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S E R V I C E S

**Thame Cattle Market Site, Land north of Rycote Lane,
Thame, Oxfordshire**

Geophysical Survey (Magnetic)

by Kyle Beaverstock

Site Code: RLT 24/85

(SP 6856 0534)

Thame Cattle Market Site, Land north of Rycote Lane, Thame, Oxfordshire

Geophysical Survey (Magnetic) Report

For Thame Farmers Mart

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code RLT 24/85

July 2024

Summary

Site name: Thame Cattle Market Site, Land north of Rycote Lane, Thame, Oxfordshire

Grid reference: SP 6856 0534

Site activity: Magnetometer survey

Date and duration of project: 1 – 2 July 2024

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: RLT 24/85

Area of site: c. 6.8ha

Summary of results: A small number of magnetic anomalies were detected by the geophysical survey, most of which relate to scattered ferromagnetic material, however a few weak positive linear anomalies may relate to buried cut features such as ditches.

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✓ 11.07.24 Tim Dawson✓ 10.7.24

Thame Cattle Market Site, Land north of Rycote Lane, Thame, Oxfordshire A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 24/85b

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Rycote Lane, Thame, Oxfordshire (SP 6856 0534) (Fig. 1). The work was commissioned by Jake Collinge of Jake Collinge Planning Consultancy, 4 Hawthorn Avenue, Thame, Oxfordshire, OX9 2AS, on behalf of Thame Farmers Mart, North Street, Thame, Oxon, OX9 3FP.

Planning permission is to be sought from South Oxfordshire District Council for a new cattle market, commercial units and associated works on a plot of land north of Rycote Lane, Thame. Due to the potential disturbance of below ground archaeological features, predetermination archaeological work including a geophysical survey has been requested inform the planning process. This is in accordance with the *National Planning Policy Framework* (NPPF 2023), and the District's policies on archaeology. The field investigation was carried out to a specification was approved by Steven Weaver, Senior Planning Archaeologist for Oxfordshire County Council. The fieldwork was undertaken by Kyle Beaverstock and Logan Ward between the 1st and 2nd of July 2024 and the site code is RLT 24/85.

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 c.2km to the west of the town centre of Thame (Fig. 1) and 800m south-east of the hamlet of North Weston in South Oxfordshire District. At the time of survey it consisted of a 6.8ha section of a larger arable field which is bounded by farmland to the west and north, Rycote Lane to the south and industrial units to the east. This rectangular parcel of land is relatively flat and sits at a height of 70m above Ordnance Datum. underlying geology is recorded as primarily as Gault Formation mudstone with a band of alluvium cutting east-west across the northern half of the site (BGS 1994). Mudstone geologies generally provide an average magnetic response but, as with alluvium, this can be variable (EH 2008).

Site history and archaeological background

The archaeological potential of the site stems from its location in the archaeologically rich hinterland of Thame. A planning consultation document provided by Oxfordshire County Archaeological Services (OCAS) details the archaeological significance of the site's immediate vicinity. In summary, the site is located 300m to the west of the deserted medieval village of North Weston which survives as low earthworks at Manor Farm, which itself has origins in the early 17th century. Archaeological investigations in advance of housing development at Thame Meadow, some 600m to the north-east of the site, identified extensive remains including prehistoric monuments and settlement evidence covering the Neolithic, Iron Age, Roman and Saxon periods. The landscape around the site area during the medieval period was generally agricultural in nature with the village at North Weston providing a focal point. Geophysical survey evidence to the north-east of the site has identified possible post-medieval clay extraction pits around the junctions of Rycote Lane and Thame Road and the Christmas Hill brickworks is known to have been positioned on Rycote Lane itself c.450m east of the site in the 19th century.

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 0.13m intervals along traverses 1m apart, providing an appropriate methodology balancing cost and time with resolution. Traverses were walked at an alternating zig-zag pattern along a roughly north to south orientation across the survey area. No significant obstructions were encountered during 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, 2020).

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 R2 Receiver, centimetre edition GPS. Readings were collected by two Bartington Grad601-2 loggers and collated using MLgrad601 software on a HP Pavilion x360 14-ek1511sa 14” 2 in 1 Laptop running Windows 11 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 R2 Receiver, 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 TerraSurveyor64 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

Clip from -2.00 to 2.00 nT

De-stripe: median, all sensors

De-spike: threshold 1, window size 3×3

De-stagger: all grids, both by -1 intervals

Effect

Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.

Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.

Compresses outlying magnetic points caused by interference of metal objects within the survey area.

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 two further figures (Figs. 3-4), followed by a fifth plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 5). Anomalies are shown as colour-coded lines, points and polygons.

The greyscale plot of the processed data is exported from TerraSurveyor64 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 3.38 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. Mean nano Tesla (nT) readings will be represented by $\bar{x}$.

