LAND AT WAYE BARTON, IPPLEPEN, DEVON

GEOPHYSICAL SURVEY (LIWB15)

Work undertaken for

LarkEnergy

October 2015

Report produced by
Jonathon Smith BA (Hons), MA

OASIS Ref: archaeol1- 227540
National Grid Reference: SX 83661 64237
Accession No: RAMM 15/47

APS Report No: **99/15**

ARCHAEOLOGICAL PROJECT SERVICES

REGISTERED ORGANISATION CIfA

Quality Control

Waye Barton,
Ipplepen,
(near Littlehempston)
Devon

LIWB15

Project Coordinator	Gary Taylor
Site Staff	Neil Jefferson, Jonathon Smith and Fiona Walker
Survey processing and report	Jonathon Smith

Checked by Project Manager	Approved by Team Leader
Gary Taylor	Denise Drury
Date: 26/10/15	Date: 27/10/15

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1. SUMMARY

Detailed magnetic gradiometer survey was undertaken for Lark Energy in connection with proposed development on land at Waye Barton, Ipplepen, Devon. The survey totalled c. 17.8ha.

Research has indicated that the site lies in an area of known archaeological remains. Cropmarks have revealed a number of possible prehistoric enclosures to the west of the site. During the medieval period there is evidence of farmsteads on the valley floor. The survey did not detect any features within the areas where crop marks had been observed, but did reveal two possible enclosures nearby. Several probable field boundaries and a possible trackway were also identified. A number of these are recorded on 19th century maps.

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'* (CIfA 2014a).

2.2 Background

Archaeological Project Services was commissioned by Lark Energy to undertake a detailed magnetometer survey totalling some 17.8ha on land at Waye Barton, Ipplepen, Devon. This was in advance of proposed development of the area. The survey was carried out over six days between 12th and 17th October 2015.

Cropmarks seen in aerial photography indicate that probable prehistoric features are present in the western most part of the site ('Area A'). There are several sites associated with medieval farmsteads in the surrounding area, but none fall within the site itself (Cope-Faulkner 2015).

2.3 Topography and Geology

Ipplepen is located 28km south of Exeter and 36km northeast of Plymouth, in the Teignbridge district of Devon (Fig. 1).

The proposed development site is located 2.2km southeast of the centre of Ipplepen, to the east of Waye Barton at National Grid Reference SX 83661 64237 (Fig. 2).

Local soils are freely draining slightly acid loamy soils (CU 2015). These soils are developed on a solid geology of Permo-Triassic Torbay Breccia overlying outcrops of Devonian Norton Slate Formation on the southeast corner of the site (BGS 2004).

The southwestern part of the site (Areas A and B) lies on a generally east-facing moderate slope with heights ranging from *c*. 84m OD down to *c*. 33m OD within the valley of a minor watercourse. The stream runs along the eastern boundary of Area A and Area B. Heights rise in the northeastern part (Area C) to a maximum 60m OD. In Area C a stream enters the area from the southeast corner and cuts through the middle of the area before disappearing in the low lying marshy area along the western edge.

3. GEOPHYSICAL SURVEY

3.1 Methods

The layout of the survey area is shown in

Figure 3. The survey has been split into three areas (A - C) for the ease of presenting results. The site was covered by short grass or clover, but was steeply sloped which hampered data collection. In the north of Area C the gradient was so steep that the field staff could not obtain reliable results and therefore this area was excluded from the survey. The weather was generally warm and bright.

Survey was undertaken in accordance with English Heritage (2008) and CIfA (2014b) 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.

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 (Clark 1996).

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.

Sampling interval and data capture
Readings were taken at 0.25m intervals along traverses 1m apart. This equates to 6400 sampling points in a full 40m x 40m 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 TerraSurveyor software. This can emphasise various aspects contained within the data that 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 median 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 median 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 = 2; Y radius = 2; Threshold = 3SD; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -5 to 5nT.

3.2 Results

The presentation of the data for the site involves a greyscale print-out of the minimally processed data (Figs 4, 7 and 10; clipped for display but otherwise unprocessed) and the processed data (Figs 5, 8 and 11). Magnetic anomalies have been identified and plotted on to interpretative drawings (Figs 6, 9 and 12). The results have been combined (Fig 13) and compared with historical maps (Figs 14 and 15).

Area A (Figs 4, 5 and 6)

Positive linear anomalies
There are four distinct sets of positive linears in this area. The first is a series of parallel northwest-southeast orientated anomalies (highlighted in blue). These are 8 metres apart, very regular and sharply defined, and have the appearance of modern land drains.

The second set of positive linears (highlighted with green) are very broad with diffuse edges and are irregular in shape. This are likely to be geological in nature, most likely palaeochannels related to valley streams.

The third set of positive linears (highlighted in red) are narrow, sharply defined and straight. These are likely to be human-made ditches.

The fourth set of positive linears (dashed red lines) are very diffuse and may be human-made ditches, but might be geological in origin or artefacts of natural variations in the data. Whilst several of these linears appear to be associated with possible ditches or probable palaeochannels, two form enclosures; one is a double rectangular enclosure and the other semi-circular.

Discrete positive anomalies
Examples of discrete positive anomalies are highlighted with red circles and might possibly represent pit features. However, they could also be geological features and no distinction can be drawn on the basis of form alone.

Discrete bipolar anomalies
Strong bipolar anomalies (highlighted with blue circles) are apparent in the area. These represent modern agricultural features such as metal gates and feeding troughs.

Area B (Figs 7, 8 and 9)

Positive linear anomalies
There are three distinct sets of positive linears in this area. At the north of the area, a set of positive linears (highlighted with green) are very broad with diffuse edges and are irregular in shape. This are likely to be geological in nature.

Towards the eastern edge of the field, running parallel to the stream, are several diffuse and irregular positive linears (highlighted with a dashed red line). These

seem geological in nature, perhaps related to a river terrace. However, in places the linears seem very straight and connected by right angles, which suggests some are human-made.

Three linears (highlighted with red lines) are very sharp and strong, which suggests they are human-made ditches. Each runs northwest to southeast.

Discrete positive anomalies
Examples of discrete positive anomalies are highlighted with red circles and might possibly represent pit features. However, they could also be geological features and no distinction can be drawn on the basis of form alone.

Negative linear anomalies
This area has three negative linears (highlighted with yellow dashed lines). These are relatively diffuse, but key into other features. They probably represent banks associated with field boundaries.

Discrete bipolar anomalies
Strong bipolar anomalies (highlighted with blue circles) are apparent in the area. These represent modern agricultural features such as metal gates and feeding troughs.

Area C (Figs 10, 11 and 12)

Positive linear anomalies
There are two distinct kinds of positive linears in this area. The first (highlighted with green) are relatively weak, have diffuse edges and run parallel to the stream that runs northeast-southwest through the area. These are likely to be caused by river terracing.

The second set of positive linears (highlighted in red) are somewhat stronger and may represent human-made ditches.

Discrete positive anomalies
Examples of discrete positive anomalies are highlighted with red circles and might possibly represent pit features. However, they could also be geological features and no distinction can be drawn on the basis of form alone.

Negative linear anomalies
This area has two negative linears (highlighted with yellow dashed lines). In the northern field the anomaly probably represents a bank associated with a field boundary. However, in the south field the anomaly is more likely to be related to the current stream course which is cut through the topsoil and is consequentially less magnetic.

Bipolar linear anomalies
A very strong bipolar linear cuts through the site east-west at the northern end of the Area. This is a large gas pipe, which has its position marked by posts in the field boundaries.

Discrete bipolar anomalies
Strong bipolar anomalies (highlighted with blue circles) are apparent in the area. The large anomaly to the south of the field is an electricity pylon and the anomaly immediately to its west is a pile of construction material. The remaining six bipolar anomalies are likely to be modern metallic items in the topsoil.

4. DISCUSSION

The majority of the well-defined anomalies that suggest ditches cross the valley perpendicular to the slope and are most likely to be old field boundaries. This is supported by cross referencing the identified anomalies with old maps. The site's field boundaries have changed significantly between the earliest 1802 map (Fig 14) and their current form. Several of the field boundaries in the 1842 and 1887 map (Fig 15) correspond closely with identified ditch-like anomalies. It seems likely that the remaining

geophysically-identified ditches either predate the maps or were temporary in nature.

