THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

Countesthorpe Crematorium, Foston Road, Countesthorpe, Leicestershire

Geophysical Survey (Magnetic)

by Tim Dawson

Site Code: FCL 13/68

(SP 5922 9584)

Countesthorpe Crematorium, Foston Road, Countesthorpe, Leicestershire

Geophysical Survey (Magnetic) Report

For Memoria Ltd

by Tim Dawson

Thames Valley Archaeological Services Ltd

Site Code FCL 13/68

April 2014

Summary

Site name: Countesthorpe Crematorium, Foston Road, Countesthorpe, Leicestershire

Grid reference: SP 5922 9584

Site activity: Magnetometer survey

Date and duration of project: 4th April 2014

Project manager: Steve Ford

Site supervisor: Tim Dawson

Site code: FCL 13/68

Area of site: 1.33ha

Summary of results: Several positive anomalies were identified representing buried cut features such as ditches. However, the orientation and layout of the majority of these suggests that they most likely represent features created by agricultural processes, such as ploughing or ridge and furrow. Five other positive anomalies may indicate the presence of archaeological features, either ditches or pits, but these may equally be agricultural in origin.

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✓ 11.04.14
	Steve Preston✓ 11.04.14

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Countesthorpe Crematorium, Foston Road, Countesthorpe, Leicestershire
A Geophysical Survey (Magnetic)

by Tim Dawson

Report 13/68b

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at the future site of Countesthorpe Crematorium, Foston Road, Countesthorpe, Leicestershire (SP 5922 9584) (Fig. 1). The work was commissioned by Mr Justin Mason of Capital Law, Capital Building, Tyndall Street, Cardiff, CF10 4AZ on behalf of Memoria Ltd, The Pool House, Bicester Road, Stratton Audley, Oxfordshire, OX27 9BS.

Planning permission (13.0471/1/PX) for the construction of a new crematorium and associated parking and gardens has been granted on appeal (APP/T2405/A/13/2210523) by Blaby District Council, subject to a condition (8) which requires the implementation of a programme of archaeological work. The western part of the site has been surveyed previously (Smith 2010) and was not resurveyed as part of this phase of work.

This is in accordance with the Department for Communities and Local Government's *National Planning Policy Framework* (NPPF 2012), and the District's policies on archaeology. The field investigation was carried out to a specification approved by Ms Teresa Hawtin, Senior Planning Archaeologist at Leicestershire County Council. The fieldwork was undertaken by Tim Dawson and Lizzi Lewins on 4th April 2014 and the site code is FCL 13/68.

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 fringes of Countesthorpe, a large village *c*.3km south of the outskirts of Leicester. It occupies a triangular parcel of land bounded to the north by Foston Road, to the west partly by a field with further fields to the south-west (Fig. 2, Pls 1 and 2). A stream forms part of the south-eastern section of the boundary. The land slopes gently downhill from the road in the north to the tip of the triangle at the southern end of the site. The survey site has an area of 1.33 ha centred on NGR SP 5922 9584 and lies at a height of approximately 77m above Ordnance Datum. The site is located on Wigston Member boulder clay in the north-west and alluvium in the south-east with a band of first river terrace sand and gravel deposits dividing the two (BGS 1969).

Conditions during the survey were damp at the outset but as the sun came out the ground dried out and air warmed up. Ground cover consisted of thick but short grass with a shallow ditch running north-south down the centre of the field and a large depression in the northern area containing slightly rougher grass. The field boundaries consisted of wooden post-and-rail fencing with a metal gate along the northern edge and hedgerows and trees on the other sides.

Site history and archaeological background

The archaeological potential of the site has been highlighted in an archaeological desk-based assessment (Elliott 2013). In summary the site lies within an area with few archaeological findspots or deposits on or immediately close to the site but with various prehistoric sites in the general area. There is a moderate scatter of prehistoric flintwork and some metalwork from the region, an undated cropmark complex visible from the air to the north-east and Bronze Age burials to the north of the village. The area of the field to the north-west of the site has been subject to a previous geophysical survey (Smith 2010) but without revealing any obvious archaeological anomalies other than 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 20m × 20m grid (English Heritage 2008), providing an appropriate methodology balancing cost and time with resolution. The survey grid was laid out as planned aligned north-south along the straight hedgerow that forms the field's western boundary (Fig. 2). There were no obstacles to the survey.

