APPENDIX B GEOPHYSICS REPORT

magnitude surveys

Geophysical Survey Report

Bowshiel, East Berwickshire, Scottish Borders

For

ERM

Magnitude Surveys Ref: MSNT1874

January 2025

3 Captain Street

Bradford

BD1 4HA

01274 926020

info@magnitudesurveys.co.uk

Report By:

Hamza Aslam BSc (Hons) MSc PCIfA

Report Approved By:

Dr Paul S. Johnson FSA MCIfA

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Abstract

Magnitude survey was commissioned to assess the subsurface archaeological potential of a c. 181ha area of land at Bowshiel, Scottish Borders. A fluxgate gradiometer survey was successfully completed across the majority of the survey area with c. 21ha unable to be surveyed due to steep slopes, and overgrown vegetation. Possible archaeological activity has been identified in the form of a partial rectilinear enclosure and further ancillary features that are related to the historical fort. Anomalies associated with agricultural activity have also been identified as former field boundaries, former and modern ploughing trends. Further linear and curvilinear anomalies have been identified across the survey area but are of undetermined classification. Natural anomalies are present throughout the area and are identified as colluvial processes. The impact of magnetic disturbances corresponded to field boundaries, electric fences and structures.

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1. Introduction

1.1. Magnitude Surveys Ltd (MS) was commissioned by ERM to undertake a geophysical survey over a c. 181ha area of predominantly pasture and arable land at Bowshiel, Scottish Borders (NT 78982 67901).

1.2. The geophysical survey comprised quad towed, and hand carried GNSS fluxgate gradiometer survey. Magnetic survey is the standard primary geophysical method for archaeological applications in the UK due to 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 featured buildings (SFBs) 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, 2020) and the European Archaeological Council (Schmidt *et al.,* 2015).

1.4. It was conducted in line with a WSI produced by MS (Ho, 2024).

1.5. The survey commenced on 23/09/2024 and finished in 4 deployments.

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 for Archaeological Prospection).

2.2. The directors of MS are involved in cutting edge 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 has served as 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 Paul Johnson has a PhD in archaeology from the University of Southampton, is a Fellow of the Society of Antiquaries of London and a Member of CIfA, has been a member of the ISAP Management Committee since 2015, and is currently the Chair of the Archaeological Prospection Community of the European Archaeological Association.

2.3. All MS managers, field and office staff have degree qualifications relevant to archaeology or geophysics 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 c. 500m north of Pease Burn (Figure 1). Gradiometer survey was undertaken across 19 fields totalling 181ha under predominantly pasture and arable conditions. The survey area was bordered by Gledstane forest to the north, the A1 to the east, Pease Burn

to the south, and Ewieside Hill to the west. 21ha within the survey area could not be surveyed due to either excessively steep slopes, overgrowth, or crop coverage.

4.2. Survey considerations:

Survey Area	Ground Conditions	Further Notes
1	The survey area consisted of pasture which sloped down towards the north.	The survey area was bordered by stone walls on all four sides. A small section in the northeast corner was unsurveyable due to overgrown vegetation.
2	The survey area consisted of uneven pasture which sloped down towards the north.	The survey area was enclosed by stone walls on all four sides. An excavation pit was located in the centre of the area. Additionally, a small section in the northeast corner was unsurveyable due to overgrown vegetation.
3	The survey area consisted of pasture which sloped down towards the east.	The survey was bordered by stone walls on all four sides. A small section in the east corner was unsurveyable due to steep slope and overgrown vegetation. A water tower is located at the boundary of the west of the survey area.
4	The survey area consisted of pasture which sloped down towards the east.	The survey area was bordered by stone walls to the north and west, while the eastern and southern edges were bordered by an electric fence. Additionally, two metal gates were located along the eastern side of the survey area.
5	The survey area consisted of a flat pasture.	The northern boundary of the survey area was marked by a stone wall, while metal fences bordered the east, south, and west sides. Telegraph poles with overhead cables were located on the eastern side, running from north to south.
6	The survey area consisted of flat arable land.	The survey area was enclosed by stone walls on all four sides. A section towards northwest corner was unsurveyable due to overgrown vegetation. A water tower is located on the eastern boundary.
7	The survey area consisted of pasture which sloped down towards the east.	The survey area was bordered by stone walls to the north and east, south by a tarmac road and west by metal wire fencing. A trough was present in the centre of the survey area, while overhead cables and poles were present along the northern boundary.
8	The survey area consisted of pasture.	The survey area was bordered by stone walls to the north and west, while metal fencing bordering the survey area from east to south.
9	The survey area consisted of pasture which sloped down towards the east.	The survey area was bordered by a stone wall to the north, with an electric fence along the east and south. The western boundary featured a trench, backed by metal fencing. Additionally, overhead cables ran from west to east.

10	The survey area consisted of pasture and sloped down towards the east.	The survey area was bordered by an electric fence to the north, a hedge to the east and a stone wall to the west. A small section along the southern side was unsurveyable due to overgrown vegetation and steep slope.
11	The area consisted of pasture which sloped down from south and west towards the centre of field.	The survey area was enclosed by a hedgerow and electric fence on all four sides. A telegraph pole with overhead cables ran along the eastern side of the survey area.
12	The survey area consisted of an arable field which sloped down towards the centre from the east and west sides.	The survey area was bordered by a stone wall and metal fencing to the north. Hedgerow and metal fencing bordering the survey area in the east, south and west. Additionally, metal gates were located to the north.
13	The survey area consisted of an arable field.	The survey area was bordered by hedgerows on all four sides along with metal fencing.
14	The survey area consisted of pasture which sloped down towards the south.	The survey area was bordered by metal fencing to the north and west and to the east and south, by stone walls. Telegraphic poles with overhead cables were present along the northern boundary.
15	The survey area consisted of pasture which sloped down towards the east.	The survey area was enclosed by metal fencing to the north and east, with stone walls bordering the south and west.
16	The survey area consisted of pasture which sloped down towards the southwest.	The survey area was bordered by metal fencing to the north, east and west, and a stone wall to the south. Telegraph poles with overhead cables ran from northwest to southeast along the southern part of the survey area.
17	The survey area consisted of pasture.	The survey area was bordered by trees to the north and hedgerows to the east and south. There is no physical boundary present to the west of the survey area. Only the centre of the survey area could be surveyed due to the presence of overgrown vegetation.
18	The survey area consisted of an arable field which sloped down towards the northwest.	The survey area was bordered by metal fencing and stone walls to the north, east and west. To the south, it was bordered by a metal fence. A metal gate was present to the west of the survey area.
19	A survey area consisted of a stubble field which sloped down towards east.	The survey area was bordered by a stone wall to the north, west, and south, with a metal fence along the east. During the survey, hay bales were present at different sections of the east side. Two small sections were unsurveyable in the southwest and northeast due to dense vegetation.

4.3. The underlying geology comprises Gala Wacke Group which consists of wacke stone, siltstone and mudstone. There are superficial deposits of Devensian Diamicton Till under the southeastern fields (Areas 9 - 19) of the survey area (British Geological Survey, 2024).

4.4. The soils mainly consist of freely draining brown soils, with some imperfectly draining in the southwest part of the survey area and a small part in the southeast (Scotland's Soils, 2024).

5. Archaeological Background

5.1. The following is a summary of Historic Environment Records (HER) produced by CANMORE and provided by ERM.

5.2. There are several monuments recorded within the survey area.

5.3. In the northwest of the survey area, 'Old Quarries' is marked on the 1st Edition of OS map, which is dated to the post Medieval period (HER 342727).

5.4. A site visit in 1911 recorded an enclosed fort on the western boundary of the survey area. It had a 225-ft internal diameter and was surrounded by a single mound, now recognisable by the presence of stones. Its date is unknown (HER 58721).

5.5. At the centre of the survey area, a farmhouse was observed and has been recorded and shown as Bowsheell on historical maps. It is dated to the Medieval period (HER 278499).

5.6. Immediately to the west of the farmhouse (5.5 above), a mill dam dated to post Medieval period was recorded on the 1st Edition OS map (HER 342729).

5.7. To the southwest of the farmhouse (5.5 above), an old road was marked on the 1st Edition OS map (HER 342725).

5.8. At the southwest of the survey area, a c. 12m diameter, c. 2m wide, prehistoric ring-ditch was recorded (HER 241407).

5.9. At the southeastern corner of the survey area, the Iron Age "Big Chesters" fort with surrounding single rampart on the north and west of the fort, were recorded by a site visit in 1911 (HER 58717).

5.10. To the southwest of Big Chesters, a fort was traceable in 1856 and described as circular, smaller than and close to the 'camp' of Big Chesters. Nothing remained by the time of the site visit in 1911 and its date is unknown (HER 58718).

5.11. To the south of Big Chesters, a Royal Air Force plane crashed on 8th May 1942 (HER 353679).

5.12. At the east of the survey area, a series of cropmarks were recorded suggesting a series of probably prehistoric 2–3 meter diameter pits partly enclosing a large oval-shaped pit or hollow (HER 360603).

5.13. To the northwest of Big Chesters, An old road, dated to the post Medieval period was marked on the 1st Edition OS map (HER 342726).

5.14. On the east of the survey area, a probably prehistoric fort labelled as "Little Chesters" was recorded by a site visit in 1911, and depicted on historical OS mapping. It was measured at c. 170 ft by 145 ft and surrounded by a single rampart (HER 58720).

