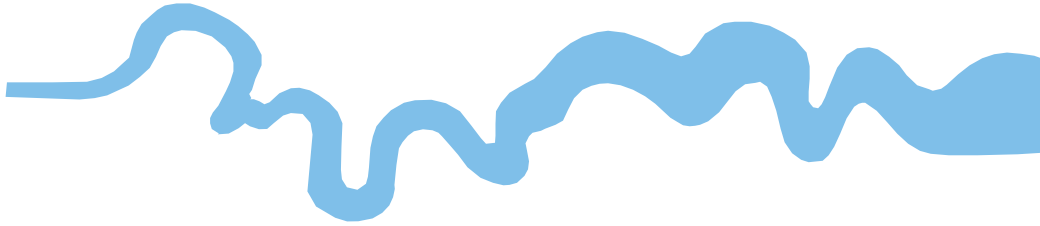


T V A S



NORTH MIDLANDS

**Land at New Barns Farm, Pearl Lane,
Stourport, Worcestershire**

Geophysical Survey (Magnetic)

by Kyle Beaverstock

Site Code: PLS18/144

(SO 7962 6991)

Land at New Barns Farm, Pearl Lane, Stourport, Worcestershire

Geophysical Survey (Magnetic) Report

For Barratt West Midlands

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code PLS 18/144

August 2018

Summary

Site name: Land at New Barns Farm, Pearl Lane, Stourport, Worcestershire

Grid reference: SO 7962 6991

Site activity: Magnetometer survey

Date and duration of project: 28th – 31st August 2018

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: PLS18/144

Area of site: 15.6ha

Summary of results: A few weak linear anomalies as well as a small square positive anomaly were uncovered over the course of the survey. These most likely represent the remains of an agricultural field system.

Location of archive: The archive is presently held at TVAS North Midlands, Stoke-on-Trent in accordance with TVAS digital archiving policies.

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Report edited/checked by: Steve Ford✓ 6.9.18 Tim Dawson✓ 6.9.18
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Land at New Barns Farm, Pearl Lane, Stourport, Worcestershire A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 18/144

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at New Barns Farm, Pearl Lane, Stourport, Worcestershire (SO 79619 69910) (Fig. 1). The work was commissioned by Sarah Gallagher of Ecus Ltd. Unit 1 Woodlands Business Village, Coronation Road, Basingstoke, Hampshire, RG21 4JX, on behalf of Barratt Homes West Midlands, 60 Whitehall Road, Halesowen, West Midlands B63 3JS.

The site is being considered for the development of a housing estate with associated roads and services. The site lies within the authority of Wyre Forest District Council and would be subject to conditions which may require the implementation of a program of archaeological investigation. This would be in accordance with the Department for Communities and Local Government's National Planning Policy Framework (NPPF 2018), and the District's policies on archaeology. The fieldwork was undertaken by Kyle Beaverstock and Ashley Kruger between the 28th to the 31st of August 2018 and the site code is PLS18/144.

The archive is presently held at TVAS North Midlands, Stoke-on-Trent in accordance with TVAS digital archiving policies.

Location, topography and geology

The site is located in Astley Cross approximately 1.5 km south west of Stourport-upon-Severn, Worcestershire (Fig. 2). It comprised of two fields of somewhat rectangular shape the site topography runs from the high point at 51m above Ordnance Datum (aOD) in the north and slopes down to 38m aOD in the southern area of the site. The site is currently being utilised for arable farming and the underlying geology is stated as Upper Mottled Sandstone (BGS 1976). Weather conditions during the survey period were initially overcast and dry with the cloud later clearing (Pl. 1-4).

Site history and archaeological background

The archaeological potential of the site stems from previous excavations associated with the Blackstone to Astley aqueduct which were undertaken in the 1990s which crossed part of the site itself (Hemingway and Buteux. 1992). These excavations identified a multi-phase Roman agricultural landscape including a ditch, pits,

postholes and a possible large aisled building. It is likely that some of these buried remains extend beyond the aqueduct excavations into the remainder of the site area. A full list and description of local historical assets can be found in the Desk-based Assessment (Gallagher 2018).

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 east to west zig-zag orientation across the northern survey area and north-west to south-east in the eastern field. The site was generally clear, however there were a few minor obstructions including a rubbish pile in the south eastern corner of the northern field, a large tree in the centre of the southern field and to the south of this was a small rectangular fence protecting a large manhole.

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 Chartered Institute for Archaeologists (2002, 2011, 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 -3 to 3 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 (Figs. 3 and 4) with the processed data then presented as a second set of figures (Figs. 5 and 6), followed by a third set to present the abstraction and interpretation of the magnetic anomalies (Figs. 7 and 8). 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 3.2.1 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

Several weak positive linear anomalies were detected within the surveyed area. In the north of the larger upper field a series of weak positive linear anomalies were seen including weak linear anomaly [Fig. 7: 1] which ran north-west to south-east for c. 26m before turning to the north-east for 22m. To the west of this anomaly is another weak linear anomaly [2], this anomaly runs from the north-west to the south-east for 74m turning to the south-west for 115m. This anomaly may represent the Roman ditch found during the previous excavation. A short ditch [3] aligned north-east to the south-west and running from the centre of the north-east to the south-west ditch [2] for approximately 30m and is likely part of a field division. These weak linear anomalies most likely represent ditches which are part of an agricultural field system.

