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URCHFONT HILL, URCHFONT, WILTSHIRE
REPORT ON GEOPHYSICAL SURVEYS, APRIL 2014

Zoe Edwards, Neil Linford, Paul Linford and Andrew Payne

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Research Report Series 29-2014

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SUMMARY

A geophysical survey was conducted at Urchfont Hill, on the northern escarpment edge of Salisbury Plain above the Vale of Pewsey, as part of the Marden Environs NMP enhancement project, to locate and assess the survival of archaeological activity at the site indicated by aerial photography and metal detector finds in advance of limited excavation. Fluxgate magnetometer survey was conducted in a field of maturing rape crop (1.3 ha), together with more limited earth resistance (1.06ha) to help clarify the interpretation of the magnetic data. , A vehicle towed caesium magnetometer survey (2.9ha) was carried out over an adjacent field in grass where no damage to the crops would occur. Despite the very weak magnetic response art the site, the surveys successfully identified a probable trackway and further weakly defined anomalies that potentially represent traces of earlier field boundaries, field systems or enclosure ditches, some of which partly correspond to the aerial photographic evidence.

CONTRIBUTORS

The field work was conducted by Neil Linford, Paul Linford and Andy Payne from the English Heritage Geophysics Team, together with Zoe Edwards who was undertaking a Heritage Environment Placement working with the team.

ACKNOWLEDGEMENTS

The authors wish to express their thanks to the landowners and tenants who allowed access for the survey to take place: Wiltshire County Council, MOD Defence Estates and Mr Rob Snook of Rookery Farm, Urchfont. We are also grateful to our colleagues David Roberts, for assistance with arranging site access, together with Ed Carpenter and Helen Winton for providing information and expertise in relation to the aerial photography undertaken for the Marden Environs NMP enhancement project.

ARCHIVE LOCATION

Fort Cumberland.

DATE OF FIELDWORK AND REPORT

The fieldwork was conducted between 31st March and 4th April 2014. The report was completed on 2nd July 2014. The cover shows the magnetometer survey in progress looking north from Urchfont Hill across the Vale of Pewsey.

CONTACT DETAILS

Andy Payne, Geophysics Team, English Heritage, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth, PO4 9LD.; tel. 02392 856750; email andy.payne@english-heritage.org.uk

CONTENTS

INTRODUCTION

Geophysical surveys were conducted at Urchfont Hill on the northern edge of Salisbury Plain above the Vale of Pewsey (NGR SU 038 555, Figure 2). The purpose of the geophysical survey was to complement aerial photography and evidence from metal detector finds, that suggested the presence of potential Later Prehistoric/Romano-British occupation, in advance of limited intrusive investigation, as part of the Marden Environs NMP Enhancement Project (NHPP Project Number 3A4.310, RASMIS 6302: Carpenter and Winton 2011; Winton and Linford 2012; Roberts 2014). Aerial photography has identified a range of activity on Urchfont Hill (Figures 1, 8 and 9), including a ploughed-out Bronze Age bowl barrow, just beyond the available survey area, a number of linear and curvilinear features described as the earthworks of a field system of uncertain date (NRHE HOB UID 904553), and incomplete cropmarks suggesting an Iron Age or Roman enclosure defined by curving banks and with flanking ditches in places (NRHE HOB UID 1493468). Prominent earthworks in the vicinity of New Plantation (Figure 2, Area A) form tracks or hollow ways incised into the escarpment edge.

Previous geophysical survey conducted over the mixed Chalk and Greensand geology of the Marden NMP enhancement project area has revealed a variable, and often weak, magnetic response. It was hoped that the current work would help to further assess the efficacy of caesium and fluxgate instrumentation, together with earth resistance, in the wider Vale of Pewsey (Corney *et al.* 1994; Martin 2008; Field *et al.* 2009; Linford *et al.* 2013a; 2013b; Hardwick and Payne 2014).

The site consists of two fields the first under grass (Figure 2, Area A) and the other in arable production with a maturing crop of oilseed rape present at the time of the survey (Figure 2, Area B). The underlying geological deposits consist of Upper Cretaceous New Pit Chalk formations, (principally blocky, white firm to moderately hard chalk with numerous marls or paired marl seams) overlain by shallow, well-drained calcareous soils, of the Upton 2 Association (Soil Survey of England and Wales 1983; British Geological Survey (NERC) 2013). Weather conditions were mixed but generally damp and overcast with occasional rain showers and sunny intervals.

Figure 1: Extract from 1954 RAF vertical black and white aerial photograph of the southern edge of the Vale of Pewsey (North to top of frame) with the enclosure and field system visible in centre and centre left (RAF 540/1302 110, 11-MAY-1954, cf Figures 8 and 9).

METHOD

Magnetic survey

Caesium magnetometer

The caesium magnetometer data was collected from the pasture field along the instrument swaths shown on Figure 2 (Area A) using an array of six high sensitivity Geometrics G862 caesium vapour magnetometer sensors mounted on a non-magnetic sledge. This sledge was towed behind a low impact, all-terrain vehicle (ATV) which also provided the power supply and housed the data logging electronics. Five of the sensors were mounted in a linear array transverse to the direction of travel 0.5m apart and, vertically, ~ 0.2m above the ground surface. The sixth was fixed 1.0m directly above the central magnetometer in the array to act as a gradient sensor. The sensors were set to sample at a rate of 16 Hz based on the typical average travel speed of the ATV (3.2m/s) giving a sampling density of ~ 0.2m by 0.5m along successive swaths. Each swath was separated from the last by approximately 2.5m, navigation and positional control being achieved using a Trimble R8 series Global Positioning System (GPS) receiver mounted on

the sensor platform 1.75m in front of the central sensor. Sensor output and survey location was monitored during acquisition to ensure data quality and minimise the risk of gaps in the coverage due to the use of a grid-less system.

