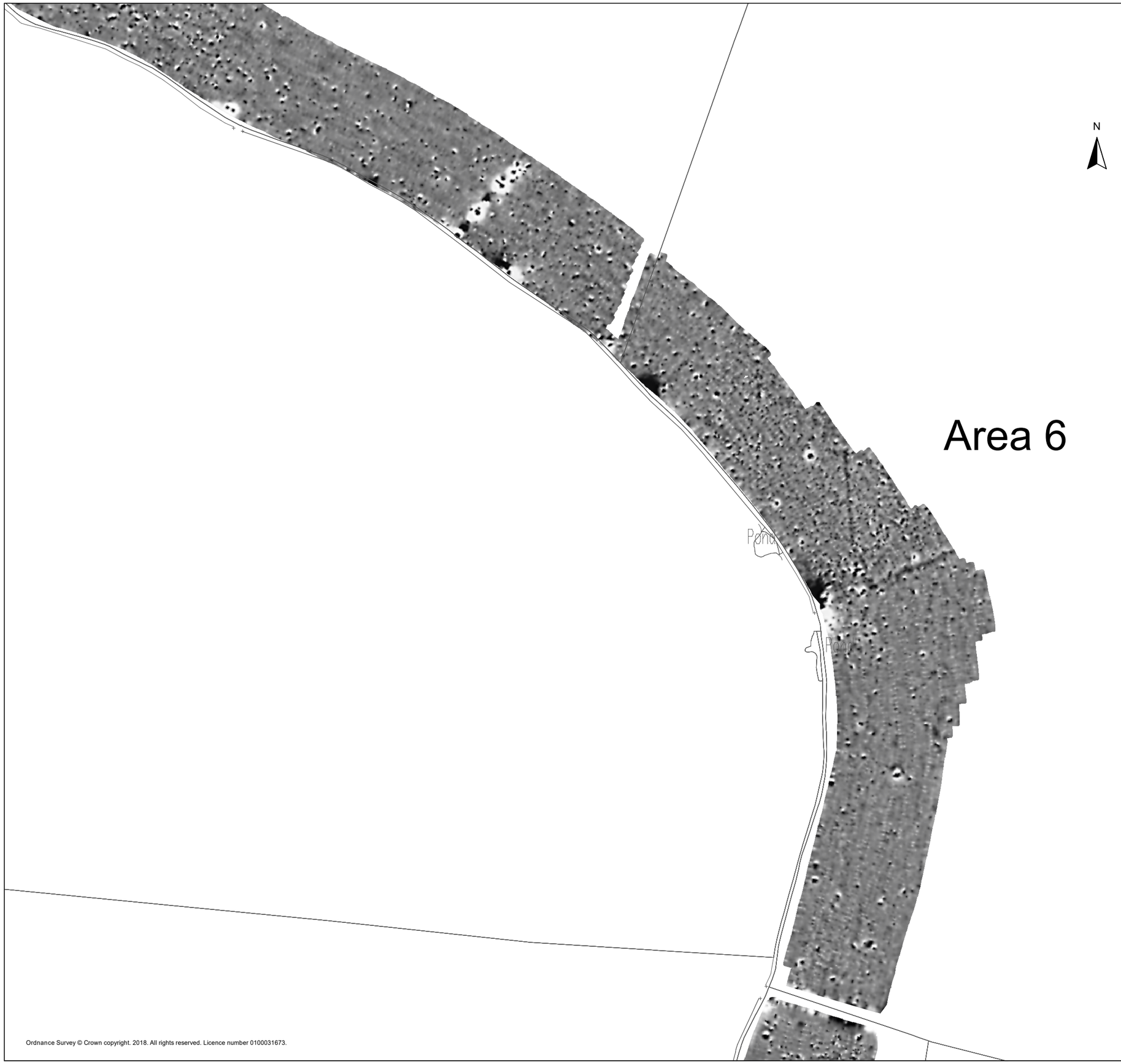



SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 09 |

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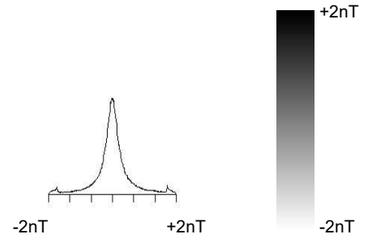
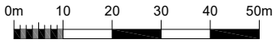
# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plot of filtered magnetometer data - Area 5 south east & Area 6




