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Leominster Priory, Leominster, Herefordshire

Report on Geophysical Surveys, October 2023

Neil Linford, Paul Linford, Andrew Payne, Sandra Hahn and Megan Clements

Geophysics

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Leominster Priory, Leominster, Herefordshire
HR6 8NH

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Historic England
Fort Cumberland
Fort Cumberland Road
Eastney
Portsmouth PO4 9LD

Summary

Caesium magnetometer, earth resistance and Ground Penetrating Radar (GPR) surveys were conducted in accessible areas in the immediate vicinity of Leominster Priory, Leominster, Herefordshire. The vehicle towed caesium magnetometer survey (0.9ha) was conducted over a large area of recreational space, known as The Grange, found to the south of the priory and responded mainly to buried metal with limited indications of localised burning, former paths and evidence for medieval ridge and furrow cultivation. Earth resistance survey (0.7ha) confirmed the survival of the double apsidal presbytery to the east of the priory, together with evidence to support a possible north building range of the priory cloister in Pinsley Mead. Results from the vehicle towed GPR survey (2.1ha) were less successful, perhaps due to heavily saturated soil conditions, but identified fragmentary structural remains to partially corroborate the other two techniques.

Contributors

The geophysical fieldwork was conducted by Neil Linford, Paul Linford, Andrew Payne and Sandra Hahn (Ludwig-Maximilians-Universität München). Megan Clements assisted with the processing and reporting of the magnetic survey data.

Acknowledgements

The authors are grateful for the help provided by colleagues from Leominster Town Council and the Priory Church for coordinating access to allow the survey to take place. The cover image shows the vehicle towed caesium magnetometer survey in progress over The Grange public utility space (photograph taken by Neil Linford).

Archive location

The full digital project archive is held by the Geophysics Team, Historic England, Fort Cumberland, Fort Cumberland Road, Portsmouth, PO4 9LD.

Date of survey

The fieldwork was conducted between the 16th and 20th October 2023 and the report completed on 12th of February 2024.

Contact details

Paul Linford, Geophysics Team Principal, Historic England, Fort Cumberland, Fort Cumberland Road, Southsea, Portsmouth, PO4 9LD. Tel: 02392 856761. Email: paul.linford@historicengland.org.uk.

Contents

Introduction

Caesium magnetometer, earth resistance and Ground Penetrating Radar (GPR) surveys were conducted in the vicinity of Leominster Priory, Leominster, Herefordshire. The aim of the survey was to support the Historic England Midlands Development Advice Team by providing information about parts of the subsurface remains of the former Benedictine priory. The current scheduled elements of the priory have 'Old County Number' records which are some of our oldest designation records and do not yet have the full descriptions of their modernised counterparts. The geophysical survey will allow the standing structures of the priory to be understood in the context of the surviving subsurface archaeological remains and inform any revised descriptions and future management.

The site of Leominster Priory may have been that of a minster church, possibly founded as early as the 7th century, which was later destroyed and replaced by a Benedictine abbey for nuns in the 9th century, which appears to have been dissolved in the 11th century. Henry I granted land at Leominster to Reading Abbey in the 1120s who then founded the priory on the current site. The surviving Priory Church of St Peter and St Paul (National Heritage List for England (NHLE) 1077617) is found to the north-east of the modern town enclosed by the Kenwater and Lugg rivers. Other listed buildings within the the Leominster Priory Scheduled Monument (NHLE 1005529) include the Old Rectory (NHLE 1077618) and the Forebury Chapel (NHLE 1007319). The Grange is an open public utility space, formerly used to hold cricket and tennis matches, to the south-west of the Priory Church, defined by large earth banks. Previous archaeological investigations, including antiquarian excavations and a GPR survey, have revealed the full extent of the original church (Freeman 1853a, 1853b; Brown and Wilson 1994; Barker 2003; Watson 2015), together with evidence for both fishponds contemporary with the priory and large deposits of soil introduced during the construction of a gasometer in 1893 in Pinsley Mead (Logan 2010). The town was selected in 2019 as one of the government-funded High Street Heritage Action Zones. This initiative, delivered by Historic England with local partners, unlocked the potential of high streets across England by improving the historic environment to help boost pride in place, connect communities and drive economic growth.

Shallow, well drained, lime rich soils of the Icknield Association (341) have developed over undifferentiated diamicton Till and Morainic glacial deposits of Quaternary sand and gravel (Soil Survey of England and Wales 1983; Geological Survey of Great Britain 1989, 2000). Survey areas were down to well-kept grass with some paths, mature trees and grave markers in the churchyard. Weather conditions were generally dry, with some short heavy downpours during the survey, and heavy overnight rain that led to saturated soil conditions.

Method

Caesium Magnetometer

Magnetic survey only covered the area identified as The Grange on Figure 1.

Magnetometer data was collected along the instrument swaths shown in Figure 1 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 R8s Global Navigation Satellite System (GNSS) receiver mounted on the sensor platform 1.65m in front of the central sensor and a second R8s 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 2. Figure 6 displays the truncated data as a trace plot and as a linear greyscale image clipped between limits of ± 2.5nT/m.

Earth Resistance

Earth resistance survey was conducted over the areas identified on Figures 1, 3 and 16 as the Priory Church, Churchyard, Pinsley Mead and Pinsley Mead Orchard.

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 for all areas are depicted as a linear greyscale image in Figure 3 superimposed on the base OS mapping data. Figures 7 and 8 show 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.

Ground Penetrating Radar

Ground Penetrating Radar (GPR) survey was conducted over the areas identified on Figures 1, 4 and 17 as the Priory Church, Pinsley Mead and Pinsley Mead Orchard, Pinsley Mead South, The Grange and the Playing Field.

A 3d-Radar (Kontur) 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 4. 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 step 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 9. 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 5, 10, 11, 12, 13 and 14. 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 17. 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

Caesium Magnetometer Survey

A graphical summary of significant magnetic anomalies [**m1-7**] discussed in the following text superimposed on the base OS mapping data is provided in Figure 15.

In the centre of The Grange a rectangular anomaly [**m1**] is formed from a series of discrete, ferrous responses with readings >748nT/m. While [**m1**] is located over the approximate area of the former cricket pitch, the intense readings suggest these anomalies are buried ferrous metal. Similar anomalies located around the edges of The Grange [**m2**], are also likely to be buried ferrous metal. However, two anomalies [**m3**] present within the rectangular [**m1**] have a much weaker magnitude of positive response <10nT/m and no surrounding negative “halo”, suggesting they are pits, possibly the consequence of removing the metal that was once there. To the west, [**m4**] has a more thermoremanent response, perhaps indicative of localised burning possibly associated with a 16th century hop kiln reported here with other agricultural buildings, but all removed by the 18th century (Brown 1989).

A parallel, linear positive anomaly [**m5**] correlates with the current north-south path across The Grange, most likely due to metal kerbs on each edge of the path. Linear anomalies [**m6**] with a more variable response to the east of the path are characteristic of ridge and furrow. To the west of the path, linear anomalies [**m7**] are possibly former footpaths or, perhaps, associated with the former agricultural history of The Grange. A scattering of discrete positive pit-type responses of unknown origin and negative anomalies, perhaps due to animal burrowing, are found across The Grange. High magnitude anomalies at the edge of the survey are due to extant iron bollards and railings, while the scattering of smaller ferrous responses may well be due to modern detritus.

Earth Resistance Survey

A graphical summary of significant earth resistance anomalies [**r1-44]** discussed in the following text superimposed on the base OS mapping data is provided in Figure 16.

Priory Church

A group of parallel linear and concentric curvilinear high resistance anomalies [**r1-6**] confirm the survival of the original apsidal presbytery known from previous excavation (Plate1, OS Historic County Mapping Series: Herefordshire 1904-1939 Epoch 3, RCHME 1934). The smaller radial side chapels are weakly defined and are more evident in the high-pass filtered data (Figure 7(D) and 7(H)), where the structure on the south-east side of the main apse is most clearly resolved at [**r7**] with less obvious indications of a central chapel projecting from the east-west axis of the apse [**r8**]. A third structure may be present

to the north-east in the region of [**r9**], forming a possible symmetrical arrangement of side chapels, but due to the interrupted survey coverage in this area the evidence is insufficiently clear to identify surviving building remains. The antiquarian excavations suggest the wall foundations of the side chapels were mainly robbed out, although still identifiable at the time (Plate 1, Freeman 1853a, 1853b). Weakly resolved higher resistance anomalies [**r10**] and [**r11**] may also possibly suggest sub-partitions of the ambulatory passage between the inner and outer apsidal structures.

The outer northern wall of the presbytery [**r6**] is only partially described within the available area, truncated by a more recent building shown on historic mapping (OS Historic County Mapping Series: Herefordshire 1904-1939 Epoch 3). Both the well-preserved section of the inner southern wall of the presbytery, strongly resolved at [**r1**], and the southern outer wall [**r4**] do not extend to meet the upstanding wall of the Priory Church. This is, perhaps, due to later disturbance or stone robbing and corroborates a narrow gap shown on the excavation plan between the ambulatory passage of the presbytery apse and the end of the Nave and South Transept of the Priory Church (Plate 1, Freeman 1853a, 1853b). A well-defined localised high resistance anomaly [**r12**] within the presbytery may be indicative of a possible altar platform, tomb or grave marker but could also be due to disturbance from the excavation.

Possible rubble deposits are found as a 6m wide strip of higher resistance [**r13**] along the southern boundary of the survey area more consistent, perhaps, with a spread of stone material from a boundary wall rather than buried building structures. A curvilinear high resistance anomaly [**r14**] to the west of [**r13**], most evident in the high-pass filtered data (Figures 7(D) and 7(H)), may represent the remains of semi-circular chapel extending from the south transept of the Priory Church (Plate 1).

A quadrangular arrangement of wall-type anomalies [**r15-17**] immediately to the east of the presbytery may represent remains of the known Lady chapel and a possible 14th century extension (Plate 2, Freeman 1853a; Brown and Wilson 1994; Barker 2003; Watson 2015). Although elements of [**r15-17**] may also relate to former Victorian garden pathways these anomalies are most clearly apparent in the deeper 1m mobile electrode separation data (cf [**gpr5**]) suggesting deeper structural remains (OS Historic County Mapping Series: Herefordshire 1843-1893 Epoch 1). A similar former apsidal presbytery and Lady chapel was also revealed by geophysical survey at Dunstable Priory (Linford *et al.* 2022).

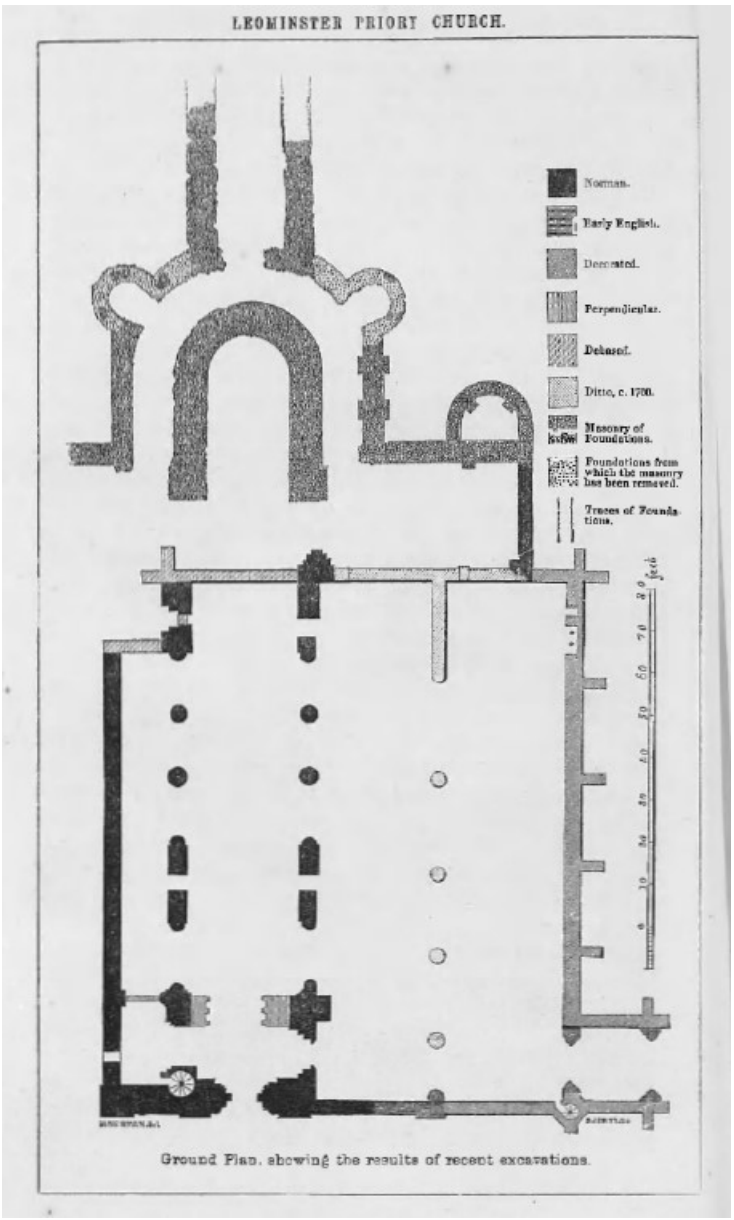

Plate 1: plan of the excavations published by Freeman (1853a).