After data collection the corresponding readings from the gradient sensor were subtracted from the measurements made by the other five magnetometers to remove any transient magnetic field effects caused by the towing ATV. The median value of each instrument traverse was then adjusted to zero by subtracting a running median value calculated over a 60m 1D window. This operation corrects for slight biases added to the measurements owing to the diurnal variation of the Earth's magnetic field and any slight directional sensitivity of the sensors. A linear greyscale image of the combined magnetic data is shown superimposed over the base Ordnance Survey (OS) mapping on Figure 3 and minimally processed versions of the data truncated to ±35 nanotesla per metre (nT/m) are presented as a traceplot and a linear greyscale image in Figure 5.

Fluxgate gradiometer

To avoid damage to the oilseed rape in Area B, the survey was conducted using hand-held Bartington Grad601-2 dual sensor fluxgate gradiometers raised above the crop height (potentially reducing the sensitivity of the fluxgate measurements further in comparison to the caesium survey), over a grid of 30mx30m squares (Figure 2, Area B) established with a Trimble R8 GPS. Readings were collected at a 0.25m sample interval along successive, parallel, northwest-southeast orientated traverses spaced 1.0m apart, using the 100 nT/m range setting of the instruments. Data were periodically downloaded and reviewed in the field for quality assurance. Subsequent data processing included the suppression of any effects due to directional sensitivity and instrumental drift, and truncation of extreme values outside the range of ±35nT/m.

A linear greyscale image of the data is shown superimposed over the base OS mapping in Figure 3. The minimally processed data is also presented as a traceplot in Figure 6(A) and as an equal area greyscale image following the suppression of intense near-surface ferrous responses (Figure 4(B), Scollar *et al.* 1990, 492).

Earth resistance survey

Selected grids within Area B (Figure 2) were surveyed using a Geoscan RM15 resistance meter and a PA5 electrode frame in the twin electrode configuration with readings taken at 1.0m intervals along parallel traverses separated by 1.0m using a 0.5m mobile electrode spacing. Post-acquisition processing of the twin electrode data included the application of a 2m by 2m thresholding median filter to remove isolated high readings caused by poor contact (Scollar *et al.* 1990, 492).

The final processed twin electrode results are presented as greyscale images superimposed over the OS mapping on Figure 4, and minimally processed versions of the data are shown as traceplots and greyscale images and on Figure 7.

RESULTS

Magnetic survey

A graphical summary of the significant magnetic anomalies, [m1-10], discussed in the following text, superimposed on the base OS map data, is provided on Figure 8 in relation to the aerial mapping evidence.

General response

The magnetic response is extremely weak with significant anomalies falling close to the noise limit of the fluxgate instruments, although they are better resolved in the caesium survey due to a combination of the lower sensor height, increased sensitivity and denser sample interval used.

Caesium survey results – Area A

A weakly defined (0.7 nT/m), broad linear anomaly **[m1]** correlates with a break of a steep slope at the top of the hill and probably represents a field lynchet (also visible as a slight topographical feature on the ground surface in this area), perhaps associated with the wider co-axial field system mapped more extensively by aerial survey (cf Figure 1 and Figure 8). To the east **[m2]** coincides with the position of a ditch shown on the aerial survey mapping, and the magnetic anomaly appears to continue further south-west towards the New Plantation (Figure 8), consistent with the continuation of a series of post-medieval hollow ways which originate at the bottom of the hill (NRHE AMIE monument number 1486112).

Two alignments of discrete ferrous responses **[m3]** and **[m4]** are likely to represent former fencing subdividing Area A. Further to the east, a strong, rectilinear anomaly **[m5]** is suggestive of a former small building or structure and may also be associated with similar ferrous responses at **[m6]**. Anomalies **[m5]** and **[m6]** are most likely to be of recent origin, associated with either the Westdown Artillery range or, perhaps, agricultural activity.

Fluxgate survey results – Area B

A weakly defined (0.1 - 0.6nT/m positive linear magnetic anomaly **[m7]** follows the parish ward division between Urchfont and Easterton, and most likely represents the earthwork field boundary shown on the 1954 aerial photography (Figure 1).

Two additional parallel anomalies [m8 and m9] exhibit a similar magnitude of response to [m7] and follow the ward boundary, on a slightly different alignment, running down the escarpment towards the extant earthworks, thought to be the remains of a trackway surviving in the Goose Hole Plantation. The straight, parallel ditch sections of [m8 and m9] are, perhaps, suggestive of a Roman routeway in keeping with the aerial survey interpretation and metal detector finds from the area. A very weak (0.1 – 0.4 nT/m), highly diffuse anomaly [m10] is just visible and may, in part, correlate with a broken bank identified by the aerial survey as the possible remains of an Iron Age or Roman enclosure or field system (NRHE AMIE monument number 1493468, Figure 8).

Earth resistance survey

A graphical summary of the significant earth resistance anomalies, [r1-11], discussed in the following text, superimposed on the base OS map data, is provided on Figure 9 in relation to the aerial mapping evidence.

Due to the very weak level of magnetic response earth resistance survey was conducted over the location of selected magnetic anomalies and cropmarks within Area B. A broad low resistance ditch-type response [r1] replicates [m7], following the parish ward boundary, together with similar anomalies [r2 and r3] that correspond with the trackway previously identified by [m8 and m9]. Analysis of the traceplot (Figure 7(A)), shows an area of raised resistance between the two flanking ditches [r2 and r3], suggesting some form of compacted surface may still survive along the course of the trackway.

