LAND AT
DODDINGTON ROAD
WELLINGBOROUGH
NORTHAMPTONSHIRE

GEOPHYSICAL SURVEY

Work undertaken for
Lark Energy Ltd

Report produced by
S J Malone PhD MIfA

September 2013

National Grid Reference: SP 892 656
OASIS Reference No.: archaeol1-158937

APS Report No: 99/13

ARCHAEOLOGICAL
PROJECT
SERVICES

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1. SUMMARY

Detailed magnetic gradiometer survey was undertaken in connection with proposed development on land at Doddington Road, Wellingborough, Northamptonshire. The survey area totalled c. 16ha.

The survey revealed a number of features of probable archaeological origin, for the most part in the western of the two fields (Area 1).

Here, a series of linear anomalies, although somewhat disconnected, appears to define three sides of a small enclosure. There is no clear relationship with the ridge and furrow pattern (seen across much of the survey area, but here rather indistinct), but the alignment and form of the enclosure suggests something of earlier than medieval date. Another short disconnected length to the southeast is of similar character and alignment and may be related. Discrete positive anomalies in the vicinity may represent pit features, however these are not confined to the interior of the enclosure so any direct relationship remains uncertain (and responses of similar character can be seen in the centre of the eastern field, Area 2).

Further linear positive anomalies in the northwest of Area 1 probably also represent archaeological features. Discrete positive anomalies are more widespread but rather sparse and without clear context. Given the variability of the background an archaeological interpretation for these remains uncertain. Remaining responses within the survey generally result from remnants of medieval ridge and furrow cultivation, defunct field boundaries and broader background geological variation.

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 Lark Energy Ltd to undertake detailed magnetometer survey totalling some 16ha on land at Doddington Road, Wellingborough, Northamptonshire in connection with proposed development of the area. The survey was carried out between the 8th and 14th August 2013.

2.3 Topography and Geology

Wellingborough is located 18km northeast of Northampton in the administrative district of Wellingborough, Northamptonshire (Fig. 1).

The site is located on the southern edge of Wellingborough, c. 2km south of the town centre, on the southeast side of The Ridge/Doddington Road, at National Grid Reference SP 892 656 (Fig. 1).

The survey area lies on ground sloping down eastwards to the River Nene, which lies just beyond the eastern edge of the site, declining from about 80m to c. 40m OD. Dry valleys, aligned east-west, run through the area and are located near the northern and southern edges of the area.

Local soils across the majority of the site are of the Moreton association, brown

calcareous earths developed over Jurassic clay and limestone (Hodge *et al*. 1984, 257). Along the eastern fringes of the site the soils are Fladbury 1 Association pelo-alluvial gleys developed in river alluvium (ibid. 194).

3. GEOPHYSICAL SURVEY

3.1 Methods

Location and layout of the survey areas is shown in Figure 2. The field had been left fallow but was mown prior to survey and in generally good condition.

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 3, 4, 6, 7, 9, 10, 12, 13; clipped for display but otherwise unprocessed), together with greyscale plots of the processed data (Figs 5, 8, 11, 14, 15). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig. 16) and are described below.

Linear positive anomalies
A small number of positive linear anomalies of probable archaeological origin are highlighted. In the northwest corner of Area 1 three short linear anomalies probably represent ditched features. **A** runs parallel to the ridge and furrow pattern (see below) and probably represents a former field boundary. **B** and **C**, however, run athwart this pattern and are likely to represent ditched features of earlier date. In the centre of Area 1, a series of linear anomalies **D**, although somewhat disconnected, appears to define three sides of a small enclosure. There is no clear relationship with the ridge and furrow, which is here rather indistinct, but its alignment and form suggests something of earlier than medieval date. Another short disconnected length **E** is of similar character and alignment and may be related. Linear anomaly **F** runs roughly west-east from Area 1 into Area 2, parallel to the ridge and furrow to the north but marking the boundary with a more north-south pattern to the south. The positive response suggests a ditched feature (rather than a headland, for example) and probably reflects a former field boundary preserving part of the layout of medieval furlongs.

Discrete positive anomalies
Background variability means that individual discrete responses can be difficult to interpret unless of distinctive form. Several are highlighted, but interpretation as archaeological features remains tentative. There is a concentration across the centre of Area 1 in the vicinity of enclosure **D**, however these are not confined to the interior so any direct relationship remains uncertain (and responses of similar character can be seen at **G** in the centre of Area 2). Isolated anomalies, e.g. at **H** in the south of Area 1, are somewhat better defined with a clearly localised positive response, but have no clear context.

Agricultural response
A pattern of parallel gently curving linear response is evident across much of the area and is caused by remnants of former medieval ridge and furrow cultivation. Interruption to the pattern may reflect differential survival, although background variation is fairly large and north-south alignments may be less visible owing to processing effects (in particular the destripe filter).

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. The very strong response at **I** in the southwest corner of Area 1 is typical

of that caused by larger diameter pipelines (e.g. gas or water main). Other large responses in this Area reflect the positions of electricity poles supporting the north-south and east-west overhead lines. A spread of material **J** just east of the gate between the two fields also produces a strong (largely negative) response.

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
Broader patterns of variation, usually rather sinuous and with diffuse edges, generally reflect variation in underlying deposits. Those marked towards the southern edge of the field may reflect accumulated deposits in the east-west dry valley. Those at **K** and **L**, running north-south in Area 2, probably reflect variations in the underlying bedrock.

4. DISCUSSION

Detailed magnetic gradiometer survey has revealed a number of features of probable archaeological origin, for the most part in the western of the two fields (Area 1).

Here, a series of linear anomalies, although somewhat disconnected, appears to define three sides of a small enclosure. There is no clear relationship with the ridge and furrow pattern (seen across much of the survey area, but here rather indistinct), but the alignment and form of the enclosure suggests something of earlier than medieval date. Another short disconnected length to the southeast is of similar character and alignment and may be related. Discrete positive anomalies in the vicinity may represent pit features, however these are not confined to the interior of the enclosure so any direct relationship remains uncertain (and responses of similar character can be seen in the centre of the eastern field, Area 2).

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5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge Mike Lee of Lark Energy Ltd who commissioned the project and arranged access; Tom Lane (APS) edited the report.

6. PERSONNEL

Project coordinator: Gary Taylor
Geophysical Survey: Andy Failes, Jonathon Smith
Survey processing and reporting: Steve Malone

7. BIBLIOGRAPHY

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

Hodge, CAH., Burton, RGO., Corbett, WM., Evans, R., and Seale, RS, 1984 *Soils and their use in Eastern England*, Soil Survey of England and Wales 13

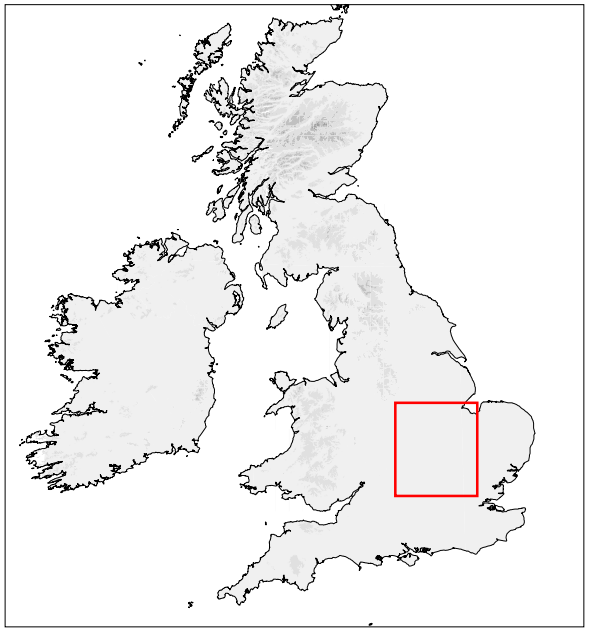
IfA, 2008 *Standard and Guidance for Field Evaluation.*

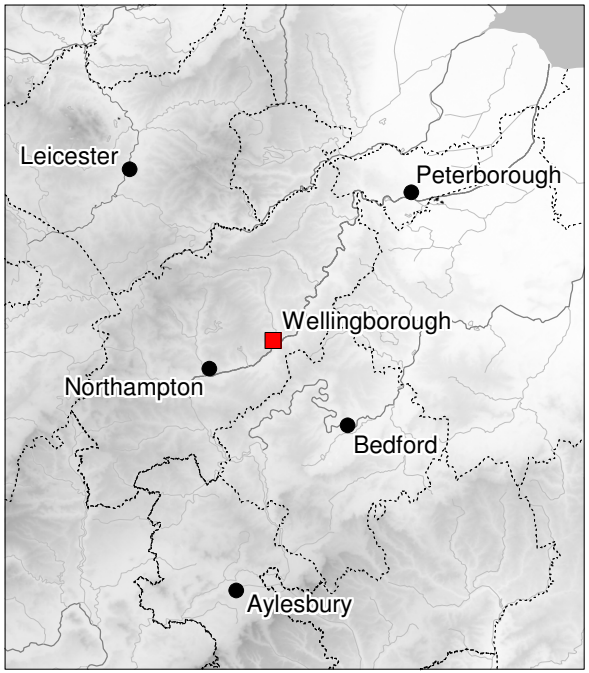
IfA, 2011 *Standard and Guidance for Geophysical Survey.*

