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Stonehenge Visitor Centre, Winterbourne Stoke, Wiltshire

Report on Geophysical Surveys, July 2023

Megan Clements, Neil Linford, Paul Linford and Andrew Payne

Geophysics

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Summary

Earth resistance, caesium magnetometer and ground penetrating radar (GPR) surveys were conducted at the Stonehenge Visitor Centre, Winterbourn Stoke, Wiltshire, as preliminary investigations into the archaeological potential of the area in advance of proposals to expand educational facilities at the site. The earth resistance (0.7ha) and vehicle towed caesium magnetometry (1.3ha) surveys have mostly detected modern activity related to the Visitor Centre's construction, landscaping and use along with agricultural activity. Both surveys have also identified pit-type anomalies of possible anthropogenic origin. Results from the vehicle towed GPR survey (1.7ha) largely responded to surface disturbance over the site due to recent event marquees, known foot paths and utilities, together with anomalies due to the underlying chalk geology.

Contributors

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

Acknowledgements

The authors are grateful for the help provided by colleagues from the English Heritage Trust in coordinating access for the survey to take place. The cover image shows the earth resistance survey being conducted and the sign the Visitor Centre displayed to inform visitors of the on-going activity (photo taken by Neil Linford).

Archive location

The digital report for this research will be archived with the Archaeology Data Service (available via Historic England 2012) and the Historic England Reports Database (Historic England 2023). The digital project archive is held by the Historic England Geophysics team, Fort Cumberland, Fort Cumberland Road, Portsmouth, PO4 9LD.

Date of survey/research/investigation

The fieldwork was conducted between the 24th and 27th July 2023 and the report completed on 4th of August 2023.

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Contents

Introduction

Earth resistance, caesium magnetometer and ground penetrating radar (GPR) surveys were conducted in the area surrounding the Stonehenge Visitor Centre, Amesbury, Wiltshire at the request of the English Heritage Trust (EHT). The geophysical surveys were required to contribute to an evaluation of archaeological potential in advance of planned works to construct new educational facilities adjacent to the shuttle bus turnaround north of the Stonehenge Visitor Centre and a replica Neolithic communal structure adjacent to the existing replica dwellings to the east. The project was carried out under the auspices of the Shared Services Agreement between EHT and Historic England (HE). The areas involved have previously been surveyed by both HE (then English Heritage) and other organisations, using mainly magnetic survey (Linford and Martin 2009; Gray 2023). The aim of the current survey is to enhance and extend the existing coverage with higher-sample density caesium magnetometer and GPR datasets and complement these with more targeted earth resistance coverage.

While no scheduled monuments are contained within the survey area, parts of the site lie inside the Stonehenge World Heritage Site (WHS). This is a landscape rich in archaeological heritage in which there remains high potential for discovering further archaeological activity, particularly more ephemeral, non-monumental remains that have tended to receive less attention in the past (Roberts *et al.* 2017). Previous geophysical surveys in the vicinity largely detected pit-type anomalies, confirmed through subsequent archaeological evaluation trenches, although many were related to tree throws that are perhaps of more limited significance (Gray 2023).

Shallow, well drained, lime rich soils of the Icknield Association (map key 341) have developed over the underlying Seaford Chalk formation (Geological Survey of Great Britain 1950; Soil Survey of England and Wales 1983) and previous geophysical surveys have demonstrated that archaeological remains typically exhibit detectable magnetic and earth resistance contrasts in this geological context. GPR has not previously been tested in the vicinity of the Visitor Centre but has been successful elsewhere within the WHS (for instance Linford *et al.* 2012; Gaffney *et al.* 2018). Ground conditions at the time of the survey were down to well grazed or mown grass in the immediate vicinity of the Visitor Centre with wider areas of more overgrown meadow towards the field margins. The area adjacent to the bus turnaround was cut to a short sward immediately prior to the survey. Weather conditions were general dry with some light rain showers throughout the week, maximum daily temperatures were around 20^{o}C.

Method

The methodologies employed for each technique conform to the guidance set out by the Europae Archaeologiae Consilium (Schmidt *et al.* 2015) and the proposed scheme of investigation was agreed prior to commencement with the EHT Properties Curation team, the HE Development Advice team and the Wiltshire Council Archaeological Officer.

Earth Resistance

Measurements were recorded over a series of 30m grids established with a Trimble R8s GNSS (Figure 1) using a Geoscan RM85 earth resistance meter, internal multiplexer, and a PA5 electrode frame in the Twin-Electrode configuration, to allow two separate surveys, with electrode separations of 0.5m and 1.0m, to be collected simultaneously. The 0.5m electrode separation coverage was designed to detect near-surface anomalies in the upper 0.5m of the subsurface whilst the 1.0m separation survey allowed anomalies to a depth of about 1-1.25m to be detected. For the 0.5m electrode separation survey readings were taken at a density of 0.5m x 1.0m whilst for the 1.0m separation survey they were taken at a density of 1.0m x 1.0m.

Extreme values caused by high contact resistance were suppressed using an adaptive thresholding median filter with radius 1m (Scollar *et al.* 1990). As rainfall altered the background resistivity of the subsurface as the survey progressed grid edges were matched between adjacent 30m grids using the method of Haigh (1992). The results for the near-surface 0.5m electrode separation survey are depicted as a linear greyscale image in Figure 4 superimposed on the base OS mapping data. Figures 7 and 8 show this minimally processed data from both the 0.5m and 1.0m electrode separation surveys presented as trace plots and linear greyscale images. Also shown in these figures are greyscale plots of the same datasets after further application of high- and low-pass Gaussian filters with radii of 3.0m and 0.6m respectively for the half metre separation dataset and 3.0m and 1.0m for the one metre separation data.

Caesium Magnetometry

Magnetic survey covered most of the site except for two small areas. It was not possible to complete coverage over the area to the north of the path leading east from the Visitor Centre towards Stonehenge owing to safety concerns operating the towed array in proximity to the large number of visitors using the path to access the WHS landscape. Furthermore, the confined area adjacent to the bus turnaround was not surveyed as the confined space surrounded by ferrous fencing combined with buses operating nearby throughout the day rendered it unsuitable for magnetic survey.

Magnetometer data were collected along the instrument swaths shown in Figure 2 using an array of six Geometrics G862 caesium vapour sensors mounted on a non-magnetic sledge (Linford *et al.* 2018). The sledge was towed behind a low-impact All-Terrain Vehicle (ATV) which housed the power supply and data logging electronics. Five sensors were mounted 0.5m apart in a linear array transverse to the direction of travel and, vertically, ~0.36m above the ground surface. The sixth was fixed 1.0m directly above the centre of this array to act as a gradient sensor. The sensors were sampled at a rate of 25Hz resulting in an along-line sample density of ~0.12m given typical ATV travel speeds of 2.5-3.0m/s. As the five non-gradient sensors were 0.5m apart, successive survey swaths were separated by approximately 2.5m to maintain a consistent traverse separation of 0.5m. Navigation and positional control were achieved using a Trimble R8 Global Navigation Satellite System (GNSS) receiver mounted on the sensor platform 1.65m 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 were continuously monitored during acquisition to ensure data quality and minimise the risk of gaps in the coverage.

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 or other nearby vehicles. The median value of each instrument traverse was then adjusted to zero by subtracting a running median value calculated over a 50m 1D window (see for instance Mauring *et al.* 2002). This operation corrects for any remaining biases added to the measurements owing to the diurnal variation of the Earth's magnetic field. A linear greyscale image of the minimally processed truncated data (±150nT/m) is shown superimposed over the base Ordnance Survey (OS) mapping in Figure 5. Figure 9 displays the truncated data as a trace plot and as a linear greyscale image clipped between limits of ± 2.5nT/m.

Ground Penetrating Radar

A 3d-Radar MkIV GeoScope Continuous Wave Step Frequency (CWSF) Ground Penetrating Radar (GPR) system was used to conduct the survey collecting data with a multi-element DXG1820 vehicle towed, ground coupled antenna array (Linford *et al.* 2010; Eide *et al.* 2018). A roving Trimble R8s Global Navigation Satellite System (GNSS) receiver was mounted on the GPR antenna array, that together with a second R8s base station was used to provide continuous positional control for the survey collected along the instrument swaths shown on Figure 3. The GNSS base station receiver was adjusted to the National Grid Transformation OSTN15 using the Trimble VRS Now Network RTK delivery service. This uses the Ordnance Survey's GNSS correction network (OSNet) and gives a stated accuracy of 0.01-0.015m per point with vertical accuracy being half as precise.

Data were acquired at a 0.075m x 0.075m sample interval across a continuous wave stepped frequency range from 40MHz 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 75ns), 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 full GPR survey data set are shown on Figure 10. To aid visualisation amplitude time slices were created from the entire data set by averaging data within successive 2.5ns (two-way travel time) windows (e.g. Linford 2004). An average sub-surface velocity of 0.117m/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 therefore represents the variation of reflection strength through successive ~0.15m intervals from the ground surface, shown as individual greyscale images in Figures 6, 11, 12 and 13. Further details of both the frequency and time domain algorithms developed for processing this data can be found in Sala and Linford (2012).

Due to the size of the resultant data set a semi-automated algorithm has been employed to extract the vector outline of significant anomalies shown on Figure 16. The algorithm uses edge detection to identify bounded regions followed by a morphological classification based on the size and shape of the extracted anomalies. For example, the location of possible pits is made by selecting small, sub circular anomalies from the data set (Linford and Linford 2017).

Results

Earth Resistance Survey

A graphical summary of significant earth resistance anomalies [**r1-r21]** discussed in the following text superimposed on the base OS mapping data is provided in Figure 14.

Several low resistance anomalies within the survey grids to the south and east of the Visitor Centre **[r1-r9]** correspond with areas of short grass, the increased soil moisture content likely due to lower transpiration relative to the fully developed vegetation in the unmown meadow areas. In particular **[r1]** (also detected in the GPR survey [gpr16]) corresponds with the wicker hurdle making activity area while other anomalies in the group occur in areas of heavy visitor footfall. **[r5]** and **[r6]** (also detected as [gpr4] and [gpr3]) relate to the location of the temporary marquee and a route to it from the car park respectively. However, landscaping to form graded slopes may also contribute to the lowered resistance of **[r2]** and **[r7].** Two discrete high resistance anomalies close to the southern wall of the Visitor Centre **[r10]** and **[r11]** are also likely to be due to landscaping related to its construction.

Linear low resistance anomalies **[r12]** and **[r13]** (the former also detected as [gpr14]) may be due to infilled drainage ditches although, given its alignment parallel to the visitor path, **[r12]** may alternatively represent a previous position of this route. T-shaped high resistance linear anomaly **[r14]** (which may also have been partially detected as [gpr10]) is probably due to surface water drainage pipework.

