

CWCH/01



LAND AT WHITEHOUSE FARM CHICHESTER, WEST SUSSEX

GEOPHYSICAL SURVEY

commissioned by The Environmental Dimension Partnership
on behalf of Linden Homes and Miller Strategic Land

January 2016

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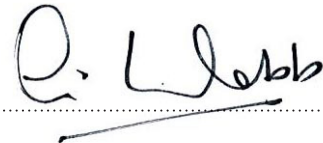
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ARCHAEOLOGY**

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PROJECT SUMMARY

Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 100 hectares of agricultural land on the north-western periphery of Chichester to provide information about the archaeological potential of land proposed for predominantly residential development. An area of definite archaeological potential has been identified to the immediate south of Whitehouse Farm characterised by a complex of interlinking ditched enclosures either side of a trackway, and being suggestive of Romano-British activity. At the periphery of the complex, an area of possible industrial activity is suggested. In addition, the survey has identified a ditch which is probably part of the Chichester Entrenchments – a system of late Iron Age defensive earthworks which are recorded as a Scheduled Ancient Monument (Ref. 1005856). Elsewhere, few anomalies of archaeological potential have been identified with the vast majority of anomalies being due to localised variations in the soils and superficial deposits. There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions within the proposed development area. Therefore, based on the results and interpretation of the data, the archaeological potential across the majority of the site is considered to be low, with a high archaeological potential ascribed to the field immediately west of Whitehouse Farm.

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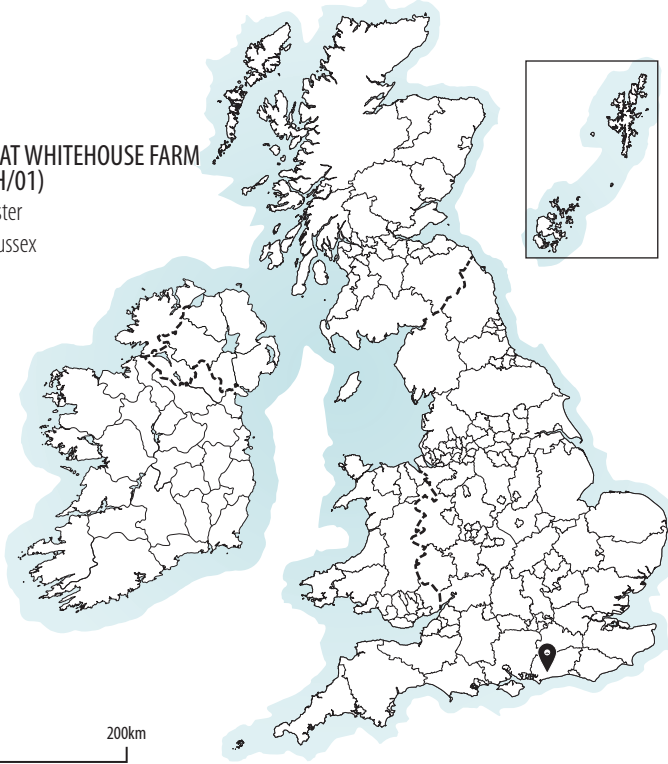
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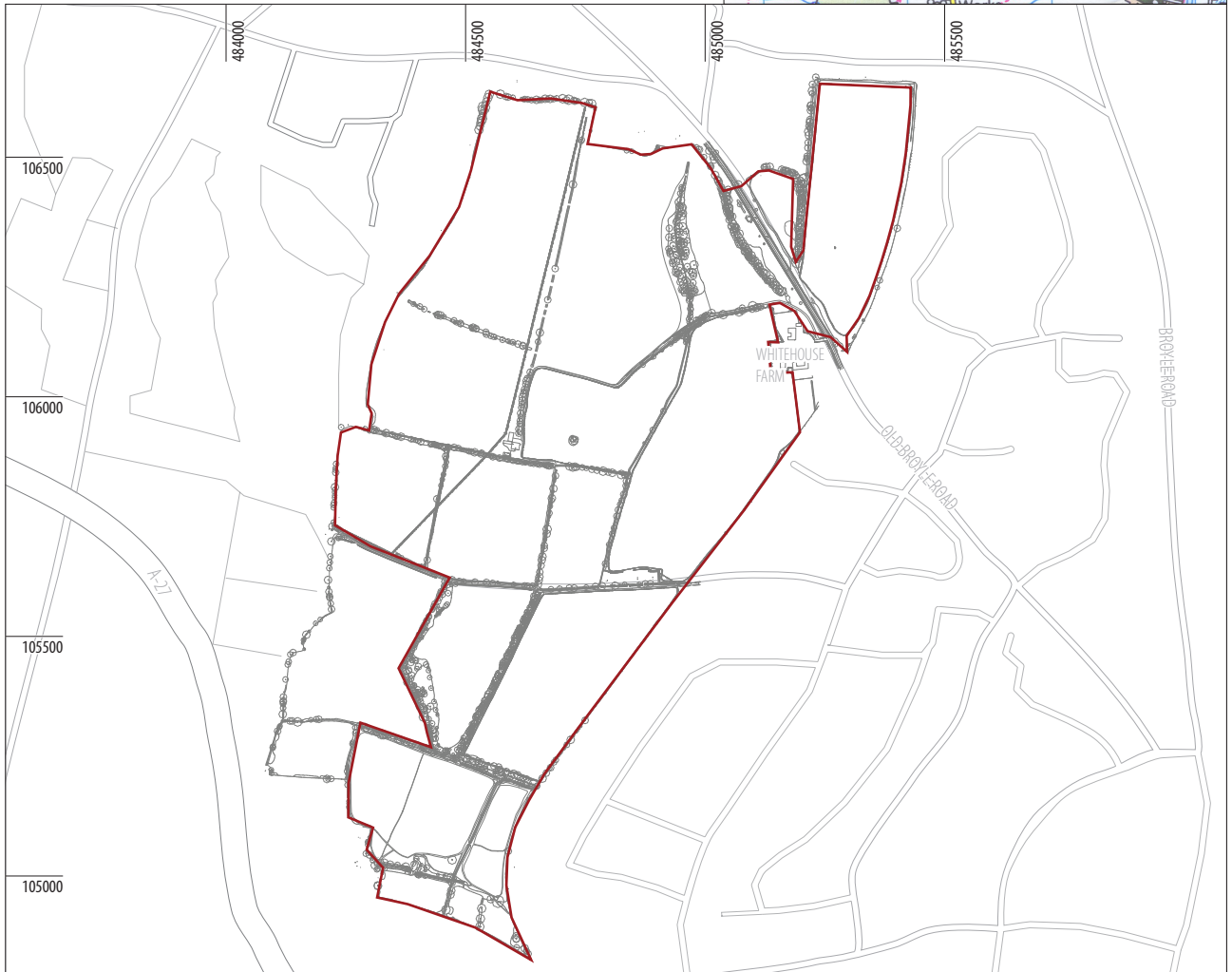
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LAND AT WHITEHOUSE FARM
(CWCH/01)
Chichester
West Sussex



0 200km



KEY
 geophysical survey boundary

0 1,000m

scale 1:15,000 @ A4



NORTH

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ILLUS 1 Site location (1:15,000)

LAND AT WHITEHOUSE FARM CHICHESTER, WEST SUSSEX

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by The Environmental Dimension Partnership (The Consultant) on behalf of Linden Homes and Miller Strategic Land (The Clients) to undertake a geophysical (magnetometer) survey on land which is proposed for residential development to the north-west of Chichester, West Sussex. The work was undertaken in accordance with a Written Scheme of Investigation (Headland Archaeology 2015) with guidance within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (David et al. 2008). The survey was carried out between September 14th and October 8th 2015 in order to provide additional information on the archaeological potential of the site.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The geophysical survey area comprises nineteen fields (F01-F19) within an irregularly-shaped parcel of land on the north-western periphery of Chichester, centred at NGR SU 8470, 0570 (see **ILLUS 1**). The site is bound to the east by Centurion Way (formerly the route of the Chichester to Midhurst Railway), to the south by the West Coastway Railway, to the west by a minor watercourse running along Upper Rouse Copse and, for the most part, the B2178 Old Broyle Road in the north. However, the survey area extends to a small parcel of land located north of the B2178 and extending to Brandy Hole Lane, which is a minor road that runs east-west from the A286 Midhurst Road.

The site is generally located on a south-facing gradient being at 32m above Ordnance Datum (aOD) in the north and 7m aOD in the south. Locally, the topography slopes towards two shallow valleys which are occupied by minor watercourses running from north to south towards Chichester Harbour (see **ILLUS 9**).

At the time of the survey the largest of the fields contained recently harvested cereal crops, with F04, F05, F10, F13 and F17–F19 being either fallow or under rough pasture (see **ILLUS 2–ILLUS 7** inclusive).

1.2 GEOLOGY AND SOILS

The solid geology consists of London Clay Formation (clay, silt and sand) in the south and Lambeth Group (clay, silt and sand) in the north. These are overlain by superficial deposits of Head (gravel, sand, silt and clay) which have accumulated between the foot of the chalk escarpment of the South Downs, to the north, and the coastal plain, to the south. Pockets of River Terrace deposits are recorded in the centre and north of the site (See **ILLUS 9**; British Geological Survey 2015).

The soils in the north of the survey area are classified in the Soilscape 6 association, being characterised as freely draining, slightly acidic loams and Soilscape 22 in the south of the survey area, characterised as loams with a naturally high groundwater (LandIS 2015).

2 ARCHAEOLOGICAL BACKGROUND

An Archaeological and Heritage Assessment (EDP 2014) has identified two designated heritage assets within the overall proposed development area, including a Scheduled Ancient Monument (SAM) and a Grade II listed building. The scheduled monument relates to a north/south section of the Chichester Entrenchments (Late Iron Age defensive features), which comprise a bank and ditch along the east side of Broyle Copse and extending south towards the B2178, Old Broyle Road (Ref 1005856). Several scheduled monuments are recorded within the wider landscape including Fishbourne Roman Palace (Ref 1005829), located 370m south-west of the PDA and Chichester City Walls, 900m to the south-east (see **ILLUS 10**).

Several undesignated heritage assets are recorded on land within and immediately surrounding the survey area (see **ILLUS 10**) within the West Sussex Historic Environment Record (HER). The B2178 Old Broyle Road, which passes through the north-east of the PDA, is thought to follow the route of a Roman road (HER 5997) and finds of pottery (HER 2390, HER 2433) alongside the road may indicate the site of a villa in the vicinity. Roman coin find spots (HER 2391 and HER 2388) are also recorded in the landscape surrounding Whitehouse Farm.



ILLUS 2 General view of Field 7, looking west
ILLUS 3 General view of Field 9, looking south-west
ILLUS 4 General view of Field 10, looking north



A geophysical survey (ASWYAS 2014) of a field south of F10 and west of F13 (see **ILLUS 8**), identified anomalies likely to be due to a soil-filled anti-tank ditch and a soil-filled ditch probably indicating a former (unmapped) boundary feature of unknown date. A cluster of anomalies of uncertain origin may also be of archaeological interest.

3 AIMS, METHODOLOGY AND PRESENTATION

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of any proposed development on potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended.

The general 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. Features 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 and Gater, 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

Bartington Grad601 magnetic gradiometers were used during the survey, taking readings at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m grids, so that 3,600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) software was used to process and present the data.

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble GeoXR model).

3.2 REPORTING

A general site location plan is shown in **ILLUS 1** at a scale of 1:15,000. **ILLUS 2** to **ILLUS 7** inclusive are general site condition photographs. **ILLUS 8**, **ILLUS 9** and **ILLUS 10** are 1:7,500 scale plots displaying the greyscale data, overall interpretation, geology, and HER data. Detailed data plots ('raw' and processed) and interpretative illustrations are presented at a scale of 1:1,500 in **ILLUS 11** to **ILLUS 38** inclusive. More detailed data plots of F9 are presented at a scale of 1:1,000 in **ILLUS 39**, **ILLUS 40** and **ILLUS 41**.

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. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 4.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Headland Archaeology 2015) and guidelines outlined by English Heritage (David et al. 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations reproduced from Ordnance Survey mapping are 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 geophysical survey has recorded a variable magnetic background response across the survey area manifesting as a plethora of discrete anomalies throughout the datasets. These anomalies are thought to be caused by localised variations in the prevailing soils and the superficial deposits from which they derive. Subtle changes in the background response have been noted and these are mainly topographical in origin although former land use accounts for the minimal levels of variation within F10 and F13. These fields are shown as being forested up until the 1961 edition Ordnance Survey and it is thought that the reduced levels of cultivation and/or manuring of these fields accounts for the lower level of background variation.

Within this variable magnetic background, numerous anomalies have been identified. These are discussed below and cross-referenced to specific examples depicted on the interpretative figures, where appropriate.

Ferrous/modern 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 or material is common on most sites, often being present as a consequence of manuring or tipping/infilling.

Three buried service pipes have been identified by the survey as high-magnitude dipolar linear anomalies. The first of these, A, can be seen traversing the northern edges of F2 and F3 before deviating northwards across F4 and along the western boundary of F6 (see **ILLUS 12–ILLUS 20** inclusive). Within the south of F15, two service pipes, B and C, can be seen on an east/west alignment either side of a ruined building(s) (see **ILLUS 36**, **ILLUS 37** and **ILLUS 38**).



ILLUS 5 General view of Field 11, looking west

ILLUS 6 General view of Field 15, looking west

ILLUS 7 General view of Field 17, looking south-west



Other ferrous anomalies of note include the alignment of four large 'spikes', D, along the eastern edge of F1 and F7 (see **ILLUS 12–ILLUS 14** and **ILLUS 21–ILLUS 23**). These anomalies are caused by telegraph poles carrying overhead wires.

Within the west of F8 (see **ILLUS 21**, **ILLUS 22** and **ILLUS 23**), a broad band of magnetic enhancement, E, corresponds to the route of farm track which first appears on the 1912 edition Ordnance Survey map. The enhancement is caused by magnetic material (gravel, brick, sand etc.) within the composition of the former track.

Magnetic disturbance around the periphery of the fields are generally caused by ferrous material within, or forming part of, the adjacent field boundaries.

Agricultural anomalies

Analysis of historical OS mapping indicates that a number of boundaries within the survey area have been removed since the publication of the first edition OS map in 1875. Two east/west aligned boundaries have been removed from within F6, a north-east/southwest boundary has been removed from F8, and north/south aligned boundaries have been removed from within F14 and F15 respectively. However, the only former field boundary to have been detected by the geophysical survey is the north/south aligned boundary within the east of F14, the boundary manifesting as a low-magnitude linear anomaly, F (see **ILLUS 33**, **ILLUS 34** and **ILLUS 35**). The anomaly is caused by the contrast between the soil-fill of a ditch and the surrounding soils. The reason for the absence of the other former field boundaries in the datasets is not clear. Assuming that the former boundaries comprised of a ditch (as opposed to a hedge/fence/wall) it is possible that they have been removed in their entirety by subsequent deep cultivation or that there is insufficient magnetic contrast in the local soils for the soil-filled ditch to manifest as a magnetic anomaly. However, this latter explanation would appear less likely given that the survey has identified other anomalies in the vicinity (and on similar soils and superficial geologies) which are caused by soil-filled cut features (see Geological anomalies and Possible archaeological anomalies below).

Within the west of F3 and F9 and the east of F8, a curvilinear anomaly, G, is interpreted as a possible former field boundary (see **ILLUS 15–ILLUS 17** and **ILLUS 24–ILLUS 26**). The anomaly flanks the eastern side of the north/south aligned minor watercourse and appears to correspond to the projected extension of a linear plantation of trees to the north of F9 and dividing F2 and F3. The anomaly does not correspond to any features depicted on early Ordnance Survey maps and therefore may be of archaeological or local historical interest, but an agricultural interpretation seems probable.

Series of 'speckled' parallel linear trend anomalies can be seen within the west of F10 and the south of F14 (see **ILLUS 27–ILLUS 29** and **ILLUS 33–ILLUS 35** respectively). The broad, even spacing of the anomalies are typical of field drains with the 'speckled' appearance being due to magnetic material (usually gravel) used in the composition of the drain.

Elsewhere, faint linear trends have been identified within several of the fields. These are generally orientated parallel with, or at right-angles to, the existing field boundaries and are caused by modern cultivation furrows.

Geological anomalies

As mentioned above, there are subtle variations within the magnetic background across the site. The density of discrete anomalies appears to increase to the north of the survey area at the most elevated part of the site (F1, F2, F7 and F8). This is likely to be due to the nearer-surface presence of Head superficial deposits. In contrast, the discrete anomalies identified in the lower-lying fields to the south of Salthill Lane/Newlands Lane are more widely dispersed giving the data a more monotone appearance. A curving band of magnetic enhancement, H, which traverses the north of F10–F12 before turning north into F8 (see **ILLUS 24–ILLUS 29** inclusive), corresponds closely to the narrower, steeper contours of the hillside (see **ILLUS 10**) and this band is likely to be topographical in nature. The short linear trends are probably caused by hill wash/run-off.

