Substrata
Archaeological Geophysical Surveyors

An archaeological gradiometer survey

Land at Blanford St Mary, Dorset

Ordnance Survey (E/N): 388680,105280 (point)

Report: 150217

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17 February 2015

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Accompanying CD-ROM

Report ..... Adobe PDF format
Copies of report figures ..... Adobe PDF format
Raw and processed grid & composite files ..... DW Consulting TerraSurveyor 3 formats
Minimal processing data plots and metadata ..... Adobe PDF format
GIS project, shape files and classification schema
- GIS project ..... Manifold 8 '.map' file
- GIS shape files ..... ESRI standard
- GIS classification schema ..... Adobe PDF format

AutoCAD version of the survey interpretation (if required) ..... AutoCAD DXF

1 Survey description and summary

1.1 Survey

Type:	twin-sensor fluxgate gradiometer
Date:	26 January 2015 to 2 February 2015
Area:	11 ha
Project Manager:	Ross Dean BSc MSc MA MIfA
Lead surveyor:	Nick Crabb BSc MA

1.2 Client

AC Archaeology Ltd, Manor Farm Stables, Chicklade, Hindon, Nr. Salisbury, Wiltshire SP3 5SU

1.3 Location

Site:	Land at Blanford St Mary
Village & Civil Parish:	Blanford St Mary
Administrative District:	North Dorset
County:	Dorset
Nearest Postcode:	DT11 9PY
NGR:	ST886052
Ordnance Survey E/N:	388680,105280 (point)

1.4 Archive

OASIS number:	substrat1-204089
Archive:	At the time of writing, the archive of this survey will be held by Substrata.

1.5 Introduction

This report was commissioned by AC Archaeology Ltd on behalf of clients. The application area covers approximately 11ha of agricultural land on the southern side of Blandford St Mary The location of the proposed development area is shown in Figure 1.

1.6 Summary

The magnetic contrast across the area was relatively low but sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses. Given the low magnetic response, it is possible that there are more archaeological features present than were recorded in the dataset.

Sixteen magnetic anomaly groups were identified as possibly representing archaeological deposits or features. One group represents a former railway line mapped in 1888 and removed before 1988. Another group is likely to represent the northern side of a former field lane mapped by the Ordnance Survey between 1888 and 1962. The remaining magnetic anomaly groups identified as pertaining to possible archaeological deposits or features are typical of anomalies representing former field boundaries, enclosures or agricultural features such as strip lynchets of unknown dates.

2 Survey aims and objectives

2.1 Aims

1. Define and characterise and detectable archaeological remains on the site.
2. Help establish the cultural heritage and archaeological implications of a proposal for a solar array.

2.2 Objectives

1. Complete a gradiometer survey across agreed parts of the application area.
2. Identify any magnetic anomalies that may be related to archaeological deposits, structures or artefacts.
3. Within the limits of the techniques and dataset, archaeologically characterise any such

anomalies or patterns of anomalies.
4. Accurately record the location of the identified anomalies.
5. Produce a report based on the survey that is sufficiently detailed to inform any subsequent development on the site about the location and possible archaeological character of the recorded anomalies.

3 Standards

The standards used to complete this survey are defined by the Institute for Archaeologists (2011). The codes of approved practice that were followed are those of the Institute for Archaeologists (2008 and 2010) and Archaeology Data Service/Digital Antiquity Guides (undated). The document text was written using the house style of the Institute for Archaeologists (Institute for Archaeologists, undated).

4 Site description

4.1 Landscape and land use

The application area covers approximately 11ha of agricultural land bordering the A350 and A354 on the southern side of Blandford St Mary as shown in Figure 1.

4.2 Geology

The application area is located on chalk of the Seaford Chalk Formation And Newhaven Chalk Formation (undifferentiated).

The superficial geology is not recorded in the source used (British Geological Survey, undated).

5 Archaeological background

The following is a short summary of information obtained from the Dorset Historic Environment Record (HER) within 500m of the proposed development site and relevant to the understanding of the gradiometer survey. Except where specifically cited, this information was obtained using the Heritage Gateway (English Heritage, undated 1).

