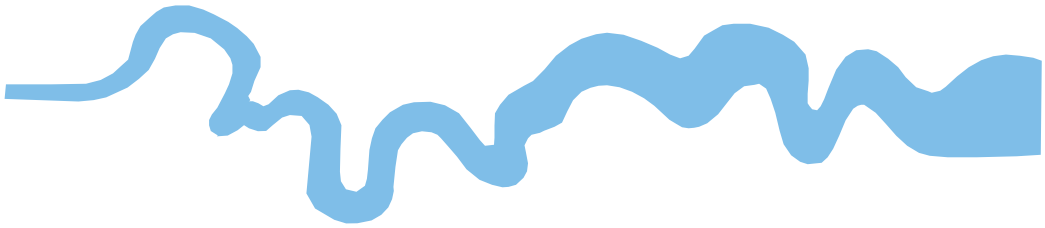
T V A S



SOUTH

Land East of Yapton Lane, Walberton, West Sussex

Geophysical Survey (Magnetic)

by Kyle Beaverstock

Site Code: YLW21/56

(SU 9780 0598)

Land east of Yapton Lane, Walberton, West Sussex

Geophysical Survey (Magnetic) Report

For Land Allocation Limited

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code YLW 21/56

March 2021

Summary

Site name: Land east of Yapton Lane, Walberton, West Sussex

Grid reference: SU 9780 0598

Site activity: Magnetometer survey

Date and duration of project: 3rd and 4th March 2021

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: YLW21/56

Area of site: c.9.5ha

Summary of results: The geophysical survey identified a number of magnetic anomalies which are likely to represent a range of archaeological features including possible trackways and a potential Roman structure as well as associated field boundaries and other discrete features.

Location of archive: The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Report edited/checked by:	Steve Ford✓ 18.03.21
	Tim Dawson✓ 19.03.21

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Land east of Yapton Lane, Walberton, West Sussex
A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 21/56

Introduction

This report documents the results of a geophysical survey (magnetic) carried out east of Yapton Lane, Walberton, West Sussex (SU 9780 0598) (Fig. 1). The work was commissioned by Lanpro Services Ltd Brettingham House, 98 Pottergate, Norwich, NR2 1EQ.

The geophysical survey was commissioned in order to inform a planning application to the Arun district of West Sussex. The fieldwork was undertaken by Kyle Beaverstock and Luciano Cicu between the 3rd and 4th of March 2021 and the site code is YLW21/56.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Location, topography and geology

The site is located on the eastern side of Walberton which lies south of the A27, between Chichester and Littlehampton (Fig. 1). It is bounded by Yapton Lane to the west, woodland to the north and east and farmland to the south. This parcel of land is relatively flat sitting at a height of 15m above Ordnance Datum and the underlying geology is stated as primarily undifferentiated River Terrace deposits above London Clay, with the band of Head deposits along the eastern edge of the field (BGS 1996).

Site history and archaeological background

The site is located in an area with a rich archaeological heritage with numerous Bronze Age, Iron Age and Roman sites as well as the important Palaeolithic site of Boxgrove 5km away (Rudling 2003). More locally, a number of excavations by a local archaeological society to the immediate south of the site at Blacksmiths Corner (WAS 2008; 2009) have revealed a Roman villa complex.

Methodology

Sample interval

Data collection involved the traversing of the survey area along straight and parallel lines using two cart-mounted Bartington Grad601-2 fluxgate gradiometers. Even coverage was achieved with the use of regularly spaced markers at the ends of traverses and the real-time positional trace plot. Readings were taken at 0.25m intervals along traverses 1m apart, providing an appropriate methodology balancing cost and time with resolution. Traverses were walked at an alternating north to south zig-zag orientation across the survey area. No obstructions were encountered by the geophysical survey, conditions were dry and bright.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to 10^{-9} Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations and standards set out by both European Archaeological Council (EAC 2015) and the Chartered Institute *for* Archaeologists (2002, 2014).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for the fast yet detailed surveying of an area.

