LAND OFF
WAINFLEET ROAD,
BOSTON

GEOPHYSICAL SURVEY

Work undertaken for
Larkfleet Homes Ltd

Report produced by
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April 2014

National Grid Reference: TF 3402 4548
Accession No.: LCNCC 2014.33
OASIS Reference No.: archaeol1-178150

APS Report No: 41/14

ARCHAEOLOGICAL
PROJECT
SERVICES

Quality Control

GEOPHYSICAL SURVEY
LAND OFF
WAINFLEET ROAD,
BOSTON,
LINCOLNSHIRE

Project Coordinator	Gary Taylor
Site Staff	Andrew Failes, Jonathon Smith
Survey processing and report	Andrew Failes

Checked by Project Manager	Approved by Senior Archaeologist
Gary Taylor	Tom Lane
Date: 24/4/14	Date: 30-4-14

CONTENTS

1. SUMMARY

Detailed magnetic gradiometer survey was undertaken in connection with proposed development on land off Wainfleet Road, Boston, Lincolnshire. The survey area totalled c. 4ha.

Detailed magnetic gradiometer survey has revealed five linear and curvilinear features of potential archaeological origin, for the most part in Field B along with three possible discreet pit type features, two occurring in Field A, with a relatively larger anomaly in Field B. With regards to the linear and curvilinear anomalies overall responses are somewhat weak. It is thought that these might represent former drainage or subdivision of the field.

There was a good deal of magnetic disturbance picked up during the survey from bipolar anomalies in the form of drainage pipes or services, fencing around trees (in Field B), a water trough and disturbance at the edges of the fields.

2. INTRODUCTION

2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation. Evaluation is defined as *'a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate'* (IfA 2008).

2.2 Background

Archaeological Project Services was commissioned by Larkfleet Homes Ltd to undertake detailed magnetometer survey totalling some 4ha on land off Wainfleet Road, Boston, Lincolnshire in connection with proposed development of the area. The survey was carried out between the 3rd and 9th of April 2014.

The site is adjacent to Burton Hall, a late 16th century building.

2.3 Topography and Geology

Boston is situated 45km southeast of Lincoln and approximately 7km from the northwest coast of The Wash, in the Fenland of south Lincolnshire. Bisected by the River Witham, the town is located in the administrative district of Boston Borough, Lincolnshire (Fig. 1). Although on the edge of the urban area of Boston, the site is actually within Fishtoft parish.

The proposed development site is located north of Wainfleet Road to the east and north of Burton House, at National Grid Reference TF 3402 4548 (Fig. 2)

The survey area lies at a height of c. 3m OD on fairly level ground, with the exception of a depression representing a former pond in the northeast corner of Field B (Fig 11). The site lies on the boundary of two different soil associations. Coarse silty calcareous alluvial gley soils of the Wisbech association developed in stoneless marine alluvium occur at the northern and western areas of the site, while the southern and eastern end are Butterwick fine silty gleyic brown alluvial soils developed over drift geology of silty clay (Robson 1990). The solid geology of the area consists of Ampthill Clay Formation mudstone with argillaceous limestone nodules (BGS 2014)

3. GEOPHYSICAL SURVEY

3.1 Methods

Location and layout of the survey areas is shown in Figure 3. Field A, to the northwest, was lying fallow, while Field B in the southeast consisted of pasture. Both fields were in good condition for survey.

Survey was undertaken in accordance with English Heritage (2008) and IfA (2011) guidelines and codes of conduct.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. This records subtle changes in the magnetic field resulting from differing features in the soil. Changes as small as 0.2 nanoTesla (nT) in an overall field strength of c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity.

Magnetometers measure changes in the Earth's magnetic field. With two sensors configured as a gradiometer the recorded values indicate the difference between two magnetic measurements separated by a fixed distance. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame with a 1m separation between the sensing elements giving a strong response to deep anomalies.

The mapping of anomalies in a systematic manner allows interpretation of the type of material present beneath the surface. Strong magnetic anomalies are generated by buried iron-based objects or by kilns or hearths, usually resulting in a bipolar (positive/negative) response. More subtle positive anomalies representing pits and ditches can be seen where these contain more topsoil which is normally richer in magnetic iron oxides and provides a contrast with the natural subsoil (but this can vary depending on the nature of the underlying deposits). A negative anomaly may result from upcast bank material. Wall foundations can also show as negative anomalies where the stone is less magnetic than the surrounding soil, or as stronger positive and negative anomalies if of brick, but are not always responsive to the technique.

It should be noted that not all features will be responsive and absence of anomalies does not necessarily indicate absence of archaeological features.

Sampling interval and data capture
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid. The Grad 601 has a typical depth of penetration of 0.5m to 1.0m although a greater range is possible where strongly magnetic objects have been buried in the site.

Readings are logged consecutively into the data logger which is downloaded daily either into a portable computer whilst on site or directly to the office computer. At the end of each job, data is transferred to the office for processing and presentation.

Processing and presentation of results
Processing is performed using specialist ArcheoSurveyor software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves flattening the background levels with respect to adjacent traverses and adjacent grids (Destripe or zero mean traverse). Despiking is also performed to reduce the effect of the anomalies resulting from small iron objects often found on agricultural land. Further processing can then be carried out which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following are the processing techniques carried out on the processed gradiometer data used in this report:

1. DeStripe (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

2. Despike (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)
Parameters: X radius = 1; Y radius = 1; Threshold = 3SD; Spike replacement =

mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -3 to 3nT.

3.2 Results

The presentation of the data for the site involves a print-out of the raw or minimally processed data as greyscale and trace plots (Figs 4, 5, 7, 8); clipped for display but otherwise unprocessed), together with greyscale plots of the processed data (Figs 6, 9 & 10). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig. 11) and are described below.

Linear positive anomalies
A small number of positive linear anomalies of potential archaeological origin are highlighted in the central area of Field A at **A** and in the northwestern quadrant of Field B at **B** (Fig. 11). Responses are weak with little magnetic contrast overall and these intermittent linear responses remain difficult to interpret. However, their alignment differs from the extant boundaries, so they may represent something of greater antiquity. A possible enclosure can be seen at **B,** along with the possibility of a double ditch oriented on an east to west alignment. A weak slightly curvilinear anomaly was recorded at **A** and remains difficult to interpret, it may possibly relate to drainage or subdivision of the field as does a linear anomaly at **D** in Field B.