8. ABBREVIATIONS

BGS British Geological Survey

IfA Institute for Archaeologists





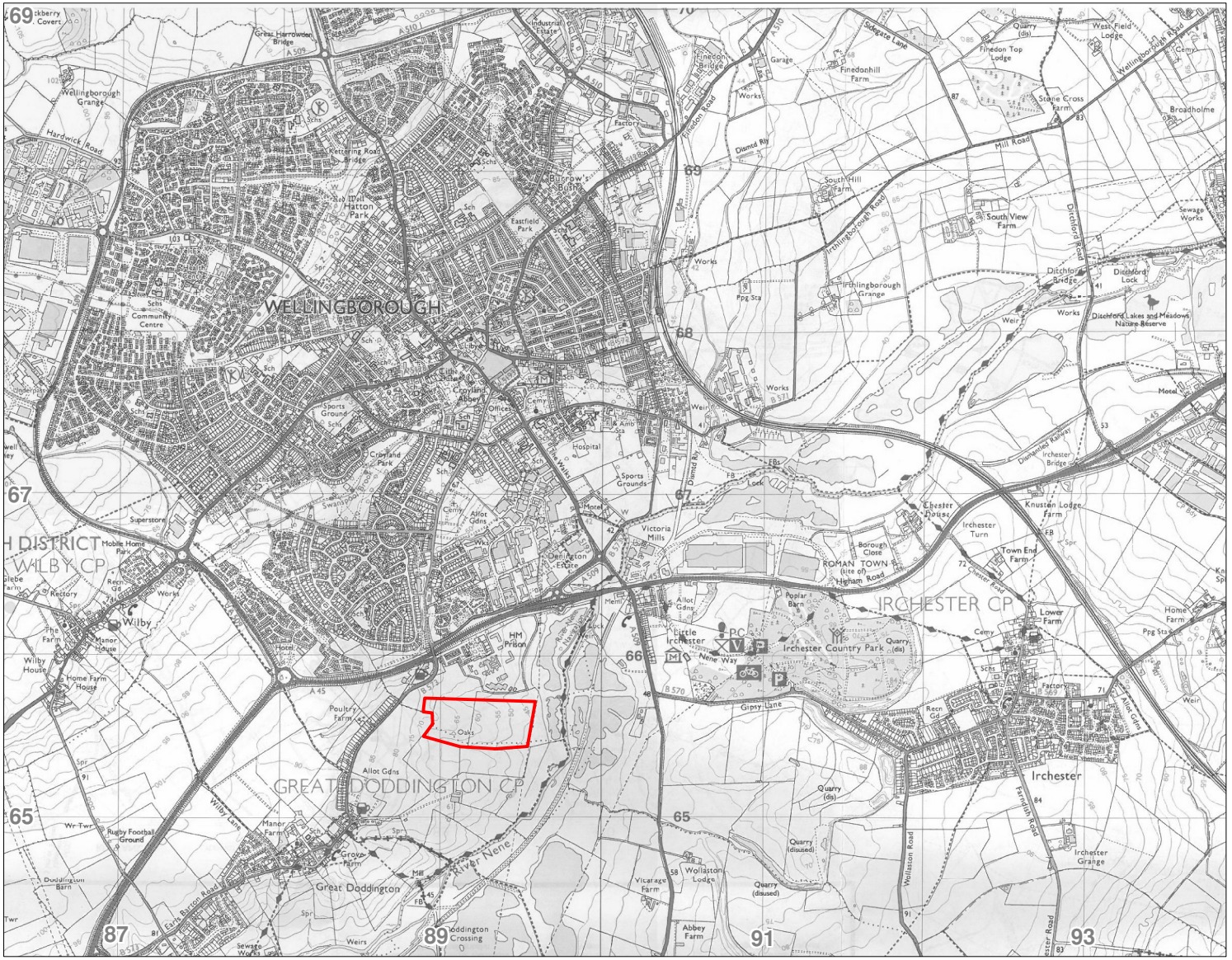


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Figure 1 Site location map

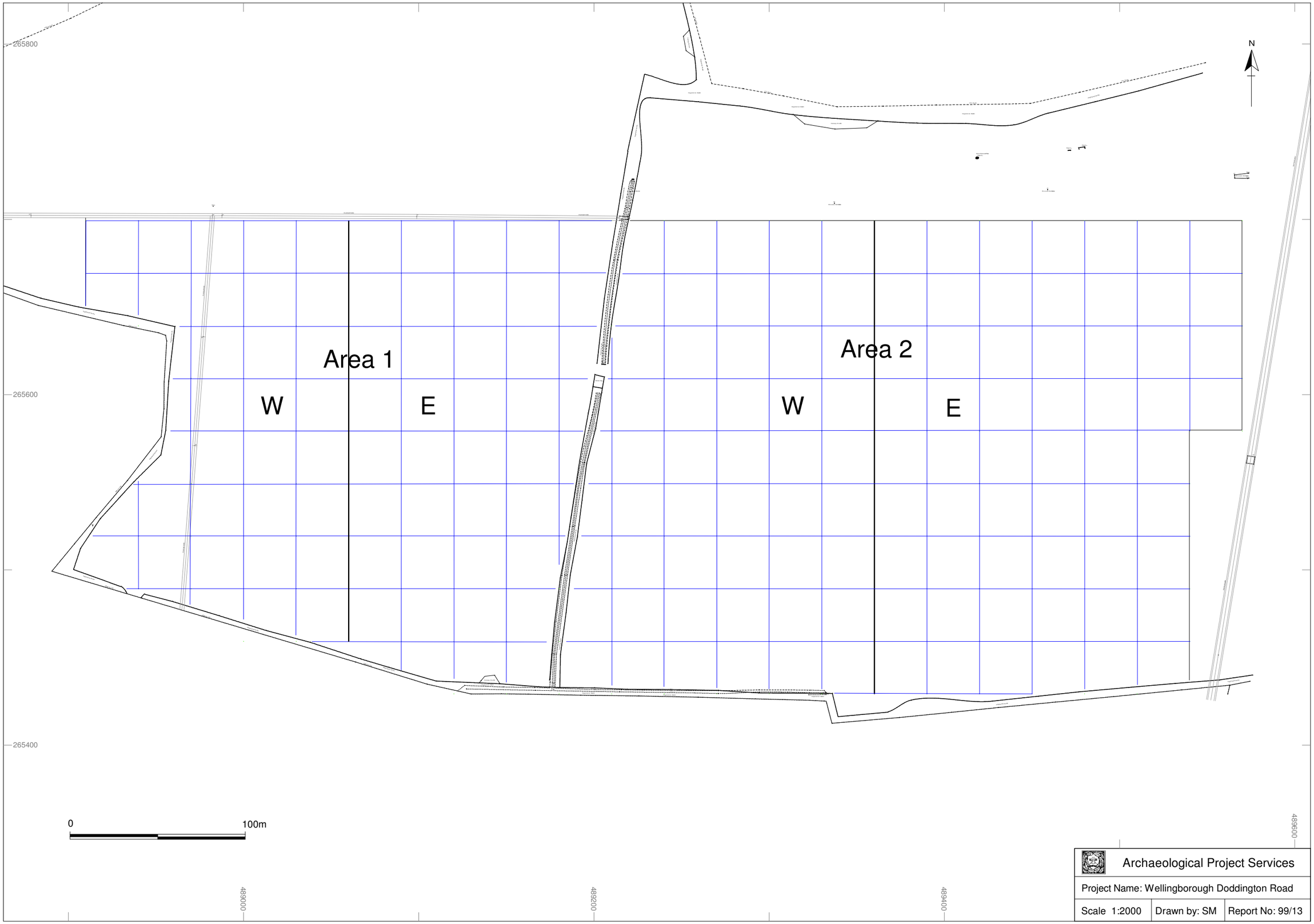

Figure 2 Location and layout of survey areas

