NAA

GEOPHYSICAL SURVEY

FIELDS 4942 5758

TENDLEY QUARRY

CUMBRIA

prepared for

Tendley Quarries Ltd

NAA 21/21

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Northern Archaeological Associates

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FIELDS 4942 AND 5758, TENDLEY QUARRY, CUMBRIA
GEOPHYSICAL SURVEY REPORT

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Disclaimer

The results of geophysical survey may not reveal all potential archaeology and do not provide a comprehensive map of the sub-surface, but only responses relative to the environment. Geological, agricultural and modern responses may mask archaeological features. Short-lived features may not give strong responses. Only clear features have been interpreted and discussed in this report.

FIELDS 4942 AND 5758, TENDLEY QUARRY, CUMBRIA
GEOPHYSICAL SURVEY REPORT

Summary

Northern Archaeological Associates (NAA) was commissioned by Tendley Quarries Ltd to undertake a geophysical survey of two fields to the north of the existing workings at Tendley Quarry (Fields 4942 and 5758), Brigham, Cumbria CA13 0SE, in advance of a proposed quarry extension (NGR: NY 08582 29470). The work was required to assess the archaeological potential of the site and help inform subsequent archaeological mitigation, if needed.

Since the turn of the 21st century, several phases of archaeological assessment have been undertaken in advance of extensions to Tendley Quarry. Between 2019 and 2020 archaeological investigations in Field 6532—located directly to the south of the current study area—identified a Bronze Age funerary site including a barrow with an adjacent inhumation. At the beginning of 2021 land to the west of the current survey area (Field 3730) was targeted with non-intrusive archaeological investigation. An oblong earthwork of unknown origin is recorded in the Historic Environment Record (HER) data and was identified during a site visit on 5 February 2021.

Geophysical survey undertaken in January 2021 identified several anomalies considered to be agricultural, geological or modern in origin, as well as two trends and a sub-circular anomaly of unknown origin (NAA 2021). Following these investigations and in consultation with Cumbria County Council it was agreed that intrusive investigation—in the form of trial trench evaluation—was required to establish the archaeological potential of the earthwork and geophysical anomalies of unknown origin (NAA forthcoming). Prior to the submission of a Written Scheme of Investigation (WSI) for the trial trench evaluation works; however, the development area was expanded to include Fields 4942 and 5758. This document details the results of geophysical survey in Fields 4942 and 5758 and aims to establish the absence or presence of anomalies that could have an archaeological potential and so may require subsequent intrusive archaeological assessment works and incorporating into the WSI currently being drafted for trial trench evaluation in Field 3730.

The geophysical survey targeted approximately 4.6ha of agricultural land and was carried out on 18 March 2021. The results of the survey identified several phases of ridge and furrow and former field boundaries. A circular anomaly was tentatively identified in the centre of Field 5758 as possibly being of an archaeological origin and several weak and diffuse trends were

present in Field 4942. Otherwise, anomalies were considered to be modern or geological in origin.

1.0 INTRODUCTION

1.1 Northern Archaeological Associates (NAA) was commissioned by Tendley Quarries Ltd to undertake a geophysical survey of land to the north-west of the existing workings at Tendley Quarry (Fields 4942 and 5758), Brigham, Cumbria CA13 0SE, in advance of a proposed quarry extension (NGR: NY 08582 29470). The work was required to assess the archaeological potential of the site and help inform subsequent archaeological mitigation, if required. The geophysical survey targeted approximately 4.6ha of agricultural land and was carried out on 18 March 2021.

1.2 This report details the setting (location, topography, geology) of Fields 4942 and 5758 and archaeological background of the scheme and gives the methodology used for the geophysical survey. The interpretation of the geophysical survey is achieved through the analysis of identified anomalies and was aided by a rapid examination of supporting information. The results of the geophysical survey are discussed below, and the interpretations are supported by appropriate illustrations. Where feasible, a detailed synopsis of anomalies is provided and, if possible, the features that the anomalies are likely to relate to are suggested.

2.0 LOCATION, GEOLOGY AND TOPOGRAPHY

Location

2.1 The survey areas lay directly to the north of Tendley Quarry, which is approximately 1km to the south of Brigham village and 0.75km to the north-east of Eaglesfield (Fig. 1). In total, five fields of pasture totalling c.4.6ha was targeted by geophysical survey (Fig. 2). The site was bounded to the east by Hotchberry Brow road, and agricultural land lies to the north, west and south.

Geology and soils

2.2 The solid geology in the east of the site comprises First Limestone (Cumbria); the west of the site contains Hensingham Grit sandstone. Superficial deposits of Devensian till are present in the centre and east of the site. No drift geology is recorded in the west of the site (BGS 2021). The soils are mapped as being of the Malham 1 Association, consisting primarily of well-drained soils in silty aeolian drift, intermixed in places with bare limestone pavement or crags (Soil Survey of England and Wales 1983; Jarvis *et al*. 1984, 234–5).

Topography

2.3 The site lies on the brow of a hill with the natural topography sloping downwards to the south-east. The highest level is in the north-west of Field 5758 and is recorded at 103m above Ordnance Datum (aOD); the south-east of Field 4942 forms the lowest point at 93m aOD.