Possible archaeological anomalies

Within the north-east corner of F9, immediately south of Whitehouse Farm, a broad rectilinear anomaly, I, has been identified on a north/south orientation (see **ILLUS 24–ILLUS 26** and **ILLUS 39–ILLUS 41**). The anomaly runs south from Whitehouse Farm for 90m before deviating on a south-easterly trajectory. This anomaly is almost certainly archaeological in origin and probably indicates the continuation of a section of the Chichester Entrenchments (Scheduled Monument Ref. 1005856) which is recorded on the same north/south alignment on the northern side of Whitehouse Farm. The anomaly is probably caused by the magnetic soil-fill of a ditch. However, the anomaly also corresponds closely to a modern trackway which is first depicted on the 1898 edition Ordnance Survey map and is removed by the 1961 edition. For this reason, the anomaly has been ascribed a possible archaeological origin. It is possible that the magnetic enhancement is caused by material within the surface of a buried farm track.

To the immediate south and south-west of I, a complex of interlinking ditched enclosures are of obvious archaeological potential and are discussed further below. South of this complex a faint rectilinear anomaly, J, has been identified and is thought to be due to soil-filled ditch (see **ILLUS 24–ILLUS 26** and **ILLUS 30–ILLUS 32**). The anomaly appears on an east/west alignment, similar to that of the surrounding agricultural trends, and therefore it is possible that the anomaly is agricultural in nature, perhaps being due to an unmapped boundary or a deep furrow or rut. However, given the local archaeological context it is possible that the ditch has earlier origins and may indicate a continuation of the adjacent archaeological complex.

A second faint rectilinear anomaly, K, is identified close to the western edge of F3 (see **ILLUS 15**, **ILLUS 16** and **ILLUS 17**), and is also thought to be caused by a ditch or gully. The anomaly is faint and no clear archaeological pattern is discernible. It is possible that the ditch is agricultural in origin, perhaps being associated with the adjacent plantation. However, in the absence of an obvious modern or agricultural explanation, an archaeological origin cannot be dismissed.

Archaeological anomalies

An area of definite archaeological potential has been identified in a prominent topographical position to the immediate south of Whitehouse Farm (see **ILLUS 24–ILLUS 26** and **ILLUS 39–ILLUS 41**). The area measures 215m from east to west and 180m from north

to south and is characterised by at least seven enclosures, E1-E7, which are appended either side of a trackway, TR1, aligned north-west/south-east. The complex is suggestive of Romano-British activity, an interpretation which is reinforced by the West Sussex HER which records Romano-British pottery and Roman coins within the local area (see ILLUS 10). No obvious archaeological anomalies are visible within the interior of the enclosures, perhaps indicating an agricultural function rather than settlement. Nevertheless, occasional discrete anomalies of elevated magnitude have been ascribed a possible archaeological interpretation given the local context, and these may be caused by soil-filled pits or by spreads of enhanced material.

At the north-western corners of E1 and E2, a broad area of magnetic enhancement, L, centred upon two very high magnitude 'spikes', M and N, is probably archaeological in origin, perhaps indicating kilns or furnaces within an area of industrial activity. Whilst no obvious archaeological pattern is visible within L, there remains some possibility that the anomalies are modern in origin, perhaps being due to buried ferrous material, although their location within the corner of the enclosures would tend to suggest that an archaeological origin is more likely.

It is worthy of note that the possible Romano-British site appears to follow the same north-west/south-east alignment upon which the southernmost section of the probable Chichester Entrenchments (Anomaly I) deviates. It is known that many elements of the Entrenchments were re-used in the Roman and Medieval periods (English Heritage 2011) and the spatial relationship between the anomalies identified here may indicate such activity.

5 CONCLUSION

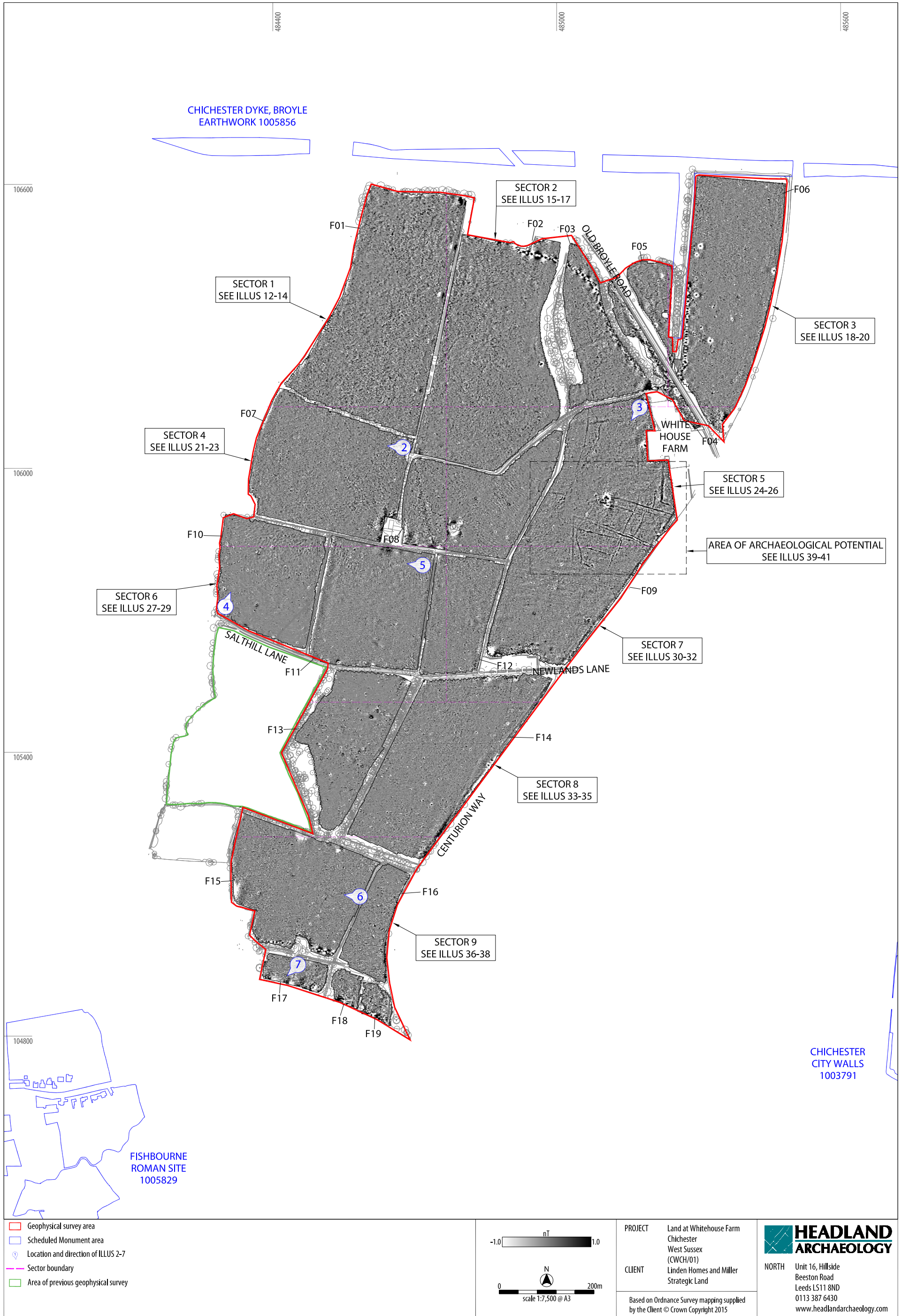
The geophysical survey has identified a clear area of archaeological potential to the immediate south-west of Whitehouse Farm. The area comprises of at least seven enclosures appended to a central trackway and is thought to be Romano-British in origin. No anomalies have been identified within the complex which can confidently be attributed to settlement activity, and therefore it is possible that the enclosures were agricultural in function. The layout of the trackway and enclosures appears to respect the alignment of a broad rectilinear anomaly, a ditch which is thought to be part of an unrecorded section of the Chichester Entrenchments (Scheduled Monument 1005856). This may indicate the re-use, in the Roman period, of earlier landscape features.

Elsewhere, few anomalies of archaeological potential have been identified by the survey with the majority of the anomalies being due to localised variations within the soils and the Head superficial deposits from which they derive.

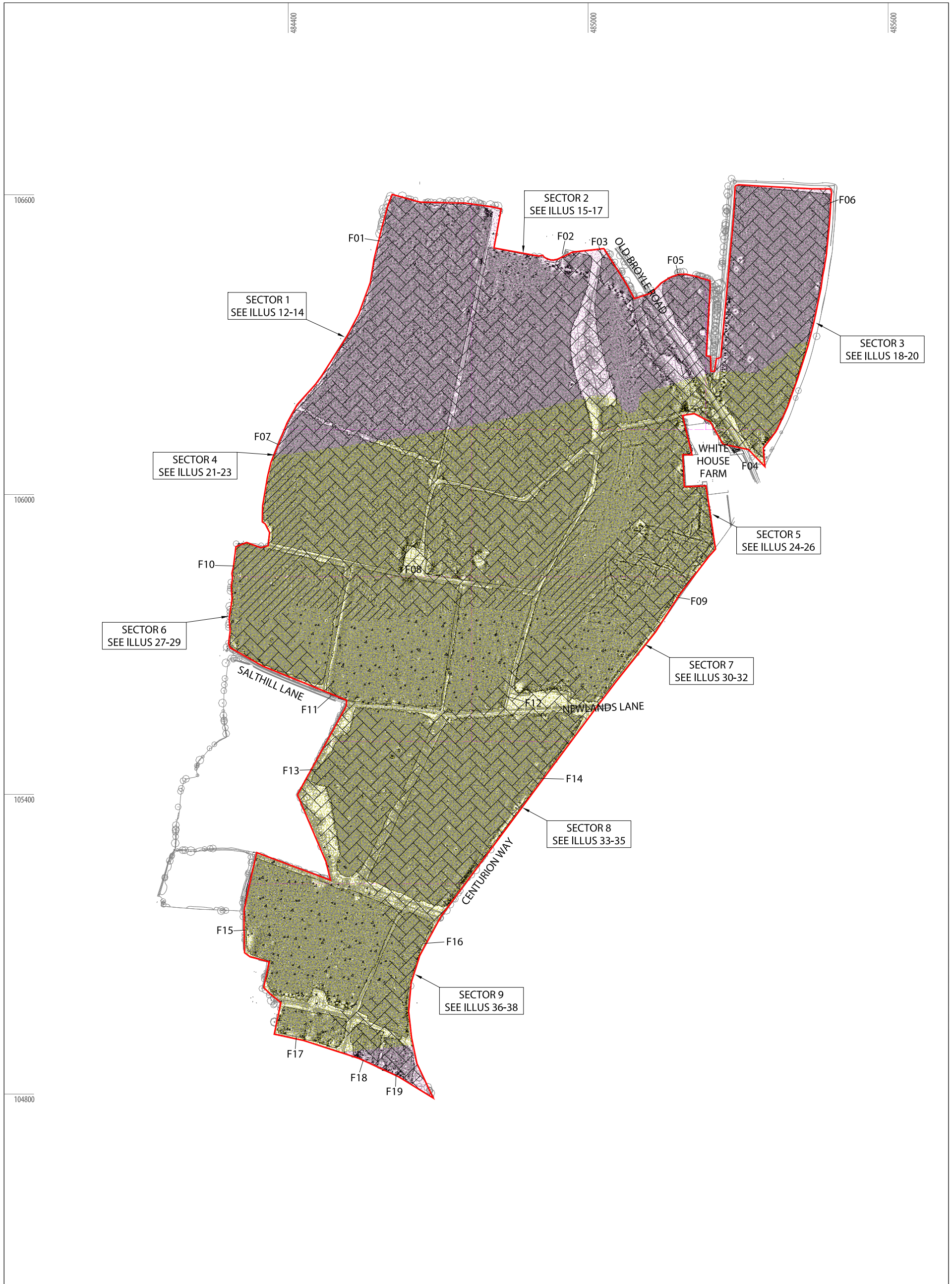
There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions within the geophysical survey area. Therefore, based solely on the results and interpretation of the geophysical data, the archaeological potential across the majority of the site is assessed to be low, with a high archaeological potential ascribed to the field immediately west of Whitehouse Farm.

6 REFERENCES

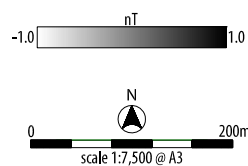
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ILLUS 8
Survey location showing processed greyscale magnetometer data



- Geophysical survey area
- Sector boundary
- Lambeth Group - Clay, Silt and Sand
- London Clay Formation - Clay, Silt and Sand
- Head - Gravel, Sand, Silt and Clay
- Head - Clay, Silt, Sand and Gravel
- River Terrace Deposits (undifferentiated)



PROJECT Land at Whitehouse Farm
Chichester
West Sussex
(CWCH/01)

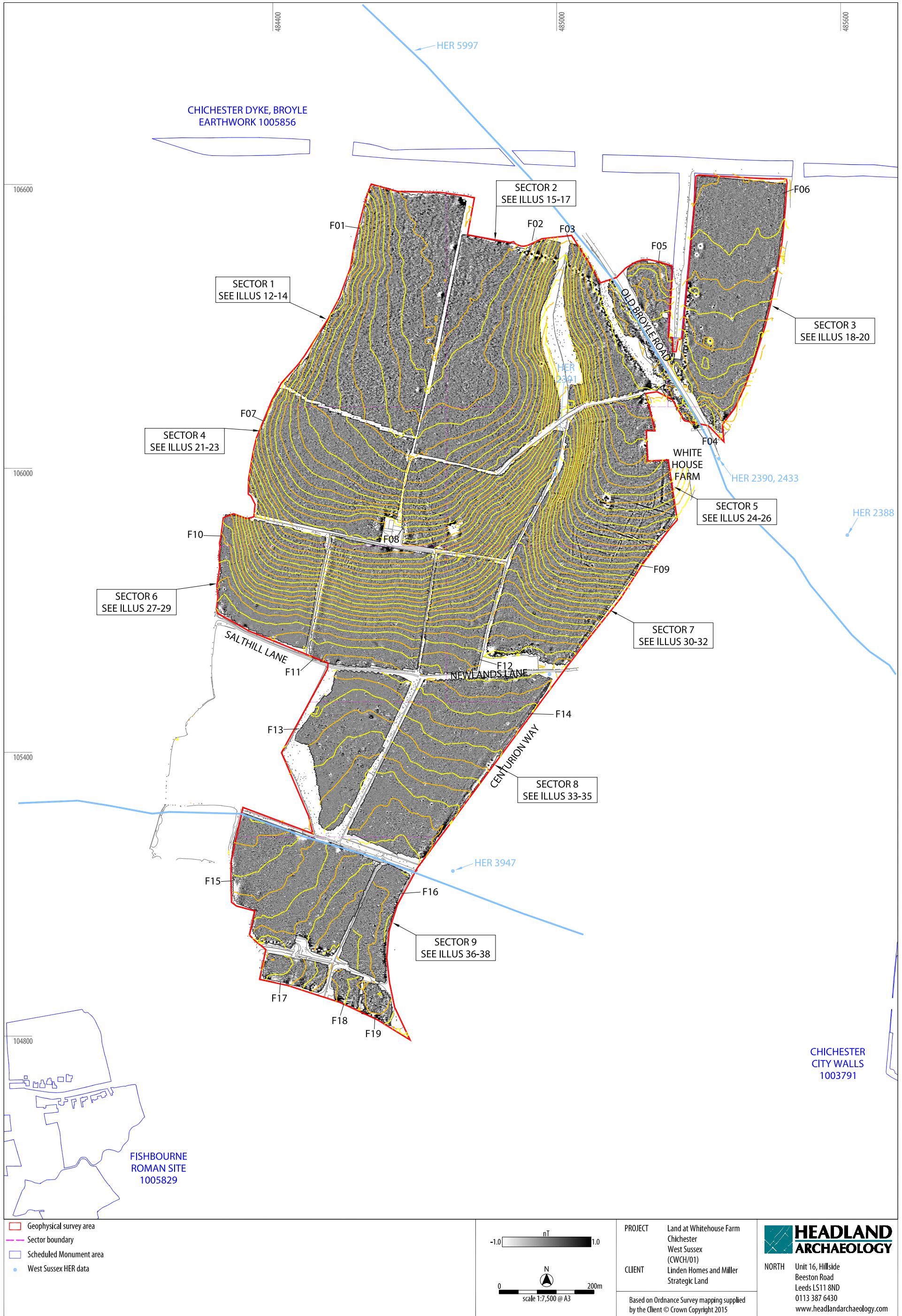
CLIENT Linden Homes and Miller
Strategic Land

