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## ELTON 2, WARMINGTON, NORTHAMPTONSHIRE

### GEOPHYSICAL SURVEY

Authors: Dr John Summers Matthew Baker, Dr David Bescoby	
NGR: TL 07096 91909	Report No: 5049
District: East Warmington	Site Code: AS1810
Approved: Claire Halpin MCIfA	Project No: 6422
Signed:	Date: 17th February 2016 Revised 29th March 2016

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**ARCHAEOLOGICAL SOLUTIONS LTD**

**PI House, 23 Clifton Road, Shefford, Bedfordshire SG17 5AF  
Tel 01462 850483**

**Unit 6, Brunel Business Court, Eastern Way,  
Bury St Edmunds IP32 7AJ  
Tel 01284 765210**

**e-mail [info@ascontracts.co.uk](mailto:info@ascontracts.co.uk)  
[www.archaeologicalsolutions.co.uk](http://www.archaeologicalsolutions.co.uk)**



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**Silver**

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## OASIS SUMMARY SHEET

<b>Project details</b>			
Project name	<i>Elton 2, Warmington, Northamptonshire: Geophysical Survey</i>		
<i>In February 2016, Archaeological Solutions Ltd carried out a magnetic gradiometer survey at Elton 2, Warmington, Northamptonshire (NGR TL 07096 91909).</i>			
<i>The survey identified a complex network of natural channels relating to previous courses and activity of the River Nene, which bounds the site on all sides. Among these channels were some adjoining the northern boundary which represent the previous course of the river prior to canalisation during the 18th century. Also present were numerous large discrete features which are likely to represent tree root hollows, although an archaeological origin cannot be ruled out.</i>			
Project dates (fieldwork)	<i>1st-10th February 2016</i>		
Previous work (Y/N/?)	<i>N</i>	Future work	<i>TBC</i>
P. number	<i>6422</i>	Site code	<i>AS1810</i>
Type of project	<i>Geophysical Survey</i>		
Site status	<i>-</i>		
Current land use	<i>Pasture and woodland</i>		
Planned development	<i>Extension to existing quarry/reservoir</i>		
Main features (+dates)	<i>Complex network of natural channels relating to activity of the River Nene. Large (c.3m) discrete features - probable tree root hollows.</i>		
Significant finds (+dates)	<i>-</i>		
<b>Project location</b>			
County/ District/ Parish	<i>Northamptonshire</i>	<i>East Northamptonshire</i>	<i>Warmington</i>
HER/ SMR for area	<i>Northamptonshire County Council Historic Environment Record (NCC HER)</i>		
Post code (if known)	<i>-</i>		
Area of site	<i>c.14.5ha</i>		
NGR	<i>TL 07096 91909</i>		
Height AOD (max/ min)	<i>15-20m AOD</i>		
<b>Project creators</b>			
Brief issued by	<i>Northamptonshire County Council</i>		
Project supervisor/s	<i>Matthew Baker</i>		
Funded by	<i>Ingrebourne Valley Ltd</i>		
Full title	<i>Elton 2, Warmington, Northamptonshire: Geophysical Survey</i>		
Authors	<i>Summers, J.R., Baker, M., Bescoby, D.</i>		
Report no.	<i>5049</i>		
Date (of report)	<i>February 2016</i>		



# ELTON 2, WARMINGTON, NOTHAMPTONSHIRE

## GEOPHYSICAL SURVEY

### SUMMARY

*In February 2016, Archaeological Solutions Ltd carried out a magnetic gradiometer survey at Elton 2, Warmington, Northamptonshire (NGR TL 07096 91909).*

*The survey identified a complex network of natural channels relating to previous courses and activity of the River Nene, which bounds the site on all sides. Among these channels were some adjoining the northern boundary which represent the previous course of the river prior to canalisation during the 18th century. Also present were numerous large discrete features which are likely to represent tree root hollows, although an archaeological origin cannot be ruled out.*

### 1 INTRODUCTION

1.1 In February 2016, Archaeological Solutions Ltd carried out a magnetic gradiometer survey at Elton 2, Warmington, Northamptonshire (NGR TL 07096 91909; Figs. 1 - 2). The survey was commissioned to inform and support a planning application for a proposed reservoir extension on land at Elton, on advice from the Northamptonshire County Council County Archaeological Advisor (NCC CAA).

1.2 The project was carried out in accordance with a specification compiled by AS (dated 6<sup>th</sup> January 2016) and approved by the Northamptonshire County Council County Archaeological Advisor (NCC CAA). The geophysical survey was carried out in accordance with the Historic England document *Geophysical Survey in Archaeological Field Evaluation*, 2008, and ClfA, *The use of Geophysical Techniques in Archaeological Evaluations* and *ClfA Standard and Guidance for Archaeological Geophysical Survey* (published 2014).

#### *Objectives*

1.3 The investigation of the site by geophysical survey was designed to determine the extent and significance of sub-surface features in order to identify whether further mitigation would be required in association with development proposals (such as trial trench evaluation).

## *Planning policy context*

1.4 The National Planning Policy Framework (NPPF 2012) states that those parts of the historic environment that have significance because of their historic, archaeological, architectural or artistic interest are heritage assets. The NPPF aims to deliver sustainable development by ensuring that policies and decisions that concern the historic environment recognise that heritage assets are a non-renewable resource, take account of the wider social, cultural, economic and environmental benefits of heritage conservation, and recognise that intelligently managed change may sometimes be necessary if heritage assets are to be maintained for the long term. The NPPF requires applications to describe the significance of any heritage asset, including its setting that may be affected in proportion to the asset's importance and the potential impact of the proposal.

1.5 The NPPF aims to conserve England's heritage assets in a manner appropriate to their significance, with substantial harm to designated heritage assets (i.e. listed buildings, scheduled monuments) only permitted in exceptional circumstances when the public benefit of a proposal outweighs the conservation of the asset. The effect of proposals on non-designated heritage assets must be balanced against the scale of loss and significance of the asset, but non-designated heritage assets of demonstrably equivalent significance may be considered subject to the same policies as those that are designated. The NPPF states that opportunities to capture evidence from the historic environment, to record and advance the understanding of heritage assets and to make this publicly available is a requirement of development management. This opportunity should be taken in a manner proportionate to the significance of a heritage asset and to impact of the proposal, particularly where a heritage asset is to be lost.

## **2 DESCRIPTION OF THE SITE**

2.1 The village of Warmington lies c.8km south-west of Peterborough in the county of Northamptonshire. The hamlet of Eaglethorpe is located to the north-west, truncated by the A605. The site lies in agricultural land to the north-west of Eaglethorpe comprising mostly pasture but also some woodland.

2.2 The site is an irregular shape lying within the floodplain of the River Nene. Channels of the latter surround the site on all sides and have likely been diverted in the past. A public footpath runs from south to north across the site giving access to nearby Fotheringhay.

2.3 The site lies on lower ground within the river valley at c.15m AOD. The underlying geology of the area is complex; the site lies on three separate bedrock formations. Most of the southern portion of the site is underlain by Whitby Mudstone Formation, the northern portion mostly by the Grantham formation, with a segment of Rutland formation on its northern boundary. The overlying soil is loamy and clayey with naturally high groundwater (BGS 1978;

SSEW 1983).

### 3 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

3.1 An archaeological desk-based assessment was prepared for the site (Wilson & Henry 2015). In summary:

*The site is located on the periphery of the historic Saxon villages of Warmington and Eaglethorpe within a landscape dominated by the River Nene. Bronze Age round barrows and ditches have been recorded in the field to the north-west of the site. Evidence for prehistoric activity including Bronze Age burials and Iron Age field systems and droveways has been identified to the east, and may be part of a wider prehistoric landscape. The evidence for later periods is focused within the village to the south-east, excepting a possible medieval trackway that may run along the route of the Nene Way from Fotheringhay to London. Based on the known archaeology the site has a low to moderate potential for archaeological remains.*

### 4 METHOD OF WORK

#### *Introduction*

4.1 The magnetic survey was performed using a dual sensor Grad601-2 Magnetic gradiometer manufactured by Bartington instruments Ltd. The gradiometer measures small distortions in the earth's magnetic field caused by the presence of magnetically susceptible buried objects. The instrument is extremely sensitive and capable of detecting changes in magnetic field strength of the order of 0.1 nanoTesla (nT).

