

Tritax Symmetry (Hinckley) Limited

HINCKLEY NATIONAL RAIL FREIGHT INTERCHANGE

The Hinckley National Rail Freight Interchange Development Consent Order

Project reference TR050007

Environmental Statement Volume 2: Appendices

Appendix 13.3 - Geophysical Survey Report (Phase 1) [part 1 of 2]

Document reference: 6.2.13.3

Revision: 01

October 2022

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
Regulation 14

This document forms a part of the Environmental Statement for the Hinckley National Rail Freight Interchange project.

Tritax Symmetry (Hinckley) Limited (TSH) has applied to the Secretary of State for Transport for a Development Consent Order (DCO) for the Hinckley National Rail Freight Interchange (HNRFI).

To help inform the determination of the DCO application, TSH has undertaken an environmental impact assessment (EIA) of its proposals. EIA is a process that aims to improve the environmental design of a development proposal, and to provide the decision maker with sufficient information about the environmental effects of the project to make a decision.

The findings of an EIA are described in a written report known as an Environmental Statement (ES). An ES provides environmental information about the scheme, including a description of the development, its predicted environmental effects and the measures proposed to ameliorate any adverse effects.

Further details about the proposed Hinckley National Rail Freight Interchange are available on the project website:



The DCO application and documents relating to the examination of the proposed development can be viewed on the Planning Inspectorate’s National Infrastructure Planning website:

<https://infrastructure.planninginspectorate.gov.uk/projects/east-midlands/hinckley-national-rail-freight-interchange/>

Appendix 13.3: This document was prepared by Headland Archaeology in 2018 as part of the baseline gathering exercise for the HNRFI. Since this report was prepared amendments have been made to the defined Order Limits as a result of design development. Nonetheless, the contents of this report continue to form a robust evidence base and as such this appendix is used to support the assessment in Chapter 13 (document Reference 6.1.13) of the ES.

HRFI18



HINCKLEY NATIONAL RAIL FREIGHT INTERCHANGE, LEICESTERSHIRE

GEOPHYSICAL SURVEY

commissioned by EDP
on behalf of db symmetry

May 2018

HINCKLEY NATIONAL RAIL FREIGHT INTERCHANGE, LEICESTERSHIRE

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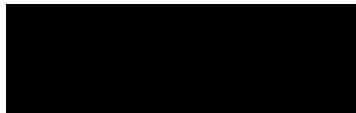
PROJECT INFO:

HA Project Code **HRFI18** / NGR **SP 4624 9494** / Parish **Elmesthorpe, Sapcote, Aston Flamville** / Local Authority **Leicestershire** / OASIS Ref. **headland5-317763**

PROJECT TEAM:

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PROJECT SUMMARY

Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey, covering a 190 hectare site at Hinckley, Leicestershire, where a new strategic rail freight interchange (SRFI) is proposed. Evaluation of the proposed development area has been notably affected by the extensive application of green waste as soil conditioner over 75% of the site. This has resulted in a widespread elevated magnetic background against which any low magnitude anomalies of archaeological potential, if present, may be masked. For this reason, the archaeological potential over the affected fields remains uncertain although it is thought that any extensive areas of enclosed settlement, if present, would have been detected, at least in part, over the majority of the geophysical survey area. A single localised ring-ditch has been identified at Hobbs Hayes Farm in an area unaffected by green waste. This anomaly is ascribed high archaeological potential and probably locates a round barrow. No further anomalies of archaeological potential have been identified over the 25% of fields where green waste has not been applied and, in these fields, the archaeological potential is assessed as low.

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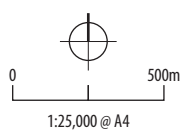
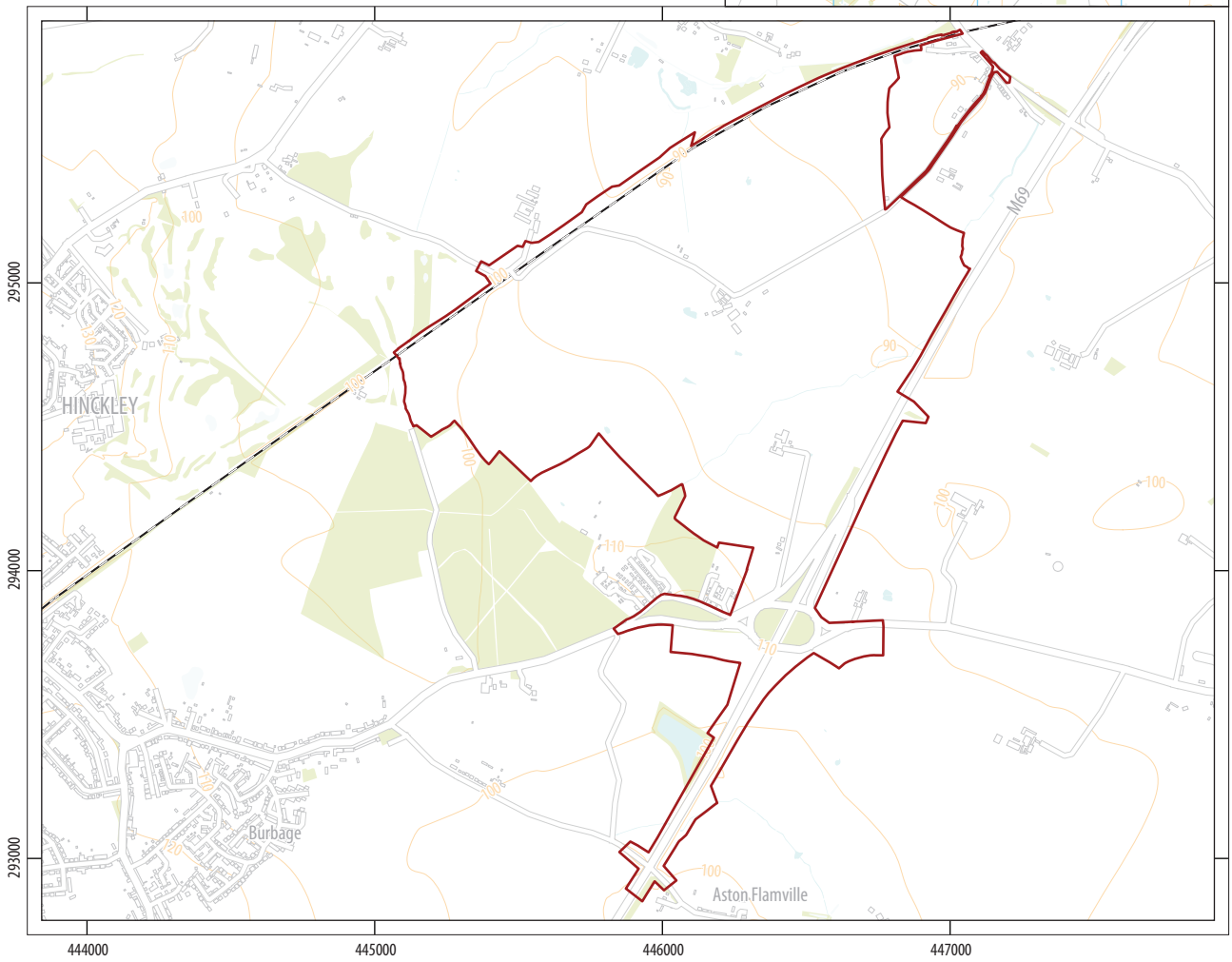
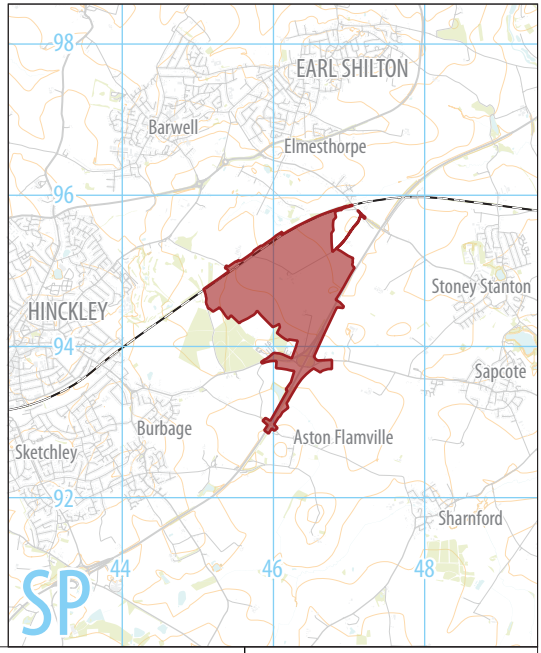
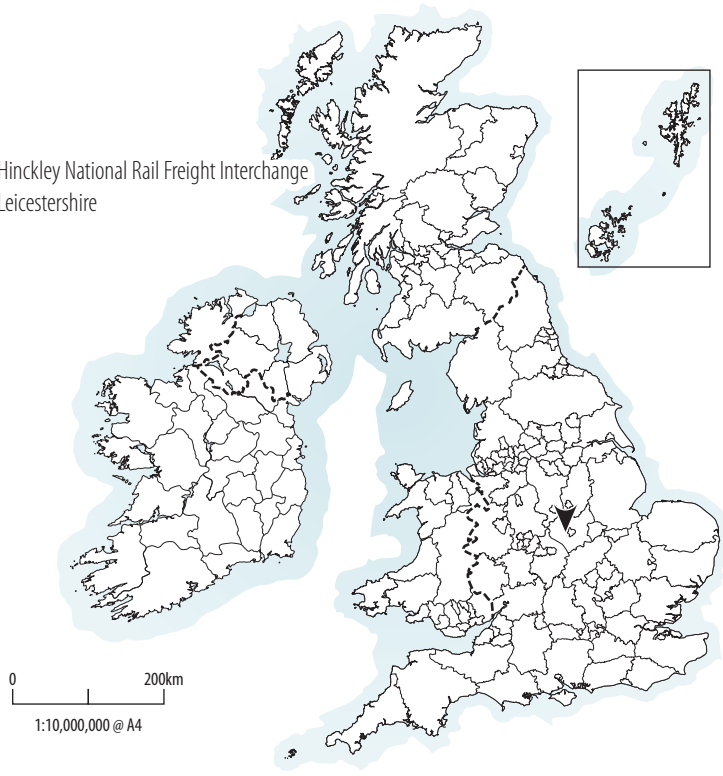
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Hinckley National Rail Freight Interchange
Leicestershire



development consent order boundary



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ILLUS 1 Site location

HINCKLEY NATIONAL RAIL FREIGHT INTERCHANGE, LEICESTERSHIRE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by EDP (the Consultant), on behalf of db symmetry (the Client) to undertake a geophysical (magnetometer) survey at Hinckley, Leicestershire, where a new strategic rail freight interchange (SRFI) is proposed. The survey will inform an Environmental Statement which will be submitted with a Development Consent Order (DCO) to the Planning Inspectorate to be examined on behalf of the Secretary of State for Transport.