5.15. At the eastern boundary of the survey area, a fort of unknown date, labelled as Fermy Knowe on historical OS mapping was recorded, and was surrounded by a single rampart in 1915 (HER 58719)

6. Methodology

6.1. Data Collection

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

6.1.2. 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

6.1.3. The magnetic data were collected using MS' bespoke quad-towed and hand carried GNSS positioned system.

6.1.3.1. MS' 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.

6.1.3.2. 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.

6.1.3.3. 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.

6.2. Data Processing

6.2.1. Magnetic data were processed in bespoke in-house software produced by MS. Processing steps conform to the EAC and Historic England guidelines for 'minimally enhanced data' (see Section 3.8 in Schmidt *et al.*, 2015: 33 and Section IV.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.

6.3.Data Visualisation and Interpretation

6.3.1. 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 XY trace plot (Figures 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53). XY trace plots visualise the magnitude and form of the geophysical response, aiding anomaly interpretation.

6.3.2. Geophysical results have been interpreted using greyscale images and XY traces in a layered environment, overlaid against open street maps, satellite imagery, historical maps, LiDAR data, and soil and geology maps. Google Earth (2025) was also consulted, to compare the results with recent land use.

6.3.3. 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 from further work, in order to constantly improve our knowledge and service.

7.2.Discussion

7.2.1. A fluxgate gradiometer survey was carried out over c. 181ha of land at Bowshiel, Scottish Borders with c. 21ha unable to be surveyed due to steep slopes and overgrown vegetation. The geophysical results are presented in combination with satellite imagery and historical maps (Figures 4, 6, 8, 10).

7.2.2. The fluxgate gradiometer survey has responded well to the environment of the survey area. Anomalies of possible archaeology, agricultural, natural, and undetermined origins have been identified.

7.2.3. The survey data indicated a strong magnetic background derived from the underlying geology of the survey area. Modern interference is limited to the edges of the fields in close proximity to metal wire fencing, structures, and farming equipment. A number of features that were identified previously within the HER and on historical mapping have not been identified in the survey data (e.g. Area 11 - 241407 ring ditch; Area 12 - 34725 Post Med Road; Area 18 - 353679 Aircraft, 58718 enclosure; Area 19 - 360603 Pits, 34726 post Medieval Road, 58720 Little Chesters Fort), this may be a result of their having insufficient contrast with the background, or potentially that these features no longer survive in a detectable form.

7.2.4. The geophysical survey has identified various anomalies of possible archaeology in Areas 1, 5, 10, 18, 19 (Figures 6, 8, 10, 12). These anomalies form shapes of rectilinear to sub-circular enclosures and are interpreted as being possibly archaeological in origin due to their morphology, defined edges, concentration and location in proximity to mapped remains.

7.2.5. Anomalies resulting from agricultural activities have been identified in the form of possible former field boundaries, present and probably pre-modern cultivation.

7.2.6. Numerous anomalies in spread patterns with strong positive and negative signals have been observed and identified as the result of lightning strikes. The heat generated by the lightning strike causes remanent magnetism by altering the composition of the rock.

7.2.7. Anomalies of natural origins have been observed and are likely related to the geological process of colluviation. This is visible in the data as wide positive natural bands most apparent in the total field plots (Figures 3, 5, 7, 9).

7.2.8. Various discrete linear to curvilinear anomalies are classified as ''Undetermined''. These anomalies could be identified as archaeological, agricultural, and natural origins but a confidential classification is not possible.

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

7.3.1.3. **Ferrous/Debris (Spread)** – A ferrous/debris spread refers to a concentration of multiple discrete, dipolar anomalies usually resulting from highly magnetic material such as rubble containing ceramic building materials and ferrous rubbish.

7.3.1.4. **Magnetic Disturbance** – The strong anomalies produced by extant metallic structures, typically including fencing, pylons, vehicles and service pipes, have been classified as 'Magnetic Disturbance'. These magnetic 'haloes' will obscure weaker anomalies relating to nearby features, should they be present, often over a greater footprint than the structure causing them.

7.3.1.5. **Undetermined** – Anomalies are classified as Undetermined when the origin of the geophysical anomaly is ambiguous and there is no supporting contextual evidence to justify 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 distinct from those caused by ferrous sources.

7.3.2. Magnetic Results - Specific Anomalies

7.3.2.1. **Archaeology Possible (Strong & Weak)** – A group of linear to curvilinear weakly enhanced positive anomalies **[1b]** have been identified in the north of Area 1 (Figures 11 & 12). These anomalies appear to form a rectilinear enclosure. These anomalies do not correspond to any heritage asset identified previously. In the east of Area 5, a weakly enhanced sub-rectangular anomaly has been observed **[5a]** (Figures 19 & 20). This anomaly comprises four curvilinear sides that form a star-shape pattern and may relate to the presence of a nearby fort indicated on historical mapping. This anomaly does not directly correspond with

any known heritage assets in the HER, but it is close to a farmstead (278499) which is c. 80m away to the southeast. In the south of Area 10, numerous linear and curvilinear anomalies exhibiting a strong and weak magnetic enhancement and forming a rectilinear enclosure have been identified **[10a]** (Figures 47 & 48). These anomalies correspond to a historical fort shown on OS mapping and recorded in the HER (58721). Further linear and curvilinear anomalies exhibiting a similar magnetic strength have also been detected within the confines of these enclosures and surroundings, indicative of possible external features. At the south of Area 19 and northeast of Area 18, two weak negative enhanced curvilinear anomalies have been observed **[19a]** (Figures 51 & 52). These anomalies form an almost full circle with a diameter of c. 90m, centred on the fort of "Big Chesters" HER (58717).

7.3.2.2. **Agricultural (Weak)** – Weak linear and curvilinear anomalies have been identified within survey Areas 9, 12, 13, 16 **[9a, 12a, 13a, 13b, 16a]** (Figures 20 & 21, 27 & 28, 35 & 36, 39 & 40, 48 & 49, 50 & 52). These anomalies correspond with former field boundaries and crop marks visible on satellite imagery.

7.3.2.3. **Agricultural (Spreads)** – A spread of weakly enhanced material consisting of discrete anomalies has been identified in the north-east corner of Area 1 [**1c]** (Figures 11 & 12). This spread aligns with fieldwork conducted in past years and is visible on recent satellite imagery.

7.3.2.4. **Agricultural (Trends)** – Parallel linear anomalies exhibiting weak magnetic enhancement and spaced closely c. 10-15m apart from each other have been identified in survey Areas 4, 10, 16 (Figures 31 & 32, 35 & 36, 47 & 48). These anomalies correspond with modern ploughing trends and are visible on satellite imagery.

7.3.2.5. **Former Agricultural (Trends)** – Weakly enhanced, linear and curvilinear anomalies **[4c, 11b]** (Figures 31, 32, 47, 48) running in parallel alignments have been recorded within survey Areas 4 & 11. The anomalies are different from the current agricultural trend line and have an equal spacing of c. 8m. Therefore, these anomalies are related to former ploughing line and identified as "Former Agricultural (Trends).

7.3.2.6. **Lighting Strike (Spread)** – Several discrete irregular spread patterns with strong dipolar anomalies **[1a, 1d, 2a, 2b, 3a, 3b, 5a, 6a, 11a]** have been identified in some of the survey areas (Areas 1, 2, 3, 5, 6, 10, 11). These anomalies, most prominent in the Total Field plots (Figures 3, 4, 5, 6, 9, 10), appear to originate from a single central point. Their dipolar signal and dendritic pattern are characteristic of lightning-induced magnetism. This type of anomaly results from the flow of electrical current through the ground along paths of low resistance, inducing a magnetic field around the flow path (Trinks and Biwall, 2011). The heat generated by the lightning strike can also cause remanent magnetism by altering the composition of the rock.

7.3.2.7. **Natural (Strong/Weak/Spread)** – Anomalies that are classified as "Natural" have been identified throughout the survey areas. These patterns are likely the result of colluvial processes.

7.3.2.8. **Undetermined (Weak)** – In Area 1, a few linear to curvilinear anomalies have been observed. They are close to the anomalies that are identified as possible archaeology however, these anomalies are morphologically indistinct and do not have any supporting contextual evidence to permit a confident classification. At the centre of Area 4 and north and south of Area 10, anomalies **[4a, 4b]** have been observed across the survey area (Figures 31 & 32). These anomalies have weak positive magnetic signals, likely associated with drainage features. However, due to their morphological shape and pattern, a definitive interpretation cannot be made. A similar anomaly in Area 9 **[9b]** (Figures 39 & 40) is suggestive of a cut feature with weakly enhanced infill, though again lacking a diagnostic morphology or signal**.**

8. Conclusions

8.1. A fluxgate gradiometer survey was successfully completed across the survey area. The geophysical survey has detected anomalies related to possible archaeological, agricultural, natural, and undetermined origins. The underlying geology and topography have produced a generally enhanced magnetic background. Variations in the geology of the survey area have been identified and are likely related to colluvial processes. Magnetic disturbance from extant pylons, telegraph poles, and fencing was limited to field boundaries.

8.2. Possible archaeological anomalies have been identified. Anomalies **[10a]** and **[19a]** correspond to forts indicated on the historical OS mapping and the HER records. Anomalies **[1b]** and **[5a]** do not correspond to any previously known features on historical OS maps or in the HER records.