The situation in Area B along the stream course is slightly different. The series of diffuse anomalies here are only roughly aligned with the old field boundaries and it is likely that the anomalies identified represent a longer-term management of the lands towards the base of the valley. Alternatively, the anomalies may represent bands of soil slippage or river terraces on the steep slopes of the stream valley

In Area C two of the 'ditches' identified, which cross the area east-west, may in fact be the remains of a trackway connecting Waye Barton with Tallys Oak. A footpath is recorded on the 1887 map (the first map to record footpaths) which runs east to the centre of Area C, then loops south, avoiding the hill. The first part of the path is mirrored by a positive response in the geophysics. However, from the point at which the path turns, a second positive response cuts straight across the gradient of the hill towards Tallys Oak, perhaps suggesting an earlier, or less formal, path.

The cropmarks recorded at the western side of the site (Area A) are not reflected in the magnetometer survey. Aside from a very short length of ditch, the only significant anomalies in this area are likely to be a result of land drains. It is possible that the signals from the land drainage obscure more subtle anomalies caused by prehistoric features, particularly as pre-Iron Age remains often produce a weak magnetic signal. Moreover, if the archaeological remains responsible for the cropmark formation are not magnetically-distinct from the background then they would not be detectable by magnetometer survey. However, nearby are two small possible enclosures, which might reflect prehistoric settlement towards the top of the hill.

5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge Lark Energy who commissioned the project. Gary Taylor and Denise Drury edited the report.

6. PERSONNEL

Project coordinator: Gary Taylor
Geophysical Survey: Neil Jefferson, Jonathon Smith and Fiona Walker
Survey processing and reporting: Jonathon Smith.

7. BIBLIOGRAPHY

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Cope-Faulkner, P. 2015 *Archaeological Desk Based Assessment of Land to the East of Waye Barton, Ipplepen, Devon*. Heckington: APS Report 68/15