Results

A small number of magnetic anomalies were detected by the geophysical survey (Figs. 2-4). Along the northern and southern boundary are areas of magnetic disturbance [**Fig. 5: 1**], this is characterised by high bipolar positive and negative responses ($\pm 99\text{nT}$) and is likely the result of ferromagnetic material in the fencing. In the south of the field are linear areas of magnetic disturbance [**2**] ($\pm 99\text{nT}$). These are orientated north-west to south-east and run for 36m with a 16m gap and continuing for 101m with another 32m gap and continuing into the south-eastern corner. These are likely related to buried services such as a ferrous pipe or cable although the disjointed nature of the overall line suggests that it might be partially removed. Across the survey area are a series of bipolar and dipolar anomalies [**3**] that are characterised by positive ($\bar{x} = +57.4\text{nT}$) points with an associated negative response ($\bar{x} = -62\text{nT}$) and are likely caused by buried ferromagnetic objects such as fragments of farm machinery. In the north and south are two areas of weak background variations [**4**] which are characterised by irregular low positive responses ($\bar{x} = +1.1\text{nT}$) and are likely caused by variations in the underlying geology.

In the north are a series of parallel weak positive linear anomalies orientated west to east [5-7]. These range between 198m and 160m in length and are all approximately 9m apart and likely represent cut features such as ditches, however anomaly [8] matches the location of a drainage ditch noted on the 1994 Ordnance Survey map.

Conclusion

The underlying Gault geology is known for having variable and sometimes poor magnetic response however, a number of anomalies were detected by the geophysical survey. Many of these are related to scattered buried ferromagnetic material, services and geological variations. However a series of weak positive linear anomalies were detected in the north of the survey area. These may represent cut features or furrows although they are in an area where a former water channel is noted on the 1994 Ordnance Survey map. (Madden 2024).

References

- BGS, 1994, *Geological Survey of England and Wales*, 1:50,000 series, Sheet 237, Solid and Drift, Keyworth
- CIFA, 2020, '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
- EH, 2008, *Geophysical Survey in Archaeological Field Evaluation*, English Heritage, Swindon
- IFA, 2002, 'The Use of Geophysical Techniques in Archaeological Evaluation', IFA Paper No. 6, Reading
- Madden, C, 2024, 'Thame Cattle Market Site, Land north of Rycote Lane, Thame, Oxfordshire: Archaeological Desk-based Assessment', Thames Valley Archaeological Services report 24/85, Reading
- NPPF, 2023, *National Planning Policy Framework* (revised), Department for Levelling Up, Housing and Communities, London

Appendix 1. Survey and data information

Programme:

Name: TerraSurveyor64
Version: 4.0.18.1

Raw data

Name: RLT24-85_01_RAW
Desc: Imported as Composite from: RLT24-85_01.xyz
InstDesig: MLGrad Import
SurveyDate: 01/07/2024
AssembleDate: 03/07/2024
ProcessDate: 03/07/2024
Units:
Surveyed Area: 5.0666 ha
Survey Extent: 5.9953 ha
GPS Datum: WGS-84
Map Coordinate System: DDD
Survey Type: GPS
Average point interval : 1.32m
Interval & Radius : 0.13m 2m
Source GPS totals: Trackgroups:1 Tracks:1024, Points:150832

Base layer Stats

Max: 98.70
Min: -99.90
Std Dev: 8.77
Mean: -0.85
Median: -0.90

Name: RLT24-85_02_RAW
Desc: Imported as Composite from: RLT24-85_02.xyz
InstDesig: MLGrad Import
SurveyDate: 02/07/2024
AssembleDate: 03/07/2024
ProcessDate: 03/07/2024
Units:
Surveyed Area: 1.5585 ha
Survey Extent: 2.0497 ha
GPS Datum: WGS-84
Map Coordinate System: DDD
Survey Type: GPS
Average point interval : 1.31m
Interval & Radius : 0.13m 2m
Source GPS totals: Trackgroups:1 Tracks:352, Points:45072

Base layer Stats

Max: 98.40
Min: -99.90
Std Dev: 8.41
Mean: -0.82
Median: -0.70

Minimally processed data

Name: RLT24-85_01_MIN
Top layer Stats
Max: 10.00
Min: -10.00
Std Dev: 1.59
Mean: -0.04
Median: 0.00

Hi/Lo

FilterModeHigh
WindowLength 21
WindowWidth 21
WeightingMode Median
Threshold 1.00
ReplaceCenterWith Average

Clip

Base
CutTurnAngle 0.00
CutTurnThreshold 0
CutTurnLength 0.00
BreakOnJumpDistance 0.00
DiscardOverlapThreshold -1.00
DiscardOverlapMinTrack 0
DiscardOverlapMethod DelNew
PointReduction 0.00

DeStripe
Mode Track
Method Mean
Orientation Along
MaintainMean ✗
ThresholdType None
ThresholdMin 2.00
ThresholdMax 2.00
Sectors 5
WindowLength 101

Hi/Lo
FilterModeHigh
WindowLength 21
WindowWidth 21
WeightingMode Median
Threshold 1.00
ReplaceCenterWith Average

Clip
Min -10.00
Max 10.00
SelectSD 0.00

Name: RLT24-85_02_MIN
Top layer Stats
Max: 10.00
Min: -10.00
Std Dev: 1.57
Mean: -0.02
Median: 0.00