The work was undertaken in accordance with the requirements of the National Policy Statement for National Networks (DfT 2014) a Written Scheme of Investigation for Geophysical Survey (Harrison 2018) and in line with current best practice (Chartered Institute for Archaeologists 2014, English Heritage 2008).

The survey was carried out between the 5th of March and 6th of April 2018.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The site lies 3km north-east of Hinckley in an area of mixed farmland to the north-west of M69 Junction 2 (see Illus 1). The Development Consent Order Boundary (DCOB) encompasses 48 fields (F1-F48) and three farms which are bounded to the north-west by the Nuneaton to Felixstowe railway, with the M69 motorway defining the south-eastern boundary. The the south-western boundary is defined by field boundaries beyond which are blocks of deciduous woodland, including Burbage Wood, Aston Firs and Freeholt Wood. The north-eastern boundary is also bounded by field boundaries beyond

which lies the village of Elmesthorpe, a linear settlement on the B581 Station Road (see Illus 6). An unnamed stream flows north-eastwards through the southern portion of the site.

Generally, the topography slopes from north to south at a height of between 85m Above Ordnance Datum (AOD) in the north to 110m AOD in the south, although there are a number of more localised undulations within this range.

At the time of the survey the majority of the fields to the north of the unnamed stream were under short wheat and rape crops with the exception of F13, F14, F17 and F18 which were under pasture. To the south of the unnamed stream the fields were mostly under pasture, although F45 contained rape (see Illus 2 – Illus 5). Access was not granted to F46 or F48.

1.2 GEOLOGY AND SOILS

The bedrock geology within the DCOB comprises mudstone of the Mercia Mudstone Group. The superficial deposits vary mostly between Bosworth Clay and Thrussington Member – diamicton (see Illus 7). Pockets of Wolston sand and gravel are recorded in the west, whilst alluvial deposits are recorded along the course of the unnamed stream in the southern portion of the site. No superficial deposits are recorded around Hobbs Hayes Farm (NERC 2018).

The soils are mainly classified in the Soilscape 18 association, characterised as slowly permeable, seasonally wet loams with the soils in the north-east of the DCOB being classified in the Soilscape 8 association, characterised as freely draining, slightly acid but base-rich soils (Cranfield University 2018).



ILLUS 2 F1, looking south-west

2 ARCHAEOLOGICAL BACKGROUND

Little is known with regards the archaeological potential of the DCOB. A single undated ditch cropmark is recorded on the Leicestershire Historic Environment Record (HER) within the north of the site (see Illus 7). Other than an upstanding barn at Hobbs Hayes Farm, no further heritage assets are known within the DCOB.

Analysis of historical Ordnance Survey (OS) mapping indicates that the pattern and division of land within the DCOB has remained largely unchanged since the publication of the first edition OS map in 1888 (see Illus 7) albeit with the occasional removal of boundaries to create larger fields.

3 AIMS, METHODOLOGY AND PRESENTATION

The general aim of the geophysical survey was to provide sufficient information to establish the presence/absence, character and extent of any archaeological remains within the survey area. This will therefore enable an assessment to be made of the impact of the proposed development on any sub-surface archaeological remains, if present.

The specific archaeological objectives of the geophysical survey were:

- › to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- › to therefore model the presence/absence and extent of any buried archaeological features; and
- › to prepare a report summarising the results of the survey.

3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. A feature such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney & Gater 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system was programmed to take readings at a frequency of 10Hz (allowing for a 10–15cm sample interval) on roaming traverses (swaths) 4m apart. These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS)



ILLUS 3 F25, looking north-west **ILLUS 4** F38, looking south-east **ILLUS 5** F45, looking south-east

outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software was used to collect and export the data. Terrasurveyor V3.0.32.4 (DWConsulting) software was used to process and present the data.

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:25,000. Illus 2–5 are site condition photographs. Illus 6 is a 1:10,000 survey location plan showing the direction of survey as GPS swaths. Illus 7 shows the cropmark and geology data (NERC 2018) overlying the 1888-1913 six inch OS map, also at 1:10,000. Detailed data plots of the fully processed data, with accompanying interpretative plots are produced, also at 1:10,000, as Illus 8 and Illus 9. Large-scale, fully

processed (greyscale) data, minimally processed data (XY traceplot) and accompanying interpretative plots are presented at a scale of 1:2,000 in Illus 10–36 inclusive with more detailed plots (1:1,000) of the area of archaeological activity (AAA) shown in Illus 37 to Illus 39 inclusive.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. Data processing details are presented in Appendix 4. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 5.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Harrison 2018), guidelines

outlined by Historic England (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations from Ordnance Survey mapping are reproduced with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

4 RESULTS AND DISCUSSION

Generally, the ground conditions were good although soft conditions impeded progress in places. However, this has not impacted adversely on the quality of data collected which is of a high standard throughout.

The magnetic background differs clearly throughout the DCOB, from a relatively uniform background within F13, F14, F15 (south), F17, F18, F29–F31, F34, F36, F37–F44 and F47 to a highly elevated and speckled magnetic background elsewhere. This elevated background is characteristic of the recent application of green waste as soil conditioner. Against these backgrounds numerous, linear and discrete anomalies have been identified and these are discussed below and cross-referenced to specific examples on the interpretive figures, where appropriate.

4.1 FERROUS ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris is common on most sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious clustering to these ferrous anomalies which might indicate an archaeological origin. Across those fields unaffected by green waste it is probable that the 'spike' responses are likely caused by the random distribution of ferrous debris in the upper soil horizons.

Extensive areas of high magnitude magnetic responses are recorded over 75% of the DCOB. These responses are characteristic of green waste which has been spread and mixed into the topsoil as soil conditioner. The response is not fully understood but is thought to be caused by the presence of magnetic compounds in the soil created during decomposition processes, and also by frequent ferrous contaminants within the waste material. Against this background it may not be possible to clearly distinguish any low magnitude anomalies of archaeological potential, if present, within the affected area. Whilst high magnitude anomalies have been identified against the elevated background such as the ploughing trends within F19 (see Illus 10–12) and the broad, amorphous geological anomalies within F22/F24/F26 (see Illus 13–15) it is possible that low magnitude archaeological anomalies, if present, may be masked against this background.

Localised areas of magnetic disturbance within F1 (FP1; see Illus 16–18), F25 (FP2 and FP3; see Illus 19–21) and F26 (FP4; see Illus 13–15) locate former ponds. The disturbance is due to magnetic material within the material used to infill the former ponds.

The magnetic disturbance dominating F29 (see Illus 22–24) is less uniform than that caused by green waste and is thought to be caused by modern dumping/tipping, perhaps being associated with the construction of the adjacent M69 and/or overpass.

A single high magnitude dipolar linear anomaly (SP1; Illus 31–33) has been identified aligned north-east/south-west in the north-west of F45. The anomaly locates a buried service pipe.

Areas of disturbance around the perimeter of the survey areas and along the field edges is due to ferrous material within the adjacent boundaries.

4.2 AGRICULTURAL ANOMALIES

Analysis of historical Ordnance Survey (OS) mapping indicates that the pattern and division of land within the DCOB has remained largely unchanged since the publication of the first edition OS map in 1888 albeit with the occasional removal of boundaries to create larger fields. Seven of these former boundaries have been detected by the survey as high magnitude linear anomalies (FB1–FB7). The anomalies are caused by the contrast between the soil-fill of a ditch and the surrounding soils. A curvilinear anomaly (FT; see Illus 16–18) within F1 corresponds to a former farm track which is depicted on modern OS maps.

Broadly-spaced linear anomalies are recorded within F1 and F17–F19 (Illus 10–12). These anomalies are due to the medieval and post-medieval practice of ridge and furrow cultivation with the striped appearance being due to the magnetic contrast between former ridges and the soil-filled furrows.

More closely-spaced linear trend anomalies across F17, F18 and in the fields surrounding Hobbs Hayes Farm are typical of recent ploughing. Other linear anomalies, often speckled in appearance, and oblique to the surrounding field boundaries are likely to locate field drains.

