Historic England

Geophysics

Sheepwash Farm, Brindley Heath, Staffordshire Report on Geophysical Surveys, April 2017

Andrew Payne and Cara Pearce

Discovery, Innovation and Science in the Historic Environment

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SHEEPWASH FARM, BRINDLEY HEATH, STAFFORDSHIRE

REPORT ON GEOPHYSICAL SURVEY, APRIL 2017

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SUMMARY

Fluxgate magnetometer and earth resistance surveys were conducted for the Cannock Chase Through Time project to investigate a group of possible burnt mound sites, expected to be of Bronze Age date, previously identified from lidar data in the eastern part of Cannock Chase, Staffordshire. The magnetometer survey (0.63ha) confirmed the response over a previously recorded burnt mound, but produced more ambiguous results over the wider area. Earth resistance survey (0.36ha) was targeted over the location of the three most prominent mounds in the lidar data, complementing the magnetic results over the known burnt mound and suggesting a degree of disturbance associated with the other topographic features.

CONTRIBUTORS
The geophysical fieldwork was conducted by Andrew Payne, Cara Pearce and Dan Hunt from Historic England together with volunteers from the Chase Through Time project including: Simon Bristow, Samantha Mead, Jim Andrews, Anne Andrews, Colin Evans, Nigel Maus, Brian Cooper, Mary Cartwright, Amie Smith, Ivan Poole and Ian Jones.

ACKNOWLEDGEMENTS
The authors are grateful to the landowner, Mr Steve Taylor, for allowing access for the surveys and to Rebecca Pullen (Historic Places Investigation Team – North) for providing useful information on the burnt mound sites in advance of the survey. Gary Ball (Staffordshire County Council) greatly assisted with the planning of the fieldwork through coordinating the involvement of the volunteers.

ARCHIVE LOCATION
Fort Cumberland, Portsmouth.

DATE OF SURVEY
The fieldwork was conducted during the 4 and 5th April 2017 and the report completed on 30th August 2017. The cover image shows earth resistance survey being undertaken by the Cannock Chase Through Time volunteers in the area of the potential burnt mound sites east of the course of the Rising Brook.

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CONTENTS

INTRODUCTION

Magnetometer and earth resistance surveys were undertaken to investigate a series of potential burnt mound features (Topping 2011) of expected Bronze Age date, previously identified from airborne laser scanning (lidar) data at Sheepwash Farm, Brindley Heath, Staffordshire. The surveys were conducted as part of the Historic England (HE) contribution to the Staffordshire County Council Heritage Lottery Fund project 'The Chase Through Time' (RASMIS 7472), devised to support the commemoration of the Great War: Home Front Legacy by improving understanding of the extensive and well preserved First World War landscapes of local, national and international significance on Cannock Chase. While there is a strong focus on the Great War, the project will explore how the entirety of the Chase has changed over time (Went and Winton 2016).

Using a range of ground based survey methods, HE, with the help of local volunteers, are mapping and exploring the remains of the First World War camps (as well as other traces of how the landscape was managed from prehistory to the present) identified from lidar and analysis of historic air photographs. The aim of the geophysical survey was primarily to provide the volunteers with training and experience in using these techniques for the future investigation of sites of interest on the Chase. This supplemented previous training by HE in support of the project in analytical earthwork survey and recording techniques, and interpretation of lidar data.

The lidar had identified three mounds (Figure 1, Area 1; **A-C** on inset) in fields alongside the Rising Brook, close to where it passes Flaxley Green. The most southerly mound (**A**; Staffordshire HER, MST 999, NHRE uid 304675) to the east of the brook was identified as a burnt mound from its circular form as a result of previous survey and investigation (Hodder and Welch 1987). The ground to the north of this is uneven, partly because of a number of former water channels winding across the area and further irregularly shaped mounds made up of low spreads of material are present at (**B**) and (**C**). An additional suspected burnt mound (MST 3778) is located in a separate field to the north and was covered by magnetic survey only (Figure 1, Area 2). Extending on the analysis of the lidar, geophysical survey was undertaken to find out more about the composition, structure and character of the mounds.

