East Anglia TWO Offshore Windfarm

Appendix 24.4

Proposed Onshore Cable Corridor and Substation Sites: Geophysical Survey Report

Part 1 of 2

Environmental Statement
Volume 3

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EAON18

EAST ANGLIA ONE NORTH/TWO OFFSHORE WINDFARMS PROPOSED ONSHORE CABLE CORRIDOR AND SUBSTATION SITES

Geophysical Survey

For ScottishPower Renewables Ltd

July 2019

HEADLAND ARCHAEOLOGY

EAST ANGLIA ONE NORTH/TWO OFFSHORE WINDFARMS PROPOSED ONSHORE CABLE CORRIDOR AND SUBSTATION SITES

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July 2019

HA Job no.:	EAON18
NGR:	Western end of corridor 641000, 261200 Substation site 641500, 261100 Landfall 647500, 260000 South-eastern end of corridor 647000, 260000
Council:	Suffolk
SHER Event No:	Western end of corridor FRS 075 Substation site KND 029 Landfall ARG 100 South-eastern end of corridor ARG 111
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GEOPHYSICAL SURVEY

Headland Archaeology (UK) Ltd has carried out a geophysical (magnetometer) survey, which to date has covered approximately 455 hectares, incorporating the boundary comprising the Onshore Development Area (ODA), as presented for the Environmental Statement (ES) and the Development Consent Order (DCO), for the East Anglia One North/Two Offshore Windfarms. This report covers the survey completed up until the end of May 2019; further survey is anticipated in late summer/early Autumn 2019 as crops are harvested. The aim of the survey was to provide further information about the archaeological potential within the ODA and to help determine (where possible within the confines of other environmental and engineering constraints) the preferred cable route and substation locations, and informing an appropriate mitigation strategy to be formally agreed in the early post-consent stages of the projects, if consent is achieved. This report discusses the broad areas of archaeological activity (AAA's) identified within the ODA and which have been included within the ES. Any additional survey will be reported separately. The results of these further survey works will ultimately serve to inform and contribute to the development of post consent mitigation strategies in relation to the archaeological and cultural heritage resource.

The survey has clearly demonstrated that the prevailing geological and pedological conditions are favourable for the detection of sub-surface archaeological remains and consequently it is assessed that the results provide a reliable indication of the extent of all the significant areas of sub-surface archaeological remains within the ODA, subject to the limitations of the technique. Anomalies indicative of probable or possible archaeological features and activity have been identified throughout the ODA, the majority of which were previously unknown, thus adding significantly to the archaeological understanding of the landscape across which the cable corridor will traverse. Although the suspected archaeological remains extend throughout the ODA there are still areas where no anomalies of archaeological potential have been identified from the geophysical survey. However, the low magnitude exhibited by some of the anomalies and the partial and discontinuous nature of others suggests that, in certain instances, the archaeological remains may be more extensive than revealed by the survey, either due to partial truncation by modern agricultural techniques and/or a lack of magnetic contrast on a variable geological substrate. Nevertheless, eleven broad areas comprising both concentrations of anomalies or single clearly defined features are identified as AAA's. Most of the linear anomalies are interpreted as being the result of soil filled ditches forming an extensive and complex network of field systems and enclosures, most likely for animals. These field systems and potential stock enclosures are of uncertain date but probably range from the later prehistoric or early Roman periods with others more likely of post-medieval date. Smaller, sub-divided, enclosures with numerous discrete anomalies are interpreted as possibly having been the sites of human occupation. Several of these settlement sites are identified, particularly in the western half of the ODA, again varying dates are likely including medieval. As well as the enclosures and settlement sites, circular anomalies, interpreted as locating round barrows of possible Bronze Age date and a windmill of likely post-medieval date, are also identified.

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by ScottishPower Renewables Ltd (the Client) to undertake a geophysical (magnetometer) survey within the Onshore Development Area (ODA) for the East Anglia ONE North/TWO Offshore Windfarms (Illus 1-5). The survey is required in order to provide information on the archaeological potential of the ODA and to inform the Environmental Statement (ES) submitted as part of the Development Consent Order (DCO) application being prepared by Royal HaskoningDHV.

ScottishPower Renewables (SPR) is currently building the 714MW East Anglia ONE Offshore Windfarm approximately 43km off the coast of Suffolk and are proposing to develop further offshore windfarms in the area, including the 800MW East Anglia ONE North Windfarm and the 900MW East Anglia TWO Windfarm.

These two proposed projects are Nationally Significant Infrastructure Projects (NSIP) that are being developed respectively by East Anglia ONE North Limited and East Anglia TWO Limited (the Applicants) both of whom are wholly owned subsidiaries of SPR. Both projects have the potential to make a substantial contribution to UK 2030 energy targets by meeting nearly 10% (5% for each project) of the UK offshore wind cumulative deployment target for 2030. The East Anglia ONE North offshore windfarm site is located in the southern North Sea, approximately 36km from its nearest point to the port of Lowestoft and 42km from Southwold whilst the East Anglia TWO offshore windfarm site is approximately 32km from its nearest point to Southwold, and 37km from Lowestoft. The proposed East Anglia ONE North project will have an operational capacity of up to 800MW, which is enough to power approximately 659,000 UK households whilst the proposed East Anglia TWO project will have an operational capacity of up to 900MW, which is enough to power approximately 742,413 UK households. Both projects would be principally comprised of offshore wind turbines, offshore electrical and construction, operation and maintenance platforms, offshore export cables, onshore cables, an onshore substation, a National Grid substation and National Grid overhead line realignment works.

Both projects are in the pre-application stage and their application programmes run in parallel, however they will be submitted as separate DCO applications. The onshore development area, which includes landfall location, onshore cable route, onshore substation location and National Grid infrastructure, has been developed to allow for the construction of both the proposed projects. At this stage it is not known whether both projects would be constructed simultaneously or sequentially.

Scoping opinions for the two windfarms have been received from the Planning Inspectorate, comments relating to the Archaeology and Cultural Heritage (Onshore) sections have been partly addressed by the completion of a Desk-Based Assessment (DBA – Headland 2018) and the Preliminary Environmental Information Report (PEIR – Royal HaskoningDHV 2019) and subsequent Environmental Statement (ES) of which this report will form an appendix.

The survey was undertaken in accordance with a Method Statement for Onshore Geophysical Survey (Headland Archaeology 2018a), guidance contained within the National Planning Policy Framework (MHCLG 2019) and in line with current best practice (e.g. EAC 2016).

1.1 Site location, land use and topography

The Site (for the substations and route of the proposed onshore cables) has been identified by a detailed site selection process as outlined in Chapter 4 Site Selection and Assessment of Alternatives of the East Anglia TWO and East Anglia ONE North Environment Statements, submitted as part of the DCO application. It includes land between Sizewell and Thorpeness at the landfall and extends inland approximately 9km terminating at the proposed substation site just to the north of Friston, encompassing the parishes of Aldringham-cum-Thorpe, Leiston, Knodishall and Friston. The ODA is in multiple landownership and the land use is a mixture of arable and market garden agriculture with areas of heath, scrub, woodland and sand dunes to the far east along the coastal edge.

Since the commencement of the geophysical survey the limits of the ODA have undergone substantial revision and refinement. The most recent iteration of the ODA is presented in the illustrations throughout and covers an area of up to approximately 555 hectares across the parishes of Aldringham-cum-Thorpe, Leiston, Knodishall and Friston.

All of the farmed land within the ODA has been surveyed except where ground conditions precluded survey (such as areas of bird cover around the periphery of some fields), where access could not be agreed within the project timetable or in areas on the periphery of the ODA which it was subsequently decided were likely to fall out with the cable corridor.

The survey was carried out over a number of phases as crops were harvested and access was agreed between August 2018 and May 2019, although it is expected that other areas will ultimately be subject to survey once crops are harvested and associated access permissions in place.

1.2 Geology and soils

The underlying bedrock geology comprises Crag Group Sand (NERC 2019). This is overlain across most of the ODA with superficial deposits of Lowestoft Formation Diamicton, Sand and Gravel and Clay and Silt. A small band of Alluvium is recorded adjacent to the Hundred River and there are also small areas where there are no recorded superficial deposits (Illus 2).

The soils are classified in the Soilscape 10 and Soilscape 7 associations which are characterised as freely draining slightly acid sandy soils and freely draining slightly acid but base rich soils respectively (Cranfield University 2018).

2 ARCHAEOLOGICAL BACKGROUND

An Onshore Archaeology and Cultural Heritage Desk Based Assessment has been undertaken (Headland 2018). This report compiled baseline data from a variety of sources including aerial photographs, historic maps, LIDAR data and archaeological records held by Suffolk Historic Environment Record and the National Record of the Historic Environment. The latter sources revealed that there are no designated assets and 41 previously recorded non-designated assets within the ODA. As part of the desk-based research a further 72 previously unidentified potential assets were highlighted, predominantly from the analysis of historic mapping and LiDAR data (Illus 3).

It is not proposed to give a detailed description of the assets, but a general overview is provided below.

Nearly half (19 out of 41) previously recorded assets relate to Second World War activity, mostly near to the coast and in areas that were/are unsuitable for survey. Other assets relate to extant features in the landscape, quarry pits or post-medieval features. Only eight records relate to cropmarks likely to be due to features pre-dating the post-medieval period.

Out of the 72 newly identified assets very few relate to previously unidentified cropmarks, with the majority due to features/activity of post medieval or modern date, such as depressions probably relating to small scale quarrying or perhaps bomb craters, relict field boundaries and post-medieval buildings and Second World War infrastructure, identified from analysis of LIDAR data or historic mapping. The conclusions of the DBA are summarised below.

The DBA states that '*the LiDAR assessment is considered likely to have identified all substantial upstanding heritage assets within the ADBA Study Area, although smaller discrete features may have been missed due to the limited coverage at resolutions greater than 2m*'. In relation to the '*below ground archaeological remains the map regression will have identified any features still present in the 19th century, but will not have identified earlier features, which may not have survived above ground to this date*', and '*the aerial photography analysis is likely to have detected a majority of cropmark features*'. The report concluded that '*there remains the potential that further below ground archaeological remains are present, either as smaller features not readily detected in aerial photography or due to the ground conditions at the time the photos were taken not being conducive to cropmark formation*'.

It was therefore concluded that '*on the basis of the known archaeological and historical background ….. there is considered to be a moderate to high likelihood that further prehistoric remains survive within the ADBA Study Area*'. These may include possible assemblages of flint artefacts, especially along the gravel terraces of the Hundred River; it should be noted that these type of remains are not likely to be identified by geophysical survey and are only likely to be identified during more intrusive archaeological survey and/or investigation.

It was also considered that there is '*a moderate likelihood of further Iron Age and Romano-British remains in the form of possible settlements and associated field systems*'. It was recognised that Iron Age and Roman sites (likely to comprise traces of ditches and earthworks) were more conducive to identification through geophysical survey.

It was also considered that there is '*a medium to high potential for evidence of Anglo-Saxon and medieval agricultural land use within the ADBA Study Area*'. Patterns of medieval land use are again readily identified through geophysical survey. Within the area around the probable church of Buxlow (KND 009 and HA6) there was considered to be a high or very high potential of burials.

Overall the archaeological potential of the ADBA Study Area was assessed as '*medium*'.

3 AIMS, METHODOLOGY AND PRESENTATION

The overall aim of the geophysical survey was to gather sufficient information to enable an assessment to be made of the density and extent of any sub-surface archaeological remains within the defined limits of the (I)ODA (previously the 'Indicative' Onshore Development Area, now the Onshore Development Area). This information would then be used to further inform the route of the onshore cable corridor and position of other infrastructure.

Specifically, the aims were to:

- undertake a programme of detailed magnetometry across as much of the (I)ODA as possible;
- to corroborate, identify and characterise sub-surface anomalies that may have an archaeological origin (including defining the spatial limits of already known or suspected heritage assets);
- to discount areas within the survey area that are found to have been subject to previous 'modern' disturbance, for example where the geophysical survey data indicate the presence of 'made' or previously heavily disturbed ground;
- provide an interpretation of all recorded geophysical anomalies in order to inform the design of a scheme-wide programme of archaeological evaluation trial trenching (in this instance this will be an initial informative stage of mitigation, post-consent); and
- to produce a comprehensive site archive and report that is compliant with all relevant standards, guidance and good practice.

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 archaeological sites can be obtained as buried features often producing 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.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system is programmed to take readings at a frequency of 10Hz (allowing for a 10-15cm sample interval) on roaming traverses 4m apart. These readings are stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system is linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

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

3.2 Reporting

A general site location plan is shown in Illus 1 at a scale of 1:50,000. Survey location plans showing the superficial geology and field numbers, LIDAR features and previously unidentified heritage assets, as well as processed and interpreted data are shown on Illus 2 to Illus 9 inclusive at scales of 1:25,00 and 1:12,500. The data is presented and interpreted at a scale of 1:2,500 in Illus 10 to Illus 87 inclusive. This includes fully processed (greyscale) data, minimally processed data (XY traceplot) and accompanying interpretative plots. The data from the eleven AAA's are also presented at a larger scale (1:1,000) in Illus 88 to Illus 195 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 Method Statement (Headland Archaeology 2018a), supplied to SPR and submitted to and approved by Suffolk County Council Archaeology Service (SCCAS), guidelines endorsed by Historic England (EAC 2016) 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

4.1 General

A variable magnetic background has been recorded throughout the ODA manifesting in the data as a plethora of discrete areas of magnetic enhancement. These are due to localised variations in the depth and composition of the soils and the superficial deposits from which they derive. Areas of variation are also caused by differing agricultural activities and ploughing regimes.

Mostly the survey was carried out after the arable and market garden crops had been harvested although Headlands' bespoke system did allow survey between mature and semi-mature potato and parsnip crops. Ground conditions were generally good across the ODA and the data quality is correspondingly good throughout with two instances of poor data quality due to sensor errors when working close to the high voltage overhead cables. Archaeological anomalies have been identified across all soil types and on all the different superficial geologies. Consequently, it is assessed that the results provide a reliable indication of the extent of all the **significant** areas of sub-surface archaeological remains within the ODA. However, as discussed previously, there are certain types and periods of archaeological activity that are unlikely to be identified by magnetic survey. These include unenclosed prehistoric activity and Saxon settlement. Alternative survey strategies may be appropriate to identify archaeological activity of these periods and types.

The discontinuous nature of some of the anomalies which have been interpreted as of possible or probable archaeological origin demonstrates that detection of some soil-filled features may be hampered by either low magnetic contrast in the surrounding soils and/or the depth of the superficial deposits or differential degradation due to modern intensive farming practices. In these circumstances some discrete and low magnitude anomalies may not manifest in the data at all.

The anomalies identified by the survey fall into a number of categories but are broadly interpreted according to their origin, whether archaeological or non-archaeological.

The non-archaeological anomalies are described first and are categorised as being due to modern, agricultural, geological or quarrying activity. Only exemplar anomalies

(i.e. those that can be clearly and directly related to extant or mapped features or that correspond with heritage assets described in the DBA) are described in detail in the report text. However, all significant anomalies are shown on the interpretation illustrations.

Anomalies that are interpreted as of possible or probable archaeological origin are then described and discussed within the context of the eleven areas of archaeological activity (AAA's) which have been identified across the ODA. The AAA's are described from east to west starting at the point at which the cable makes landfall and moving westwards to the substation site. Each AAA has been interpreted by period (based on morphology and other supporting information) and an attempt has been made to ascribe likely importance. It should be noted, however, that these are subjective predictions and the date and importance of the remains can only be more objectively established by intrusive means (i.e. intrusive evaluation and subsequent excavation).

It should also be noted that not all the anomalies interpreted as of possible archaeological origin fall within AAA's. In these cases, the anomalies are typically single linear or discrete anomalies which cannot be confidently interpreted as non-archaeological and which have therefore been ascribed a possible archaeological status.

4.2 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 is common on most sites, often being present as a consequence of manuring or tipping/infilling. Throughout the ODA there is no obvious clustering to these ferrous anomalies which might indicate an archaeological origin, although this cannot be guaranteed. Far more probable is that the 'spike' responses are likely caused by the random distribution of ferrous debris in the upper soil horizons.

Several high magnitude dipolar linear anomalies have been identified across the ODA, such as that running along the southern boundary of Field GO-09 (Illus 28-30 - 647158, 261455). These are caused by buried service pipes.

Of particular note are the parallel linear anomalies, aligned broadly east/west, in the north-eastern corner of GO-11 (Illus 22-24 – 646962, 262500) that locate the underground power cables from the Galloper Offshore Windfarm.

Discrete areas of disturbance are identified around the base of the electricity pylons which support the overhead power lines that skirt around the northern limits of the ODA, such as in BH-11 (see Illus 85-87 – 639944, 260505) and GO-14 (see Illus 31-33 – 646173, 261922). The disturbance is caused by the proximity of the magnetometer to the pylon superstructure.

A rectilinear area of disturbance, in the north-west of BE-05 (Illus 52-54 – 643403, 260307), corresponds with modern agricultural buildings visible on AP60. These buildings have obviously been demolished since the aerial photograph was taken, and the disturbance is due to magnetic debris left over from the demolition which has then been incorporated into the topsoil.

Magnetic disturbance around the periphery of fields is due to ferrous material within or close to the adjacent boundaries and is of no archaeological interest unless specified otherwise.

4.3 Geological anomalies

Discrete low magnitude anomalies are identified throughout the ODA. These are geological in origin and are caused by minor variations in the depth and composition of the topsoil (or the superficial deposits from which the upper soil horizons are derived), or the accumulation of topsoil along the breaks in, or bottom of, slopes.