The detailed magnetometry survey was carried out using two dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometers mounted upon a Bartington non-magnetic cart. A two-wheeled lightweight structure pushed by hand, the cart consisted a bank of four vertically-mounted Bartington Grad601-2 magnetic sensor tubes at 1m apart and a Trimble Geo 7x centimetre edition GPS. Readings were collected by two Bartington Grad601-2 loggers and collated using MLgrad601 software on a Linx 12x64 tablet running Windows 10 mounted at the rear of the cart. This enables readings to be taken of both the general background magnetic field and any localised anomalies with the difference being plotted as either positive or negative buried features. All

sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches can be seen from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear anomaly feature or within a discrete area.

The Trimble Geo7x centimetre edition GPS system with centimetre real-time accuracy was used to tie the cart traverses into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the TerraSurveyor software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

Process	**Effect**
Clip from -1.50 to 1.50 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
De-spike: threshold 1, window size 3×3	Compresses outlying magnetic points caused by interference of metal objects within the survey area.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.

The raw data plot is presented as a greyscale plot shown in relation to the site (Fig. 2) with the processed data then presented as a second figure (Fig. 3), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons.

The greyscale plot of the processed data is exported from TerraSurveyor in a georeferenced portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is combined with grid and site plans in QGIS 2.18.15 and exported again in .PNG format in order to present them in figure templates in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised, they are exported in .PDF format for inclusion within the finished report.

Results

The survey recorded a range of magnetic anomalies primarily across the central area of the site (Figs. 2 and 3). In the north of the site are two parallel positive linear anomalies **[Fig. 4: 1]**, orientated northeast to southwest which run for 129m and 186m to form a possible trackway 19m wide. To the northeast, this trackway appears to respect an earlier L-shaped positive linear anomaly **[2]**, which is orientated northwest to southeast before turning to the northeast. This measures 35m and 50m respectively and forms the corner of what may be an enclosure. To the south are a pair of curved positive linear anomalies **[3]**, one of these runs from the southern side of trackway **[1]** to the south, curving round to the west and then to the north running for a total of 100m, 2m to the south of this is a parallel weak positive linear anomaly. These both appear to respect possible trackway **[1]** and probable road **[4]** and are likely to be a contemporary field boundary.

Running through the centre of the site is a further trackway **[4]**, represented by two parallel positive linear anomalies 9m apart running northwest to the southeast for c.70m before petering out and reappearing and running for c.200m into the site's southern boundary. Between these parallel linear anomalies in the southern part of the roadway is a short positive linear anomaly, this could represent a road surface, an underlying feature or a previous phase.

In the southern area of the site on the western side of trackway **[4],** a series of positive linear anomalies were recorded surrounded by some negative responses. These appear to be on the same alignment as the northwest to southeast aligned trackway and the angular shape of these anomalies suggest that they could be foundation cuts for a building **[6]**. The building is c.40m long and c.30m wide and may contain a series of rooms. On the opposite side of the trackway from the possible building is a short positive linear anomaly **[7]** orientated southwest to the north east forming a possible entranceway.

To the north of this possible building is a positive linear anomaly **[5]** orientated northeast to the southwest and 110m long. It runs from the western side of the trackway to the corner of boundary ditch **[8]** forming a northern boundary. On the southern side of the possible building are a series of positive linear anomalies **[8]**, that run from the buildings's southeast corner **[6]** to the southwest for c.69m before turning to the southeast and running for c.74m with a gap in the northern part of this section of ditch forming a possible entrance. Within this rectangular boundary is a second boundary 23m to the south running in a parallel direction to the southwest and turning to the southeast and running 4m east of the outer boundary ditch forming a possible trackway.

Across the site and particularly concentrated in the area around the possible building **[6]** are a number of irregular positive anomalies **[9]**. These anomalies have a high amplitude which defines them from the background variations in the geology but have no discernible form. These may be irregular pits or pit clusters or they may be indications of underlying features which are being masked by the higher amplitude of the structural remains.

Along the western boundary is an area of magnetic disturbance **[10]** which is represented by a bipolar response of high amplitude, and was most likely caused by ferrous material in the fencing or possibly a buried service which may be masking features in this area.