5.1 Heritage Assets within the Application Area

A Mesolithic (10000 to 4000 BC) lithic implement was discovered during an excavation within the field in preparation for the construction of theA350 Spetisbury by-pass (English Heritage Pastscape reference number 1214285).

5.2 Heritage Assets within 500m of the Application Area

Prehistoric (500000BC to 42AD) worked flint was recovered from a number of layers during an archaeological evaluation in advance of development at Stour Park in 1993 (HER 2 004 046).

Evidence for a Prehistoric field system, possibly Bronze Age (2350BC to 701BC) was excavated during an archaeological evaluation of land at Blandford St Mary in advance of housing development in 1994. Six linear features were cut into the underlying subsoil; two of which contained post medieval artefacts, the remainder contained no datable artefacts and are interpreted as of prehistoric date. Fragments of probably Bronze Age flint were recovered from the spoil heaps (HER MDO23855)

Romano British (43 to 409 AD) inhumation burials, were found in 1833, approximately 0.25 miles due south of Blandford Bridge. The exact location of the site and the finds has not been determined on the ground. An archaeological evaluation adjacent to the east of the site was conducted during 1994 but no evidence for Romano-British activity was recovered. It is possible that the finds were made during quarrying activity and that part or all of the site has been quarried away (Dorset HER number 22 04 030).

Shrunken Medieval (1066AD to 1539AD) settlement earthworks were visible at Stour Park, Blandford St Mary, prior to the development of a retail park. Excavation in advance of development demonstrated that occupation spanned the late Saxon and medieval periods, possibly being deserted during the 14th century. (Dorset HER number 2 04 024)

There are a number of other heritage assets within the area surrounding the site but these are generally Post-Medieval and not relevant to the understanding of the survey data.

6 Results, discussion and conclusions

This survey was designed to record magnetic anomalies. The anomalies themselves cannot be regarded as actual archaeological features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeological features. The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to archaeological deposits and structures.

The reader is referred to section 7.

6.1 Results

Figures 2 shows the interpretation of the survey data including the anomaly groups identified as relating to archaeological deposits along with their numbers. Table 1 is an extract of the detailed analysis of the survey data which is provided in the attribute tables of the GIS project on the accompanying CD-ROM and in the project archive.

Figure 2 and Table 1 comprise the analysis of the survey data. Plots of the processed data are provided in Figures 3 and 4.

6.2 Discussion

General points

Given the relatively low magnetic response across the survey area, it is possible that there are more archaeological features present than were recorded in the dataset.

Anomalies though to relate to natural features and recently deposited rubble were not mapped.

Recent man-made objects such as manholes, water management equipment, drains, cables and other services were only mapped where they comprised significant magnetic responses across the dataset that needed clarification. If mapped, they are listed in Table 1 but are not discussed below.

Data collection along the survey area edges was restricted as shown in Figures 2 to 4. Strong magnetic responses mapped close to these field boundaries are likely to relate to such materials except where indicated otherwise in Figures 2 and 3.

Approximately north-east to south-west trending lines can be seen in the data across a number of areas and in particular on in the south-eastern part of the application area. These are most likely to represent natural features resulting from periodic near-surface or surface water flow.

The relatively large irregular groups of positive anomalies also in the south-eastern section of the application area are likely to represent natural deposits such as sinkholes.

Data relating to historical maps and other records

Magnetic anomaly group 1 represents a former railway line mapped as crossing the application area by the Ordnance Survey between 1888 and 1978, and removed by 1988-89

Group **7** coincides with, and is liable to represent, the northern side of a former field lane mapped by the Ordnance Survey between 1888 and 1962.

Data with no previous archaeological provenance

Groups **8 and 14** may represent either archaeological deposits or natural features.

The remaining magnetic anomaly groups identified as pertaining to possible archaeological deposits or features are typical of anomalies representing former field

boundaries, enclosures or agricultural features such as strip lynchets of unknown dates.

6.3 Conclusions

The magnetic contrast across the area was relatively low but sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses. Given the low magnetic response, it is possible that there are more archaeological features present than were recorded in the dataset.