Base
CutTurnAngle 0.00
CutTurnThreshold 0
CutTurnLength 0.00
BreakOnJumpDistance 0.00
DiscardOverlapThreshold -1.00
DiscardOverlapMinTrack 0
DiscardOverlapMethod DelNew
PointReduction 0.00

DeStripe
Mode Track
Method Mean
Orientation Along
MaintainMean ✗
ThresholdType None
ThresholdMin 2.00
ThresholdMax 2.00
Sectors 5
WindowLength 101

Name: RLT24-85_02
Top layer Stats
Max: 2.00
Min: -2.00
Std Dev: 0.52
Mean: -0.01
Median: 0.00

Base
CutTurnAngle 0.00

Min -10.00
Max 10.00
SelectSD 0.00

Processed data

Name: RLT24-85_01

Top layer Stats

Max: 2.00

Min: -2.00

Std Dev: 0.52

Mean: -0.01

Median: 0.00

Base

CutTurnAngle 0.00

CutTurnThreshold 0

CutTurnLength 0.00

BreakOnJumpDistance 0.00

DiscardOverlapThreshold -1.00

DiscardOverlapMinTrack 0

DiscardOverlapMethod DelNew

PointReduction 0.00

DeStripe

Mode Track

Method Mean

Orientation Along

MaintainMean X

ThresholdType None

ThresholdMin 2.00

ThresholdMax 2.00

Sectors 5

WindowLength 101

Hi/Lo