It is notable that former field boundaries, ridge and furrow, modern ploughing and field drains have been identified within most of the fields affected by the green waste, demonstrating that some soil-filled features can be detected against this background. On this basis, it is thought likely that any extensive areas of enclosed settlement, if present, would have been detected, at least in part, by the geophysical survey. However, no agricultural anomalies have been detected within the extremely variable backgrounds in F12, F16, F24 and F26. In these fields it is considered unlikely that any anomalies of archaeological potential, if present, would manifest in the data.

4.3 GEOLOGICAL ANOMALIES

Broad and amorphous high magnitude anomalies are clearly discernible against the elevated magnetic backgrounds in F22, F24

and F26. These anomalies are thought to be geological in origin, perhaps locating isolated deposits of sand and/or gravel.

Across those fields unaffected by green waste, numerous discrete areas of magnetic enhancement are thought to be due to localised variations in the depth and composition of the soils.

4.4 ARCHAEOLOGICAL AND POSSIBLE ARCHAEOLOGICAL ANOMALIES

An isolated ring-ditch is identified in F38, immediately west of Hobbs Hayes Farm, centred at SP 4635 9446 (RD1; see Illus 37–39). The ring-ditch measures 20m in diameter and probably locates a round barrow. Discrete areas of magnetic enhancement in the interior of the ring-ditch and to the immediate north-west, may be due to pits.

No anomalies of archaeological potential have been identified to confirm the undated ditch cropmark (MLE68) which is recorded on the Leicestershire HER in F23/25. The cropmark is recorded in a field affected by the application of green waste and, if it is caused by a soil-filled feature, it is unclear whether it would manifest as a magnetic anomaly under these conditions.

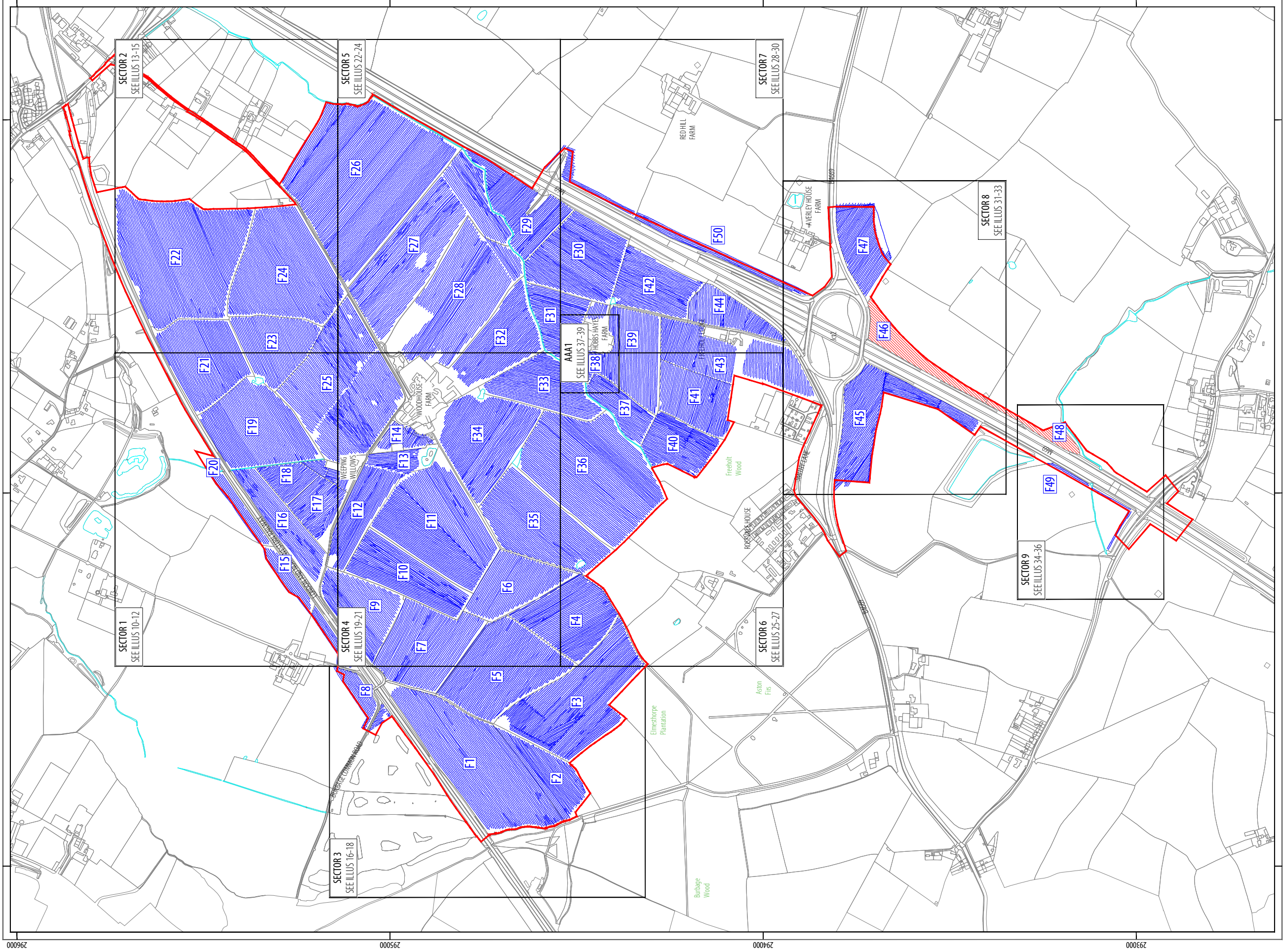
5 CONCLUSION

Evaluation of the proposed development area has been notably affected by the extensive application of green waste as soil conditioner over 75% of the site. This has resulted in a widespread elevated magnetic background against which any low magnitude anomalies of archaeological potential, if present, may be masked. For this reason, the archaeological potential over the affected fields remains uncertain although it is thought that any extensive areas of enclosed settlement, if present, would have been detected, at least in part, over the majority of the geophysical survey area. A single localised ring-ditch has been identified at Hobbs Hayes Farm in

an area unaffected by green waste. This anomaly is ascribed high archaeological potential and probably locates a round barrow. No further anomalies of archaeological potential have been identified over the 25% of fields where green waste has not been applied and, in these fields, the archaeological potential is assessed as low.

6 REFERENCES

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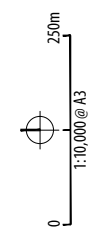
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- ▬▬▬ GPS swaths
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- ▨ no access

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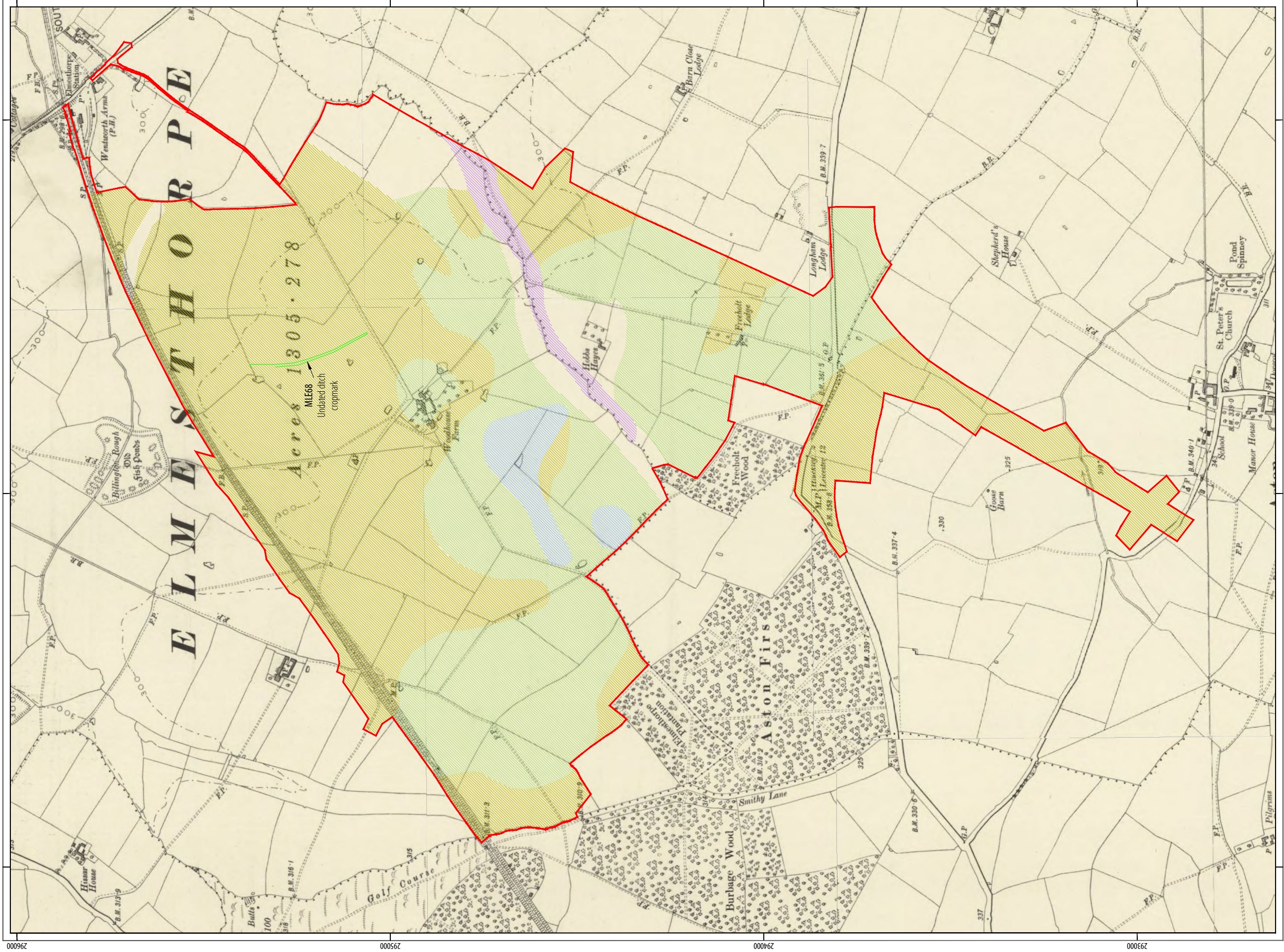


