Historic England

Remote Sensing

Stonehenge Southern WHS Survey, Diamonds Field, Boreland Farm Report on Geophysical Surveys, August 2015

Neil Linford, Paul Linford and Andrew Payne

Discovery, Innovation and Science in the Historic Environment

Research Report Series no. 93-2015

Research Report Series 93-2015

STONEHENGE SOUTHERN WHS SURVEY, DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

REPORT ON GEOPHYSICAL SURVEYS, AUGUST 2015

Neil Linford, Paul Linford and Andrew Payne

NGR: SU 105 410

© Historic England

ISSN 2059-4453 (Online)

The Research Report Series incorporates reports by the expert teams within the Investigation & Analysis Division of the Research Group of Historic England, alongside contributions from other parts of the organisation. It replaces the former Centre for Archaeology Reports Series, the Archaeological Investigation Report Series, the Architectural Investigation Report Series, and the Research Department Report Series.

Many of the Research Reports are of an interim nature and serve to make available the results of specialist investigations in advance of full publication. They are not usually subject to external refereeing, and their conclusions may sometimes have to be modified in the light of information not available at the time of the investigation. Where no final project report is available, readers must consult the author before citing these reports in any publication. Opinions expressed in Research Reports are those of the author(s) and are not necessarily those of Historic England.

For more information write to Res.reports@HistoricEngland.org.uk
or mail: Historic England, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth PO4 9LD

SUMMARY
Geophysical survey was undertaken on Wilsford Down over the Diamond Field, Boreland Farm, Wilsford cum Lake, Wiltshire, as part of the Stonehenge World Heritage Site (SWHS) Southern Landscape Project. Results from a vehicle towed caesium magnetometer survey (26.9ha) were partially affected by ferrous disturbance associated with the rotational use of the land as an outdoor pig rearing unit, but successfully complemented records of known historic assets within the survey area. Ground Penetrating Radar survey (2.3ha) was focused on the scheduled Neolithic long barrow and a group of round barrows where, together with the magnetic survey and aerial photographic evidence, the survival of additional significant remains beyond the current designation description has also been confirmed.

CONTRIBUTORS
The geophysical fieldwork was conducted by Neil Linford, Paul Linford and Andrew Payne.

ACKNOWLEDGEMENTS
The authors are grateful to Rachel Hosier of Boreland Farm who kindly enabled the survey to take place at short notice, and provided much useful discussion of the results.

ARCHIVE LOCATION
Fort Cumberland, Portsmouth.

DATE OF SURVEY
The fieldwork was conducted between 24th to 28th August 2015 and the report completed on 30th November 2015. The cover image shows the towed caesium magnetometer survey in progress.

CONTACT DETAILS
Paul Linford, Geophysics Team (Remote Sensing), Historic England, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth PO4 9LD.
Tel: 02392 856750. Email: paul.linford@historicengland.org.uk

CONTENTS

INTRODUCTION

Caesium magnetometer and Ground Penetrating Radar (GPR) surveys were conducted on Wilsford Down over Diamonds Field, Boreland Farm, Wislford cum Lake, Wiltshire, as part of the Stonehenge World Heritage Site (SWHS) Southern Landscape Project (RASMIS 7238, SHAPE 22310.50, Protection Result 2EO.1), which aims to provide advance intelligence of any potential nationally-important undesignated sites within the southern SWHS, following the Government announcement in December 2014 to prioritise a road improvement scheme for the A303 trunk road (Bowden 2015b). In addition, there are significant Heritage at Risk and Development Management drivers as our understanding of the resource within SWHS is less well developed than that to the north of the current A303, where landscape-scale research projects have taken place within the recent past (Bowden 2015a).

The current survey was conducted during a first tranche of fieldwork in autumn 2015 that included available sites selected from within the Priority 1 study area (Figure 1, Linford *et al.* 2015a, 2015c, 2015b). This report provides an intitial summary of the geophysical survey results for circulation before compilation of a more synthetic overview report, drawing out and integrating key findings from the project as a whole.

The Diamonds Field site, contains known heritage assets including fragments of field systems (AMIE UID 219540), barrows (AMIE UID 219699 and 943682), linear ditches and earth works (AMIE UID 962149 and 219799), and is situated on Upper Cretaceous Seaford Chalk geology over which shallow well drained calcareous soils of the Icknield Association have developed, with deeper flinty calcareous silty soils in small coombes and valleys (Geological Survey of England and Wales 1950 ; Soil Survey of England and Wales 1983). The site slopes gently from the A303 to a pronounced dry valley to the south, and was fallow after the harvest with a short stubble surface. Works to establish infrastructure to relocate the out-door pig unit from an adjacent field were ongoing during the survey. Weather conditions during the field work were mixed with occasional heavy rain showers between sunnier intervals.

METHOD

Magnetometer survey

The magnetometer data was collected along the instrument swaths shown on Figure 2 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 16Hz 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 Global Navigation Satellite System (GNSS) receiver mounted on the sensor platform 1.75m in front of the central sensor and a second R8 base station receiver established using the Ordnance Survey VRS Now correction service. 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 4 and minimally processed versions of the range truncated data (± 150nT/m) are shown as a traceplot and a histogram equalised greyscale image on Figures 6 and 7 respectively.

Ground Penetrating Radar survey

A 3d-Radar MkIV GeoScope Continuous Wave Stepped-Frequency (CWSF) Ground Penetrating Radar (GPR) system was used to conduct the survey collecting data with a multi-element GX1820 vehicle towed, ground coupled antenna array (Linford *et al.* 2010). A roving Trimble R8 Global Navigation Satellite System (GNSS) receiver, , together with a second R8 base station receiver established using the Ordnance Survey VRS Now correction service, was mounted on the GPR antenna array to provide continuous positional control for the survey collected along the instrument swaths shown on Figure 3. Data were acquired at a 0.075m x 0.075m sample interval across a continuous wave stepped frequency range from 60MHz to 2.99GHz in 4MHz increments using a dwell time of 2ms. A single antenna element was monitored continuously to ensure data quality during acquisition together with automated processing software to produce real time amplitude time slice representations of the data as each successive instrument swath was recorded in the field (Linford 2013).

Post acquisition processing involved conversion of the raw data to time-domain profiles (through a time window of 0 to 70ns), adjustment of time-zero to coincide with the true ground surface, background and noise removal, and the application of a suitable gain function to enhance late arrivals. Representative profiles from the GPR survey are shown on Figure 8. To aid visualisation amplitude time slices were created from the entire data set by averaging data within successive 2.4ns (two-way travel time) windows (e.g. Linford 2004). An average sub-surface velocity of 0.0968m/ns was assumed following constant velocity tests on the data, and was used as the velocity field for the time to estimated depth conversion. Each of the resulting time slices, shown superimposed over the OS mapping in Figure 4 and as individual greyscale images in Figures 9 and 10, therefore represents the variation of reflection strength through successive ~0.12m intervals from the ground surface. Further details of both the frequency and time domain algorithms developed for processing this data can be found in Sala and Linford (2010).

RESULTS

Magnetometer survey

A graphical summary of the significant GPR anomalies, [**m1-25**] discussed in the following text, superimposed on the base OS map data, is provided in Figure 11.

In general, the magnetic response at the site is relatively good, although the results were affected by localised ferrous disturbance associated with the out door pig rearing unit, including the agricultural water supply [**m1** and **m2**], and some agricultural vehicle ruts [**m3-5**] are also evident in the data. To the south of the survey some irregular linear and curvilinear anomalies [**m6-9**] are probably related to downslope erosion gullies and the geomorphological sediments found along the course of the dry valley (cf Linford *et al.* 2009).

The field system (AMIE 219540) identified from aerial photography to the north of the survey area is replicated as a pattern of weak negative response [**m10**], probably representing ploughed-out banks, that appear to terminate at a weakly defined positive anomaly [**m11**]. A single, more strongly magnetised (up to 10nT/m), ditch-type anomaly [**m12**] continues south from the intersection of [**m10**] and [**m11**] around the Neolithic long barrow (SAM 1010830, Wilsford 34) where it coincides with a further pattern of possible linear boundary ditches [**m13-18**].

Elements of this ditch system [**m15-16**] extend west to meet the scheduled linear earthwork (SAM 1010837), running alongside the eastern boundary of the Diamond plantation. The area within the vicinity of [**m15-17**] also contains a high concentration of pit-type anomalies [**m19**] compared to the wider survey

area and may be indicative of settlement activity associated with with the linear boundaries and barrows, and a recorded flint scatter (Bowden 2015a, Figure 2.6). However, historic mapping suggests some of the pit-type anomalies may be related to comparatively recent tree clearance associated with the previous wider extent of the Diamond plantation (OS Historic County Mapping Series: Wiltshire 1919 - 1939 Epoch 4).

The ditches [**m20**] and [**m21**] of the two largest barrows in the scheduled group (SAM No. 1010834, Wilsford 35-36e) appear strongly magnetised (up to 10nT/m), and are found together with a smaller ring-ditch [**m22**] with a similar magnitude of response to the south, and a further series of closely spaced or interlocking, more weakly magnetised (< 2nT) sub-circular anomalies [**m23**]. No internal anomalies are apparent within [**m23**] but it is possible that some of the ditches are interrupted or of partially segmented form. The magnetic survey confirms the survival of a greater concentration of individual monuments within the barrow group indicated by the aerial photography (Figure 13; Crutchley 2002) exceeding the description of only seven barrows in current designation. A group of strong positive pit-type responses [**m24**] is present immediately south of [**m23**], which may represent associated settlement activity.

Few significant responses are found to the south of the barrow group towards the dry valley beyond the parallel linear anomalies [**m25**], suggestive of an avenue or trackway, which correlates with a more extensive ditch system enclosing a much larger area of Normanton Down identified from aerial survey evidence (Figure 13; Crutchley 2002). The parallel linear anomalies [**m25**] also continue west from the survey area in the aerial mapping, perhaps suggesting the southern boundary of the Diamond plantation respected the course of this as an extant earthwork before truncation by ploughing.