Across the southeast of the survey area several discrete weak (about 3 ohm) low resistance anomalies can be discerned **[r15]**, measuring 2-3m in diameter. These might indicate pits or quarry features but there are no clear correlations with anomalies in the magnetic survey, so they may simply be due to variations in the underlying chalk surface. However, towards the north of the survey area and immediately east of the Neolithic huts, discrete high resistance anomaly **[r16]** does correspond with magnetic anomaly [m2]. Detection with two different techniques strengthening the case for a potentially anthropogenic feature in the near subsurface here.

Two parallel, narrow, curvilinear low resistance anomalies about two metres apart **[r17]** are, owing to their segmented appearance, suggestive of a former fence line. However, they have also been detected over part of their course in the magnetic and GPR surveys as [m3] and [gpr15] where they appear more likely to be due to compression from movement of a heavy vehicle or perhaps a former pathway. Two groups of weakly defined, parallel linear anomalies have been detected in the northeast and southeast corners of the survey grid adjacent to the Visitor Centre **[r18]**. These are likely to be responses to former cultivation patterns detected in both the magnetic survey reported here and the earlier

2009 survey although the south-eastern group do not appear to be on exactly the same alignment as the magnetic anomalies suggesting these may instead be due to vehicle movements.

Turning attention to the separate small survey area north of the Visitor Centre and adjacent to the bus turnaround, an extremely weak north-south linear anomaly may tentatively be suggested **[r19]** possibly corresponding with [gpr28] (see below). The broad band of high resistance along the southern boundary **[r20]** is likely due to moisture depletion owing to roots from the stand of trees defining the boundary here. Additional very weak linear anomalies **[r21]** are likely due to surface compression possibly caused by animal tracks.

Caesium Magnetometer Survey

A graphical summary of significant magnetic anomalies [**m1**-**15**] discussed in the following text superimposed on the base OS mapping data is provided in Figure 15.

Across the entirety of the surveyed area numerous pit-type anomalies have been identified. The dense distribution of ferrous anomalies hinders confident interpretation of many of these. However, those anomalies identified as having a 'positive magnetic' enhancement are more likely to be due to the presence of pits as opposed to variations in the underlying chalk geology. Previous magnetic and GPR surveys in the Stonehenge World Heritage Site have found similar distributions of pit anomalies across the landscape but it has not proved possible to distinguish those caused by human activity from those due to animal action or tree throws without subsequent intrusive investigation (see for instance Linford *et al.* 2017).

In the southeast corner are several pit-type anomalies [**m1**] that appear to form a sub-rectangular alignment. This formation may be coincidental, however given the rich archaeological landscape, an anthropogenic origin and significance cannot be discounted.

A sub-circular, positive magnetic anomaly [**m2**] has been identified in the north of the survey area which coincides in position with resistance anomaly [r16]. The anomaly's size and differentiation from other identified pit-type anomalies imply a different origin, possibly anthropogenic. In the same location are two negative curvilinear anomalies [**m3**] that may result from ridges formed from vehicle tracks or a former pathway (see [r17] and [gpr15]).

Additional negative linear anomalies [**m4**] and [**m5**] have been detected in the south of the surveyed area. These anomalies are more substantial than [**m3**] and likely related to modern agricultural activity. This is especially likely for [**m4**] as it shares the same orientation as the modern field boundary and the historic plough lines detected across most of the eastern side of the surveyed area [**m6**]. The positive linear anomalies [**m7**] to the south share a similar alignment to [**m5**], implying a possible agricultural origin, however the distance between [**m5**] and [**m7**], and the presence of large areas of ferrous anomalies, militates caution in this interpretation.

The magnetic data has been affected by ferrous activity likely related to modern practices. In the west of the surveyed area are two diffuse spreads of ferrous activity [**m8**] likely related to the building of the Visitor Centre, modern landscaping and visitor activity. The ferrous activity detected around the edge of the survey area [**m9**] is almost certainly due to extant wire fences. The modern visitor pathway has been clearly detected [**m10**] with ferrous activity to its immediate north [**m11**], again likely due to the building of the Visitor Centre or landscaping associated with the pathway (see [gpr14]). The diffuse ferrous anomalies to the south and northwest of the path [**m12**] are probably due to modern landscaping.

A series of four, possibly five, similar large discrete ferrous anomalies [**m13**] have been identified forming an arc around the Visitor Centre with responses consistent with that of a vertical magnetised rod. These are possibly the result of fence posts or other boundary markers installed during the Centre's construction. Immediately west of the Neolithic huts are an additional three ferrous anomalies [**m14**] with profiles suggesting a different causation, perhaps associated with modern agricultural activity. The large ferrous anomaly [**m15**], also identified as [gpr16] and coinciding with [r1], corresponds to the area designated for wicker hurdle making, the ferrous response perhaps due to landscaping.

Ground Penetrating Radar Survey

A graphical summary of the significant GPR anomalies, [**gpr1-31**] discussed in the following text, superimposed on the base OS map data, is provided in Figure 16.

Reflections have been recorded throughout the 75ns two-way travel time window, although there are few significant responses beyond a two-way travel time of ~60.0ns (3.51m) where the signal is more heavily attenuated. The amplitude of response varied between the different areas of ground vegetation cover, with more evident attenuation over the longer uncut meadow where the antenna array was not in direct contact with the ground (Linford *et al.* 2012). The very near-surface data contains high-amplitude responses due to visible metallic features, such as the kerbs of the access path [**gpr1**] from the Visitor Centre and the utility inspection covers adjacent to road at [**gpr2**]. More subtle high-amplitude anomalies are found over areas of shorter grass following the access path from the visitor carpark [**gpr3**] and in the immediate vicinity of both the events marquee [**gpr4**] and the replica Neolithic houses [**gpr5**]. Animal burrows are evident between 0.0 and 7.5ns (0 to 0.44m) predominantly to the south of the survey area [**gpr6**], although similar anomalies are also found at [**gpr7**] in the area of short mown grass adjacent to the bus departure from the Visitor Centre. Further low and high amplitude anomalies in this area seem likely to represent the boundary between the mown grass and uncut meadow [**gpr8**] together with a series of short linear responses [**gpr9-11**], possibly associated with surface water drainage.

There are also two areas of more amorphous high-amplitude response [**gpr12**] and [**gpr13**], possibly associated with made ground at either end of the access path. A low-amplitude ditch-type anomaly [**gpr14**] is found parallel to the north of the path, possibly a drain or edge of the short-mown grass, with a possible spur turning to the north. A parallel double linear anomaly [**gpr15**] in the very near-surface data appears to be due to vehicle ruts, or a possible former path-way, with a similar more amorphous response is found at [**gpr16**] where the meadow has been cut for the wicker hurdle making activity. This area of the site within the lower lying dry valley contains some fragmented linear anomalies [**gpr17**] due to a former cultivation pattern visible between 2.5 and 10.0ns (0.15 to 0.59m).

A shallow low amplitude anomaly [**gpr18**] found between 5.0 and 10.0ns (0.29 to 0.59m) is found to the south of the Visitor Centre and may, perhaps, represent a former access route from the carpark. However, a series of high amplitude reflectors found both to the south [**gpr19**] and smaller responses [**gpr20**] within [**gpr18**] could suggest these anomalies are associated with the construction of the Visitor Centre. A more subtle 'L' shaped anomaly [**gpr21**] crosses [**gpr18**] and, from the location, could represent the location of a former temporary marquee. More tentative anomalies [**gpr22**] sharing a similar orientation to [**gpr21**] are found in the deeper data beyond 40.0ns (2.34m) and it seems likely that these are associated with near-surface multiple reflections from ground compaction due to a temporary marquee. The ground compaction is almost certainly confined to the very near surface and these apparently deeper anomalies are due to the reverberation of the radar reflections, only visible in later time slices due to greater signal attenuation. Comparison with the magnetic data suggests [**gpr22**] correlates with an area of ferrous disturbance, perhaps indicative of made ground following the construction of the Visitor Centre.

A series of rectilinear anomalies are visible to the west of the activity marquee at [**gpr23**] and to the south at [**gpr24**] from between 5.0 and 20.0ns (0.29 to 1.17m), where [**gpr24**] corresponds with a parch mark visible in the grass at the time of the survey and may associated with an orthogonal response [**gpr25**] to the north. From their location [**gpr23-25**] are likely to be associated with ground compaction from the ballast used to secure recent temporary event marquees (H Sebire *pers comm*). More irregular high-amplitude anomalies [**gpr26**] gently dipping to the south east are evident from between 5.0 and 60.0ns (0.29 to 3.51m) and most likely represent a geological interface, perhaps a flint or marl layer within the underlying chalk (Linford *et al.* 2012). A wide scatter of pit-type anomalies [**gpr27**] are found between 12.5 and 22.5ns (0.73 to 1.32m) but the significance of these is difficult to fully interpret in areas where they may be associated with either animal burrows [**gpr6**] or the geological response [**gpr26**]. There is possibly some correlation between the pits [**gpr27**] and similar anomalies found in the magnetic data, including three of the prominent ferrous responses (cf [m13]).

The small survey area immediately adjacent to the current coach turning circle contains a high-amplitude linear response [**gpr28**] between 2.5 and 40.0ns (0.15 to 2.34m), presumably due to the known drainage cut here. There is also a high-amplitude response [**gpr29**] adjacent to the kerb of the coach turning circle most likely associated with made ground following the redesigned traffic flow in this area. Two orthogonal, low amplitude ditch-type anomalies [**gpr30**] are more difficult to fully interpret given the limited area available for survey. A more amorphous band of high-amplitude response [**gpr31**] dips gently from south to north from between 12.5 and 40.0ns (0.73 to 2.34m) and could again be associated with either a geological interface.

Conclusions

The earth resistance, caesium magnetometry and ground penetrating radar surveys have detected a fairly dense spread of anomalies across both surveyed areas but these are predominantly of modern origin relating to activity associated with the construction, maintenance and use of the Visitor Centre. Further anomalies probably relating to previous agricultural activity have also been identified such as former cultivation patterns and a possible vehicle trackway as well as possible animal burrowing and geological variation.

A possible archaeological origin cannot be discounted for one sub-circular anomaly immediately east of the area containing the replica Neolithic huts. This has been identified in both the earth resistance and caesium magnetometer surveys as **[r16]** and **[m2]** respectively. The magnetic survey has also detected a scatter of pit-type anomalies across the survey area, typical of those detected across the Stonehenge landscape and some of these may have an anthropogenic origin, as has been found on upon excavation elsewhere within the World Heritage Site. Those of a higher probability to be of archaeological interest are here concentrated towards the southeast of the survey area away from the areas of current interest.