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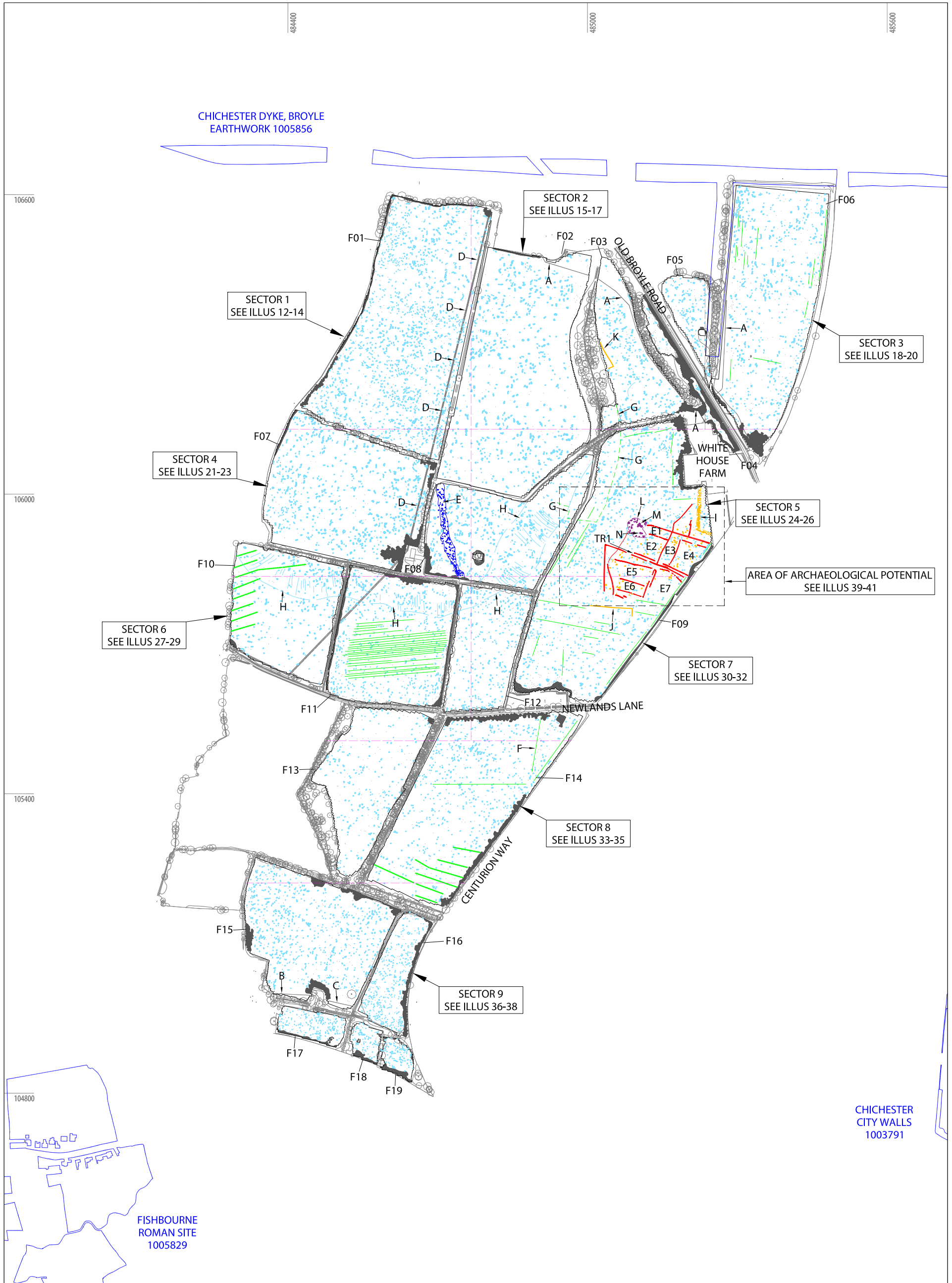
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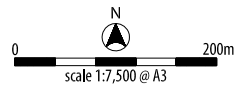
ILLUS 9
Processed greyscale magnetometer data overlain by geology detail



ILLUS 10
Processed greyscale magnetometer data showing Scheduled Monuments, West Sussex HER data and contour detail



<p>□ Scheduled Monument area</p> <p>— Sector boundary</p>		<p>TYPE OF ANOMALY</p> <p>● Magnetic Enhancement</p> <p>— Linear Trend</p> <p>— Linear Trend</p> <p>— Linear</p> <p>— Linear</p> <p>— Linear</p>		<p>INTERPRETATION</p> <p>Modern Track</p> <p>Agricultural</p> <p>Field Drain</p> <p>Former Field Boundary</p> <p>Former Field Boundary?</p> <p>Geological Variation</p>		<p>TYPE OF ANOMALY</p> <p>— Linear Trend</p> <p>● Magnetic Enhancement</p> <p>● Magnetic Enhancement</p> <p>— Linear Trend</p> <p>● Magnetic Enhancement</p>		<p>INTERPRETATION</p> <p>Geology</p> <p>Geology</p> <p>Archaeology?</p> <p>Burning?/Industrial?</p> <p>Archaeology</p> <p>Archaeology</p>	
<p>TYPE OF ANOMALY</p> <p>● Dipolar Isolated</p> <p>● Magnetic Disturbance</p> <p>— Dipolar Linear</p>		<p>INTERPRETATION</p> <p>Ferrous Material</p> <p>Ferrous Material</p> <p>Service Pipe</p>							



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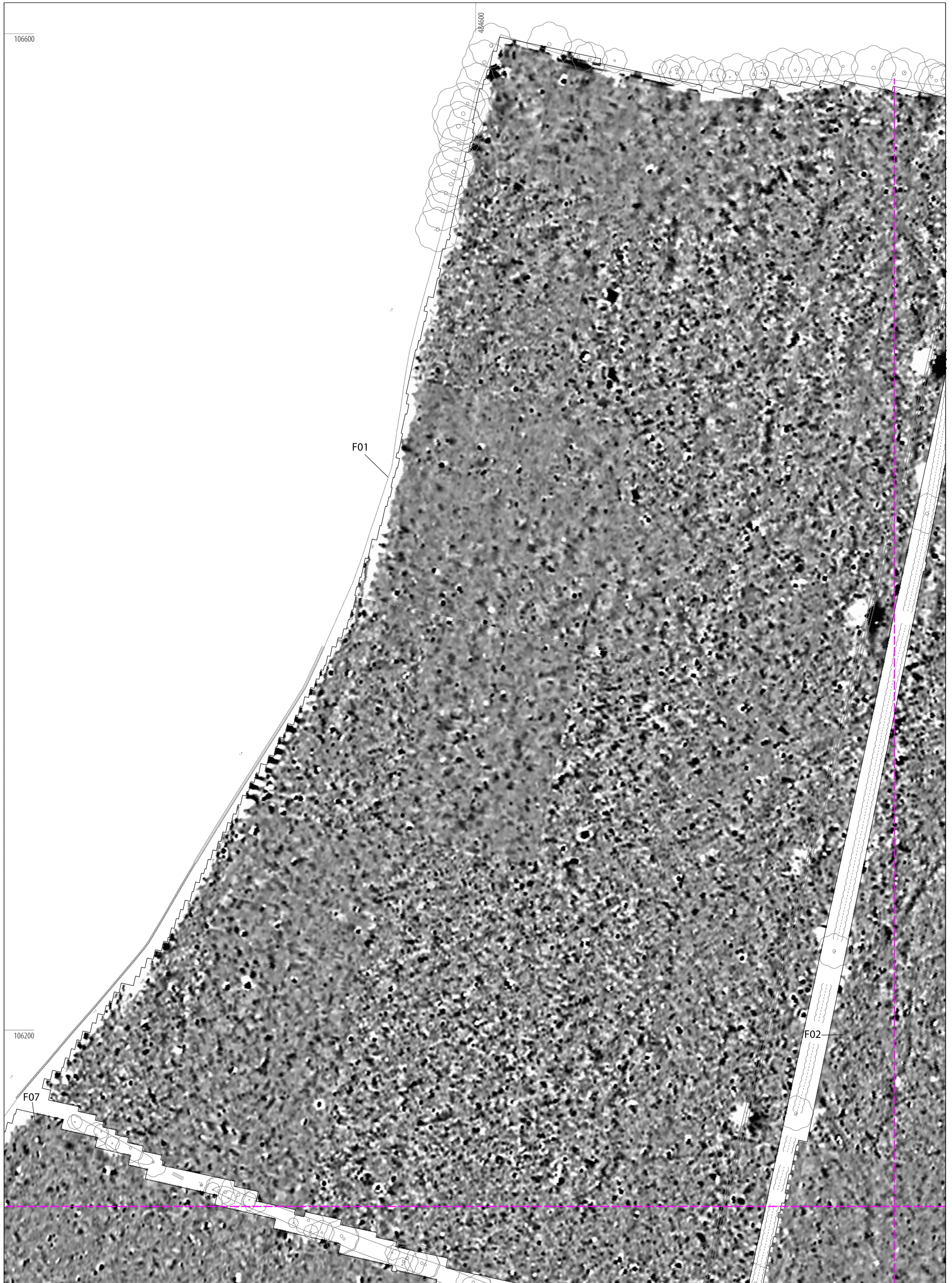
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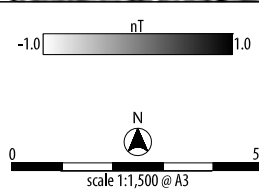
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ILLUS 11
Overall interpretation of magnetometer data



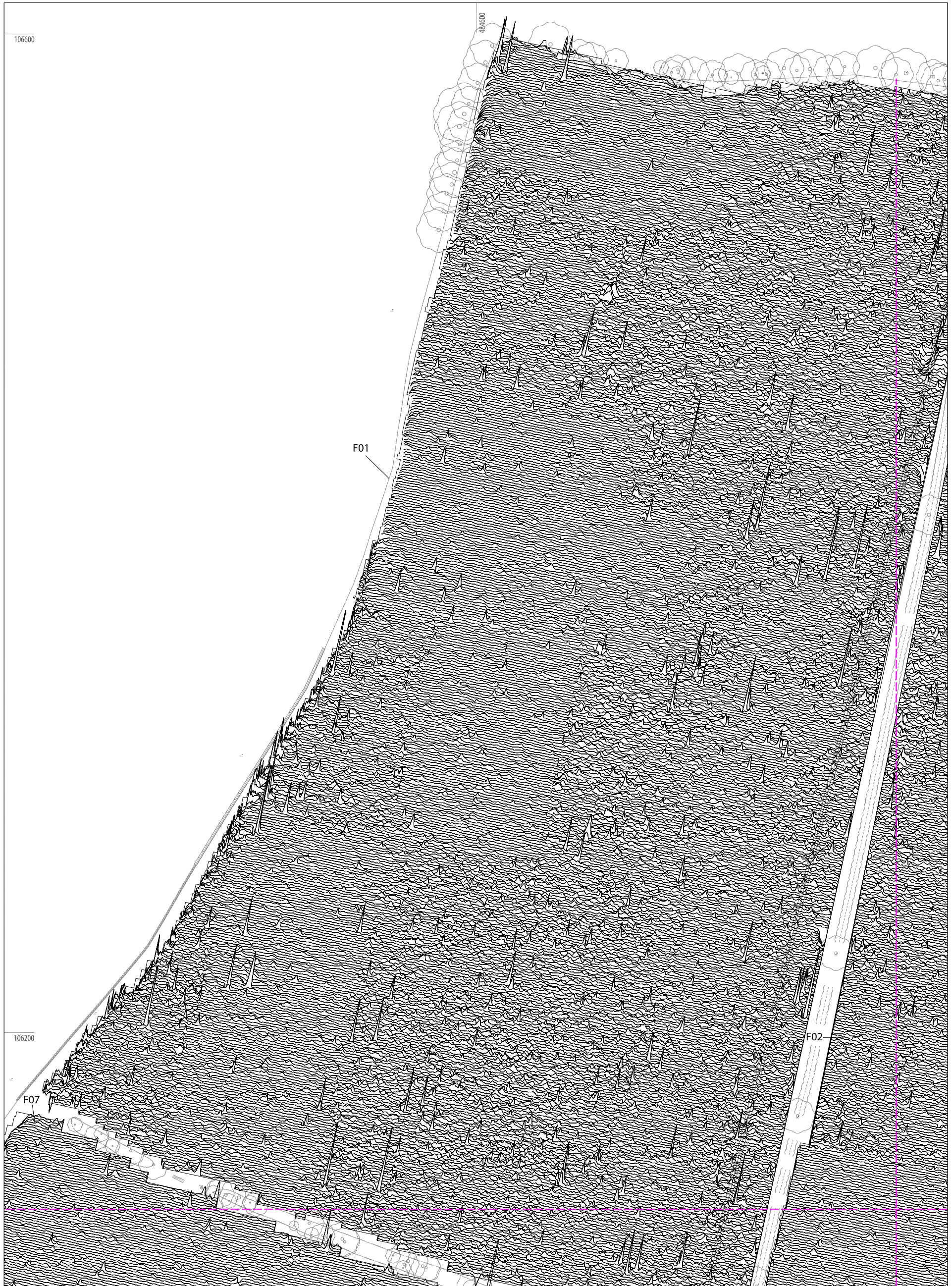
— Sector boundary



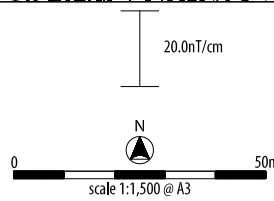
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Illus 12
Processed greyscale magnetometer data; Sector 1



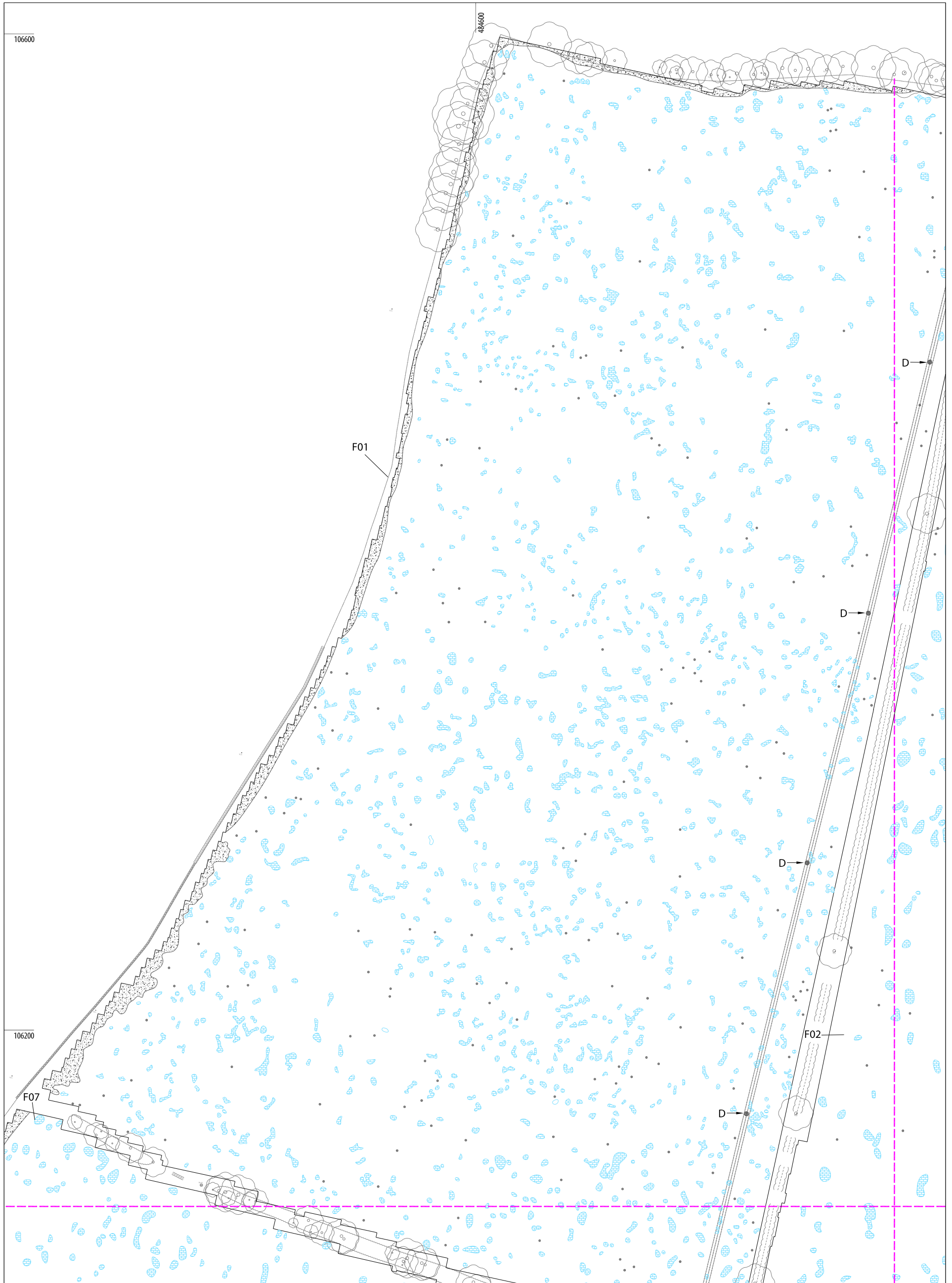
--- Sector boundary



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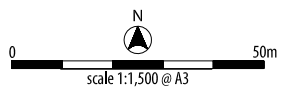
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Illus 13
XY trace plot of minimally processed magnetometer data; Sector 1



