



**magnitude
surveys**

**Geophysical Survey Report
Land to the East of the A38 and North of the A419
Whitminster, Gloucestershire**

**For
RPS Group**

**On behalf of
Robert Hitchins Limited**

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Abstract

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of c. 101ha of land to the East of the A38 and North of the A419, Whitminster, Stroud, Gloucestershire. A fluxgate gradiometer survey was successfully completed across the survey area. Extensive archaeological activity has been identified across much of the survey area, with several probable enclosures of uncertain date. Most of these enclosures are isolated from each other and have differing morphologies, and therefore it is unclear how or if they relate. Several other anomalies of possible archaeological origin are present but are largely weaker and fragmented, which has limited a definitive interpretation. Two separate, isolated anomalies potentially relating to a kiln or concentrated burning activity have also been detected, these are of undetermined date and origin. Agricultural activity has been identified throughout the site as former field boundaries, infilled ponds, in addition to extensive ridge and furrow cultivation, which is also visible as extant earthworks across much of the survey area. Anomalies of undetermined origin have been detected across the survey area, including a spread of material in the east which could be related to the construction of the M5 motorway or with extraction activity. The magnetic haloes relating to the multiple modern services crossing the survey area may have masked weaker anomalies in their vicinity.

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1. Introduction

- 1.1. Magnitude Surveys Ltd (MS) was commissioned by RPS Group, on behalf of Robert Hitchins Limited, to undertake a geophysical survey on a c.101ha area of land to the East of the A38 and North of the A419, Whitminster, Stroud, Gloucestershire (SO781086).
- 1.2. The geophysical survey comprised hand-pulled and quad-towed, cart-mounted and hand-carried GNSS-positioned fluxgate gradiometer survey. Magnetic survey is the standard primary geophysical method for archaeological applications in the UK for its ability to detect a range of different features. The technique is particularly suited for detecting fired or magnetically enhanced features, such as ditches, pits, kilns, sunken earth houses, and industrial activity (David *et al.*, 2008).
- 1.3. The survey was conducted in line with the current best practice guidelines produced by Historic England (David *et al.*, 2008), the Chartered Institute for Archaeologists (CIfA, 2014) and the European Archaeological Council (Schmidt *et al.*, 2015).
- 1.4. It was conducted in line with a WSI produced by MS (Magnitude Surveys, 2020).
- 1.5. The survey commenced on 17/08/2020 and took 14 days to complete.

2. Quality Assurance

- 2.1. Magnitude Surveys is a Registered Organisation of the Chartered Institute for Archaeologists (CIfA), the chartered UK body for archaeologists, and a corporate member of ISAP (International Society of Archaeological Prospection).
- 2.2. The directors of MS are involved in the cutting edge of research and the development of guidance/policy. Specifically, Dr. Chrys Harris has a PhD in archaeological geophysics from the University of Bradford, is a Member of CIfA and is the Vice-Chair of the International Society for Archaeological Prospection (ISAP); Finnegan Pope-Carter has an MSc in archaeological geophysics and is a Fellow of the London Geological Society, as well as a member of GeoSIG (CIfA Geophysics Special Interest Group); Dr. Kayt Armstrong has a PhD in archaeological geophysics from Bournemouth University, is a Member of CIfA, the Editor of ISAP News, and is the UK Management Committee representative for the COST Action SAGA; Dr. Paul Johnson has a PhD in archaeology from the University of Southampton, has been a member of the ISAP Management Committee since 2015, and is currently the nominated representative for the EAA Archaeological Prospection Community to the board of the European Archaeological Association.
- 2.3. All MS managers have relevant degree qualifications to archaeology or geophysics. All MS field and office staff have relevant archaeology or geophysics degrees and/or field experience.

3. Objectives

- 3.1. The objective of this geophysical survey was to assess the subsurface archaeological potential of the survey area.

4. Geographic Background

4.1. The survey area was located on the eastern edge of Whitminster (Figure 1). Gradiometer survey was undertaken across 22 pasture fields. The survey area was bounded by hedges and overhanging trees to the north, hedges and the M5 to the east, the A419 to the south and the A38 to the west (Figure 2). Due to the presence of a construction site compound, dense vegetation, ponds and steep topography c. 2.2ha could not be surveyed.

4.2. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	The area consisted of a flat pasture field with areas of dense nettles which prevented survey in places.	The area was bounded to the north, south and west by a wire fence, hedgerow and trees. A farm track bounded the area to the west. Telegraph poles were located within the area, with overhead powerlines crossing the area east to west. Farm equipment was located in the eastern end of the area.
2	The area consisted of a flat grass field, previously ploughed and still relatively bumpy terrain	The area was bounded to the north, south and west by a wire fence, trees and hedgerow and to the east by a wire fence, hedgerow and the M5.
3	The area consisted of flat grassland-pasture.	The area was bounded to the north by a farm track, to the east by an electric fence and farm track and to the south and west by a wire fence, hedgerow and trees.
4	The area consisted of flat grassland-pasture.	The area was bounded to the north, east and west by a wire fence, trees and hedgerow and to the south by a farm track.
5	The area consisted of a flat pasture field, previously ploughed and very bumpy. Sloping down from south west to the north east.	The area was bounded on all sides by a wire fence, hedgerow and trees. Water troughs were present in the north-western corner and near the entrance to the field. A gas pipe marker was visible at the northern and southern ends of the field.
6	The area consisted of a pasture field sloping slightly downwards from west to east.	The area was bounded to the north, east and south by a wire fence, hedgerow and trees, to the west by an electric fence and farm track. A temporary electric fence divided the centre of the field on an east to west alignment.
7	The area consisted of a pasture field sloping slightly from north west to the south east.	The area was bounded on all sides by a wire fence, to the north by a farm track, to the east and south by hedgerow and west by a wooden fence. A temporary electric fence bisected the field.
8	The area consisted of an undulating pasture field.	The area was bounded to the north and east by hedgerows and trees, to the south by a wire fence and the M5 to the west. A line of trees ran

		into the field in the southern half of the survey area.
9	The area consisted of a pasture field sloping down from south to north.	The area was bounded on all sides by a wire fence and hedgerows.
10	The area consisted of flat grassland-pasture.	The area was bounded to the north and east by a wire fence and hedgerows and to the south and west by a farm track and electric fence. The field was divided by a temporary fence running diagonally through the field splitting it in two.
11	The area consisted of flat grassland-pasture.	The area was bounded to the north and east by a wire fence and hedgerows, and to the south and west by a farm track and electric fence. The field was divided by a temporary fence running diagonally through the field splitting it in two.
12	The area consisted of a pasture field sloping down from south to north.	The area was bounded on all sides by a wire fence and hedgerow, and in the northern corner and halfway along the western border by housing. Telegraph poles were located in the survey area, with the overhead lines crossing the area from east to west in the southern half of the field and north to south along the centre of the field.
13	The area consisted of flat grassland-pasture.	The area was bounded to the south, east and north by a wire fence. The area was bounded to the west by fencing and hedgerow. Extant ridge and furrow were visible running on a northeast to southwest orientation. An overhead powerline cable was present to the east of the survey area running northeast to southwest.
14	The area consisted of mostly flat Grassland-pasture. A slight slope was located to the south of the Area running north.	The area was bounded to the north, west and south by wire fencing and hedgerow. The area to the east was bounded by hedgerow bordering the M5. A borehole monitoring cover was located within the northern end of the survey area. Livestock equipment was present to the western side of the survey area.
15	The area consisted of a grassland- pasture field sloping down to the NE in the NE half of the field and down to the SW in the SW half of the field. In the southern corner the field sloped steeply down from N to S. In the northwest of the field was an area of dense tall vegetation which was unsurveyable. Heavy rain led to wet and muddy	The area was bounded on all sides by trees and hedgerows. Several large trees were located within the field. In the centre of the field was a pond surrounded by a wire fence.

	ground conditions and so the steep slope in the south west corner was too dangerous to traverse and unsurveyable.	
16	The area consisted of flat pasture with visible ridge and furrow features.	The area was bounded to the west, east and south by wire fencing, and to the north by hedgerows. A power sub-station was located beyond the northern boundary. A pond was located at the eastern boundary.
17	The area consisted of pasture which sloped down from northern to southern edge.	The area was bounded on all sides by hedgerows.
18	The area consisted of pasture which sloped down from northeast corner to southwest corner.	The area was bounded on all sides by hedgerows.
19	The area consisted of pasture which sloped down from northern to southern edge.	The area was bounded to the east and north by hedgerows, to the west by wooden fencing, and to the south by a barbed wire fence. A borehole monitoring cover was located along the northern edge of the survey area.
20	The area consisted of pasture which was mostly flat with a steep slope on the north-western edge, sloping down to the south-west.	The area was bounded to the northwest and southeast by trees, by fencing to the northeast and southwest. A cow shed was located in the northern corner.
21	The area consisted of pasture which was mostly flat with a steep slope on the north-western edge, sloping down to the south-west.	The area was bounded by trees to the northwest and fencing on all other sides.
22	The area consisted of flat pasture land.	The area was bounded to the northwest by temporary metal construction fencing, and bounded on all other sides by wire fencing.

4.3. The underlying geology comprises of mudstone of the Blue Lias and Charmouth Mudstone Formations. Superficial deposits consist of two bands of sand and gravel which cross the southern section of the survey area (British Geological Survey, 2020).

4.4. The soils consist of lime-rich loamy and clayey soils with impeded drainage (Soilscapes, 2020).

5. Archaeological Background

5.1. The following is a summary of an archaeological desk based assessment produced and provided by RPS Group (RPS Group, 2020).

5.2. Prehistoric activity has been recorded in the form of a possible Prehistoric enclosure located c. 370m west of the survey area. In addition, a number of Bronze Age barrows and Neolithic pits are recorded c. 800m southwest of the survey area.

- 5.3. Evidence of Roman occupation within the survey area is recorded as the presence of a sherd of Roman pottery and tile fragment discovered in the east of the survey area. Additional Roman pottery has been recorded c. 60m southeast of the survey area. Further evidence of potential Roman occupation is recorded in the form of a possible Roman Villa and field system c. 200m southeast of the survey area.
- 5.4. Evidence of Medieval activity within the survey area is limited to extant remains of ridge and furrow. Available cartographic evidence shows that the site has been comprised of agricultural land or woodland since 1838.

6. Methodology

6.1. Magnetometer surveys are generally the most cost effective and suitable geophysical technique for the detection of archaeology in England. Therefore, a magnetometer survey should be the preferred geophysical technique unless its use is precluded by any specific survey objectives or the site environment. For this site, no factors precluded the recommendation of a standard magnetometer survey. Geophysical survey therefore comprised the magnetic method as described in the following section.

6.2. Data Collection

6.2.1. Geophysical prospection comprised the magnetic method as described in the following table.

6.2.2. Table of survey strategies:

Method	Instrument	Traverse Interval	Sample Interval
Magnetic	Bartington Instruments Grad-13 Digital Three-Axis Gradiometer	1m	200Hz reprojected to 0.125m

6.2.3. The magnetic data were collected using MS' bespoke hand-pulled/quad-towed cart system or hand-carried GNSS-positioned system.

6.2.3.1. MS' cart and hand-carried system was comprised of Bartington Instruments Grad 13 Digital Three-Axis Gradiometers. Positional referencing was through a multi-channel, multi-constellation GNSS Smart Antenna RTK GPS outputting in NMEA mode to ensure high positional accuracy of collected measurements. The RTK GPS is accurate to 0.008m + 1ppm in the horizontal and 0.015m + 1ppm in the vertical.

6.2.3.2. Magnetic and GPS data were stored on an SD card within MS' bespoke datalogger. The datalogger was continuously synced, via an in-field Wi-Fi unit, to servers within MS' offices. This allowed for data collection, processing and visualisation to be monitored in real-time as fieldwork was ongoing.

6.2.3.3. A navigation system was integrated with the RTK GPS, which was used to guide the surveyor. Data were collected by traversing the survey area along the longest possible lines, ensuring efficient collection and processing.

6.3. Data Processing

6.3.1. Magnetic data were processed in bespoke in-house software produced by MS. Processing steps conform to Historic England's standards for "raw or minimally processed data" (see sect 4.2 in David et al., 2008: 11).

Sensor Calibration – The sensors were calibrated using a bespoke in-house algorithm, which conforms to Olsen et al. (2003).

Zero Median Traverse – The median of each sensor traverse is calculated within a specified range and subtracted from the collected data. This removes striping effects caused by small variations in sensor electronics.

Projection to a Regular Grid – Data collected using RTK GPS positioning requires a uniform grid projection to visualise data. Data are rotated to best fit an orthogonal grid projection and are resampled onto the grid using an inverse distance-weighting algorithm.

Interpolation to Square Pixels – Data are interpolated using a bicubic algorithm to increase the pixel density between sensor traverses. This produces images with square pixels for ease of visualisation.

6.4. Data Visualisation and Interpretation

6.4.1. This report presents the gradient of the sensors' total field data as greyscale images, as well as the total field data from the lower sensors. The gradient of the sensors minimises external interferences and reduces the blown-out responses from ferrous and other high contrast material. However, the contrast of weak or ephemeral anomalies can be reduced through the process of calculating the gradient. Consequently, some features can be clearer in the respective gradient or total field datasets. Multiple greyscale images of the gradient and total field at different plotting ranges have been used for data interpretation. Greyscale images should be viewed alongside the relevant XY trace plot (Figures 13, 16, 19, 22, 25, 28, 31, 34 and 37). XY trace plots visualise the magnitude and form of the geophysical response, aiding in anomaly interpretation.

6.4.2. Geophysical results have been interpreted using greyscale images and XY traces in a layered environment, overlaid against open street maps, satellite imagery, historic maps, LiDAR data, and soil and geology maps. Google Earth (2020) was consulted as well, to compare the results with recent land usages.

6.4.3. Geodetic position of results - All vector and raster data have been projected into OSGB36 (ESPG27700) and can be provided upon request in ESRI Shapefile (.SHP) and Geotiff (.TIF) respectively. Figures are provided with raster and vector data projected against OS Open Data.

7. Results

7.1. Qualification

7.1.1. Geophysical results are not a map of the ground and are instead a direct measurement of subsurface properties. Detecting and mapping features requires that said features have properties that can be measured by the chosen technique(s) and that these properties have sufficient contrast with the background to be identifiable. The interpretation of any identified anomalies is inherently subjective. While the scrutiny of the results is undertaken by qualified, experienced individuals and rigorously checked for quality and consistency, it is often not possible to classify all anomaly sources. Where possible an anomaly source will be identified along with the certainty of the interpretation. The only way to improve the interpretation of results is through a process of comparing excavated results with the geophysical reports. MS actively seek feedback on their reports as well as reports of further work in order to constantly improve our knowledge and service.

7.2. Discussion

7.2.1. The geophysical results are presented in consideration with satellite imagery and historic maps (Figures 6 and 10).

7.2.2. A notable portion of the survey area has been affected by modern interference from buried services and it should be noted that the strength of magnetic haloes relating to these may obscure undisturbed archaeology in their vicinity. Despite this, the fluxgate gradiometer survey has detected anomalies relating to probable and possible archaeology, in addition to significant areas of ridge and furrow, former field boundaries and drainage features.

7.2.3. The anomalies relating to probable and possible archaeological activity are separated into five different groups of enclosures, each with differing characteristics and morphologies. Some of the enclosures appear to respect the alignment of regimes of ridge and furrow within the survey area, which suggests that these anomalies could be contemporaneous to the ridge and furrow and indicate further evidence of medieval occupation of the survey area. The most extensive series of enclosures is located across Areas 3 & 10, in the centre of the survey area, unfortunately there is a buried service which bisect these enclosures though there may be further surviving unidentified anomalies which have been masked by the magnetic halo of the service.

7.2.4. Several anomalies categorised as possible archaeology have been identified. It is possible that these anomalies could be continuations of the enclosures identified in the data but are all too weak and fragmented to provide definitive interpretation. Two anomalies characteristic of potential high temperature activity have been detected, these are of unknown date but likely relate to burnt or fired material, possibly a kiln or other concentrated burning activity. These anomalies did not have any apparent spatial relationship with any identified potential activity, though an archaeological origin cannot be ruled out.

7.2.5. Evidence of agricultural activity is present within all fields, with several containing evidence of ridge and furrow and former field boundaries. Much of the ridge and furrow

detected was visible on site as extant earthworks (see Sections 4.2 & 5) and is concentrated in the southern areas.

7.2.6. In Area 8, adjacent to the M5, a large zone of anomalies of undetermined origins has been identified (Figure 5). These could have a variety of causes, due to this area's location bounding onto the M5, it is possible that the anomalies relate to waste material from the construction of the Motorway. Equally, these anomalies could be caused by the removal of trees or other extraction activity.

7.3. Interpretation

7.3.1. General Statements

7.3.1.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually.

7.3.1.2. **Data Artefact** – Data artefacts usually occur in conjunction with anomalies with strong magnetic signals due to how the sensors respond to very strong point sources. These are usually visible as minor 'streaking' following the line of data collection. While these artefacts can be reduced in post-processing through data filtering, this would risk removing real features. Therefore, these artefacts are indicated as necessary to preserve the data as 'minimally processed'.

7.3.1.3. **Ferrous (Spike)** – Discrete ferrous-like, dipolar anomalies are likely to be the result of isolated modern metallic debris on or near the ground surface.

7.3.1.4. **Ferrous/Debris (Spread)** – A ferrous/debris spread refers to a concentrated deposition of discrete, dipolar ferrous anomalies and other highly magnetic material.

7.3.1.5. **Magnetic Disturbance** – The strong anomalies produced by extant metallic structures along the edges of the field have been classified as 'Magnetic Disturbance'. These magnetic 'haloes' will obscure the response of any weaker underlying features, should they be present, often over a greater footprint than the structure they are being caused by.

7.3.1.6. **Undetermined** – Anomalies are classified as Undetermined when the anomaly origin is ambiguous through the geophysical results and there is no supporting or correlative evidence to warrant a more certain classification. These anomalies are likely to be the result of geological, pedological or agricultural processes, although an archaeological origin cannot be entirely ruled out. Undetermined anomalies are generally not ferrous in nature.

7.3.2. Magnetic Results - Specific Anomalies

7.3.2.1. **Probable and Possible Archaeology (Enclosures: Areas 3 and 10)** – Covering most of the central western section of Area 3 are a series of positive anomalies [3a] indicative of cut features (Figures 5 and 24). These anomalies, despite being

fragmented in places, form probable rectilinear enclosures and sub-enclosures. It should be noted that a service cuts through the archaeological anomalies and the effect of the magnetic halo from this will obscure further weaker features. A likely continuation of anomaly [3a] is present in the neighbouring Area 10. These anomalies [10a] share a similar alignment and morphology and to anomaly [3a] and likely represent the same phase of activity. Dating these anomalies is difficult, however, it should be noted that these anomalies ([3a] and [10a]) appear to respect the alignment of the regime of ridge and furrow surrounding them and therefore could be contemporaneous.