A series of broad linear low [r4-8] and high [r9-11] resistance trends are difficult to assess within the two limited survey areas. In part, these coincide with the ditch and bank indicated by the aerial photography [r4-6], and as a group these anomalies could be interpreted as a combination of either ditch-type anomalies or, perhaps, natural banding in the chalk subsoil (Figure 9).

CONCLUSION

The magnetometer and resistance surveys have mapped a number of linear ditch-type anomalies suggestive, perhaps of field systems, linear boundaries and a trackway, but are not necessarily indicative of a later prehistoric or Roman period settlement focus in the area. A combination of the extant crop and the underlying geology has resulted in a very weak magnetic response, although it is difficult to ascertain whether this also reflects more limited magnetic enhancement through lack of significant past occupation activity or, subsequent truncation by ploughing. Wider area survey with the towed caesium magnetometer array is recommended after the oilseed rape has been harvested to allow coverage with more suitable instrumentation for detecting weaker anomalies.

LIST OF ENCLOSED FIGURES

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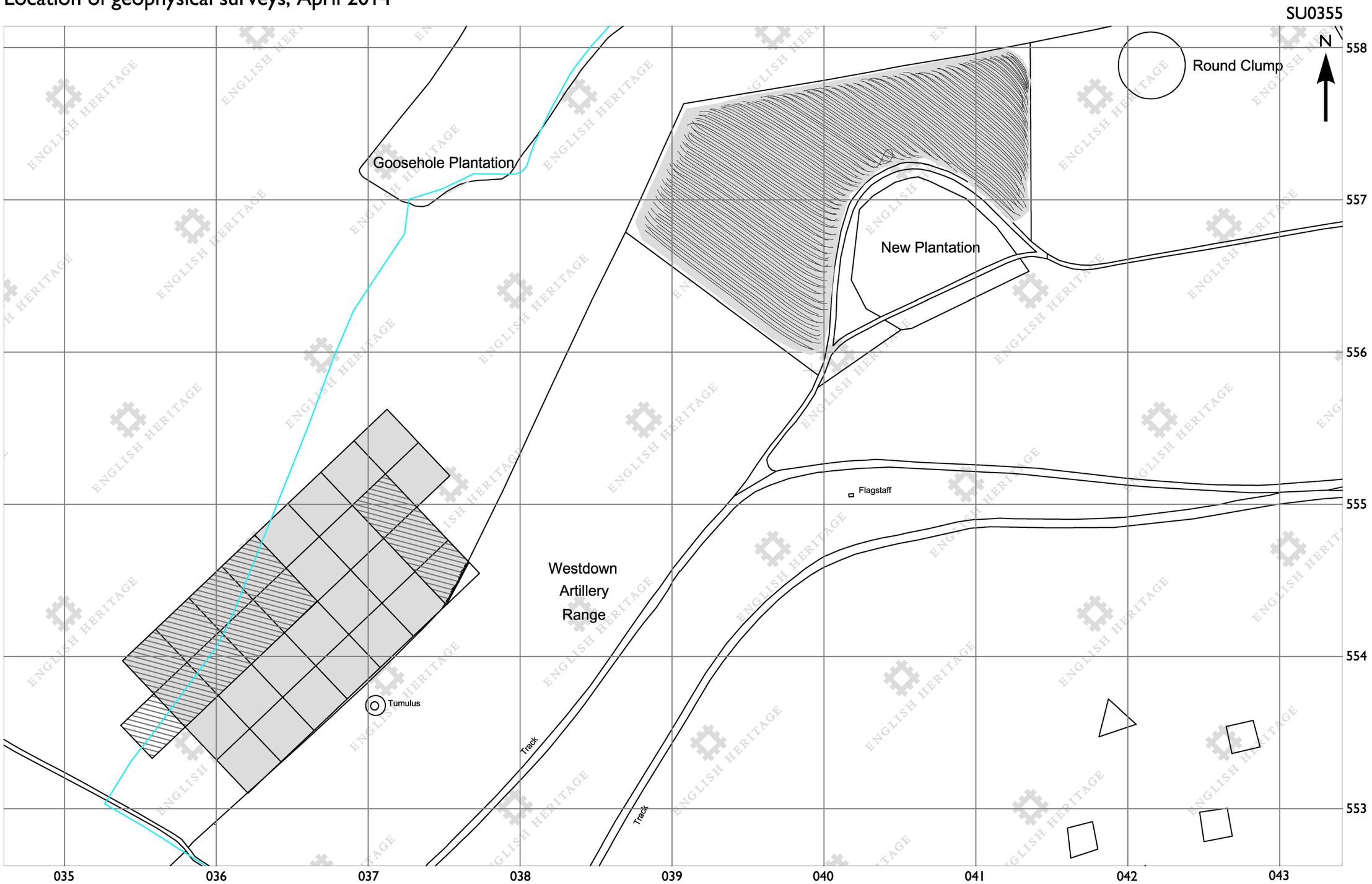
Figure 2

URCHFONT HILL, URCHFONT, WILTSHIRE
Location of geophysical surveys, April 2014



0 90m
1:2500

fluxgate magnetometer survey

Twin probe resistance survey

caesium magnetometer survey swaths

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Figure 3

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Location of magnetic surveys, April 2014

