The Old Sarum Landscapes Project

Research Report No. 3

Report on the Geophysical Survey at Old Sarum, Wiltshire, April and July 2016, and April and July 2017

SREP 1/2018

Compiled by K. Strutt, D. Barker, A. Langlands, T. Sly

Archaeological Prospection Services of Southampton

List of Contents

List of Illustrations

Report on the Geophysical Survey at Old Sarum, Wiltshire, April and July 2016, and April and July 2017

Summary

This report presents the results of the geophysical survey undertaken at Old Sarum, near Salisbury in Wiltshire, between March 2016 and July 2017. It specifies the survey methodology together with an interpretation discussion of the survey results. The survey was conducted over parts of Old Sarum, the eastern suburbs, and a number of fields between Old Sarum and the River Avon, including Dean's Park Field. The results indicate a number of archaeological features, including roads and structures associated with the eastern suburb of Old Sarum, and multiple phases of activity in a potential western suburb along Phillip's Lane to the west of the monument.

1. Introduction

Between the March 2016 and July 2017 a number of geophysical surveys were conducted at Old Sarum to the north of Salisbury in Wiltshire (Fig. 1). These formed the third and fourth seasons of survey work undertaken as part of the Old Sarum Landscapes Project, investigating the archaeology of Old Sarum and Stratford-sub-Castle (Strutt et al. 2014; 2015). The survey was undertaken by staff and students from the Universities of Southampton and Swansea, and volunteers from Stratford sub-Castle and the vicinity of Salisbury. The work was directed by the authors with much of the survey work being conducted by undergraduate and postgraduate students from the Department of Archaeology at the University of Southampton. The survey comprised a week of survey with third year, postgraduate students and volunteers in April 2016 and April 2017, and three weeks of survey with students and volunteers in July 2017. In addition 4 days of survey was conducted by the authors in July 2016.

The report presented here combines the results of the magnetometer and earth resistance surveys from 2016 and 2017, leading on from the results of the 2014 and 2015 surveys (Strutt et al. 2014; 2015). In order to ensure that the numbering continues from the 2014 and 2015 seasons, and that the data makes sense the numbering sequence continues from the previous reports.

1.1 Site Location and Background

The site of Old Sarum (Fig. 2) is located in Wiltshire some 3km to the north of Salisbury in the Avon Valley. The monument, number 1015675, includes a univallate Iron Age hillfort with evidence of Romano-British occupation and documentary evidence of a Saxon burh and mint (Bushe-Fox 1950; Richards 2010; List Entry Summary). The site was rebuilt as a royal motte and bailey castle including a cathedral and bishop's palace and extra-mural settlement. The remains of the castle and cathedral are Listed Grade I and the monument is in the care of the Secretary of State (Fig. 3). It is situated c.3km NNE of Salisbury, at the west end of a westward facing chalk spur overlooking the River Avon. The hillfort is roughly

oval in shape, enclosing an area of c.12ha, with entrances at the east and west ends. Excavations within the hillfort have produced evidence of early Iron Age settlement and of later Iron Age and Romano-British occupation from the 1st to the 3rd centuries AD. Included within the scheduling is an area of Iron Age activity located outside the hillfort close to the eastern entrance. The site is the focus for a number of major Roman roads with a settlement alongside the road to the south of the monument. There is, however, scant evidence for Roman settlement within the defences of the hillfort, with some Samian Ware and building foundations under the inner bailey providing the strongest evidence for Roman occupation within the earthworks.

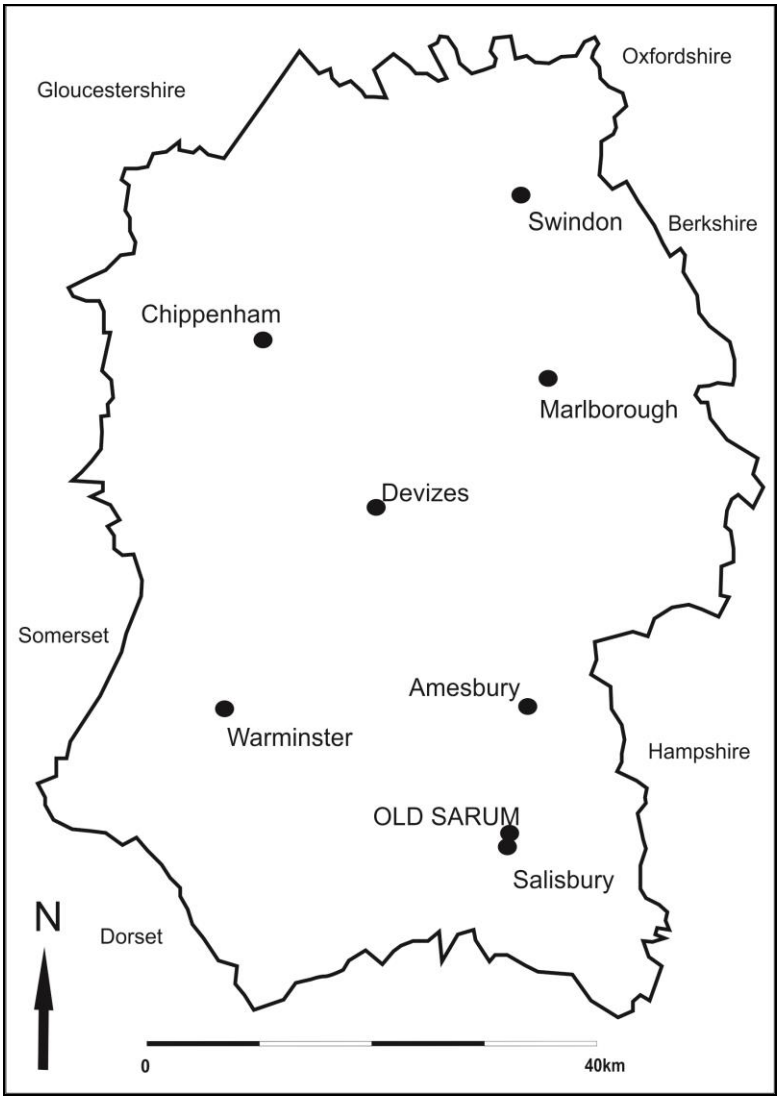

Figure 1 Map of the county of Wiltshire, showing the location of Old Sarum

There is, however, a lack of any substantial evidence for Romano-British occupation within the hillfort and current understanding does not allow this suggested location to be confirmed.

Documentary sources attest to the establishment of a Saxon burh, at the site. After the Norman Conquest in 1066 a royal motte and bailey castle was built within the hillfort. The defences of the hillfort were adapted to become those of the outer bailey while a mound was constructed in the centre of the hillfort.

The inner bailey, the entrance of which is on its eastern side, now contains the ruins of a series of stone buildings dating from c.1100 AD to the 13th century. The outer bailey of the medieval castle includes earthwork banks radiating from the motte to the outer defences. Those to the north east and south of the motte may have defined the outer bailey of the post-Conquest castle. The Norman town may have been established within the south western quadrant and the north western quadrant includes the ecclesiastical precinct within which lie the remains of the cathedral and other associated structures. The cathedral now survives as low walls and reinstated areas marking out the composite ground plan of its two phases of construction.

The first cathedral was built in 1078,, and consisted of a nave separated from two side aisles by eight great arches on each side. At the apsidal east end, the main altar and two side chapels in the transepts were also enclosed by semi-circular apses. This building was completed in 1092 and almost immediately largely destroyed. Rebuilding in the Norman style commenced in 1130 under Bishop Roger and involved the large scale levelling of this part of the hillfort interior. Outside the western limits of the defences aerial photographs show traces of what may be a contemporaneous suburb of Old Sarum. Although understanding of the extent, nature and survival of these remains is currently incomplete, artefacts recorded after cultivation immediately beyond the western hillfort entrance enable the eastern part of the possible settlement to be confirmed and included within the scheduling. Beyond the eastern limits of the defences, to the south of the main entrance, lie part of the remains of the east suburb, defined by surviving earthworks and by recorded finds dating from the 12th to the 14th centuries. Although understanding of the full extent of these remains is currently incomplete, and they have been considerably disturbed to the east of the Salisbury to Amesbury road, an area can be defined which is included within the scheduling.

Excavation has been conducted at the site in the 20th century, including Hope's work in the earlier part of the century (Hope 1911; 1914; 1916; 1917) and a number of trial excavations and archaeological mitigations prior to development in the area (for instance excavations on the trunk main replacement). Previous geophysical survey has been conducted at the site, with a survey of the supposed chapel site being conducted in 2003 (http://archaeologydataservice.ac.uk/archives/view/ehgsdb_eh_2011/fullrecord.cfm?id=2664), and resistivity survey of part of the monument in 2005 (http://archaeologydataservice.ac.uk/archives/view/ehgsdb_eh_2011/fullrecord.cfm?id=2804).

Figure 2 Orthorectified photographic image of Old Sarum (source: Google Earth)

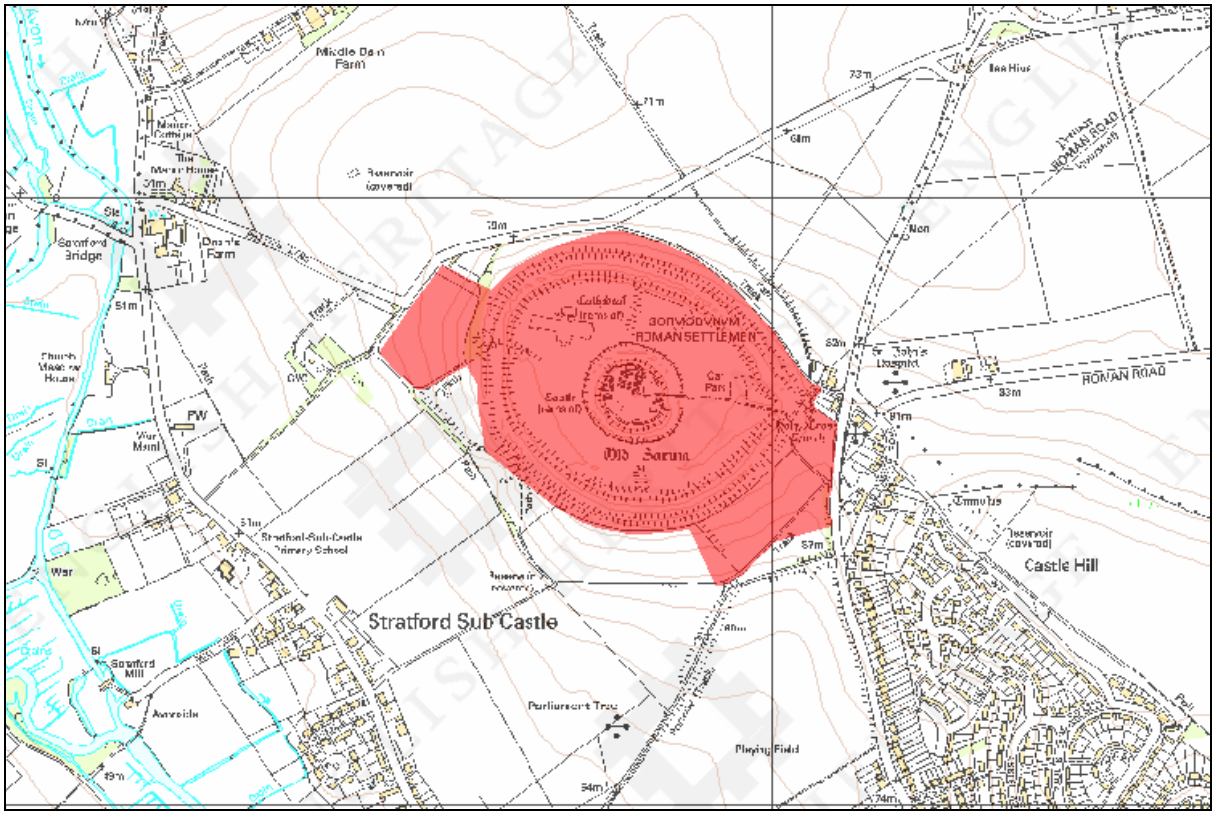

Figure 3 The scheduled area of Old Sarum and Stratford-sub-Castle

The Historic Environment Record for the monument and its environs and desk-based assessment for the monument and its environs (Richards 2010) indicates a palimpsest of archaeological material, including significant features from the Iron Age, Romano-British period, Saxon, Medieval and post-medieval periods. A detailed assessment of the archaeology is given in several other accounts, however, a number of prominent areas exist in the landscape surrounding Old Sarum that would benefit from further non-intrusive investigation. The scheduled area of Old Sarum Castle contains multi-period evidence that would benefit from geophysical investigation. The exact layout of the medieval castle plan, and the Saxon Burg would merit attention. Although the location of possible Romano-British settlement has been noted, no actual evidence for occupation has been found.

The area immediately to the south of Old Sarum contains the remains of a Romano-British settlement, scheduled monument number 1004688. Considerable evaluation work in the area has highlighted the presence of Roman deposits at Stratford sub-Castle (James 2009). In addition the area to the north-west contains the medieval settlement associated with the castle. Although much of the settlement appears to have been mapped from air photographic evidence, topographic and geophysical survey would potentially produce further information on the nature and extent of the site, and its relationship with the castle.

The site was taken over by the Royal Air Force in 1941 in order to provide defence for the airfield to the east of the site. The site was closed to the public and defended by extensive barbed wire belts on the outer ramparts. Some machine gun points, Nissen Huts for accommodation and cinder roads for access were built, all of which were removed after the war.

1.2 Geology at Old Sarum

Old Sarum is located on the Newhaven chalk formation which covers the area around Salisbury and Stratford Sub-Castle (Fig. 4).

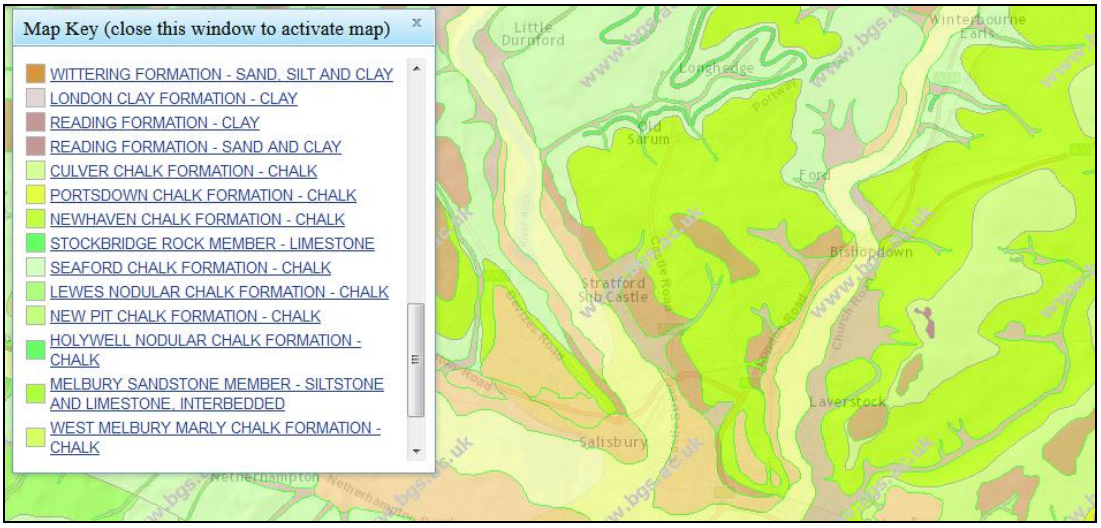

Figure 4 Geological map of the area of Old Sarum

1.3 Aims of the Survey

The objective of the survey project is primarily to provide an opportunity for training of archaeology students from the University of Southampton undertaking survey and geophysical survey modules of study, to produce new and extensive data for Old Sarum and its immediate environs using non-intrusive techniques of prospection (Fig. 5), and topographical survey methods to map the extant archaeological remains. The aims of the survey, in line with the project overview (Strutt et al. 2014) were to:

- To produce a new topographic interpretation for Old Sarum and Stratford Sub-Castle, integrating LiDAR data with on-site topographic survey of visible features.
- To produce a geophysical survey of the area, using an integrated strategy comprising different methods including earth resistance survey, magnetometry, Ground Penetrating Radar (GPR) and Electrical Resistivity Tomography (ERT).
- To create a dataset for use by researchers and management personnel at English Heritage and other interested organisations.
- To provide a framework for the training of Archaeology undergraduate and postgraduate students from the University of Southampton
- To potentially provide an opportunity for outreach by the Department of Archaeology at the University of Southampton, to local community organisations and archaeological groups.

