THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

SOUTH WEST

Land at Latchley, Gunnislake, Cornwall

Geophysical Survey (Magnetic)

by Tim Dawson

Site Code: LGC13/28

(SX 4069 7346)

Land at Latchley, Gunnislake, Cornwall

Geophysical Survey (Magnetic) Report

For Selleck Nicholls Homes

by Tim Dawson

Thames Valley Archaeological Services Ltd

Site Code LGC 13/28

February 2013

Summary

Site name: Land at Latchley, Gunnislake, Cornwall

Grid reference: SX 4069 7346

Site activity: Magnetometer survey

Date and duration of project: 8th February 2013

Project manager: Tim Dawson

Site supervisor: Tim Dawson

Site code: LGC 13/28

Area of site: 0.54ha

Summary of results: One set of anomalies which represent potential archaeological features was recorded crossing the centre of the site. These had the appearance of two parallel ditches with a bank in between and may be a buried land boundary.

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✓ 15.02.13
	Andrew Mundin✓ 13.02.13

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Land at Latchley, Gunnislake, Cornwall
A Geophysical Survey (Magnetic)

by Tim Dawson

Report 13/28

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at a triangular plot of land at Latchley, Gunnislake, Cornwall (SX 4069 7346) (Fig. 1). The work was commissioned by Mr Steven Hill of Terra Firma (South), The Pump House, 44 Marlborough Road, Exeter EX2 4LL on behalf of Selleck Nicholls Homes, Polhilsa, Stoke Climsland, Callington, PL17 8PP.

Planning permission is to be sought from Caraden District Council to develop a steeply sloped plot of land at Latchley for residential use. As part of the pre-application surveys for the site, a geophysical survey (magnetic) has been requested by Mr Philip Copplestone of Cornwall Council Historic Environment Service, advisors to the District Council. The fieldwork was undertaken by Marta Buczek and Tim Dawson on 8th February 2013 and the site code is LGC 13/28.

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 south-western edge of the village of Latchley which stands in a loop of the River Tamar on the Cornish side (Fig. 1). The nearest town is Gunnislake, *c*.3km to the southeast, with Tavistock standing on the Devon side of the Tamar *c*.7km to the east. To the east of the survey site is the village of Latchley, to the south is an unnamed road and to the west and north are woodland. The topography of the region is dictated by the fast-flowing River Tamar, which flows north-eastward *c*.500m northwest of the site. The land either side of the river, including the site, is at a height of over 100m above Ordnance Datum (aOD) and drops rapidly down to the valley floor at 20m aOD in the space of *c*.250m. The site itself is a 0.54ha paddock ranging between *c*.65 aOD in the south and 45m in the north. It is primarily covered with grass with patches of thick undergrowth and clumps of birch trees especially, towards the western end of the area. The underlying geology is described as Kate Brook Slate Formation (BGS 1994).

The site conditions at the time of the survey were wet with several periods of rain occurring during the fieldwork. The ground across most of the paddock had been kicked up by the horses resulting in an uneven wet,

muddy surface making surveying difficult (Plates 1 and 2). In addition, the steepness of the slope and the presence of several patches of thick undergrowth and low trees made several areas of the site inaccessible.

Site history and archaeological background

The site lies within ancient enclosed land and is part of medieval strip fields associated with the settlement of Latchley. The site is also within the Cornish Mines World Heritage Site.

The settlement of Latchley is first recorded in 1318. The name is English and contains an unknown element and 'clearing'. The remains of its medieval field system survive in the modern pattern of fields to the north west of the settlement. The field boundaries around Latchley are likely to be the strip fields of a medieval open field system, associated with the medieval settlement of Latchley. The ford across the River Tamar between Lamerhooe and Latchley is probably of medieval origin. However, the mapped position of the ford in the 19th century is different to that shown on current maps and it appears that the road on the Latchley side has been re-orientated in order to make an access route to Wheal Benny. In the 1960s two flint knives and a scraper were found near to Lowertown Farm, Latchley less than 100m to the east of the site.