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 Interchange
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 db symmetry



ILLUS 6 Survey location showing GPS swaths

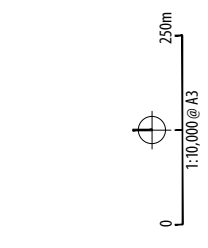


- development consent order boundary
- Leicestershire HER data

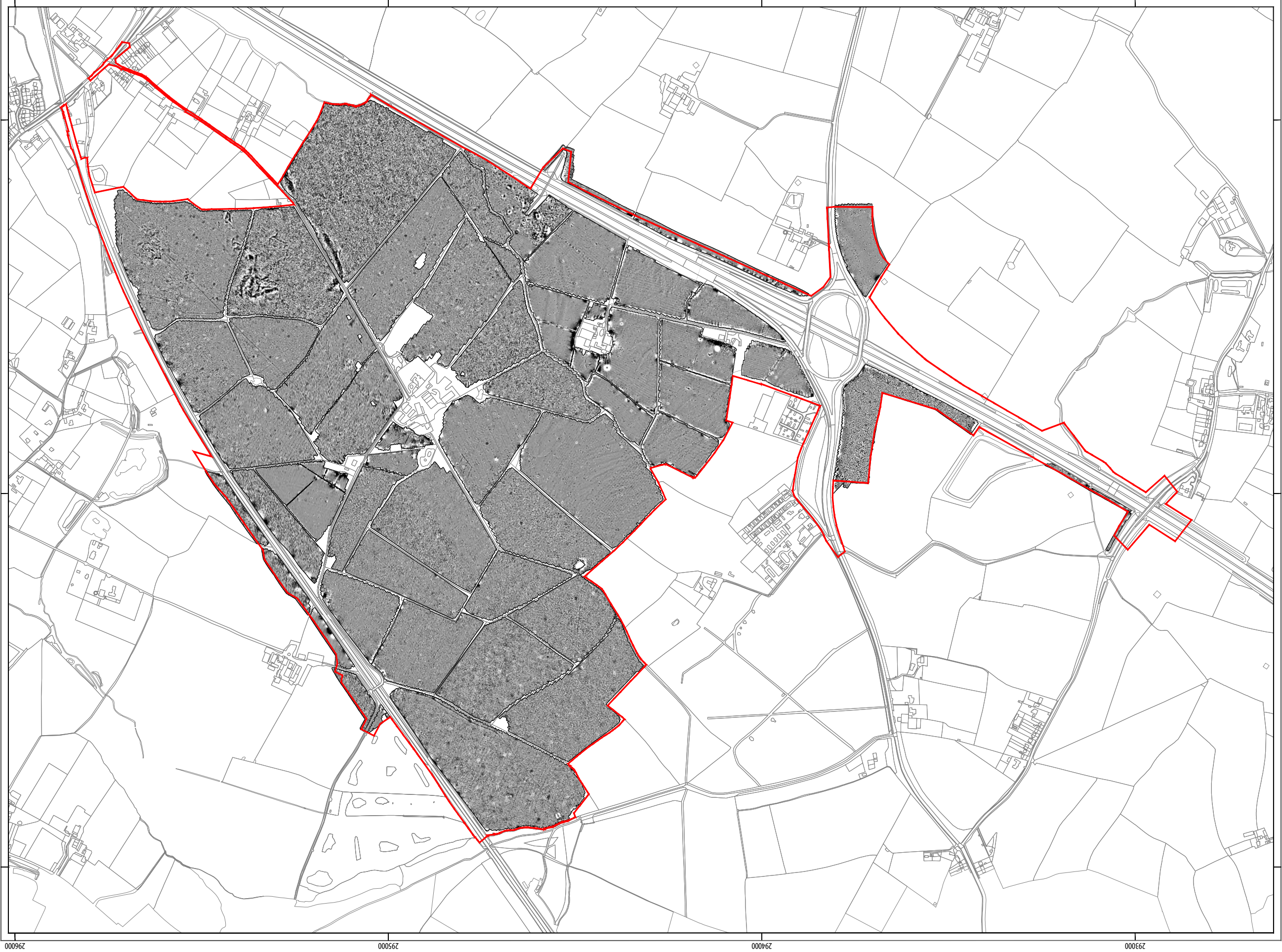
- SUPERFICIAL DEPOSITS**
- Bosworth Clay Member - clay and silt
- Thrusington Member - diamicton
- Wolston Sand and Gravel - sand and gravel
- Alluvium - clay, silt, sand and gravel

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ILLUS 7 Survey location showing cropmark and superficial deposits overlying the 1888-1913 six inch OS map

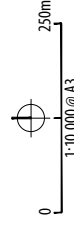


□ development consent order boundary



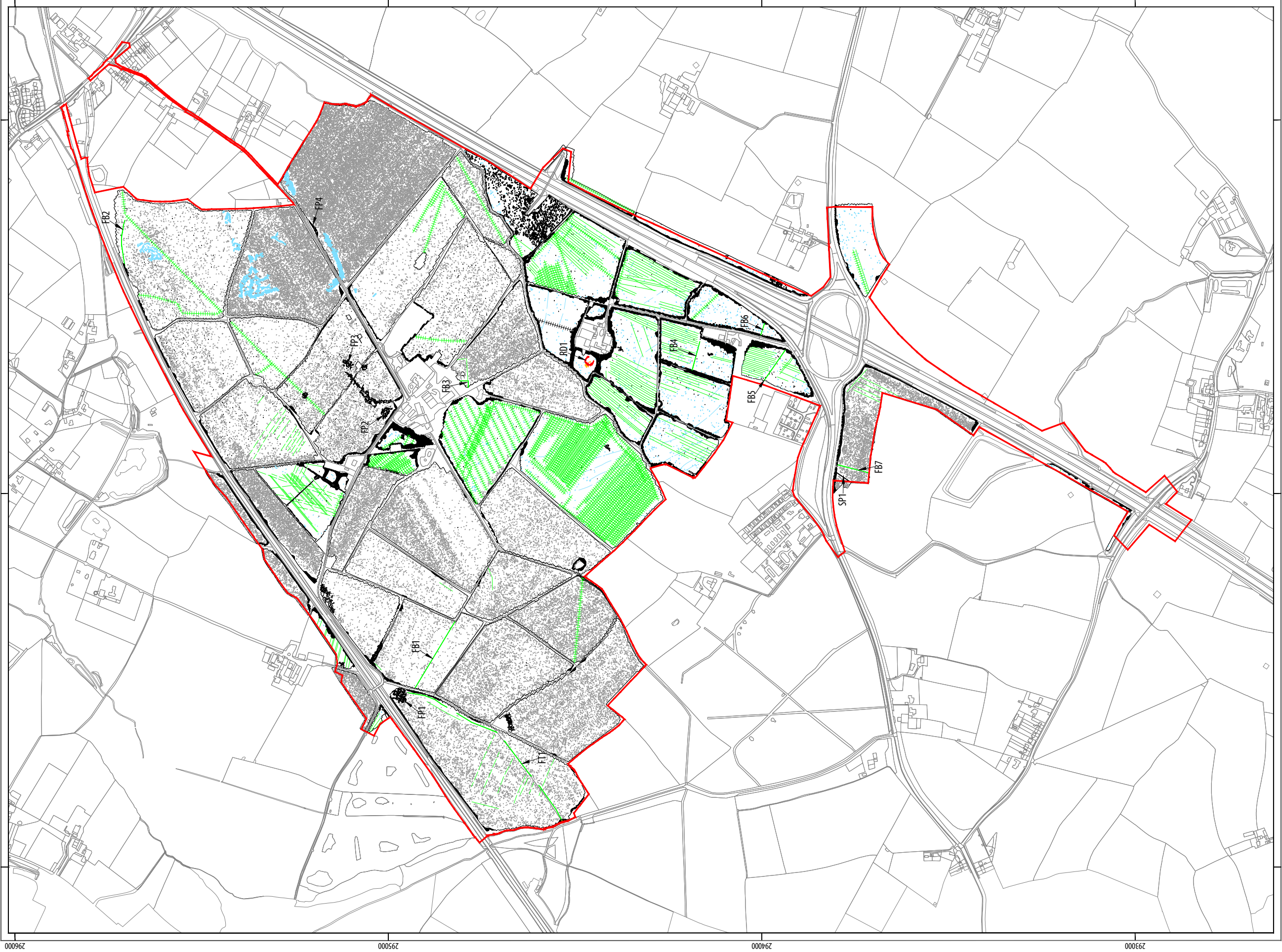
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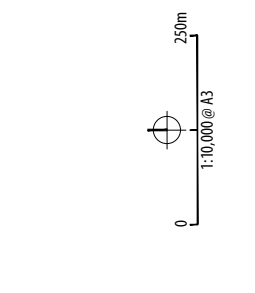


TYPE OF ANOMALY	INTERPRETATION
• dipolar isolated	ferrous material
• magnetic disturbance	ferrous material
— dipolar linear	service pipe
— dipolar linear	fence
○ magnetic disturbance	green waste
— linear trend	agricultural