Discrete positive anomalies
A single discrete positive area anomaly was recorded at **C** in Field B. This might possibly represent a pit, but it is very close to a strong bipolar anomaly and may be related to it. Two smaller discrete positive anomalies were recorded in Field A and possibly represent pits. However, as these anomalies exist on their own, it is difficult to interpret them based on form alone.

Linear bipolar anomalies
A total of four linear bipolar anomalies were recorded during the survey and represent either drainage pipes or services.

Magnetic disturbance
Strong area bipolar response generally results from larger metal items (either buried or at the surface) but may also be caused by concentrations of debris at field margins or by metal elements in fencing of boundaries. They are most notable here along the lines of linear bipolar anomalies and at the southern edges of Field B. The roughly circular magnetic disturbances recorded in Field B relate to trees with metal fencing around them. The large magnetic disturbance in the southwestern corner of Field B towards the southern end of the linear bipolar anomaly relates to a large metal water trough.

Modern disturbance
Elevated positive and negative readings are evident along the western edge of Field A and probably represent disturbance due to the construction of the road.

Iron spikes (discrete bipolar anomalies)
Iron items within the topsoil give a distinctive localised bipolar (strong positive with associated strong negative) response. Such items usually derive from relatively recent management or agricultural use of the land – broken or discarded pieces of agricultural machinery or other modern debris. These are fairly widely scattered with no particular concentrations.

Geological response
Ovoid and diffuse response at **E** in the northeastern corner of Field B reflects a dip in the landscape and represents a former pond.

4. DISCUSSION

Detailed magnetic gradiometer survey has revealed five linear and curvilinear features of potential archaeological origin, for the most part in Field B and three

possible discreet pit type features, two occurring in Field A with a relatively larger anomaly in Field B. With regards to the linear and curvilinear anomalies overall responses are somewhat weak. It is thought that these might represent former drainage or subdivision of the field.

There was a good deal of magnetic disturbance picked up during the survey from bipolar anomalies in the form of drainage pipes or services, fencing around trees (in Field B), a water trough and disturbance at the edges of the fields.

5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge Dan Endersby of Larkfleet Homes who commissioned the project and arranged access; Gary Taylor and Tom Lane (APS) edited the report.

6. PERSONNEL

Project coordinator: Gary Taylor
Geophysical Survey: Andrew Failes, Jonathon Smith
Survey processing and reporting: Andrew Failes

7. BIBLIOGRAPHY

BGS, 2014 *BGS online geology*

English Heritage, 2008 *Geophysical Survey in Archaeological Field Evaluation.*

IfA, 2008 *Standard and Guidance for Field Evaluation.*

IfA, 2011 *Standard and Guidance for Geophysical Survey.*

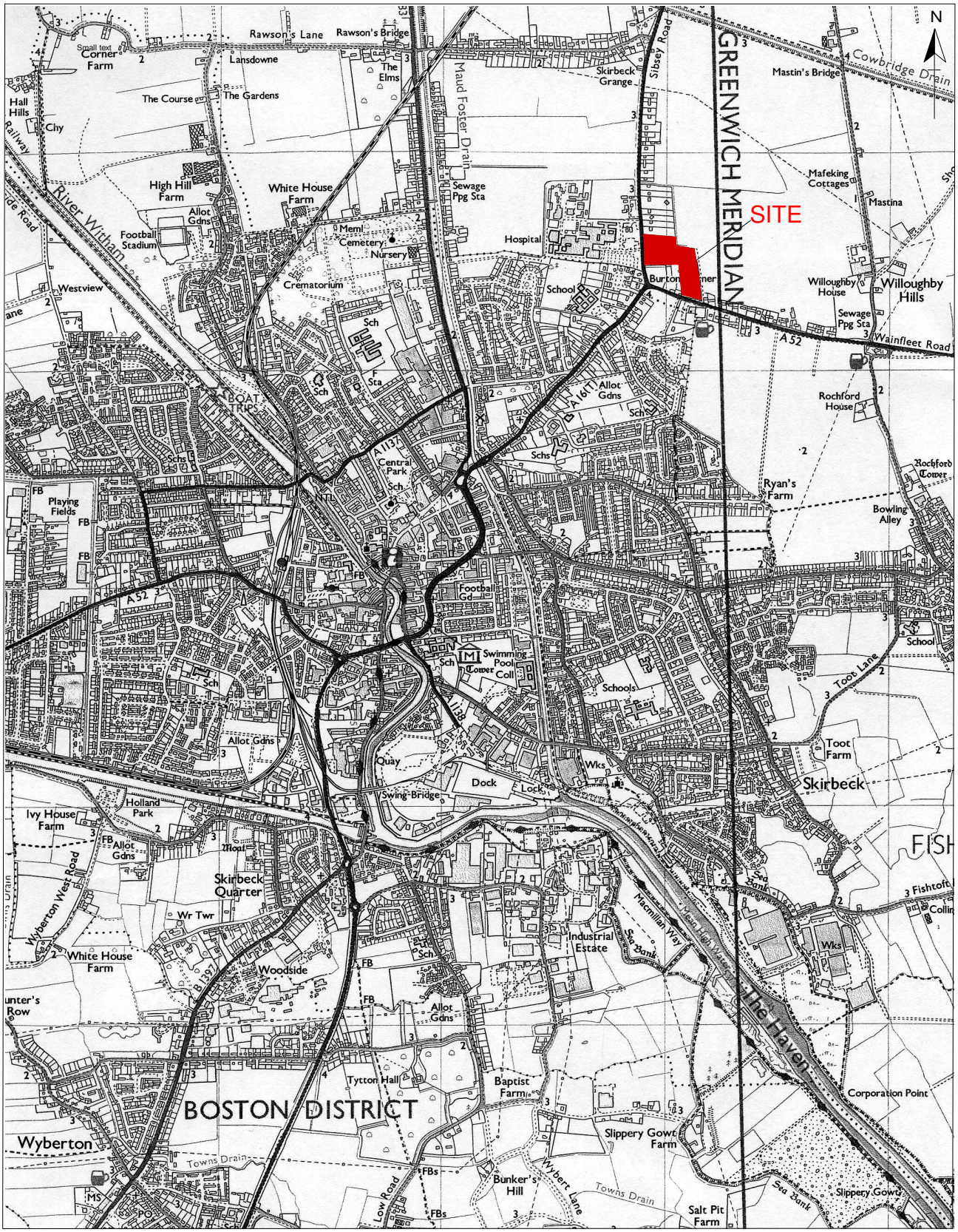
Robson, J. D. 1990 *Soils of the Boston and Spalding District* Mem. Soil Surv. Gt. Br.