Methodology

Sample interval

Data collection required a temporary grid to be established across the survey area using wooden pegs at 30m intervals with further subdivision where necessary. Readings were taken at 0.25m intervals along traverses 1m apart. This provides 3600 sampling points across a full 30m × 30m grid (English Heritage 2008), providing an appropriate methodology balancing cost and time with resolution. The initial plan for the grid layout had it aligned to the Ordnance Survey grid with the origin along the site's south-eastern edge. This was altered slightly realigning the grid to be parallel to the contours of the slope to make the process of surveying easier (Fig. 2).

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 set out by both English Heritage (2008) and the Institute for Archaeologists (2002).

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 ArcheoSurveyorLite 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**
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
Clip from -25.00 to 25.00 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
De-stagger: sub-grid (Area: Top 30, Left 0, Bottom 43, Right 119) Mode: outbound by -4 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 ArcheoSurveyorLite 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

The survey identified only one set of magnetic anomalies which may be of archaeological origin (Fig. 4). This consists of two parallel positive linear anomalies **[Fig 4: 1, 2]** with a negative one sandwiched between them **[3]** aligned east-west across the centre of the site. This may represent a buried bank, the negative anomaly, with a ditch feature on either side, possibly demarking a land boundary. A single large dipolar anomaly obscures the centre of the linear anomalies **[4]** and is probably caused by a large ferrous object. As the site was surrounded by wire mesh fences, the edges of the survey plot, particularly in the south and east, show a high level of magnetic interference **[5]**. This may have the effect of masking weaker features of potential archaeological origin. The remaining anomalies consist of scattered small discreet magnetic spikes, probably caused by buried ferromagnetic metal objects **[6]**.

Conclusion

Despite the adverse conditions in which the survey was undertaken the data gathered shows one set of anomalies which represent potential archaeological features. Of the remainder of the site that was available for survey the only anomalies noted were those most likely caused by buried ferrous objects, both large and small. The wire mesh fence that surrounded the site affected the visibility of potential archaeological features in the southern and eastern areas of the site.

References

BGS, 1994, *British Geological Survey*, 1:50,000, Sheet 337, Solid and Drift Edition, Keyworth

English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*, English Heritage, Portsmouth (2nd edn)

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

Appendix 1. Survey and data information

Raw data
COMPOSITE
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: Marta Buczek, Tim Dawson on 08/02/2013
Assembled by: Marta Buczek on 11/02/2013
Direction of 1st Traverse: 180 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32000

Dimensions
Composite Size (readings): 240 x 120
Survey Size (meters): 60 m x 120 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 100.00
Min: -100.00
Std Dev: 15.09
Mean: -5.86
Median: -4.66
Composite Area: 0.72 ha
Surveyed Area: 0.2949 ha

PROGRAMME
Name: ArcheoSurveyor
Version: 2.5.19.6

Source Grids: 7
1 Col:0 Row:0 grids\07.xgd
2 Col:0 Row:1 grids\06.xgd
3 Col:0 Row:2 grids\05.xgd
4 Col:0 Row:3 grids\04.xgd
5 Col:1 Row:1 grids\01.xgd
6 Col:1 Row:2 grids\02.xgd
7 Col:1 Row:3 grids\03.xgd

Processed data
Stats
Max: 25.00
Min: -25.00
Std Dev: 8.04
Mean: -0.56
Median: 0.01

Processes: 4
1 Base Layer
2 DeStripe Median Sensors: All
3 Clip from -25.00 to 25.00 nT
4 De Stagger: Grids: SubGrid (Area: Top 30, Left 0, Bottom 43, Right 119) Mode: Outbound By: -4 intervals