Sixteen magnetic anomaly groups were identified as possibly representing archaeological deposits or features. One group represents a former railway line mapped in 1888 and removed before 1988. Another group is likely to represent the northern side of a former field lane mapped by the Ordnance Survey between 1888 and 1962. The remaining magnetic anomaly groups identified as pertaining to possible archaeological deposits or features are typical of anomalies representing former field boundaries, enclosures or agricultural features such as strip lynchets of unknown dates.

7 Disclaimer and copyright

The description and discussion of the results presented in this report are the authors, based on his interpretation of the survey data. Every effort has been made to provide accurate descriptions and interpretations of the geophysical data set. The nature of archaeological geophysical surveying is such that interpretations based on geophysical data, while informative, can only be provisional. Geophysical surveys are a cost-effective early step in the multi-phase process that is archaeology. The evaluation programme of which this survey is part may also be informed by other archaeological assessment work and analysis. It must be presumed that more archaeological features will be evaluated than those specified in this report.

8 Acknowledgements

Substrata would like to thank Peter Cox of AC Archaeology Ltd for commissioning us to complete this survey.

9 Bibliography

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Clark, A. (2000) *Seeing Beneath the Soil, Prospecting methods in archaeology*, London: Routledge

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Appendix 1 Analysis table and supporting plots

General Guidance

The anomalies represented in the survey plots provided in this appendix are magnetic anomalies. The apparent size of such anomalies and anomaly patterns are unlikely to correspond exactly with the dimensions of any associated archaeological features.

A rough rule for interpreting magnetic anomalies is that the width of an anomaly at half its maximum reading is equal to the width of the buried feature, or its depth if this is greater (Clark, 2000: 83). Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies. In northern latitudes the position of the maximum of a magnetic anomaly will be displaced slightly to the south of any associated physical feature.