--- Sector boundary

TYPE OF ANOMALY	INTERPRETATION
● Dipolar Isolated	Ferrous Material
● Magnetic Disturbance	Ferrous Material
■ Magnetic Enhancement	Geology



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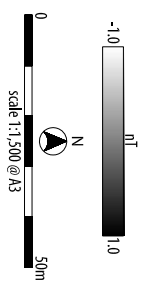
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Illus 14
Interpretation of magnetometer data; Sector 1



— Section boundary



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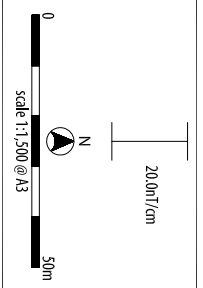
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Illus 15
 Processed greyscale magnetometer data; Sector 2



485200

--- Sector boundary



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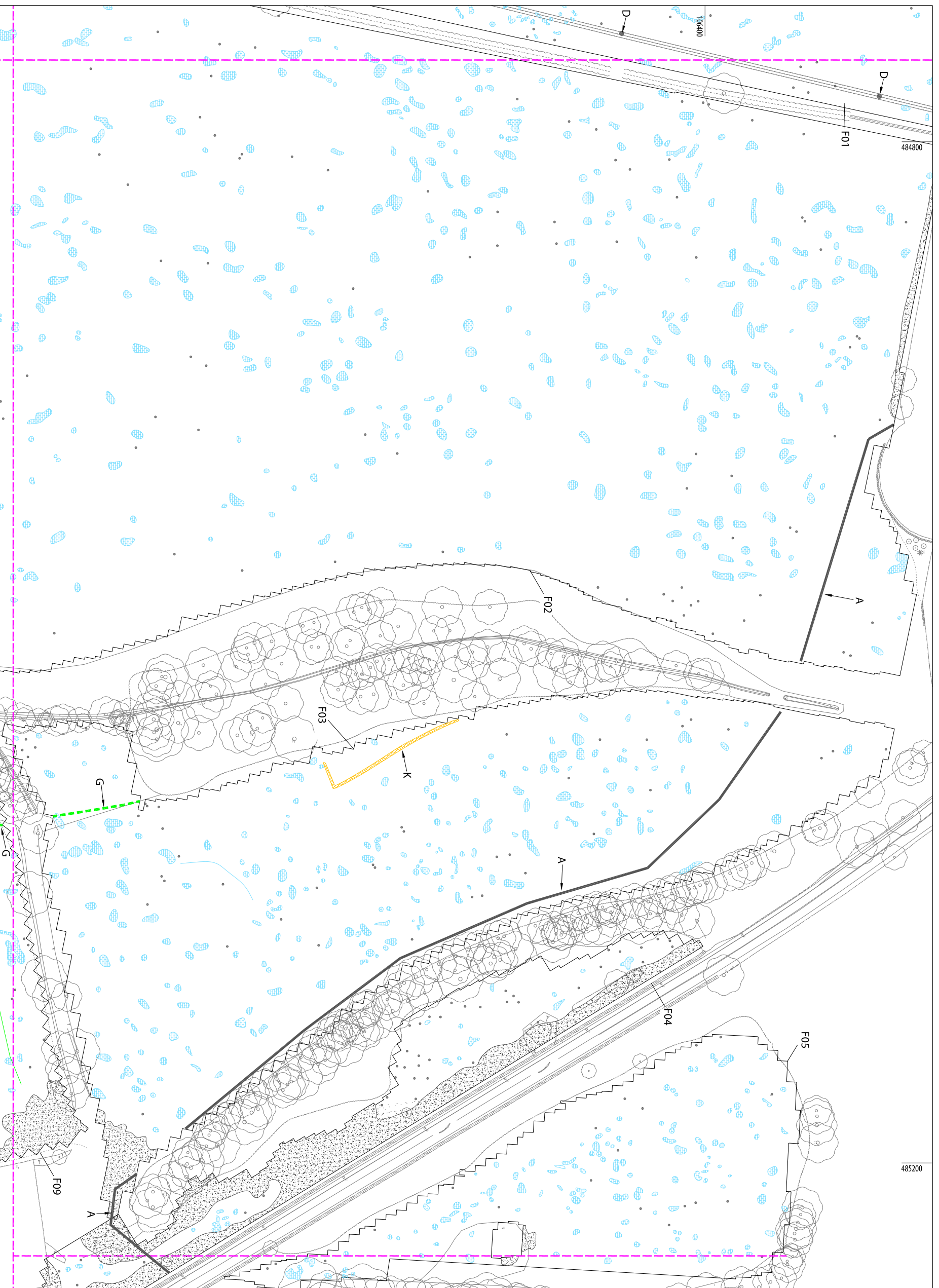
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Illus 16
XY trace plot of minimally processed magnetometer data; Sector 2



TYPE OF ANOMALY	INTERPRETATION
• Dipolar bedded	Ferrous Material
• Magnetic Disturbance	Ferrous Material
— Dipolar Linear	Service Pipe
— Linear Trend	Agricultural Boundary
— Linear	Former Field Boundary
— Linear Trend	Geology
— Magnetic Enhancement	Geology
— Magnetic Enhancement	Archaeology?



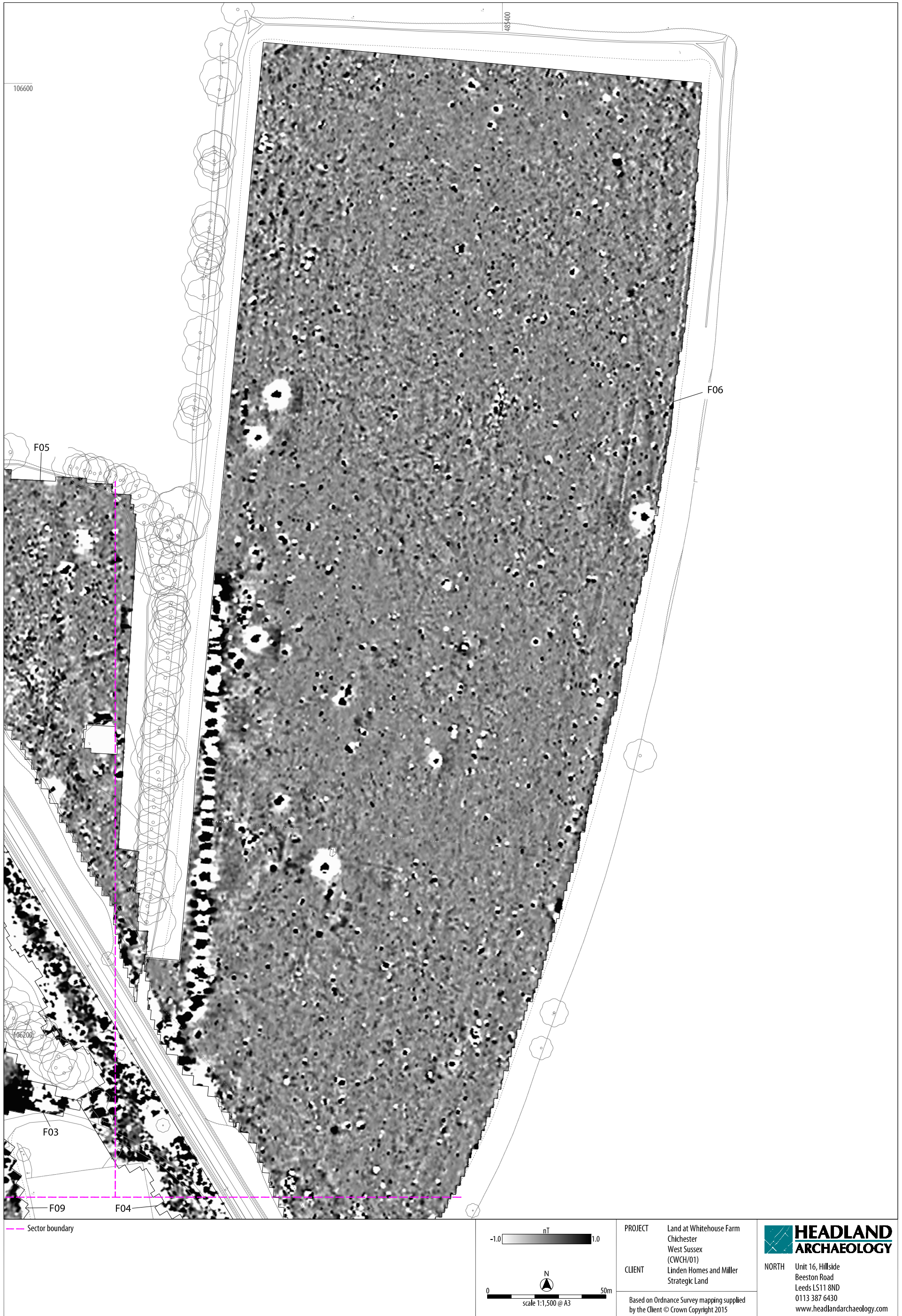
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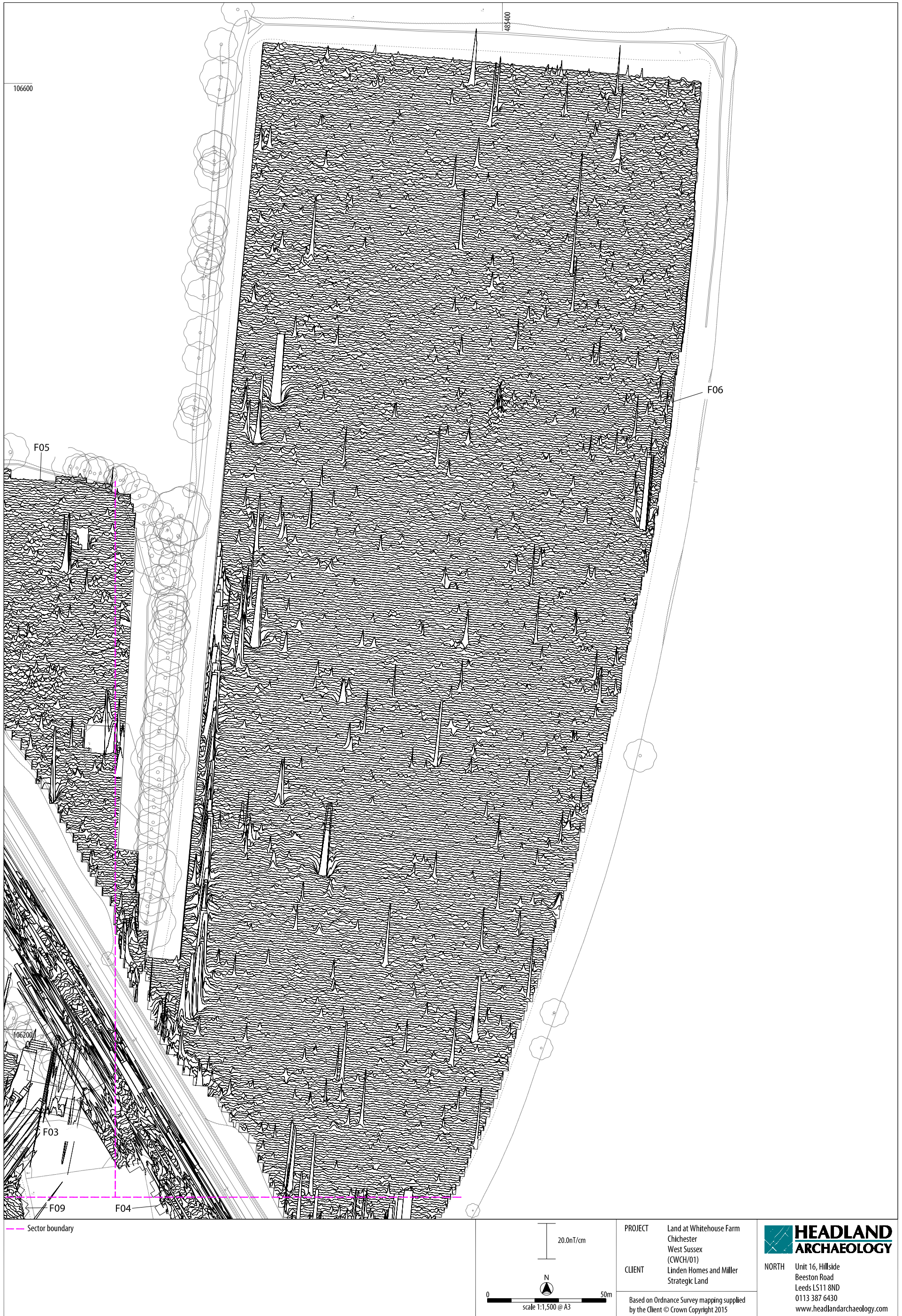
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Illus 17
Interpretation of magnetometer data: Sector 2



Illus 18
Processed greyscale magnetometer data; Sector 3



Illus 19
XY trace plot of minimally processed magnetometer data; Sector 3



--- Section boundary



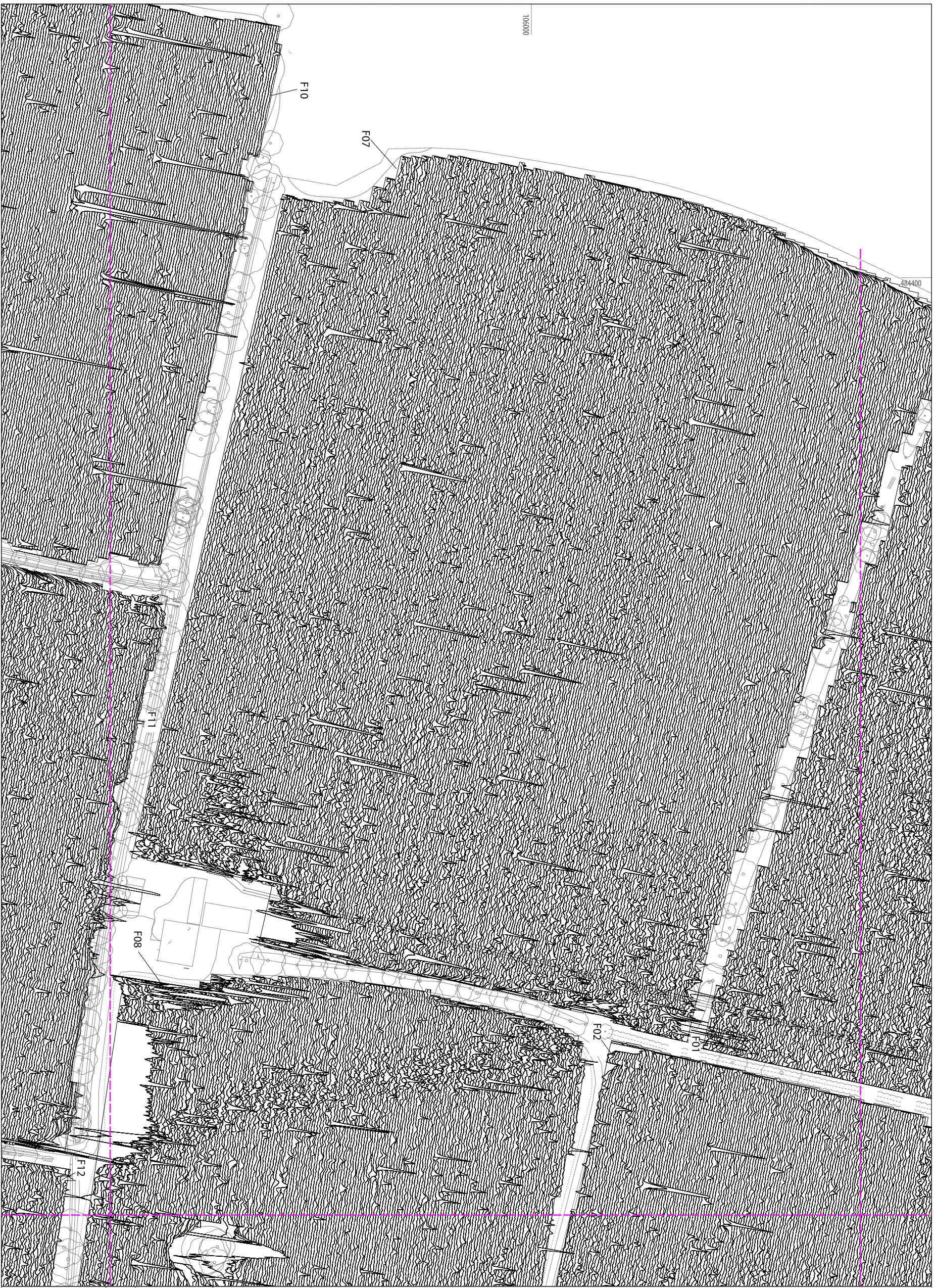
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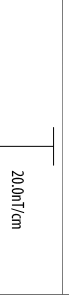
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— Sector boundary