Conclusion

The geophysical survey revealed a significant number of anomalies of archaeological interest generally aligned down the centre of the site. These include a northeast to southeast aligned trackway which runs across the full length of the site. At the southern end of the site, there are a series of enclosures and a possible building situated to the west of this trackway, while the corner of an enclosure on the same alignment was recorded on the site's northern edge to the trackways's east. A further wider possible trackway crosses the site's northwestern side, to the immediate south-east of which is a possible enclosure which appears to respect the northwest to southeast algiend trackway to its east. All of these features appear to be concentrated in this corridor and may be contemporary as they appear to respect each other, although there is a suggestion of some earlier phases of these features. This possible building is most likely Roman and related to the villa found in the field to the immediate south and may represent an ancillary building.

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Rudling, D (ed), 2003, *The Archaeology of Sussex to AD2000*, Brighton

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WAC 2009, 'The Roman Villa at Blacksmith's Corner, Walberton, West Sussex: An interim report on the 2009 excavations' Worthing Archaeological Society

Appendix 1. Survey and data information

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

Raw data
Filename: Walberton A RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 497667.695144297, 106222.908899019 m
Southeast corner: 497889.475144297, 105811.068899019 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 222 m x 412 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 213807, Recorded: 213807

Stats
Max: 96.50
Min: -99.90
Std Dev: 3.45
Mean: -0.46
Median: -0.42
Composite Area: 9.1338 ha
Surveyed Area: 7.2102 ha

Filename: Walberton B RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 497870.929626062, 106130.066593283 m
Southeast corner: 498008.079626062, 105839.256593283 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 137 m x 291 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 61063, Recorded: 61063

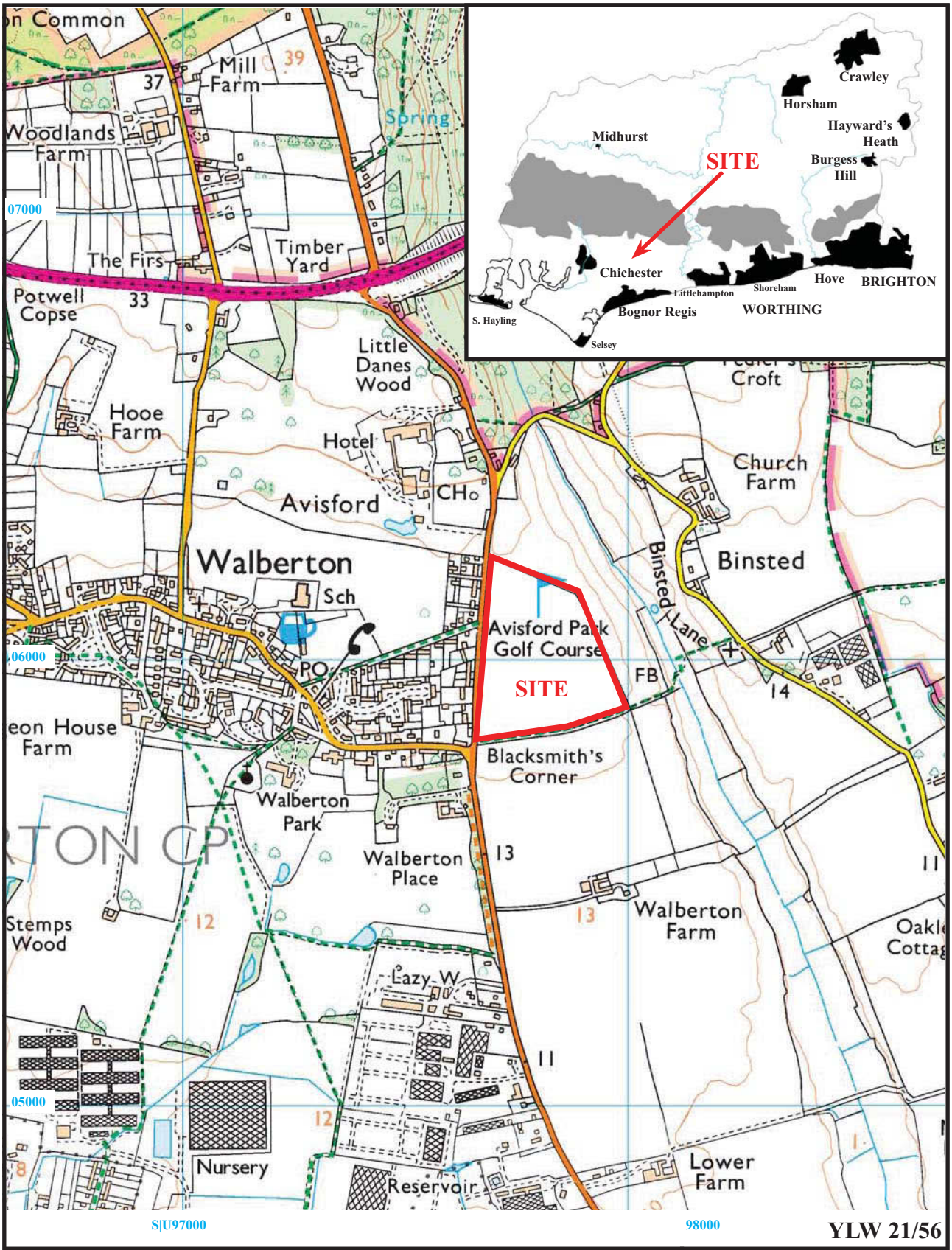
Stats
Max: 96.30
Min: -99.90
Std Dev: 5.70
Mean: 0.07
Median: 0.49
Composite Area: 3.9885 ha
Surveyed Area: 2.1127 ha