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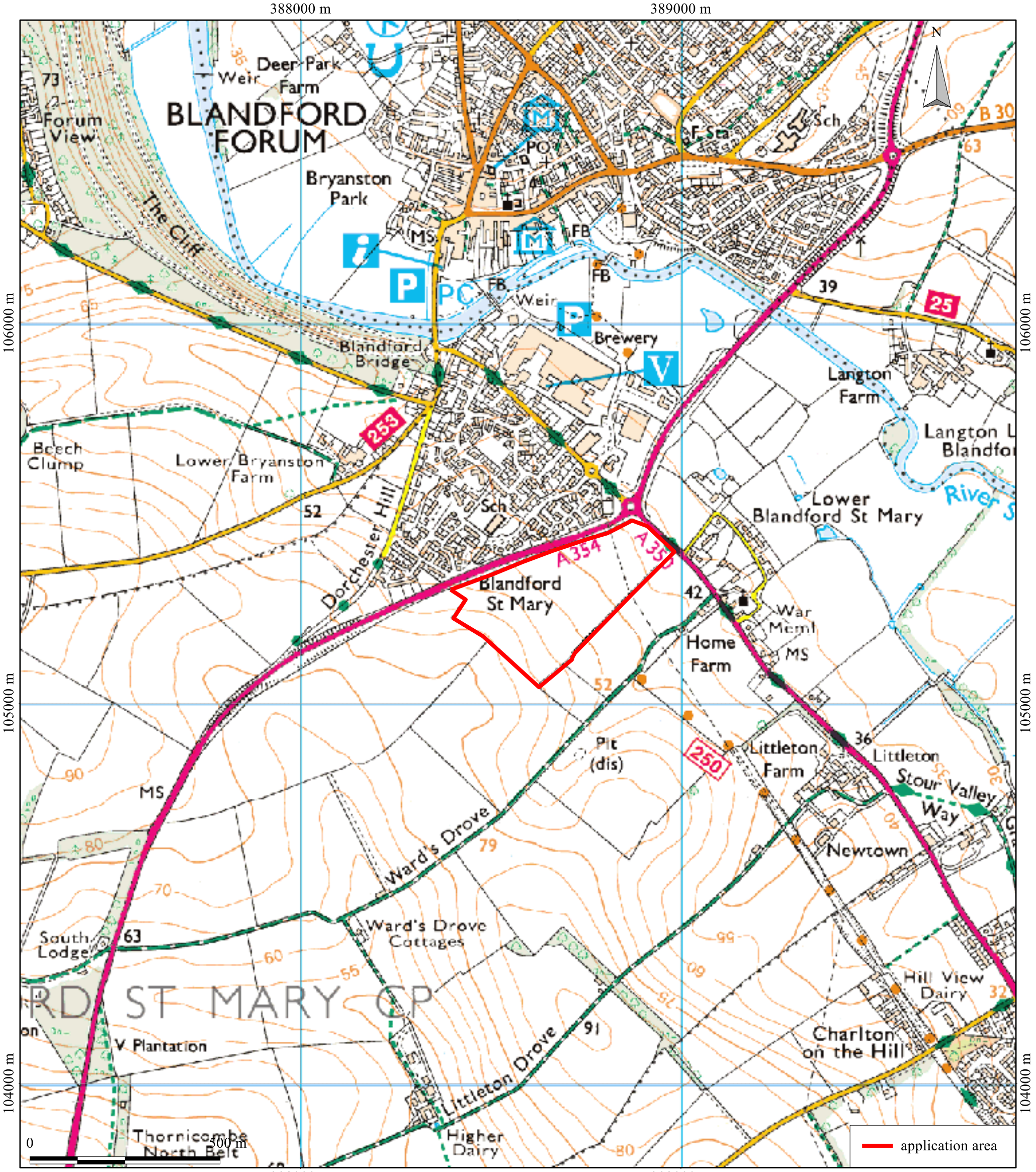
anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1		likely, broad high contrast	curvilinear	former railway line	anomaly group coincides and represents a demolished former railway line mapped crossing the field by the Ordnance Survey between 1888 and 1978 but removed by 1988-89	OS maps 1888 1:2500 to 1988-89 1:10000
2		possible, positive	disrupted linear			
3		possible, positive	disrupted linear			
4		possible, positive	linear			
5		possible, positive	disrupted return			
6		possible, positive	linear			
7		likely, positive	disrupted linear	lane boundary	anomaly groups coincide with the northern side of a lane mapped by the Ordnance Survey between 1888 and 1962; groups are unlikely to represent recent ploughing although they align with anomalies representing such elsewhere in the field	OS maps 1888 1:2500 to 1962 1:10,560
8		possible, positive	disrupted curvilinear		anomaly group may represent either archaeological or natural deposits	
9		possible, positive	disrupted curvilinear			
10		possible, positive	disrupted linear			
11		possible, positive	disrupted linear			
12	13 15	possible, positive	disrupted linear			
13	12	possible, positive	disrupted linear			
14		possible, positive	disrupted curvilinear		anomaly group may represent either archaeological or natural deposits	
15	12	possible, positive	disrupted linear			
16		possible, positive	disrupted linear			
101		possible, high contrast linear	service	service	anomaly group represents a relatively recent ferrous pipe or cable	
102		possible, low contrast linear		service trench		

Table 1: data analysis



British Grid
centre X: 388571.57 m, centre Y: 105287.68 m

Scale: 1:10000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 1: location map