#### *Survey Methodology*

4.2 All fieldwork methods complied with the guidelines issued by Historic England and by the Chartered Institute for Archaeologists (Historic England 2008; CIfA 2014) and with the method statement for the project (Archaeological Solutions, dated 09/11/ 2015). Grid squares measuring 30m x 30m were set out across the entirety of the survey area, forming a grid network – see **Fig. 3**. The exact spatial location of the survey grid was recorded using a Leica GS09 GPS smart rover. Geophysical data were collected systematically in a zig-zag pattern within each grid square along traverses spaced at 1 m apart. The gradiometers were configured to record measurements at 0.25 m intervals along each traverse, giving a total of 3600 measurements per grid square.

4.3 Areas amounting to 1.16ha could not be surveyed (**Fig. 3**). In the most part, this was due to standing water, in addition to an area of trees in the promontory on the western edge of the survey area.

## *Data Processing*

4.4 The remedial processing of the data can enhance anomalous responses caused by potential archaeological features and eliminate magnetic noise from natural/modern sources. Data processing also allows for the correction of spatial errors introduced during the survey and inherent instrument heading errors. The survey data were processed using Terrasurveyor LITE software, where the following data processing routines were applied:

**Destripe:** Removal of striping effects from the raw data caused by discrepancies between different sensors and walking directions. Although the sensors were re-calibrated regularly (every 4-6 grids), unfavourable weather conditions prevailed during the survey and had an effect on sensor calibration that was visible in the data (**Figs. 4-9**).

**Destagger:** Correction of the displacement of anomalies caused by alternate zig-zag traverses. These displacements are often observable in gradiometer data collected with zig-zag traverses if the sample interval is less than 1m. In some areas of the survey, such as the SE corner, the effect of this was particularly great due to very wet ground conditions making it very difficult to complete the grids at an even pace.

**Clip:** Clipping the data replaces all values outside a specified minimum and maximum with those values. This reduces the masking effect of extreme values on the shaded greyscale plot and makes weaker archaeological and geological anomalies more visible. The data were clipped in stages, with the final plot displaying +1.9nT and -2nT.

4.5 Following comments by Lesley-Ann Mather (NCC) on the first submission of this report, the gradiometer data were re-processed by Dr. D Bescoby to test that the AS data processing using Terrasurveyor LITE had highlighted all significant geophysical anomalies. The data processing carried out by Dr. Bescoby is summarised below and greyscale plots of the processed data are included as **Figs. 10-12**.

**Destripe, using a zero-mean traverse:** i.e. the background mean of each traverse within an individual grid square is set to zero.

**Destagger:** Correction of the displacement of anomalies caused by alternate zig-zag traverses.

**Interpolation in the y direction** using a triangulation with linear interpolation routine.

The plots are shown with a dynamic range of +/- 9 nT, which shows clearly the varying signal strengths between detected anomalies.

### *Display and interpretation*

4.6 The processed data are displayed as a greyscale magnetic map (**Figs. 7-9 and 10-12**) and the interpretation of anomalous magnetic responses undertaken manually with recourse to documented responses from subsequently excavated features, along with reference to Northamptonshire HER and historic map data. A graphical interpretative plan of the site identifying potential archaeological features (**Fig. 13**) was then produced in AutoCAD LT2015.

## **5 RESULTS**

5.1 The unprocessed data from the magnetic survey are shown in **Figs. 4-6**, displayed as an x-y trace plot indicating the overall range of magnetic values recorded within the study area. Greyscale plots of the processed data, following the application of the data processing methodology described in 4.4, are shown in **Figs. 7-9**. The re-processed data from Dr. D Bescoby, following the processing methodology described in section 4.5, are shown in **Figs. 10-12**. The processed data revealed no anomalies indicative of archaeological features. The plot shows a complex pattern of positive anomalies which are considered to be of geological origin, relating to the activity of the River Nene (**Fig. 13**).

### *Geological and natural features*

5.2 The majority of the results from the survey are likely to be of natural origin, relating to the River Nene, which bounds the entire site. Along the northern edge of the site, where the course of the river has been altered, a number of positive anomalies (**1**) correspond with the historic course of the river marked on the 1775 plan of Warmington (**Fig. 14**) and the first edition OS map (**Fig. 15**). These are masked in places by magnetic disturbance from buried ferrous objects (**6** and **7**) and were not recorded in the NW of the site where ground conditions inhibited geophysical survey.

5.3 Through the centre of the site are two broken, sinuous positive anomalies (**2** and **3**) running in a broadly N-S orientation. These are likely to represent silted channel meanders, most likely associated with a previous course of the river.

5.4 Along the southern edge of the site are a large number of positive anomalies (**4**) with a broadly E-W orientation, aligned with the present course of the river. These are likely to represent numerous water channels pre-dating the alteration of the river in this area and the construction of two weirs associated with the watermill to the SE of the site (**Figs. 14** and **15**). Other positive anomalies across the site (**5**) are also likely to represent remnants of buried channels.

5.5 Across the entire survey area are variations in the data that can be

interpreted as patterned ground of geological origin. This has not been marked on **Fig. 13** to avoid confusing and obscuring the other anomalies. These responses are likely to relate to alluvial processes across the site over a prolonged period of time.

5.6 Scattered across the site, although concentrated more within the eastern and western portions of the survey are a number of small positive sub-circular anomalies (**6**), measuring on average 3m in diameter. These responses are most likely to relate to infilled root hollows of trees that once flanked the river margins. However, their similarity in some instances to known magnetic responses from infilled pit features of archaeological origin should be noted.

### *Modern Disturbance*

5.6 A series of large regularly spaced dipolar anomalies (**7**) were present on a SE-NW alignment in the eastern field. The anomalies are at 20m intervals and could represent the remains of old metal fence posts or telegraph poles.

5.7 Three wider spaced large dipolar anomalies 45m east of (**8**), on a similar SE-NW alignment, also represent buried ferrous objects. The 45m spacing of these may indicate the remains of telegraph poles.

5.8 An area of magnetic disturbance (**9**) was recorded in the NE of the survey area, adjacent to the foot bridge and lock. The disturbance was caused by ferrous metals used in the construction of these features. This disturbance may have masked other geophysical anomalies in this area of the site.

5.9 A number of areas of magnetic disturbance were also present in the south of the site (**10**). These were caused by wire fencing along the southern boundary.

## **6 Conclusion**

6.1 Numerous positive linear magnetic anomalies were recorded across the survey area (**1-5**). All of those recognised appear to be of natural origin relating to a long history of riverine activity across the site. Some of these (**1**) can be related to alterations in the course of the river along the northern boundary of the site during the 18th century. Dating of the other channels is impossible and some could be of significant antiquity.

6.2 The magnetic responses were strong and well defined, demonstrating the suitability of the site's geology for magnetometer survey. Areas of magnetic disturbance were present (**7-9**) which may have obscured weaker magnetic anomalies. Also, some areas of the site could not be surveyed due to vegetation or standing water. However, the area of the site affected is



relatively small and unlikely to have had a significant detrimental effect of the discovery of sub-surface archaeological features on the site.

6.3 The network of natural channels and geological disturbance was extensive and it is possible that the prevalence of these features could have masked weaker responses from features of archaeological origin. A number of discrete magnetic anomalies (6) revealed probable root bowls of trees once occupying riverbank locations, although some of these could feasibly be caused by cut pit features of archaeological origin.

6.4 As noted above, there was some stagger and striping in the raw data, caused predominantly by poor ground and atmospheric conditions. These errors were easily compensated through basic data processing protocols and it is not considered that they have had an effect on the detection or recognition of geophysical anomalies.

6.5 Comparison of the original greyscale plot of processed gradiometer data (Figs. 7-9) with the re-processed data from Dr. Bescoby (Figs. 10-12) shows that the range of identifiable anomalies are consistent between the two plots. This indicates that all anomalies that were detectable through magnetic gradiometer survey of the site have been identified and described.

## **ACKNOWLEDGEMENTS**

Archaeological Solutions Limited would like to thank Ingrebourne Valley Ltd for funding the assessment.

AS is pleased to acknowledge the advice and input of Lesley Ann Mather, Northamptonshire County Council County Archaeological Advisor (NCC CAA).

## **BIBLIOGRAPHY**

Historic England (English Heritage), 2008. *Geophysical Survey in Archaeological Field Evaluation*.