8. ABBREVIATIONS

BGS British Geological Survey

IfA Institute for Archaeologists

Figure 1 - General Location Plan



0 1000m

Archaeological Project Services		
Project Name: Boston Wainfleet Road (BOWR14)		
Scale 1:25000	Drawn by:AF	Report No: 41/14

Figure 2 - Site Location Plan

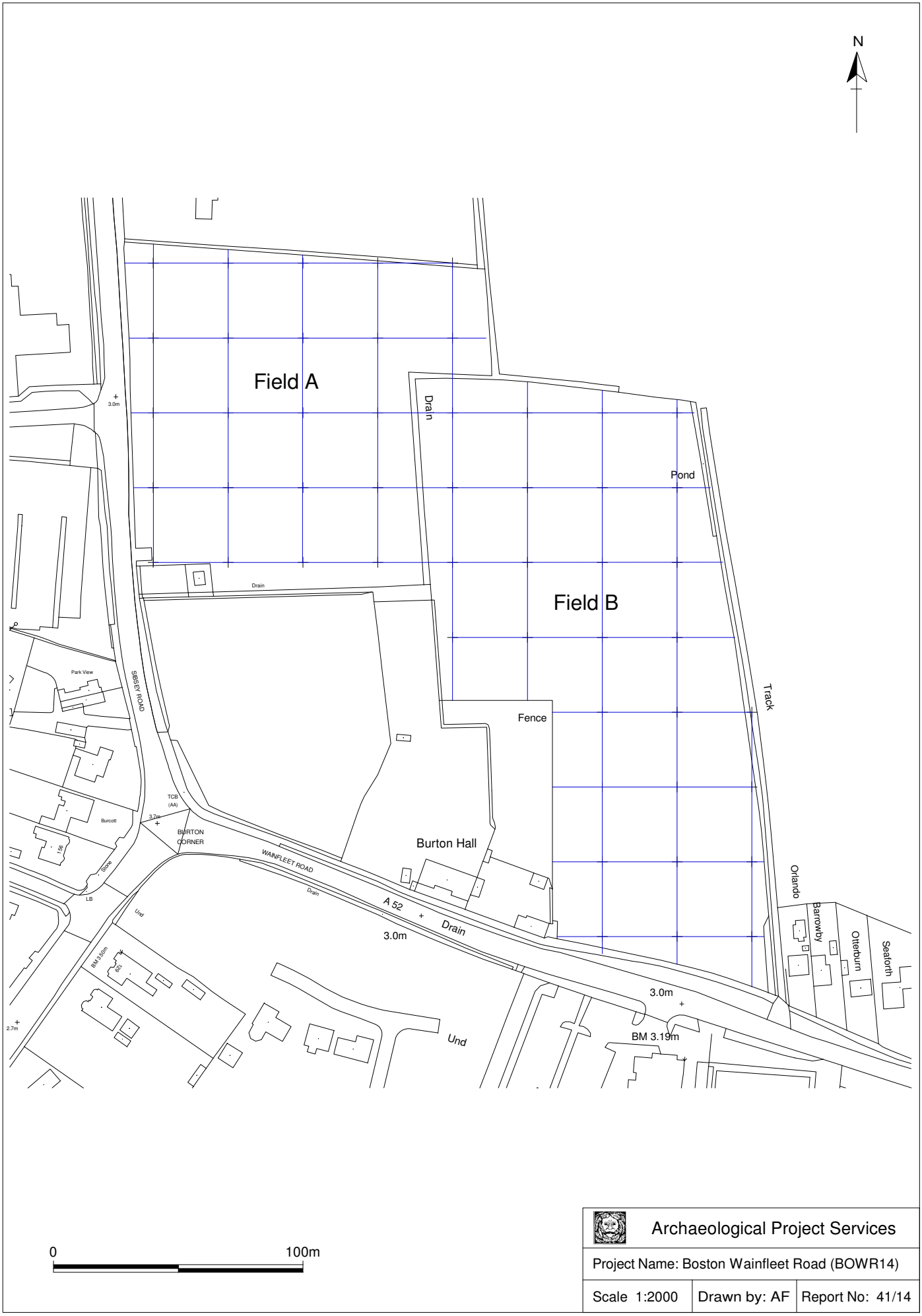


Figure 3 - Layout of survey area

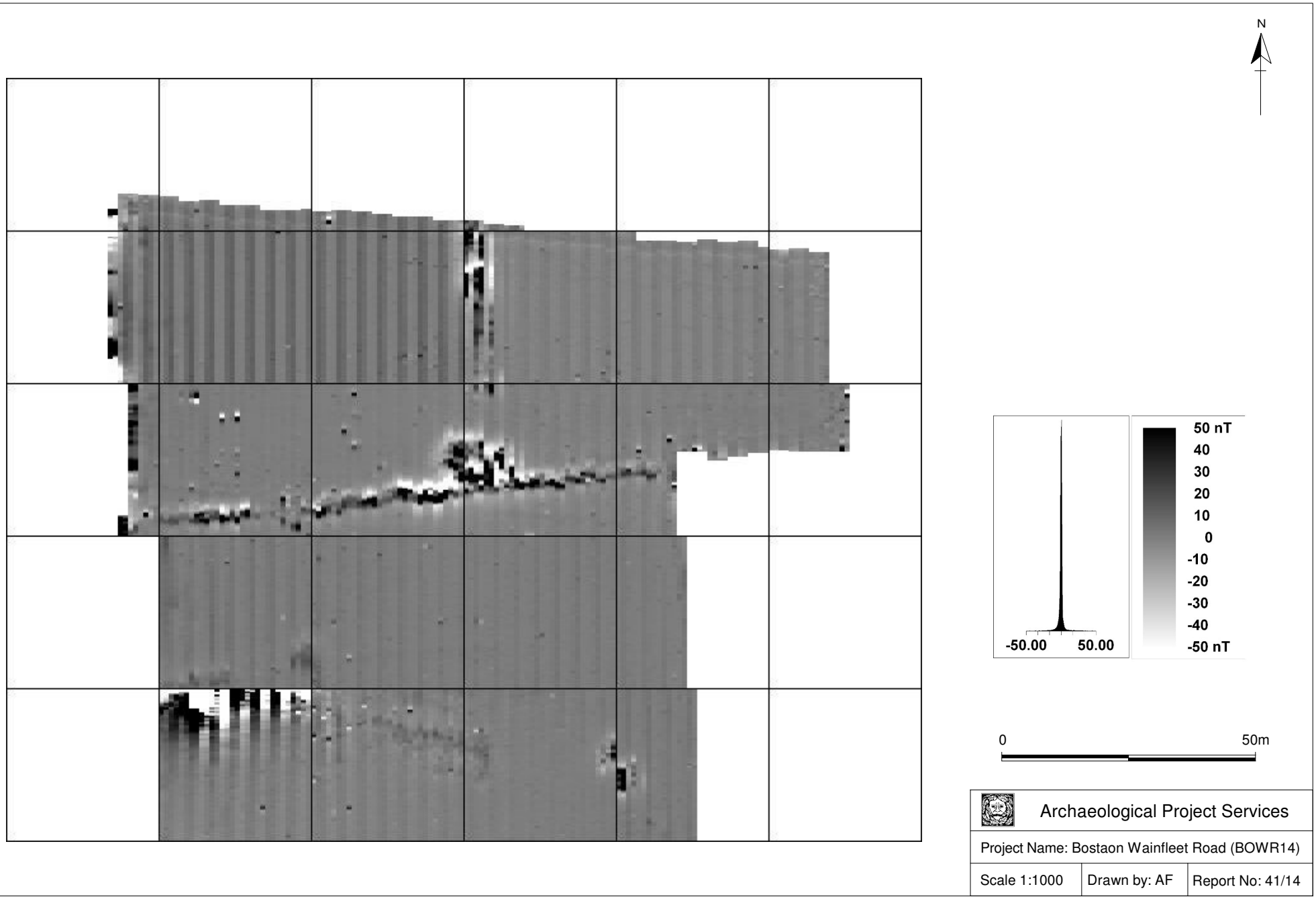