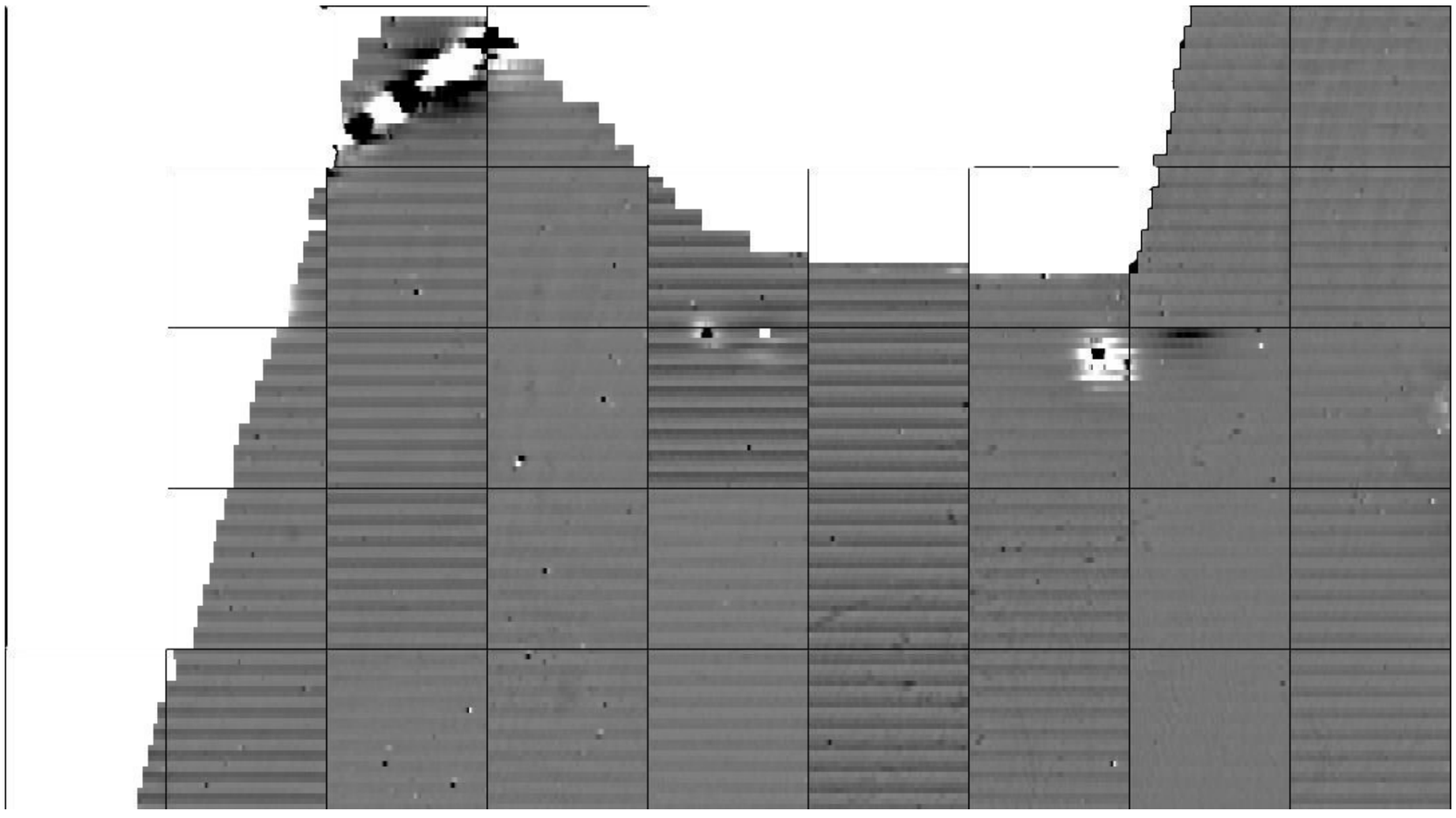

Figure 3 Area 1 West minimally processed data greyscale plot

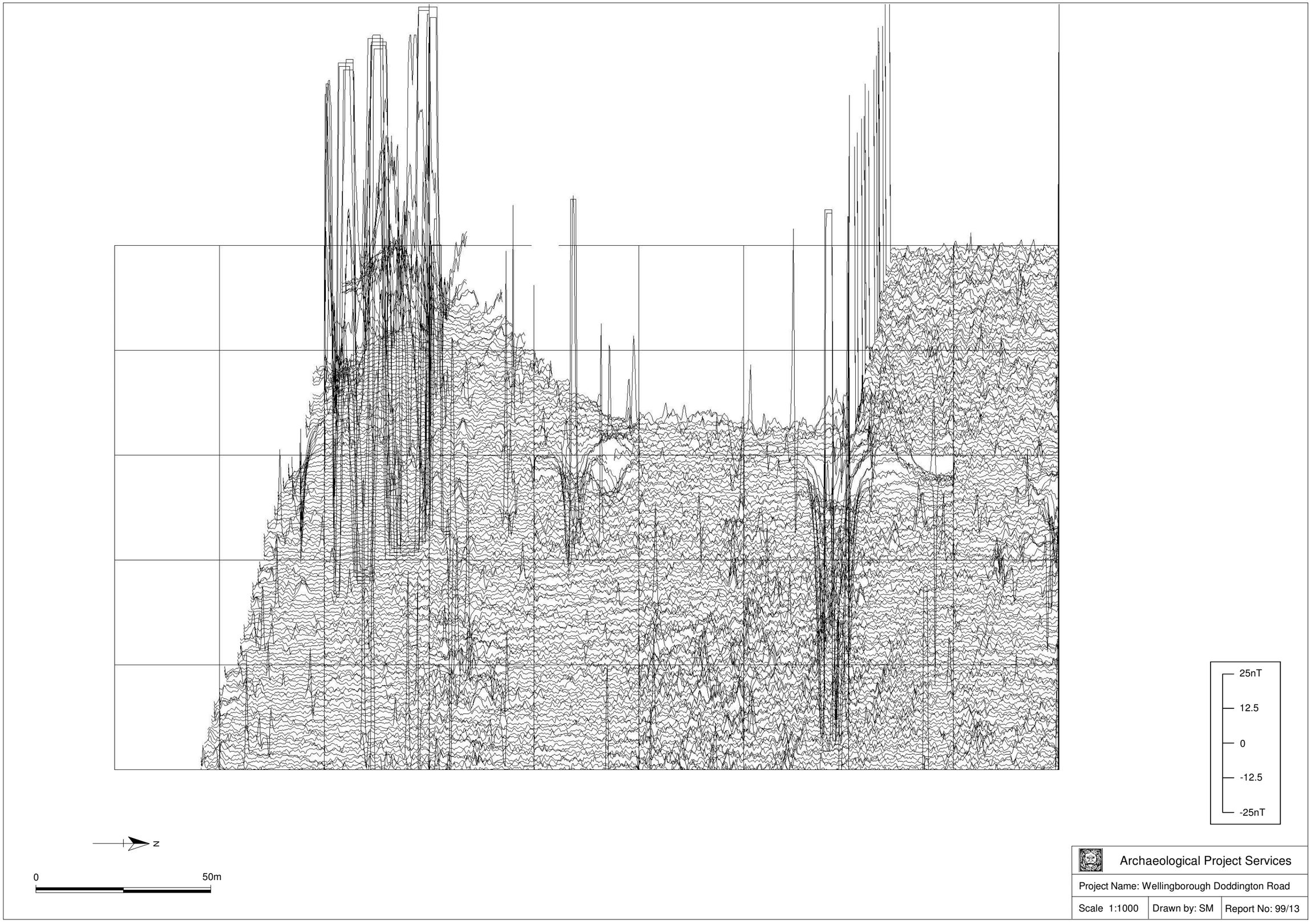

Figure 4 Area 1 West minimally processed data trace plot

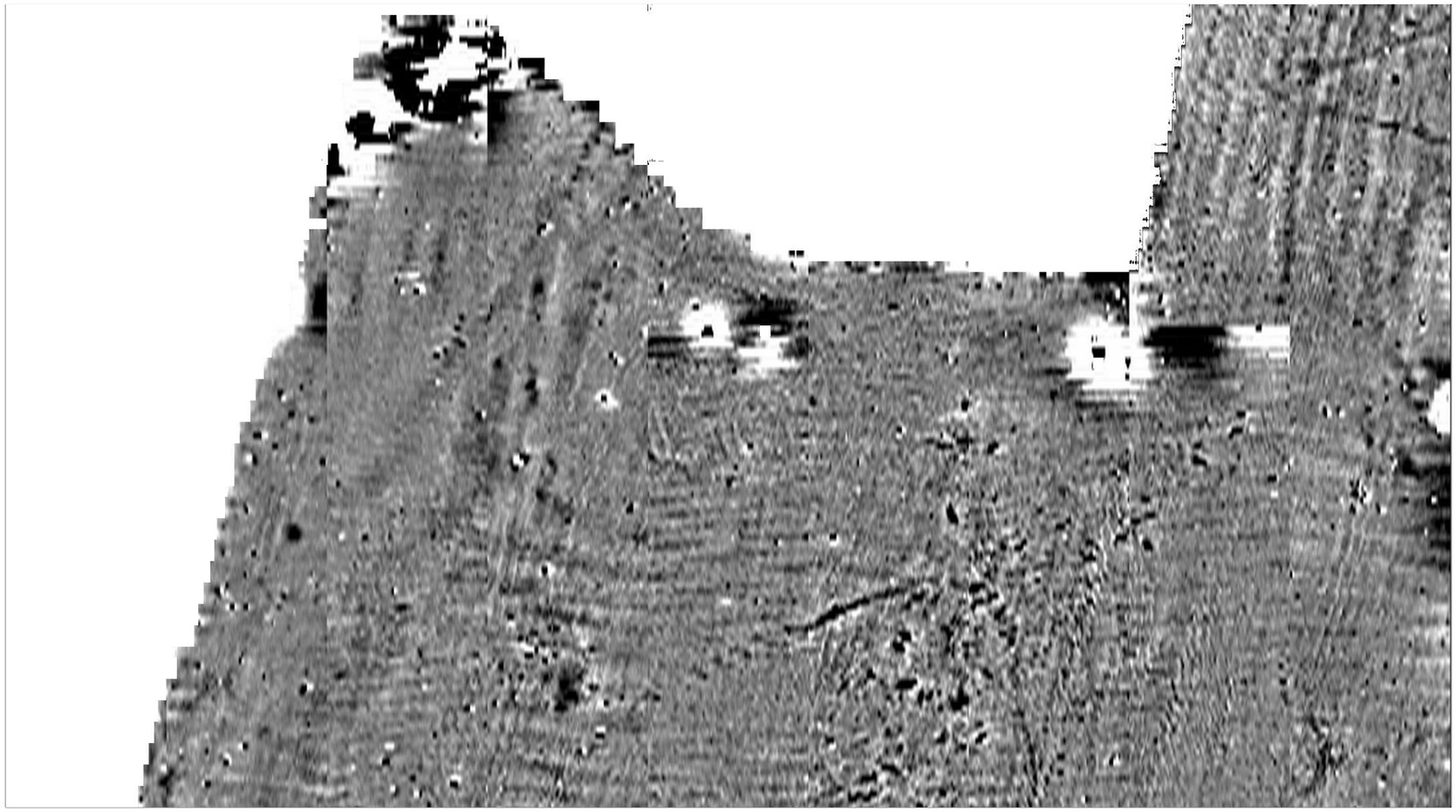