Chartered Institute For Archaeologists, 2014, *Standard and Guidance for Archaeological Geophysical Survey*. Available online at: [http://www.archaeologists.net/sites/default/files/CIfAS&GGeophysics\\_1.pdf](http://www.archaeologists.net/sites/default/files/CIfAS&GGeophysics_1.pdf)

SSEW 1983 *Soil Survey of England and Wales: Soils of South East England (sheet 4)*. Harpenden, Rothamsted Experimental Station/Lawes Agricultural Trust

SSEW 1983 *Soil Survey of England and Wales: Legend for the 1:250,000 Soil Map of England and Wales* Harpenden, Rothamsted Experimental Station/Lawes Agricultural Trust

Wilson, L & Henry, K, 2015, *Elton 2, Warmington, Northamptonshire; An*

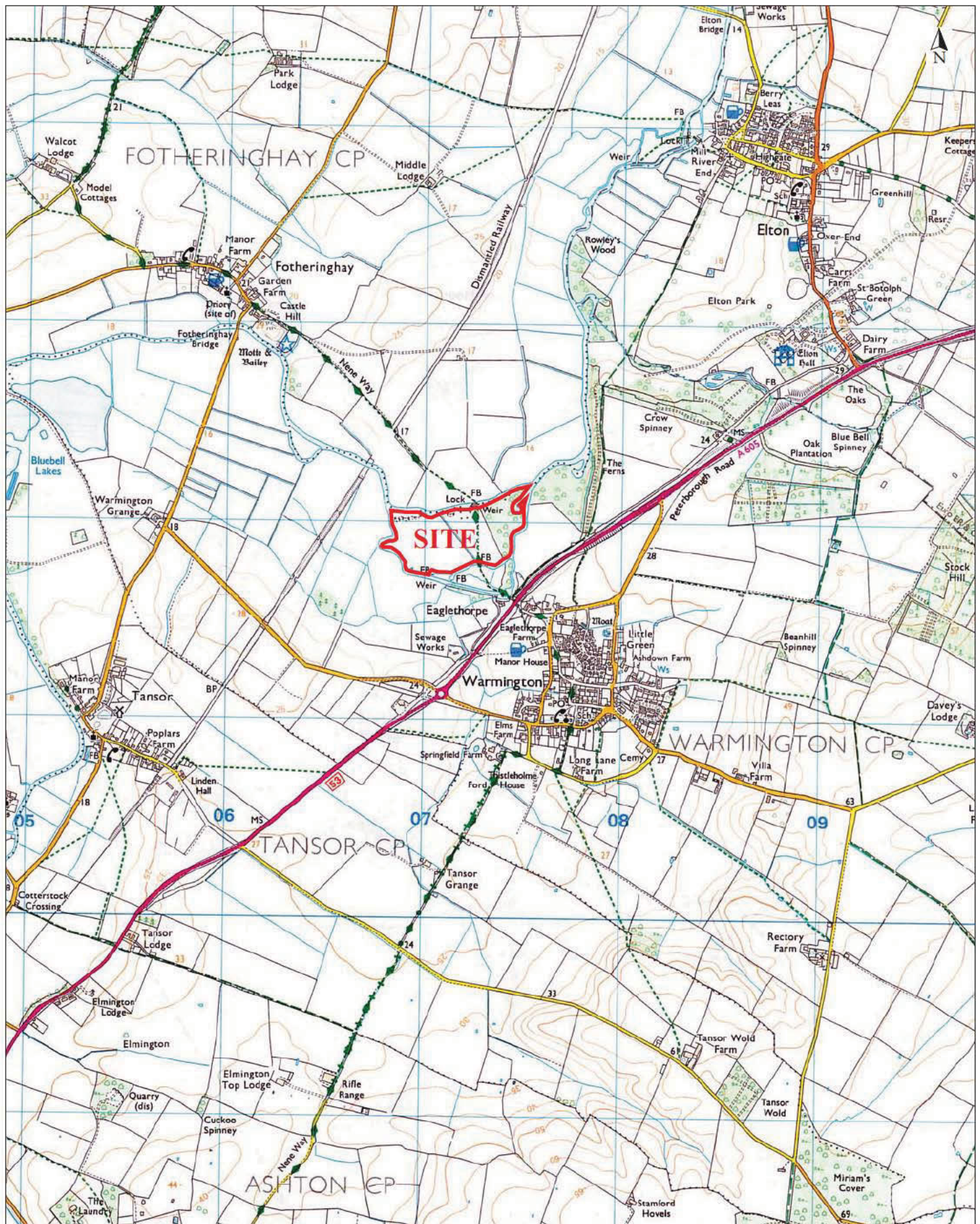
*archaeological desk-based assessment*, AS Report 4981



**APPENDIX 1****CARTOGRAPHIC SOURCES**

<b>Date</b>	<b>Description</b>	<b>Fig. No.</b>	<b>Scale</b>	<b>Location</b>
1775	Plan of Warmington	14	-	NRO
1885	First Ed. Ordnance Survey map; sheet XIII. NE	15	6"	NRO

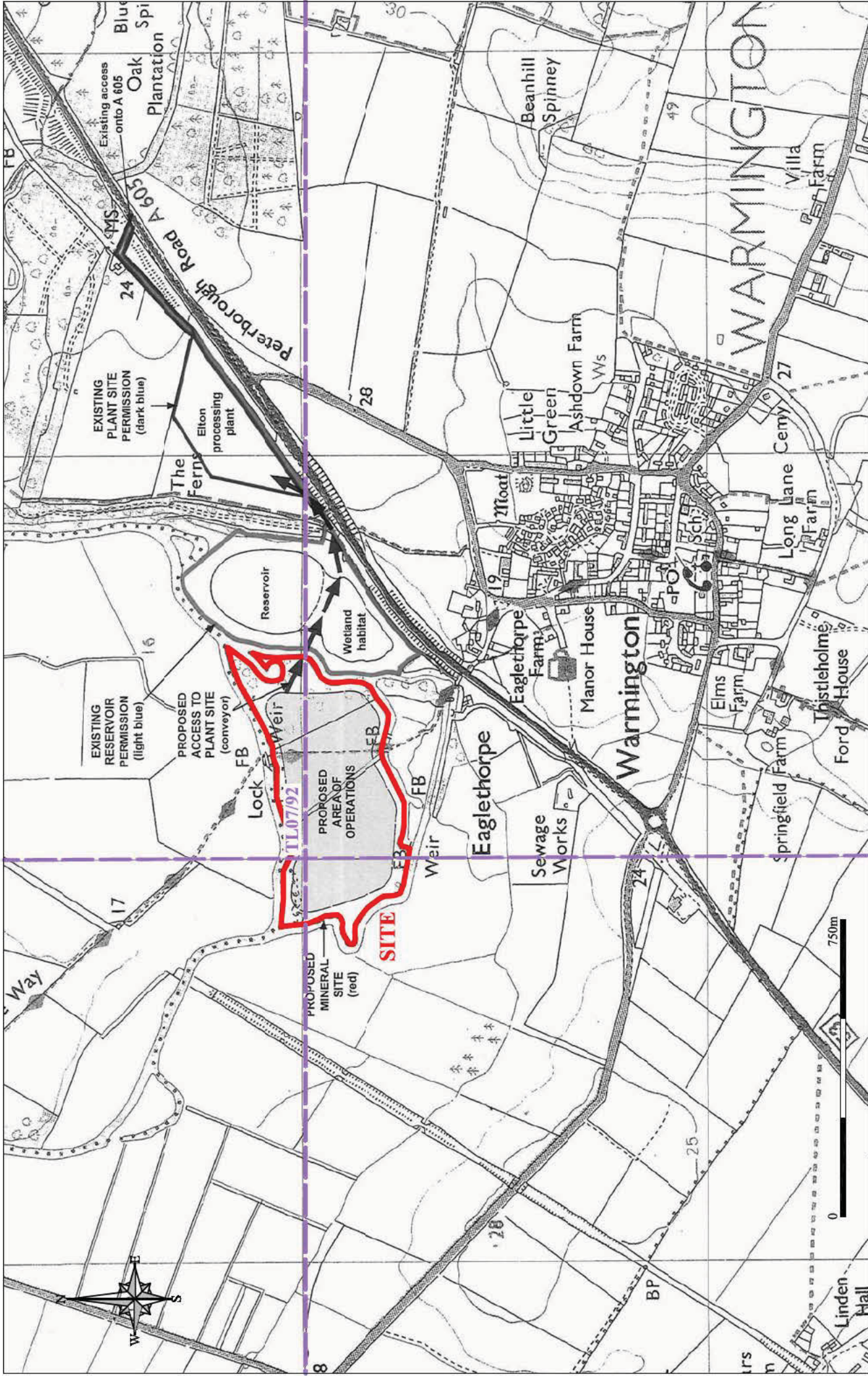




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**Fig. 1 Site location plan**  
 Scale 1:25,000 at A4  
 Warrington Quarry, Peterborough, Northants (P6422)