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 (2008) and the Institute for Archaeologists (2002, 2011).

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 fast yet detailed survey 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 seem 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 GeoXH 6000 handheld GPS system with sub-decimetre 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 TerraSurveyorLite 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 -1.30 to 1.30 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.

Once processed, the results are presented as a greyscale plot shown in relation to the site (Fig. 3), followed by a second plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons. The grid layout and georeferencing information (Fig. 2) is prepared in EasyCAD v.7.22.01, 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 TerraSurveyorLite in 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 rotated to orientate it to north and combined with grid and site plans 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

Several magnetic anomalies were recorded by the survey (Fig. 3). Of these a handful may represent cut features, e.g. ditches or pits, of archaeological origin (Fig. 4). The first is a pair of large positive anomalies which lie at right-angles to each other in the centre of the field **[Fig. 4: 1]**. Their strong positive magnetic signatures suggest that they are two sizable ditches although their position and orientation indicate that they may be part of a series of earthworks caused by agricultural activity. These agricultural features can be seen as series of parallel weak positive lines which cross the field in north-south and east-west directions **[2]**. This suggests ploughing or, as seen in the field to the west (Smith 2010), the effects of medieval or post-medieval ridge-and-furrow farming. There are three other positive anomalies which may represent buried discrete features such as pits **[3, 4, 5]** although, as with **[1]** they could be the result of agricultural activity, particularly as they appear to coincide with the intersections between the north-south and the east-west furrows.

Other anomalies identified were a negative linear which usually denotes a buried raised features such as a bank but in this case matched up with the shallow ditch that runs southwards down the centre of the field **[6]**. The field's other topographical feature, the large depression at its northern end, is also reflected in the magnetic plot although this time as an area of magnetic disturbance **[7]**, suggesting it may have been the site of small-scale mineral extraction. Similar disturbance patterns can be seen along the northern and western boundaries, particularly in the north-western corner where the metal gate is located. The magnetic plot also shows several ferrous spikes caused by buried ferromagnetic objects of unknown date.

Conclusion

The geophysical survey of the future site of Countesthorpe Crematorium was successfully completed to plan. The field was surveyed but only a handful of anomalies were identified which may represent buried archaeological features, both pits and ditches. These, and the weaker positive anomalies around them, are more likely the magnetic signatures of agricultural activity across the site, possibly medieval or post-medieval ridge-and-furrow. The other anomalies identified most likely represent a ditch and depression noted in the surface of the field and buried ferromagnetic objects.

References

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IFA, 2011, *Standard and Guidance: for archaeological geophysical survey*, Reading

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

Smith, H, 2010, 'Archaeological geophysical survey on land adjacent to Countesthorpe Cemetery, Foston Road Countesthorpe, Leicestershire', Northamptonshire Archaeology report 10/86, Northampton

Appendix 1. Survey and data information

Raw data
Instrument Type: Bartington (Gradiometer)
Units: nT
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32000

Dimensions
Composite Size (readings): 720 × 100
Survey Size (meters): 180 m × 100 m
Grid Size: 20 m × 20 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 98.20
Min: -100.00
Std Dev: 3.32
Mean: 0.57
Median: 0.80
Composite Area: 1.8 ha
Surveyed Area: 1.1803 ha

PROGRAMME
Name: TerraSurveyor
Version: 3.0.25.1

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

Processed data
Stats
Max: 1.30
Min: -1.30
Std Dev: 0.59
Mean: 0.01
Median: 0.00

Processes: 6
1 Base Layer
2 Clip from -4.00 to 5.00 nT
3 Despike Threshold: 1 Window size: 3×3
4 DeStripe Median Sensors: All
5 De Stagger: Grids: All Mode: Both By: -2 intervals
6 Clip from -1.30 to 1.30 nT