4.4 Agricultural anomalies

Analysis of historic cartographic sources (tithe and estate maps and early edition Ordnance Survey maps) indicates that the pattern of land division throughout the ODA has undergone change from the late 18th century up to the present day. Some boundaries have been removed to create larger fields. Some of these former boundaries manifest in the data as linear anomalies (soil-filled ditches), such as in GO-20 (645267, 260847) and GO-21 (Illus 40 to Illus 45 – 644997, 260860) in the eastern half of the ODA or in BE-04 (Illus 61-63 – 643093, 260238) or as linear alignments of ferrous anomalies, which are caused by modern debris within the fill of the ditch or which has accumulated along the former field margins.

In other areas, such as in AAA1 (see below), there is clearly an extensive system of land division, on more than one alignment, which is only partially recorded on historic mapping. Where the anomalies clearly match boundaries displayed on the tithe maps, or clearly intersect with boundaries that are recorded, they are interpreted as of agricultural origin. Other linear anomalies which do not correlate with mapped boundaries, or which are on slightly different alignments, are interpreted as of possible archaeological origin (see below). It is considered equally possible that these too are post-medieval boundary divisions although alternatively they may be significantly earlier, hence the possible archaeological interpretation.

The more closely-spaced linear anomalies, aligned parallel with the extant field boundaries, are due to modern ploughing, such as in GO-04 (Illus 13-15 – 646802, 260287) and GO-12 (Illus 25-27 – 646862, 262133). Perhaps surprisingly, no anomalies have been identified which are caused by medieval and/or post medieval ridge and furrow cultivation. This is presumably due to the intensive nature of the current agricultural regimes having removed any vestigial traces of older agricultural practices.

Linear trend anomalies have also been identified, most prominently at the western end of the corridor in BA-02

(Illus 64-69 – 641553, 261181), within the site of the substations, and BH-11 (Illus 85-87 – 6399543, 260686). These anomalies are sometimes oblique to the surrounding field boundaries and/or arranged in a partial herring-bone pattern and are characteristic of modern field drains. Unsurprisingly the land drains are concentrated on the less well draining areas, predominantly where superficial deposits of diamicton are recorded.

4.5 Quarrying anomalies

Numerous amorphous localised areas of magnetic disturbance are identified throughout the ODA being more prevalent in the eastern half of the corridor. These anomalies are interpreted as being due to backfilled clay and gravel extraction pits. The largest examples are located in fields GO-01 (647514, 260736), GO-05 (646652, 260412), GO-10 (646977, 261920) and GO-20 (Illus 13-15, 25-30 and 40-42 – 645340, 261234), in the eastern half of the ODA, being visible in the LiDAR data being recorded as LF45 in GO-01 (647513, 260739), LF48 (646735, 260431) and LF49 in GO-05 (646666, 260412), LF43 in GO-10 (646971, 261924) and LF38 in GO-20 (645355, 261224). In the western half of the ODA LF29 in RM-04 (Illus 58-60 – 642569, 261215) also locates an area of disturbance interpreted as a pit. Some of these pits are visible as cropmarks on the aerial photographs, such as in GO-09 (647134, 261628), where AP2, AP22 and AP23 all locate pits identified as anomalies in the survey (Illus 28-30). Many of these small-scale enterprises would have been designed to cater for a specific, local, purpose and hence short lived. Consequently, although some of these pits are recorded on historic mapping many more are not but have been identified using aerial photographs, LIDAR data and geophysical survey data in combination. The magnetic disturbance is caused by magnetic debris (brick, tile, iron etc.) within the material used to infill the extraction pits.

It is considered possible that some of these anomalies (i.e. ones not recorded on historic mapping) may be due to backfilled bomb craters but there is no definitive information on this and no basis in the data on which to discriminate between a backfilled extraction pit or a backfilled bomb crater.

4.6 Possible archaeological anomalies

Unless specified all the linear anomalies described are likely to be due to soil filled cut features, such as ditches, forming clear patterns of enclosure and land division. Against a variable magnetic background, it is difficult to confidently discriminate between discrete anomalies which may be due to archaeological features, such as pits, which may be indicative of occupational activity, and those that are probably due to localised geological variation. For this reason, most of the discrete anomalies within enclosures have been ascribed a possible archaeological origin with those outside, except where the responses are particularly broad or high in magnitude, interpreted as of non-archaeological origin.

Anomalies interpreted as being of possible archaeological origin are caused by soil-filled features such as pits or ditches or by spreads of magnetically enhanced material within the upper soil horizons. Whilst these anomalies do not manifest in any coherent archaeological pattern, they are either located near to areas of known archaeology, or cannot be satisfactorily interpreted as either modern, agricultural or geological in origin. Several of these anomalies lead to/from areas of previous quarrying activity and so could be associated with this extraction. On this basis, these anomalies are interpreted as potentially archaeological in origin.

4.7 Areas of archaeological activity

Unless specified all the linear anomalies described are likely to be due to soil filled cut features, such as ditches, forming clear patterns of enclosure and land division. With the variable magnetic background it is difficult to confidently discriminate between discrete anomalies which may be due to archaeological features, such as pits, which may be indicative of occupational activity, and those that are probably due to localised geological variation. For this reason, most of the discrete anomalies within enclosures have been ascribed a possible archaeological origin with those outside, except where the responses are particularly broad or high in magnitude, interpreted as of non-archaeological origin.

Eleven distinct areas of archaeological activity (AAA) have been identified, which are discussed below. These range from individual features to extensive areas of settlement and/or enclosure.

4.7.1 AAA1 (Illus 88-120)

The most extensive area of potential archaeological activity comprises a c. 3km section of the ODA extending northwards from the point at which the cable route makes landfall. Numerous conjoining linear anomalies form a huge, complex, system of land division and enclosure covering an area of approximately 116 hectares.

The most coherent pattern of former fields is seen in field GO-03 (Illus 91-99 – 647030, 260465). Further to the north (beyond the defined AAA) the anomalies become fragmentary and less coherent in GO-09 (647079, 261687), GO-10 (646941, 261910), GO-11 (646947, 262265) and GO-12 (646774, 262185) but nevertheless are still present albeit in a more truncated pattern. The size and shape of the enclosures varies but all are broadly rectilinear in morphology and are generally aligned on a similar orientation to the current field pattern. A few of the linear anomalies correspond with boundaries on tithe or estate maps indicating a likely post-medieval origin whilst others clearly intersect with mapped boundaries and on this basis these anomalies have been interpreted as of agricultural origin (green on the interpretation illustrations). Some anomalies do not readily fit this pattern of land division and for this reason have been interpreted as of possible archaeological origin. However, on balance, it would seem most likely that most of the field system in

AAA1 is of probable post-medieval origin. This area is also characterised by evidence of small-scale extraction and it is also possible that some of the linear anomalies may be associated with this activity, possibly being caused by drains. Certainly, no anomalies indicative of settlement activity have been identified and on this basis these anomalies are predicted to be of low to medium (at most) archaeological importance.

On the northern edge of GO-04 (Illus 88-90 – 646772, 260590) a semi-circular anomaly locates the ploughed down remains of a likely Bronze Age barrow, approximately 16m in diameter. Other barrows are recorded in the wooded area immediately to the north, outside the ODA. A distinct discrete anomaly situated in the centre of the barrow is highly likely to be associated with the barrow, possibly a cremation burial. This barrow feature is predicted to be of medium archaeological importance.

4.7.2 AAA2 (Illus 121-129)

AAA2 in GO-16 (645922,261879) encompasses a single circular anomaly which is also interpreted as the ploughed down remains of a Bronze Age barrow (Illus 121-123). Two discrete anomalies immediately north of the probable former monument could be pits or areas of burning associated with the former monument. This barrow feature is predicted to be of (at most) medium archaeological importance.

Fifty metres to the east of the double pylons and 250m south of the barrow a rectangular enclosure, of unknown date, is identified. Several discrete anomalies, two with the characteristic X-Y traceplot profile of a kiln (see Illus 125) is identified in GO-16 (646016, 261724). These features are predicted to be of (at most) medium archaeological importance.

In GO-17 (645985, 261422), immediately to the south of GO-16, a series of discontinuous linear anomalies perhaps forming another rectilinear enclosure are identified (Illus 127-129). A small square enclosure within the south-eastern corner of the 'enclosure' is also identified. Seven high magnitude 'spike' anomalies are also recorded. Linear cropmarks corresponding with some of these anomalies are recorded on AP74 and AP77. A tentative military interpretation was placed on the cropmarks. No definitive archaeological interpretation can be made from the magnetic data hence a possible archaeological interpretation is given. A predicted medium importance (at most) may be appropriate.

4.7.3 AAA3 (Illus 130-147)

AAA3 encompasses another very large area (approximately 98 hectares) which covers five fields extending from OT1 and OT2 in the south-west to GO-20 (645509, 261278) in the north-east. Three separate foci of activity are identified.

To the north of AAA3 (GO-21 and GO-22) a confusing pattern of linear and rectilinear anomalies, aligned broadly on the points of the compass, extend 0.75km from north/south. Considerable quarrying activity in these two fields makes confident interpretation more difficult but the pattern of enclosure appears dissimilar to that defined within AAA1 being considerably less regular. The only well-defined feature is a rectangular enclosure in GO-20 (Illus 40-42 – 645043, 260728), aligned broadly north/south with a much smaller enclosure appended to the its south-eastern corner. Other linear anomalies then extend southwards into GO-21 where the enclosures then extend westwards across the full width of the field. Some discrete anomalies have been interpreted as of possible archaeological origin but given the quarrying activity and general variation in the magnetic background this interpretation is far from certain. The date of this system of enclosures is uncertain and could date from the Iron Age to post-medieval periods. A predicted low to high importance (at most) is ascribed.

In the field immediately to the south, GO-22 (644969, 260518), a small square enclosure is appended on the eastern side of a linear anomaly that locates a former field boundary. High magnitude discrete anomalies within the enclosure are also interpreted as archaeological in origin. Linear anomalies immediately to the east define at least five former fields/enclosures. These former fields are on the same alignment as the former field boundary to the west and also to the current field layout so are interpreted as of likely post-medieval date. Nevertheless, an archaeological origin for these anomalies has been ascribed, with predicted low to medium importance.

The final focus of activity is around the southern edge of GO-22 extending south into OT-01 (Illus 43-45). Here sinuous parallel curvilinear anomalies (which cross the current field boundary between) mark the northern boundary (possibly a trackway) of a series of small enclosures that extend from the southern side of the possible trackway; the south-western sides of these enclosures are not identified and the archaeological activity does not continue into OT-02. In OT-01 the archaeological activity clearly does continue although with no obvious pattern except for the continuation of the trackway. Numerous anomalies of enhanced susceptibility attest to archaeological activity. These features are predicted to be of low to high (at most) archaeological importance.

4.7.4 AAA4 (Illus 148-159)

Immediately west of Aldeburgh Road is AAA4. This large area comprises an extensive system of former field division and settlement which have been split into three main foci of archaeological activity.

Aligned parallel with, and adjacent to, the eastern boundary of BE-07 is a complex arrangement of linear anomalies forming a ladder-like series of smaller conjoined

enclosures aligned north/south across the full length of the field (644388, 260175). At the southern end of the field the enclosures are much smaller with numerous internal discrete anomalies suggestive of settlement and/or industrial activity. As elsewhere within the corridor quarrying activity in the south-eastern corner of the field has truncated some of the archaeological remains. This area is predicted to be of medium to high (at most) archaeological importance, particularly to the south-eastern corner of the field.

Approximately 250 metres to the west, in BE-06 (644146, 260219), is a trackway, also aligned north/south, running the length of the field, and clearly defined by two parallel ditches. A fragmentary ditch type anomaly aligned east/west, extending east from the trackway, strongly suggests that the land between the trackway and the settlement described above was divided into large fields as is the land to the west of the trackway. Of particular note is a small circular feature (644187, 260168 - bisected by the current field boundary) lying immediately to the south of this ditch. It is not clear whether this is a small enclosure appended to the former boundary, or perhaps to a ploughed-out barrow feature which has been deliberately avoided by later activity. Again, this area is predicted to be of medium to high (at most) archaeological importance.

The third element in this AAA is located in BE-03 and BE-05 (643705, 260320) and comprises a more complete pattern of former field division. However, along the northern edge of BE-03 the enclosures become much smaller with numerous discrete anomalies hinting at activity other than just stock control. One small circular anomaly (643950, 260283) with a possible entrance to the western side is particularly noted. The predicted archaeological importance along the northern edge of BE-03 is medium to high (at most) and low to medium within the wider field system.

4.7.5 AAA5 (Illus 169-171)

Along the western edge of BE-04 (642905, 260320), parallel with the road, a roadside enclosure approximately 70m in length is clearly identified. Several discrete anomalies, which are interpreted as of possible or probable archaeological origin, are identified within this enclosure. The enclosure appears to be in turn enclosed by a linear ditch type anomaly which extends from the current field boundary to the north to the small wooded area to the south-west. To the east of the enclosure several linear ditch type anomalies, on broadly the same south-west/north-east alignment, indicate a wider field system in the surrounding area. This area is predicted to be of (at most) medium archaeological importance.

4.7.6 AAA6/7 (Illus 160-168)

A circular anomaly with a cross-shaped anomaly central within it in field RM-04 (Illus 160-163 – 642659, 261072) locates a post-medieval windmill recorded on historic mapping. This feature is predicted to be of (at most) medium archaeological importance.

The partial remains of a probable barrow are identified on the boundary between RM-10 and RM-11 (642601, 260657). The archaeological importance of this feature is also predicted to be medium (at most).

A small cluster of sub-rectangular enclosures in the centre of field RM-13 (Illus 166-168 – 642554, 260561) may potentially be dated to the Middle Bronze Age through to the early Roman period although the partial remains of the barrow, less than 100m to the north-east, could suggest a prehistoric date for the enclosures to be more likely. Linear anomalies suggest the partial remains of larger enclosures to the north and east in RM-10, RM-11 and RM-12 (642778, 260729). Another small isolated rectilinear enclosure is identified on the northern limit of the survey area in RM-10. This cluster of archaeological activity is predicted to be of (at most) medium importance.

4.7.7 AAA8 (Illus 181-183)

Three or four conjoining rectangular enclosures aligned north/south are identified on the southern boundary of RM-09 (642153, 260715). The enclosures do not continue into RM-14, although other discontinuous linear anomalies are identified throughout this field hinting at the presence of larger fields to the south. The date of these features is uncertain but again could be from the Iron Age to post-medieval. These remains are predicted to be of (at most) medium archaeological importance.

4.7.6 AAA9 (Illus 175-180 and 184-192)

AAA9 also encompasses a large area, approximately 45 hectares, extending across several fields, BA-01, WR-01, WR-02, WR-03, WR-05, WR-06, WR-07, WR-08 and RM-08 (Illus 67-69 and Illus 73-78 – 641589, 260811). Of greatest significance is the cluster of conjoining enclosures in field RM-08 which extends for approximately 225m on a north-east/south-west alignment from the adjacent lane, bordering the south-western section of Grove Wood. The numerous discrete anomalies are indicative of occupation and this cluster of anomalies is probably the remains of a roadside settlement of likely medieval date. To the north-western side of the lane the anomalies become much weaker and disparate but are likely to indicate the continuation of the settlement. Throughout the remainder of AAA9 discontinuous linear anomalies are again indicative of a former system of field division of uncertain date. The areas of possible settlement bordering Grove Wood are predicted to be of medium importance, whilst the field system is likely to be of only low importance.

4.7.7 AAA10 (Illus 172-174)

Another small square cluster of rectilinear enclosures, approximately 70m by 70m, is identified in the far north-west of the ODA in RM-01 (641948, 261472), adjacent to the power lines. Some of the responses are very low magnitude suggesting that the archaeological activity may be more extensive than currently revealed by the magnetic survey. These enclosures again could date from the later prehistoric through to the early post-Roman periods. The archaeological importance is predicted to be medium.

4.7.8 AAA11 (Illus 193-195)

The final area of currently identified potential is located at the extreme western end of the ODA in BH-09 (640267, 260688). Two foci of activity are identified.

The smaller area is located immediately south of the twin pylons and the magnetic response from the pylons is clearly masking the full extent of the archaeology. Anomalies locating two small enclosures aligned north/south are identified as well as several large discrete anomalies which are interpreted as of possible archaeological origin. This area is predicted to be of (at most) medium archaeological importance.

The second area is far more extensive and comprises an L-shaped arrangement of enclosures which extends 150m south from the corner of New Covert to the southern boundary of BH-09 (640267, 260688) and then extending 225m east, following, but overlapping with, the current boundary between BH-09 and BH-10 (640189, 260541). Several large discrete anomalies are almost certainly archaeological in origin. This area is predicted to be of medium to high (at most) archaeological importance.

4.7.9 The Substation Site

The fields where the substations will be sited (centred at 641395, 261184) have perhaps the least apparent archaeological interest within the areas surveyed to date with virtually no anomalies of possible archaeological origin and none of probable archaeological origin being identified. Whilst it is accepted that no geophysical survey will identify all archaeological features it can be stated with a reasonable degree of confidence that it is unlikely that there will be significant or extensive archaeological activity within the substation area on the basis that archaeological activity has been clearly identified (AAA10 and AAA11) on the same geology and soils (diamicton overlying Crag Group Sand) as prevail within the footprint of the substations.