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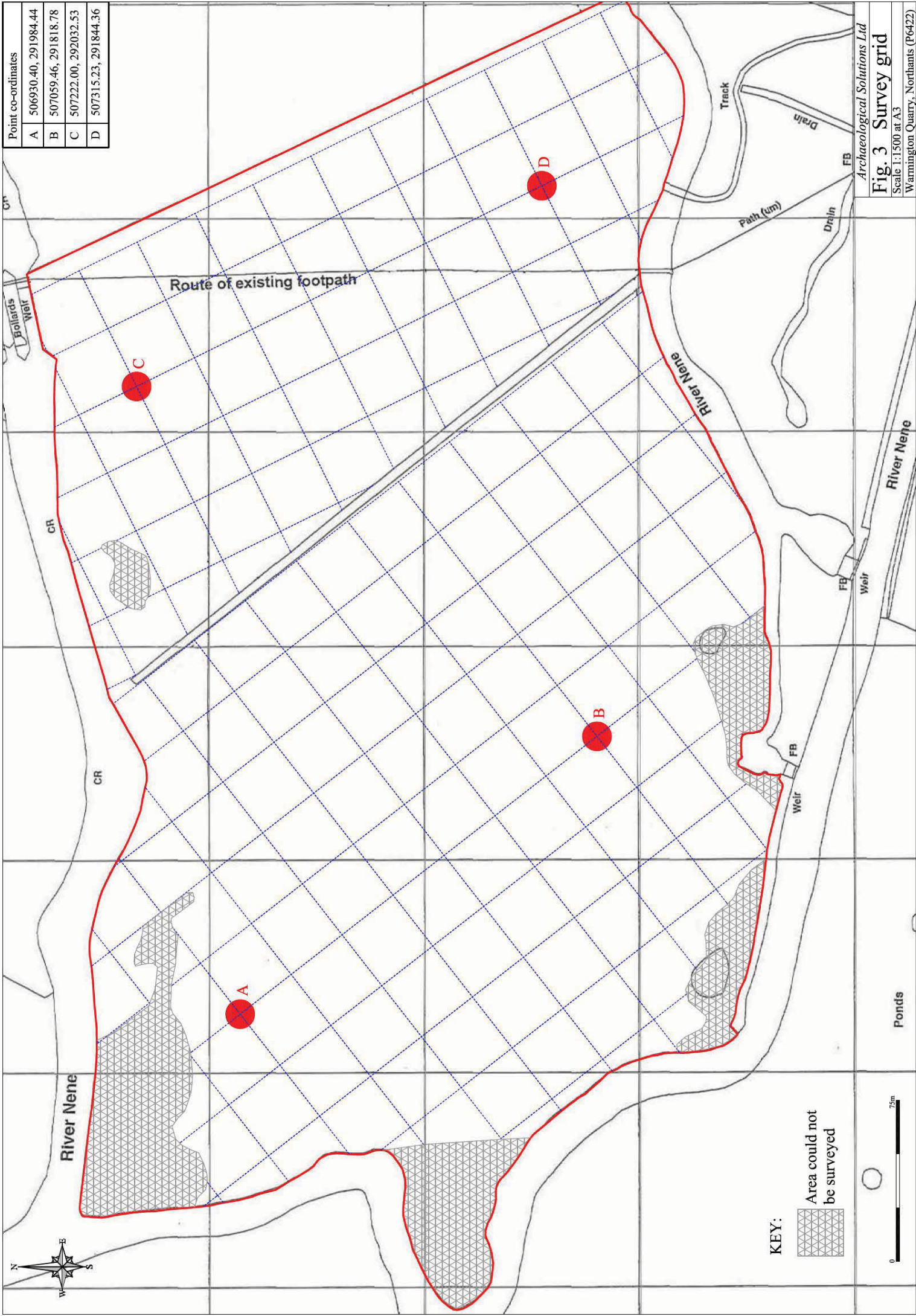
**Fig. 2 Detailed site location plan**

Scale 1:12,500 at A4

Warmington Quarry, Peterborough, Northants (P6422)



Point co-ordinates	
A	506930.40, 291984.44
B	507059.46, 291818.78
C	507222.00, 292032.53
D	507315.23, 291844.36



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**Fig. 3 Survey grid**  
 Scale 1:1500 at A3  
 Warrington Quarry, Northants (PG422)

KEY:  
 Area could not be surveyed

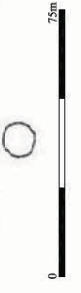






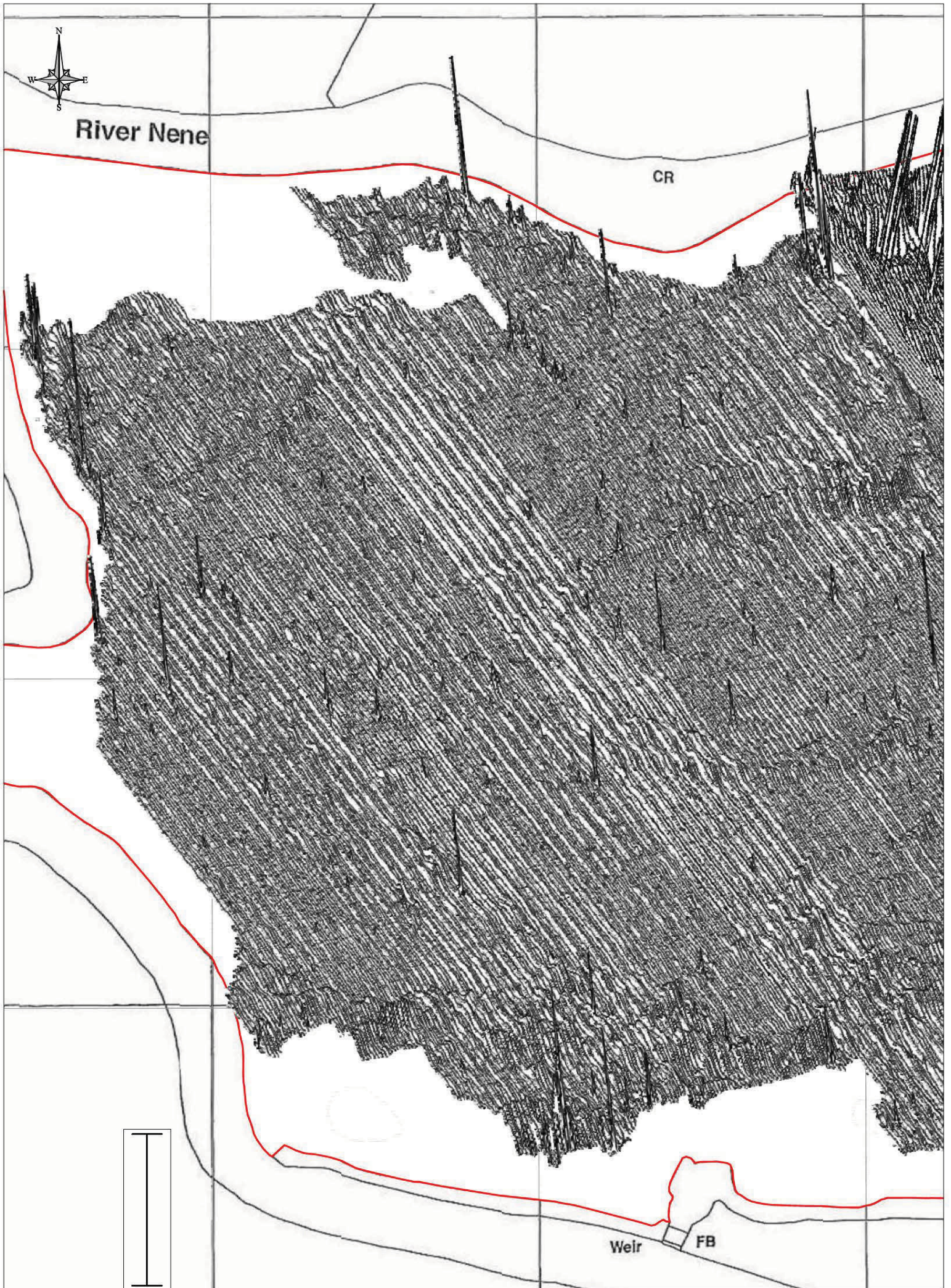
Fig. 6

Fig. 5

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 Fig. 4 X-Y plot of gradiometer data  
 Scale 1:1500 at A3  
 Warrington Quarry, Northants (P6422)