SCALE 1:1250




SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 10 |

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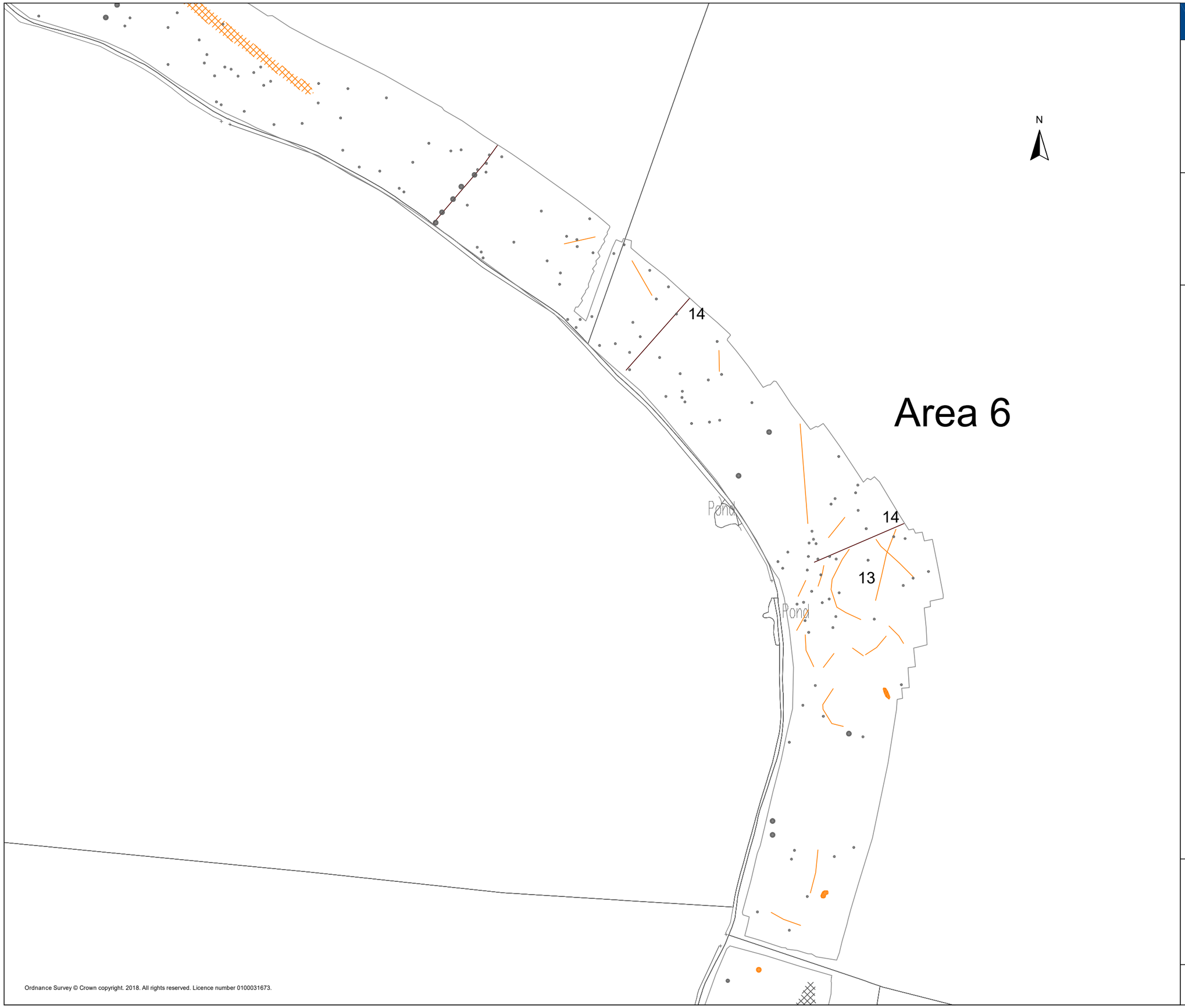
# Geophysical Survey
# Chesterton Farm Foul Water Pipeline - Hills Quarry Route
# Siddington
# Gloucestershire