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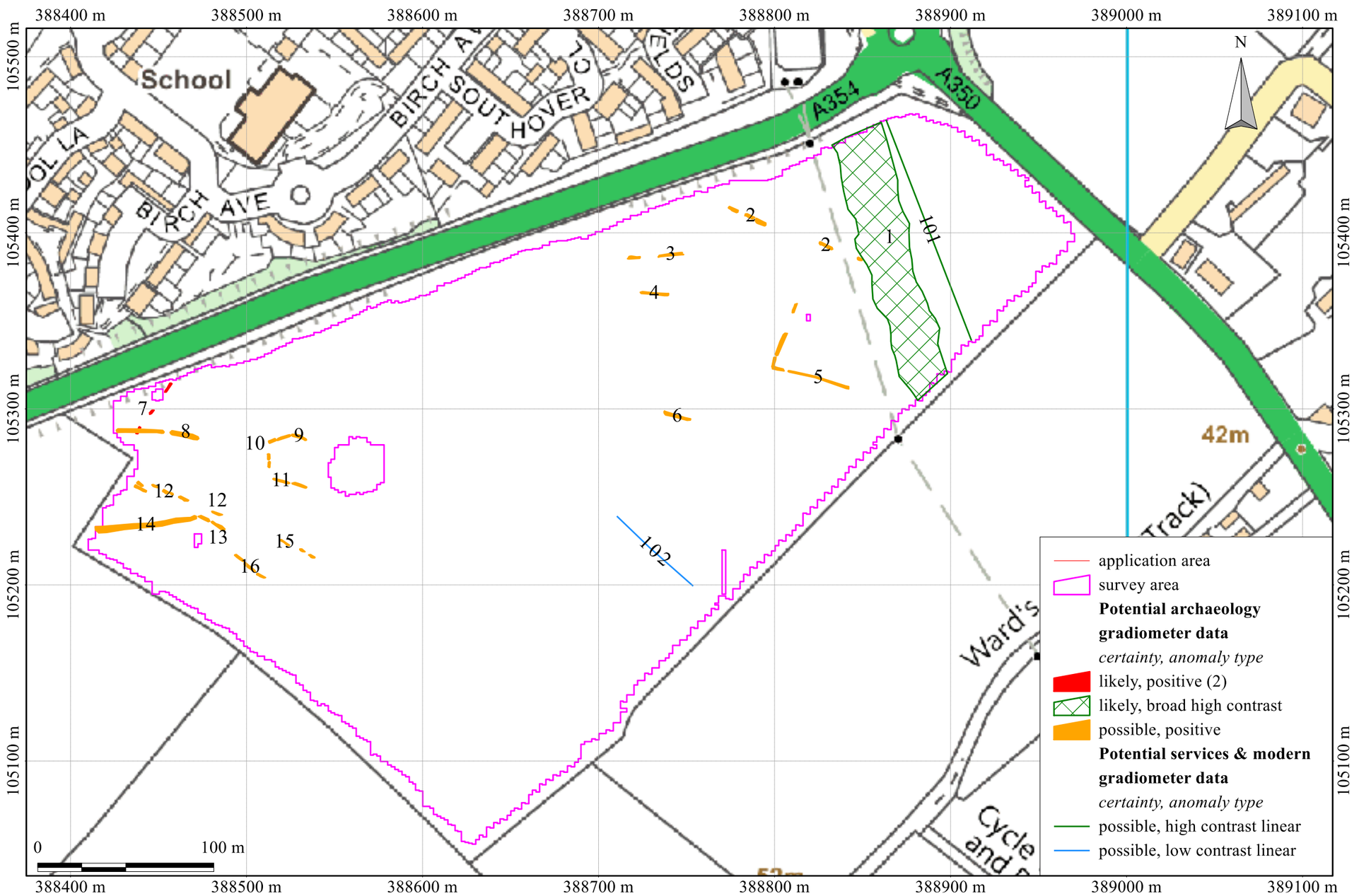

British Grid
centre X: 388745.99 m, centre Y: 105275.47 m

Scale: 1:2500 @ A3. Spatial Units: Meter. Do not scale off this drawing

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
3. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

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Figure 2: survey interpretation

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British Grid
centre X: 388745.99 m, centre Y: 105275.47 m

Scale: 1:2500 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 3: shade plot of processed data