Figure 4 - Minimally processed data greyscale plot

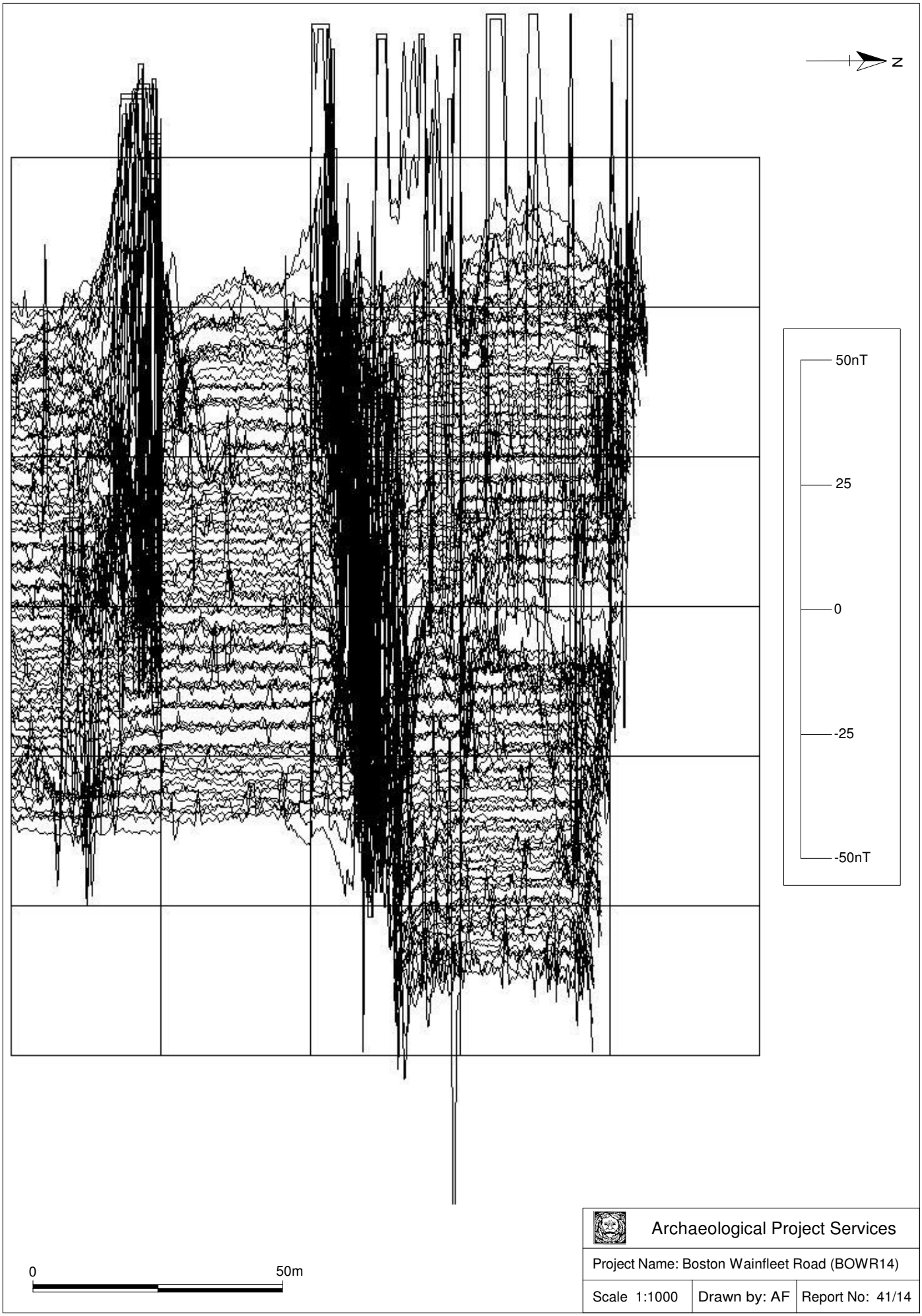


Figure 5 - Field A, minimally processed data trace plot

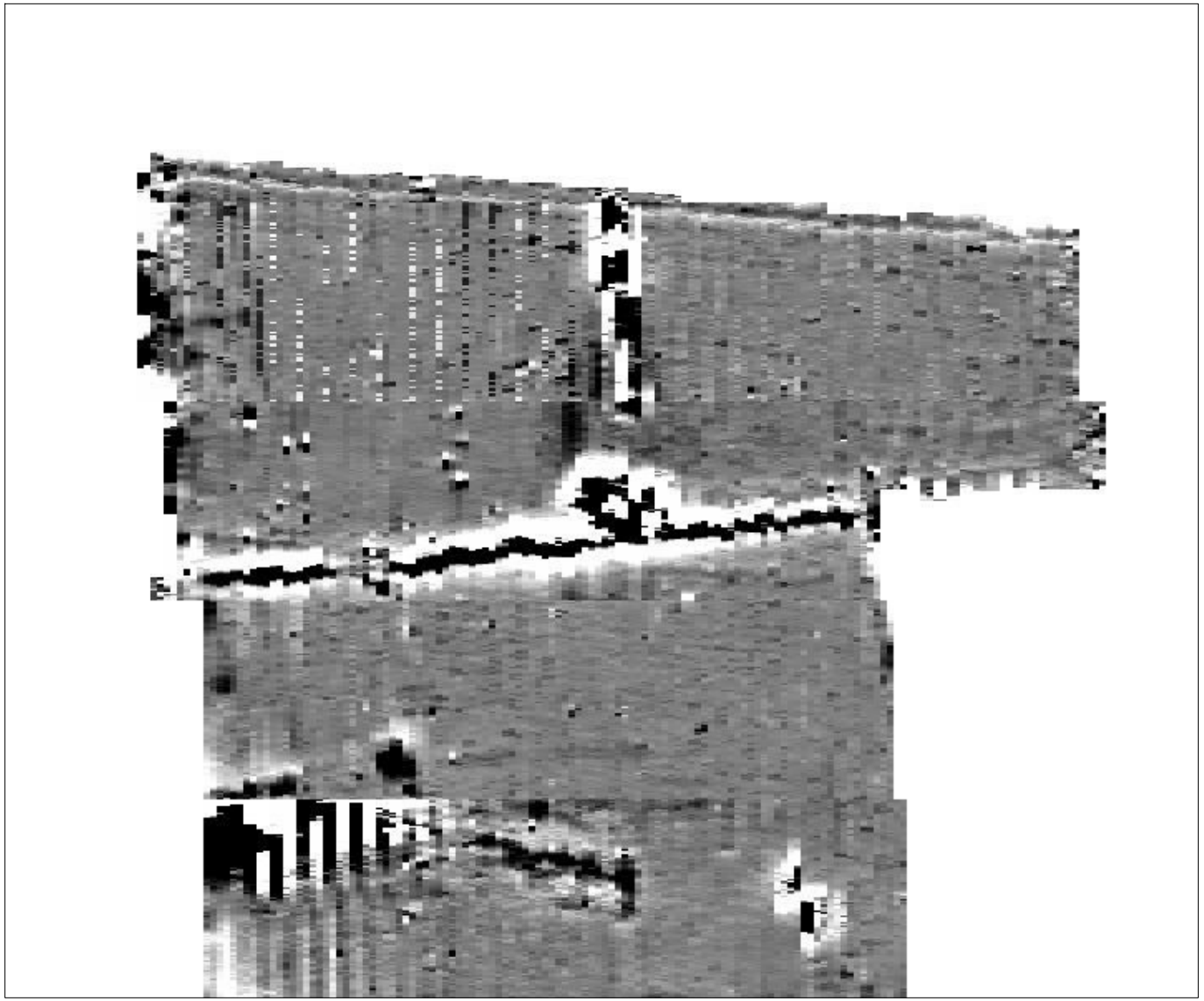
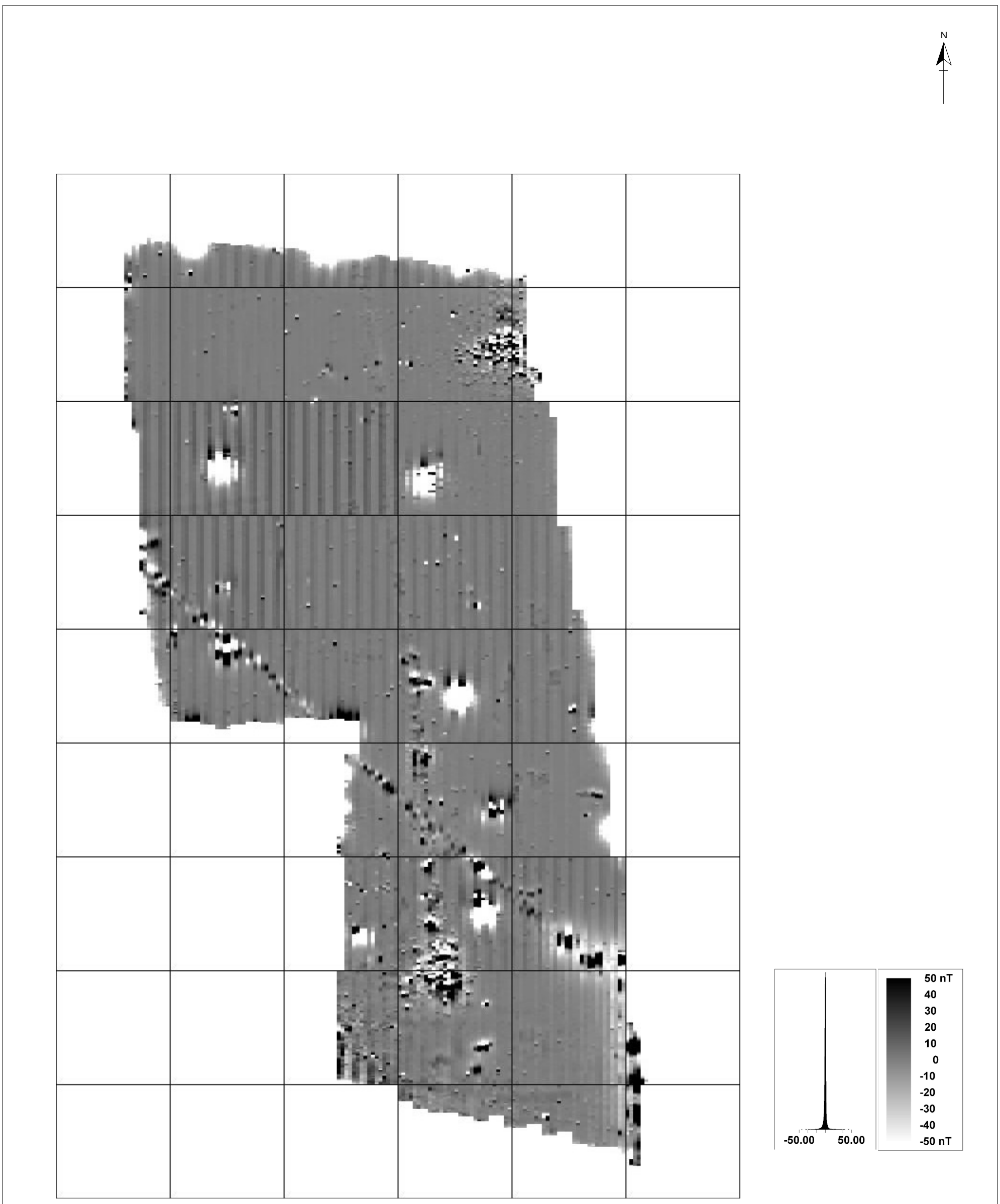