3.0 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

Previous archaeological investigations

3.1 A number of archaeological works have been carried out by various companies prior to previous quarry extensions at Tendley Quarry including:

- Headland Archaeology: a rapid archaeological desk-based assessment (Conolly and Carter 2001) and trial trenching (Dutton 2003);
- West Yorkshire Archaeological Services (WYAS): geophysical surveys (Webb 2003; Gidman and Webb 2007; Watson 2008);
- Oxford Archaeology North: trial trenching (Lee and Vannan 2008);
- North Pennines Archaeology: trial trenching (Jackson 2009; Haigh 2011);
- GSB Prospection: geophysical survey (GSB 2014);
- Northern Archaeological Associates: trial trenching (NAA 2014); geophysical survey (NAA 2017); trial trenching (NAA 2018a); excavation (NAA 2018b); geophysical survey (NAA 2019); excavation (NAA 2020); and geophysical survey (2021).

3.2 No significant archaeological remains were revealed during the surveys undertaken between 2001 and 2014. Geophysical survey undertaken in 2017 to the north-west of the quarry identified several linear anomalies that were suggested to possibly indicative of archaeological features (NAA 2017). Trial trenching and a subsequent small excavation carried out by NAA recorded small linear gullies and pits containing charcoal, burnt stones and fired clay. Artefacts were limited to a whetstone and a probable hammerstone, neither of which were diagnostic. Although these features were undated, the character of the pits could be suggestive of prehistoric settlement in the vicinity of the site (NAA 2018b).

3.3 Between 2019 and 2020, an Early Bronze Age funerary monument was identified directly to the north of the current quarry workings during a geophysical survey and subsequent archaeological evaluation (Fig. 2: Field 6532). Excavations recorded a penannular gully c.25m in diameter with an entrance to the south-east, thought to be the remains of a barrow. The gully enclosed four pits, a posthole, and an inhumation with an associated Early Bronze Age Food Vessel (NAA 2019; NAA 2020; Figs 5 and 7).

3.4 Geophysical survey was undertaken in January 2021 in fields directly to the west of the proposed development area (PDA) (Fig. 2: Field 3730). Largely, the results of the survey were considered to be agricultural, modern or geological in origin. The presence of ridge and furrow and anomalies associated with former field boundaries suggested that the surveyed area had retained an agricultural function since at least the medieval period. Several anomalies of unknown origin, along with an earthwork that is recorded in the HER data that identified during a subsequent site visit (albeit did not correspond with any geophysical anomalies), were identified as requiring further archaeological evaluation in the form of archaeological trial trenching (NAA 2021; NAA forthcoming). A Written Scheme of Investigation (WSI) for the trial trench evaluation works is currently in production, awaiting the results of the geophysical survey which are presented in this report (NAA forthcoming).

Historical background

3.5 The route of a Roman road running between Ravenglass and Papcastle is reputed to pass close to Tendley Hill (Margary 1973, 389–95). Historic accounts suggest that parts of this road were uncovered during quarrying activity, though no other finds or sites dating to this period have been revealed in the vicinity.

3.6 A cist burial of probable early medieval date was found at Eaglesfield, which is c.1.5m to the south-east of the PDA (Wilson 1978). Closer to the current site, a number of burials are reported to have been found during quarrying on Tendley Hill, and one discovered in 1814 was accompanied by a 10th-century sword, a 'pike' (possibly a spear) and a brooch (*ibid.*, 48; Edwards 1992, 48). The 1867 Ordnance Survey (OS) map notes '*human remains have been found here*' on Tendley Hill at the eastern side of Hotchberry Brow. There is believed to be some correlation between early medieval burials and historic boundaries, and the presence of the boundary between Dean and Brigham parishes, skirting Tendley Hill, may suggest that it was an early cemetery.

3.7 Little is known about medieval activity in the direct hinterland of the site. Geophysical survey undertaken in numerous fields surrounding the quarry has recorded extensive ridge and furrow. This suggests that the area had been agricultural land in the wider hinterland of Cockermouth since at least the medieval period. Historic maps from the mid-19th century show much of the area surrounding Tendley Quarry forming strip fields and show the changes in land management.

3.8 During the post-medieval period, Tendley Hill was subjected to extensive limestone quarrying. Several quarries and lime kilns are recorded on 19th-century mapping and are shown to have grown in size between the 1867 and 1890 Ordnance Survey maps.

4.0 AIMS AND OBJECTIVES

4.1 The aim of the geophysical survey was to map and record potential buried features located within the PDA. Through detailed analysis of the results of the geophysical survey, NAA aimed to provide a detailed interpretation that assessed the archaeological potential of the site and will inform future archaeological mitigation strategies.

4.2 The objectives of the survey were to:

- undertake a geophysical survey across areas deemed suitable for data collection;
- attempt to identify, record and characterise any sub-surface remains within the survey boundary;
- assess the archaeological potential of identified anomalies and locate any possible concentrations of past activity; and
- inform the requirement for any further archaeological investigation within the site.

5.0 METHODOLOGY

5.1 The geophysical survey was undertaken as a gradiometer survey using the Bartington Grad601-2 dual magnetic gradiometer system with data logger. The readings were recorded at a resolution of 0.01nT, and data was collected with a traverse interval of 1m and a sample interval of 0.25m. All recorded survey data were collected with reference to a site survey grid comprising individual 30m x 30m squares. The grid was established using Real Time Kinematic (RTK) differential GPS equipment and marked out using non-metallic survey markers. All grid nodes were set out with a positional accuracy of at least 0.1m as per existing guidelines (CIfA 2014; Schmidt *et al.* 2015) and could be relocated on the ground by a third party. The base lines used to create the survey grids are shown on Figure 2 and further details are available in Appendix A.

5.2 The processing was undertaken using Geoplot 3.0 software and consisted of standard processing procedures. Details of processing steps applied to collected data are given in Appendix B.

5.3 On the greyscale plot (Figs 3–5), positive readings are shown as increasingly darker areas and negative readings are shown as increasingly lighter areas.