- To potentially provide an opportunity for student involvement in other aspects of the archaeology at Old Sarum and Stratford Sub-Castle, for instance archive work as part of possible dissertation topics.

To that end, the field seasons in 2016 and 2017 aimed to continue the survey work from 2014 and 2015, exploring the eastern and western suburbs of Old Sarum, complementing the existing data.

2. Survey Methodology

For the 2016 and 2017 survey at old Sarum magnetometry and earth resistance were applied. Results of these techniques are extremely dependent on the geology of the particular area, and whether the archaeological remains are derived from the same materials. Magnetometry is a passive technique which uses sensors to measure variations in the strength of the Earth's magnetic field in nanotesla (nT). Earth resistance is based on the passing of an electrical current through the soil and measuring the resistance to the current.

2.1 Techniques of Geophysical Survey: Magnetometry and Earth Resistance

Magnetic prospection of soils is based on the measurement of differences in magnitudes of the earth's magnetic field at points over a specific area (Fig. 5). The iron content of a soil provides the basis for its magnetic properties, with the presence of minerals such as magnetite, maghaemite and haematite iron oxides all affecting the magnetic properties of soils. Although variations in the earth's magnetic field which are associated with archaeological features are weak, especially considering the overall strength of the magnetic field of around 48 Teslas (48,000 nanoTesla, or nT). It follows that these instruments are very sensitive indeed.

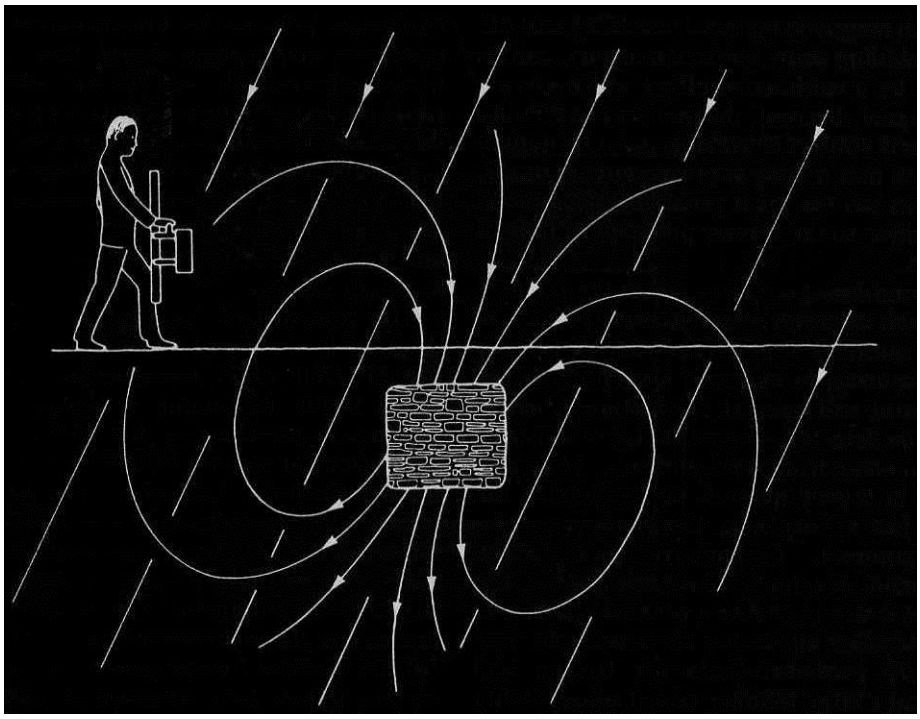

Figure 5 **Schematic diagram indicating the use of a magnetometer over archaeological remains, and the local magnetic field of the buried objects in relation to the earth's magnetic field (from Clark 1996)**

Three basic types of magnetometer are available to the archaeologist; proton magnetometers, fluxgate gradiometers, and alkali vapour magnetometers (also known as caesium magnetometers, or optically pumped magnetometers). Fluxgate instruments are based around a highly permeable nickel iron alloy core, which is magnetised by the earth's magnetic field, together with an alternating field applied via a primary winding. Due to the fluxgate's directional method of functioning, a single fluxgate cannot be utilised on its own, as it cannot be held at a constant angle to the earth's magnetic field. Gradiometers therefore have two fluxgates positioned vertically to one another on a rigid staff. This reduces the effects of instrument orientation on readings. Fluxgate gradiometers are sensitive to 0.5nT or below depending on the instrument. However, they can rarely detect features which are located deeper than 1m below the surface of the ground.

Archaeological features such as brick walls, hearths, kilns and disturbed building material will be represented in the results, as well as more ephemeral changes in soil, allowing location of foundation trenches, pits and ditches. Results are however extremely dependent on the geology of the particular area, and whether the archaeological remains are derived from the same materials. Around 1.5 hectares can be surveyed each day.

Twin probe array earth resistance survey is based on the ability of sub-surface materials to conduct an electrical current passed through them. All materials will allow the passing of an electrical current through them to a greater or lesser extent. There are extreme cases of conductive and non-conductive material (Scollar et al 1990, 307), but differences in the structural and chemical make-up of soils mean that there are varying degrees of resistance to an electrical current (Clark 1996, 27). The technique is based on the passing of an electrical current from probes into the earth to measure variations in resistance over a survey area. Resistance is measured in ohms (Ω), whereas resistivity, the resistance in a given volume of earth, is measured in ohm-metres (Ωm). Four probes are generally utilised for electrical profiling (Gaffney et al. 1991, 2), two current and two potential probes. Survey can be undertaken using a number of different probe arrays; twin probe, Wenner, Double-Dipole, Schlumberger and Square arrays.

2.2 Survey Strategy

For the survey grid system was established using a Leica Viva Real Time Kinetic (RTK) GPS (Figs 6 and 7) utilising the Ordnance Survey coordinate system OSGB36. Wooden survey pegs and spray markers were set out at 30m by 30m intervals, and the grids for all areas were georeferenced together with the other landscape features and breaks of slope recorded during the topographic survey of the site.

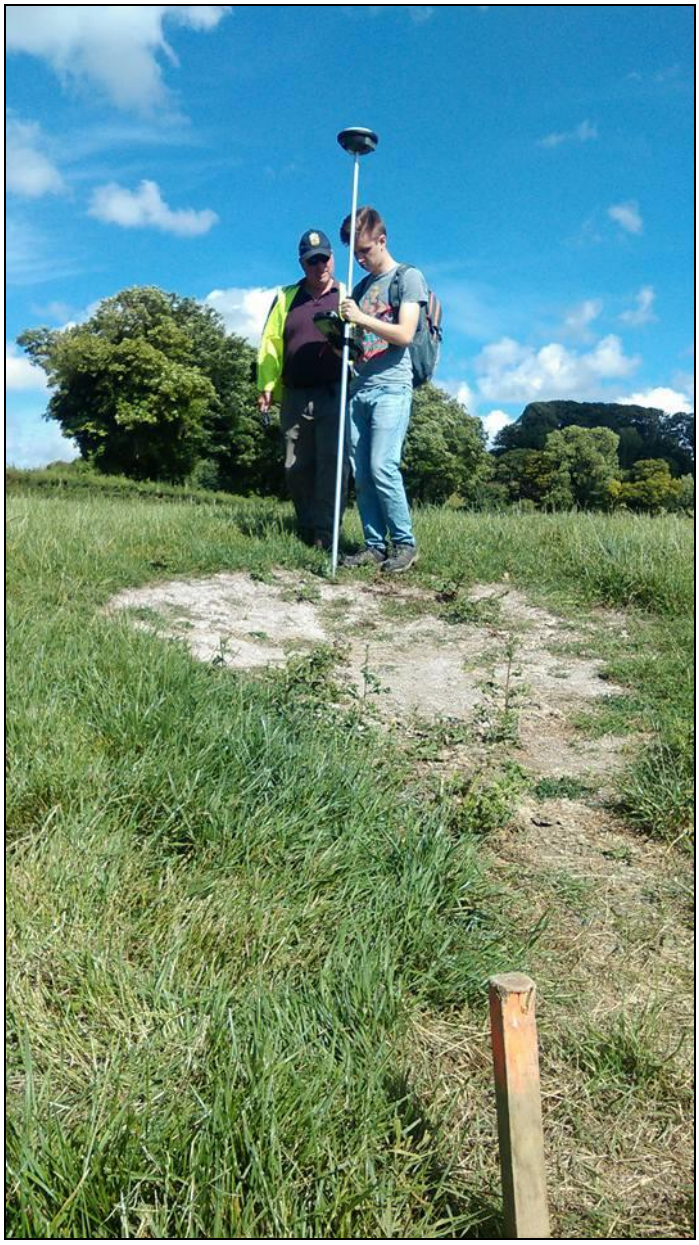

Figure 6 Gridding out using a Leica RTK Smartnet GPS (photo: K. Strutt)

Figure 7 **Leica RTK GPS with Smartnet being used to grid out at Old Sarum (photo: K. Strutt)**

Figure 8 **Magnetometer survey being conducted using a Bartington Instruments Grad 601 fluxgate gradiometer, July 2016 (photo: D. Barker)**

Figure 9 **Magnetometer survey being conducted in Dean's Park Field to the west of Old Sarum, July 2017 (photo: K. Strutt)**

The magnetometer survey was conducted using a Bartington Instruments Grad 601 dual sensor fluxgate gradiometer (Figs 8 and 9). Measurements were taken at 0.25m intervals on

0.5m traverses, with data collected in zig-zag fashion. The survey data were processed using Geoplot 3.0 software. The processing of data was necessary to remove any effects produced by broad variations in geology, or small-scale localised changes in magnetism of material close to the present ground surface. Magnetometer data were despiked to remove any extreme magnetic values caused by metallic objects. A zero mean traverse function was then applied to remove any drift caused by changes in the magnetic field. A low pass filter was then applied to remove any high frequency readings, and results were then interpolated to 0.5m resolution across the traverses.

Earth resistivity was carried out using a Geoscan Research RM15 resistance meter, with measurements taken at 1.0m intervals along traverses spaced 1.0m apart (Fig. 10).

The data from each survey were exported as a series of bitmaps, and were imported into and georeferenced in a GIS, relating directly to other salient spatial information such as AutoCAD maps of the site and relevant air photographic imagery. An interpretation layer of archaeological and modern features was digitized deriving the nature of different anomalies in the survey data from their form, extent, size and other appropriate information. As no direct chronological information can be derived from the geophysical survey data, much of this had to be inferred from the morphology of anomalies, and the relationships between different features.

Figure 10 Earth resistance survey being carried out using a Geoscan Resesarch RM15 by students and volunteers (photo: K. Strutt)

3. Survey Results

3.1 The Magnetometer Survey

The magnetometer survey in 2016 focussed on the area to the east and south of Old Sarum, running from the Eastern Suburb round to the south of the monument. In 2017 all work moved to the area to the west of Old Sarum, in Dean's Park field, and the fields to the south of Dean's Park. All of the survey aimed at mapping the extent and nature of possible suburbs and extra-mural settlement at Old Sarum (Fig. 11).

The results of the magnetometry reported here follow on from the reports from 2014 and 2015 (Strutt et al. 2014; 2015). Thus the numbering sequence in the images and text follows on from these previous reports.

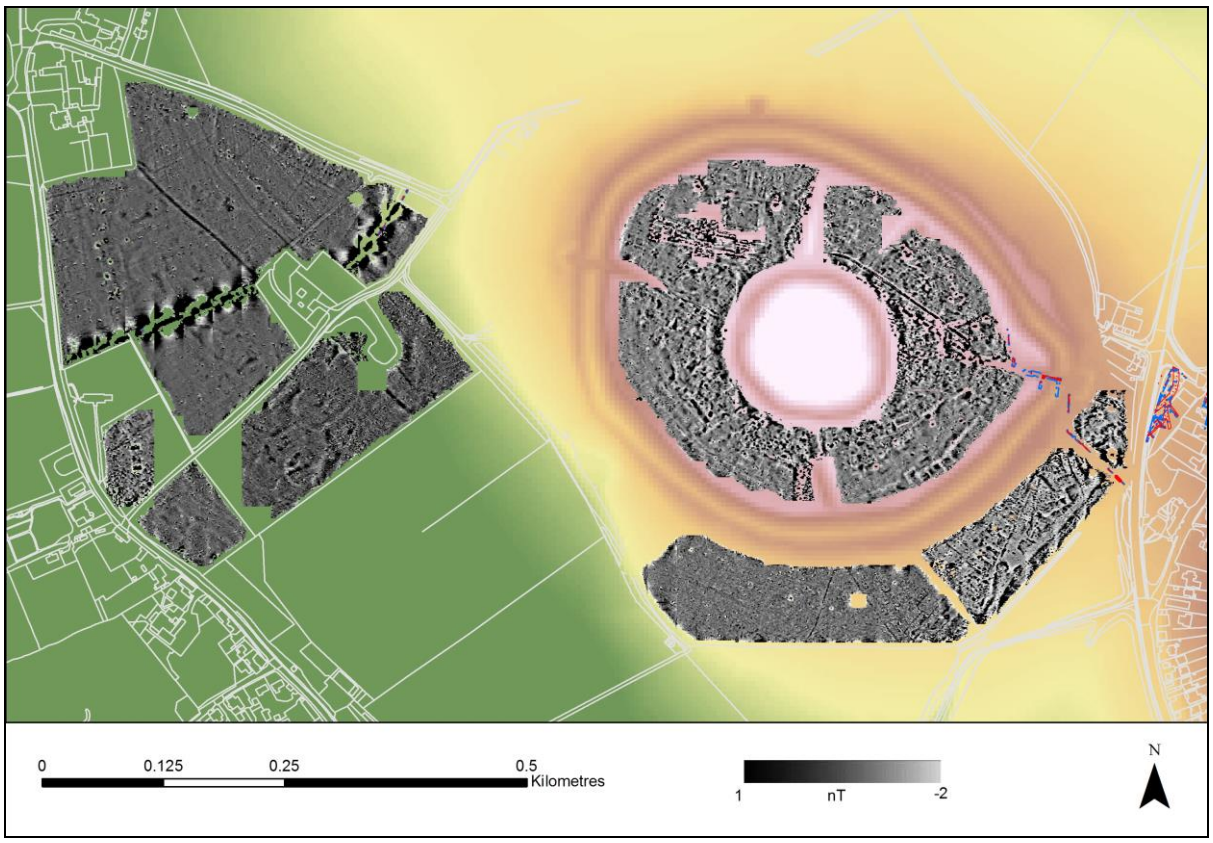

Figure 11 Greyscale image of the magnetometer survey at Old Sarum (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

To the south of Old Sarum (Figs 12 and 13) the remains of the eastern suburb seem to continue in the field immediately to the south of the earthworks of the monument. A substantial earthwork demarcates the field boundary between the area surveyed in 2015 and the field covered with magnetometry in 2016. The scale of this feature indicates that it might be less a lynchet derived from later cultivation, and suggests an earthwork thrown up to the south of the main monument. To the south of this a series of linear positive anomalies mark a system of ditches **[m178]**, **[m179]**, **[m180]** and **[m181]** all measuring some 10m in

length, and forming rectilinear enclosures, presumably associated with medieval structures similar to those located to the east.

