Geophysical Survey Report: Sloden Inclosure

NGR: SU 2904 1302

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Abbreviations

BU	Bournemouth University
DBA	Desk-Based Assessment
EAC	European Archaeological Council
FE	Forestry England
GIS	Geographical Information System
HE	Historic England
HER	Historic Environment Record
NFNPA	New Forest National Park Authority
NGR	National Grid Reference
RB	Romano-British
RCHME	Royal Commission on the Historical Monument of England
SSSI	Site of Special Scientific Interest
WSI	Written Scheme of Investigation

Project Summary

Title	Geophysical Survey of Romano-British Pottery Kilns at Sloden Inclosure
Location	Sloden Inclosure, New Forest National Park, Hampshire
NGR	SU 2094 1302
Site Status	Scheduled Ancient Monument
Techniques	Rapid Gradiometer and Magnetic Susceptibility survey
Date of Fieldwork	12/03/2019 to 20/03/2019
Date of Report	15/06/2019
Project Team	Jack Brown, James Brown, Lawrence Shaw and the NFNPA Volunteers
Project Supervisors	James Brown and Lawrence Shaw
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Location of Archive	NFKnowledge.org

Summary of Results

In March 2019, a geophysical survey was undertaken at Sloden Inclosure, New Forest by the NFNPA. The techniques employed were magnetometry and magnetic susceptibility.

The survey encompassed four areas totalling 2.025 hectares. The results of the survey identified known archaeology sites as well as potential new archaeological anomalies in these areas.

The archaeology anomalies were six of the nine known scheduled kilns, a suggested Iron Age Hillfort and Post-Medieval enclosure. The kilns were excavated by Heywood Sumner in the 1920s and Vivian Swan in the 1960s.

The magnetometry survey revealed that the six kilns were not accurately located within their scheduling.

Some modern disturbances were recorded, and it is most likely that they link to the modern forestry activity.

A magnetic susceptibility was further employed over one of the kilns sites confirmed by the magnetometry results. The results of the magnetic susceptibility survey supported the results seen in the gradiometer survey.

1.0 Introduction

In March 2019, a magnetometry and magnetic susceptibility survey was undertaken at Sloden Inclosure, New Forest (NGR: SU 2094 1302) by the NFNPA. The purpose of the survey was to confirm the location of known recorded RB pottery kilns that are situated within the inclosure (Monument No: 1003458).

The survey took place from the 12th March 2019 to the 20th March 2019 with the consent of the Forestry England who manage the land on behalf of the Crown Estate. The RB kilns are scheduled monuments, so a section 42 license was required, which was obtained from Rebecca Lambert, Inspector of Ancient Monuments. (Historic England ref: AA/06225/5).

1.1 Survey Objectives

The survey consisted of several objectives:

- To Identify previously unknown archaeological deposits and features that are associated with the known sites
- To accurately locate the kilns in regard to their scheduling
- To locate the past excavations and define their extents
- To be able to interpret the relationship between the kilns and the Iron Age Hillfort (Local Number: 19822) and Post-Medieval sub-rectangular enclosure (Local Number: 19739)

1.2 Site Location

The focus of the study area is Sloden Inclosure, located in the civil parish of Hyde in the New Forest National Park (**Figure 1 & 2**). Sloden Inclosure encompasses 120 hectares of mixed woodland that is designated as a SSSI.

1.3 Site Geology

Sloden Inclosure lays upon a mixed geology. The bedrock geology of the inclosure (**Figure 3**) consists of Poole Formation (sand, silt, clay), Barton Formation (clay) and Selsey Sand Formation (sand, silt, clay). The Superficial geology of the inclosure (**Figure 4**) consists of river terrace deposits (sand and gravel) and Alluvium (silt, sand, clay, gravel). There are also areas that are defined as ‘Head’ and these consist of deposits such as gravel, clay and sand (BGS Survey 2011).

1.4 Archaeological Background

Prior to the standard of archaeological recording set by Pitt-Rivers, John Wise investigated the Sloden Inclosure in the 1860s for any undisturbed pottery kilns. In his attempts to locate a kiln, Wise opened up various points in the inclosure but was met with no success (Wise 1895, page 216). It is unclear whether Wise excavated in areas near to the known scheduled kilns as he does not reference his excavations to any location.

Sloden Inclosure was first systematically examined on by Heywood Sumner from 1915 – 1927, during which he excavated five kilns. Sumner’s work expanded the understanding on RB pottery kilns and it’s New Forest industry.

Archaeological investigation on the site ceased until the FE prompted excavation to avoid damage to any sites that would occur from their upcoming forestry activities. Consequently, Vivien Swan excavated two kilns in lower Sloden in 1966, of which the exact location of these kilns is unknown. In 1969, Swan re-excavated a kiln dug by Sumner in 1925.

In 1989, the Hampshire Field Club and Archaeological Society commenced annual seasons of excavation at Sloden Inclosure. Finds were initially limited to sherds of pottery but in the 1990 excavation, a pottery kiln was identified along with sherds of pottery. However, the kiln is unexcavated (Pasmore 1991, page 10).

PastScape mentions that a non-intrusive survey was conducted in 1993 within the Sloden Inclosure by the Geophysical Surveys of Bradford (see **Appendix 4**). The choice of survey was Magnetometry and was commissioned by the RCHME. The survey recorded the remains of three possible kilns and associated features. The survey was limited by the dense undergrowth and a fallen tree, which may have led to more subtle features not being detected. Presently, the report for this survey is not available and hence, the location of these kilns is unknown.

1.5 Hampshire Heritage Environment Record Entries

The Hampshire HER data identifies 118 archaeological sites within a 1km radius of the centre of Sloden Inclosure (**Figure 5**). From the 118 archaeological sites, 10 are deemed to be of national importance and protected by scheduling. The 10 Scheduled Monuments within Sloden Inclosure include nine RB pottery kilns that are grouped under one listing (List ID 1003458). In addition to this, to the south of Sloden lies a medieval hunting lodge (List ID 1016525).

From the Prehistoric period, there are five monuments and one findspot that have been dated to this time. These monuments consist of Iron Age enclosures, Bronze Age burnt mounds and a Neolithic scraper.

The HER data lists 45 entries for the Roman period. These monuments range from the scheduled pottery kilns to find-spots of pottery and quarries.

The HER data contains five finds that can be dated to the Medieval period. These include the scheduled hunting lodge, banks, pounds and an abandoned settlement.

The HER data dates 20 monuments to the post-medieval period. These include a sub-rectangular enclosure, timber plantations, banks and ditches.

The HER data also lists several features that are either undated or have been dated with a wide range expanding over several periods. There are 43 undated monuments within the area. These include banks, ditches, sandstone quarries and clay pits.

2.0 Methodology

2.1 Magnetometry Survey

A magnetometer survey was carried out by using a Bartington GRAD601-A fluxgate gradiometer. The survey was undertaken in a gridded manor, using 20 x 20m grids. The traverse separation was 0.5m and the equipment recorded 8 samples per metre. Due to the environment, a parallel method was chosen for this technique with each survey beginning in the South-West and heading North. The units were measured in nanoTesla (nT) and the range of the equipment was 1000 nT. Once the targeted area was surveyed, the data was transferred from the gradiometer to the laptop.

The area survey was split into 4 areas: Area A-D. **Table 1** shows the area each site covered by the gradiometer in hectares. See **Figures 1** & **2** for the location of the survey areas.

Table 1: Total amount of each area covered by magnetometry in hectares

AREA NAME	AREA SURVEYED IN HECTARES (HA)
A	0.712
B	0.274
C	0.254
D	0.785
TOTAL	2.025

2.2 Magnetic Susceptibility

Rapid magnetic susceptibility was undertaken across the survey areas: A-D. The reason for this was to roughly locate the scheduled kilns and consequently, assist in deciding the most suitable areas to survey with the magnetic gradiometer. This was undertaken with a Bartington MS3 and only one detailed survey was undertaken which was grid B3.

The MS3 had a traverse separation of 1m, whilst taking readings every 1m. The readings are measured in χm and the survey area can be seen in F**igure 1** & **2**. The grid was situated upon what we presumed to be informed by the magnetometer survey to be the kiln (**Figure 18**). As oppose to the gradiometer that was limited by the terrain, the MS3 Bartington was not affected by the terrain.

2.3 GPS and Total Station

The survey grids were set out to the ordnance survey OSGB36 datum by using a combination of Arc-GIS, Leica VIVA differential GPS and a Lecia TS06 Total Station. A limitation of using GPS at this site was that the density of trees prevented a clear signal for the GPS. This would lead to the GPS accuracy being lessened. To overcome this obstacle, the total station was used to capture specific coordinates of grids.

2.4 Survey Considerations

Each area consisted of woodland that did affect the standard of surveying (see **Plates 1-10**). Area A was the only survey area that contained some open grassland area that was favourable for surveying (**Plate 1**). The rest of the survey areas consisted of conditions that were challenging.

The terrain had various obstacles such as trees, fallen trees and piles of dead bracken. Surveying in such conditions did impede the ability of the operator and there was a risk that the equipment would be knocked, which resulted in high increased noise levels and even spurious anomalies (Gaffney & Gater 2003, page 80). Moreover, the site area consisted of abandoned fence posts and loose metal wiring, which were difficult to notice and may have been surveyed. This would have created a magnetic disturbance in the results.

Area B consisted of tree throws and stumps that were uneven and difficult to survey over. The tree stumps are the remaining features of the trees that once covered this area. An aerial photograph from 1940 depicts the survey area consisting of several trees (**Figure 17**).

The suggested location for the kiln for area C was near to a metal wired fence. This created implications for the surveying, specifically the laying out of grids as the metal wired fence cuts through the targeted area. Disturbance from the wired fence can be seen in the data as dipoles running in a linear direction from west to east (See **Plate 8**). Gaffney & Gater (2003, page 81) state that the general rule is to acquire data at least 1m away from the fence and disturbances can be detected from up to 5m away. The survey team chose to ignore this rule due to the priorities of the survey objectives.

Survey areas B, C and D contained visible pottery sherds on the topsoil. Pottery sherds are often found in dumps or spreads near kilns. (Historic England 2015, page 41). Therefore, to corroborate an interpretation of a kiln from the geophysics data, a spread of pottery sherds provides evidence to support the interpretation.

The pottery sherds may have influenced results in the magnetic susceptibility results as this equipment only measures the topsoil magnetic variance, which is where the pottery is situated. As the pottery is subjected to firing, it could be probable that the objects may create some bias on the magnetic susceptibility data.

The weather was considered to be favourable with sunny and windy conditions being present throughout the survey. Only one day consisted of heavy rain and wind, in which the extent of surveying that day was limited to the open grassland of Area A.

2.5 Post-Survey Processing

The data from the magnetometer surveys were processed through Terra Surveyor. The data from the magnetic susceptibility survey was processed through Arc-GIS. The GPS grids and mapping were processed through Arc-GIS. This report was produced by using Microsoft Word 2016.

2.5.1 Terra Surveyor

To emphasise the anomalies in the data set, the raw gradiometer data was processed. When data is processed, original raw data is being removed to enhance the image. Therefore, it is important to both minimalize the amount of processing so that there is a minimal amount of data being lost and to record the processes clearly. Therefore, processing steps were limited to ‘Clip’ and ‘Destripe’ (See **Appendix 1** for the processing steps for each area).

2.5.2 Arc-GIS

Arc-GIS was used to interpret and process the magnetic susceptibility results. Using Arc-GIS, a spot plot was created (**Figure 14 & 15**) with the numbers that were plotted during the data collection. Finally, Arc-GIS was also used to generate a kriging image that reflected the magnetic magnitude in the soil (**Figure 16**).

3.0 Results

3.1 Magnetometry Survey

The results have been displayed as greyscale plots (raw data) and trace plots. **Figures 6-9** represent the gradiometer data for each area. **Appendix 2** shows the trace plots for each area.

In total, the results identify six anomalies of high magnetism across all areas, with the average reading of these anomalies of 140nT. Gaffney and Gator (2003, page 156) note an example of a gradiometer survey undertaken at Sloden over a suspected RB kiln, which produced a strong anomaly of over 100nT (See **Appendix 4** for the trace plot). The results of Area A and D also display the 1920 excavations undertaken in these areas. There are a number of curvilinear, linear and irregular features that are present in the results for each area. There are numerous anomalies that may represent dipoles and is most likely signs of ferrous debris.

Table 1 list out certain terms that may be used to classify the anomalies.

Table 1: List of terms used to classify responses

Category	Description
Possible Archaeology	Responses similar to archaeological features but may not be morphologically discrete of definitive. These are often positive linear, curvilinear, circular or rectangular purposes
Dipolar	An isolated positive response with associated negative features
Magnetic Disturbance	Numerous dipolar responses scattered across an area. A higher amplitude response indicates ferrous debris, a moderate response indicates potential thermoremanent material, and a lower amplitude response indicates a general ground disturbance
Archaeology	Responses from known, extant archaeological features; visible in lidar surveys or recorded with accurate location details

3.2 Magnetic Susceptibility Survey

The result of this technique is displayed in **Figures 14-16**.

The results of the magnetic susceptibility survey display an area of high magnetic responses with the highest reading being 256 χm. The spot plot (**Figure 14** & **15**) shows an area of high magnetic responses in the North East corner of the survey area. The responses emitted readings of 102 χm to 256 χm around a 9m diameter.

Area B was subjected to a windblown event where a majority of trees created up casts. **Figure 17** displays Sloden and the survey areas as seen from above in 1940. It is clear that the trees were still in place and so, the windblown event must have occurred between 1940 and now. This is an important event as it may affect the results of the magnetic susceptibility survey. There is potential for these up casts to have moved pottery sherds and soil that consisted of higher magnetised properties than the surrounding soil.

Furthermore, area B was subjected to animal burrowing, caused by rabbits and moles. The disturbance caused may present some bias in the results for this area.

In 1920, Sumner notes the obstruction of trees preventing excavation and so, he decided to excavate a series of test pits across Area B (1927, page 57). It may be that this area of high magnetism correlates with the disturbed soils associated with this activity. This would have caused some extent of disturbance to the area, which might be reflected onto our results. Despite this, the results appear to compliment the gradiometer results for area B.

4.0 Interpretation

4.1 Magnetometry Survey

The interpretation of the gradiometer results can be seen in **Figures 10-13**. For each area surveyed, the anomalies will be given the associated letter to the survey area (i.e. A1). It is important to note that the gradiometer data will consist of responses that are broader than the actual size of the feature (Gaffney & Gator 2003, page 113).

<u>Area A</u>

The interpretation of the results for Area A is shown in **Figure 10**.

A1 is a weak positive linear anomaly that is up to 51m in length and is SSW – NNE aligned. **A1** may represent a linear cut feature such as a hollowed path or trackway.

A2, **A6**, **A11**, **A16** have been characterised as dipoles.

A3-**A5** and **A17** are circular positive anomalies. Each anomaly is c. 2m in diameter and have been interpreted to be possible archaeology. Excavation would be required to identify whether or not the features are archaeology.

A12 and **A13** are ring shaped anomalies that have positive responses and are 10m and 12m in diameter, respectively. These anomalies have been interpreted to be possible archaeology. Excavation would be necessary to determine whether it is archaeology or not.

A7 is a 16m wide area that consists of both positive and negative responses. Gaffney & Gater (2003, page 111) state that past excavations can be identified in gradiometer surveys as the area will consist of magnetic signals that are contained to a well-defined boundary. This is evident in this case and it is known from Sumner's 1927 publication that he excavated this kiln in 1920 (Sumner 1927, page 50-52). Hence, **A7** may be interpreted to be the past excavation of the RB kiln.

A8-**A10** and **A15** are known archaeological features. **A8** is a circular anomaly with high positive readings. This has been interpreted to be the RB kiln that is situated in this area. This interpretation is corroborated by descriptive accounts of Sumner's excavations of the Sloden kilns (Sumner 1927, page 50-52). It should also be noted that **A8** cuts into the bank of the Iron Age hillfort (**A9** & **A10**) and that the kiln can be seen in the lidar data as a depression (**Appendix 5**).

A9 and **A10** are positive linear anomalies that are E-W aligned and are both 90m in length. The anomalies are most likely to be in-filled cut features as the soil is more magnetically enhanced than the surrounding soil. When the gradiometer data is compared with the lidar data, it becomes clear that **A9** and **A10** are associated with the Iron Age Hillfort (Local Number: 19822), possibly representing ditches.

A15 is a slightly negative curvilinear that is E-W aligned and is 61m in length. Negative linear anomalies are representative of banks where the material consists of lower magnetic readings than the surrounding soil has built up. Comparing the gradiometer data to the lidar data for this area reveals that **A15** is the bank to the post-medieval sub-rectangular enclosure (Local Number: 19739).

A18 is a couple of anomalies that are SW of the RB kiln (D8) and they consist of enhanced positive readings. **A18** coincides with the Iron Age Hillfort and so, there may be an association. It is difficult to interpret what **A18** might be and further investigation, such as excavation, will be required to determine whether it is archaeological or not.

Area B

The interpretation of the results for Area B is shown in **Figure 11**.

B1 is an irregular shaped anomaly that consists of high positive readings. The anomaly is 6m in length and has been interpreted to be the RB kiln. This interpretation is supported by the abundance of pottery sherds that are present in this area as well as the descriptive account of Sumner who investigated the kiln in 1920 through a series of test pits (Sumner 1927, page 57). It should also be noted that the kiln is located on the ditch of the Iron Age hillfort (**Appendix 5**).