0 75m



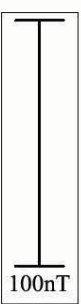


River Nene

CR

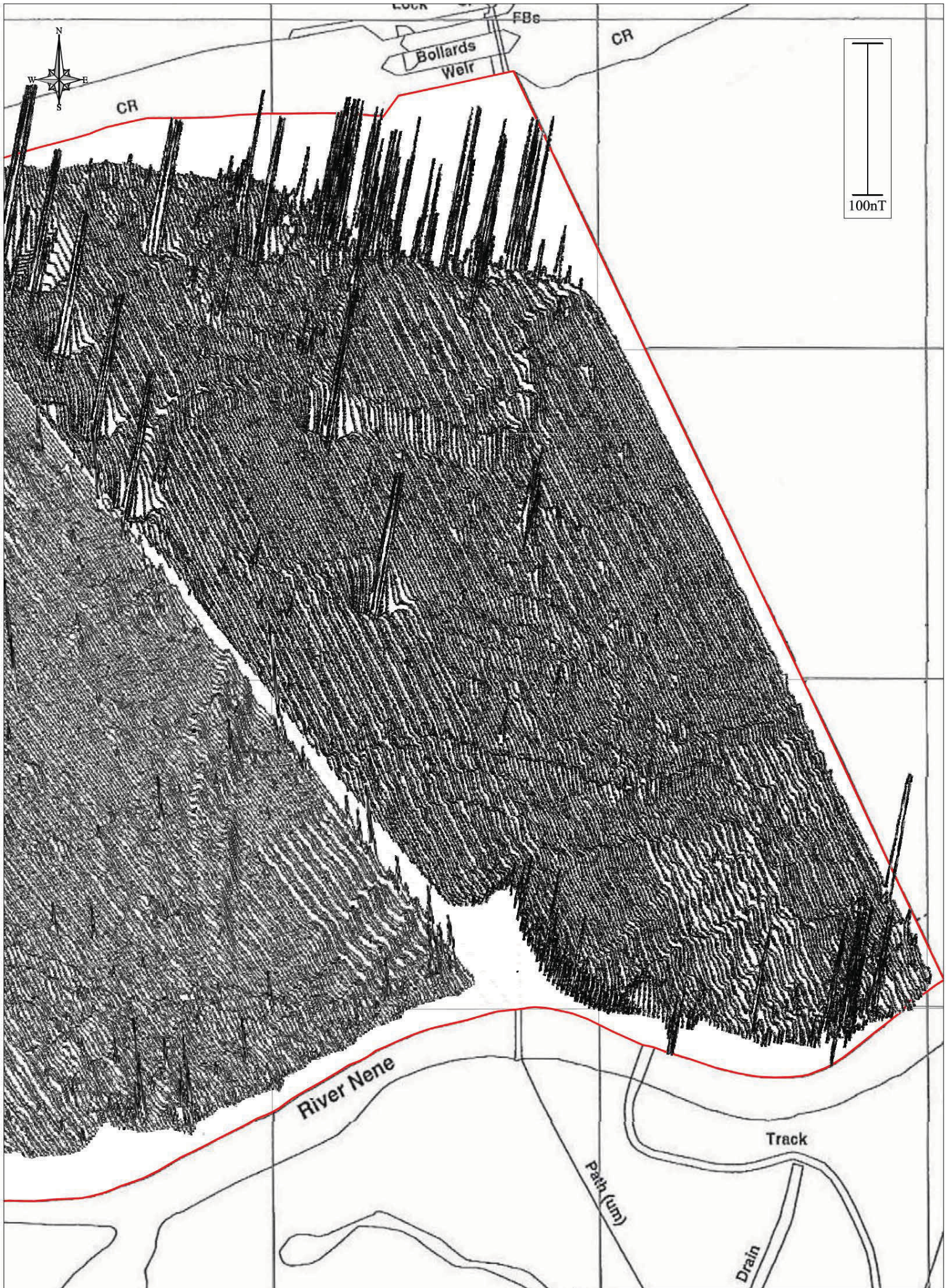
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FB



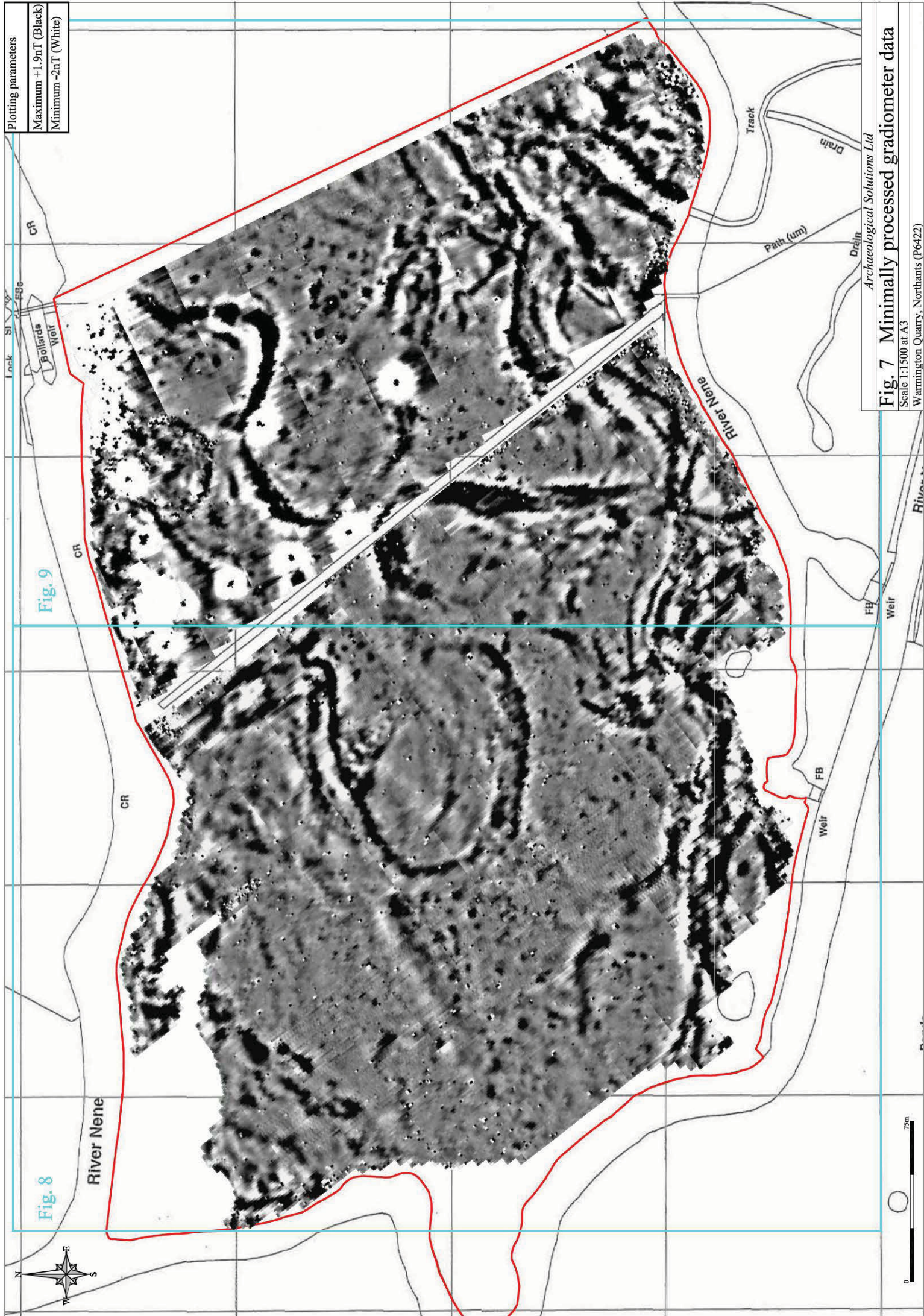
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**Fig. 5 X-Y plot of gradiometer data (west)**  
Scale 1:1000 at A3  
Warmington Quarry, Northants (P6422)