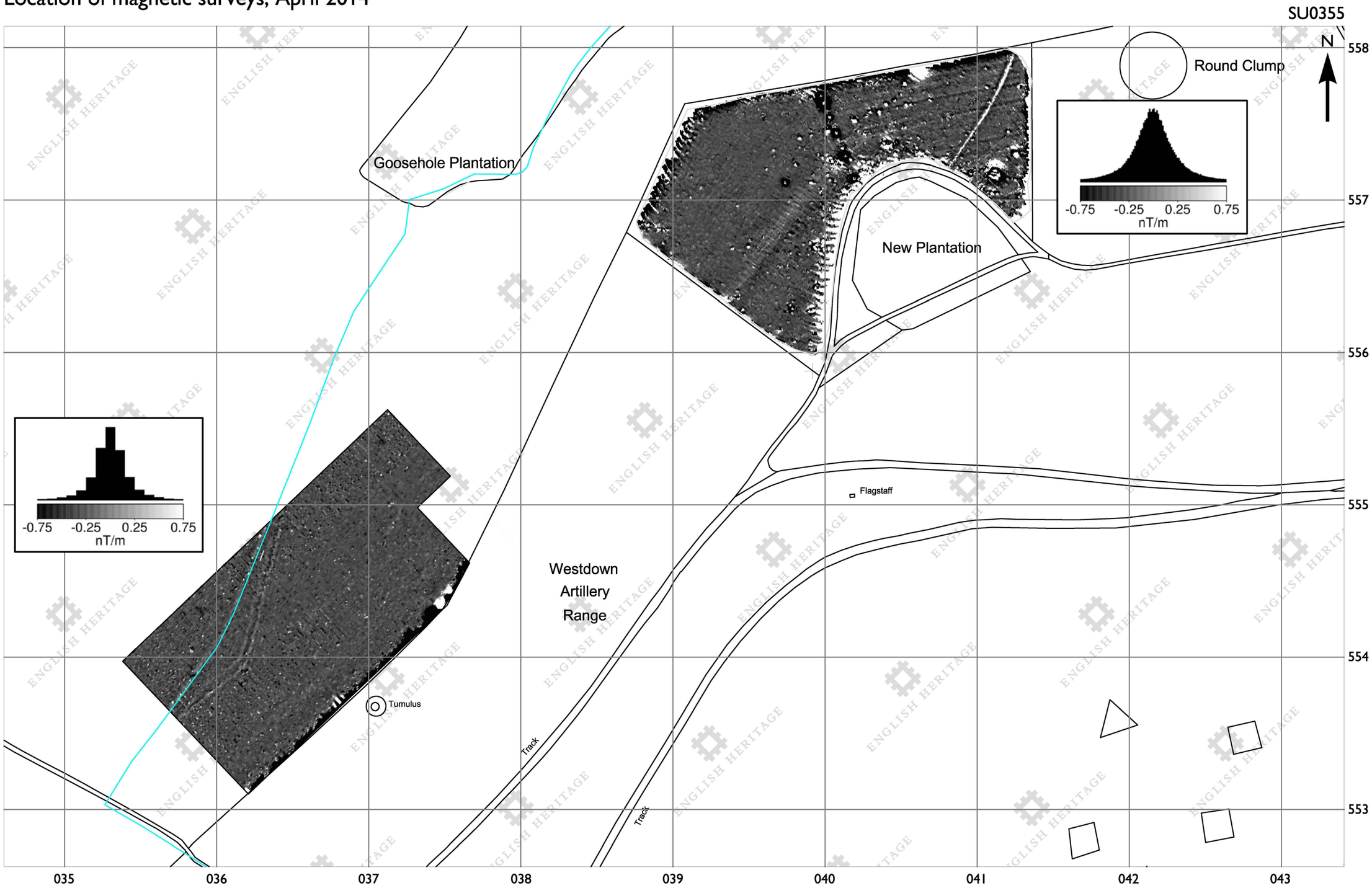

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Figure 4

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Location of earth resistance survey, April 2014