Ground Penetrating Radar survey

A graphical summary of the significant GPR anomalies, [**gpr1-24**] discussed in the following text, superimposed on the base OS map data, is provided in Figure 12.

The GPR survey was focused over the known round barrows and the accessible portion of the upstanding long barrow, where topography and vegetation allowed access. Significant reflections were recorded throughout the 70ns two-way travel time window, although later reflections beyond ~40ns become more highly attenuated. The local geomorphology, presumably gently dipping bands of marl or flint bedding within the chalk ([**gpr1**] on Figure 8, cf Linford *et al.* 2012), appear as series of high amplitude, amorphous reflectors that migrate laterally throughout the amplitude time slices, but for clarity are not included on Figure 12.

The very near surface data is dominated by vehicle tracks and standing crop stubble associated with the recent harvest, together with evidence for animal burrows [**gpr2**] between 4.8 and 7.2ns (0.22 - 0.33m) and the agricultural water supply [**gpr3**] which corresponds with [**m1**] from 9.6 to 19.2ns (0.44 - 0.88m). One of the burrows [**gpr2**] appears to run up to the ditch of the large bowl barrow [**gpr4**].

More significant anomalies correlate with the location of the main barrow group, with a predominantly low amplitude response recorded over the ditch circuit of the both largest bowl barrow [**gpr4**] and the pond barrow [**gpr5**] between 9.6 and 33.2ns (0.44 to 1.43m). There is a more limited response to the smaller barrows, with generally incomplete sub-circular anomalies [**gpr6-15**] found in a limited depth range between 9.6 and 19.2ns (0.44 to 0.88m). This suggests the survival of shallow ditched monuments, corroborating the more complete yet very weak magnetic response [**m23**]. A more tentative weak, high amplitude circular anomaly [**gpr16**] is found to the NE of the main barrow group and is only partially protected by the boundary of the scheduled monument, but is too close to the course of the ferrous pipe [**m1**] to be described by the magnetic data and also does not appear in the aerial photographic record.

A number of fragmented linear anomalies [**gpr17-22**] are scattered across the survey area and, in general, these correspond with the magnetic response suggestive of field or boundary ditches (cf [**m13-18**]), although the GPR data indicates some additional detail.

The response over the long barrow is complicated by a combination of the topography and presence of established animal burrows within the mound. It is possible that the low amplitude anomalies [**gpr23**] represent a partial response to the flanking ditches, but it is more difficult to confidently interpret the high amplitude response [**gpr24**] within the central mound between 9.6 and 28.8ns (0.44 to 1.32m) as this will, at least in part, be due to the animal barrows.

CONCLUSIONS

Both the magnetic and GPR surveys at the site have successfully resolved anomalies that, in general, correlate well with the known aerial photographic evidence. Whilst the magnetic survey was affected by both recent ferrous disturbance from agricultural activity and, in part, a relatively weak magnitude of response, the data confirms the survival of the majority of known remains and has identified some additional significant activity. For example, the geophysical data supports the NMP aerial mapping that suggests the group of barrows found in the centre of the site is both more numerous in terms of the number of small, circular ditched monuments present, and also extends beyond the area protected by the current designation. The concentration of pit-type anomalies varies throughout the magnetic survey, although this may, in part, be related to more recent tree clearance close to the Diamond plantation.

LIST OF ENCLOSED FIGURES

Figure 13 Graphical transcription of the National Mapping Programme aerial photographic evidence (1:5000).

REFERENCES

Baldwin, E 2010 Stonehenge Hidden Landscapes Interim Geophysical Survey Report Field Season 1 (2010-2011). unpublished interim report for the National Trust and English Heritage, University of Birmingham.

Bowden, M 2015a Stonehenge World Heritage Site: landscape survey south of the A303 – 'Stonehenge southern WHS survey'. Historic England, R G, Project Design Version 0.3.

Bowden, M 2015b Stonehenge World Heritage Site: landscape survey south of the A303 (RaSMIS 7238). Historic England, upublished project design.

Crutchley, S 2002 *'Stonehenge World Heritage Site Mapping Project Management report '*. English Heritage Aerial Survey Report Series **AER/14/2002**.

Geological Survey of England and Wales 1950 Salisbury, England and Wales Sheet 282, Drift edition. Chessington, Surrey.

Linford, N 2004 'From Hypocaust to Hyperbola: Ground Penetrating Radar surveys over mainly Roman remains in the U.K.'. *Archaeological Prospection*, **11** (4), 237-246.

Linford, N 2013. *Rapid processing of GPR time slices for data visualisation during field acquisition*. In Neubauer, W, Trinks, I, Salisbury, R and Einwogerer, C (Editors), Archaeological Prospection, Proceedings of the 10th International Conference, May 29th - June 2nd 2013 2013 (Vienna: Austrian Academy of Sciences Press). 176-78.

Linford, N, Linford, P, Martin, L and Payne, A 2009 *'Silbury Hill, Wiltshire, Report on Geophysical Surveys 2005-2008'*. English Heritage Research Department Reports **105/2009**.

Linford, N, Linford, P, Martin, L and Payne, A 2010 'Stepped-frequency GPR survey with a multi-element array antenna: Results from field application on archaeological sites'. *Archaeological Prospection*, **17** (3), 187-198.

Linford, N, Linford, P and Payne, A 2012 *'Stonehenge Monument Field And Barrows, Wiltshire, Report On Geophysical Surveys, September 2010, April And July 2011'*. English Heritage Research Reports Series **34/2012**.

Linford, N, Linford, P and Payne, A 2015a *'Southern WHS Survey, Diamonds Field, Druid's Lodge, Wiltshire, Report On Geophysical Surveys, August 2015'*. Historic England Research Reports Series **94/2015**.

Linford, N, Linford, P and Payne, A 2015b *'Southern WHS Survey, Normanton Down, Wiltshire, Report On Geophysical Surveys, August 2015'*. Historic England Research Reports Series **96/2015**.

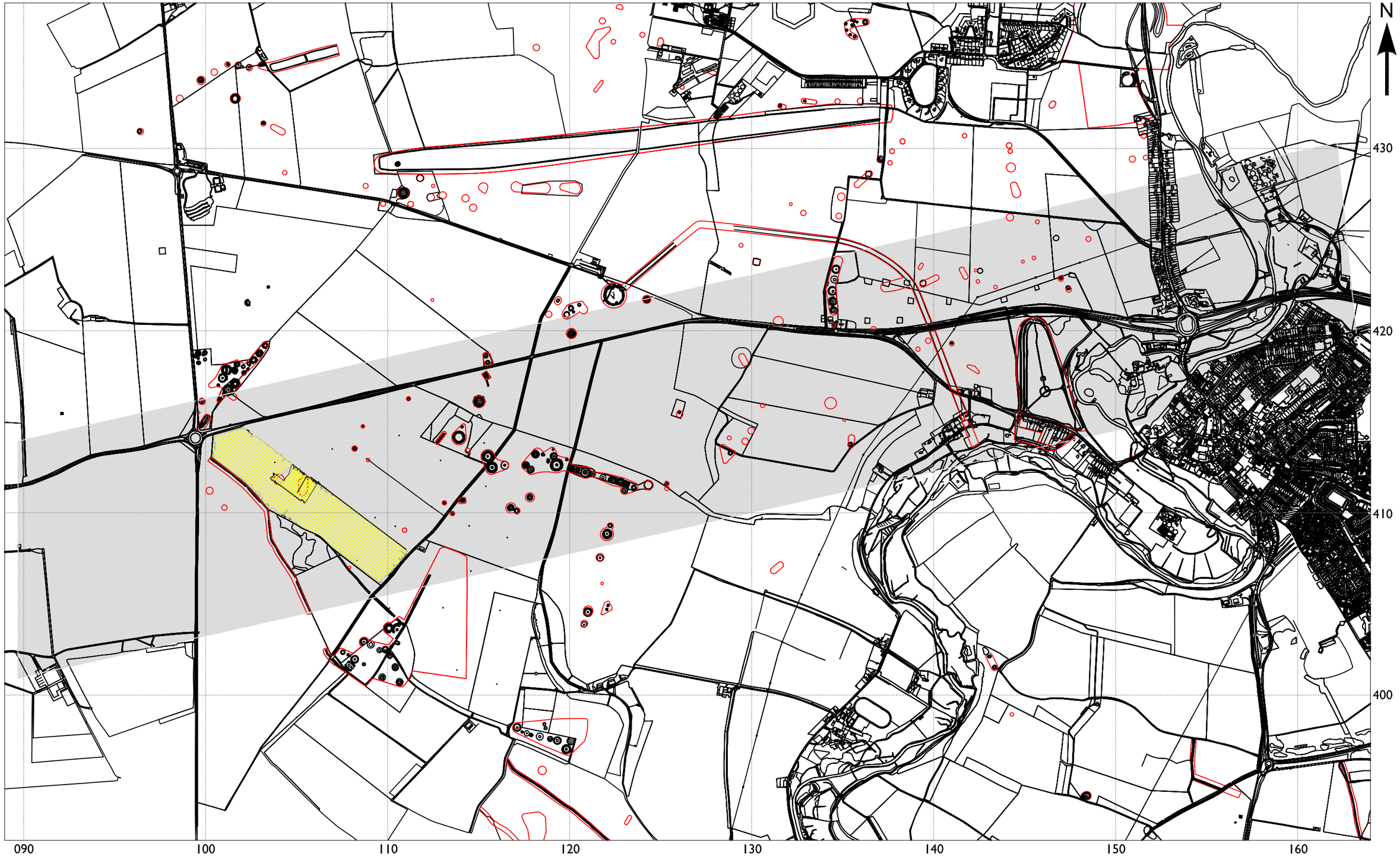
Linford, N, Linford, P and Payne, A 2015c *'Southern WHS Survey, West Amesbury Farm, Wiltshire, Report On Geophysical Surveys, August 2015'*. Historic England Research Reports Series **95/2015**.