4.7.10 Buxlow / Buxton Chapel (KND 009 / HA 6)

Two possible locations of the site of the former parish church of Buxlow/Buxton are noted in the DBA and both have been covered by the geophysical survey due to the presence of allotments, although one field (HE-02) was only partly surveyed. On the HER the site of the church is recorded as KND 009 (641417, 260629) in field HE-02/WR-08. No anomalies of clear or obvious archaeological potential have been identified here although there is a distinct area of disturbed readings in the centre of the field (641362, 260609) which might not be inconsistent with a spread of material resulting from the destruction of a building. However, variation in the superficial deposits and soils might also account for the recorded response. Part of this field was also unsuitable for survey (allotments) and therefore remains currently unevaluated.

An alternative location is slightly further to the north-east in RM-08 where a rectilinear cropmark has been identified (HA6 – 641613, 260763). This cropmark again corresponds with an area of very variable magnetic responses although a geological origin is preferred at this stage.

5 Conclusion

The survey has successfully evaluated 455 hectares to date with anomalies indicative of archaeological activity identified in clusters across the full extent of the ODA and on all prevailing soils and geologies. This leads to the conclusion that the survey has likely identified all significant areas of archaeological activity, excepting those types and periods of archaeology that are not readily identified by magnetometry. The periods represented by this identified activity is still uncertain in most instances, but overall there is likely to be activity dating from the Bronze Age (round-barrows) to the post-medieval (field systems, quarrying). The full potential and fully established / substantiated levels of likely importance of the remains is also still uncertain at this stage, but is predicted to range from low, in the case of the field systems, to medium/high (as a worst case) in the case of the areas of settlement and possible round barrows. It is worth noting that many of the archaeological features identified in the AAA's are already out with of the refined ODA, and/or are likely to be out with the final onshore cable corridor area, following any additional micrositing in the post-consent stages. However, it should also be noted that there remains the possibility of archaeological features being present in apparently 'blank' areas.

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7 Appendices

7.1 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.

7.2 Appendix 2 Survey location information

An initial survey base station was established using a Trimble VRS differential Global Positioning System (dGPS). The magnetometer data was georeferenced using a Trimble RTK differential Global Positioning System (Trimble R8s model).

Temporary sight markers were laid out using a Trimble VRS differential Global Positioning System (Trimble R8s model) to guide the operator and ensure full coverage. The accuracy of this dGPS equipment is better than 0.01m.

The survey data 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 cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

7.3 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 associated 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.

7.4 Appendix 4 Data processing

Digital, geo-referenced copies of the geophysical survey plans will be supplied with the report for inclusion in the Suffolk HER.

The gradiometer data has been presented in this report in processed greyscale and minimally processed XY trace plot format.

Data collected using RTK GPS-based methods cannot be produced without minimal processing of the data. The minimally processed data has been interpolated to project the data onto a regular grid and de-striped to correct for slight variations in instrument calibration drift and any other artificial data.

A high pass filter has been applied to the greyscale plots to remove low frequency anomalies (relating to survey tracks and modern agricultural features) in order to maximise the clarity and interpretability of the archaeological anomalies.

Data is also clipped to remove extreme values and to improve data contrast.

7.5 Appendix 5 Oasis Data Collection Form: England

OASIS ID: headland5-317948

Project details

Project name	East Anglia 1 North
Short description of the project	540 hectare corridor
Project dates	Start: 01-06-2018 End: 31-03-2019
Previous/future work	No / Yes
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 3 - Operations to a depth more than 0.25m
Monument type	UNKNOWN Uncertain
Monument type	UNKNOWN Uncertain
Significant Finds	UNKNOWN Uncertain
Significant Finds	UNKNOWN Uncertain
Methods & techniques	"'Geophysical Survey"'
Development type	Wind farm developments
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology	Unknown
Drift geology	Unknown
Techniques	Magnetometry

Project location

Country	England
Site location	SUFFOLK IPSWICH IPSWICH Leiston
Postcode	IP16 4LT
Study area	540 Hectares
Site coordinates	TM 645357 261217 51.87011214314 1.843336076086 51 52 12 N 001 50 36 E Point
Height OD / Depth	Min: 10m Max: 20m

Project creators

Name of Organisation	Headland Archaeology
Project brief originator	Headland Archaeology
Project design originator	Headland Archaeology
Project director/manager	Alistair Webb
Project supervisor	Bishop, R
Type of sponsor/funding body	Electricity Authority/Company
Name of sponsor/funding body	Scottish Power Renewables

Project archives

Physical Archive Exists?	No
Digital Archive recipient	In house
Digital Contents	"other"
Digital Media available	"Geophysics"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	EAST ANGLIA ONE NORTH/TWO OFFSHORE WINDFARMS PROPOSED ONSHORE CABLE CORRIDOR AND SUBSTATION SITES
Author(s)/Editor(s)	Webb, A.

Other bibliographic details	EAON18
Date	2019
Issuer or publisher	Headland Archaeology
Place of issue or publication	Leeds
Description	A4/A3 Bound report
Entered by	Sam Harrison (sam.harrison@headlandarchaeology.com)
Entered on	4 July 2019

7.6 Appendix 6 Method Statement

EAON18

East Anglia ONE North and East Anglia TWO

Method Statement for Onshore Geophysical Survey

Client: Scottish Power Renewables

v.02

Headland Archaeology (UK) Ltd
Unit 16 Hillside
Beeston Road
Leeds
LS11 8ND
June 2018

HEADLAND ARCHAEOLOGY Ltd

1 Introduction

1.1 This Method Statement has been prepared by Headland Archaeology to describe the proposed method for undertaking geophysical (predominantly but not exclusively magnetometer) survey in advance of groundworks for Scottish Power Renewables (SPR) East Anglia ONE North and East Anglia TWO projects. At this stage of project development SPR have taken the decision to survey the entire Indicative Onshore Development Area (IODA) which comprises the Landfall Refined Area, Onshore Cable Corridor Refined Area and Substation Refined Area. The survey has been expanded to allow for micro-siting where feasible within the larger land take area and comprises the IODA as shown on Illus 1.

1.2 The geophysical survey will be recorded with Suffolk County Council Archaeology Service (SCCAS) before the survey commences (the process is in train) and a Suffolk Historic Environment Record (SHER) parish code will be obtained. All material (including paper and digital archive) that is submitted to the HER or deposited in the Suffolk County Council Archaeological Archive will be marked with this code.

1.3 The scheme of work will be undertaken in accordance with the requirements of the National Planning Policy Framework (DCLG 2012) and with SCCAS Standard Requirements for Geophysical Survey (SCCAS 2017).

1.4 The Method Statement has been produced to the standards laid down in Historic England's guideline publication Geophysical Survey in Archaeological Field Evaluation (English Heritage 2008) and the Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Archaeological Geophysical Survey (CIfA 2014).

2 Objectives

2.1 The principal objectives of the programme of geophysical survey are to gather information to establish the presence/absence, character and extent of any archaeological remains within the IODA, and to inform further strategies should they be necessary.

2.2 The aims of the survey are:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore determine the likely presence/absence and extent of any buried archaeological features; and
- to produce a comprehensive site archive and report.

3 Project team

3.1 The project will be managed for Headland Archaeology by Alistair Webb (Senior Archaeological Geophysicist). Curricula vitae of key personnel who may be employed on the project are contained within Appendix 1. Each field team will comprise of at least one supervisor.

3.2 The project team will familiarise themselves with the background to the site and will be aware of the project's aims and methodologies.

3.3 Headland Archaeology (UK) Ltd is a Registered Archaeological Organisation and abides by the Codes of Conduct and Approved Practice and Standards of the Chartered Institute for Archaeologists. The company has all the necessary technical and personnel resources for the satisfactory completion of the survey.

4 Insurance & copyright

4.1 Headland Archaeology (UK) Ltd is fully indemnified and all necessary insurances can be presented on request.

4.2 Copyright will be retained by Headland Archaeology (UK) Ltd. Headland will licence the client and other bodies as necessary for use in matters relating to the project and for use of the project archive by the relevant museum. This licence will also extend to non-commercial use.

5 Health & safety

5.1 All of Headland's work is undertaken in accordance with current H&S legislation. A risk assessment and method statement will be prepared prior to the commencement of fieldwork. All staff will wear appropriate PPE.

6 Method

6.1 A geophysical (magnetometer - gradiometer) survey will be carried out across all of the IODA as identified on Illus 1 except where access is not available or the ground conditions mitigate against survey. Where survey cannot be undertaken SCCAS will be informed and reasons provided as to why the magnetometer survey could not be carried out.

6.2 It is likely that due to crop conditions the survey may be delayed/ the survey is not possible in particular land parcels. If access is delayed, and further refinement of the Indicative Development Area has occurred in the intervening time, SPR reserve the right to not undertake, or amend the survey, over land that will not therefore be required for development purposes.

6.3 The survey will be undertaken using four Bartington Grad601 sensors mounted at 1m intervals (allowing for a 1m traverse interval) onto a rigid carrying frame. The system will be programmed to take readings at a frequency of 10Hz (allowing for a 10-15cm sample interval) on roaming traverses spaced 4m apart. These readings will be stored on an external weatherproof laptop and later downloaded for processing and interpretation. MLGrad601 and MultiGrad601 (Geomar Software Inc.) software will be used to collect and export the data. Terrasurveyor V3.0.32.4 (DWConsulting) software will be used to process and present the data.

6.4 The magnetometer system will be linked to a Trimble R8s and R2 Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy of each data point.

6.5 A series of temporary sight markers will be established within each survey area using a Trimble dGPS system. The markers will guide the operator and ensure full coverage with the magnetometer system.

6.6 At the start of each day the magnetometer will be left idle whilst switched on for approximately 30 minutes to allow the instrument to acclimatise to the site conditions. The instrument will thereafter be balanced when necessary and at least twice during the day.

6.7 To assess the consistency of the data a single repeat track will be undertaken at the start/end of each day. These will be displayed in the report.

6.8 The geophysical survey will comply with guidelines outlined by Historic England (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014).

6.9 Consideration will always be given to the use of alternative survey techniques where in the opinion of the consultant or contractor different methodologies might help identify specific target features or mitigate specific ground conditions. Such techniques might include resistivity, ground penetrating radar or electromagnetic techniques. Any change in technique should be discussed with and approved by SCCAS prior to any change in methodology.

7 Reporting and Archive

7.1 On completion of the survey, a report will be produced containing all relevant information including:

- site code/project number; dates for fieldwork visits; grid references; location plan, and a plan showing the limits of the survey area;
- a non-technical summary of the reason for, aims and main results of the survey;
- an introduction to outline the circumstances leading to the commission of the project and any restrictions encountered;
- the aims and objectives of the survey;
- the methodology used;
- a summary and synthesis of the archaeological results in relation to the methods used. This shall be supported by a survey location plans and plots of minimally processed (X-Y traceplot) and fully processed (greyscale) data at a minimum scale of 1:2500 with larger scale (1:1000) plots of all areas of archaeological significance. Each plan/plot will have a bar scale and accurately oriented north sign; and
- references to all primary and secondary sources consulted.

7.2 Data will be presented in both raw (X-Y traceplot) and processed (greyscale) formats at an appropriate range. The interpretation of the data will be made following analysis of and taking account of HER data, cropmarks, historic mapping, topographic and man-made features and any other factor that might have an effect on the data. All these factors will be discussed in the final report and the results assessed both on a site by site basis but also in the wider landscape.

7.3 All figures will be reproduced from Ordnance Survey mapping with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

7.4 A draft report will be produced for comment to both the client and SCCAS. Following amendment/approval of the draft a final report will be completed and submitted to the client, to SCCAS and the Local Planning Authority and/or Conservation Officer. A digital copy will also be supplied to SCCAS and digital geo-referenced of the data plots and interpretation graphics also supplied to Suffolk HER. Georeferenced vector data will also be supplied to SCCAS and SHER.

7.5 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.

7.6 In addition, Headland Archaeology will make their work accessible to the wider research community by submitting digital data and copies of the report on line to OASIS – an OASIS summary sheet will be included as an appendix to the report as will be a copy of the approved WSI.

8 Monitoring

8.1 A standard working day will involve driving to site, condition surveys of the survey area, survey area setting out and detailed geophysical survey. Data will be sent back to the office on a regular basis and progress reports provided to the client.

Key Contacts

Alistair Webb, Regional Manager	0113 387 6430
Sam Harrison, Manager	0113 387 6431
Eddie Bailey, Health and Safety Coordinator	0131 467 7748
Survey team leader: Ross Bishop	07471 038794

9 Bibliography

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10 APPENDIX 1: Curricula Vitae of key personnel

Summary Curriculum Vitae for the key personnel to be employed on the proposed project are detailed below together with their proposed role in the scheme.

Senior Manager:	Alistair Webb BA MCIfA
Project Manager:	Sam Harrison BSc MSc MCIfA
Senior Archaeologist:	David Harrison BA MSc MCIfA
Supervisor (Geophysics):	Ross Bishop BA
Supervisor (Geophysics):	Mark Evans BSc
Supervisor (Geophysics):	Olivier Vansassenbrouk BA MA MSc
Archaeological Geophysicist:	Krasimir Dyulgerski BA MRes
Archaeological Geophysicist:	Richard McGregor Edwards BA MA

Name:- Alistair Webb BA MCIfA

Current Position:- Regional Manager, Headland North

Proposed Role:- Senior Archaeological Geophysicist

Alistair is the Senior Manager responsible for overall management of the geophysical survey teams, as well as other developer funded archaeological field projects. He was employed by Archaeological Services WYAS for more than 25 years working at all levels within the organisation from Site Assistant to Senior Manager, being involved in geophysical surveys almost exclusively for 15 years, as well as managing other large fieldwork projects. During his career at ASWYAS he wrote in excess of 350 grey literature reports, the majority being on geophysical surveys, for clients in all sectors of the heritage industry including national bodies such as English Heritage and Historic Scotland, as well as for other archaeological contracting companies, heritage consultants and commercial companies. He has recently co-authored a publication on the medieval and post-medieval archaeology of Bradford.

Alistair joined Headland in April 2015 as Regional Manager to set up and run the Headland North office in Leeds which specialises in archaeological geophysical surveys throughout the United Kingdom.

Alistair gained his BA in Environmental Studies in 1984 and in 1995 successfully completed modules on Magnetic and Electromagnetic Methods of Survey, part of the MSc in Archaeological Prospection run by Bradford University. Alistair is a Member of the Chartered Institute for Archaeologists (MCIfA), a member of the CIfA

geophysics Special Interest Group (GeoSIG) and the International Society for Archaeological Prospection (ISAP). He has successfully completed IOSH Managing Safely training.

Name:- Sam Harrison BSc MSc MCIfA

Current Position:- Project Manager

Proposed Role:- Project Manager

Sam graduated in 2002 from Bradford University with an Honours degree in Archaeological Sciences. He subsequently refined his interest in remote sensing techniques gaining an MSc in Archaeological Prospection in 2005.

He joined Headland in May 2015 following 11 years with Archaeological Services WYAS where he managed over 200 geophysical survey projects from small scale Heritage Lottery funded community schemes to large-scale linear infrastructure projects up to 700 hectares in size. He has substantial experience in managing, organising and undertaking shallow sub-surface archaeological prospection techniques including magnetometry, earth resistance, ground penetrating radar, ERT and electro-magnetic methods. Sam is highly experienced in specialist geophysics software programs, such as Geoplot and Terrasurveyor, as well as AutoCAD Map, Illustrator, MapInfo and ArcGIS.

Sam is a Member of the Chartered Institute for Archaeologists (MCIfA) and has completed the ILM Leadership and Management Course (Level 3). He is also CSCS certified.

Name:- David Harrison BA MSc MCIfA

Current Position:- Senior Archaeologist

Proposed Role:- Senior Geophysical Supervisor

David has more than 12 years' experience of organising, undertaking and reporting on commercial geophysical surveys across the UK and Ireland. In his current position, David is responsible for managing small to medium sized projects, managing large amounts of geophysical data on a daily basis, quality control and reporting. In recent years, he has specialised in large-scale multi-sensor magnetometer surveys using both Sensys and Bartington systems. Since joining Headland in 2015 David has been integral in the development and design of Headland's own unique hand-carried multi sensor magnetometer, complete with on board GPS and wireless technology.

David has a BA (Hons) in Archaeology awarded in by 1999 by King Alfred's College, Winchester and an MSc in Archaeology awarded by the University of Liverpool in 2002. David is CSCS certified and First Aid at Work trained. He is a Member of the Chartered Institute for Archaeologists (MCIfA) and has successfully completed IOSH Managing Safely training.

Name:- Ross Bishop BA

Current Position:- Project Supervisor (Geophysics)

Proposed Role:- Supervisor

Ross graduated from York University in 2013 with a BA in Archaeology and has subsequently accrued more than 4 years' experience in commercial archaeology, the vast majority in geophysical survey. He joined Headland in 2015 as a geophysical survey supervisor and has supervised on several large housing development projects as well as regional linear infrastructure schemes.

Ross is experienced in undertaking both conventional gridded magnetometer surveys as well as large scale multi sensor GPS based surveys. In addition, he has experience in earth resistance, electromagnetic, ERT, ground penetrating radar and topographical survey. He is SSSTS and CSCS certified.

Name:- Mark Evans BSc

Current Position:- Project Supervisor (Geophysics)

Proposed Role:- Supervisor

Mark graduated from the University of Sheffield in 2005 with a BSc in Archaeological Sciences. He has since undertaken modules as part of the MA Landscape Archaeology course (University of Sheffield) and the University of Oxford Continuing Education Landscape Survey course (2014).

He joined Headland Archaeology in 2017 having supervised geophysical field surveys throughout the UK for the previous three years. He has extensive experience in surveying on linear schemes, wind farms, photo-voltaic schemes, housing developments, and on several nuclear facilities. Mark has substantial experience in GPS topographic survey, GPS-based magnetometer cart survey, hand-held gradiometer survey, earth resistance and electromagnetic (EM) survey. He is CSCS and SSSTS certified.