8.3. Agricultural activities have been identified across the survey area in the form of former field boundaries, former and modern ploughing trends, and crop marks that are visible on satellite imagery caused by fieldwork in the recent past.

8.4. Anomalies identified as lighting strikes have also been identified across the survey area, mainly caused by electric currents passing through weak resistance rocks and mineralogical changes within rock due to heat.

8.5. Anomalies of undetermined origin have been identified. While these anomalies are considered likely the result of modern agricultural and/or natural processes, an archaeological origin cannot be entirely ruled out.

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 any dictated time embargoes.

10. Copyright

10.1. Copyright and intellectual property pertaining to all reports, figures and datasets produced by Magnitude Services Ltd is retained by MS. The client is given full licence to use such material for their own purposes. Permission must be sought by any third party wishing to use or reproduce any IP owned by MS.

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12. Project Metadata

MS Job Code	MSSK1874
Project Name	Bowshiel, Scottish Borders
Client	ERM
Grid Reference	NT (78982 67901)
Survey Techniques	Magnetometry
Survey Size (ha)	181ha (Magnetometry), 21ha Unsurveyable
Survey Dates	23/09/2024 – 27/09/2024, 30/09/2024 – 03/10/2024, 25/11/2024 – 26/11/2024
Project Lead	Leigh A. Garst BFA MSc MCIfA
Project Officer	King Yin Kennis Ho MSc
HER Event No	N/A
OASIS No	N/A
S42 Licence No	N/A
Report Version	1.0

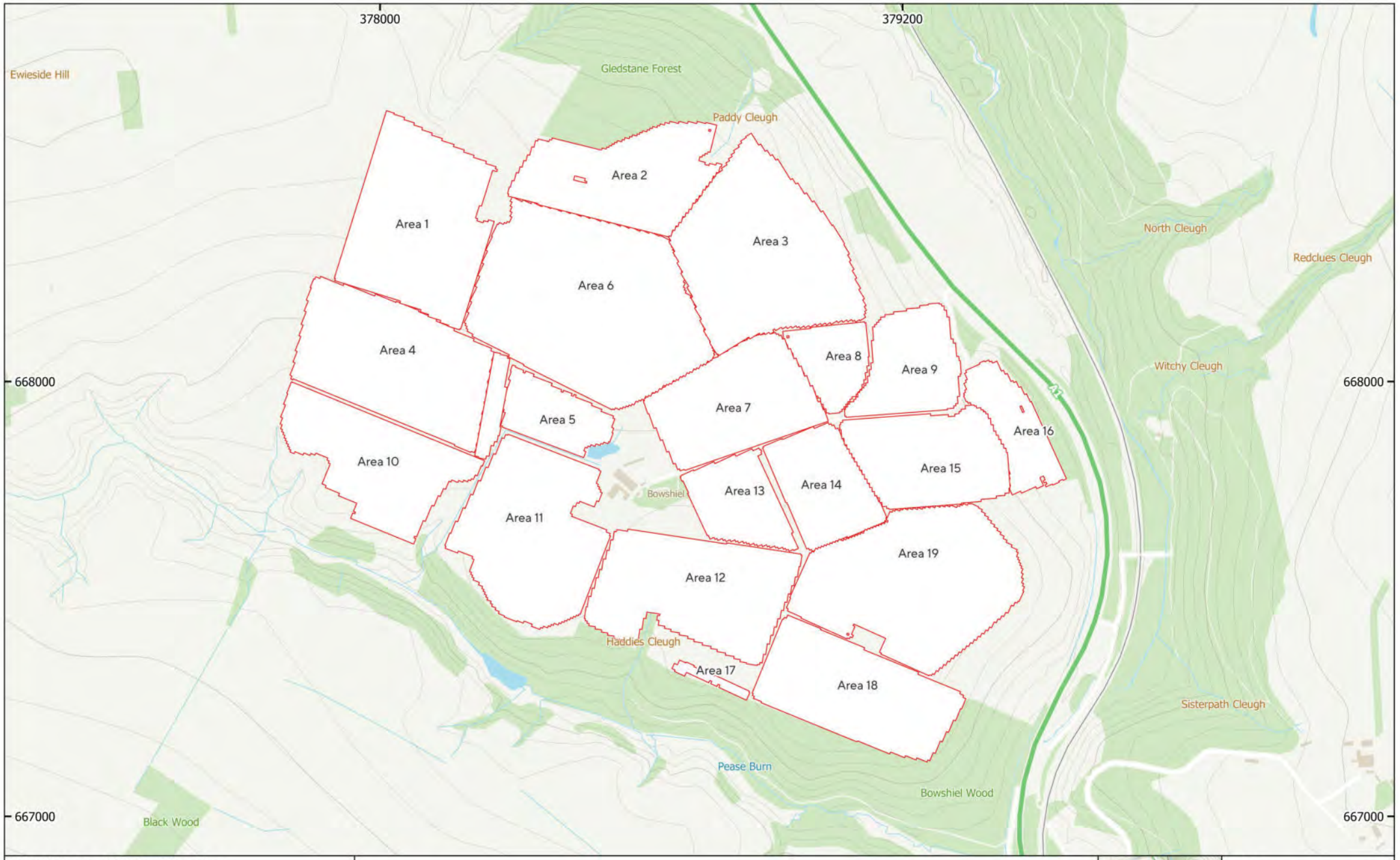
13. Document History

Version	Comments	Author	Checked By	Date
0.1	Initial draft for Project Lead to Review	HA	LAG	12 December 2024
0.2	Draft following Project Lead corrections. Director approval to client	KH	PSJ	18 December 2024
0.3	Draft following client's comments	KH	PSJ	30 January 2025
1.0	Final			22 April 2025

MSNT1874 - Bowshiel, Scottish Borders
Figure 1 - Geophysical Survey Location
1:25,000 @ A4

Geophysical Survey Location

0 0.5 1 km

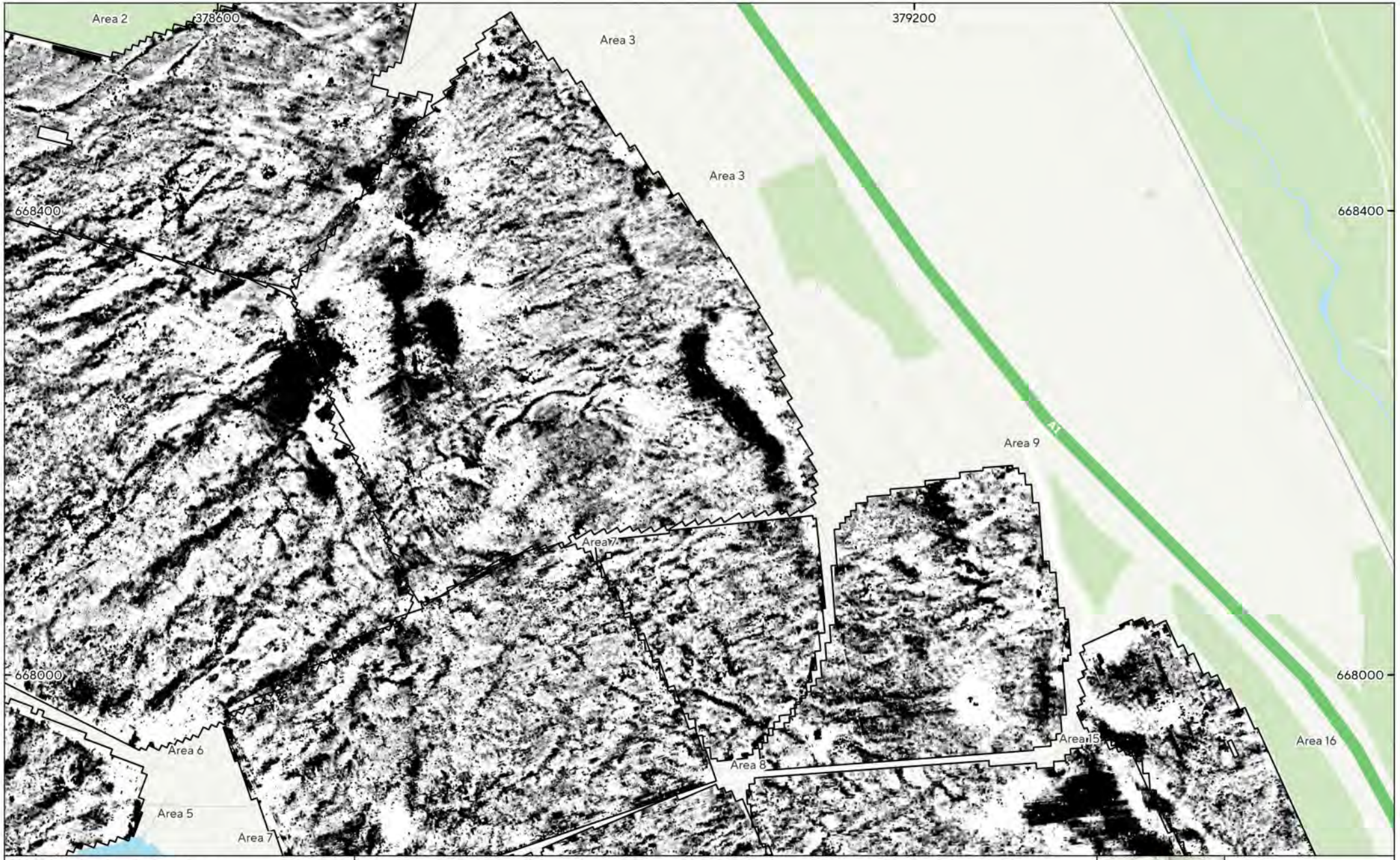


MSNT1874 - Bowshiel, Scottish Borders
Figure 2 - Geophysical Survey Areas
1:8,000 @ A3

