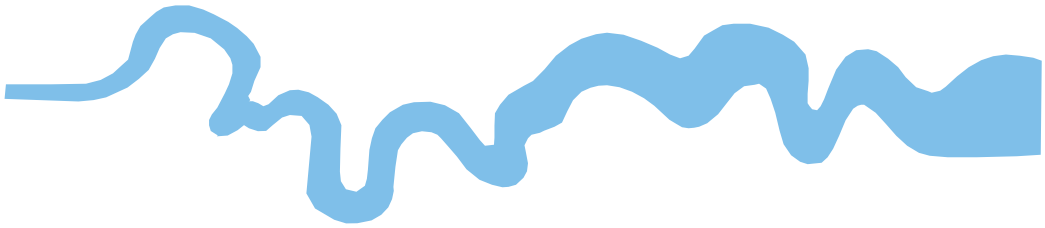
T V A S



NORTH MIDLANDS

Land at Coton Lane, Tamworth, Staffordshire

Geophysical Survey (Magnetic)

by Kyle Beaverstock

Site Code: CLT22/199

(SK 1916 0561)

Land at Coton Lane, Tamworth, Staffordshire

Geophysical Survey (Magnetic) Report

For Brindle and Green Limited

by Kyle Beaverstock

TVAS Normid

Site Code CLT 22/199

July 2022

Summary

Site name: Land at Coton Lane, Tamworth, Staffordshire

Grid reference: SK 1916 0561

Site activity: Magnetometer survey

Date and duration of project: 27th – 28th July 2022

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: CLT22/199

Area of site: c.2.5ha

Summary of results: A number of anomalies were detected by the geophysical survey although none appear to be of an archaeological nature.

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

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Report edited/checked by: Steve Ford✓ 16.08.22

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Land at Coton Lane, Tamworth, Staffordshire
A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 22/199

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Coton Lane, Tamworth, Staffordshire (SK 1916 0561) (Fig. 1). The work was commissioned by Tom Hough of Brindle and Green Ltd. on behalf of Avant Homes Ltd. 1 Phoenix Place, Phoenix Centre, Nottingham, NG8 6BA.

Planning permission is to be sought from Tamworth Borough Council for the construction of new housing on a c. 2.5ha hectare plot of land. A geophysical survey has been requested in order to guide further work. This is in accordance with the *National Planning Policy Framework* (NPPF 2021), and the Borough's policies on archaeology. The fieldwork was undertaken by Kyle Beaverstock on 27th – 28th July 2022 and the site code is CLT22/199.

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 along the northern edge of Tamworth (Fig. 1). 1.1km east of the River Tame. The site is bounded by Coton Lane to the south, the Tamworth to Lichfield Trent Valley railway line to the west, industrial parking to the north and residential units to the east. The site drops from a height of 67m above Ordnance Datum (aOD) in the east to 61m aOD in the west and the underlying geology is Boulder Clay in the east and First Terrace gravel in the west (BGS 1971).

Site history and archaeological background

The archaeological potential of the site has been highlighted in a desk-based assessment (Hough 2021), In summary there are no records of archaeological sites or finds within the survey area itself however there are a number of sites within the vicinity of the site. These include prehistoric features such as barrows/ring ditches of probable Bronze Age date are recorded along with an enclosure and the finding of a Late Iron Age gold coin. A Roman site with a double-ditched enclosure is recorded to the south east with a further Roman settlement to the north east. There are also various entries in the county historic environment record for the medieval and post-

medieval periods including listed buildings and landscape features such as parklands, water meadows and ridge and furrow.

Methodology

Sample interval

Data collection required a temporary grid to be established across the survey area using wooden pegs at 20m intervals with further subdivision where necessary. Readings were taken at 0.25m intervals along traverses 1m apart. This provides 1600 sampling points across a full 30m × 30m grid (EAC 2015), providing an appropriate methodology balancing cost and time with resolution. A number of obstructions were encountered by the geophysical survey including a large pylon in the central of the field, a dividing fence and some vegetation in the north-east and north-west of the survey area. 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 a dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometer. The instrument consists of two fluxgates mounted 1m vertically apart with a second set positioned at 1m horizontal distance. 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.