Figure 5 Area 1 West processed data greyscale plot

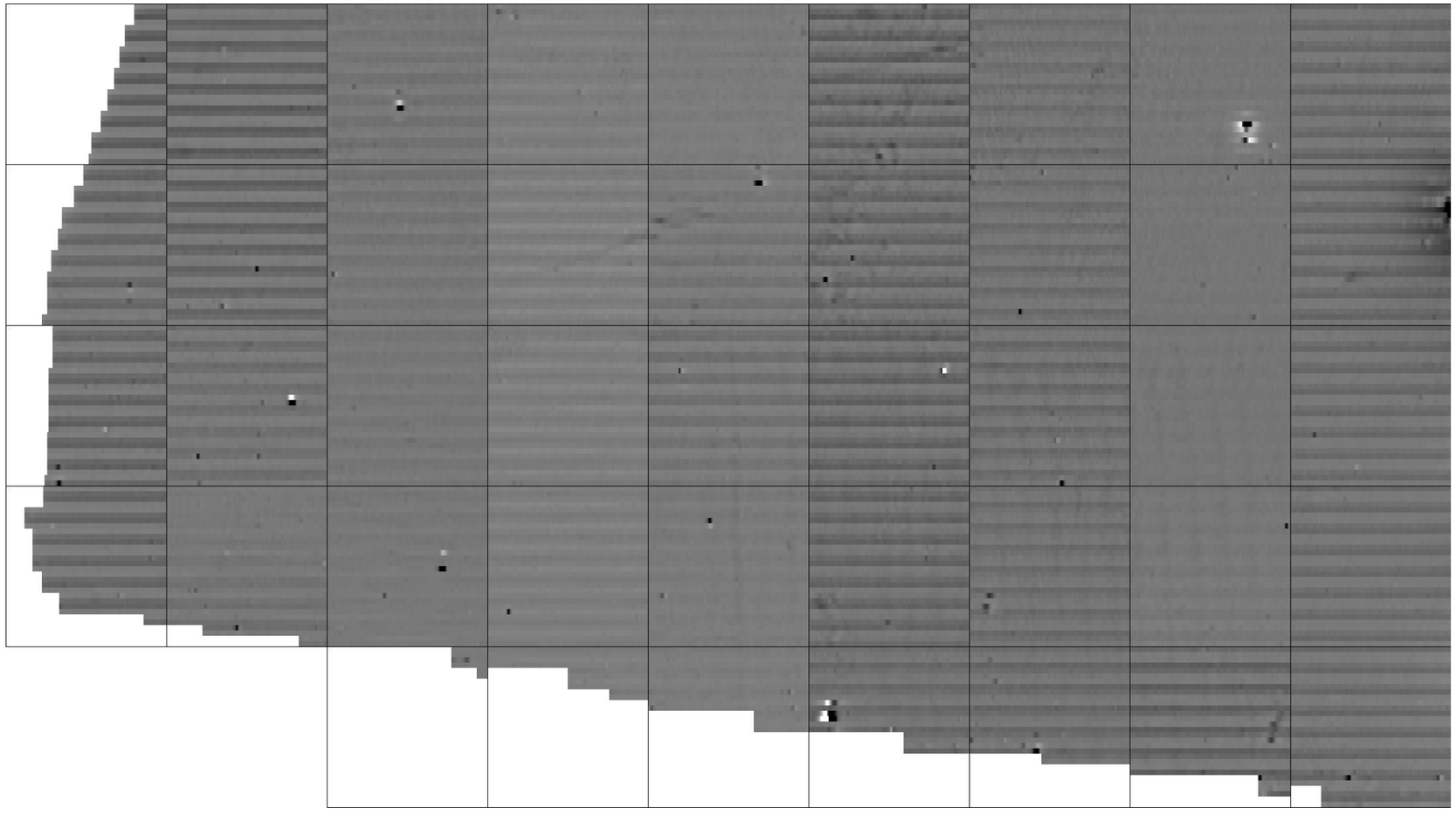

Figure 6 Area 1 East minimally processed data greyscale plot

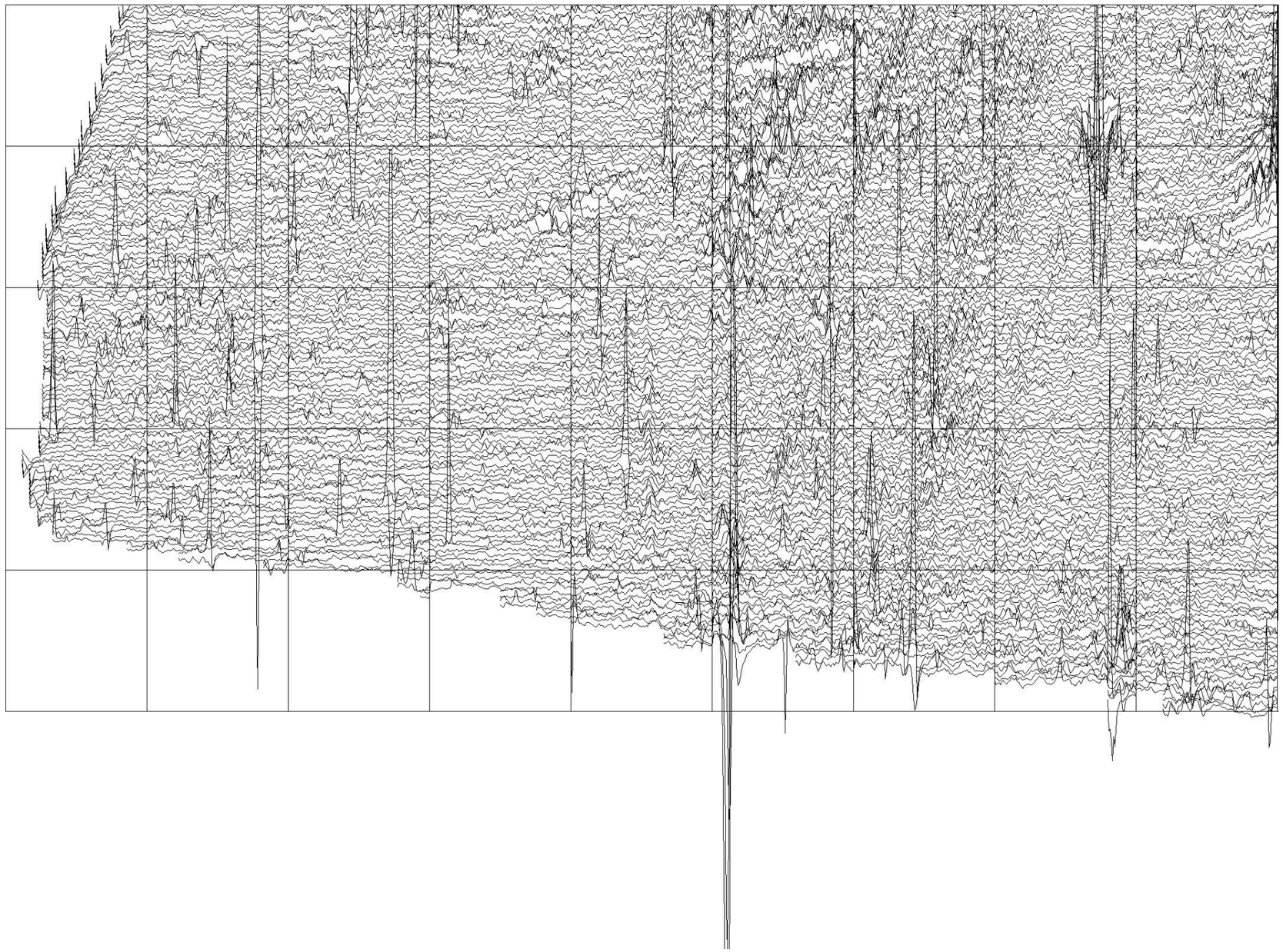

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Figure 7 Area 1 East minimally processed data trace plot