Survey Extent

Magnitude Surveys

0 80 160 240 320 m



MSNT1874 - Bowshiel, Scottish Borders
Figure 3 - Magnetic Total Field Overview (Area 2 (West), 3, 5 & 6 (West), 7 (North), 8, 9, 14 (North), 15 & 16 (North))
1:3,000 @ A3

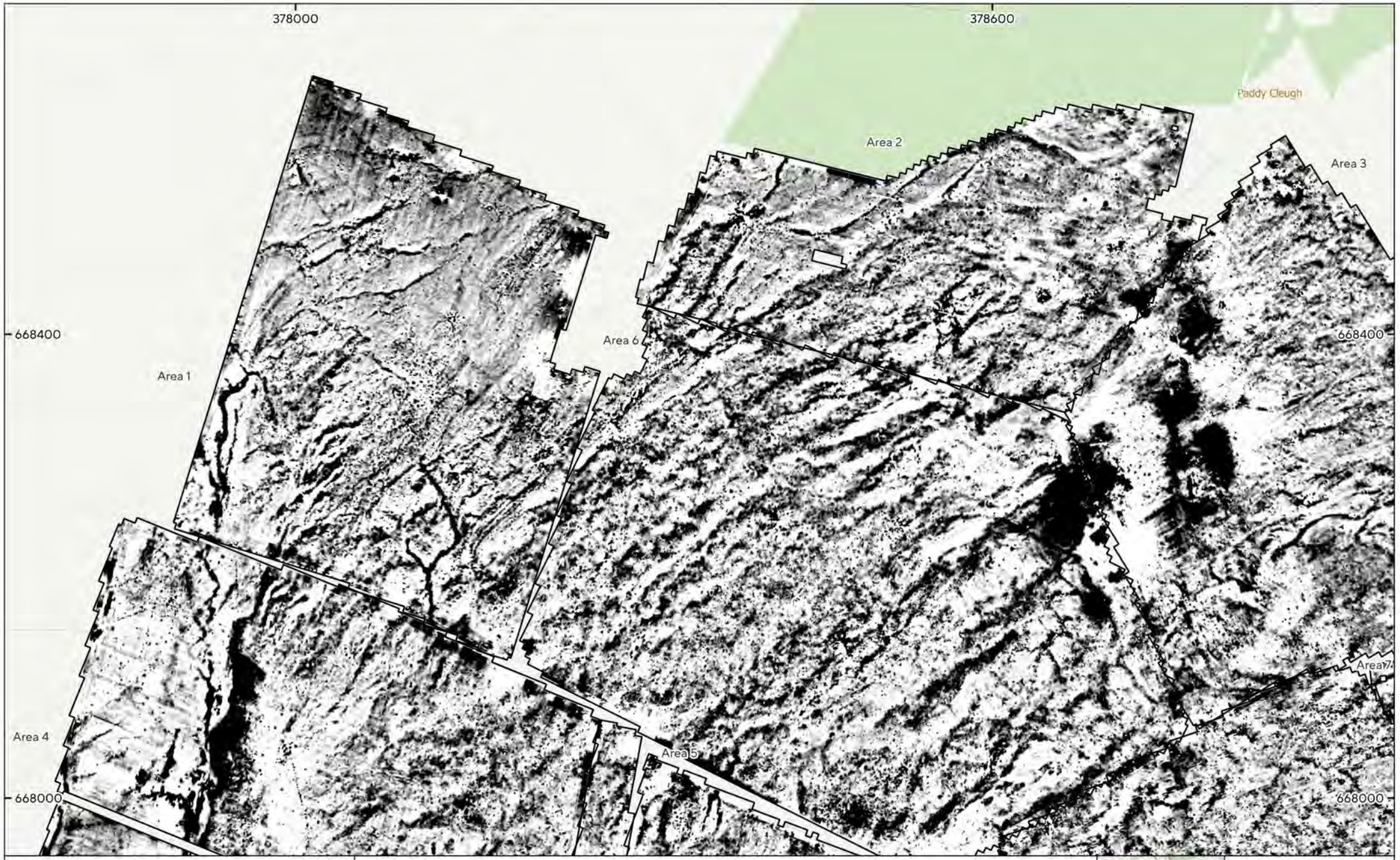
Magnitude Surveys

MSNT1874 - Bowshiel, Scottish Borders
Figure 4 - Magnetic Interpretation over Historical Mapping and Satellite Imagery Overview (Area 2 (West), 3, 5 & 6 (West), 7 (North), 8, 9, 14 (North), 15 & 16 (North))
1:3,000 @ A3

- Archaeology Possible (Weak)
- Agricultural (Weak)
- Natural (Strong)
- Natural (Weak)
- Natural (Spread)
- Lighting Strike
- Undetermined (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Ferrous (Spike)

Magnitude Surveys

30 60 90 120 m



MSNT1874 - Bowshiel, Scottish Borders
Figure 5 - Magnetic Total Field Overview (Area 1, 2, 3 (West), 4 (North), 5 (North), 6 & 7 (North))
1:3,000 @ A3

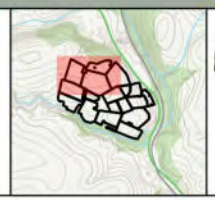
48,997 49,005

Magnitude Surveys

30 60 90 120 m

MSNT1874 - Bowshiel, Scottish Borders
Figure 6 - Magnetic Interpretation over Historical Mapping and Satellite Imagery Overview (Area 1, 2, 3 (West), 4 (North), 5 (North), 6 & 7 (North))
1:3,000 @ A3

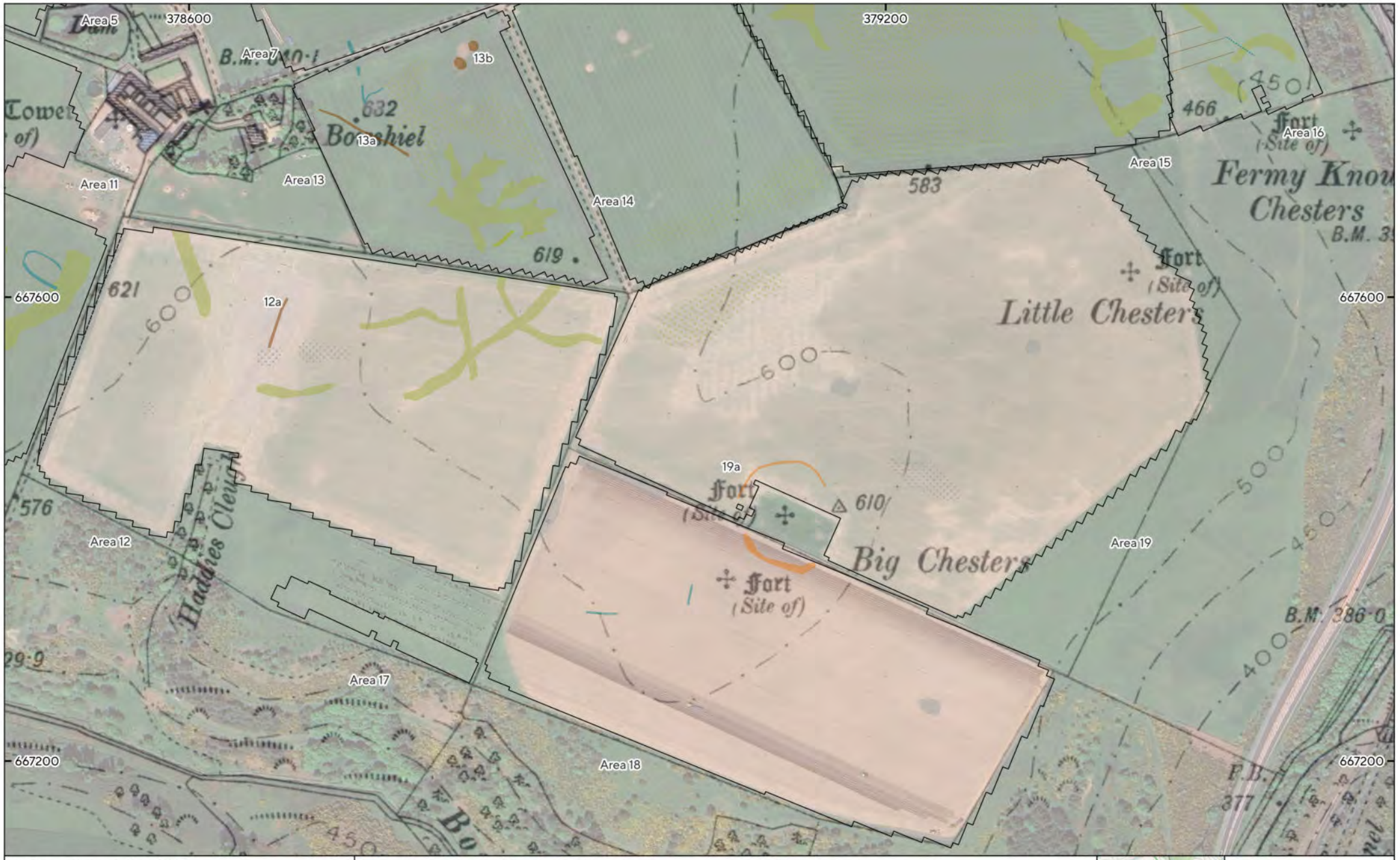
- Archaeology Possible (Weak)
- Agricultural (Spread)
- Natural (Strong)
- Natural (Weak)
- Natural (Spread)
- Lighting Strike
- Undetermined (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Formor Agricultural (Trend)
- Agricultural (Trend)
- Ferrous (Spike)