CU, 2015 *The Soils Guide*

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

8. ABBREVIATIONS

BGS British Geological Survey

CIfA Chartered Institute for Archaeologists

CU Cranfield University

OD Ordnance Datum

Figure 1 - General Location Map

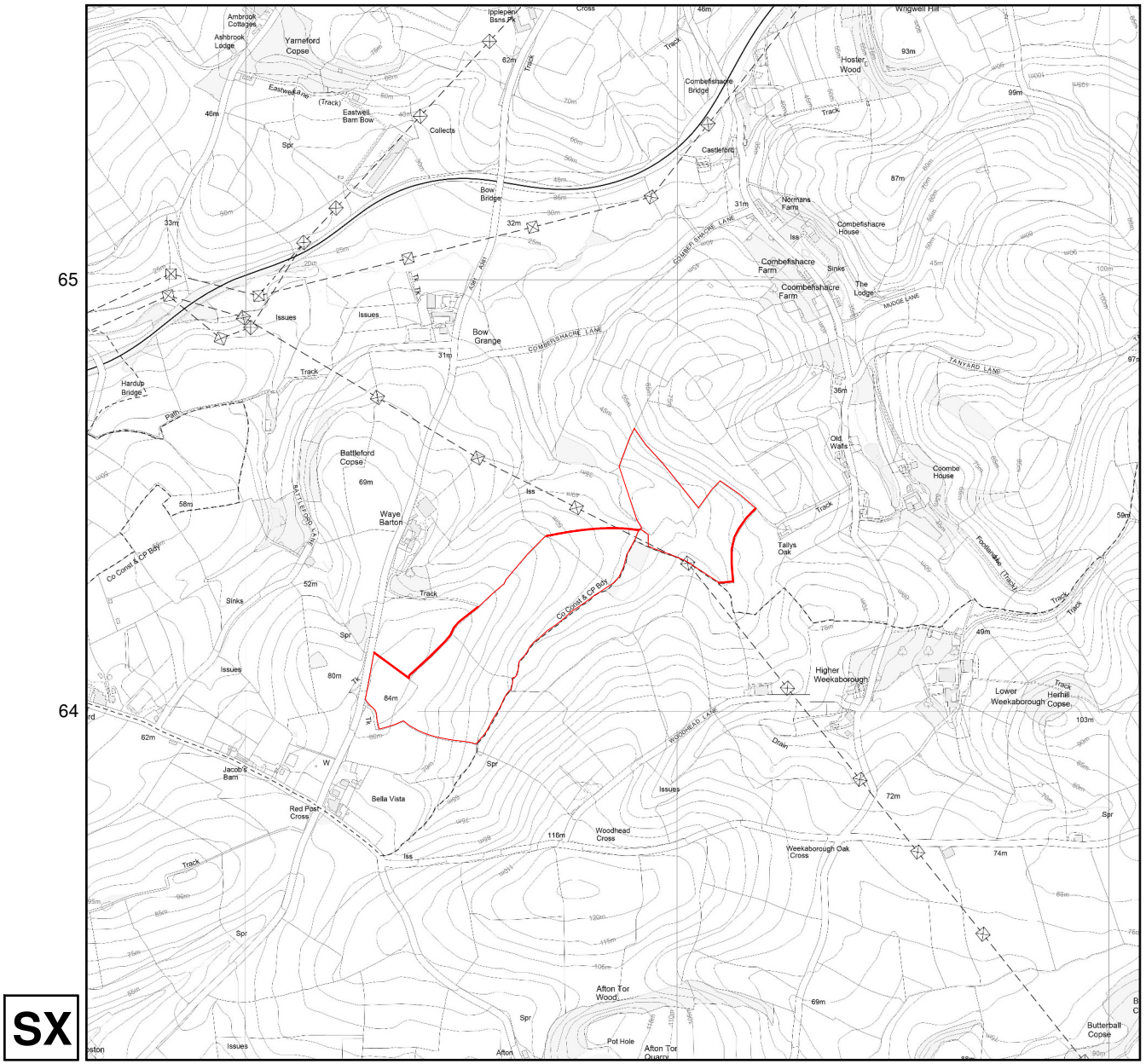


Figure 2 - Site Location

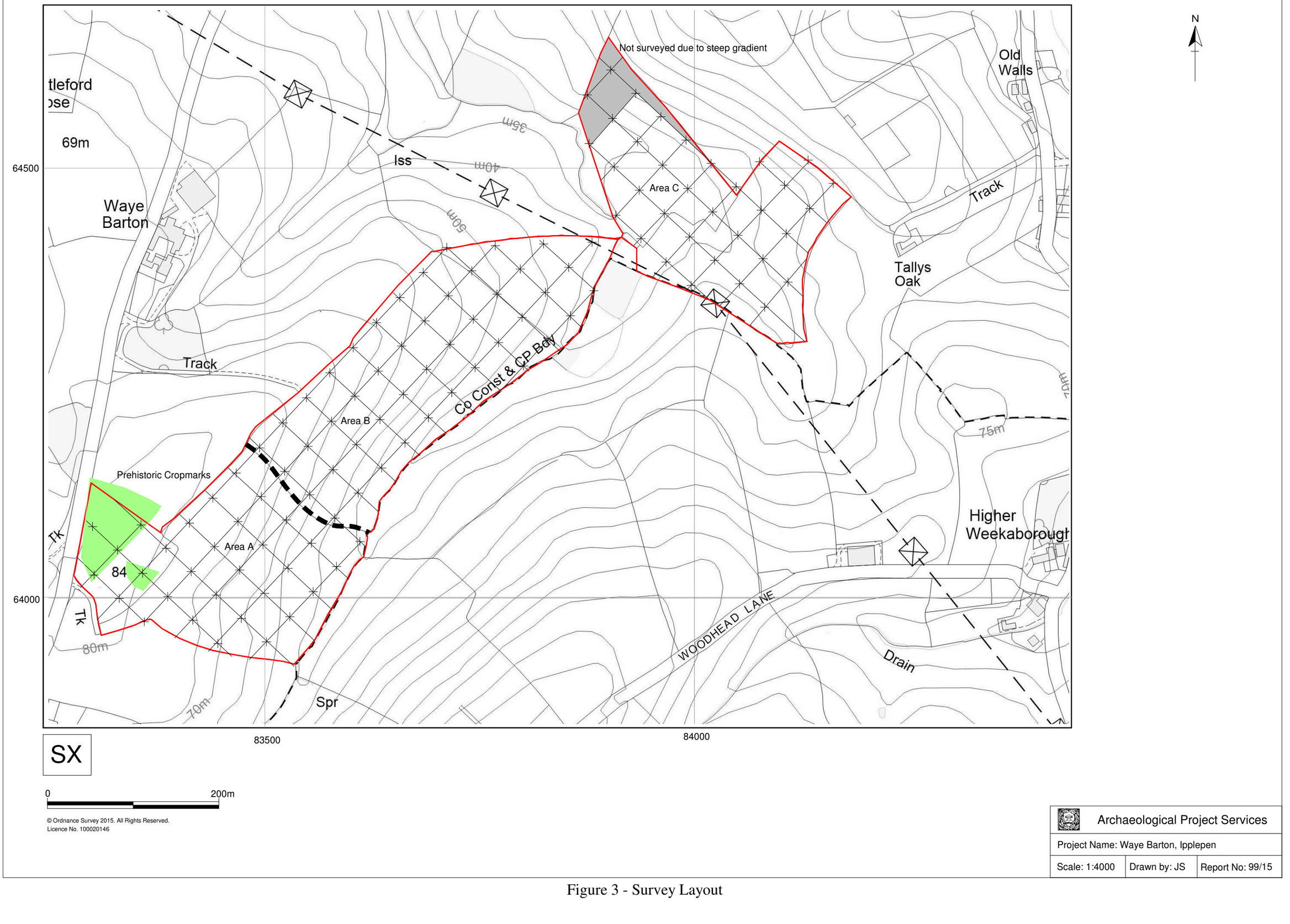


Figure 3 - Survey Layout

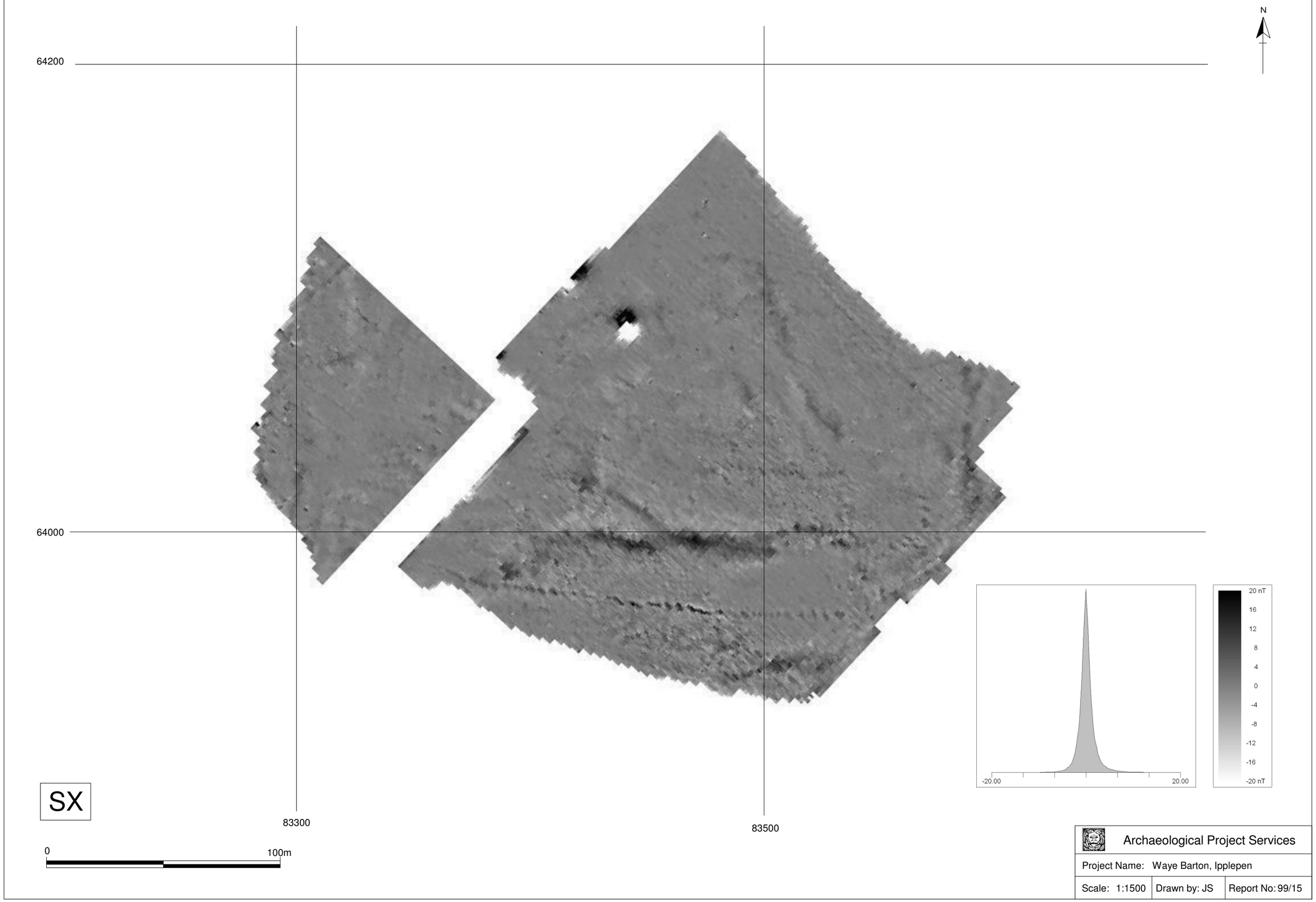


Figure 4 - Area A minimally processed greyscale data

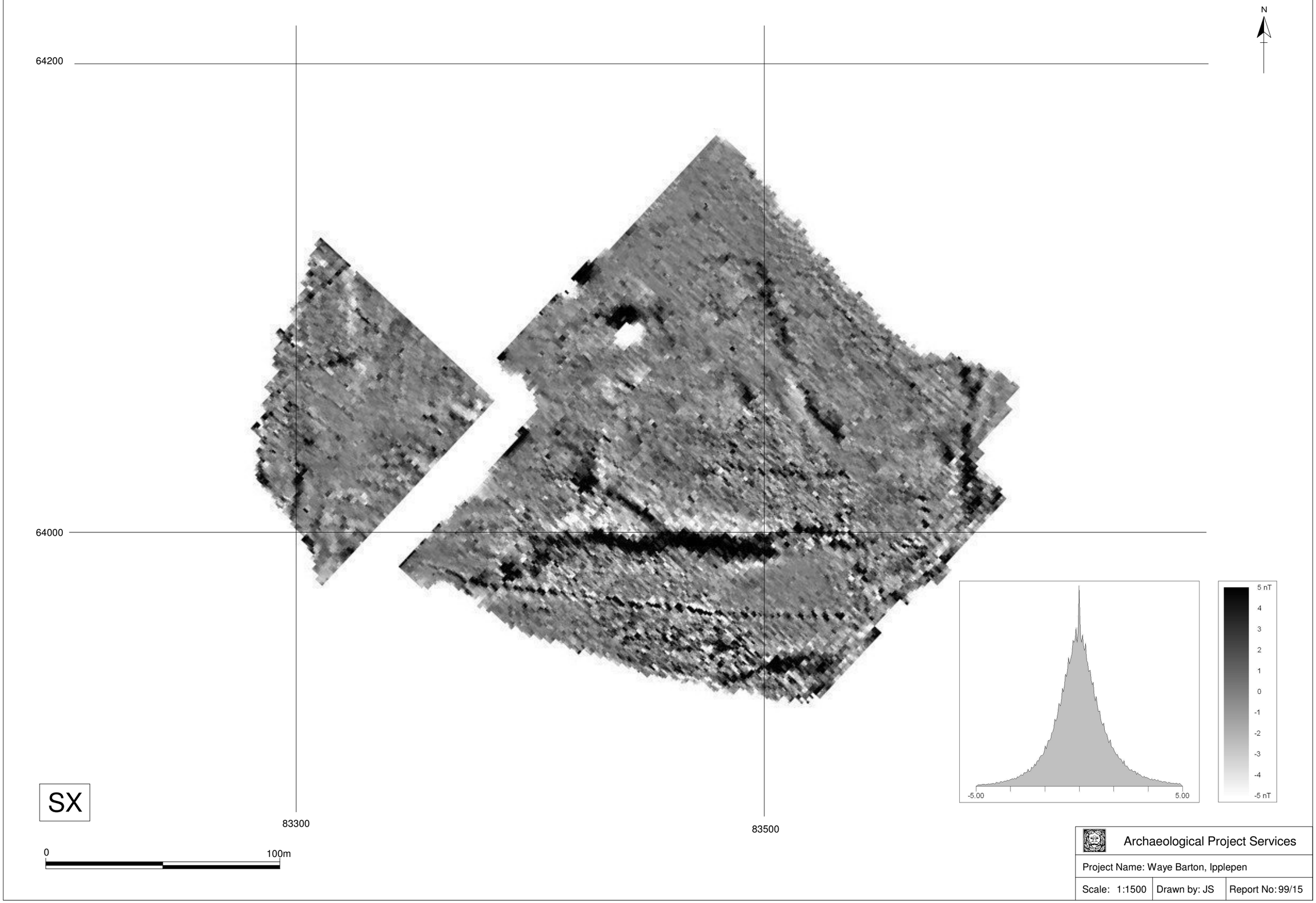


Figure 5 - Area A processed greyscale data

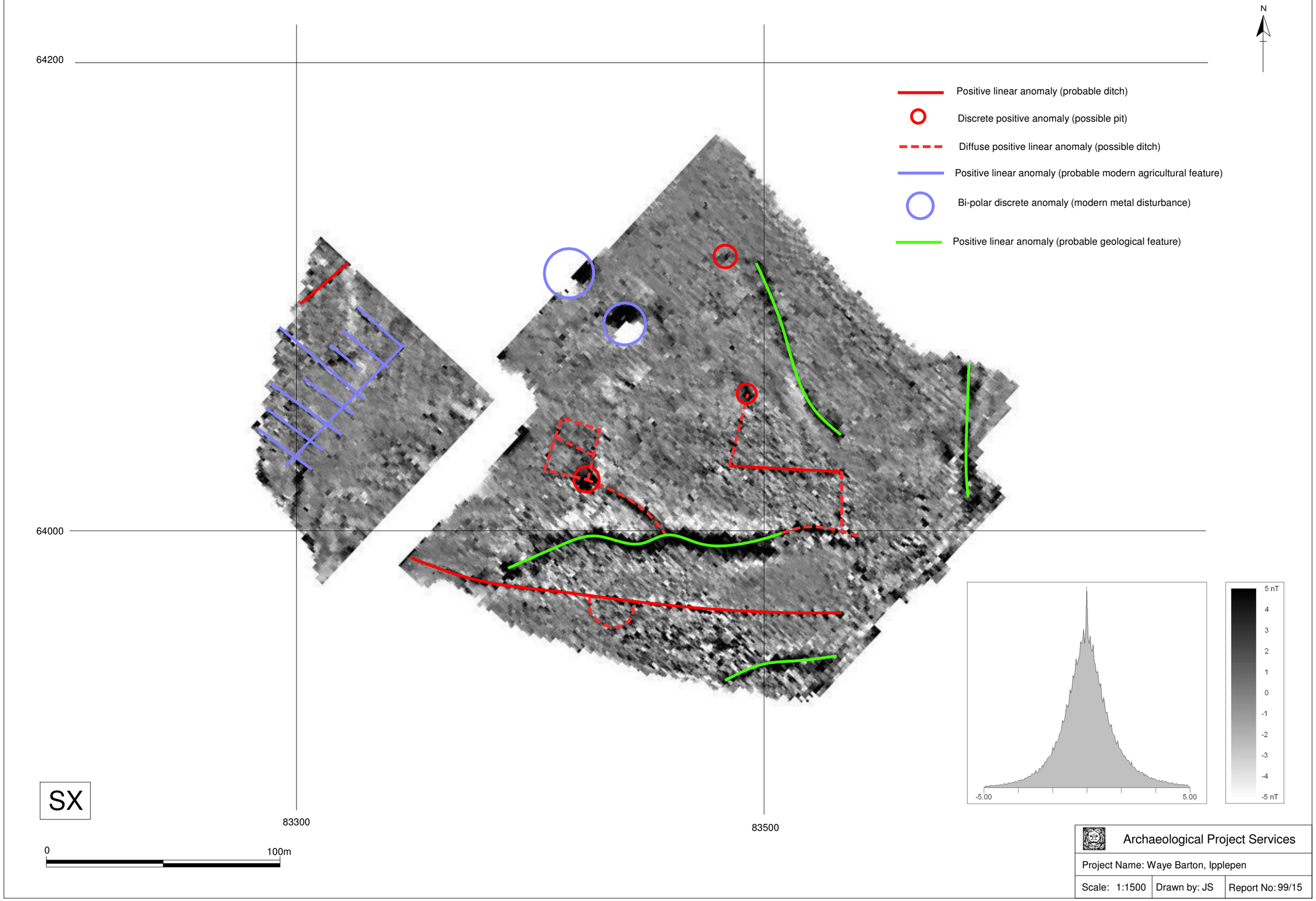


Figure 6 - Area A interpreted data

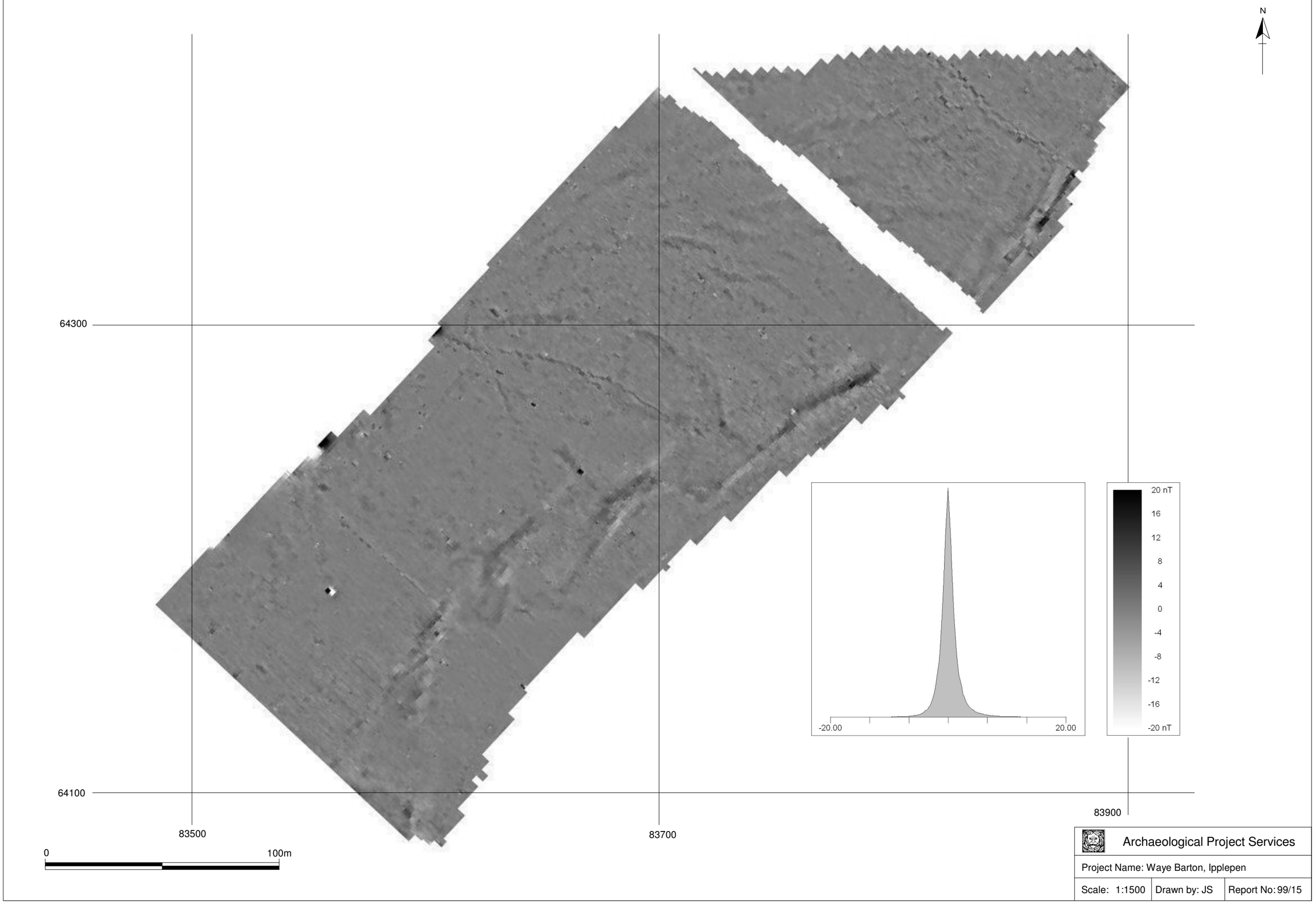


Figure 7 - Area B minimally processed greyscale plot

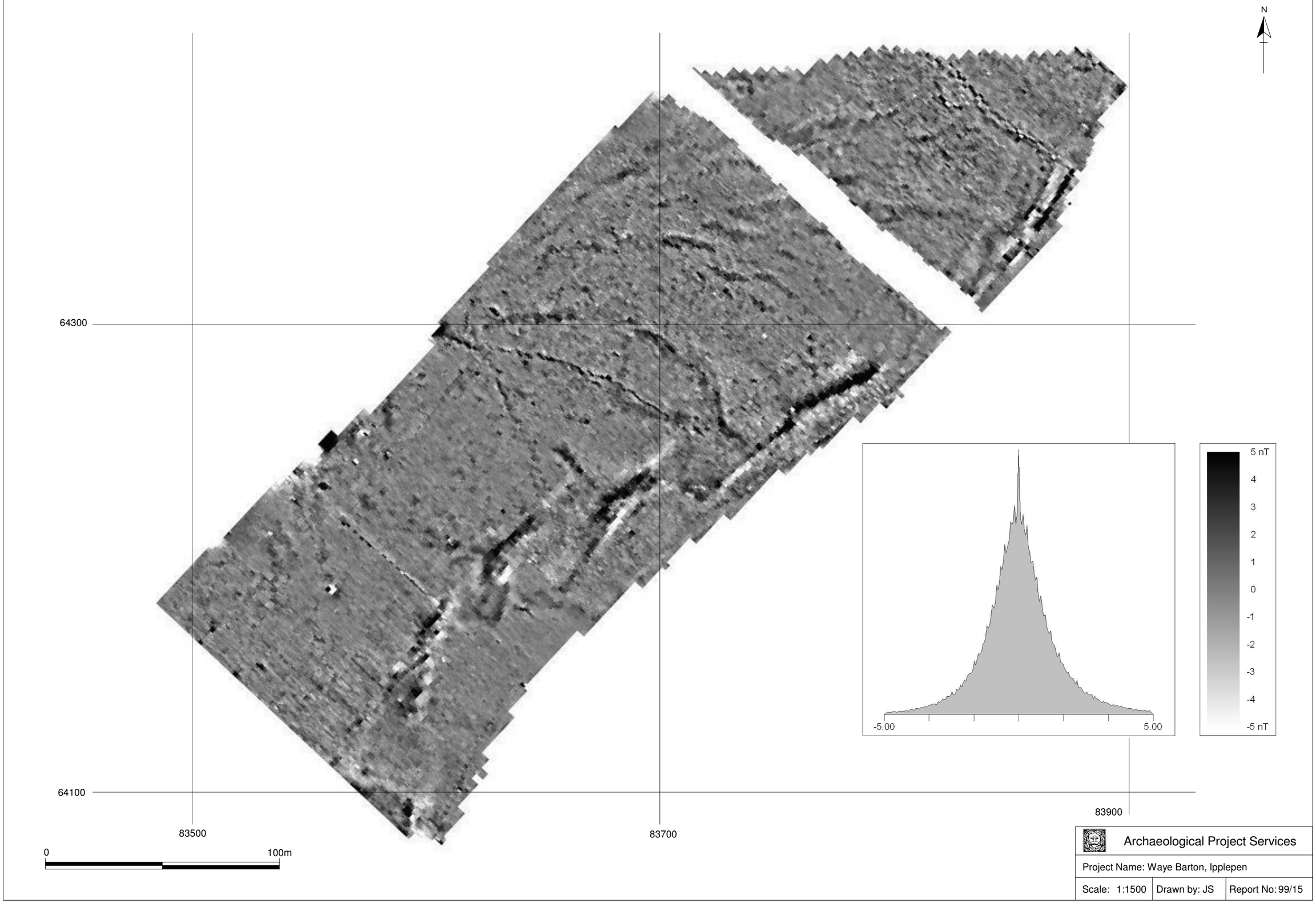


Figure 8 - Area B processed greyscale plot

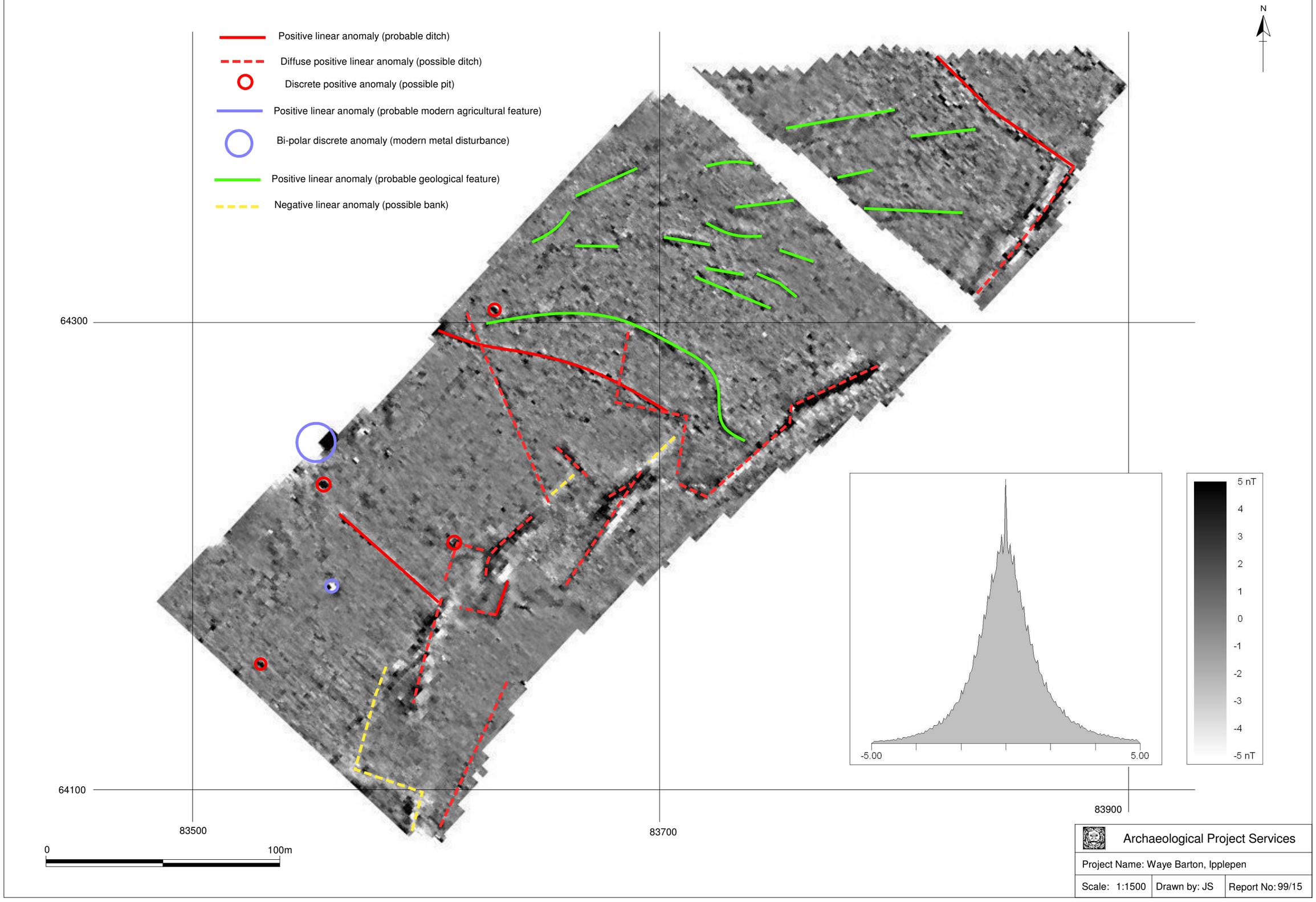


Figure 9 - Area B interpreted data

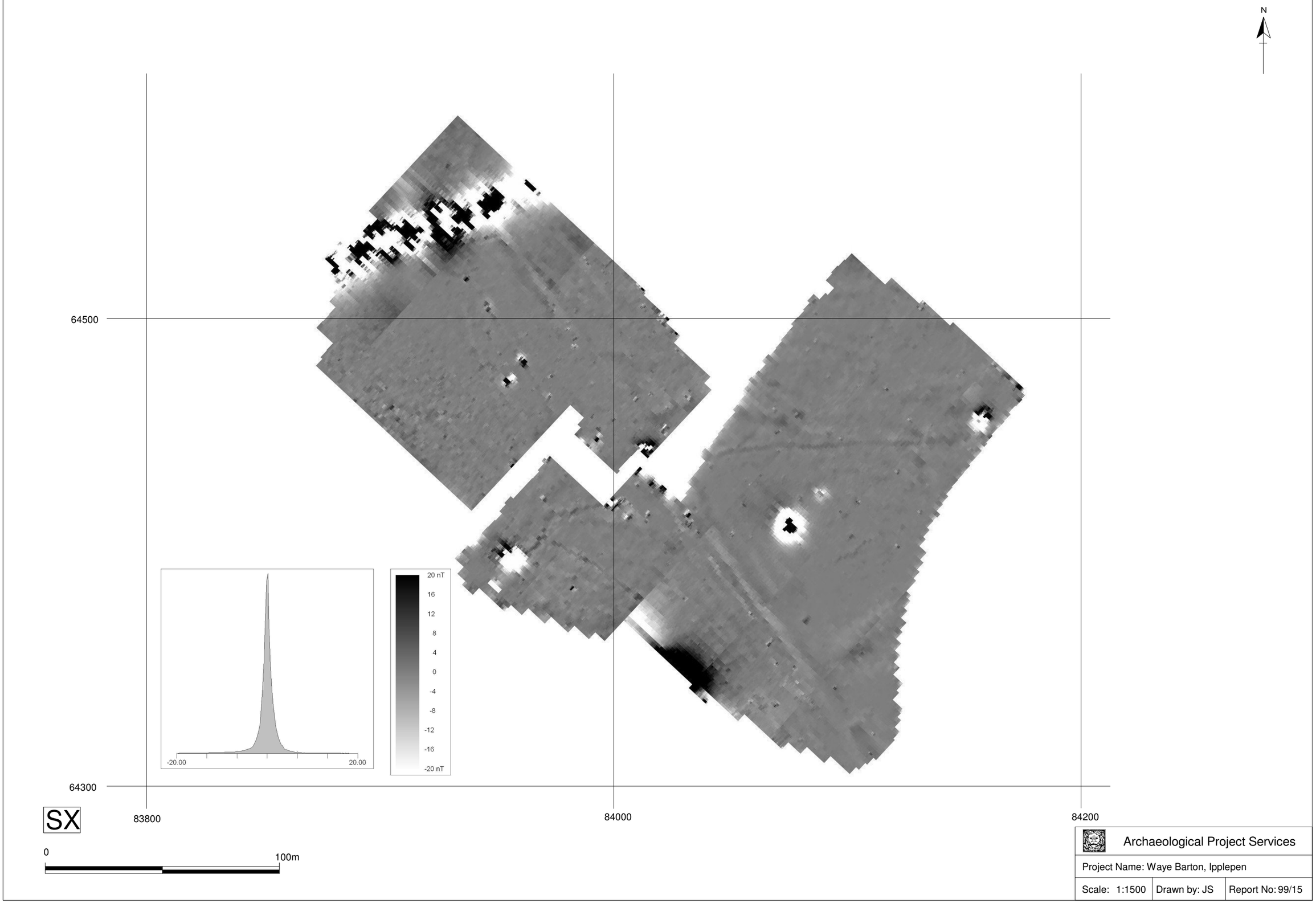


Figure 10 - Area C minimally processed greyscale data