A Trimble Geo7x handheld GPS system with sub-decimetre real-time accuracy was used to tie the site grid 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 5.50 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
Interpolate: *y* doubled	Increases the resolution of the readings in the *y* axis, enhancing the shape of 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.
Search & Replace: from: ±30 nT to: ±1000 nT with: dummy	Removes extreme values resulting from magnetic interference caused by near-by ferromagnetic objects.
Range match (area: top 90, left 0, bottom 149, right 359) to top edge	Equalises the range of values between areas surveyed by different operatives, correcting for differences in setup.
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. 3) with the processed data then presented as a second figure (Fig. 4), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 5). Anomalies are shown as colour-coded lines, points and polygons. The grid layout and georeferencing information (Fig. 2) is prepared in EasyCAD v.7.58.00, producing a .FC7 file format, and printed as a .PDF for inclusion in the final report.

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 2.16.2 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

A number of anomalies were detected by the geophysical survey, these mostly consist of areas with high responses such magnetic disturbance **[1]** these areas along the boundary and surrounding the central pylon are represented by bipolar responses and are likely caused by ferrous material in the fencing and the pylon structure. In the west are a number of large areas of magnetic debris **[2]**, these are represented by a number of dipolar responses over a large area. The strength of these responses suggests that these are likely caused by ground disturbance with some possible thermoremnant material. In the east of the site is an area of weak background variations **[3]**, these anomalies are usually represented by irregular positive weak responses and are likely caused by either natural features or changes in the underlying geology.

Conclusion

A modest number of anomalies were detected by the geophysical survey, however none of these appear to have an archaeological nature. Some appear to be of geological nature however a significant area, particularly in the east appears to be interference from ferrous materials and debris, this may be masking potential features.

References

BGS, 1971, *British Geological Survey*, 1:63,360, Sheet 154, Drift Edition, Keyworth

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

Hough, T, 2021, Land off Coton Lane, Tamworth, Staffordshire , Archaeological desk-based assessment, Brindle and Green, Derby

IFA, 2002, 'The Use of Geophysical Techniques in Archaeological Evaluation', IFA Paper No. 6, Reading

NPPF, 2021, *National Planning Policy Framework*, Ministry of Housing, Communities and Local Govt, London

Appendix 1. **Survey and data information**

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

Raw data
Filename: Comp 1 RAW.xcp
Instrument Type: Grad 601 (Magnetometer)
Units: nT
Survey corner coordinates (X/Y):
Northwest corner: 419210.926, 305733.416 m
Southeast corner: 419360.926, 305523.416 m
Direction of 1st Traverse: 153 deg
Collection Method: ZigZag
Sensors: 2 @ 1 m spacing.
Dummy Value: 2047.5

Dimensions
Survey Size (meters): 150 m x 210 m
X&Y Interval: 0.25 m

Stats
Max: 96.99
Min: -100.00
Std Dev: 19.20
Mean: -0.25
Median: 0.17
Composite Area: 3.15 ha
Surveyed Area: 2.0336 ha