TYPE OF ANOMALY	INTERPRETATION
— linear trend	ridge and furrow
— linear trend	field drain
— linear	former field boundary
— linear	farm track
— linear trend	geological variation
— magnetic enhancement	geology

TYPE OF ANOMALY	INTERPRETATION
○ magnetic enhancement	archaeology?
○ magnetic enhancement	archaeology

ABBREVIATIONS
FT farm track
FB former boundary
FP former pond
RD ring-ditch
SP service pipe

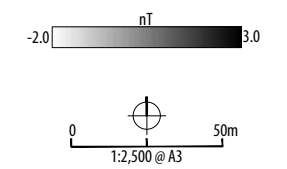
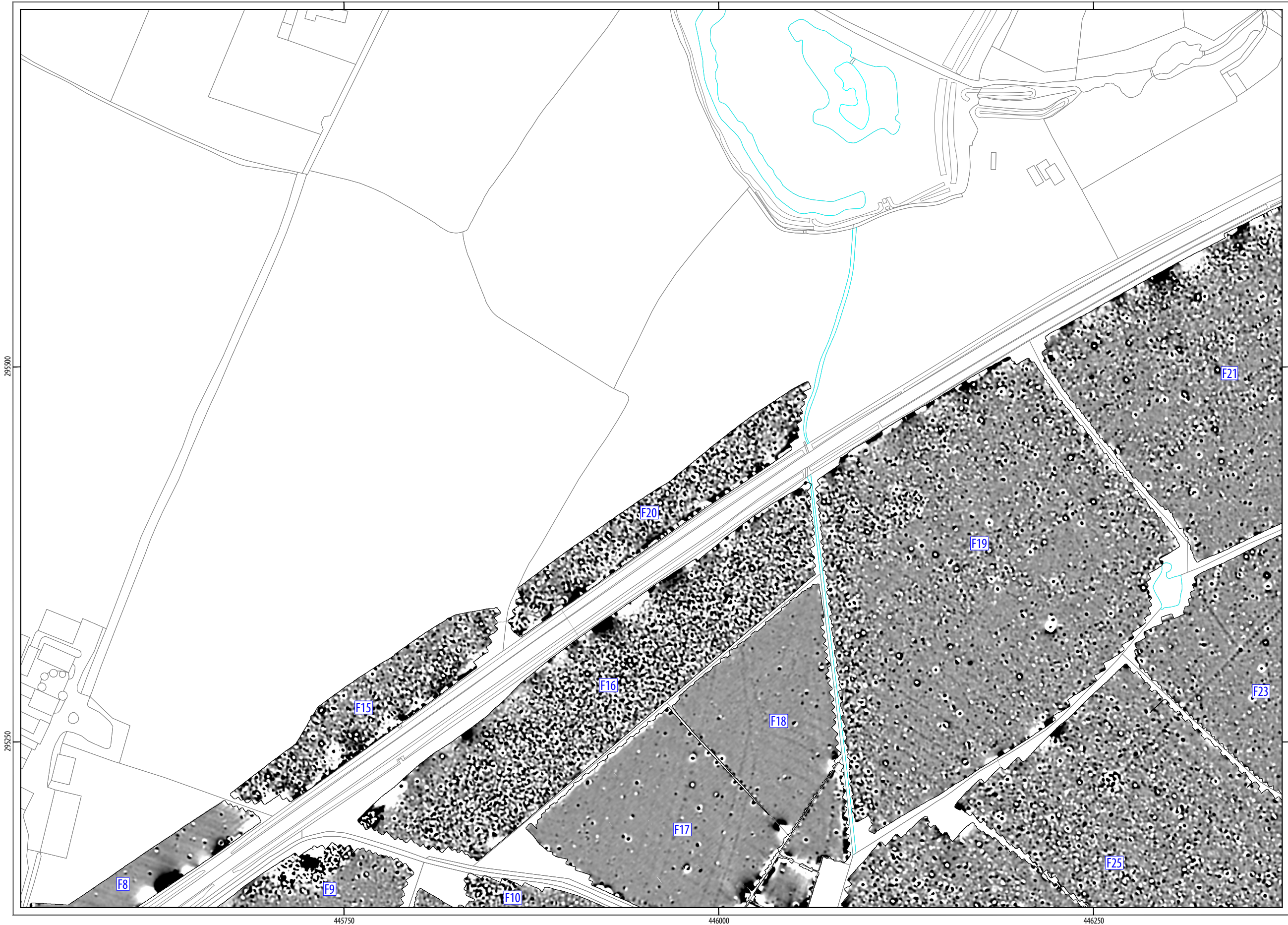


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ILLUS 9 Interpretation of magnetometer data

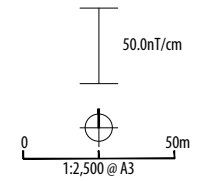
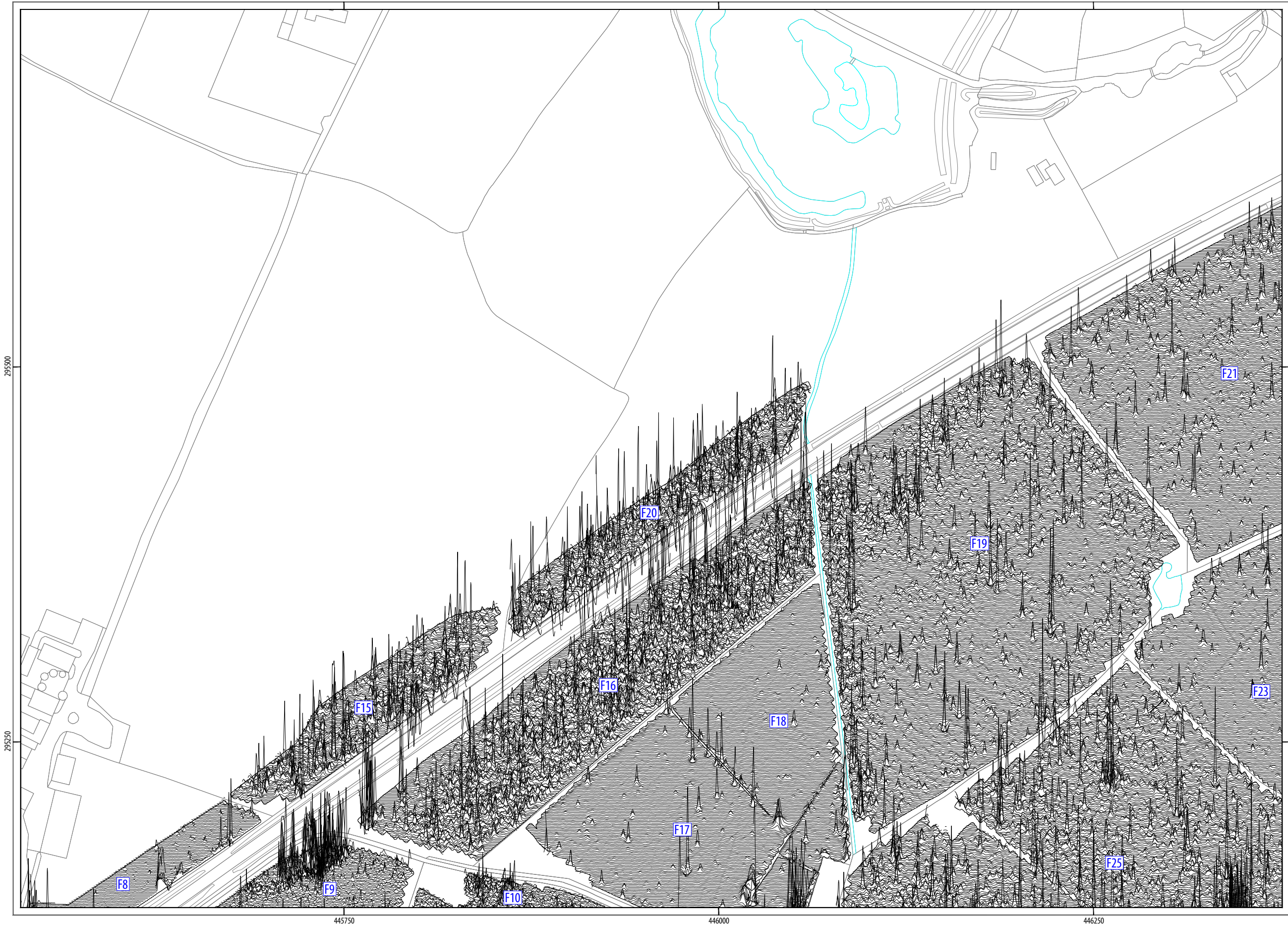


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ILLUS 10 Processed greyscale magnetometer data; Sector 1