FilterModeHigh

WindowLength 21

WindowWidth 21

WeightingMode Median

Threshold 1.00

ReplaceCenterWith Average

Clip

Min -10.00

Max 10.00

SelectSD 0.00

Clip

Min -5.00

Max 5.00

SelectSD 0.00

Clip

Min -2.00

Max 2.00

SelectSD 0.00

CutTurnThreshold 0

CutTurnLength 0.00

BreakOnJumpDistance 0.00

DiscardOverlapThreshold -1.00

DiscardOverlapMinTrack 0

DiscardOverlapMethod DelNew

PointReduction 0.00

DeStripe

Mode Track

Method Mean

Orientation Along

MaintainMean X

ThresholdType None

ThresholdMin 2.00

ThresholdMax 2.00

Sectors 5

WindowLength 101

Hi/Lo

FilterModeHigh

WindowLength 21

WindowWidth 21

WeightingMode Median

Threshold 1.00

ReplaceCenterWith Average

Clip

Min -10.00

Max 10.00

SelectSD 0.00

Clip

Min -5.00

Max 5.00

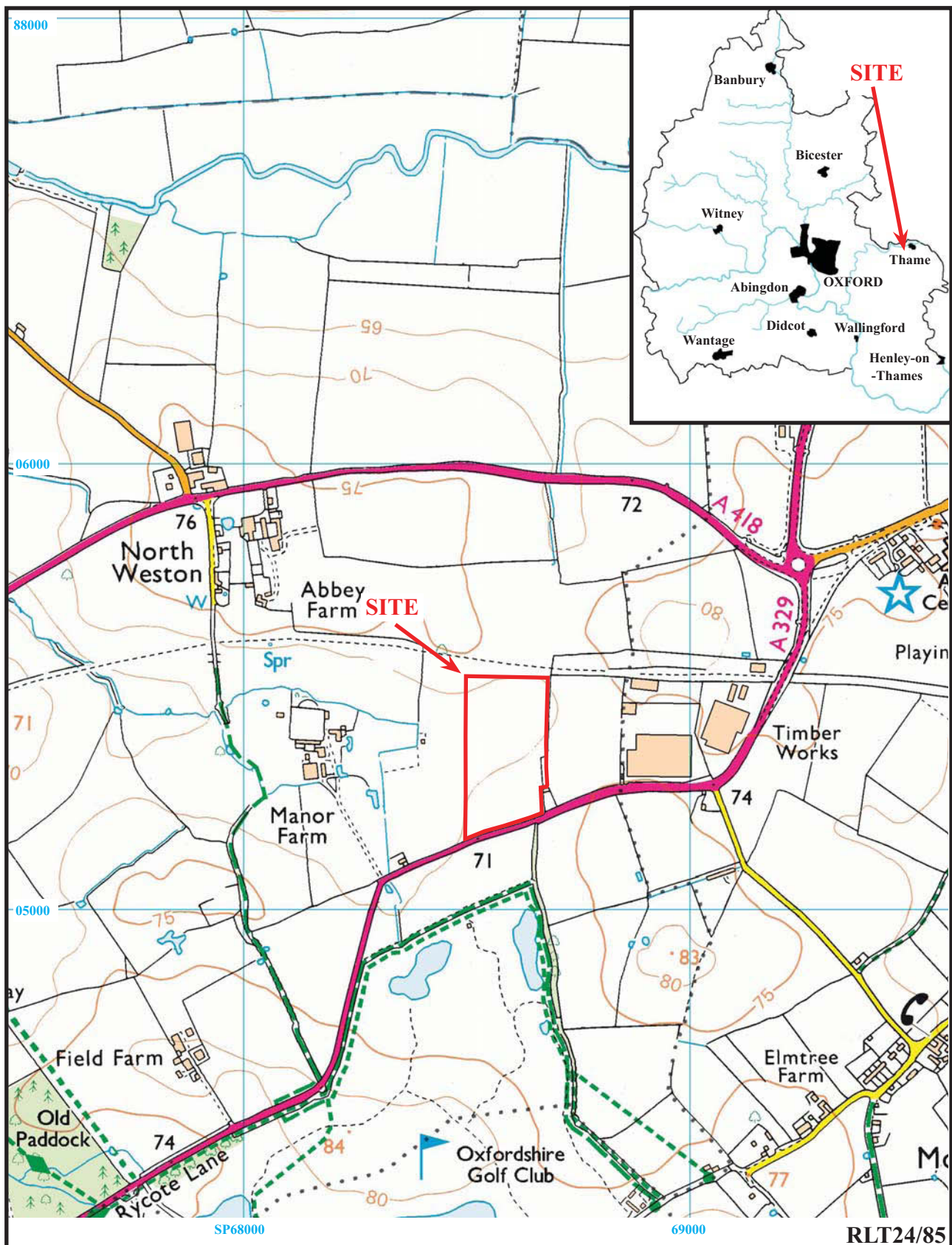
SelectSD 0.00

Clip

Min -2.00

Max 2.00

SelectSD 0.00



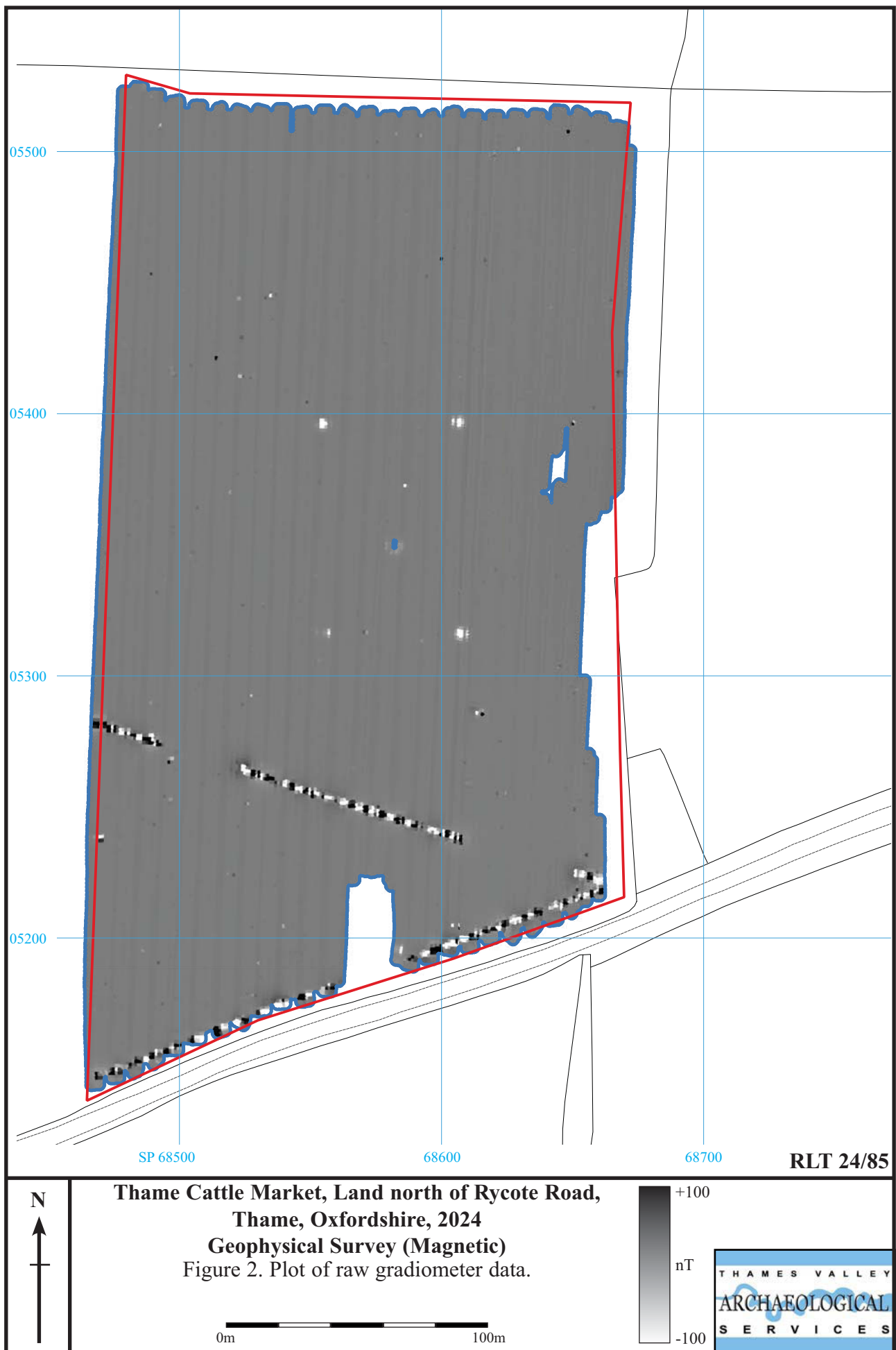
**Thame Cattle Market Site, Land north of Rycote Lane,
Thame, Oxfordshire, 2024**