At the southern end of the larger northern field is a slightly curved ditch running from the south-west to the north-east [4] for c.196m, this ditch is likely related to an earlier field system as seen on the c.1838 map (Gallagher 2018). In the centre of the southern field a square anomaly [Fig. 8: 5], measuring 15m long by 8m wide, this may represent the remains of a small structure. In the south of the southern field running from the south-west to the north-east is a weak linear anomaly [6] running for c.110m with a small break in the centre.

Running north to south down the entirety of the site is a positive linear anomaly with a large associated negative response [7]. This anomaly represents the aqueduct laid in the 1990s and the focus of the previous excavations, disturbance from this anomaly may mask other features however, this area was previously stripped and recorded in an archaeological excavation. A bipolar linear anomaly [8] in the south western corner of the survey area running south-east to the north-west is almost certainly a pipeline or some form of modern service. There are also several dipolar anomalies, due to the strength of the magnetic response they are likely to be buried ferrous objects or modern debris across the surveyed area. There were also a number of dipolar points, these may represent small discreet features such as pits or postholes although they may also represent buried ferrous objects, no discernible pattern could be gleaned.

Conclusion

Over the course of the survey a number of weak linear anomalies were observed as well as a stronger positive anomaly with a rectangular shape. The weak linear anomalies in the northern area of the site may represent the remains of an agricultural field system and is possibly related to the remains of a Roman field system found in the 1990s excavations (Hemingway and Buteux. 1992). The other weak linear anomalies are probably related to the former field system as seen on the c.1938 map. The rectangular anomaly in the centre of the southern field however may be the remains of a small structure of indeterminate date.

References

- BGS, 1976, *British Geological Survey*, 1:50,000, Sheet 182, Solid and Drift Edition, Keyworth
- CI/A, 2002, *The Use of Geophysical Techniques in Archaeological Evaluation*, IFA Paper No. 6, Reading
- CI/A, 2011, *Standard and Guidance: for archaeological geophysical survey*, Reading
- CI/A, 2014, *Standard and Guidance: for archaeological geophysical survey*, Reading
- English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*, English Heritage, Portsmouth (2nd edn)
- Gallagher, S, 2018, 'New Barns Farm, Stourport, Worcestershire – Archaeological Desk-based Assessment', ECUS unpublished report 11657, Sheffield
- Hemingway, J, and Buteux, V, 1992. A Roman site at Dunley Road, Areley Kings
- NPPF, 2018, *National Planning Policy Framework*, Dept Communities and Local Government, London

Appendix 1. Survey and data information

Programme:

Name: TerraSurveyor
Version: 3.0.34.4

North field – north half

Raw data

Survey corner coordinates (X/Y):
Northwest corner: 379454.259909731, 270217.876168664 m
Southeast corner: 379739.219909731, 270023.656168664 m
Collection Method: Zigzag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702
Source GPS Points: 70871

Dimensions

Composite Size (readings): 2192 x 1494
Survey Size (meters): 285 m x 194 m
Grid Size: 285 m x 194 m
X Interval: 0.13 m
Y Interval: 0.13 m

Stats

Max: 107.23
Min: -109.74
Std Dev: 12.77
Mean: -0.66
Median: 0.41
Composite Area: 5.5345 ha
Surveyed Area: 2.2911 ha

Processed data

Stats

Max: 3.32
Min: -3.30
Std Dev: 0.92
Mean: -0.09
Median: 0.02

GPS based Processes 5

- 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 -3.00 to 3.00

North field – south half

Raw data

Survey corner coordinates (X/Y):
Northwest corner: 379457.553131326, 270079.324563887 m
Southeast corner: 379771.243131326, 269797.094563887 m
Collection Method: Zigzag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702
Source GPS Points: 212207

Dimensions

Composite Size (readings): 2413 x 2171
Survey Size (meters): 314 m x 282 m
Grid Size: 314 m x 282 m
X Interval: 0.13 m
Y Interval: 0.13 m

Stats

Max: 107.23
Min: -109.74
Std Dev: 20.14
Mean: -3.92
Median: -0.39
Composite Area: 8.8533 ha
Surveyed Area: 6.4626 ha

Processed data

Stats

Max: 3.32
Min: -3.30
Std Dev: 1.15
Mean: -0.20
Median: 0.02

GPS based Processes 5

- 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 -3.00 to 3.00

South field

Raw data

Survey corner coordinates (X/Y):
Northwest corner: 379526.338429396, 269844.930654058 m
Southeast corner: 379787.248429396, 269576.870654058 m
Collection Method: Zigzag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Source GPS Points: 128775