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**Fig. 6 X-Y plot of gradiometer data (east)**  
 Scale 1:1000 at A3  
 Warrington Quarry, Northants (P6422)





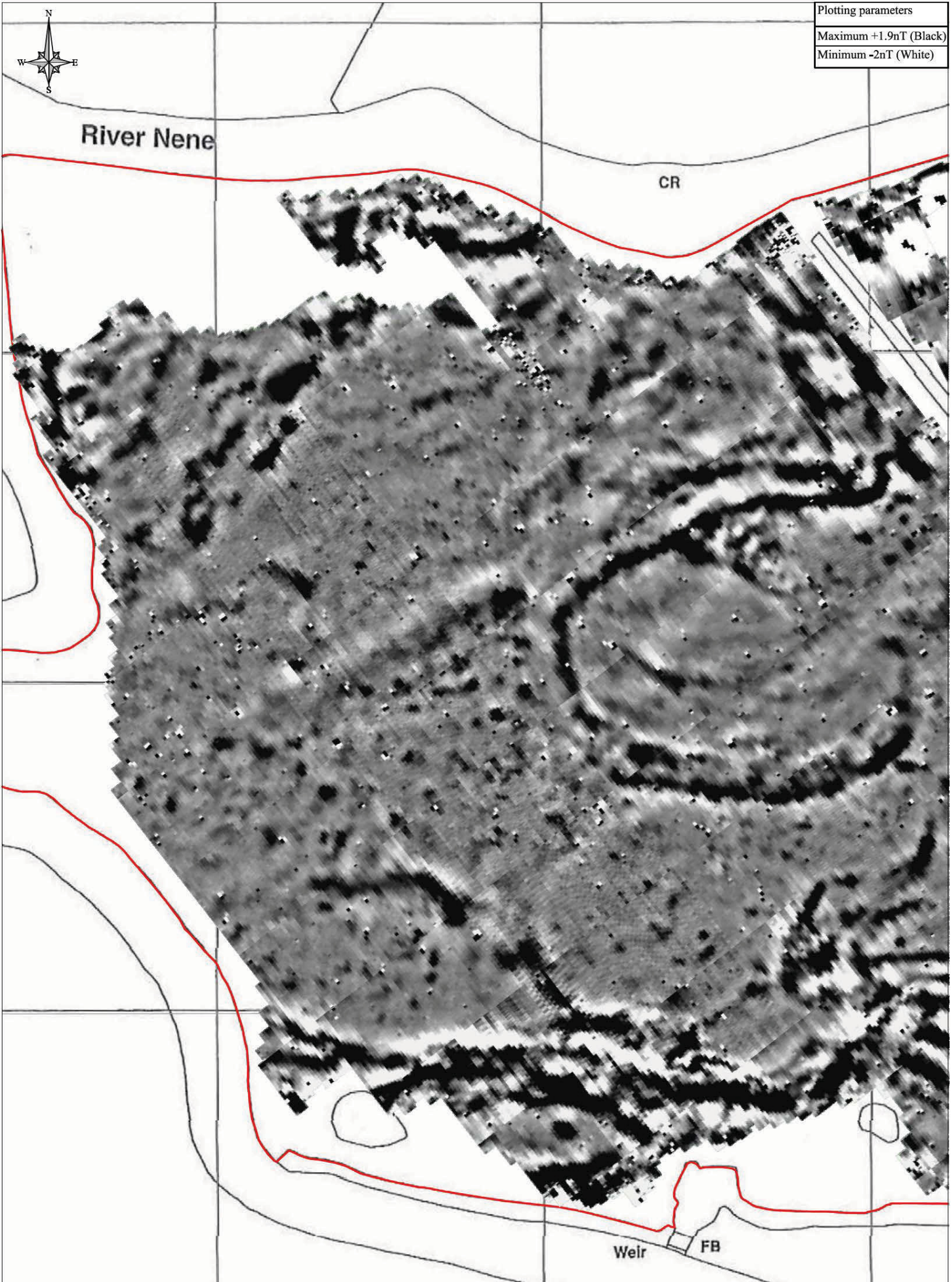




Plotting parameters  
Maximum +1.9nT (Black)  
Minimum -2nT (White)

River Nene

CR

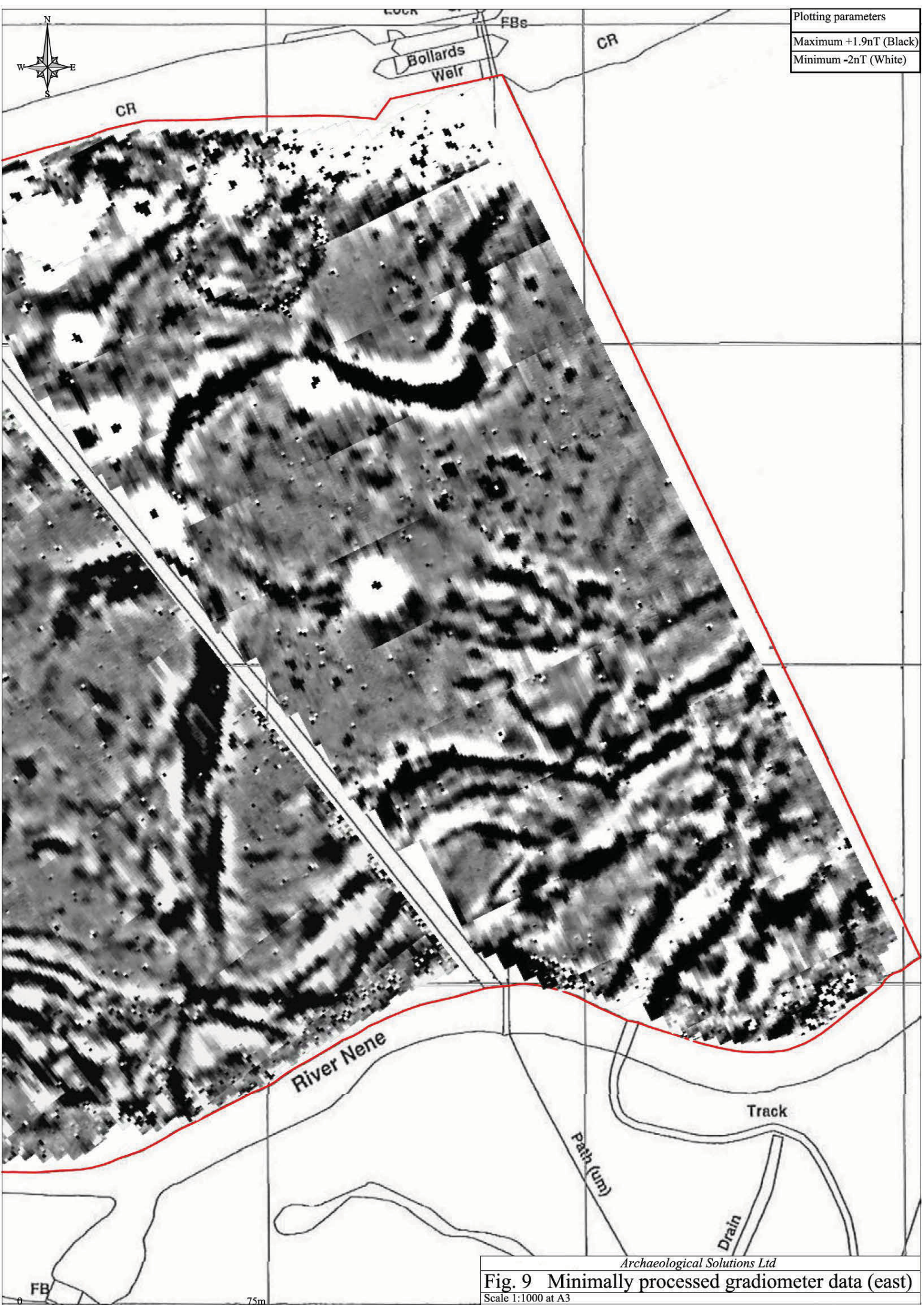


Weir FB

0 75m

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**Fig. 8** Minimally processed gradiometer data (west)  
Scale 1:1000 at A3  
Warmington Quarry, Northants (P6422)





Plotting parameters	
Maximum	+1.9nT (Black)
Minimum	-2nT (White)