7.3.2.2. Probable and Possible Archaeology (Enclosures: Area 6) – On the south-eastern edge of Area 6 is a fragmented, sub-rectangular anomaly [6a], c.33m in diameter with several possible branching anomalies running to the north and west (Figures 5 and 15). Within the anomaly are a number of weak discrete, positive anomalies which, due to their proximity, could be related. In addition, there are two concentrations of isolated either positive or dipolar anomalies which has been categorised as possible archaeology due to its proximity but could equally have been caused by recent agricultural activity [6b].

7.3.2.3. Probable and Possible Archaeology (Enclosures: Area 9 and Area 14) – On the eastern edge of Area 9 and into the western edge of Area 14 are a series of very fragmented weak linear and curvilinear anomalies [9a & 14a] (Figures 5 and 18). Enclosing the western and southern edges of these anomalies are three curvilinear anomalies c. 18m to c.25m in length. There are several very weak anomalies directly to the north and south of the possible enclosure which have been categorised as “Possible Archaeology” due to their proximity to [9a] but these could equally relate to agricultural features or natural variations in the soil. The anomalies in Area 14 [14a] are very fragmented, partially due to being cut by two field drains, resulting in difficulty providing a definitive interpretation.

7.3.2.4. Probable and Possible Archaeology (Enclosures: Area 15) – On the northern edge of Area 15, a concentration of linear positive anomalies and isolated positive anomalies [15a] indicative of archaeological features have been detected (Figures 9 and 27). They form part of a sub-rectilinear feature measuring c.26m by c.20m in size. Like many of the archaeological features present throughout the survey area it has been partially obscured by the magnetic halo of a modern service. In the centre of the area adjacent to a modern pond, a curvilinear positive anomaly [15b] has been identified, indicative of an infilled ditch which forms three sides of a probable enclosure measuring c.30m on each side (Figures 9 and 36). An anomaly which appears to form a circular shape [15c], c.10m in diameter, could be interpreted as a possible ring ditch that appears to relate to the enclosure [15b]. There are a number of other anomalies of possible archaeological origins within or surrounding the probable enclosure [15b], throughout Area 15, these are either much weaker anomalies or do not have a coherent form (Figure 9).

- 7.3.2.5. **Possible Archaeology (Area 1)** – A pair of weak, linear anomalies have been detected in the northern end of Area 1 [1a] (Figure 20). These anomalies exhibit a magnetic signal that is more similar to the anomalies of an agricultural origin which have been identified in Area 13, than those of probable archaeological origin in Area 3, though as they have not been identified on available historic maps these have been categorised as “Possible Archaeology”. Also located in the northern end of Area 1, a series of strong linear and discrete anomalies [1b] have been identified within a concentration of dipolar anomalies (Figure 21). These could relate to a former structure within an area of rubble, though there is a possibility that they relate to earlier, archaeological activity.
- 7.3.2.6. **Possible Archaeology (Area 20)** – At the southern end of Area 20, a single, weak linear anomaly has been identified [20a] (Figure 33). The anomaly is isolated from other identified archaeological features, though it does not relate to any known or mapped features so has been classified as being of possible archaeological origin.
- 7.3.2.7. **Possible Burnt/Fired** – Two anomalies have been identified within Areas 1 [1c] and 22 [22a] (Figures 24 & 30), that are indicative of high temperature activity. One of which exhibits a distinctive ‘double-peaking’ in the magnetic signal, visible in the XY Traces (Figure 25). This type of magnetic signal could relate to a former kiln, or area of concentrated burning. It is not possible to suggest a date but despite these anomalies not being located in close association with any other identified archaeological activity, an archaeological origin cannot be ruled out.
- 7.3.2.8. **Undetermined (Spread and Strong) (Area 8)** – Throughout the northern section of area 8 is a spread of strong isolated responses of undetermined origin. These responses range in size from c. 8m in diameter to much smaller responses of less than a meter, the larger of which have been highlighted individually. Historic mapping only shows agricultural activity within this area, so providing a definitive interpretation of these responses is not possible. These responses could be a result of waste from the construction of the M5 which bounds the area on its east, or the removal of trees from the woodland that surround the area. It should be noted that the ridge and furrow which characterises much of the site is not present in this northern area. This could suggest that this area was woodland during the medieval period.
- 7.3.2.9. **Undetermined (Area 19)** – A broad, positive anomaly [19a] runs oblique to the ridge and furrow for c.100m in the north-eastern section of Area 19. This area is more visible in the total field data and likely forms part of the agricultural regime or is a natural feature, however, an archaeological origin cannot be fully ruled out.
- 7.3.2.10. **Ridge and Furrow (Trend)** – Throughout the survey area several regimes of broad ridge and furrow on varying orientations have been identified. Much of

this ridge and furrow is extant and previously recorded as likely being from the medieval period (see Sections 4.2 & 5.4).

7.3.2.11. **Agricultural** – Several former field boundaries and former ponds have been identified across the survey area. In some areas (Areas 12 and 13) these boundaries have associated infilled ponds (anomalies [12a] and [13a]) which result in a stronger magnetic signal. Running on an east to west alignment across Areas 20, 21 and 22 is a linear feature which corresponds with the position of a footpath visible in historic maps (Figures 6 & 10).

8. Conclusions

- 8.1. A fluxgate gradiometer survey has successfully been undertaken across most of the survey area. The geophysical survey has detected a range of different types of anomalies of archaeological, agricultural and modern origin, as well as, anomalies of undetermined classification. A large portion of the survey area is dominated by modern interference from buried services which cross the survey area and it should be noted that the strength of these may obscure archaeology in their vicinity.
- 8.2. Archaeological activity has been identified across much of the survey area in the form of five separate series of probable enclosures and sub-enclosures. Many of these appear to have differing morphologies which would suggest multiple phases of activity across the survey area. Further anomalies of possible archaeological origin have been identified which could form continuations of the enclosures, but these anomalies are generally more ephemeral and fragmented so it is difficult to provide a definitive interpretation. Evidence of possible burnt or fired material has also been identified in two areas, these do not appear to have any relationship with other detected features, though an archaeological origin is still possible. They are suggestive of a kiln or concentrated burning activity.
- 8.3. Agricultural activity has been identified in the form of a number of ridge and furrow regimes, which are also present as extant earthworks across much of the survey area, multiple former field boundaries, and infilled ponds.
- 8.4. Anomalies of undetermined origin are present throughout the survey area. There is a notable zone of these in the north-eastern part of the survey area, which could possibly be caused by waste material from the construction of the nearby M5 motorway or the removal of trees from former woodland.

9. Archiving

- 9.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein (2013). This stores the collected measurements, minimally processed data, georeferenced and un-georeferenced images, XY traces and a copy of the final report.
- 9.2. MS contributes reports to the ADS Grey Literature Library upon permission from the client, subject to the any dictated time embargoes.

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11. References

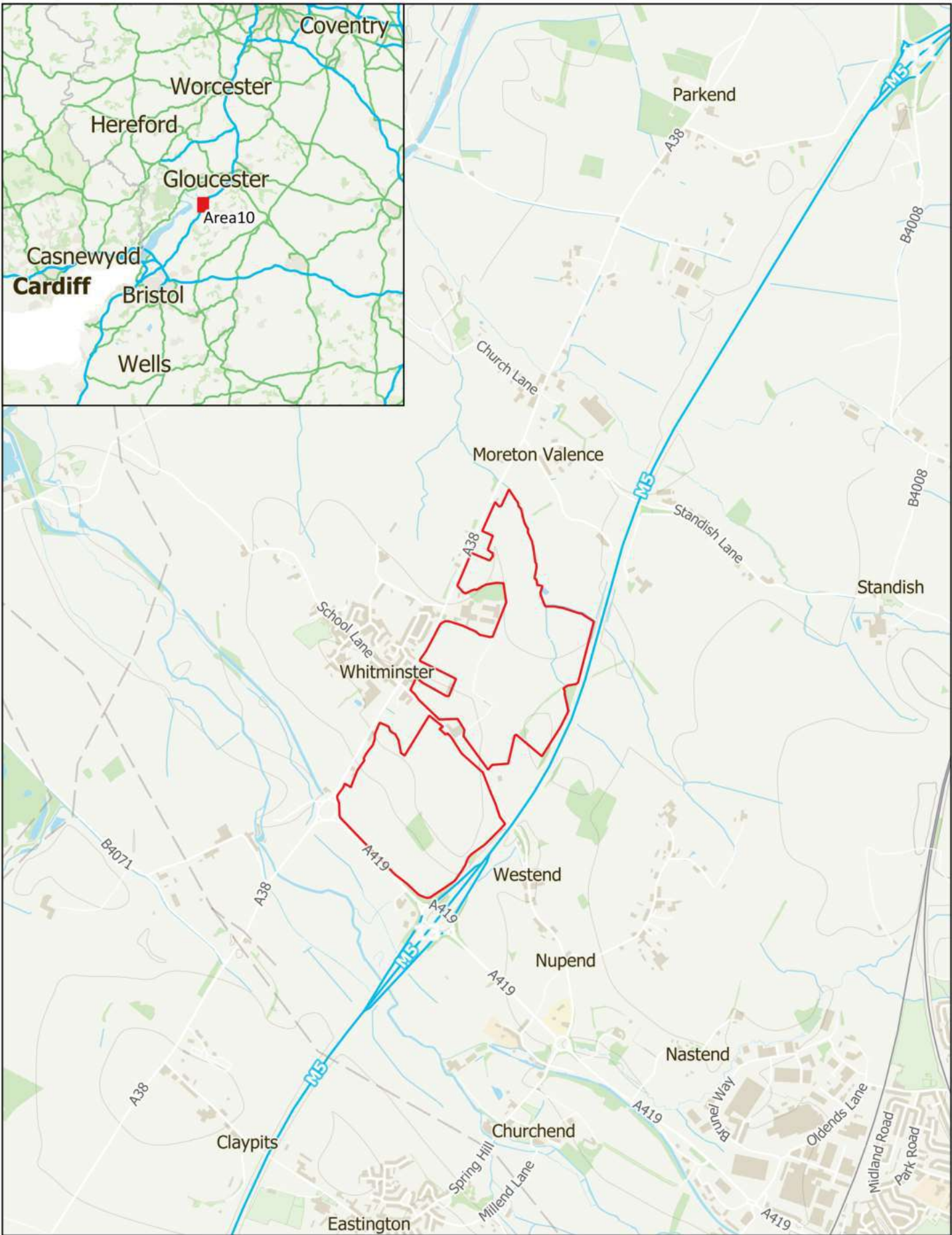
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- Soilscapes, 2020. [Whitminster, Gloucestershire]. Cranfield University, National Soil Resources Institute [<http://landis.org.uk>]. [Accessed 11/09/2020].

12. Project Metadata

MS Job Code	MSSO722
Project Name	Land East of the A38 and West of the A419, Whitminster, Stroud, Gloucestershire
Client	RPS Group
Grid Reference	SO781086
Survey Techniques	Magnetometry
Survey Size (ha)	101ha
Survey Dates	2020-08-17 to 2020-09-04
Project Lead	Leanne Swinbank BA ACIfA
Project Officer	Lauren Beck BA
HER Event No	TBC after report submission
OASIS No	magnitud1-404121
S42 Licence No	N/A
Report Version	1.0

13. Document History

Version	Comments	Author	Checked By	Date
0.1	Initial draft for Project Officer to Review	CA	LB	11 September 2020
0.2	Corrections from Project Officer review	LB	FPC	14 September 2020
0.3	Draft for Director Approval	LB	PSJ	17 September 2020
0.4	Draft to send to Client	LB	PSJ	17 September 2020
1.0	Issued as Final	LB	PSJ	22 September 2020



MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud

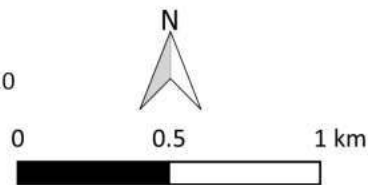
Figure 1 - Site Location

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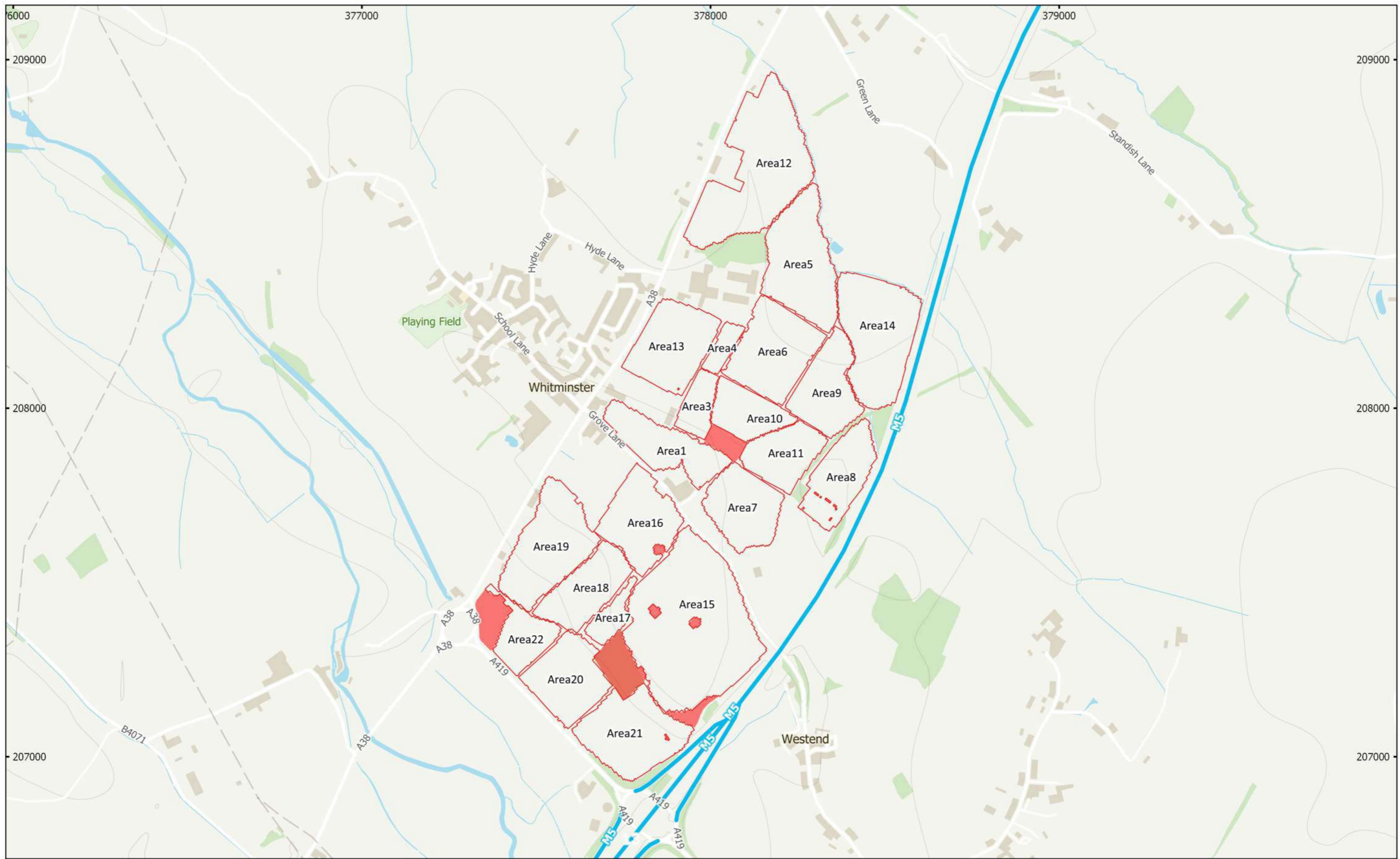
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 Site Boundary

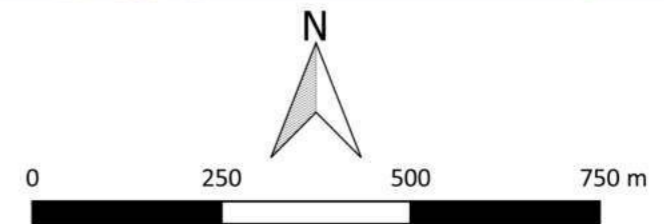


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MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 2 - Location of Survey Areas
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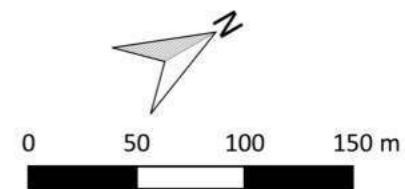
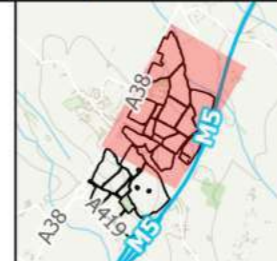
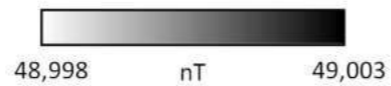
- Survey Extent
- Unsurveyable



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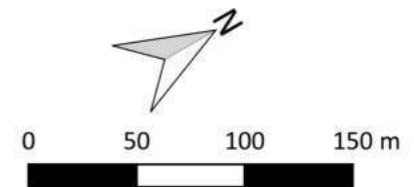
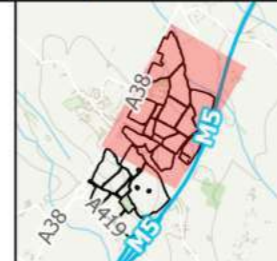
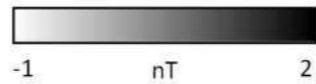


MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 3 - Magnetic Total Field (Lower Sensor) (Overview) (East)
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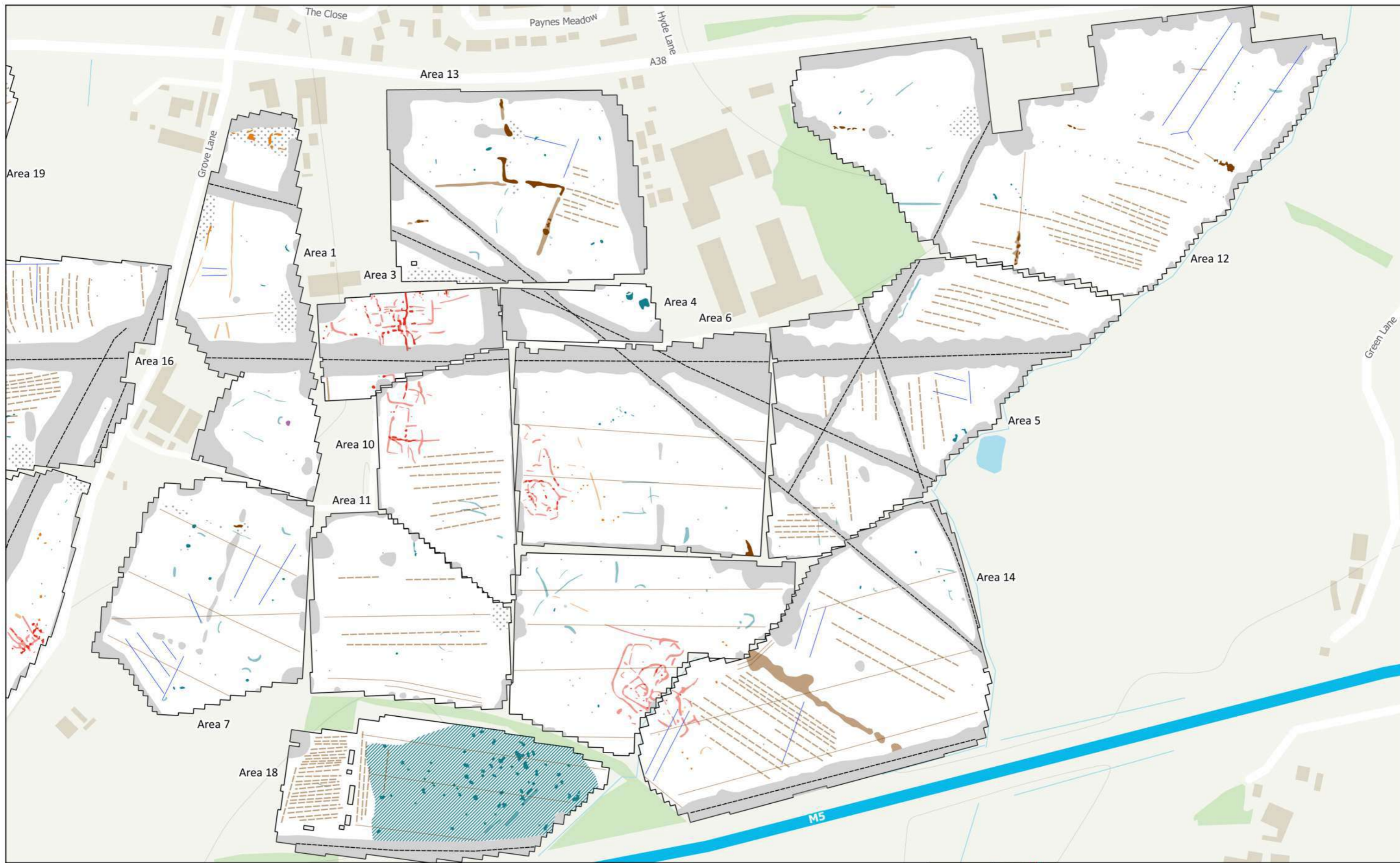




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 Figure 4 - Magnetic Gradient (Overview) (East)
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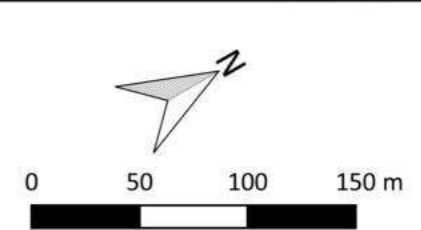
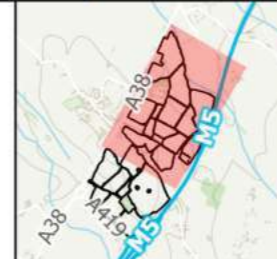


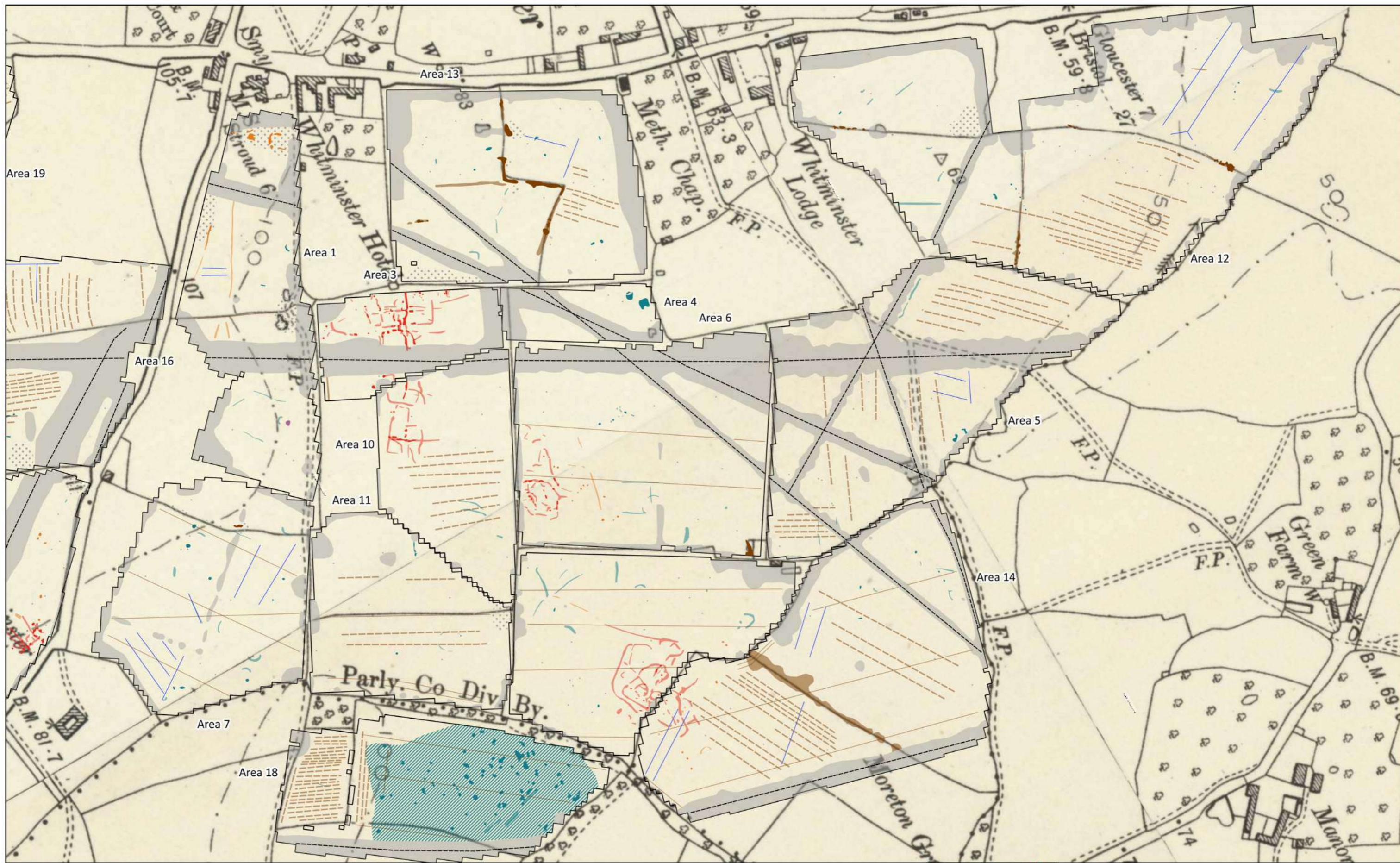
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 Figure 5 - Magnetic Interpretation (Overview) (East)
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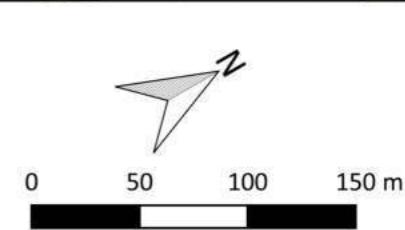
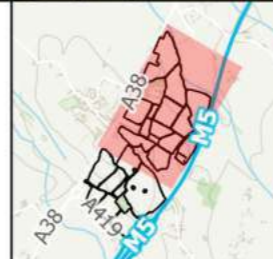
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| Archaeology Probable (Weak) | Possible Burnt/Fired | Agricultural (Trend) |
| Archaeology Possible (Strong) | Magnetic Disturbance | Service |
| Archaeology Possible (Weak) | Ferrous/Debris (Spread) | Ridge and Furrow (Trend) |
| Archaeology Possible (Spread) | Undetermined (Strong) | Drainage Feature |
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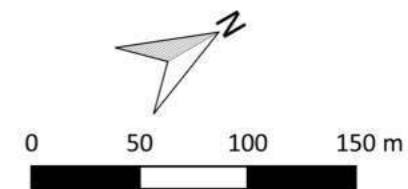
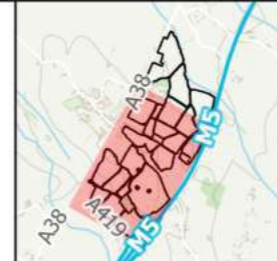
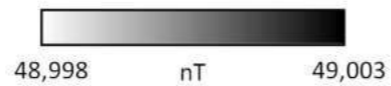
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 6 - Magnetic Interpretation Over Historic Maps (Overview) (East)
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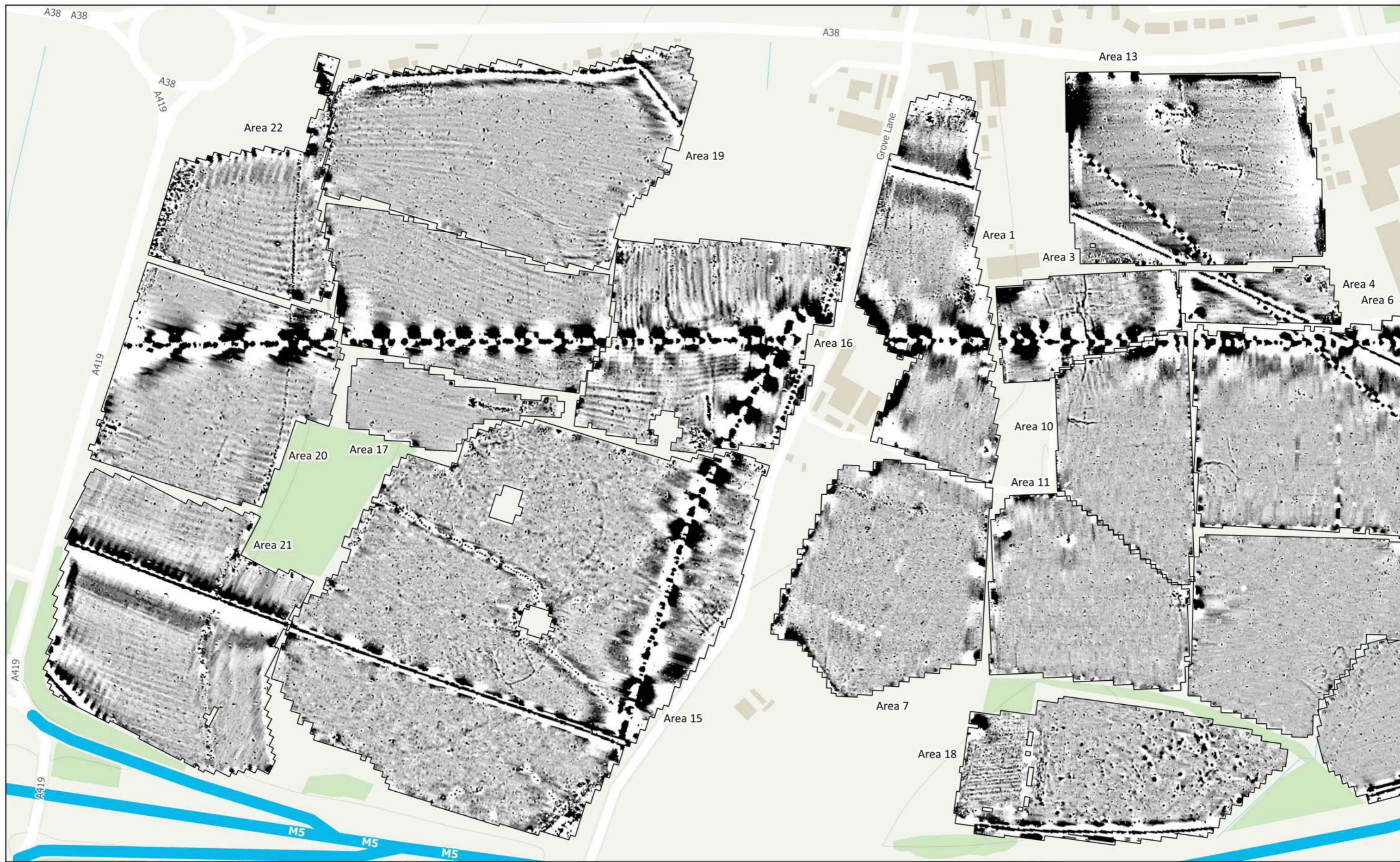
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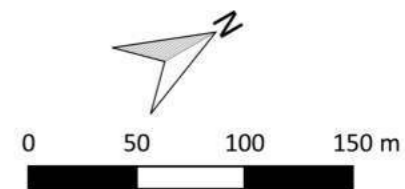
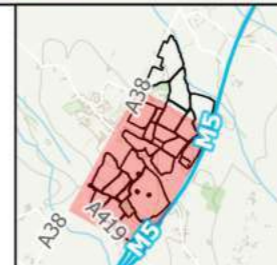
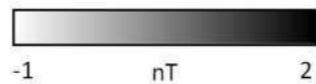


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 Figure 7 - Magnetic Total Field (Lower Sensor) (Overview) (West)
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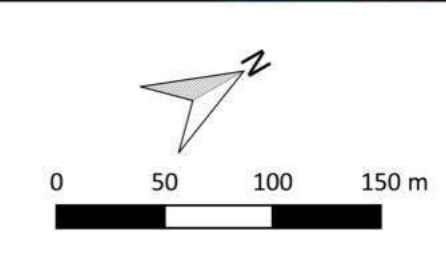
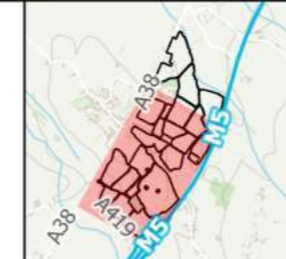
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 Figure 8 - Magnetic Gradient (Overview) (West)
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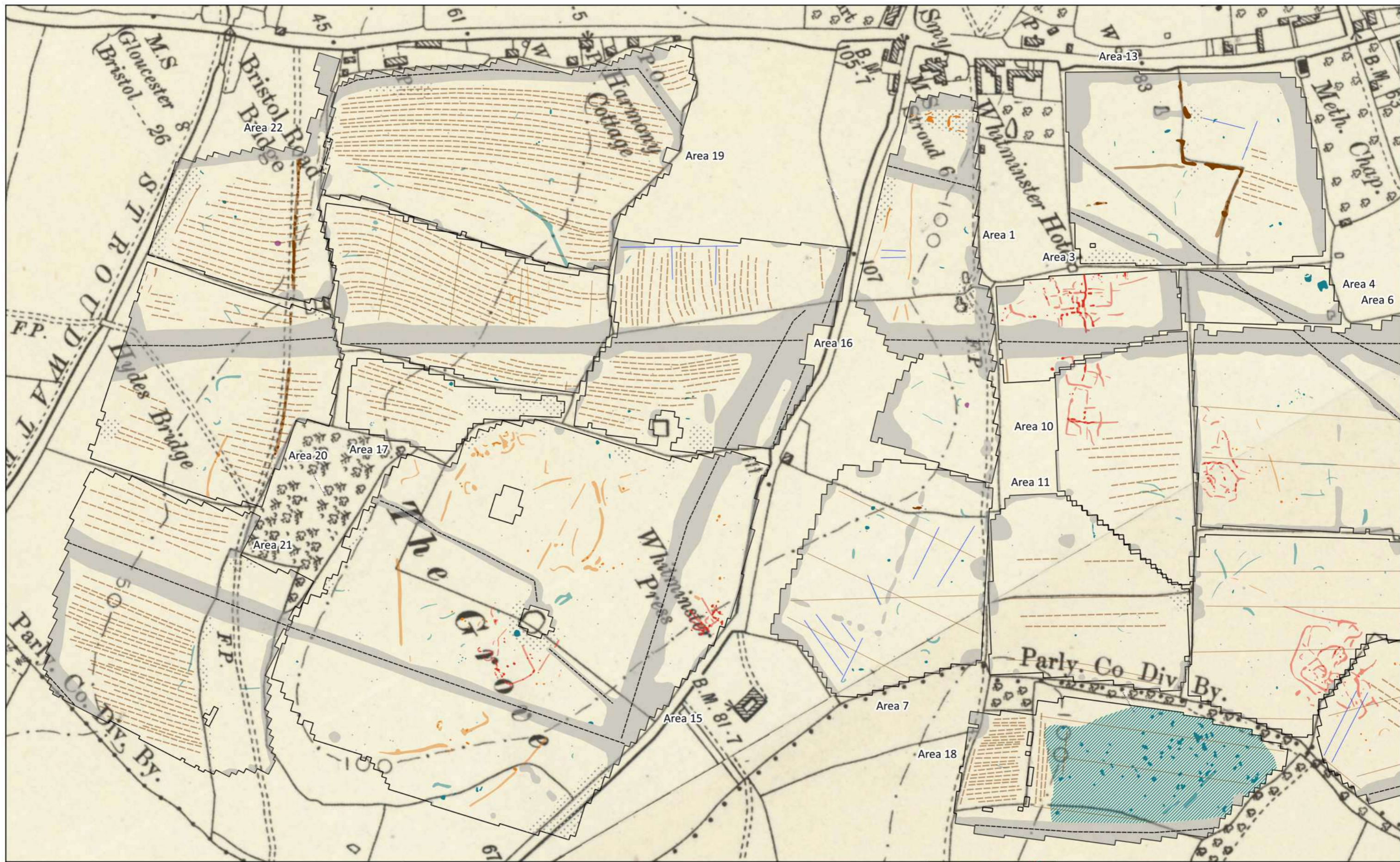