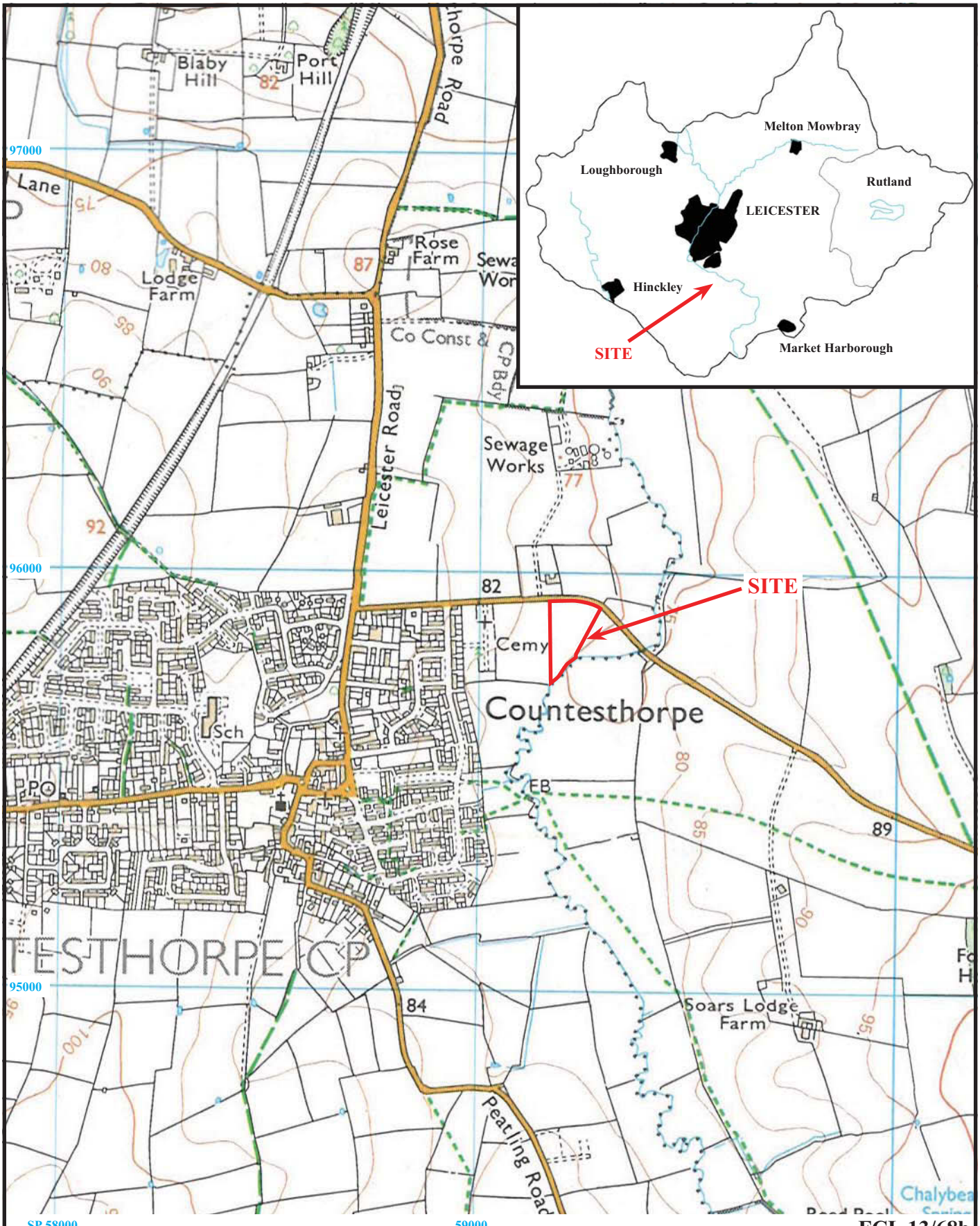

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Figure 1. Location of site within Countesthorpe and Leicestershire.