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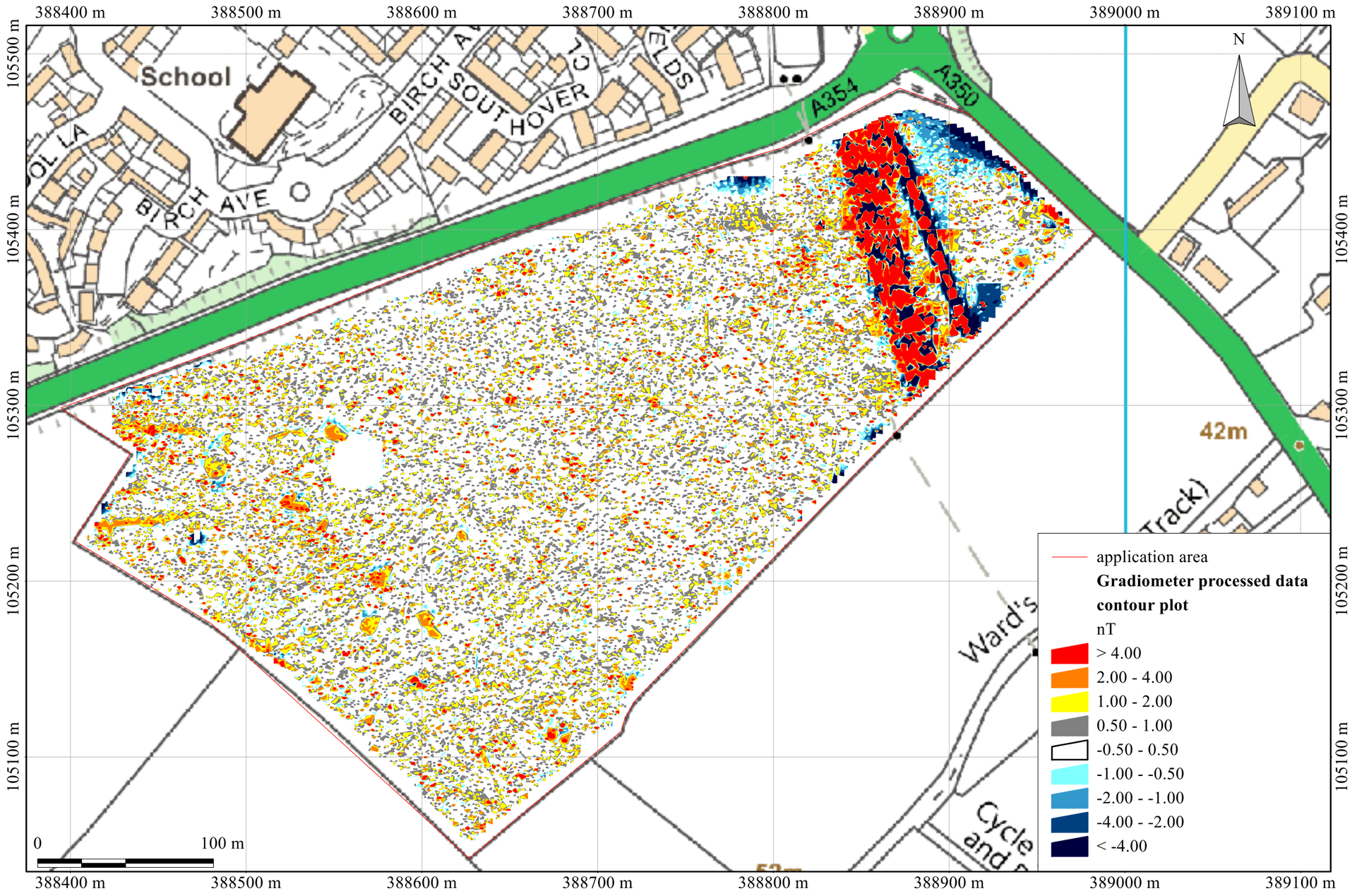

British Grid
centre X: 388745.99 m, centre Y: 105275.47 m

Scale: 1:2500 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 4: contour plot of processed data

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Appendix 2 Methodology Summary

<table>
<tr><th colspan="2">Table 1: methodology summary</th></tr>
<tr><td colspan="2">Documents
Survey methodology statement: Dean (2015)</td></tr>
<tr><td colspan="2">Methodology
1. The work was undertaken in accordance with the survey methodology statement. The geophysical (gradiometer) survey was undertaken with reference to standard guidance provided by the Institute for Archaeologists (2011) and Archaeology Data Service/Digital Antiquity Guides (undated).
2. The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system.
3. Data processing was undertaken using appropriate software, with all anomalies being digitised and geo-referenced. The final report included a graphical and textual account of the techniques undertaken, the data obtained and an archaeological interpretation of that data and conclusions about any likely archaeology.</td></tr>
<tr><td colspan="2">Grid
Method of Fixing: DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates.
Composition: 30m by 30m grids
Recording: Geo-referenced and recorded using digital map tiles.
DGPS used: Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program.</td></tr>
<tr><td>Equipment
Instrument: Bartington Instruments grad601-2
Firmware: version 6.1</td><td>Data Capture
Sample Interval: 0.25-metres
Traverse Interval: 1 metre
Traverse Method: zigzag
Traverse Orientation: GN</td></tr>
<tr><td colspan="2">Data Processing, Analysis and Presentation Software
IntelliCAD Technology Consortium IntelliCAD 7.2
DW Consulting TerraSurveyor3
Manifold System 8 GIS
Microsoft Corp. Office Excel 2013
Microsoft Corp. Office Publisher 2013
Adobe Systems Inc Adobe Acrobat 9 Pro Extended</td></tr>
</table>