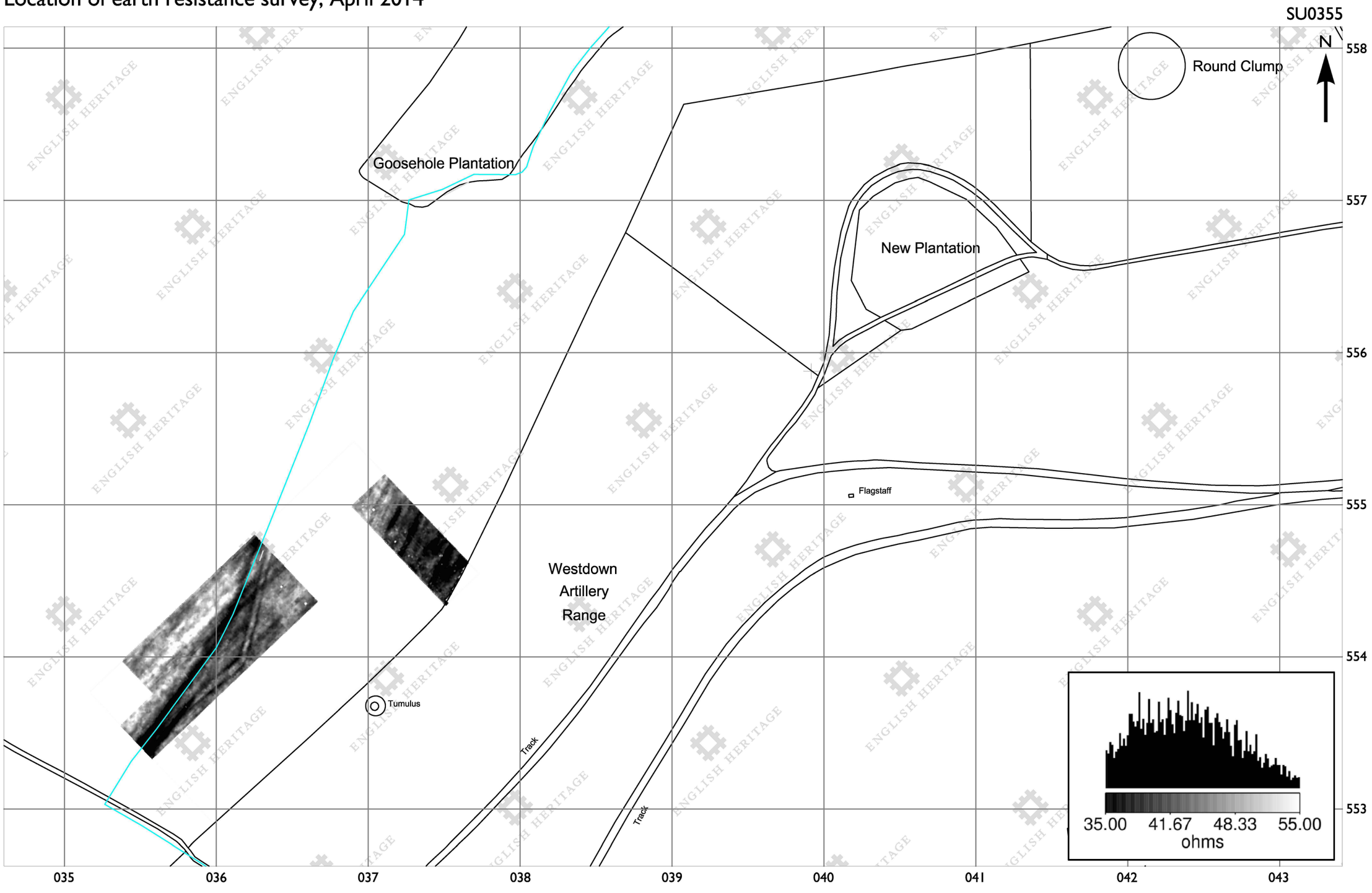

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Figure 5

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Caesium magnetometer survey, April 2014

(A) Traceplot of minimally processed data

20 nT/m

N

(B) Linear greyscale image of minimally processed data

-1.00 -0.33 0.33 1.00
nT/m

0 60m
1:1000

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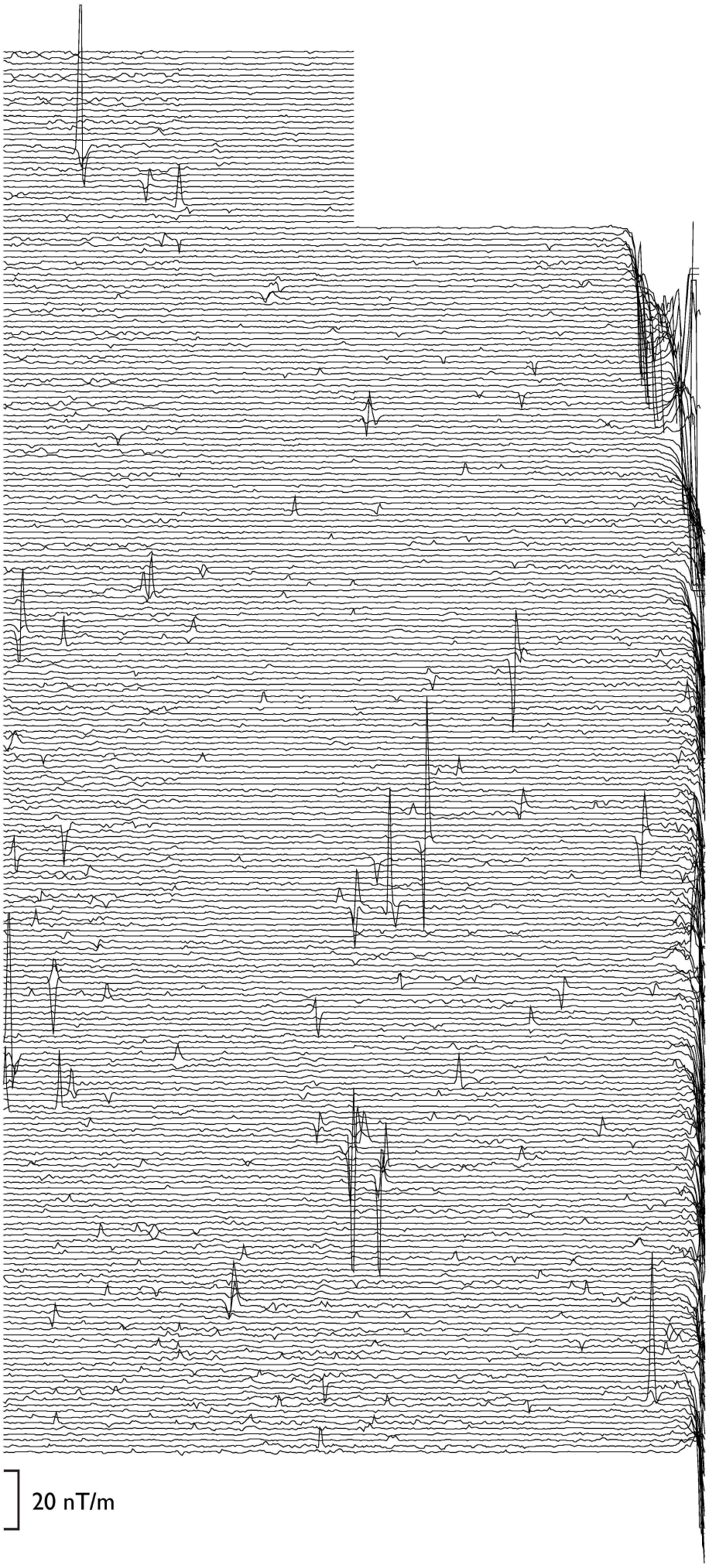
Figure 6