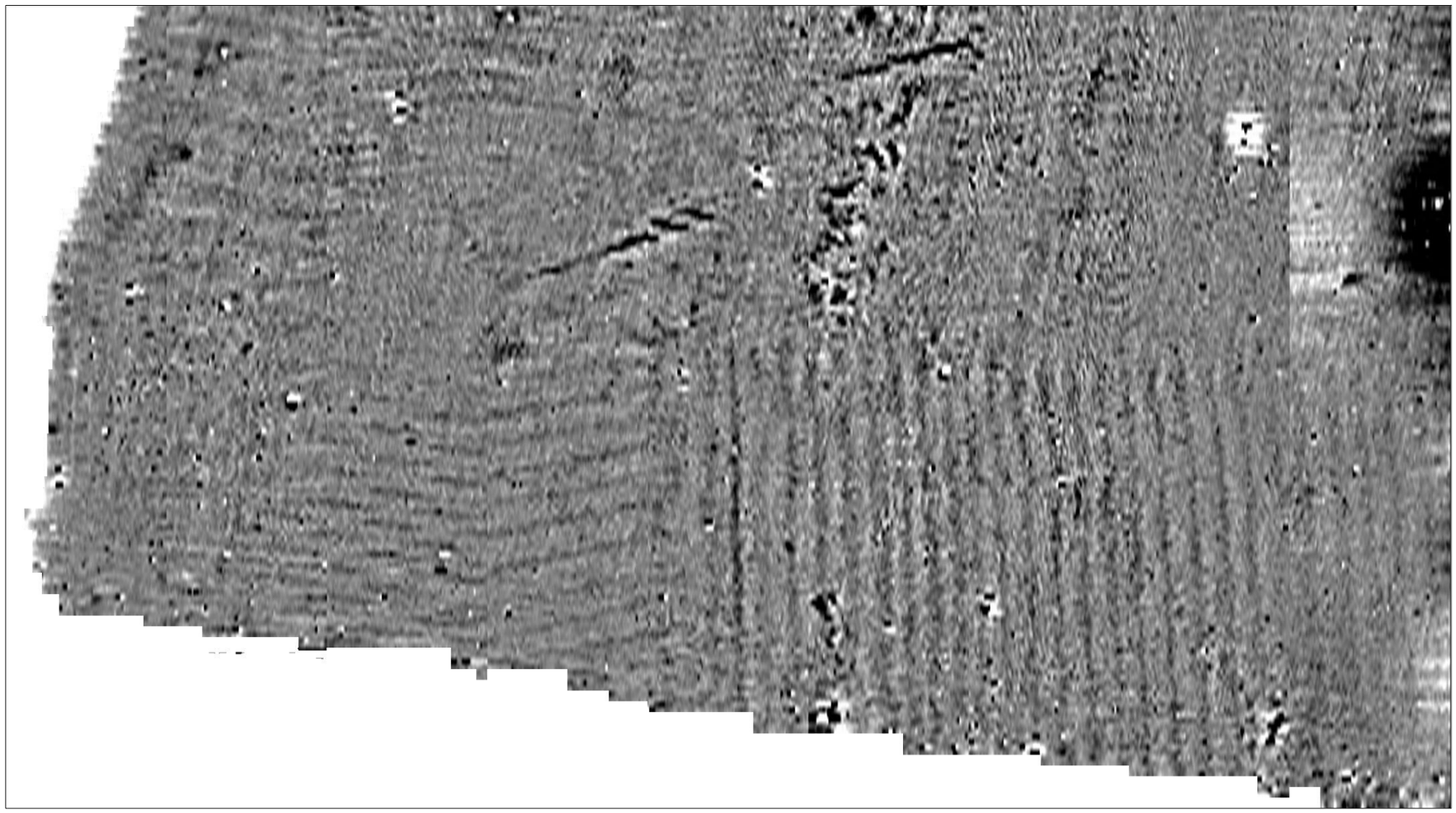


Figure 8 Area 1 East processed data greyscale plot

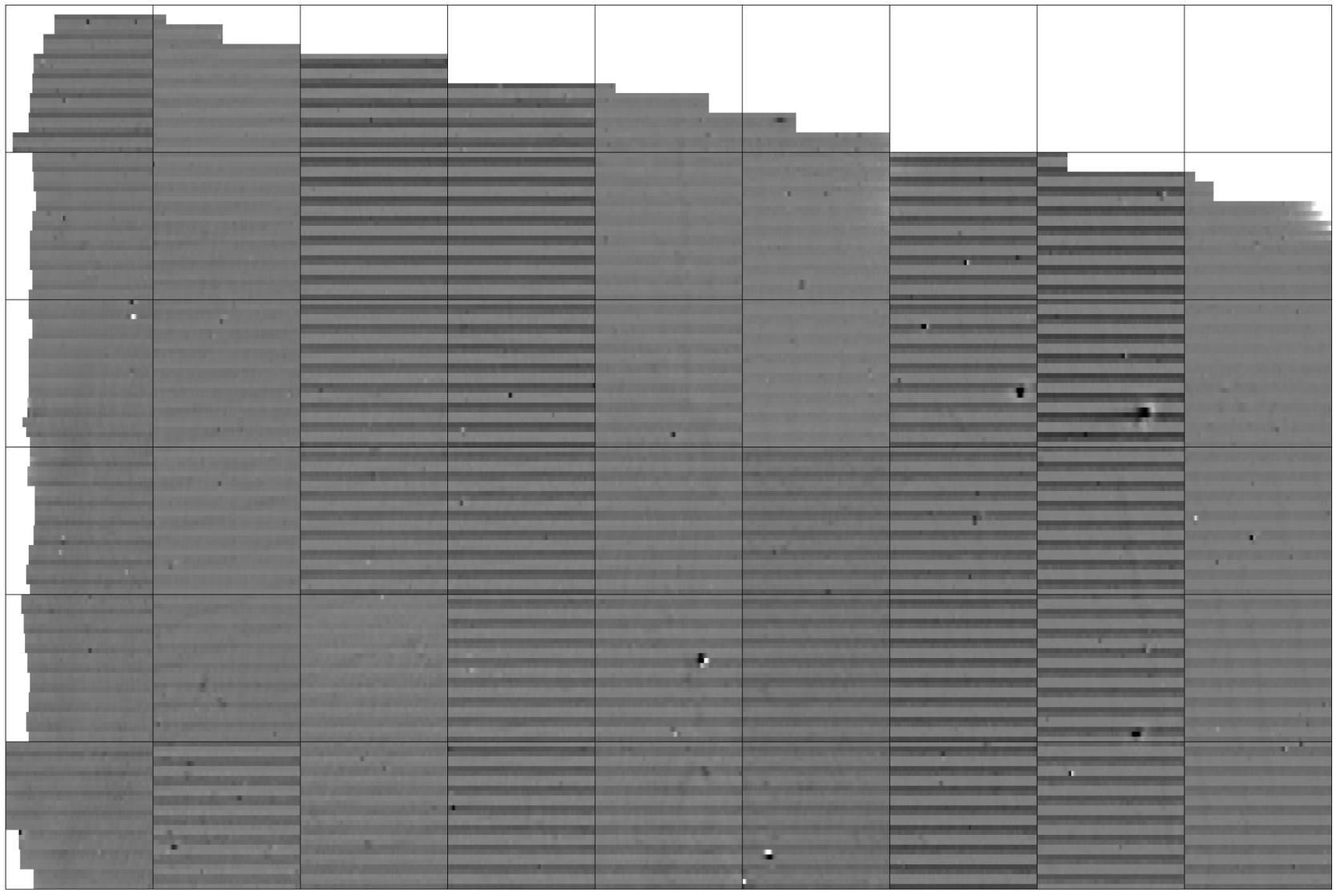


Figure 9 Area 2 West minimally processed data greyscale plot