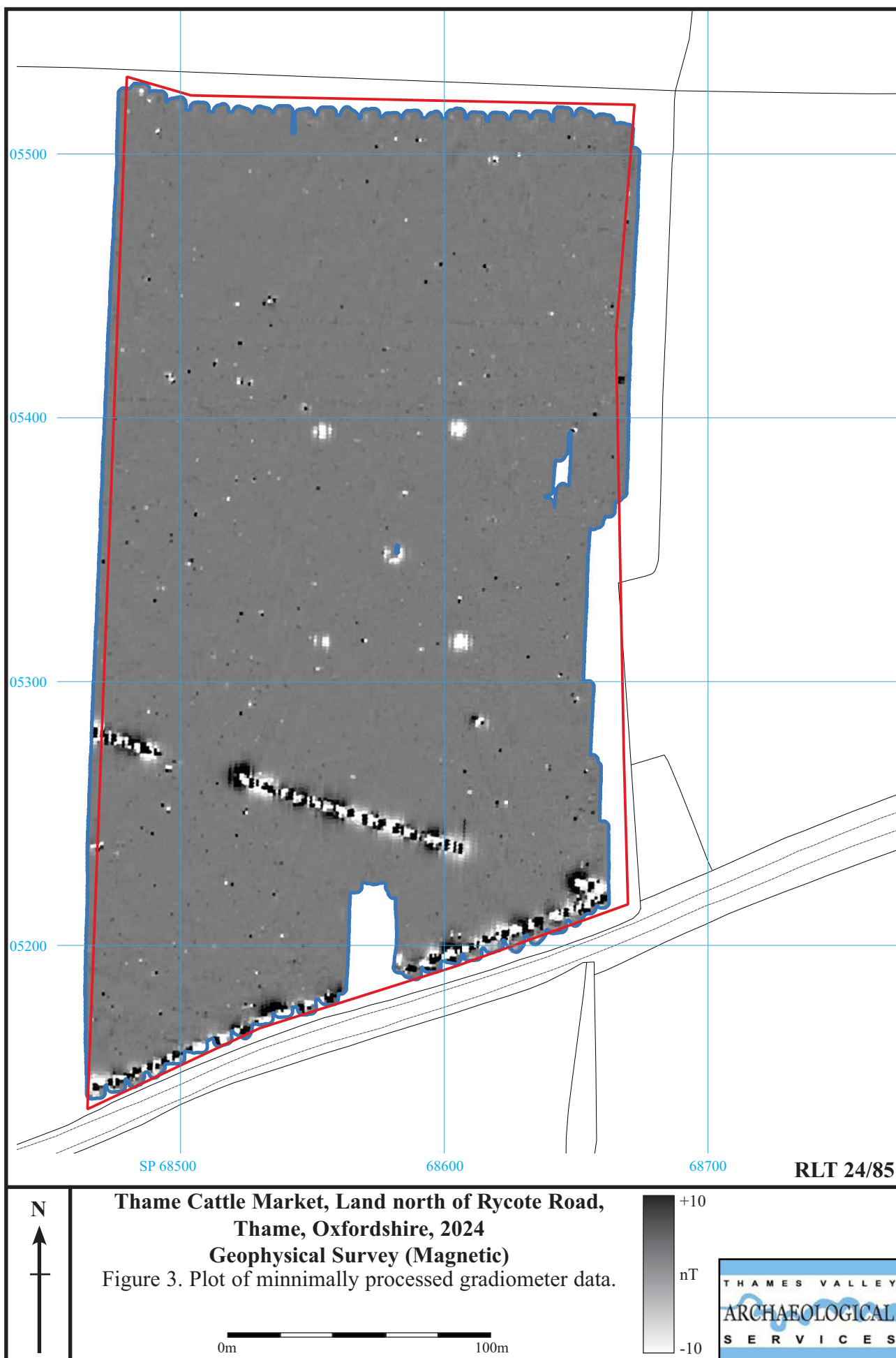
Proposal for geophysical survey (magnetic)

