LAND AT JAMES ROAD, CROWLAND, LINCOLNSHIRE

GEOPHYSICAL SURVEY (CRJR15)

Work undertaken for
Crowland Parish Council

August 2015

Report produced by
Jonathon Smith BA (Hons), MA

OASIS Ref: archaeol1-227803
National Grid Reference: TF 24580 09780
Accession No: LCNCC:2015.121

APS Report No: **90/15**

ARCHAEOLOGICAL PROJECT SERVICES

Quality Control

James Road,
Crowland,
Lincolnshire

CRJR15

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Site Staff	Jonathon Smith
Survey processing and report	Jonathon Smith

Checked by Project Manager	Approved by Team Leader
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Date: 20/10/15	Date: 26/10/15

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1. SUMMARY

Detailed magnetic gradiometer survey was undertaken for Crowland Parish Council in connection with proposed development on land at James Road, Crowland, Lincolnshire. The survey totalled c. 1.62ha.

A prehistoric creek runs through the site and medieval settlement abuts the survey area to the north. The magnetometer survey revealed evidence of the creek and an associated field boundary, but no indications of any other archaeological features.

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 Robert Doughty Consultancy Limited, on behalf of Crowland Parish Council to undertake a detailed magnetometer survey totalling some 1.62ha on land at James Road, Crowland, Lincolnshire. This was in advance of proposed development of the area. The survey was carried out on 18th September 2015.

No prehistoric material is known from the immediate vicinity of the site. It is likely that any such material lies buried beneath alluvial deposits, though the sand and gravel island upon which Crowland sits contains evidence spanning the Neolithic to Bronze Age periods.

Evidence from lidar data shows the southern area, east of James Road, as partly lying over an infilled creek. This creek is thought to have been active during the Neolithic and early Bronze Age with the area of the site becoming fen into the medieval period. The site has been subject to fieldwalking, but this did not identify any archaeological material (Hayes and Lane 1992, 192-202).

Crowland is first mentioned in the mid 8th century by Felix, the biographer of St Guthlac. Referred to as *Crugland*, *Cruuulond* and *Cruwland,* the name is derived from the Old English *cruw* or *crug*, meaning a bend, referring to a bend in the River Welland (Cameron 1998, 35).

Much of the subsequent history of Crowland is centred on the abbey and surrounding town. The site lies south of the town within an area known as Alderlands. This area of land probably comprised part of the initial gift to the abbey, although it is not until 1155 that a genuine charter including this land is first documented. It was unlikely that the area of the site was farmed, although as a peat fen it would have been an important resource for wildfowling, thatching and seasonal grazing (Cope-Faulkner 2015).

2.3 Topography and Geology

Crowland is located 12.7km south of Spalding and 17.7km southeast of Bourne, in the South Holland district of Lincolnshire (Fig 1).

The site is located approximately 600m southeast of the centre of Crowland as

defined by the Crowland Abbey, south of James Road, close to its junction with the A16, centred on National Grid Reference TF 24580 09780 (Figs 2 and 3).

Local soils are of the Downholland 1 Association, typically clayey humic alluvial gley soils formed over former creeks (Hodge *et al*. 1984, 166). These soils are developed on a drift geology of older marine alluvium which overlies a solid geology of the Jurassic Oxford Clay Formation (BGS 1984).

3. GEOPHYSICAL SURVEY

3.1 Methods

The layout of the survey area is shown in Figure 3. The site was split in two by a barbed wire fence. Northwest of the fence the site was gently undulating and covered in cereal stubble, which made it ideal for surveying. Southeast of the fence the site was covered by potato ridges still in foliage and was in an extremely poor condition for surveying. The weather was 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 (Fig 4; clipped for display but otherwise unprocessed) and the processed data (Fig 5). Magnetic anomalies have been identified and plotted onto and interpretative drawing (Fig 6).

Positive linear anomalies
A single positive linear was identified (highlighted with a red line). This is likely to be a drainage ditch.