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 Figure 9 - Magnetic Interpretation (Overview) (West)
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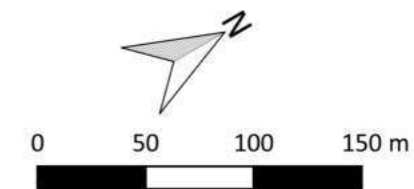
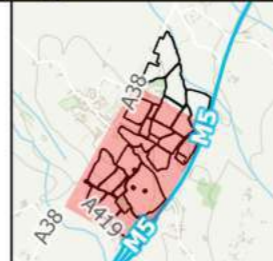
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| Archaeology Possible (Strong) | Magnetic Disturbance | Service |
| Archaeology Possible (Weak) | Ferrous/Debris (Spread) | Ridge and Furrow (Trend) |
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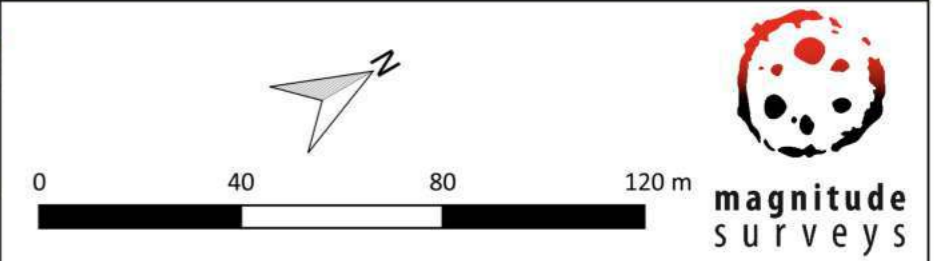
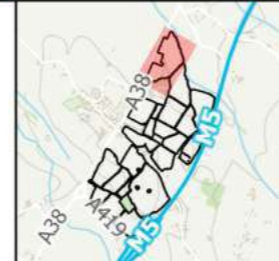
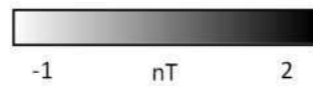
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 Figure 10 - Magnetic Interpretation Over Historic Maps (Overview) (West)
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| ■ Archaeology Possible (Strong) | ■ Magnetic Disturbance | - - - Service |
| ■ Archaeology Possible (Weak) | ■ Ferrous/Debris (Spread) | — Ridge and Furrow (Trend) |
| ■ Archaeology Possible (Spread) | ■ Undetermined (Strong) | — Drainage Feature |
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Figure 11 - Magnetic Gradient (Areas 12 & 5)
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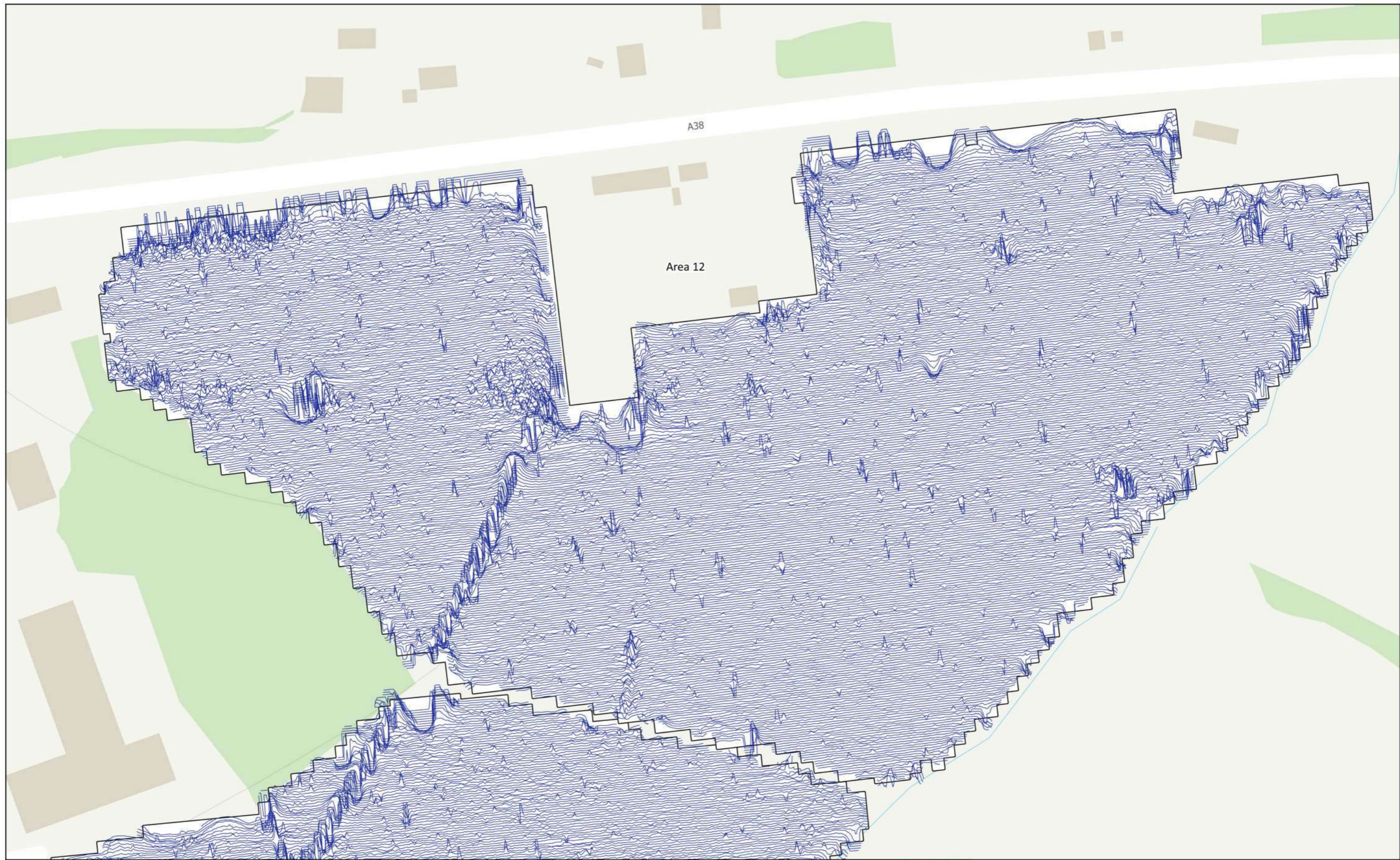
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 12 - Magnetic Interpretation (Areas 12 & 5)
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- | | | |
|-------------------------|-----------------------|--------------------------|
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| Agricultural (Weak) | Undetermined (Weak) | Drainage Feature |
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| Ferrous/Debris (Spread) | Service | |


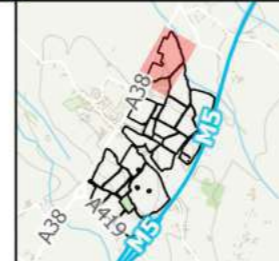
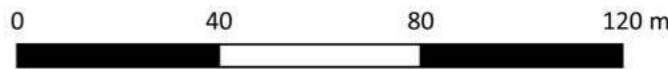



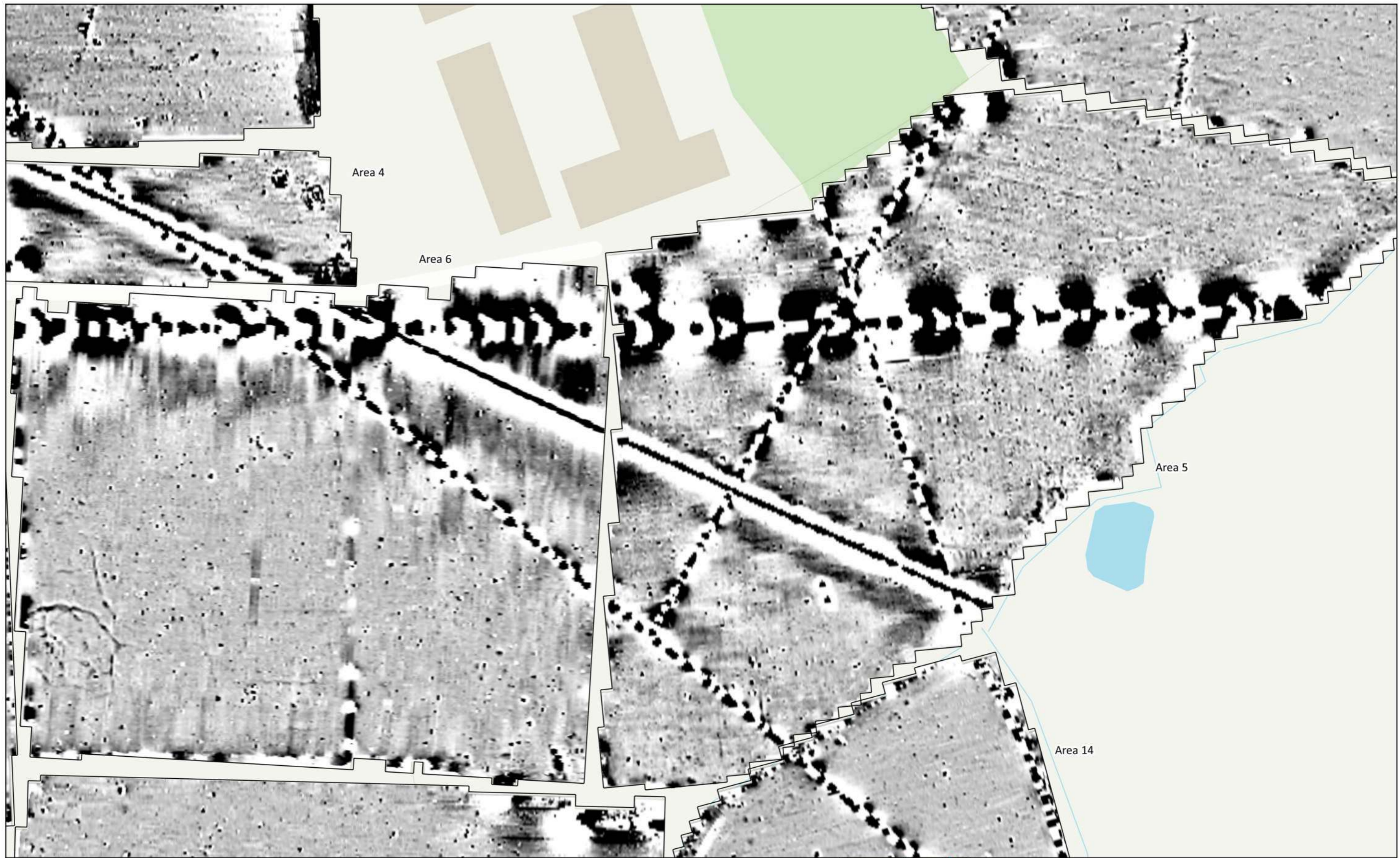
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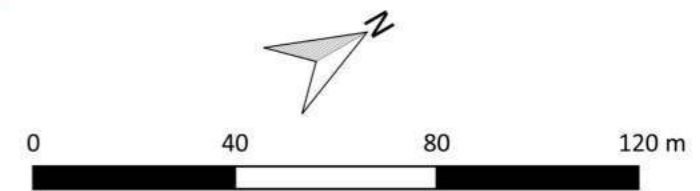
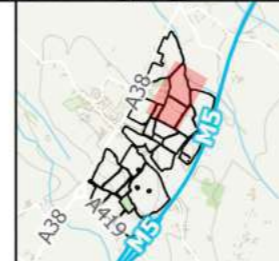
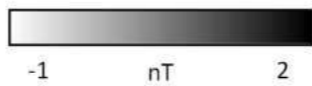


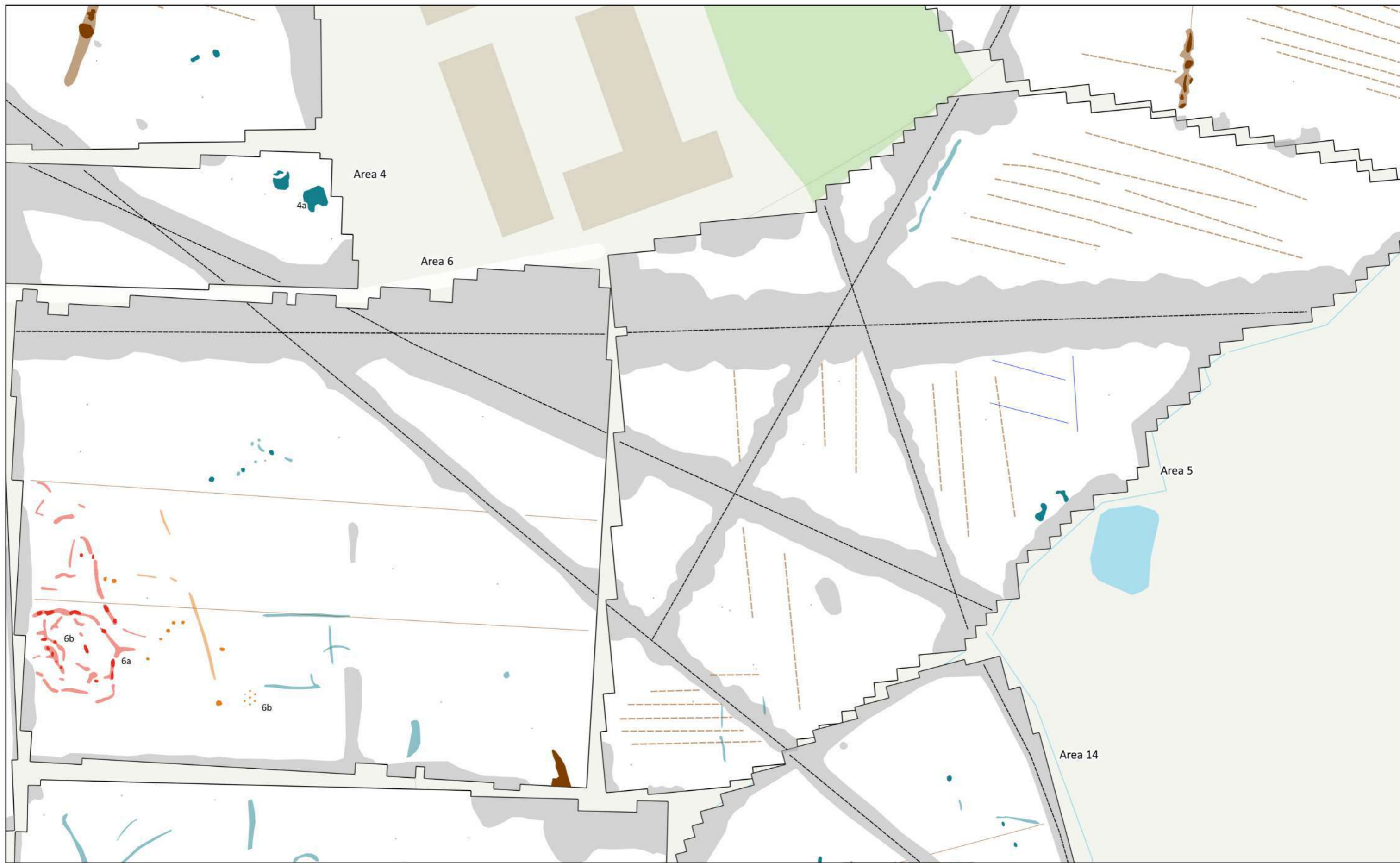
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
Figure 13 - XY Trace Plot (Areas 12 & 5)
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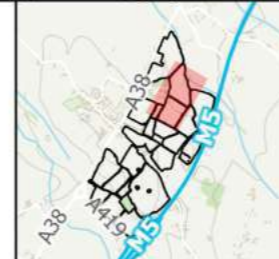
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 14 - Magnetic Gradient (Areas 5, 6, 4 & 14)
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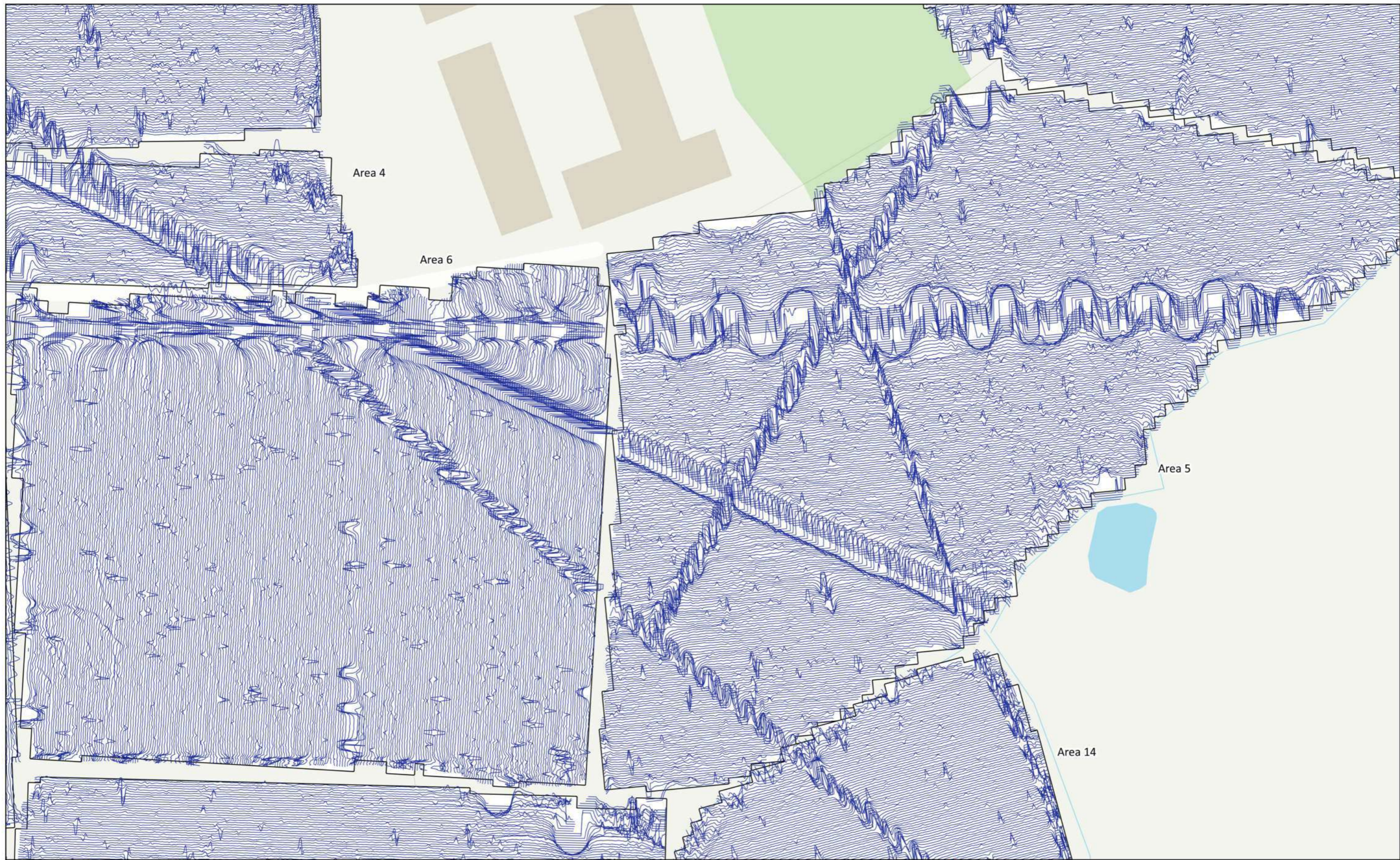


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 Figure 15 - Magnetic Interpretation (Areas 5, 6, 4 & 14)
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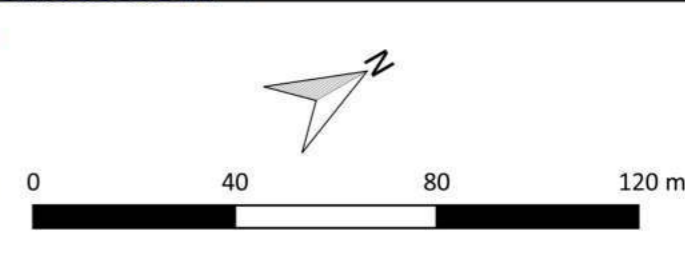
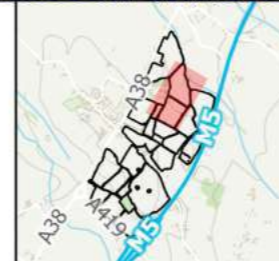
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| ■ Archaeology Probable (Weak) | ■ Agricultural (Weak) | - - - Service |
| ■ Archaeology Possible (Strong) | ■ Magnetic Disturbance | - - - Ridge and Furrow (Trend) |
| ■ Archaeology Possible (Weak) | ■ Undetermined (Strong) | — Drainage Feature |
| ● Archaeology Possible (Spread) | ■ Undetermined (Weak) | · Ferrous (Spike) |