5.4 Interpretation of identified anomalies is generally achieved through analysis of anomaly patterning and increases in magnetic response, and is often aided through examining supporting information (including but not limited to historic maps, LiDAR survey data, aerial photographs, as well as geophysical survey data and excavation results in the direct hinterland of the scheme). To aid understanding of the PDA results, the data and its interpretation are shown alongside the previous surveys in Fields 3730 and 6532 (Figs 5 and 7).

5.5 The interpreted data uses colour coding to highlight specific readings in the survey area (see Figs 6 and 7).

Surface conditions and other mitigating factors

5.6 At the time of the survey, the site contained pasture. Field boundaries comprised hedgerows, metal fencing and drystone walls. Occasional areas of high vegetation occurred along field edges.

5.7 Attempts were made to avoid areas affected by above-ground features that were likely to have a high magnetic susceptibility, such as metal fencing, to minimise the potential for their magnetic responses to impinge on the survey results and mask potential buried features.

5.8 Of the 4.6ha development area, 3.8ha was suitable to be surveyed.

6.0 GEOPHYSICAL SURVEY RESULTS

6.1 Two field boundaries present on the 1867 Ordnance Survey map were identified in the geophysical survey results in Field 4942 (Fig. 6: **A**). A further possible field boundary that does not appear on historic maps occurs in the west of Field 4942 (Fig 6: **B**).

6.2 A curvilinear anomaly with an internal amorphous anomaly was identified in the centre of Field 5758 (Fig. 6: **C**). It is unclear if these anomalies are archaeological in origin or are caused by geological or pedological changes in the substrata.

6.3 There are several weak and diffuse linear trends. These fail to produce the necessary patterning or increases in magnetic response in order to be interpreted fully, and as a consequence their origin is unknown.

6.4 Broadly spaced ridge and furrow occurs commons across Fields 4942 and 5758: in the south of the PDA it largely appears on an east–west orientation, while in the north it generally has a north–south orientation.

6.5 An isolated bipolar anomaly was identified in the west of Field 4942 that is likely to be caused by highly magnetic material, such as a ferrous object(s) in the topsoil of the site (Fig. 6: **D**).

6.6 Dipolar anomalies are generally likely to relate to ferrous or modern objects buried in the topsoil. Consequently, these anomalies are largely considered to be of a modern nature and so have not been depicted on interpretation plots. Areas of increased magnetic response have been used to highlight concentrations of dipolar anomalies. Generally, these are considered likely to be caused by modern magnetic debris in the topsoil or near the surface of the site. In particular, **E** appears to be the continuation of a magnetic disturbance identified in the Field 3730 (Figs 5–7), and **F** corresponds with the location of a modern paddock (Fig. 6).

6.7 There are several broad responses within the area surveyed that are plausibly caused by geological or pedological changes in the substrata.

7.0 CONCLUSIONS

7.1 NAA was commissioned to undertake a geophysical (gradiometer survey) to the north of the current workings at Tendley Quarry to assess the archaeological potential of the area in advance of an extension of the quarry.

7.2 Although tentative, the anomaly with the greatest potential of being of an archaeological origin occurs in the centre of Field 5758 and comprised a curvilinear anomaly with a central amorphous anomaly (Fig 6: **C**). Although the anomaly is composed of much stronger increase in magnetic values than anomalies proven to be archaeological in nature in Field 6532 (Fig. 5), it has a fairly unform shape that could be indicative of an infilled feature. It is also worth noting that there are several anomalies with a broad form, that were considered to plausibly be geological in origin in the direct vicinity of **C**. Consequently, it cannot be dismissed that there is a potential that **C** is geological in origin, or alternatively if proven to be archaeological that nearby anomalies suggested to be geological could instead be caused by infilled features.

7.3 Evidence of agricultural activity since at least the medieval period was recorded in the form of ridge and furrow and field boundaries recorded on 19th-century Ordnance Survey maps. A further potential field boundary not evident on historic maps was also identified.

7.4 Otherwise, anomalies were considered to be of a modern or geological in nature.

8.0 STORAGE AND CURATION

8.1 The records of the geophysical survey are currently held by NAA. All material will be appropriately packaged for long-term storage in accordance with national guidelines (CIfA 2014; Schmidt *et al*. 2015). An online OASIS form will be completed within three months of the completion of the project. This will include submission of a PDF version of the final report to the Archaeology Data Service via the OASIS form.

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Cartographic sources

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Ordnance Survey (1900) Cumberland LIV.NW (includes: Brigham; Broughton; Broughton Moor; Camerton; Great Clifton; Greysouthen; Little Clifton. (Revised 1898 to 1899).

APPENDIX A

TECHNICAL INFORMATION

GRADIOMETER SURVEY

Magnetic surveys measure distortions in the earth's magnetic field caused by small magnetic fields associated with buried features (Gaffney and Gater 2003, 36) that have either remnant or induced magnetic properties (Aspinal *et al.* 2008, 21–26). Human activity and inhabitation often alter the magnetic properties of materials (Aspinal *et al.* 2008, 21) resulting in the ability for numerous archaeological features to be detected through magnetic surveys. Intensive burning or heating can result in materials attaining a thermoremanent magnetisation; examples of which include kilns, ovens, hearths and brick structures (*ibid.*, 27; Gaffney and Gater 2003, 37). When topsoil that is rich with iron oxides fills a man-made depression in the subsoil, it creates an infilled feature, such as a pit or ditch, with a higher magnetic susceptibility compared to the surrounding soil (Aspinal *et al.* 2008, 37–41; Gaffney and Gater 2003, 22–26). Magnetic surveys can also detect features with a lower magnetically susceptibility than the surrounding soil, an example of which is a stone wall.