The site is situated on deep well drained coarse loamy and sandy soils (locally over gravel) of the 541r Wick 1 association (Soil Survey of England and Wales 1983) developed over Triassic Kidderminster Formation (formerly known as Bunter) sandstone and conglomerate inter-bedded sedimentary bedrock and river terrace deposits (Geological Survey of Great Britain 1964). The fields covered by the geophysical surveys are under permanent pasture and weather conditions during the field work were mostly warm, dry and sunny.

METHOD

Magnetometer survey

Magnetometer survey was conducted using a Geoscan FM36 fluxgate gradiometer over a series of 30m grid squares (Figure1) established with a Trimble R8 series Global Navigation Satellite System (GNSS) using a base station receiver and the Ordnance Survey VRS Now correction service. Readings were recorded on the 0.1 nanotesla (nT) resolution setting at 0.25m intervals along successive parallel traverses spaced 1.0m apart.

A linear greyscale image of the magnetometer data is presented in Figure 2 in relation to the Ordnance Survey (OS) base map after minimal post acquisition processing including the suppression of any effects due to directional sensitivity and instrumental drift, by the setting of each traverse to a zero mean, and truncation of extreme values outside the range of ±100nT. Minimally processed versions of the magnetic data from Area 1 are shown as a trace plot in Figure 4(A) and as a greyscale and false colour image in Figures 4(B) and 4(C) respectively. Trace plot and greyscale images of the minimally processed versions of the magnetic data from Area 2 are shown in Figure 5.

Earth resistance survey

Earth resistance data was recorded over a series of 30m grid squares (Figure 1) using a Geoscan RM15 resistance meter and a PA5 electrode frame in the 0.5m twin electrode configuration with readings collected at 1.0m intervals along traverses spaced 1.0m apart.

The earth resistance data is presented as a linear greyscale image superimposed over the OS mapping in Figure 3 after minimal post acquisition processing including the application of a 2m radius threshold median filter to remove occasional extreme readings caused by poor probe contact (Scollar *et al.* 1990, 492). Additional trace plot, greyscale and false colour images of the data are presented with the magnetic survey data for comparison in Figures 4(D), 4(E) and 4(F) respectively.

RESULTS

Magnetometer survey

A graphical summary of significant magnetic anomalies [**m1-13**] discussed in the following text superimposed on base OS map data is provided in Figure 6.

Magnetometer survey should be an effective technique for investigating burnt mounds, due to the enhanced magnetisation produced by heating associated with these structures.

Mound **A** (MST999) is defined by a raised magnetic response [**m1**] coincident with the topography, but with a reduction in strength around the outer edge of the mound [**m2**] and also at [**m3**] surrounding a central high magnitude anomaly [**m4**] up to 20nT. Together [**m3**] and [**m4**] may, perhaps, indicate an internal trough and hearth feature.

A more irregular, diffuse response [**m5**] is found over mound **B**, suggesting a broader spread of more magnetic material in the soil rather than in a concentrated structure. This may indicate a previous burnt mound that has been disturbed (and would explain the irregular topography of mound **B**) or alternatively modern dumping of magnetic material on the site, perhaps related to improvement of ground surface or drainage conditions in the field. A group of positive anomalies and an area of raised response at [**m6**] may be significant and potentially related to [**m5**], although no mound structures are visible in the lidar data. There is no expression of mound **C**, located immediately to the east of [**m6**]**,** in the magnetic data, casting doubt on it representing a burnt mound, however it does clearly appear to be composed of higher resistance stone material (see below) perhaps deposited or constructed for a different purpose such as a spoil heap or dump from construction of drainage channels or the nearby railway line. Other possible interpretations include a natural feature of the river valley geomorphology.

A series of vague negative and positive linear trends, [**m7**] and [**m8**] are likely to be a response to natural or artificial drainage features and two areas of intense ferrous disturbance of relatively recent origin are present at [**m9**].

In Area 2, to the north, there is an area of anomalous response (intense but not ferrous) at [**m10-12**] where another burnt mound (MST 3778) was suspected. The activity mapped in this area consists of a strong linear response [**m10**] (>20 nT) joined at both ends by more intense positive and negative magnetic anomalies [**m11**] and [**m12**] (peak magnitude±50nT) that might indicate the presence of industrial activity or intense burning. Unfortunately, a limited amount of data at [**m13**] was compromised, most likely by ferrous material on the instrument operator, at the time of acquisition.