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**Fig. 9 Minimally processed gradiometer data (east)**  
 Scale 1:1000 at A3  
 Warmington Quarry, Northants (P6422)



Plotting parameters	
Maximum	+9nT (Black)
Minimum	-9nT (White)

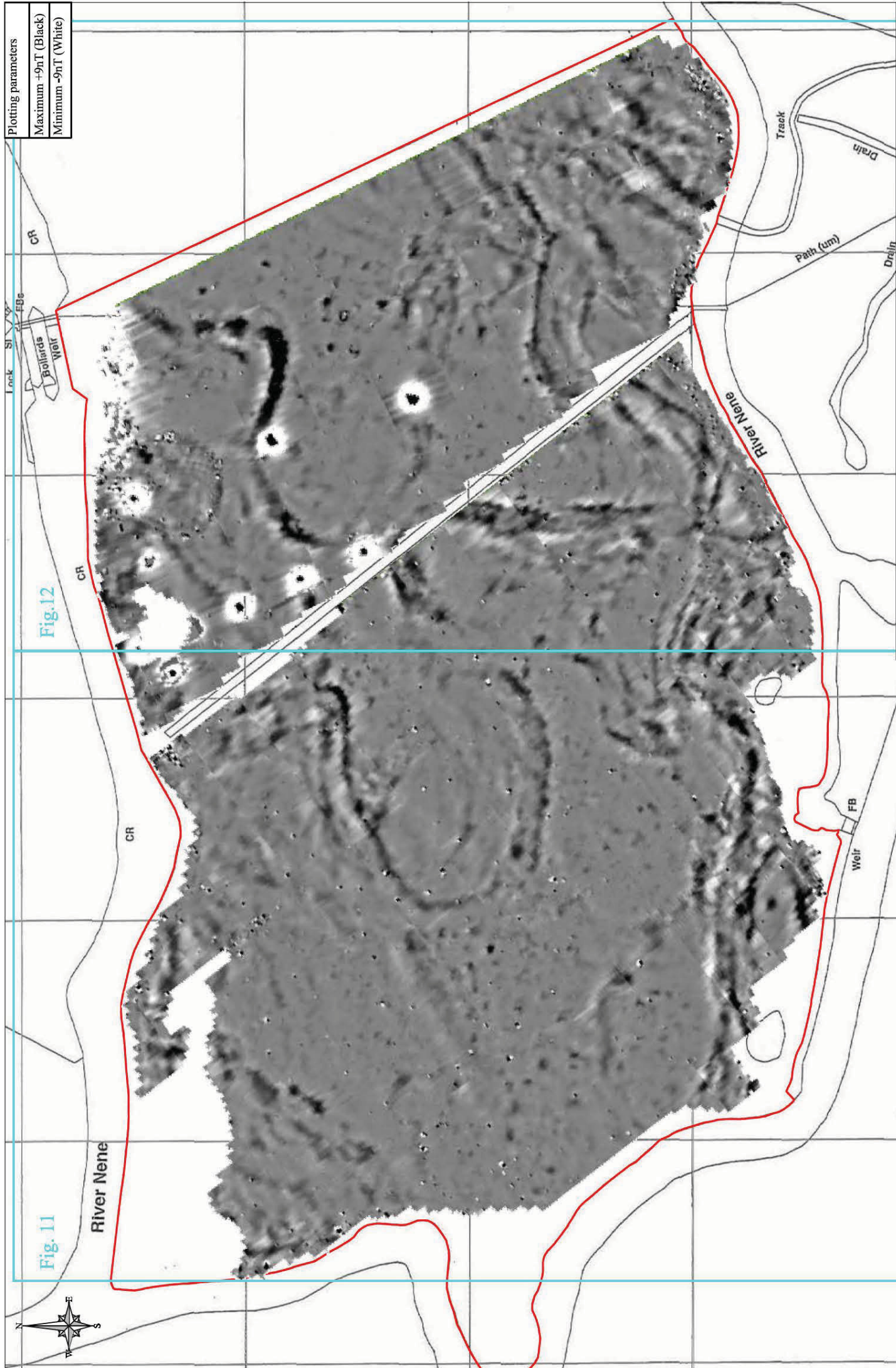


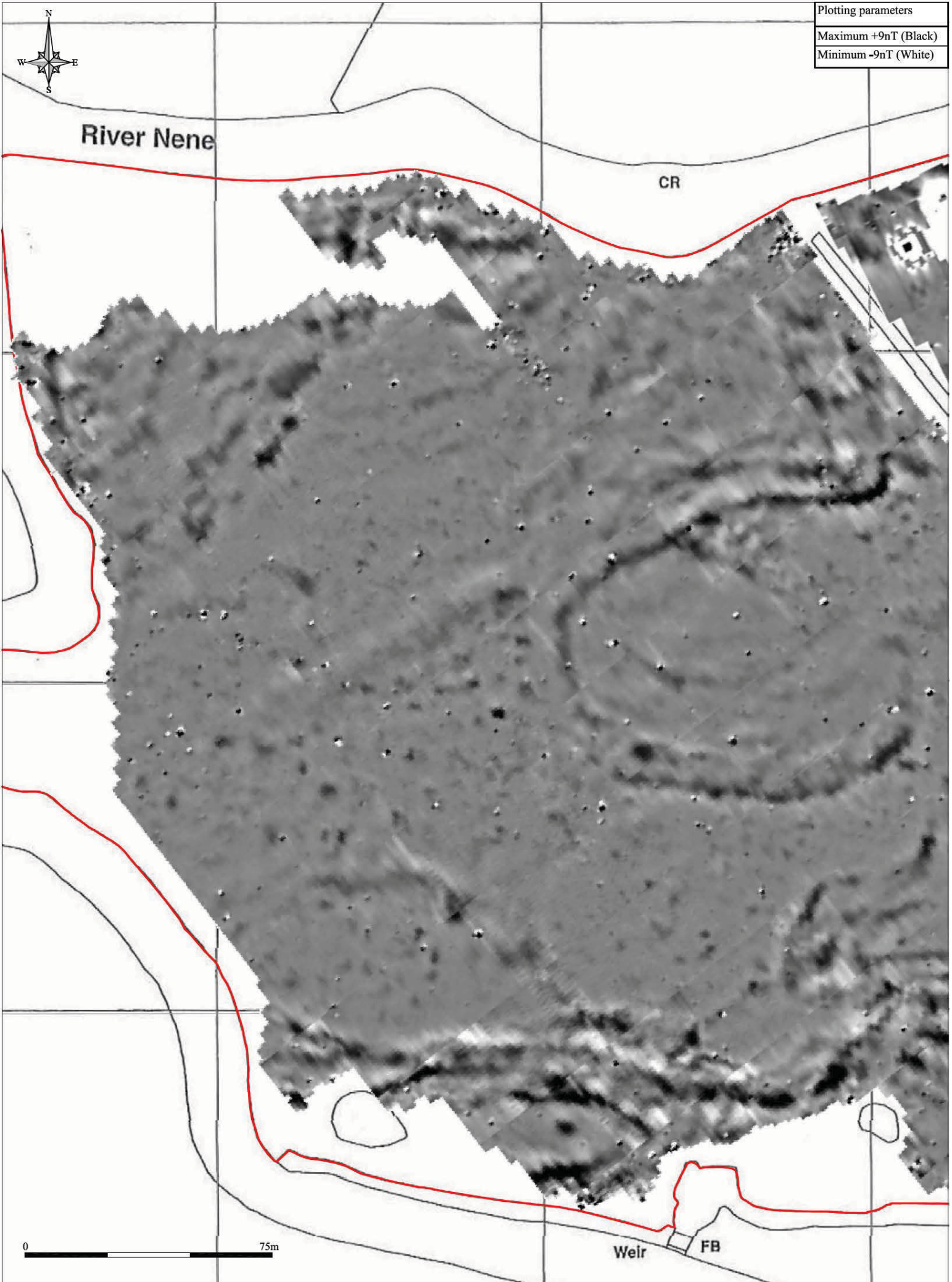
Fig. 12

Fig. 11

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Fig. 10 Greyscale plot of gradiometer data, re-processed by Dr D. Bescoby  
Scale 1:1500 at A3  
Warrington Quarry, Northants (P6422)