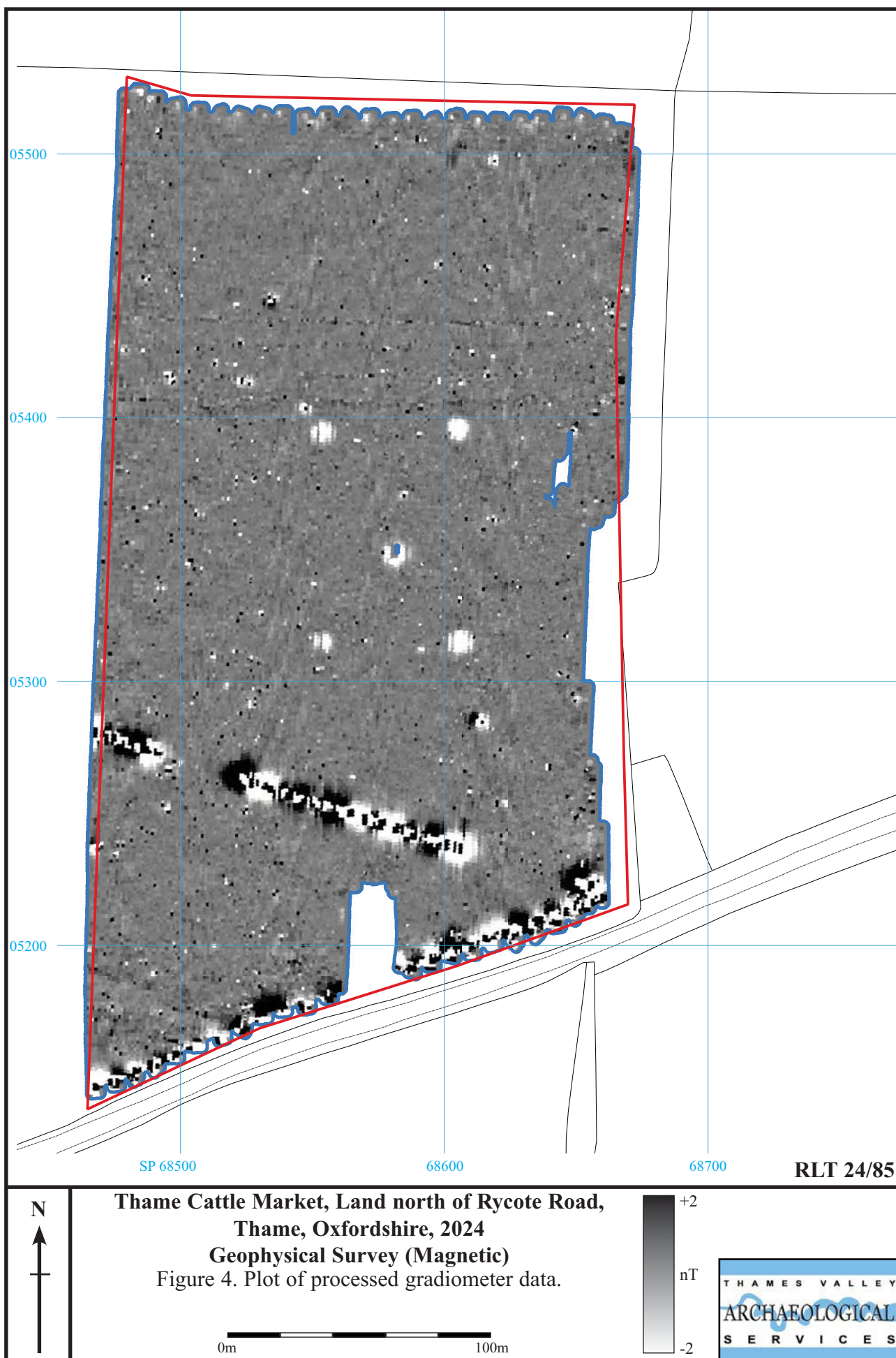
Figure 1. Location of site within Thame and Oxfordshire.