Soil Survey of England and Wales 1983 Soils of England and Wales: Sheet 6 - South East England Harpenden: Lawes Agricultural Trust.

Figure 1

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

Location of geophysical survey within Priority 1 project area, August 2015



© Crown Copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100019088.

0 1500m
1:20000

Scheduled areas

Stonehenge Southern World Heritage Site Survey: Priority 1 project area

Caesium magnetometer survey area

GPR survey area

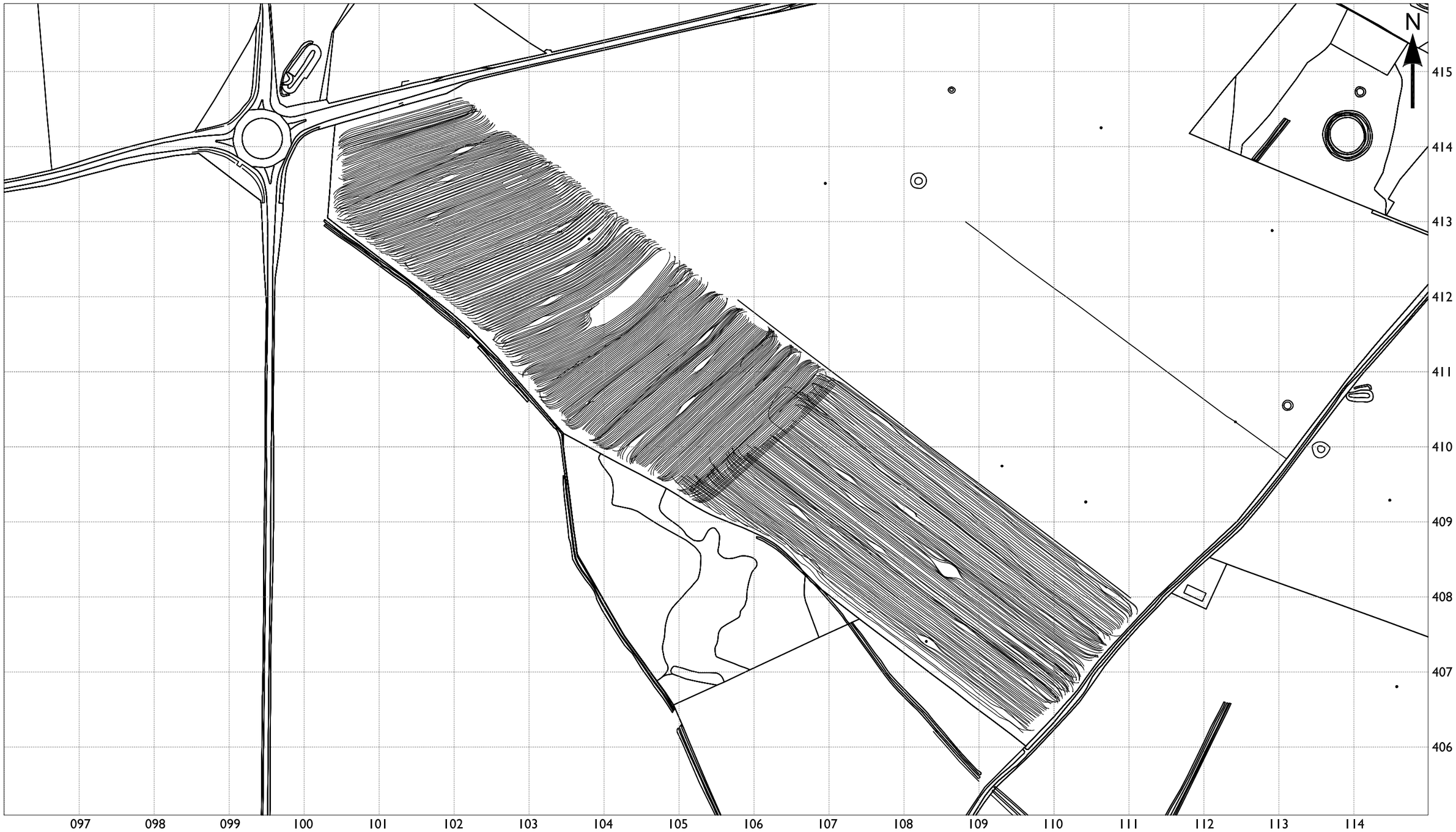
Historic England

Geophysics Team 2015

Figure 2

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

Location of caesium magnetometer survey swaths, August 2015



© Crown Copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100019088.

0 300m

1:5000

Caesium magnetometer survey swaths

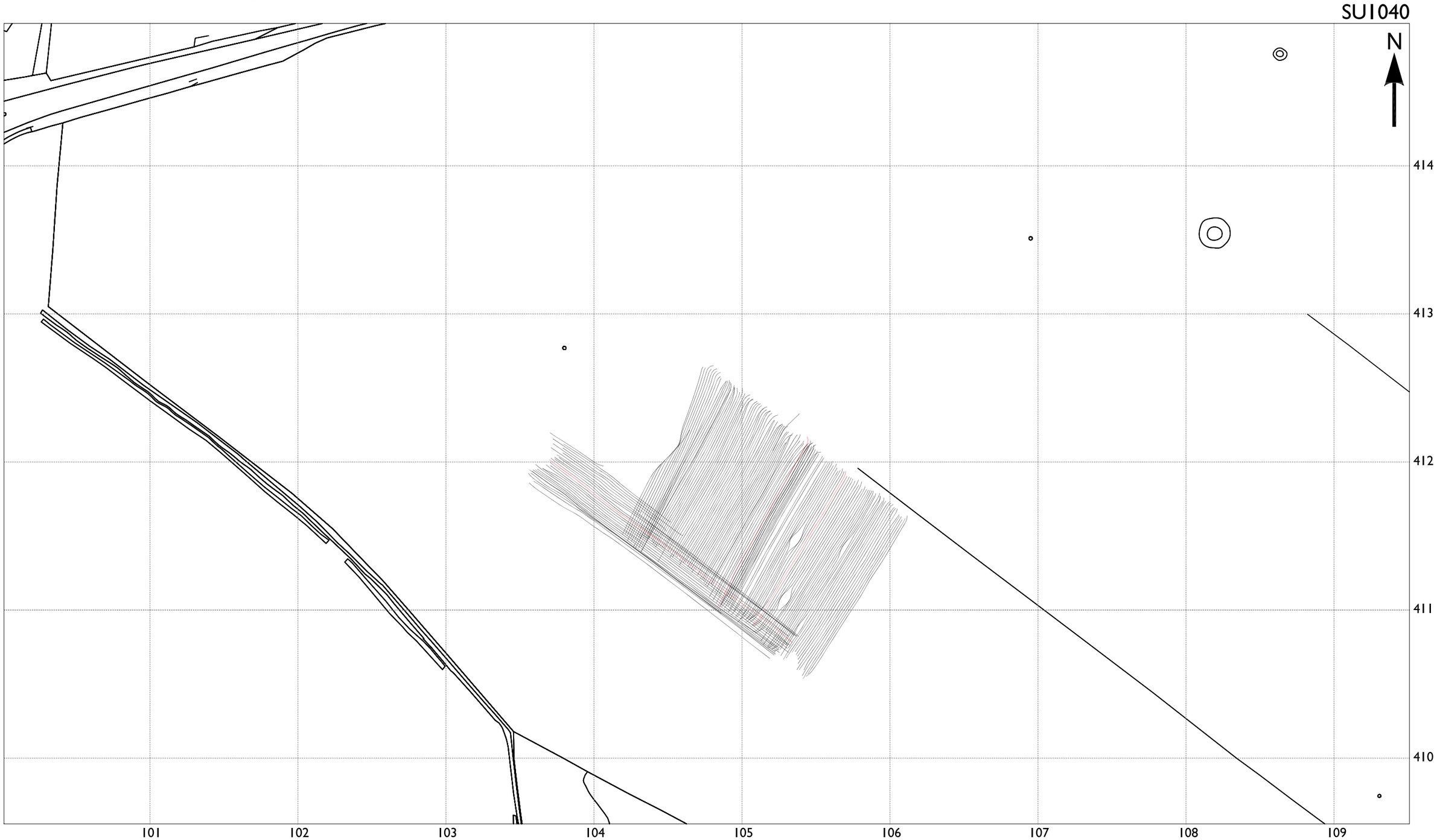
Geophysics Team 2015

Historic England

Figure 3

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

Location of GPR survey swaths, August 2015



© Crown Copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100019088.