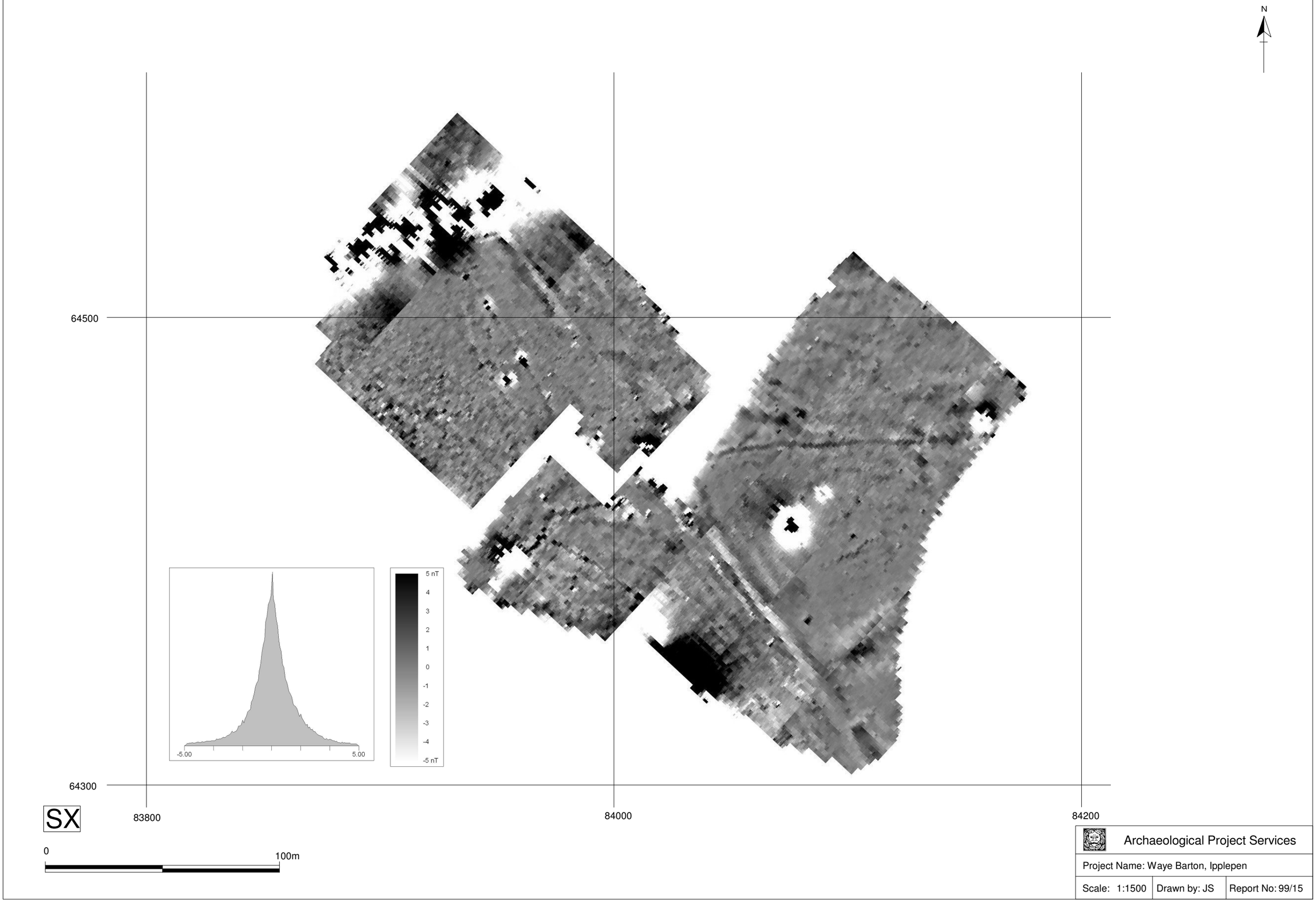


Figure 11 - Area C processed greyscale data

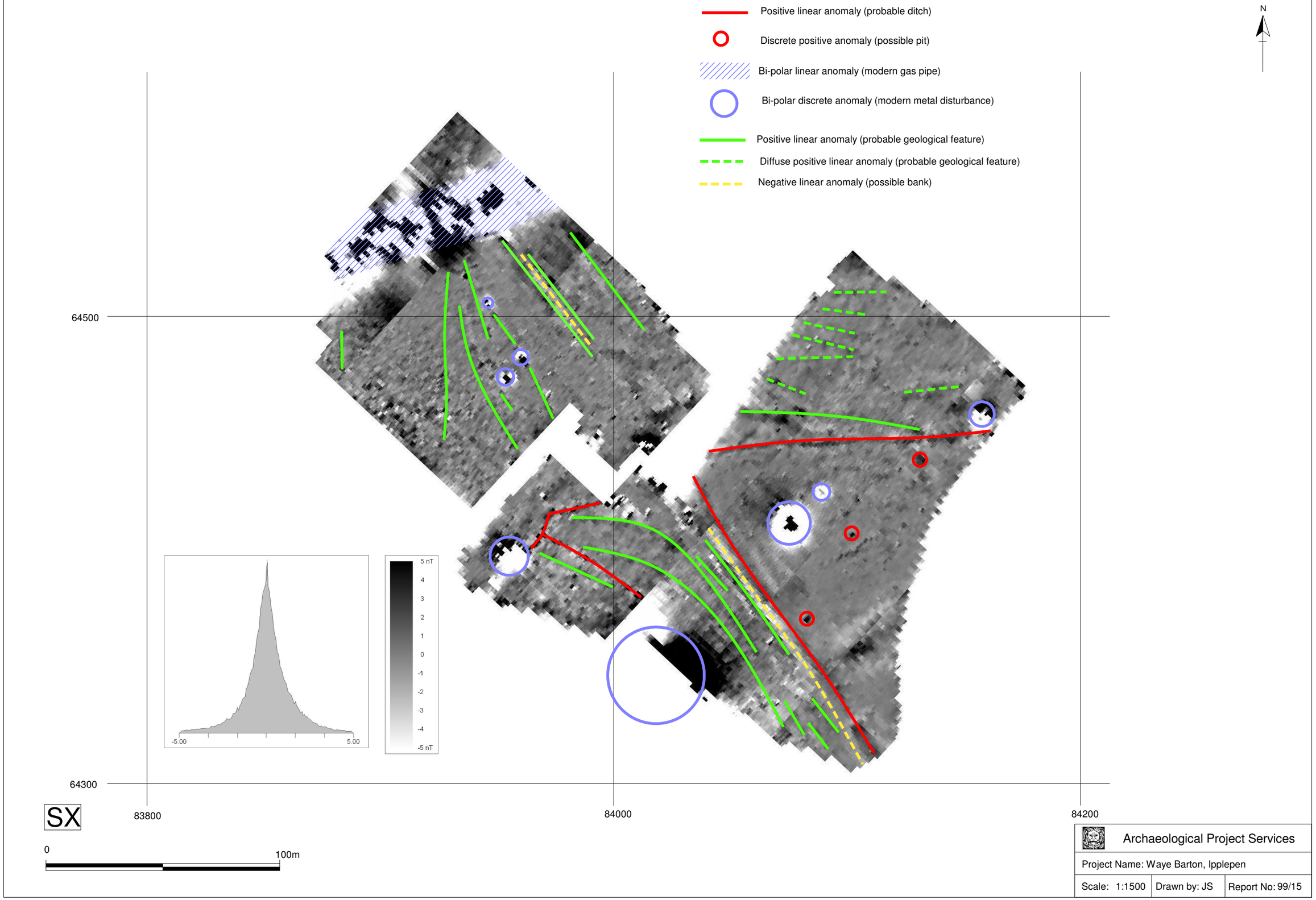


Figure 12 - Area C interpreted data

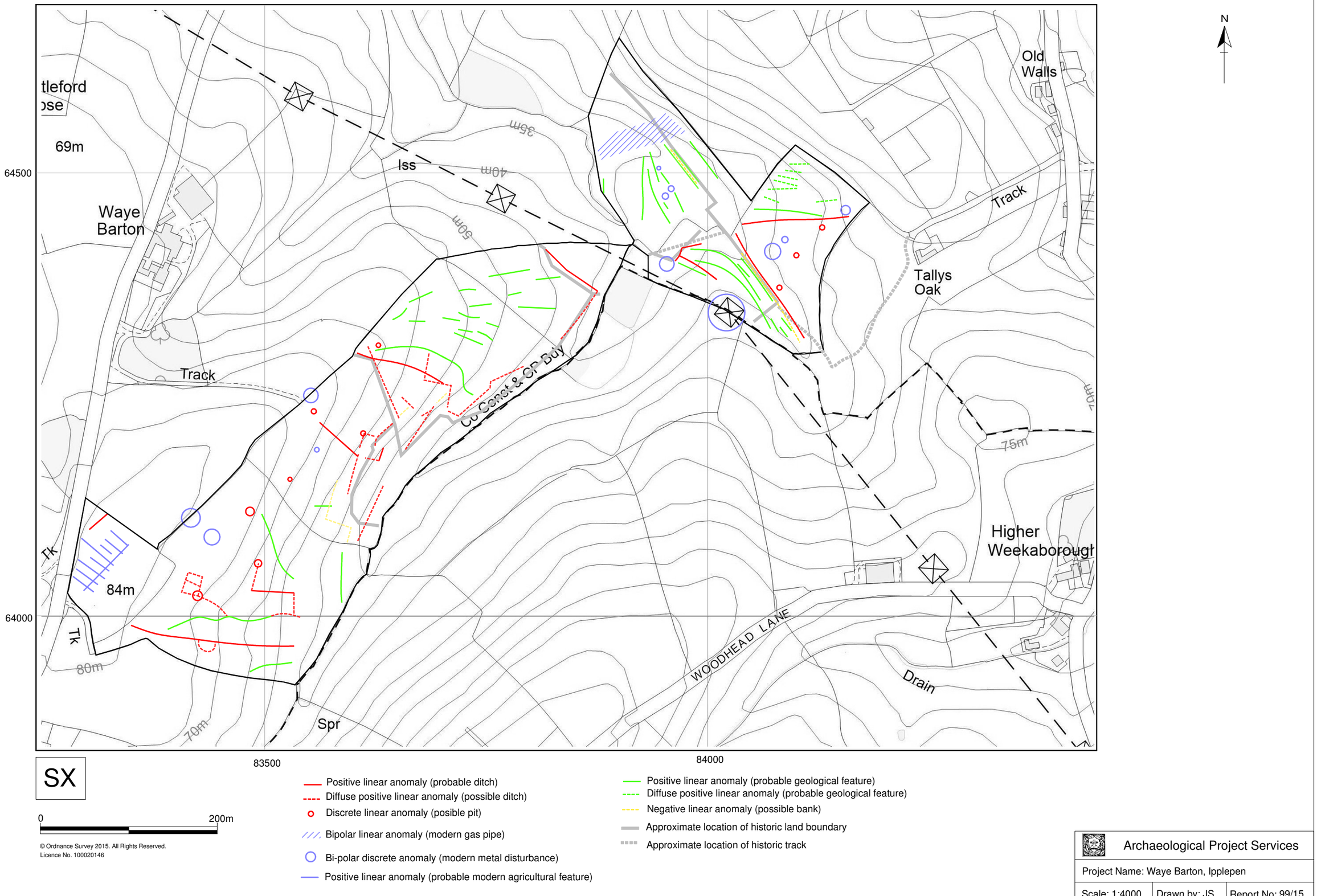


Figure 13 - Overall results

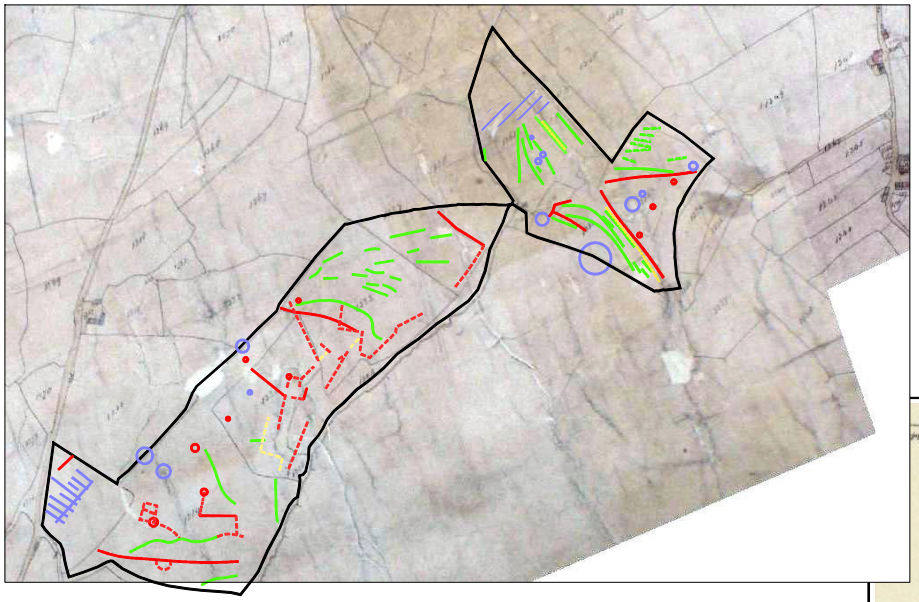
N

Positive linear anomaly (probable ditch)
Diffuse positive linear anomaly (possible ditch)
Discrete positive anomaly (possible pit)
Positive linear anomaly (probable modern agricultural feature)
Bi-polar linear anomaly (modern gas pipe)
Bi-polar discrete anomaly (modern metal disturbance)
Positive linear anomaly (probable geological feature)
Diffuse positive linear anomaly (possible geological feature)
Negative linear anomaly (possible bank)

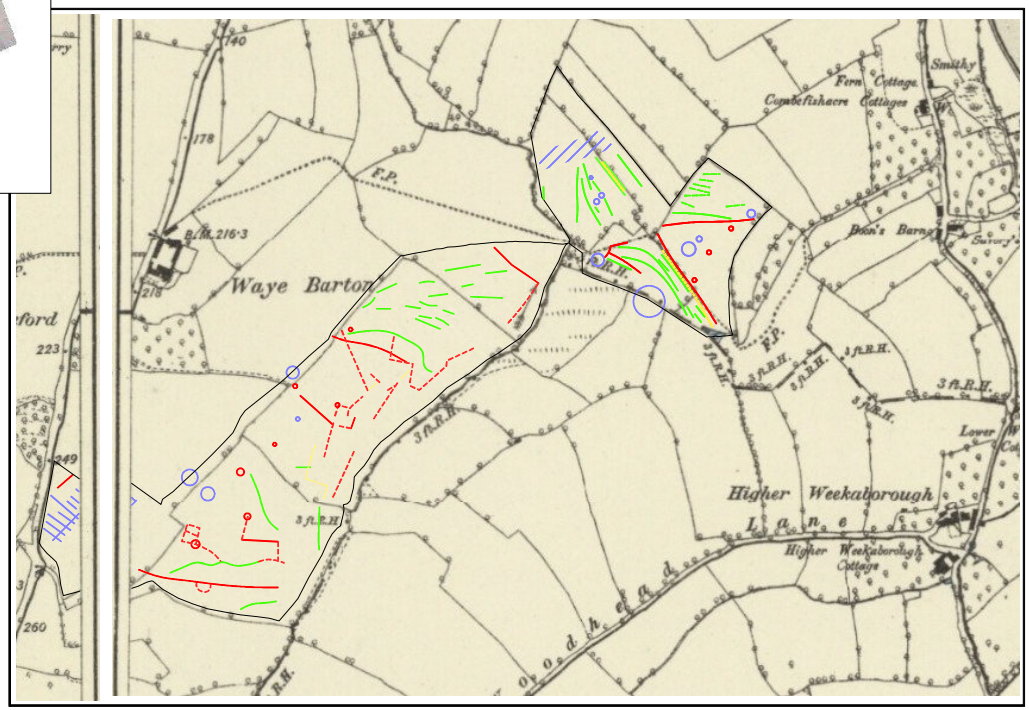
0 500m
Approx. Scale

Archaeological Project Services		
Project Name: Waye Barton, Ipplepen		
Scale 1:10,000	Drawn by: JS	Report No: 99/15

Figure 14 - Extract from the Ordnance Surveyor's 2" drawing, 1802, with geophysical interpretive results