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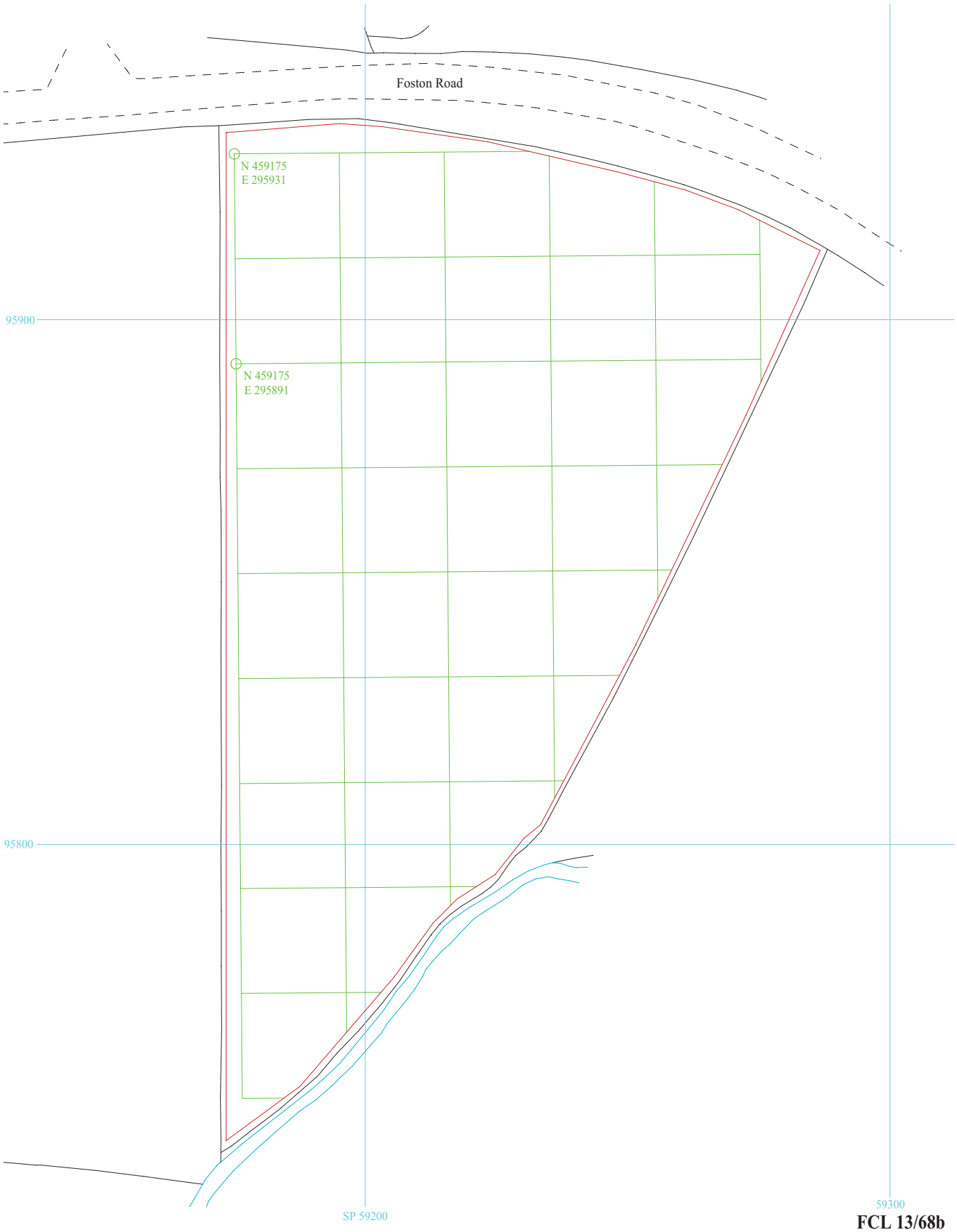

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Figure 2. Survey grid layout and georeferencing.

