

ARCHAEOLOGICAL
SERVICES
DURHAM UNIVERSITY

on behalf of
BWB Consulting Ltd

Barnburgh Lane
Goldthorpe
South Yorkshire

geophysical survey

report 5934
March 2023

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1. Summary

The project

- 1.1 This report presents the results of a geophysical survey conducted in advance of proposed development of land at Barnburgh Lane, Goldthorpe, South Yorkshire. The works comprised approximately 2.9ha of magnetometer survey.
- 1.2 The works were commissioned by BWB Consulting Ltd and conducted by Archaeological Services Durham University.

Results

- 1.3 Probable ditches, possibly representing land boundaries pre-dating the OS, have been identified.
- 1.4 Traces of former ridge and furrow cultivation have been detected.
- 1.5 An area of disturbed ground has been detected.

2. Project background

Location (Figure 1)

- 2.1 The survey area was located on land at Barnburgh Lane, Goldthorpe, South Yorkshire (NGR centre: SE 4689 0397). To the north were trees along a dismantled railway line and a housing development on a former colliery site; to the east was farmland; to the south was Barnburgh Lane with farmland beyond; to the west and south-west were residential estates.
- 2.2 One survey of approximately 2.9ha was conducted in a single land parcel, covering over 90% of the 3.1ha proposed development area (PDA).

Development proposal

- 2.3 A residential development is proposed.

Objective

- 2.4 The aim of the survey was to assess the nature and extent of any sub-surface features of potential archaeological significance within the survey area, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in relation to the development.
- 2.5 The regional research framework *South Yorkshire Historic Environment Research Framework* (<https://researchframeworks.org/syrf/> accessed 17-03-2023) contains an agenda for archaeological research in the region, which is incorporated into regional planning policy implementation. In this instance, the scheme of works was designed to address research questions relating to the Iron Age and Romano-British, Later Medieval, Post Medieval, and Industrial periods.

Methods statement

- 2.6 The surveys have been undertaken in accordance with instructions from the client, a method statement provided by Archaeological Services Durham University and national standards and guidance (see para. 5.1 below).

Dates

- 2.7 Fieldwork was undertaken on 6th March 2023. This report was prepared for March 2023.

Personnel

- 2.8 Fieldwork was conducted by Mark Woolston-Houshold. Geophysical data processing and report preparation was by Richie Villis, with illustrations by David Graham. The project manager was Richie Villis.

Archive/OASIS

- 2.9 The site code is **GBL23**, for **Goldthorpe Barnburgh Lane 2023**. The survey archive will be retained at Archaeological Services Durham University and a copy supplied on CD to the client for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **Online Access to the Index of archaeological investigations project (OASIS)**. The OASIS ID number for this project is **archaeol3-514063**.

3. Historical and archaeological background

- 3.1 The South Yorkshire SMR (accessed via www.heritagegateway.org.uk) lists four records within 1km of the centre of the PDA. These include the cropmark of a possible Iron Age or Romano-British enclosure at Hickleton, to the north of the PDA, and cropmarks of a possible Iron Age or Romano-British track and field boundary to the south of the PDA. The other two entries are for a dovecote approximately 800m south-east of the PDA and the site of a former 'Fire Engine' marked on a 1772 map 300m south of the PDA.
- 3.2 Although there is no direct evidence of prehistoric or Romano-British activity in the PDA, evidence that the surrounding area was exploited in prehistory does exist; a resource relating to this exploitation may therefore survive within the PDA.
- 3.3 There is no direct evidence of medieval or post-medieval activity within the PDA. The site lies beyond the historic cores of the medieval villages of Goldthorpe, to the west, and Barnburgh, to the east. Historic maps show the PDA was probably in agricultural use throughout the medieval and post-medieval periods.
- 3.4 By far the biggest changes in the landscape took place during the early parts of the 20th century when the industrial revolution saw the construction of the Dearne Valley Railway along the northern edge of the PDA and later the opening of Goldthorpe Colliery to the north.