0 150m

1:2500

2015-02-18-007 Location of selected GPR profile shown on Figure 10

Ground Penetrating Radar survey swaths

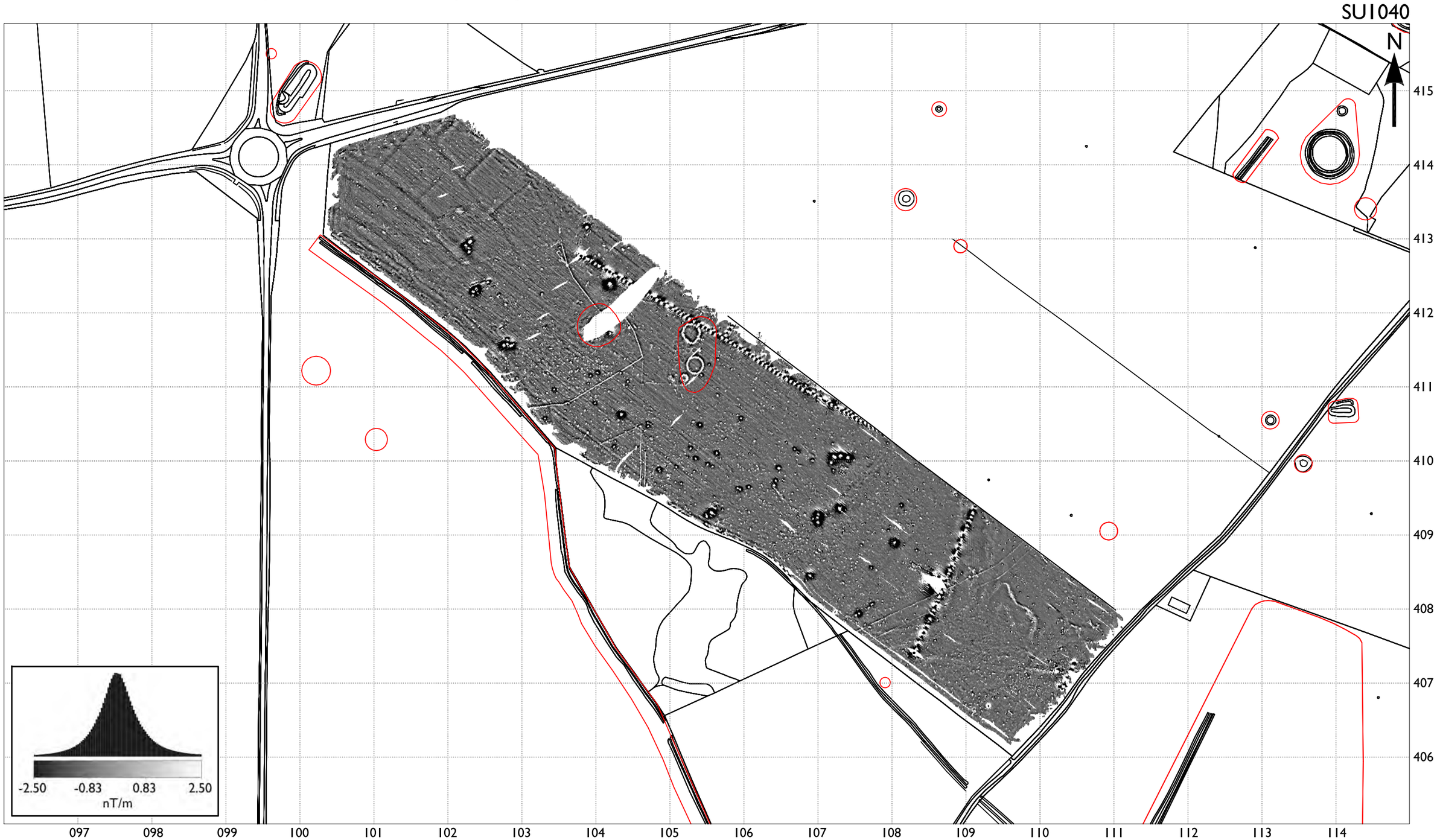
Geophysics Team 2015

Historic England

Figure 4

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

Location of caesium magnetometer survey, August 2015



© Crown Copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100019088.

0 300m

1:5000

Scheduled areas

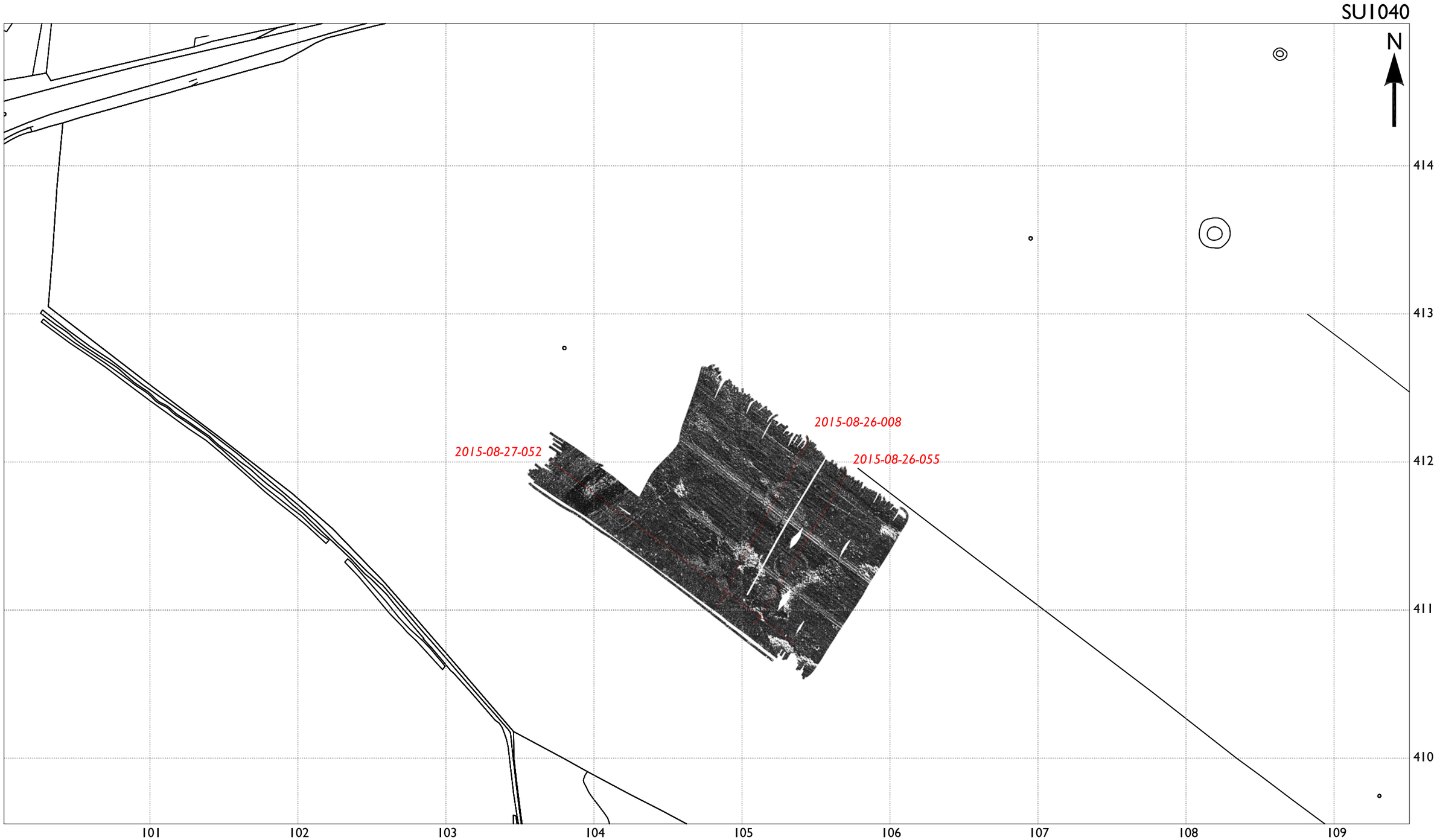
Geophysics Team 2015

Historic England

Figure 5

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

GPR amplitude time slice between 16.8 - 19.2ns (0.77 - 0.88m), August 2015



© Crown Copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100019088.