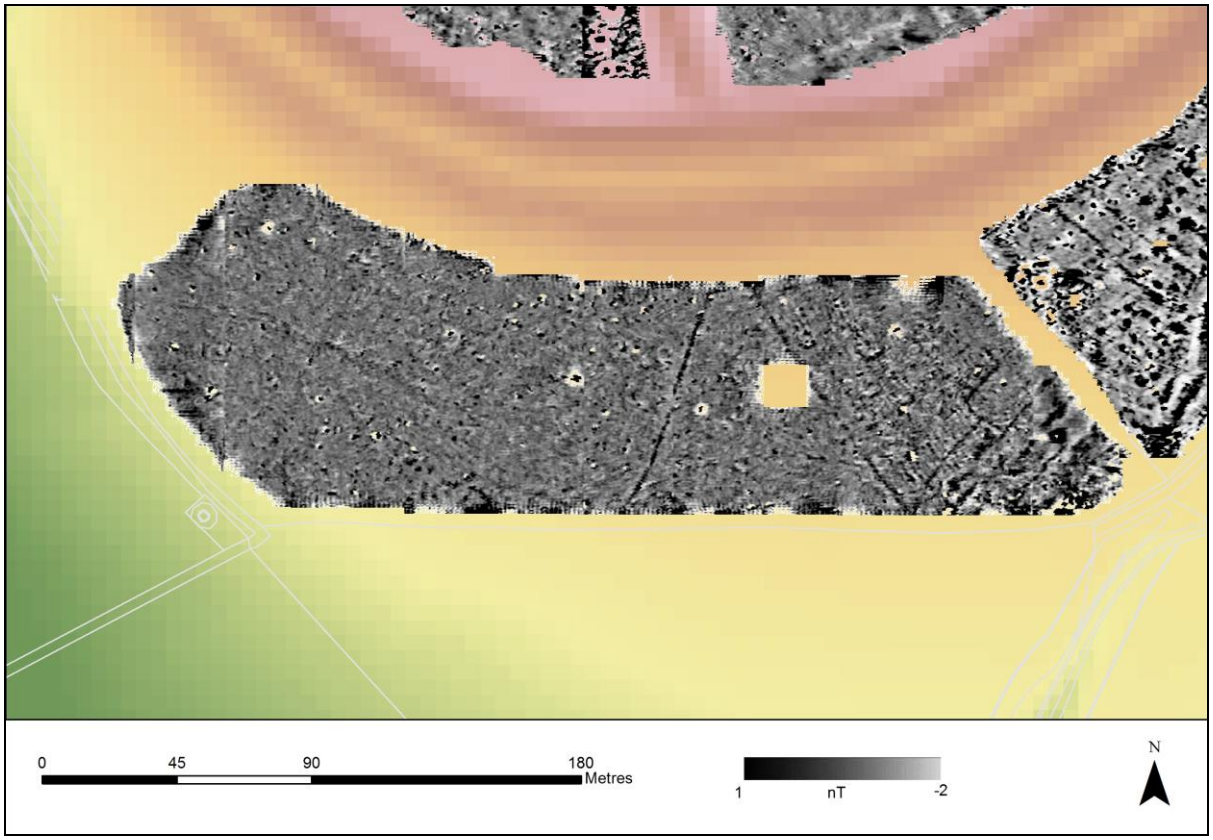

Figure 12 Greyscale image of the magnetometer survey for the field to the south of Old Sarum (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

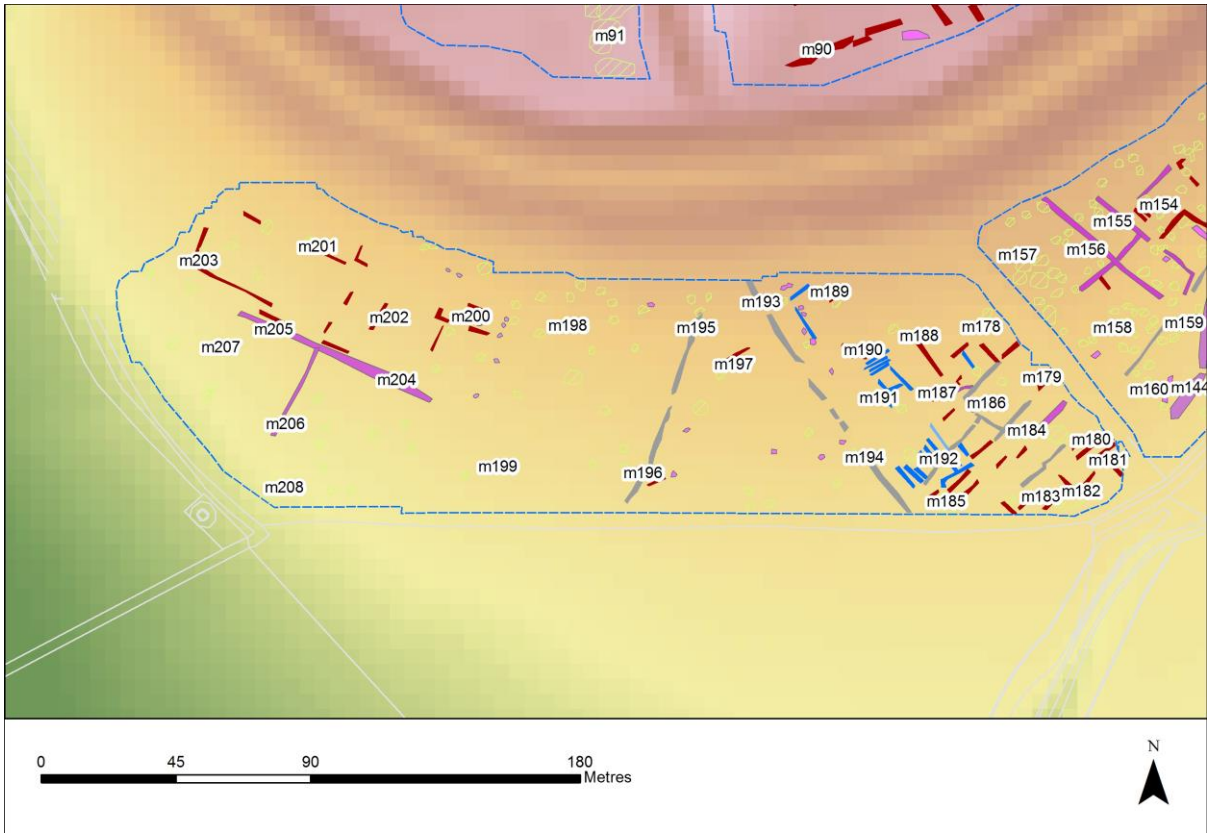

Figure 13 Interpretation plot derived from the results of the magnetometer survey for the field to the south of Old Sarum (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

These anomalies run in a north-east to south-west direction **[m182]** and **[m183]** against the modern northern and southern boundaries of the field, following instead the line of the Portway/Ackling Dyke on its way to the River Avon to the south-west of Old Sarum. A second set of linear positive anomalies **[m184]** and **[m185]** run parallel to the Portway. A open area, delineated by ditches **[m186]** and measuring some 20m by 10m is located to the north with further positive linear anomalies **[m187]** and **[m188]** to the north.

A series of negative and positive linear anomalies are ranged from north-west to south-east **[m189]**, **[m190]**, **[m191]** and **[m192]**, indicating possible remains of ditches and structures, but also possible plough damage to material. These back on to a more substantial linear anomaly **[m193]** and **[m194]** measuring 94m in length and 3m wide, marking a ditch. This feature is matched by a second ditch **[m195]** and **[m196]** running north to south for 83m and measuring 3m in width. Faint traces of linear positive anomalies **[m197]** are visible between these two anomalies.

An area of almost no linear anomalies, but with a series of discrete dipolar anomalies marking modern ferrous material is located to the west **[m198]** and **[m199]**. Further to the west, however, very faint traces of linear anomalies **[m200]**, **[m201]**, **[m202]** and **[m203]** demarcate possible remains of ditch features stretching over 95m across the area.

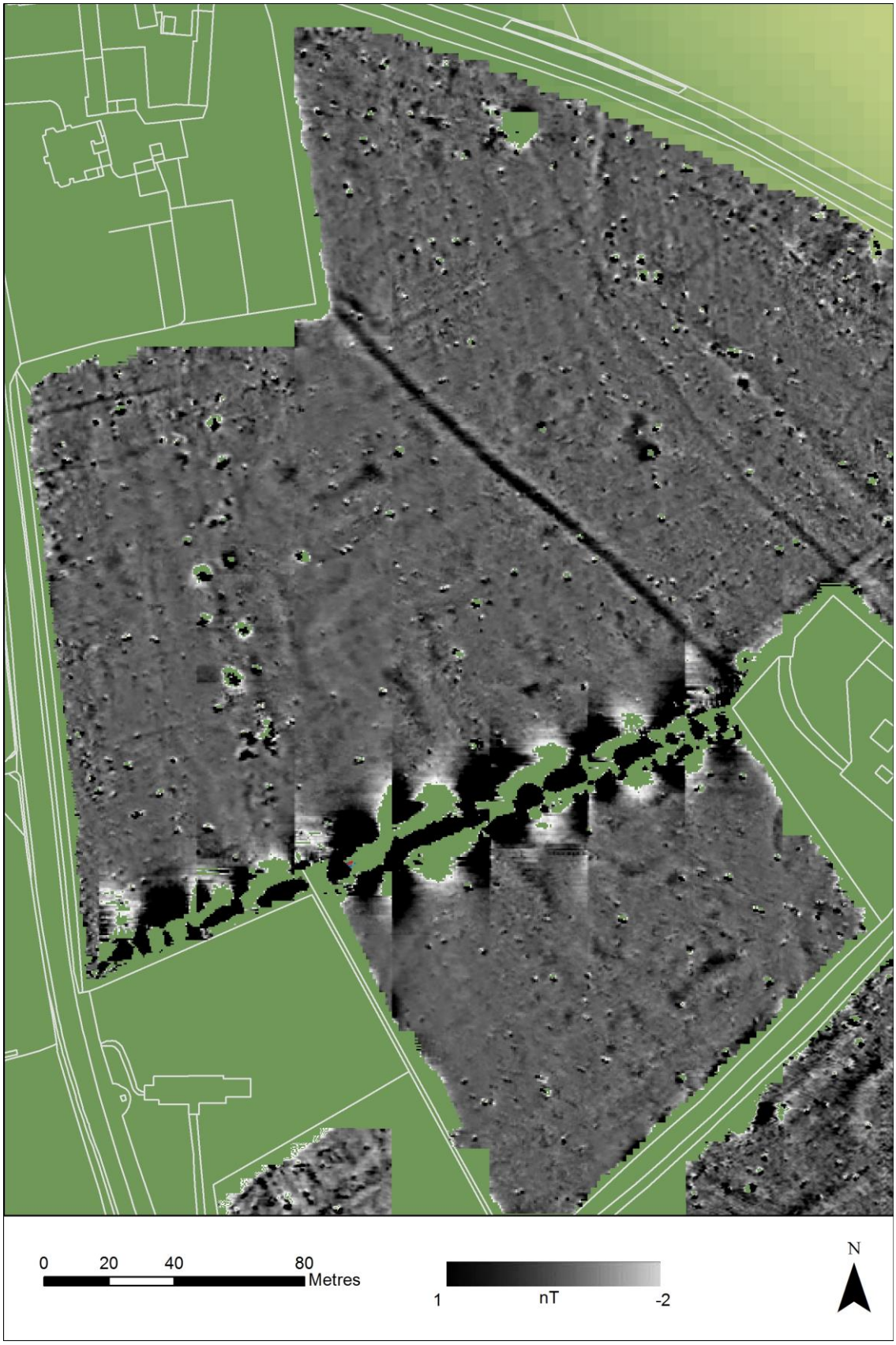

Figure 14 Greyscale image of the magnetometer survey for the western part of Dean's Park Field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

Figure 15 Interpretation plot derived from the results of the magnetometer survey for the western part of Dean's Park Field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

These are delimited by a faint but broad positive linear anomaly **[m204]** and **[m205]** marking a ditch. A similar anomaly **[m206]** runs from north to south abutting **[m205]**. Faint traces of linear anomalies **[m207]** and **[m208]** are also visible in the area.

Results of the 2017 magnetometry (Figs 14 – 21) cover some 11.5 hectares to the west of Old Sarum, to the east of the road through Stratford sub-Castle, and surrounding the churchyard of St Lawrence's church. The results are dominated by a substantial dipolar linear anomaly **[m209]**, **[m210]** and **[m211]** running for 80m to the north of the gas sub-station at Dean's Park, and for 215m across Dean's Park field to the north of St Lawrence church, marking the line of a modern gas pipeline. The rest of the survey area indicates buried remains of a complex nature, with alignments suggesting multiple phases of occupation and land use. Along the northern edge of Dean's Park field next to Phillip's Lane a substantial though faint negative linear anomaly **[m212]**, **[m213]** and **[m214]** runs from north to south for a distance of 30m, before turning to the south-east and continuing for over 135m. This seems to mark a bank or similar earthwork. To the south of this a substantial negative linear anomaly **[m215]** and **[m216]** marks a possible road and modern access to the gas sub-station. To the west of the bank feature a positive linear anomaly **[m217]** and **[m218]** indicates the line of a ditch running for 170m, forming part of a more complex system of ditches that may predate the bank feature. To the south-west of this a very substantial broad positive linear anomaly **[m219]** and **[m220]** running from north-west to south-east for a distance of 170m, and measuring 5m across indicates the line of a possible ditch or, with greater probability, the line of a road or hollow way running towards the Avon Bridge. A second smaller positive linear anomaly **[m221]** respects the line of the hollow way feature, running alongside for a distance of 20m, then turning to the north-east **[m222]** and running for a further 75m. Several other ditch features **[m223]**, **[m224]** and **[m225]** mark possible evidence of enclosure ditches pre-dating the bank feature **[m212]**.

Immediately to the south of Phillip's Lane a series of linear and rectilinear anomalies mark the presence of structures and ditches. A linear anomaly **[m226]** marks a ditch running along the southern edge of these features. A number of negative rectilinear anomalies **[m227]**, **[m228]** and **[m229]** mark possible structural remains, some measuring up to 10m across. The ditch and structural anomalies continue to the east of the pipeline **[m209]**, with several ditches **[m230]** and at least one negative rectilinear anomaly **[m231]** and **[m232]** indicating a possible building. The area to the east of the hollow way is also marked by a series of faint linear negative anomalies. Some of these suggest evidence for post-medieval plough activity, while more substantial features to the west **[m233]** indicate possible terraces, indicating where the natural chalk is closer to the surface.

In the western half of Dean's Park field, and to the west of the hollow way feature, a number of discrete positive anomalies **[m234]** and **[m235]** indicate deep deposits of possible archaeological material. A pattern of potential settlement also runs adjacent to the Stratford sub-Castle road. A strong linear positive anomaly **[m236]**, **[m237]** and **[m238]** marks a ditch with a series of dipolar anomalies along its length. Several east-west linear anomalies **[m239]**, **[m240]**, **[m241]**, **[m242]** and **[m243]** mark the boundaries of possible burgage plots fronting onto Stratford sub-Castle Lane.

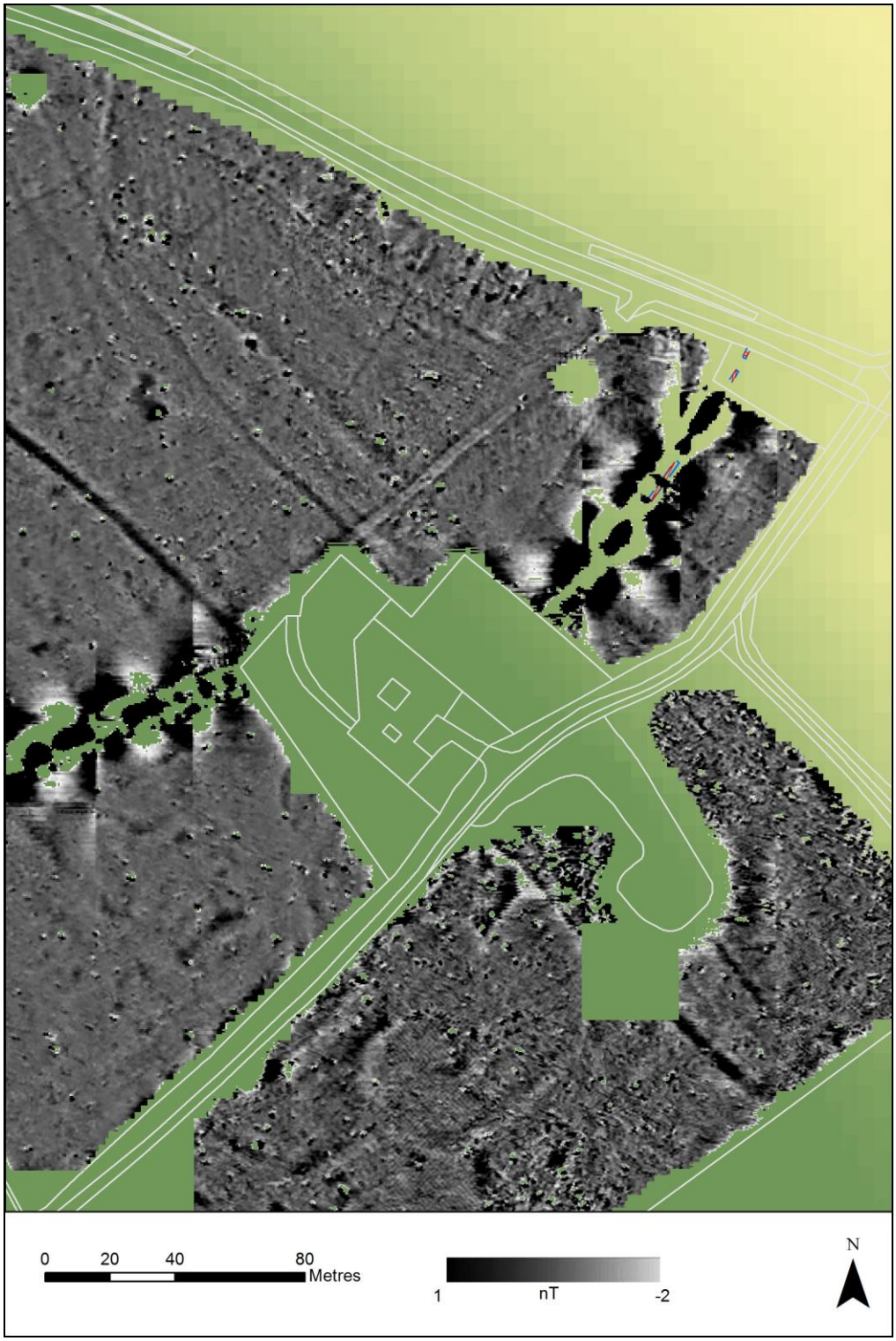

Figure 16 Greyscale image of the magnetometer survey for the eastern part of Dean's Park Field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