4. Landuse, topography and geology

- 4.1 At the time of survey the proposed development area comprised a single arable field that had been rolled and seeded. To the north were trees and bushes, to the south was Barnburgh Lane, to the west was a tarmacked public footpath. Three steel streetlights were alongside Barnburgh Lane. Steel security fencing was in the north-west corner.
- 4.2 The area undulated gently with elevations of between 40m OD and 32m OD.
- 4.3 The underlying solid geology of the area comprises Carboniferous mudstone, siltstone and sandstone of the Pennine Middle Coal Measures Formation. No overlying superficial deposits are recorded. An area of artificial made-ground is recorded to the north of the PDA along the line of the former railway and across the former Goldthorpe Colliery site.

5. Geophysical survey Standards

- 5.1 The survey and reporting were conducted in accordance with the Chartered Institute for Archaeologists (CIfA) *Standard and Guidance for archaeological geophysical survey* (2020); the *EAC Guidelines for the Use of Geophysics in Archaeology* (Schmidt *et al.* 2015); and the Archaeology Data Service & Digital Antiquity *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2013).

Technique selection

- 5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.
- 5.3 In this instance it was considered likely that cut features such as ditches and pits might be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) could also be present.
- 5.4 Given the anticipated nature and depth of targets, and the non-igneous geological environment of the study area, a magnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

- 5.5 Magnetic gradient measurements were determined using a Sensys Magneto MX V3 multi-sensor magnetometer survey system towed by a quad-bike. Eight FGM650/3 fluxgate gradiometer sensors were mounted at 0.5m intervals, logging data at less than 0.08m intervals along traverses, providing high density data collection.
- 5.6 Data collection point locations were recorded using an integrated global navigation satellite system (GNSS) with real-time kinematic (RTK) correction typically providing 5-10mm accuracy and subsequently converted to the Ordnance Survey (OS) National Grid using the OSTN15 transformation.
- 5.7 Data were downloaded on site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

- 5.8 Sensys MonMX, DLMGPS and MagnetoARCH software were used to record and display gradient and positional data, to create a matrix of gridded values at 0.2m by 0.2m intervals and to produce a continuous tone greyscale image of the raw data. TerraSurveyor software was then used to produce a continuous tone greyscale image of filtered data. Trace plots of the data were examined but are not presented in this report. The greyscale images are presented in Figures 2-3; geophysical and archaeological interpretations are presented in Figures 4-5. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla.
- 5.9 The following basic processing functions have been applied to the magnetic data:

<i>clip</i>	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
<i>de-spike</i>	locates and suppresses iron spikes in gradiometer data
<i>interpolate</i>	increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.1m x 0.1m intervals

5.10 The following filter has been applied to the magnetic data (Figure 3):

<i>low pass filter</i>	(applied with Gaussian weighting) to remove high frequency, small-scale spatial detail; for enhancing larger weak features and smoothing data
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Interpretation: anomaly types

5.11 A colour-coded geophysical interpretation plan is provided. Three types of magnetic anomaly have been distinguished in the data:

<i>positive magnetic</i>	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches
<i>negative magnetic</i>	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids
<i>dipolar magnetic</i>	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and utilities) and/or fired structures such as kilns or hearths

Interpretation: features

5.12 A colour-coded archaeological interpretation plan is provided.

5.13 Several series of parallel, broad, alternate positive and negative magnetic anomalies have been detected across the survey area on at least four different orientations. These almost certainly reflect traces of former ridge and furrow cultivation. Former field boundaries are shown on historic OS editions that broadly correspond to changes in the orientation of these remnant cultivation features.

5.14 Relatively well-defined rectilinear positive magnetic anomalies have been detected on a slightly differing alignment to the former cultivation. These anomalies reflect relatively high magnetic susceptibility materials, almost certainly representing sediment in former ditches. The varying strength of these anomalies reflects a variation in the sediment, perhaps representing differing fills including possibly burnt material or more richly organic material. It is possible that these features represent land boundaries pre-dating the early OS editions and the construction of the adjacent railway to the north.