Figure 6 - Field A, processed data greyscale plot



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Scale 1:1000	Drawn by: AF	Report No: 41/14

Figure 7 - Field B, minimally processed data greyscale plot

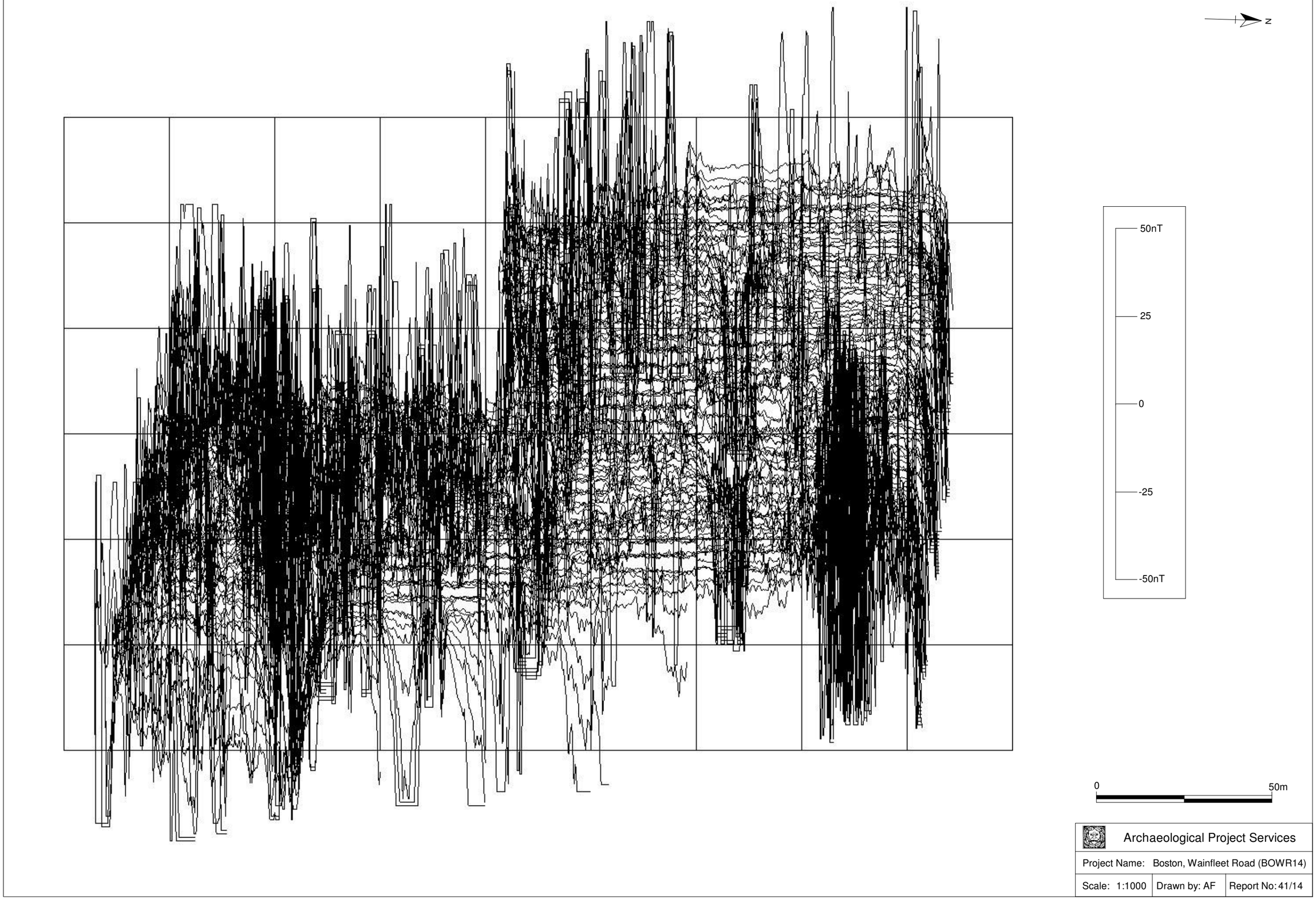