B2 and **B3** are considered to be the same anomaly that is a S-NNE aligned positive linear and is 61m in length. When the lidar data is overlying the gradiometer results, it can be seen that **B2** and **B3** are part of the ditch to the Iron Age Hillfort. The reason for the distinction between the two is that **B3** consists of higher positive readings than **B2**. This is most likely the result of the waste material from the kiln, **B1**, which magnetically enhanced the ditch fill in the area.

B4-**B7** have been interpreted to be dipoles.

B8 is an area that is 24m in diameter and consists mostly of negative readings with some positive readings. Sumner (1927, page 57) notes that the area is covered in trees which prevented any excavation from occurring and test pits were undertaken instead. The disturbance of the soil may be the reason for the difference in the magnetic magnitude between the area and the surrounding soil. As previously mentioned in **section 2.4**, a windblown event occurred in the inclosure between 1940 and the present day. This event would have caused substantial ground disturbance and could be a reason for the difference in the magnetic responses. It is possible that the response is an indicator of either possible thermoremanent material or a general disturbance of ground (**Table 1**) as there is evidence of an RB kiln that is situated within this anomaly (**Figure 11**). Therefore, **B8** has been characterised as magnetic disturbance.

Area C

The interpretation of the results for Area C is shown in **Figure 12**.

C1 is an oval positive anomaly that is roughly 5m in diameter. This anomaly has been interpreted to be the RB kiln. One reason for this interpretation is that the anomaly consists of high positive readings, which may be interpreted as a thermoremanent response. This is where the feature has been subjected to firing and as a result, it has acquired a magnetic field. This is common with kilns as they have been fired in situ and hence, will appear on the gradiometer data as strong positive responses. Furthermore, the interpretation is corroborated by the large spread of pottery sherds within the area. The kiln was located by Sumner in 1920 (Sumner 1927, page 85), in the 1960s by Pasmore (Fulford 2000 page 143) and is visible in the lidar data as a raised platform (**Appendix 5**). Moreover, a kiln should give off high value readings, as Clark (1996, page 80) states that the readings of a kiln can be as great as 500nT. From the trace plot (**Appendix 2**), it can be seen that the highest reading is 270nT, thus further supporting the interpretation of **C1** being the RB kiln. There is a distinct visual difference in the gradiometer results when comparing **C1** to the rest of the kilns. There is less 'noise' in the area surrounding **C1** compared to the rest. Moreover, Fulford (2000, page 143) notes that this is the location of a probable kiln site. Therefore, **C1** has been interpreted to be an unexcavated kiln.

C2-**C7** are a grouping of anomalies that are circular in shape and no greater than 3m in size. Each anomaly comprises of positive responses. Excavation of these features would be required to determine whether this interpretation is true and to determine whether it is archaeological or not.

C8-**C14** have been characterised as dipoles This is most likely to be the result of the metal wired fence that dissects the two survey areas (Previously mentioned in **section 2.4**)

C15 and **C17** are both weak positive linear response and are 20m and 40m respectively in length. **C17** has been interpreted to be a trackway as when the gradiometer data is overlying the lidar data, the trackway can be seen clearly [**Appendix 5**).

Unlike **C17**, **C15** does not have a clear impression on the lidar data, which may be an indicator that **C15** is not a trackway (**Appendix 5**). Due to the appearance of the **C15**, it may be interpreted to be a ditch. Therefore, **C15** has been characterised as possible archaeology and excavation of the anomaly would be necessary to determine whether it is archaeology.

C16 is a semi-circular area of positive responses and has been characterised as archaeology as it corresponds to the raised floor, which the kiln sits within [**Plate 8**]. This interpretation is supported by the spread of loose pottery amongst the topsoil in this area as well as the raised floor being easily identifiable at the site. The raised floor is also visible in the lidar data (see **Appendix 5**).

<u>Area D</u>

The interpretation of the results for Area D is shown in **Figure 13**.

D1-**D5** and **D20** have been characterised as dipoles. It may be argued that **D1**-**D5** could result in possible archaeology as there are kilns in close proximity that reflect a similar result. However, the survey was cut by the trackway, which may have caused these anomalies. Moreover, there was no evidence of pottery sherds within this area, which is usually a good indicator that a kiln is present (Historic England 2015, page 41).

D18 and **D19** have been interpreted to be dipoles. Similar to the anomalies listed above, it is possible that they may be associated with the RB kiln or the past excavation. This is due to the fact that the trackway that cuts through the survey area D was not surveyed. Therefore, it is entirely possible that they may be associated with the RB kiln.

D6-**D9** and **D22** are small circular positive anomalies that are no greater than 2m in size. It is possible that these anomalies could be test pits that were undertaken in this area. Wise (1985, page 213) states that he 'opened up the ground at various points' in Sloden Inclosure, which suggests a test pit approach was undertaken. However, Wise's excavations occurred before plans were considered of great importance in archaeology and it is unclear on the locations of his investigations. The anomalies have been interpreted as possible archaeology. To determine the nature of these anomalies, excavation would be required.

D10 is a negative linear that is WSW-NNE aligned and is 42m in length. **D10** has been interpreted to be the modern drainage system and is not archaeological.

D11 and **D12** are weak positive linear anomalies. **D11** is NW-SE aligned and 20m in length whilst **D12** is NNE-SW aligned and 28m in length. Both of these anomalies are weak and may be characterised as possible archaeology and could be associated with the past excavations. Further investigation would be required to determine the nature of **D11** and **D12**.

D13 is a positive linear anomaly that is NW-SW aligned and is 12m in length. Due to it's enhanced positive signals, **D13** has been interpreted as possible archaeology and could possibly be associated with the past excavations. However, further investigation would be necessary to determine whether **D13** is archaeological or not.

D14 is a circular shaped positive anomaly that is 10m in size. **D14** has been interpreted to be a kiln, which may be supported by the spread of pottery sherds amongst the topsoil. NFHAG may have located this kiln in their 1989 excavation but due to the unclear plans, it is difficult to decisively tell if it is the kiln that NFHAG located (Pasmore 1991, page 10). However, if it is the same kiln, they did not excavate it which might be the explanation in the magnetic differences when comparing to the other kilns in the survey. The suspected kiln can be seen as a mound in the lidar data (**Appendix 5**).

D15-**D17** are areas that consist of both strong positive and negative responses. The anomalies show a difference in magnetic amplitude to the surrounding soils. Therefore, **D15**-**D17** have been interpreted to be the past excavations of the RB kilns. This is supported by Sumner's accounts of his excavations in this area (Sumner 1927, page 57). The lidar data (**Appendix 5**) shows **D15** as a depression and a mound and **D16** as a mound.

D21 is a C-shaped anomaly with positive responses situated in the south of the data. The anomaly may be a ditch due to slightly enhanced positive response. However, it is difficult to determine whether **D21** is archaeological or not and excavation of the anomaly would be necessary to answer this question. Therefore, **D21** has been characterised as possible archaeology.

D23 is an area that consists of both strong positive and negative responses. **D23** has been interpreted to be the RB kiln. This interpretation derives from the highest magnetised responses in this area. It is clear that the RB kiln is associated to this anomaly as there is an abundance of pottery sherds. However, to determine the exact location and extent of the RB kiln, excavation would be required.

D24 and **D25** are named 'No.1 kiln' and 'No.2 Kiln' respectively by Sumner (1927, page 57). It is difficult to identify 'No.2 Kiln' from Sumner's descriptive accounts as he states 'No.2 Kiln is 100 yards to the east of No.1 kiln'. When observing Sumner's plans of the kilns within Sloden, there is no kiln that is 100 yards to the east of 'No.1 Kiln'. Thus, I have denoted **D25** to be Sumner's 'No.2 Kiln'. Therefore, these anomalies can be interpreted as the scheduled RB kilns in this area. This is further supported by the spread of pottery amongst the topsoil around these areas, which suggests that a kiln is within the area. **D24** and **D25** are visible as mounds in the lidar data (**Appendix 5**).

4.2 Magnetic Susceptibility Survey

The magnetic susceptibility survey compliments the gradiometer survey for area B (**Figure 15 & 17**). The results also mirror the spread of pottery sherds that are visible on the ground. Clark (1996, page 125) highlights that substantial enhancement is to be expected from the kiln and the burning associated with it. Furthermore, these values correlate with the high values from the gradiometer survey. Moreover, EAC guidelines (2016) acknowledge that topsoil magnetic susceptibility results are considered to be of value when interpreting gradiometer data. Therefore, the results of the magnetic susceptibility survey indicate the location of the known scheduled kiln.

4.3 Location of the Scheduling areas

For each area surveyed, the existing scheduled area did not cover the location of the kilns (See **Appendix 3**). This means that the historically important kilns are not protected by their scheduling and hence, the kilns are vulnerable from forestry works. Therefore, it is important to mend the scheduling areas with the updated coordinates of the kiln locations. This, the FE and their management strategies will be informed, which will hopefully help to slow down the current decline of these monuments (FE & NFNPA per comms 2018-2023).

For area A, it could be argued that there is a possibility for a kiln to be situated in the scheduling area. Due to the ground conditions, it was not possible to survey (**Plate 2**). Sumner (1927, page 53) mentions that after the excavation of the small kiln, he dug trial holes in the adjoining ground and found no signs of another kiln. Therefore, it is presumed that the kiln located in area A is the same kiln that Sumner excavated and that the scheduling is erroneous.

5.0 Conclusion

A number of anomalies that are of an archaeological nature have been interpreted from the magnetometry data. The gradiometer survey helped to identify the location of the Romano-British pottery kilns and the past excavation of these kilns. Moreover, the survey has helped to confirm that the scheduling areas are incorrect and do not cover the actual kilns. The bank of the post-medieval sub-rectangular enclosure was located as well as the ditch of the Iron Age Hillfort, which was located in both area A and Area B. In area D, the anomaly in the NE corner is most likely of archaeological origin and has been interpreted as an unexcavated kiln.

Further work

The survey covered six of the nine scheduled kilns that are situated in Sloden Inclosure. Progressing forward, further geophysical survey over the remaining three scheduled areas is deemed necessary. Evidently from the results of this work, it could be argued that the scheduling areas of the remaining pottery kilns in Sloden do not encompass the actual location of the kilns. The remaining three kilns were not surveyed because of the survey constraints delaying time (**Section 2.4**). Surveying the rest of the scheduled kilns would confirm whether the scheduling areas for those areas are correctly placed over the kilns. Thus, aiding the management plans of the site.

As previously mentioned, the kilns in both area A and B cut into the bank of the Iron Age hillfort. As this occurs with both of the kilns in this area, questions should be asked about the relationship between the Iron Age hillfort and the RB kilns. Is there a relationship between the two sites? Is there a reason for the location of the kilns? Excavation of the kiln and Iron Age hillfort would be necessary to determine whether the features are linked.

Another aspect is the potential excavation of the suspected pottery kiln in area D. Excavation would help to identify this anomaly as well as attributing to the knowledge of the Romano-British pottery industry, if it is a pottery kiln.

The results of the geophysical survey appear to show little signs of associated infrastructure that the New Forest Romano-British pottery industry is lacking. Is the lack of evidence for the associated infrastructure (e.g. trackways, storage buildings, quarries) an indicator of the features never originally existing due to the very temporary nature of the activity at the site or have they been destroyed by modern activity such as forestry activity?

6.0 Acknowledgements

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8.0 Plates

1: View of the open grassland in Area A facing South-West

2: View of Area A facing NE (Image taken 2 months after survey)

3: Area B facing East-North-East

4: View of area B

5: Area B Facing N (Image taken 2 months after survey)

6: View of Area C facing SW

7: View of Area C and the raised facing floor SW (image taken 2 months after survey)

8: View of Area C and the metal wired fence, facing SW (Image taken 2 months after survey)

9: View of Area D facing W

10: View of Area D facing NNW (Image taken 2 months after survey)