Dimensions

Composite Size (readings): 2007 x 2062
Survey Size (meters): 261 m x 268 m
Grid Size: 261 m x 268 m
X Interval: 0.13 m
Y Interval: 0.13 m

Stats

Max: 107.55
Min: -109.76
Std Dev: 22.03
Mean: -2.99
Median: 1.04
Composite Area: 6.994 ha
Surveyed Area: 4.5751 ha

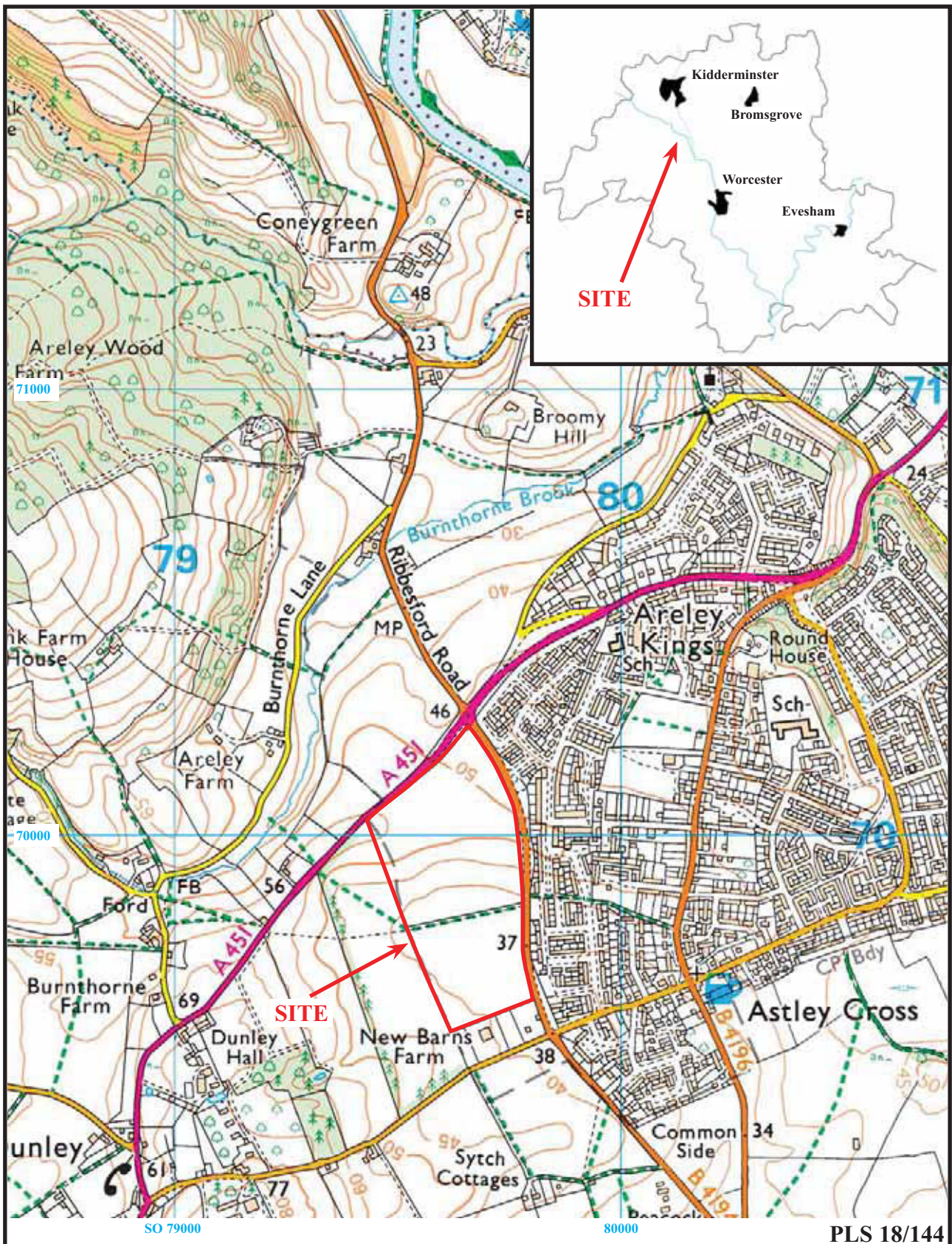
Processed data

Stats

Max: 3.32
Min: -3.30
Std Dev: 1.31
Mean: -0.27
Median: 0.02

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 at 2.00 SD
- 6 Clip from -3.00 to 3.00