Extract from the Ipplepen Tithe Award map, 1842



Extract from the 1st edition Ordnance Survey map 1887

- Positive linear anomaly (probable ditch)
- Diffuse positive linear anomaly (possible ditch)
- Discrete positive anomaly (possible pit)
- Positive linear anomaly (probable modern agricultural feature)
- Bi-polar linear anomaly (modern gas pipe)
- Bi-polar discrete anomaly (modern metal disturbance)
- Positive linear anomaly (probable geological feature)
- Diffuse positive linear anomaly (possible geological feature)
- Negative linear anomaly (possible bank)

0 500m

N

Archaeological Project Services		
Project Name: Waye Barton, Ipplepen		
Scale 1:10,000	Drawn by: JS	Report No: 99/15

Figure 15 - Extracts from 1842 Tithe map and 1887 O.S. map, with geophysical interpretive results

Appendix 1
THE ARCHIVE

The archive consists of:

6 Daily record sheets
1 Report text and illustrations
Digital data

File names	LIWB15 W01.xgd to LIWB15 W606.xgd LIWB15 Y01.xgd to LIWB15 Y603.xgd LIWB15 Area 1.xcp and LIWB15 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. Grids suffixed with '-a' are re-orientated copies. 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	TerraSurveyor 3.0.25.1 running under Windows 7
Date of last modification	20/10/15
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

Final destination of the archive is:

Royal Albert Memorial Museum
Exeter,
Devon,
EX4 3RX

Accession number: RAMM 15/47

OASIS Record No: archaeol1- 227540

Site Code: LIWB15

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol1-227540

Project details

Project name	Waye Barton, Little Hempston, Devon: Geophysics
Short description of the project	A 17.8ha magnetometer survey on land east of Waye Barton, Little Hempston, Devon. The survey revealed several undated field boundaries, a possible track way and two possible prehistoric enclosures.
Project dates	Start: 12-10-2015 End: 17-10-2015