Discrete positive anomalies
Three examples of discrete positive anomalies have been highlighted with red circles. These may be large pits, but are more likely to be geological disturbance.

Geological disturbances
Two broad ribbons of disturbance (highlighted with green hatching) run east to west through the site and are very likely to be geological features related to former creeks.

Modern disturbances
Along the southeastern edge of the site is a broad area of disturbance that is very likely due to modern land management practices, perhaps spreading material from ditch cleaning, or the build-up of a plough headland.

4. DISCUSSION

The creek identified in the magnetometry survey is very much smaller than the one identified by the lidar, but the two do run parallel. It seems likely that only the deepest or most permanent channels appear magnetically, whereas a broad area of deposited silt is captured in the lidar data.

Along the edge of the creek is a clear, straight ditch feature. This is very likely a drainage ditch dug along the damp course of the palaeochannel. It probably would have run further than it is highlighted in the magnetometer survey as the disturbance caused by the creek may disguise it further east.

In the southeast of the site is a broad area

of disturbance along the field edge. A recently removed field boundary (installed after 1970 and extant until after 2000) seems to confine the disturbance, which adds weight to the interpretation of the disturbance as modern.

5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge Robert Doughty Consultancy Limited who commissioned the project, on behalf of Crowland Parish Council. Gary Taylor and Denise Drury edited the report.

6. PERSONNEL

Project coordinator: Gary Taylor
Geophysical Survey: Jonathon Smith
Survey processing and reporting: Jonathon Smith.