Processed data
Filename: Walberton A.xcp
Stats
Max: 1.50
Min: -1.50
Std Dev: 0.69
Mean: 0.01
Median: 0.02
Composite Area: 9.1338 ha
Surveyed Area: 7.2102 ha

GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 DeStagger by: 50.00cm, Shift Values
5 Clip from -1.50 to 1.50

Filename: Walberton B.xcp
Stats
Max: 1.50
Min: -1.50
Std Dev: 0.69
Mean: 0.01
Median: 0.01
Composite Area: 3.9885 ha
Surveyed Area: 2.1127 ha

GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 DeStagger by: 50.00cm, Shift Values
5 Clip from -1.50 to 1.50



YLW 21/56

Land East of Yapton Lane, Walberton,
West Sussex, 2021
Geophysical Survey (Magnetic)

Figure 1. Location of site within Walberton and West Sussex.

TVAS SOUTH

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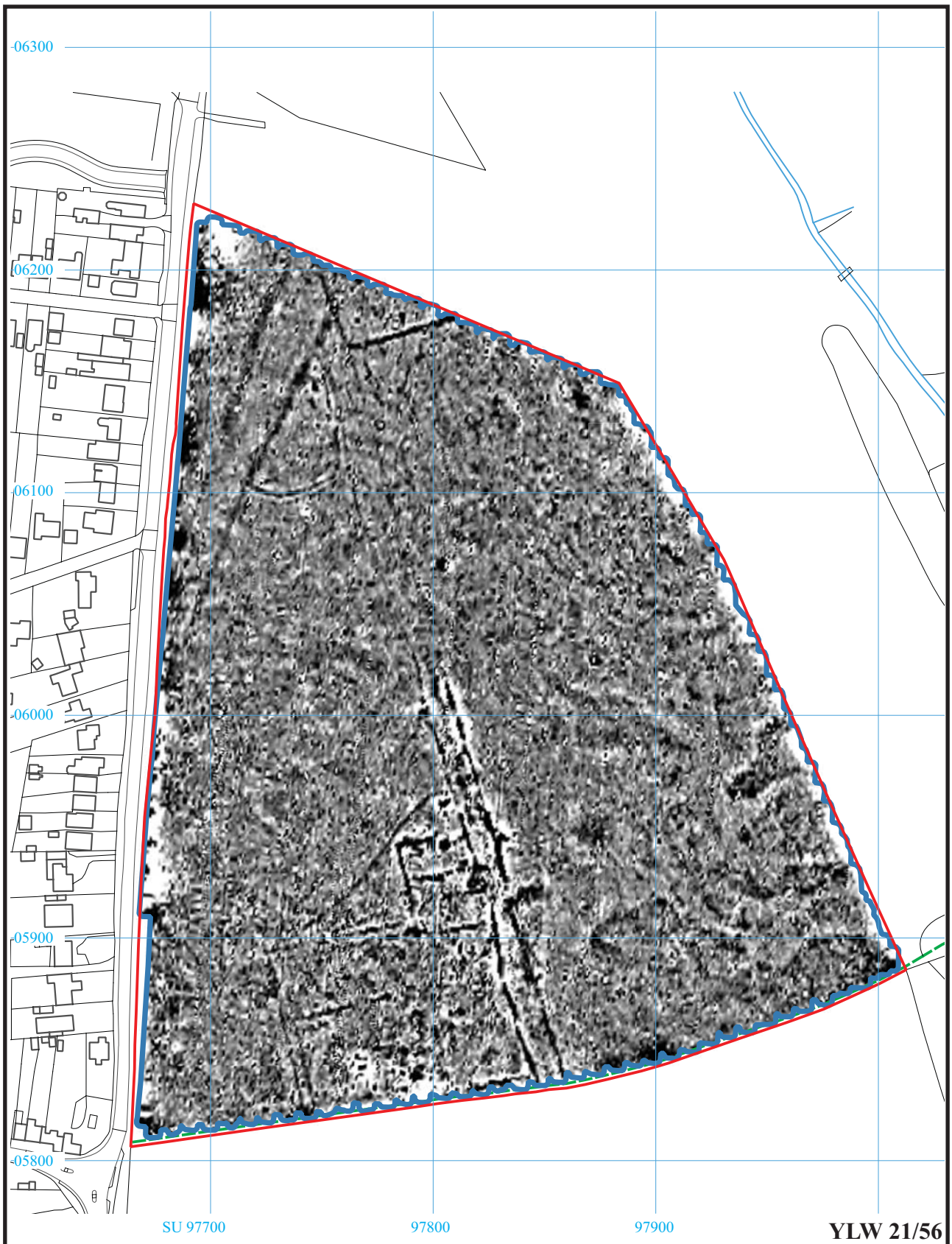
Land east of Yapton Lane, Walberton,
West Sussex, 2021
Geophysical Survey (Magnetic)
Figure 2. Plot of raw gradiometer data.

0m 100m

+100
nT
-100

TVAS SOUTH



Land east of Yapton Lane, Walberton,
West Sussex, 2021
Geophysical Survey (Magnetic)