The previous English Heritage survey (Linford and Martin 2009) was focussed on the footprint of the Visitor Centre and this new research extends coverage eastwards to encompass the remaining part of the Airman's Corner field not surveyed at that time. While this area has subsequently been subject to magnetic survey (Gray 2023), the current work augments this with two complementary techniques, earth resistance and GPR, and a higher resolution magnetic survey to increase confidence in the results. The survey suggests a similar geological and agricultural background to that detected further west but, with the exception of the possible pit-like anomalies discussed in the preceding paragraph, no substantive anomalies likely to be of archaeological origin have been identified.

List of Enclosed Figures

Figure 16: Graphical summary of significant GPR anomalies superimposed over the base OS mapping (1:1000).

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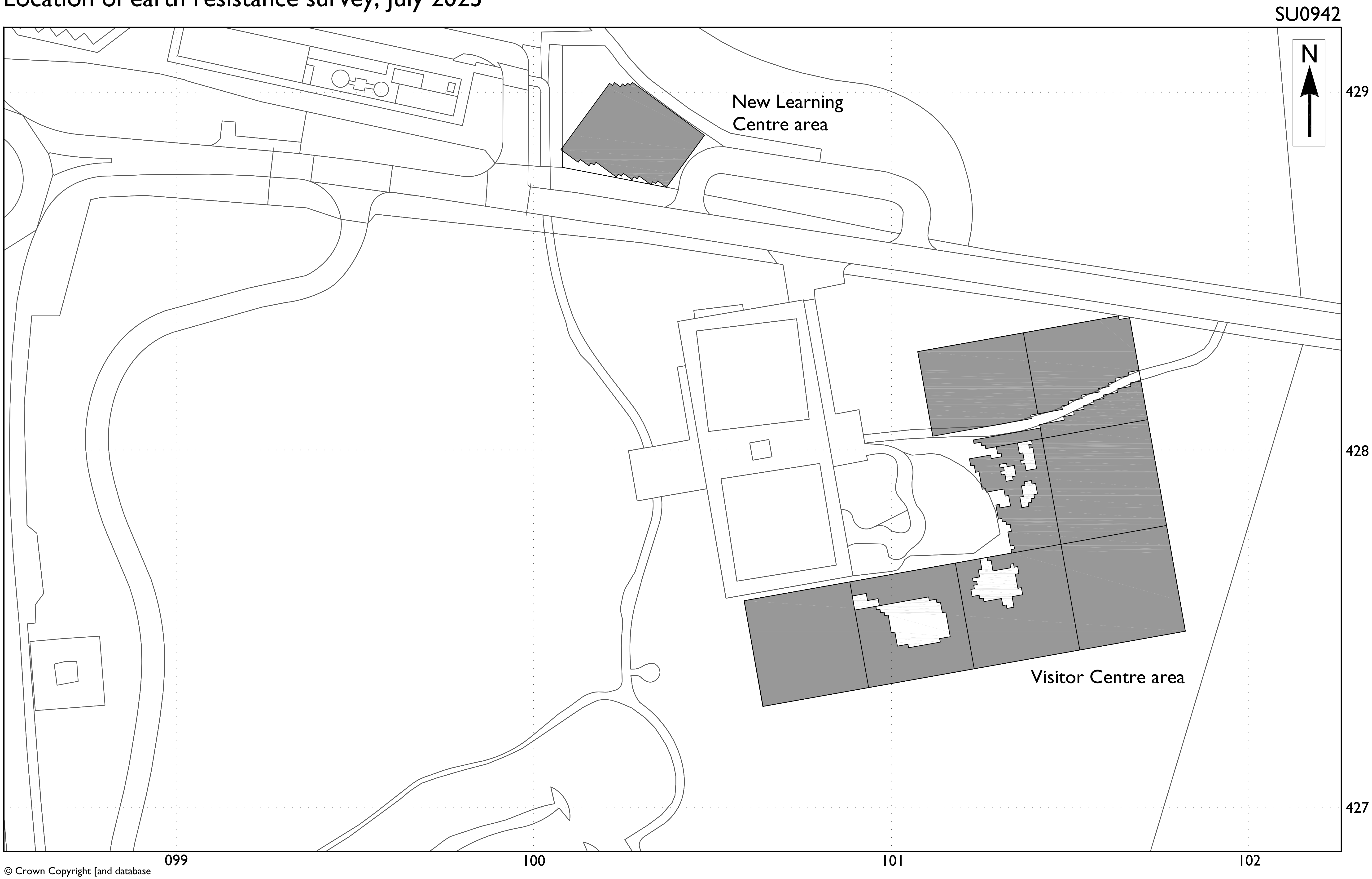
Figure 1

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE

Location of earth resistance survey, July 2023



0 90m

1:1000

earth resistance survey areas

Geophysics Team 2023

Historic England

Figure 2

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
Location of ceasium magnetometer instrument swaths, July 2023

Geophysics Team 2023

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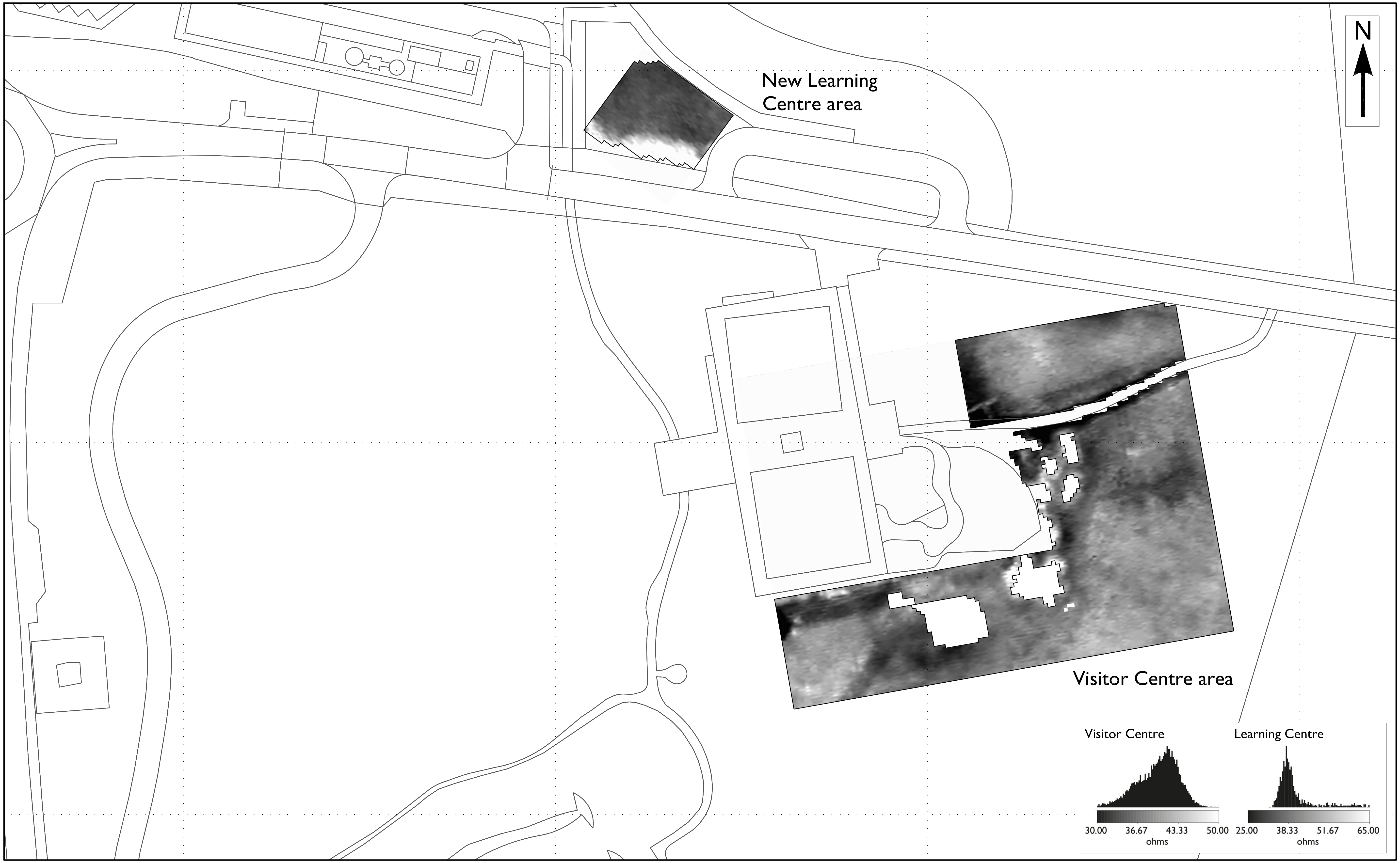
STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
Location of GPR instrument swaths, July 2023

Geophysics Team 2023

Historic England

Figure 4

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
Location of 0.5m electrode separation earth resistance surveys, July 2023



0 90m
1:1000

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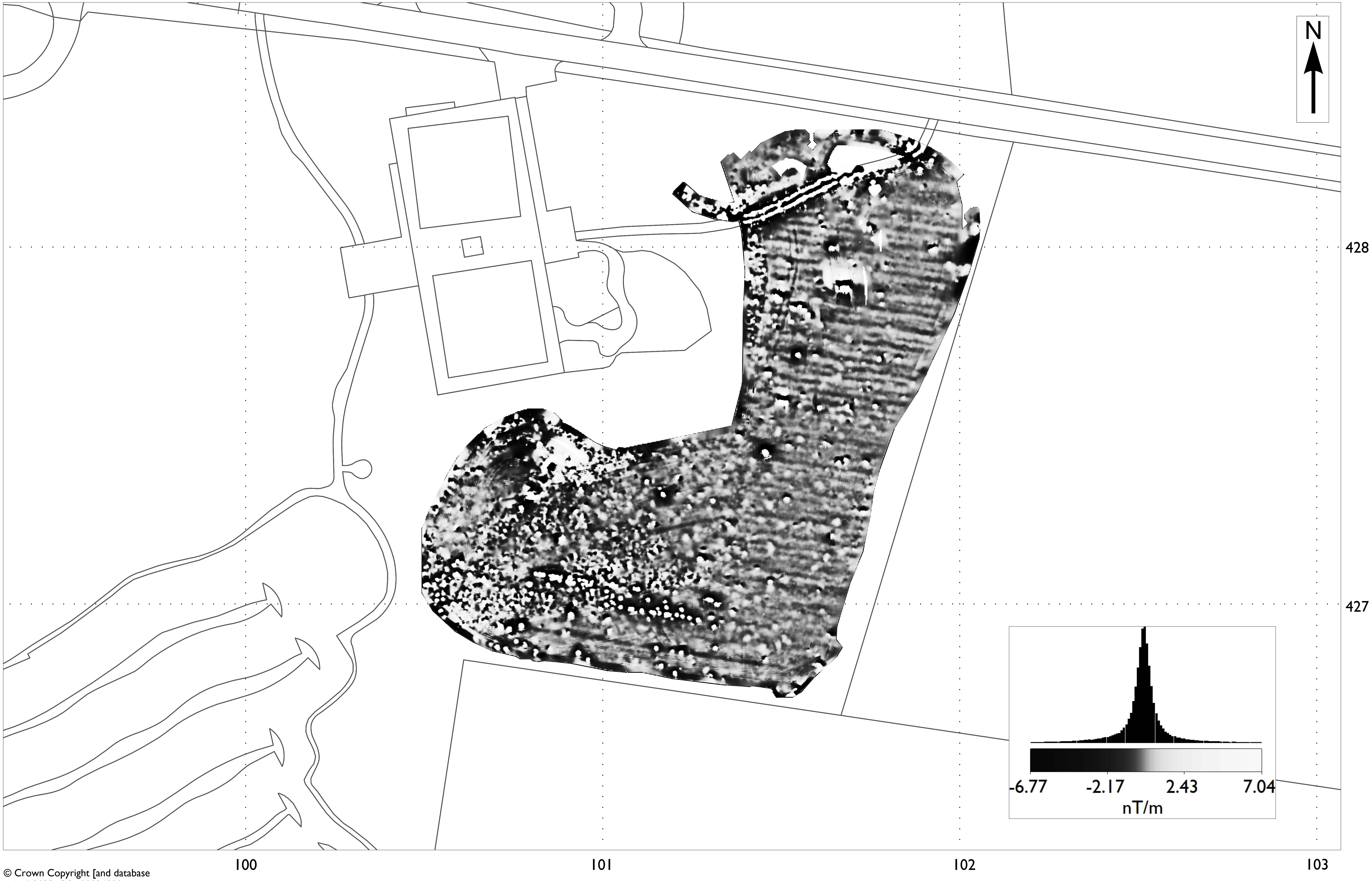
Historic England