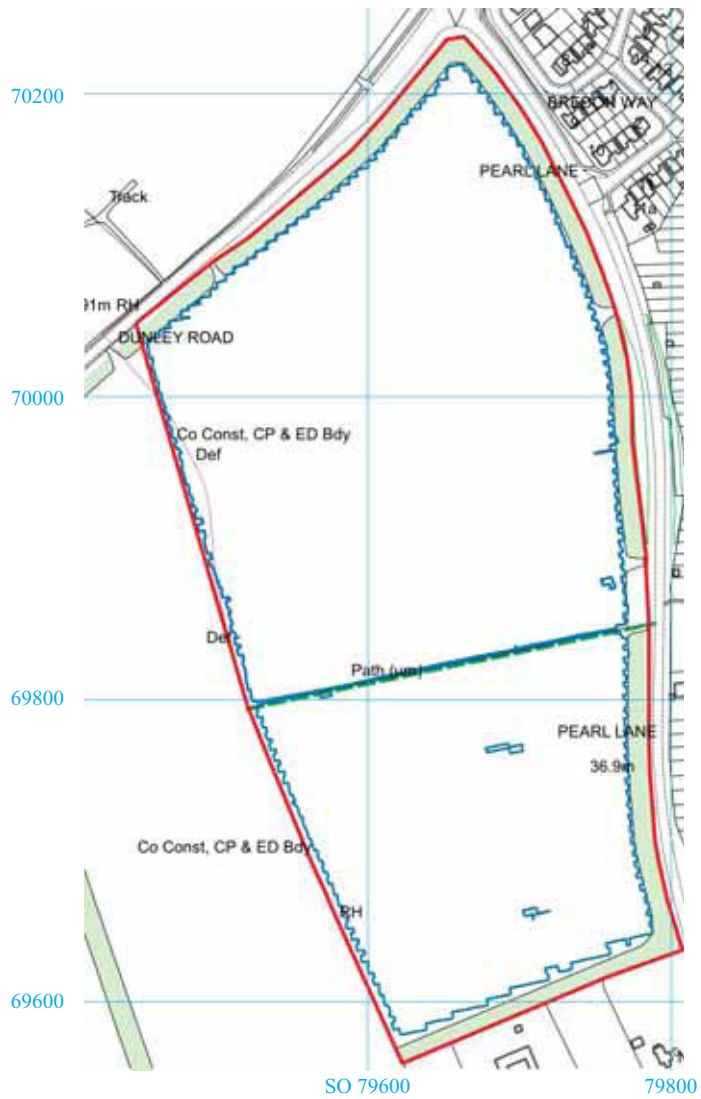
**Land at New Barns Farm, Pearl Lane,
Stourport, Worcestershire, 2018
Geophysical Survey (Magnetic)**

Figure 1. Location of site within Stourport and
Worcestershire.