Resistance survey

A graphical summary of significant earth resistance anomalies [**r1-9**] discussed in the following text superimposed on base OS map data is provided in Figure 7.

Burnt mounds would be expected to be composed of stone material that should produce a high resistance contrast between the expected coarser material of the mounds visible in the lidar and the adjacent damp soils of the river floodplain.

The response over mound **A** (MST999) consists of two high resistance peaks [**r1**] and [**r2**], again coinciding with the topographical extent of the mound with a central drop in response [**r3**], that would also be consistent with a mound of stony material with an internal central depression for the trough feature (perhaps clay lined and therefore water retentive).

High resistance responses [**r4**] and [**r5**] coincide with [**m5**] in the area of mound **B**, reflecting the irregular form expressed in the surface topography also seen in the lidar data. The interpretation of this as a burnt mound must remain inconclusive, but it is possible that a damaged or destroyed feature has been identified here. Linear low resistance anomalies, [**r6**] and [**r7**] appear to represent drainage channels meandering through this area, and [**r6**] appears to partially coincide with anomaly [**m8**].

Mound **C** in the northern part of the field has no expression at all in the magnetic data, but it does appear to be composed of higher resistance stony material [**r8**]. A further area of high resistance response [**r9**] to the south seems most likely to be of geological origin corresponding to the line of the raised river terrace.

CONCLUSIONS

The fluxgate magnetometer survey has proved the most suitable technique for identifying enhanced magnetic material associated with burnt mounds. However, only mound **A** (MST999) in the survey area to the south has produced a diagnostic magnetic anomaly, with the other raised mounds targeted by geophysics from the lidar data producing more ambiguous responses. An increased resistance response from stonier material within mound **A** was also recorded, but was only partially replicated over the other raised mounds. It would appear from the survey results that only mound **A** exhibits the expected geophysical indicators for burnt mounds of a raised magnetic response from burnt material and increased resistance from stonier material. This suggests the other raised mounds have either been disturbed or are related to other, perhaps more recent activity at the site.

LIST OF ENCLOSED FIGURES

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Figure 1

SHEEPWASH FARM, BRINDLEY HEATH, STAFFORDSHIRE
Location of geophysical surveys, April 2017