The extant north-south path is evident at [**r18**] with a further linear high resistance anomaly [**r19**] extending to the east, possibly a continuation along the alignment of [**r15**] corroborating a former path known from historic mapping (OS Historic County Mapping Series: Herefordshire 1843-1893 Epoch 1).

High resistance linear anomalies [**r20**] and [**r21**] probably represent either buried wall foundations or drainage structures adjacent to upstanding walls of the Priory Church. Lower resistance anomalies [**r22-24**] in the vicinity of the presbytery may indicate disturbance from stone robbing, previous archaeological excavation or more water retentive areas due to poor drainage potentially enhanced by the weather conditions at the time of the survey work.

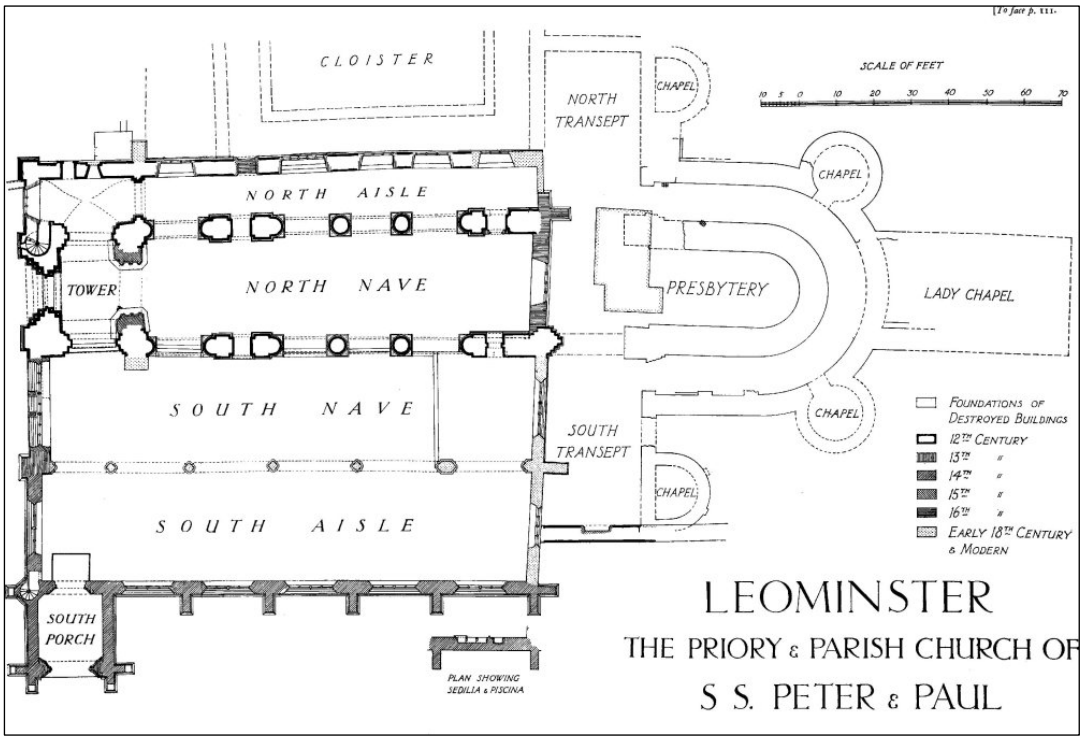

Plate 2: The apsidal presbytery, attached chapels and Lady Chapel to the east at Leominster Priory (RCHME 1934, insert facing 111).

Churchyard

A single 30m square sample area of the graveyard was surveyed to the south of the Priory Church (Figure 1) to test for the presence of any surviving structural remains. An amorphous higher resistance response [**r25**] has been detected in the north east of the survey area, but is too weak to suggest a rubble spread or stone material associated with structural remains. It is possible that [**r25**] is associated with either geological or soil variation due to landscaping perhaps. Localised high resistance anomalies may correspond with monumental masonry observed on the surface at [**r26**] and [**r28**] or possible locations of unmarked graves [**r27**]. Less clear evidence for further unmarked graves may also be present at [**r29**]. A low resistance response [**r30**] is most likely due to water retentive mulch around the base of a modern tree planting.

Pinsley Mead

A series of high resistance anomalies [**r31-33**] are suggestive of cellular masonry structures sharing a similar alignment to standing remains of the priory buildings, and perhaps form part of the north range of the Medieval cloister. The relatively weak response to [**r31-33**], enhanced through the application of a high-pass filter (Figures 8(D) and 8(H)), may possibly be due to a combination of the deep burial depth of the remains, the water retentive meadow soils bordering the Kenwater channel and wet weather conditions prior to and during the survey fieldwork. Immediately to the north of [**r31-33**], a broad but weakly

defined low resistance anomaly [**r34**] follows a parallel alignment to the surviving priory remains and could represent a defensive or flood relief ditch, the course of a former roadway or the in-filled bed of an artificial water channel, possibly associated with the Medieval fishponds located here (Brown and Wilson 1994, Illus 2).

Further possible evidence for the fishponds may be found at [**r35**], an extensive area of high resistance readings with no clear indication of structural remains, that may represent subsequently landscaped and backfilled ponds. Within [**r35**] a more concentrated group of stronger localised high resistance anomalies [**r36**] could, possibly, represent fragmented structural remains sharing a similar alignment to [**r31-33**] and the remains of the priory buildings. A series of weaker, approximately parallel higher resistance linear responses [**r37**] extend north west towards the Kenwater channel and may be associated with drainage or former agricultural land use.

A diffuse broad linear high resistance anomaly [**r38**] could represent traces of a boundary or retaining bank for one of fishponds, although a geomorphological response associated with the river channel is also possible. Weakly defined, broad, rectilinear high resistance anomalies [**r39**] aligned with [**r34**] may also represent part of a system of boundary banks, possibly constructed for water management, or be associated with a series of paddock divisions shown on historic mapping (OS Historic County Mapping Series: Herefordshire 1843-1939 Epochs 1 to 3). A localised anomaly [**r40**] is more clearly defined in the deeper penetrating 1.0m mobile electrode separation data may potentially relate to fragmented structural remains (cf [**gpr25**]).

Pinsley Mead Orchard

Amorphous areas of higher resistance [**r41**], possibly continuing from the west, are suggestive of soil variation such as alluvial deposition or gravel islands, although an in-filled pond basin is also possible. A probable drainage conduit [**r42**] extends from the south west but it is unclear whether this is associated with the monastic complex or the modern sewer pipe accessed from the utility cover found in the centre of Pinsley Mead to the west. To the north a ditch-type anomaly [**r43**] has been detected following the south side of the Kenwater channel corresponding with a gas pipe (Logan 2010). Areas of high resistance response [**r44**] to the east and north seem more likely to represent near-surface disturbance, perhaps due to animal burrows (cf [**gpr2**]).

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 17.

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 (3.09m) where the signal is more heavily attenuated. Near-surface responses between 0.0 and 5.0ns (0.0 to 0.26m) have been recorded over the edges of modern metalled paths [**gpr1**] and mole runs [**gpr2**], particularly to the east of the Playing Field.

Priory Church

Fragmented wall-type anomalies correlate with a more recent building footprint [**gpr3**] and the excavated remains [**gpr4**] of the original apsidal presbytery and attached chapels (Plate 2; OS Historic County Mapping Series: Herefordshire 1904-1939 Epoch 3; RCHME 1934). From 7.5ns (0.39m) onwards a series of rectilinear anomalies [**gpr5**] correspond, in part, with Victorian paths extending from the former presbytery (OS Historic County Mapping Series: Herefordshire 1843-1893 Epoch 1). However, some of the deeper elements of [**gpr5**] do appear to correlate with the excavated remains of the Lady Chapel found here. The southern parallel walls [**gpr6**] of the presbytery have produced the highest magnitude of response with a subtle, anomaly [**gpr7**] that may perhaps represent one of the circular side chapels.

Two broader north-south orientated anomalies [**gpr8**], together with some fragmented discrete responses [**gpr9**], are not evident on the historic mapping but could also be associated with either the building remains or a later phase of garden design. A more prominent low-amplitude response [**gpr10**] may represent robbed out walls from the original church remains. Other more fragmented anomalies [**gpr11**] are found beyond the Victorian excavations and while these could be associated with the remains of the priory, they may also be due to more recent garden design.

Pinsley Mead and Pinsley Mead Orchard

The very near-surface response across Pinsley Mead is dominated by mole runs [**gpr2**] in the orchard to the east and mature tree roots [**gpr12**]. Some more amorphous areas of high-amplitude response [**gpr13**] and [**gpr14**] are found from 5.0ns (0.26m) onwards and could, perhaps, be rubble deposits. Historic mapping shows the presence of former buildings to the west in the vicinity of [**gpr13**], although there is no indication of any structures that may be associated with [**gpr14**] (OS Historic County Mapping Series: Herefordshire 1843-1893 Epoch 1). More subtle rectilinear anomalies [**gpr15**] may, possibly, be associated with the remains of in-filled fishponds although historic mapping shows further coincident north-south subdivisions parallel to the field with the orchard to the east (OS Historic County Mapping Series: Herefordshire 1843-1939 Epochs 1 to 3).

A linear drainage conduit [**gpr16**] falls from the standing buildings diagonally across the orchard from between 12.5 and 37.5ns (0.64 to 1.93m) and appears to pass beneath the gas pipe [**gpr17**] following the edge of the survey area and the Kenwater channel to the

north (cf [**r43**]). It is unclear whether [**gpr16**] is associated with the drainage system accessed from the utility cover at [**gpr18**], or whether there is a more recent, deeper conduit beyond the depth imaged by the radar survey. More subtle linear anomalies [**gpr19**] and [**gpr20**] may also be associated with drainage, but the weaker response perhaps suggests a less substantial construction.

Other more discrete [**gpr21**] and fragmented linear [**gpr22-24**] anomalies could be associated with the conventual building remains revealed by the earth resistance survey, although the radar data lacks clarity (cf [**r31-33**]). Areas of more rectilinear, rubble type response [**gpr25**] may indicate either in-filled fishponds or, perhaps, varying land use when Pinsley Mead was subdivided into smaller paddocks.

Pinsley Mead South

The near-surface response is dominated by the metalled path [**gpr1**], particularly to the south where the construction appears to be more substantial. Other responses appear to be due to an area of longer vegetation [**gpr26**] and a tentative linear anomaly [**gpr27**], possibly a drain from the path or a tree root.

The Grange

There is a linear response [**gpr1**] in the near-surface due to the path across the centre of The Grange, together with a low-amplitude anomaly [**gpr28**] found between 2.5 and 10.0ns (0.13 to 0.52m) over the location of the former cricket square. The north-south dimension of [**gpr28**] is approximately 20m matching the known orientation and length of the wicket. A similar low-amplitude GPR response was recorded over the cricket pitch at Audley End, that was still in use at the time of the survey, resulting in an initial high-amplitude anomaly in the very near-surface due to the compacted playing surface (Linford *et al.* 2020). The low-amplitude response at both sites is most likely due to the clay content of the loam dressing used to prepare the playing surface, that may not be entirely contained with the confines of the marked cricket square. Tennis matches were also held at The Grange and it is possible that the court was also located over [**gpr28**]. A number of discrete, high-amplitude anomalies [**gpr29**] are found around the edge of [**gpr28**] and correlate with magnetic response [**m1**], perhaps indicating the location of ferrous post supports to protect the cricket square or secure covers during inclement weather.

From 5.0ns (0.26m) a series of parallel linear anomalies [**gpr30**] are suggestive of a former east-west aligned cultivation pattern. Linear anomalies at [**gpr31**], parallel to [**gpr30**], and at [**gpr32**], orthogonal to the cultivation pattern, have a more enhanced response and could tentatively be interpreted as either field boundaries or, perhaps, more recent paths. Other more fragmented anomalies [**gpr33**] and discrete responses [**gpr34**] are difficult to interpret but may possibly be associated with landscaping of the cricket pitch.

