THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

Sand Pit Road, Calne, Wiltshire

Geophysical Survey (Magnetic)

by Kyle Beaverstock

Site Code: SRC 15/251

(SU 0045 7191)

Sand Pit Road, Calne, Wiltshire

Geophysical Survey (Magnetic) Report

For Hills Group Ltd.

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code SRC 15/251

December 2018

Summary

Site name: Sand Pit Road, Calne, Wiltshire

Grid reference: SU 00459 71914

Site activity: Magnetometer survey

Date and duration of project: 12th December 2018

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: SRC 15/251

Area of site: c.0.8ha

Summary of results: No magnetic anomalies suggesting the presence of features of archaeological interest were detected over the course of the survey.

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:	Tim Dawson✓ 20.12.18

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Sand Pit Road, Calne, Wiltshire
A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 15/251b

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Sand Pit Road, Calne, Wiltshire (SU 00459 71914) (Fig. 1). The work was commissioned by Andrea Andrews of Hills Homes, Wiltshire House, County Park Business Centre, Shrivenham Road, Swindon SN1 2NR.

Planning permission (16/05344/FUL) has been gained from Wiltshire Council to construct new housing on a 0.79ha parcel of land south of Sand Pit Road, Calne, Wiltshire (SU 0045 7192). The consent is subject to a condition relating to archaeology. This is in accordance with the Department for Communities and Local Government's National Planning Policy Framework (NPPF 2012) and the County's policies on archaeology. The field investigation was carried out to a specification approved by Melanie Pomeroy-Kellinger County Archaeologist for Wiltshire County Council. The fieldwork was undertaken by Kyle Beaverstock and Camila Carvalho, on the 12th of December 2018 and the site code is SRC 15/251.

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 north-eastern edge of Calne, bounded by Oxford Road to the west, Sand Pit Road to the north-east and residential properties to the south. The irregular rectangle shaped parcel of grassland is currently not being utilised. It slopes uphill from *c*.83m above Ordinance Datum (aOD) at its western end to *c*.87m aOD at the eastern end and the underlying geology is recorded as Kimmeridge Clay (BGS 1974). Ground conditions during the survey were damp but the weather was dry (Pl. 1-3).

Site history and archaeological background

The archaeological potential of the site is discussed in detail in the desk-based assessment (Tabor 2015). To summarise, the potential mainly arises from the sites location in a region which has a rich archaeological record

with several important prehistoric sites in the chalklands to the south and multi-phased sites such as Freeth Farm to the north (Beaverstock and Dawson 2015).

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-east to south-west zig-zag orientation across the survey area. The eastern and western ends of the field were obstructed by thick brambles as well as a pylon in the south eastern corner.

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 English Heritage as published by the 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 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 -4.00 to 5 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.

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 3.4.2 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

Although no magnetic anomalies suggestive of buried archaeological features could be detected within the survey area (Fig. 3), there was significant magnetic disturbance along the southern boundary and some along the north (Fig. 4). This is most likely caused by the presence of an electric pylon and the high ferrous content of the surrounding fence. It is possible that weaker anomalies of archaeological origin may be being masked in these areas of strong responses.

Conclusion

No magnetic anomalies suggestive of buried archaeological features were recorded over the course of the survey.

References

BGS, 1974, *British Geological Survey*, 1:50,000, Sheet 266, Drift Edition, Keyworth

Beaverstock, K and Dawson, T, Land at Freeth Farm, Compton Bassett, Calne, Wiltshire, A Geophysical Survey (Magnetic), TVAS report 07/153b, Reading

CI*f*A, 2002, *The Use of Geophysical Techniques in Archaeological Evaluation*, IFA Paper No. 6, Reading

CI*f*A, 2014, *Standard and Guidance: for archaeological geophysical survey*, Reading

EAC, 2015, *EAC Guidelines for the use of Geophysics in Archaeology: Questions to Ask and Points to Consider*, EAC Guidelines 2, Namur

NPPF, 2012, *National Planning Policy Framework*, Dept Communities and Local Government, London

Tabor, R, 2015, Land south of Sand Pit Road, Calne, Wiltshire; An Archaeological Desk-based Assessment, TVAS report 15/251, Reading

Appendix 1. Survey and data information

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

Raw data
Filename: calne.xcp
Description: Imported as Composite from: calne.xyz
Instrument Type: MLgrad601 import
Units:
UTM Zone: 30U
Survey corner coordinates (X/Y):
Northwest corner: 569778.007643452, 5699972.89660098 m
Southeast corner: 569916.197643452, 5699888.39660098 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