0 20.0m (1cm)
 0 50m (1cm)
 scale 1:1,500 @ A3

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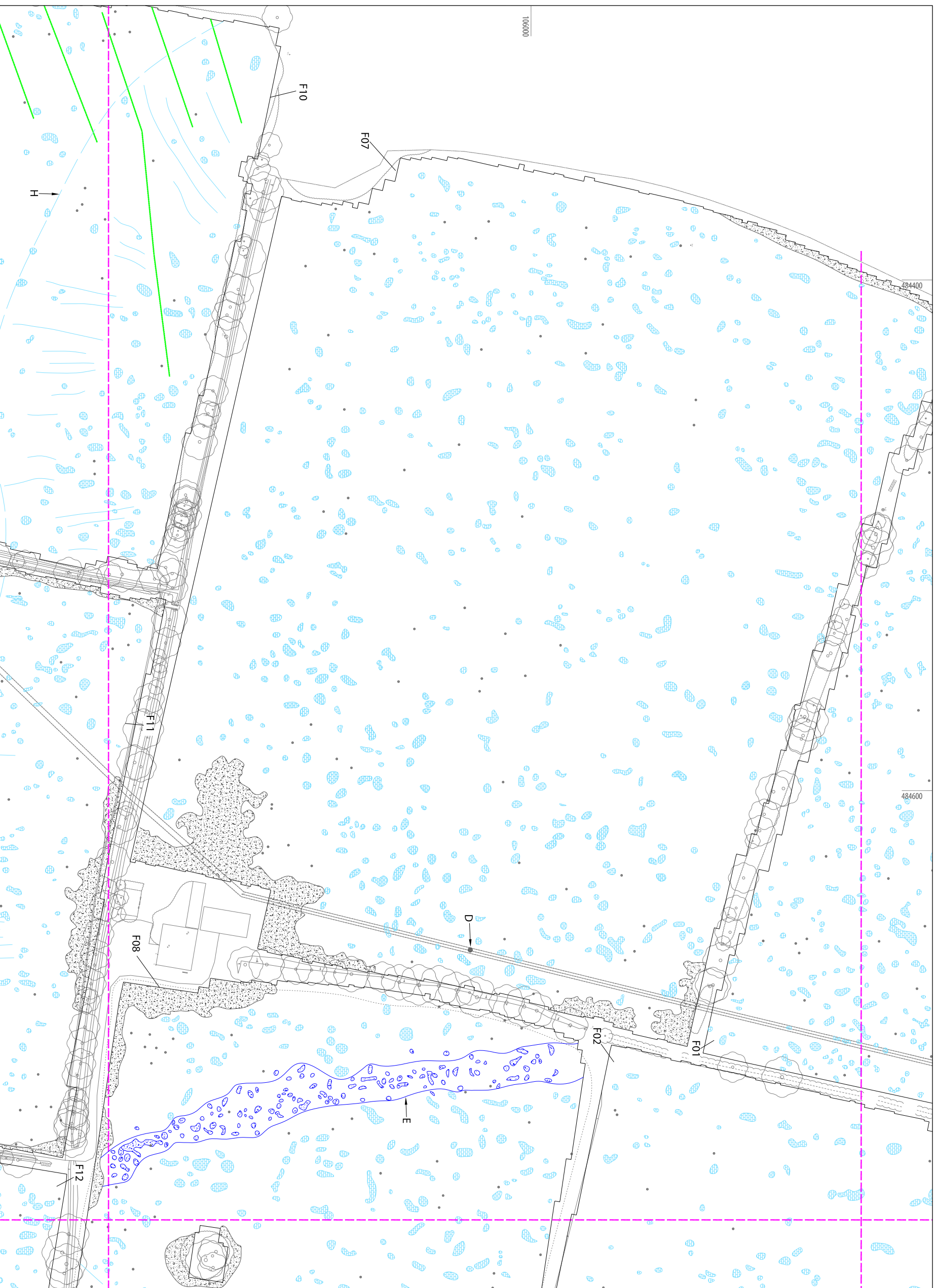
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Illus 22
 XY trace plot of minimally processed magnetometer data; Sector 4



TYPE OF ANOMALY	INTERPRETATION
• Dipolar bedded	Ferrous Material
• Magnetic Disturbance	Ferrous Material
• Magnetic Enhancement	Modern Track
• Linear Trend	Field Drain
• Linear Trend	Geology
• Linear	Geological Variation
• Magnetic Enhancement	Geology



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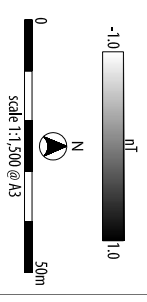
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Illus 23
Interpretation of magnetometer data: Sector 4



--- Sector boundary



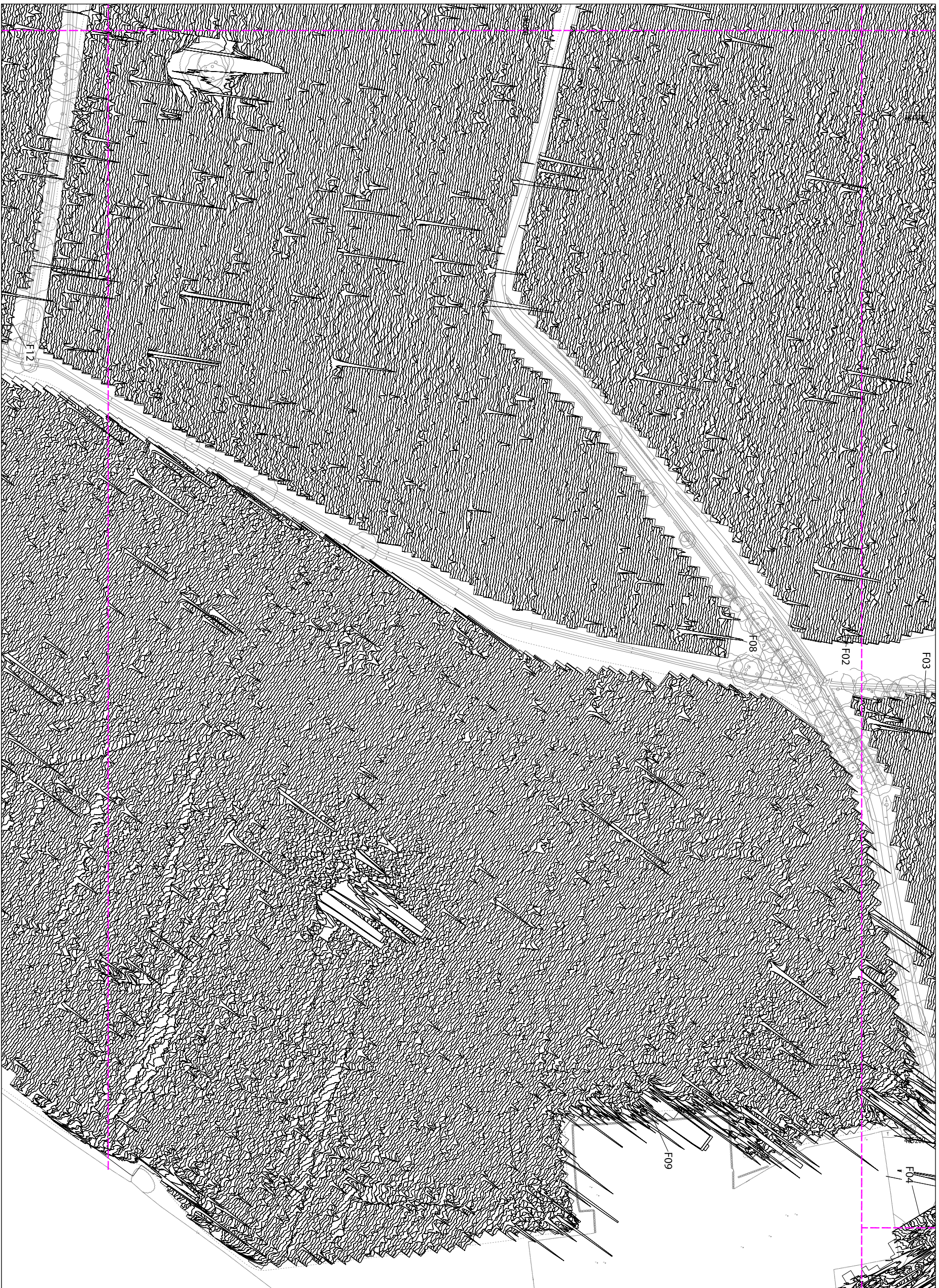
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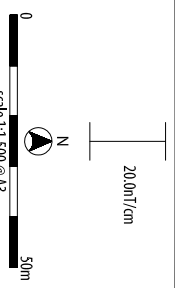
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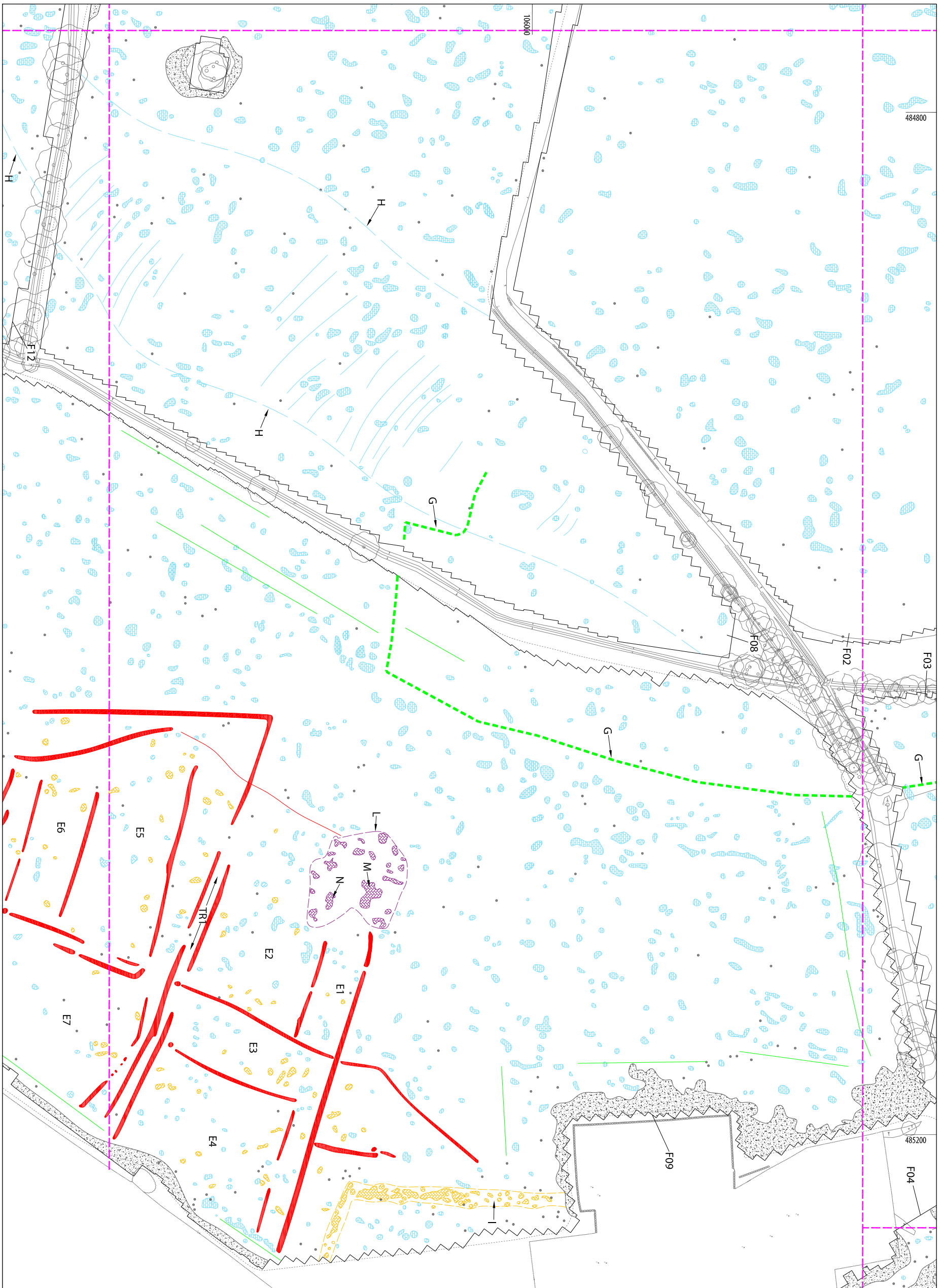
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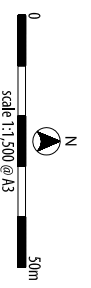
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Illus 25 XY trace plot of minimally processed magnetometer data; Sector 5



TYPE OF ANOMALY	INTERPRETATION
● Dipolar bedded	Ferrous Material
● Magnetic Disturbance	Ferrous Material
● Linear Trend	Agricultural
● Linear	Former Field Boundary/ Variation
● Linear	Geology
● Linear Trend	Geology
● Magnetic Enhancement	Geology
● Magnetic Enhancement	Archaeology?
● Magnetic Enhancement	Burning? / Industrial?
● Linear Trend	Archaeology
● Magnetic Enhancement	Archaeology



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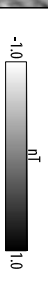
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Illus 26
Interpretation of magnetometer data: Sector 5