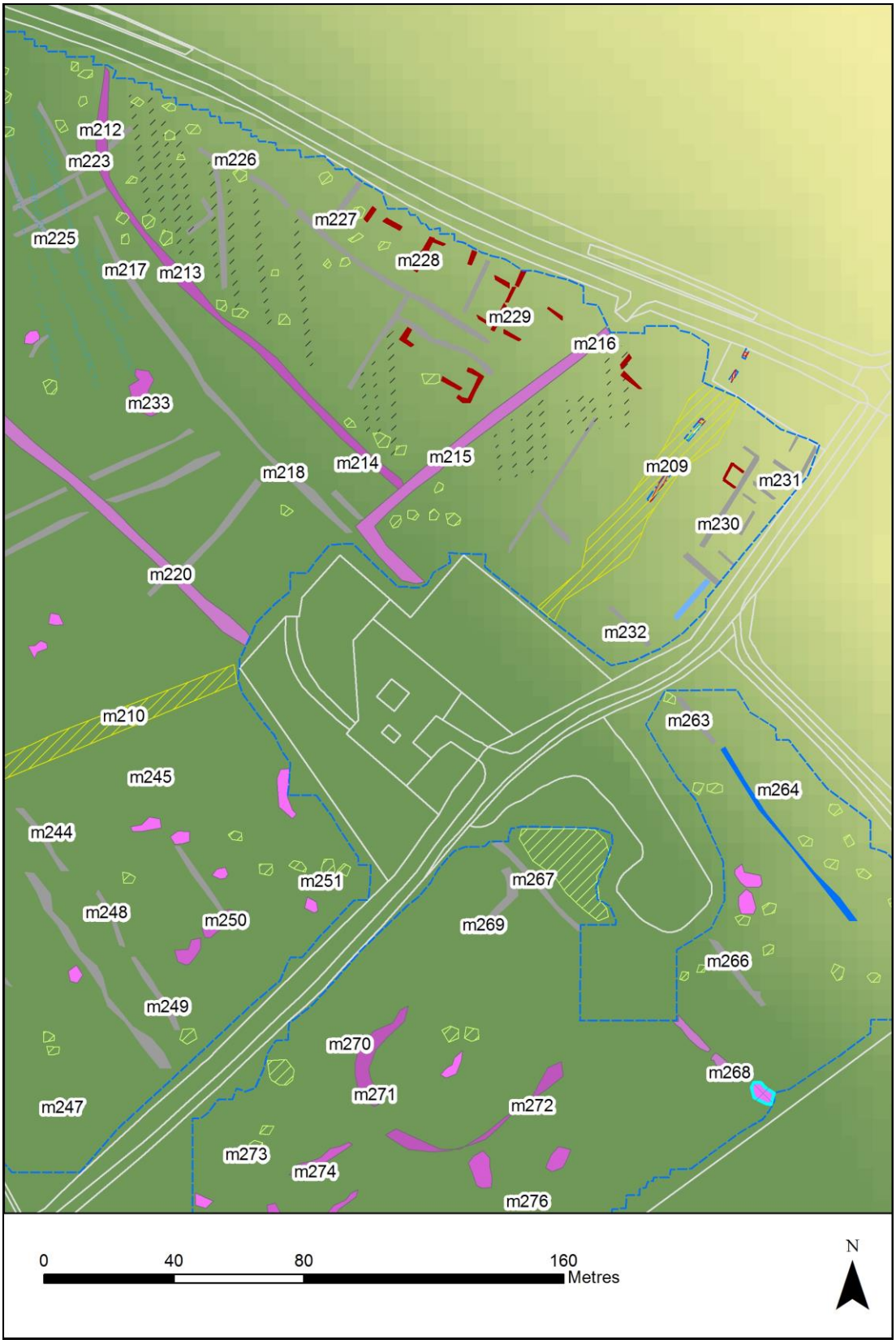

Figure 17 Interpretation plot derived from the results of the magnetometer survey for the eastern part of Dean's Park Field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

These linear anomalies are interspersed with positive and dipolar anomalies in rectilinear formation, suggesting evidence for pits and post slots for structures.

To the south of the gas pipeline **[m210]** a series of faint positive discrete anomalies are visible **[m244]**, **[m245]** with faint linear and discrete anomalies to the east of the St Lawrence churchyard **[m246]** and **[m247]**. The anomalies suggest further ephemeral deposits associated with the settlement, with some **[m248]** and **[m249]** suggesting deposits in a north-south ditch feature. Two further large discrete anomalies also indicate archaeological deposits **[m250]** and **[m251]**.

The paddock and field to the south of St Lawrence church indicate a number of anomalies associated both with the continuing pattern of the medieval settlement at Stratford sub-Castle, and with modern features. Along the northern edge of the paddock a number of linear positive anomalies and discrete pit-like features **[m252]** and **[m253]** indicate possible burgage plots and structures, with an east-west ditch marking their southern extent. To the south of this two large rectilinear dipolar anomalies **[m254]** and **[m255]** mark possible 20th century structures built from ferrous material. A series of further linear anomalies **[m256]** and **[m257]** mark possible burgage plot boundaries, although the area in the southern part of the paddock has a high level of noise caused by modern ferrous material.

The field to the south of the paddock indicates the continuation of ditches and pits in the magnetometry. A single east-west ditch is visible **[m260]** with several further anomalies in the northern corner of the field **[m258]**. Several broad bands of positive anomalies **[m259]** and **[m261]** also run across the field. Several further ditch features are marked by linear anomalies **[m262]** with possible post slot and pit features.

Magnetometry in the large field to the south of Dean's Park was incomplete by the end of the 2017 season (Fig. 22). However, a significant number of anomalies were located in the area covered by the 2017 work. In the north of the field several ephemeral ditch features run from north-west to south-east across the area **[m263]**, **[m264]** and **[m265]**. To the south a larger ditch feature is visible on the same alignment **[m266]** suggesting a possible continuation of anomaly **[m218]** from the north. To further linear anomalies **[m267]** and **[m268]** show the continuation of the linear anomaly **[m219]** and **[m220]** marking a possible ditch or hollow way. A second anomaly [m269], possibly marking a possible road, running from the line of this feature heading to the south-west.

The central portion of the field is marked by two massive negative curvilinear anomalies **[m270]**, **[m271]**, **[m272]**, **[m277]** and **[m278]**. These seem to indicate areas where gravel deposits have been banked up to protect and ovate area of ground. Surrounding these we have evidence for linear positive anomalies and pit-like anomalies **[m273]**, **[m274]**, **[m275]**, **[m276]** and **[m279]**.

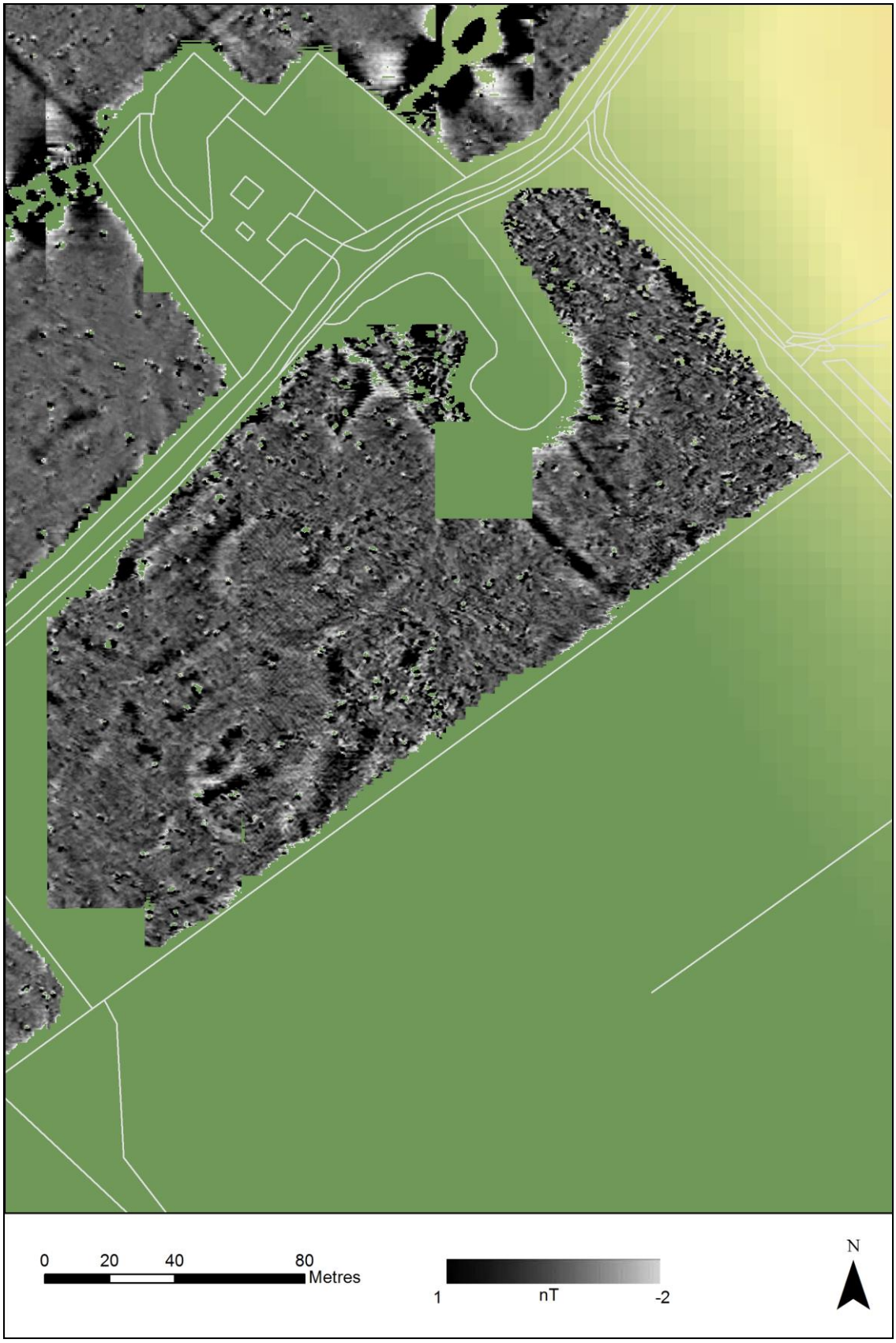

Figure 18 Greyscale image of the magnetometer survey for the east part of the long field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

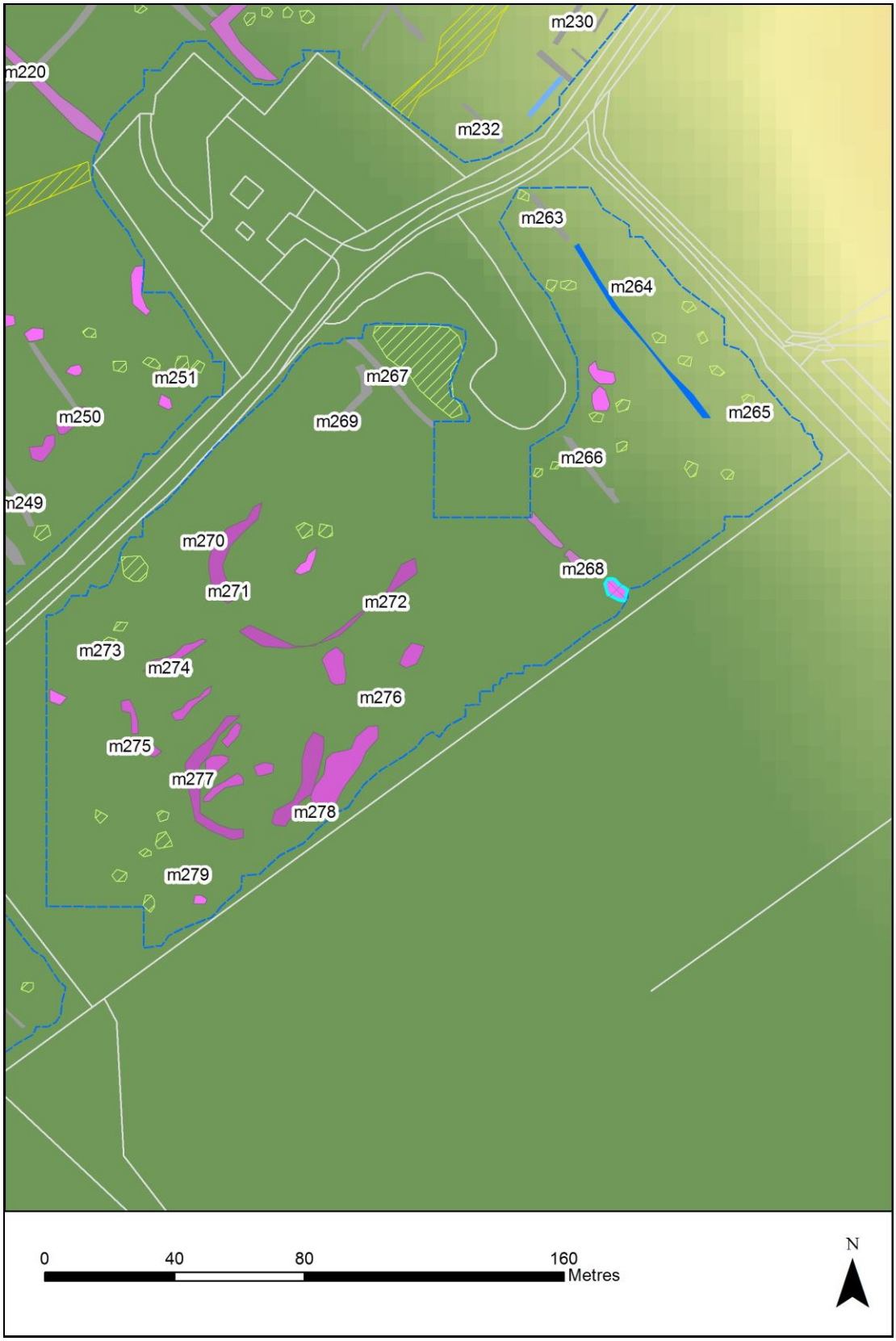

Figure 19 Interpretation plot derived from the results of the magnetometer survey for the east part of the long field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