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE

Location of caesium magnetometer data, July 2023



0 60m
1:1000

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STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
Location of GPR amplitude time slice between 12.5 and 15.0ns (0.73 to 0.88m), July 2023

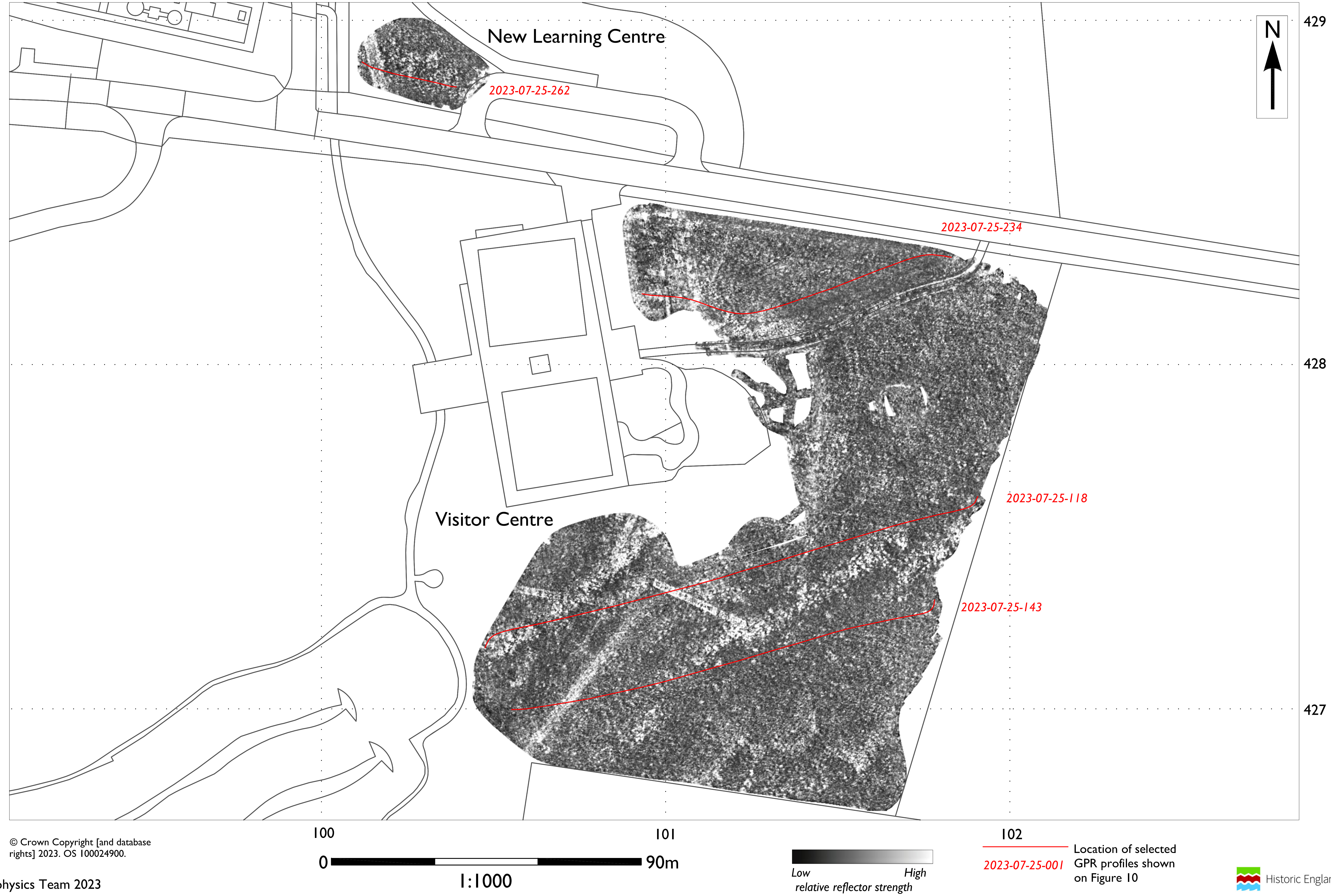

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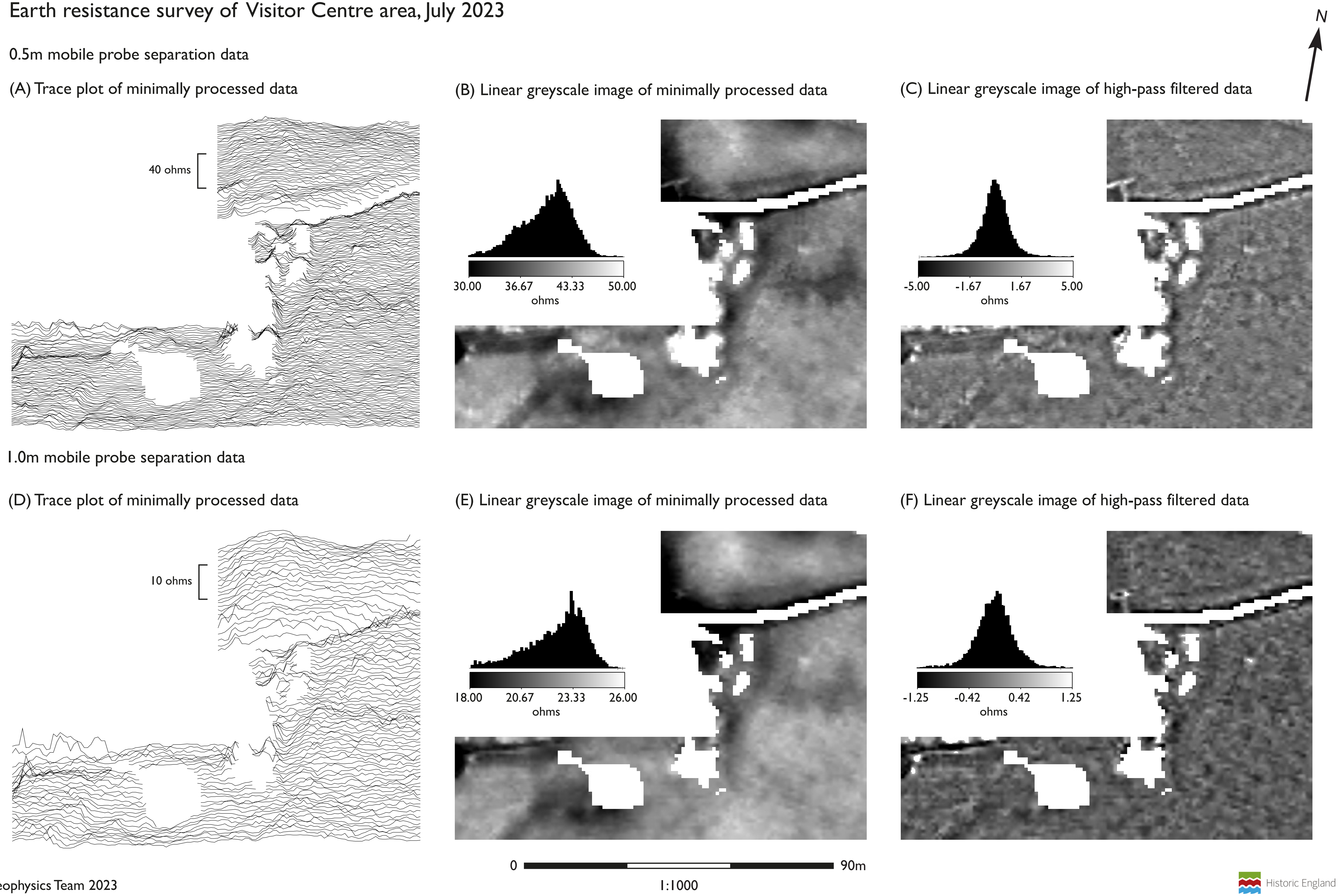
Figure 7

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE

Earth resistance survey of Visitor Centre area, July 2023

0.5m mobile probe separation data



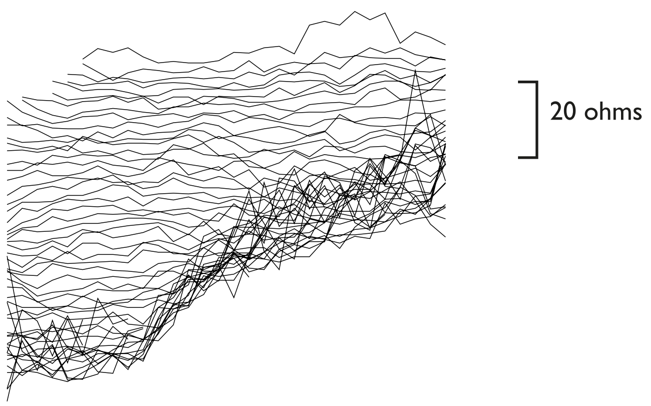
STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE

Earth resistance survey of Learning Centre area, July 2023

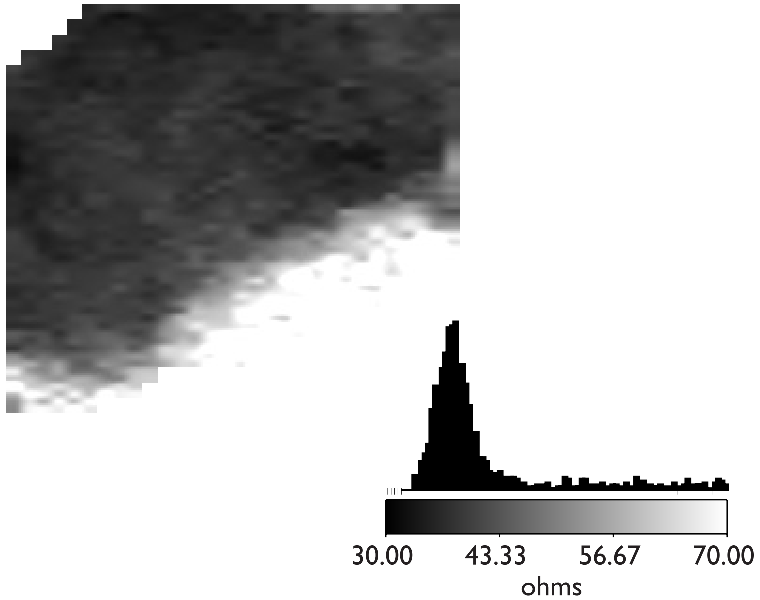
N

0.5m mobile probe separation data

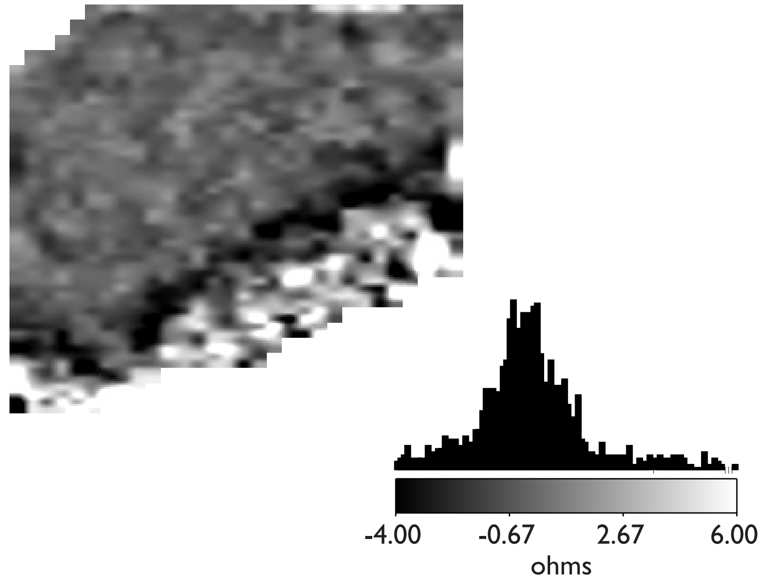
(A) Trace plot of minimally processed data



(B) Linear greyscale image of minimally processed data

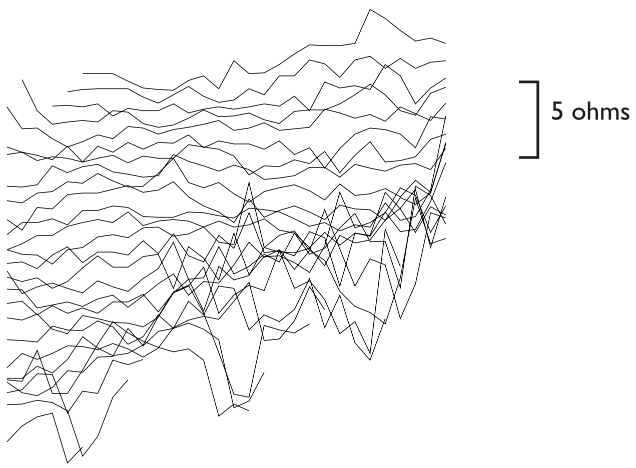


(C) Linear greyscale image of high- and low-pass filtered data

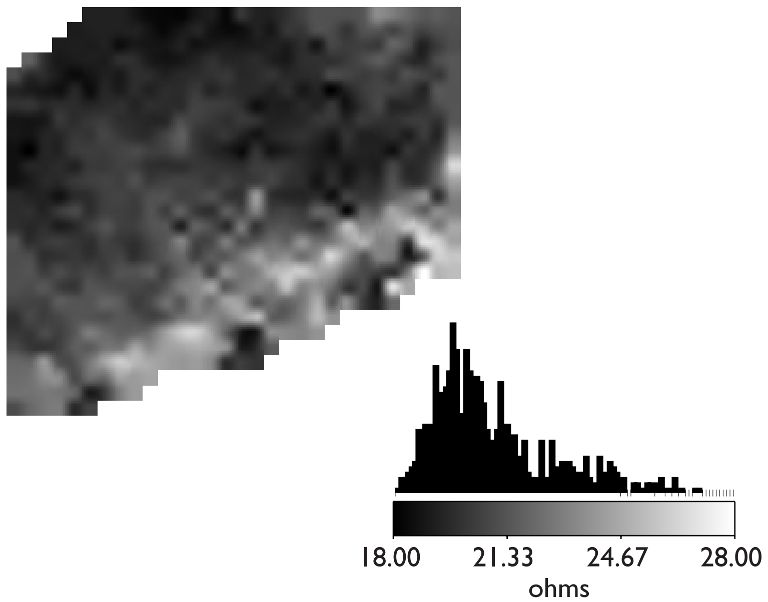


1.0m mobile probe separation data

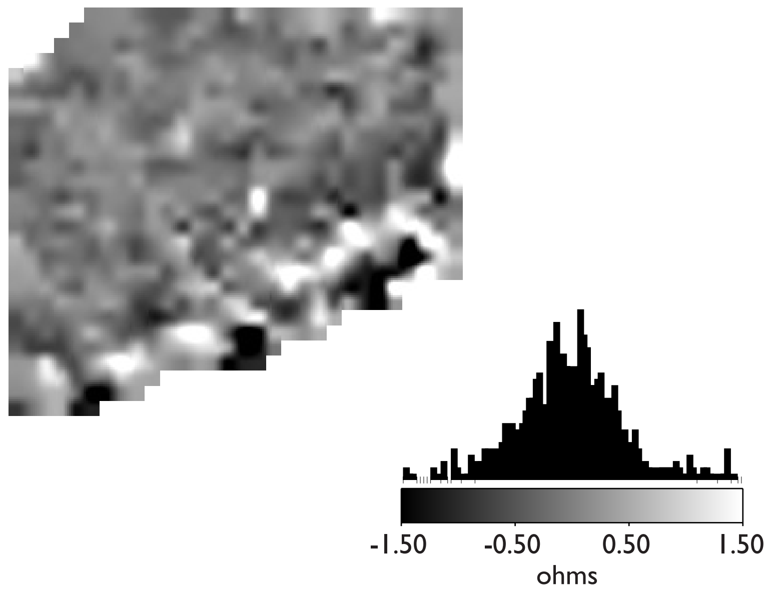
(D) Trace plot of minimally processed data