--- Sector boundary



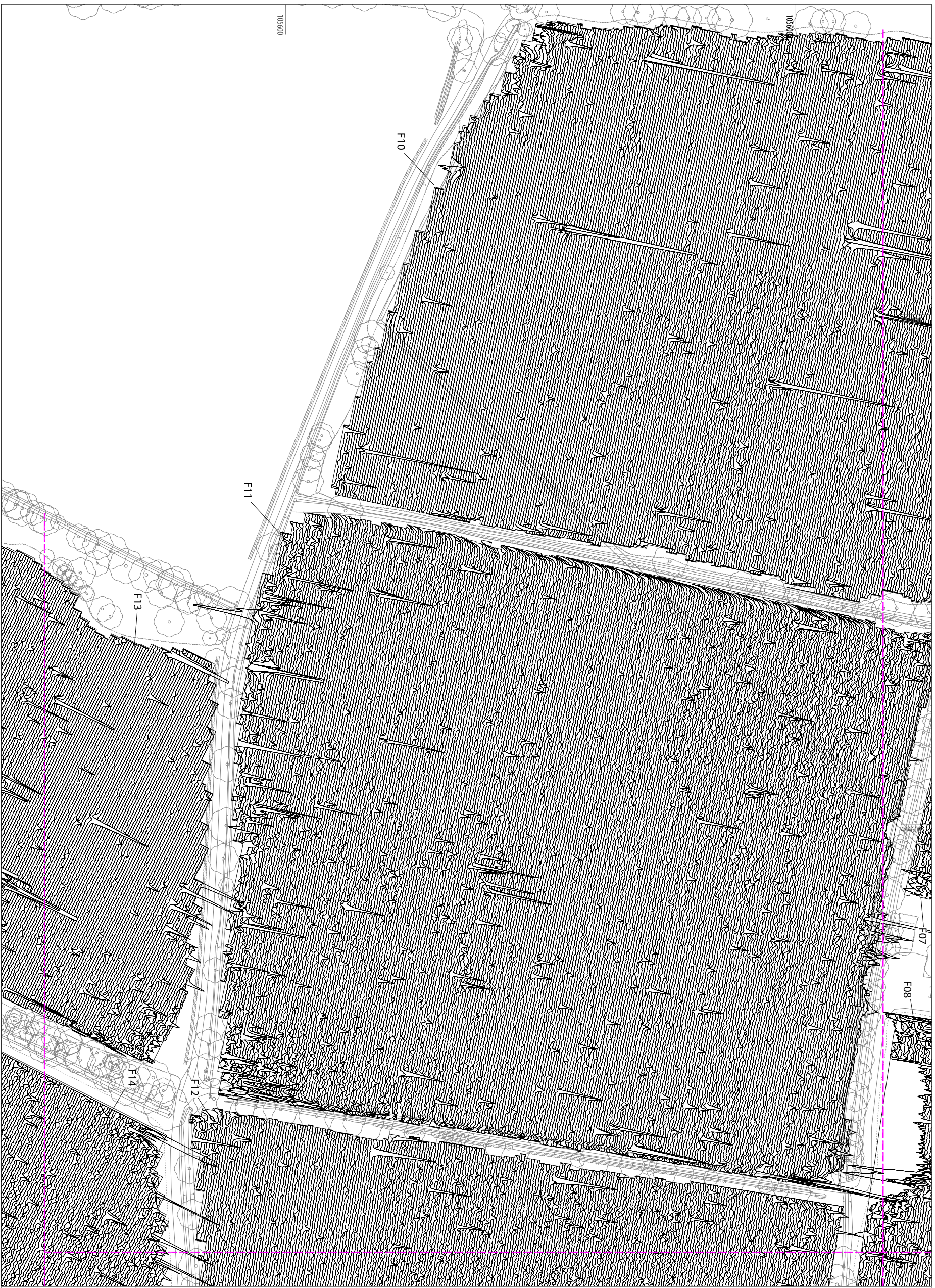
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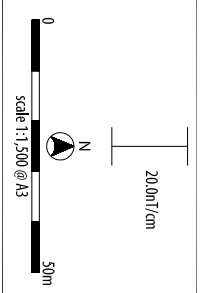
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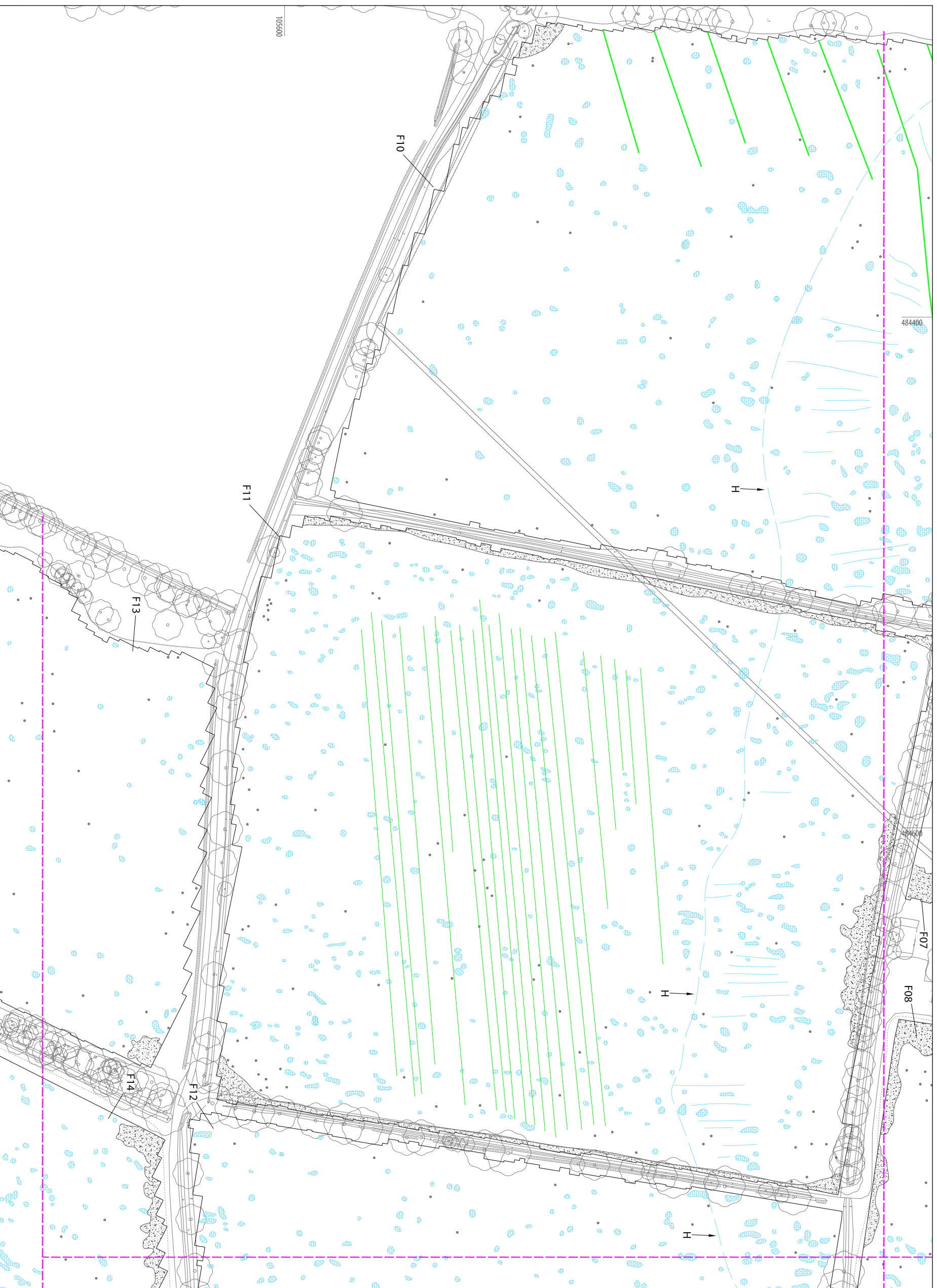
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Illus 28
XY trace plot of minimally processed magnetometer data; Sector 6



TYPE OF ANOMALY	INTERPRETATION
● Dipolar bedded	Ferrous Material
● Magnetic Disturbance	Ferrous Material
— Linear Trend	Agricultural
— Linear Trend	Field Drain
— Linear Trend	Geological Variation
— Linear Trend	Geology
— Linear Trend	Magnetic Enhancement
— Linear Trend	Geology



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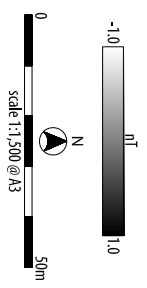
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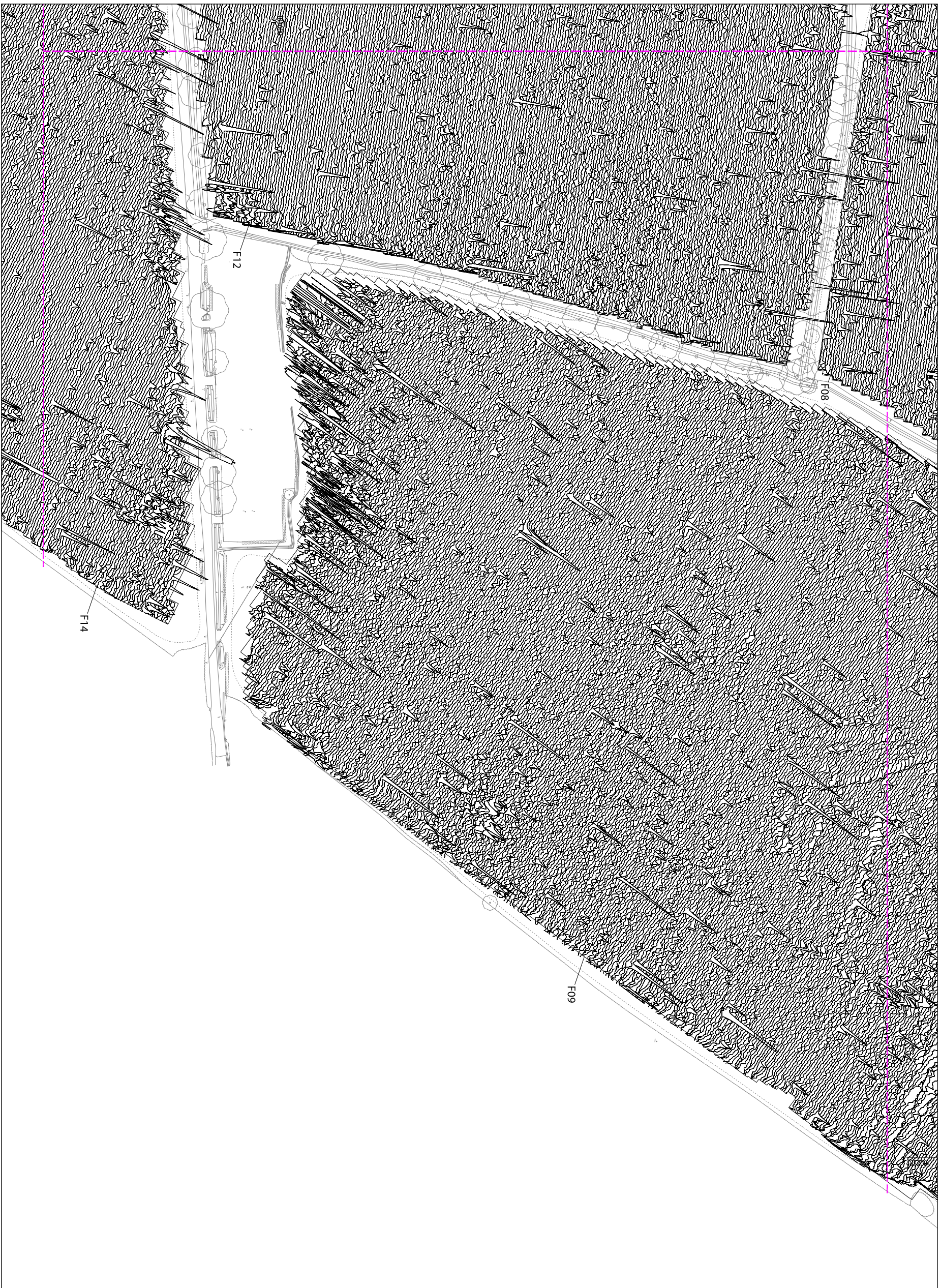
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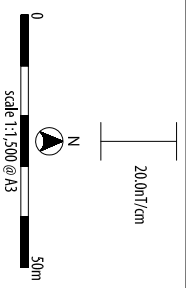
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Illus 30
Processed greyscale magnetometer data; Sector 7



— Sector boundary



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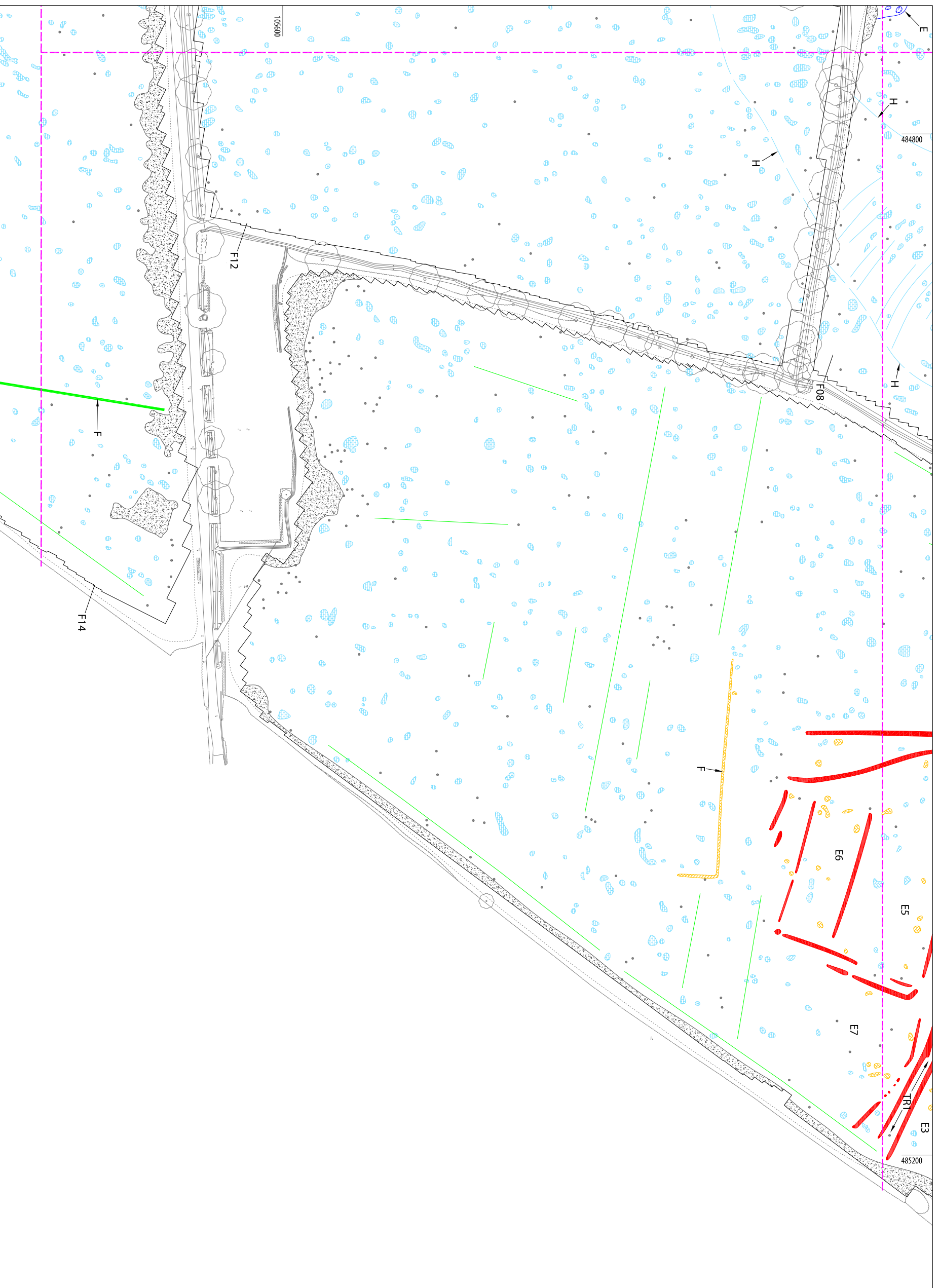
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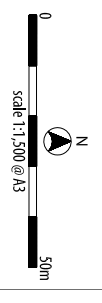
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Illus 31
XY trace plot of minimally processed magnetometer data; Sector 7



TYPE OF ANOMALY	INTERPRETATION
● Dipolar bedded	Ferrous Material
● Magnetic Disturbance	Ferrous Material
● Linear Trend	Agricultural
● Linear	Former Field
● Linear	Soil/land
● Linear	Geological Variation
● Linear	Geology
● Magnetic Enhancement	Geology
● Linear	Archaeology?
● Magnetic Enhancement	Archaeology?
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● Magnetic Enhancement	Archaeology



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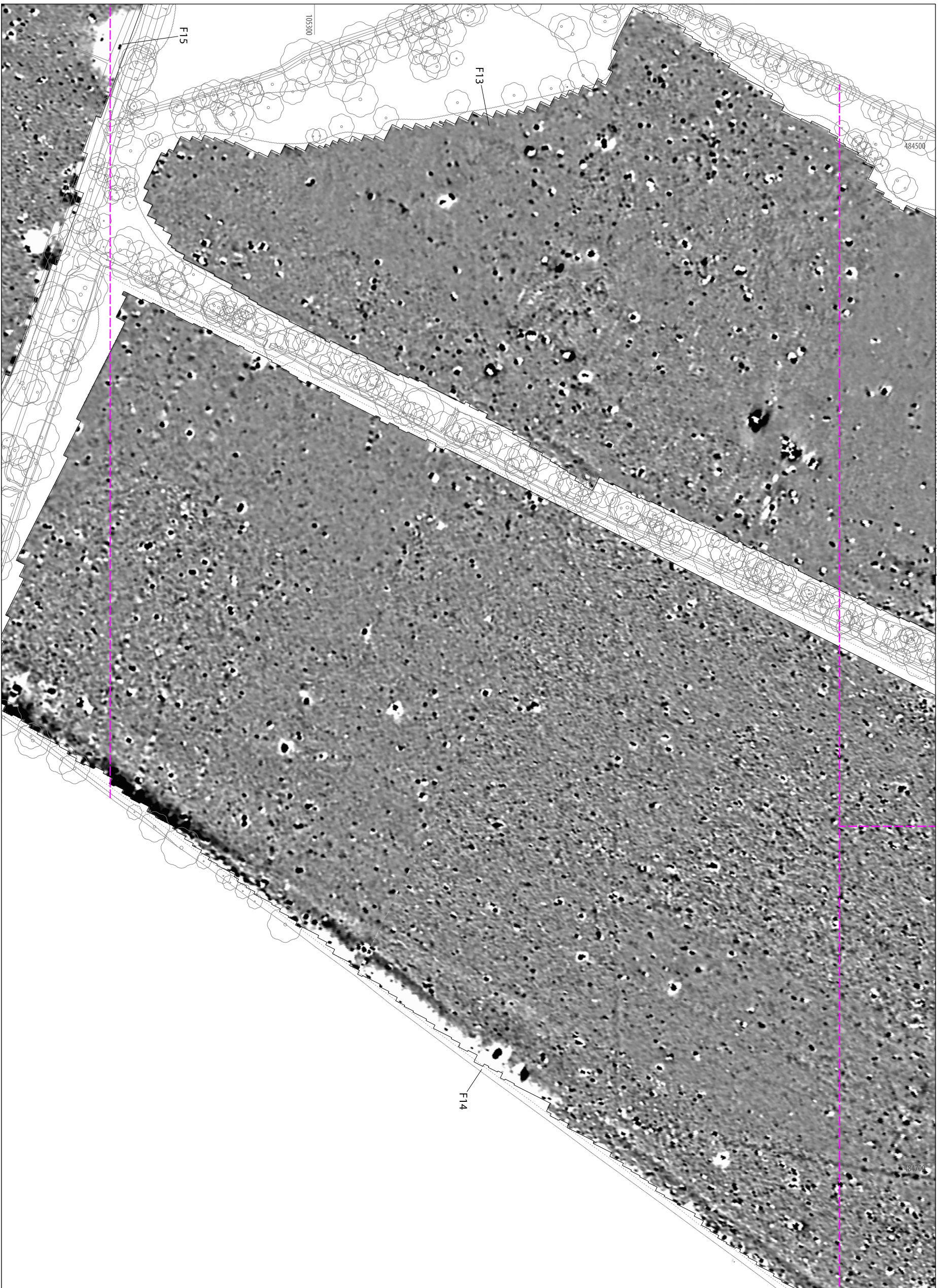
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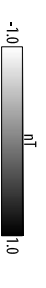
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Illus 32
Interpretation of magnetometer data: Sector 7