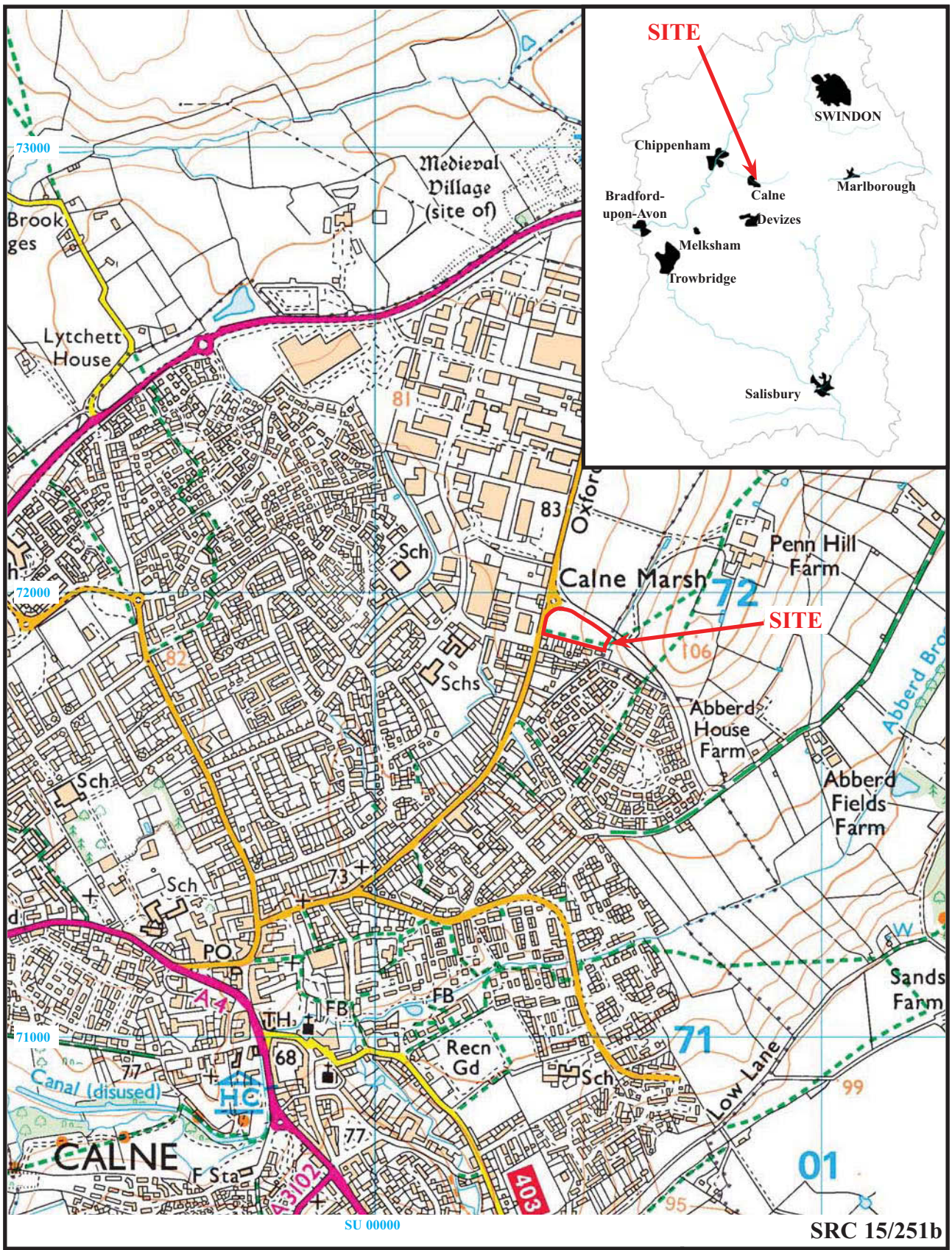
Source GPS Points: 21327

Dimensions
Composite Size (readings): 1063 x 650
Survey Size (meters): 138 m x 84.5 m
Grid Size: 138 m x 84.5 m
X Interval: 0.13 m
Y Interval: 0.13 m

Stats
Max: 102.68
Min: -109.72
Std Dev: 16.78
Mean: -2.71
Median: 1.12
Composite Area: 1.1677 ha
Surveyed Area: 0.6352 ha

Processed data
Filename: calne.xcp
Stats
Max: 11.05
Min: -11.00
Std Dev: 3.54
Mean: -0.46
Median: 0.01
Composite Area: 1.1677 ha
Surveyed Area: 0.6352 ha