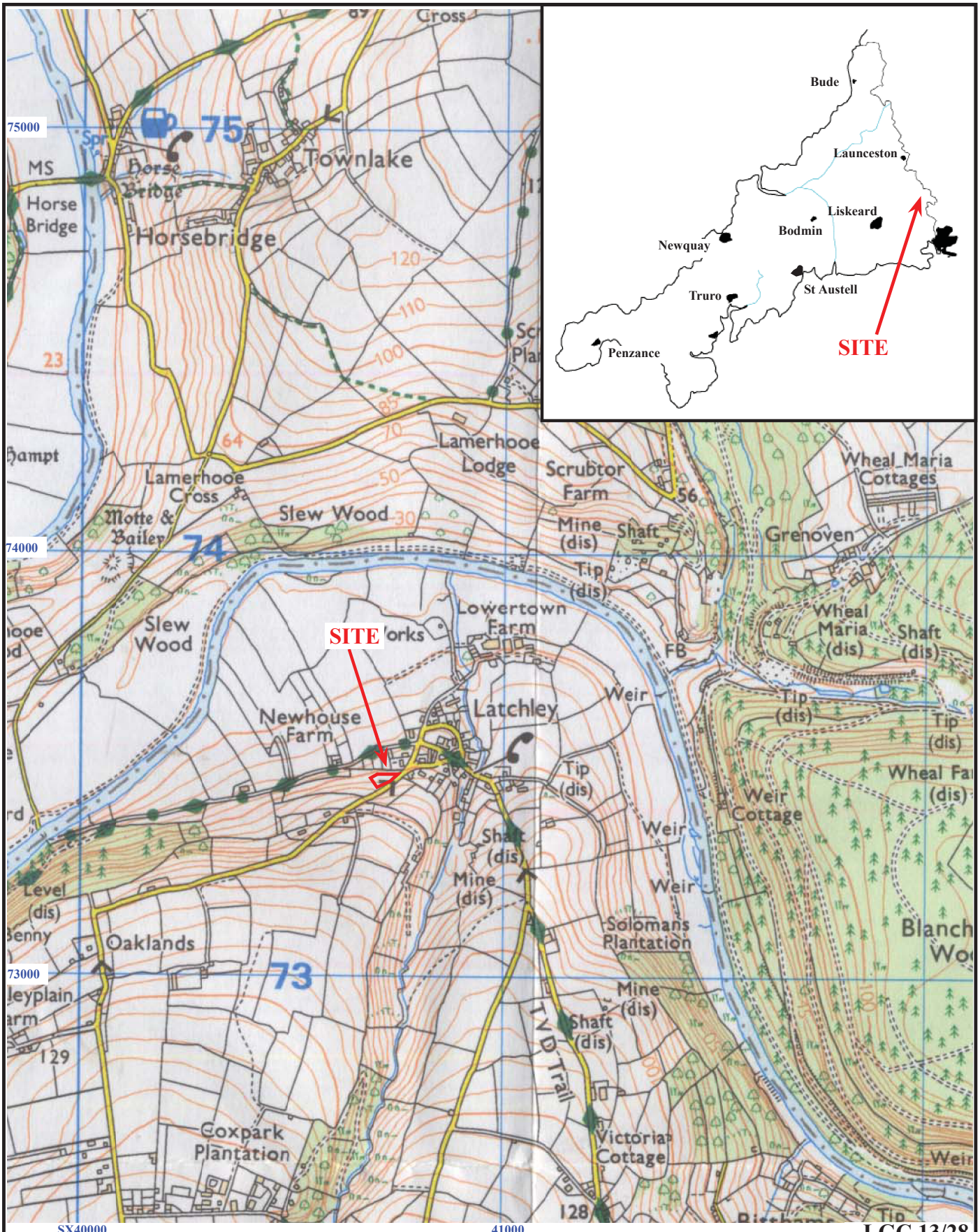

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Figure 1. Location of site at Latchley and within Cornwall.

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Land at Latchley, Gunnislake, Cornwall, 2013
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Figure 2. Grid layout.