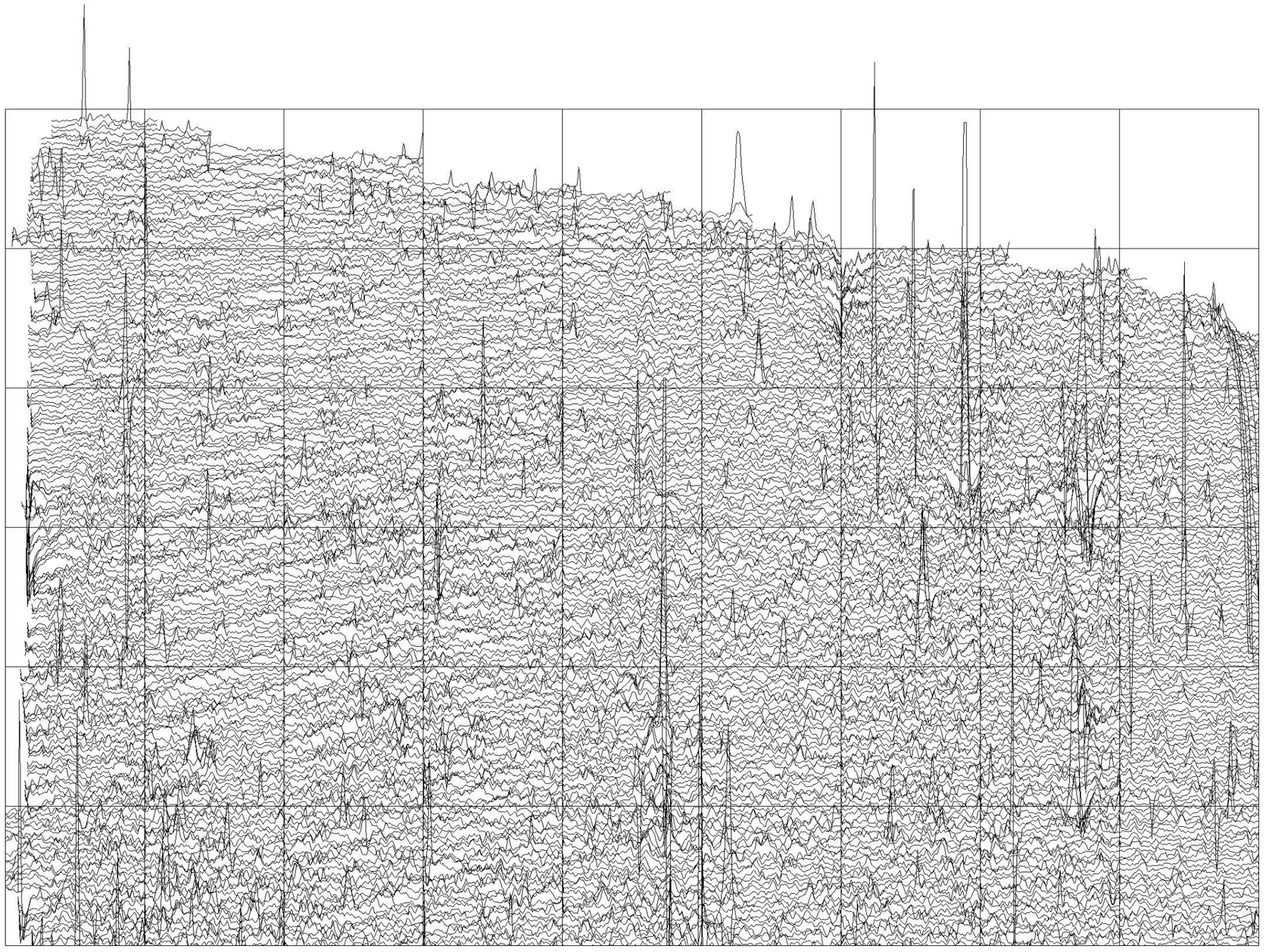


Figure 10 Area 2 West minimally processed data trace plot

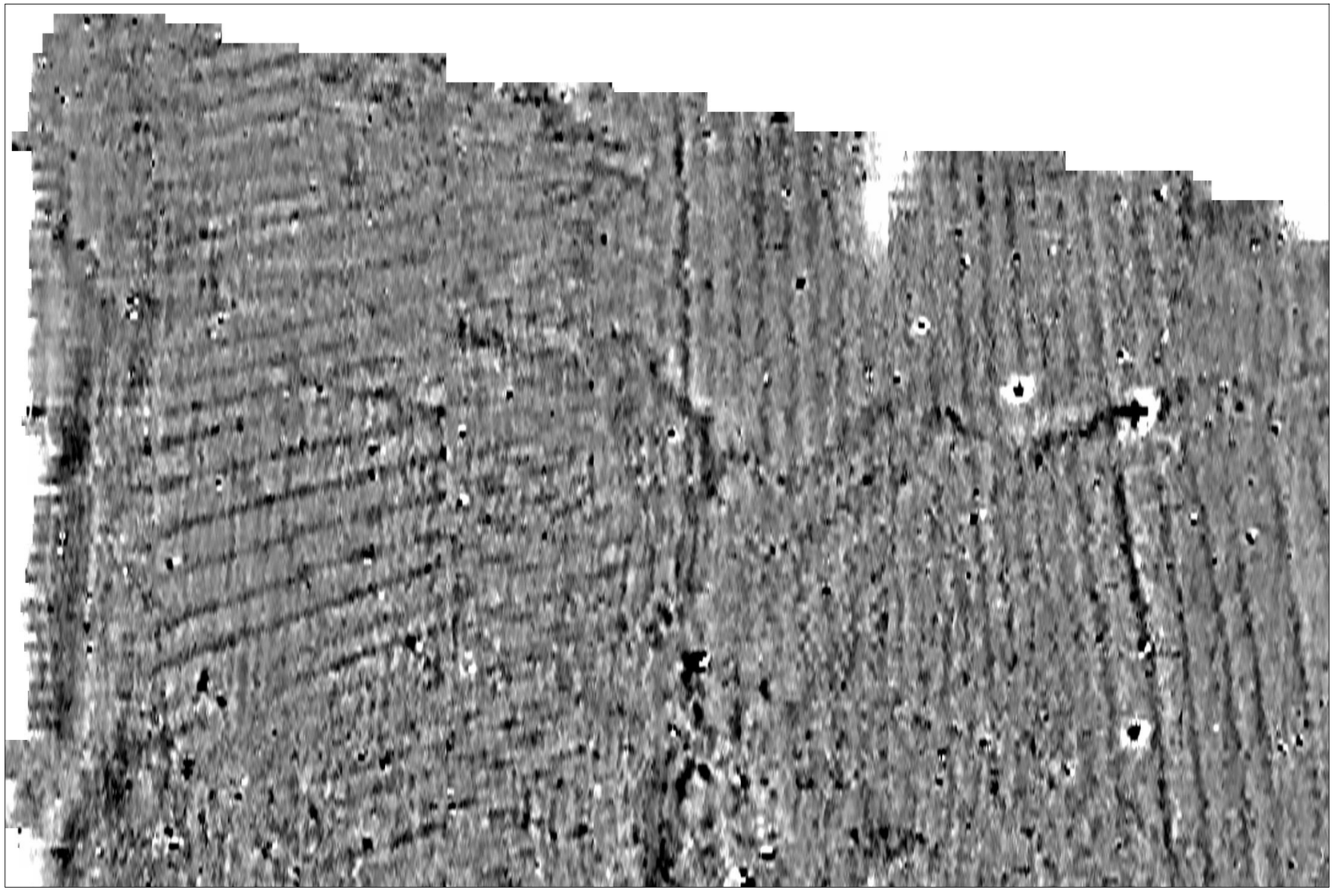
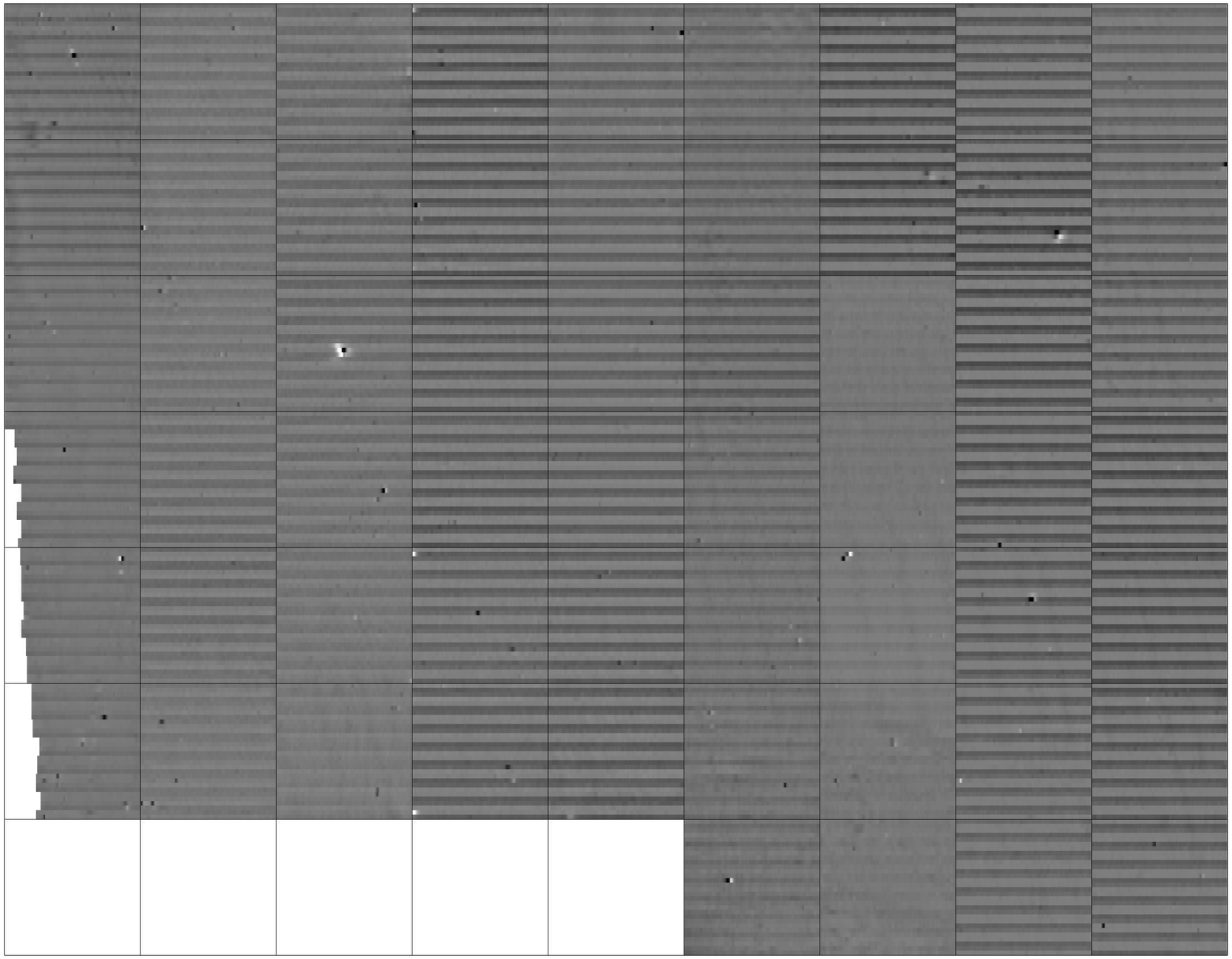