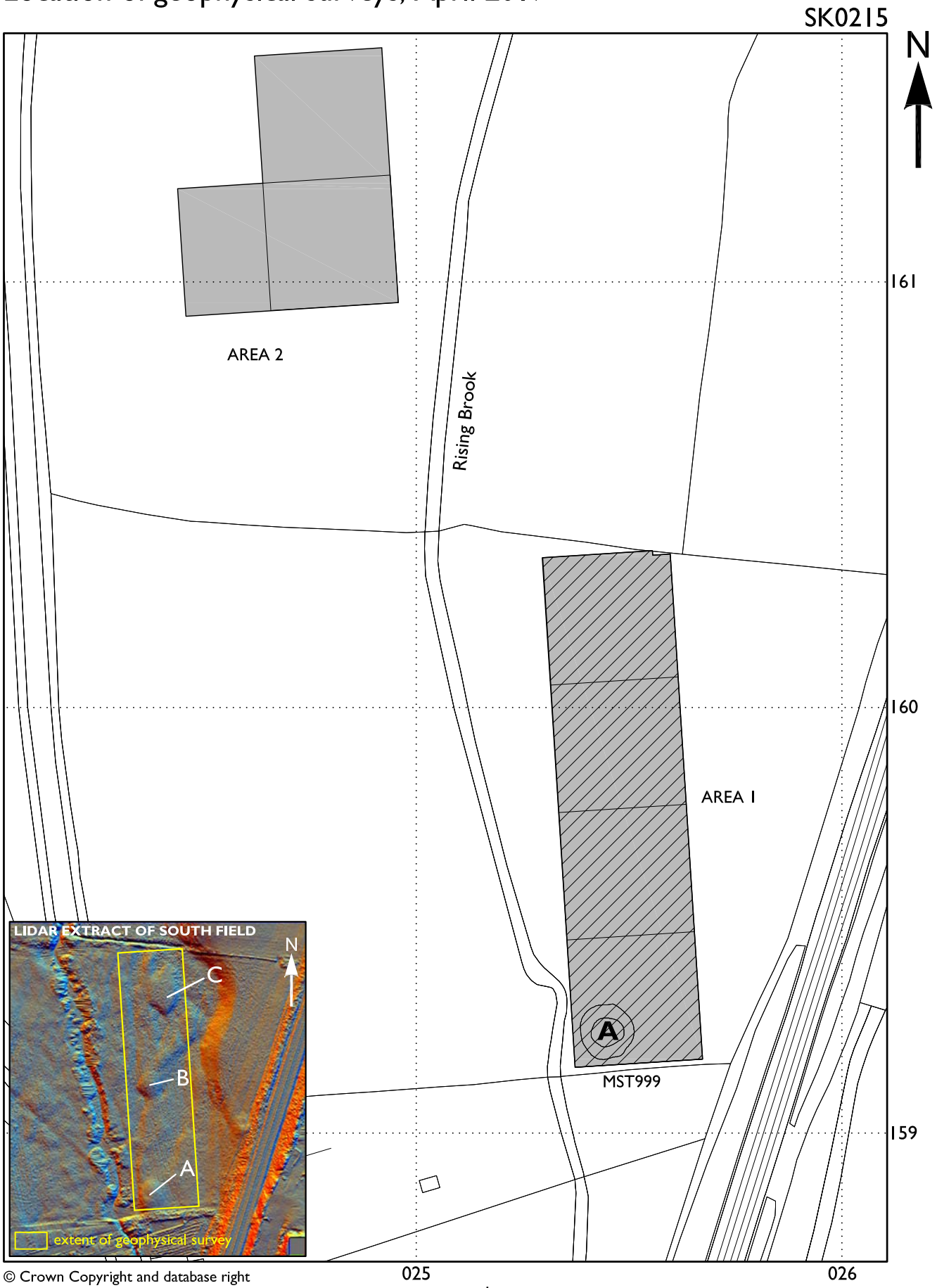

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Figure 2

SHEEPWASH FARM, BRINDLEY HEATH, STAFFORDSHIRE
Location of fluxgate magnetometer survey, April 2017

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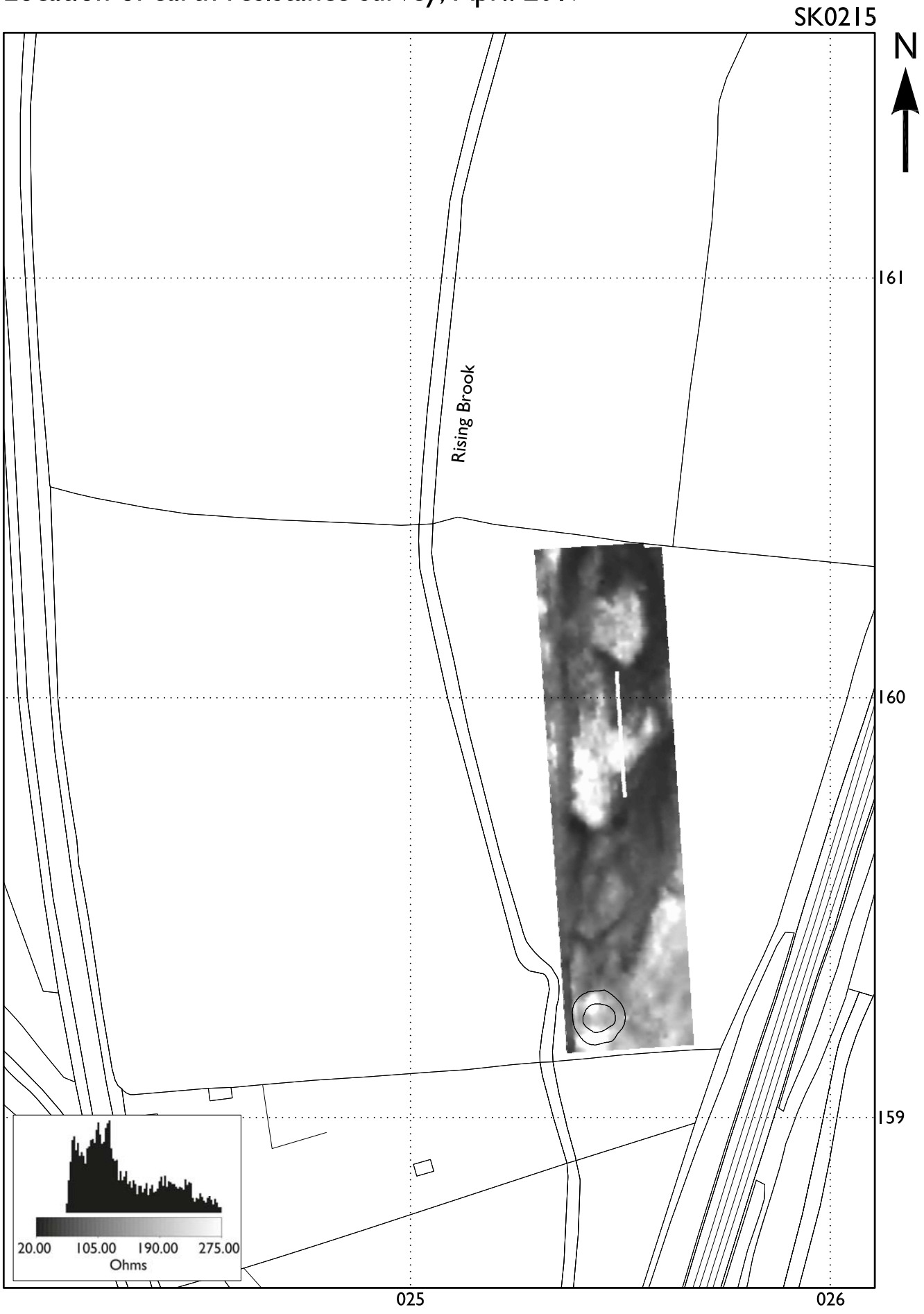
Figure 3