0 150m

1:2500

2015-08-26-008 Location of selected GPR profile shown on Figure 10

Low High
relative reflector strength

Geophysics Team 2015

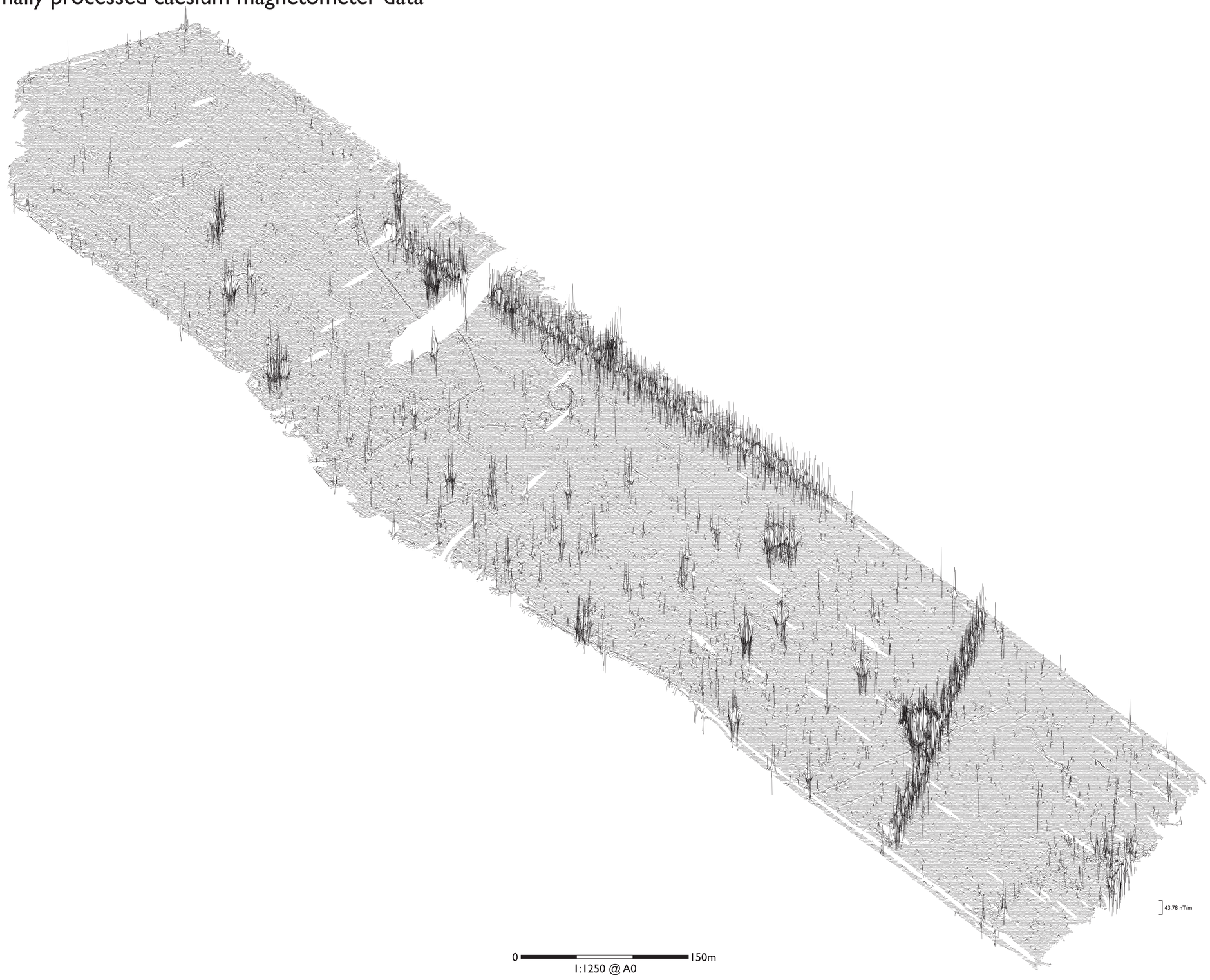
Historic England

Figure 6

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

Caesium magnetometer survey, August 2015

Traceplot of minimally processed caesium magnetometer data



Geophysics Team 2015

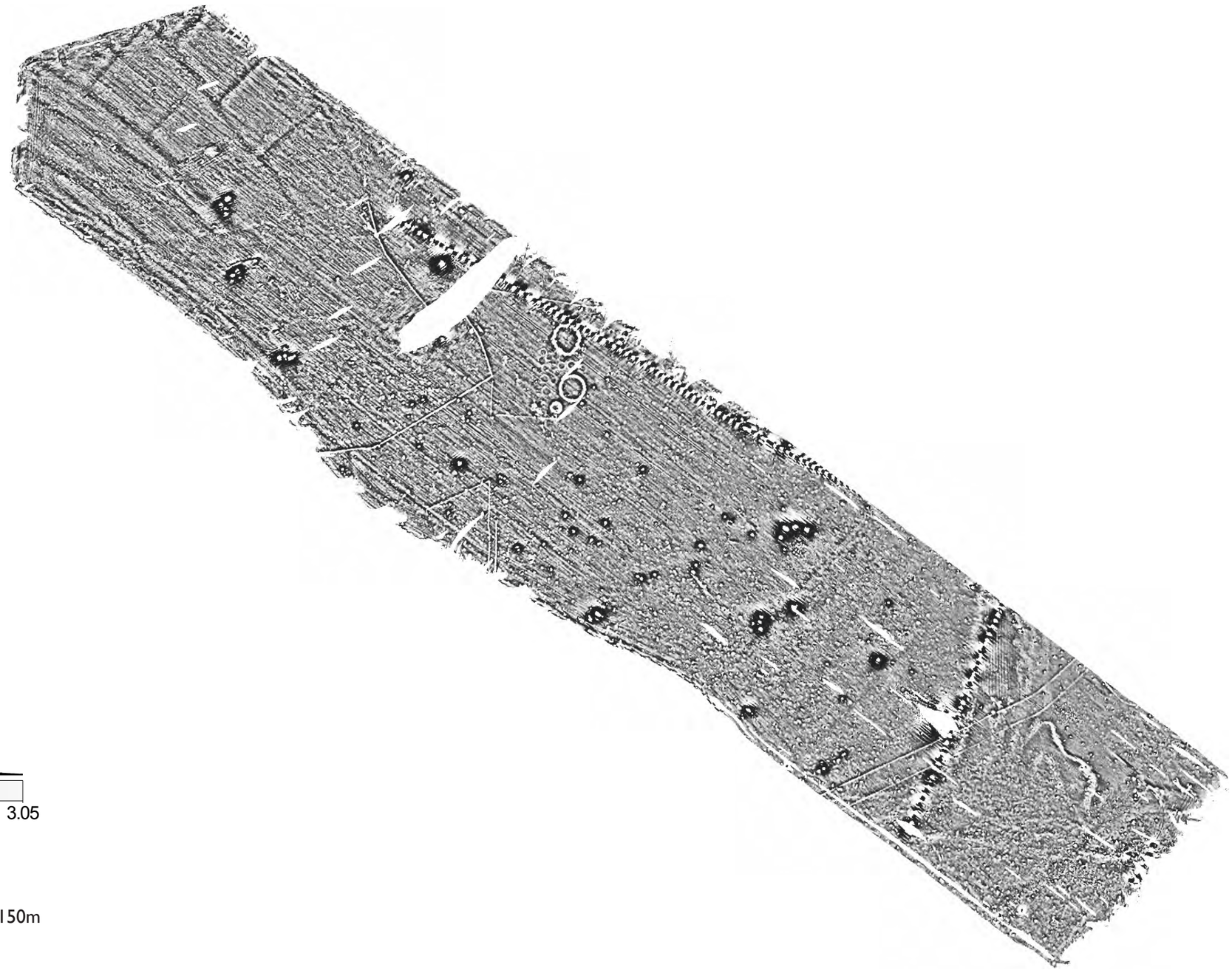
Historic England

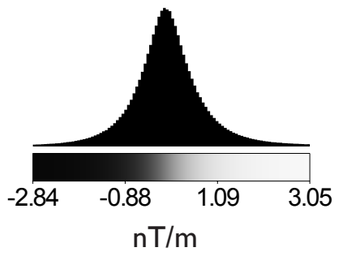
Figure 7

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

Caesium magnetometer survey, August 2015

Equal area greyscale image of minimally processed data





0 150m

1: 4000

N

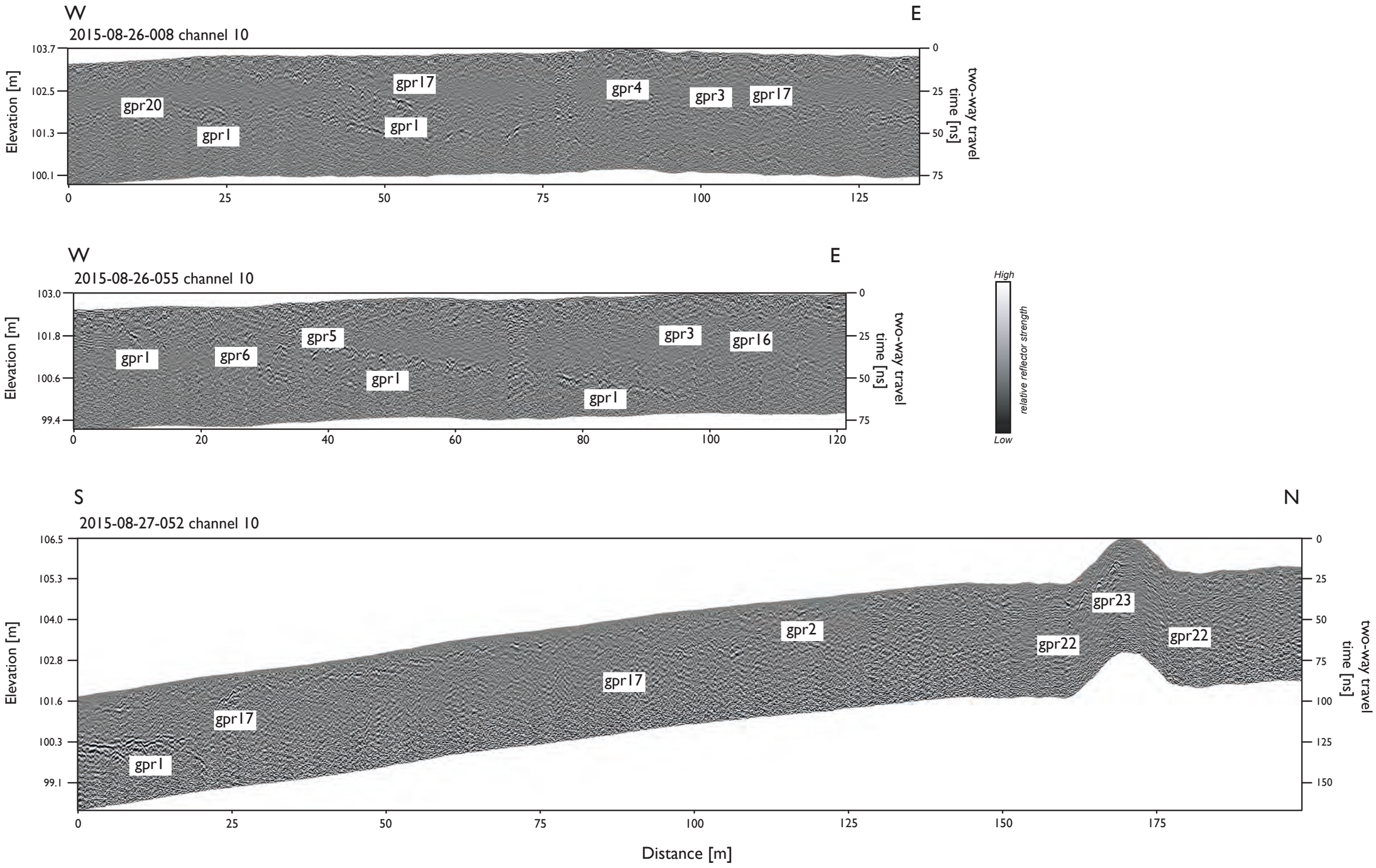
Geophysics Team 2015

Historic England

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

Topographically corrected GPR profiles, August 2015

Figure 8



Geophysics Team 2015

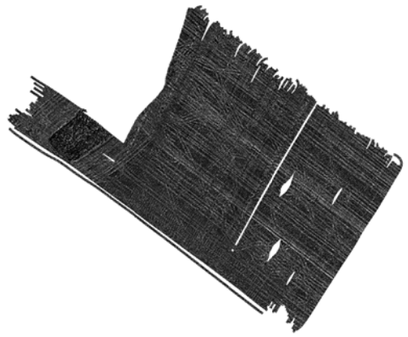
Historic England

STONEHENGE SOUTHERN WHS SURVEY GEOPHYSICS: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

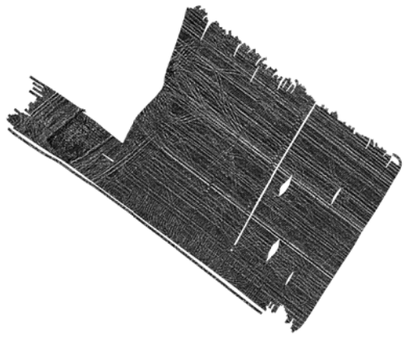
GPR amplitude time slices between 0.0 and 38.0ns (0.0 - 1.65m), August 2015