URCHFONT HILL, URCHFONT, WILTSHIRE
Fluxgate gradiometer survey, April 2014

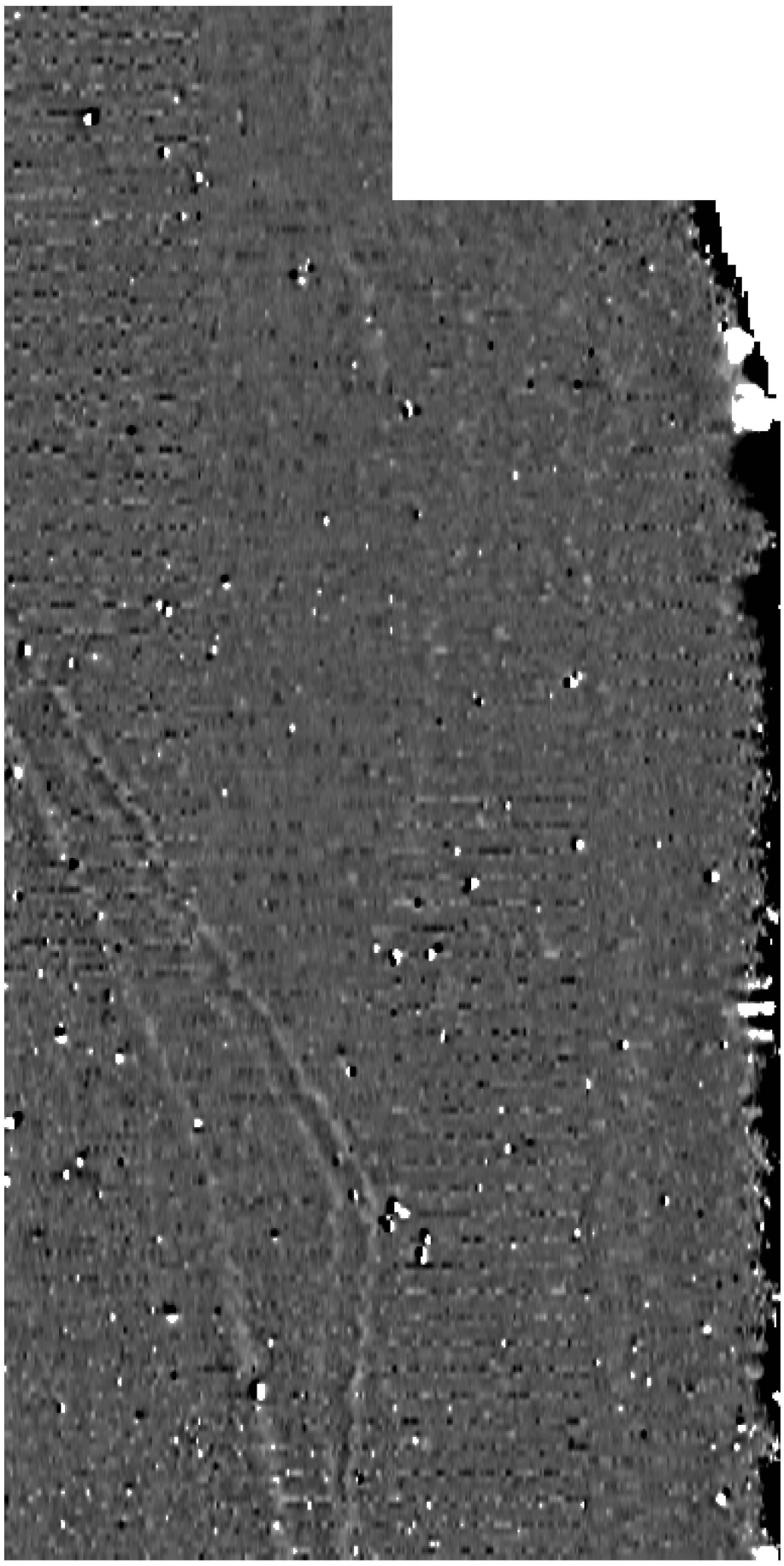
N

(A) Traceplot of minimally processed data



20 nT/m

(B) Linear greyscale image of minimally processed data



-1.00 -0.33 0.33 1.00
nT/m

0 60m
1:1000

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Figure 7

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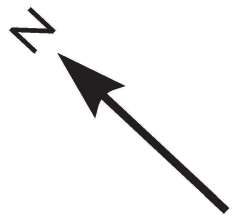
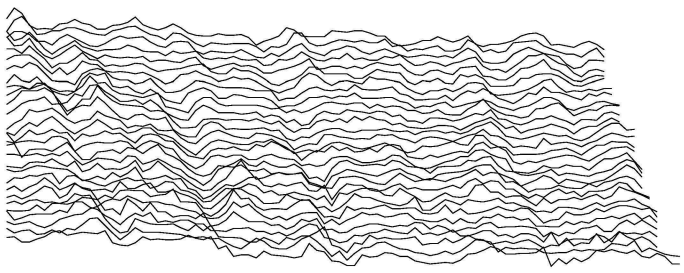