7. BIBLIOGRAPHY

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8. ABBREVIATIONS

BGS British Geological Survey

CIfA Chartered Institute for Archaeologists



Figure 1 - General location plan

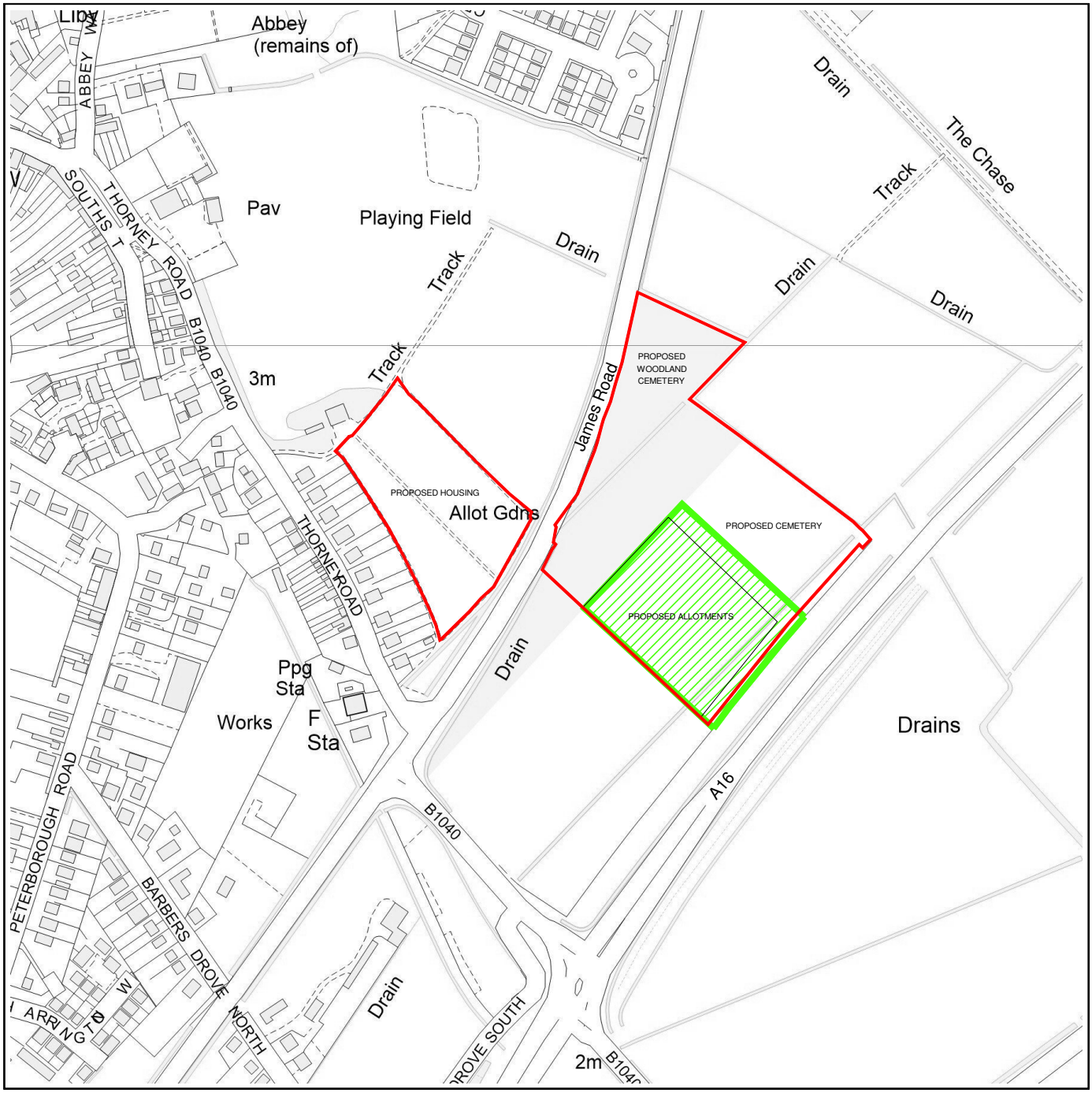


Figure 2 - Site location

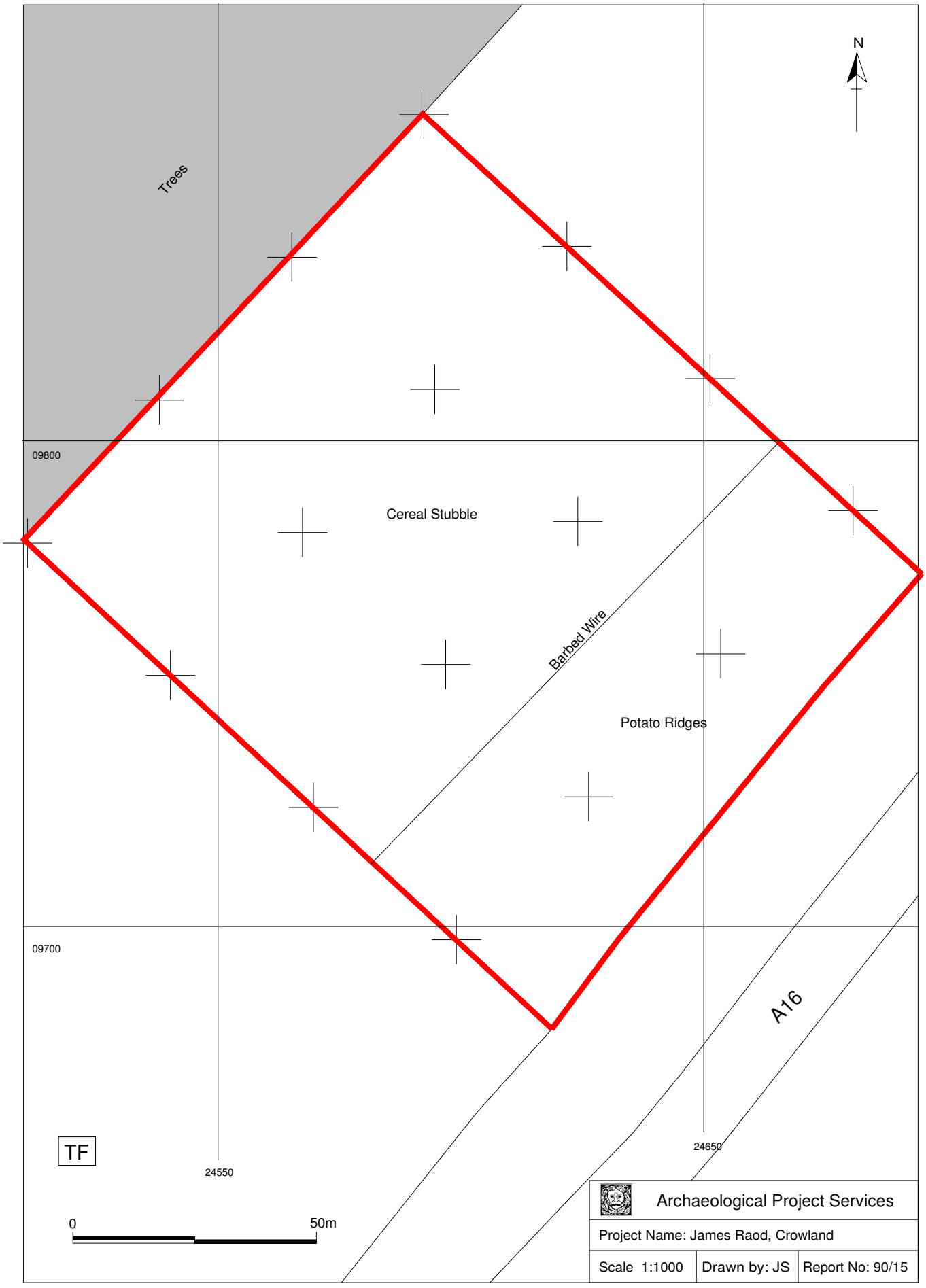


Figure 3 - Site layout

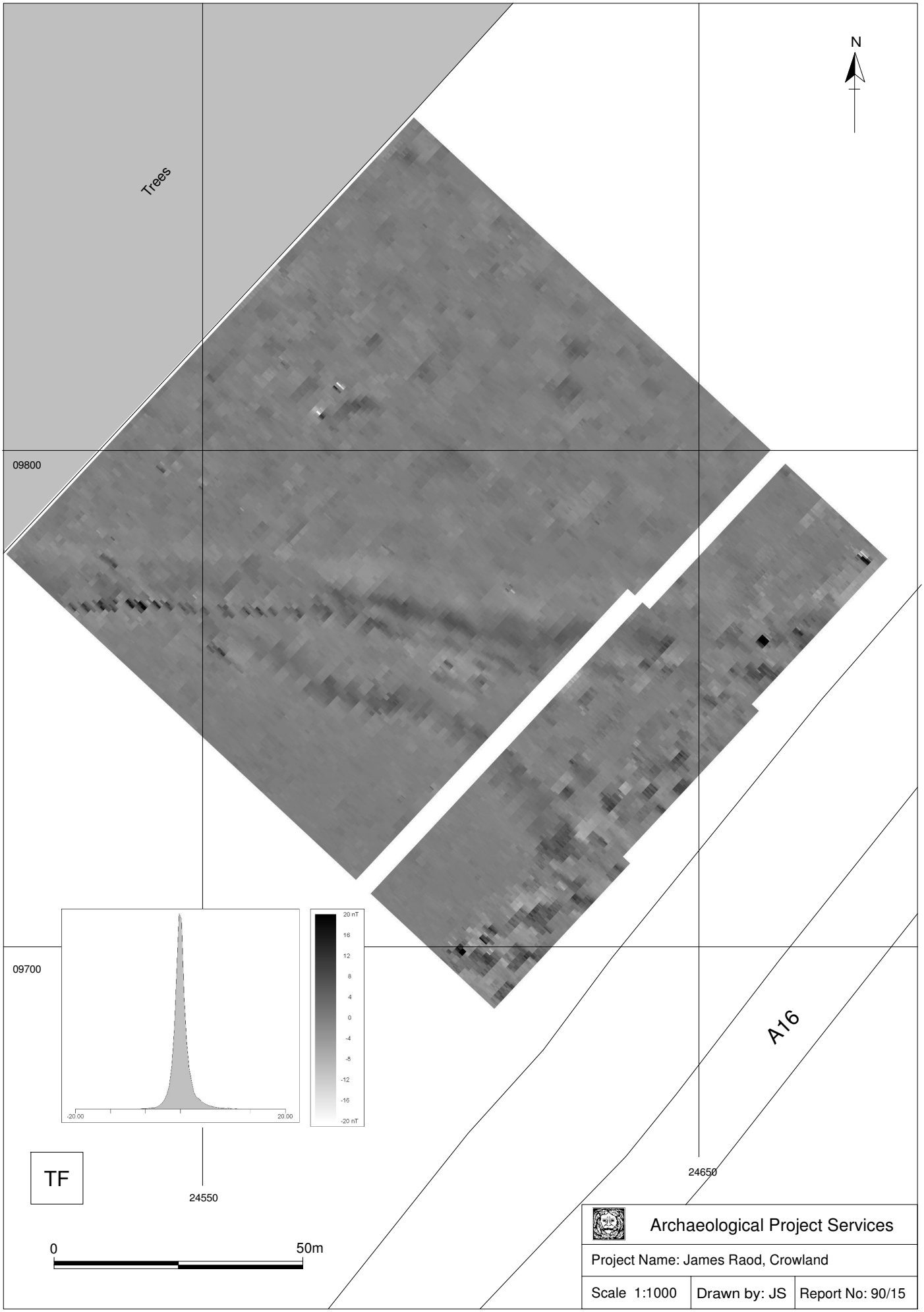


Figure 4 - Minimally processed greyscale plot

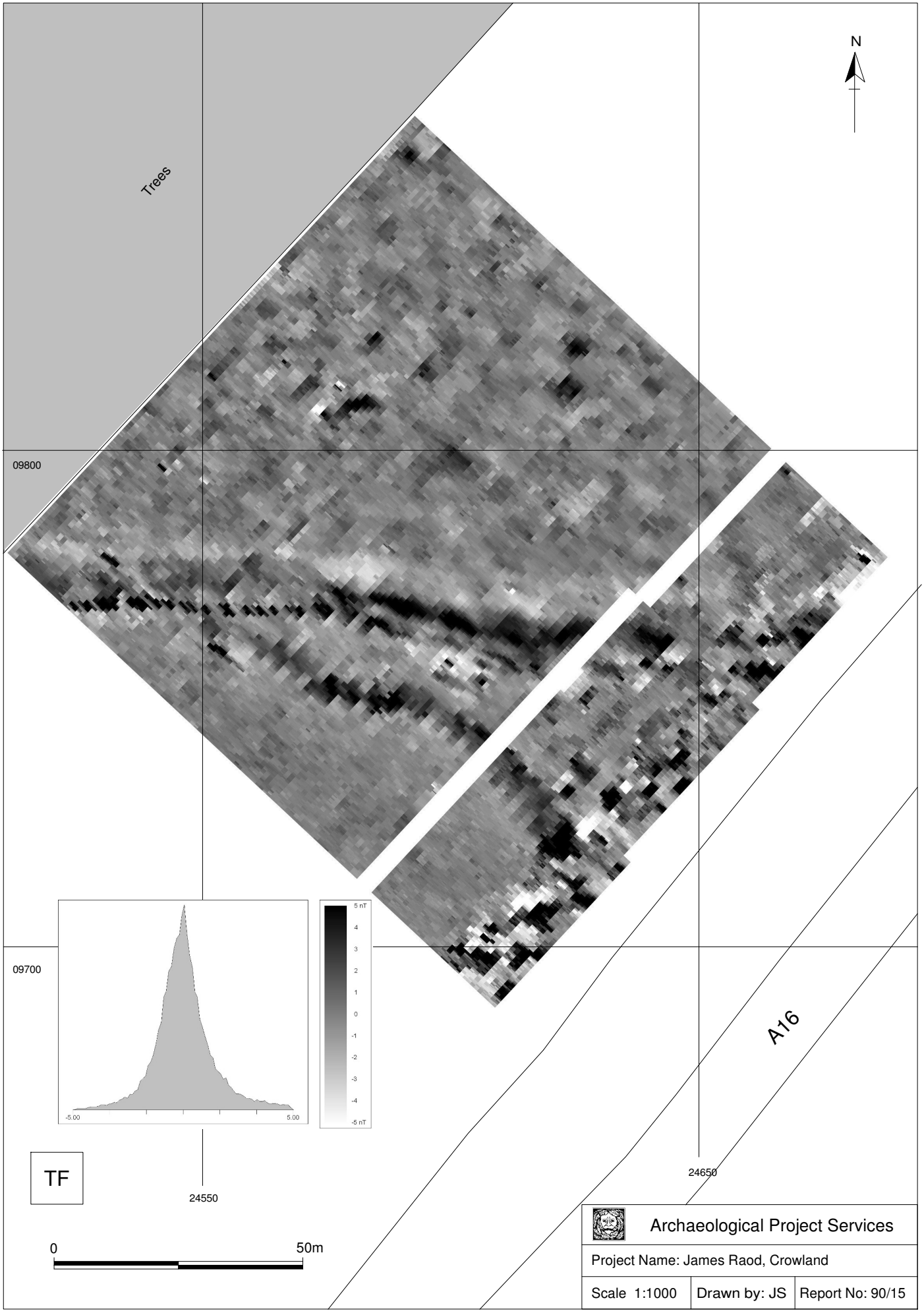


Figure 5 - Processed greyscale plot

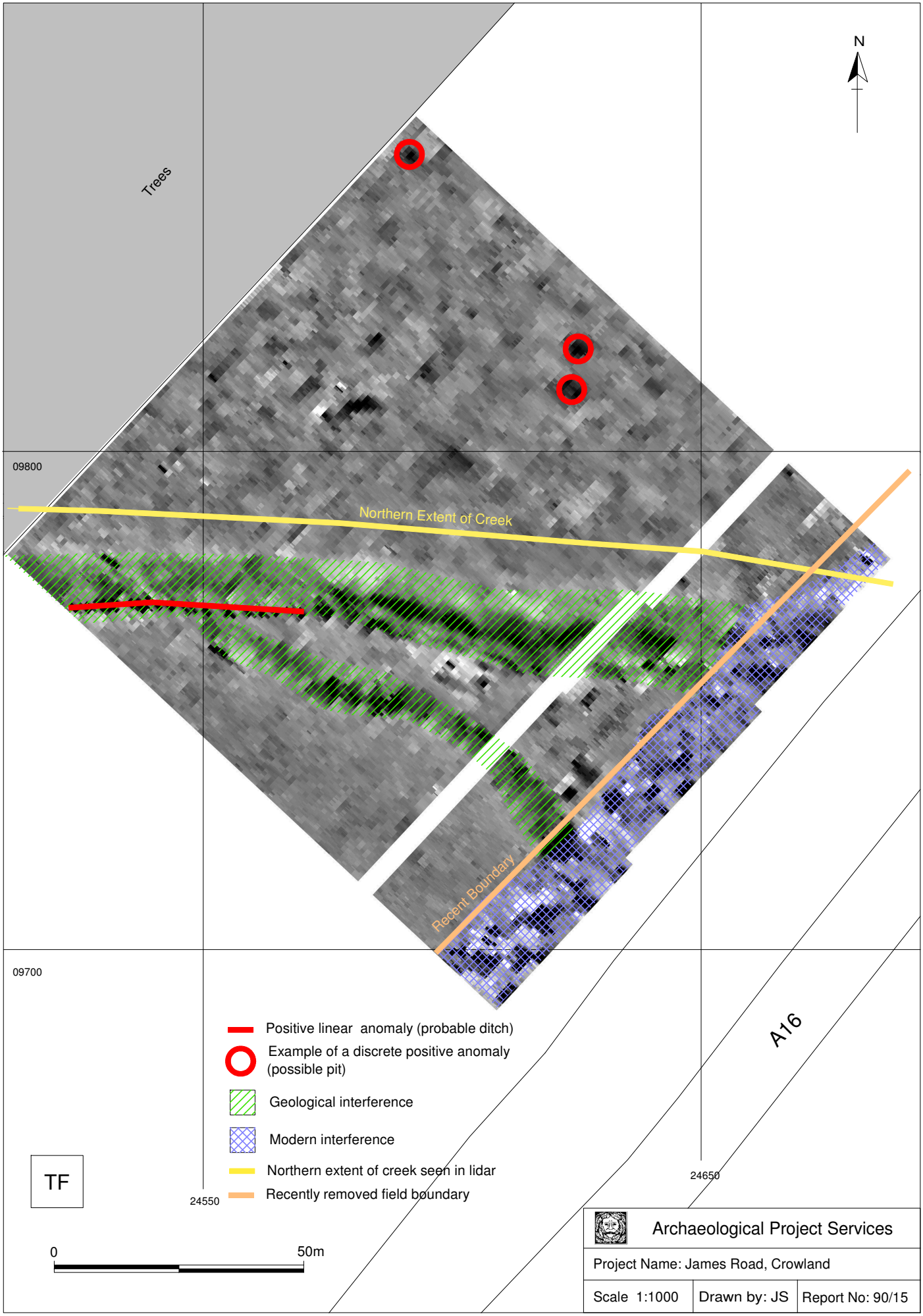