LIMITATIONS

Poor results can be due to several factors including short-lived archaeological occupation/use or sites with minimal cut or built features. Results can also be limited in areas with soils that are naturally deficient in iron compounds or in areas with soils overlying naturally magnetic geology, which will produce strong responses masking archaeological features.

Overlying layers, such as demolition rubble or layers of made ground, can hide any earlier archaeological features. The presence of above-ground structures and underground services containing ferrous material can distort or mask nearby features.

Particularly uneven or steep ground can increase the processing required, or distort results beyond the capabilities of processing. It is also possible in areas containing dramatic topographical changes that natural weathering, such as hillwash, often in combination with intensive modern ploughing, will reduced the topsoil on slopes and towards the peaks of hills, and possibly destroy or truncate potential archaeological features. Conversely, features at the bottom of slopes may be covered by a greater layer of topsoil and so if buried features are present, they appear faint within the results, if at all.

Over processing of data can also obscure or remove features, especially if they are on the same orientation as the direction of data collection. Consequently, where possible, attempts are made to ensure data is not collected on the same orientation as known potential features and that data quality is sufficient to minimise the required data processing.

INSTRUMENTATION

The data was collected using handheld Bartington Grad 601-2 fluxgate gradiometers. The Bartington 601-2 is a single-axis, vertical component fluxgate gradiometer comprising a data logger battery cassette and two sensors. The sensors are Grad-01-1000L cylindrical gradiometer sensors mounted on a rigid carrying frame; each sensor contains two fluxgate magnetometers with 1m vertical separation.

The difference in the magnetic field between the two fluxgates in each sensor is measured in nanoTesla (nT). NAA gradiometer data is recorded with a range of ±100nT, which equates to a resolution of 0.01nT. It should be noted that the actual resolution is limited to 0.03nT as a consequence of internal instrumental noise (Bartington Instruments n.d., 23).

The gradiometer records two lines of data on each traverse, the grids are walked in a zigzag pattern amounting to 15 traverses. The gradiometers are calibrated at the start of every day and recalibrated whenever necessary.

SURVEY DETAILS

Table A1: survey summary.

Item	Survey
Grid size	30m x 30m
Traverse interval	1m
Reading interval	0.25m
Direction of 1st traverse	N
Number of grids	87
Area covered	3.8ha

Table A2: baseline co-ordinates.

Item	Survey
gpA	308523.8612 529596.1169
gpB	308553.8612 529596.1169

Table A3: site information and conditions.

Item	Detail
Geology	E: First Limestone (Cumbria) W: Hensingham Grit sandstone
Superficial deposits	Devensian Till
Soils	Malham 1 Association
Topography	Highest: 103m aOD Lowest: 93m aOD
Land use	Agricultural – pasture
Weather conditions prior to and during survey	Sunny

APPENDIX B

DATA PROCESSING INFORMATION

Gradiometer survey data is downloaded using the Bartington Grad 601 software and the processing was undertaken using Geoplot 3.0 software.

Table B1: commonly applied techniques.

Process	Effect
Zero mean traverse	Removes stripping that can occur as a consequence of using multisensor arrays or a 'zigzag' data collection method by setting the mean reading for each traverse to zero.
Destagger	Removes stagger in the data introduced through inconsistent data collection pace and often exacerbated through the 'zigzag' methodology.
Clip	Clips data above or below a set value to enhance potential weaker anomalies.
Despike	Removes random spikes or high readings to reduce the appearance of dominant readings, often created by modern ferrous objects that can distort the results.
Low pass filter	Removes low-frequency waves or broad anomalies such as those caused by strong or large gradual variations in the soil's magnetic susceptibility often caused by geological or natural changes in the substrata.
Interpolation	Used to smooth or reduce the blocky appearance of data by improving the spatial density and increase the quantity of data points in the Y direction.

Table B2: processing steps.

Minimal Processing	Increased Processing
• Zero mean traverse • Destagger	• Low Pass Filter • Interpolate Y, Expand – Linear, x2

APPENDIX C

DATA VISUALISATION INFORMATION

FIGURES

The data were used to produce a series of images to demonstrate the results of surveys, which are detailed below:

- Greyscale/Colourscale Plot – This visualised the results as a shaded drawing with highest readings showing as black, running through different shades to lowest showing as white.
- XY-trace Plot – This creates a line drawing showing the peaks and troughs of the readings as vertical offset from a centreline.
- Interpreted Plot – Through detailed analysis, anomalies have been interpreted and possible features identified. Interpretation drawings are used to show potential features and in particular to reinforce and clarify the written interpretation of the data. Anomalies have been characterised using the terminology detailed in the following section, and have been assigned colour coding outlined in keys found on the relevant figures associated with this report.

MAGNETIC ANOMALIES AND TERMINOLOGY

Table C1: lexicon of terminology.

Terminology	Description
Anomaly	Any outstanding high or low readings forming a particular shape or covering a specific area within the survey results.
Feature	A man-made or naturally created object or material that has been detected through investigation works and has sufficient characteristics or supporting evidence for positive identification.
Magnetic susceptibility	The ability of a buried feature to be magnetically induced when a magnetic field is applied.
Magnetic response	The strength of the changes in magnetic values caused by a buried feature with either a greater or lesser ability to be magnetised compared with the soil around it. Anomalies are considered to have either strong/weak or positive/negative responses. The strength of magnetic response (along with patterning) can be essential in determining the nature of an anomaly, but it should be noted that the size or strength of the magnetic response does not correlate with the size of the buried feature.
Patterning of an anomaly	The shape or form of an individual anomaly.
Thermoremanence	The affect caused when a material has been magnetically altered through a process of heating. Thermoremanent magnetisation occurs when an object or material is heated passed the Curie Point and acquires a permanent magnetisation that is associated with the magnetic field that they cooled within (Gaffney and Gater 2003, 37).