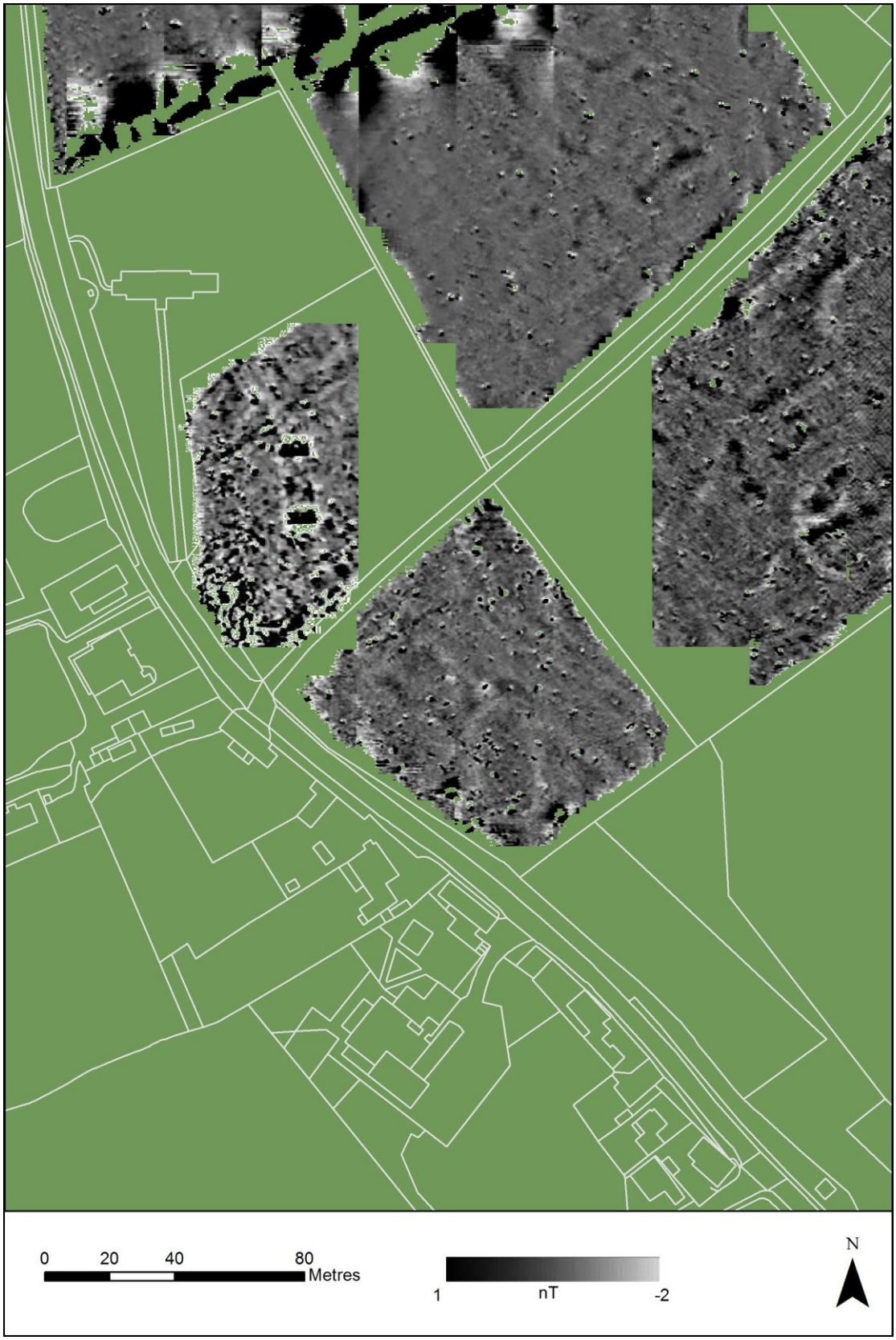

Figure 20 Greyscale image of the magnetometer survey for the paddocks and long field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

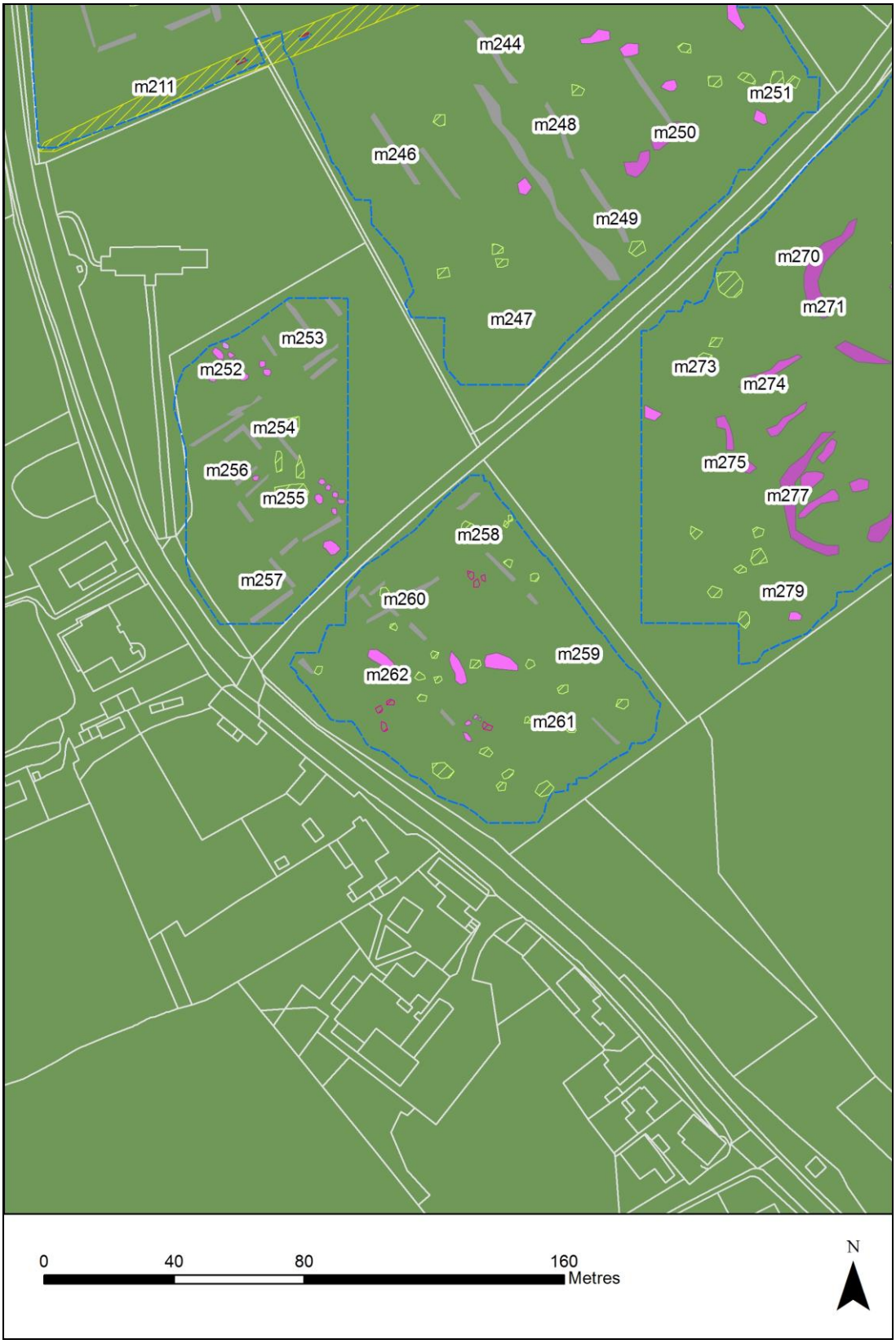

Figure 21 Interpretation plot derived from the results of the magnetometer survey for the paddocks and long field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

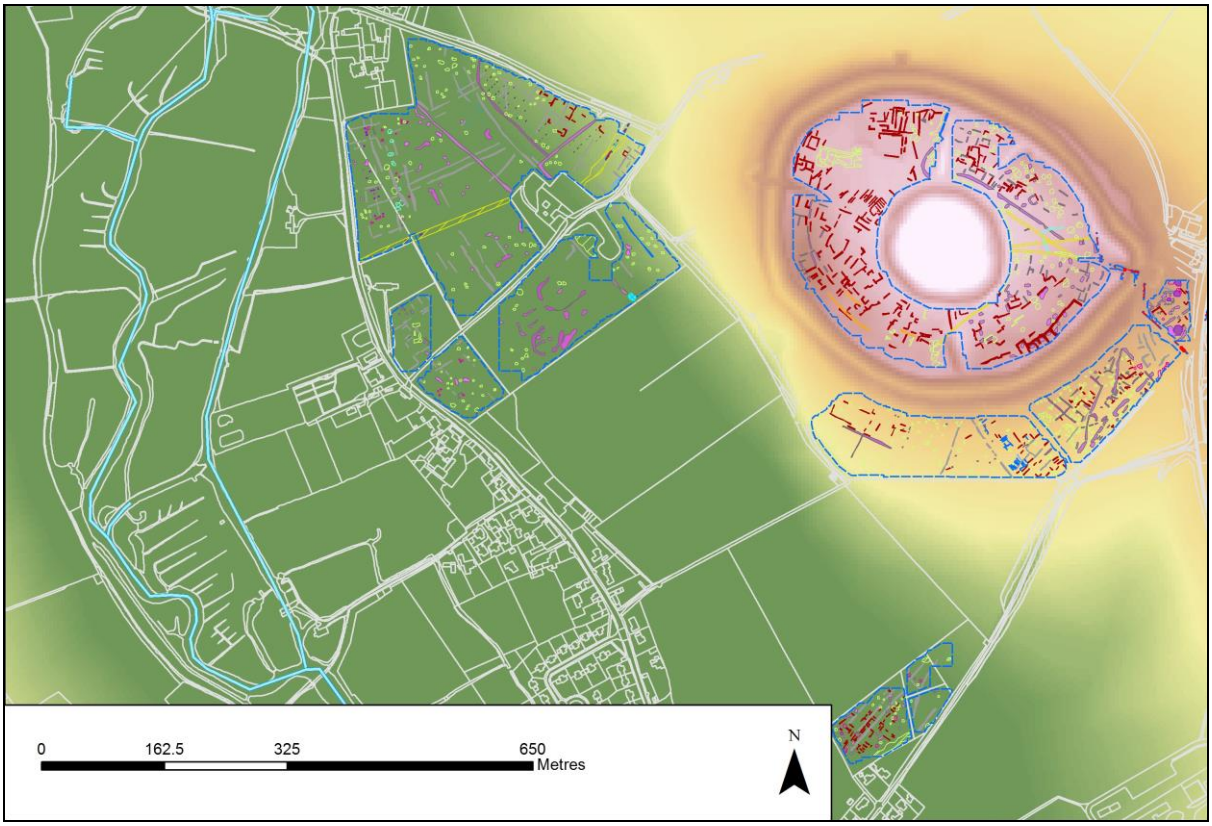

Figure 22 Interpretation layer for the magnetometry conducted in and around Old Sarum 2014-2017 (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

3.2 Earth Resistance Survey

The earth resistance surveys in 2016 and 2017 focused on a small area of survey within the inner bailey of Old Sarum, two areas of survey in the eastern suburb of Old Sarum, and a larger area of survey in the western half of Dean's Park field adjacent to the road through Stratford sub-Castle (Fig. 23). Of these only two of the areas were completed, and thus further earth resistance survey will be needed in the eastern suburb and Dean's Park. However, the results complement the magnetometer survey results in terms of the nature of the features that have been located. The results presented here follow on from the survey results in the 2014 and 2015 geophysical survey reports (Strutt et al. 2014; 2015) and therefore the numbering of features follows on from the numbering in the earlier sequences.

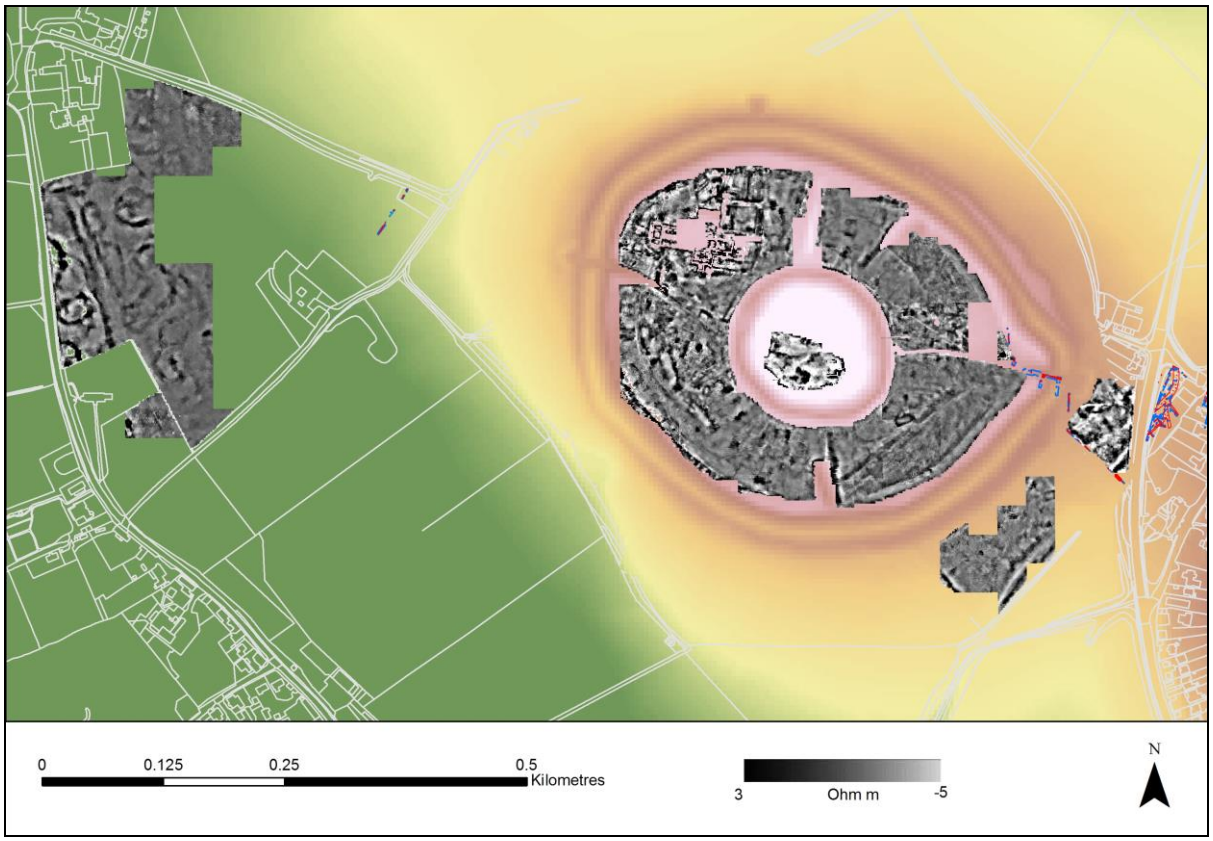

Figure 23 Greyscale image of the earth resistance survey at Old Sarum (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

The small survey area in the inner bailey (Figs 24 and 25) picked up remains of a number of buildings. These include a high resistance linear anomaly **[r121]** running from east to west for a distance of 20m with a north-south return **[r122]**. A second structure **[r123]** and **[r124]** measuring some 17m across was located in the south part of the area, with further rubble to the north **[r125]**, possible wall remains to the north of these **[r126]** and remains of a building to the east **[r127]** and **[r128]**.