Source Grids: 34
1 Col:0 Row:1 grids\17.xgd
2 Col:0 Row:2 grids\18.xgd
3 Col:0 Row:3 grids\19.xgd
4 Col:0 Row:4 grids\30.xgd
5 Col:0 Row:5 grids\32.xgd
6 Col:0 Row:6 grids\34.xgd
7 Col:1 Row:0 grids\13.xgd
8 Col:1 Row:1 grids\14.xgd
9 Col:1 Row:2 grids\15.xgd
10 Col:1 Row:3 grids\16.xgd
11 Col:1 Row:4 grids\29.xgd
12 Col:1 Row:5 grids\31.xgd
13 Col:1 Row:6 grids\33.xgd
14 Col:2 Row:0 grids\09.xgd
15 Col:2 Row:1 grids\10.xgd
16 Col:2 Row:2 grids\11.xgd
17 Col:2 Row:3 grids\12.xgd
18 Col:2 Row:4 grids\26.xgd
19 Col:2 Row:5 grids\27.xgd
20 Col:2 Row:6 grids\28.xgd
21 Col:3 Row:0 grids\05.xgd
22 Col:3 Row:1 grids\06.xgd
23 Col:3 Row:2 grids\07.xgd
24 Col:3 Row:3 grids\08.xgd
25 Col:3 Row:4 grids\23.xgd
26 Col:3 Row:5 grids\24.xgd
27 Col:3 Row:6 grids\25.xgd
28 Col:4 Row:0 grids\01.xgd
29 Col:4 Row:1 grids\02.xgd
30 Col:4 Row:2 grids\03.xgd
31 Col:4 Row:3 grids\04.xgd
32 Col:4 Row:4 grids\20.xgd
33 Col:4 Row:5 grids\21.xgd
34 Col:4 Row:6 grids\22.xgd

Processed data
Stats
Max: 5.50
Min: -4.00
Std Dev: 2.76
Mean: 0.15
Median: 0.01
Composite Area: 3.15 ha
Surveyed Area: 2.0336 ha

Processes: 7
1 Base Layer
2 DeStripe Median Sensors: Grids: All
3 Clip at 1.00 SD
4 Despike Threshold: 1 Window size: 3x3
5 Clip from -8.00 to 6.00 nT
6 Clip from -5.30 to 5.50 nT
7 Clip from -4.00 to 5.50 nT

Land at Coton Lane, Tamworth,
Staffordshire 2022
Geophysical Survey (Magnetic)

Figure 1. Location of site within Tamworth and Staffordshire,

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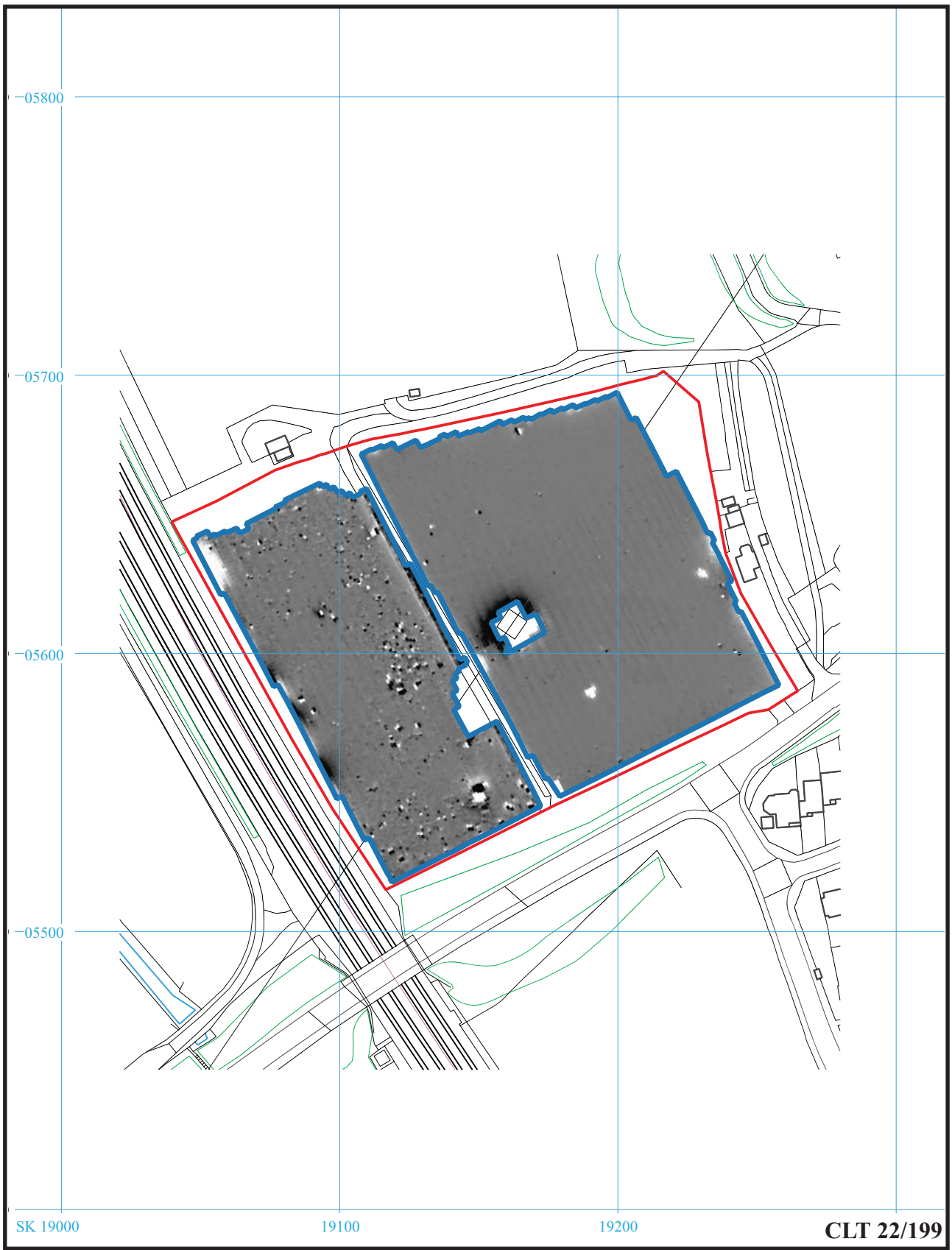