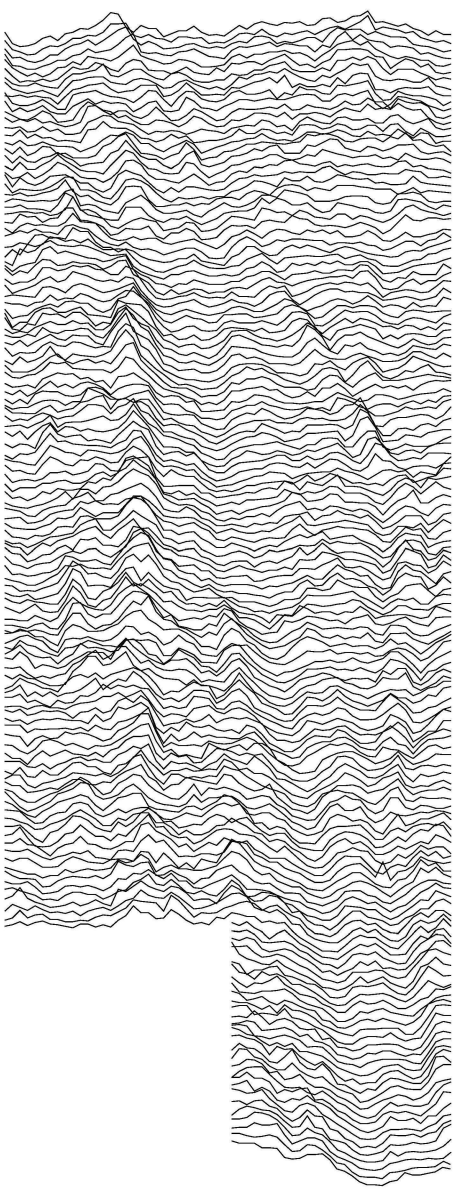
Earth resistance survey, April 2014



(A) Traceplot of minimally processed data



(B) Equal area greyscale image of minimally processed data



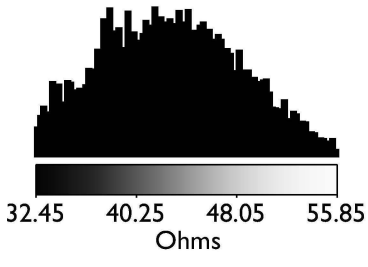


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Figure 8

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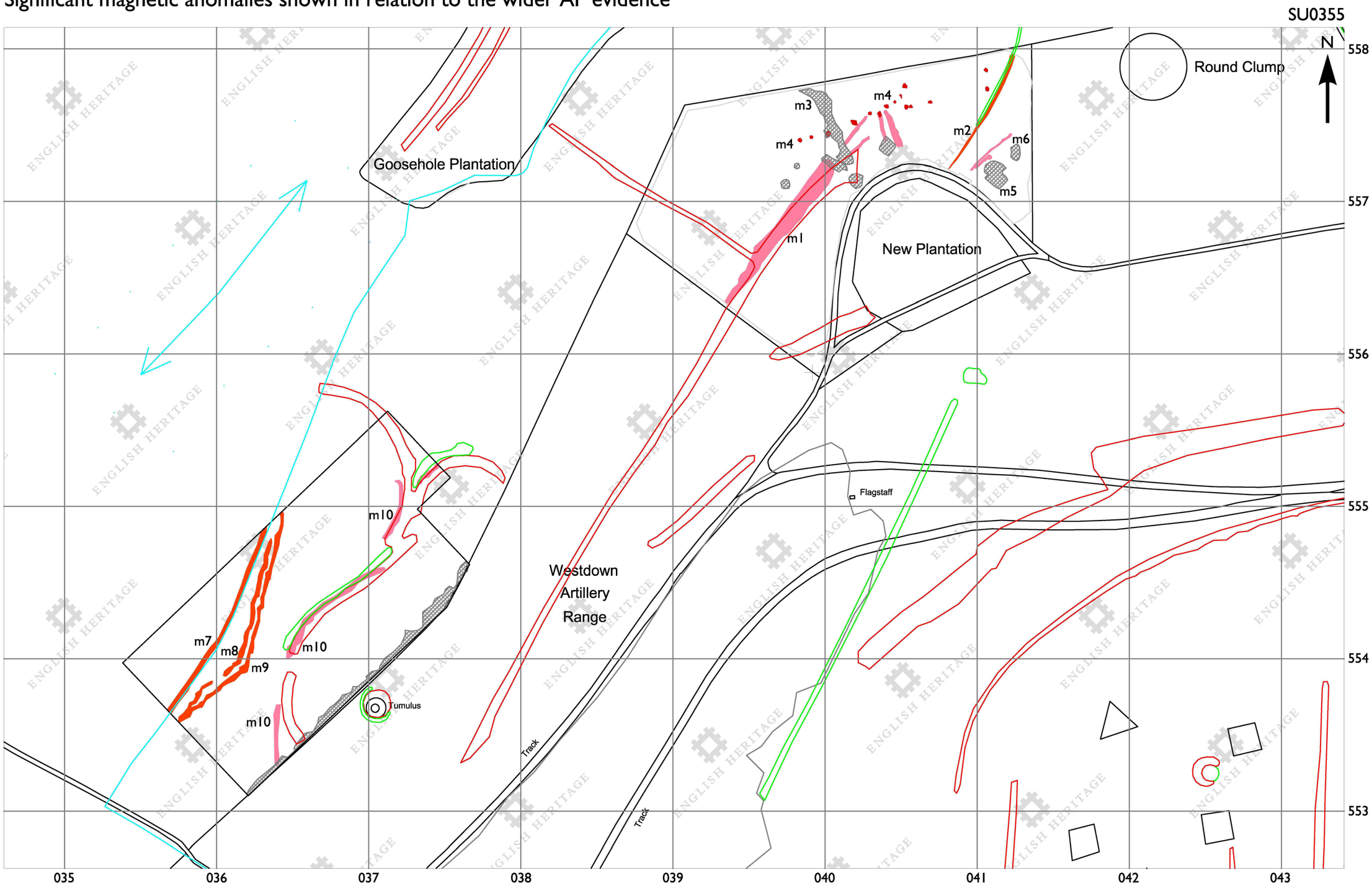
Significant magnetic anomalies shown in relation to the wider AP evidence