Name:- Olivier Vansassenbrouck BA MA MSc

Current Position:- Project Supervisor (Geophysics)

Proposed Role:- Supervisor

Olivier completed his BA and MA in Art History and Archaeology at the University of Brussels (VUB) in 2014 where he carried out his first geophysical survey as part of his dissertation on Viking defence fortresses in Flanders (Belgium). He subsequently completed an MSc in Archaeological Prospection at the University of Bradford in 2016, where his dissertation researched the effectiveness of several different geophysical survey methods in the detection of graves.

Olivier was employed at Stratascan from November 2016 until August 2017 as a Survey Assistant, participating in over 100 surveys. He has experience with magnetometer (both hand-held and cart-based), earth resistance and ground-penetrating radar surveys. Olivier joined Headland Archaeology in September 2017.

Name:- Krasimir Dyulgerski BA MRes

Current Position:- Project Assistant (Geophysics)

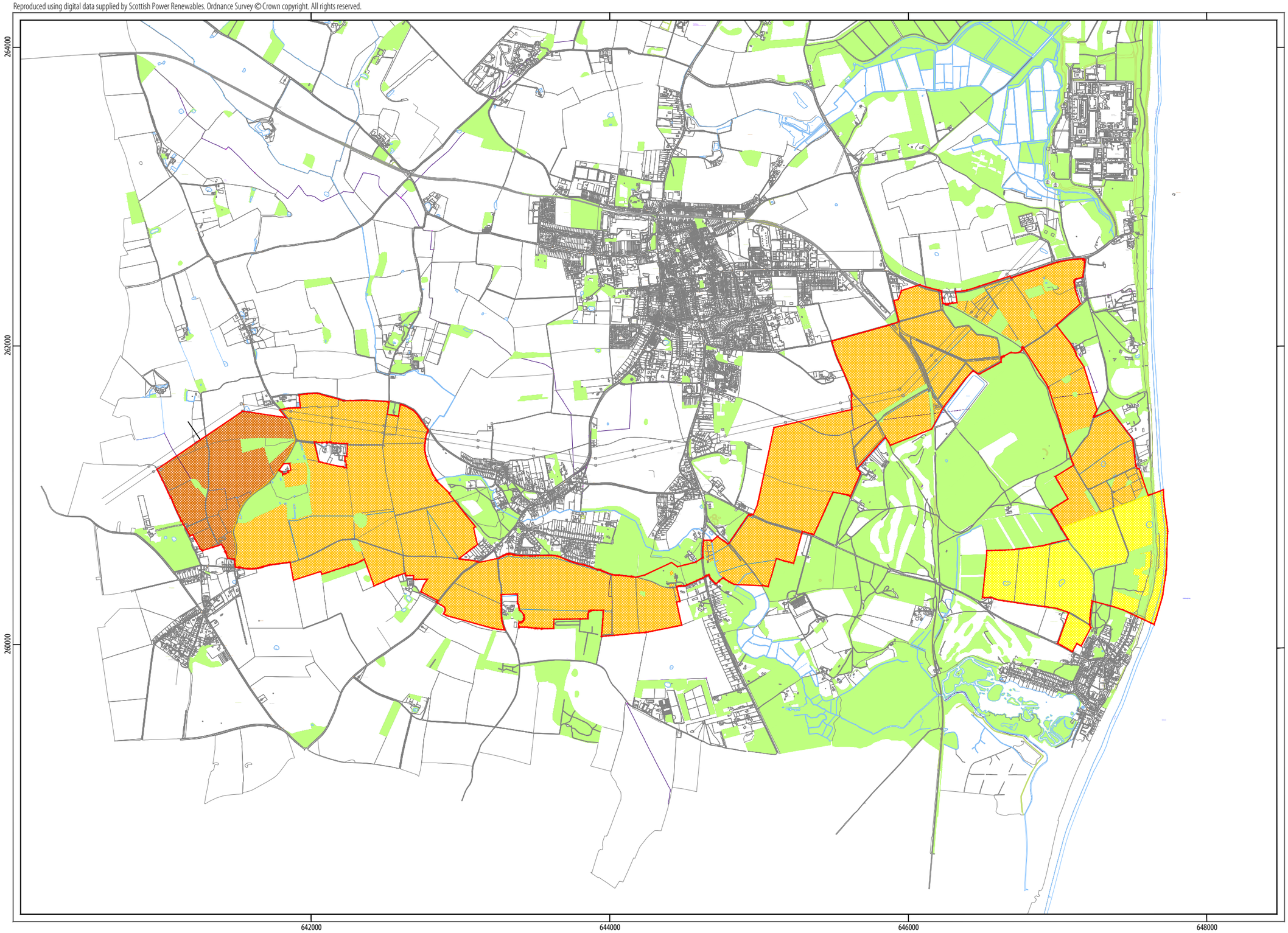
Proposed Role:- Survey Assistant

Krasimir joined Headland in October 2017. He graduated from University of Liverpool with a BA (Hons) in July 2016 and MRes in Archaeology in December of 2017. As part of his degree, he undertook two geophysical surveys in Olynthus, Greece where he gained experience in various geophysical methods such as electrical resistivity, ground penetrating radar and magnetometry (hand-held and cart-based). Since joining Headland Archaeology, Krasimir has undertaken a number of hand-carried multi-sensor magnetometer surveys in advance of housing developments, major infrastructure projects and road construction.

Name:- Richard McGregor Edwards BA MA

Current Position:- Site Assistant (Geophysics)

Richard completed a BA in Archaeology & Prehistory at the University of Sheffield in 2006. After several years conducting fieldwork on a range of sites in the UK and the Isle of Man, he returned to Sheffield and completed the MA in Landscape Archaeology in 2011. He has experience of magnetometer survey, earth resistance survey, magnetic susceptibility survey and GPS-based topographic survey. He joined Headland Archaeology in January 2018.



- geophysical survey area / IODA
- Landfall Refined Area (LRA)
- Onshore Cable Corridor Refined Area (OCCRA)
- Substation Refined Area (SRA)

0 500m
1:25,000 @ A3

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East Anglia One North/Two Offshore Wind Farm
Suffolk

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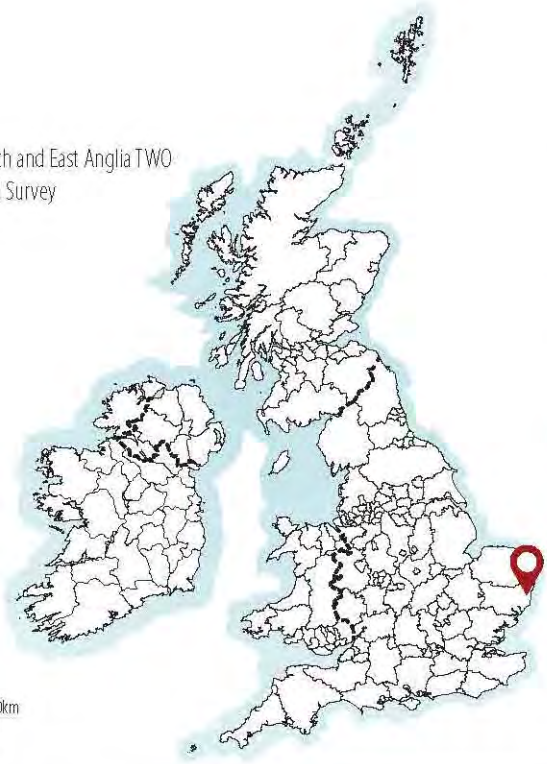
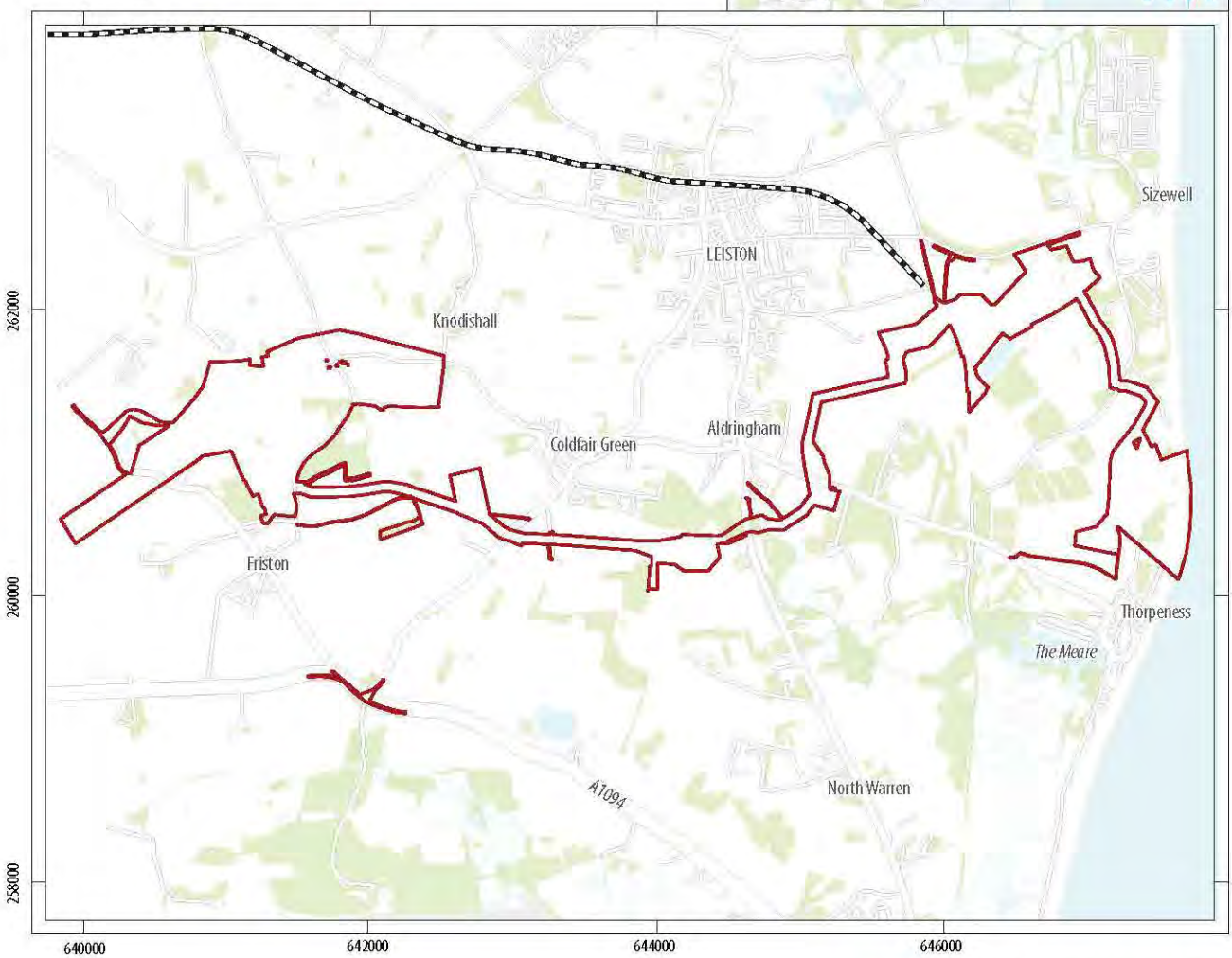
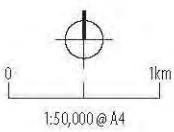
ILLUS 1 Proposed area of geophysical survey / Indicative Onshore Development Area (IODA)

East Anglia ONE North and East Anglia TWO
Onshore Geophysical Survey
Suffolk







East Anglia ONE North and East Anglia TWO Onshore Development Area

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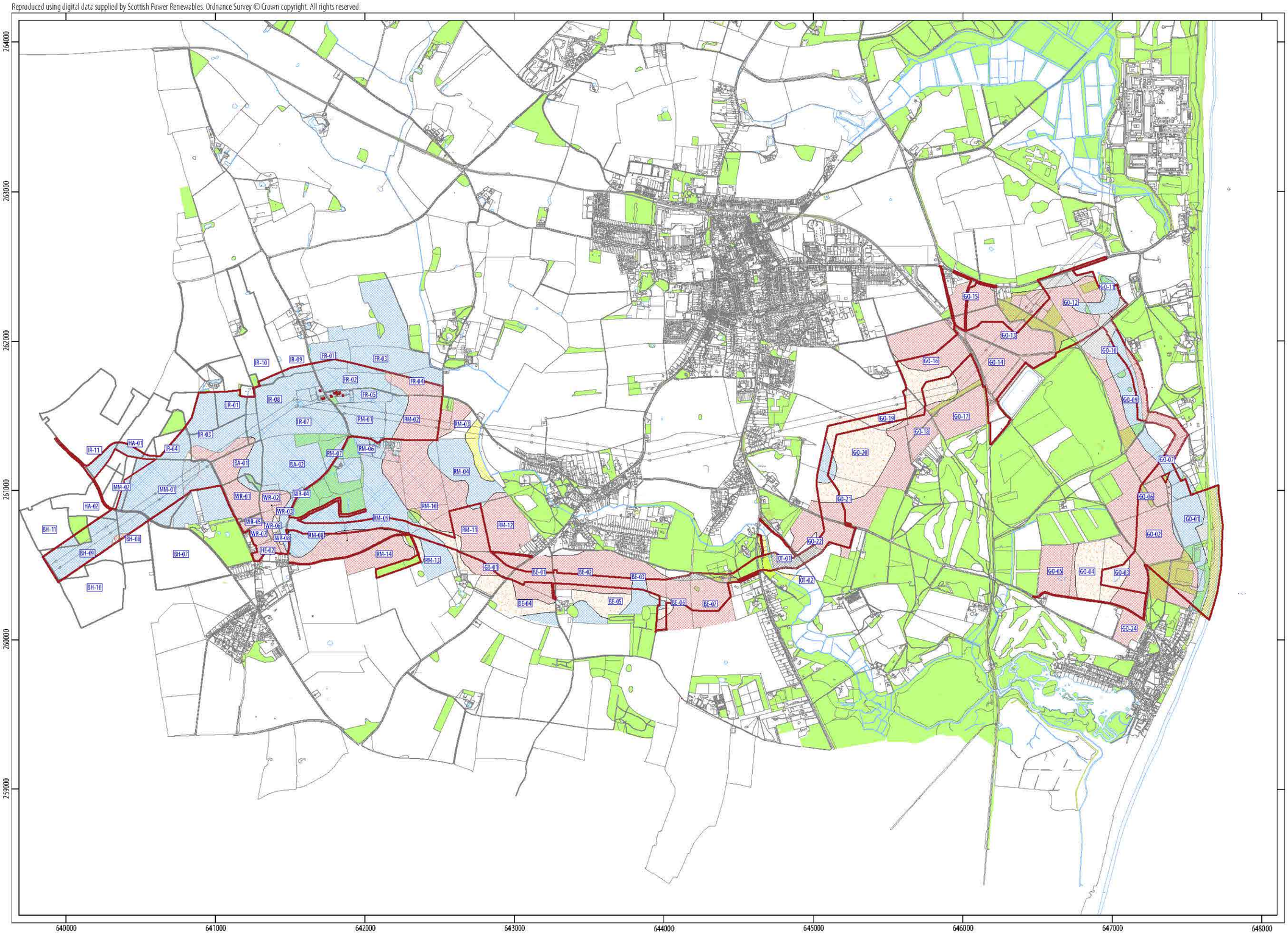
t 0113 387 6430
e north@headlandarchaeology.com
w www.headlandarchaeology.com