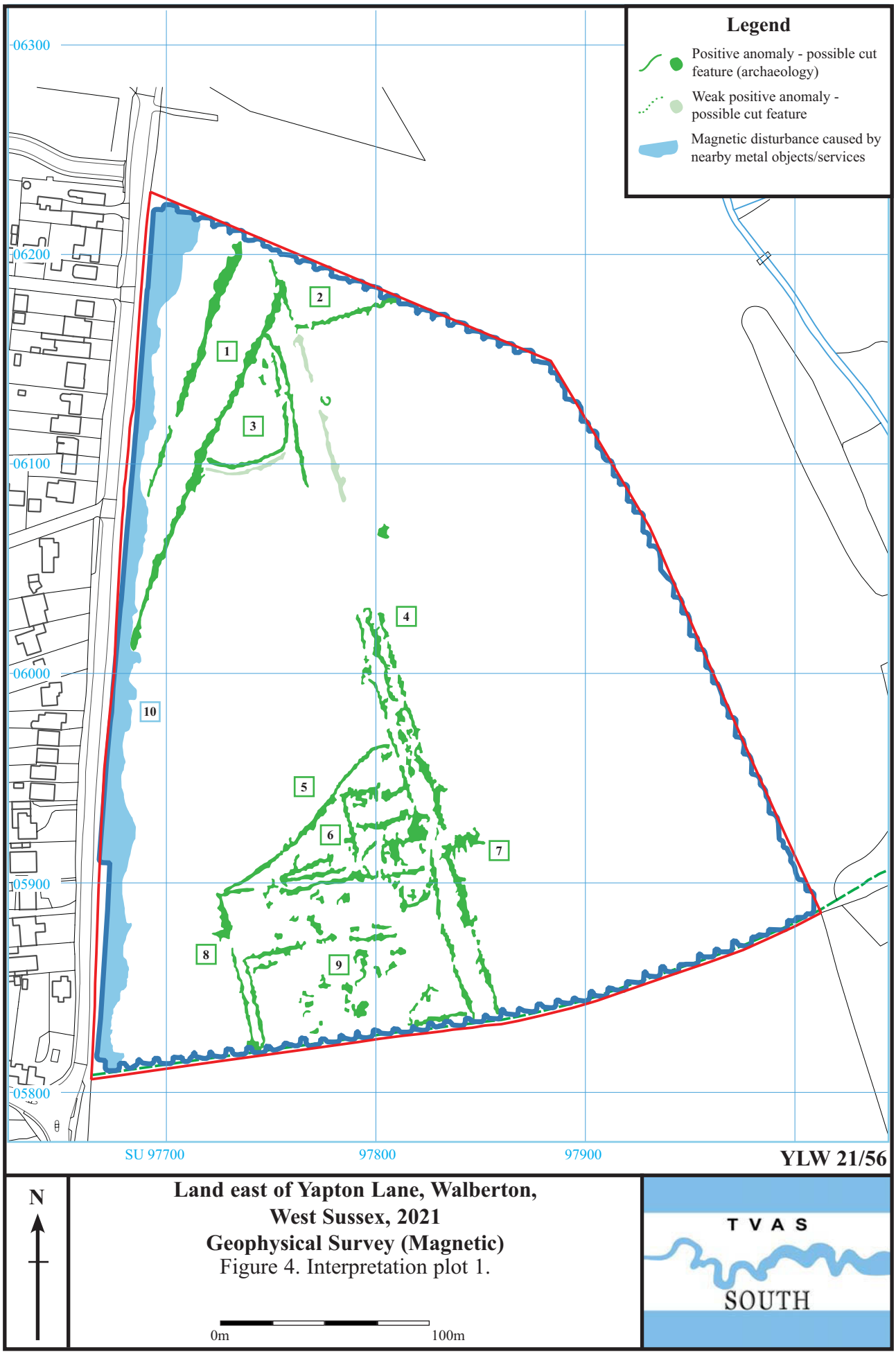
Figure 3. Plot of processed gradiometer data.