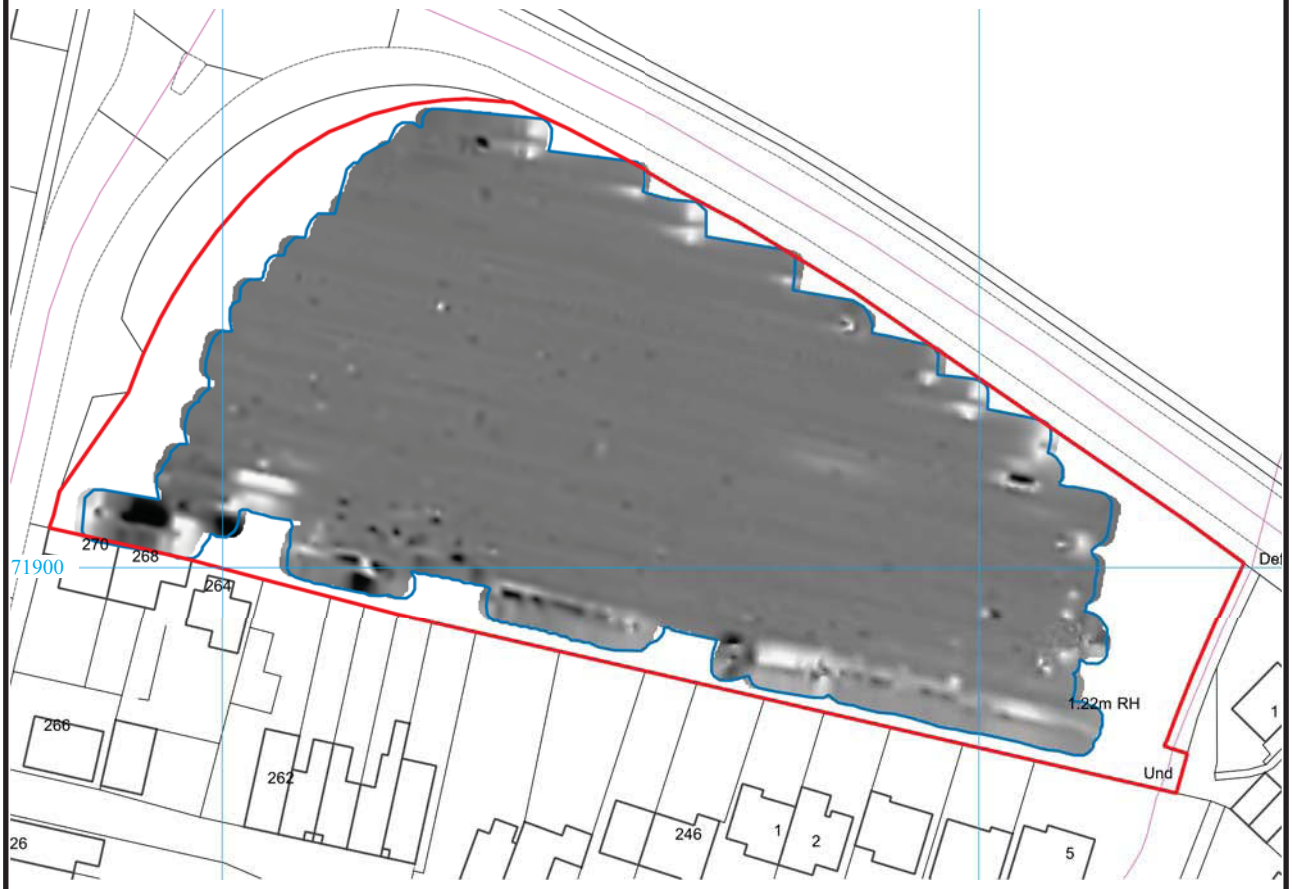
GPS based Processes: 6
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Despike Threshold: 1 Window dia: 3
5 Clip from -4.00 to 5.00
6 DeStagger by: 100.00cm, Shift Positions



Sand Pit Road, Calne,
Wiltshire, 2018
Geophysical Survey (Magnetic)

Figure 1. Location of site within Calne and Wiltshire.

THAMES VALLEY ARCHAEOLOGICAL SERVICES



SRC 15/251b

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Sand Pit Road, Calne,
Wiltshire, 2018
Geophysical Survey (Magnetic)
Figure 2. Plot of raw gradiometer data.