Figure 24 Greyscale image of the earth resistance survey for the inner bailey at Old Sarum (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

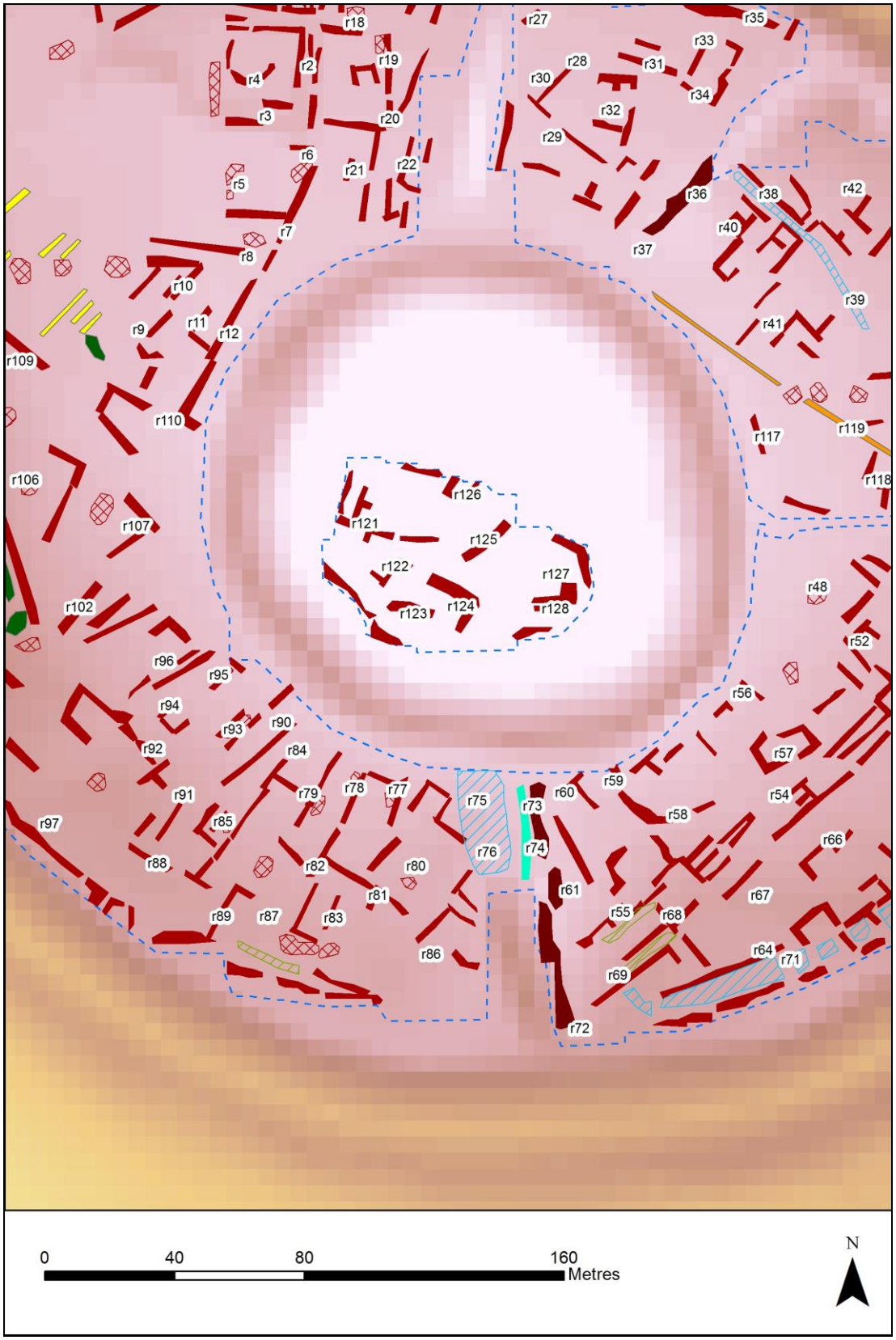

Figure 25 Interpretation plot derived from the results of the earth resistance survey for the inner bailey at Old Sarum (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

In the area of the eastern suburb of Old Sarum (Figs 26 and 27), earth resistance indicates an extension of the structures and roads located in the magnetometer results. A high resistance rectilinear anomaly **[r129]** measuring 16m across, indicates the remains of a building in the northern part of the survey area, with a second rectilinear anomaly to the east **[r130]**. A low resistance linear anomaly **[r131]** to the west of these features marks a possible road or trackway. A stronger linear anomaly **[r132]** with a second spur of low resistance measurements running off to the south **[r133]** mark two roads. To the south a set of substantial buildings is marked by a rectilinear area of high resistance anomalies **[r134]** and **[r135]** measuring over 28m across. These anomalies are cut at a tangent by a substantial low resistance linear anomaly **[r136]** and **[r137]** measuring 50m in length and 5m across, marking the line of a road. To the south of this several high resistance linear anomalies **[r138]** and **[r139]** mark further buildings. A low and high resistance linear anomaly **[r140]** on the southern edge of the area marks the line of a road or hollow way.

To the south of the modern bridleway a rectilinear high resistance anomaly **[r141]** measuring 10m by 8m marks remains of a building. Immediately to the north of this **[r142]** low resistance readings mark a possible trackway with the line of a second road or trackway **[r143]** running along the northern edge of the area. Several high resistance anomalies **[r144]**, **[r145]** and **[r146]**, and a line of high resistance readings **[r147]** and **[r148]** mark platforms and remains of structures. The latter are aligned along the side of a low resistance linear anomaly **[r149]** and **[r150]** measuring 9m in length and marking the line of a hollow way. A possible bank is also visible to the south of the hollow way **[r151]** and **[r152]**.

A series of high resistance discrete anomalies to the north and west **[r153]**, **[r154]**, **[r155]**, **[r156]** and **[r157]** mark possible structural remains and the lines of the edges of possible burgage plots running back from the hollow way towards Old Sarum. The edge of a substantial bank is located along the southern edge of the area **[r158]**.

The earth resistance survey results in Dean's Park field (Figs 28 and 29) provide an excellent counterpoint to the magnetometer survey results. In the westernmost part of the field a broad linear high resistance anomaly **[r159]** marks a bank of possible gravel indicating the northern edge of a property boundary. To the south a north-south linear high resistance anomaly **[r160]** and **[r161]** with a parallel anomaly to the west **[r162]** and **[r163]** mark two parallel banks of a track or route across the field. A similar linear anomaly **[r164]** and **[r165]** runs north-south immediately to the west, marking a possible bank.

The area is marked by a series of ovate high resistance anomalies **[r166]**, **[r167]** and **[r168]**, marking possible banks of gravel surrounding properties from the settlement. Each of these anomalies measures some 35m by 25m, with the high resistance readings measuring up to 7m across. A series of similar anomalies are located to the east **[r169]**, **[r170]**, **[r171]**, **[r172]**, **[r173]**, **[r174]** and **[r175]**, all marking similar boundaries. A linear high resistance anomaly **[r176]** also indicates one of a number of linear boundaries. Two further ovate features **[r177]** and **[r178]** are located to the south, with a linear anomaly **[r179]** also visible. In the small paddock to the west a linear anomaly marking a ditch and possible structural remains **[r180]** and **[r181]** are also visible.

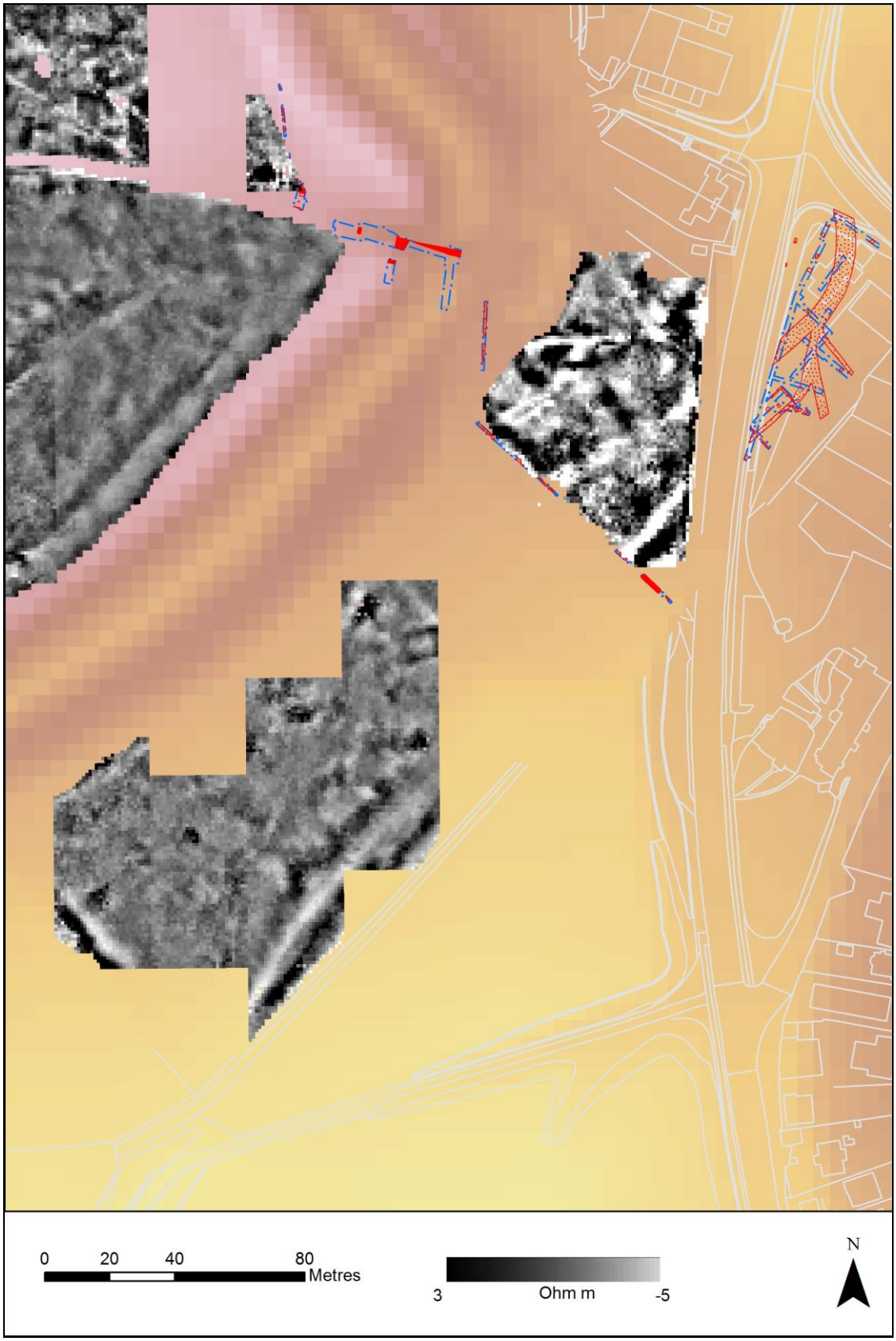

Figure 26 Greyscale image of the earth resistance survey for the eastern suburb at Old Sarum (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

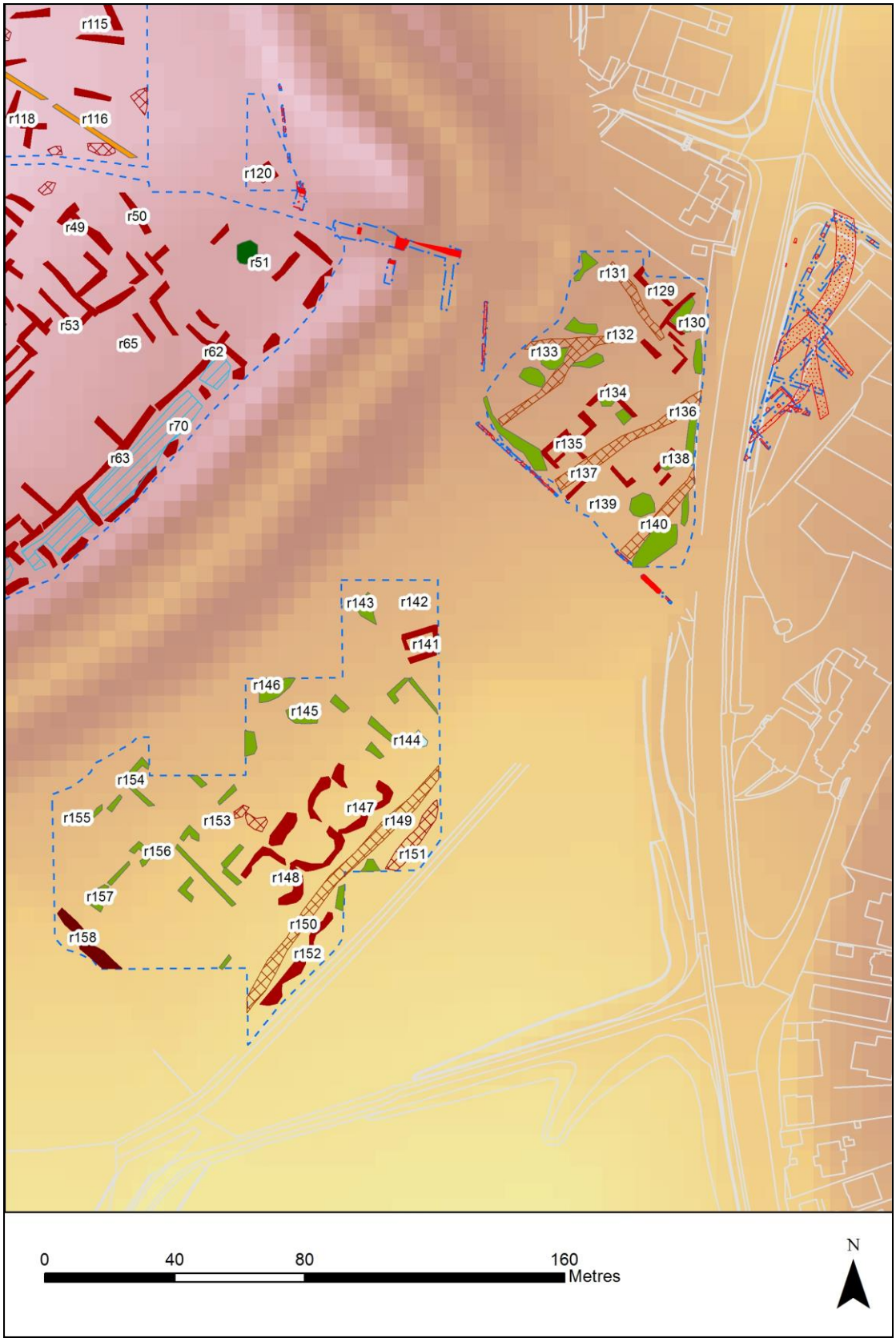

Figure 27 Interpretation plot derived from the results of the earth resistance survey for the eastern suburb at Old Sarum (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

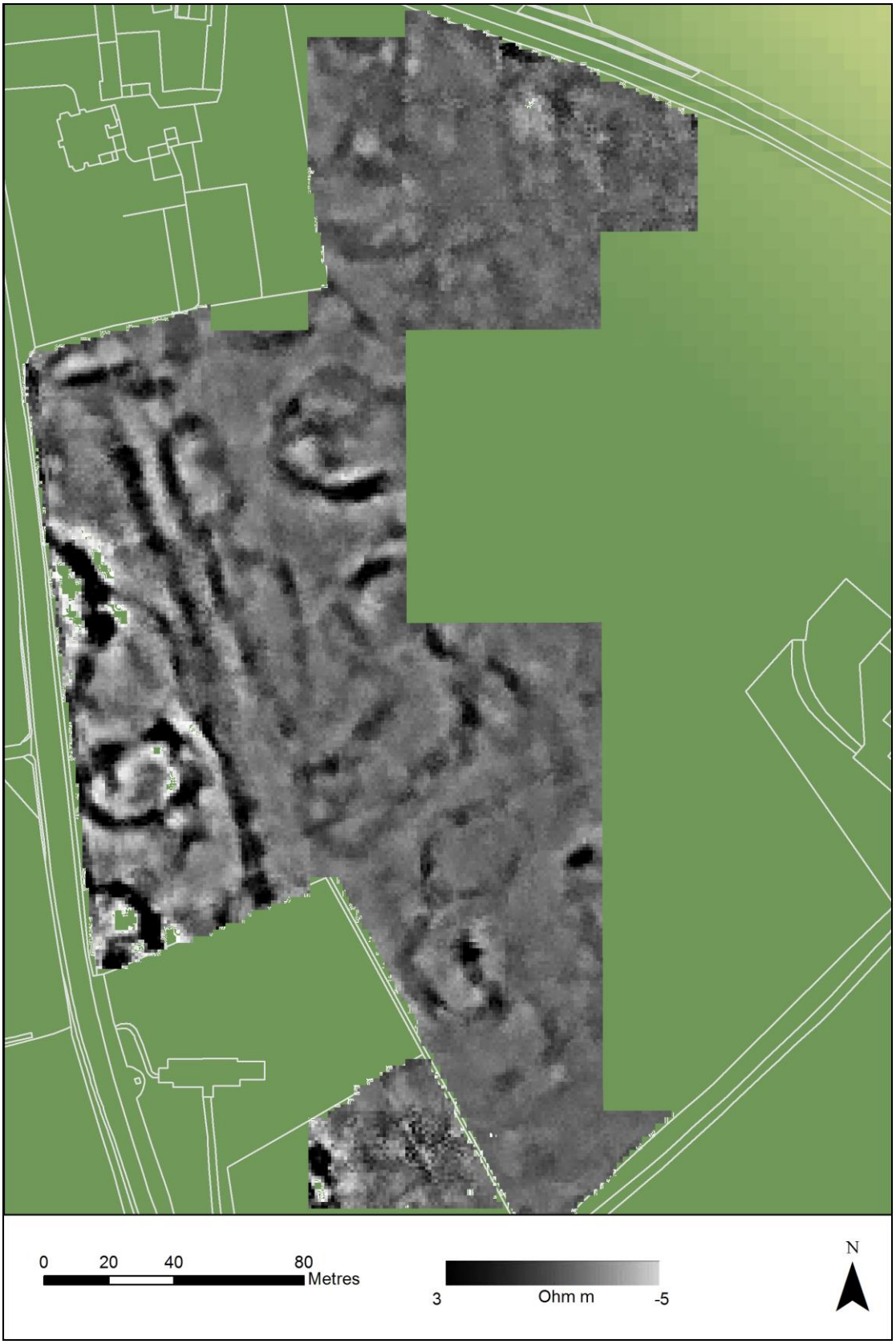

Figure 28 Greyscale image of the earth resistance survey for Dean's Park Field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

Figure 29 Interpretation plot derived from the results of the earth resistance survey for Dean's Park Field (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

Several high resistance anomalies (Figs 28 and 29) in the northern part of the survey area **[r182]**, **[r183]** and **[r184]** mark the river gravels in the area, and these may indicate a continuation of the features located in the south. A high resistance linear anomaly **[r185]** marks the line of a possible ditch or hollow way (see the magnetometry). To the north high resistance anomalies **[r186]**, **[r187]** and **[r188]** mark possible archaeological deposits including building platforms (Fig. 30).