Magnitude Surveys

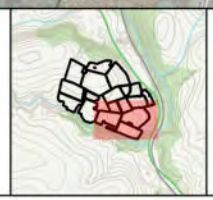
30 60 90 120 m

MSNT1874 - Bowshiel, Scottish Borders
Figure 7 - Magnetic Total Field Overview (Area 7 (South), 11 (West),12, 13, 14, 15 & 16 (South), 17, 18 & 19)
1:3,000 @ A3



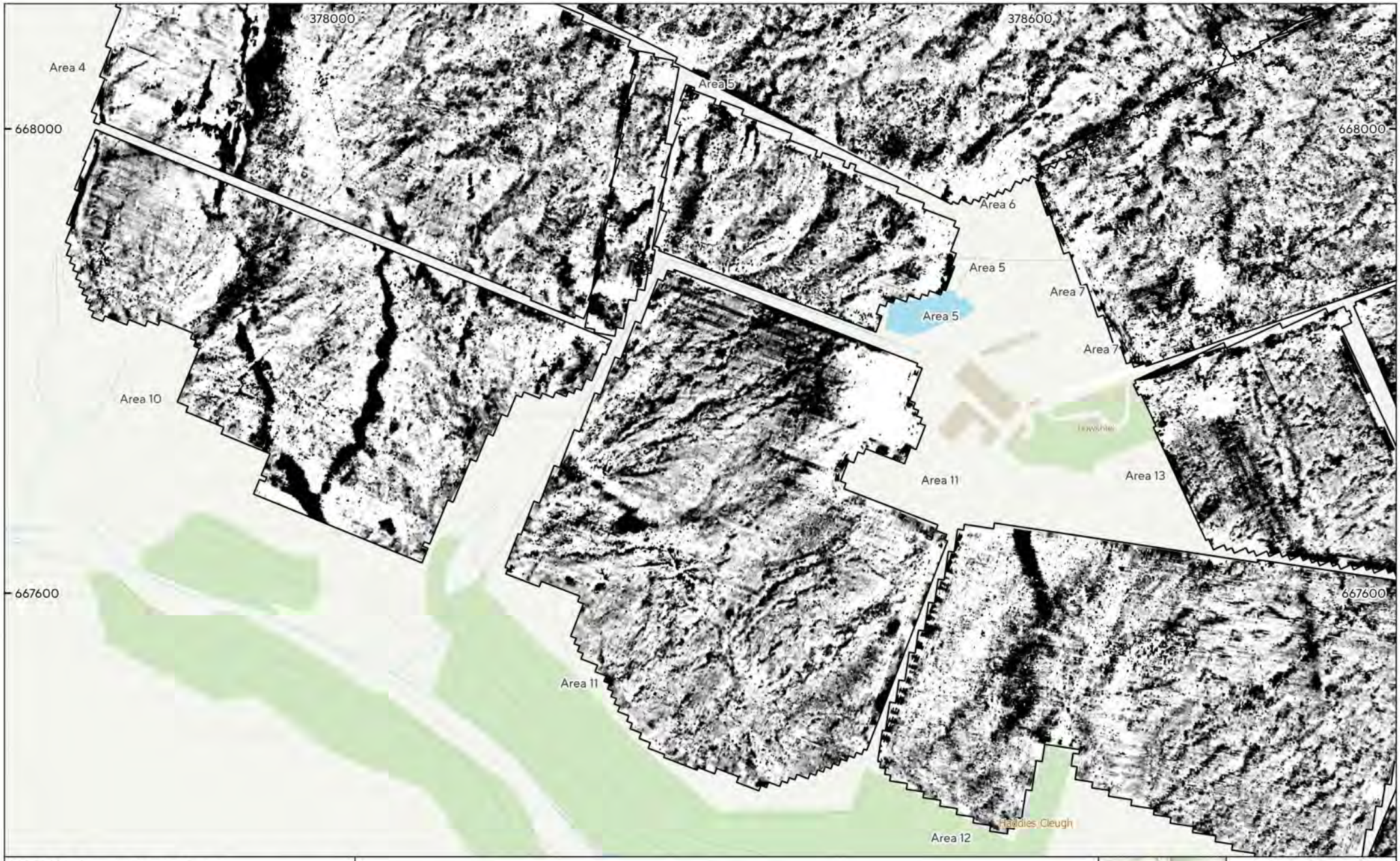
MSNT1874 - Bowshiel, Scottish Borders
Figure 8 - Magnetic Interpretation over Historical Mapping and Satellite Imagery Overview (Area 7 (South), 11 (West),12, 13, 14, 15 & 16 (South), 17, 18 & 19)
1:3,000 @ A3

- Archaeology Possible (Weak)
- Agricultural (Weak)
- Natural (Strong)
- Natural (Weak)
- Natural (Spread)
- Undetermined (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Undetermined (Trend)
- Agricultural (Trend)
- Service
- Ferrous (Spike)



Magnitude Surveys

30 60 90 120 m



MSNT1874 - Bowshiel, Scottish Borders
Figure 9 - Magnetic Total Field Overview (Area 4 (South), 5, 6 (South), 7 (West), 10, 11, 12 & 13)
1:3,000 @ A3

48,997 49,005

Magnitude Surveys

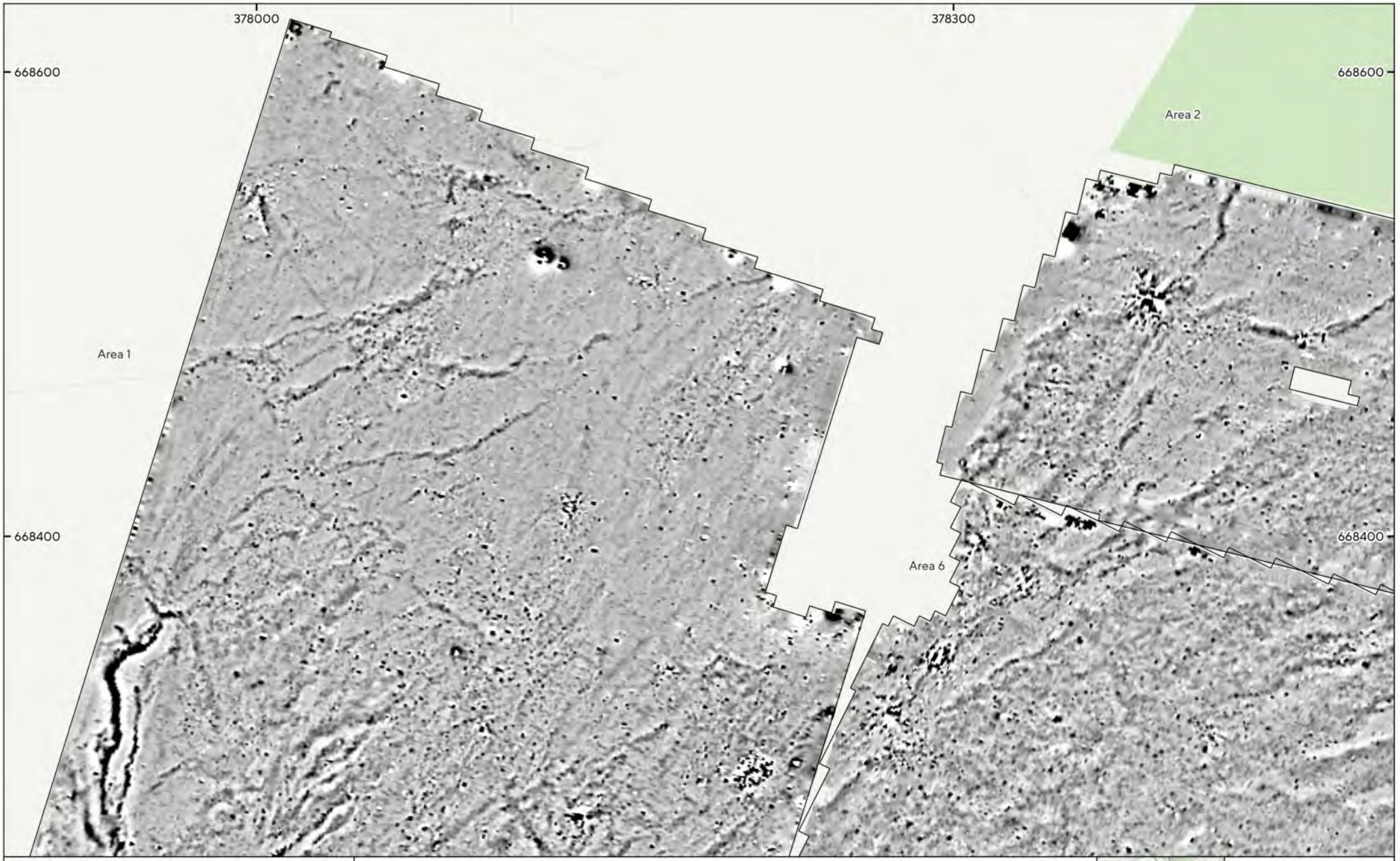
30 60 90 120 m

MSNT1874 - Bowshiel, Scottish Borders
Figure 10 - Magnetic Interpretation over Historical Mapping and Satellite Imagery Overview (Area 4 (South), 5, 6 (South), 7 (West), 10, 11, 12 & 13)
1:3,000 @ A3