Land at Coton Lane, Tamworth, Staffordshire, 2022
Geophysical Survey (Magnetic)
Figure 2. Plot of raw gradiometer data.

N

0m 100m

+100
nT
-100

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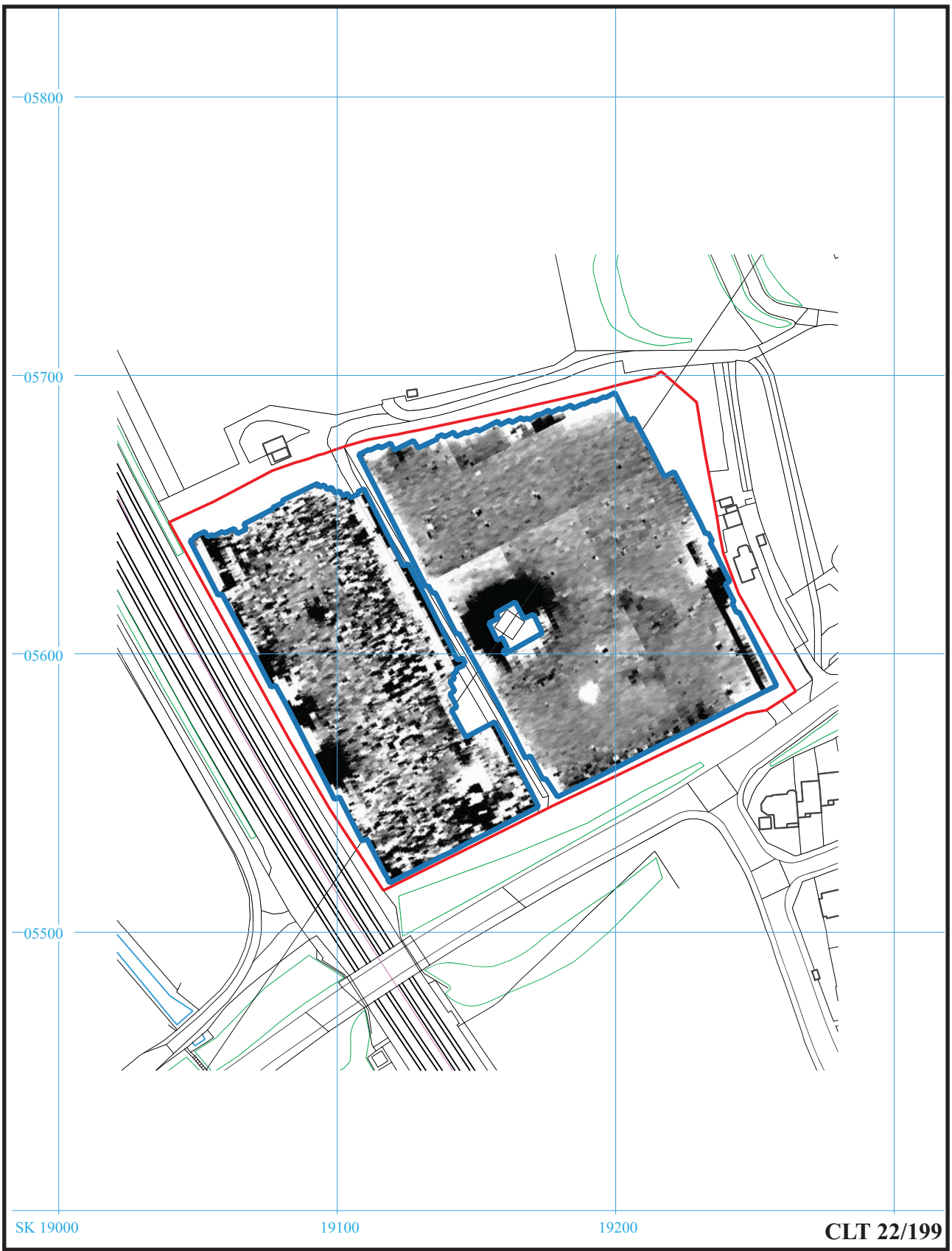
05800
05700
05600
05500
SK 19000