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aerial mapping evidence:

- ridge and furrow
- bank
- scarp
- ditch

- strongly magnetic
- positive magnetic
- raised magnetic
- agricultural / ferrous noise
- strong negative magnetic
- negative magnetic

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Figure 9

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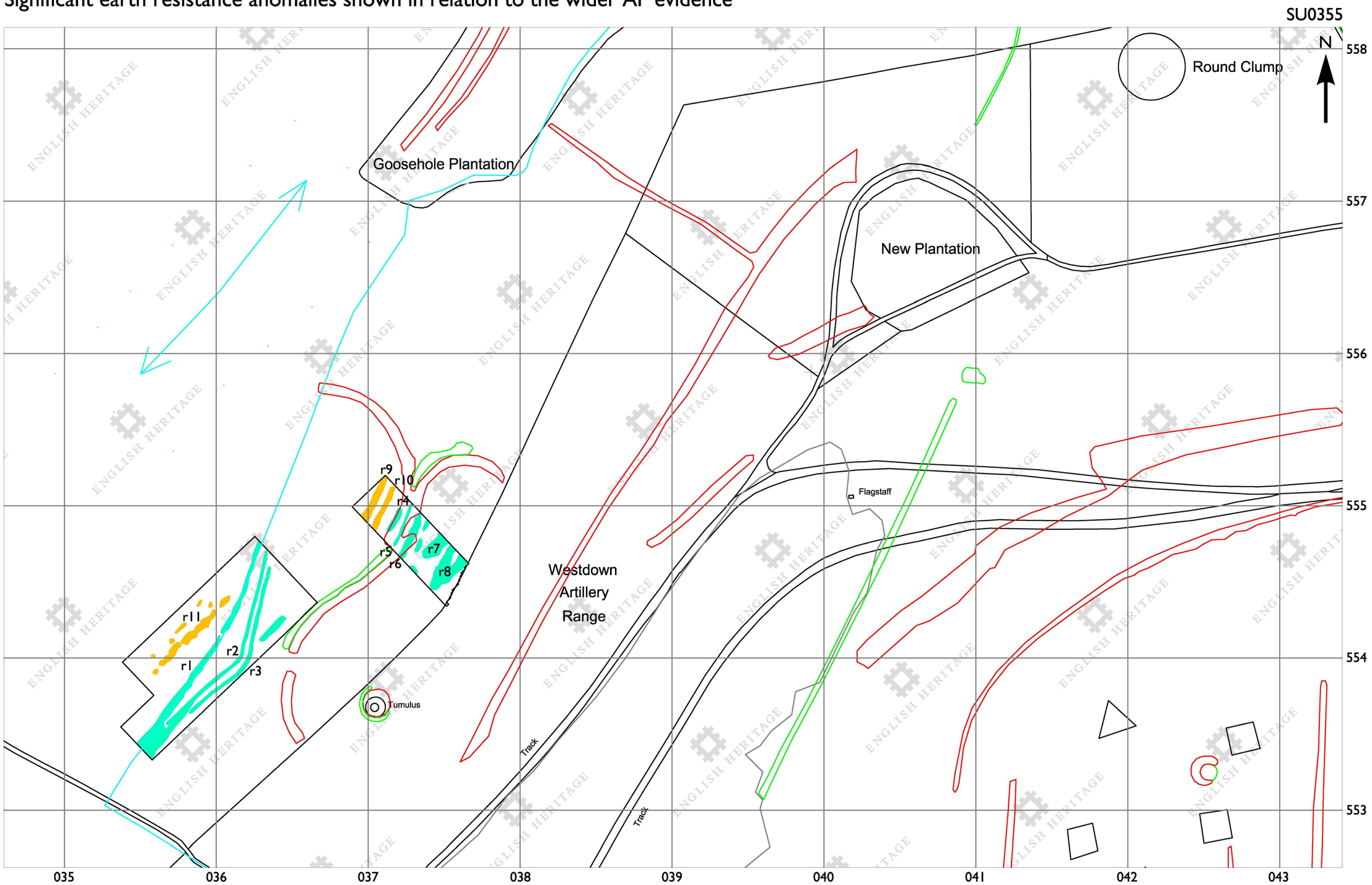
Significant earth resistance anomalies shown in relation to the wider AP evidence



0 90m

1:2500

aerial mapping evidence:

- ridge and furrow
- bank
- scarp
- ditch

- very high resistance
- high resistance
- low resistance

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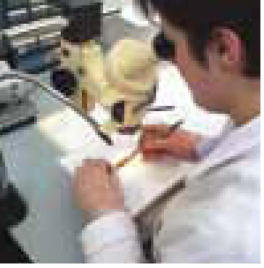
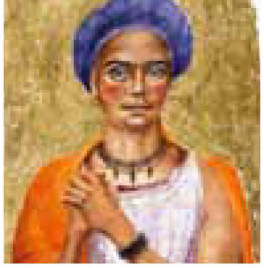

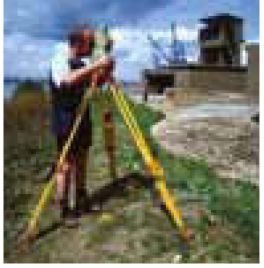
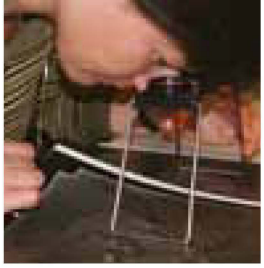


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