0 50m

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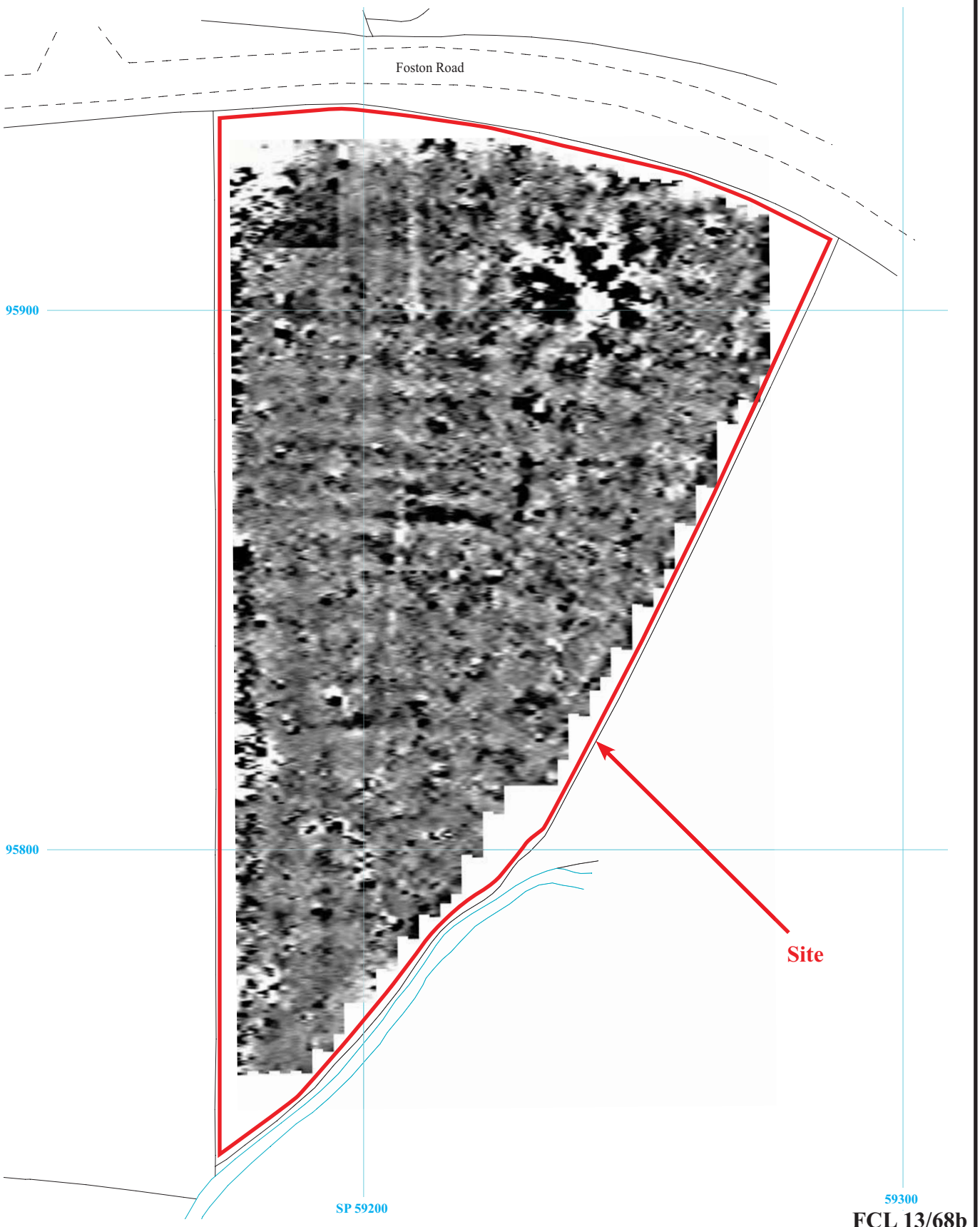

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Figure 3. Plot of minimally processed gradiometer data.