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PLS 18/144



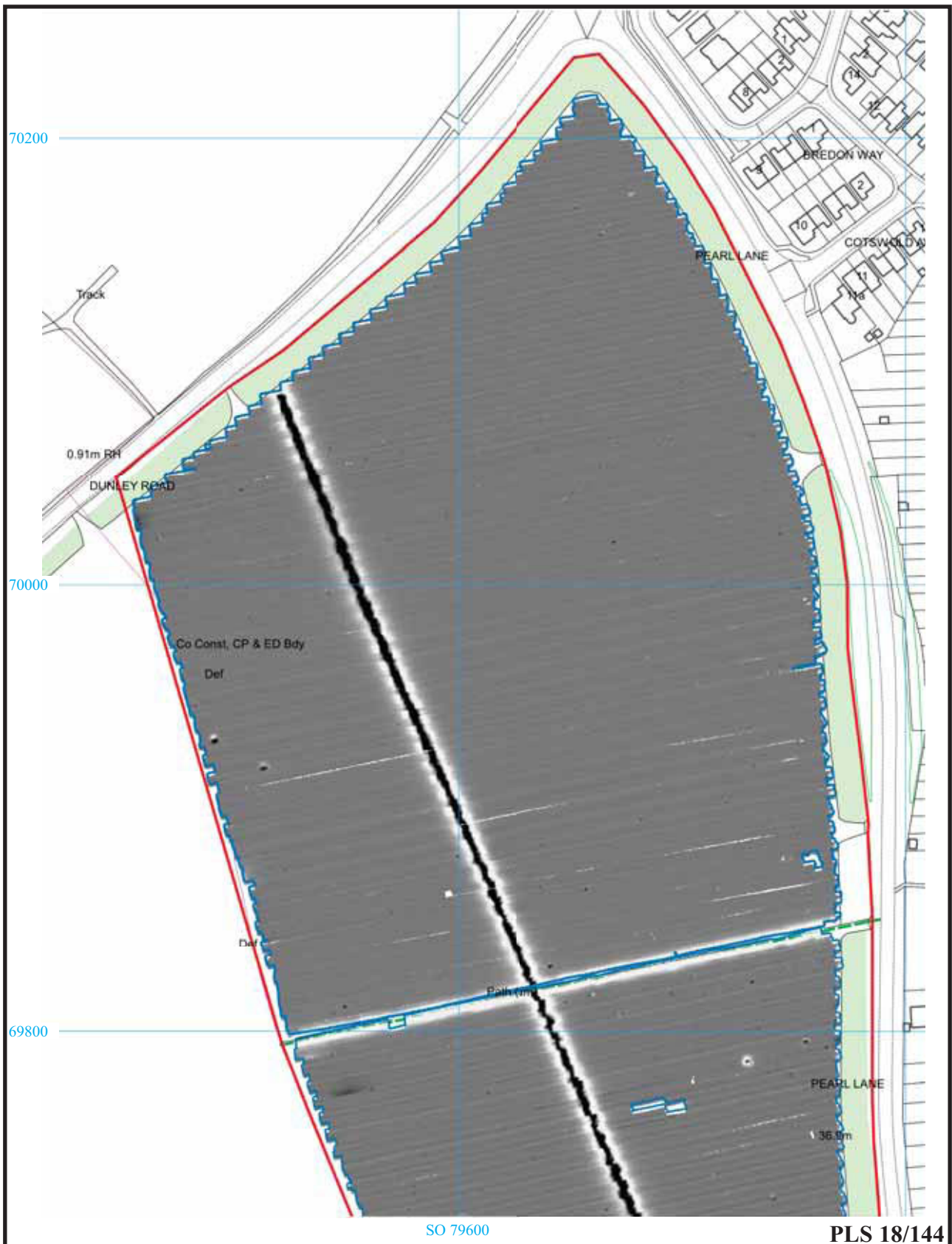
PLS 18/144



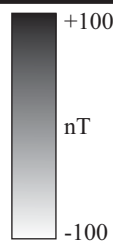
**Land at New Barns Farm, Pearl Lane,
Stourport, Worcestershire, 2018
Geophysical Survey (Magnetic)**
Figure 2. Site layout showing survey areas (blue).

0m 200m





**Land at New Barns Farm, Pearl Lane,
Stourport, Worcestershire, 2018
Geophysical Survey (Magnetic)**
Figure 3. Plot of raw gradiometer data (north).

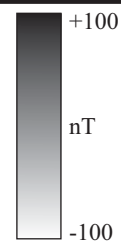


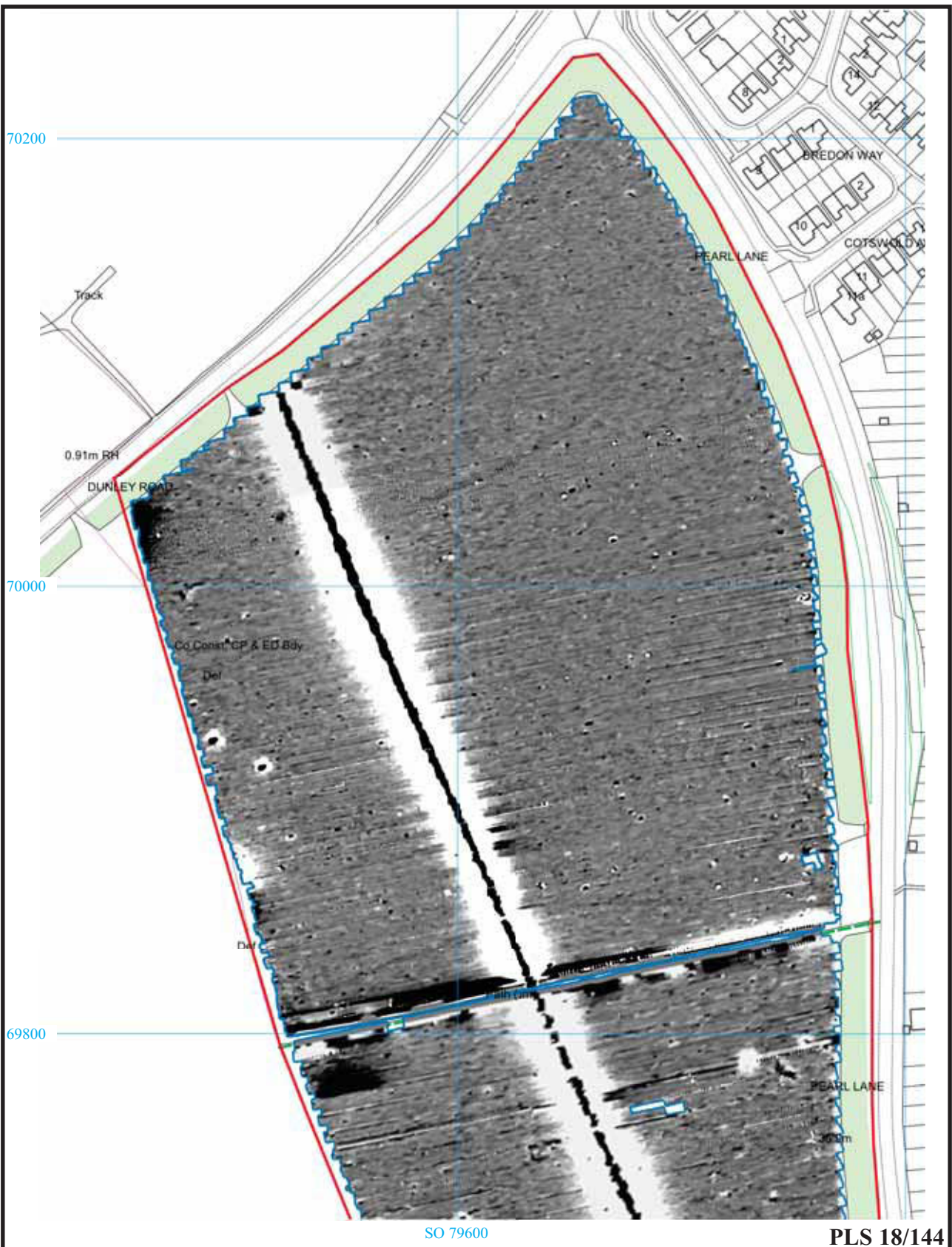


**Land at New Barns Farm, Pearl Lane,
 Stourport, Worcestershire, 2018
 Geophysical Survey (Magnetic)**
 Figure 4. Plot of raw gradiometer data (south).