19100
19200
CLT 22/199
N
Land at Coton Lane, Tamworth,
Staffordshire, 2022
Geophysical Survey (Magnetic)
Figure 3. Plot of process gradiometer data.
0m
100m
+5.50
nT
-4.00
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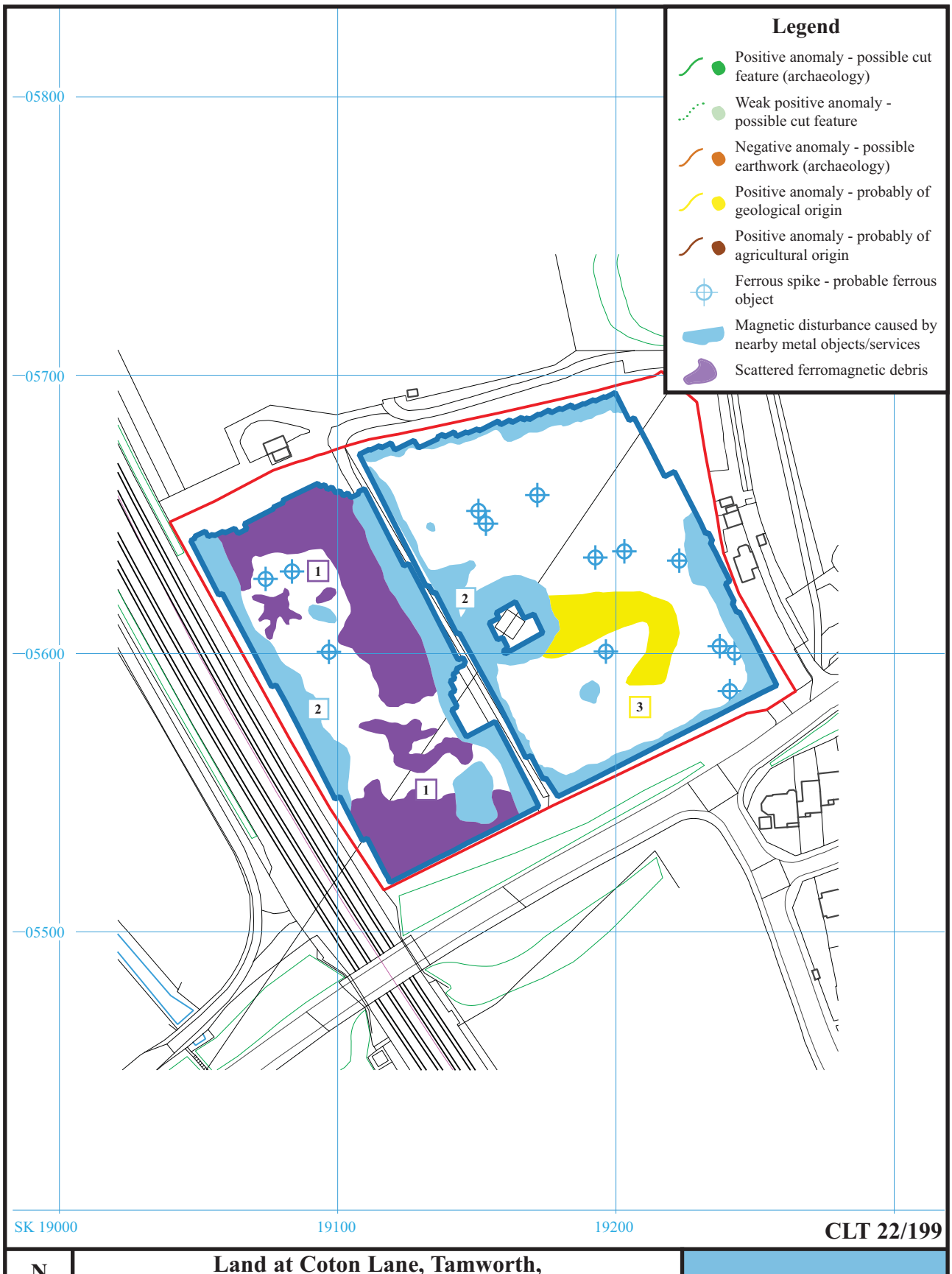