ILLUS 1 Site location



East Anglia ONE North and East Anglia TWO Onshore Development area

Lowestoft formation - clay & silt

Lowestoft formation - diamicton

Lowestoft formation - sand & gravel

Marine beach deposits - sand & gravel

Alluvium

No Superficial Deposits

0 500m

1:25,000 @ A3

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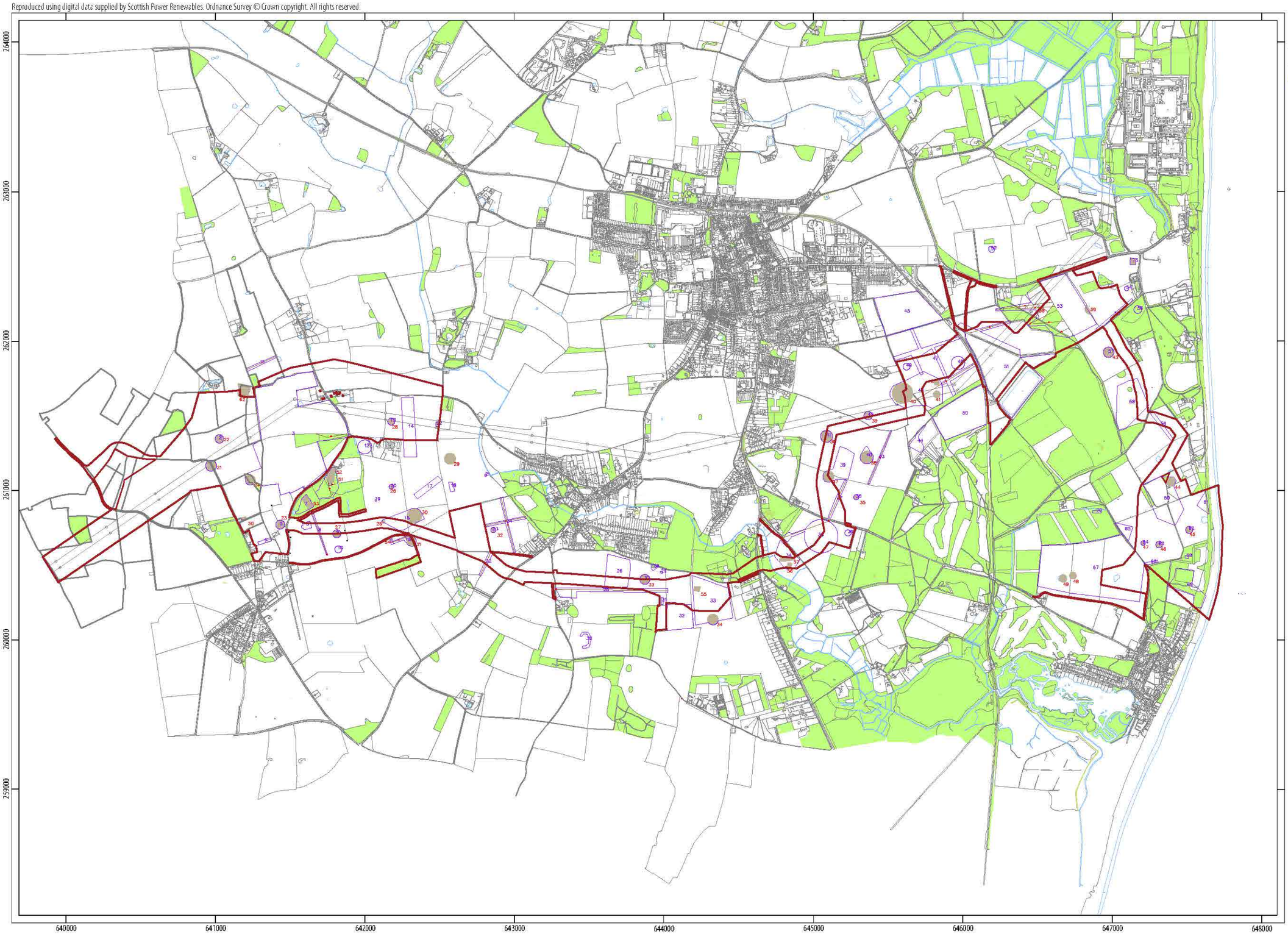
ILLUS 2 East Anglia ONE North and East Anglia TWO Onshore Development area showing superficial geology



East Anglia ONE North and East Anglia TWO Onshore Development area

LiDAR features (polygon)

LiDAR features (linear)

Previously Unidentified Heritage Asset

0 500m

1:25,000 @ A3

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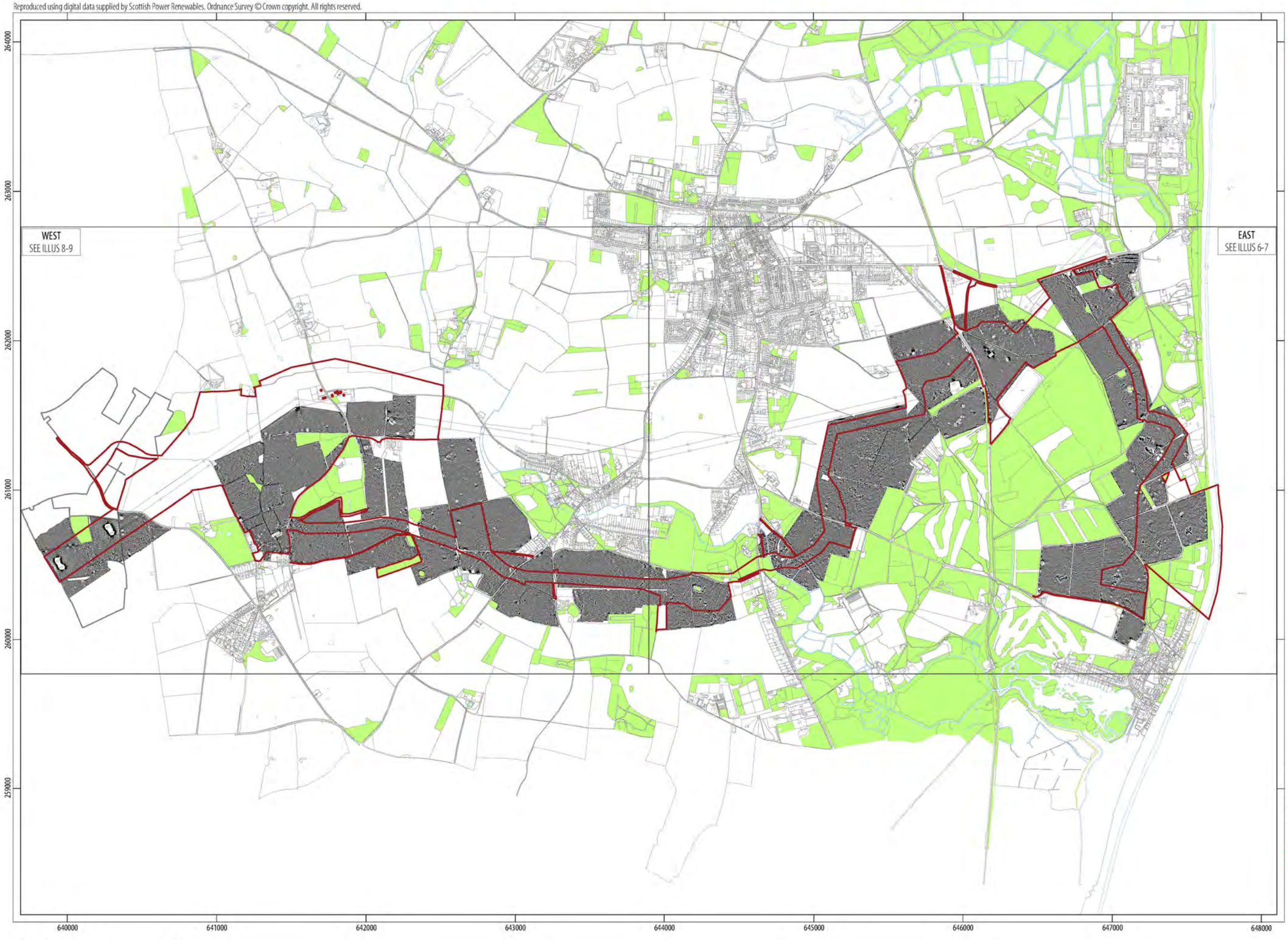
ILLUS 3 East Anglia ONE North and East Anglia TWO Onshore Development Area showing LiDAR features and previously unidentified heritage assets



East Anglia ONE North and East Anglia TWO Onshore Development area

nT
-1.0 1.0

0 500m
1:25,000 @ A3

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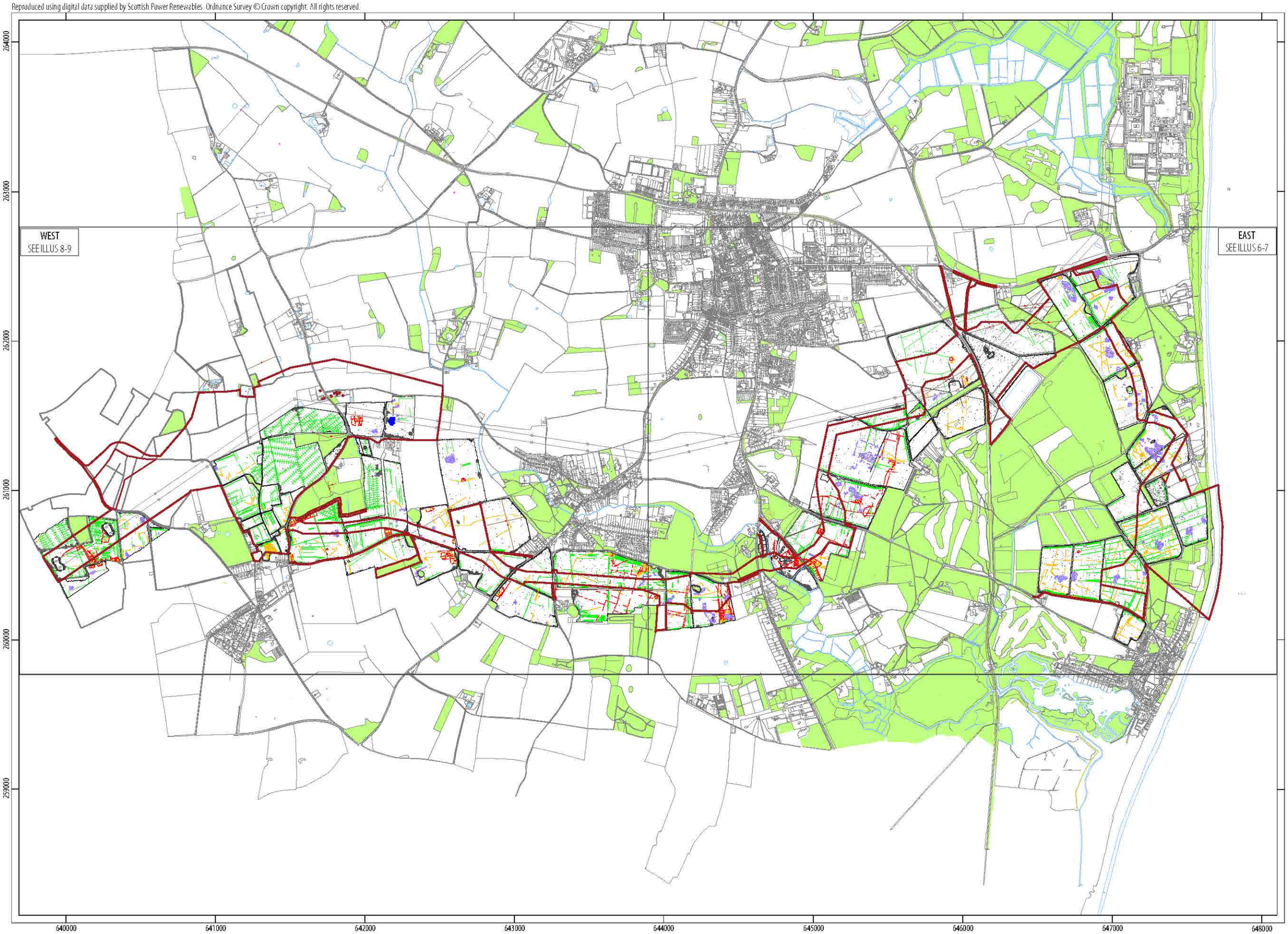
ILLUS 4 Processed greyscale magnetometer data



East Anglia ONE North and East Anglia TWO Onshore Development area

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
linear trend	bad data
magnetic disturbance	quarrying
linear trend	agricultural
linear trend	field drain
linear	former field boundary
linear	former field boundary?
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:25,000 @ A3

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ILLUS 5 Interpretation of magnetometer data excluding geological anomalies

East Anglia ONE North and East Anglia TWO Onshore Development area

SECTOR 5
SEE ILLUS 22

SECTOR 8
SEE ILLUS 31

SECTOR 6
SEE ILLUS 25

SECTOR 10
SEE ILLUS 37

AAA2-S8-12
SEE ILLUS 121

AAA2-S9-13
SEE ILLUS 124

AAA2-S9-14
SEE ILLUS 127

SECTOR 7
SEE ILLUS 28

AAA1-S7-9
SEE ILLUS 112

AAA1-S7-10
SEE ILLUS 115

SECTOR 11
SEE ILLUS 40

AAA3-S11-15
SEE ILLUS 130

SECTOR 9
SEE ILLUS 34

AAA1-S7-11
SEE ILLUS 118

AAA3-S11-17
SEE ILLUS 136

SECTOR 13
SEE ILLUS 46

SECTOR 1
SEE ILLUS 10

SECTOR 3
SEE ILLUS 16

AAA3-S11-16
SEE ILLUS 133

AAA3-S12-19
SEE ILLUS 142

SECTOR 12
SEE ILLUS 43

AAA1-S3-6
SEE ILLUS 103

AAA3-S12-18
SEE ILLUS 139

AAA1-S1-1
SEE ILLUS 88

AAA1-S1-2
SEE ILLUS 91

AAA1-S3-7
SEE ILLUS 106

SECTOR 2
SEE ILLUS 13

SECTOR 4
SEE ILLUS 19

AAA3-S12-20
SEE ILLUS 145

AAA4-S14-24
SEE ILLUS 157

AAA1-S2-3
SEE ILLUS 94

AAA1-S2-4
SEE ILLUS 97

AAA1-S4-8
SEE ILLUS 109

AAA4-S15-23
SEE ILLUS 154

AAA1-S2-5
SEE ILLUS 100

SECTOR 14
SEE ILLUS 49

262000
261000
260000
644000
645000
646000
647000
648000

nT
-1.0 1.0

0 250m
1:12,500 @ A3

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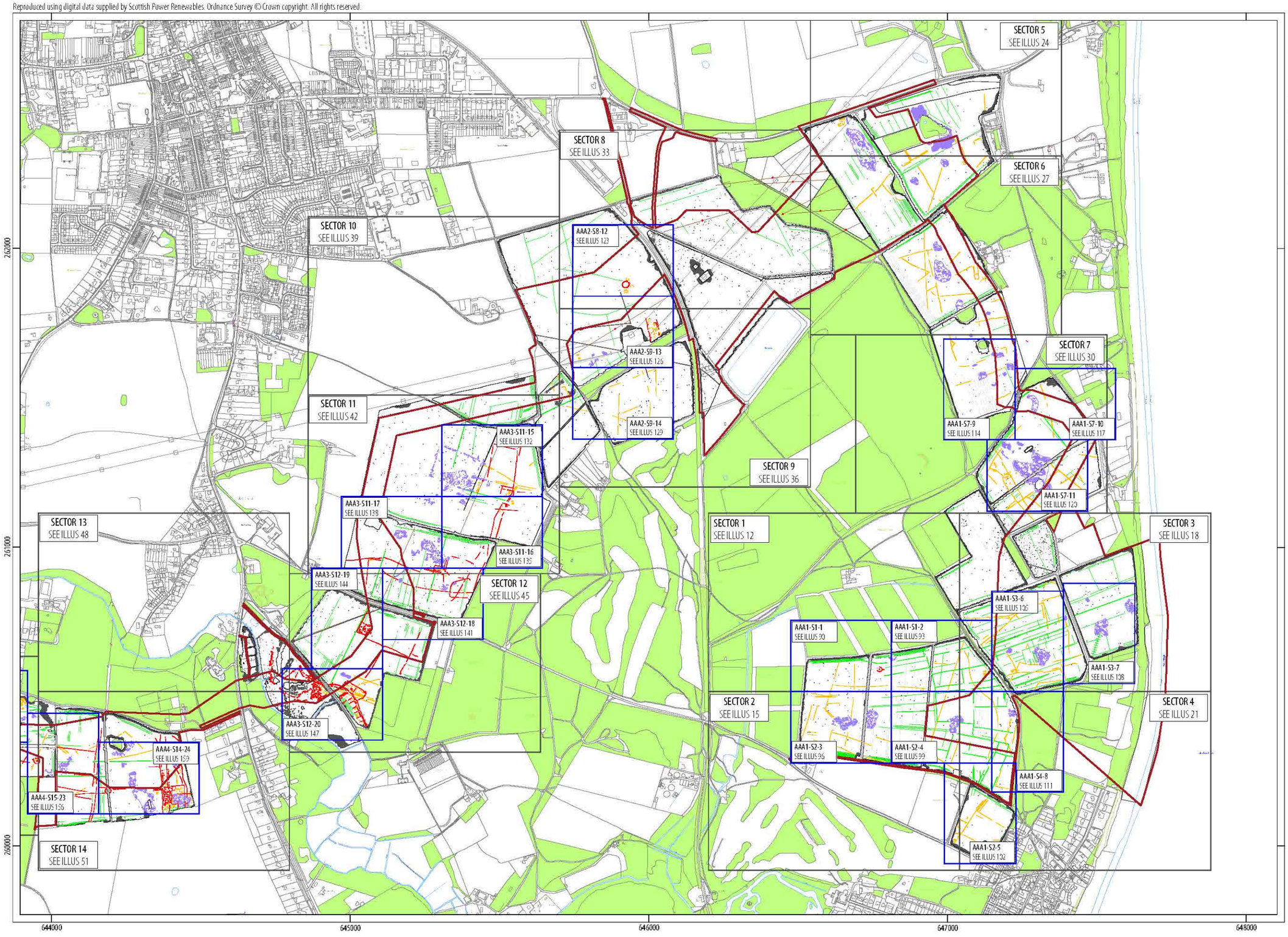
ILLUS 6 Processed greyscale magnetometer data; east



East Anglia ONE North and East Anglia TWO Onshore Development area

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
linear trend	bad data
magnetic disturbance	quarrying
linear trend	agricultural
linear trend	field drain
linear	former field boundary
linear	former field boundary?
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 250m
1:12,500 @ A3

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ILLUS 7 Interpretation of magnetometer data; east excluding geological anomalies

East Anglia ONE North and East Anglia TWO Onshore Development area

SECTOR 22 SEE ILLUS 73
SECTOR 19 SEE ILLUS 64
SECTOR 16 SEE ILLUS 55
SECTOR 25 SEE ILLUS 82
SECTOR 23 SEE ILLUS 76
SECTOR 20 SEE ILLUS 67
SECTOR 17 SEE ILLUS 58
SECTOR 26 SEE ILLUS 85
SECTOR 24 SEE ILLUS 79
SECTOR 21 SEE ILLUS 70
SECTOR 18 SEE ILLUS 61
SECTOR 15 SEE ILLUS 52