+1.3 nT

-1.3 nT

0m 50m

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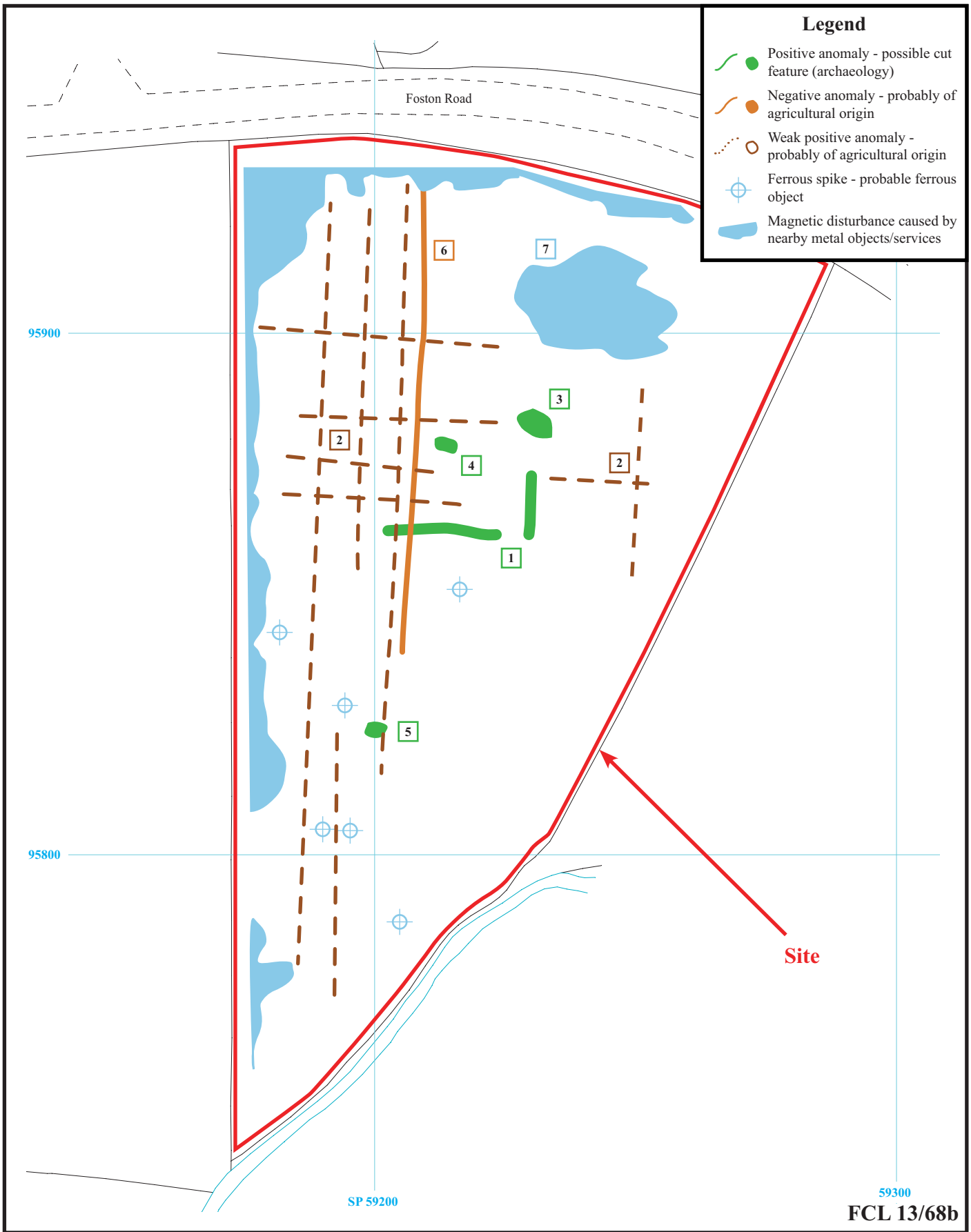

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Figure 4. Interpretation plot.

0m 50m

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Plate 1. The survey area, looking south.

Plate 2. The survey area, looking east with the shallow depression in the foreground.

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Plates 1 - 2.

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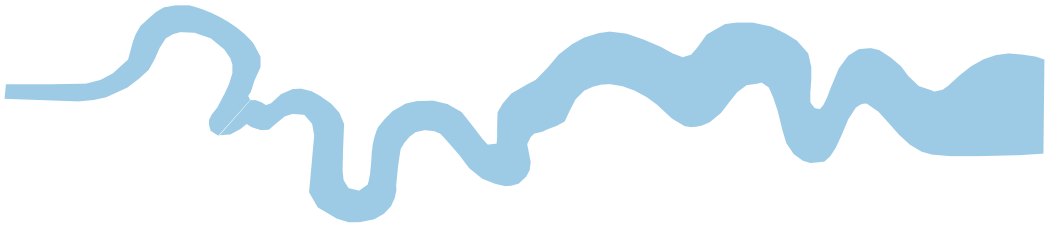
TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
Iron Age	BC/AD 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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