SHEEPWASH FARM, BRINDLEY HEATH, STAFFORDSHIRE
Location of earth resistance survey, April 2017



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CHASE THROUGH TIME

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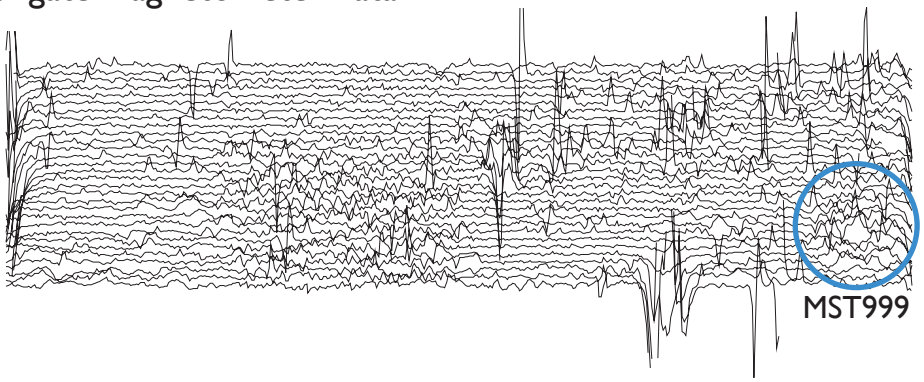
Figure 4

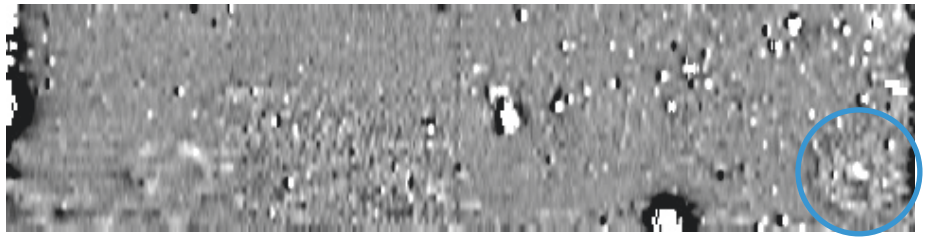
SHEEPWASH FARM, BRINDLEY HEATH, STAFFORDSHIRE, Geophysical surveys, Area 1, April 2017