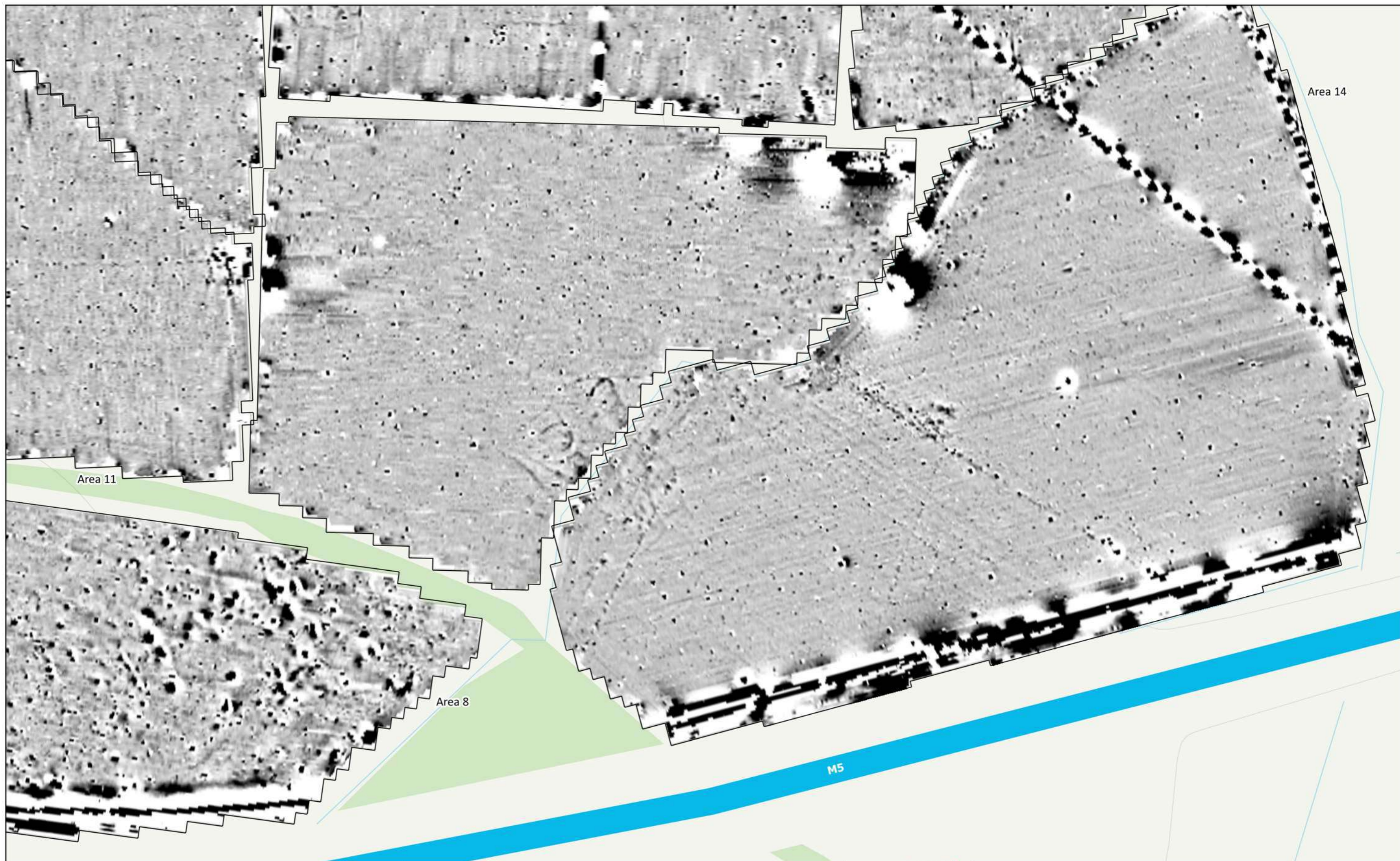


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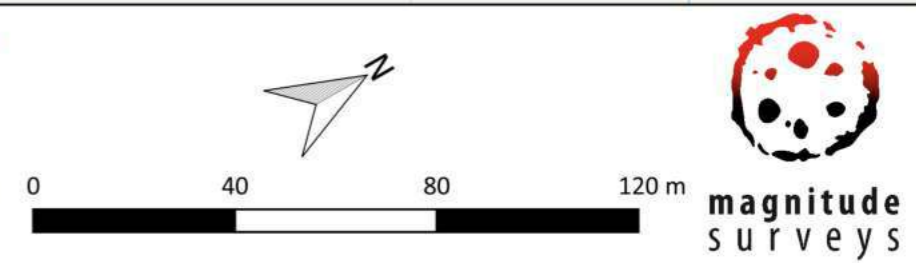
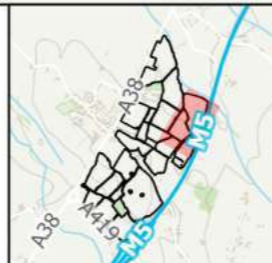
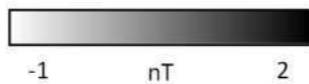


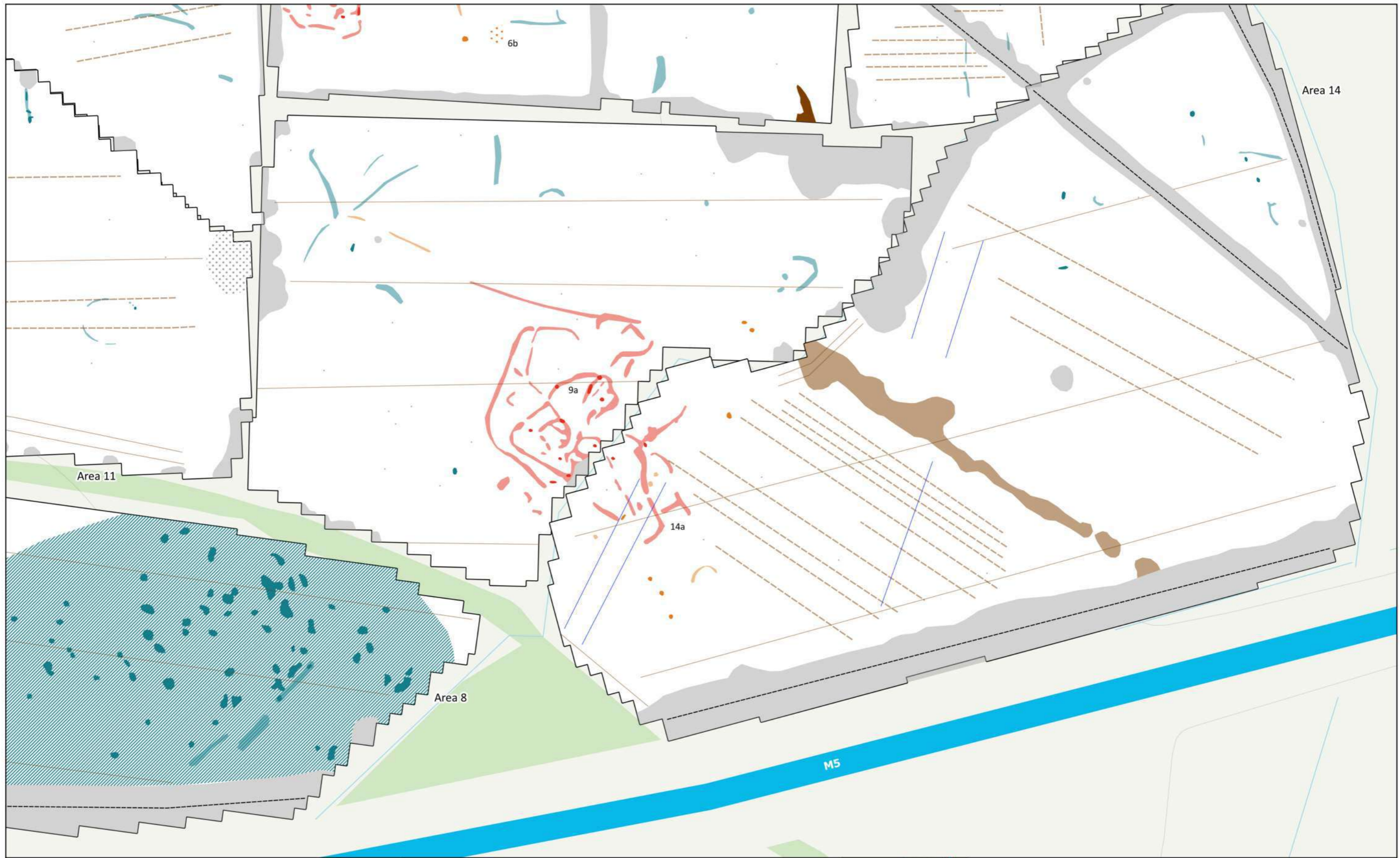
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 16 - XY Trace Plot (Areas 5, 6, 4 & 14)
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 Figure 17 - Magnetic Gradient (Areas 14, 5, 9, 11 & 8)
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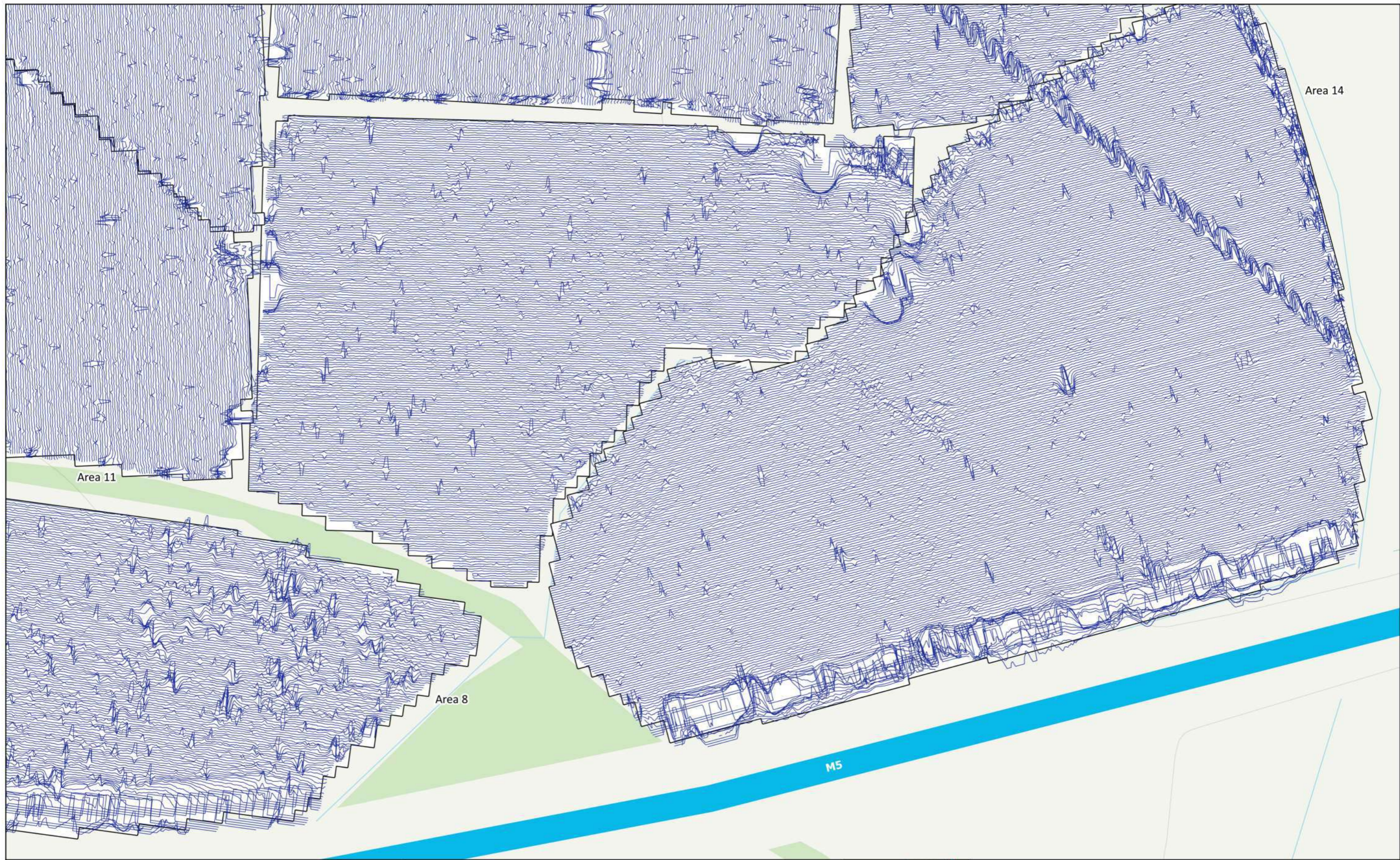


MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 18 - Magnetic Interpretation (Areas 14, 5, 9, 11 & 8)
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|--|---|---|
| ■ Archaeology Probable (Strong) | ■ Agricultural (Weak) | — Agricultural (Trend) |
| ■ Archaeology Probable (Weak) | ■ Magnetic Disturbance | - - - Service |
| ■ Archaeology Possible (Strong) | ■ Ferrous/Debris (Spread) | - - - Ridge and Furrow (Trend) |
| ■ Archaeology Possible (Weak) | ■ Undetermined (Strong) | — Drainage Feature |
| ● Archaeology Possible (Spread) | ■ Undetermined (Weak) | ● Ferrous (Spike) |
| ■ Agricultural (Strong) | ■ Undetermined (Spread) | |



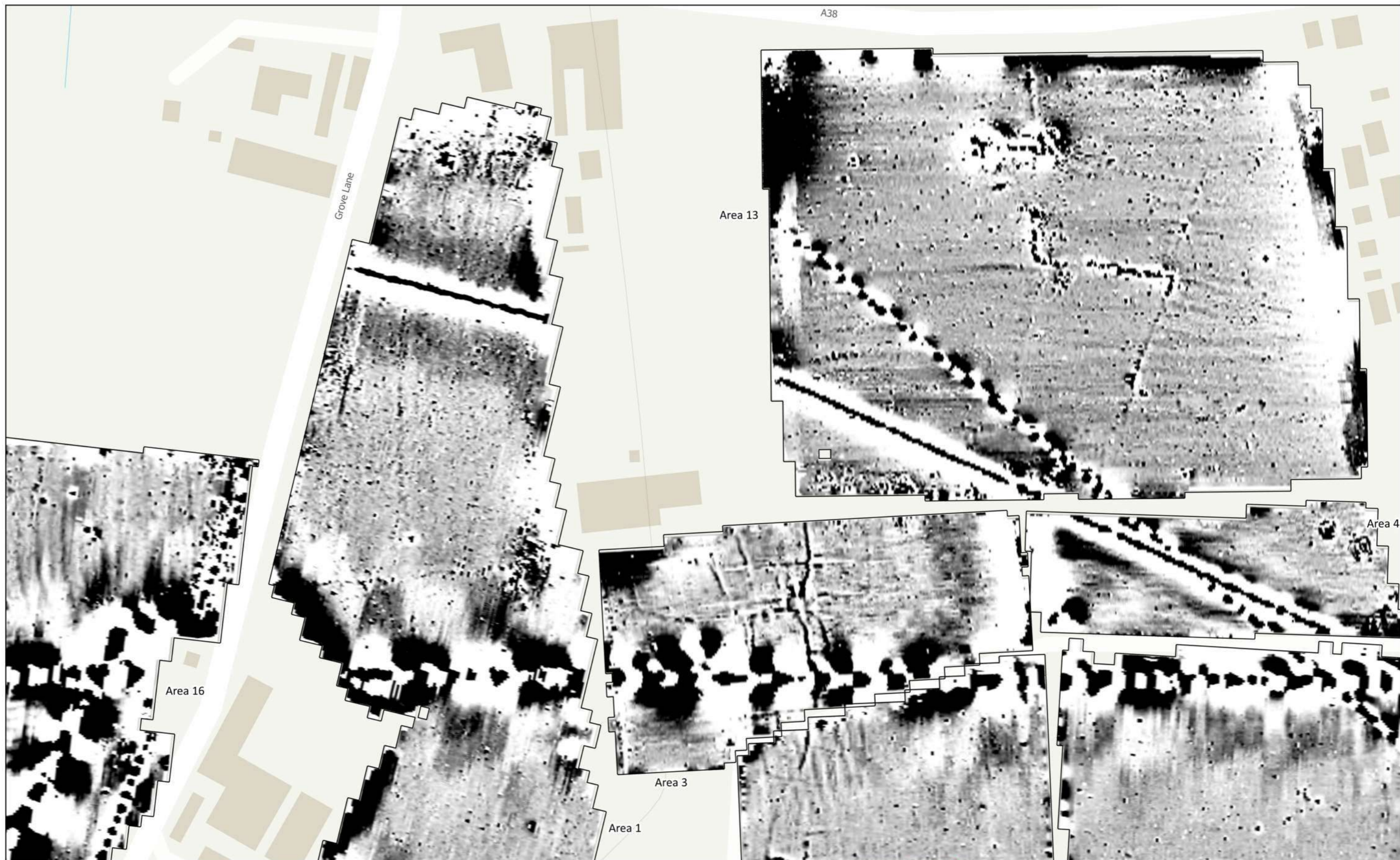
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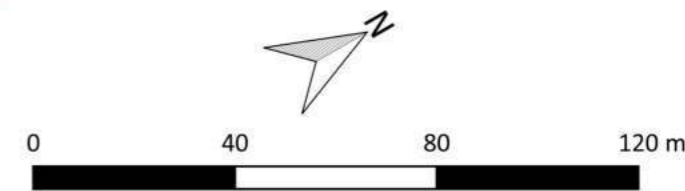
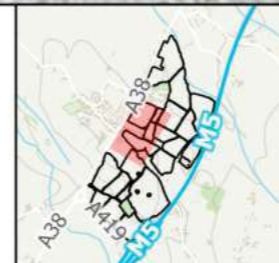
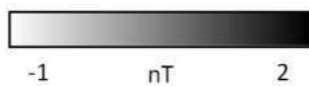
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 19 - XY Trace Plot (Areas 14, 5, 9, 11 & 8)
 30nT/cm at 1:1,500 @ A3
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MSS0722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 20 - Magnetic Gradient (Areas 13, 3, 1, 4 & 16)
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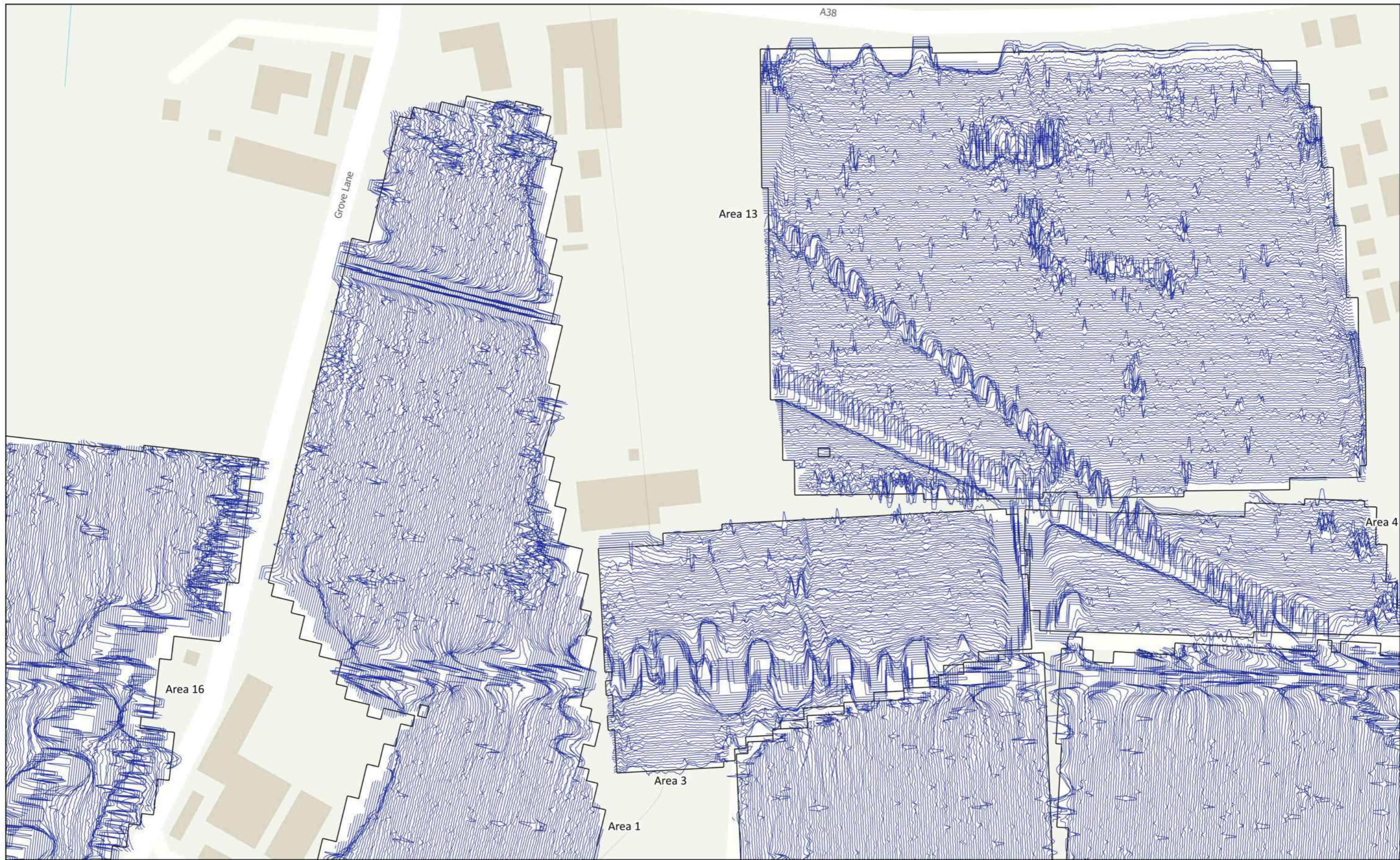


MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 21 - Magnetic Interpretation (Areas 13, 3, 1, 4 & 16)
 1:1,500 @ A3
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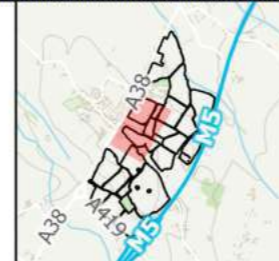
- | | | |
|--|---|---|
| ■ Archaeology Probable (Strong) | ■ Agricultural (Weak) | — Agricultural (Trend) |
| ■ Archaeology Probable (Weak) | ■ Possible Burnt/Fired | - - - Service |
| ■ Archaeology Possible (Strong) | ■ Magnetic Disturbance | — Ridge and Furrow (Trend) |
| ■ Archaeology Possible (Weak) | ■ Ferrous/Debris (Spread) | — Drainage Feature |
| ■ Agricultural (Strong) | ■ Undetermined (Strong) | ● Ferrous (Spike) |
| | ■ Undetermined (Weak) | |

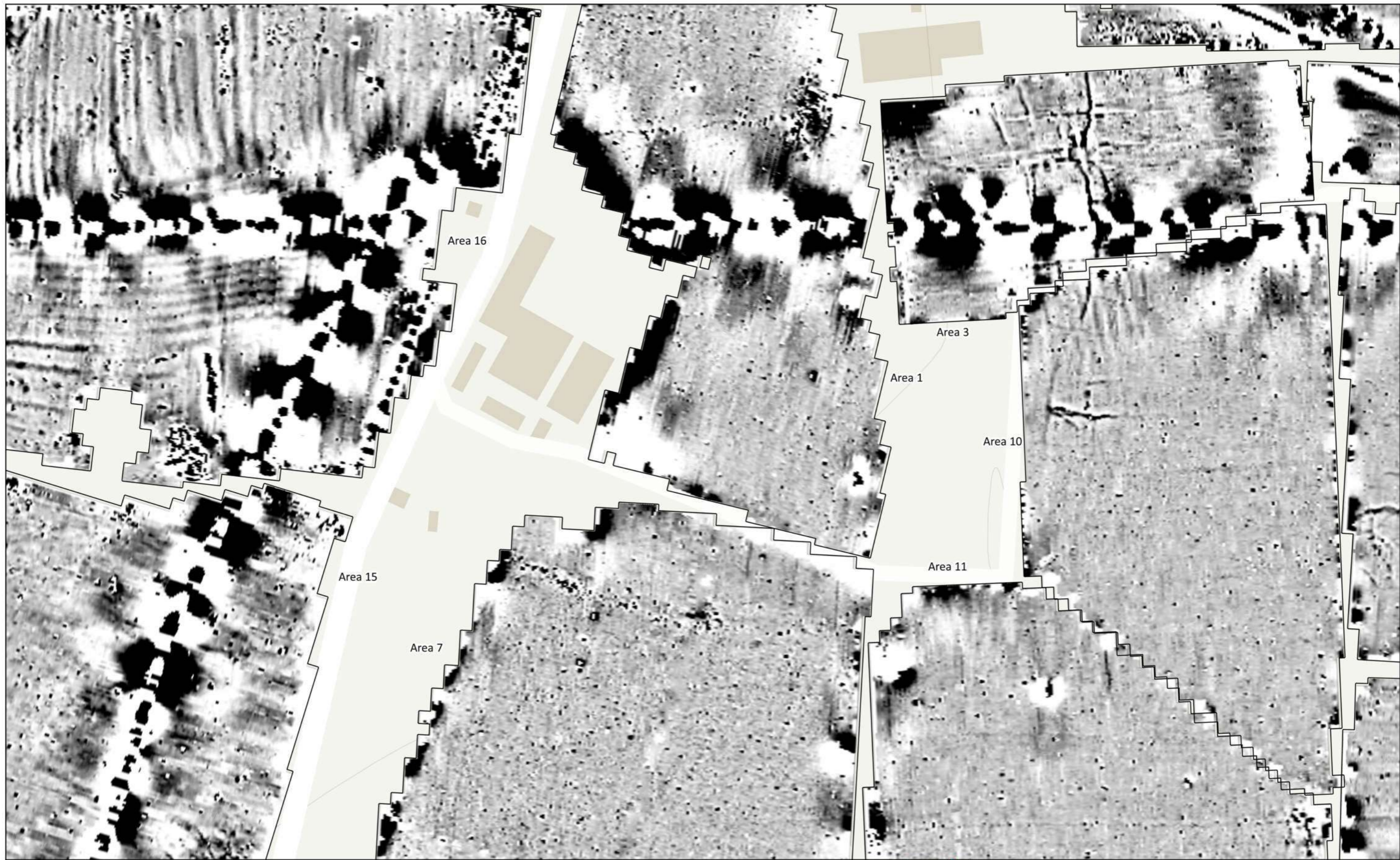


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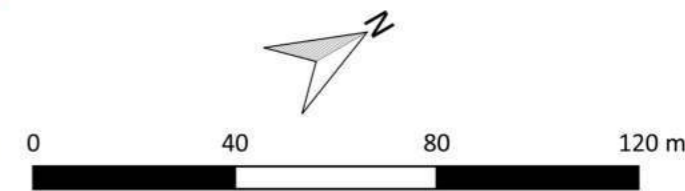
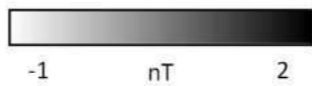


MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 22 - XY Trace Plot (Areas 13, 3, 1, 4 & 16)
 30nT/cm at 1:1,500 @ A3
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MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 23 - Magnetic Gradient (Areas 3, 10, 1, 11, 7, 15 & 16)
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MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 24 - Magnetic Interpretation (Areas 3, 10, 1, 11, 7, 15 & 16)
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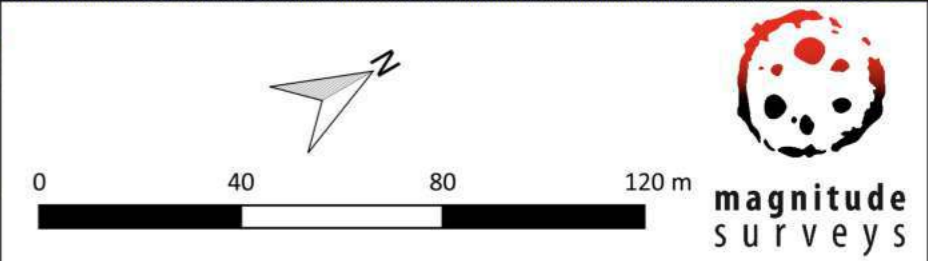
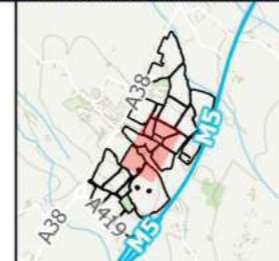
- | | | |
|-------------------------------|-------------------------|--------------------------|
| Archaeology Probable (Strong) | Agricultural (Weak) | Agricultural (Trend) |
| Archaeology Probable (Weak) | Possible Burnt/Fired | Service |
| Archaeology Possible (Strong) | Magnetic Disturbance | Ridge and Furrow (Trend) |
| Archaeology Possible (Weak) | Ferrous/Debris (Spread) | Drainage Feature |
| Agricultural (Strong) | Undetermined (Strong) | Ferrous (Spike) |
| | Undetermined (Weak) | |



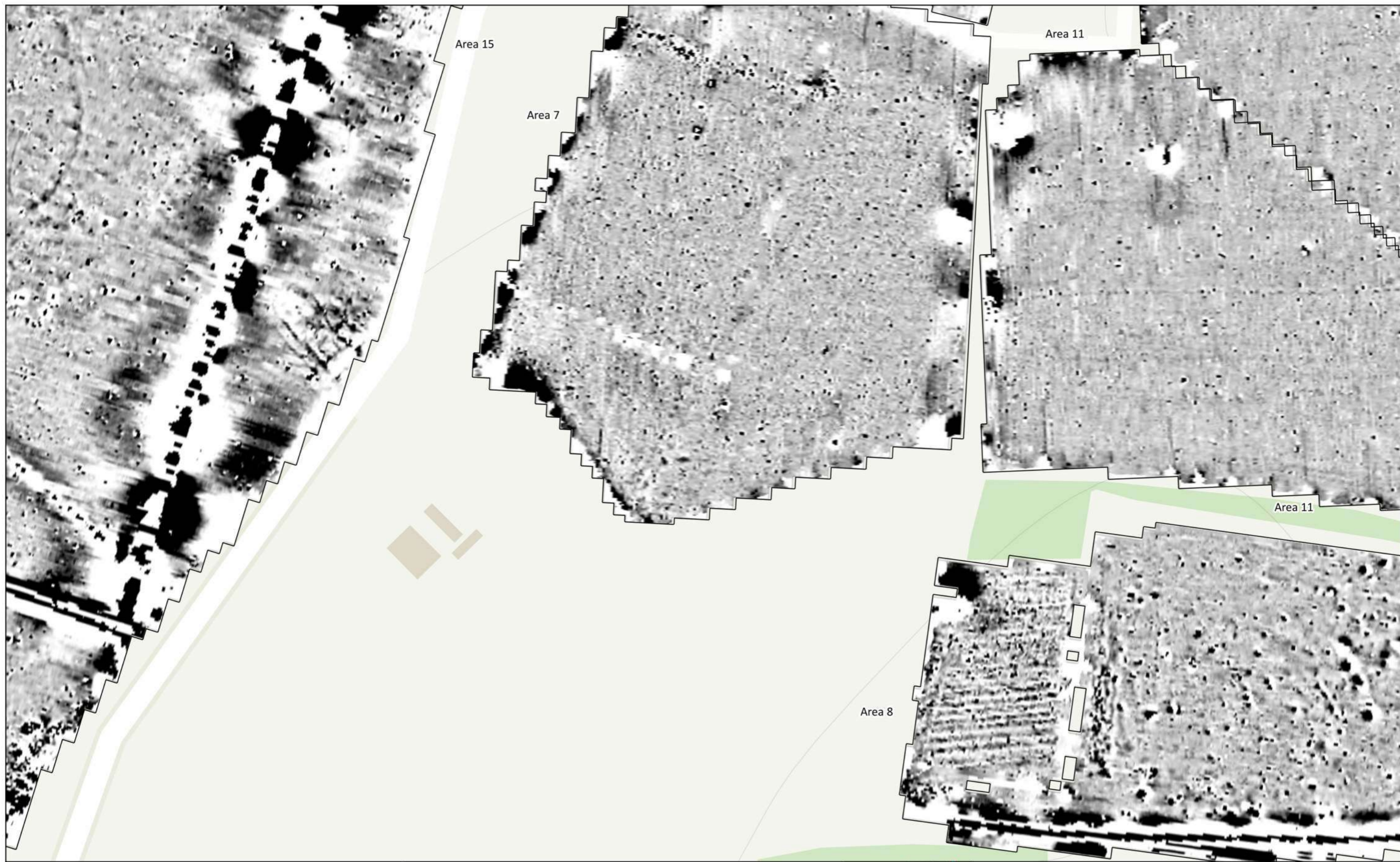
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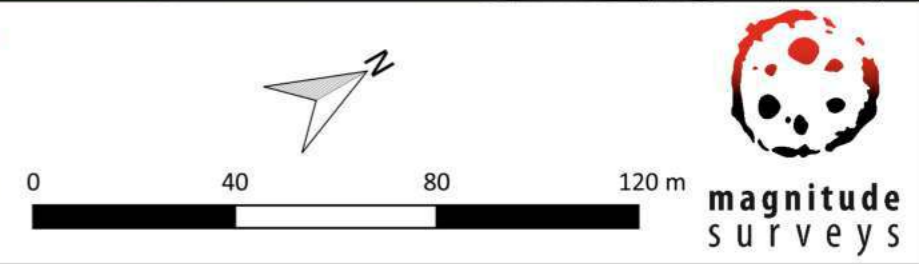
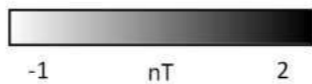
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
Figure 25 - XY Trace Plot (Areas 3, 10, 1, 11, 7, 15 & 16)
30nT/cm at 1:1,500 @ A3
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 Figure 26 - Magnetic Gradient (Areas 8, 7, 11 & 15)
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MSS0722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 27 - Magnetic Interpretation (Areas 8, 7, 11 & 15)
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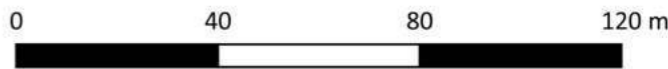

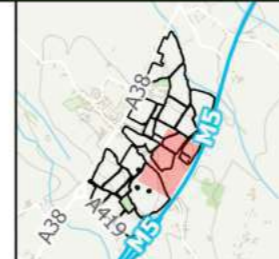
- | | | |
|--|---|--|
| ■ Archaeology Probable (Strong) | ■ Magnetic Disturbance | — Agricultural (Trend) |
| ■ Archaeology Probable (Weak) | ■ Ferrous/Debris (Spread) | - - - Service |
| ■ Archaeology Possible (Strong) | ■ Undetermined (Strong) | — Ridge and Furrow (Trend) |
| ■ Archaeology Possible (Weak) | ■ Undetermined (Weak) | — Drainage Feature |
| ■ Agricultural (Strong) | ■ Undetermined (Spread) | ● Ferrous (Spike) |