9.0 Figures

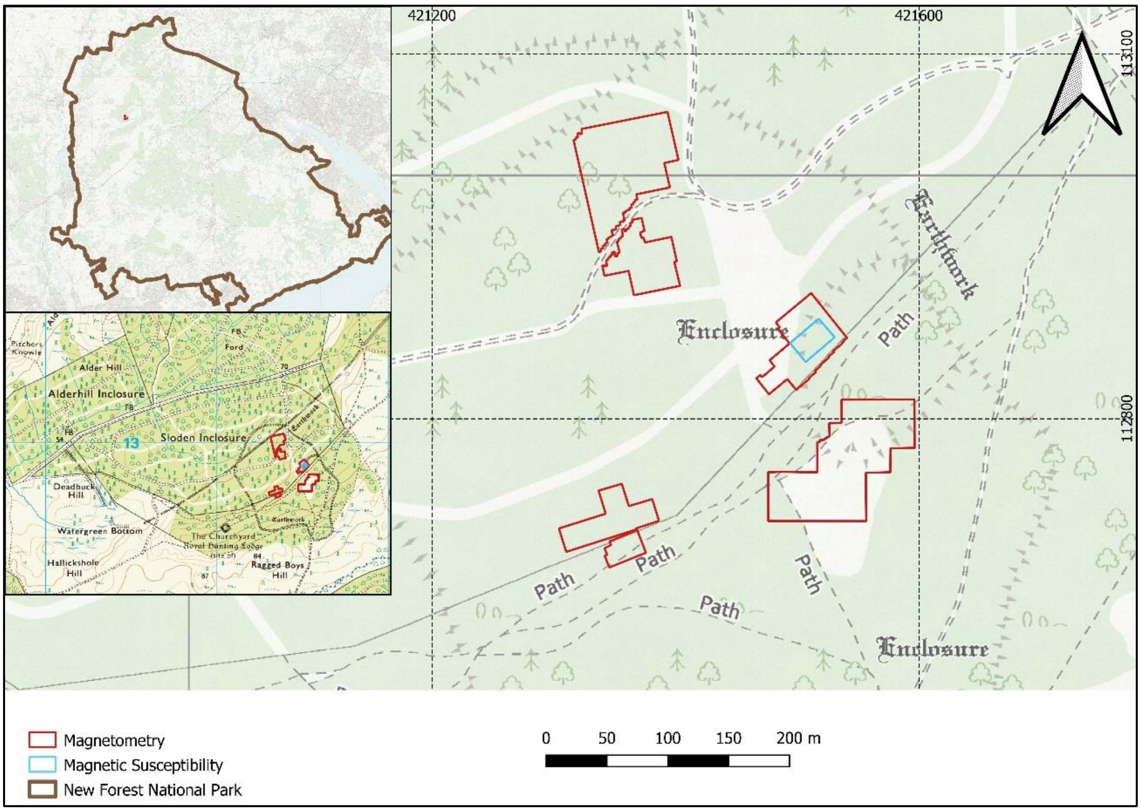


Figure 1: Overview of the survey areas

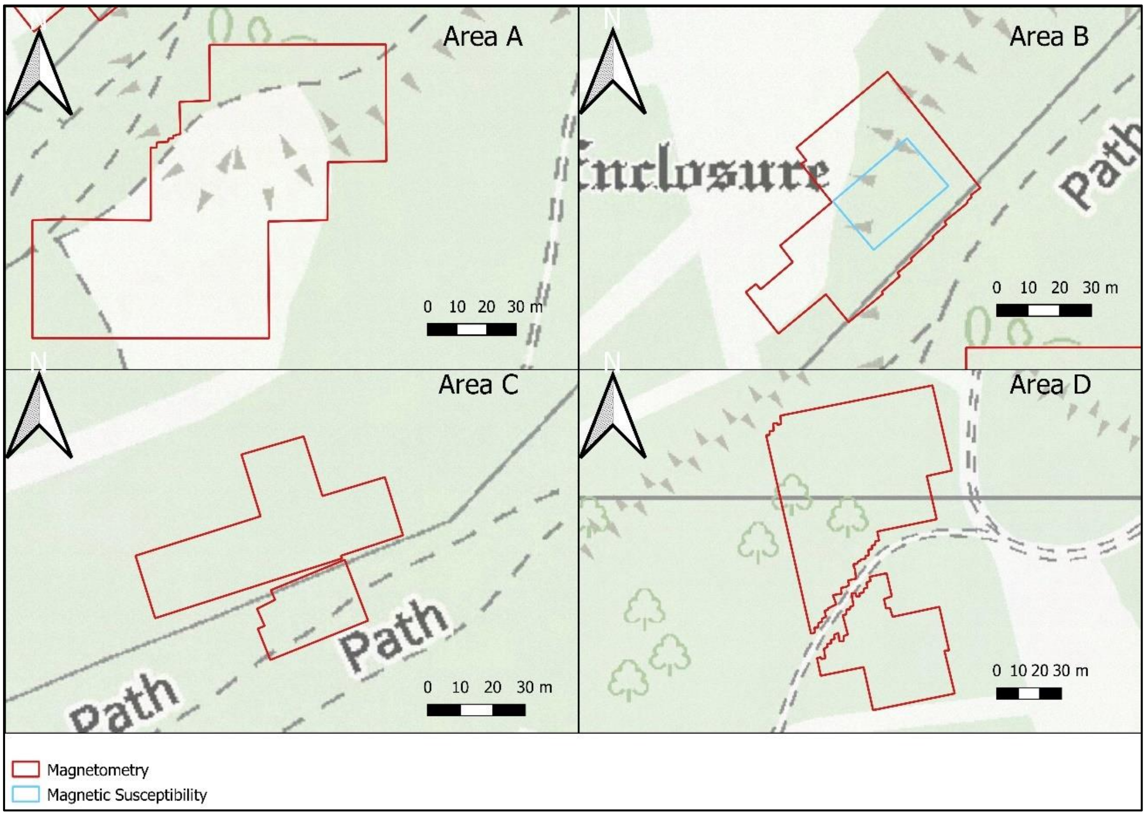


Figure 2: Location of each survey area

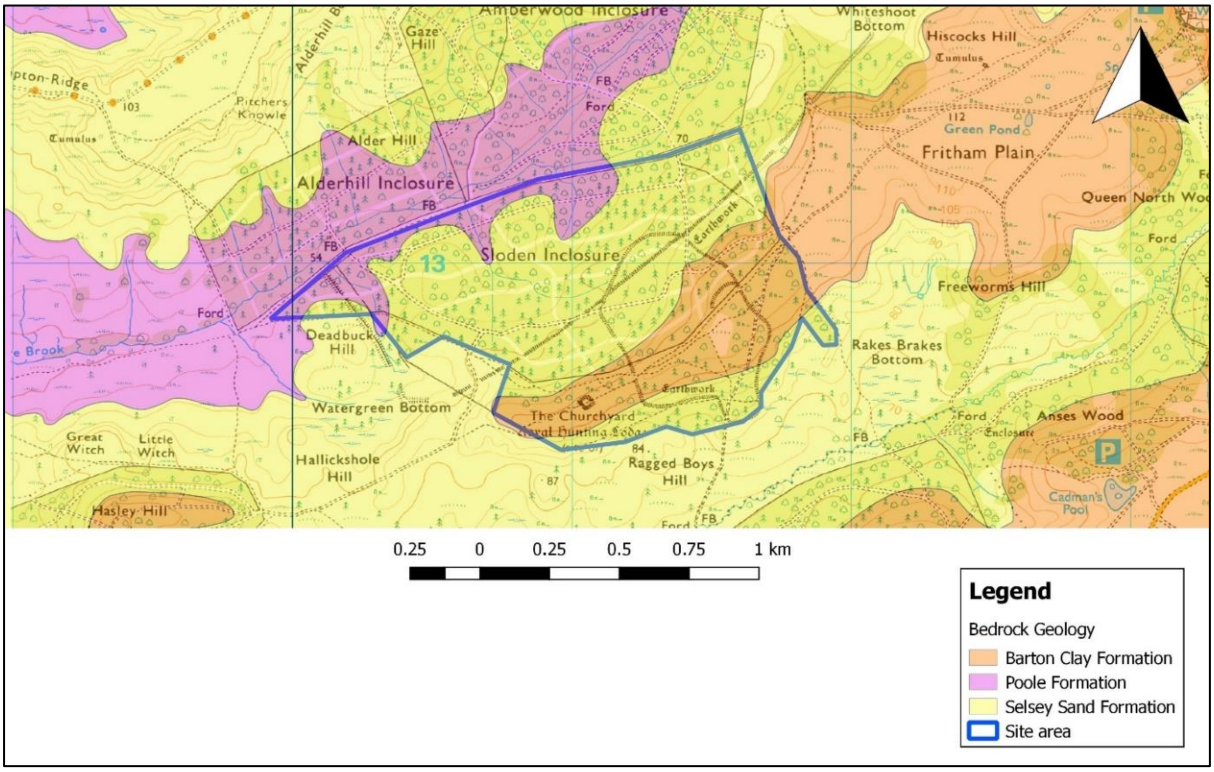


Figure 3: The bedrock geology at Sloden Inclosure

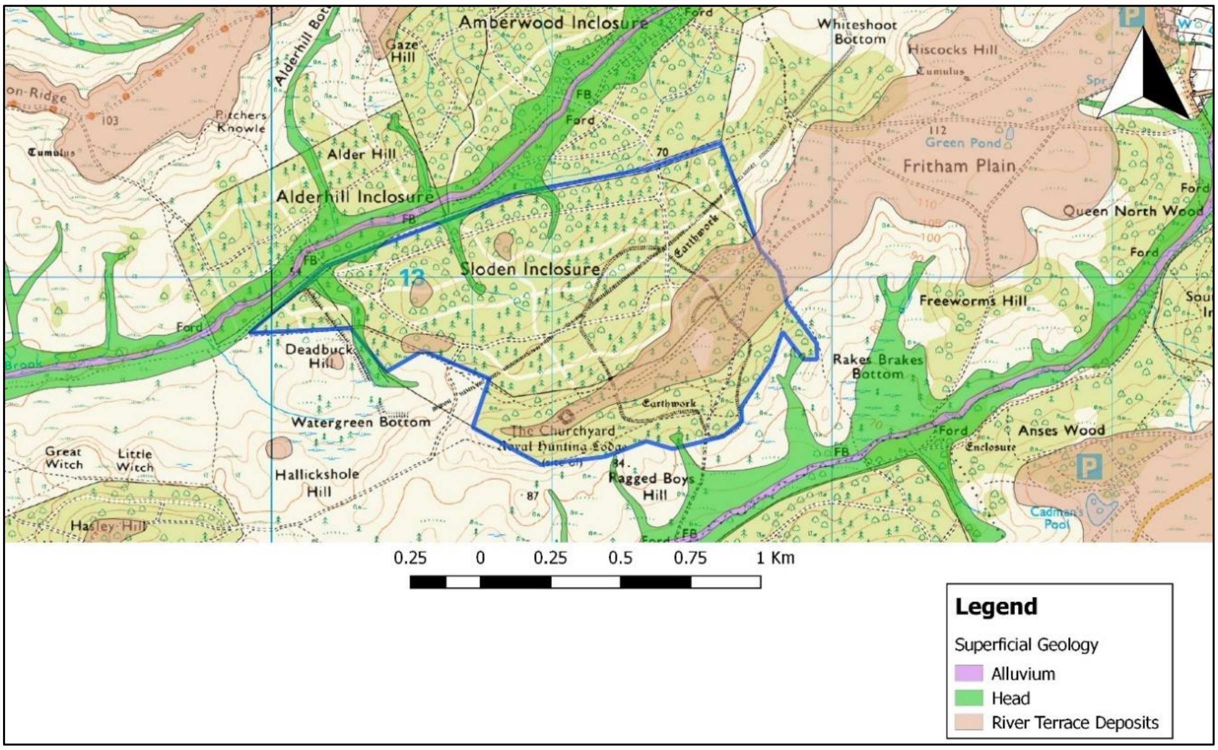


Figure 4: The superficial geology of Sloden Inclosure

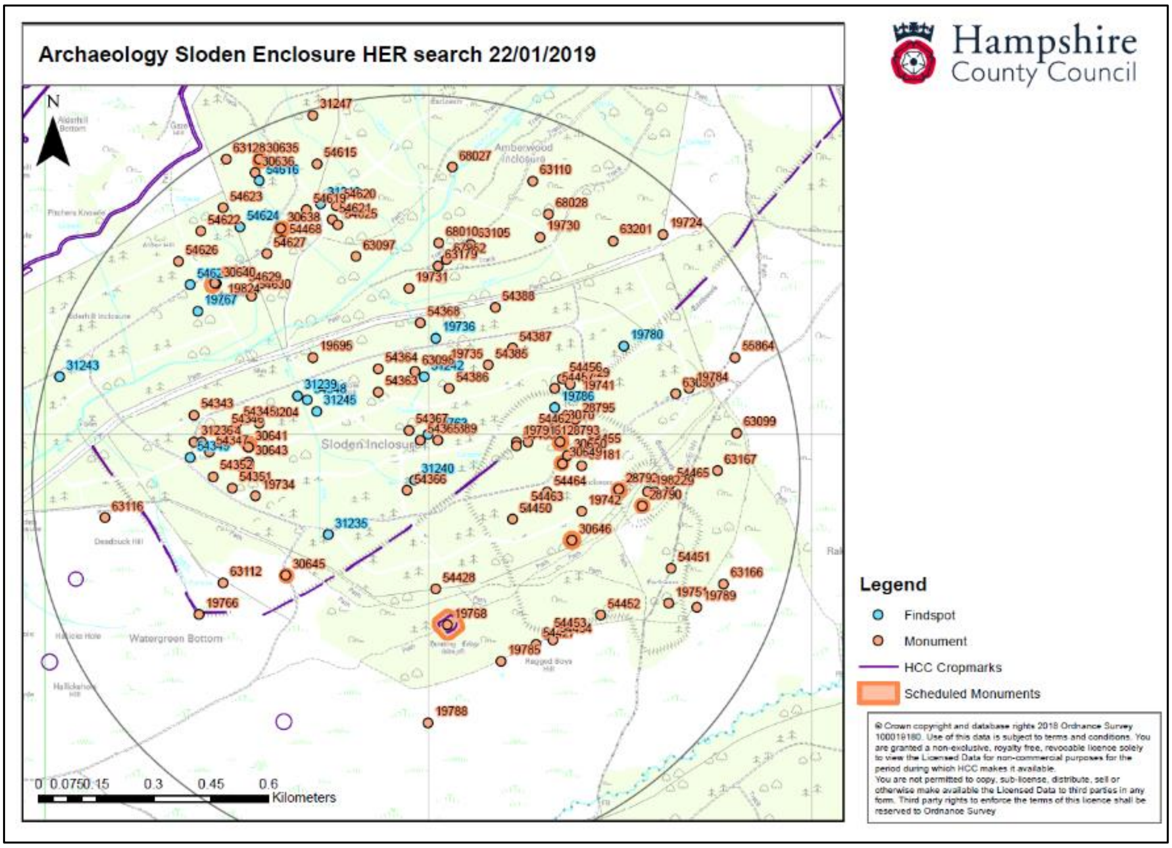


Figure 5: HER search of Sloden Enclosure with a radius of 1km from SU 2094 1302

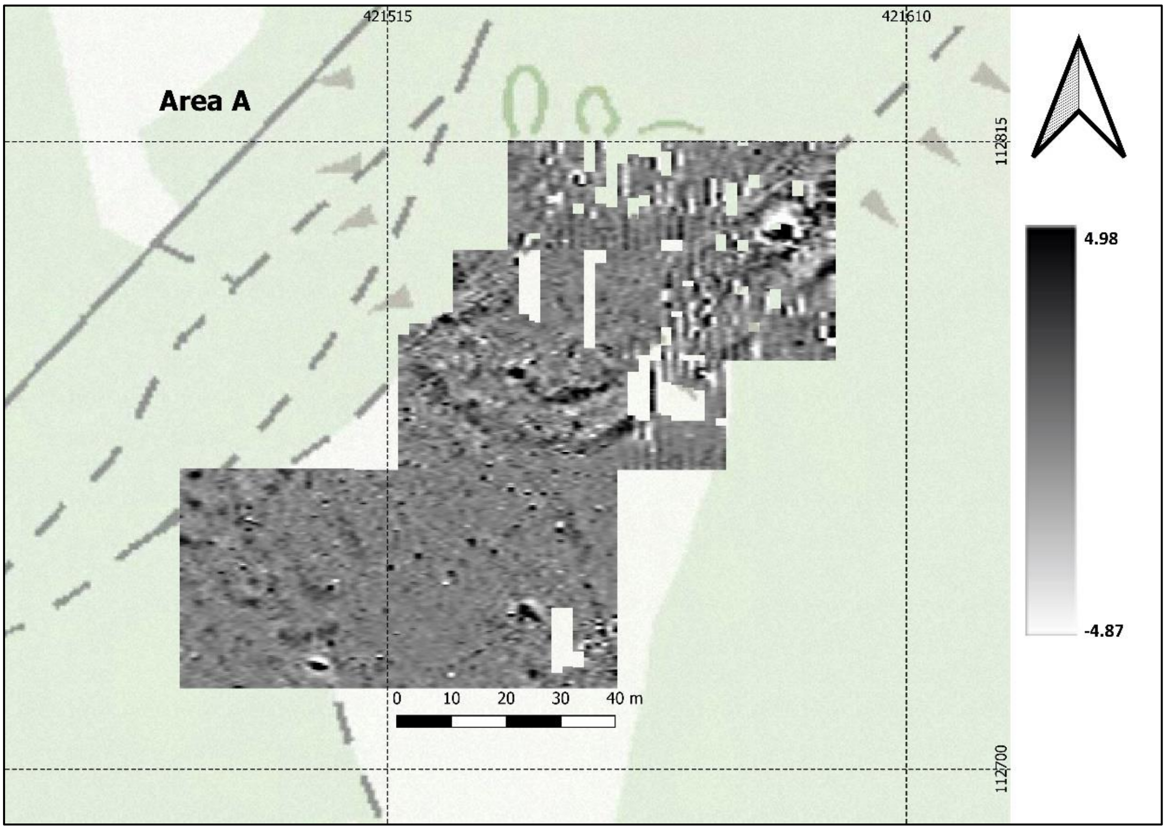


Figure 6: Greyscale plot of processed gradiometer data (Area A)

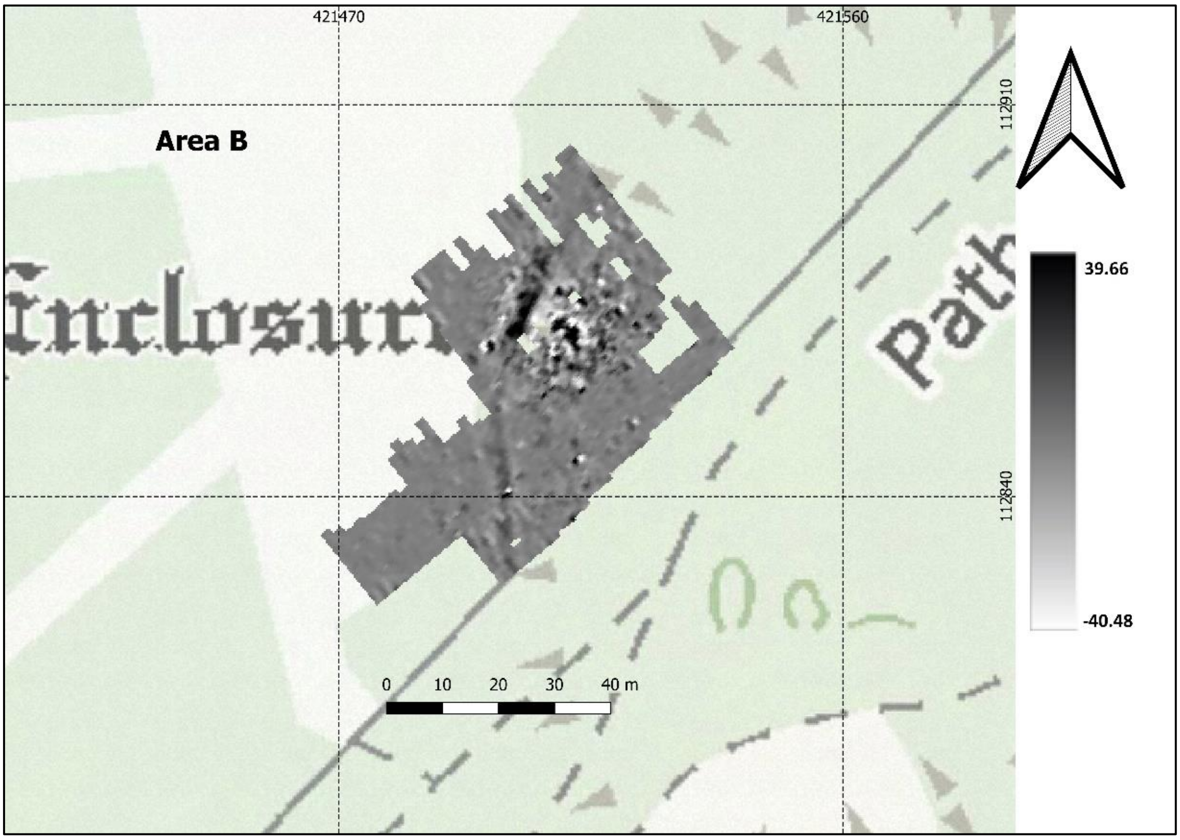


Figure 7: Greyscale plot of processed gradiometer data (Area B)

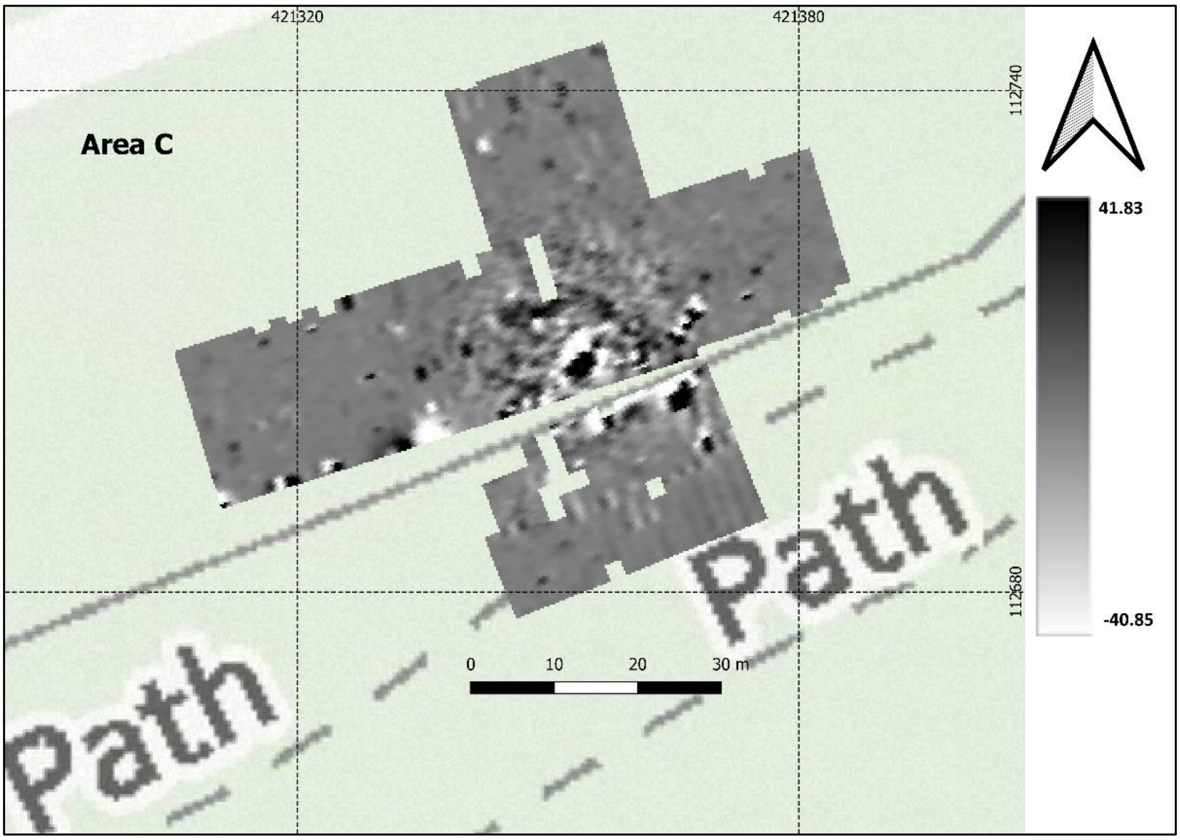


Figure 8: Greyscale pot of processed gradiometer data (Area C)