N

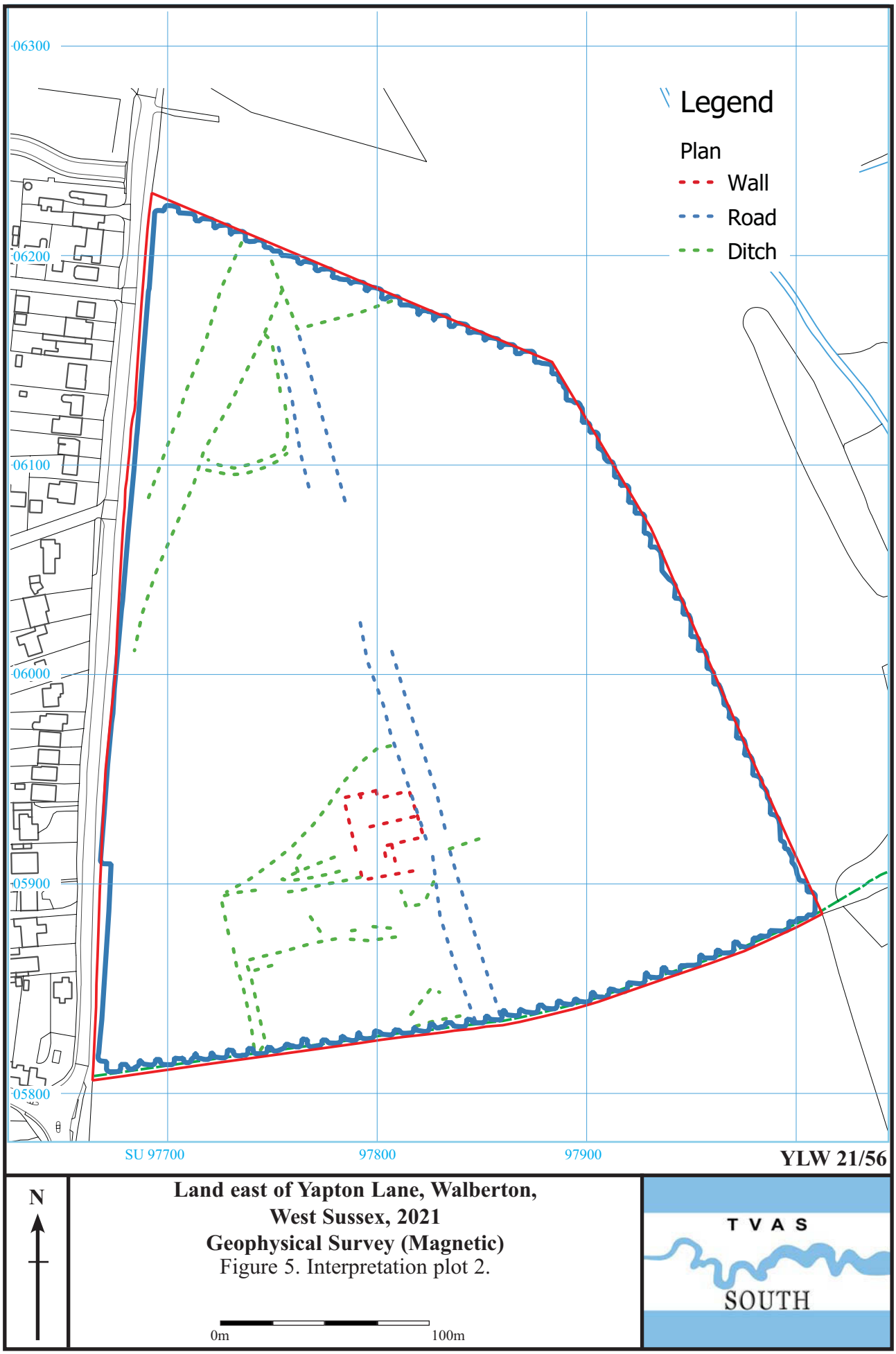
0 100m

+1.50
nT
-1.50

TVAS SOUTH



Land east of Yapton Lane, Walberton, West Sussex, 2021
Geophysical Survey (Magnetic)
Figure 4. Interpretation plot 1.



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Land east of Yapton Lane, Walberton,
West Sussex, 2021
Geophysical Survey (Magnetic)
Figure 5. Interpretation plot 2.

0m 100m

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Plate 1. Northern boundary of site looking northeast

Plate 2. Southern boundary looking west