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N

Land at Coton Lane, Tamworth, Staffordshire, 2022
Geophysical Survey (Magnetic)
Figure 4. Interpretation plot.

0m 100m

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Plate 1. Northern part of survey area looking north-west.

Plate 2. Top of survey area looking south-west.

Plate 3. Centre of survey area showing pylon and fence looking north.

Plate 4. Southern part of survey area looking west.

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Land at Coton Lane, Tamworth, Staffordshire, 2022
Geophysical Survey (magnetic)
Plates 1 to 4.

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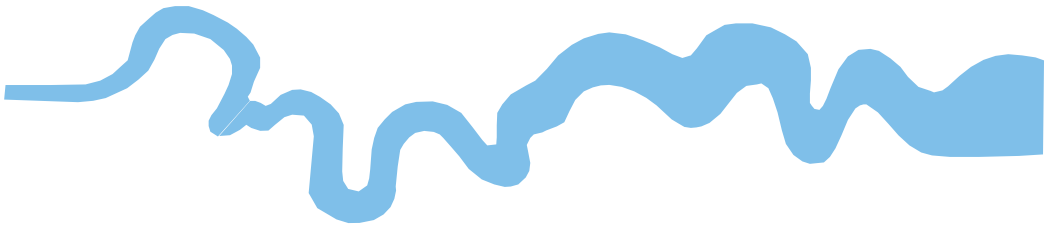
TIME CHART

	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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