Figure 9

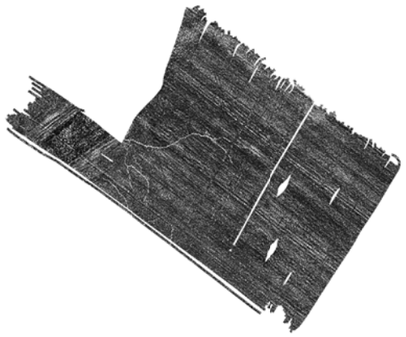
0 - 2.4ns (0.0 - 0.11m)



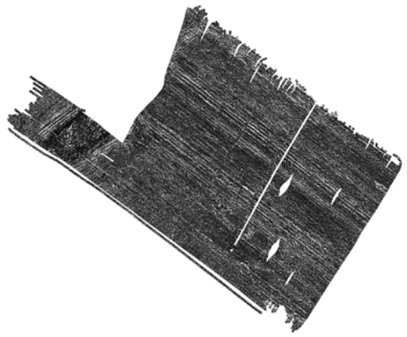
2.4 - 4.8ns (0.11 - 0.22m)



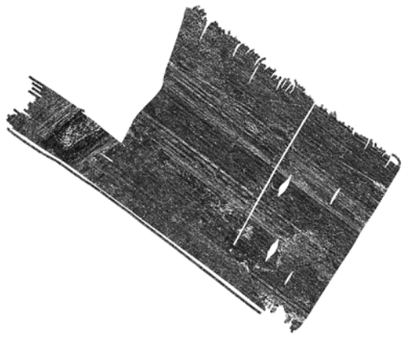
4.8 - 7.2ns (0.22 - 0.33m)



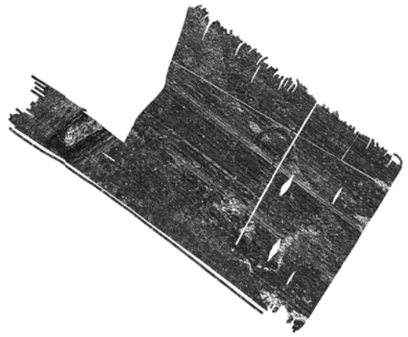
7.2 - 9.6ns (0.33 - 0.44m)



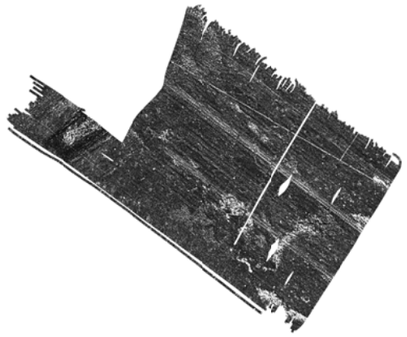
9.6 - 12.0ns (0.44 - 0.55m)



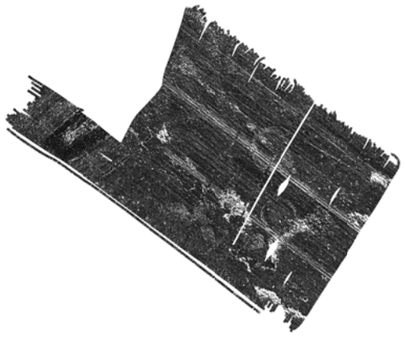
12.0 - 14.4ns (0.55 - 0.66m)



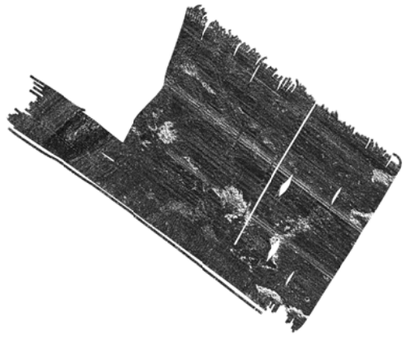
14.4 - 16.8ns (0.66 - 0.77m)



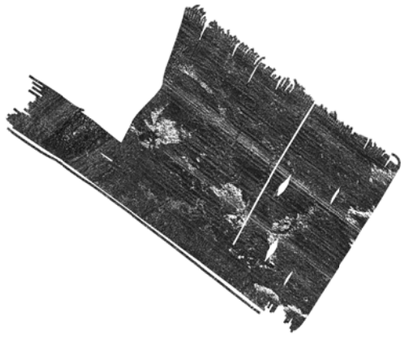
16.8 - 19.2ns (0.77 - 0.88m)



19.2 - 21.6ns (0.88 - 0.99m)

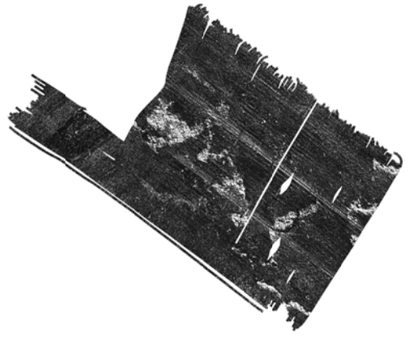


21.6 - 24.0ns (0.99 - 1.1m)

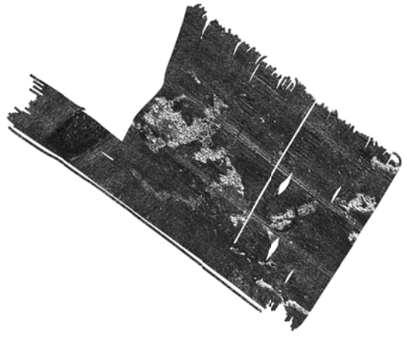


N

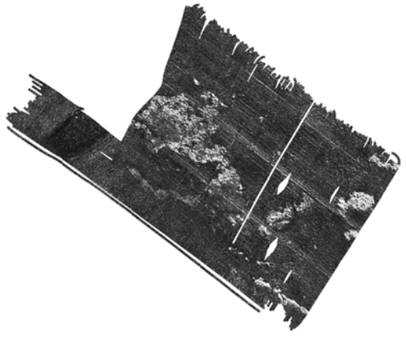
24.0 - 26.4ns (1.1 - 1.21m)



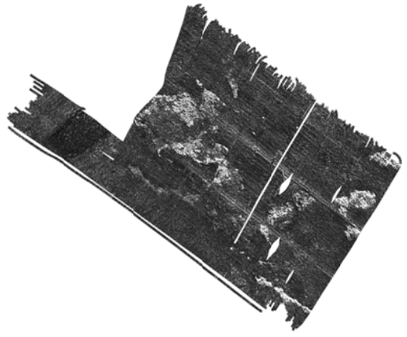
26.4 - 28.8ns (1.21 - 1.32m)



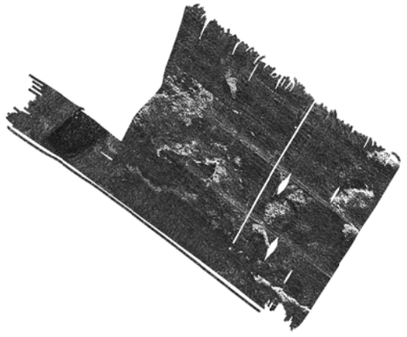
28.8 - 33.2ns (1.32 - 1.43m)



33.2 - 35.6ns (1.43 - 1.54m)



35.6 - 38.0ns (1.54 - 1.65m)



Low *High*

relative reflector strength

0 180m

1:4000

Geophysics Team 2015

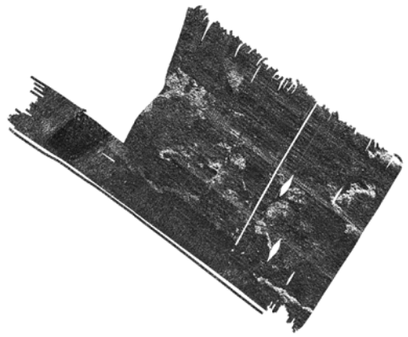
Historic England

STONEHENGE SOUTHERN WHS SURVEY GEOPHYSICS: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

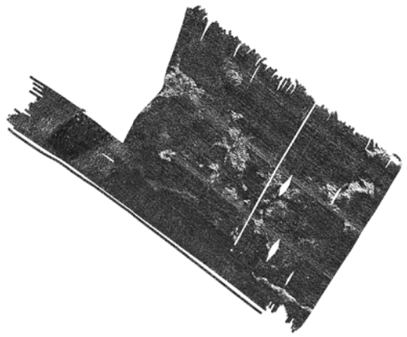
GPR amplitude time slices between 38.0 and 69.2ns (1.65 - 3.08m), August 2015

Figure 10

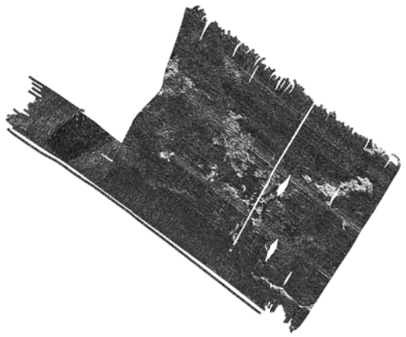
38.0 - 40.4ns (1.65 - 1.76m)