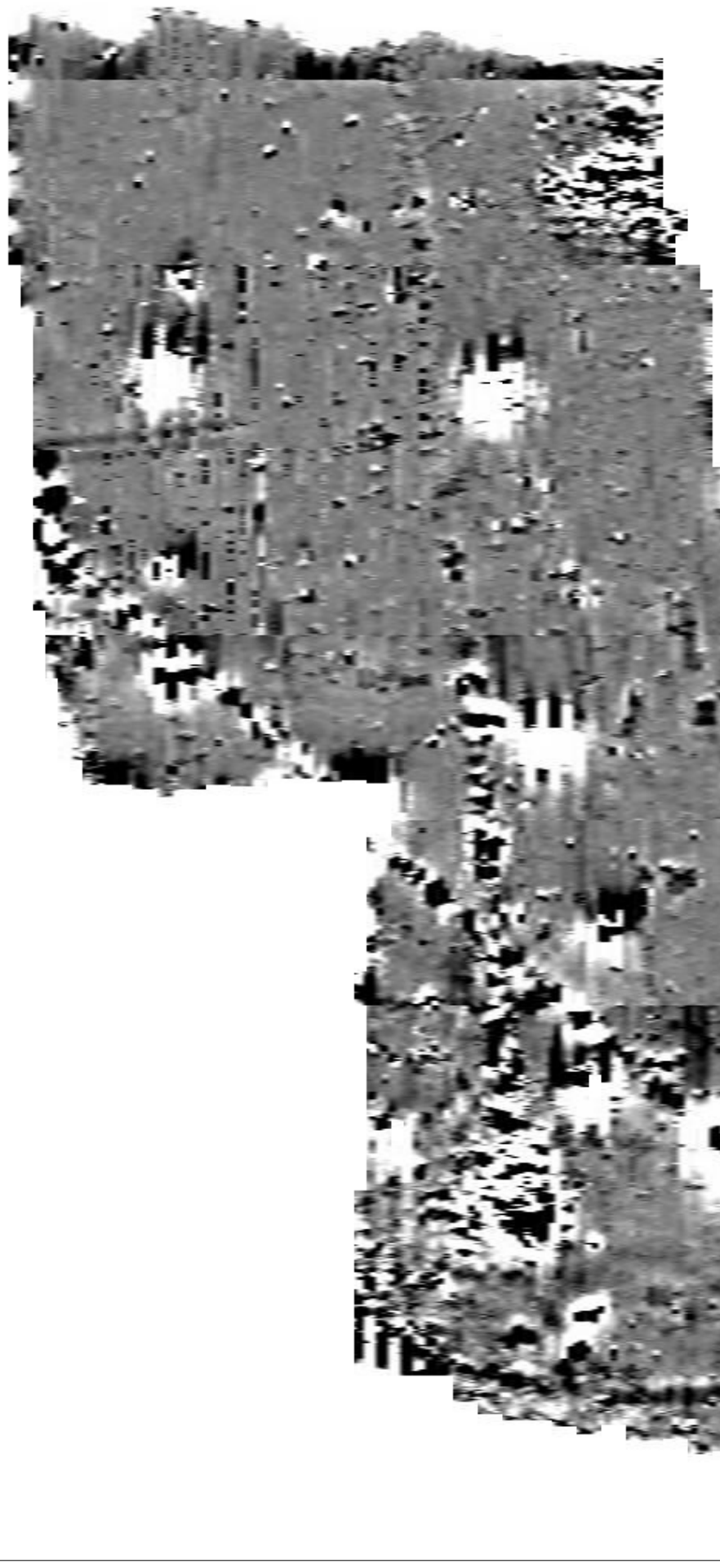
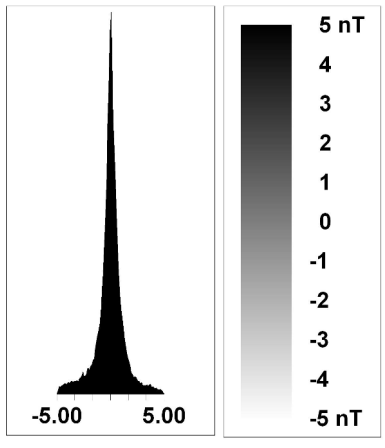


Figure 8 - Field B, minimally processed data trace plot





0 50m

Archaeological Project Services		
Project Name: Boston Wainfleet Road (BOWR14)		
Scale 1:1000	Drawn by: AF	Report No: 41/14