AAA10-S19-29 SEE ILLUS 172
AAA9-S23-33 SEE ILLUS 184
AAA9-S23-34 SEE ILLUS 187
AAA9-S23-35 SEE ILLUS 190
AAA9-S20-31 SEE ILLUS 178
AAA8-S21-32 SEE ILLUS 181
AAA9-S20-30 SEE ILLUS 175
AAA11-S26-36 SEE ILLUS 193
AAA6/7-S17-25 SEE ILLUS 160
AAA6/7-S17-26 SEE ILLUS 163
AAA6/7-S17-27 SEE ILLUS 166
AAA5-S18-28 SEE ILLUS 169
AAA4-S15-21 SEE ILLUS 148
AAA4-S15-22 SEE ILLUS 151

262000
261000
260000
640000
641000
642000
643000

nT
-1.0 1.0

0 250m
1:12,500 @ A3

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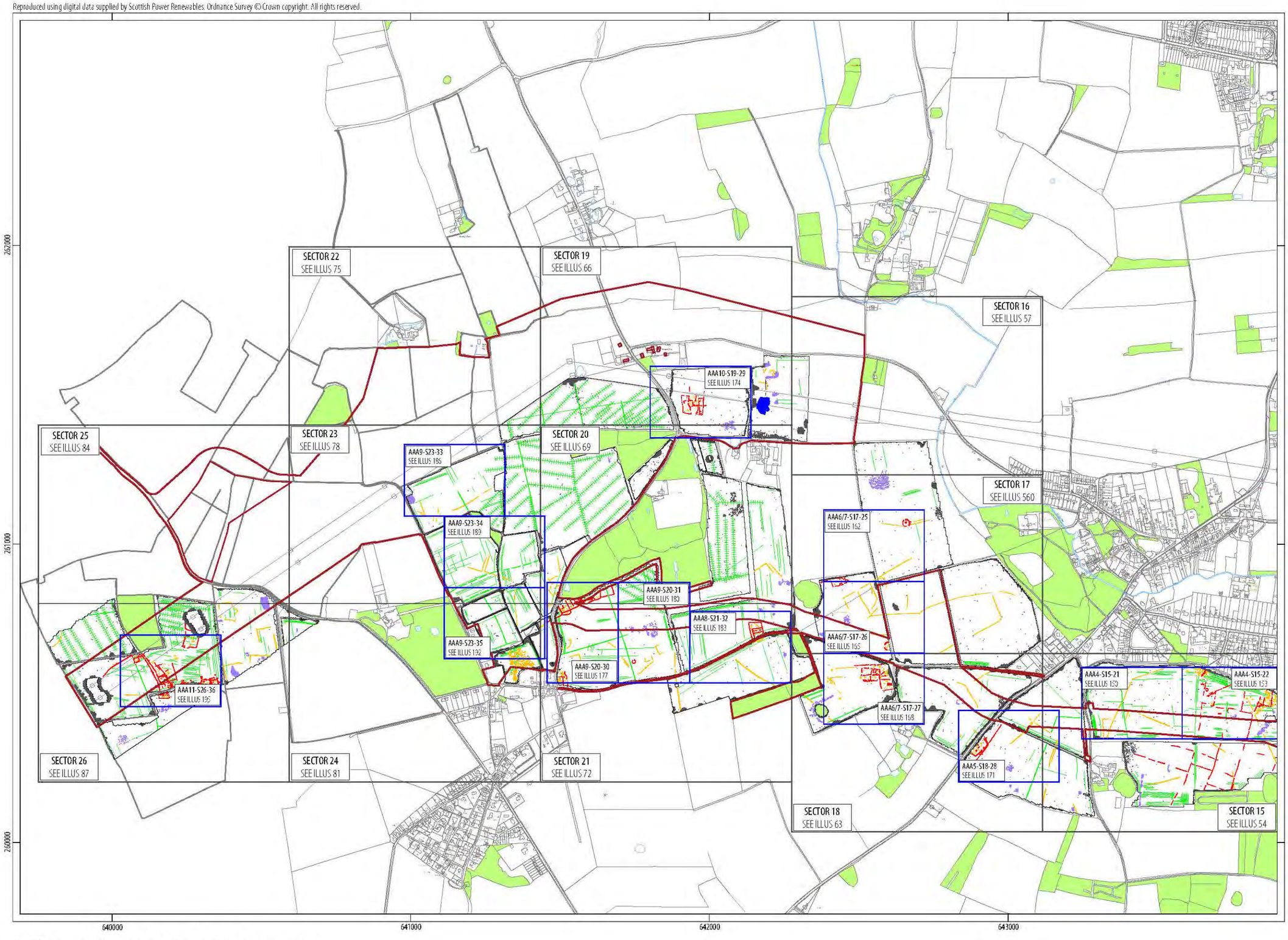
ILLUS 8 Processed greyscale magnetometer data; west



East Anglia ONE North and East Anglia TWO Onshore Development area

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
linear trend	bad data
magnetic disturbance	quarrying
linear trend	agricultural
linear trend	field drain
linear	former field boundary
linear	former field boundary?
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 250m
1:12,500 @ A3

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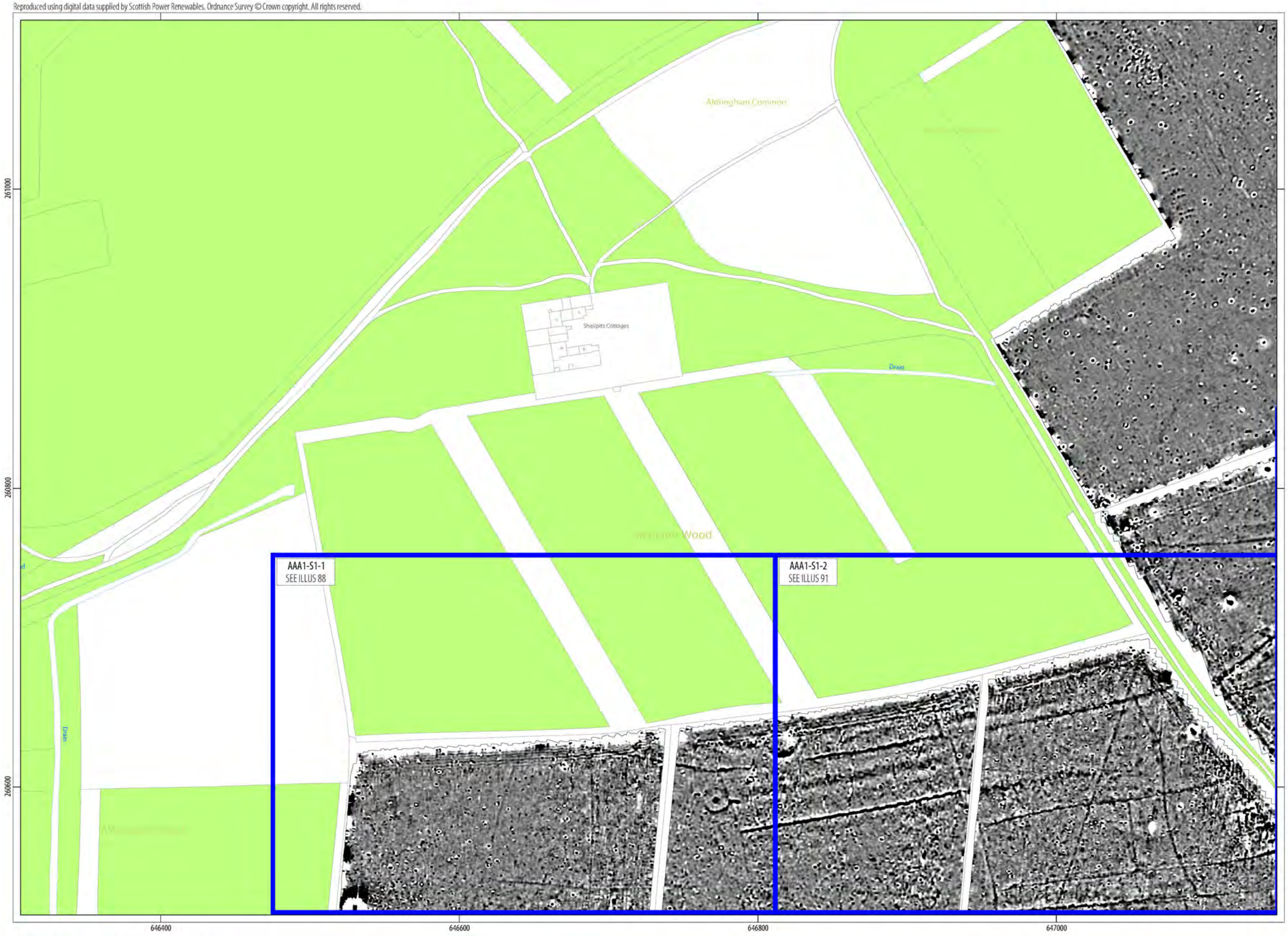
ILLUS 9 Interpretation of magnetometer data; west excluding geological anomalies



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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ILLUS 10 Processed greyscale magnetometer data; Sector 1

18.0nT/cm

0 500m
1:2,500 @ A3

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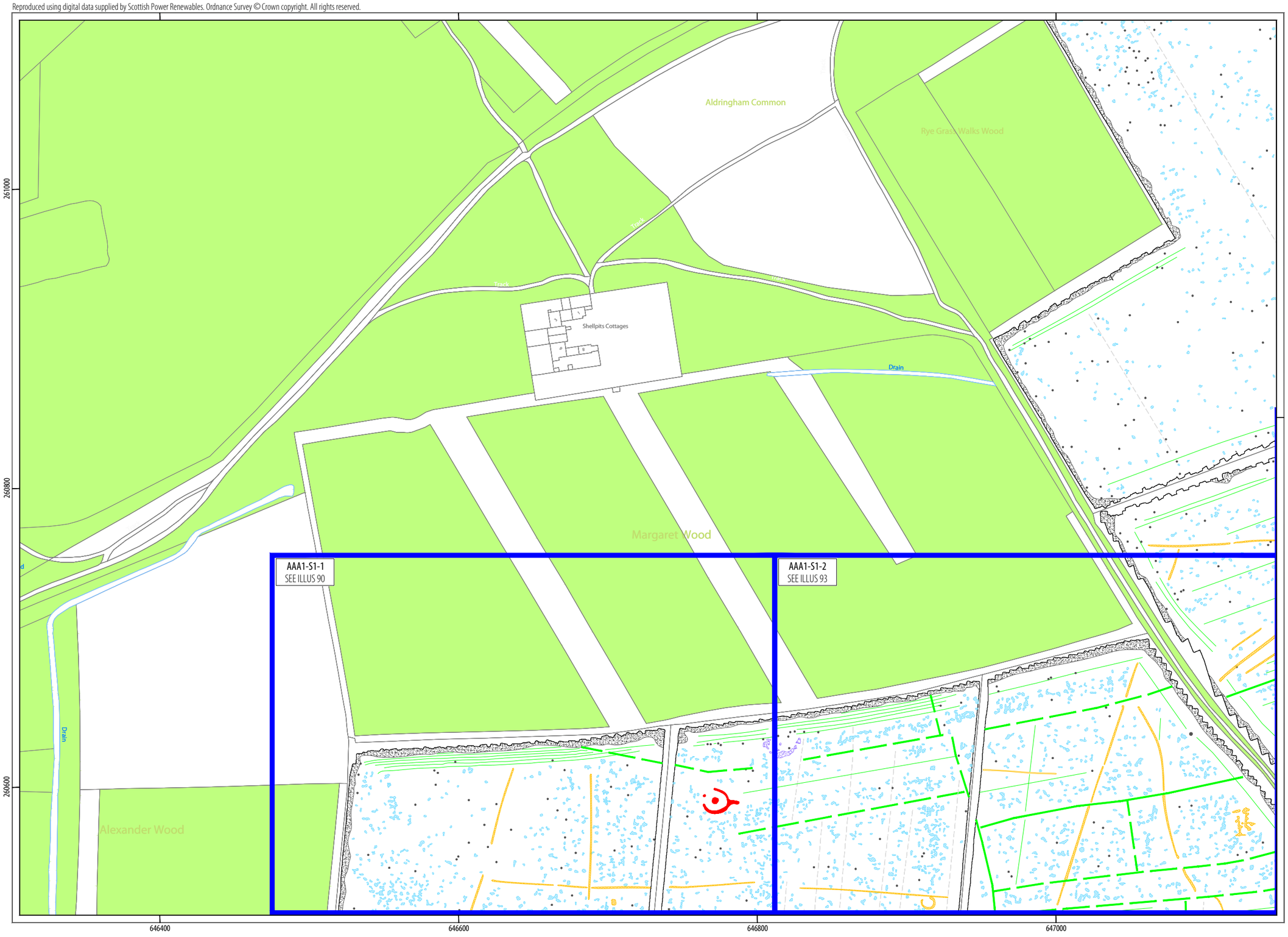
ILLUS 11 XY trace plot of minimally processed magnetometer data; Sector 1



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
linear trend	bad data
magnetic disturbance	quarrying
linear trend	agricultural
linear	former field boundary
linear	former field boundary?
magnetic enhancement	geology
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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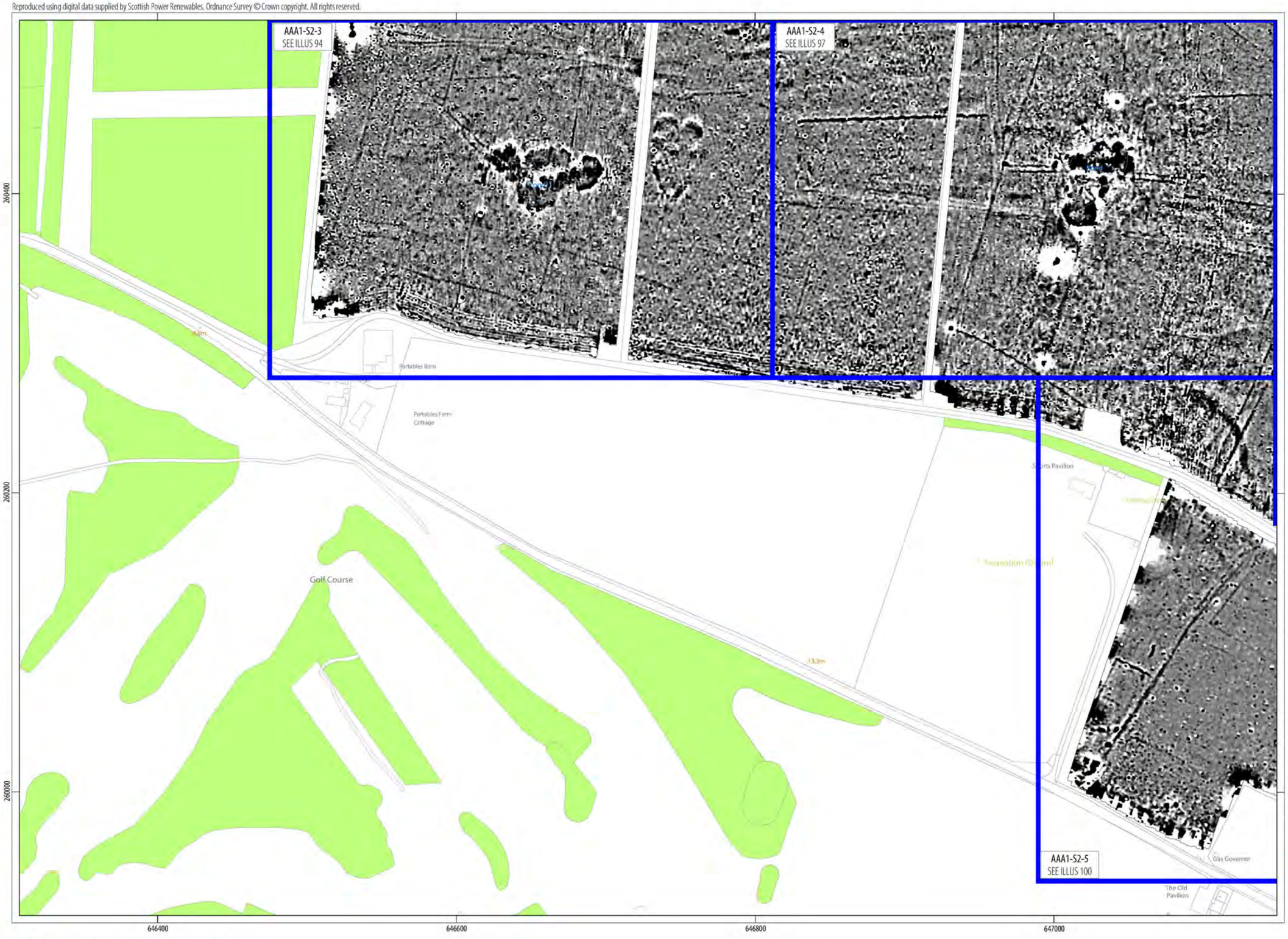
ILLUS 12 Interpretation of magnetometer data; Sector 1