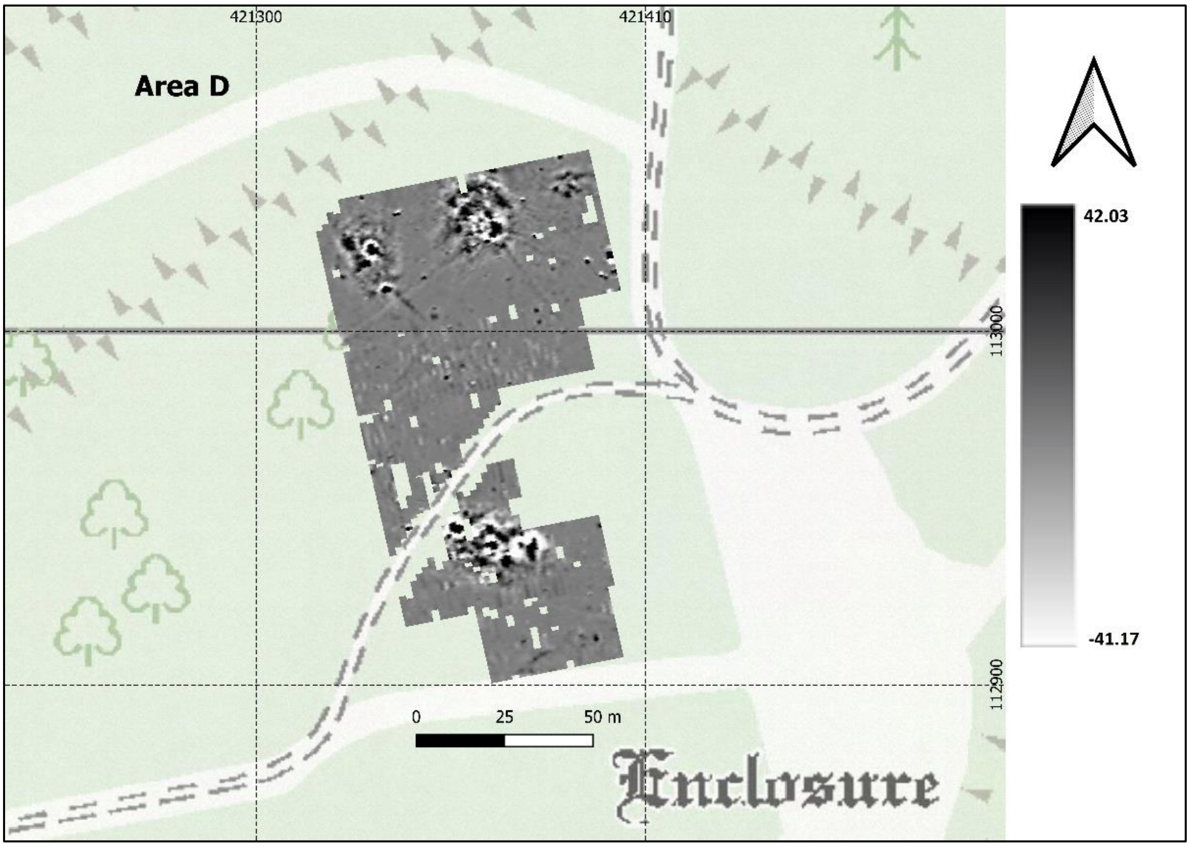


Figure 9: Greyscale plot of processed gradiometer data (Area D)