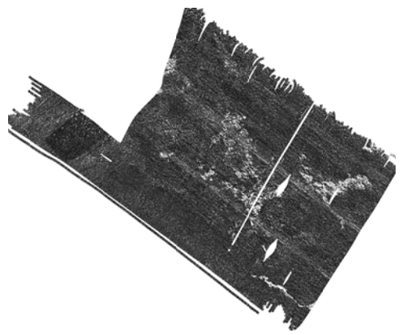
40.4 - 42.8ns (1.76 - 1.87m)



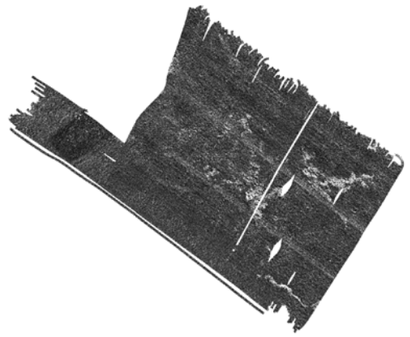
42.8 - 45.2ns (1.87 - 1.98m)



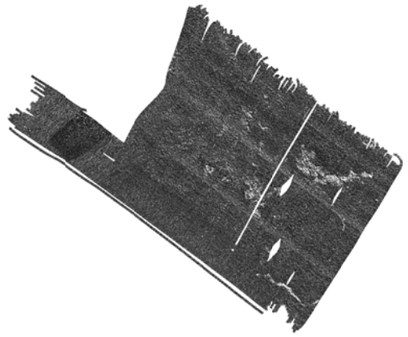
45.2 - 47.6ns (1.98 - 2.09m)



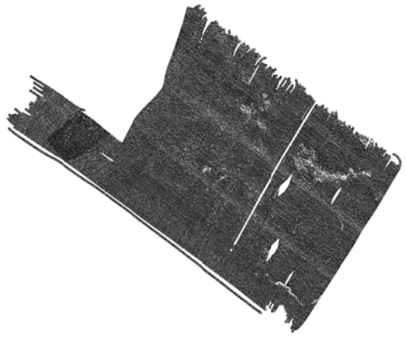
47.6 - 50.0ns (2.09 - 2.20m)



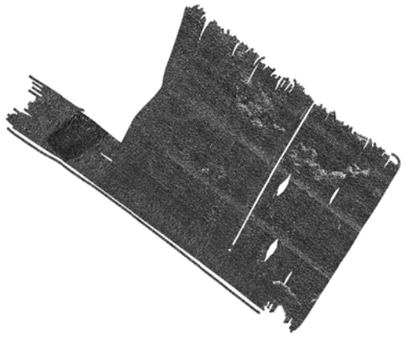
50.0 - 52.4ns (2.20 - 2.31m)



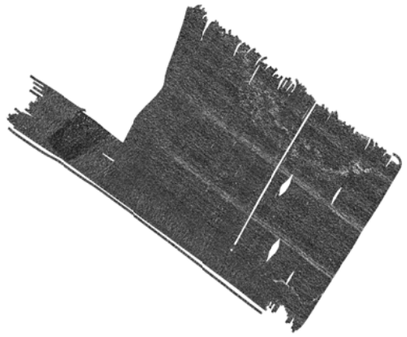
52.4 - 54.8ns (2.31 - 2.42m)



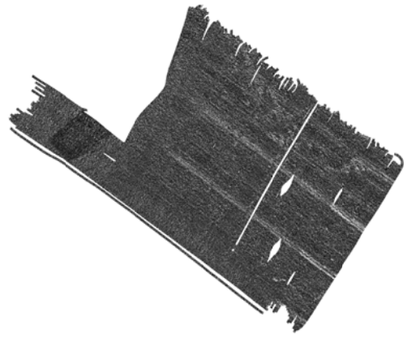
54.8 - 57.2ns (2.42 - 2.53m)



57.2 - 59.6ns (2.53 - 2.64m)

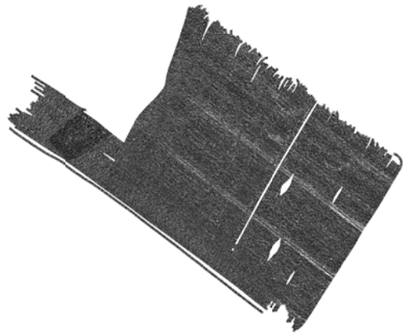


59.6 - 62.0ns (2.64 - 2.75m)

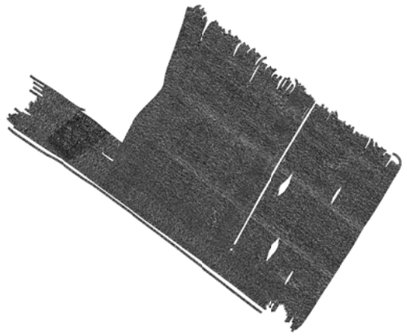


N

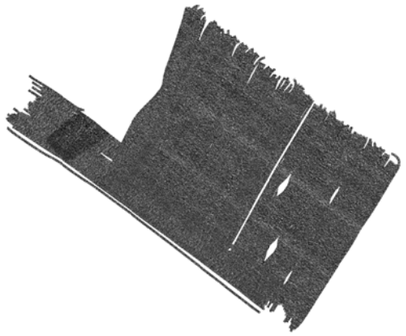
62.0 - 64.4ns (2.75 - 2.86m)



64.4 - 66.8ns (2.86 - 2.97m)



66.8 - 69.2ns (2.97 - 3.08m)



Low *High*

relative reflector strength

0 180m

1:4000

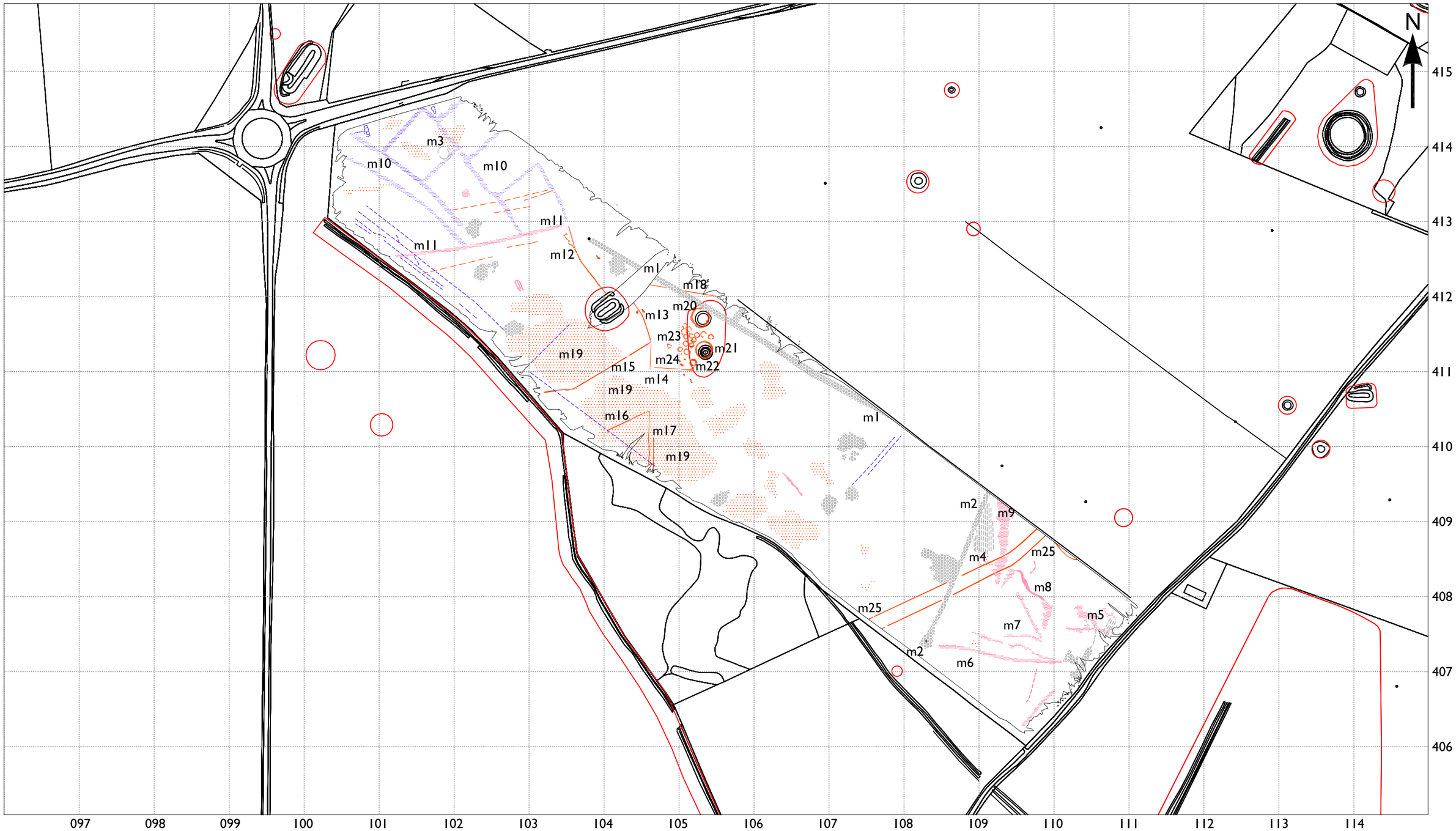
Geophysics Team 2015

Historic England

Figure 11

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

Graphical summary of significant magnetic anomalies, August 2015



© Crown Copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100019088.