(E) Linear greyscale image of minimally processed data



(F) Linear greyscale image of high- and low-pass filtered data



0 30m

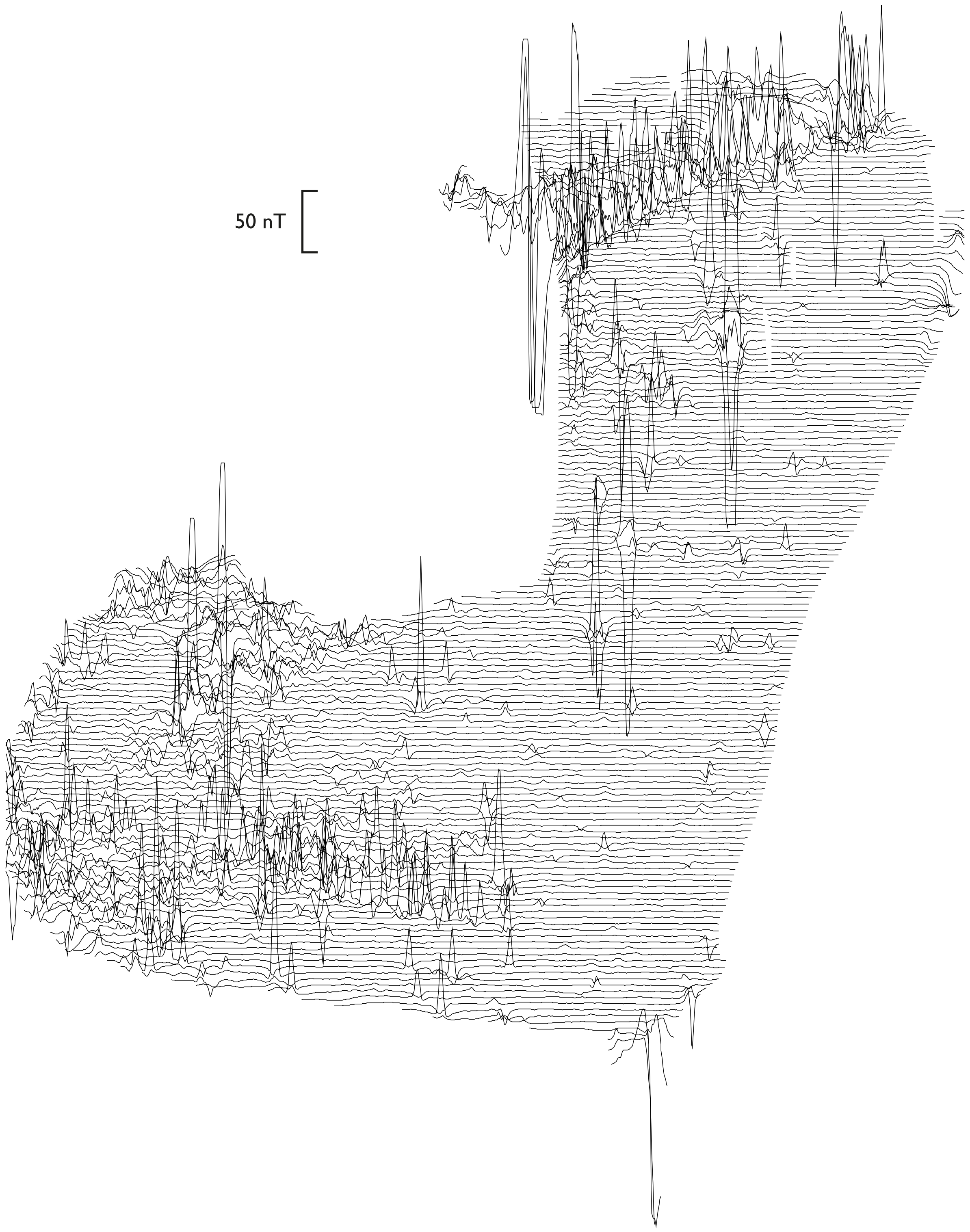
1:500

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE

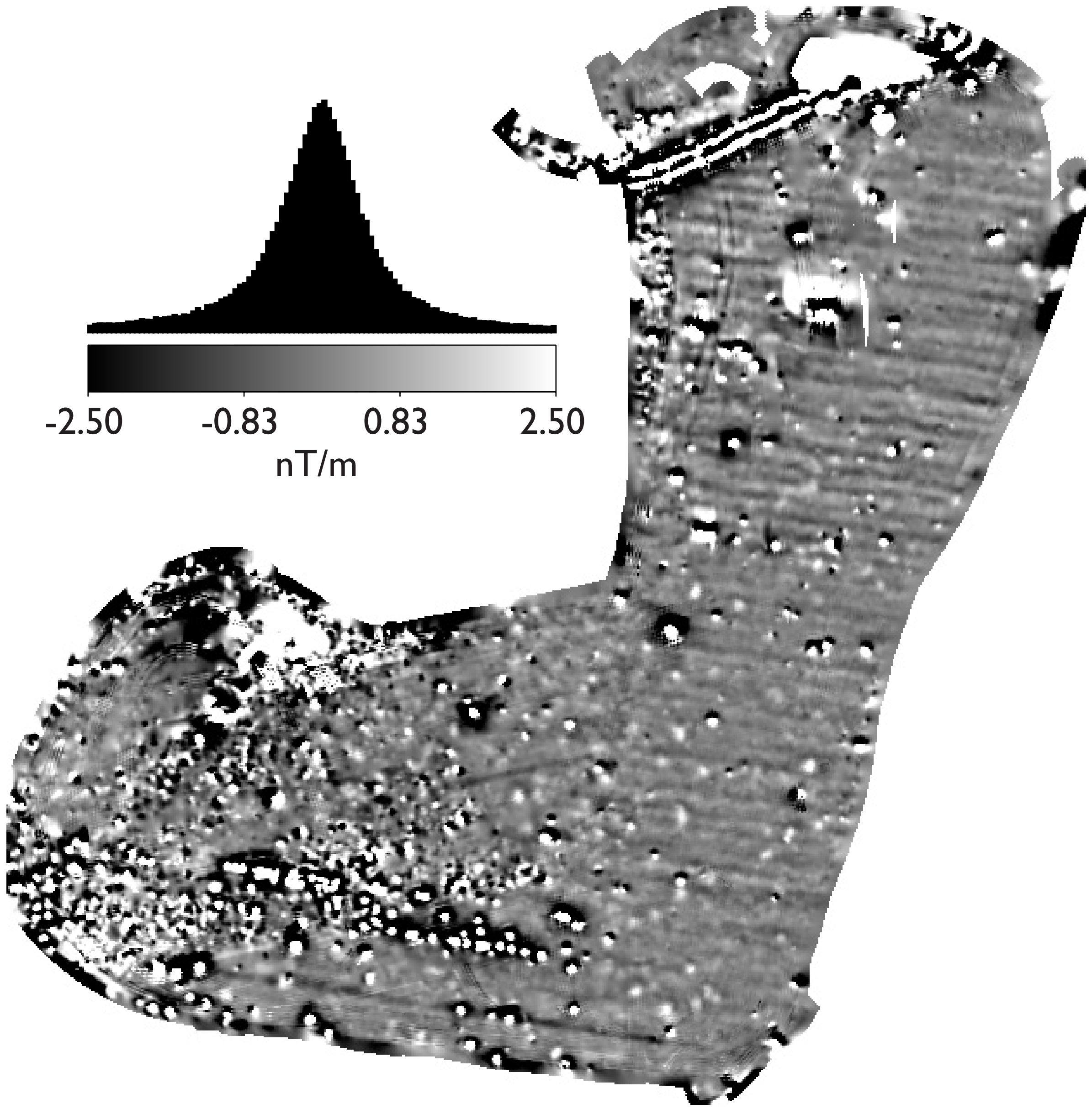
Caesium magnetometer survey data, July 2023

N

(A) Trace plot of minimally processed data



(B) Linear greyscale image of processed data



0 90m

1:1000

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
Topographically corrected GPR profiles, July 2023

Figure 10

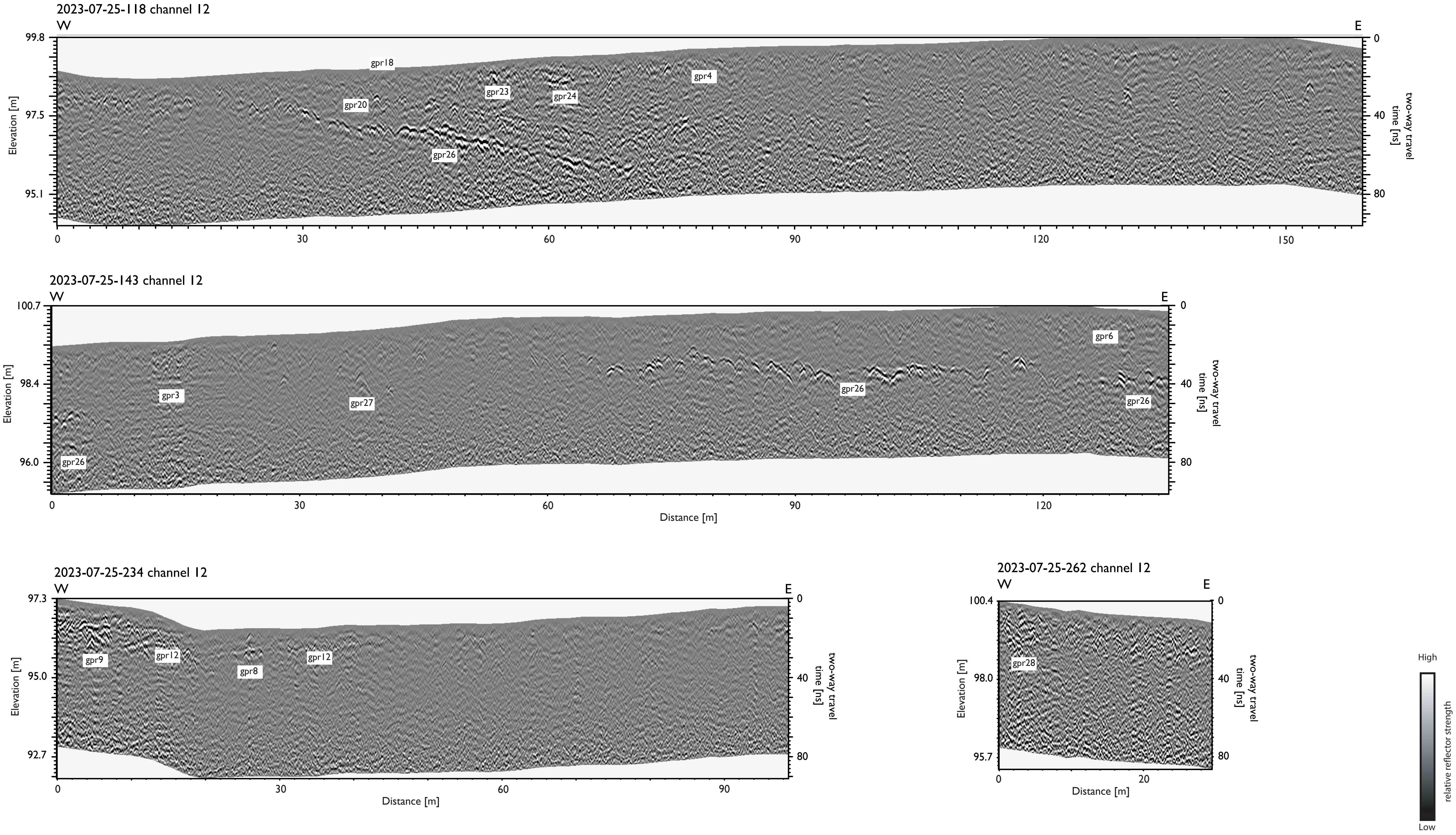


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Figure 11

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
GPR amplitude time slices between 0.0 and 20.0ns (0.0 to 1.17m), July 2023