Figure 6 - Greyscale plot with interpretation

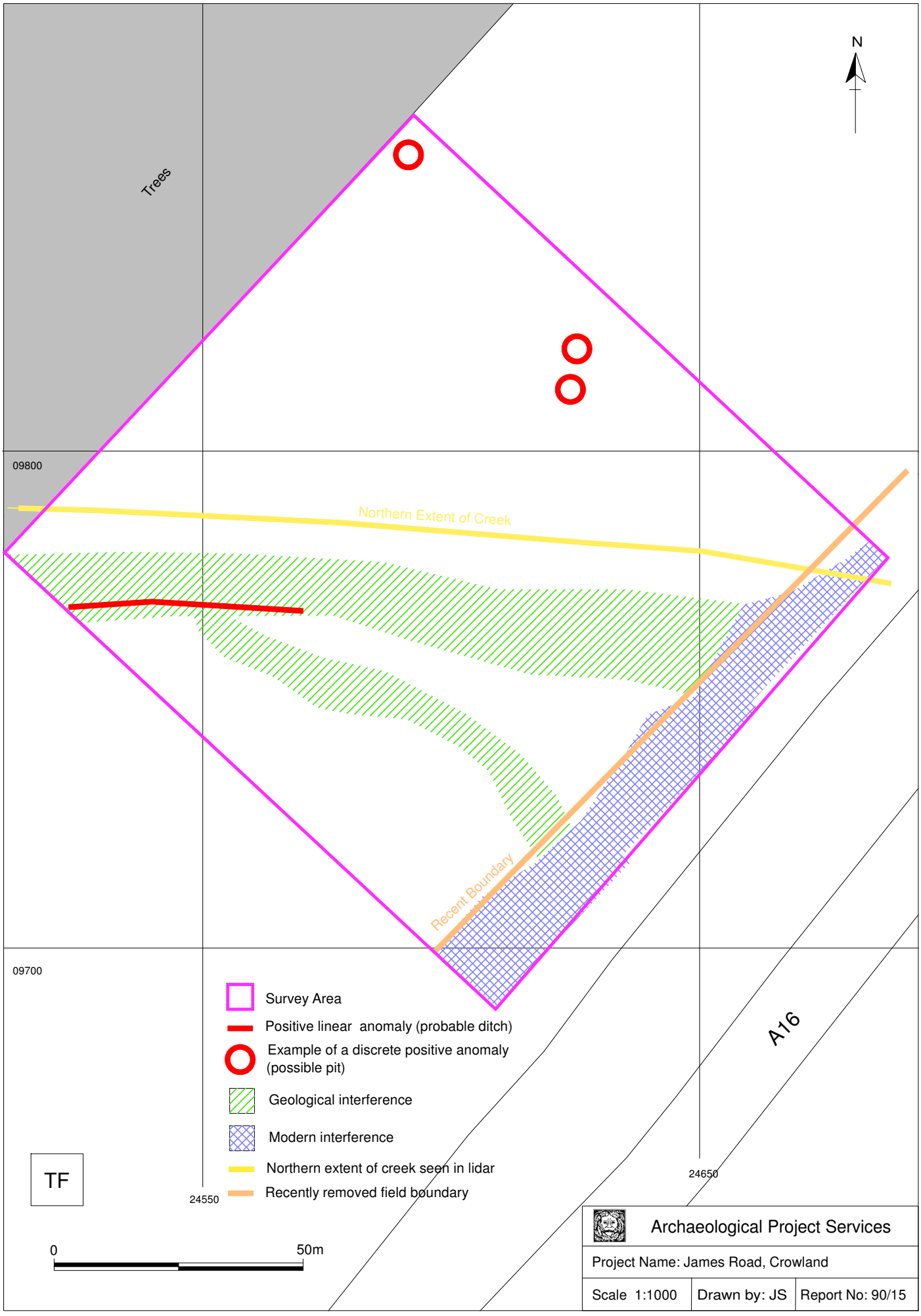


Figure 7 - Interpretive plot

Appendix 1
THE ARCHIVE

The archive consists of:

1 Daily record sheets
1 Report text and illustrations
Digital data

File names	CRJR15 01.xgd to CRJR15 12.xgd CRJR15 complete.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	18/09/2015
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 address:
The Collection
Art and Archaeology in Lincolnshire
Danes Terrace
Lincoln
LN2 1LP