Appendix 3 Data processing

Table 2: gradiometer survey - processed data metadata

SITE
Instrument Type: Bartington Grad 610
Units: nT
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

PROGRAM
Name: TerraSurveyor
Version: 3.0.25.0

Stats
Max: 112.21
Min: -113.65
Std Dev: 8.05
Mean: -0.04
Median: -0.03
Surveyed Area: 10.961 ha

Processes: 14
1 Base Layer
2 De Stagger: Grids: All Mode: Both By: -1 intervals
3 De Stagger: Grids: bsm47.xgd bsm70.xgd bsm46.xgd bsm48.xgd bsm69.xgd bsm71.xgd bsm28.xgd bsm45.xgd bsm49.xgd bsm68.xgd bsm72.xgd bsm27.xgd bsm29.xgd bsm44.xgd bsm50.xgd bsm67.xgd bsm73.xgd bsm13.xgd bsm14.xgd bsm26.xgd bsm30.xgd bsm43.xgd bsm51.xgd bsm66.xgd bsm74.xgd bsm12.xgd bsm15.xgd bsm25.xgd bsm31.xgd bsm42.xgd bsm52.xgd bsm65.xgd bsm75.xgd bsm11.xgd bsm16.xgd bsm24.xgd bsm32.xgd bsm41.xgd bsm53.xgd bsm64.xgd bsm76.xgd bsm10.xgd bsm17.xgd bsm23.xgd bsm33.xgd bsm40.xgd bsm54.xgd bsm63.xgd bsm77.xgd bsm9.xgd bsm18.xgd bsm22.xgd bsm34.xgd bsm39.xgd bsm55.xgd bsm62.xgd bsm8.xgd bsm19.xgd bsm21.xgd bsm35.xgd bsm38.xgd bsm56.xgd bsm61.xgd bsm20.xgd bsm36.xgd bsm37.xgd bsm57.xgd bsm60.xgd bsm58.xgd bsm59.xgd Mode: Both By: -2 intervals
4 De Stagger: Grids: bsm69.xgd Mode: Both By: 1 intervals
5 De Stagger: Grids: bsm112.xgd bsm113.xgd bsm128.xgd bsm114.xgd bsm127.xgd bsm129.xgd bsm115.xgd bsm126.xgd bsm130.xgd bsm143.xgd bsm116.xgd bsm125.xgd bsm131.xgd bsm142.xgd bsm144.xgd bsm117.xgd bsm124.xgd bsm132.xgd bsm141.xgd bsm145.xgd bsm152.xgd bsm118.xgd bsm123.xgd bsm133.xgd bsm140.xgd bsm146.xgd bsm151.xgd bsm153.xgd bsm119.xgd bsm122.xgd bsm134.xgd bsm139.xgd bsm147.xgd bsm150.xgd bsm154.xgd bsm120.xgd bsm121.xgd bsm135.xgd bsm138.xgd bsm148.xgd bsm149.xgd bsm136.xgd bsm137.xgd Mode: Both By: -1 intervals
6 DeStripe Median Sensors: All
7 DeStripe Median Traverse: Grids: bsm105.xgd
8 Edge Match (Area: Top 510, Left 1560, Bottom 569, Right 1679) to Left edge
9 Edge Match (Area: Top 510, Left 1200, Bottom 539, Right 1319) to Right edge
10 Edge Match (Area: Top 480, Left 1440, Bottom 509, Right 1679) to Bottom edge
11 Edge Match (Area: Top 450, Left 1440, Bottom 479, Right 1679) to Top edge
12 Edge Match (Area: Top 450, Left 1080, Bottom 479, Right 1439) to Top edge
13 Edge Match (Area: Top 450, Left 960, Bottom 479, Right 1079) to Top edge
14 Edge Match (Area: Top 480, Left 1680, Bottom 509, Right 1799) to Left edge