Different anomalies can represent different features created by human, agricultural or modern activity, or natural pedological or geological changes in the substrata.

Anomalies interpreted with a 'greater' categorisation are considered more likely to be of the interpreted characterisation; whereas a more tentative interpretation is applied to those with a 'lesser' categorisation as a consequence of weaker increases in magnetic response or the anomaly's incomplete patterning or irregular form.

The strength and size of anomalies can vary depending on the magnetic properties of the feature, the magnetic susceptibility of the soil, the depth to which the feature is buried, and the state of preservation.

Table C2: characterisation of anomalies.

Characterisation	Description
Archaeology	
Linear anomaly (unknown origin)	Linear anomalies with a positive or negative magnetic response, and composed of a patterning or shape that could be suggestive of a buried infilled feature, but lacks the strength or patterning to be conclusively interpreted.
Amorphous anomaly (unknown origin)	Isolated anomaly (archaeology) Isolated anomalies or anomalies with a more amorphous form possibly represent infilled features or thermomagnetic features such as areas of heating/burning of an archaeological origin. Unless associated with conclusively identified archaeological remains, such as linear anomalies, absolute identification of positive responses can be problematic as it is often not possible to decipher if they are of an archaeological, modern or agricultural origin. Consequently, isolated positive responses are not shown within the interpretation unless composed of a broad form or belonging to a series of isolated positive responses. Bipolar responses considered likely to be of an archaeological are also interpreted as isolated anomaly (archaeology). These are considered to relate to material with a very strong magnetic susceptibility or thermoremanent magnetisation.
Agriculture	
Field boundary	Isolated linear anomalies that are likely to be indicative of former land divisions. A more conclusive interpretation is given to linear anomalies that correspond with the location of field boundaries recorded on historic maps, aerial photos or LiDAR coverage of the site.
Ridge and furrow	Broadly spaced linear anomalies that are likely to be indicative of earlier forms of agriculture, such as ridge and furrow. These often correspond with the location of earthworks visible on the ground or identified on aerial photos or LiDAR survey coverage.
Agriculture?	Weak, irregularly spaced or isolated linear anomalies that relate to agricultural activity, but the agricultural process they are caused by is unknown.
Modern	
Bipolar response (modern)	Positive anomalies with associated negative 'halo' (bipolar) denote features with a strong magnetic response that are likely to be of a modern origin. Isolated bipolar responses of a modern nature are likely to relate to buried

Characterisation	Description
	ferrous material or objects, such as metallic agricultural debris. If a trend is noted in the alignment or spacing of isolated bipolar responses, it is possible that they are indicative of ferrous fittings or connectors used on non-magnetic buried utilities. Linear bipolar anomalies are likely to be indicative of modern services.
Dipolar response	Dipolar anomalies relate to individual spikes within the data and tend to be caused by ferrous objects. These responses have been shown only when located near to archaeological features. When the site is located in a mining landscape it is possible that identified dipolar anomalies relate to mining activity and are indicative of further pits or mine shafts.
Area of increased magnetic response	Areas of increased magnetic response denote areas of disturbance containing a high concentration of dipolar and/or bipolar responses. These are generally considered to be caused by modern debris in the topsoil, although it is possible that the disturbance is in part also caused by isolated archaeological material or geological or pedological changes in the substrata.

APPENDIX D

OASIS FORM

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: northern1-419264

Project details

Project name	Fields 4942 and 5758, Tendley Quarry, Cumbria
Short description of the project	Geophysical Survey
Project dates	Start: 18-04-2021 End: 18-04-2021
Previous/future work	Yes / Yes
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 1 - Minimal cultivation
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	''Geophysical Survey''
Development type	Mineral extraction (e.g. sand, gravel, stone, coal, ore, etc.)
Prompt	preplanning scoping
Position in the planning process	Pre-application
Solid geology (other)	First Limestone (Cumbria) and Hensingham Grit sandstone
Drift geology (other)	Devensian Till
Techniques	Magnetometry

Project location

Country	England
Site location	CUMBRIA ALLERDALE BRIGHAM Tendley Quarry
Postcode	CA13 0SE
Study area	3.8 Hectares
Site coordinates	NY 08582 29470 54.651911950027 -3.417054290357 54 39 06 N 003 25 01 W Point
Height OD / Depth	Min: 93m Max: 103m

Project creators

Name of Organisation	Northern Archaeological Associates
Project brief originator	Northern Archaeological Associates
Project design originator	Northern Archaeological Associates
Project director/manager	Alice James
Project supervisor	Oskar Sveinbjarnarson
Type of sponsor/funding body	Developer