Playing field

The near-surface response of the Playing Field is dominated by a concentration of mole runs [**gpr2**], particularly to the east of this area. However, from 5.0ns (0.26m) onwards a more rectilinear high-amplitude response [**gpr35**] is evident, possibly an area of hard standing, together with tentative linear anomalies [**gpr36**]. This appears to correlate with a similar area visible on historic aerial photography when this was used as some form of works yard (RAF/106G/UK/1358 2nd April 1946 Historic England RAF Photography). Other areas of both high [**gpr37**] and low [**gpr38**] amplitude response potentially also relate to more recent land use including, perhaps, the football pitch.

Conclusions

The caesium magnetometer, earth resistance and Ground Penetrating Radar (GPR) surveys have detected anomalies across the different areas of the site with varying degrees of success. Magnetic and GPR surveys over The Grange responded mainly to likely modern features, possibly associated with the former cricket pitch. There is also evidence for the presence of previous agricultural activity in both data sets. No convincing evidence was found here for the putative tithe barn shown on the historic mapping, although this may lie under the pavilion building beyond the available survey area. The earth resistance survey proved particularly successful in the immediate vicinity of the Priory Church where the continued survival of the original apsidal presbytery and attached chapels has been confirmed. However, no significant anomalies were detected in a sample area of the graveyard to the south of the Priory Church. In addition, earth resistance has revealed evidence for previously unknown structural remains in Pinsley Mead sharing the same orientation as the remains of the priory buildings. More fragmentary structural remains were recorded by the GPR survey over the same areas but failed to fully corroborate the newly revealed building range perhaps due to the heavily water saturated soil conditions at the time of the survey.

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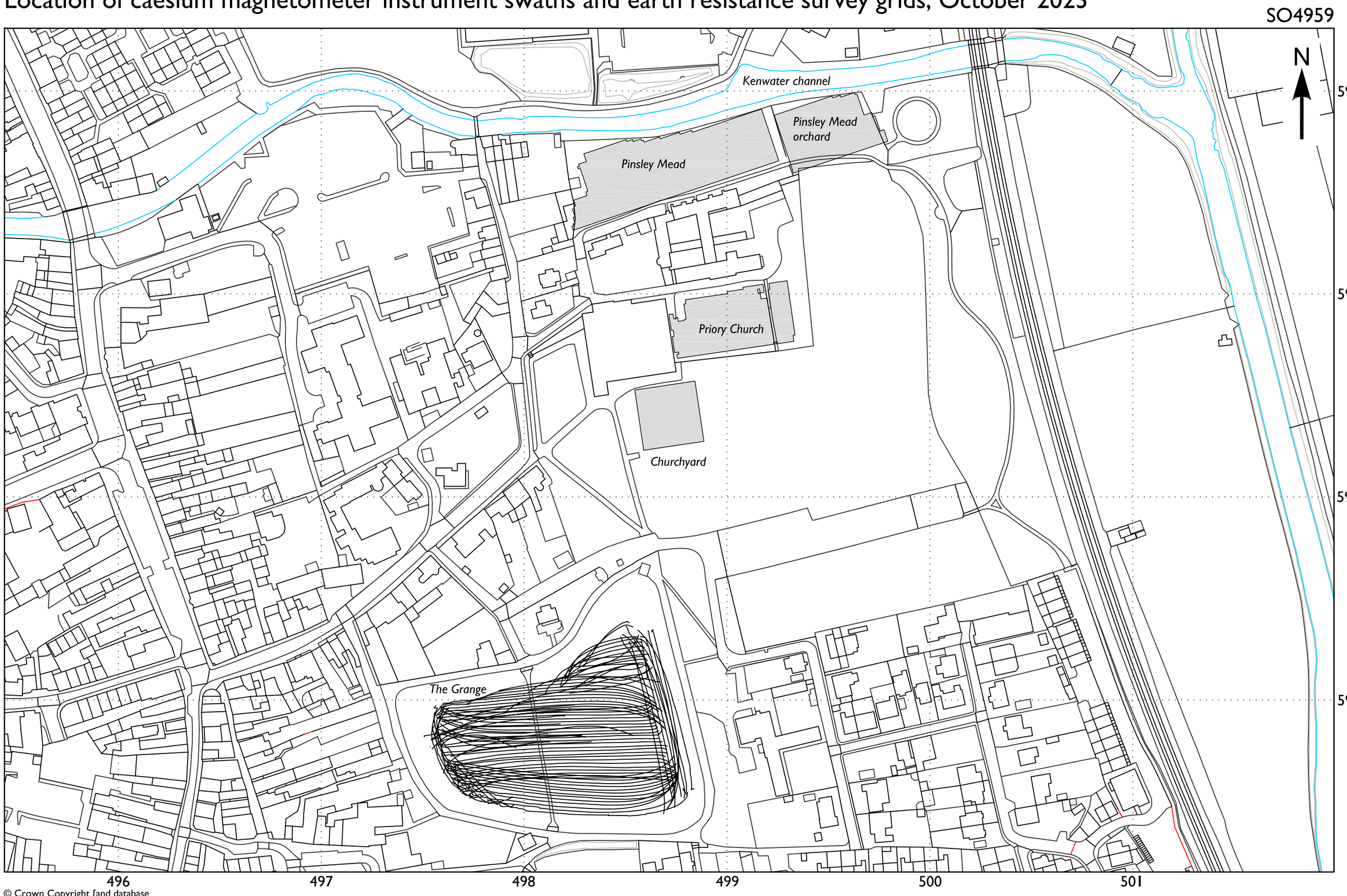
Figure 1

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

Location of caesium magnetometer instrument swaths and earth resistance survey grids, October 2023



0 150m

1:1750

Caesium magnetometer survey swaths

Earth resistance survey

Historic England

Geophysics Team 2024

Figure 2

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

Location of caesium magnetometer survey of The Grange, October 2023

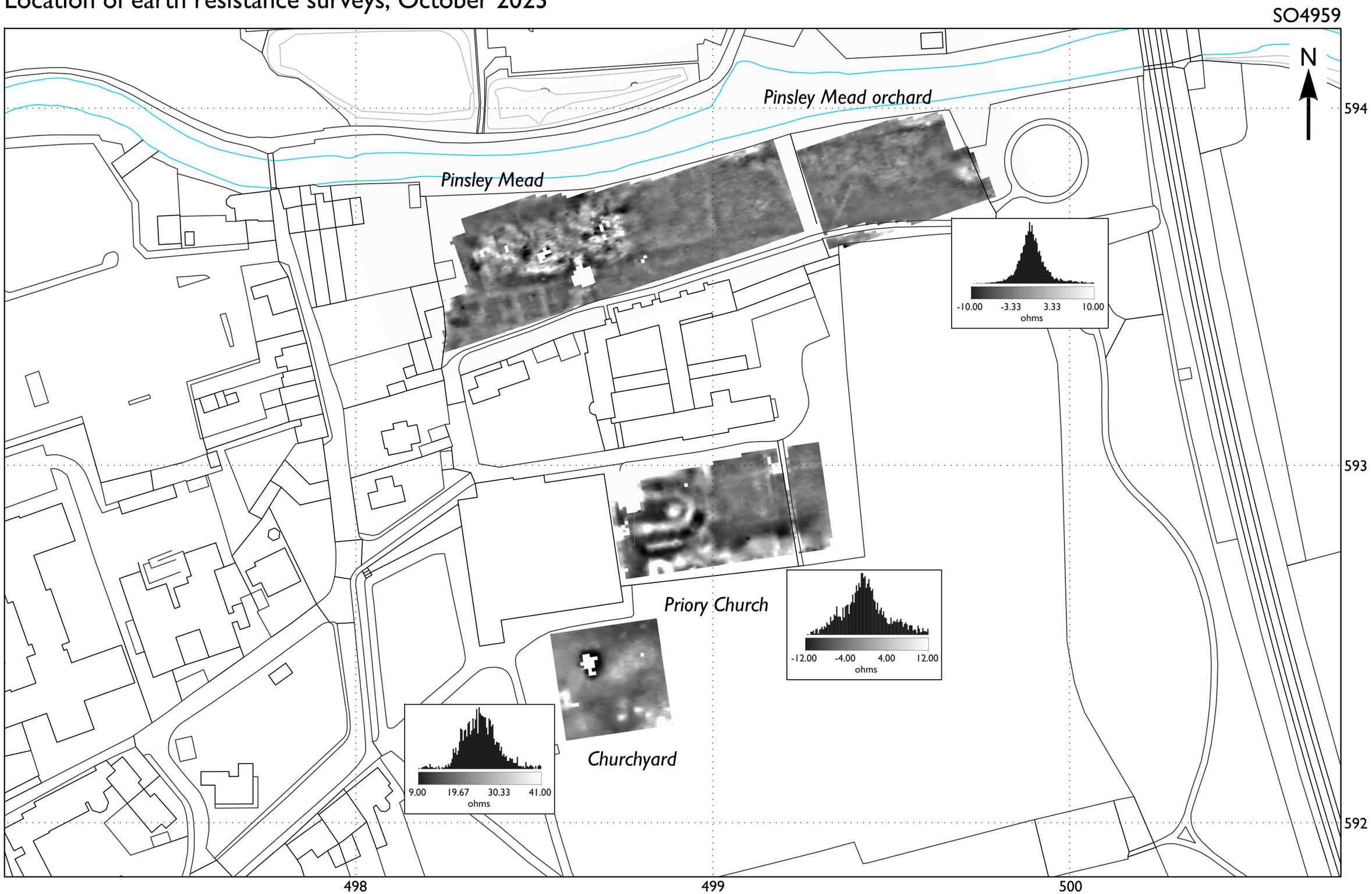
Geophysics Team 2024

Historic England

Figure 3

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

Location of earth resistance surveys, October 2023



0 90m

1:1000

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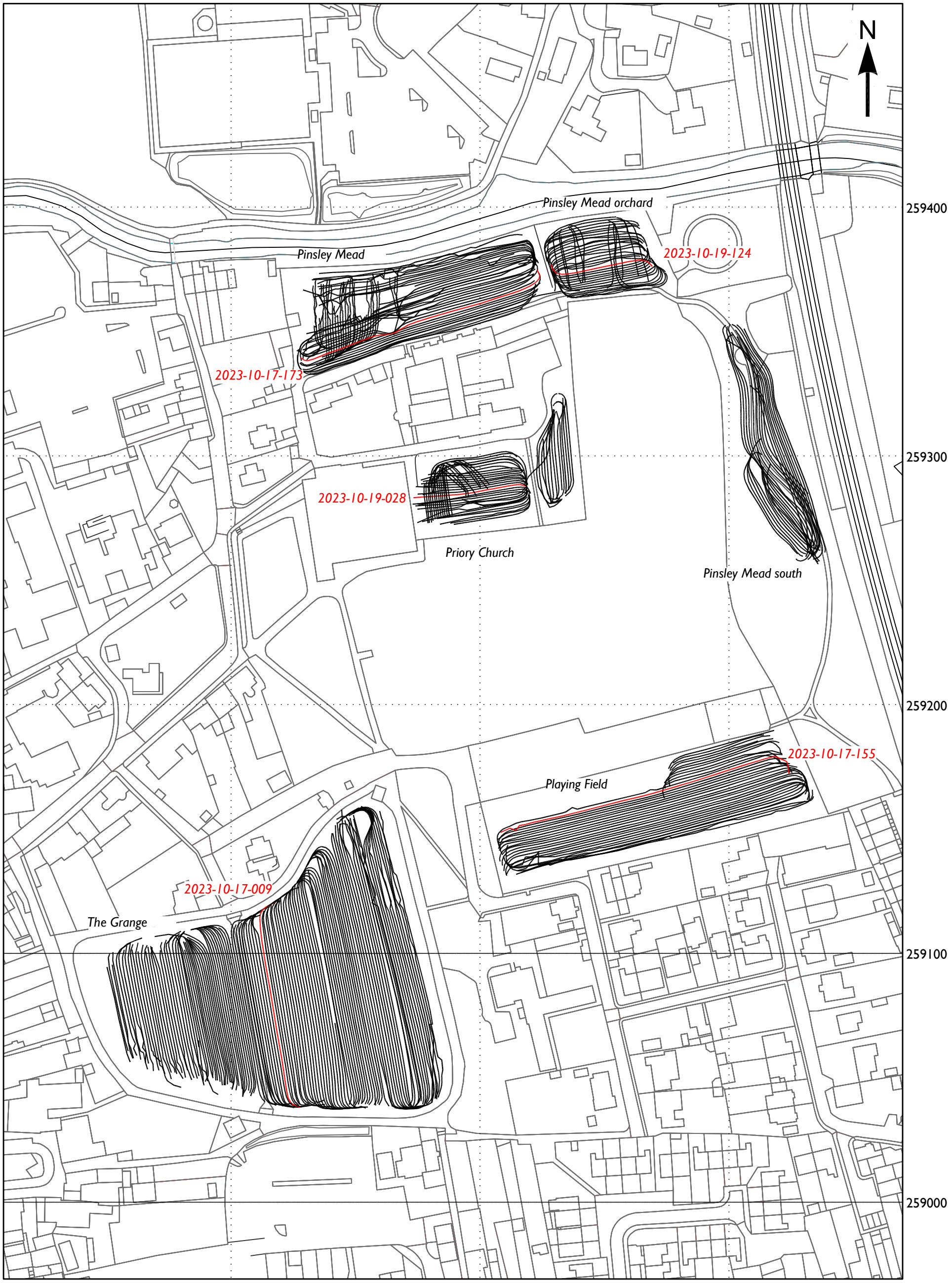
Historic England