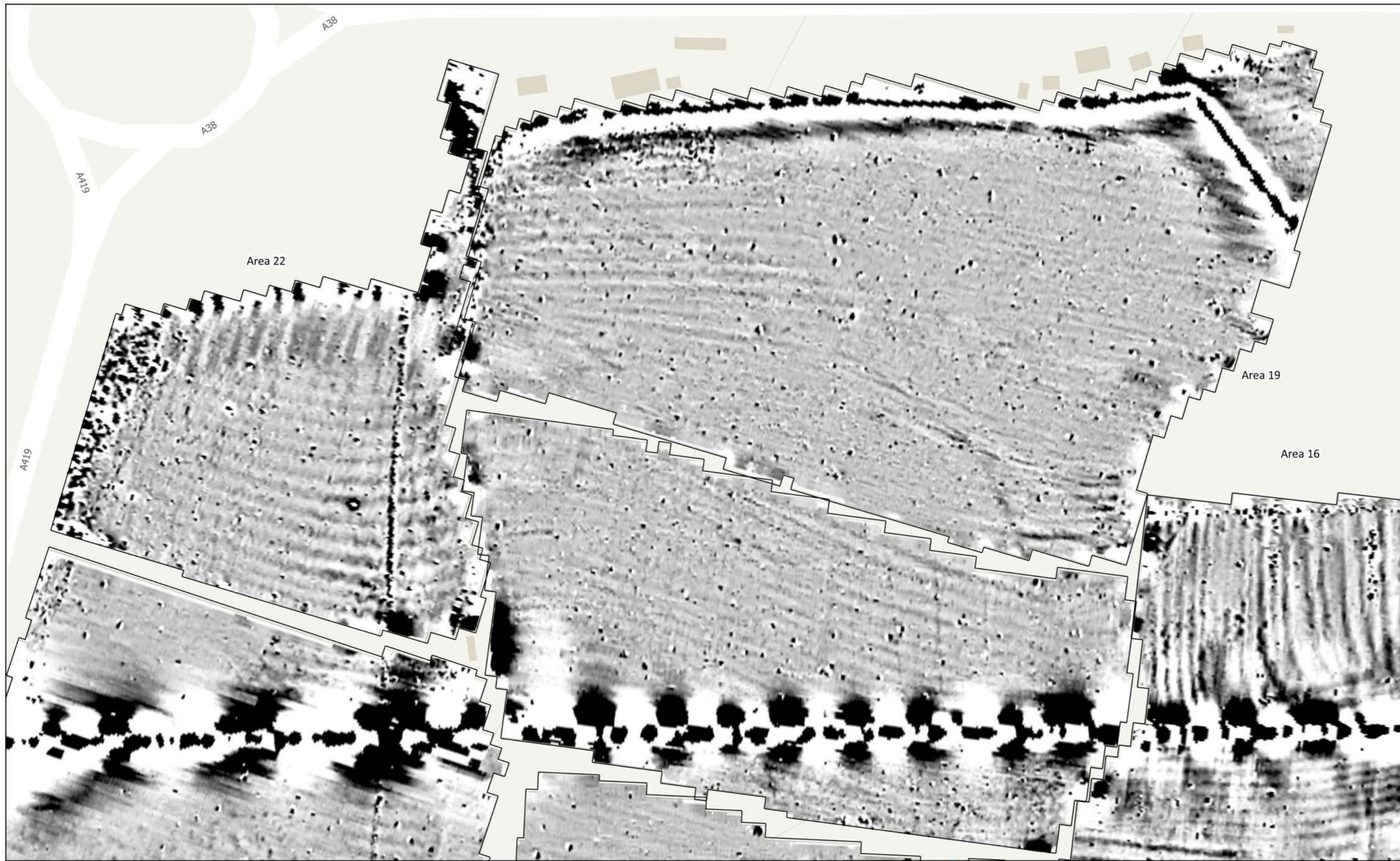
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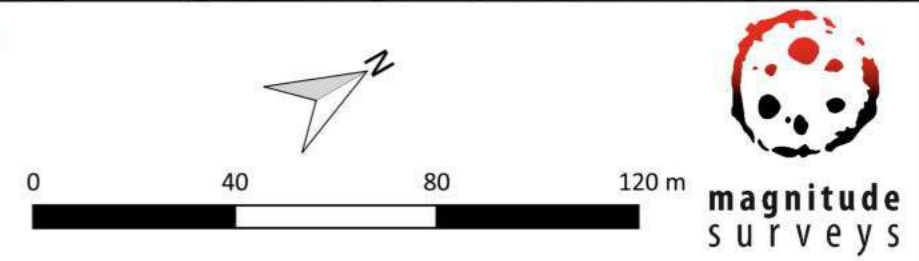
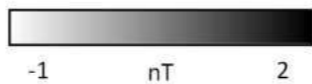
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
Figure 28 - XY Trace Plot (Areas 8, 7, 11 & 15)
30nT/cm at 1:1,500 @ A3
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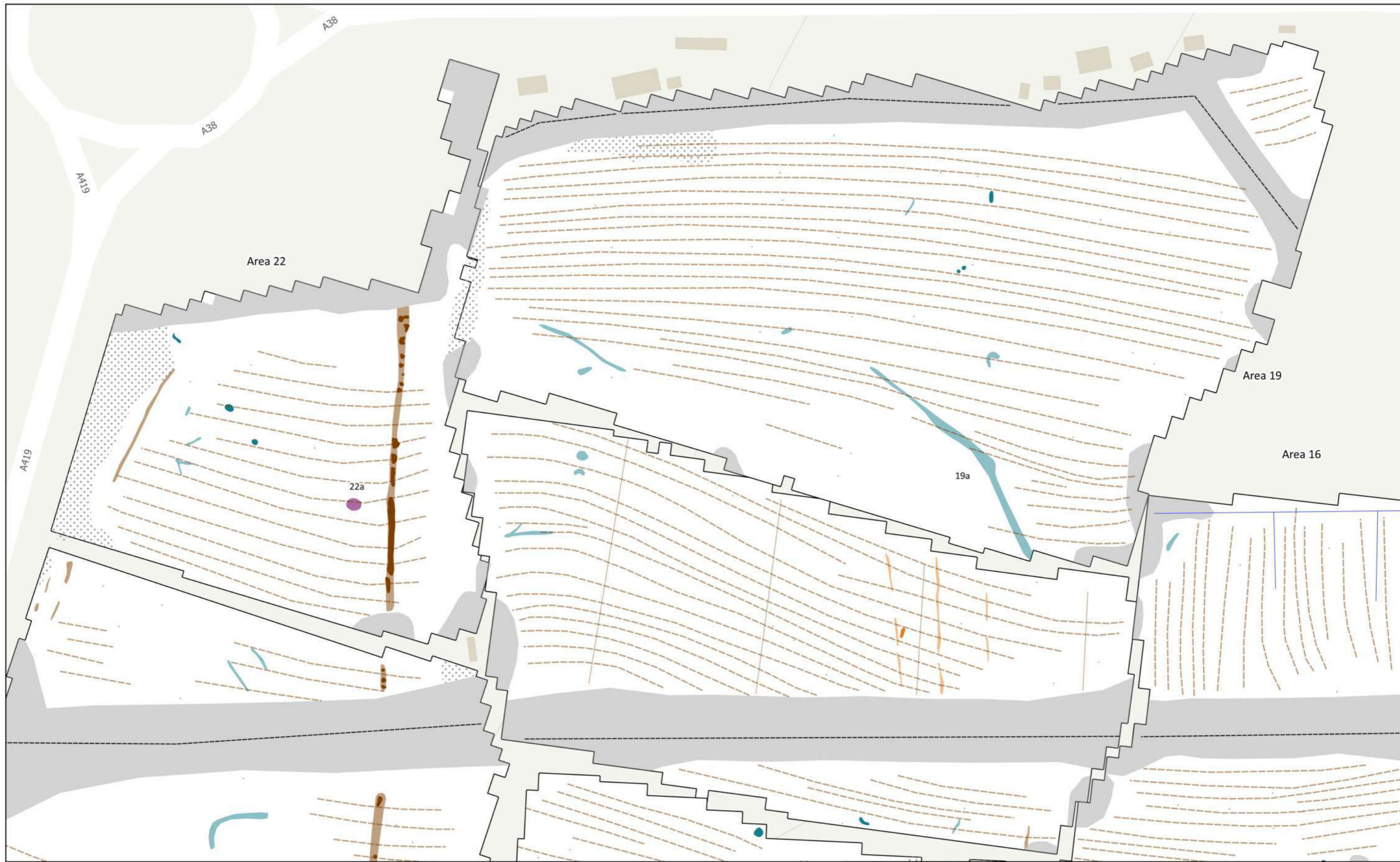


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MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
Figure 29 - Magnetic Gradient (Areas 18, 16, 19 & 22)
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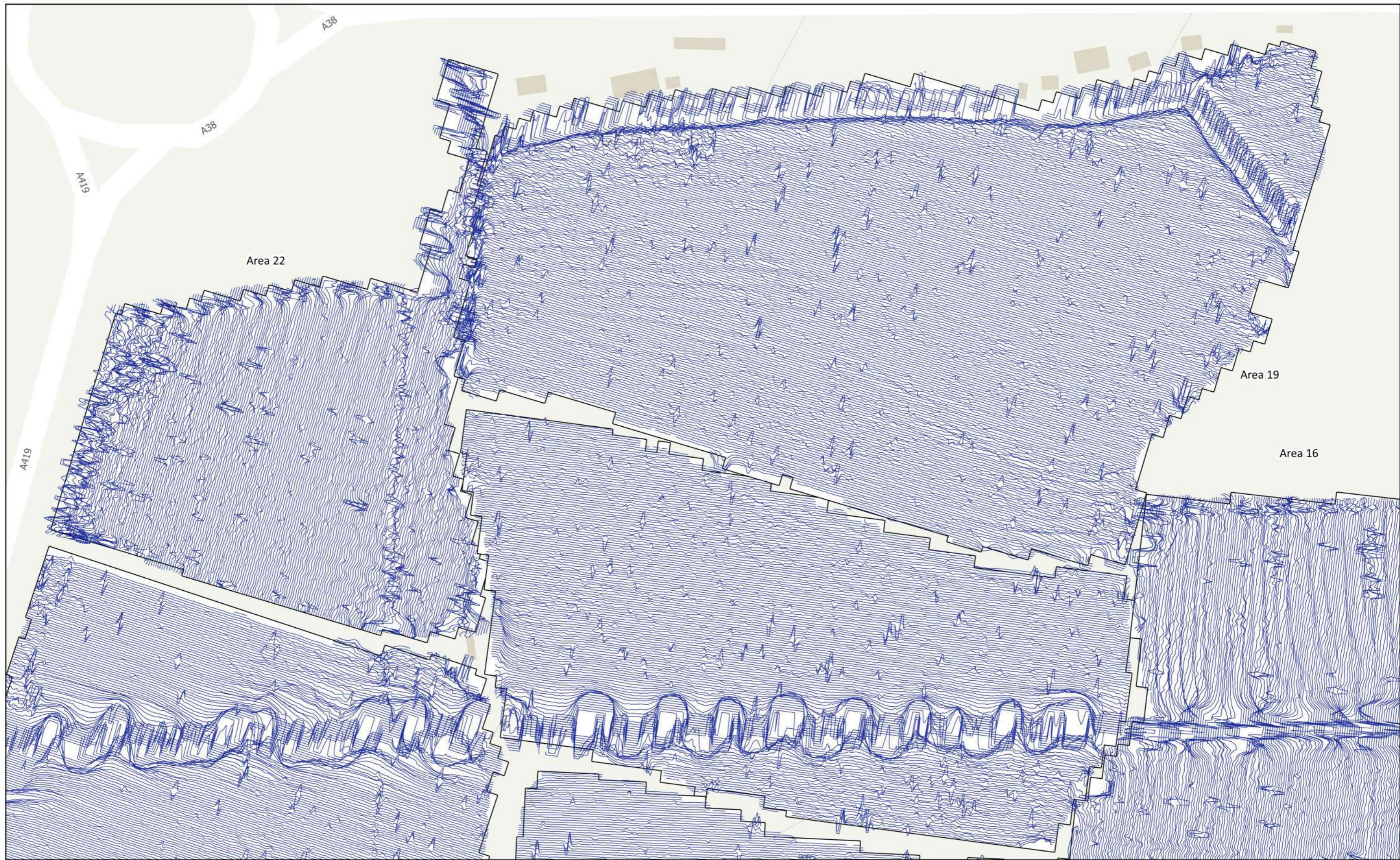
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 30 - Magnetic Interpretation (Areas 18, 16, 19 & 22)
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- | | | |
|-------------------------------|-------------------------|--------------------------|
| Archaeology Possible (Strong) | Magnetic Disturbance | Service |
| Archaeology Possible (Weak) | Ferrous/Debris (Spread) | Ridge and Furrow (Trend) |
| Agricultural (Strong) | Undetermined (Strong) | Drainage Feature |
| Agricultural (Weak) | Undetermined (Weak) | Ferrous (Spike) |
| Possible Burnt/Fired | Agricultural (Trend) | |

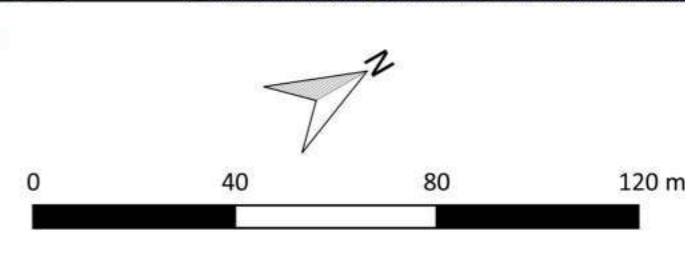
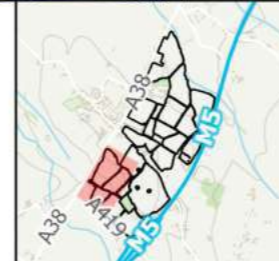


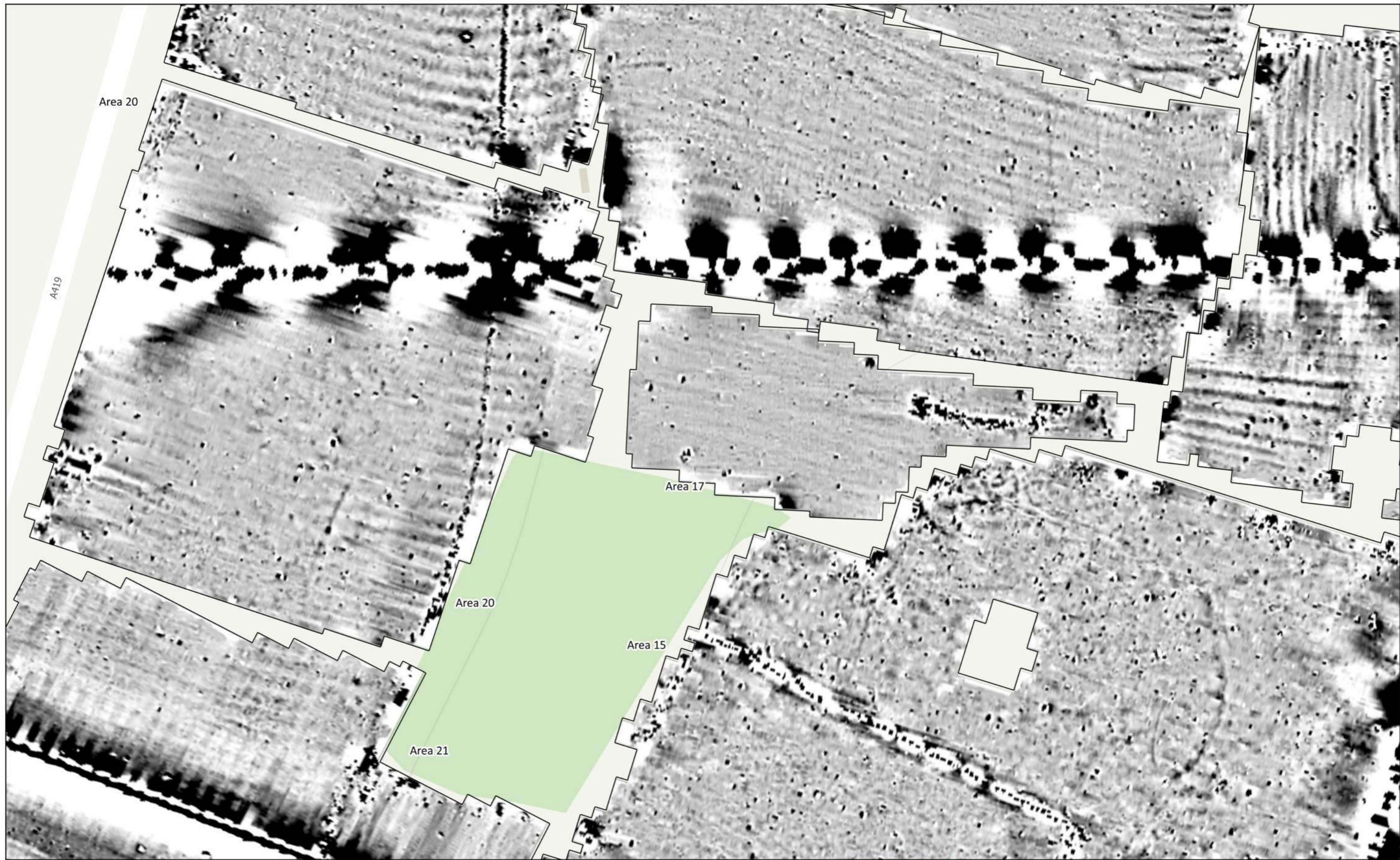
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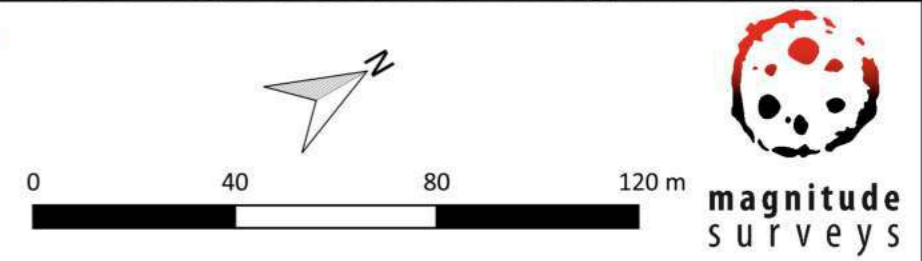
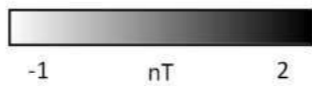