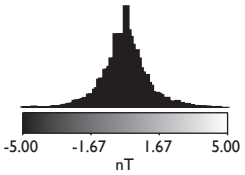
Fluxgate magnetometer data

(A)

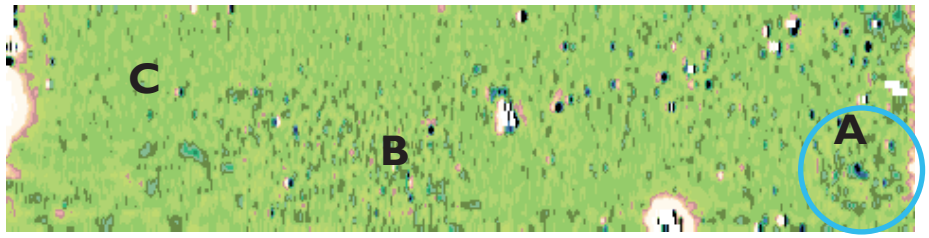


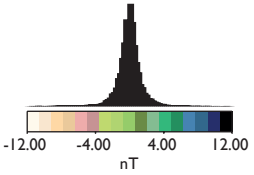
(B)





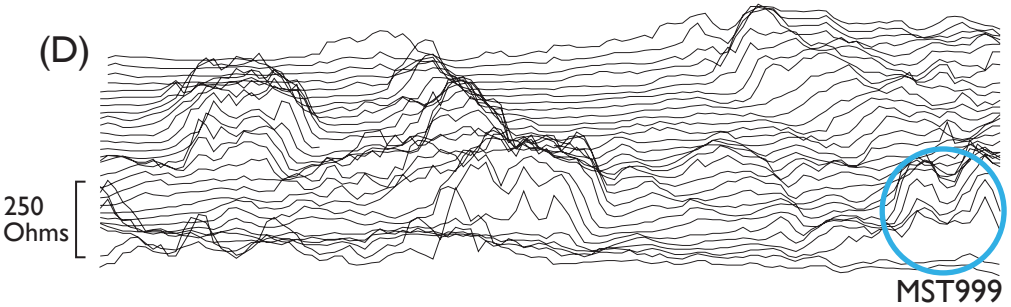
(C)



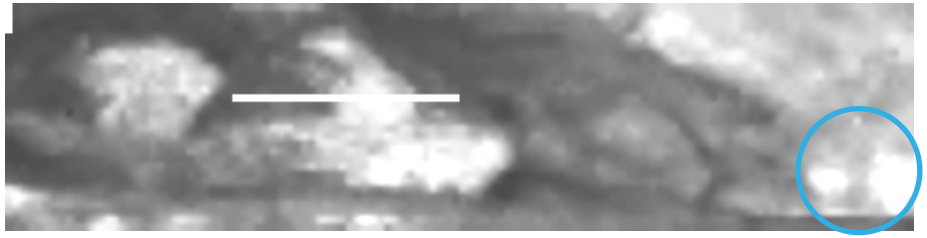


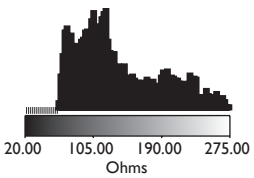
Earth resistance data

(D)

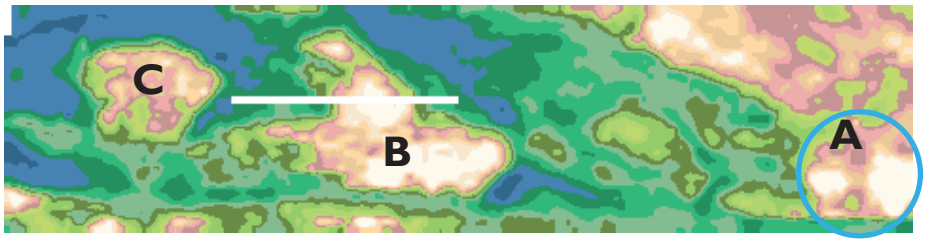


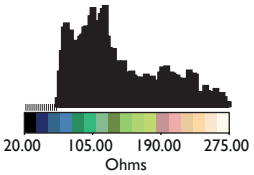
(E)





(F)