--- Section boundary



scale 1:1500 @ A3

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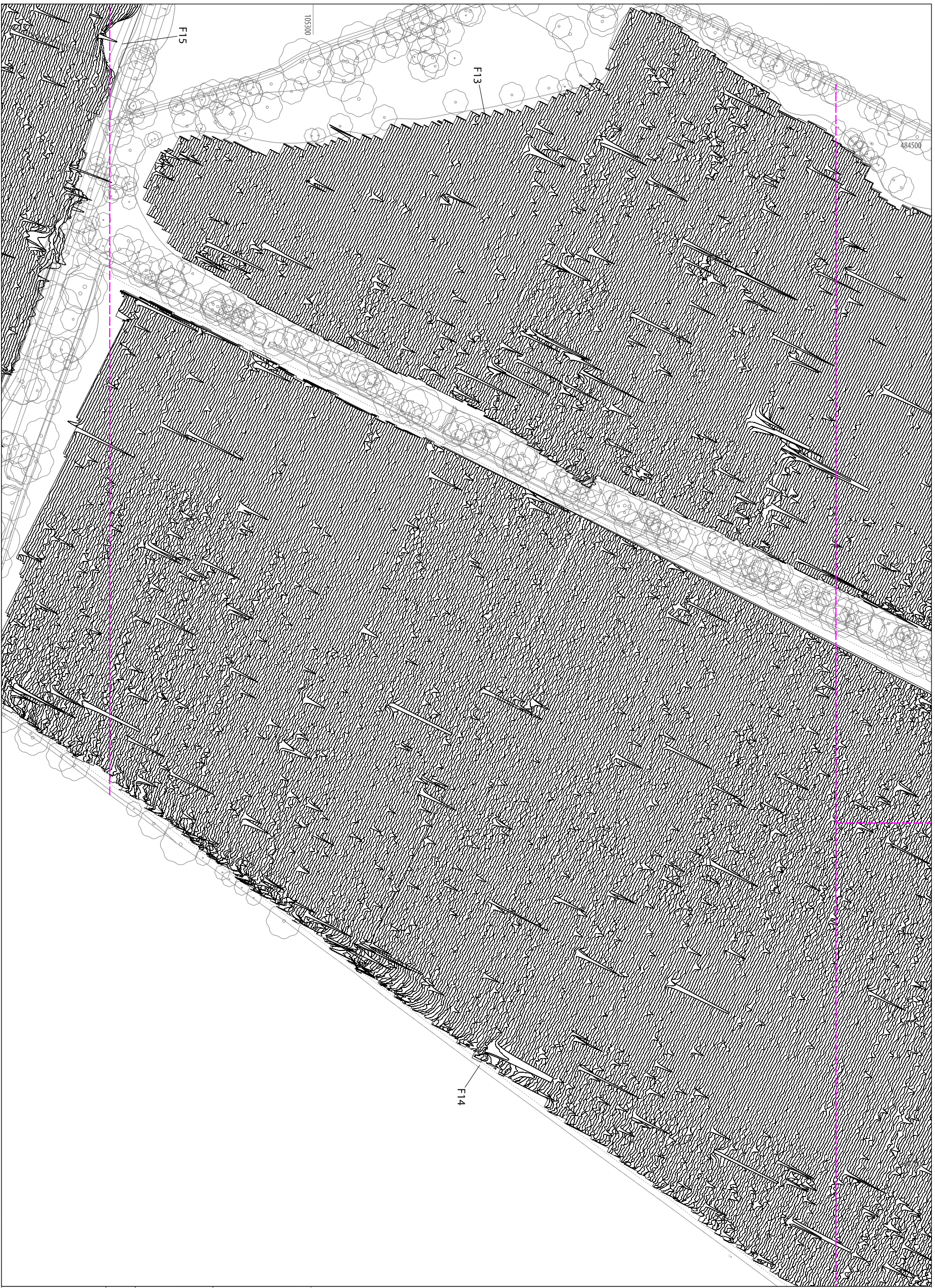
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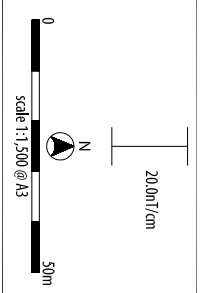
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Illus 33 Processed greyscale magnetometer data: Sector 8



— Sector boundary



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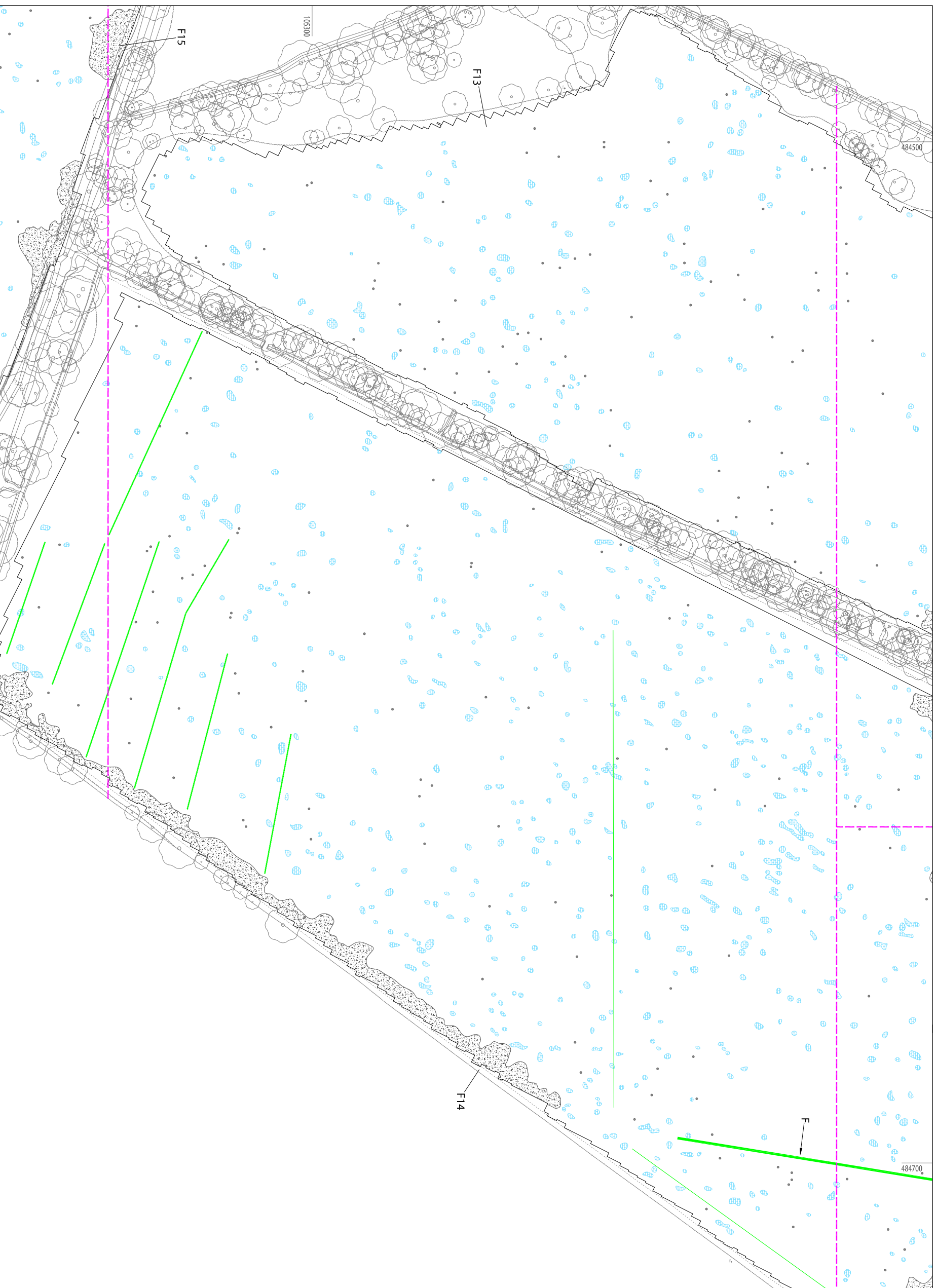
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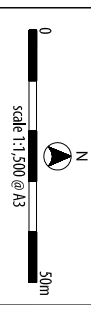
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Illus 34
XY trace plot of minimally processed magnetometer data; Sector 8



TYPE OF ANOMALY	INTERPRETATION
Dipolar bedded	Ferrous Material
Magnetic Disturbance	Ferrous Material
Linear Trend	Agricultural boundary
Linear	Former Field boundary
Magnetic Enhancement	Geology



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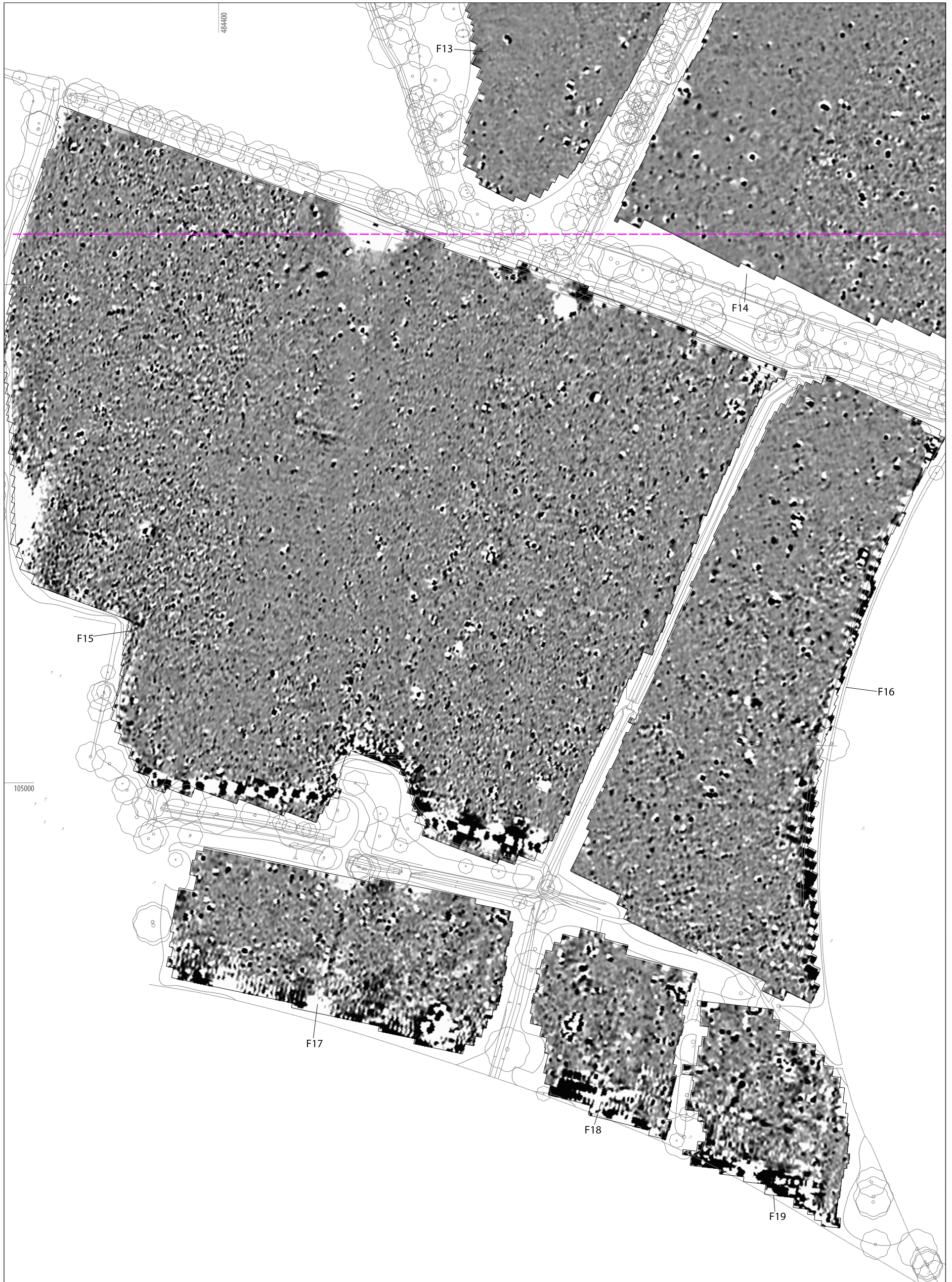
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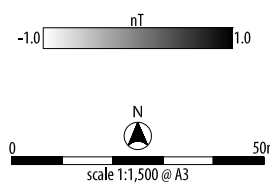
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Illus 35 Interpretation of magnetometer data: Sector 8



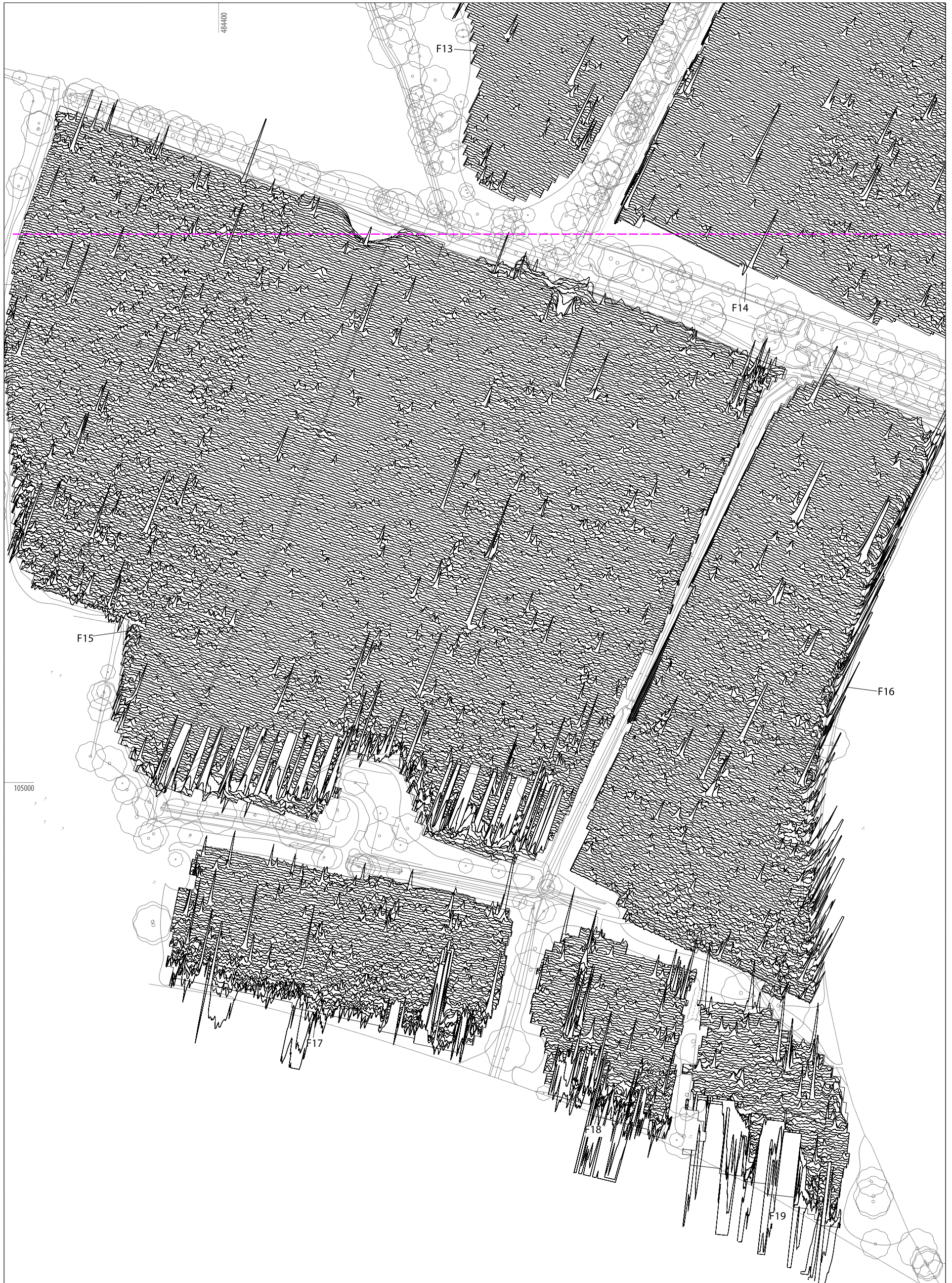
--- Sector boundary



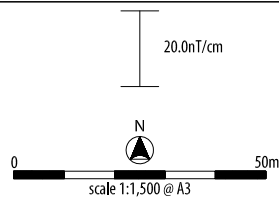
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Illus 36
Processed greyscale magnetometer data; Sector 9