Plate 3. Northern area of the site looking south

Plate 4. Southern area of the site looking north

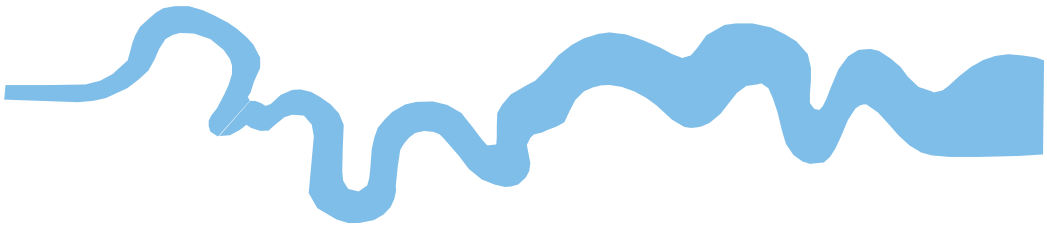
YLW 21/56

Land east of Yapton Lane, Walberton,
West Sussex, 2021
Geophysical Survey (magnetic)
Plates 1 to 4.

TVAS SOUTH

TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
	AD 0 BC
Iron Age	750 BC
Bronze Age: Late	1300 BC
Bronze Age: Middle	1700 BC
Bronze Age: Early	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC



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