OASIS Code: archaeol1-227803

Site Code: CRJR15

Accession Number: LCNCC:2015.121

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OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol1-227803

Project details

Project name	JAMES ROAD, CROWLAND, LINCOLNSHIRE: GEOPHYSICAL SURVEY
Short description of the project	A 1.6ha magnetometer survey on land adjacent to James Road, Crowland, Lincolnshire. The survey revealed a palaeochannel and a possible undated ditch.
Project dates	Start: 18-09-2015 End: 18-09-2015
Previous/future work	No / Not known
Any associated project reference codes	CRJR15 - Sitecode
Any associated project reference codes	LCNCC:2015.121 - Museum accession ID
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	DITCH Uncertain
Monument type	PALAEOCHANNEL Late Prehistoric
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Allotments
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology	OXFORD CLAY AND KELLAWAYS BEDS
Drift geology	ALLUVIUM
Techniques	Magnetometry

Project location

Country	England

Site location	LINCOLNSHIRE SOUTH HOLLAND CROWLAND James Road
Postcode	PE6 0AL
Study area	1.6 Hectares
Site coordinates	TF 24580 09780 52.671029299348 -0.157365659165 52 40 15 N 000 09 26 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	Jonathon Smith
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	The Collection
Digital Archive ID	LCNCC:2015.121
Digital Contents	"none"
Digital Media available	"Geophysics","Images vector","Survey","Text"
Paper Archive recipient	The Collection
Paper Archive ID	LCNCC:2015.121
Paper Contents	"none"
Paper Media available	"Correspondence","Diary","Plan"

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	LAND AT JAMES ROAD, CROWLAND, LINCOLNSHIRE: GEOPHYSICAL SURVEY
Author(s)/Editor(s)	Smith, J.
Other bibliographic details	APS Report 90/15
Date	2015
Issuer or publisher	Archaeological Project Services
Place of issue or	Heckington

publication	
Description	An A4 comb bound pamphlet
Entered by	Jonathon Smith (info@apsarchaeology.co.uk)
Entered on	26 October 2015

OASIS:

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