N

Response to burnt mound **A** (MST999) is shown circled

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SHEEPWASH FARM, BRINDLEY HEATH, STAFFORDSHIRE
Fluxgate magnetometer survey, Area 2, April 2017

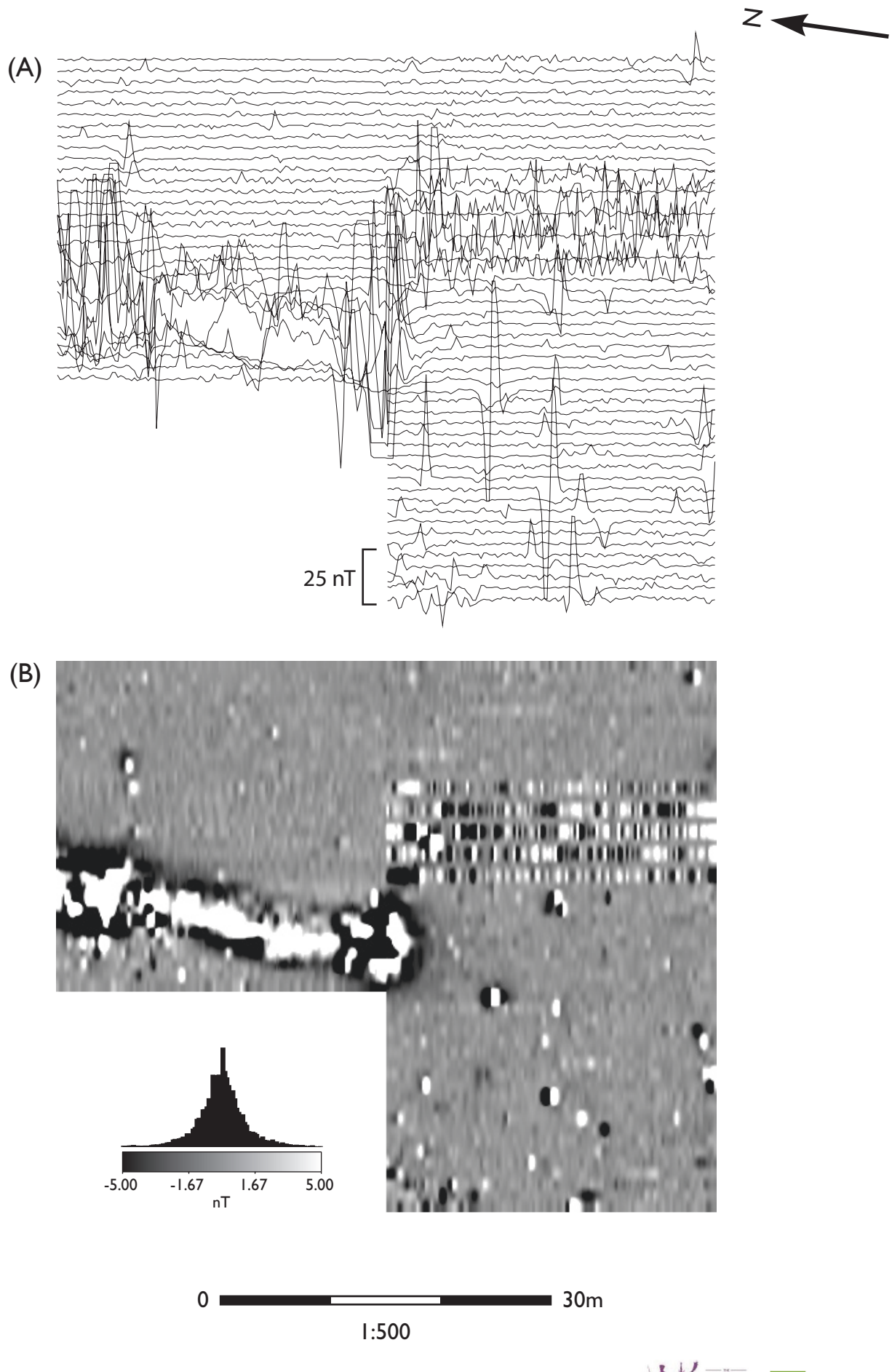

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Figure 6

SHEEPWASH FARM, BRINDLEY HEATH, STAFFORDSHIRE
Graphical summary of significant magnetic anomalies, April 2017