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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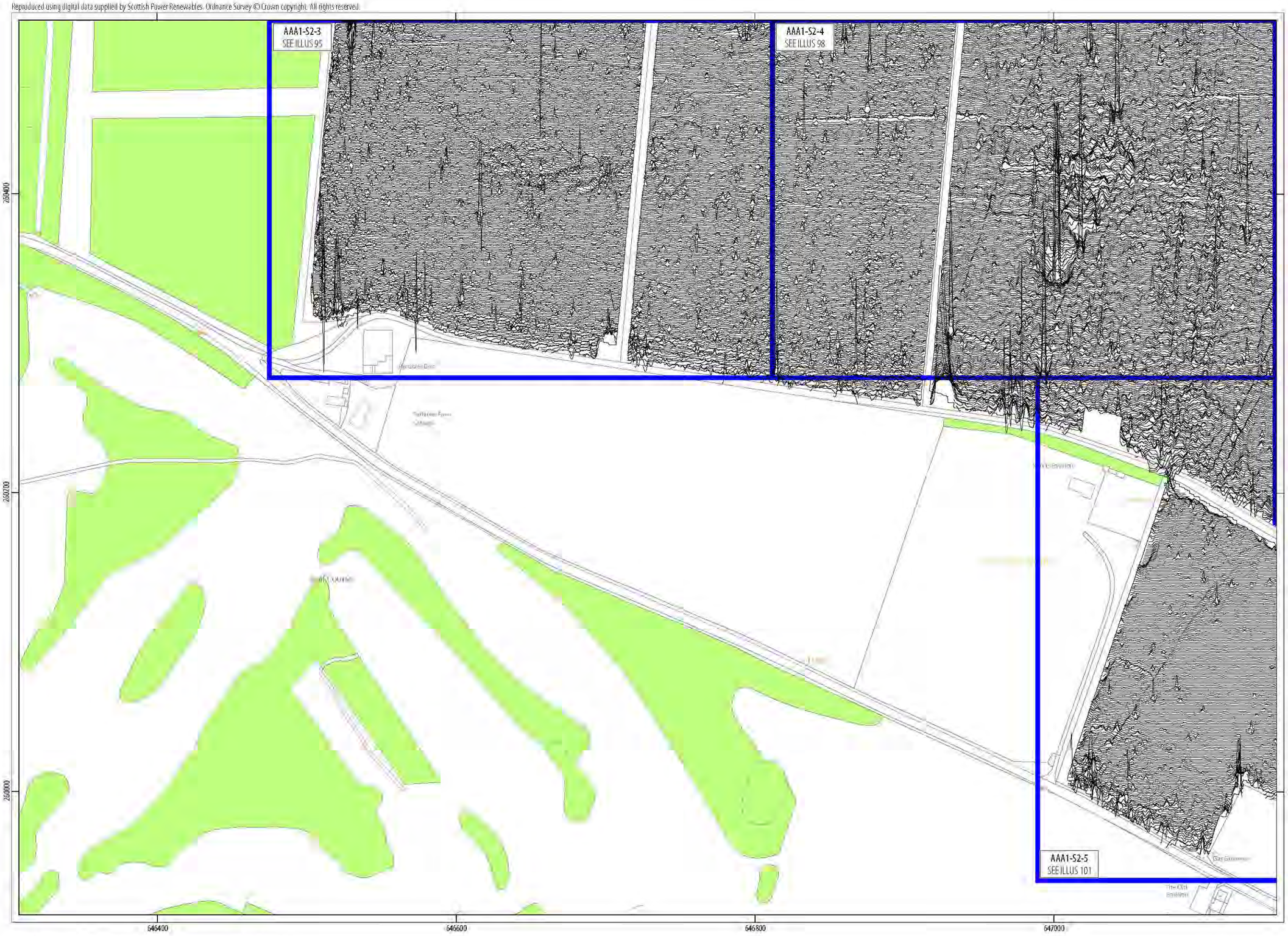
ILLUS 13 Processed greyscale magnetometer data; Sector 2



18.0nT/cm

0 500m
1:2,500 @ A3

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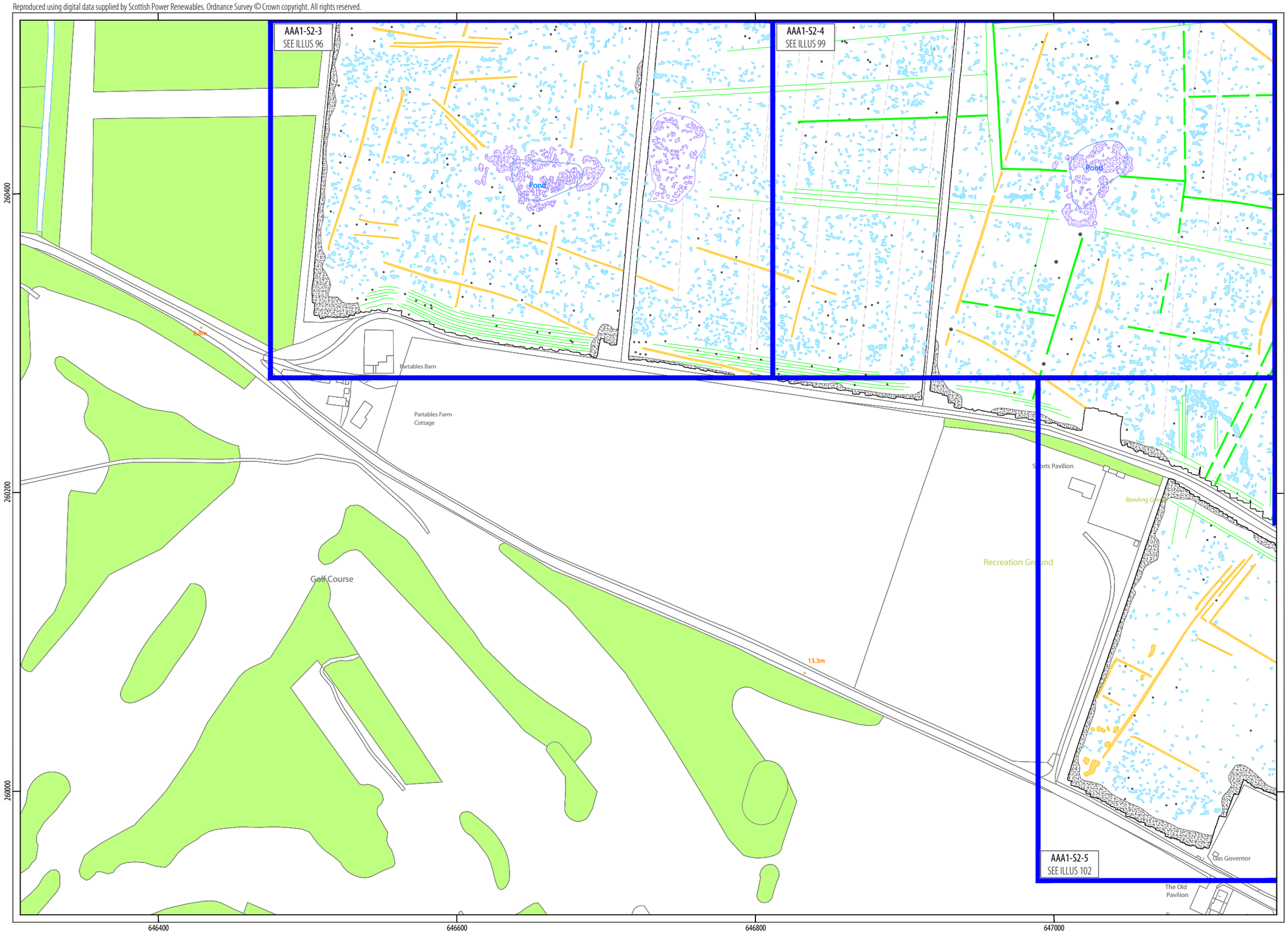
ILLUS 14 XY trace plot of minimally processed magnetometer data; Sector 2



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
linear trend	bad data
magnetic disturbance	quarrying
linear trend	agricultural
linear	former field boundary
linear	former field boundary?
magnetic enhancement	geology
magnetic enhancement	archaeology?

0 500m
1:2,500 @ A3

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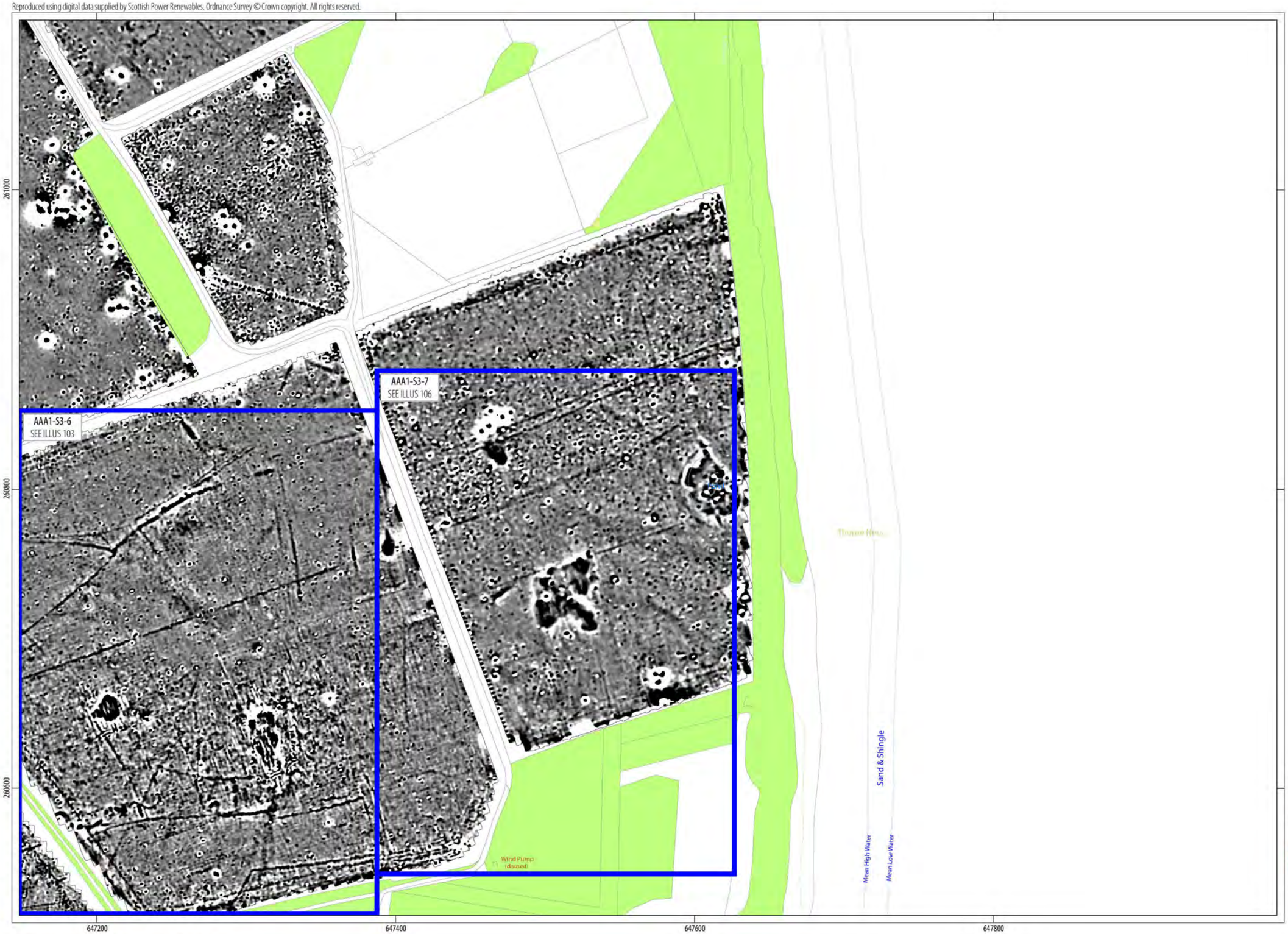
ILLUS 15 Interpretation of magnetometer data; Sector 2



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ILLUS 16 Processed greyscale magnetometer data; Sector 3

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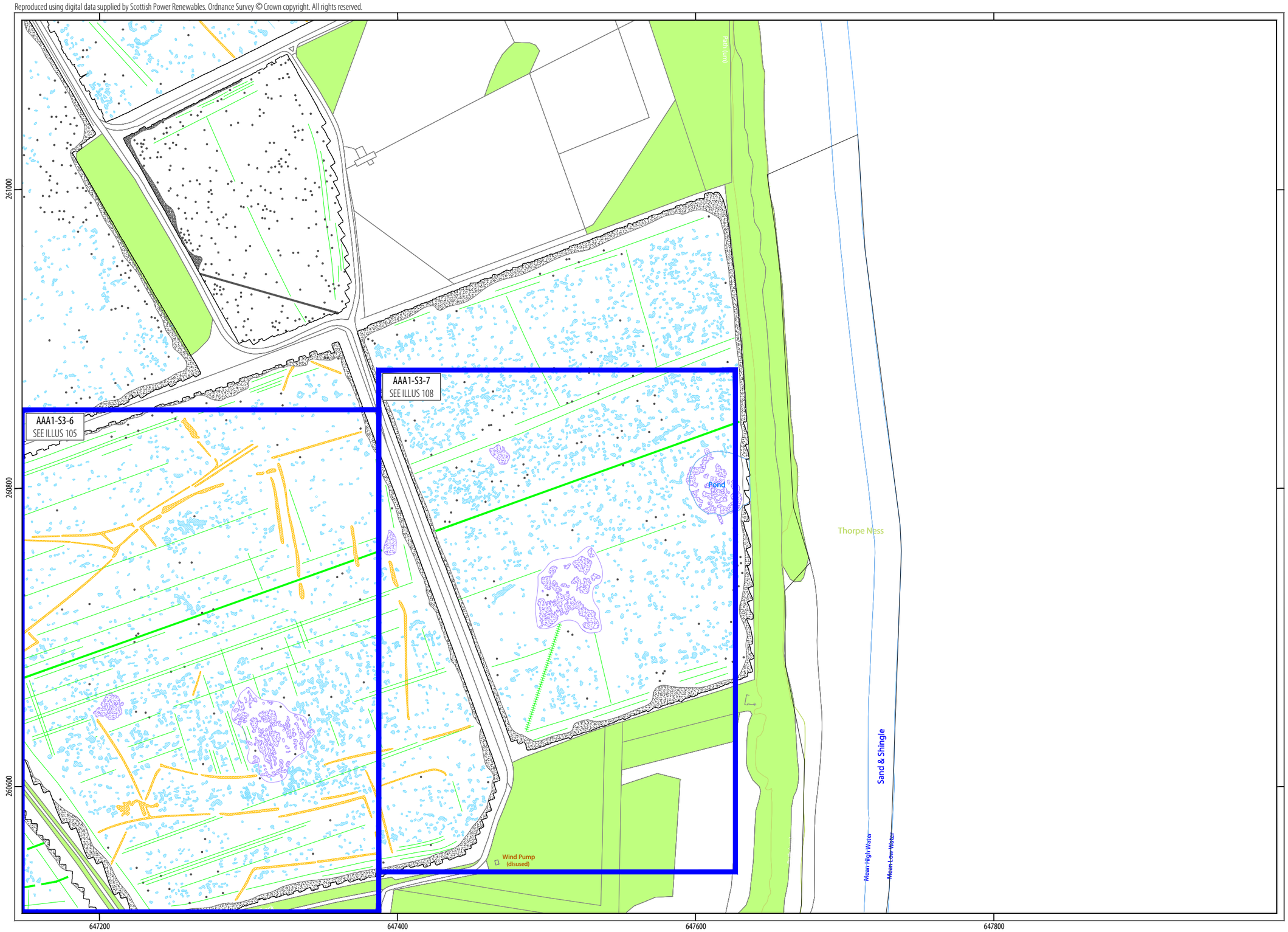
ILLUS 17 XY trace plot of minimally processed magnetometer data; Sector 3



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear	former field boundary
linear	former field boundary?
linear trend	field drain
magnetic enhancement	geology
magnetic enhancement	archaeology?