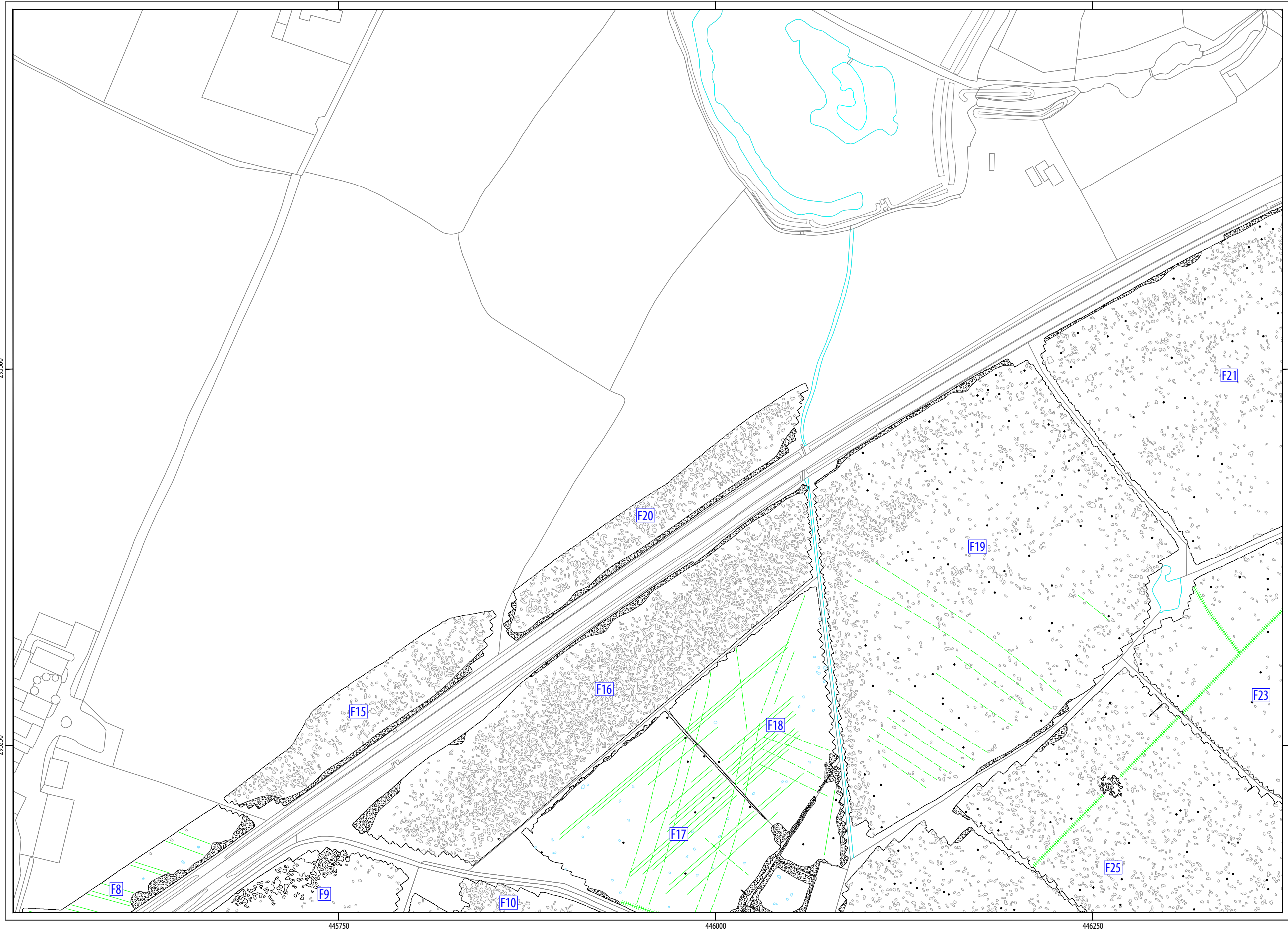
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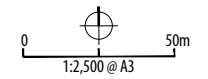


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ILLUS 11 XY trace plot of minimally processed magnetometer data; Sector 1



TYPE OF ANOMALY	INTERPRETATION
• dipolar isolated	ferrous material
● magnetic disturbance	ferrous material
○ magnetic disturbance	green waste
— linear trend	ridge and furrow
— linear trend	agricultural
— linear trend	field drain
⊕ magnetic enhancement	geology

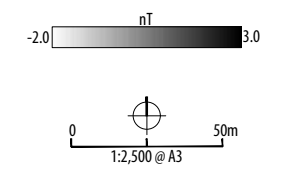
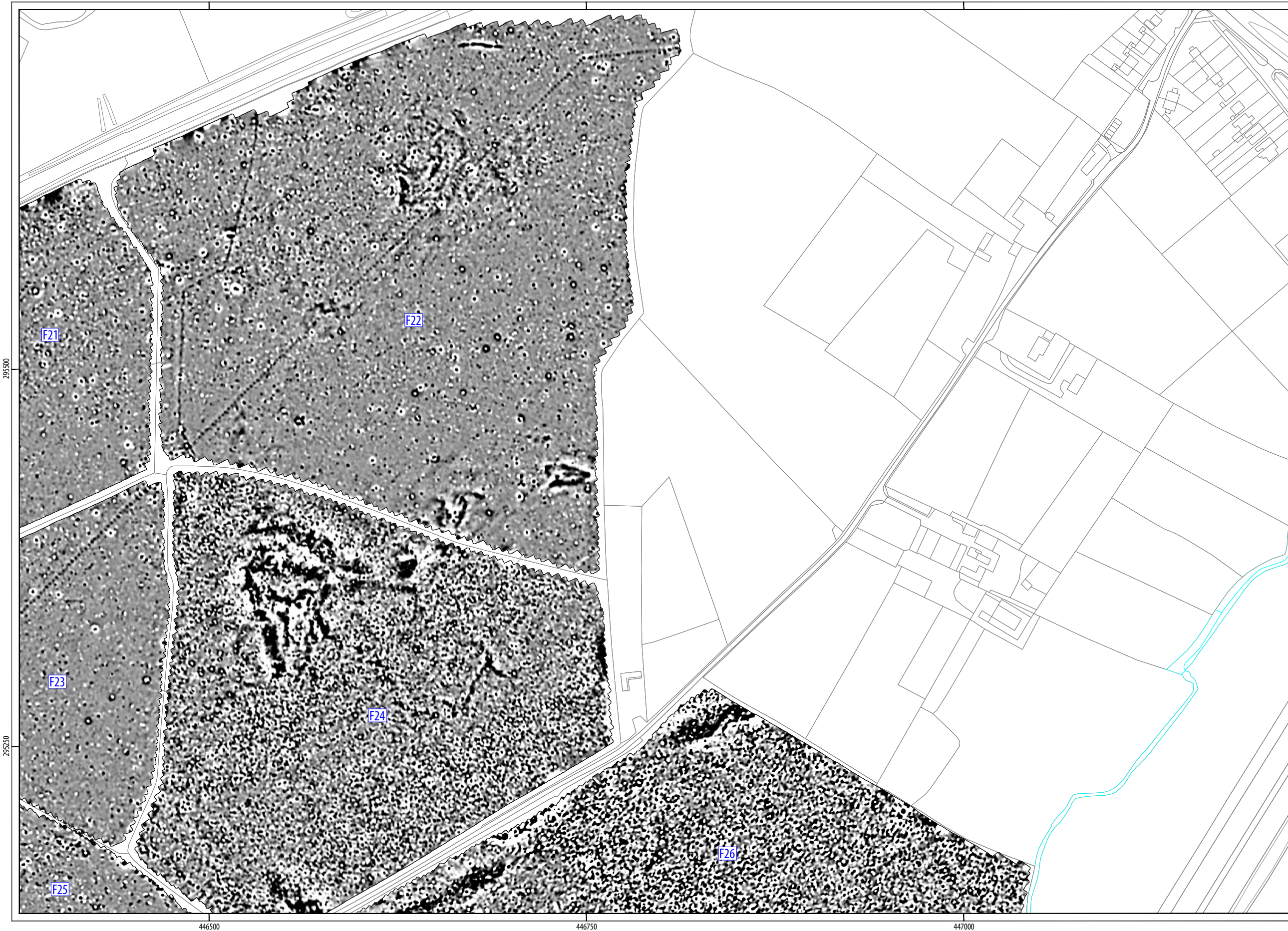


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ILLUS 11 XY trace plot of minimally processed magnetometer data; Sector 1