## Abstraction and interpretation of magnetic anomalies - Area 5 south east & Area 6




- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - former field boundary
- Discrete positive response - possible pit-like feature
- 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 11 |

Greyscale plot of minimally processed magnetometer data

Greyscale plot of filtered magnetometer data

Abstraction & interpretation of magnetic anomalies

Area 7

Area 7

Area 7

Drain

Drain

Drain

+3nT

-3nT

-3nT

+3nT

+2nT

-2nT

-2nT

+2nT

N

16

15

Positive linear anomaly - possible ditch-like feature

Positive linear anomaly - former field boundary

Discrete positive response - possible pit-like feature

Positive anomaly - magnetically enhanced material

Magnetic debris - spread of magnetically thermoremnant/ferrous material

Magnetic disturbance from ferrous material

Strong dipolar anomaly - ferrous object



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# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plots of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 7

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 12 |

Greyscale plot of minimally processed magnetometer data

Area 8

+3nT

-3nT

-3nT +3nT



Greyscale plot of filtered magnetometer data

Area 8

+2nT

-2nT

-2nT +2nT

Abstraction & interpretation of magnetic anomalies

N

17

Area 8

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# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plots of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 8 north

- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - possible pit-like feature
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

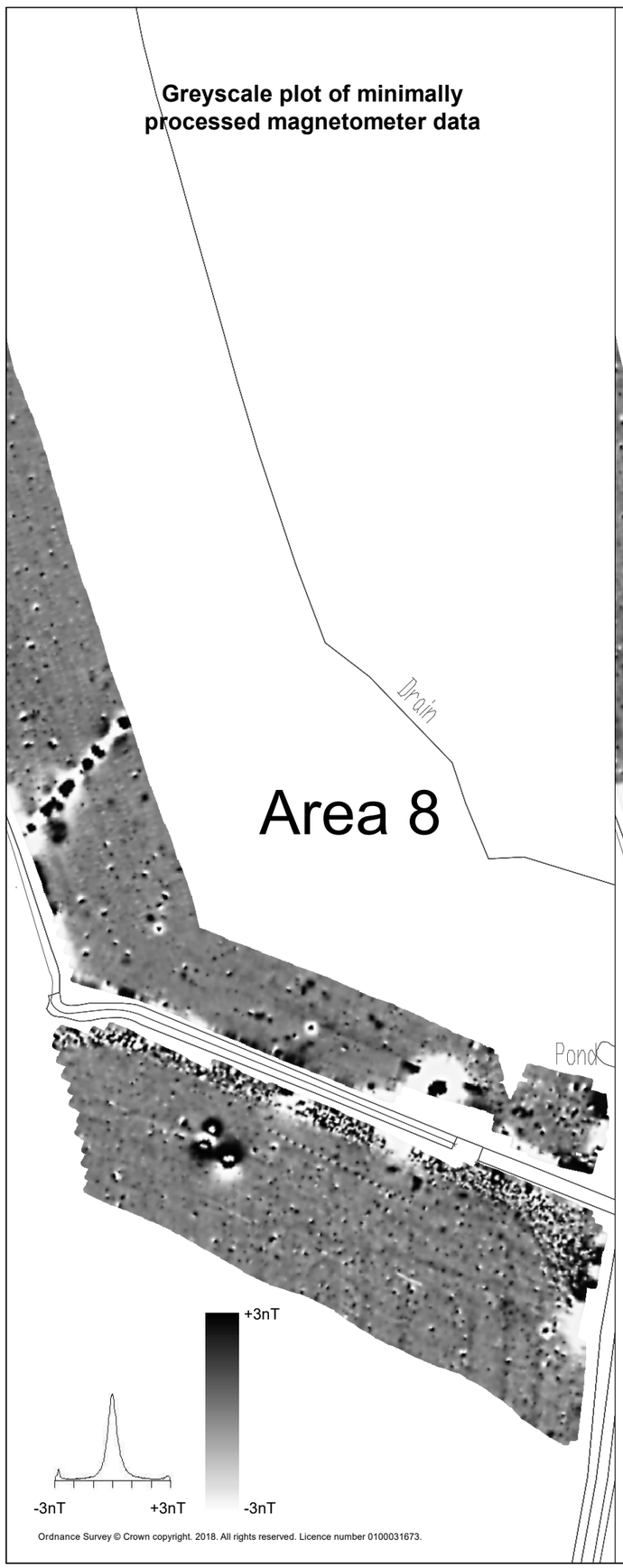
SCALE 1:1250

0m 10 20 30 40 50m

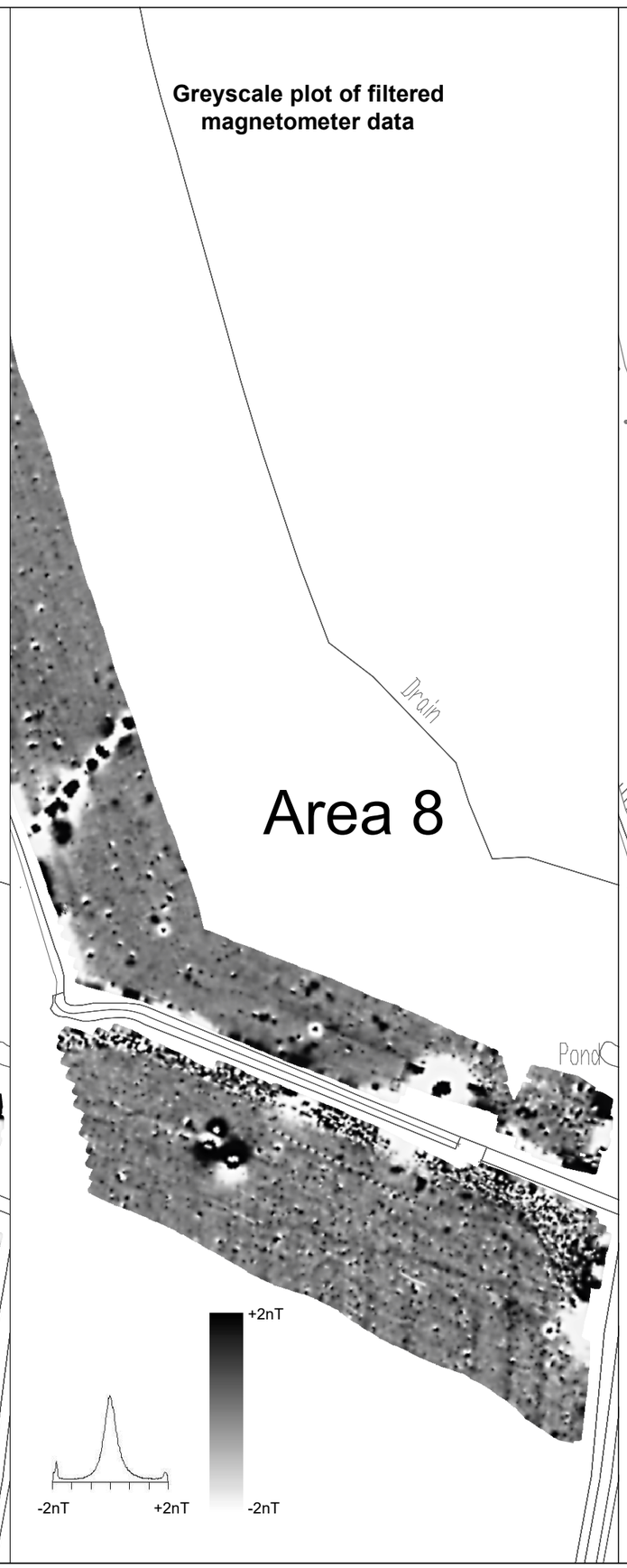
SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 13 |