- 5.15 Small, discrete dipolar magnetic anomalies have been detected across the survey area. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments, and in most cases have little or no archaeological significance. A sample of these is shown on the geophysical interpretation plan, however, they have been omitted from the archaeological interpretation plan.
- 5.16 A concentration of these anomalies has been detected along the western boundary of the area; these almost certainly reflect ground disturbance or other imported material, possibly associated with the construction of the adjacent track sometime between the 1930 and 1962 OS editions.
- 5.17 Larger dipolar magnetic anomalies detected along the southern boundary correspond to streetlights along Barnburgh Lane.

6. Conclusions

- 6.1 Approximately 2.9ha of magnetometer survey was undertaken on land at Barnburgh Lane, Goldthorpe, South Yorkshire, prior to proposed residential development.
- 6.2 Probable ditches, possibly representing land boundaries pre-dating the OS, have been identified.
- 6.3 Traces of former ridge and furrow cultivation have been detected.
- 6.4 An area of disturbed ground has been detected.

7. Sources

CIfA 2020 *Standard and Guidance for archaeological geophysical survey*. Chartered Institute for Archaeologists

Schmidt, A, 2013 *Geophysical Data in Archaeology: A Guide to Good Practice*. Archaeology Data Service & Digital Antiquity, Oxbow

Schmidt, A, Linford, P, Linford, N, David, A, Gaffney, C, Sarris, A & Fassbinder, J, 2015 *EAC Guidelines for the Use of Geophysics in Archaeology: Questions to Ask and Points to Consider*. EAC Guidelines 2, Namur

South Yorkshire Historic Environment Research Framework.
<https://researchframeworks.org/syrf/> (accessed 17-03-2023)

Figure 1: Site location

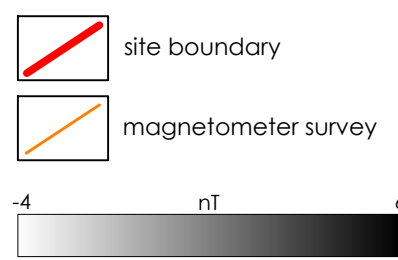
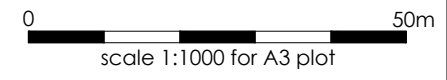
Reproduced from Explorer 278 1:25 000 by permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office. © Crown copyright 2015. All rights reserved. Licence number AL100002176