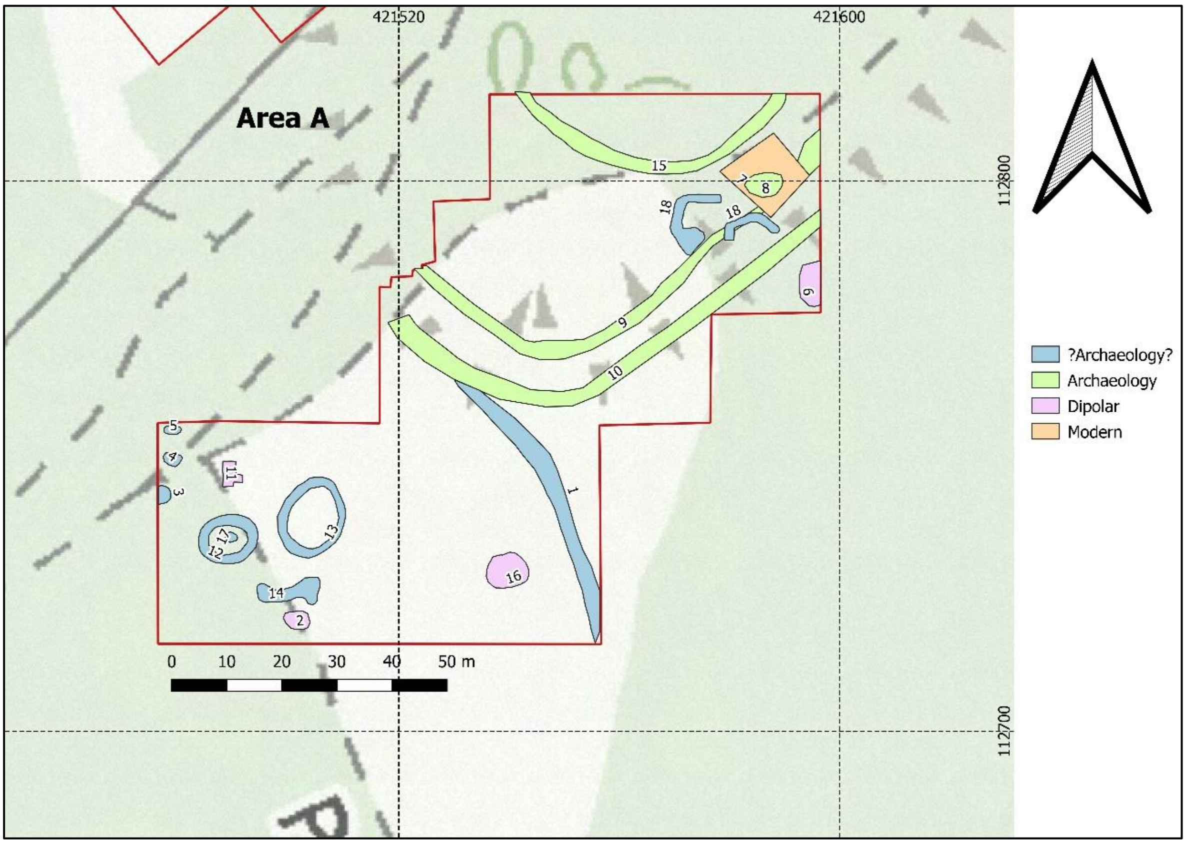


Figure 10: Interpretation of the gradiometer data for area A

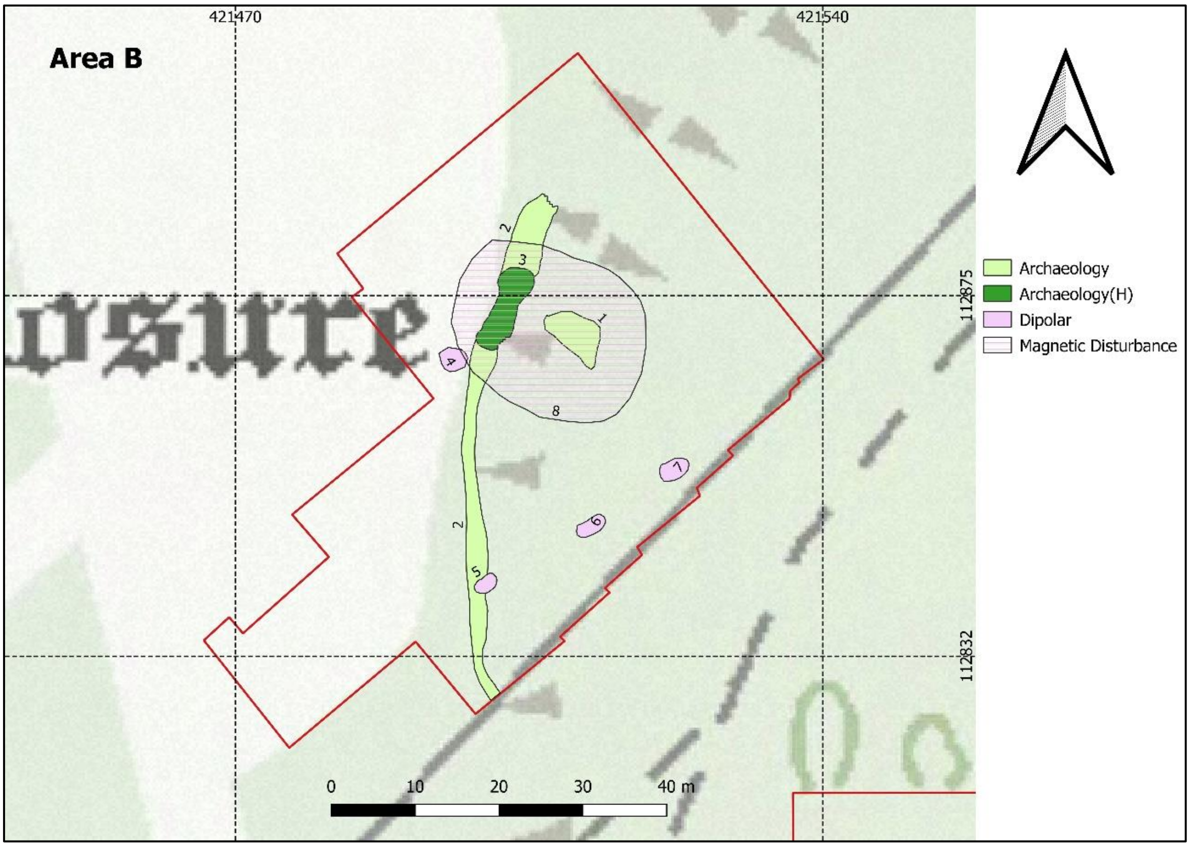


Figure 11: Interpretation of the gradiometer data for area B

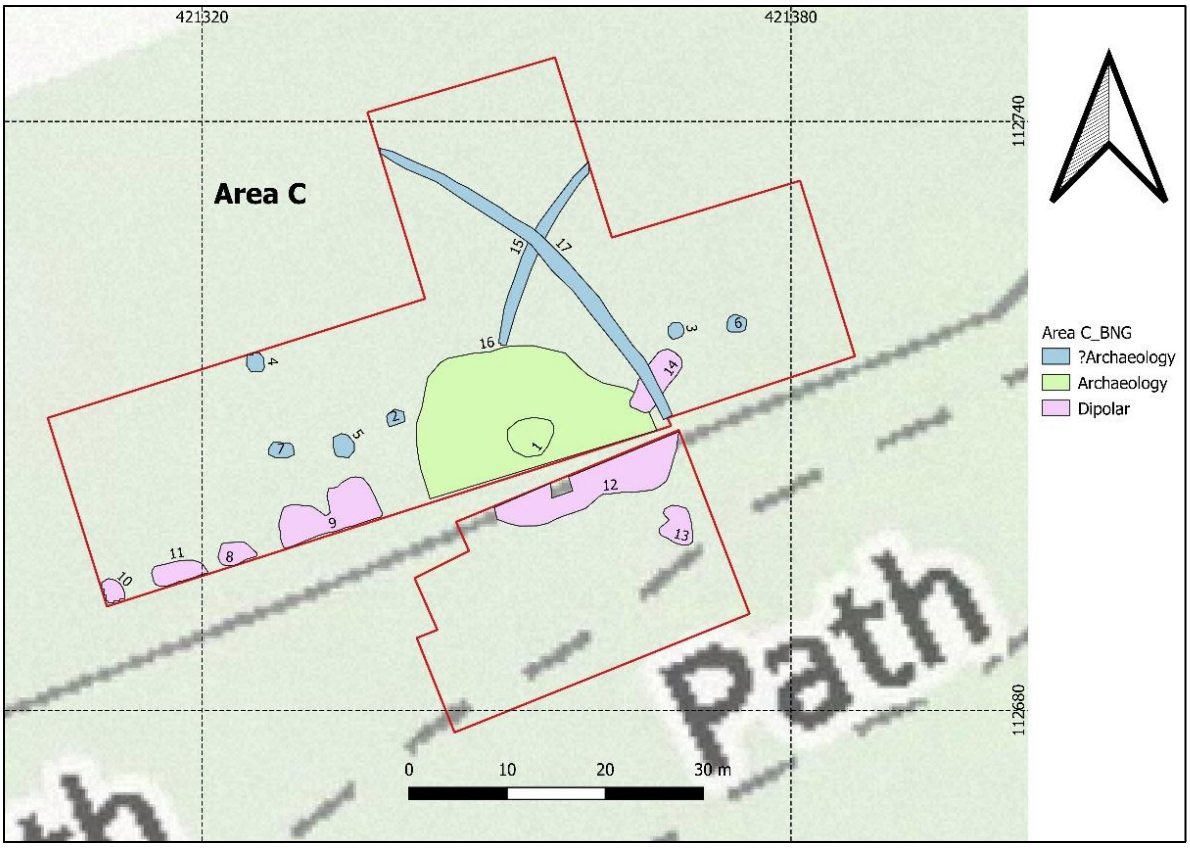


Figure 12: Interpretation of the gradiometer data for area C

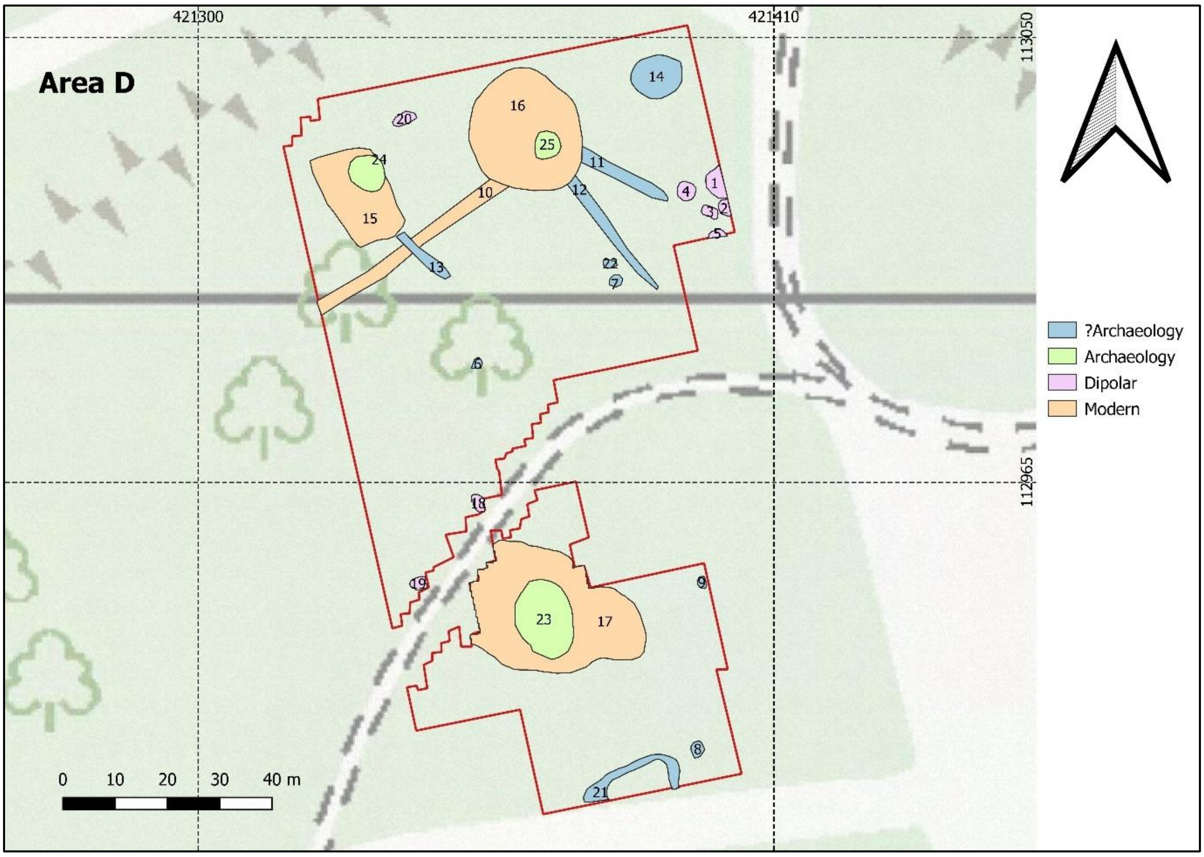


Figure 13:Interpretation of the gradiometer data for area D

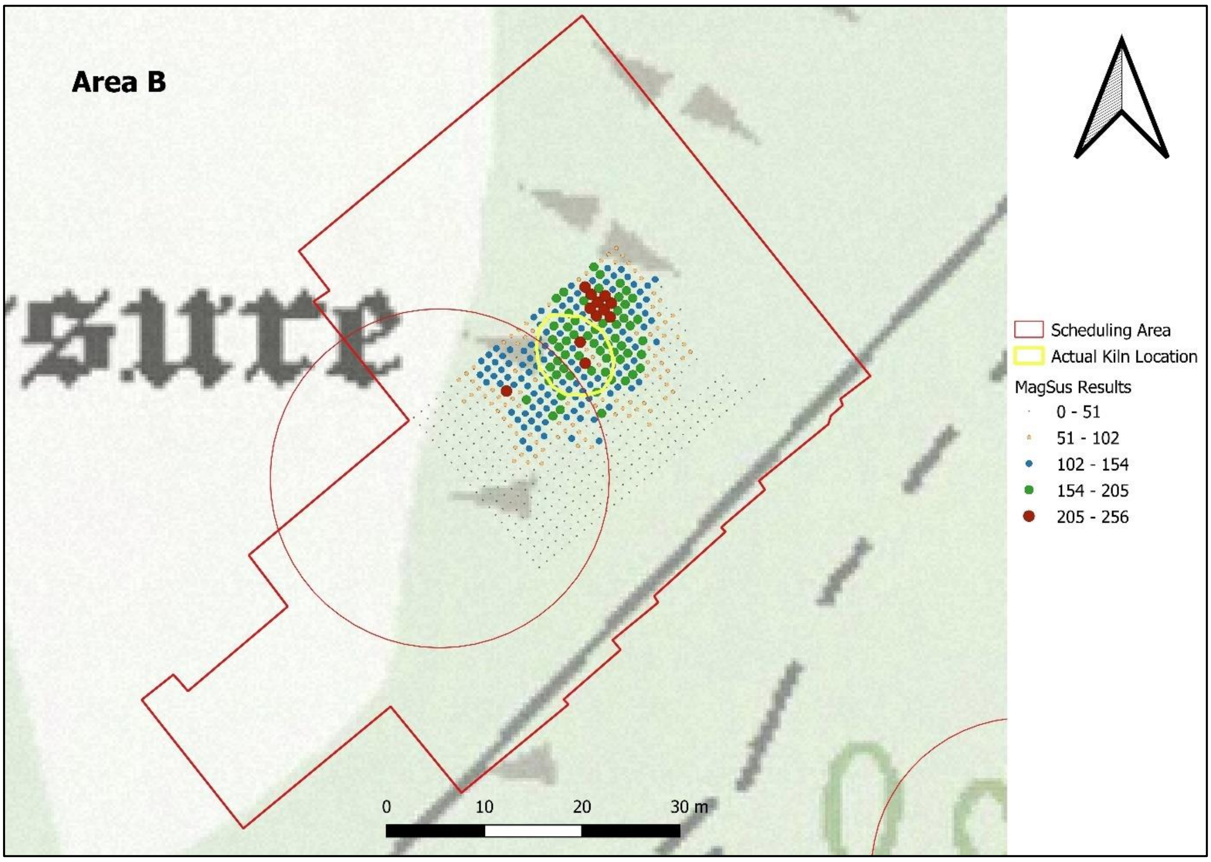


Figure 14: The Magnetic Susceptibility results compared to the Scheduling area and actual location of kiln

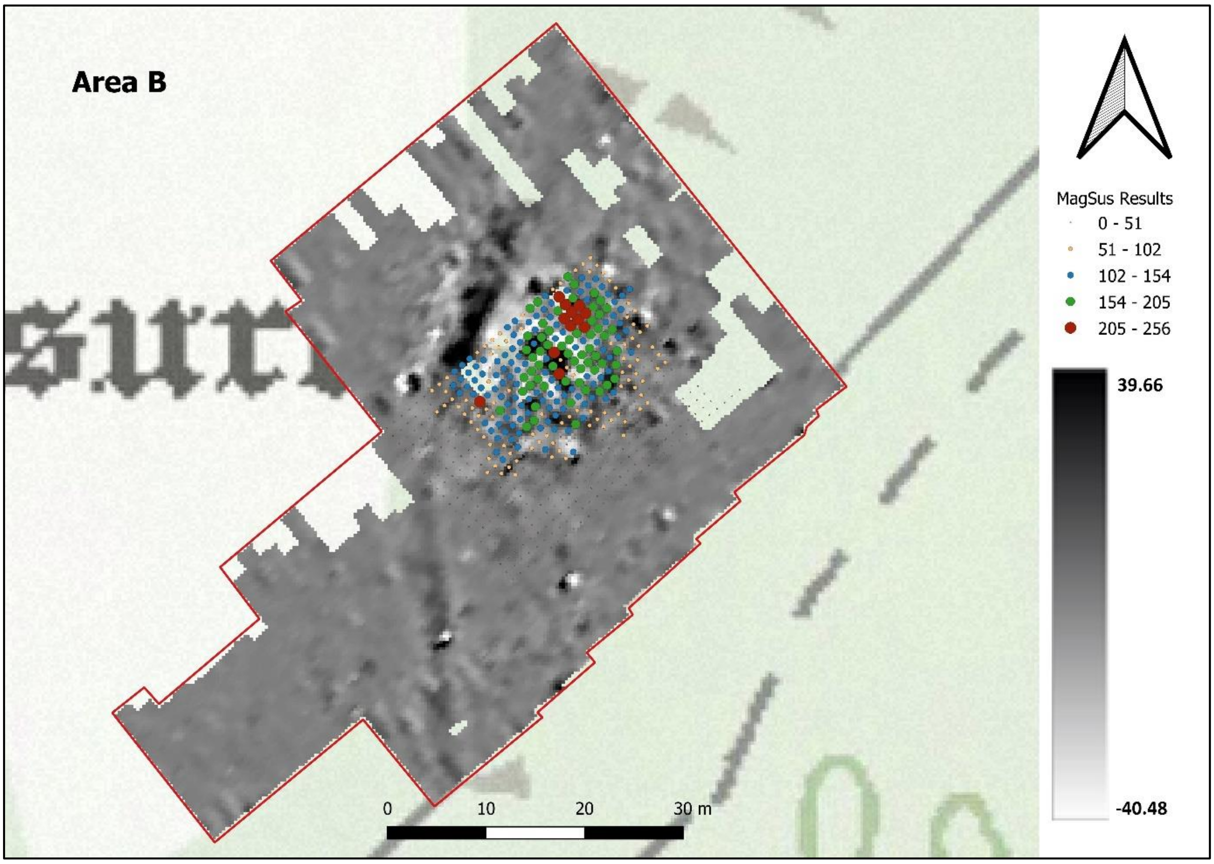


Figure 15: The magnetic susceptibility results overlying the gradiometer results

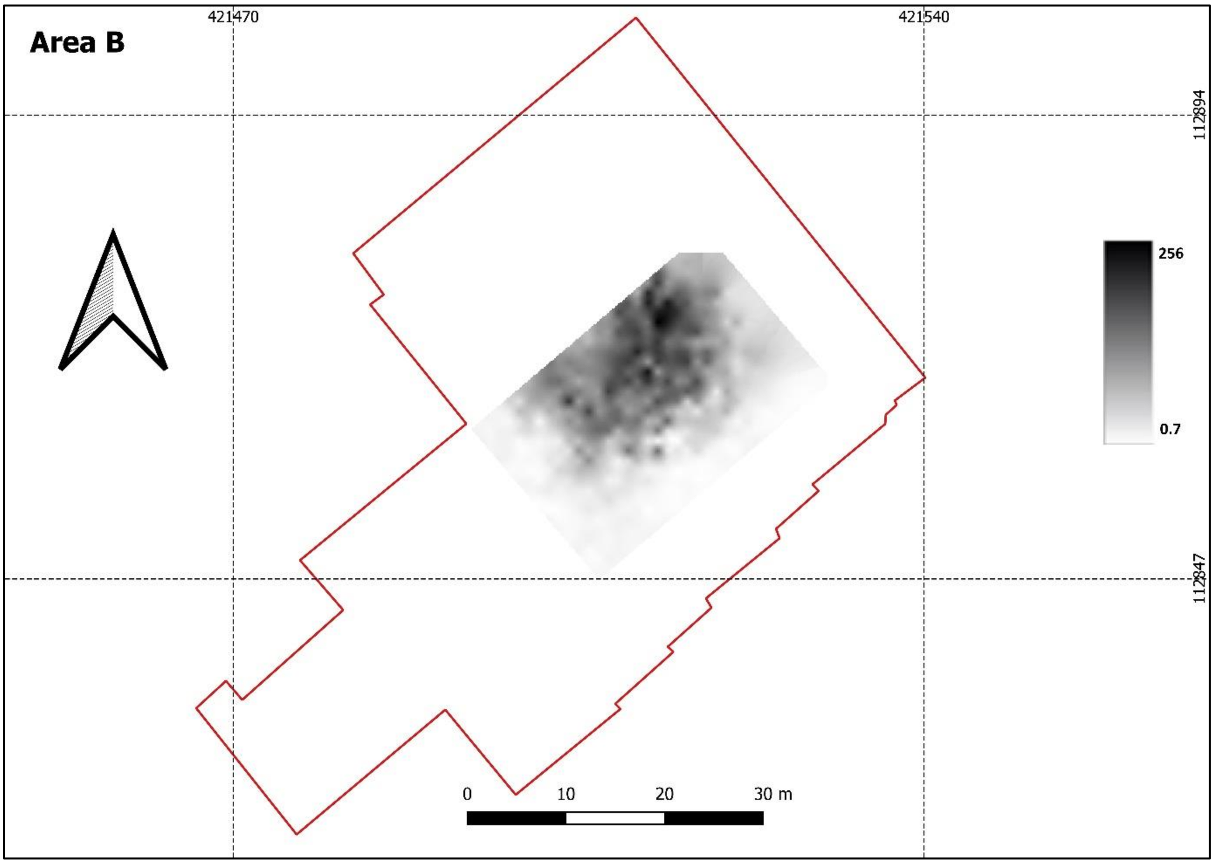


Figure 16: Map displaying the magnetic susceptibility results as a kriging image. Key is the highest and lowest point recorded

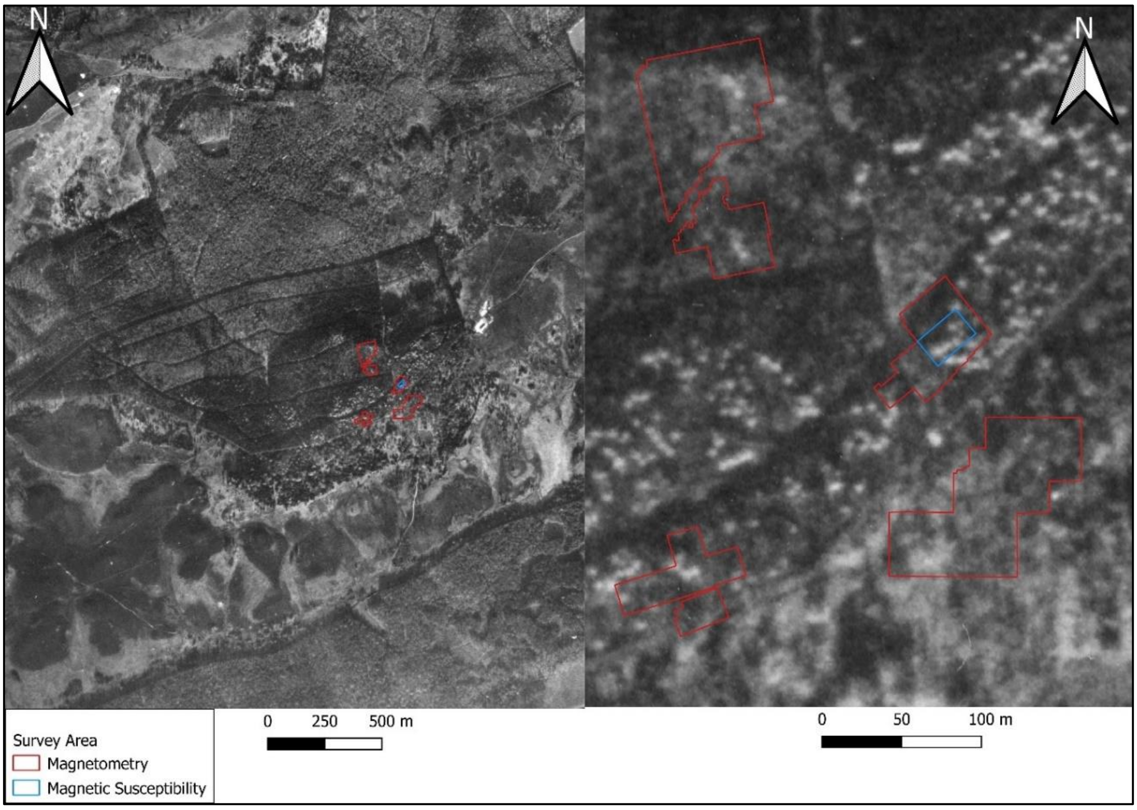


Figure 17:© Forestry England, Lyndhurst. (139_Amberwood)