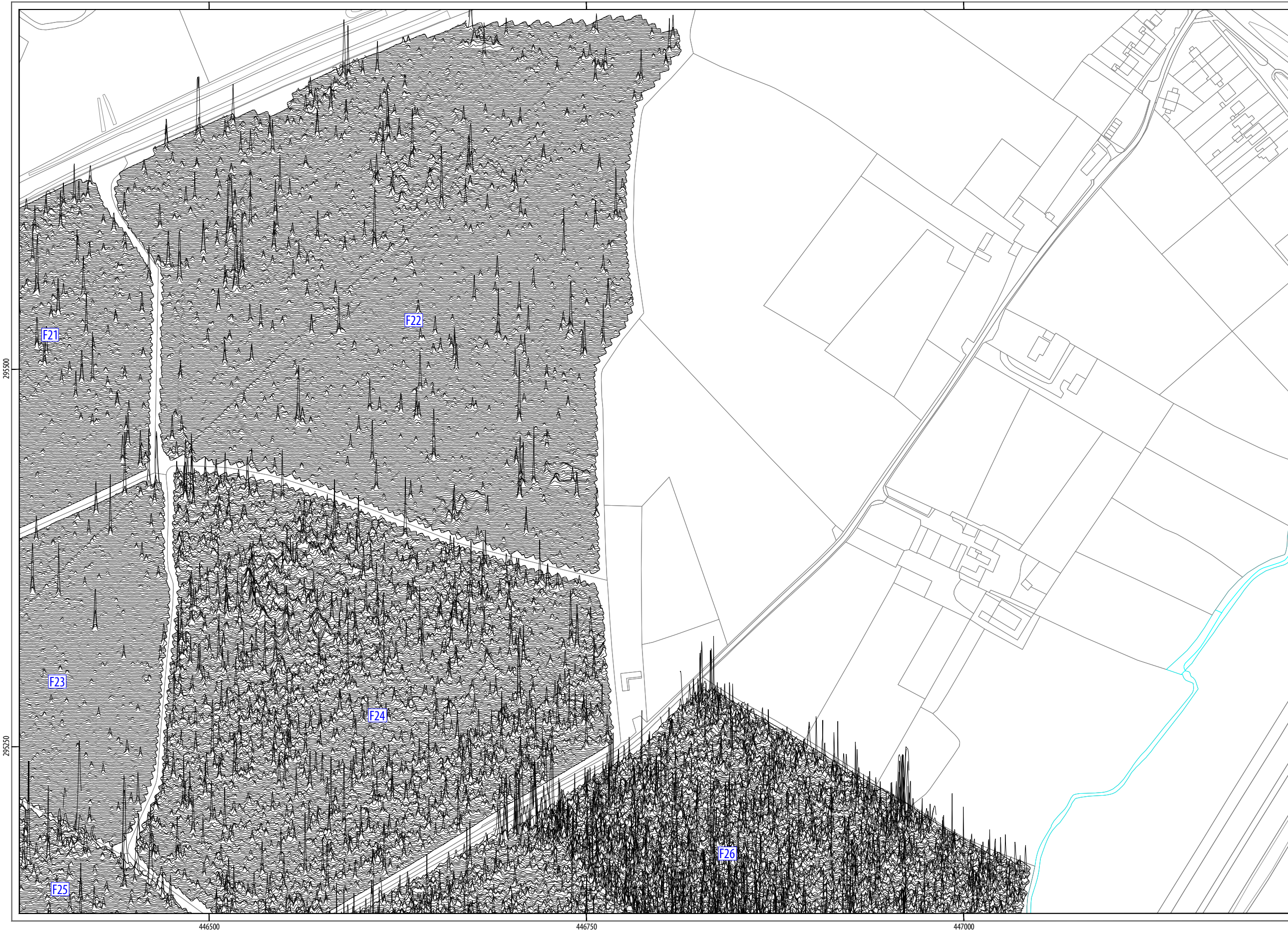


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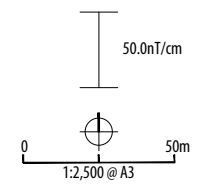
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295250

446500

446750

447000



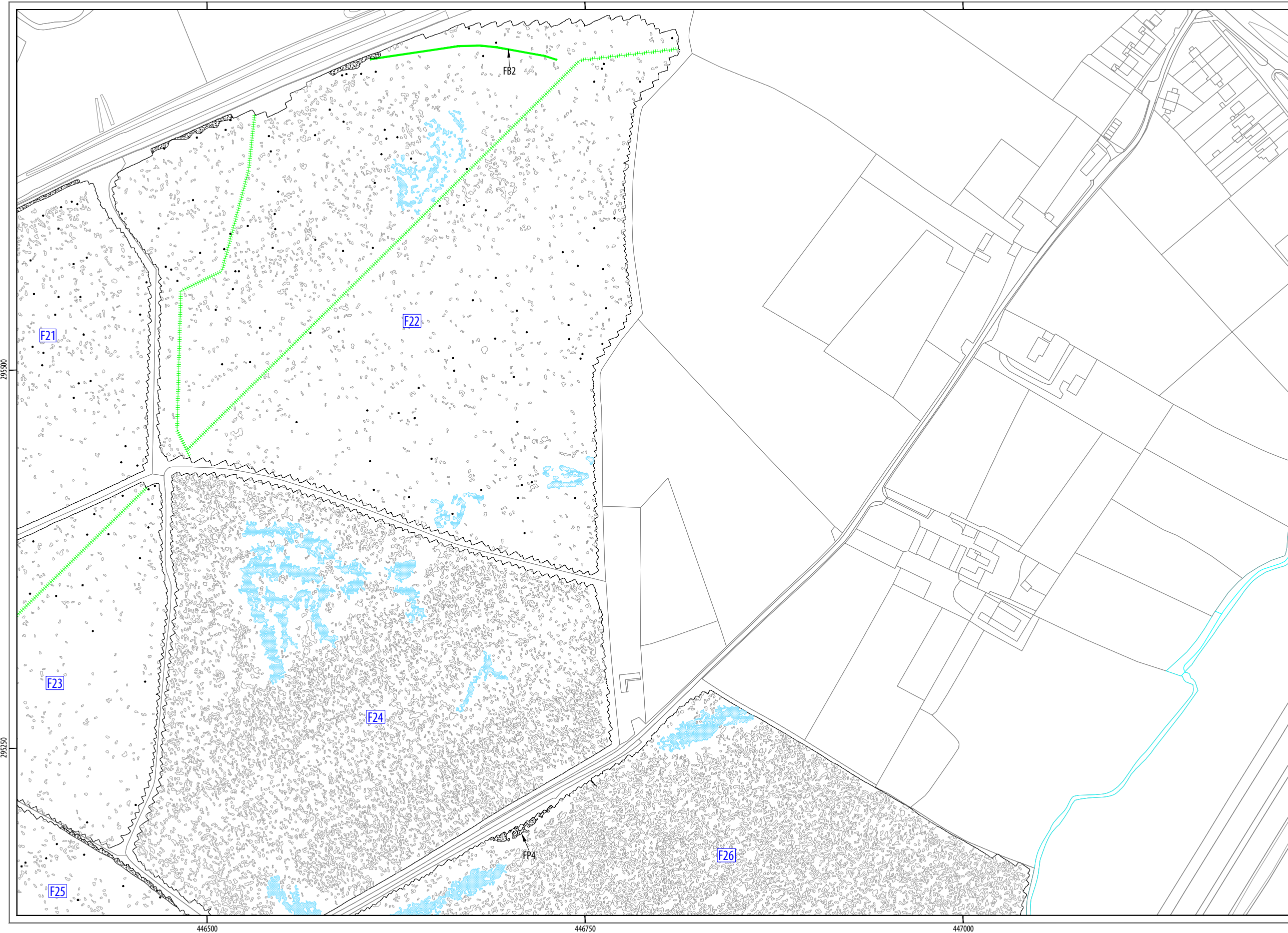
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HEADLAND
ARCHAEOLOGY

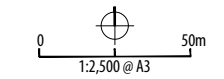
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ILLUS 14 XY trace plot of minimally processed magnetometer data; Sector 2



TYPE OF ANOMALY	INTERPRETATION
• dipolar isolated	ferrous material
● magnetic disturbance	ferrous material
○ magnetic disturbance	green waste
— linear trend	field drain
— linear	former field boundary
⊕ magnetic enhancement	geology

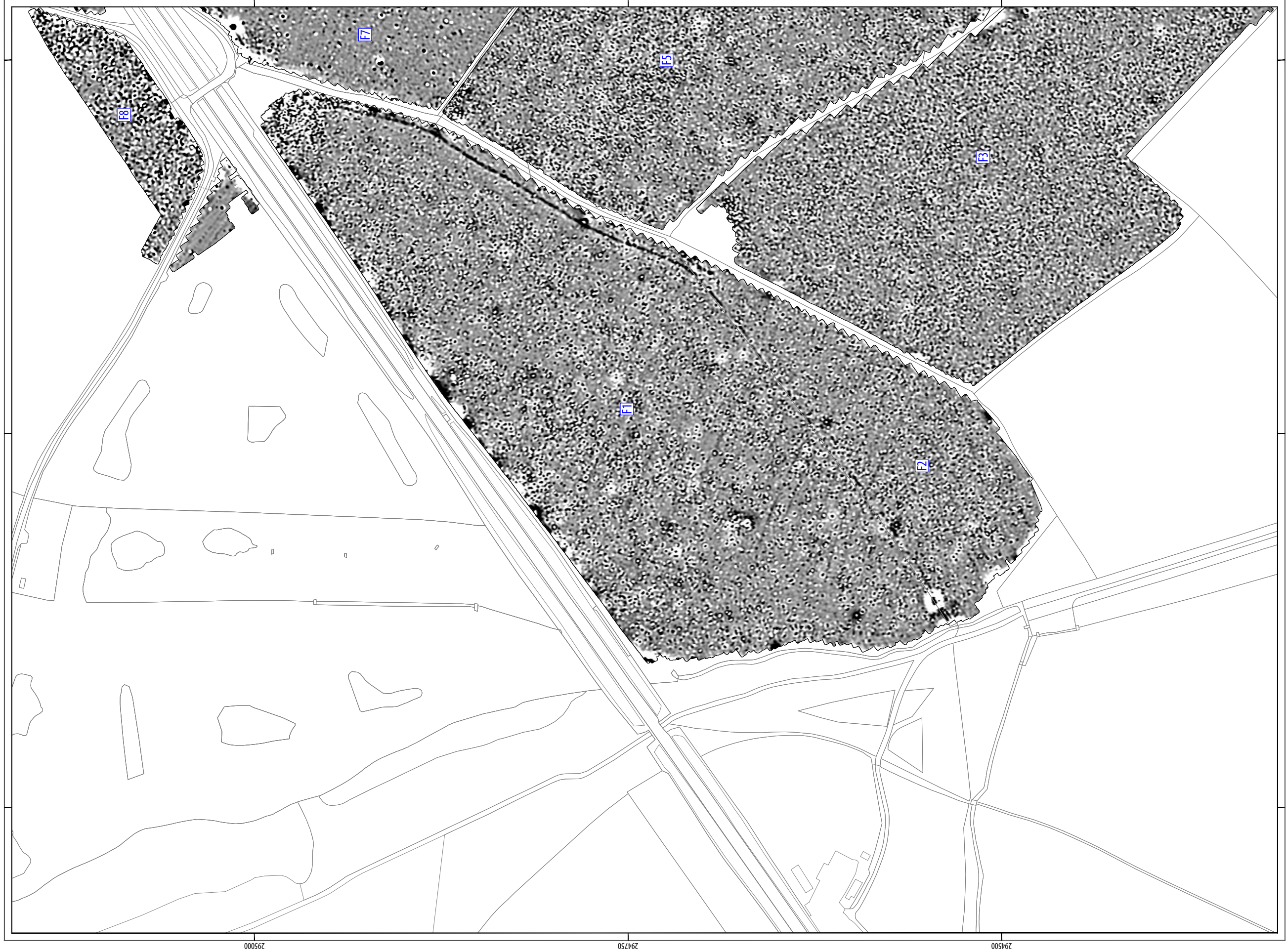
ABBREVIATIONS
 FB former boundary
 FP former pond