site boundary

0 1km

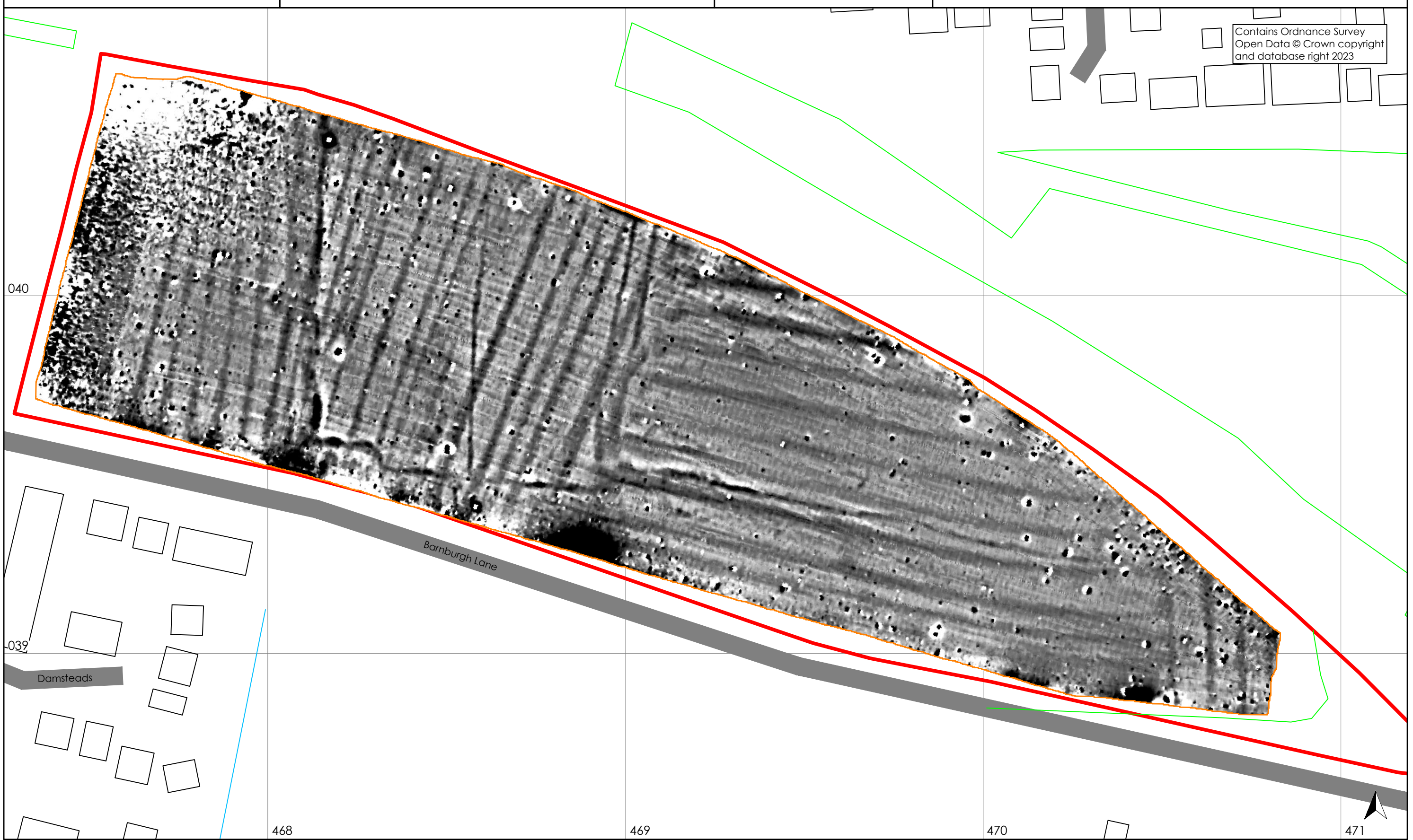
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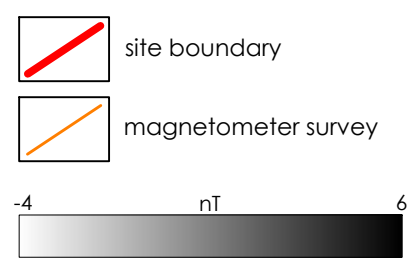
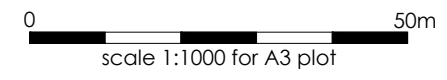