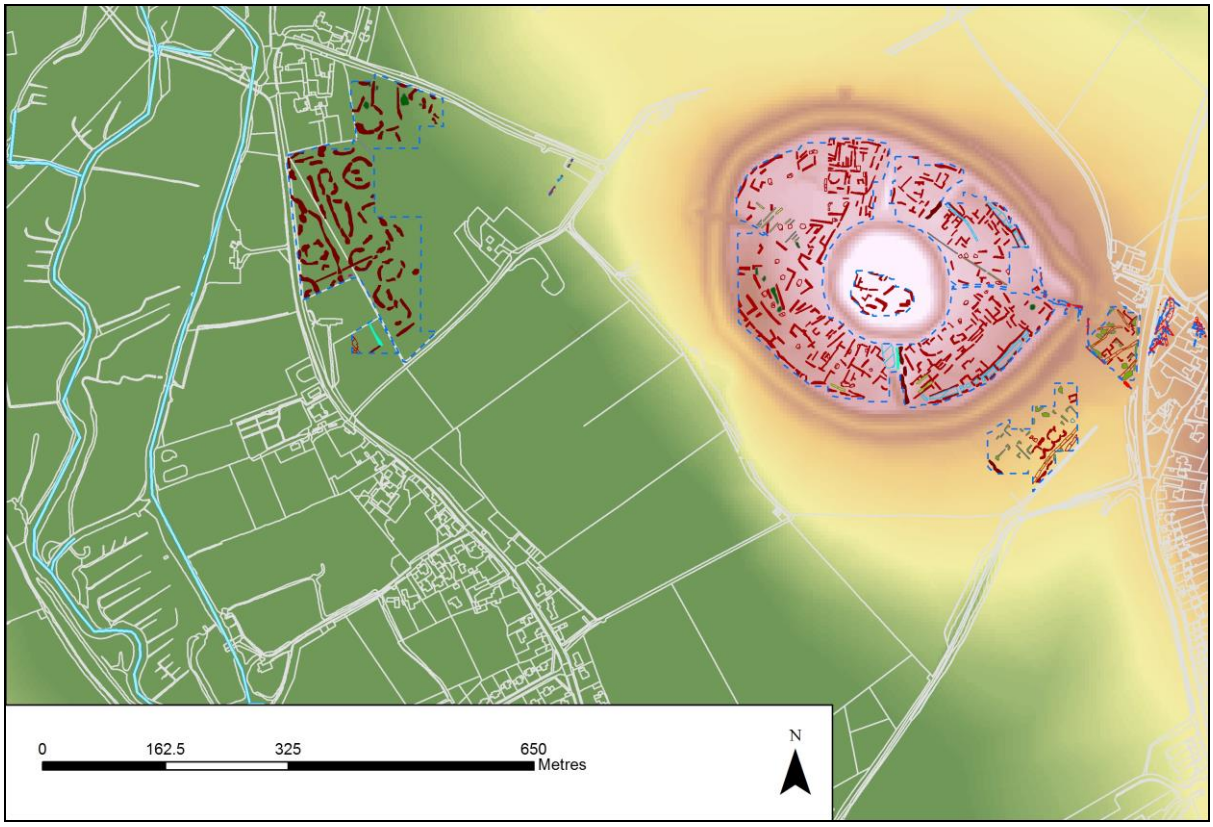

Figure 30 Interpretation plot derived from the results of the earth resistance survey for Old Sarum 2014-2017 (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

4. Discussion

The 2016 and 2017 geophysical surveys at Old Sarum (Figs 22, 30, 31) provide more food for thought on the nature and place of the city in the medieval period, and the relationship between the core of the settlement, the suburbs, and the presence of a settlement of similar period at Stratford sub-Castle.

For the inner bailey the earth resistance survey provided evidence for the extent of the supposed new hall **[r122]** and kitchen/bakehouse **[r127]** and **[r128]** in the southern part of the inner bailey (McNeill 2006, 12). These structures were uncovered during Hawley's excavations (Hope 1912; 1913) and presumably re-turfed as part of the consolidation and management of the site. Other high resistance features may indicate further structural remains not clearly represented on Hawley's plans, although these may indicate ruble of similar material in the vicinity of the keep and postern tower.

Of more substantial interest are the results of the magnetometry and earth resistance surveys in the eastern suburb and the field to the south of Old Sarum. In addition to the results of the 2015 season (Strutt et al. 2015) the 2016 results indicate the continuation of a series of roads **[m145]**, **[m146]**, **[r149]**, **[r150]** showing the line of the Portway/Ackling Dyke with a number of adjoining roads. These place the structures and roads located for the eastern suburb excavations (Musty and Rahtz 1964) in context, with the braided nature of the roads in the excavation continuing to the south-west in the geophysical survey results.

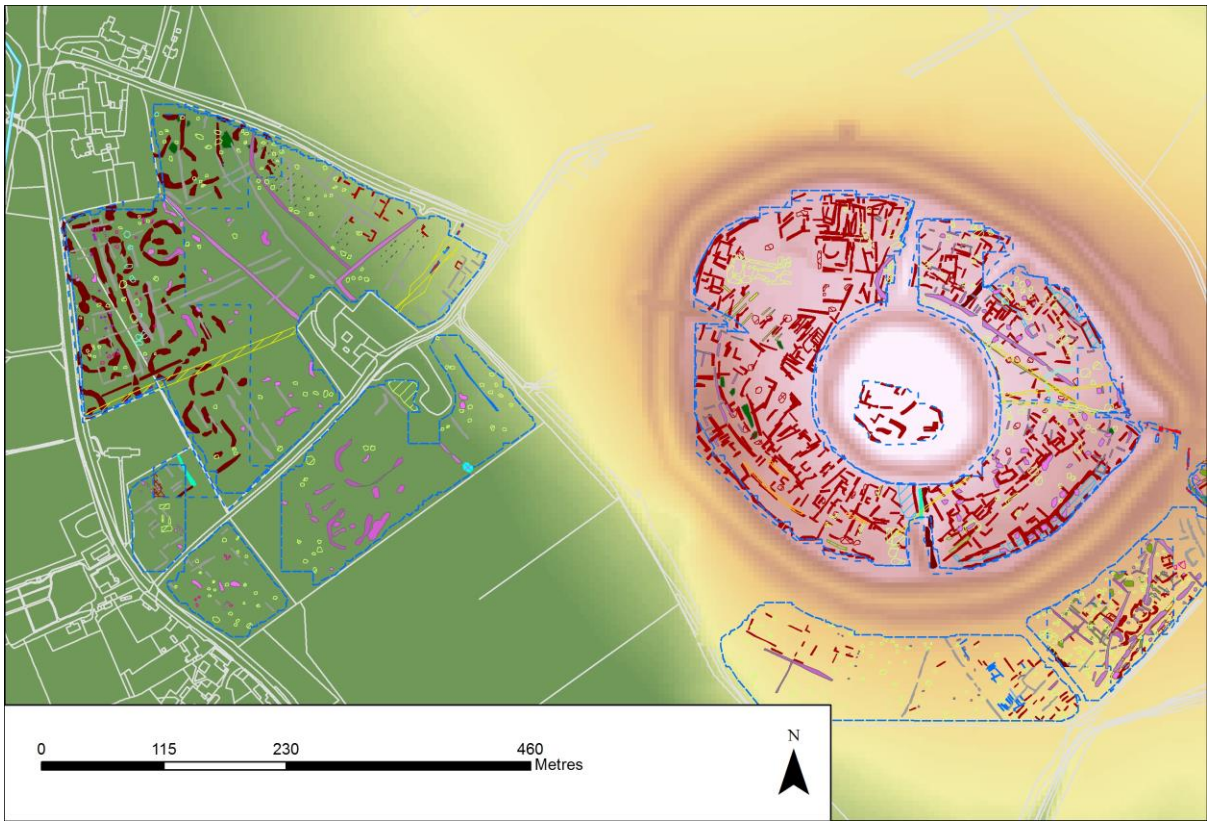

Figure 31 Composite plan of the magnetometer and earth resistance interpretations (© Crown Copyright/database right 2016. An Ordnance Survey/EDINA supplied service)

Results of the survey in this area also suggest possible different phasing between Roman and medieval structures in the area. Firstly, the line of a road **[r137]** cuts the area of potentially earlier structures. This finds some degree of corroboration in the pipeline excavations in the eastern suburbs in 1967 (The Salisbury Museum Archive), where in section S-T alongside **[r135]** and **[137]** lower deposits with Roman finds (e.g. context 136) are cut by later medieval deposits. In fact the Roman layers are superceded by two phases of medieval deposits, including 10th to 11th century material (context 135) and 12th century midden deposits with tripod pitchers and scratch ware ceramics. The different potential phases of settlement seem to continue along the line of the Portway to the south-west. Notably in the magnetometry this is indicated by possible platforms and structures on slightly different alignments, and the presence of (presumably) medieval burgage pots running back from the line of the road. The presence of platforms alongside the road **[r147]** and **[r148]** also shows that some quite substantial settlement was located in this area. This pattern of extra-mural settlement contibues in the corner of the field to the south of Old Sarum [m180], **[m181]** in spite of the quite obvious drop in the modern ground level, and presumable erosion of the Roman and medieval settlement in the construction of a later earthwork (see also Tatler and Bellamy 2008). The nature of this earthwork cannot be elucidated from the geophysical survey, however, its size suggests that it is not a lynchet derived from medieval cultivation. Bearing in mind its location, a hypothesis could be that is forms part of a system of earthworks cast up during the Civil War on the line of the road to Amesbury, and at a pinch-point in the landscape between Old Sarum and the ridge to the south-east.

Results of the survey in Dean's Park field and the surrounding area provide a new dynamic for our understanding of Old Sarum and its environs (Fig. 32). Most notably, the presence of a bank feature enclosing the northern part of the field **[m212]**, **[m213]** and **[m214]**, together with the presence of structural remain alongside Phillip's Lane **[m227]**, **[m228]**, **[m229]**, **[m230]** and **[m231]** suggest potential activity to the west of the monument of Old Sarum contemporaneous with the principle phases of medieval settlement. Excavation of a trench over the bank feature in 2017 (Langlands and Strutt forthcoming) provided evidence for a 12th and 13th century date for later phases of the feature, suggesting that the enclosing feature is contemporary with the heyday of Old Sarum as a medieval city. The complexity of the phasing of the area is also illustrated by this area, where the principal medieval features and anomalies are preceded by possible earlier ditch features **[m222]**, **[m225]**, **[m224]**, **[m217]** and **[m218]** of unknown date, but possibly Iron Age or Roman. The substantial ditch or road feature cutting across the area **[m219]**, **[m220]** also indicates possibly earlier activity. The fact that this feature runs towards the Avon Bridge indicates that it may represent the remains of a road running from the Roman settlement and line of the Portway to the south-east.

The presence of a much more extensive settlement at Stratford sub-Castle to the north and south of St Lawrence church is perhaps not surprising, given the presence of Tudor and later extant houses and properties in the vicinity. However, the pattern of burgage plot boundaries **[m239]**, **[m241]**, **[m243]** and associated pit and post slot features, and the substantial ovate anomalies in the results of the earth resistance survey **[r167]**, **[r168]**, **[r166]** suggest both multiple phases of activity, and the creation of large-scale property boundaries or flood defences. Bearing in mind the location of the settlement on the floodplain of the

Avon, comparison with other medieval settlements in wetland areas shows promise. It is certainly worth highlighting the presence of similar features on settlements elsewhere in the British Isles (Rippon 2002).

Excavation over one of the plot boundaries in 2017 (Langlands and Strutt forthcoming) indicated that the main ditch feature dates to the 13th century. However, earlier features provided preliminary evidence dating them to the 10th/11th century and a Saxo-Norman phase of activity[1]. Thus it seems relatively certain that Saxon settlement was present along the Avon to the west of Old Sarum prior to the medieval city being founded.

[1] Spot dating of features from the 2017 excavation season was conducted during a Societry of Antiquities funded workshop on the medieval ceramics at Old Sarum, held at the Salisbury Museum on 1st and 2nd February 2018.

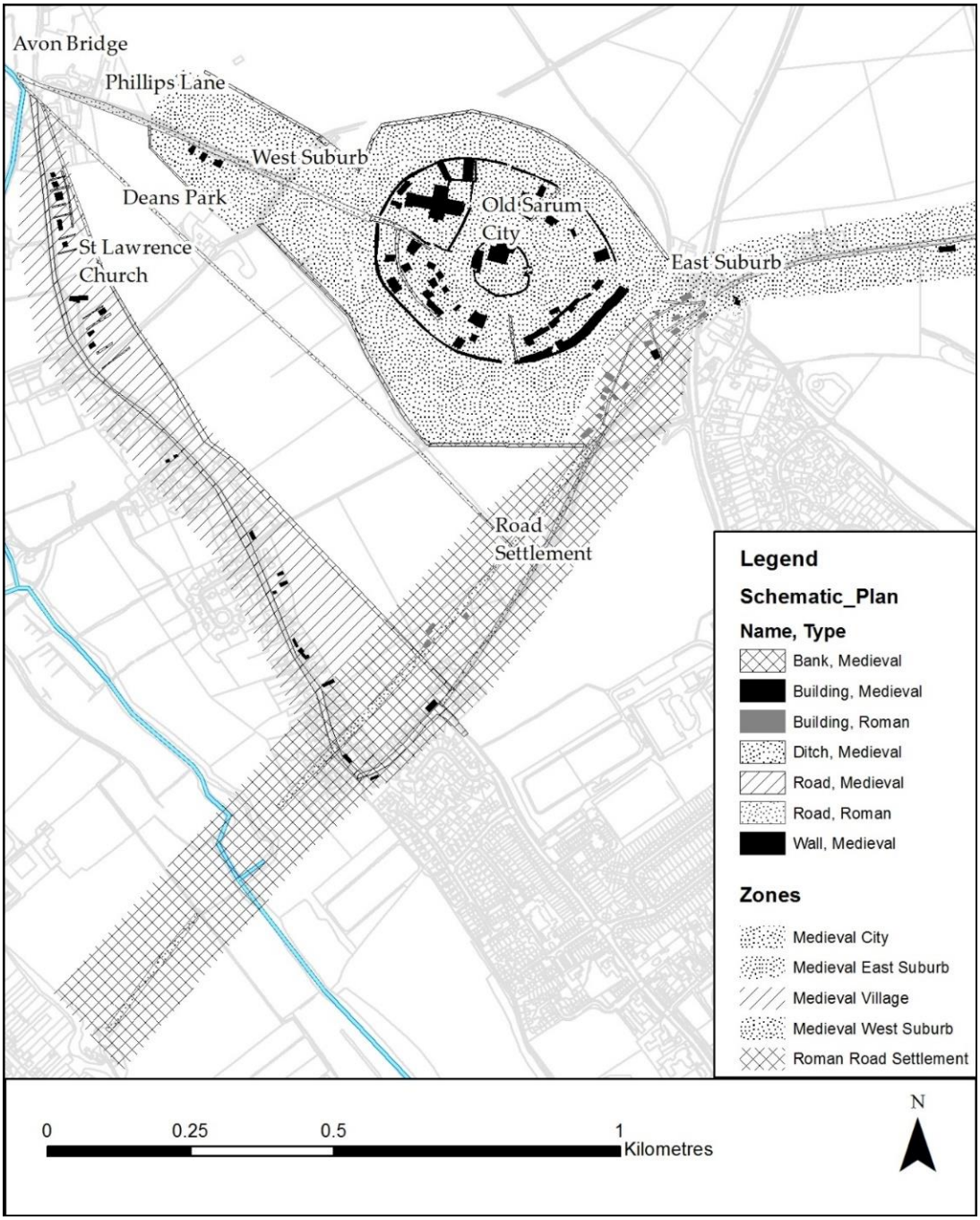

Figure 32 **Preliminary schematic diagram of the environs of Old Sarum, indicating different areas of the landscape based on the current survey results**

5. Conclusions

Results of the magnetometry and earth resistance surveys in 2016 and 2017 have provided extensive coverage and data on the nature and extent of archaeology, both in terms of the eastern suburb of the city, and a potential western suburb. The pattern of roads and tracks in the vicinity of Old Sarum are clearly represented in the results, including the routes associated with the Portway/Ackling Dyke and a new road or hollow way running to the west of Old Sarum linking the Portway/Ackling Dyke with the Avon and Avon Bridge. Structures and ditches associated with a possible western suburb are clearly visible in the magnetometry, and future survey work will investigate the area to the north of Phillip's Lane. The extent of settlement in the eastern suburb has also been revealed, although further earth resistance survey in the area is required. Finally the extent of an Saxo-Norman and medieval settlement to the west of Old Sarum, part of the settlement of Stratford sub-Castle, has been mapped in part.