Figure 4

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE
Location of GPR instrument swaths, October 2023



0 60m

1:1500

Ground Penetrating Radar survey swaths

2023-10-17-001 Location of selected GPR profiles shown on Figure 9

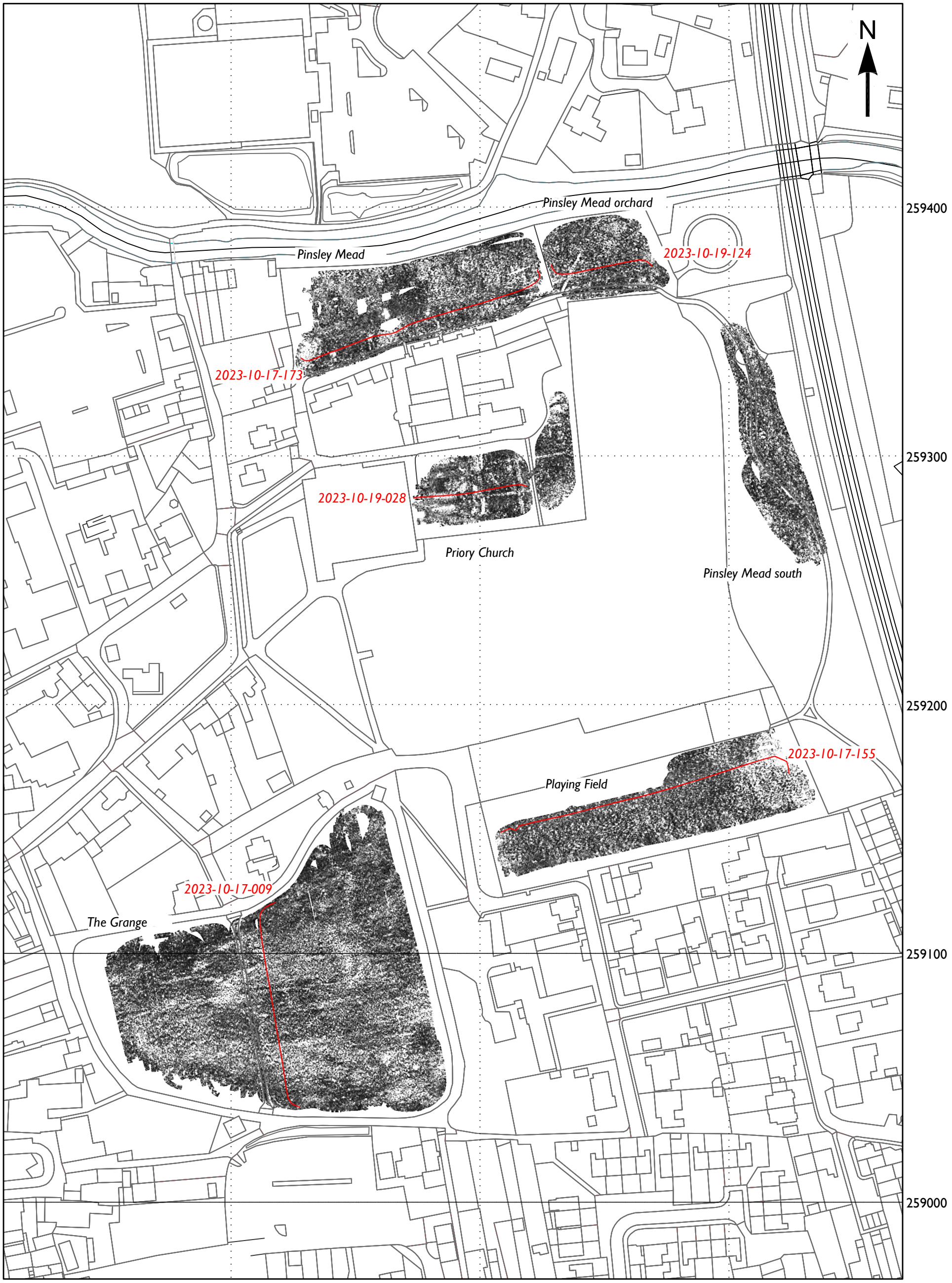
Historic England

Geophysics Team 2024

Figure 5

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

GPR amplitude time slice between 17.5 and 20.0ns (0.9 to 1.03m), October 2023



0 60m

1:1500

Low *High*

relative reflector strength

2023-10-17-001 Location of selected GPR profiles shown on Figure 9

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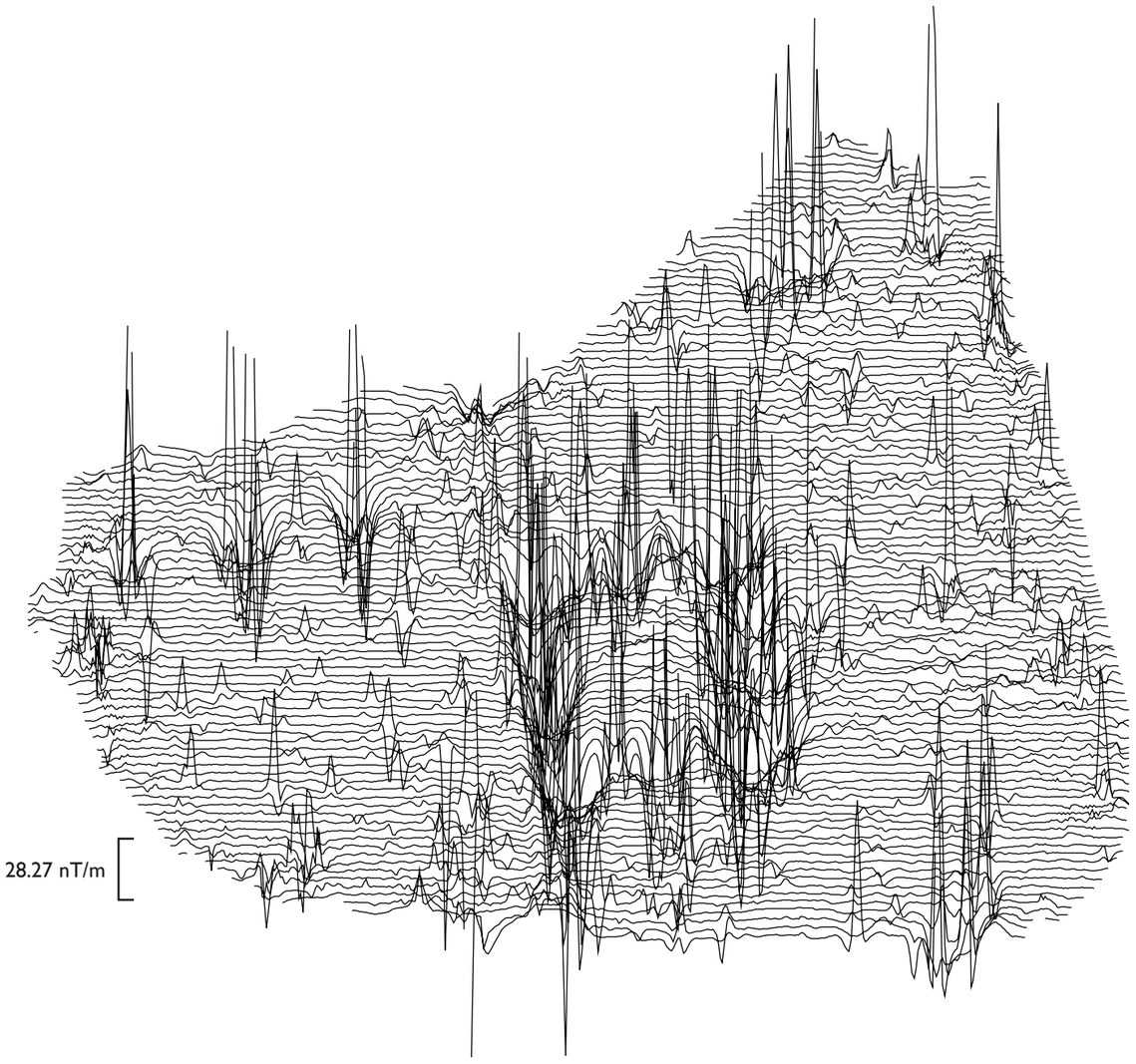
Historic England

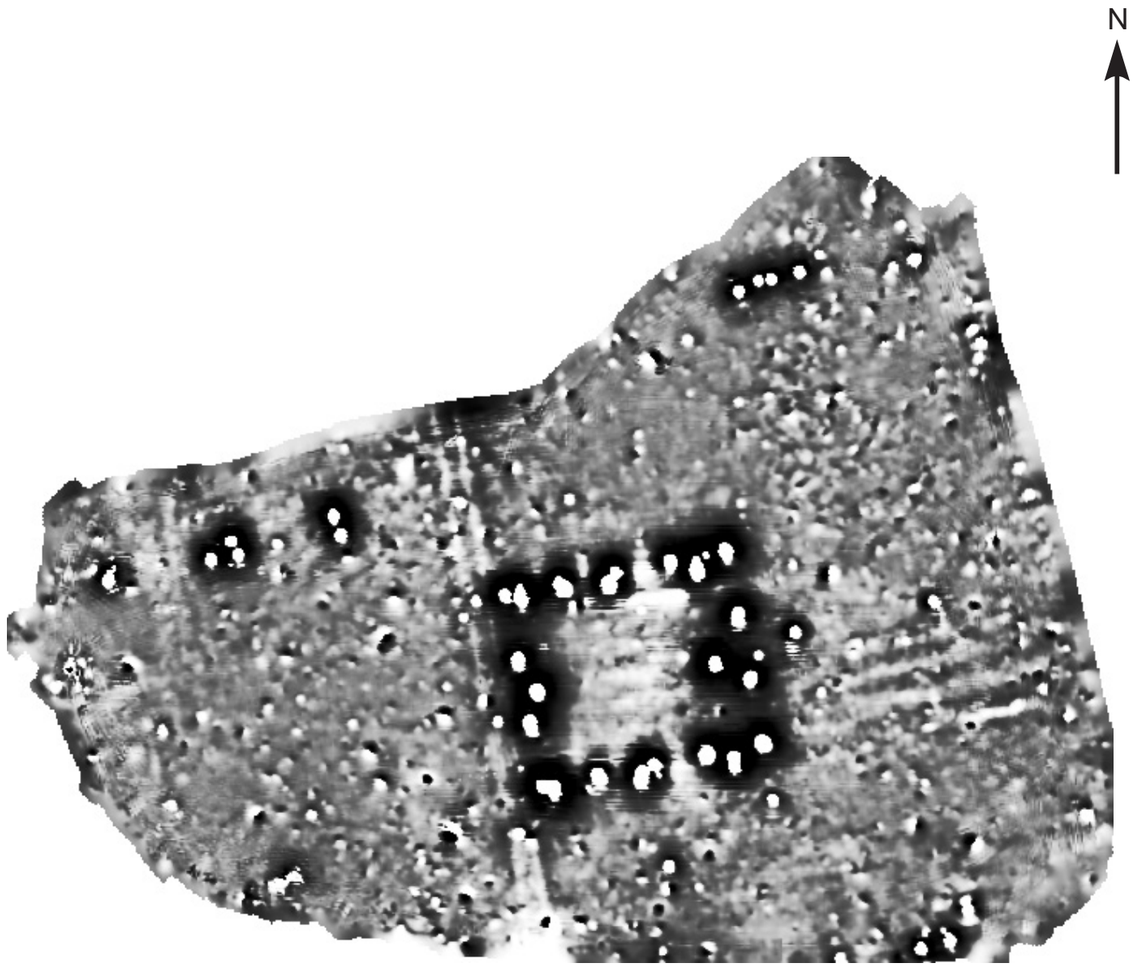
Figure 6

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE
Caesium magnetometer survey, The Grange, October 2023