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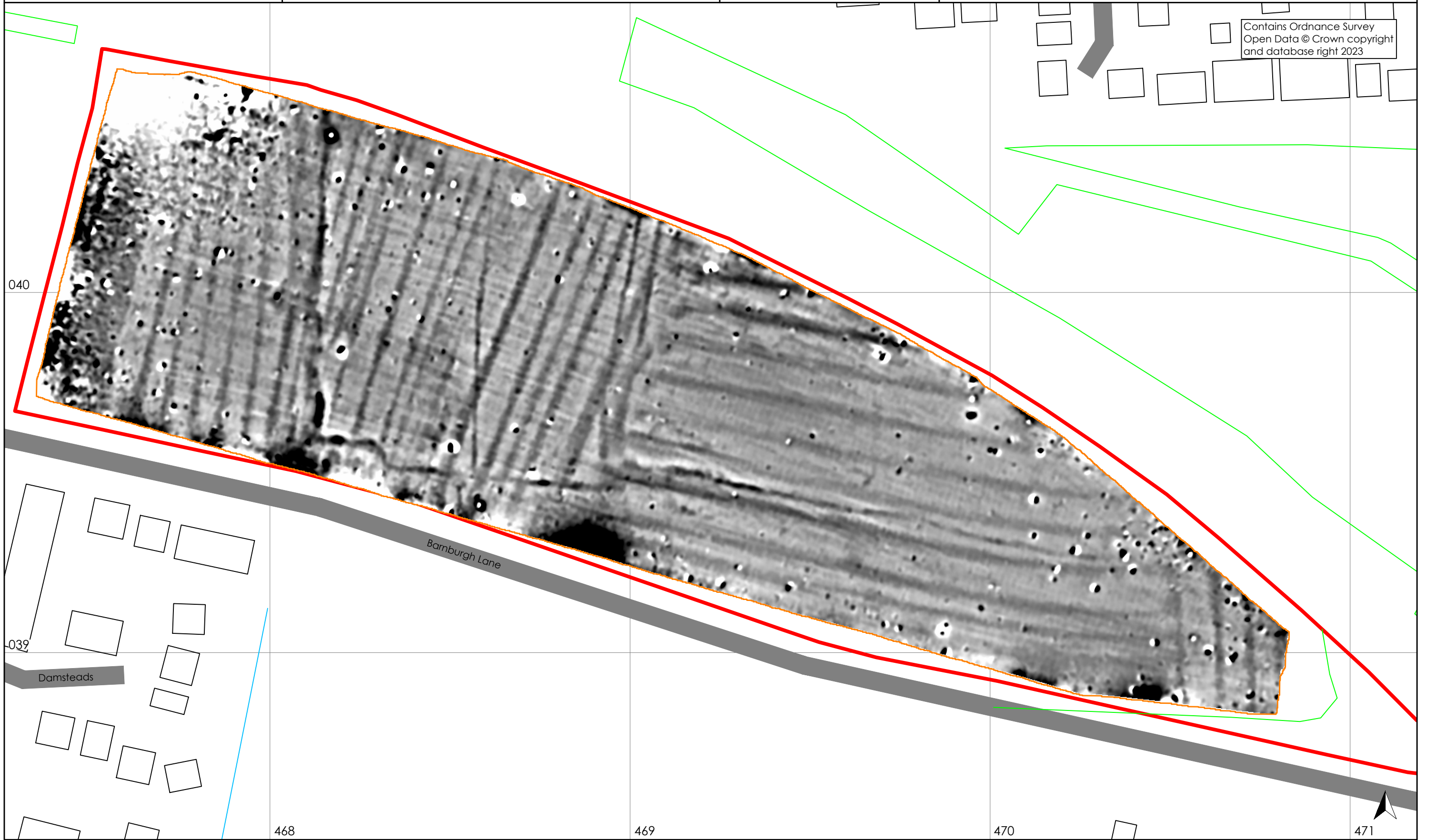
Figure 2: Magnetometer survey

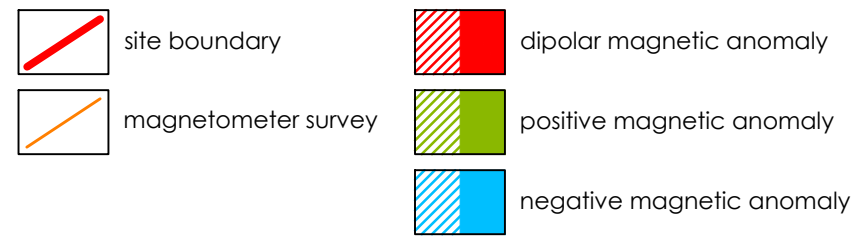
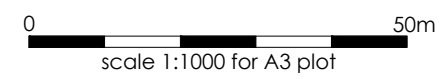




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Figure 3: Magnetometer survey (filtered data)