Figure 11 Area 2 West processed data greyscale plot



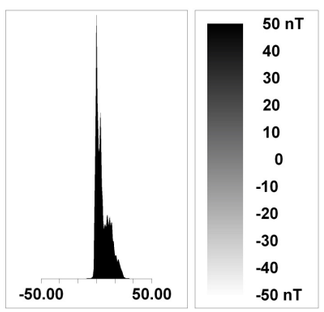


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Figure 12 Area 2 East minimally processed data greyscale plot

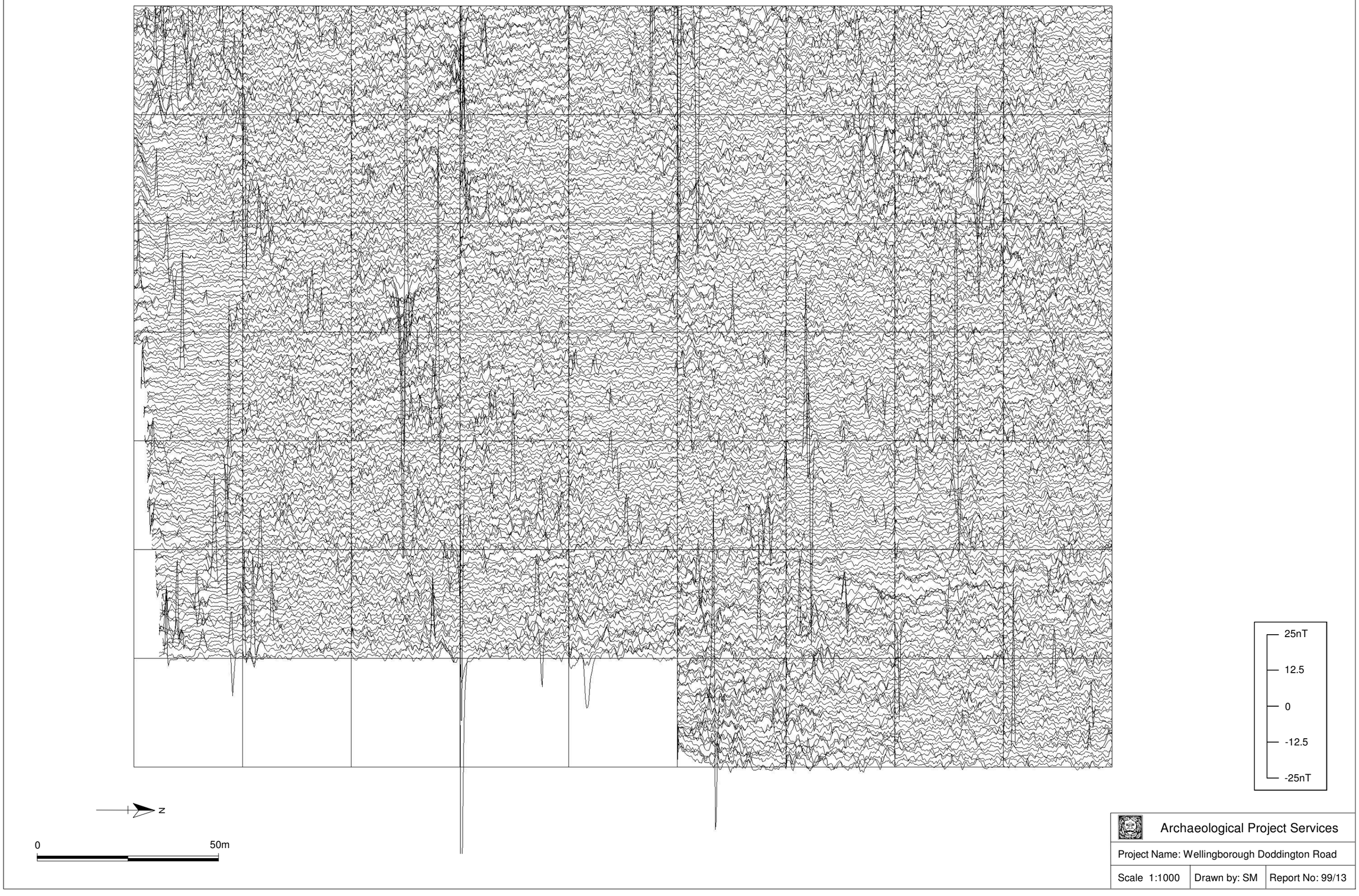
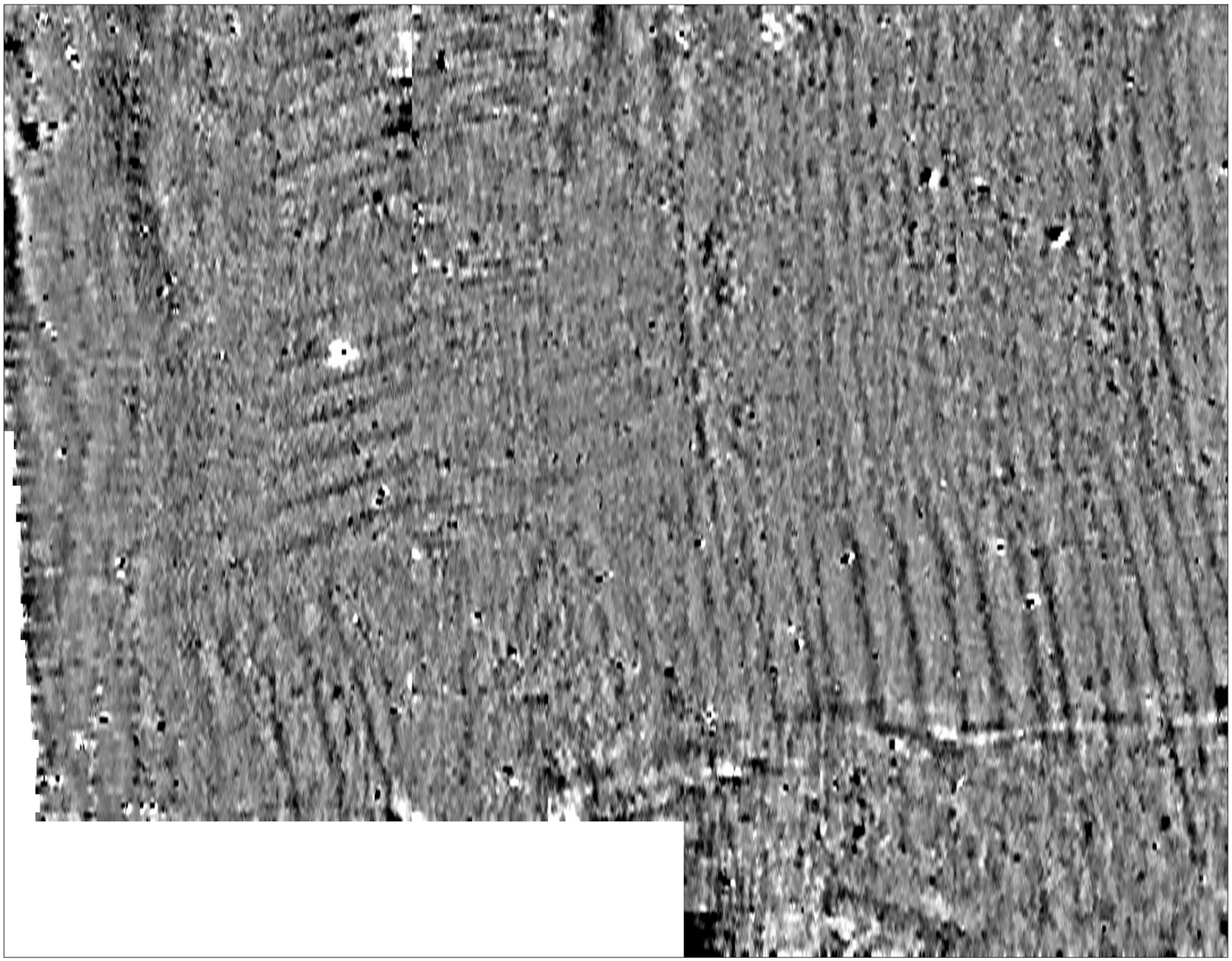
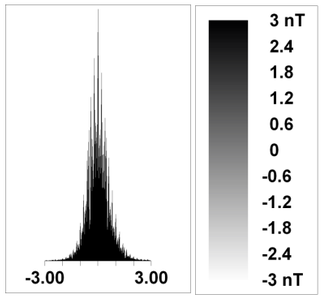