Note: export from TerraSurveyor to the GIS as ‘georeferenced data’ imposed an x=y interpolation on the data

Appendix 4 Geophysical surveying techniques

1 Introduction

Substrata offers magnetometer and earth resistance surveying. We also provide other archaeology-specific geophysical surveys such as ground penetrating radar and resistivity. The particular method or combination of methods used depends on local soil conditions and the survey requirements. These methods are capable of delivering fast and accurate assessments of the archaeology of both large and small sites.

Further details can be found on our website at www.substrata.co.uk.

2 Magnetometer surveying

Standard magnetometer surveys are the workhorse of archaeological surveying when speed and cost-effectiveness are important. Identifiable archaeological features include areas of occupation, hearths, kilns, furnaces, ditches, pits, post-holes, ridge-and-furrow, timber structures, wall footings, roads, tracks and similar buried features.

Magnetometer surveying is used to detect and map small changes in the earth's magnetic field caused by concentrations of ferrous-based minerals within the soil and subsoil, and by materials buried beneath the surface. While most of these changes are too small to affect a compass needle, they can be detected and mapped by sensitive field equipment. During surveys the different magnetic properties of top-soils, sub-soils, rock formations and archaeological features are recorded as variations against a background value. Subsequently magnetic anomalies resulting from potential archaeology can be identified and interpreted.

Bartington grad601-2 gradiometers

A gradiometer is a type of magnetometer and is sensitive to relatively small changes in the earth's magnetic field. Our primary surveying instruments are Bartington Grad601-2 (dual sensor) fluxgate gradiometers with automatic data loggers. They are specifically designed for field use by archaeologists. The Bartington gradiometers provide proven technology in archaeological magnetic surveying and offer fast, accurate set-up and survey rates. They are sensitive to depths of between 0 and 1.5m below ground level, with optimum sensitivity at depths of 1m or less.

Multiple sensor arrays

A technique relatively new to commercial archaeological surveying but well understood in academic circles involves the use of multiple magnetometer sensors towed behind a quad bike or similar vehicle. With multiple sensors and the use of on-board GPS units, it is possible to achieve faster survey rates at competitive commercial rates when compared to the use of multiple instruments and the techniques discussed above provided the ground is suitable for the vehicle and array. Substrata is pleased to announce that we now offer this service on suitable larger sites

3 Earth resistance surveying

Earth resistance surveying is an excellent tool for detecting buried archaeology. Its relatively slow rate of survey compared to magnetometer surveys means that it usually employed in commercial surveys when a detailed understanding of buried building remains is required. This technique measures changes in the electrical resistance of the ground being surveyed. In practice, the recording of differences in the electrical resistance of near-surface deposits and structures allows the detection and interpretation of masonry and brick foundations, paving and floors, drains and other cavities, large pits, building platforms, robber trenches, ditches, graves and similar buried features.

Resistance to electrical current flow in the ground depends on the moisture content and structure of the soil and other materials buried beneath the surface. For example, the higher the moisture content of a soil, the less resistant it is to electrical current flow. A ditch completely buried beneath the present ground surface is likely to have an infill soil different to that surrounding the ditch in terms of compactness and composition. As a result, the soil filling the buried ditch will retain moisture in a different way to the surrounding soil which means it will

have an electrical resistance at variance with the surrounding environment. By passing a small current through the ground it is possible to detect, record, plot and interpret such changes in electrical resistance.

For earth resistance surveying Substrata uses the Geoscan Research RM15 series multi-probe resistance meters and purpose-built automatic data-loggers. The Geoscan MPX15 multiplexer is an integral part to the instrument configuration and facilitates multi-probe arrays which speed up survey area coverage rates and, if required, facilitate simultaneous multiple-depth data collection.