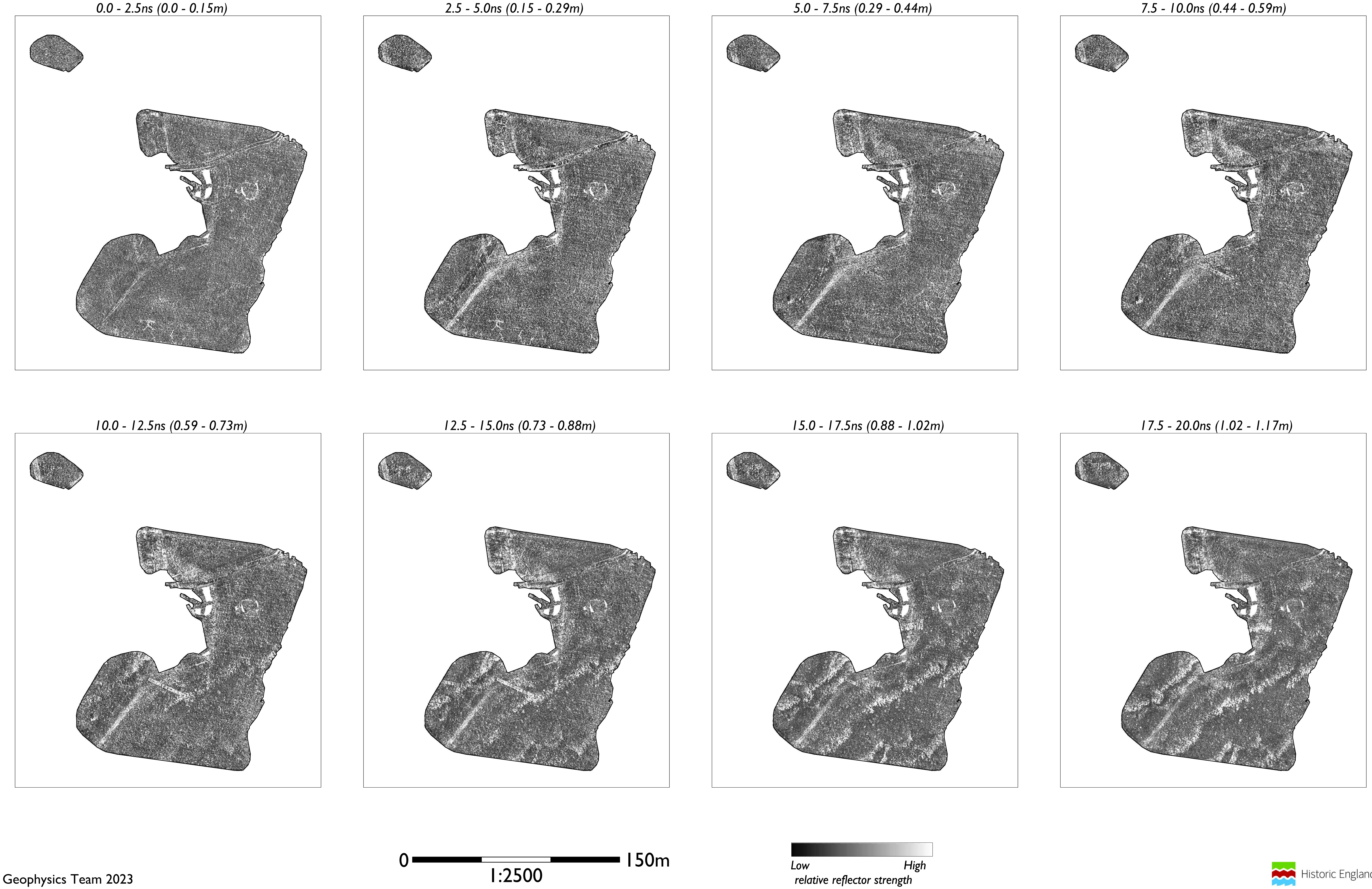

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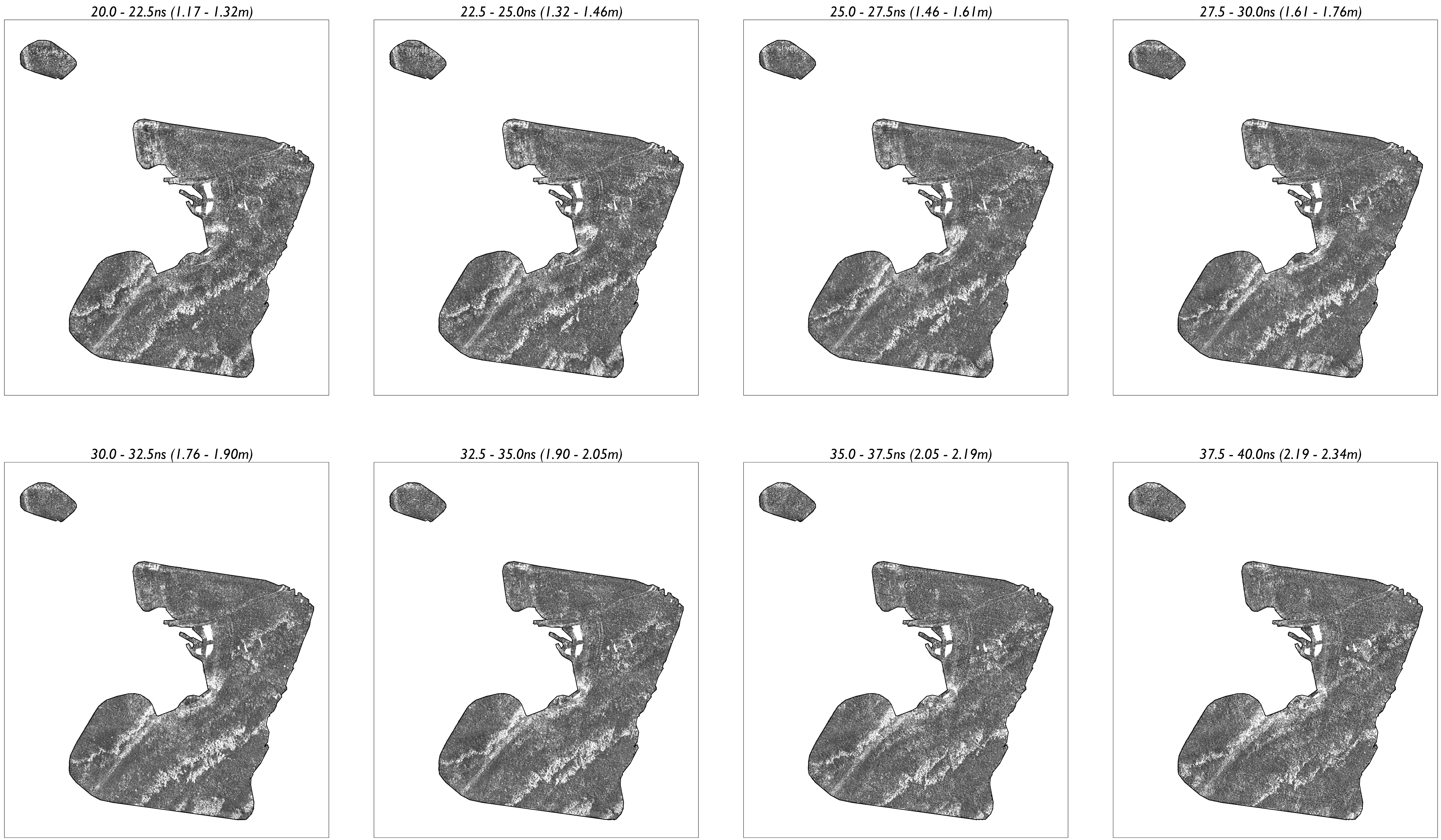
Figure 12

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
GPR amplitude time slices between 20.0 and 40.0ns (1.17 to 2.34m), July 2023



0 150m
1:2500

Low *High*
relative reflector strength

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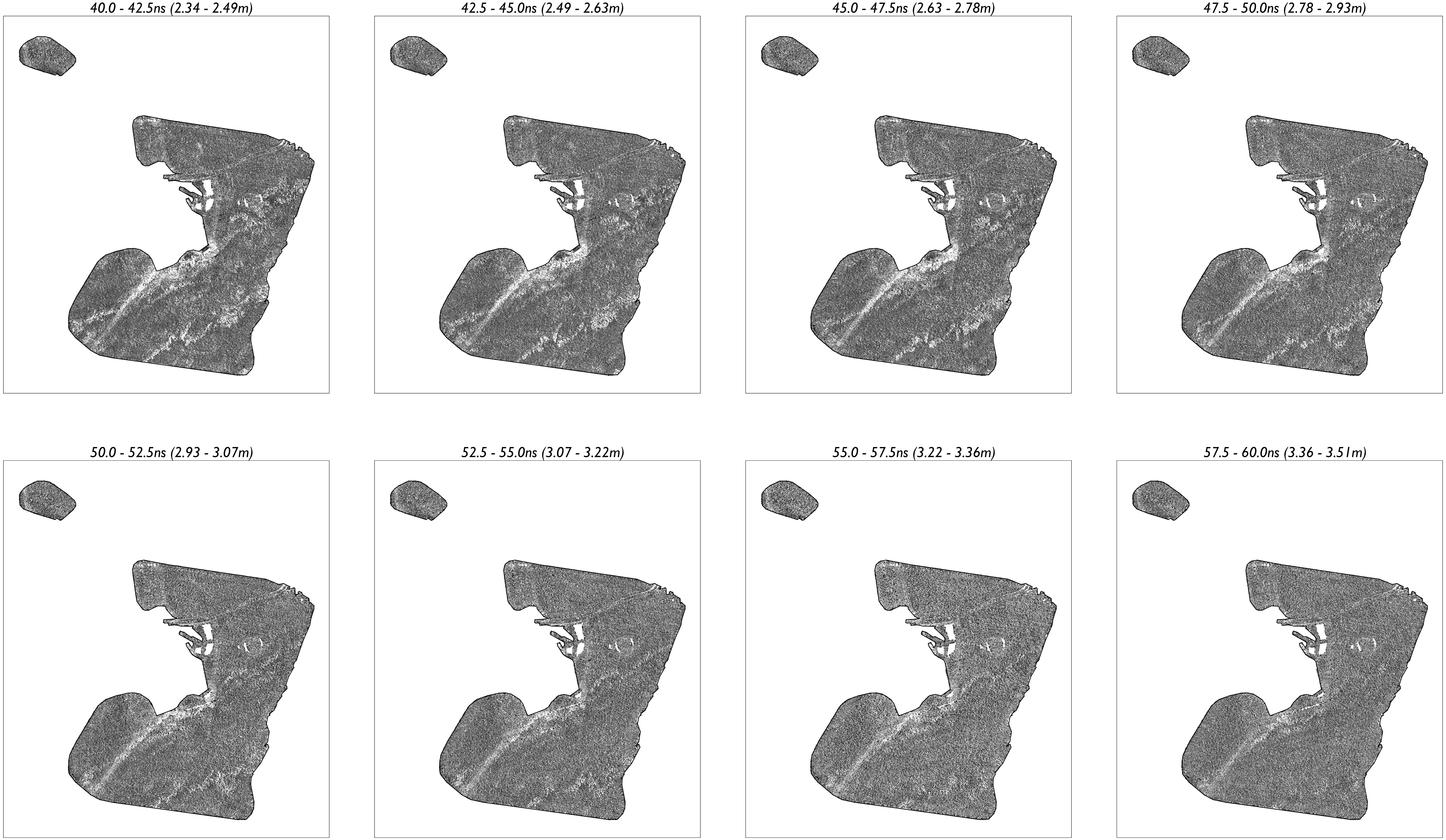
Figure 13

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
GPR amplitude time slices between 40.0 and 60.0ns (2.34 to 3.51m), July 2023