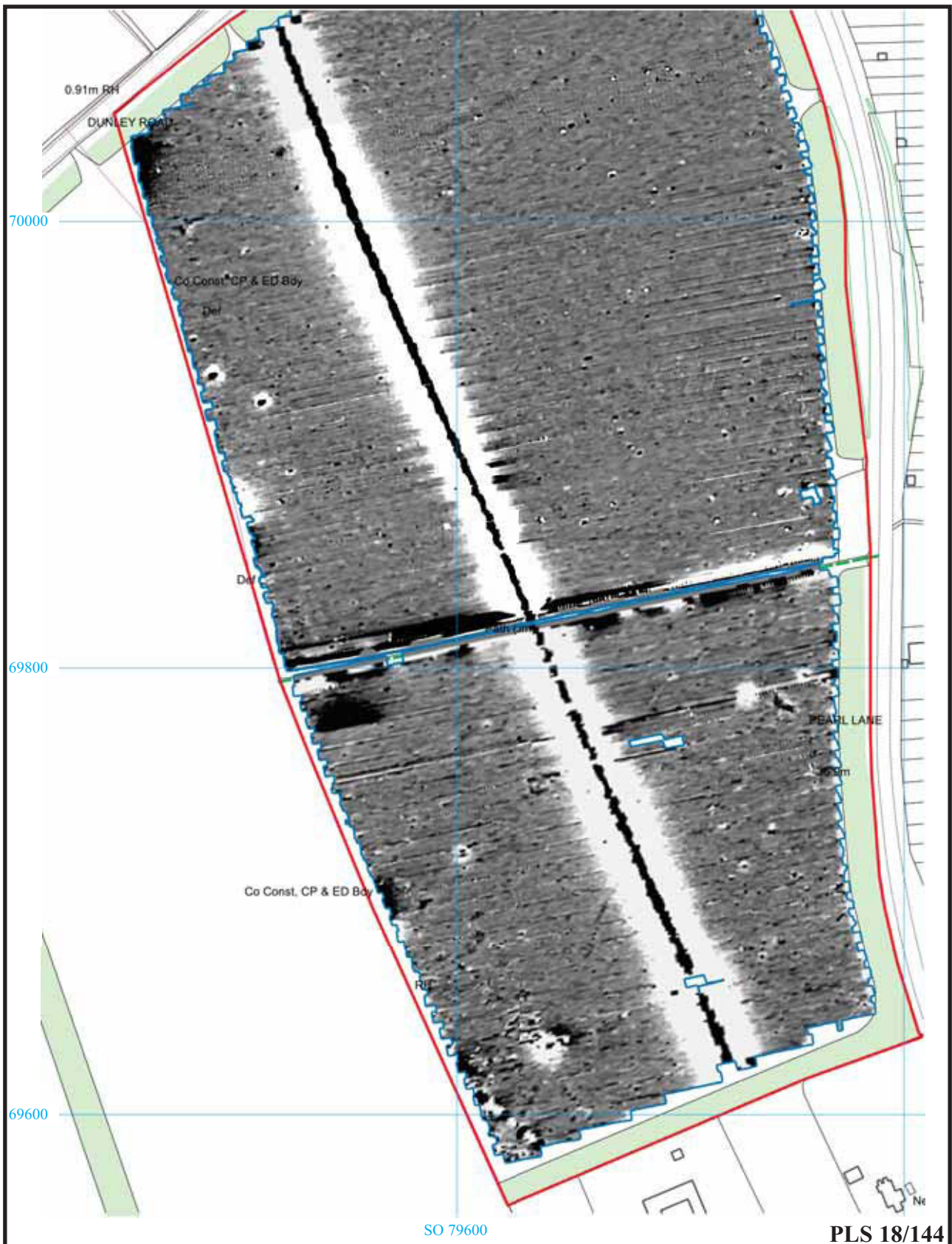
0m 200m





**Land at New Barns Farm, Pearl Lane,
Stourport, Worcestershire, 2018
Geophysical Survey (Magnetic)**
Figure 5. Plot of minimally processed gradiometer data
(north).