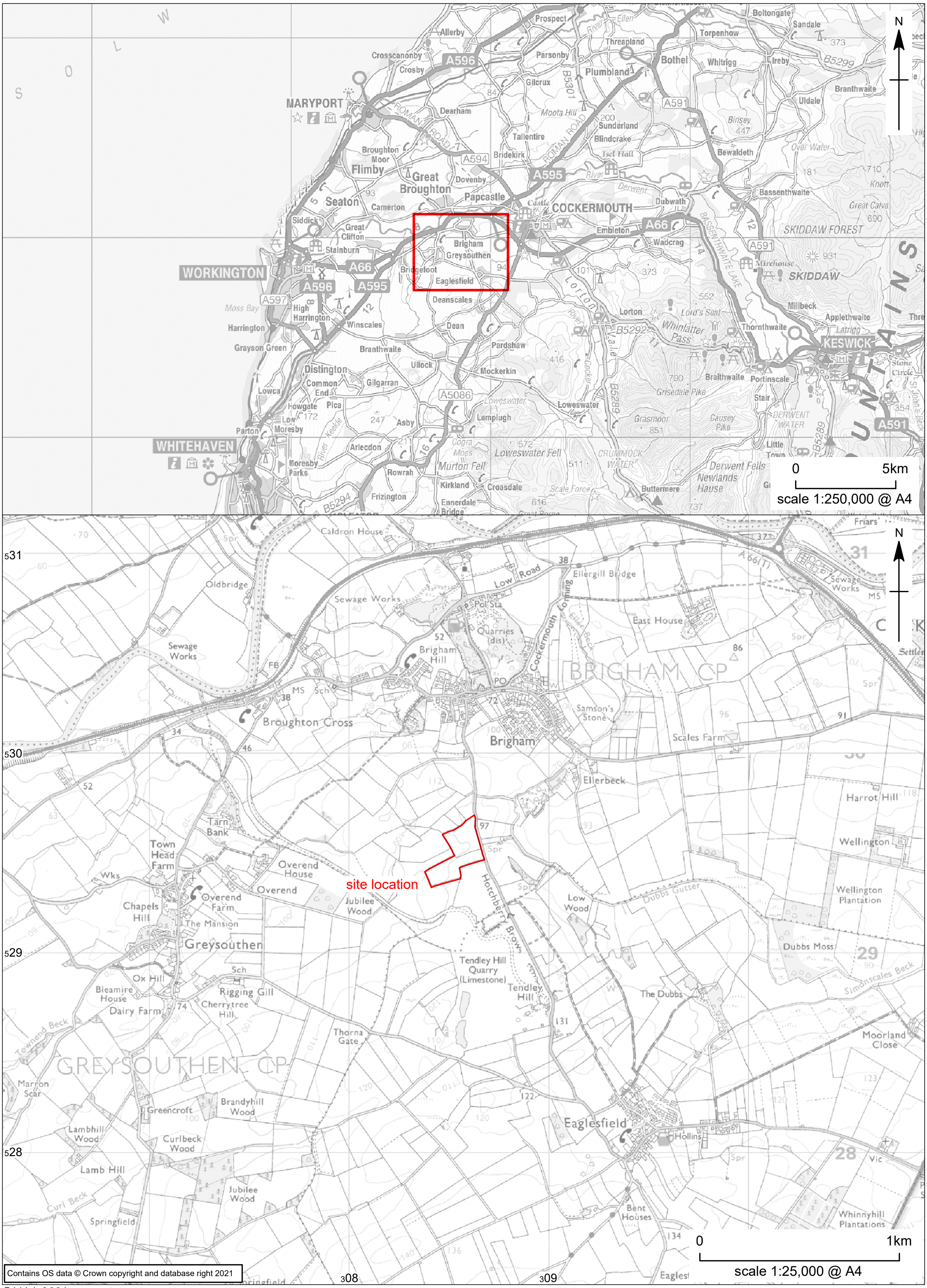
Project archives

Physical Archive Exists?	No
Digital Archive recipient	Northern Archaeological Associates
Digital Contents	''none''
Digital Media available	''Geophysics''
Paper Archive Exists?	No