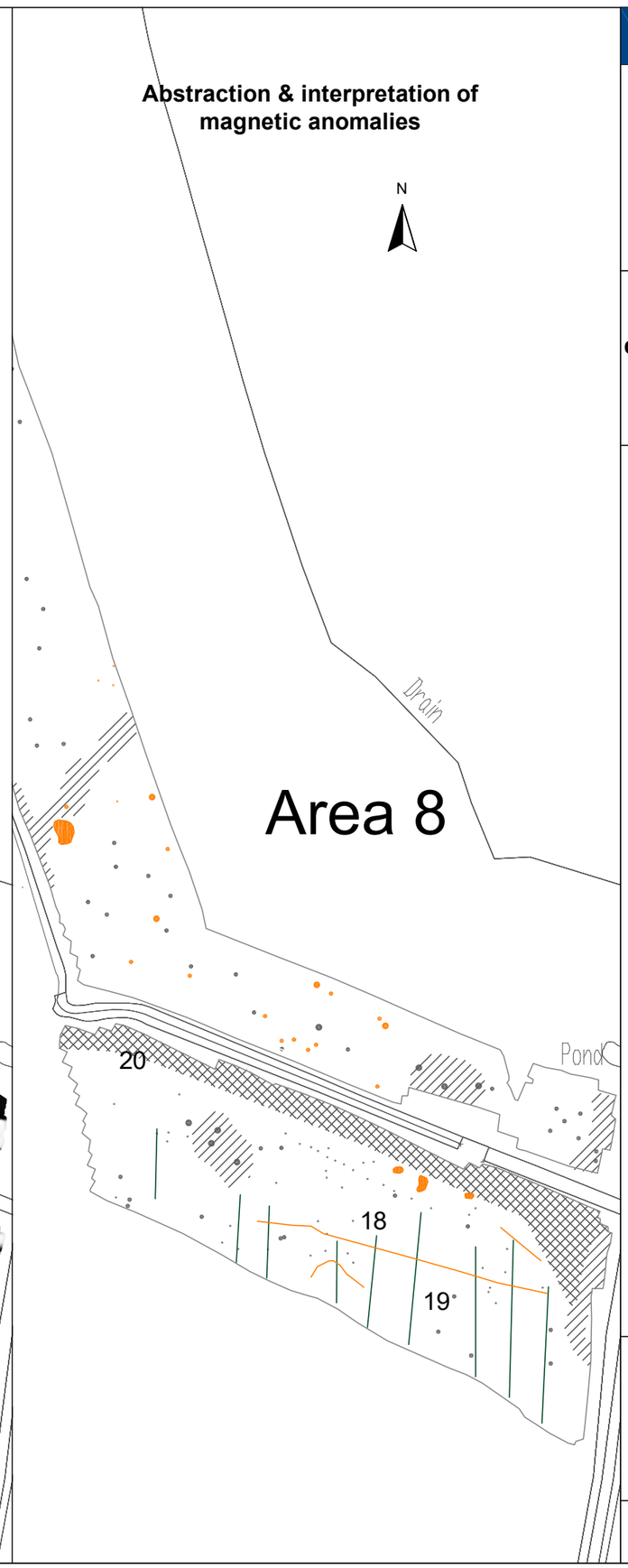
## Greyscale plot of minimally processed magnetometer data




## Greyscale plot of filtered magnetometer data




## Abstraction & interpretation of magnetic anomalies



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# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plots of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 8 south

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - ridge and furrow
- Discrete positive response - possible pit-like feature
- 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 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 14 |

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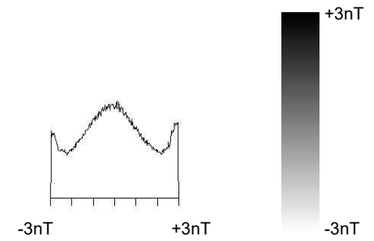
# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plot of minimally processed magnetometer data - Area 9


SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 15 |

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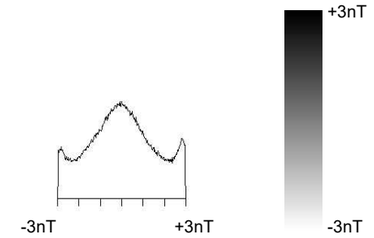
# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plot of filtered magnetometer data - Area 9







SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 16 |

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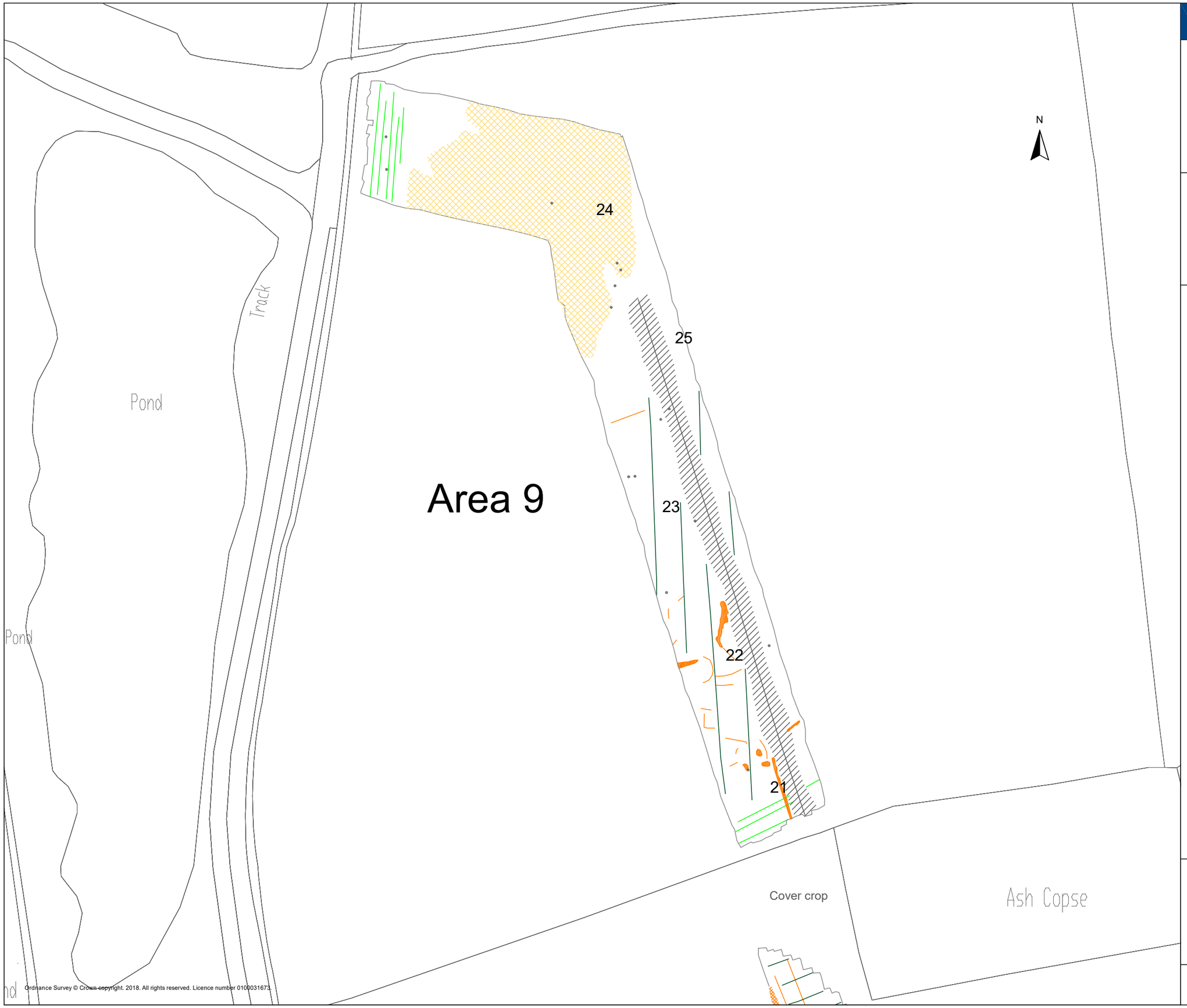
# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Abstraction and interpretation of magnetic anomalies - Area 9




- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Linear anomaly - ridge and furrow
- Discrete positive response - possible pit-like feature
- Variable magnetic response - quarrying
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- 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 17 |

**Greyscale plot of minimally processed magnetometer data**

Cover crop

Ash Copse

Area 10

**Greyscale plot of filtered magnetometer data**

Cover crop

Ash Copse

Area 10

**Abstraction & interpretation of magnetic anomalies**

N

Cover crop

Ash Copse

21

26

27

28

Area 10

Cover crop

+3nT

-3nT

+3nT

-3nT

Cover crop

+3nT

-3nT

+3nT

-3nT

Cover crop



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# Geophysical Survey Chesterton Farm Foul Water Pipeline - Hills Quarry Route Siddington Gloucestershire

## Greyscale plots of magnetometer data & abstraction & interpretation of magnetic anomalies - Area 10

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Linear anomaly - ridge and furrow
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- 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 18 |