0 50m

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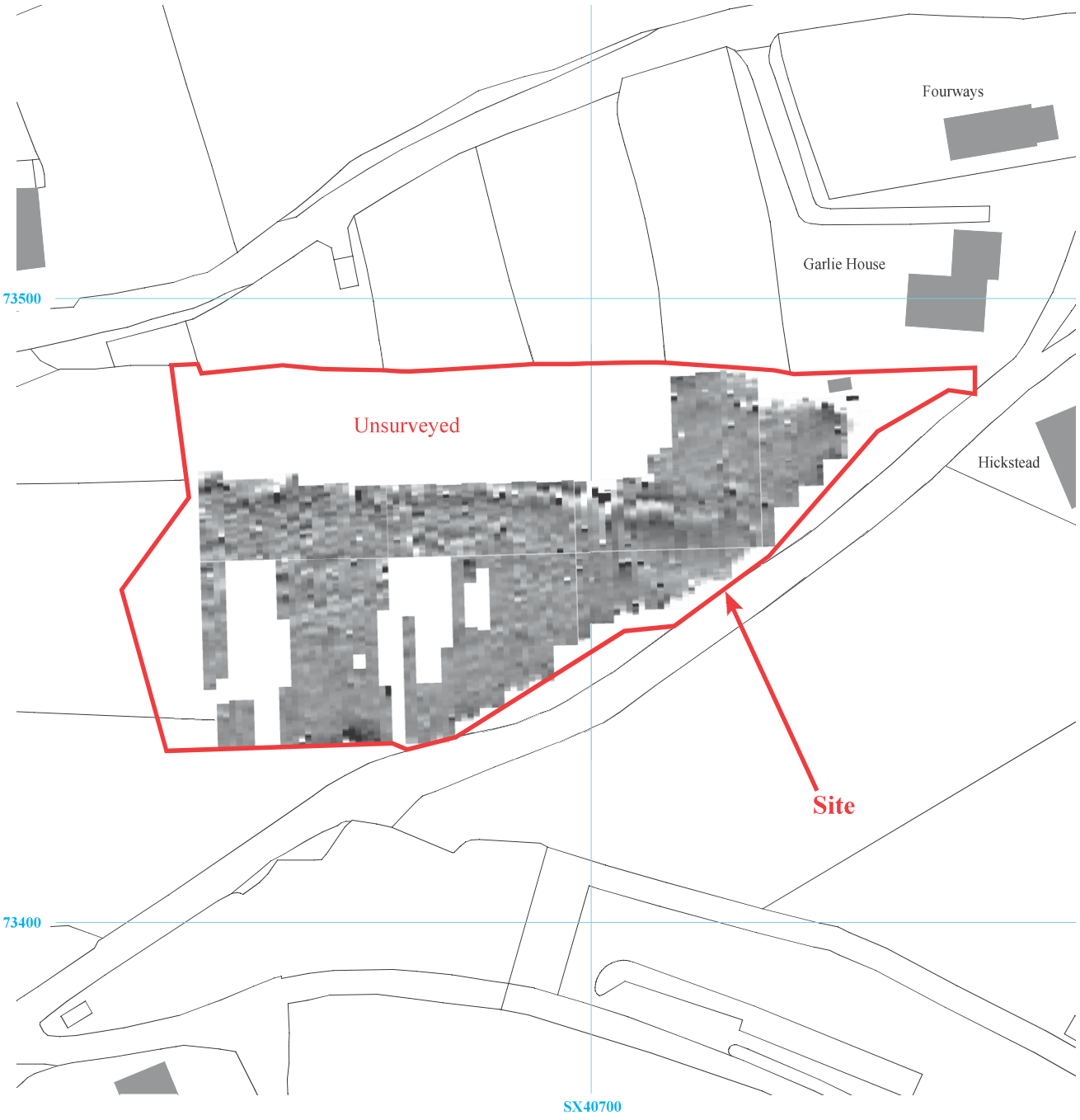

LGC 13/28

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Land at Latchley, Gunnislake, Cornwall, 2013
Geophysical Survey (Magnetic)

Figure 3. Plot of minimally processed gradiometer data.