- Archaeology Possible (Weak)
- Agricultural (Weak)
- Agricultural (Spread)
- Archaeology Possible (Strong)
- Natural (Strong)
- Natural (Weak)
- Natural (Spread)
- Lighting Strike
- Undetermined (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Formor Agricultural (Trend)
- Agricultural (Trend)
- Service
- Ferrous (Spike)

Magnitude Surveys

30 60 90 120 m

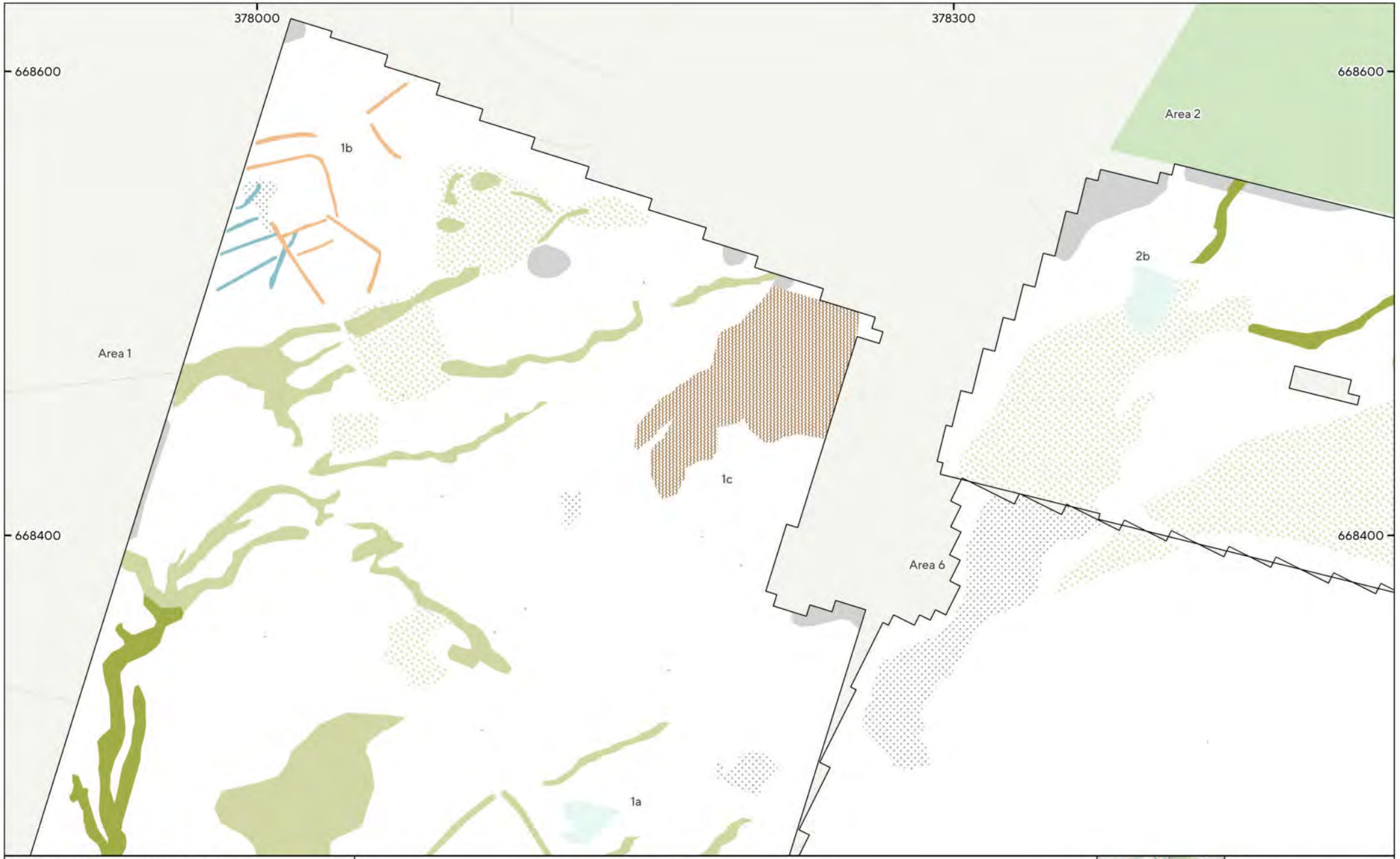


MSNT1874 - Bowshiel, Scottish Borders
Figure 11 - Magnetic Gradient (Area 1 (North), 2 (West) & 6 (North-west))
1:1,500 @ A3

-3 nT 5

Magnitude Surveys

0 15 30 45 60 m

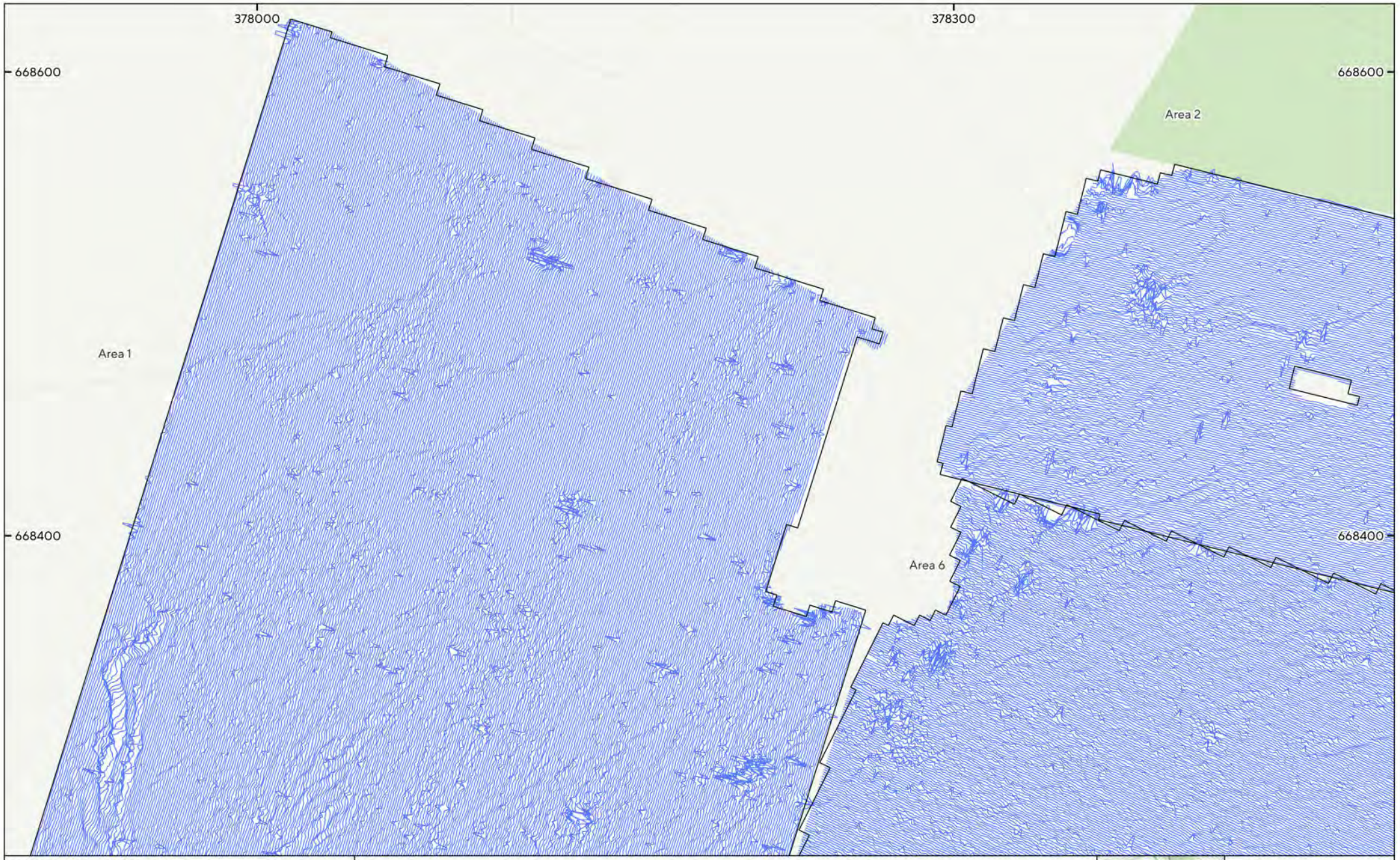


MSNT1874 - Bowshiel, Scottish Borders
Figure 12 - Magnetic Interpretation (Area 1 (North), 2 (West) & 6 (North-west))
1:1,500 @ A3