(A) Trace plot of minimally processed data after range (-/+120 nT/m) truncation



(B) Histogram normalised greyscale image of minimally processed data



0 60m

1:750

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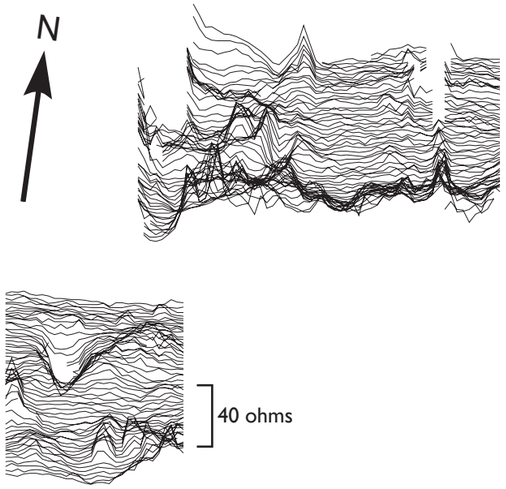
Historic England

Figure 7

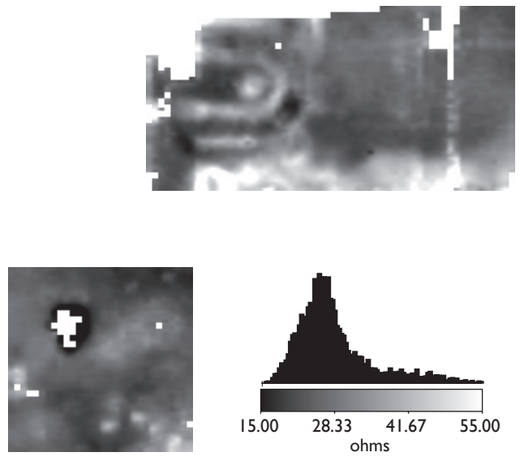
LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE
Earth resistance survey, Priory Church and Churchyard, October 2023

0.5m mobile electrode separation data

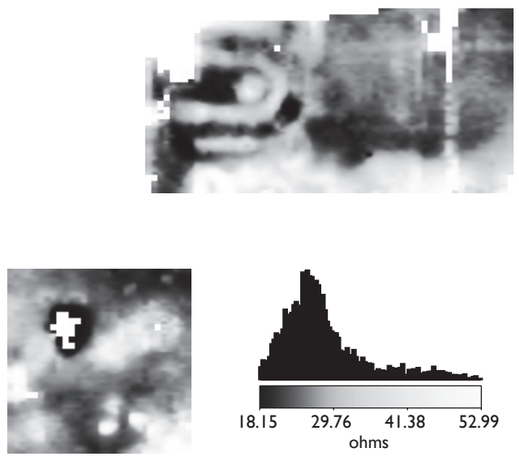
(A) Trace plot of minimally processed data



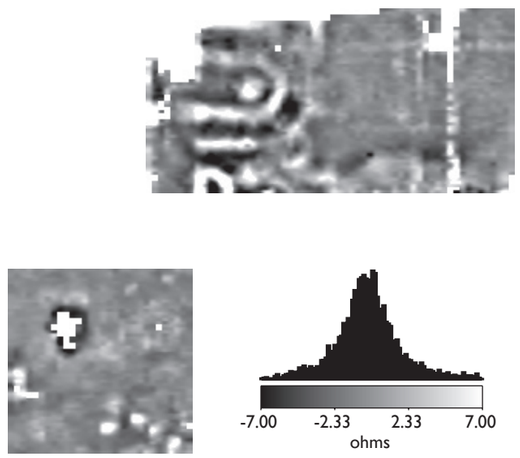
(B) Linear greyscale image of minimally processed data



(C) Histogram equalisation greyscale image of minimally processed data

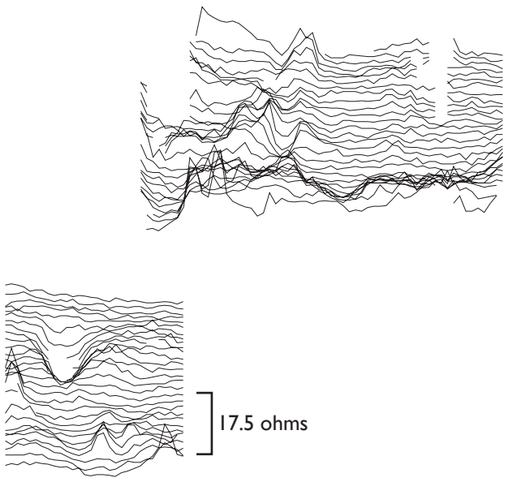


(D) Linear greyscale image of high-pass filtered data

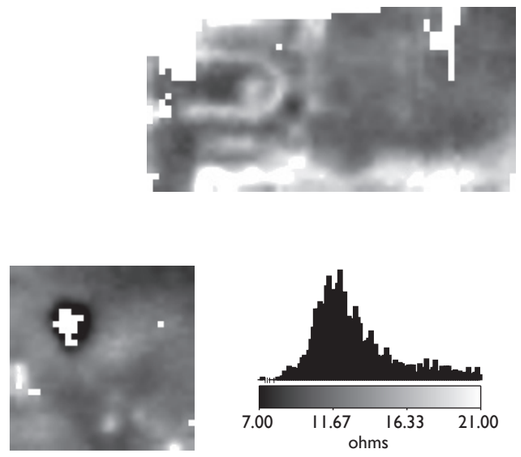


1.0m mobile electrode separation data

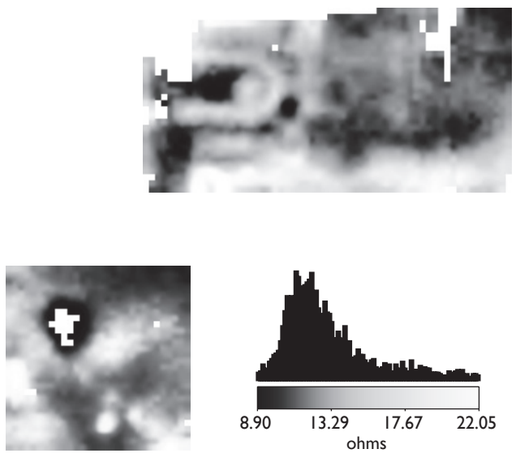
(E) Trace plot of minimally processed data



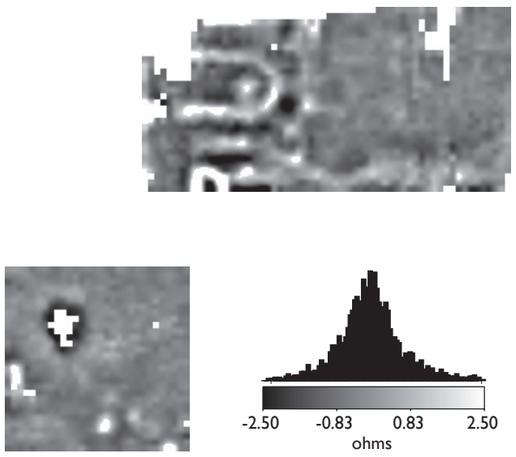
(F) Linear greyscale image of minimally processed data



(G) Histogram equalisation greyscale image of minimally processed data



(H) Linear greyscale image of high-pass filtered data



0 90m

1:1000

Geophysics Team 2024

Historic England

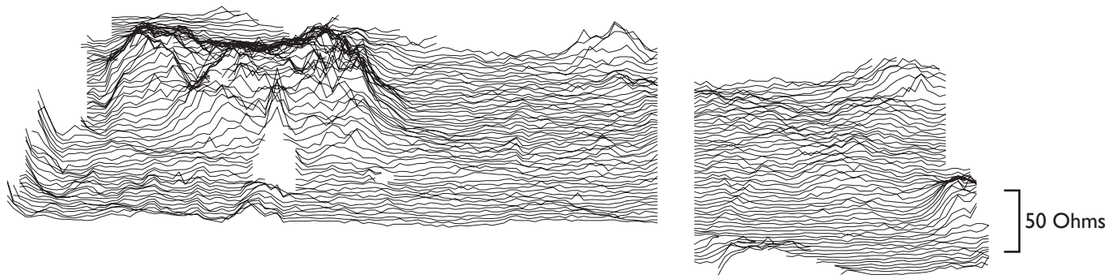
Figure 8

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

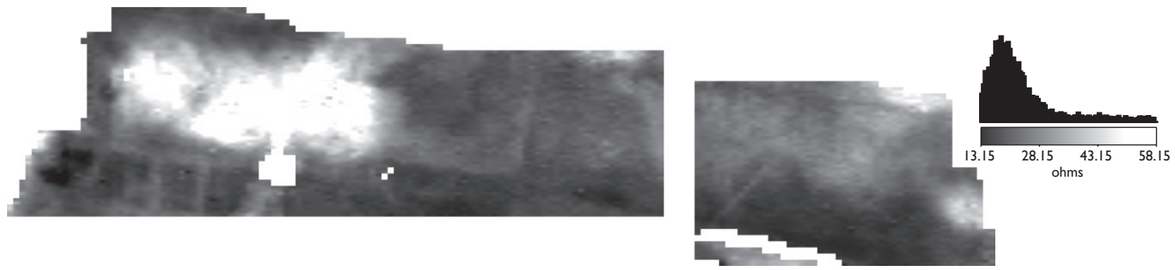
Earth resistance survey, Pinsley Mead and Pinsley Mead Orchard, October 2023

0.5m mobile electrode separation data

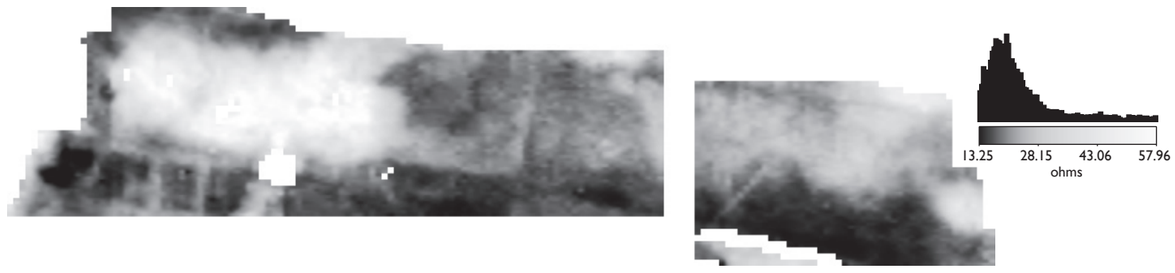
(A) Trace plot of minimally processed data



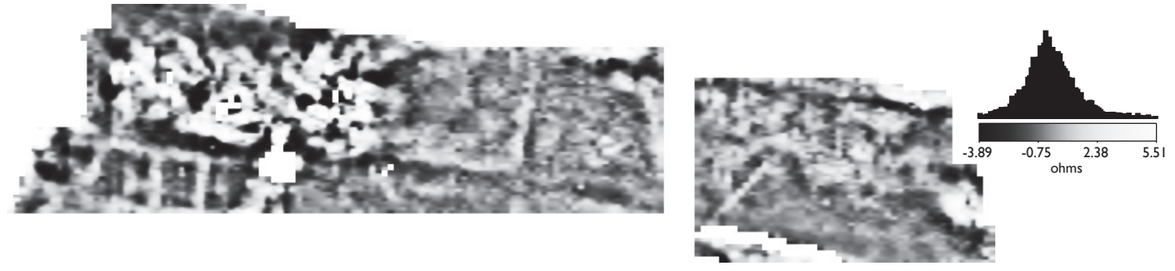
(B) Linear greyscale image of minimally processed data