Project bibliography 1

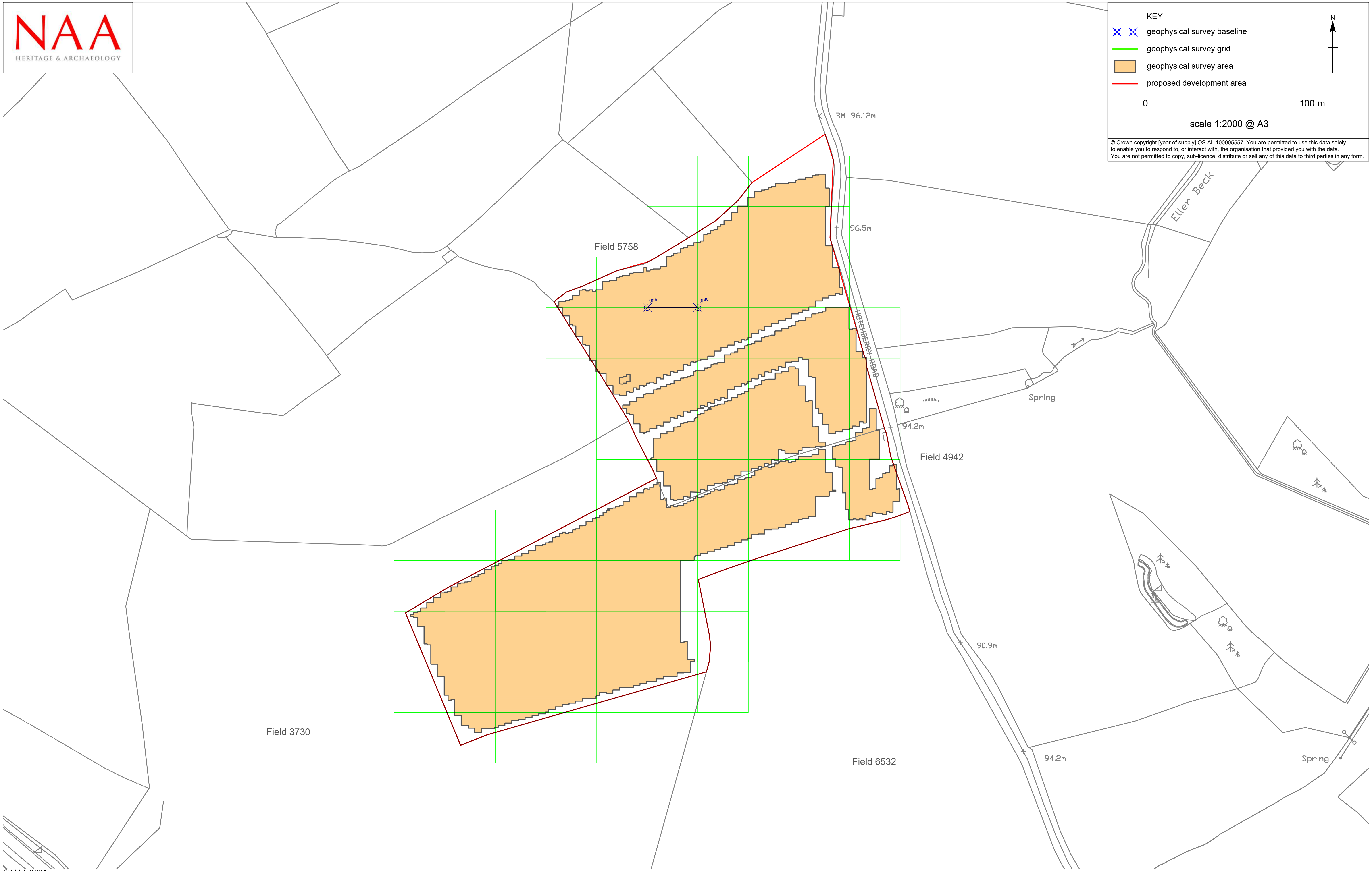
Publication type	Grey literature (unpublished document/manuscript)
Title	Fields 4942 and 5758, Tendley Quarry, Cumbria: Geophysical Survey
Author(s)/Editor(s)	James, A
Other bibliographic details	21-21
Date	2021
Issuer or publisher	NAA
Place of issue or publication	Barnard Castle
Description	Blue Spine

Entered by	Alice (aj@naaheritage.com)
Entered on	13 April 2021



Fields 4942 and 5758, Tendley Quarry, Cumbria: site location

Figure 1



Fields 4942 and 5758, Tendley Quarry, Cumbria: geophysical survey areas

Figure 2

Fields 4942 and 5758, Tendley Quarry, Cumbria: unprocessed greyscale plot of gradiometer survey results

Figure 3

Fields 4942 and 5758, Tendley Quarry, Cumbria: processed greyscale plot of gradiometer survey results