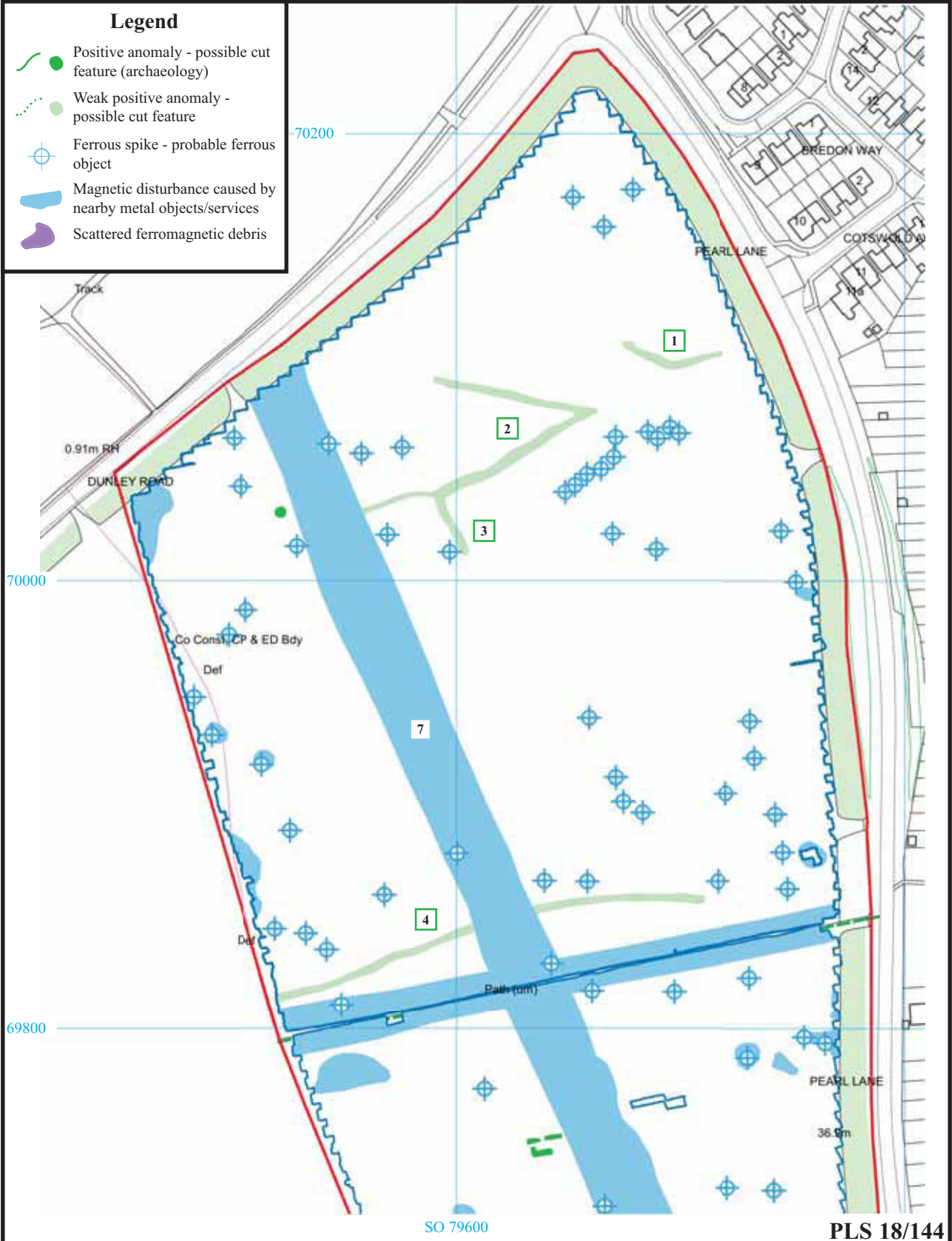


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**Land at New Barns Farm, Pearl Lane,
Stourport, Worcestershire, 2018
Geophysical Survey (Magnetic)**
Figure 6. Plot of minimally processed gradiometer data
(south).





Legend

- Positive anomaly - possible cut feature (archaeology)
- - - ● - - - Weak positive anomaly - possible cut feature
- ⊕ Ferrous spike - probable ferrous object
- █ Magnetic disturbance caused by nearby metal objects/services
- █ Scattered ferromagnetic debris