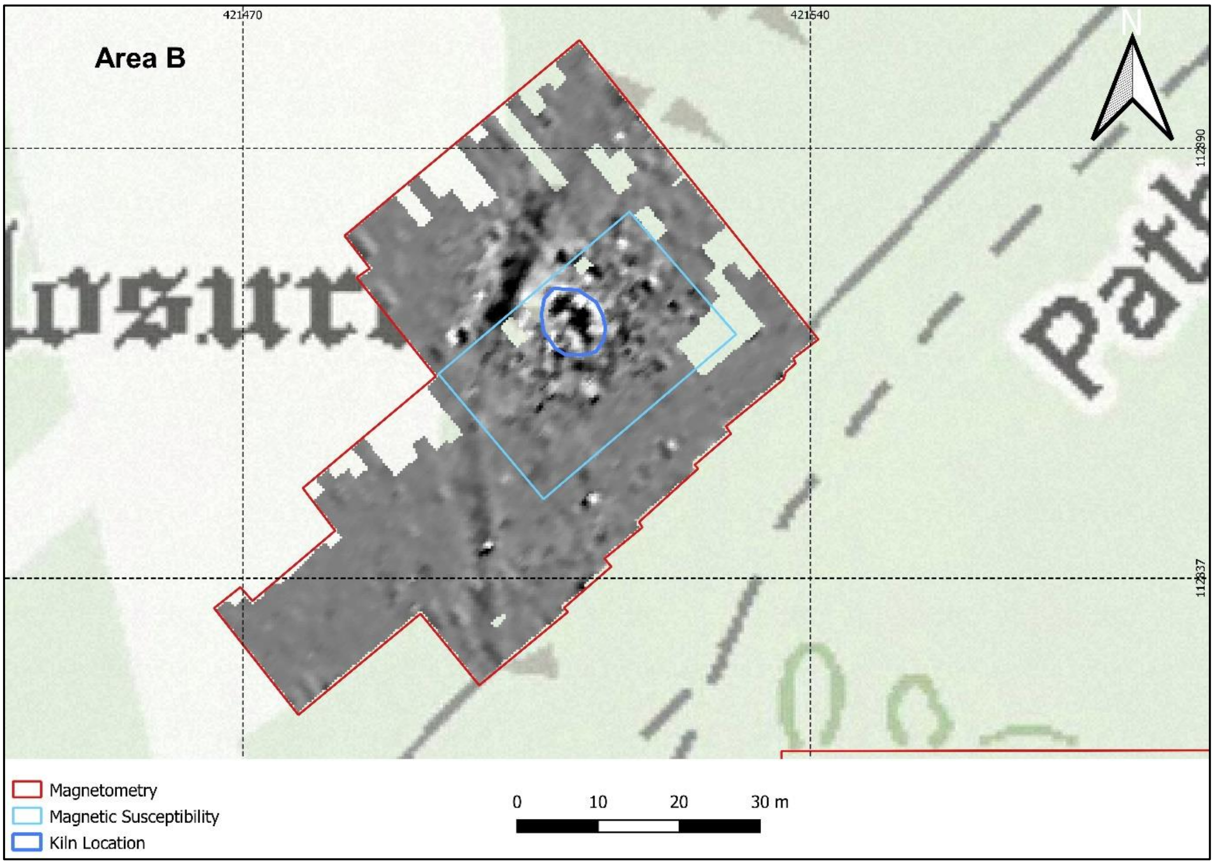


Figure 18: Grid B3 overlaying the gradiometer data with assumed kiln location

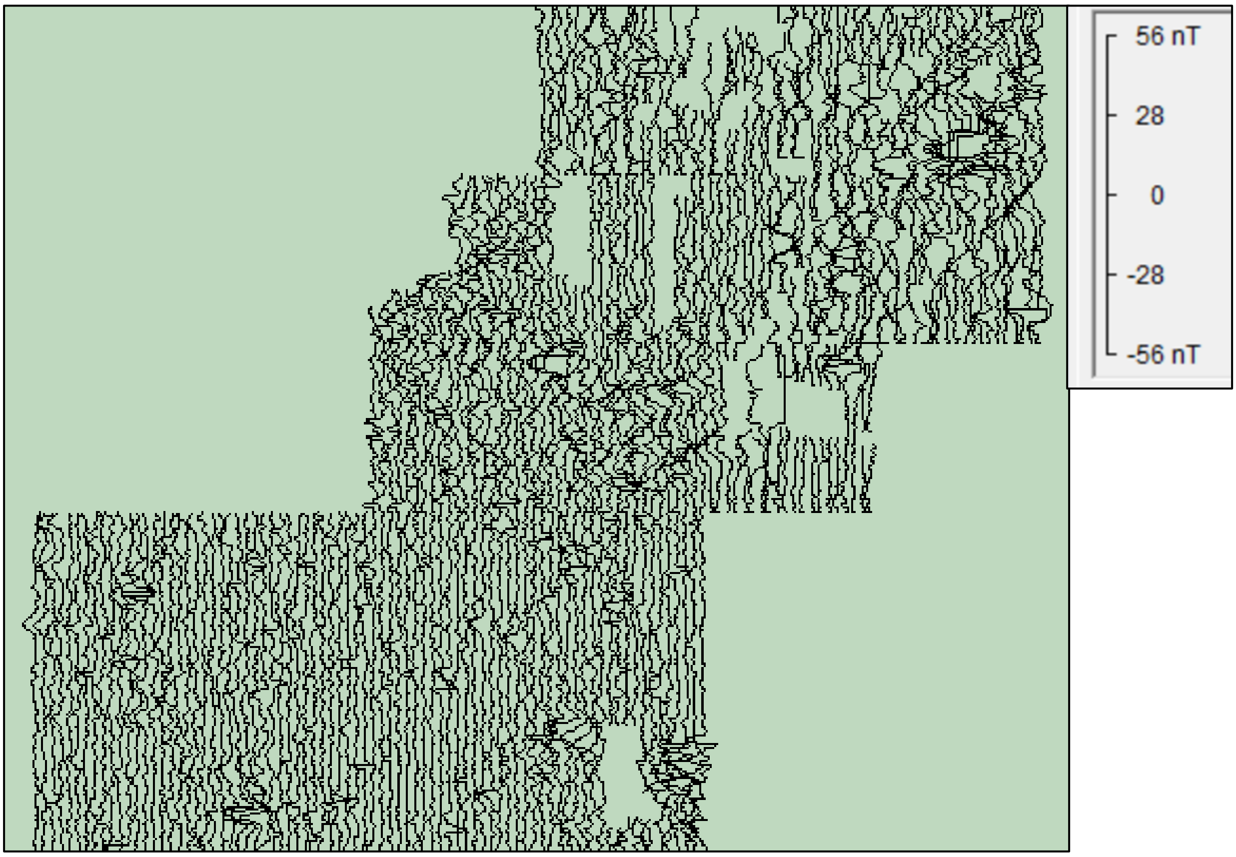
10.0 Appendices

Appendix 1: Processed steps

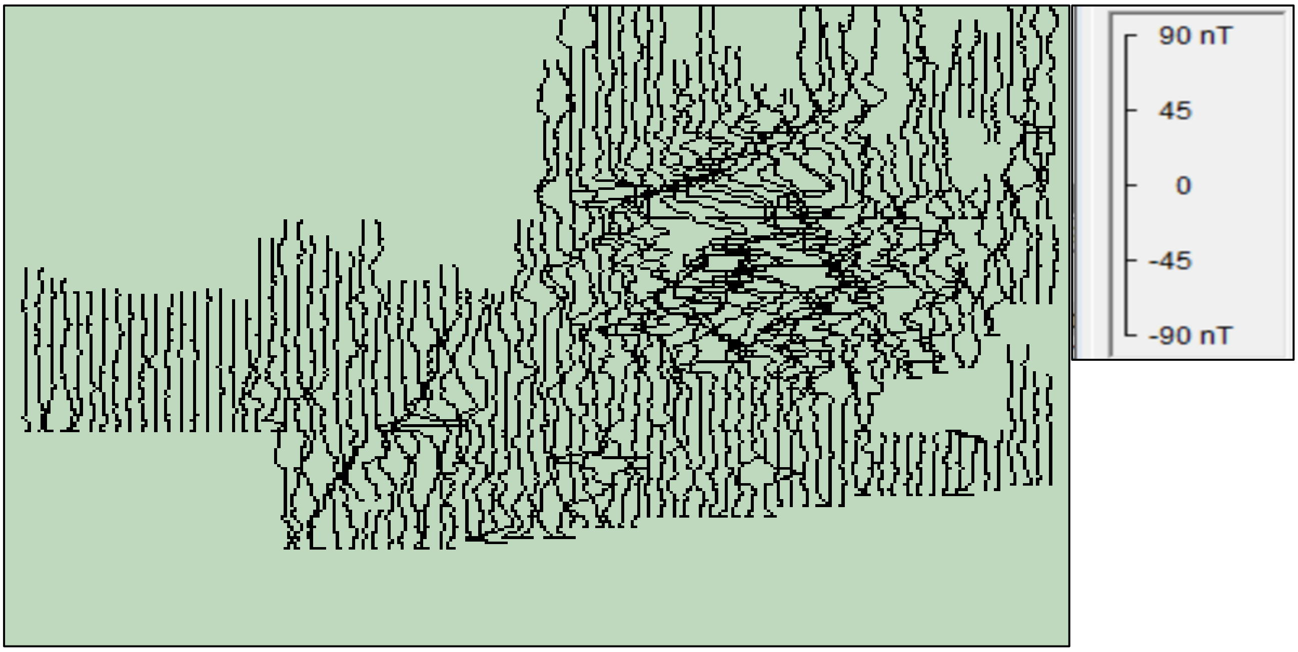
A table that lists the processing steps for each area

Survey Area	*Processing Steps (In order)*
A	• Clip at 3 SD • Destripe Median Traverse • Clip at 3.1 SD
B	• Clip at 4 SD • Destripe Median Traverse • Clip at 4.1 SD
C	• Clip at 1 SD • Destripe Median Traverse • Clip at 3 SD
D	• Clip at 3 SD • Destripe Median Traverse • Clip at 3 SD

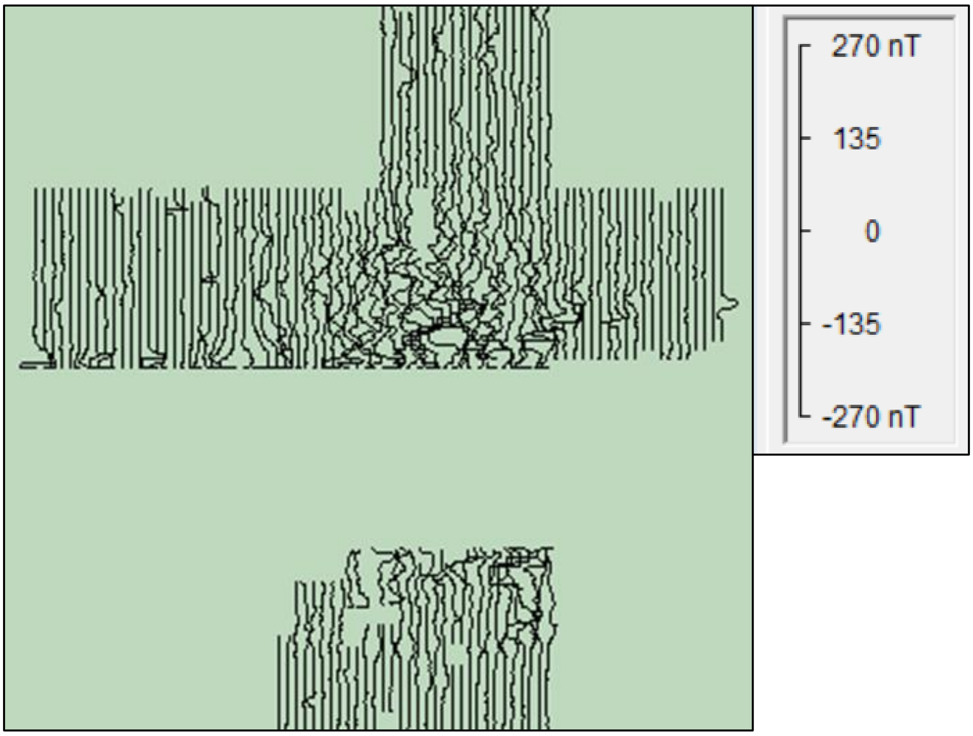
Appendix 2: Trace plots



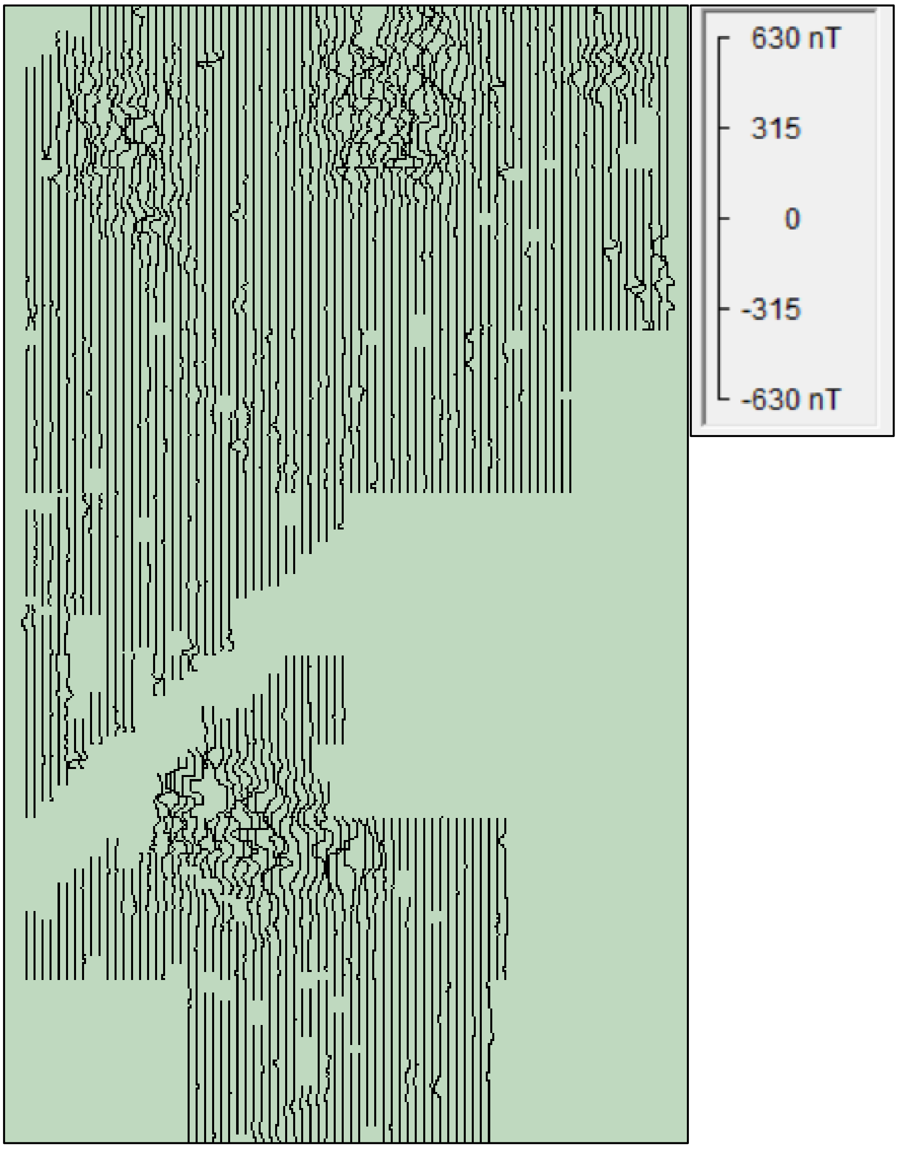
1 - Trace Plot of Area A; Scale interval of 28