Figure 4

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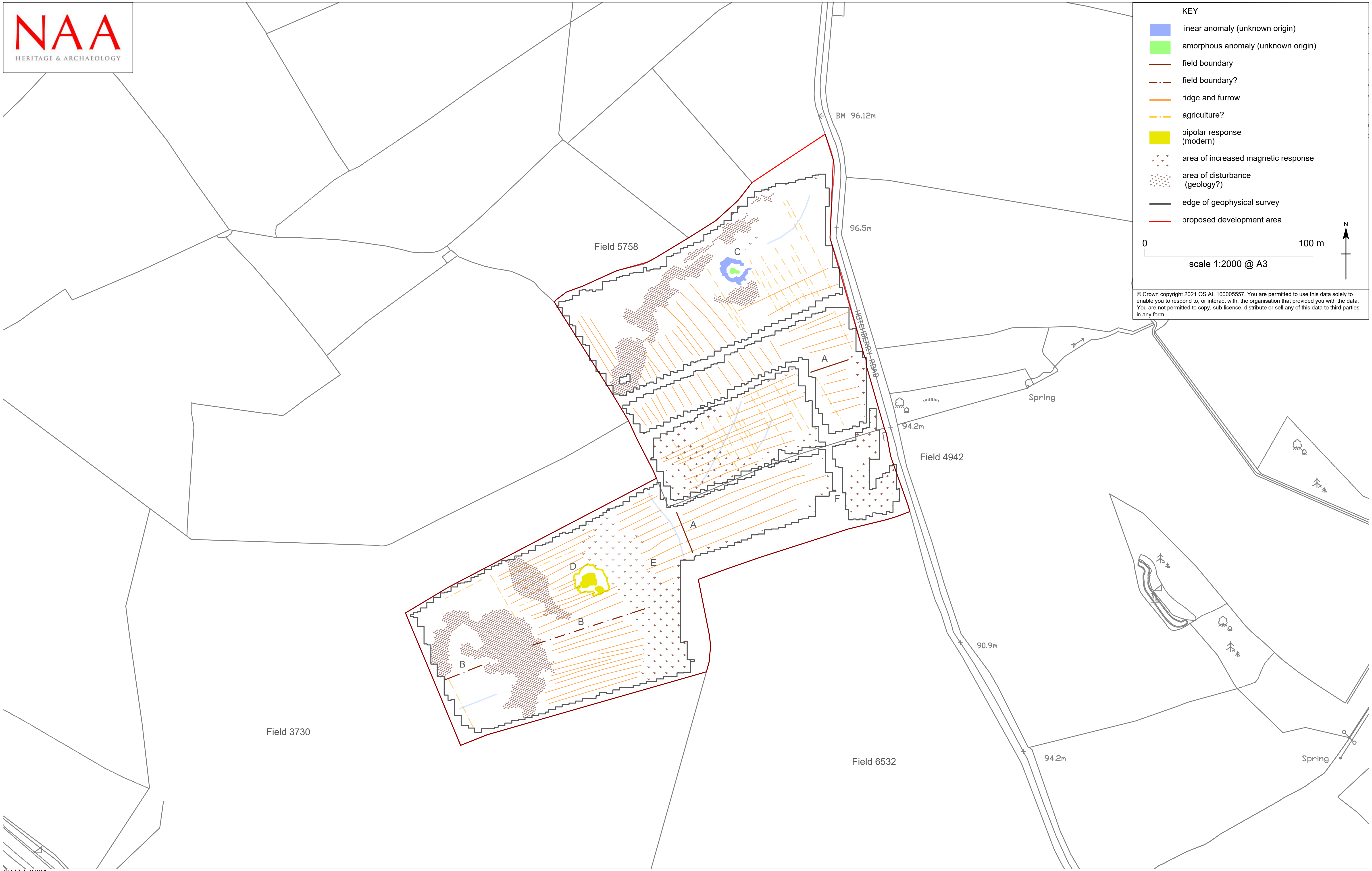
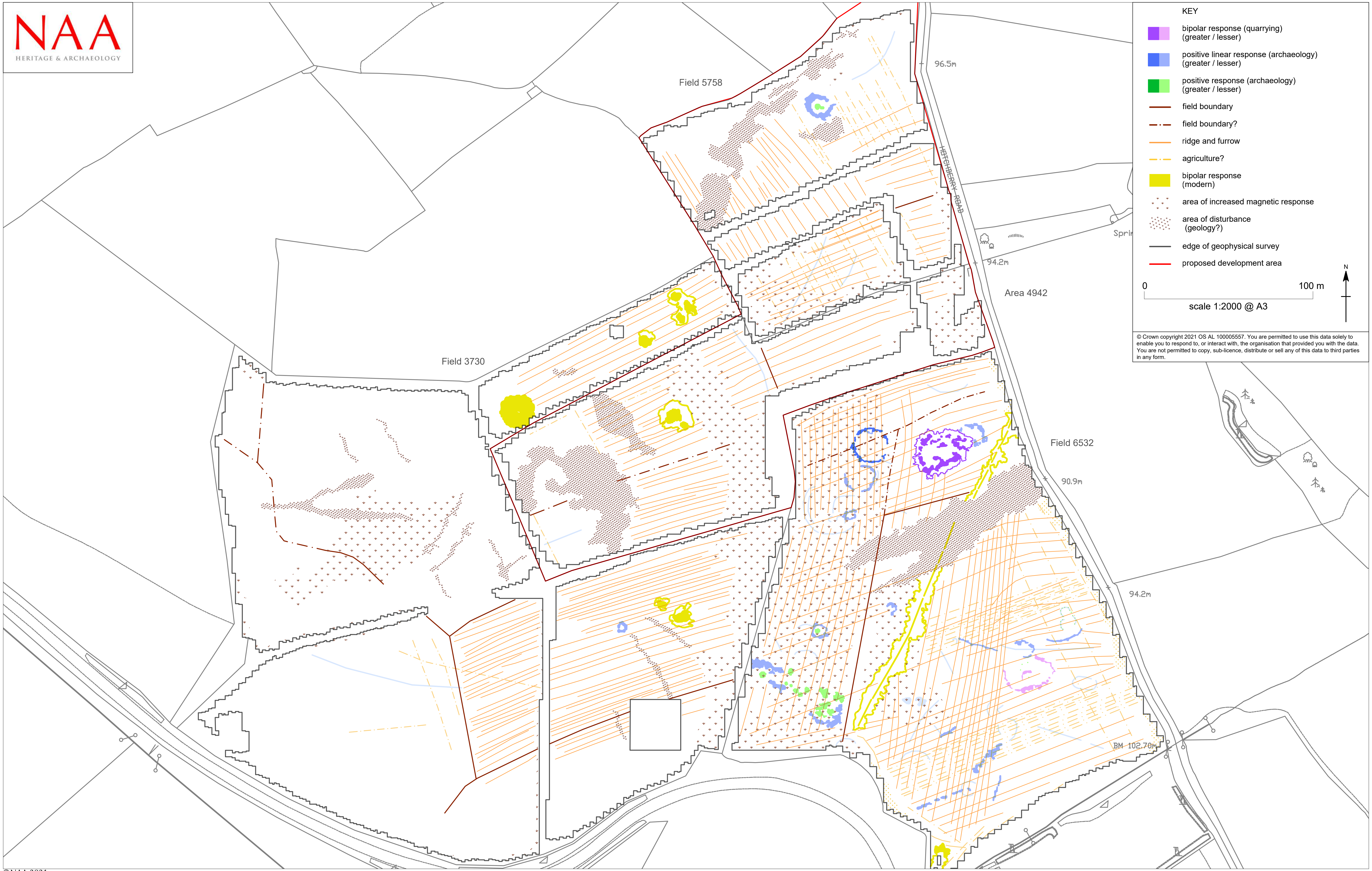
Fields 4942 and 5758, Tendley Quarry, Cumbria: processed greyscale plot of gradiometer survey results plotted with previous survey results in Areas 6532 and 3730

Figure 5



Fields 4942 and 5758, Tendley Quarry, Cumbria: interpretation of gradiometer survey results

Figure 6



Fields 4942 and 5758, Tendley Quarry, Cumbria: interpretation of gradiometer survey results plotted with previous survey results in Areas 6532 and 3730

Figure 7