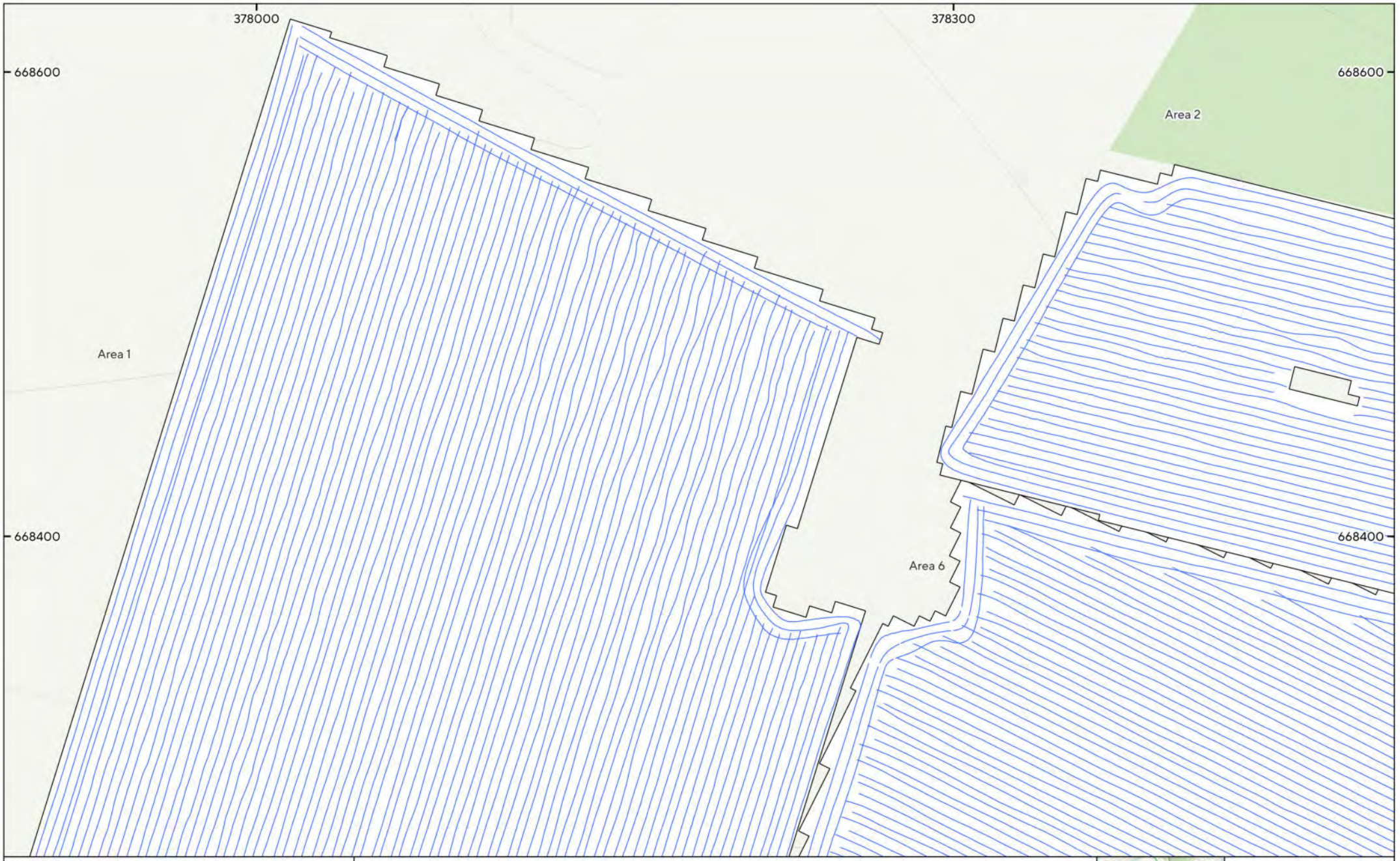
- Agricultural (Spread)
- Archaeology Possible (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Natural (Strong)
- Natural (Weak)
- Undetermined (Weak)
- Lighting Strike
- Ferrous (Spike)

Magnitude Surveys

0 15 30 45 60 m



MSNT1874 - Bowshiel, Scottish Borders
Figure 13 - XY Plot (Area 1 (North), 2 (West) & 6 (North-west))
1:1,500 @ A3 30nT/cm at 1:1,500 @ A3

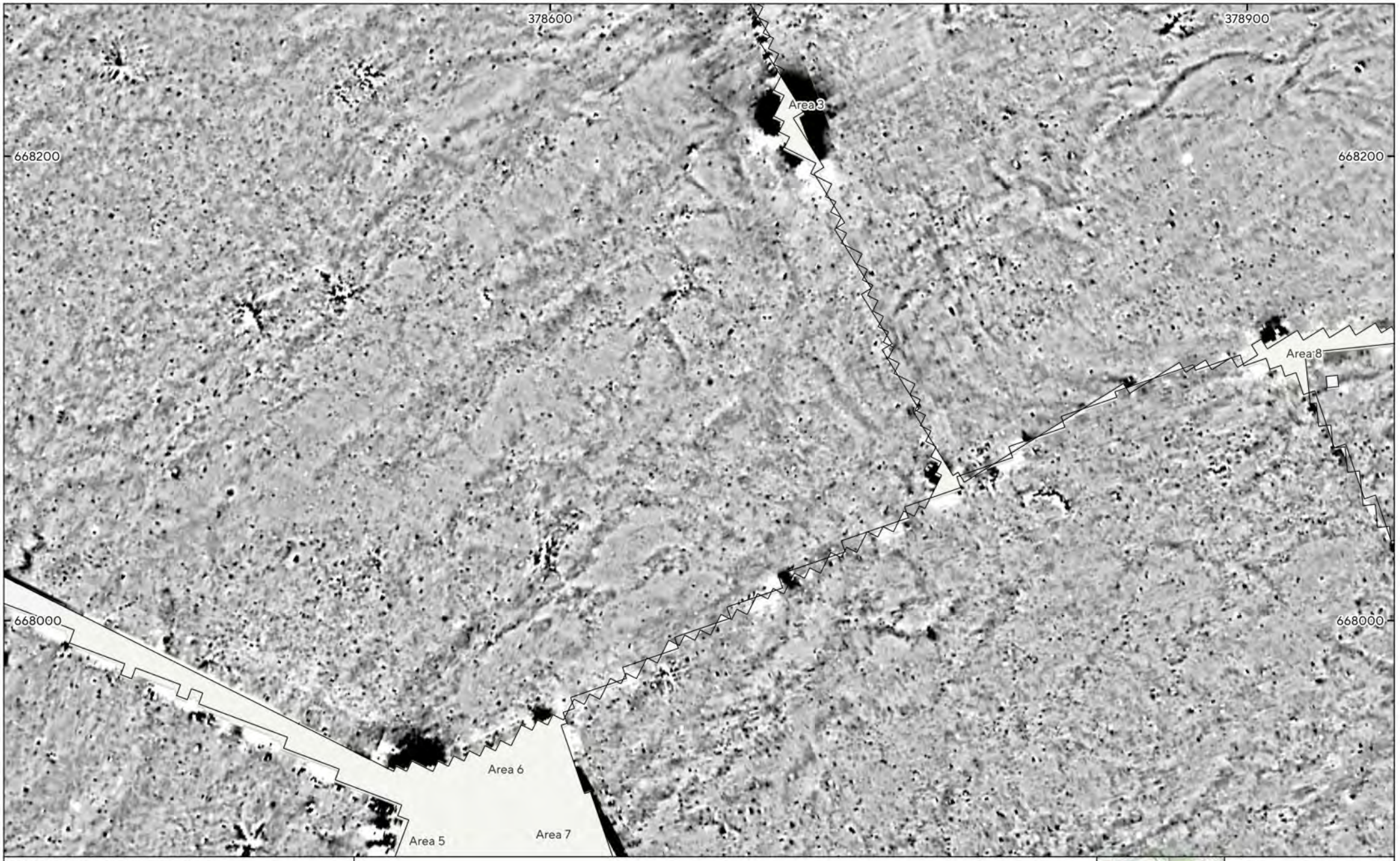


MSNT1874 - Bowshiel, Scottish Borders
Figure 14 - GNSS Plot (Area 1 (North), 2 (West) & 6 (North-west))
1:1,500 @ A3

GNSS Lines

Magnitude Surveys

0 15 30 45 60 m



MSNT1874 - Bowshiel, Scottish Borders
Figure 15 - Magnetic Gradient (Area 3 & 8 (South-west), 5 (North-east), 6 (South-east) & 7 (North-West))
1:1,500 @ A3