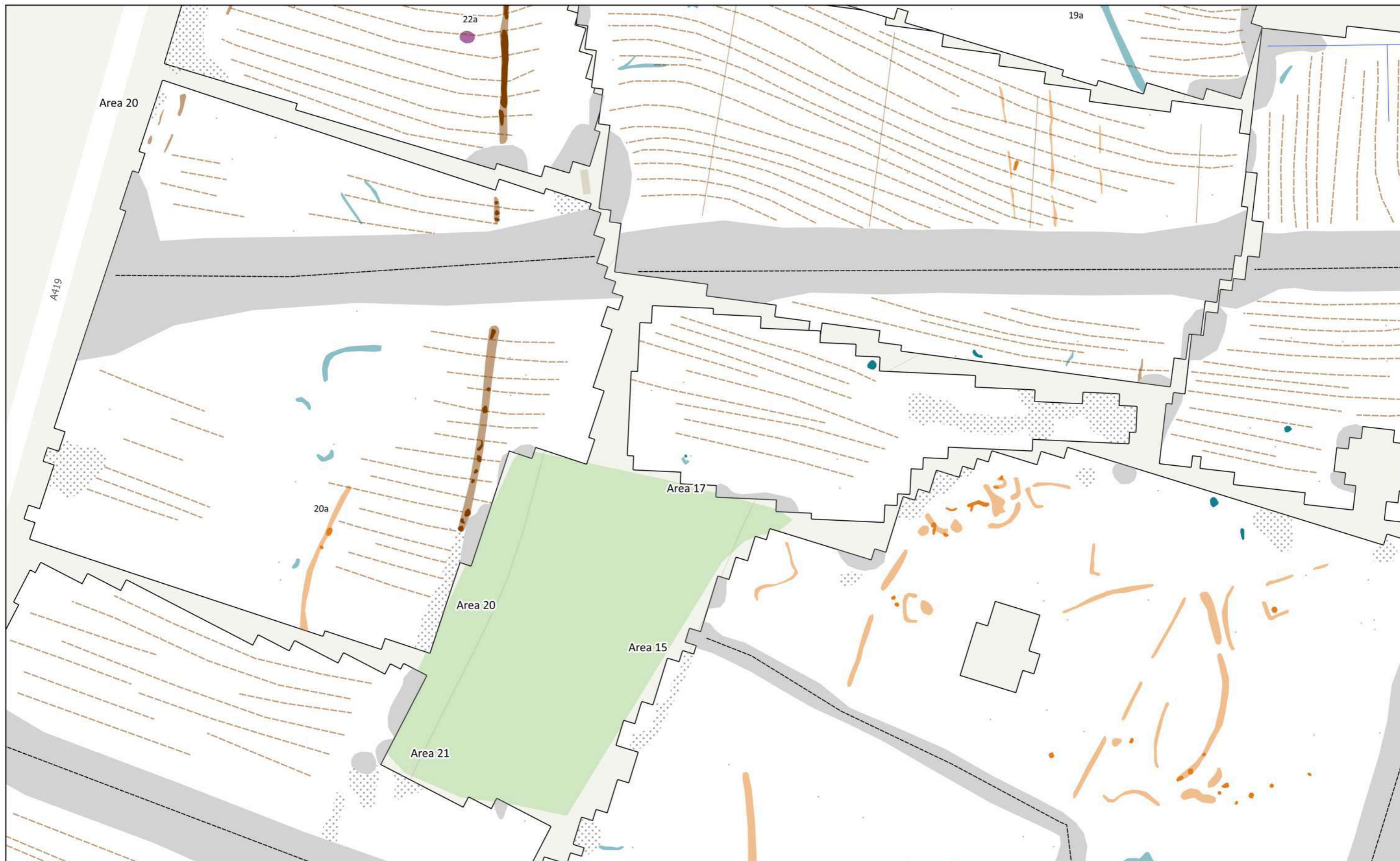
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 31 - XY Trace Plot (Areas 18, 16, 19 & 22)
 30nT/cm at 1:1,500 @ A3
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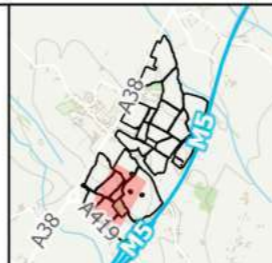
MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 32 - Magnetic Gradient (Areas 17, 20, 21, 15 & 18)
 1:1,500 @ A3
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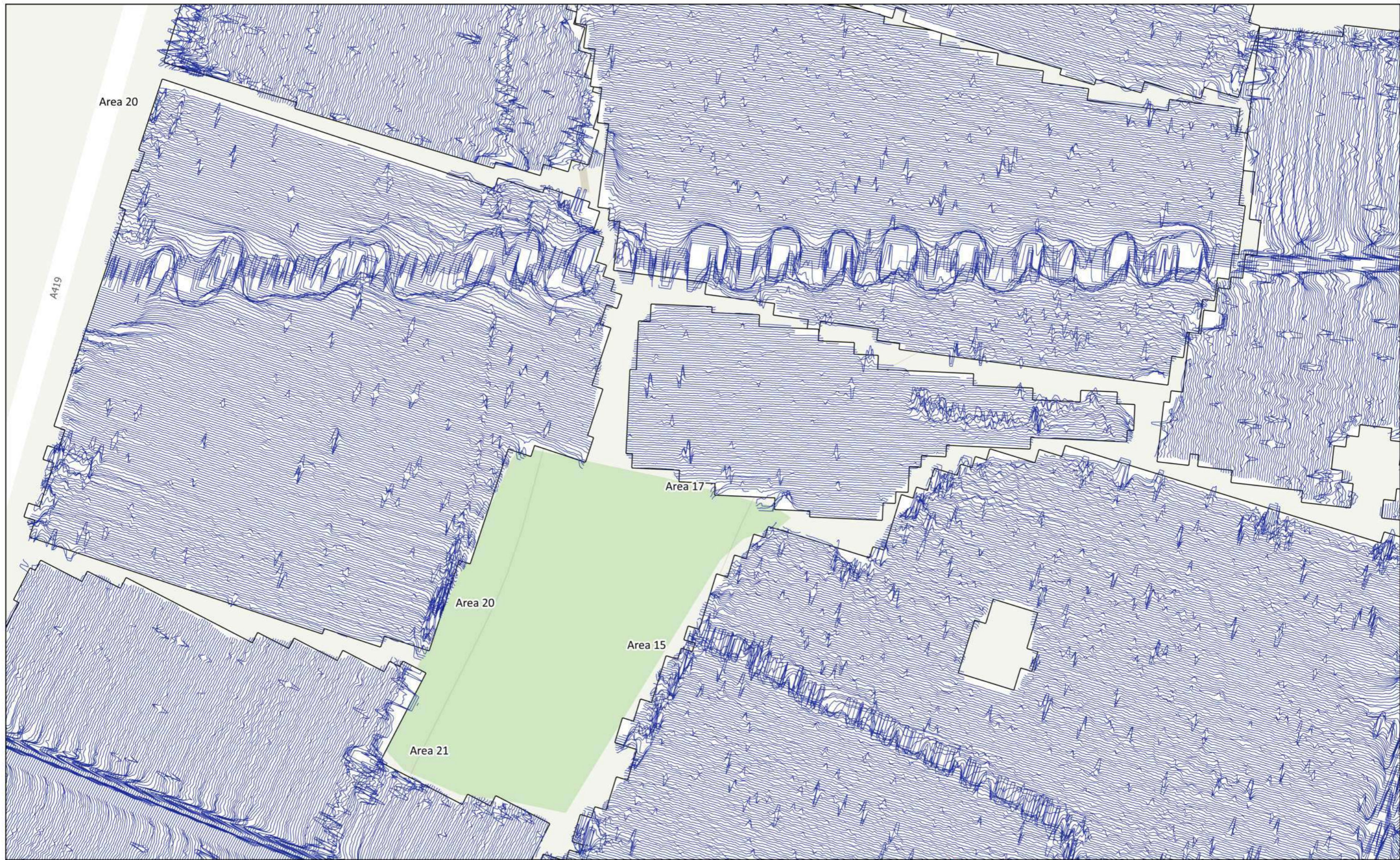


MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 33 - Magnetic Interpretation (Areas 17, 20, 21, 15 & 18)
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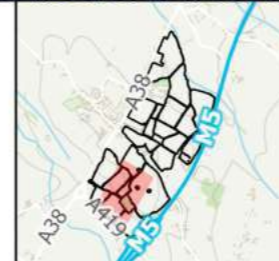
- | | | |
|-------------------------------|-------------------------|--------------------------|
| Archaeology Possible (Strong) | Magnetic Disturbance | Service |
| Archaeology Possible (Weak) | Ferrous/Debris (Spread) | Ridge and Furrow (Trend) |
| Agricultural (Strong) | Undetermined (Strong) | Drainage Feature |
| Agricultural (Weak) | Undetermined (Weak) | Ferrous (Spike) |
| Possible Burnt/Fired | Agricultural (Trend) | |



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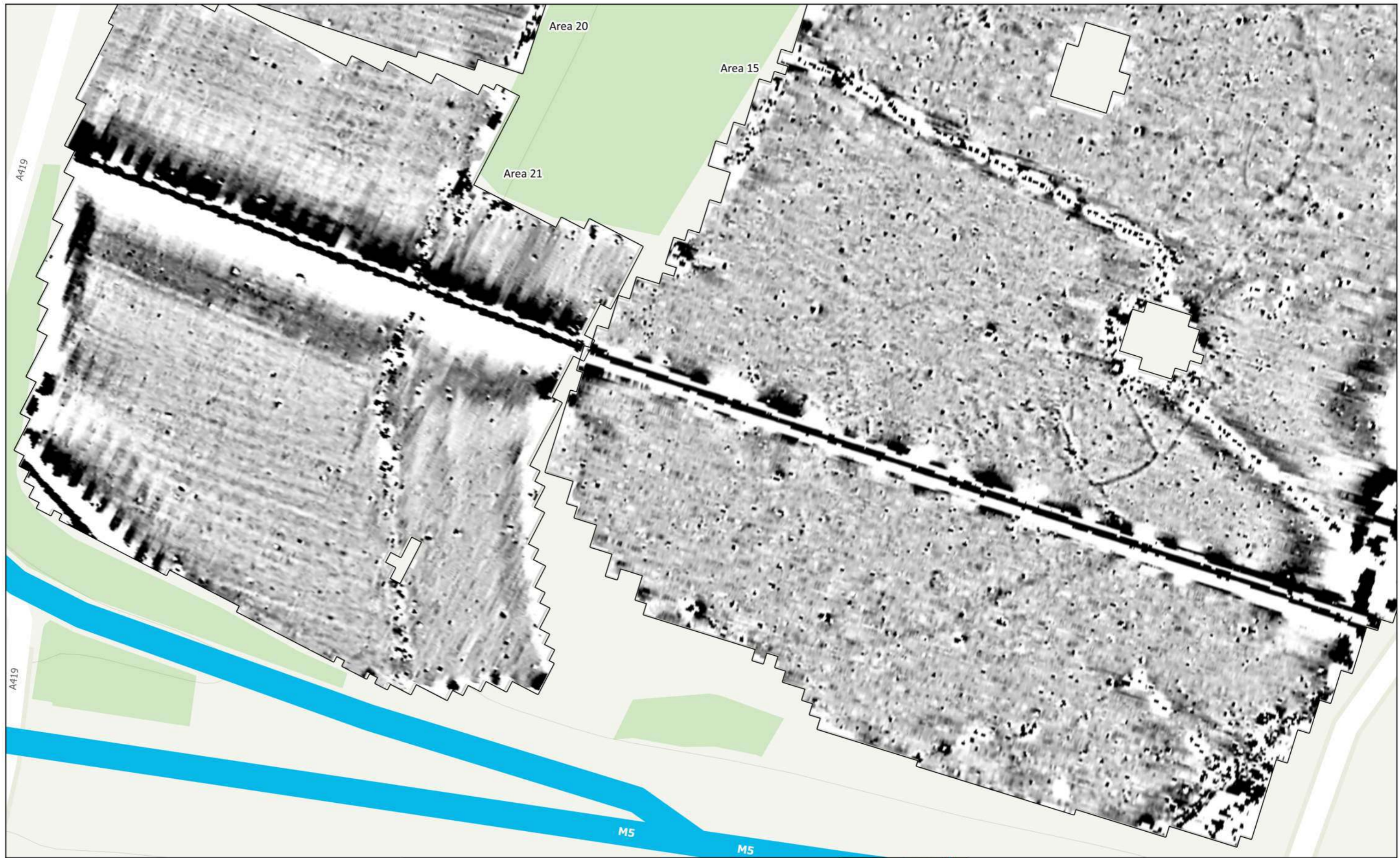


MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 34 - XY Trace Plot (Areas 17, 20, 21, 15 & 18)
 30nT/cm at 1:1,500 @ A3
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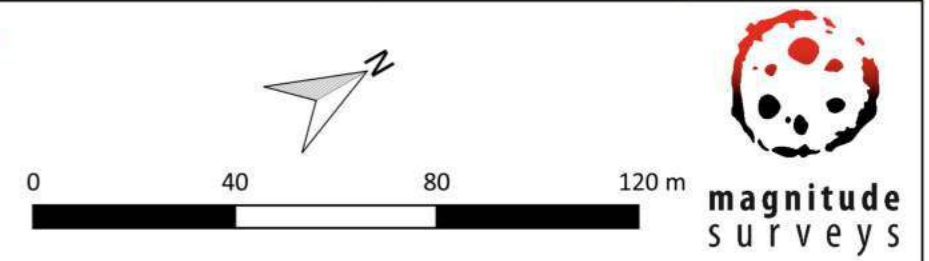
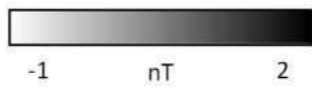


A north arrow pointing towards the top right of the page. Below it is a scale bar with markings at 0, 40, 80, and 120 meters.

The logo for Magnitude Surveys, featuring a stylized globe with red and black dots, and the text "magnitude surveys" below it.



MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 35 - Magnetic Gradient (Areas 15 & 21)
 1:1,500 @ A3
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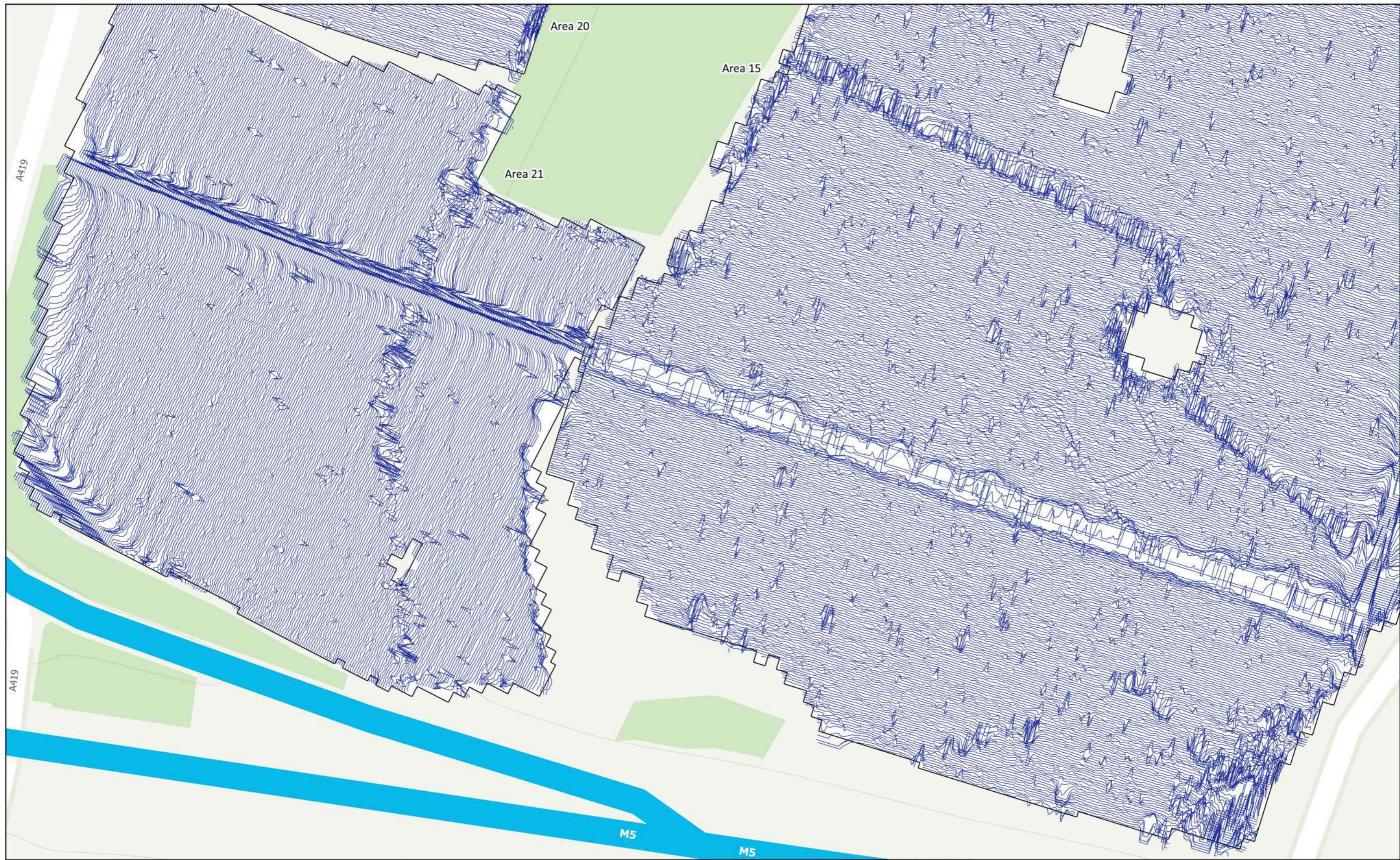


MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 36 - Magnetic Interpretation (Areas 15 & 21)
 1:1,500 @ A3
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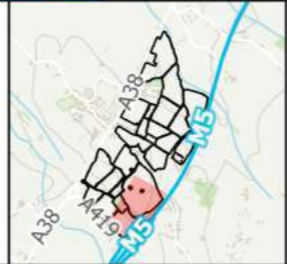
- | | | |
|--|---|--|
| ■ Archaeology Probable (Strong) | ■ Magnetic Disturbance | --- Service |
| ■ Archaeology Probable (Weak) | ■ Ferrous/Debris (Spread) | --- Ridge and Furrow (Trend) |
| ■ Archaeology Possible (Strong) | ■ Undetermined (Strong) | --- Ferrous (Spike) |
| ■ Archaeology Possible (Weak) | ■ Undetermined (Weak) | |



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MSSO722 - Land to the East of A38 and North of A419, Whitminster, Stroud
 Figure 37 - XY Trace Plot (Areas 15 & 21)
 30nT/cm at 1:1,500 @ A3
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OASIS ID: magnitud1-404121

Project details

Project name	Land to the East of the A38 and North of the A419, Whitminster, Gloucestershire
Short description of the project	Magnitude Surveys was commissioned to assess the subsurface archaeological potential of c. 101ha of land to the East of the A38 and North of the A419, Whitminster, Stroud, Gloucestershire. A fluxgate gradiometer survey was successfully completed across the survey area. Extensive archaeological activity has been identified across much of the survey area, with several probable enclosures of uncertain date. Most of these enclosures are isolated from each other and have differing morphologies, and therefore it is unclear how or if they relate. Several other anomalies of possible archaeological origin are present but are largely weaker and fragmented, which has limited a definitive interpretation. Two separate, isolated anomalies potentially relating to a kiln or concentrated burning activity have also been detected, these are of undetermined date and origin. Agricultural activity has been identified throughout the site as former field boundaries, infilled ponds, in addition to extensive ridge and furrow cultivation, which is also visible as extant earthworks across much of the survey area. Anomalies of undetermined origin have been detected across the survey area, including a spread of material in the east which could be related to the construction of the M5 motorway or with extraction activity. The magnetic haloes relating to the multiple modern services crossing the survey area may have masked weaker anomalies in their vicinity.
Project dates	Start: 17-08-2020 End: 22-09-2020
Previous/future work	Not known / Not known
Any associated project reference codes	MSSO722 - Contracting Unit No.
Type of project	Field evaluation
Current Land use	Grassland Heathland 5 - Character undetermined
Monument type	ENCLOSURES Uncertain
Monument type	FIELD BOUNDARY Uncertain
Monument type	PLOUGH Uncertain
Significant Finds	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	Unknown
Position in the planning process	Not known / Not recorded
Solid geology	Unknown
Solid geology	Blue Lias and Charmouth Mudstone

(other)

Drift geology SAND AND GRAVEL OF UNCERTAIN AGE OR ORIGIN

Techniques Magnetometry

Project location

Country England

Site location GLOUCESTERSHIRE STROUD WHITMINSTER Land to the East of A38 and North of A419, Whitminster, Stroud, Gloucestershire

Postcode GL2 7NA

Study area 101 Hectares

Site coordinates SO 781 086 51.775189652715 -2.317450235389 51 46 30 N 002 19 02 W Point

Project creators

Name of Organisation Magnitude Surveys Ltd

Project brief originator RPS

Project design originator Magnitude Surveys Ltd

Project director/manager Chrys Harris

Project supervisor Leanne Swinbank

Type of sponsor/funding body Developer

Project archives

Physical Archive Exists? No

Digital Archive recipient Gloucestershire

Digital Archive ID MSSO722

Digital Contents "Survey"

Digital Media available "Geophysics","Text","GIS"

Paper Archive Exists? No

Project bibliography 1

Publication type Grey literature (unpublished document/manuscript)

Title Land to the East of A38 and North of A419, Whitminster, Stroud, Gloucestershire

Author(s)/Editor(s) Adams, C., Beck, L.

Other bibliographic details 1.0

Date 2020

Issuer or publisher Magnitude Surveys Ltd.

Place of issue or Bradford

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Description Digital Report in PDF format

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Entered on 22 September 2020

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