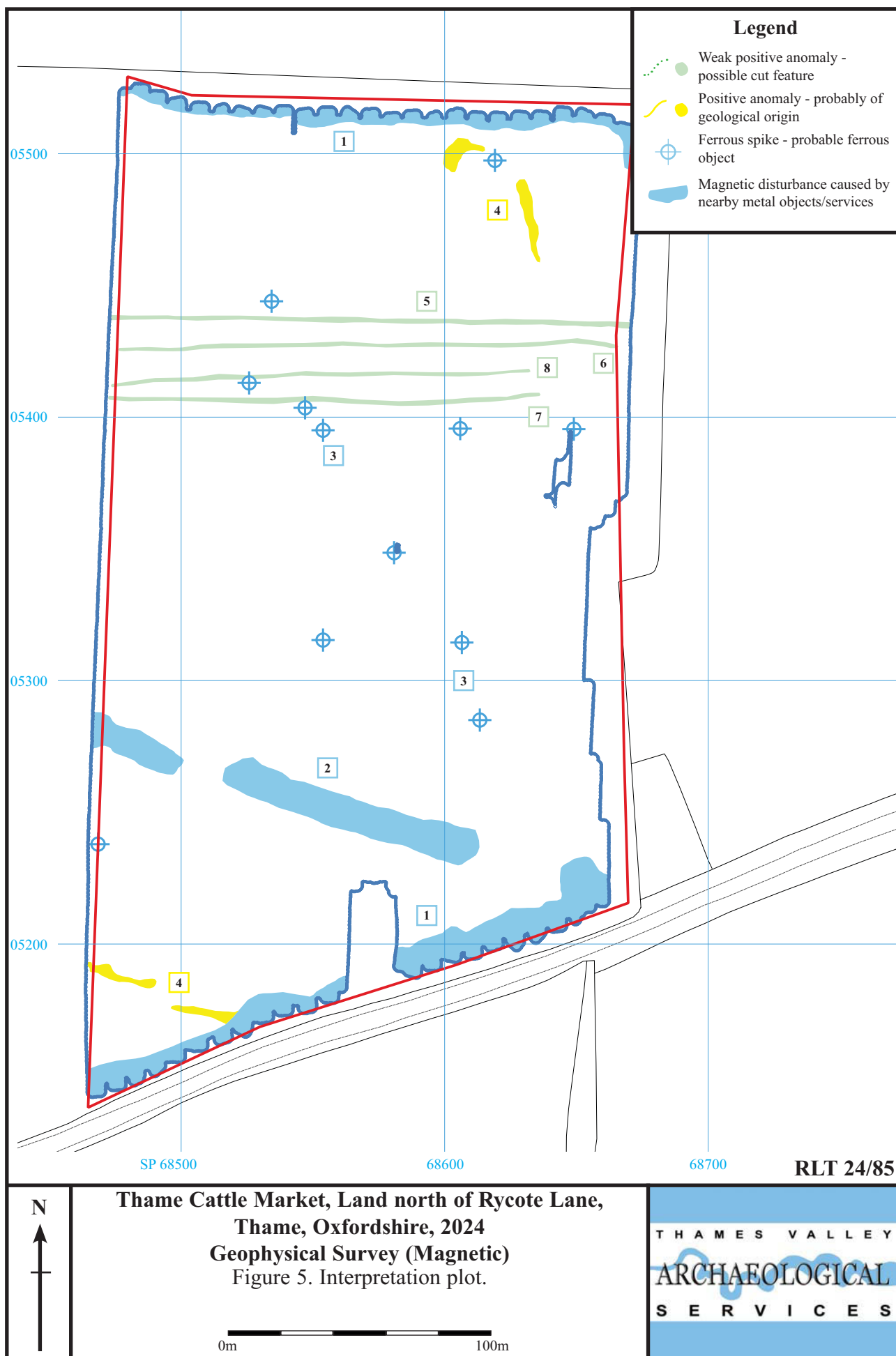
Reproduced under licence from Ordnance Survey Explorer Digital mapping at 1:12500
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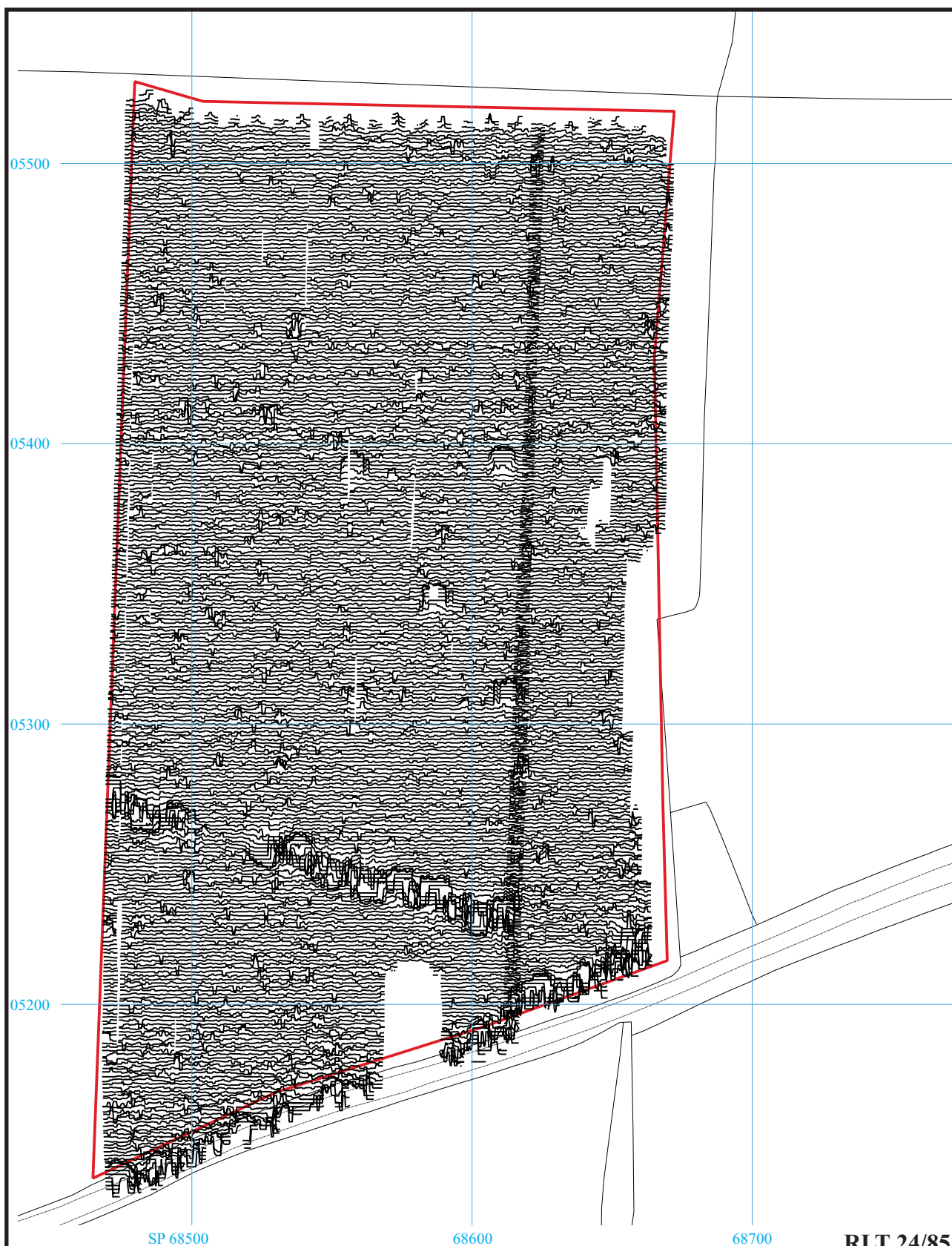
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**Thame Cattle Market, Land north of Rycote Road,
Thame, Oxfordshire, 2024
Geophysical Survey (Magnetic)**

Figure 6. XY plot of processed gradiometer data.