6. Recommendations

- The results of the magnetometer and earth resistance survey both successfully indicate the nature and extent of archaeological features to the east and west of Old Sarum. It is recommended that an integration of different techniques should be applied, including GPR, earth resistance and magnetometry to continue to map features outside of the curtilage of the ancient monument.
- On the basis of the 2016 and 2017 survey results, it is recommended that further magnetometry and earth resistance survey are conducted to target the areas along the Portway/Ackling Dyke, and between Old Sarum and the River Avon.
- In key areas of archaeological interest, for instance the western suburb, targeted GPR survey should be considered to map the extent of possible settlement.

7. Statement of Indemnity

Whilst every effort has been made to ensure that interpretation of the survey presents an accurate indication of the nature of sub-surface remains, any conclusions derived from the results form an entirely subjective assessment of the data. Geophysical survey facilitates the collection of data relating to variations in the form and nature of the soil. This may only reveal certain archaeological features, and may not record all the material present. It must be stressed that accurate interpretation of responses within small areas can prove difficult.

Acknowledgments

Considerable advice and assistance was received from a number of sources in the completion of this survey. Primarily, thanks go to Historic England and the inspector of ancient monuments, Mr Phil McMahon, for support in the drafting of the project document and application for Section 42 licence. Warm thanks are also extended to Dr Heather Sebire the Property Curator for English Heritage in supporting the fieldwork and offering advice and assistance, and to Ms Cameron Moffett the collections curator at English Heritage. The continued assistance and collaboration with Wiltshire County Council Archaeology Service is also recognised, and special thanks are owed to Ms Clare King the assistant county archaeologist. The support of the English Heritage team at Old Sarum is also kindly acknowledged, with thanks to Andy Phillips and Megan Fowlerand all of the team.

The kind permission of the Earl and Countess of Chichester was instrumental in the continuing research to the west of Old Sarum, and for the results of the survey in Dean's Park Field. Work would not have been possible without the effort and assistance of Mr Philip Simmonds during the 2017 seasons.

The authors are also particularly grateful to Bill Moffat, Jim and Heather Platt, Rosemary Winson and the Friends of Old Sarum for their input and support for the geophysical research programme.

A week of survey in the 2016 July field season was funded by the EPSRC through a grant awarded to Alex Langlands at the University of Swansea.

Finally, while this survey was partly carried out by the authors, its successful completion would have been impossible without the hard work of the survey team. Warm thanks are extended to all of the students, both undergraduate and postgraduate, that attended the survey, and special thanks are extended to all of the volunteers who worked on the survey in 2016 and 2017.

Appendix 1 Details of Survey Strategy

Dates of Survey: March 2016 to July 2017

Site: Old Sarum, Wiltshire

Surveyors: Department of Archaeology, University of Southampton

Personnel: Dominic Barker, , Timothy Sly, Kristian Strutt, undergraduates and postgraduates from the Department of Archaeology, University of Southampton, volunteers.

Geology: Chalk

Survey Type 1: Magnetometer

Approximate area: 11.5 hectares

Grid size: 30m

Traverse Interval: 0.5m

Reading Interval: 0.25m

Instrument: Bartington Instruments *Grad601-2* Dual Array Twin Fluxgate Gradiometer

Resolution: 0.1 nT

Trigger: *Grad-01* Data Logger

Survey Type 2: Earth resistance

Approximate area: 5 hectares

Grid size: 30m

Traverse Interval: 1m

Reading Interval: 1m

Instrument: Geoscan Research Resistance Meter RM15

Appendix 2: Archaeological prospection techniques utilised by the British School at Rome (BSR) and the Archaeological Prospection Services of Southampton (APSS)

The following appendix presents a summary of prospection methods, implemented by the BSR and the APSS to determine the extent and nature of sub-surface archaeological structures, remains and features. The methodology usually applied by the BSR and APSS places an emphasis on the integration of geophysical, geochemical and topographic survey to facilitate a deeper understanding of a particular site or landscape.

Geophysical Prospection

A number of different geophysical survey techniques can be applied by archaeologists to record the remains of sub-surface archaeological structures. Magnetometer survey is generally chosen as a relatively time-saving and efficient survey technique (Gaffney *et al*. 1991: 6), suitable for detecting kilns, hearths, ovens and ditches, but also walls, especially when ceramic material has been used in construction. In areas of modern disturbance, however, the technique is limited by distribution of modern ferrous material. Resistivity survey, while more time consuming is generally successful at locating walls, ditches, paved areas and banks, and the application of resistance tomography allows such features to be recorded at various depths. The BSR and APSS also implement topographic surveys over areas of prospection, to record important information concerning the location of the site. A summary of the survey techniques is provided below.

Resistivity Survey

Resistivity survey is based on the ability of sub-surface materials to conduct an electrical current passed through them. All materials will allow the passing of an electrical current through them to a greater or lesser extent. There are extreme cases of conductive and non-conductive material (Scollar *et al*. 1990: 307), but differences in the structural and chemical make-up of soils mean that there are varying degrees of resistance to an electrical current (Clark 1996: 27).

The technique is based on the passing of an electrical current from probes into the earth to measure variations in resistance over a survey area. Resistance is measured in ohms (Ω), whereas resistivity, the resistance in a given volume of earth, is measured in ohm-metres (Ω/m).

Four probes are generally utilised for electrical profiling (Gaffney *et al*. 1991: 2), two current and two potential probes. Survey can be undertaken using a number of different probe arrays; twin probe, Wenner, Double-Dipole, Schlumberger and Square arrays.

The array used by the BSR and APSS utilises a Geoscan Research RM15 Resistance Meter in twin electrode probe formation. This array represents the most popular configuration used in British archaeology (Clark 1996; Gaffney *et al*. 1991: 2), usually undertaken with a 0.5m separation between mobile probes. Details of survey methodology are dealt with elsewhere (Geoscan Research 1996).

A number of factors may affect interpretation of twin probe survey results, including the nature and depth of structures, soil type, terrain and localised climatic conditions. Response to non-archaeological features may lead to misinterpretation of results, or the masking of archaeological anomalies. A twin probe array of 0.5m will rarely recognise features below a depth of 0.75m (Gaffney *et al*. 1991). More substantial features may register up to a depth of 1m. With twin probe arrays of between 0.25m and 2m, procedures are similar to those for the 0.5m twin probe array.

Although changes in the moisture content of the soil, as well as variations in temperature, can affect the form of anomalies present in resistivity survey results, in general, higher resistance features are interpreted as structures which have a limited moisture content, for example walls, mounds, voids, rubble filled pits, and paved or cobbled areas. Lower resistance anomalies usually represent buried ditches, foundation trenches, pits and gullies. In addition to the normal twin electrode method of survey, a Geoscan Research MPX15 multiplexer can be utilised with the Resistance Meter, allowing multiple profiles of resistivity to be recorded simultaneously, or resistance tomography to be carried out up to a depth of 1.5m. APSS generally survey, as with the twin electrode configuration, to a resolution of 1 or 0.1Ω, with readings every metre or half metre.

Magnetic Survey

Magnetic prospection of soils is based on the measurement of differences in magnitudes of the earth's magnetic field at points over a specific area. Principally the iron content of a soil provides the basis for its magnetic properties. Presence of magnetite, maghaemite and haematite iron oxides all affect the magnetic properties of soils. Although variations in the earth's magnetic field which are associated with archaeological features are weak, especially considering the overall strength of the magnetic field of around 48,000 nanoTesla (nT), they can be detected using specific instruments (Gaffney *et al*. 1991).

Three basic types of magnetometer are available to the archaeologist; proton magnetometers, fluxgate gradiometers, and alkali vapour magnetometers (also known as caesium magnetometers, or optically pumped magnetometers). Fluxgate instruments are based around a highly permeable nickel iron alloy core (Scollar *et al*. 1990: 456), which is magnetised by the earth's magnetic field, together with an alternating field applied via a primary winding. Due to the fluxgate's directional method of functioning, a single fluxgate cannot be utilised on its own, as it cannot be held at a constant angle to the earth's magnetic field. Gradiometers therefore have two fluxgates positioned vertically to one another on a rigid staff. This reduces the effects of instrument orientation on readings.

Archaeological features such as brick walls, hearths, kilns and disturbed building material will be represented in the results, as well as more ephemeral changes in soil, allowing location of foundation trenches, pits and ditches. Results are however extremely dependent on the geology of the particular area, and whether the archaeological remains are derived from the same materials. For fluxgate gradiometer survey, the Bartington Grad601-2 is used. This is a twin array probe, so carries two fluxgate gradiometers which work simultaneously to increase the speed of a survey. Survey is carried out at 0.1nT

resolution, with readings taken every 0.5m by 0.25m. In flat and open territory around 1 hectare per day can be surveyed by each instrument.

Ground Penetrating Radar Survey

Ground Penetrating Radar (GPR) survey is based on the use of an electromagnetic radar wave propagated through the soil to search for changes in soil composition and the presence of structures, measuring the time in nanoseconds (ns) taken for the radar wave to be sent and the reflected wave to return. The propagation of the signal is dependent on the Relative Dielectric Permittivity of the buried material.

This technique has been applied successfully on a range of archaeological sites, in particular over substantial urban archaeological remains. GPR has been used by APSS at the Domus Aurea in Rome, at Forum Novum, and at Italica in Spain. Use of GPR is more time consuming than using magnetometry. It is more appropriate to apply this method to target particular areas of interest at an archaeological site where magnetometry or resistivity have already been applied, or where there is a potential for deeper archaeological deposits.

APSS operates a Sensors and Software radar system, configured for use with a Smartcart frame and console. This utilises a 500 Mhz antenna, which allows propagation of radar waves down to a depth of approximately 3-4m depending on the nature of the sub-surface materials.

Topographic Survey

The modern ground surface or topography often contains important information on the conditions and nature of an archaeological site, and the potential existence of structures buried beneath the soil (Bowden 1999). The changes in topography can also have a great influence on determining the nature of features in a geophysical survey. Therefore it is vital to produce a detailed and complete topographic survey as part of the field survey of any given site. This generally entails the recording of elevations across a grid of certain resolution, for instance 5 or 10m intervals, but also the recording of points on known breaks of slope, to emphasis archaeological features in the landscape.

Survey is usually undertaken by the BSR/APSS using a total station or electronic theodolite, although Global Positioning Satellite systems (GPS) are also utilised, to record the survey points. Computer software is then used to produce Digital Elevation Models of the results. Normally, survey is carried out using a Leica total station (BSR – TC805), with readings taken every 4 metres, and also on the breaks of slope of important topographical features. The resolution can be increased where necessary. Up to 5 hectares per day can be covered.

Integrated Survey Methodology

The survey work carried out by the BSR/APSS is always produced as part of an integrated survey strategy, designed to affiliate all of the geophysical survey techniques to the same grid system, which would be used for geochemical soil sampling and surface collection. Surveys are normally based on an arbitrary grid coordinate system, tied into a national system or to a series of hard points on the ground corresponding to points on a map. A set of 30m grids are then set out to provide the background for the magnetometry, resistivity, and other survey techniques which will complement the results, for instance fieldwalking and geochemical sampling

Bibliography

Barker, D., Strutt, K. and Sly, T. 2005, *Report on the Geophysical Survey at Netley Abbey*. Unpublished Survey Report.

Bowden, M. (ed.) 1999, *Unravelling the Landscape: an inquisitive approach to archaeology.* Stroud; Tempus.

Bushe-Fox, J. P. 1950, *Old Sarum, Wiltshire* (Ancient monuments and historic buildings guide book series).

Clark, A. 1996, *Seeing Beneath the Soil: Prospecting Methods in Archaeology*. London; Batsford.

Conyers and Goodman 1997, *Ground Penetrating Radar: An Introduction for Archaeologists*. Walnut Creek; Altamira.

English Heritage 2008, *Geophysical Survey in Archaeological Field Evaluation*. English Heritage Publishing.

Gaffney, C., Gater, J. and Ovendon, S. 1991, *The Use of Geophysical Survey Techniques in Archaeological Evaluations*. Institute of Field Archaeologists Technical Paper No. 9.

Hope, W. H. St. J. 1911, Report on Excavations at Old Sarum of 1909 and 1910. *Proceedings of the Society of Antiquaries of London, xxiii*, p190-201, 501-517.

Hope, W. H. St. J. 1914, Report on Excavations at Old Sarum of 1913. *Proceedings of the Society of Antiquaries of London, xxvi*, p190-201,100-117.

Hope, W. H. St. J. 1916, Report on Excavations at Old Sarum of 1915. *Proceedings of the Society of Antiquaries of London, xxviii*, p174-185.

Hope, W. H. St. J. 1917, The Sarum consuetudinary and its relation to the cathedral church of Old Sarum'. *Archaeologia*, 68, p111-126.

Langlands, A. and Strutt, K. forthcoming, Interim Report on the Excavations at Dean's Park Field, Stratford sub-Castle, Wiltshire, July 2017. Unpublished grey literature report.

Musty, J. W. G. 1959, A Pipe-line near Old Sarum: Prehistoric, Roman and Medieval Finds Including Two 12th Century Lime Kilns. *Wiltshire Archaeological Magazine* 57, 179-191.

Musty, J. W. G. & Rahtz, P. A. 1964 The Suburbs of Old Sarum. *Wiltshire Archaeological Magazine* 59, 130-154.

Rahtz, P. A. & Musty, J. W. G. 1960, Excavations at Old Sarum, 1957. *Wiltshire Archaeological Magazine* 57, 352-370.

Richards, J. 2010, *Old Sarum Castle, Wiltshire. Conservation Plan*. Unpublished report.

Rippon, S. 2002, Infield and Outfield: The Early Stages of Marshland Colonisation and the Evolution of Medieval Field Systems. ane, T and Coles, J (eds). 'Through wet and dry; essays in honour of David Hall'. Sleaford and Exeter: Lincolnshire Archaeology and Heritage Report Series No.5 and WARP Occasional Paper 17: pp 54-70.

RCHM(E) 1980, *Ancient and Historical Monuments in the City of Salisbury. Volume 1*. HMSO.

Scollar, I., Tabbagh, A., Hesse, A. and Herzog, I. 1990, *Archaeological Prospecting and Remote Sensing*. Cambridge University Press.

Strutt, K. *Report on the Geophysical Survey at Bodiam Castle, East Sussex, March – April 2010 (SREP 3/2010)*. Unpublished survey report.

Strutt, K., Sly, T. and Barker , D. 2004, *Report on the Geophysical Survey at Portchester Castle*. Unpublished survey report.

Strutt, K. Barker, D., Sly, T. and Cole, J. 2008, *Report on the Geophysical Survey at Bishop's Waltham Palace, Hampshire, July 2008 (SREP 11/2008)*. Unpublished survey report.

Strutt,K., Sly,T., Barker , D. *Report on the Geophysical Survey at Bodiam Castle, East Sussex, August 2012 (SREP 3/2012)*. Unpublished survey report.

Strutt, K., Sly, T. and Barker, D. 2014, *Old Sarum and Stratford-Sub-Castle Archaeological Survey Project: A Project Overview*. Unpublished report.

Tatler, S. and Bellamy, P.S. 2008, Installation of Rabbit Drop-Boxes, Old Sarum, Salisbury, Wiltshire. Archaeological Observations and Recording, May 2008. Terrain Archaeology Unpublished Report.

Internet Sources

List Entry Summary, the National Heritage List for England.

http://list.english-heritage.org.uk/mapsearch.aspx.

The English Heritage Geophysics Database

Record 2664,

http://archaeologydataservice.ac.uk/archives/view/ehgsdb_eh_2011/fullrecord.cfm?id=2664

Record 2804,

http://archaeologydataservice.ac.uk/archives/view/ehgsdb_eh_2011/fullrecord.cfm?id=2804

UNIVERSITY OF Southampton
School of Humanities

Archaeology
School of Humanities

Kristian Strutt
Geophysical Researcher
Archaeological Prospection
Services of Southampton.

University of Southampton
Avenue Campus
Highfield
Southampton
SO17 1BF

Direct: + 44 (0)23 8059 6866
Fax: + 44 (0)23 8059 3032
E-Mail: kds@soton.ac.uk