0m 50m

+100
nT
-100

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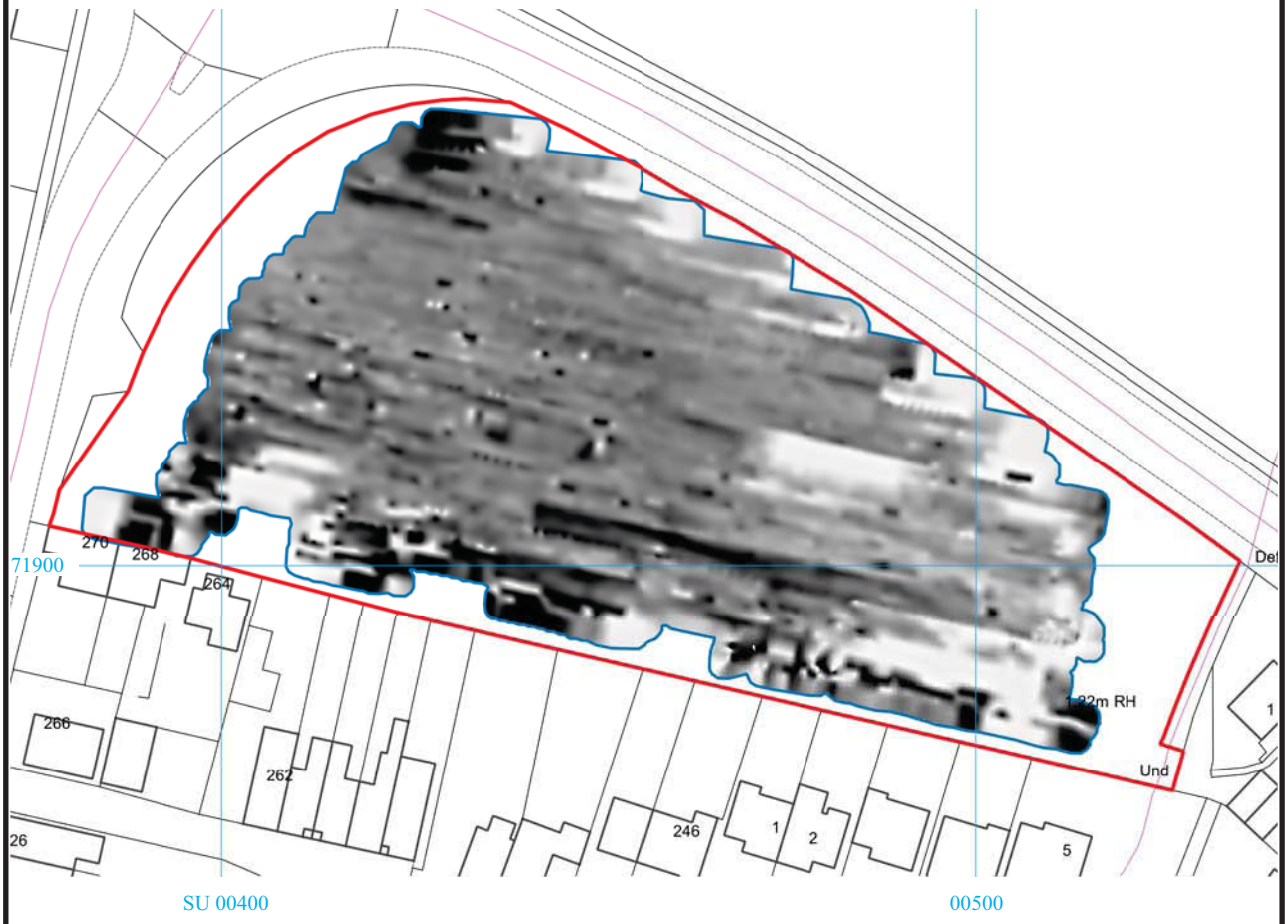

SRC 15/251b

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Sand Pit Road, Calne,
Wiltshire, 2018
Geophysical Survey (Magnetic)

Figure 3. Plot of minimally processed gradiometer data.

0m 50m

+5
nT
-4

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SRC 15/251b

N

Sand Pit Road, Calne,
Wiltshire, 2018
Geophysical Survey (Magnetic)
Figure 4 Interpretation plot.

0m 50m

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Plate 1. Western end of the field looking north-west from the centre of the site.

Plate 2. The northern boundary, looking north from the eastern end of the site.

Plate 3. Eastern end of the field looking east from the western end of the site.

SRC 15/251

Sand Pit Road, Calne
Wiltshire, 2018
Geophysical Survey (Magnetic)
Plates 1 to 3.

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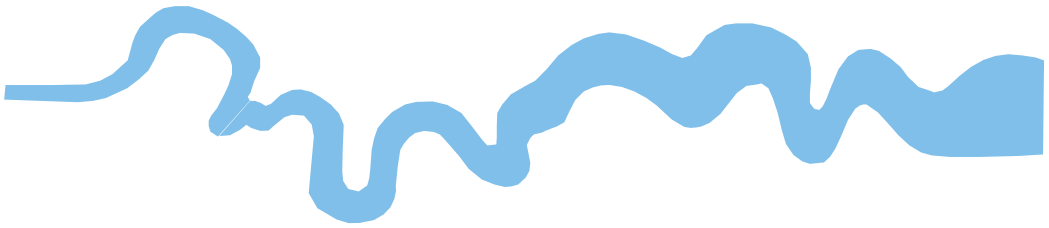
TIME CHART

	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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