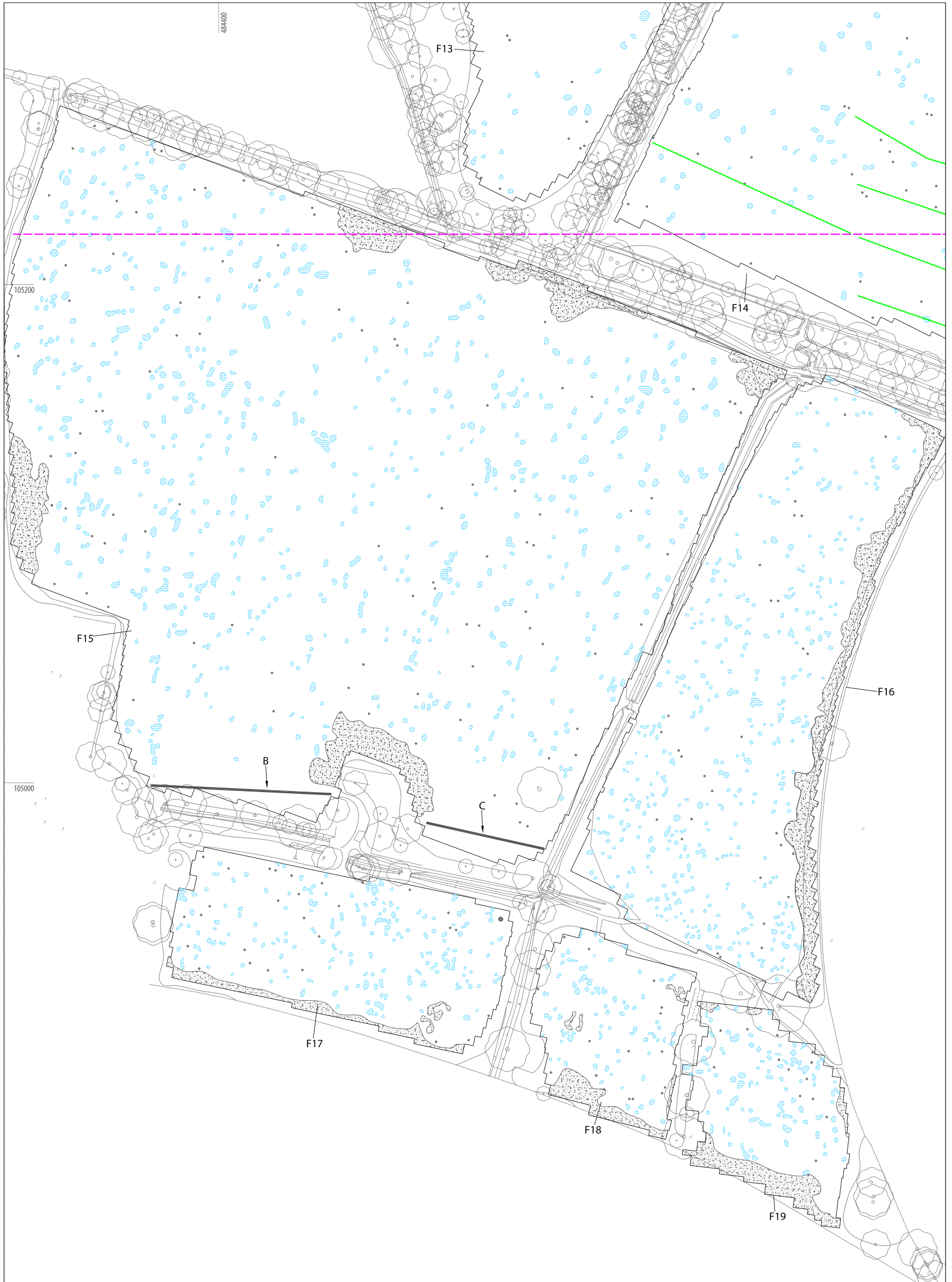
--- Sector boundary



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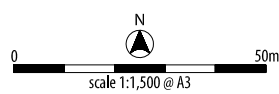
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Illus 37
XY trace plot of minimally processed magnetometer data; Sector 9



— Sector boundary

TYPE OF ANOMALY	INTERPRETATION
● Dipolar Isolated	Ferrous Material
● Magnetic Disturbance	Ferrous Material
— Dipolar Linear	Service Pipe
— Linear Trend	Field Drain
● Magnetic Enhancement	Geology



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Illus 38
Interpretation of magnetometer data; Sector 9



Section boundary



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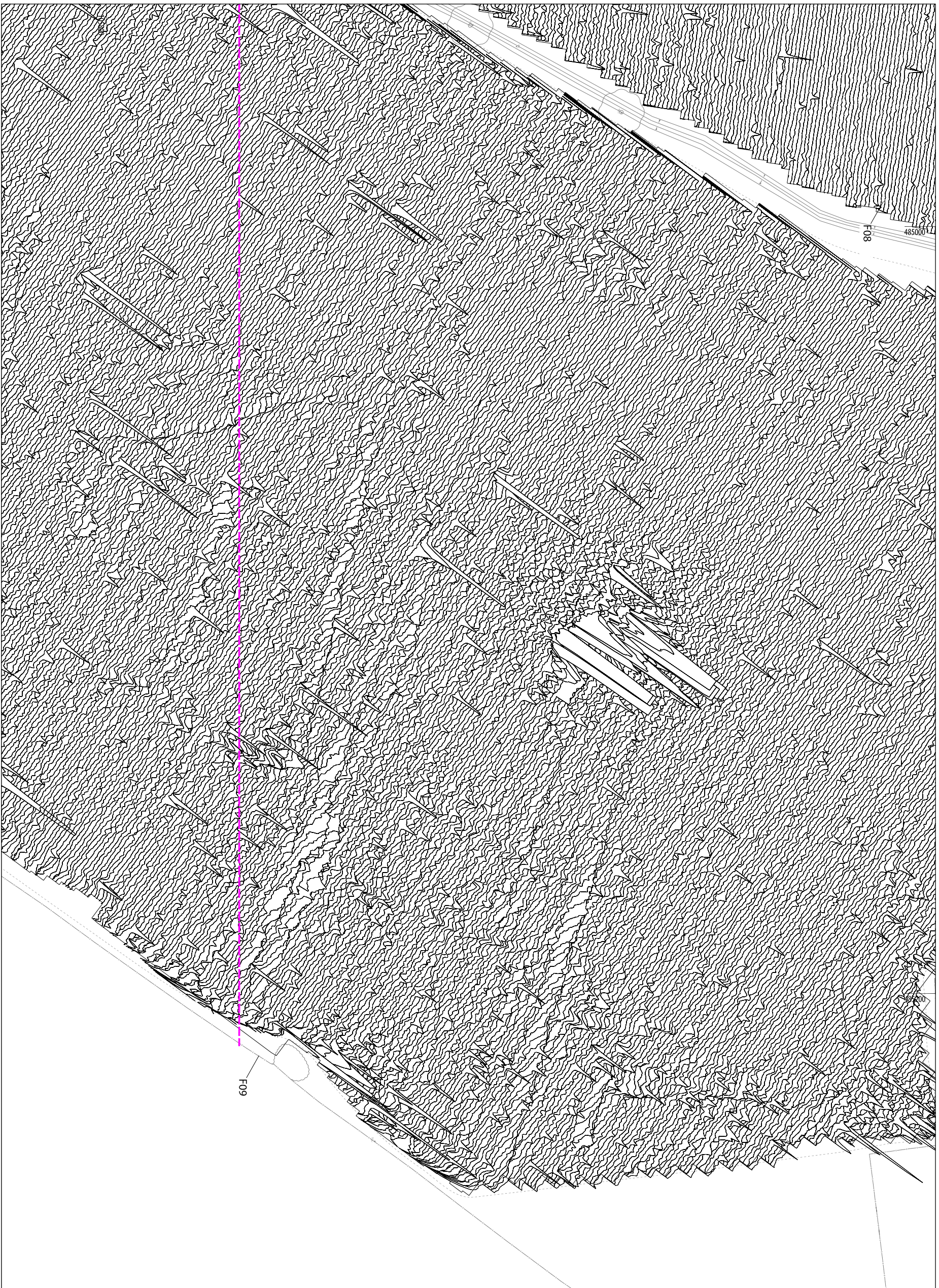
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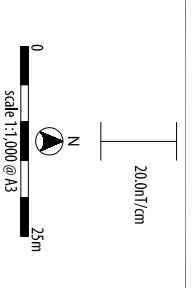
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Illus 39 Processed greyscale magnetometer data; Field 9



— Section boundary



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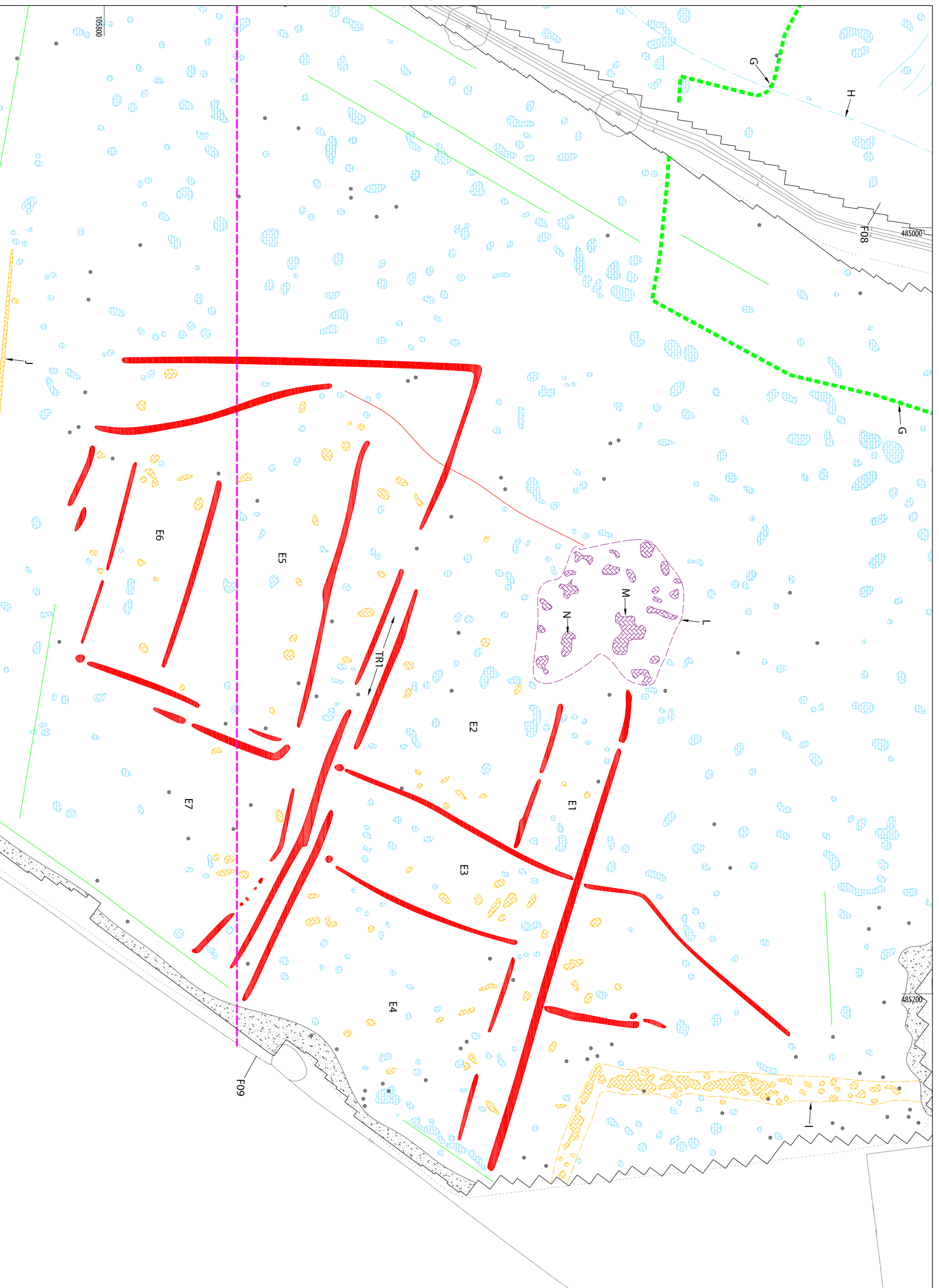
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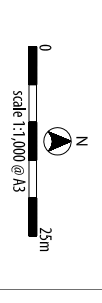
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Illus 40
XY trace plot of minimally processed magnetometer data; Field 9



TYPE OF ANOMALY	INTERPRETATION
• Dipolar bedded	Ferrous Material
• Magnetic Disturbance	Ferrous Material
• Magnetic Enhancement	Modern Track
• Linear Trend	Agricultural
• Linear	Former Field Boundary? Geological Variation
• Linear Trend	Geology
• Magnetic Enhancement	Geology
• Magnetic Enhancement	Archaeology?
• Magnetic Enhancement	Burning? Industrial?
• Linear Trend	Archaeology
• Magnetic Enhancement	Archaeology



PROJECT Land at Whitehouse Farm
Chichester
West Sussex
(CWCH/01)

CLIENT Linden Homes and Miller
Strategic Land

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Illus 41
Interpretation of area of archaeological potential: Field 9

7 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

Magnetic susceptibility and soil magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haematite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected.

The magnetic susceptibility of a soil can also be enhanced by the application of heat. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

Types of magnetic anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features

that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

APPENDIX 2 SURVEY LOCATION INFORMATION

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble GeoXR model). The accuracy of this equipment is better than 0.01m. The survey grids were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology (UK) Ltd cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises:-

- an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-239171

Project details

Project name	Land at Whitehouse Farm, Chichester, West Sussex
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 100 hectares of agricultural land on the north-western periphery of Chichester to provide information about the archaeological potential of land proposed for predominantly residential development. An area of definite archaeological potential has been identified to the immediate south of Whitehouse Farm characterised by a complex of interlinking ditched enclosures either side of a trackway, and being suggestive of Romano-British activity. At the periphery of the complex, an area of possible industrial activity is suggested. In addition, the survey has identified a ditch which is probably part of the Chichester Entrenchments - a system of late Iron Age defensive earthworks which are recorded as a Scheduled Ancient Monument (Ref. 1005856). Elsewhere, few anomalies of archaeological potential have been identified with the vast majority of anomalies being due to localised variations in the soils and superficial deposits. There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions within the proposed development area. Therefore, based on the results and interpretation of the data, the archaeological potential across the majority of the site is considered to be low, with a high archaeological potential ascribed to the field immediately west of Whitehouse Farm.
Project dates	Start: 14-09-2015 End: 08-10-2015
Previous/future work	Yes / Not known
Any associated project reference codes	CWCH15 - Sitecode
Any associated project reference codes	001 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Current Land use	Grassland Heathland 5 - Character undetermined
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology (other)	London Clay Formation and Lambeth Group
Drift geology	RIVER TERRACE DEPOSITS
Drift geology (other)	Head
Techniques	Magnetometry

Project location

Country	England
Site location	WEST SUSSEX CHICHESTER CHICHESTER Land at Whitehouse Farm, Chichester
Postcode	PO19 3AX
Study area	100 Hectares
Site coordinates	SU 8470 0570 50.844054720572 -0.796819469929 50 50 38 N 000 47 48 W Point

Project creators

Name of Organisation	Headland Archaeology
Project brief originator	The Environmental Dimension Partnership
Project design originator	Headland Archaeology
Project director/ manager	Harrison, S
Project supervisor	Bishop, R
Type of sponsor/ funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive Exists?	No
Digital Media available	"Geophysics"
Paper Archive Exists?	No
Paper Media available	"Report"

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land at Whitehouse Farm, Chichester, West Sussex; Geophysical Survey
Author(s)/Editor(s)	Harrison, D.
Date	2015
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