0 60m

1:1250

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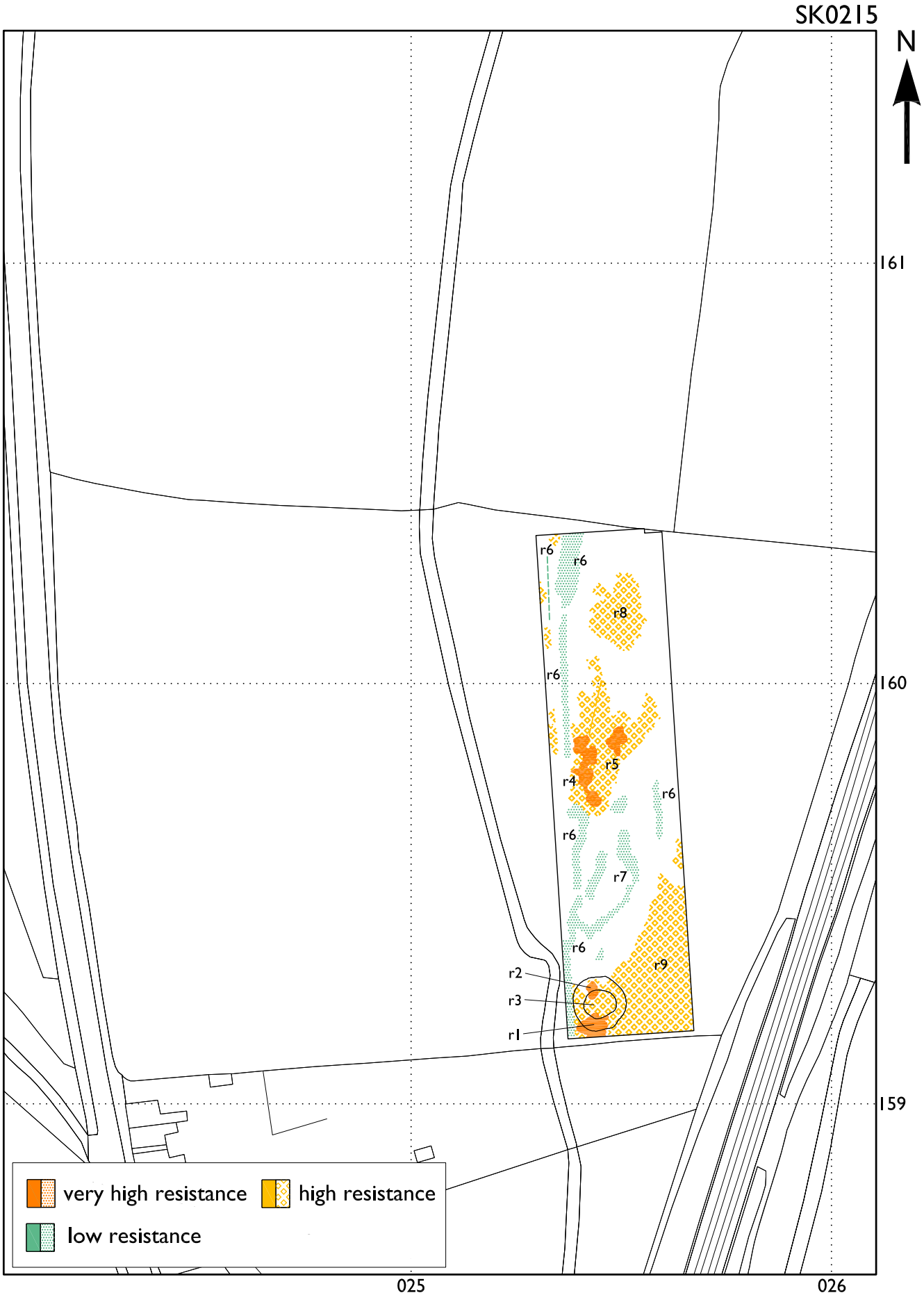
Figure 7

SHEEPWASH FARM, BRINDLEY HEATH, STAFFORDSHIRE
Graphical summary of significant earth resistance anomalies, April 2017



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