-3 nT 5

Magnitude Surveys

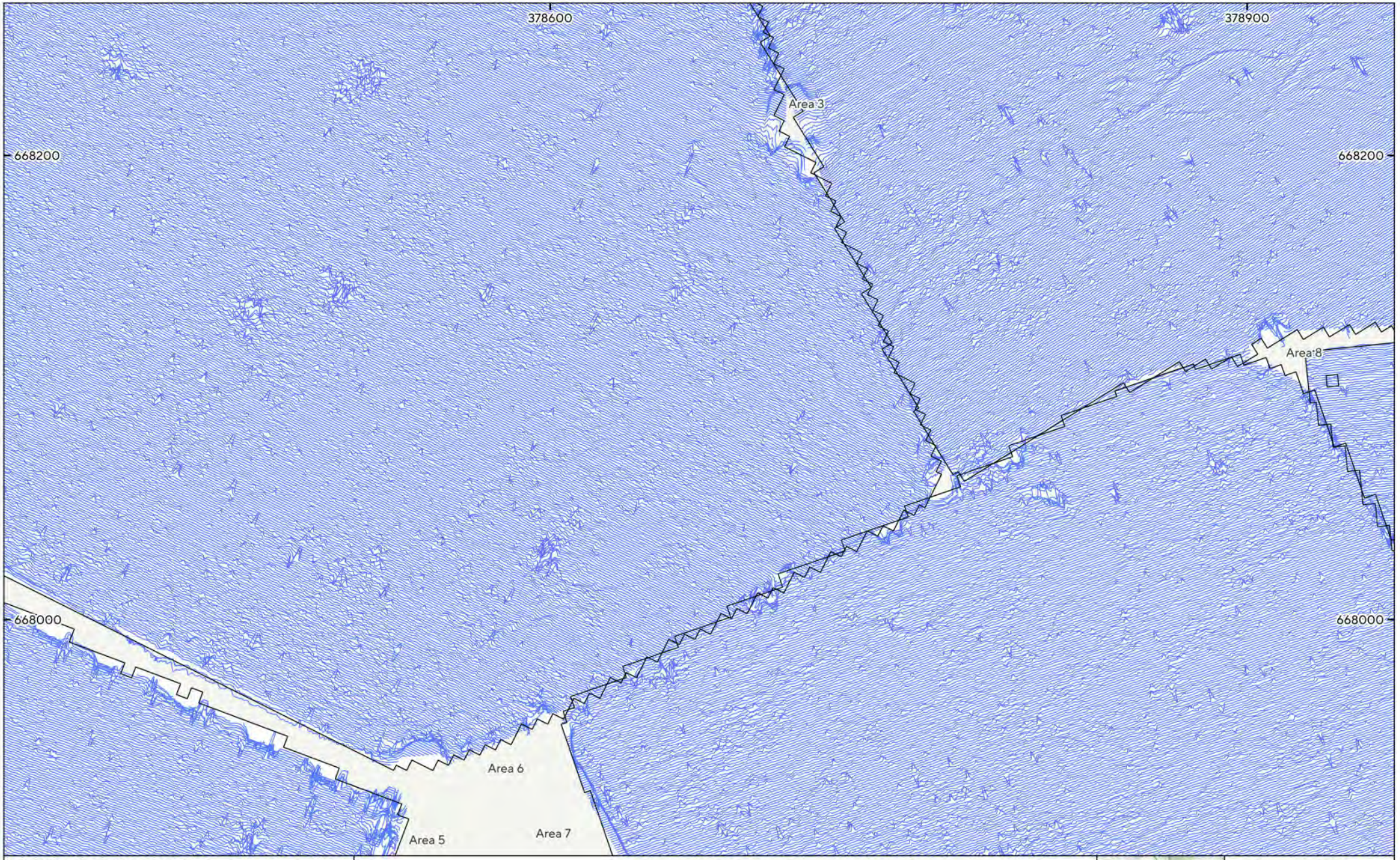
0 15 30 45 60 m

MSNT1874 - Bowshiel, Scottish Borders
Figure 16 - Magnetic Interpretation (Area 3 & 8 (South-west), 5 (North-east), 6 (South-east) & 7 (North-West))
1:1,500 @ A3

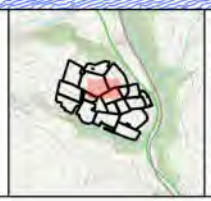
- Archaeology Possible (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Natural (Weak)
- Undetermined (Weak)
- Lighting Strike
- Ferrous (Spike)

Magnitude Surveys

0 15 30 45 60 m

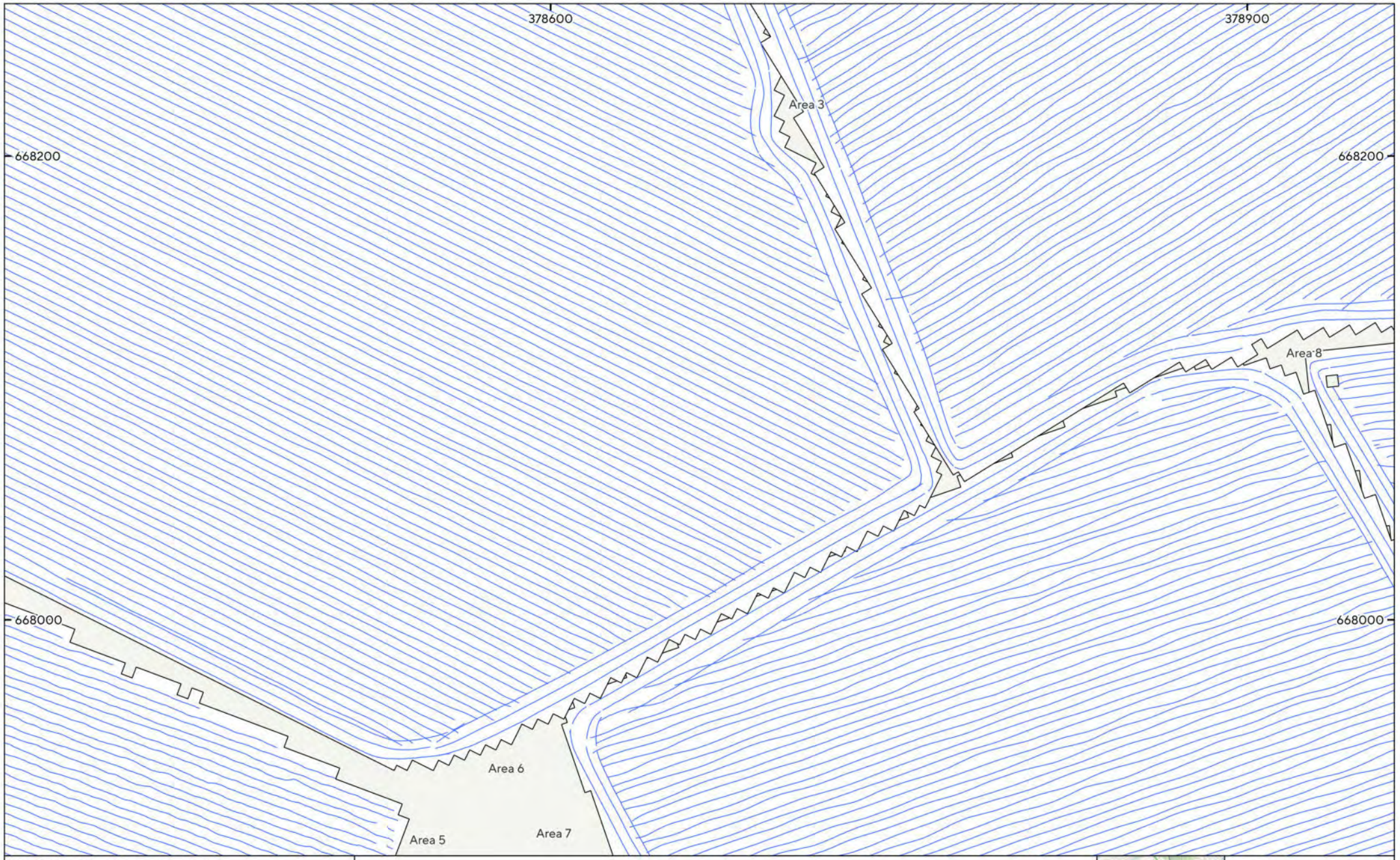


MSNT1874 - Bowshiel, Scottish Borders
Figure 17 - XY Plot (Area 3 & 8 (South-west), 5 (North-east), 6 (South-east) & 7 (North-West))
1:1,500 @ A3 30nT/cm at 1:1,500 @ A3



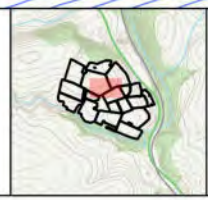
Magnitude Surveys

0 15 30 45 60 m



MSNT1874 - Bowshiel, Scottish Borders
Figure 18 - GNSS Plot (Area 3 & 8 (South-west), 5 (North-east), 6 (South-east) & 7 (North-West))
1:1,500 @ A3

GNSS Lines



Magnitude Surveys

0 15 30 45 60 m

MSNT1874 - Bowshiel, Scottish Borders
Figure 19 - Magnetic Gradient (Area 6 (South), 5 & 11 (East),12 (North),13, 7 & 14 (West))
1:1,500 @ A3

-3 nT 5

Magnitude Surveys

0 15 30 45 60 m

MSNT1874 - Bowshiel, Scottish Borders
Figure 20 - Magnetic Interpretation (Area 6 (South), 5 & 11 (East),12 (North),13, 7 & 14 (West))
1:1,500 @ A3

- Agricultural (Weak)
- Archaeology Possible (Weak)
- Magnetic Disturbance
- Ferrous/Debris (Spread)
- Natural (Spread)
- Natural (Strong)
- Natural (Weak)
- Undetermined (Weak)
- Lighting Strike
- Service
- Former Agricultural (Trend)
- Ferrous (Spike)

Magnitude Surveys

0 15 30 45 60 m

MSNT1874 - Bowshiel, Scottish Borders
Figure 21 - XY Plot (Area 6 (South), 5 & 11 (East),12 (North),13, 7 & 14 (West))
1:1,500 @ A3 30nT/cm at 1:1,500 @ A3

Magnitude Surveys

0 15 30 45 60 m