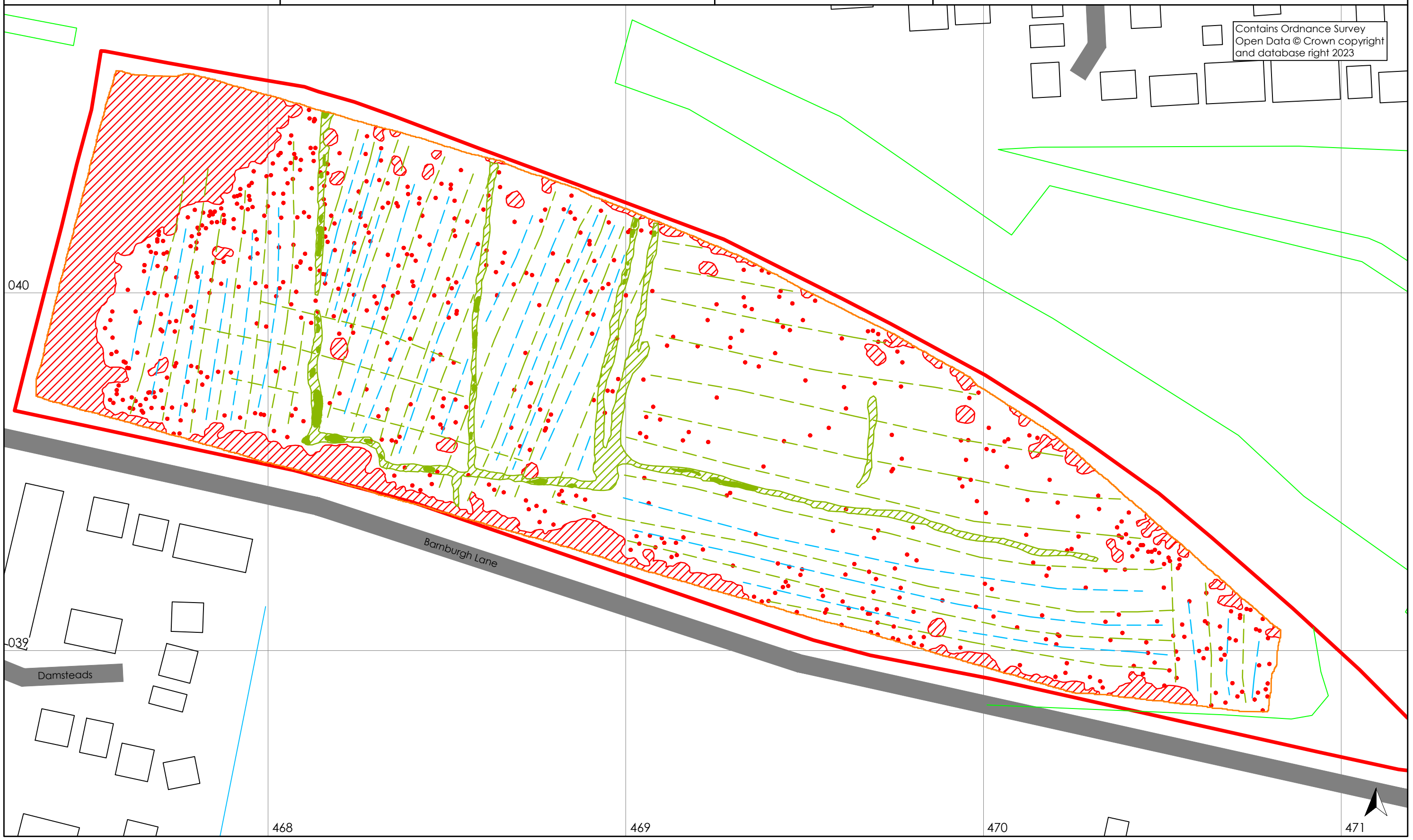


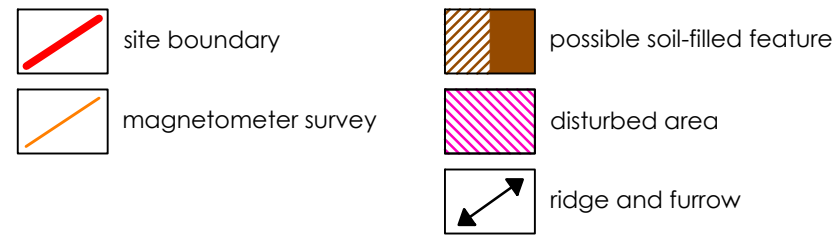


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Figure 4: Geophysical interpretation





0 50m
scale 1:1000 for A3 plot

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Figure 5: Archaeological interpretation