0 150m
1:2500

Low *High*
relative reflector strength

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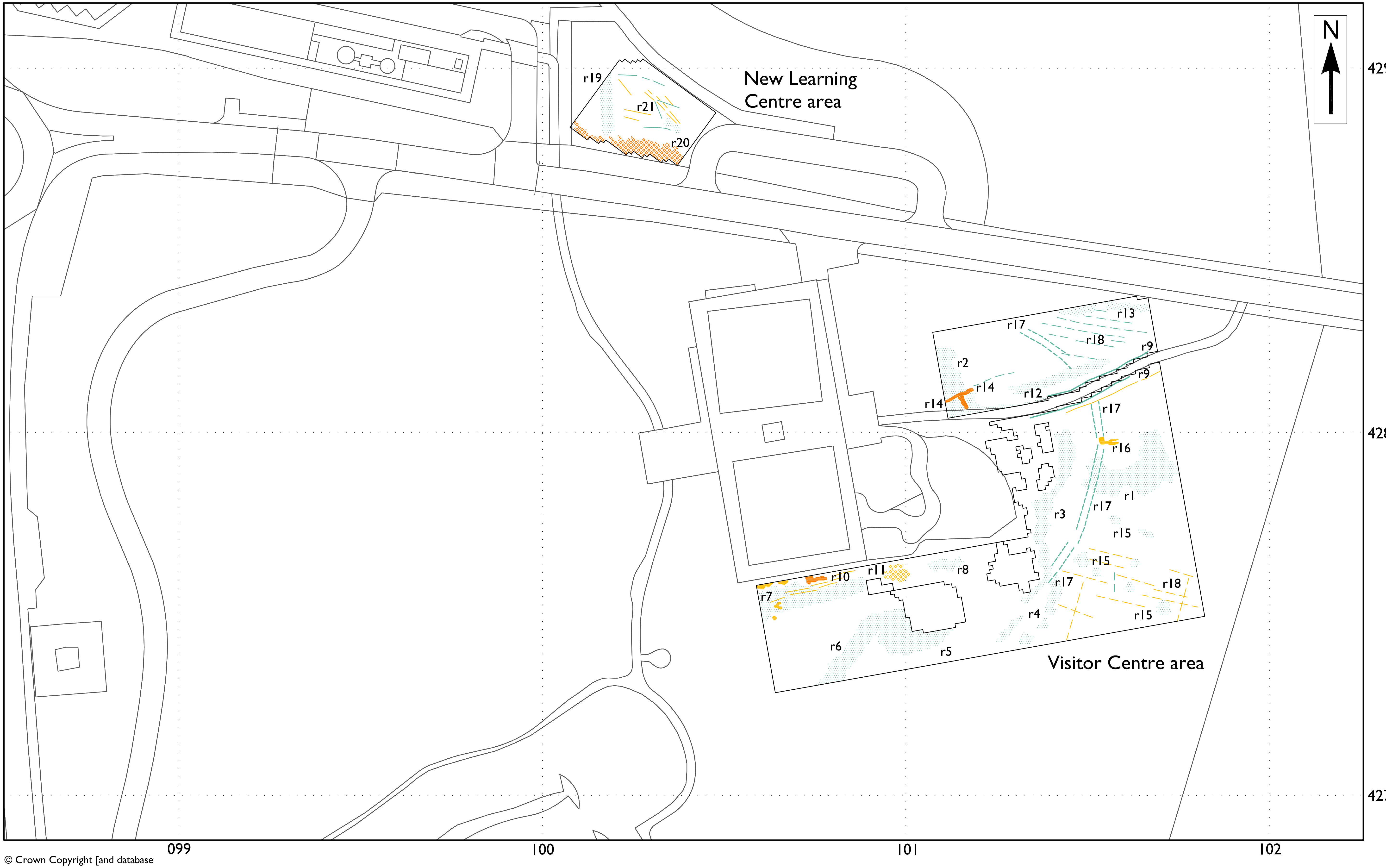
STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE

Graphical summary of significant earth resistance anomalies, July 2023

SU0942



0 90m

1:1000

very high resistance | high resistance | low resistance

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Figure 15

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
Graphical summary of significant caesium magnetometer anomalies, July 2023

SU0942

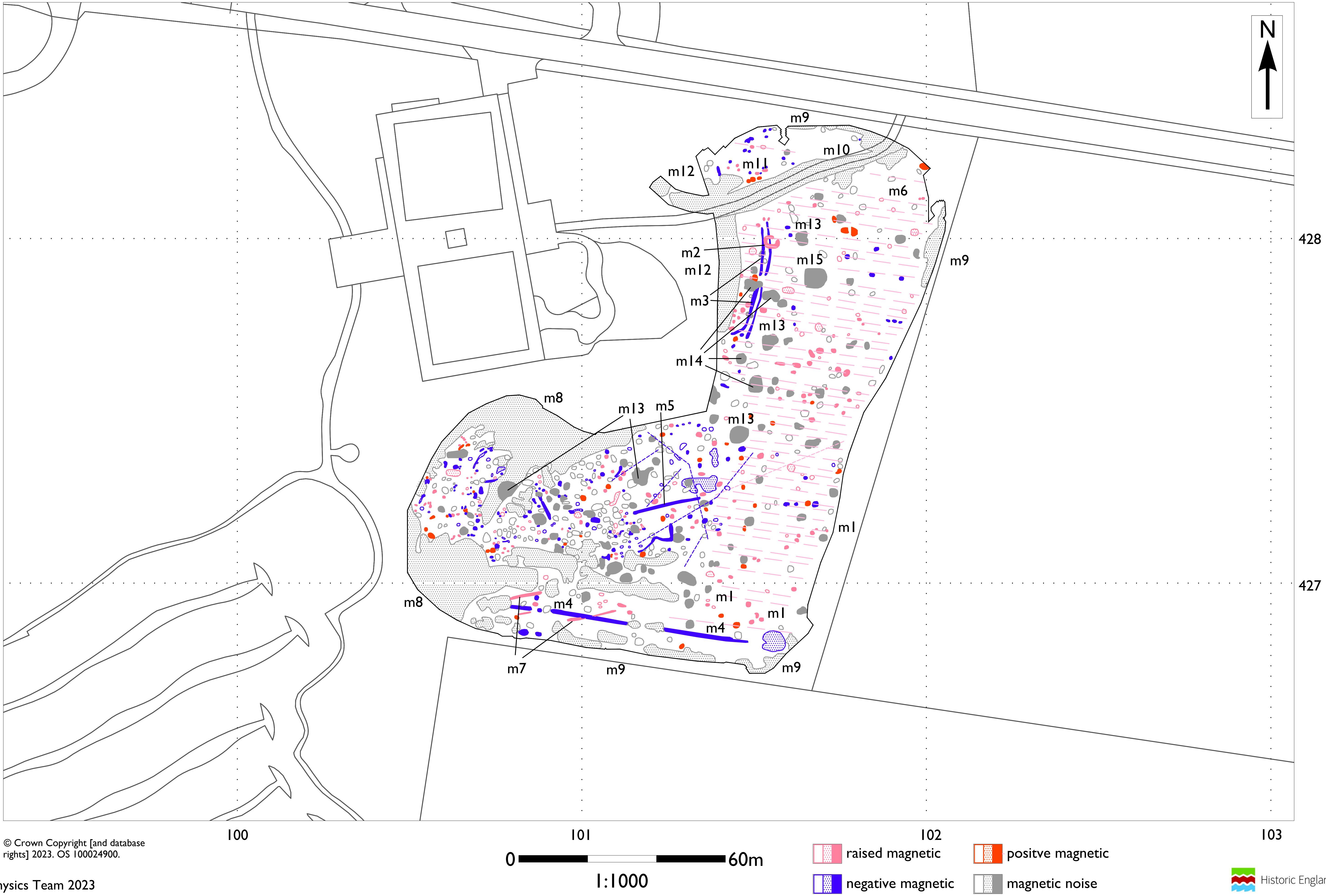

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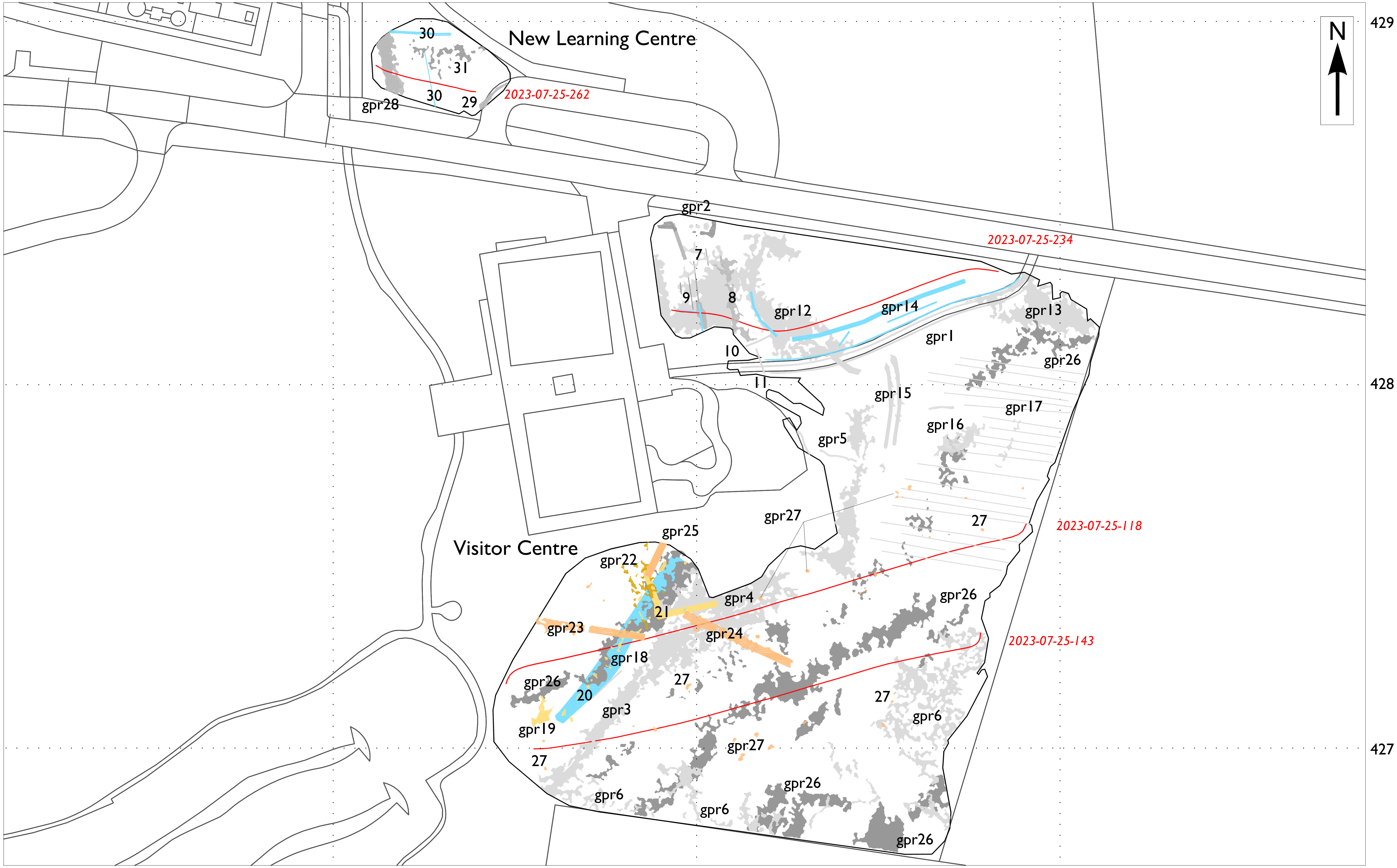
Figure 16

STONEHENGE VISITOR CENTRE, WINTERBOURNE STOKE, WILTSHIRE
Graphical summary of significant GPR anomalies, July 2023

SU0942



0 90m
1:1000

low amplitude reflectors
high amplitude reflectors
anomalies of known or recent origin
2023-07-25-001 Location of selected GPR profiles shown on Figure 10

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