Figure 13 Area 2 East minimally processed data trace plot





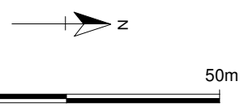


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Figure 14 Area 2 East processed data greyscale plot

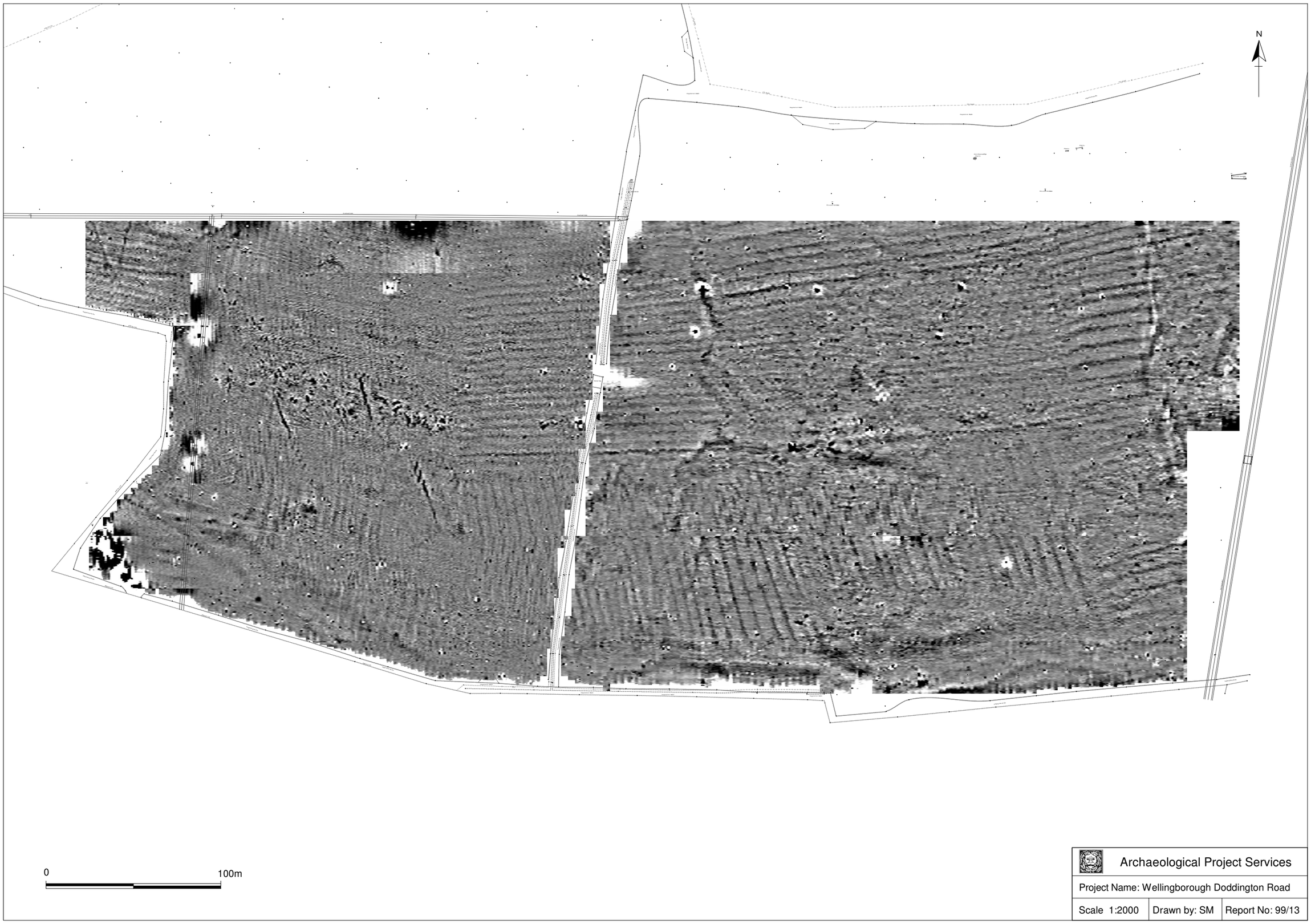

Figure 15 Processed data greyscale overlain on base plot

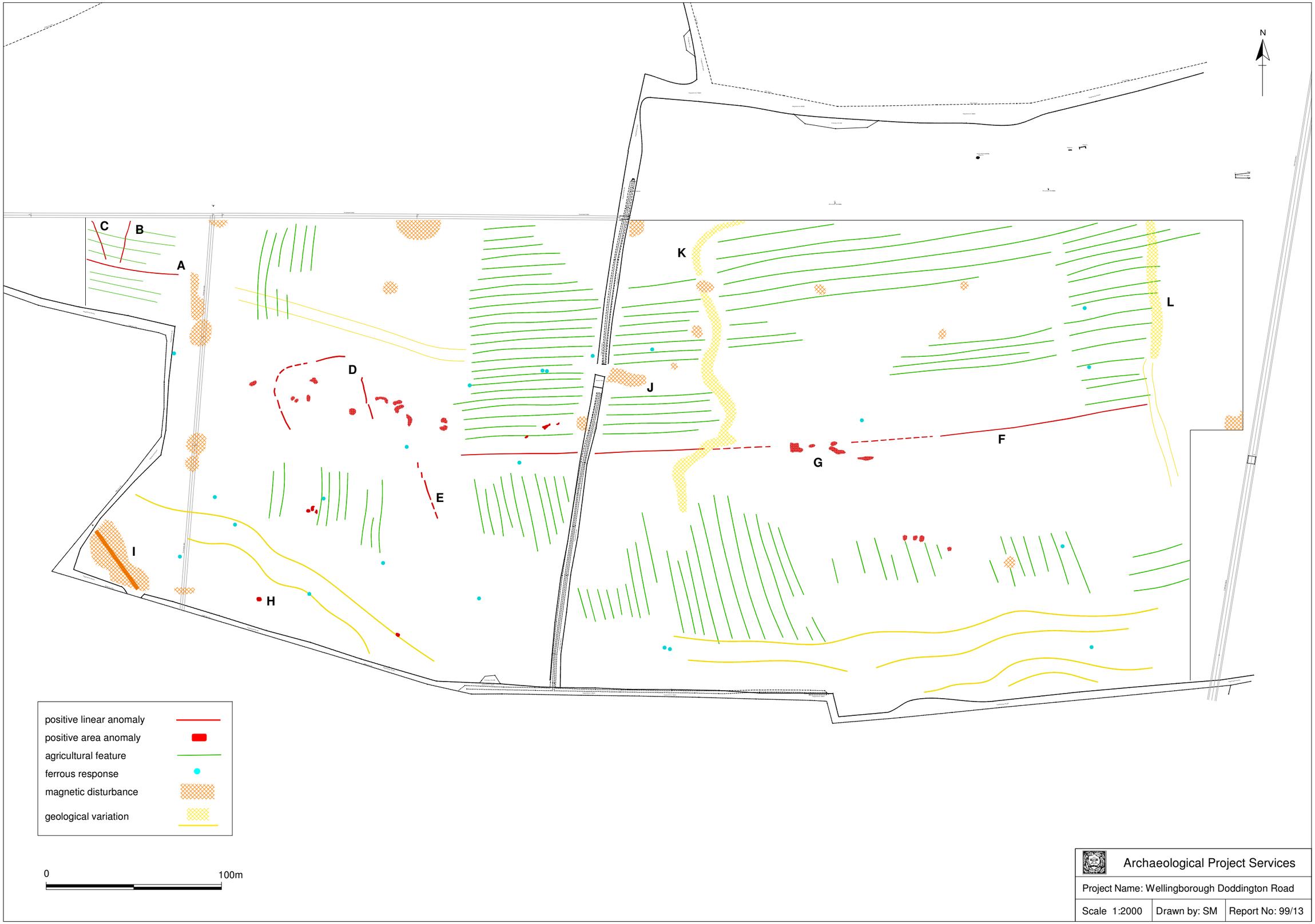

Figure 16 Interpretative plot

Appendix 2
THE ARCHIVE

The archive consists of:

5 Daily record sheets
1 Report text and illustrations
Digital data

File names	Grid files sequentially numbered: WBDR13-01.xgd to WBDR13-189.xgd		Composite files WBDR13-Area 1.xcp WBDR13-Area 2.xcp
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. 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	ArcheoSurveyor 2.5.19 running under Windows 7		
Date of last modification	11/09/13		
Indications of known areas of weakness in data			

All primary records are currently kept at:

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

APS Site Code: WBDR13