(C) Histogram equalisation greyscale image of minimally processed data

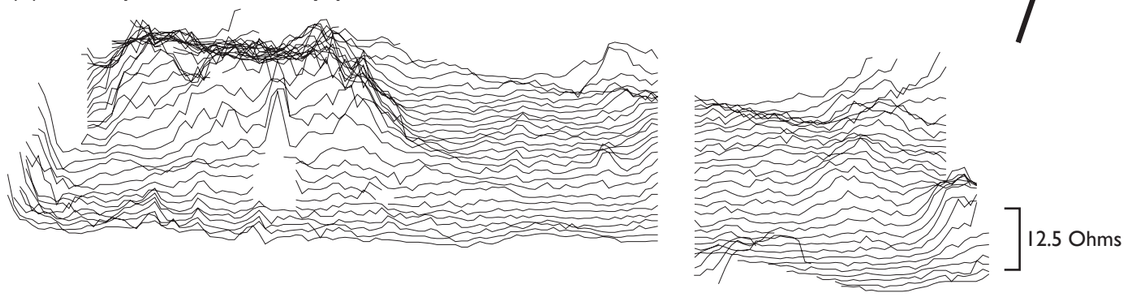


(D) Histogram equalisation greyscale image of high-pass filtered data

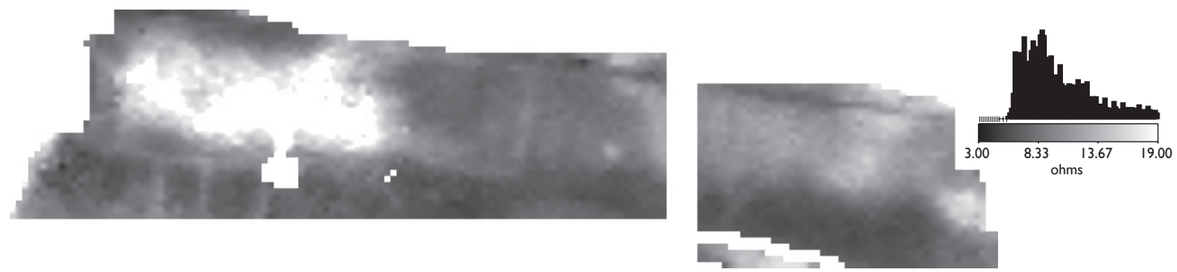


1.0m mobile electrode separation data

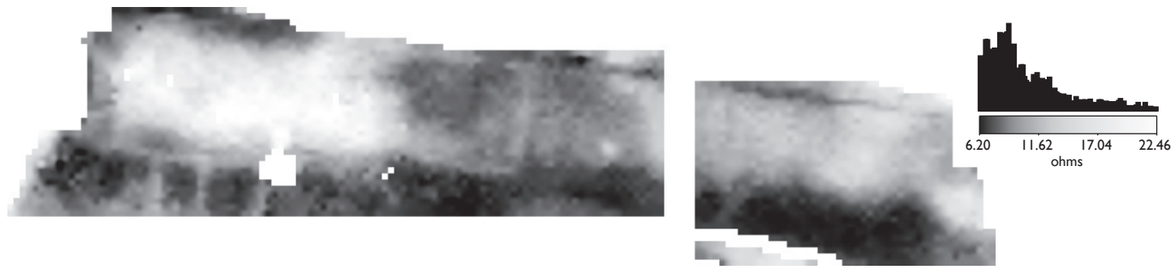
(E) Trace plot of minimally processed data



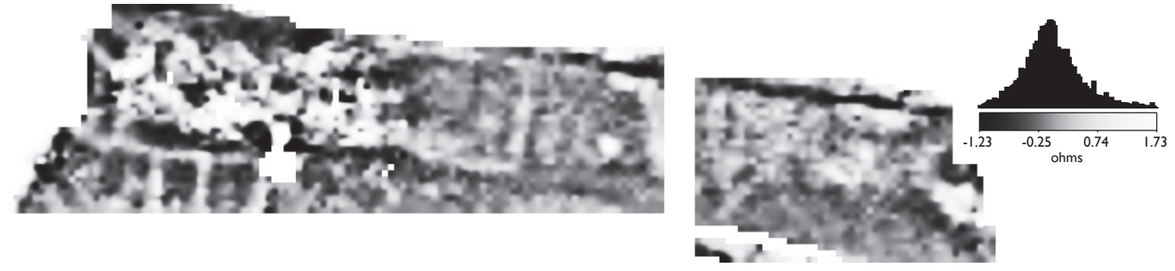
(F) Linear greyscale image of minimally processed data



(G) Histogram equalisation greyscale image of minimally processed data



(H) Histogram equalisation greyscale image of high-pass filtered data



0 90m

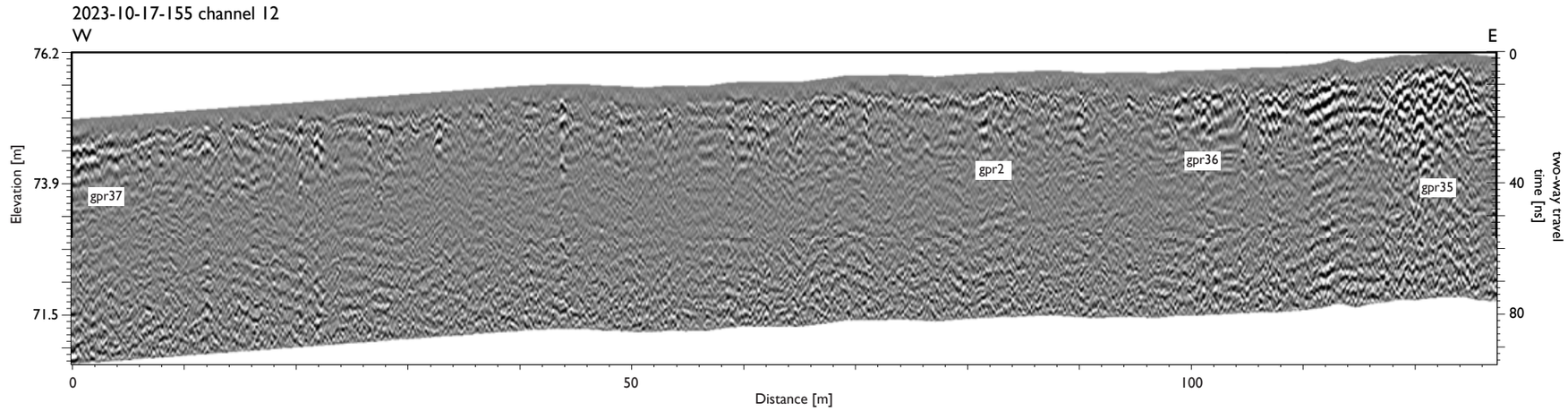
1:1000

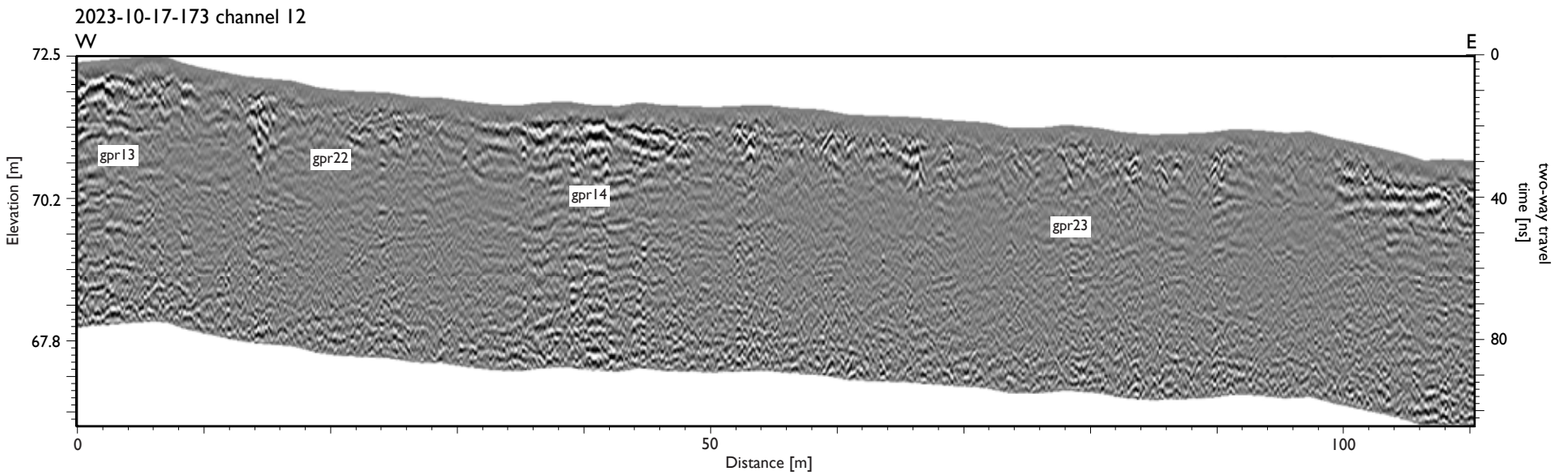
Geophysics Team 2024

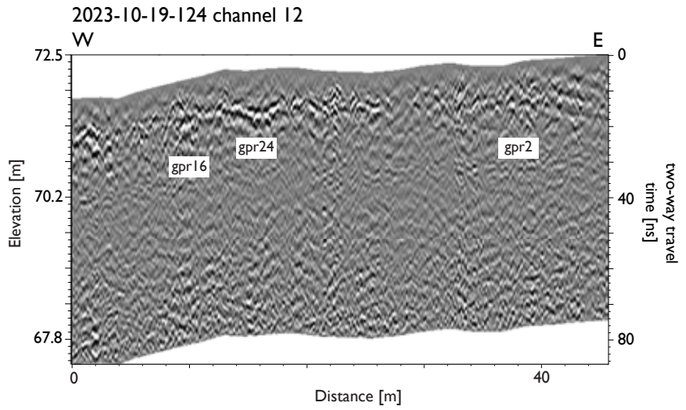
Historic England

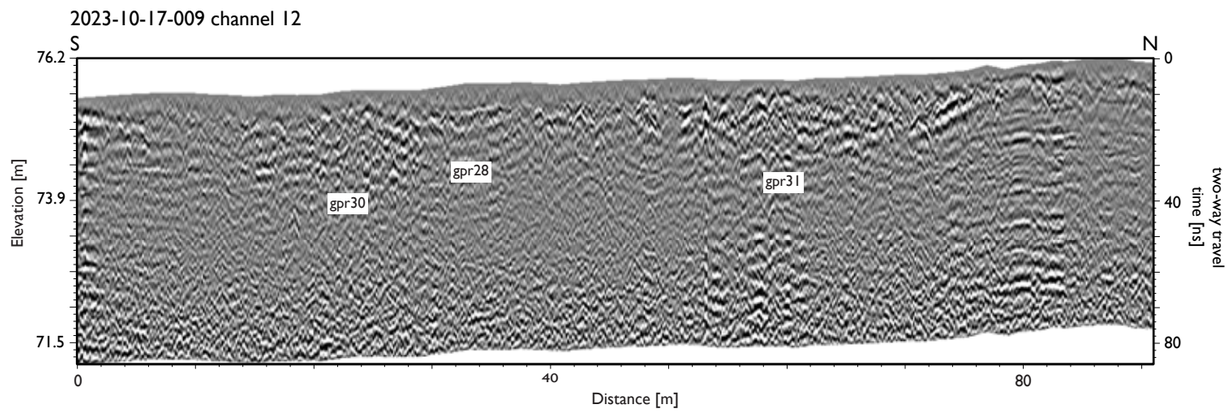
LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE
Representative topographically corrected GPR profiles, October 2023

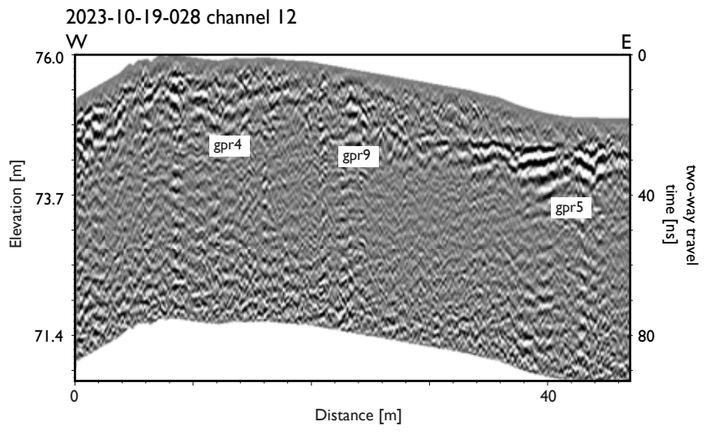
Figure 9











Geophysics Team 2024

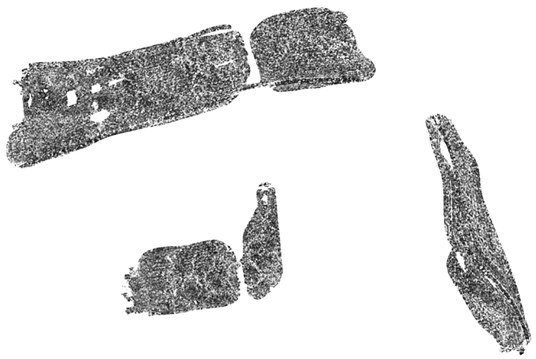
Historic England

Figure 10

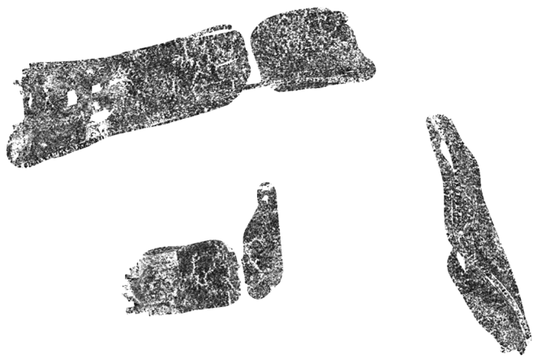
LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

GPR amplitude time slices between 0.0 and 30.0ns (0.0 to 1.55m), Priory Church and Pinsley Mead, October 2023