0m 100m



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



Plate 2. Northern part of the survey area looking south-east from the north-west.



Plate 3. Central part of the survey area looking west from the east.



Plate 4. Southern part of the survey area looking south.

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**Thame Cattle Market, Land north of Rycote Lane,
Thame, Oxfordshire, 2024
Geophysical Survey (magnetic)
Plates 1 - 4.**

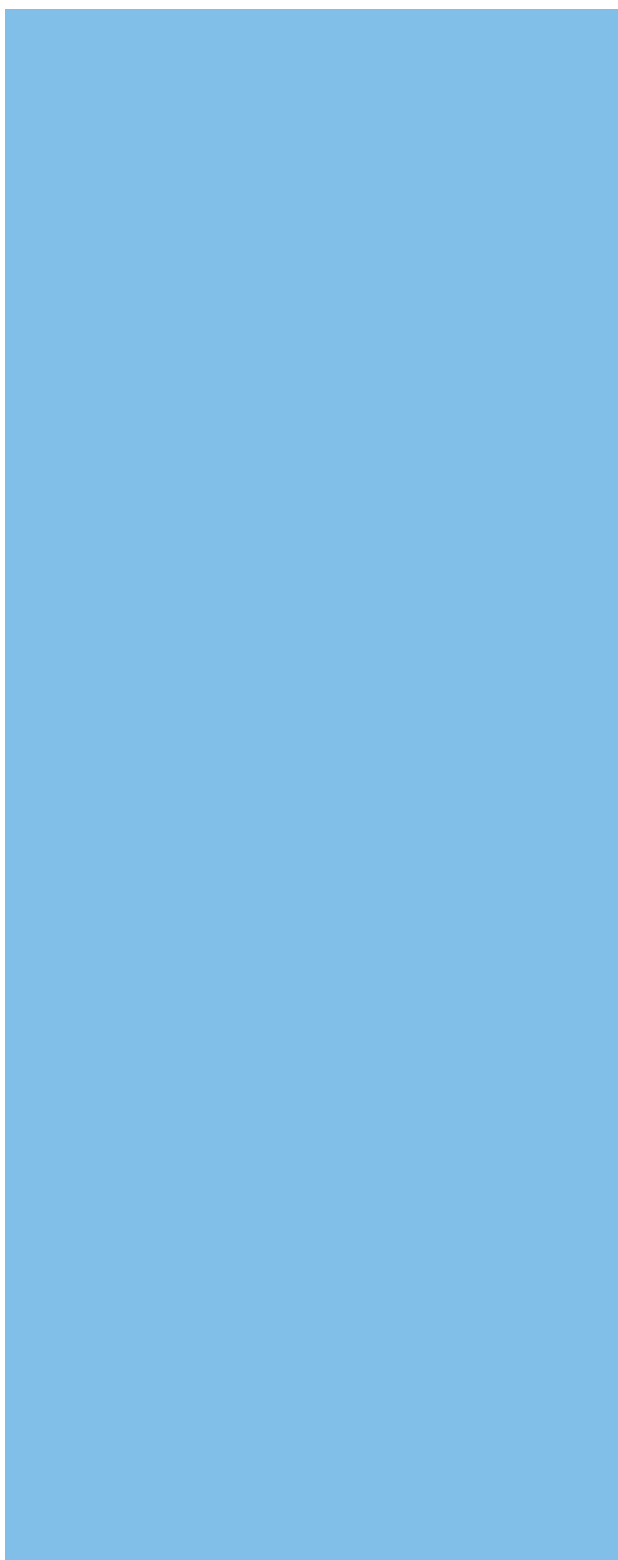
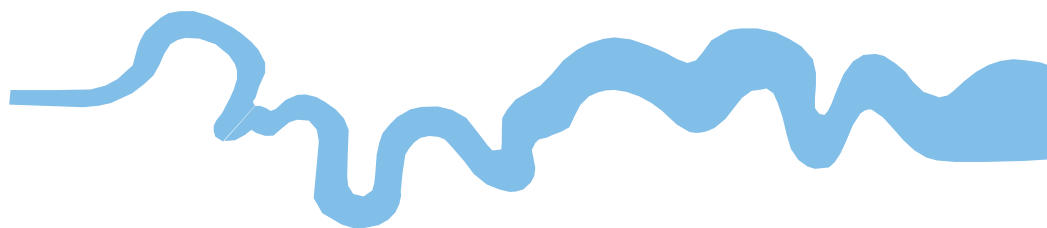
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TIME CHART

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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