0m 50m

+25 nT
-25 nT

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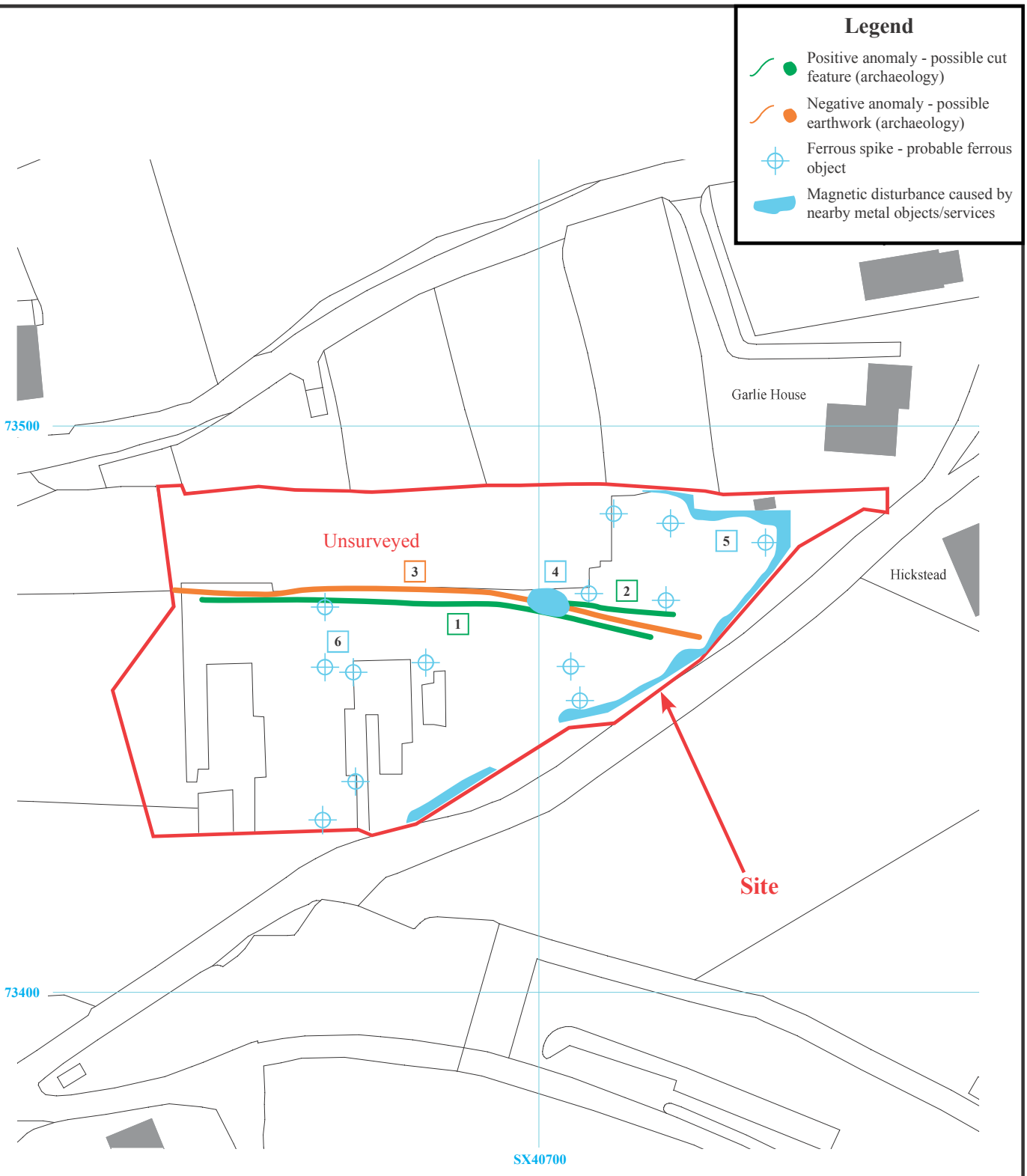

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Land at Latchley, Gunnislake, Cornwall, 2013
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Figure 4. Interpretation plot.

0m 50m

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Plate 1. The eastern part of the survey area, looking northeast.

Plate 2. The survey area, looking west.

LGC 13/28

Land at Latchley, Gunnislake,
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Plates 1 and 2.

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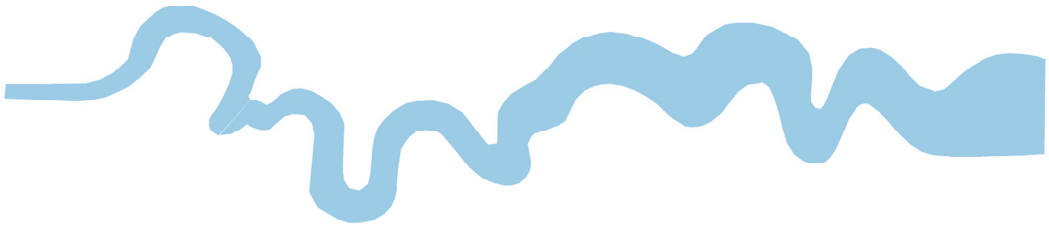
TIME CHART

	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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