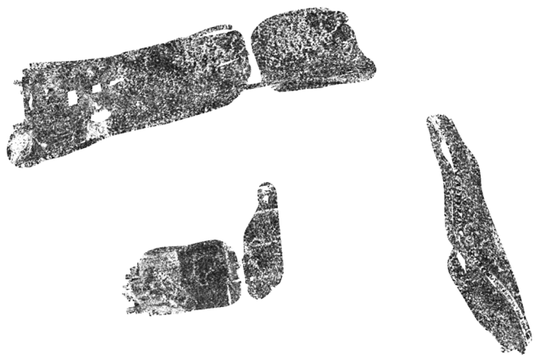
0.0 - 2.5ns (0.0 - 0.13m)



2.5 - 5.0ns (0.13 - 0.26m)



5.0 - 7.5ns (0.26 - 0.39m)

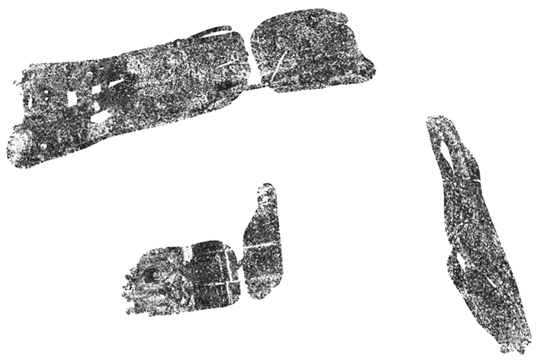


7.5 - 10.0ns (0.39 - 0.52m)

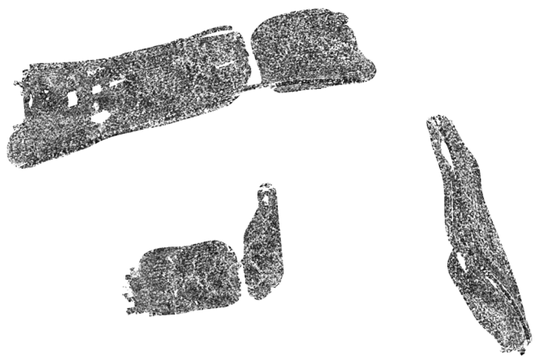
N

10.0 - 12.5ns (0.52 - 0.64m)

12.5 - 15.0ns (0.64 - 0.77m)



15.0 - 17.5ns (0.77 - 0.9m)



17.5 - 20.0ns (0.9 - 1.03m)

20.0 - 22.5ns (1.03 - 1.16m)

22.5 - 25.0ns (1.16 - 1.29m)

25.0 - 27.5ns (1.29 - 1.42m)

27.5 - 30.0ns (1.42 - 1.55m)

0 90m

1:2500

Low *High*

relative reflector strength

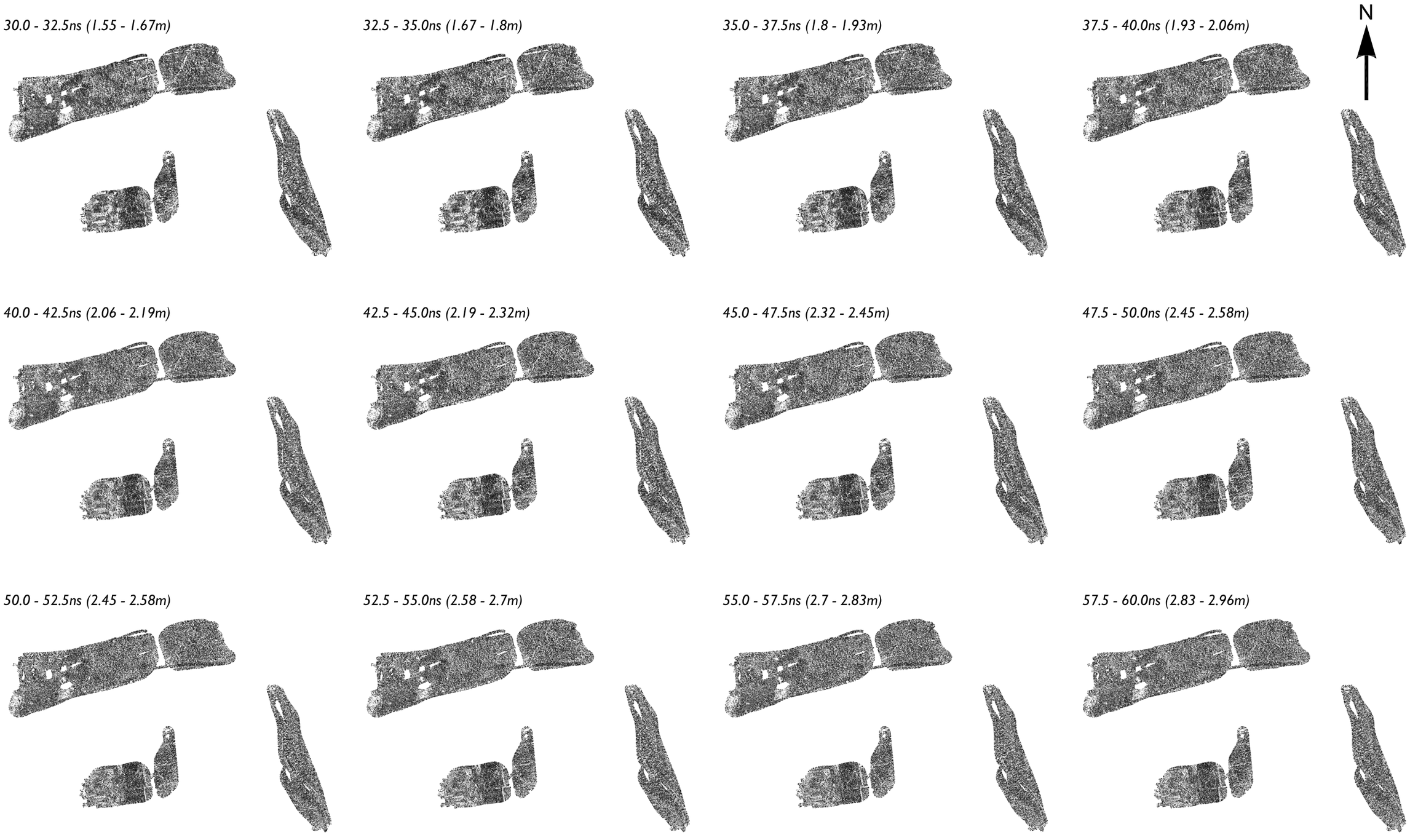
Geophysics Team 2024

Historic England

Figure 11

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

GPR amplitude time slices between 30.0 and 60.0ns (1.55 to 2.96m), Priory Church and Pinsley Mead, October 2023



Geophysics Team 2024

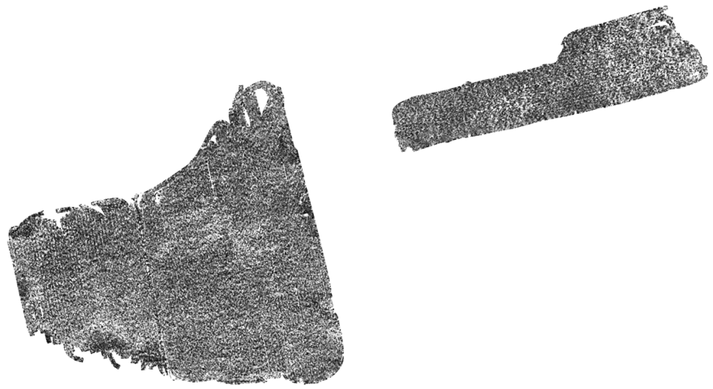
Historic England

Figure 12

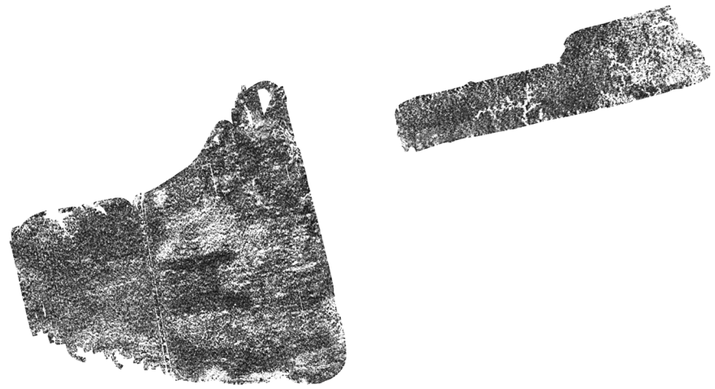
LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

GPR amplitude time slices between 0.0 and 22.5ns (0.0 to 1.16m), The Grange and Playing Field, October 2023

0.0 - 2.5ns (0.0 - 0.13m)



2.5 - 5.0ns (0.13 - 0.26m)



5.0 - 7.5ns (0.26 - 0.39m)

N

7.5 - 10.0ns (0.39 - 0.52m)

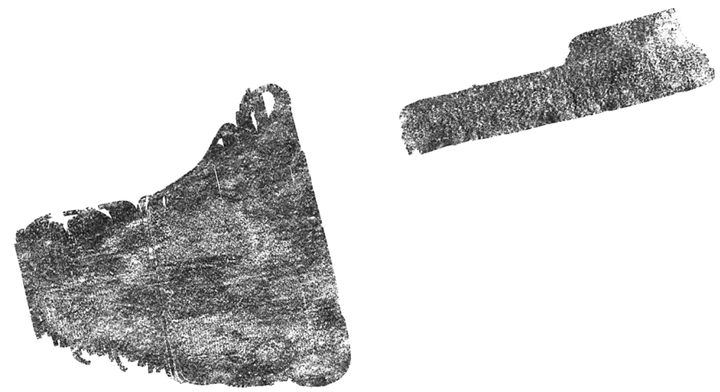
10.0 - 12.5ns (0.52 - 0.64m)

12.5 - 15.0ns (0.64 - 0.77m)

15.0 - 17.5ns (0.77 - 0.9m)

17.5 - 20.0ns (0.9 - 1.03m)

20.0 - 22.5ns (1.03 - 1.16m)



0 90m

1:2500

Low *High*

relative reflector strength

Geophysics Team 2023

Historic England

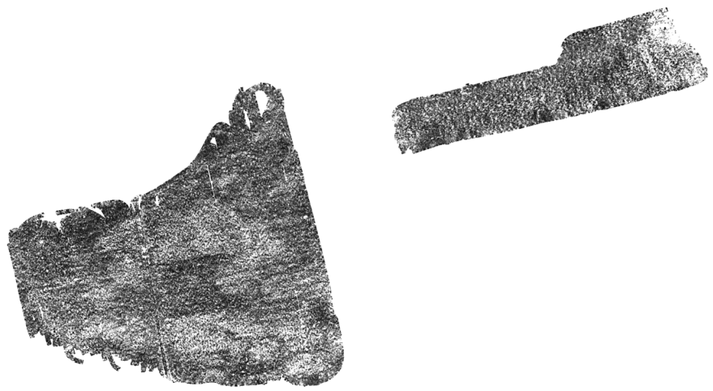
Figure 13

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

GPR amplitude time slices between 22.5 and 45.0ns (1.16 to 2.32m), The Grange and Playing Field, October 2023

N

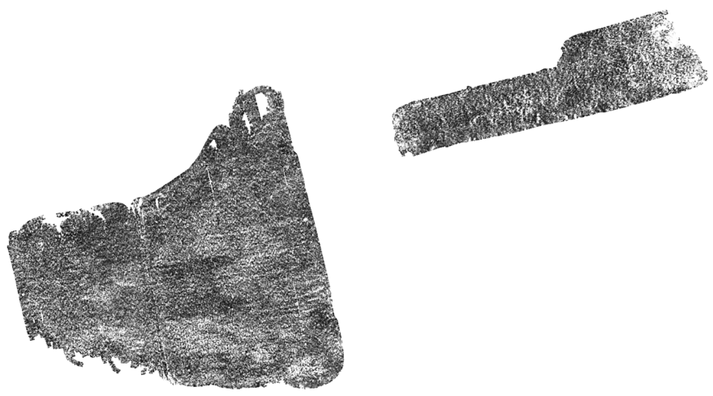
22.5 - 25.0ns (1.16 - 1.29m)



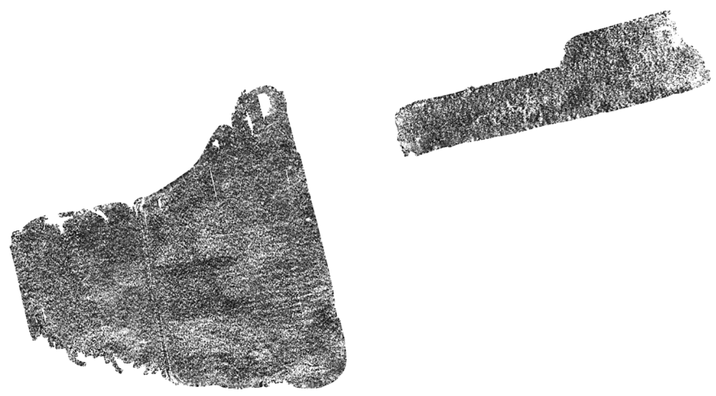
25.0 - 27.5ns (1.29 - 1.42m)