2 - Trace Plot of Area B; Scale interval of 45

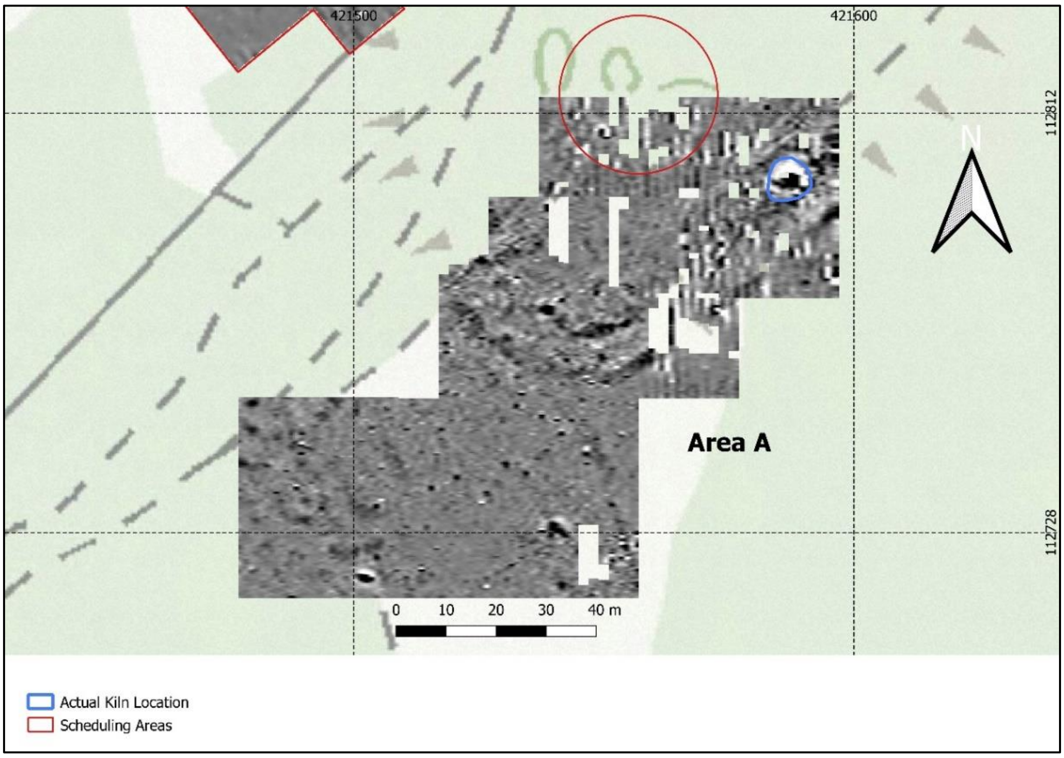


3 - Trace plot of Area C; Scale interval of 135

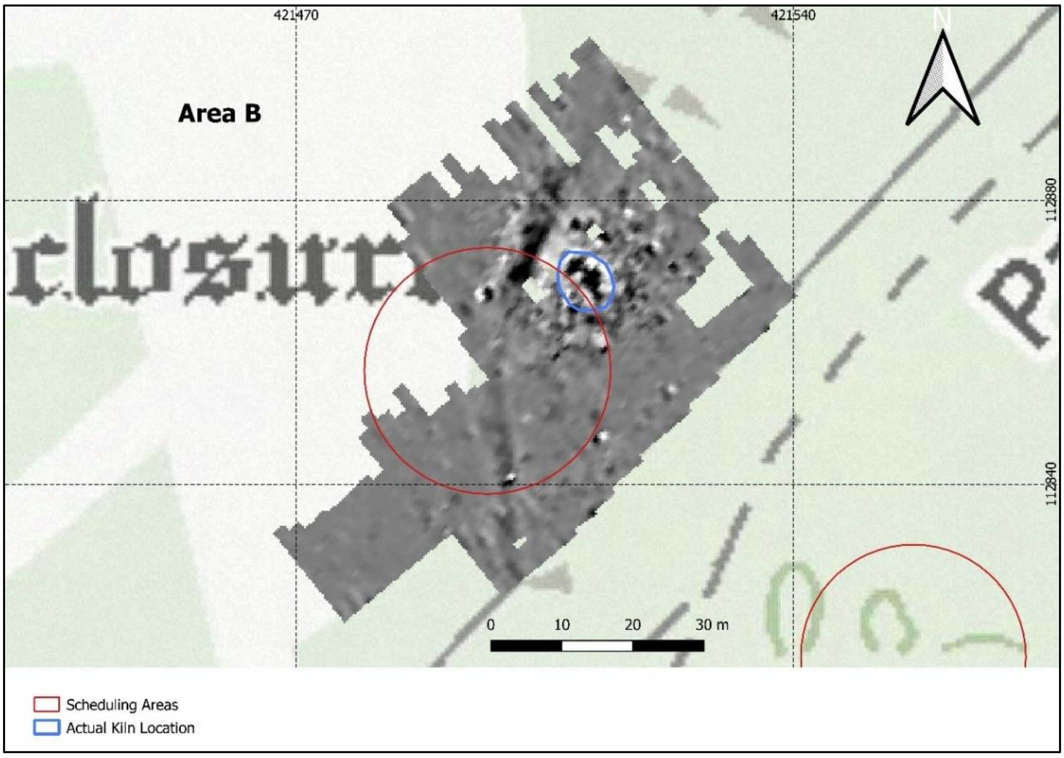


4 - Trace Plot of Area D; Scale interval of 315

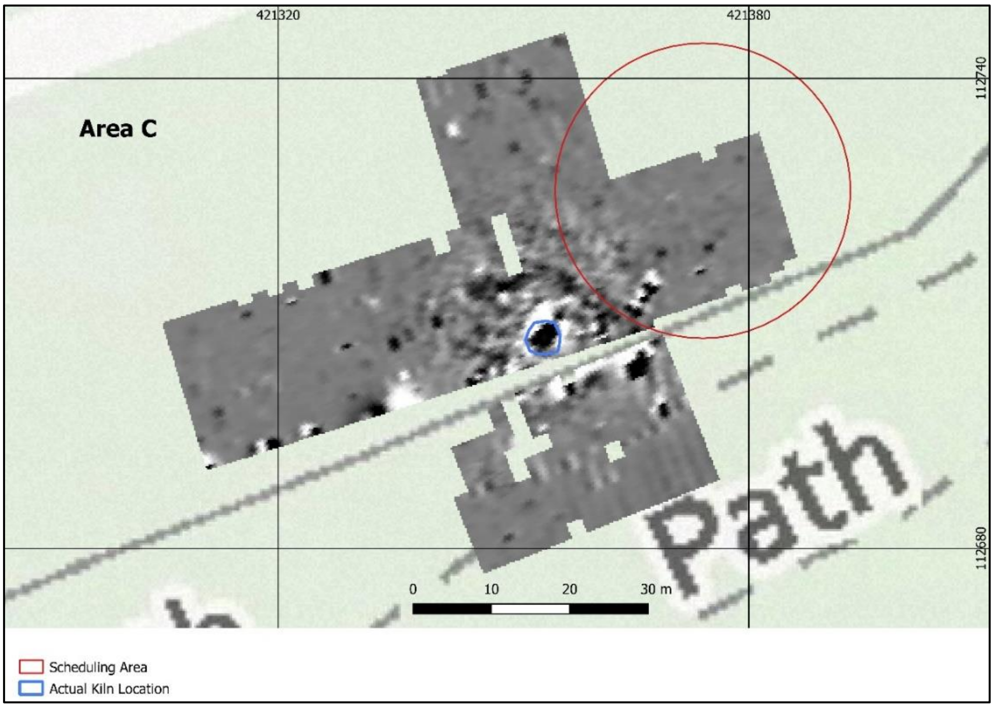
Appendix 3: Scheduling Areas



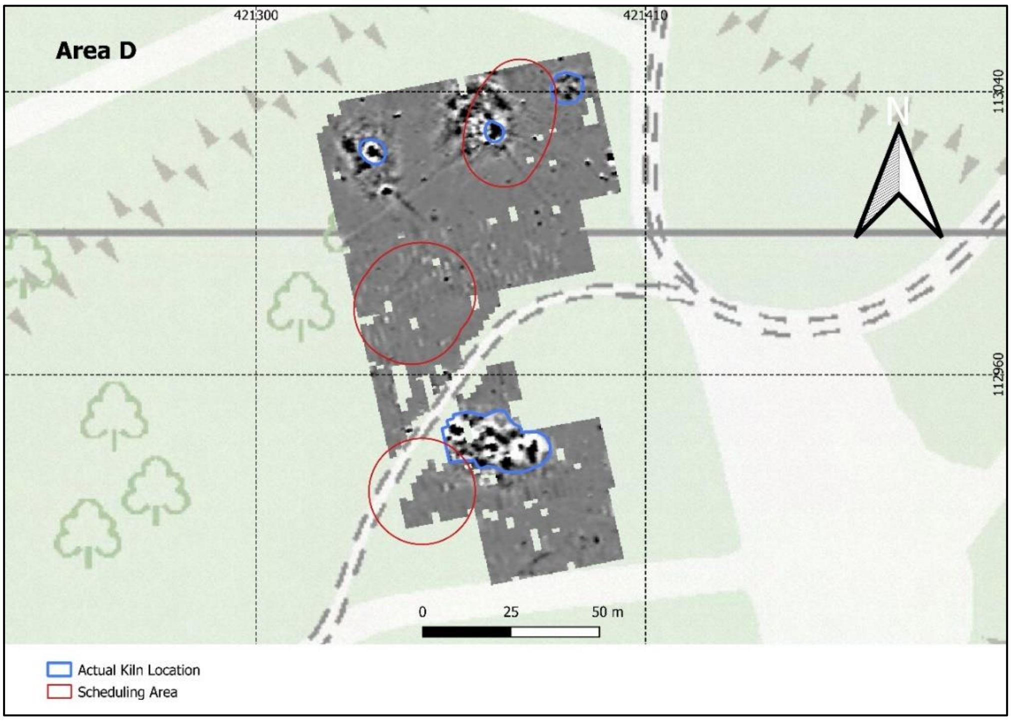
5 - Scheduling areas compared to the actual kiln location for area A



6 - Scheduling areas compared to the actual kiln location for area B

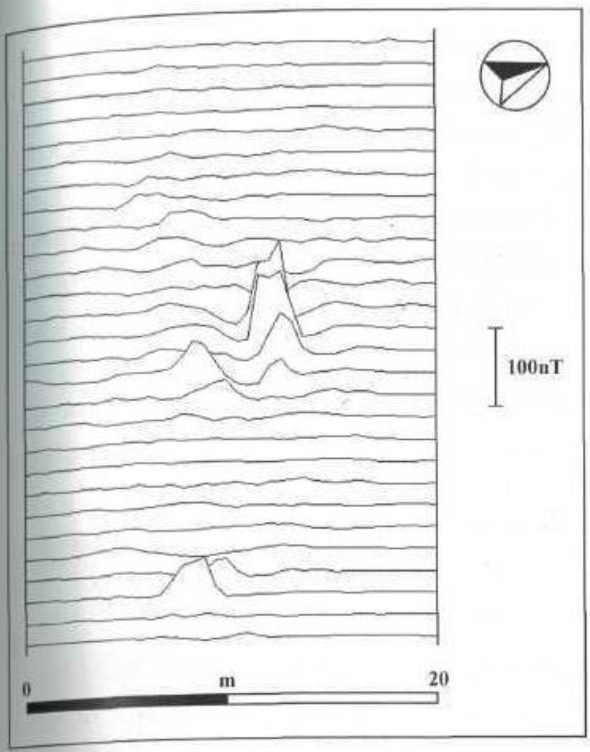


7 - Scheduling areas compared to the actual kiln location for area C



8 - Scheduling areas compared to the actual kiln location for area D

Appendix 4: Trace Plot from a geophysical survey undertaken in 1993



86 (Above) *Sloden enclosure, New Forest. Fluxgate gradiometer survey. 1 x 0.5m. Results demonstrate a 'classic' double peak over a suspected pottery kiln of Romano-British date.* GSB survey for RCHME.
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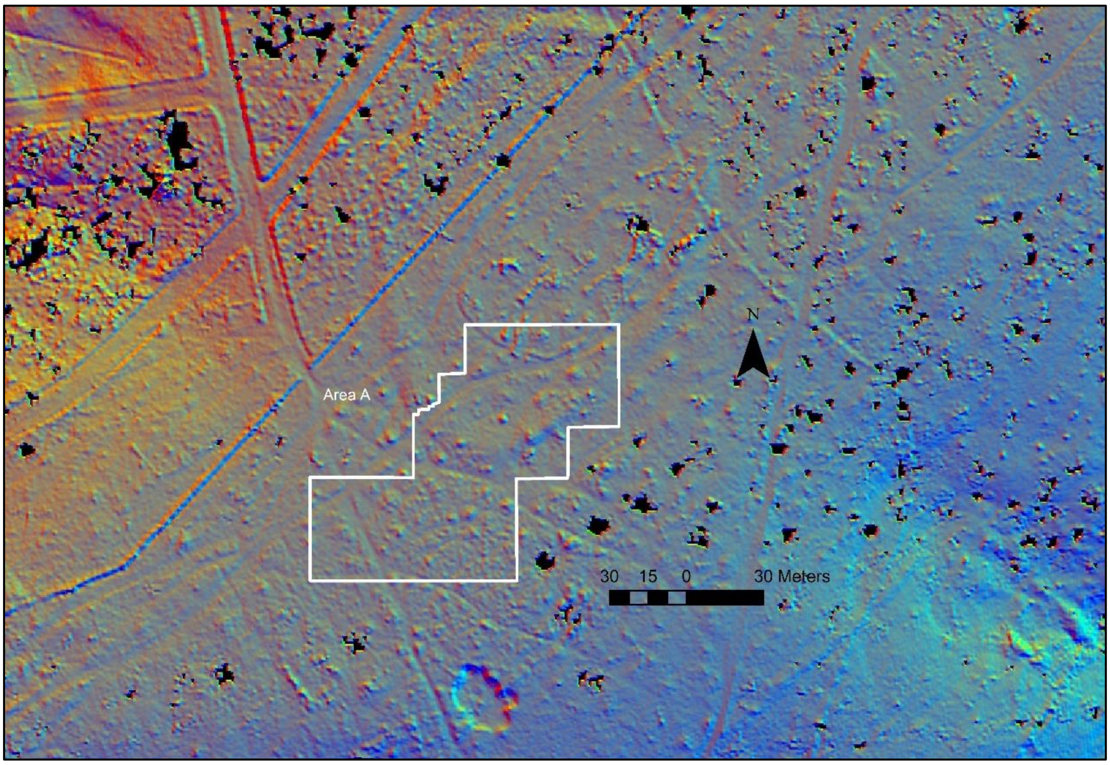
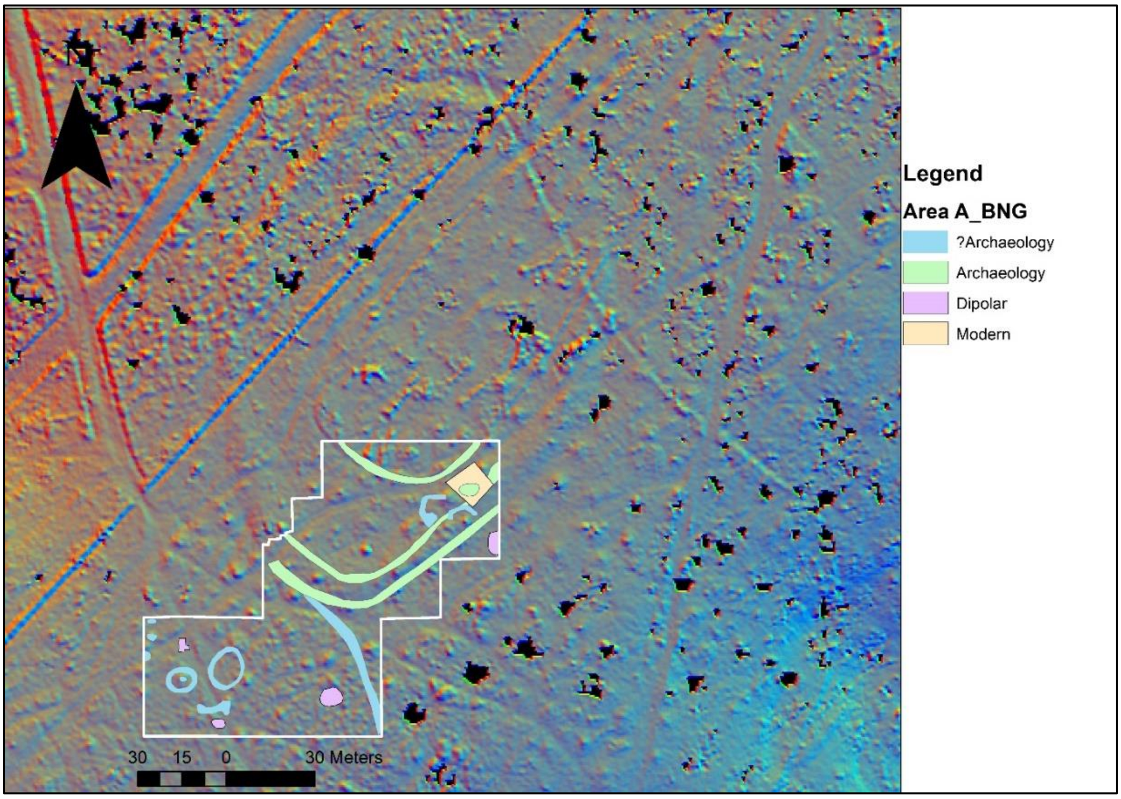
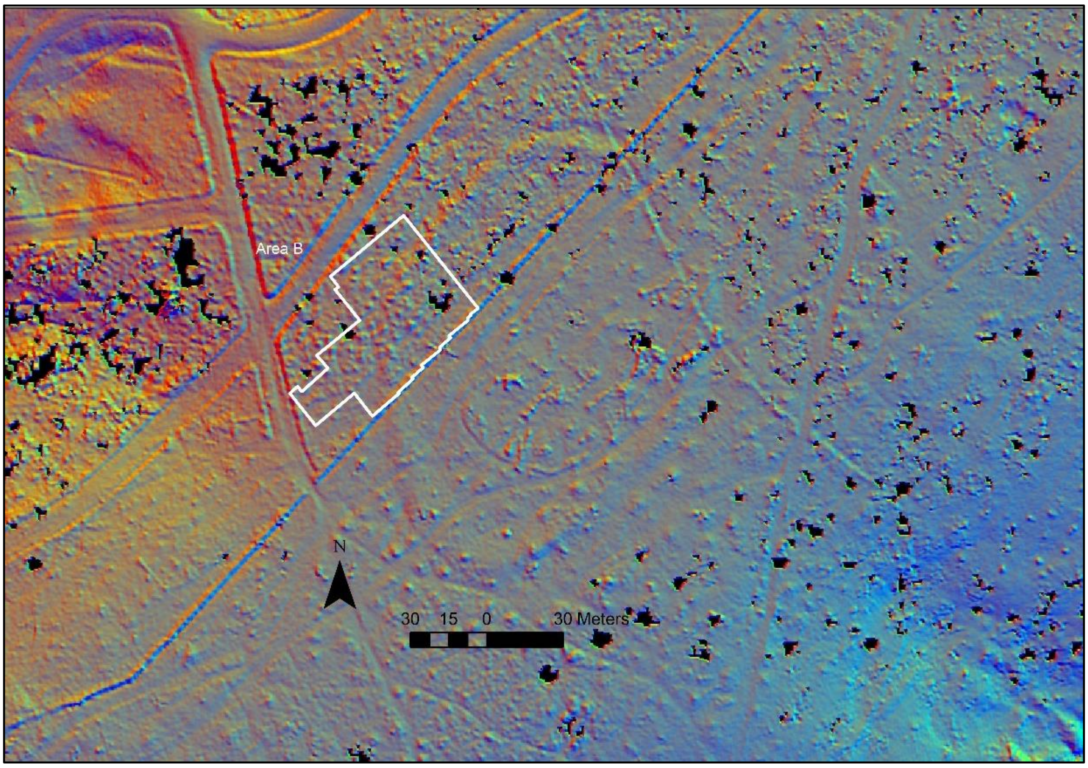
Appendix 5: Lidar data



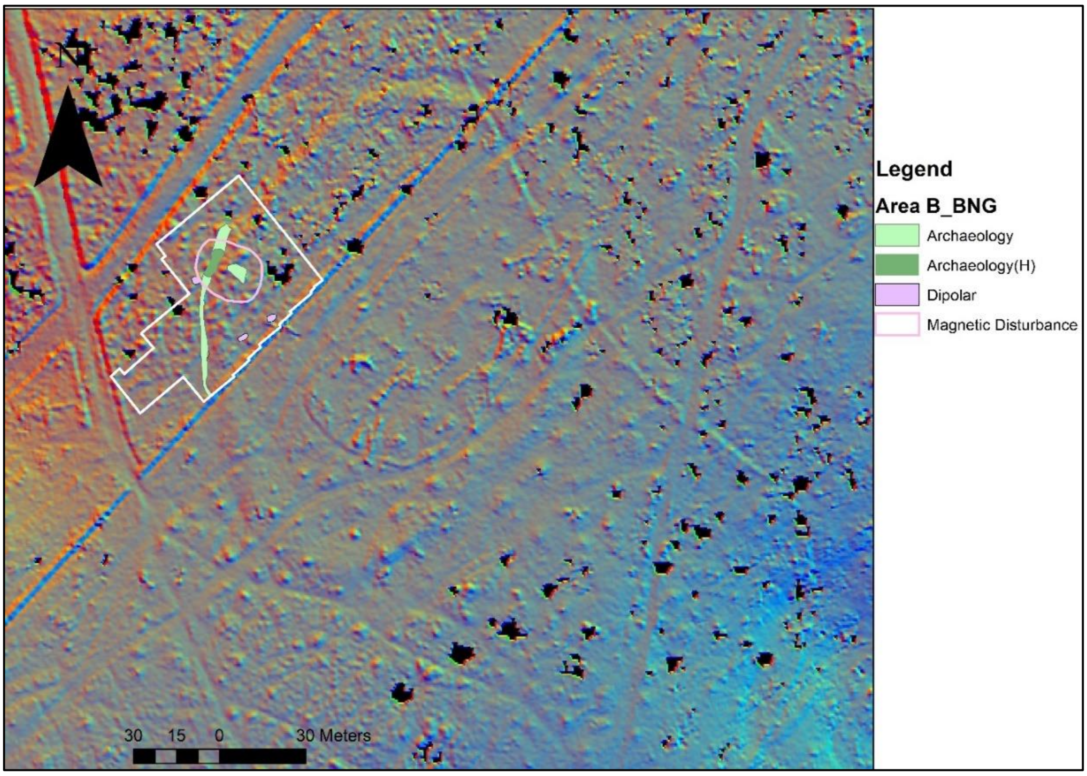
1 - Survey area A overlying the lidar data