Previous/future work	No / Not known
Any associated project reference codes	LIWB15 - Sitecode
Any associated project reference codes	RAMM 15/47 - Museum accession ID
Type of project	Field evaluation
Site status	None
Current Land use	Grassland Heathland 5 - Character undetermined
Monument type	DITCH Uncertain
Monument type	ENCLOSURE Uncertain
Monument type	TRACK Uncertain
Significant Finds	NONE None
Methods & techniques	"'Geophysical Survey"'
Development type	Solar Farm
Prompt	Voluntary/self-interest
Position in the planning process	Not known / Not recorded
Solid geology	PERMIAN BASAL BRECCIAS, SANDSTONES AND MUDSTONES
Drift geology (other)	None
Techniques	Magnetometry

Project location

Country	England
Site location	DEVON TEIGNBRIDGE IPPLEPEN Waye Barton
Postcode	TQ9 6NQ
Study area	17.8 Hectares
Site coordinates	SX 83661 64237 50.465794520877 -3.639417506623 50 27 56 N 003 38 21 W Point

Project creators

Name of Organisation	Archaeological Project Services
Project brief originator	Contractor (design and execute)
Project design originator	Gary Taylor
Project director/manager	Gary Taylor
Project supervisor	Neil Jefferson
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Royal Albert Memorial Museum
Digital Archive ID	RAMM 15/47
Digital Contents	"none"
Digital Media available	"Geophysics","Images vector","Survey","Text"
Paper Archive recipient	Royal Albert Memorial Museum
Paper Archive ID	RAMM 15/47
Paper Contents	"none"
Paper Media available	"Correspondence","Diary","Map","Plan","Report","Survey "

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
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Author(s)/Editor(s)	Smith, J.D.
Other bibliographic details	APS Report 99/15

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Issuer or publisher	Archaeological Project Services
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Entered by	Jonathon Smith (info@apsarchaeology.co.uk)
Entered on	26 October 2015

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