27.5 - 30.0ns (1.42 - 1.55m)

30.0 - 32.5ns (1.55 - 1.67m)

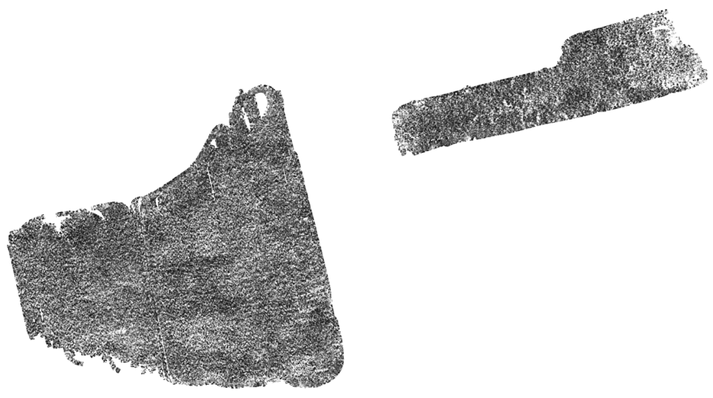


32.5 - 35.0ns (1.67 - 1.8m)

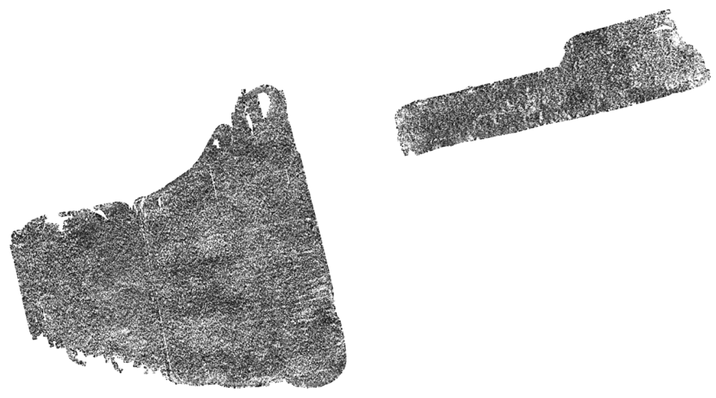


35.0 - 37.5ns (1.8 - 1.93m)

37.5 - 40.0ns (1.93 - 2.06m)



40.0 - 42.5ns (2.06 - 2.19m)



42.5 - 45.0ns (2.19 - 2.32m)

0 90m

1:2500

Low *High*

relative reflector strength

Geophysics Team 2024

Historic England

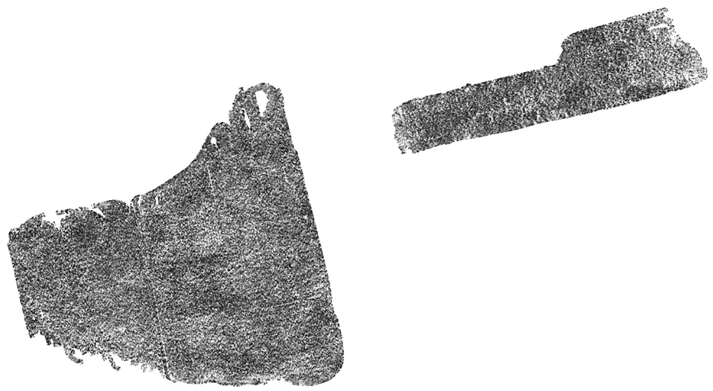
Figure 14

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

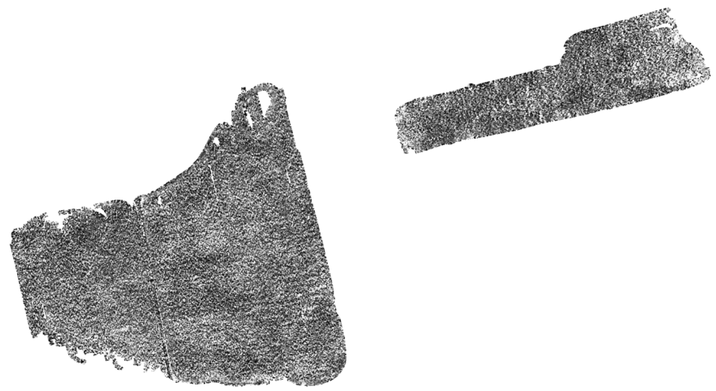
GPR amplitude time slices between 45.0 and 67.5ns (2.32 to 3.5m), The Grange and Playing Field, October 2023

N

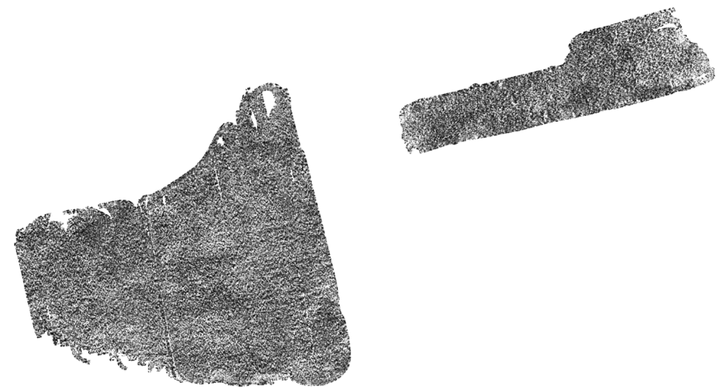
45.0 - 47.5ns (2.32 - 2.45m)



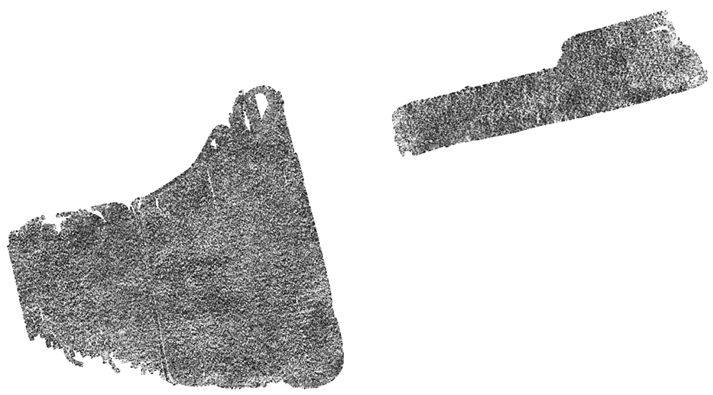
47.5 - 50.0ns (2.45 - 2.58m)



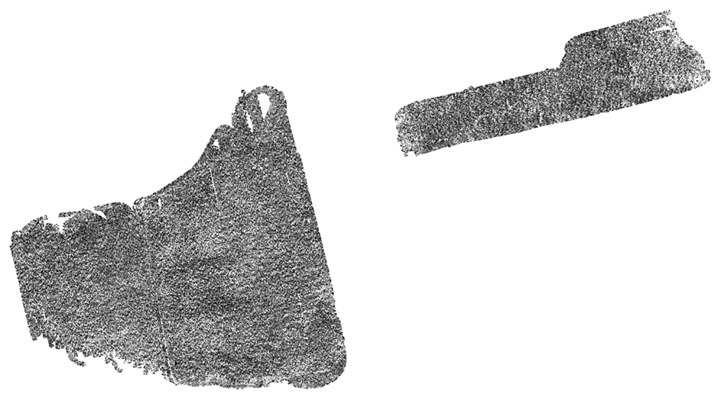
50.0 - 52.5ns (2.58 - 2.7m)



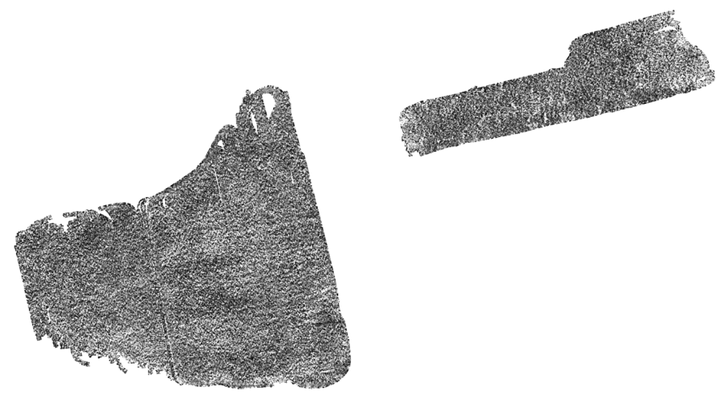
52.5 - 55.0ns (2.7 - 2.83m)



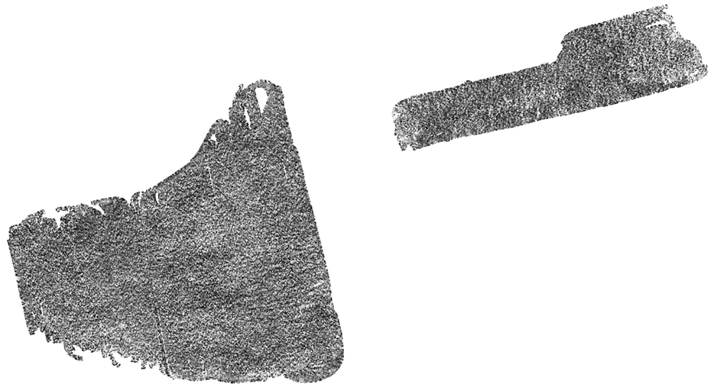
55.0 - 57.5ns (2.83 - 2.96m)



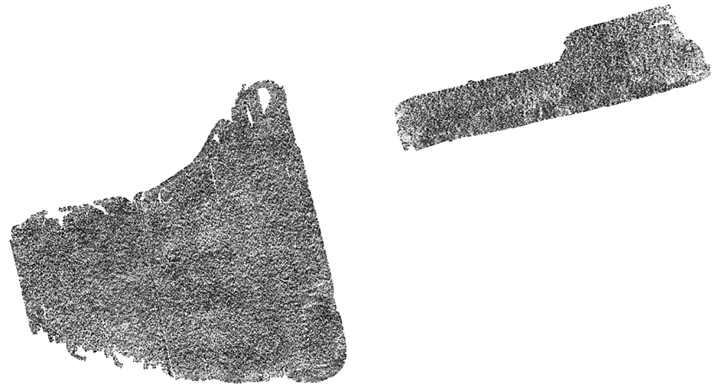
57.5 - 60.0ns (2.96 - 3.09m)



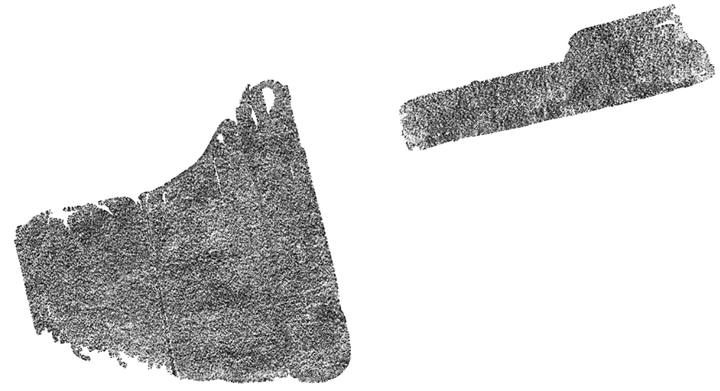
60.0 - 62.5ns (3.09 - 3.22m)



62.5 - 65.0ns (3.22 - 3.35m)



65.0 - 67.5ns (3.35 - 3.5m)



0 90m

1:2500

Low *High*

relative reflector strength

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Figure 15

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

Graphical summary of significant caesium magnetometer anomalies, The Grange, October 2023

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Figure 16

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

Graphical summary of significant earth resistance anomalies, October 2023

SO4959

N

594

593

592

498

499

500

Pinsley Mead

Pinsley Mead orchard

Priory Church

Churchyard

r1 r2 r2i r3 r4 r5 r6 r7 r8 r9 r10 r11 r12 r13 r14 r15 r16 r17 r18 r19 r20 r22 r23 r24

r25 r26 r27 r28 r29 r30

r31 r32 r33 r34 r35 r36 r37 r38 r39 r40 r41 r42 r43 r44

0 90m

1:1000

very high resistance | high resistance | low resistance

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Figure 17

LEOMINSTER PRIORY, LEOMINSTER, HEREFORDSHIRE

Graphical summary of significant GPR anomalies, October 2023

Geophysics Team 2024

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