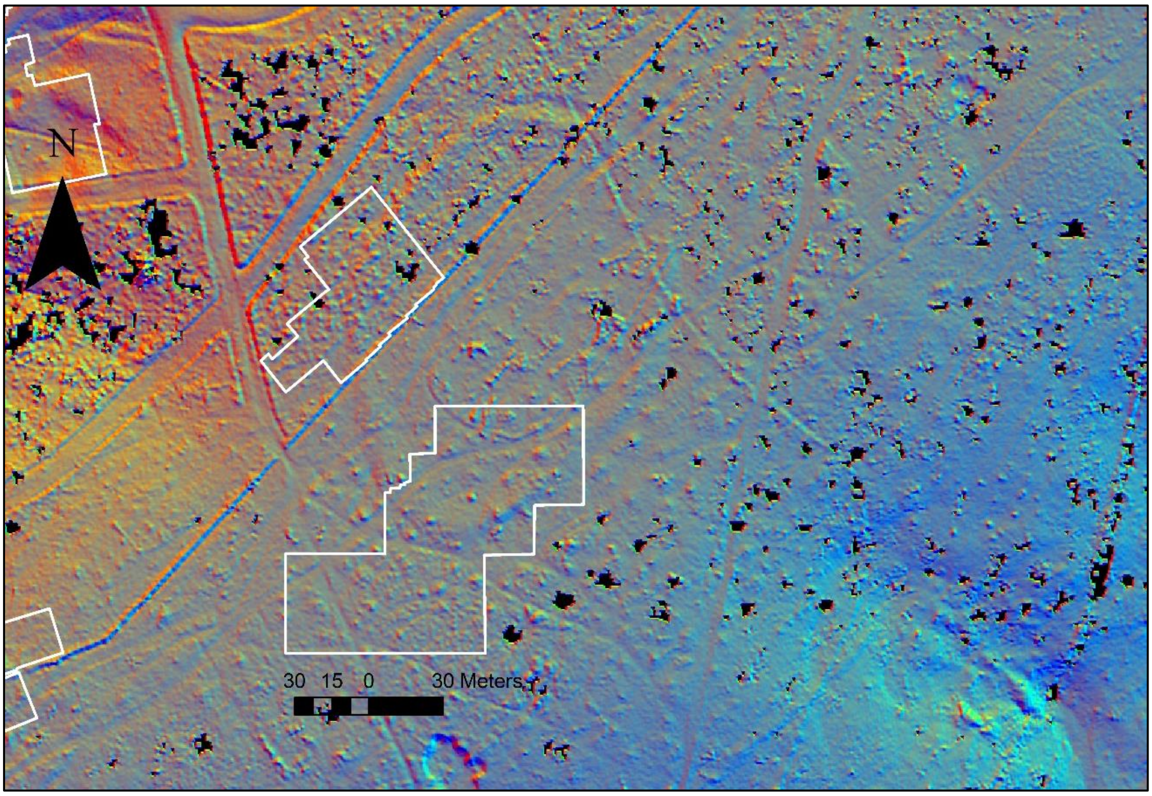
2 - Interpretations of Area A overlying lidar data



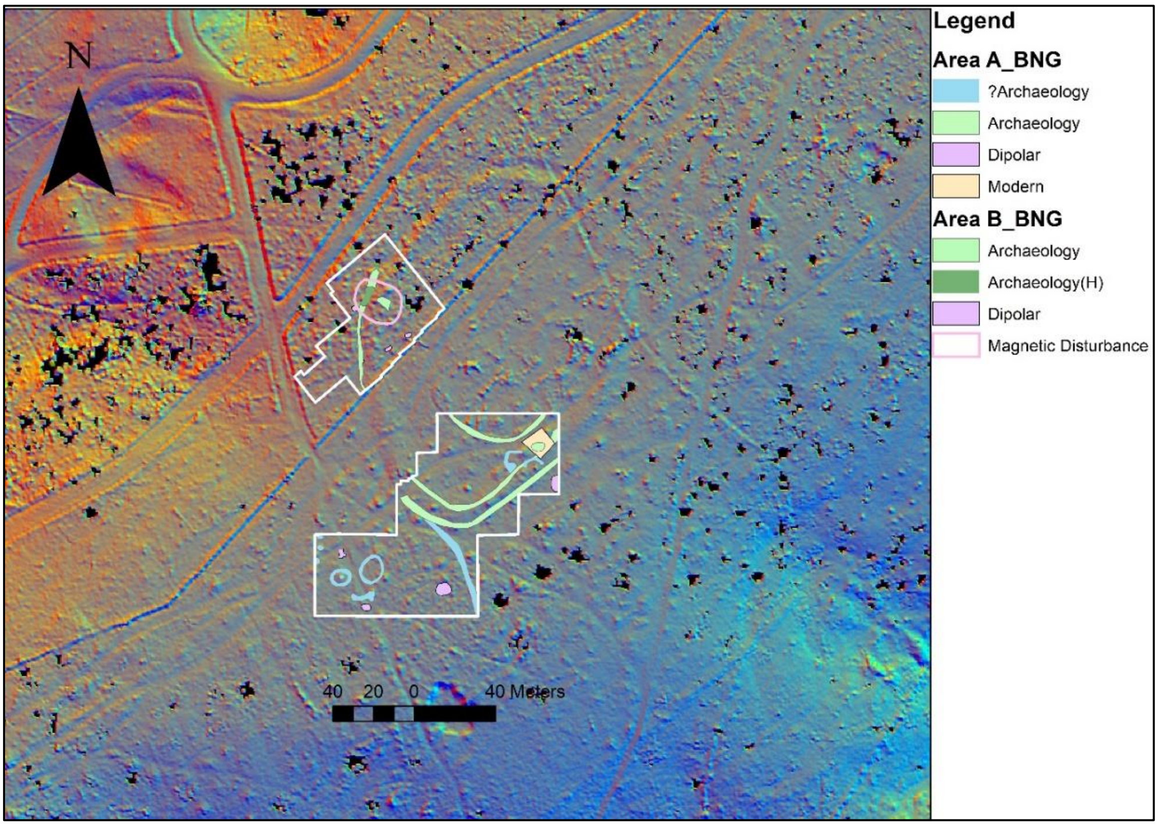
3 - Survey Area B overlying lidar data



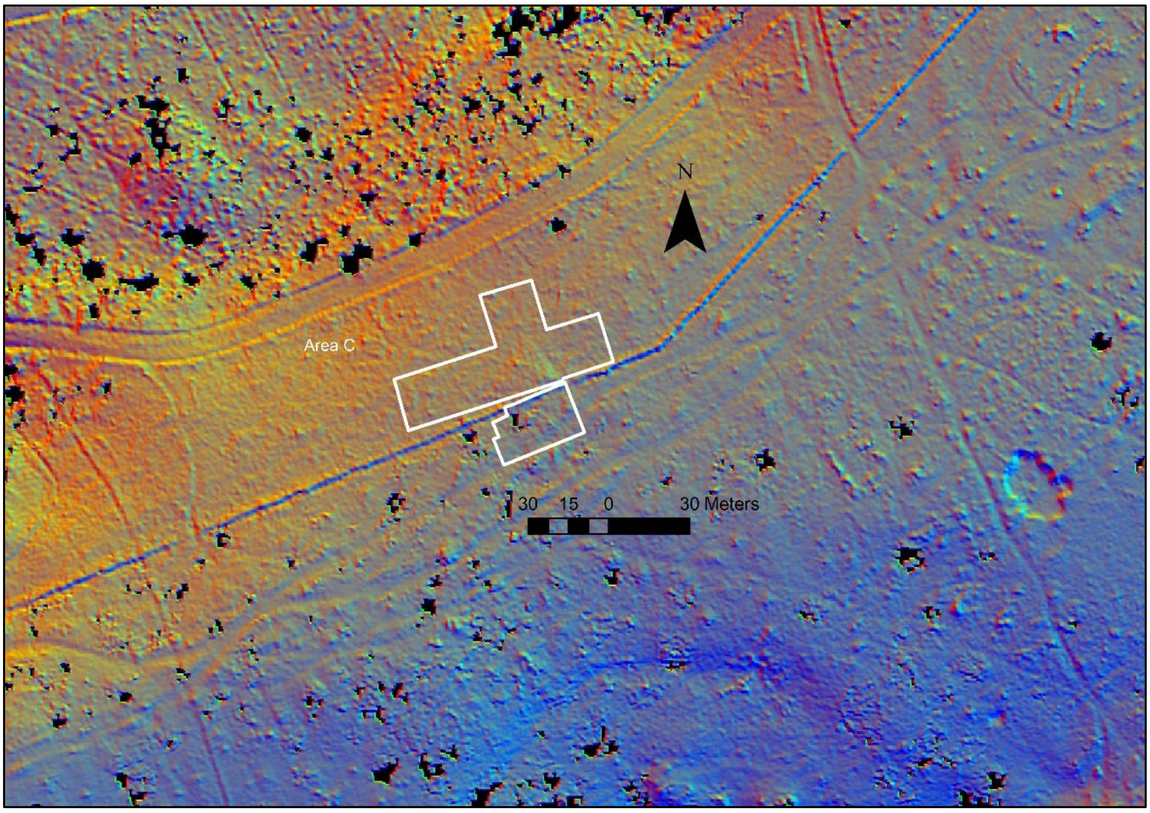
4 - Interpretations of Area B overlying lidar data



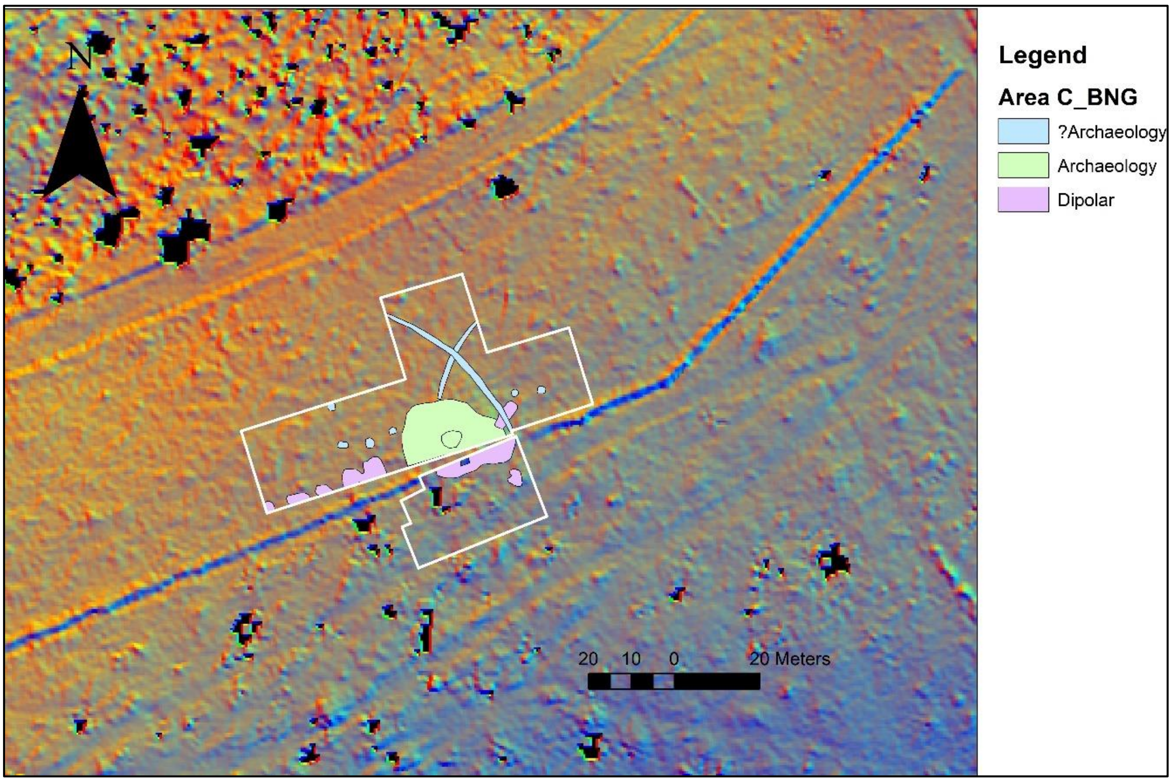
5 - Survey area A & B overlying the lidar data



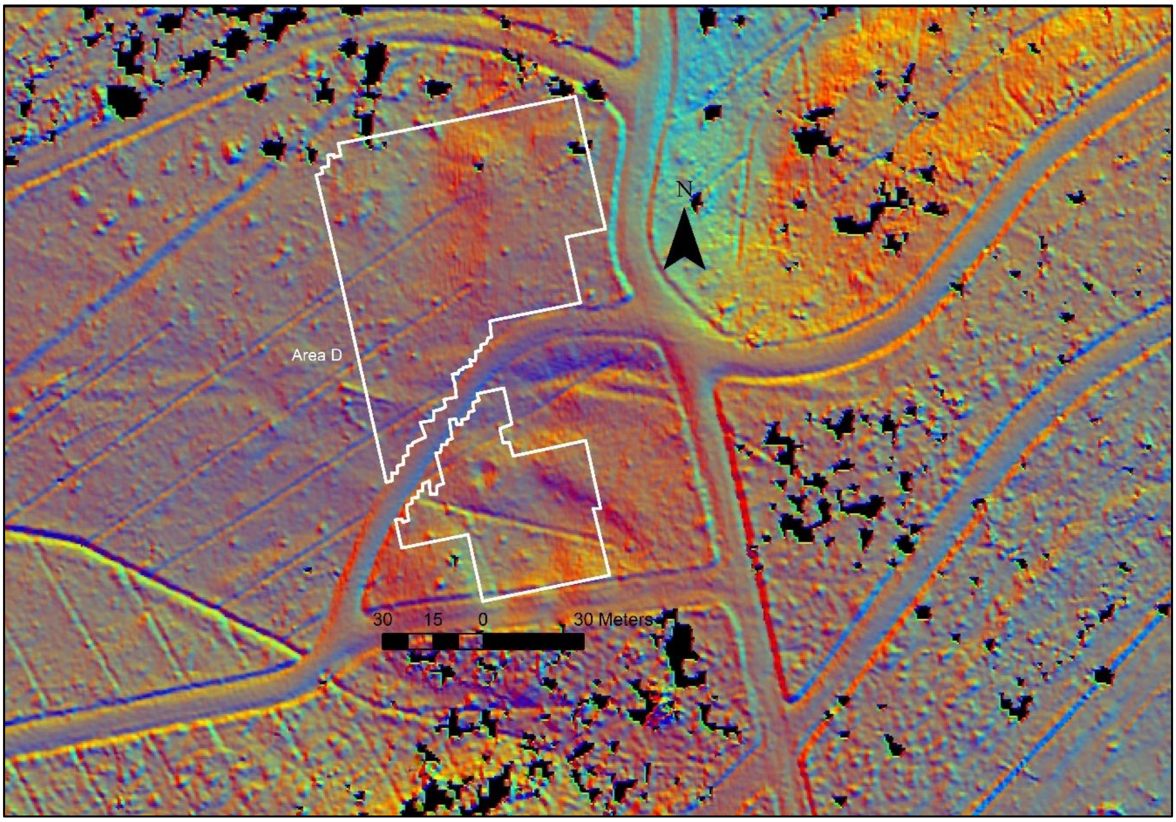
6 - Interpretations of Area A and B overlying Lidar data



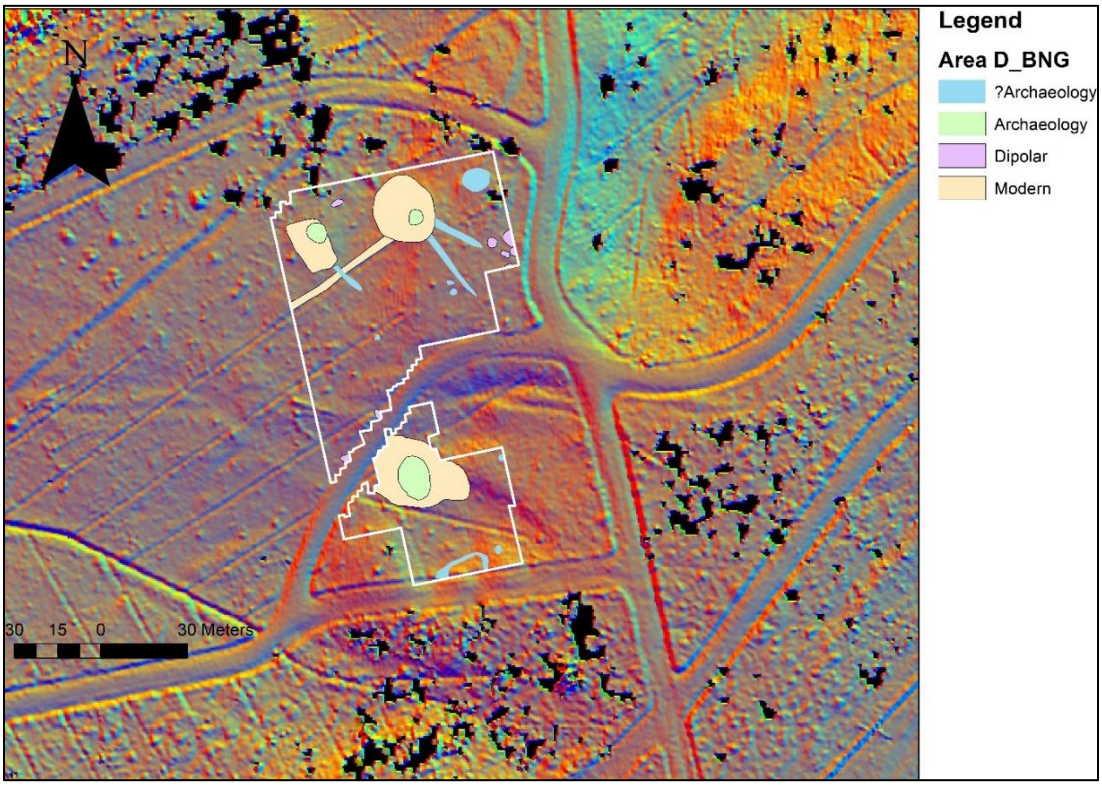
7 - Survey Area C overlying the lidar data



8 - Interpretations of Area C overlying lidar data



9 - Survey Area D overlying the lidar data



10 - Interpretations of Area D overlying the lidar data