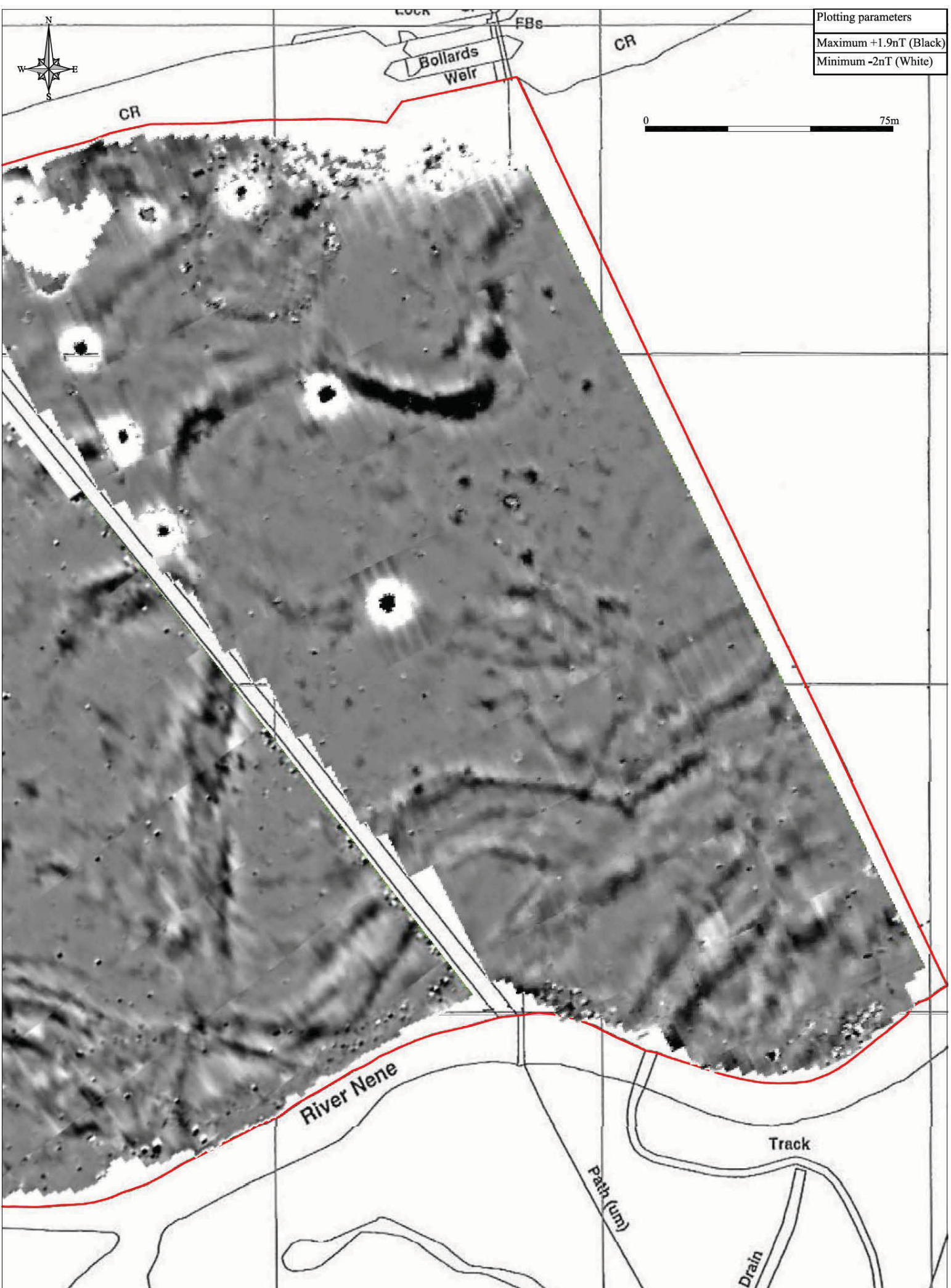




Plotting parameters  
Maximum +9nT (Black)  
Minimum -9nT (White)

0 75m

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**Fig. 11** Greyscale plot of gradiometer data (west), re-processed by Dr D. Bescoby  
Scale 1:1000 at A3  
Warmington Quarry, Northants (P6422)



Plotting parameters	
Maximum	+1.9nT (Black)
Minimum	-2nT (White)

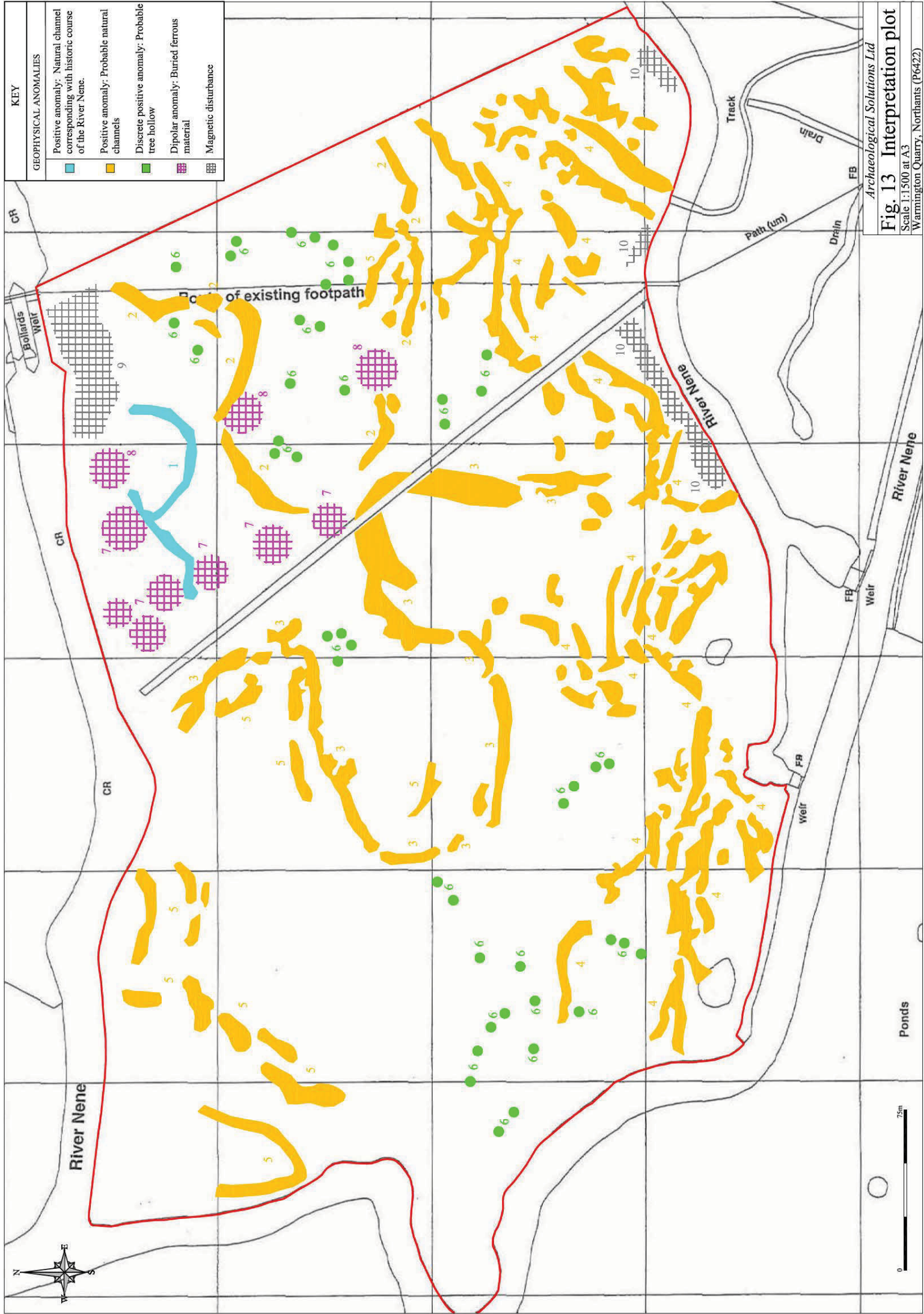
0 75m

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**Fig. 12** Greyscale plot of gradiometer data (east), re-processed by Dr D. Bescoby

Scale 1:1000 at A3  
 Warmington Quarry, Northants (P6422)







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<b>Fig. 14 1775 plan of Warmington</b>
Not to scale
Warmington Quarry, Northants (P6422)





<i>Archaeological Solutions Ltd</i>
<b>Fig. 15 OS map, 1885</b>
Not to scale
Warmington Quarry, Northants (P6422)