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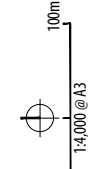
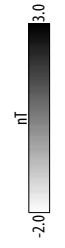


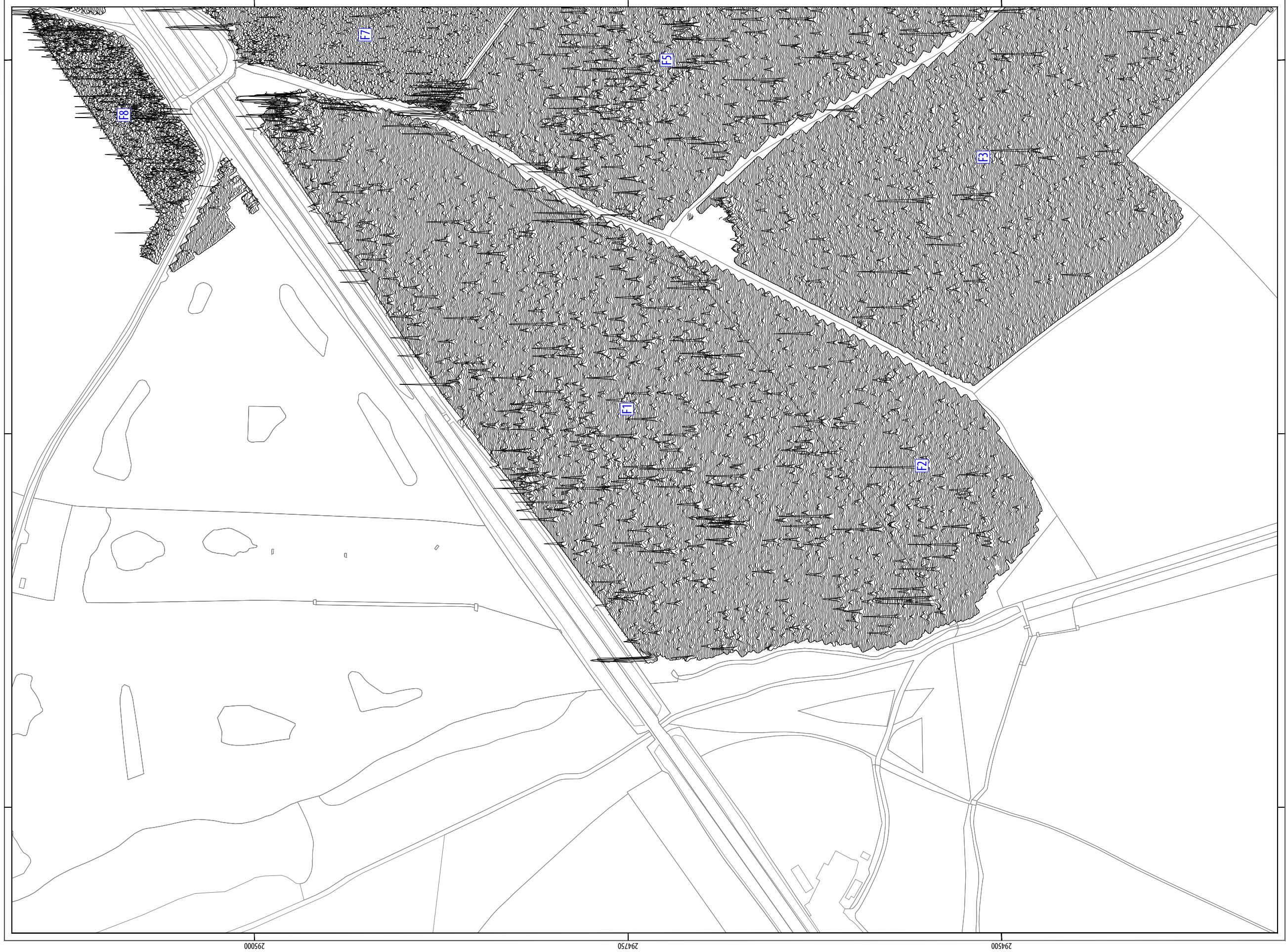
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WRNS/01
Land off Welsh Road West
Southam
Warwickshire

CLIENT
Barwood Development
Securities Ltd





445500

445250

445000

50.0m/cm

PROJECT

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Leicestershire
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1:4,000 @ A3

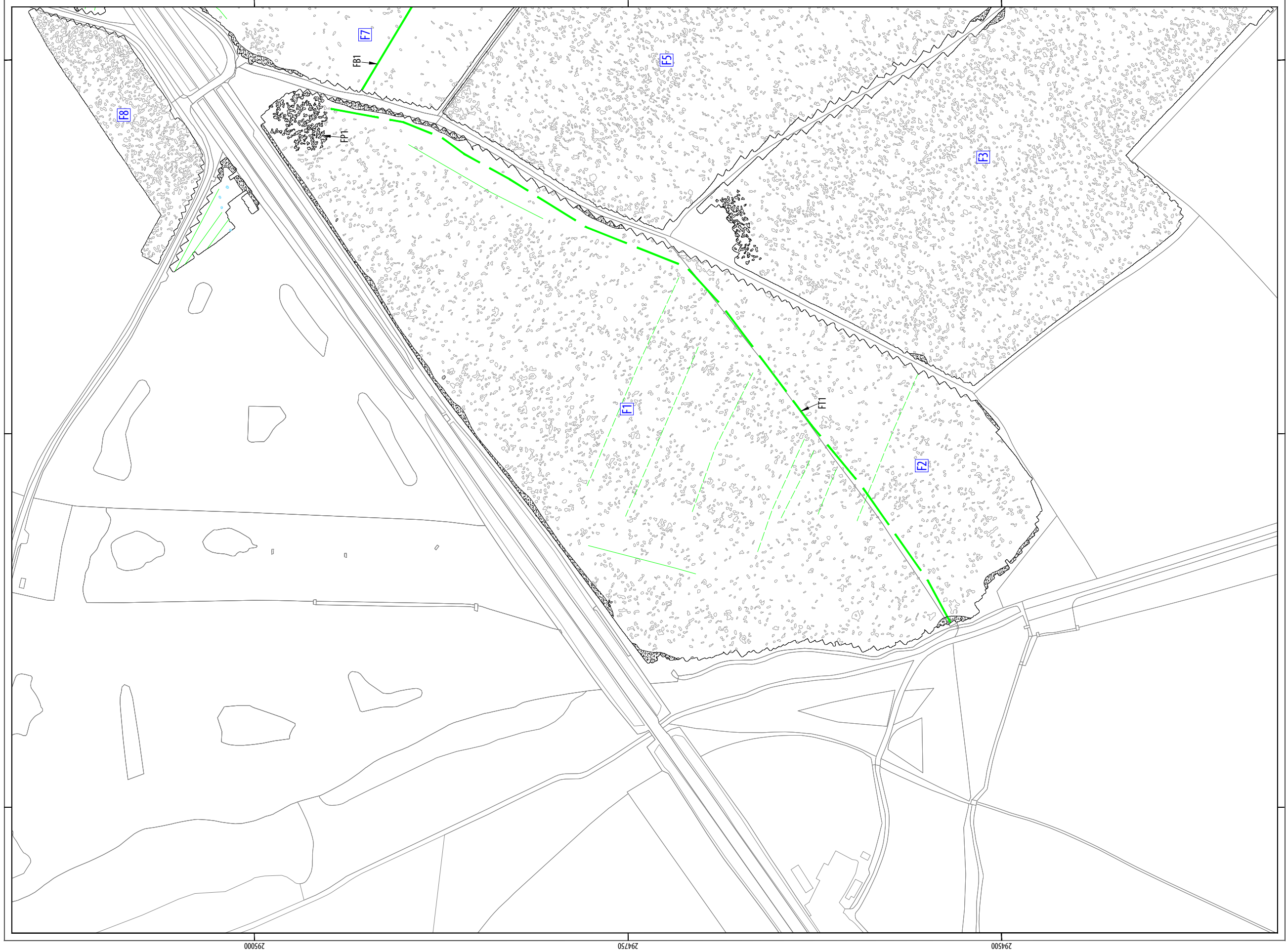
0 100m

NOR



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ARCHAEOLOGY**

ILLUS 17 XY trace plot of minimally processed magnetometer data; Sector 3

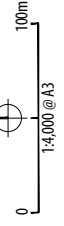


445000 445250 445500

294500 294750 295000

TYPE OF ANOMALY	INTERPRETATION
•	ferrous material
●	ferrous material
—	ridge and furrow
—	agricultural
—	former field boundary
—	geology

ABBREVIATIONS	
FT	farm track
FB	former boundary
FP	former pond



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