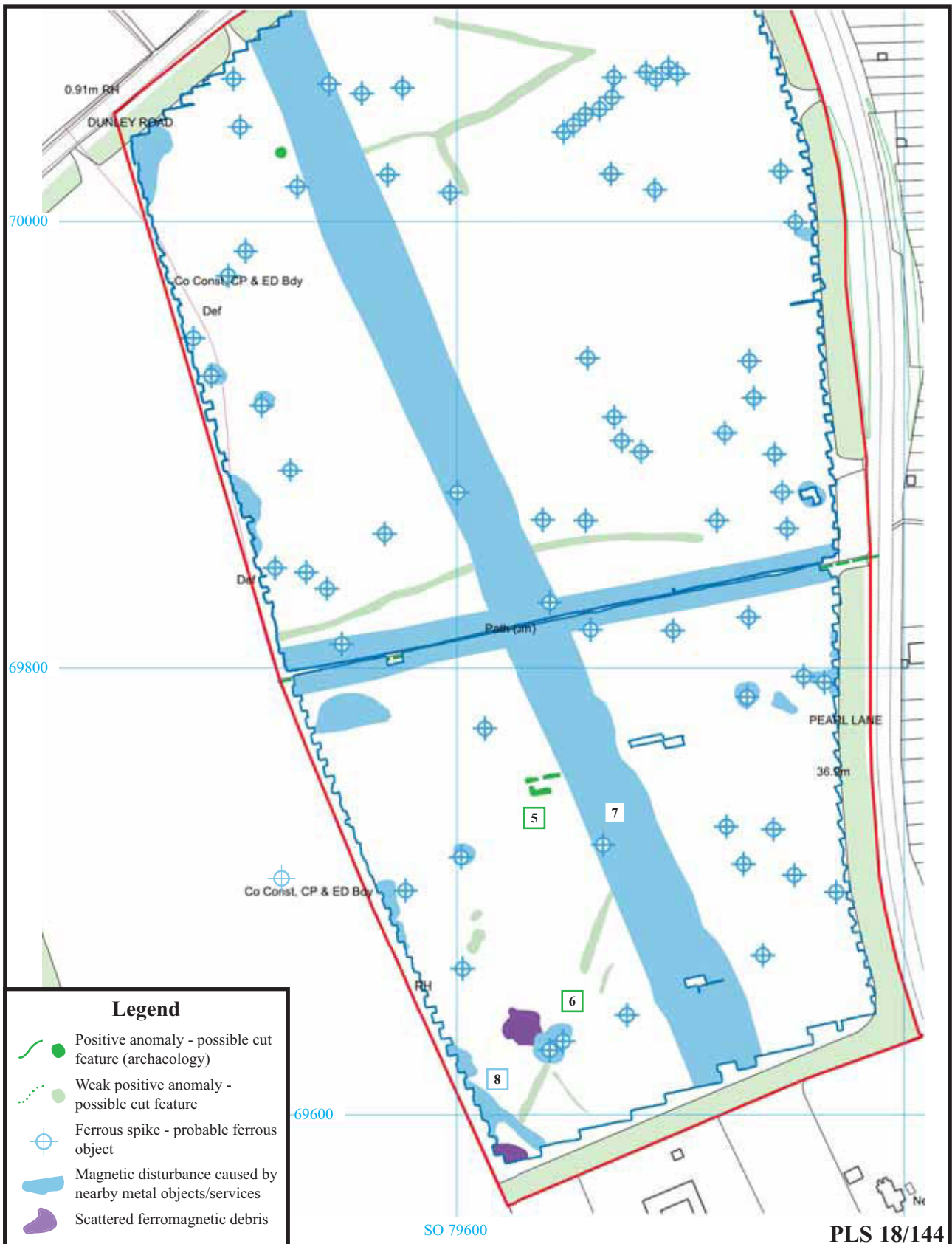
**Land at New Barns Farm, Pearl Lane,
Stourport, Worcestershire, 2018
Geophysical Survey (Magnetic)
Figure 7. Interpretation plot.**








0m 200m

THAMES VALLEY
ARCHAEOLOGICAL
SERVICES

PLS 18/144



Legend

-  Positive anomaly - possible cut feature (archaeology)
-  Weak positive anomaly - possible cut feature
-  Ferrous spike - probable ferrous object
-  Magnetic disturbance caused by nearby metal objects/services
-  Scattered ferromagnetic debris



**Land at New Barns Farm, Pearl Lane,
Stourport, Worcestershire, 2018
Geophysical Survey (Magnetic)
Figure 8. Interpretation plot.**

0m 200m

THAMES VALLEY
ARCHAEOLOGICAL
SERVICES



Plate 1. The northern end of the northern field, looking east.



Plate 2. The northern field looking south to the southern field.



Plate 3. The southern field, looking north-east.



Plate 4. Access point on the line of the aqueduct in the southern field.

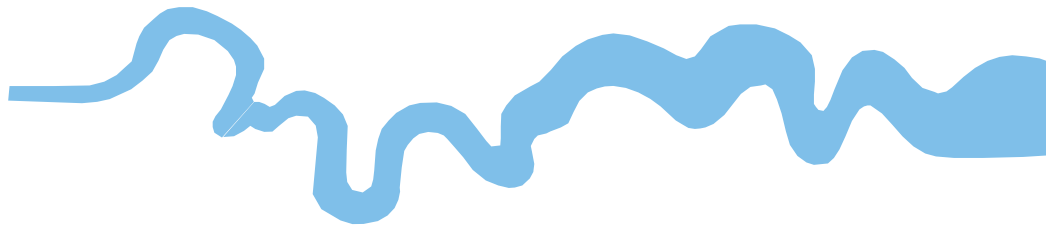
PLS 18/144

**Land at New Barns Farm, Pearl Lane,
Stourport, Worcestershire, 2018
Geophysical Survey (Magnetic)**
Plates 1 to 4.

THAMES VALLEY
ARCHAEOLOGICAL
SERVICES

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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