Figure 9 - Field B, processed data greyscale plot

Figure 10 - Processed data greyscale overall plot

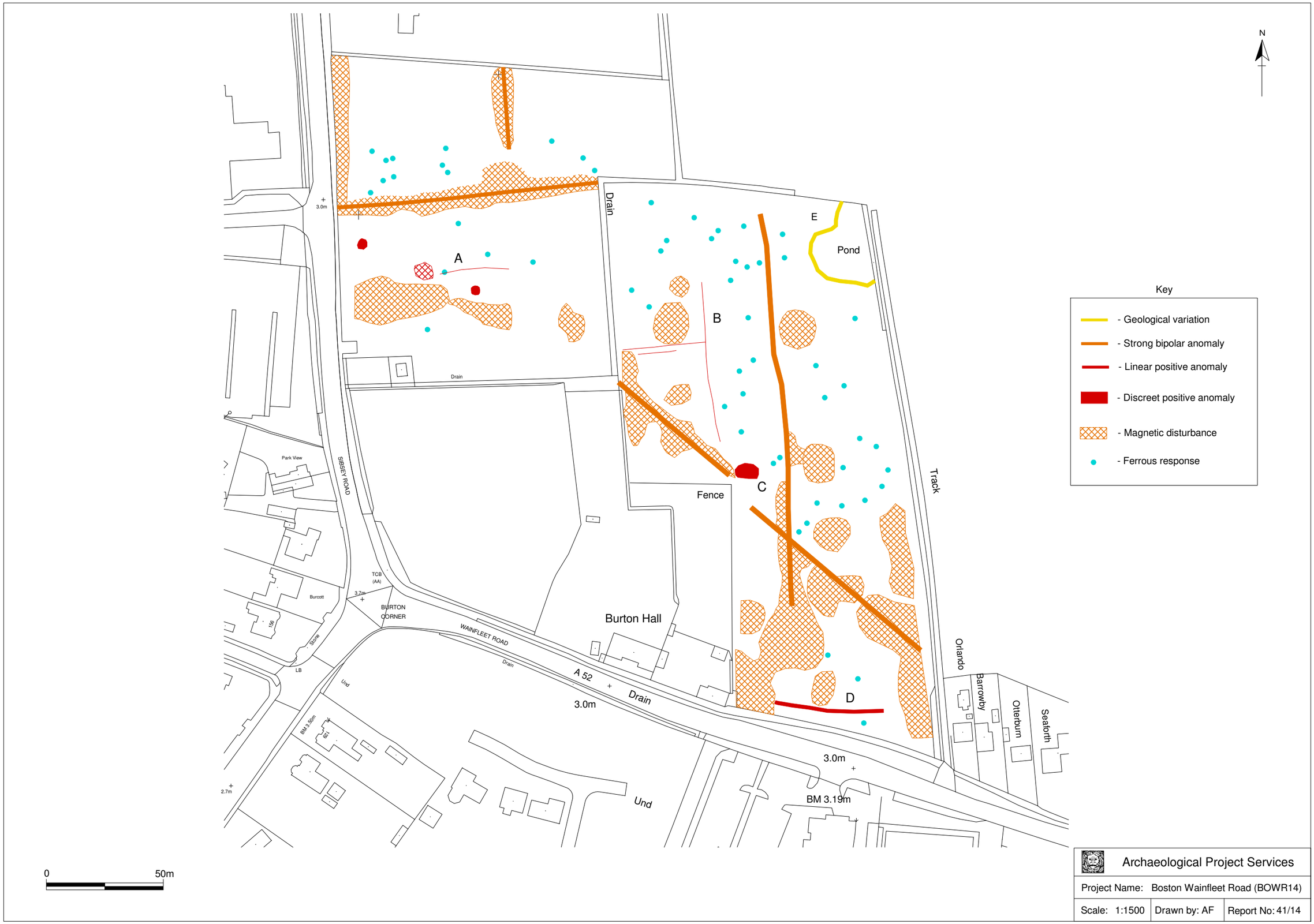


Figure 11 - Field A and B, interpretative plot

Appendix 1
THE ARCHIVE

The archive consists of:

3 Daily record sheets
1 Report text and illustrations
Digital data

File names	01-61.xgd 01-61-a.xgd	04-04-2014a.xcp 07-04-2014.xcp	10-04-2014 FieldA.xcp 10-04-2014 FieldB.xcp
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. Suffix "-a" indicates rotation to consistent orientation of first line (south from northeast corner). xcp files are composites containing record of all the data and processes used to produce the end product		
Description of file formats	All files are in plain text xml format with header data defining survey and processing parameters		
List of codes used in files	D indicates a "dummy" value within the composite data		
Hardware, software and operating systems	ArchaeSurveyor 2.5.19 running under Windows 7		
Date of last modification	22-01-14		
Indications of known areas of weakness in data	None		

All primary records are currently kept at:

Archaeological Project Services, The Old School, Cameron Street, Heckington, Lincolnshire, NG34 9RW

The ultimate destination of the project archive is:
The Collection
Art and Archaeology in Lincolnshire
Danes Terrace
Lincoln
LN2 1LP

Accession Number: LCNCC: 2014.57

Archaeological Project Services Site Code: BOWR14

OASIS project code: archaeol1-178150

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: archaeol1-178150

Project details

Project name	Geophysical survey on land off Wainfleet Road, Boston, Lincolnshire
Short description of the project	Magnetometer survey on land adjacent to a 16th century building revealed a few linear and curvilinear anomalies, perhaps former field boundaries or drainage features. A few pit-type anomalies were also recorded.
Project dates	Start: 03-04-2014 End: 09-04-2014
Previous/future work	No / Not known
Any associated project reference codes	BOWR14 - Sitecode
Any associated project reference codes	2014.33 - Museum accession ID
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 2 - Operations to a depth less than 0.25m
Current Land use	Grassland Heathland 2 - Undisturbed Grassland
Monument type	LINEAR ANOMALY Uncertain
Monument type	PIT-TYPE ANOMALY Uncertain
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Rural residential
Prompt	Voluntary/self-interest
Position in the planning process	Pre-application
Solid geology	AMPTHILL AND KIMMERIDGE CLAY
Drift geology	ALLUVIUM
Techniques	Magnetometry

Project location

Country	England
Site location	LINCOLNSHIRE BOSTON FISHTOFT WAINFLEET ROAD
Study area	3.70 Hectares
Site coordinates	TF 3402 4548 52.9895381082 -0.00316901751325 52 59 22 N 000 00 11 W Point

Project creators

Name of Organisation	Archaeological Project Services
Project brief originator	None
Project design originator	Gary Taylor
Project director/manager	Gary Taylor
Project supervisor	Andrew Failes
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	The Collection
Digital Archive ID	2014.33
Digital Contents	"Survey"
Digital Media available	"Geophysics","Survey"
Paper Archive recipient	The Collection
Paper Archive ID	2014.33
Paper Contents	"Survey"
Paper Media available	"Correspondence","Map","Miscellaneous Material","Plan","Report","Survey "

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	LAND OFF WAINFLEET ROAD, BOSTON, GEOPHYSICAL SURVEY
Author(s)/Editor(s)	FAILES, A.
Other bibliographic details	41/14

Date	2014
Issuer or publisher	APS
Place of issue or publication	HECKINGTON
Description	A4 COMB-BOUND WITH A3 INSERTS

Entered by	Gary Taylor (info@apsarchaeology.co.uk)
Entered on	2 May 2014

OASIS:

Please e-mail English Heritage for OASIS help and advice