0 300m

1:5000

Scheduled areas

positive magnetic

negative magnetic

raised magnetic

magnetic noise

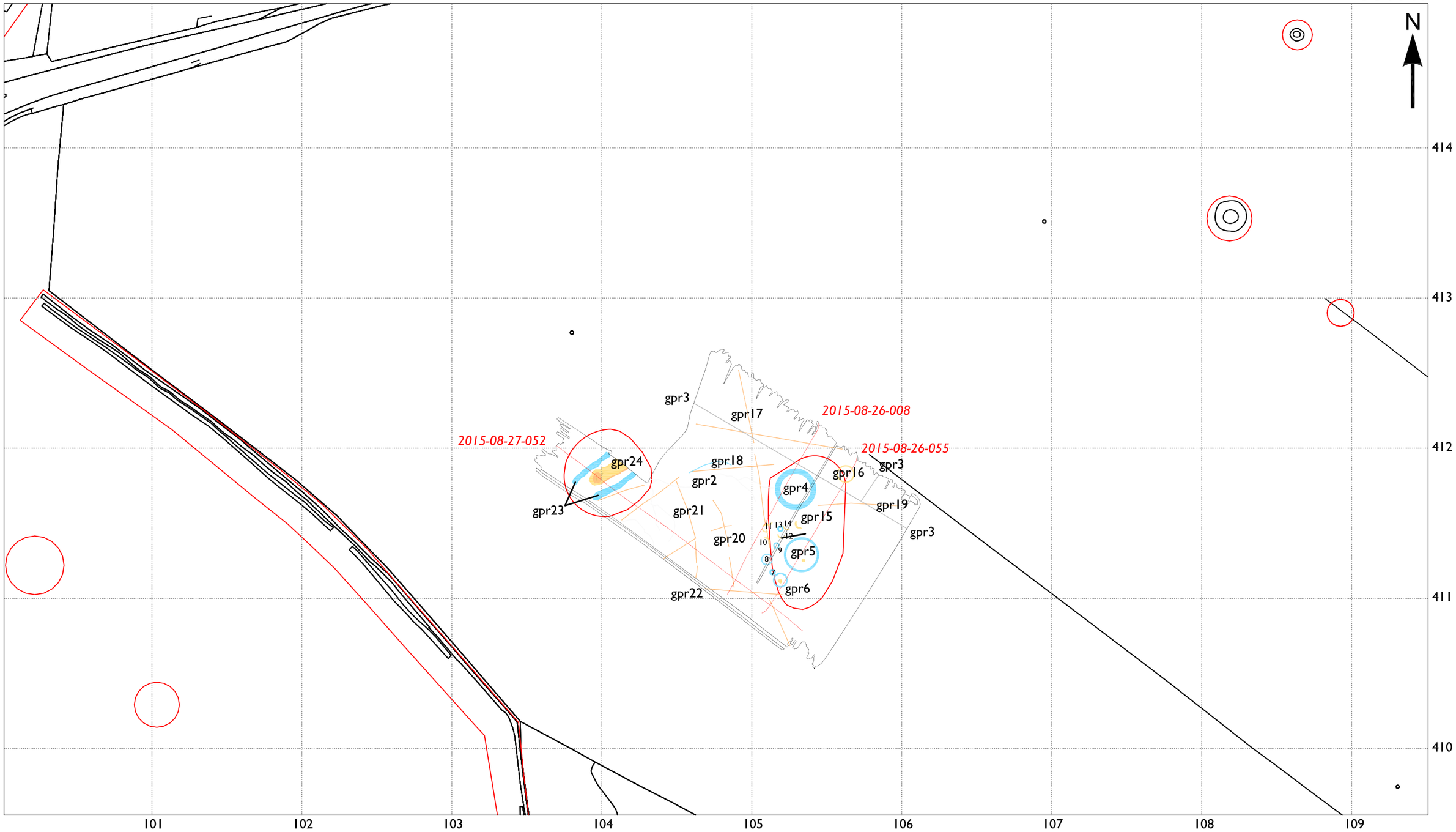
Geophysics Team 2015

Historic England

Figure 12

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

Graphical summary of significant GPR anomalies, August 2015



© Crown Copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100019088.

0 150m

1:2500

Scheduled areas

low amplitude reflectors

high amplitude reflectors

anomalies of known or recent origin

2015-08-26-008 Location of selected GPR profile shown on Figure 5

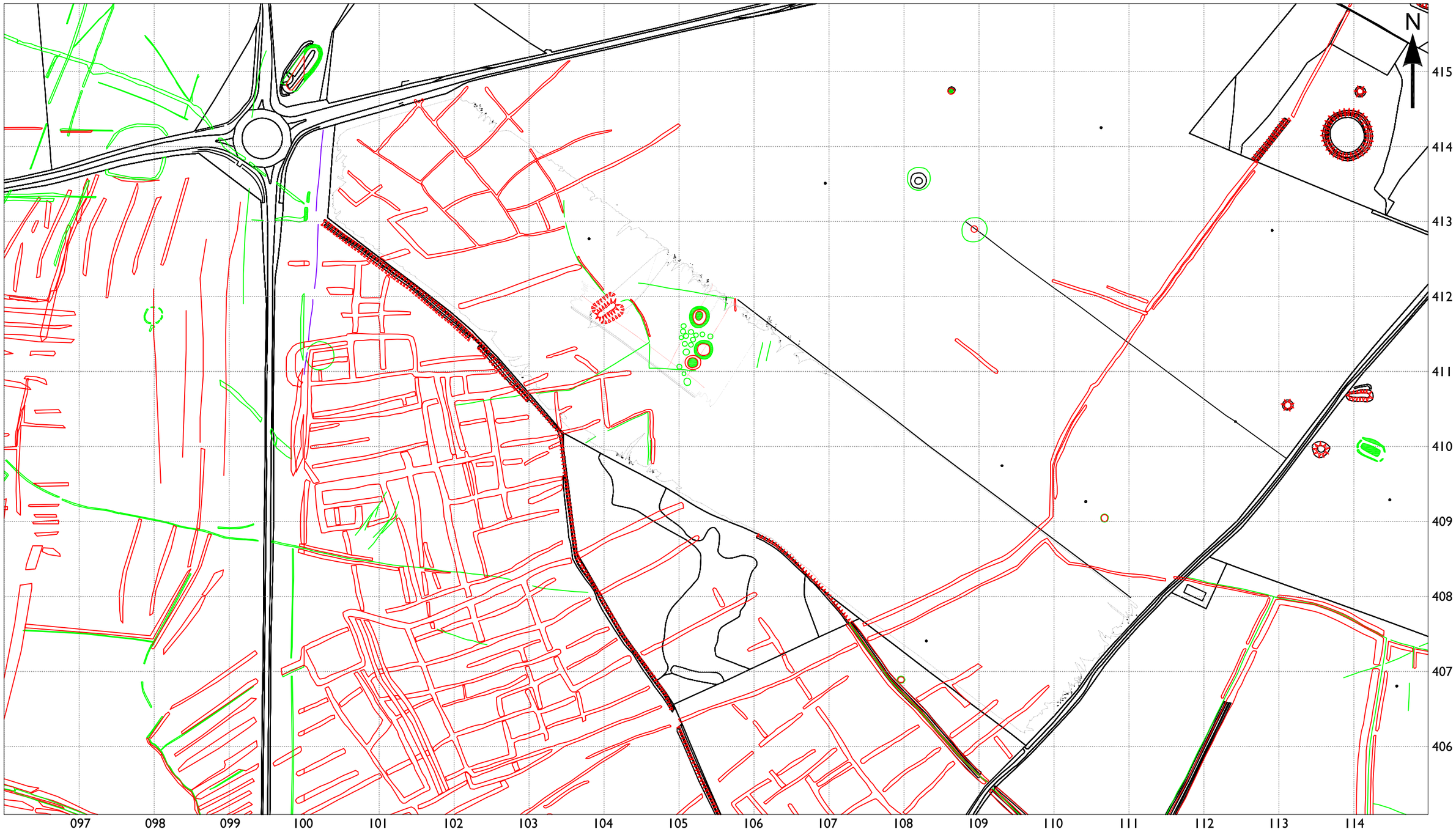
Geophysics Team 2015

Historic England

Figure 13

STONEHENGE SOUTHERN WHS SURVEY: DIAMONDS FIELD, BORELAND FARM, WILTSHIRE

NMP evidence in relation to geophysical survey areas



© Crown Copyright and database right 2015. All rights reserved. Ordnance Survey Licence number 100019088.

0 300m

1:5000

NMP mapping

ridge and furrow · scarp · bank · ditch · tramway

magnetometer survey area

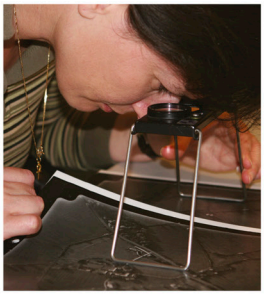
GPR survey area

Historic England

Geophysics Team 2015








Historic England Research and the Historic Environment

We are the public body that looks after England's historic environment. We champion historic places, helping people understand, value and care for them.

A good understanding of the historic environment is fundamental to ensuring people appreciate and enjoy their heritage and provides the essential first step towards its effective protection.

Historic England works to improve care, understanding and public enjoyment of the historic environment. We undertake and sponsor authoritative research. We develop new approaches to interpreting and protecting heritage and provide high quality expert advice and training.

We make the results of our work available through the Historic England Research Report Series, and through journal publications and monographs. Our online magazine Historic England Research which appears twice a year, aims to keep our partners within and outside English Heritage up-to-date with our projects and activities.

A full list of Research Reports, with abstracts and information on how to obtain copies, may be found on www.HistoricEngland.org.uk/researchreports

Some of these reports are interim reports, making the results of specialist investigations available in advance of full publication. They are not usually subject to external refereeing, and their conclusions may sometimes have to be modified in the light of information not available at the time of the investigation.

Where no final project report is available, you should consult the author before citing these reports in any publication. Opinions expressed in these reports are those of the author(s) and are not necessarily those of Historic England.

The Research Reports' database replaces the former:

Ancient Monuments Laboratory (AML) Reports Series
The Centre for Archaeology (CfA) Reports Series
The Archaeological Investigation Report Series and
The Architectural Investigation Reports Series.

ISSN 2046-9799 (Print)
ISSN 2046-9802 (Online)