0 500m
1:2,500 @ A3

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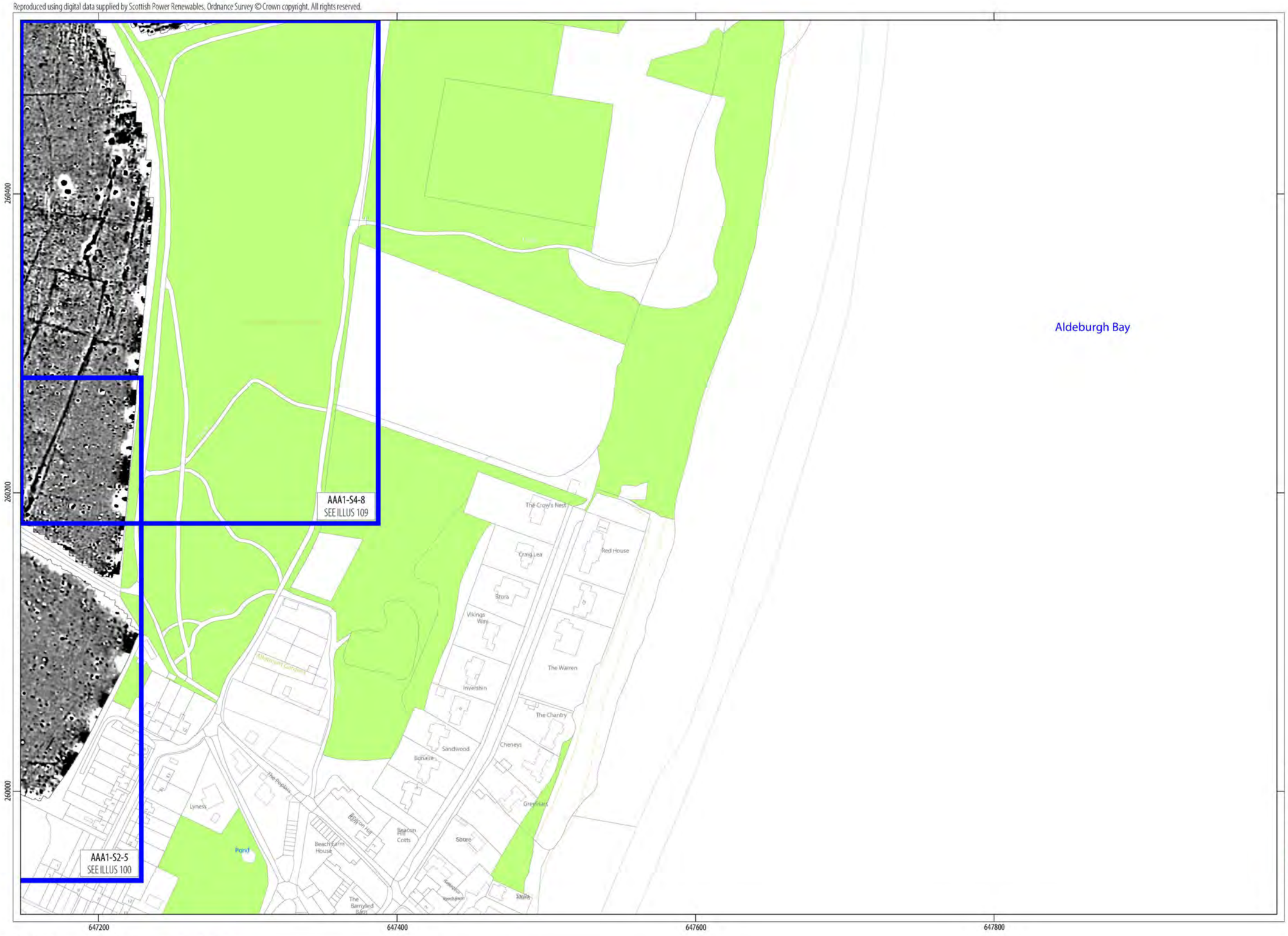
ILLUS 18 Interpretation of magnetometer data; Sector 3



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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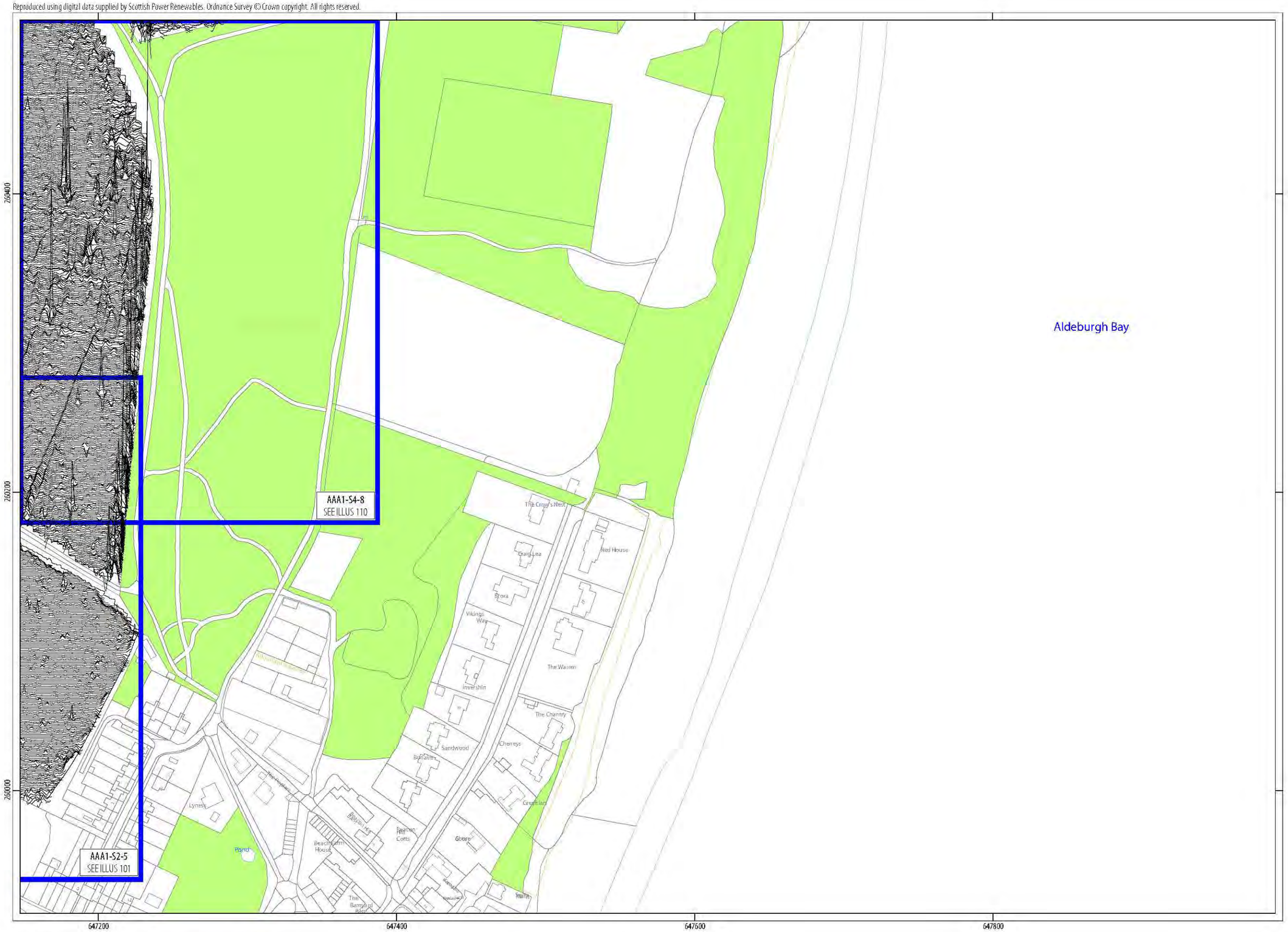
ILLUS 19 Processed greyscale magnetometer data; Sector 4



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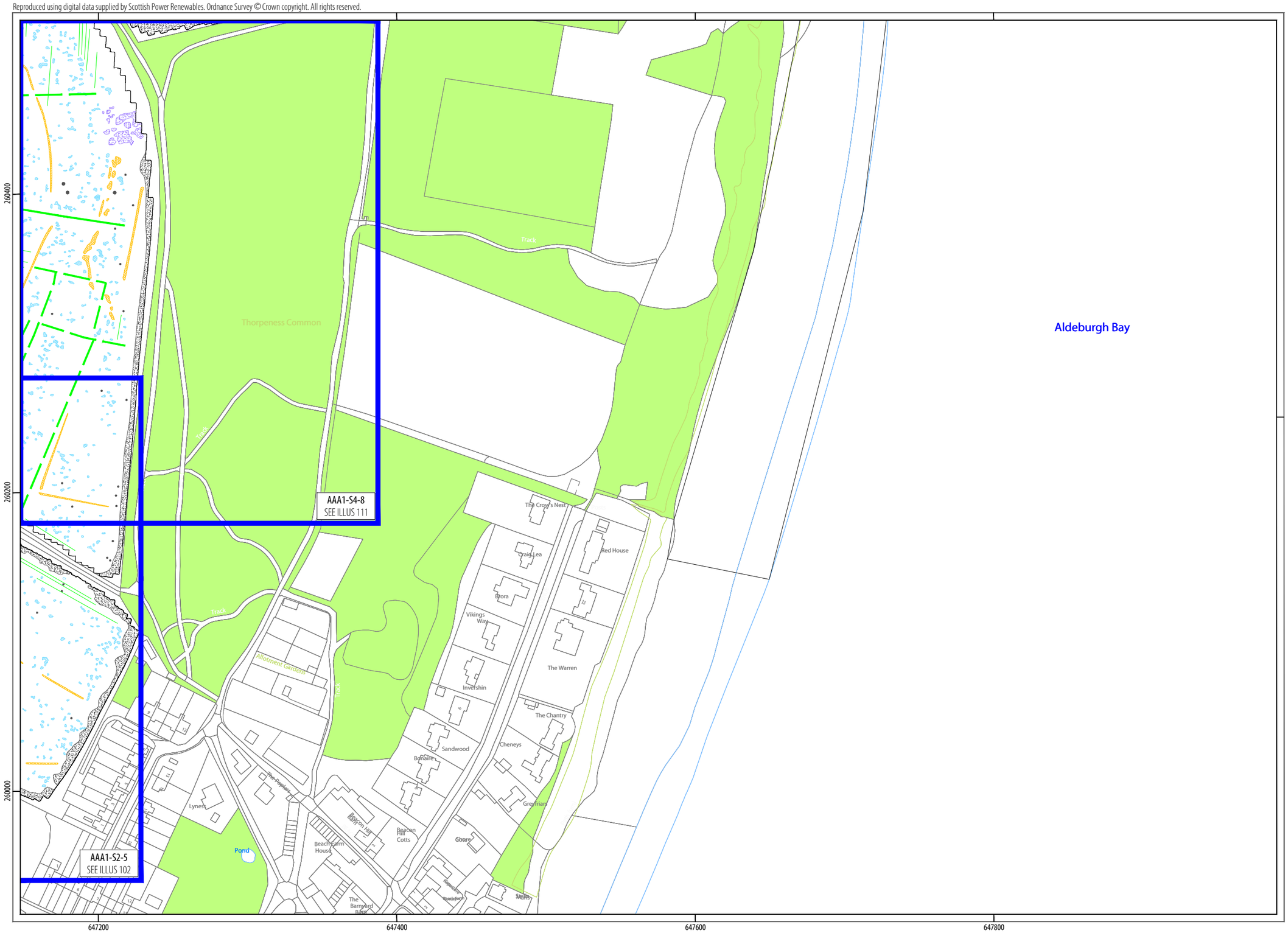
ILLUS 20 XY trace plot of minimally processed magnetometer data; Sector 4



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear	former field boundary
linear	former field boundary?
magnetic enhancement	geology
magnetic enhancement	archaeology?

0 500m
1:2,500 @ A3

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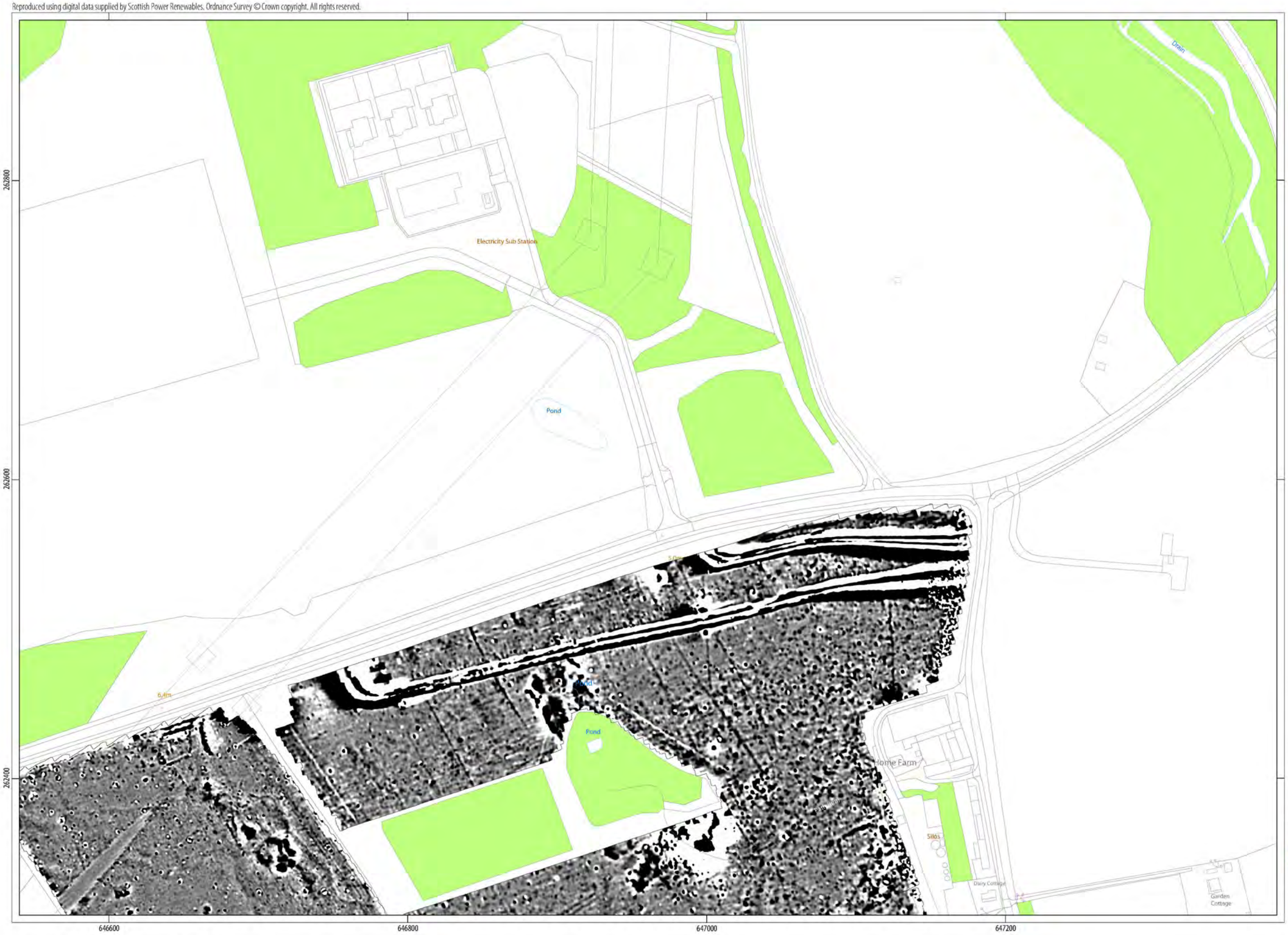
ILLUS 21 Interpretation of magnetometer data; Sector 4



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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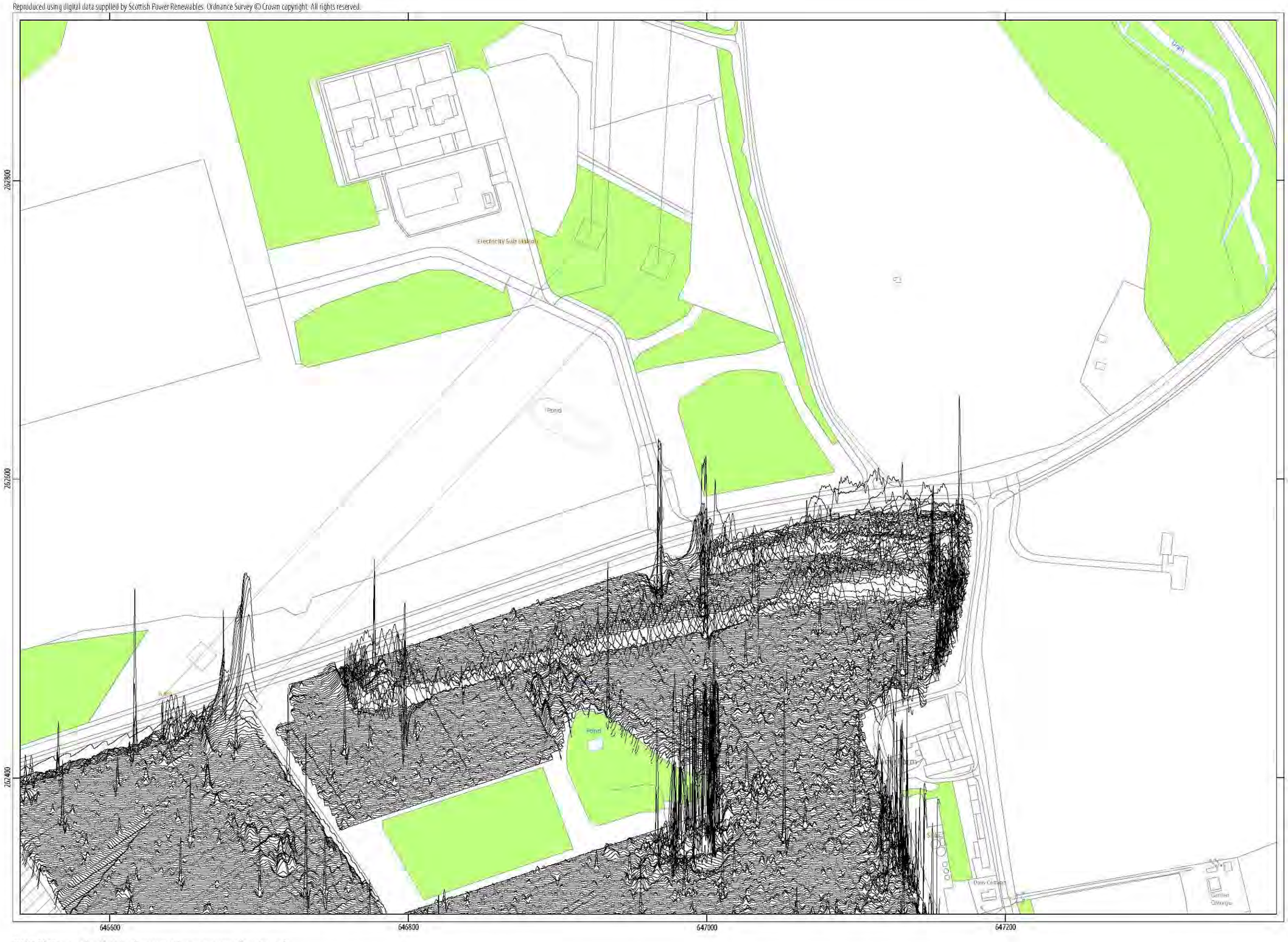
ILLUS 22 Processed greyscale magnetometer data; Sector 5



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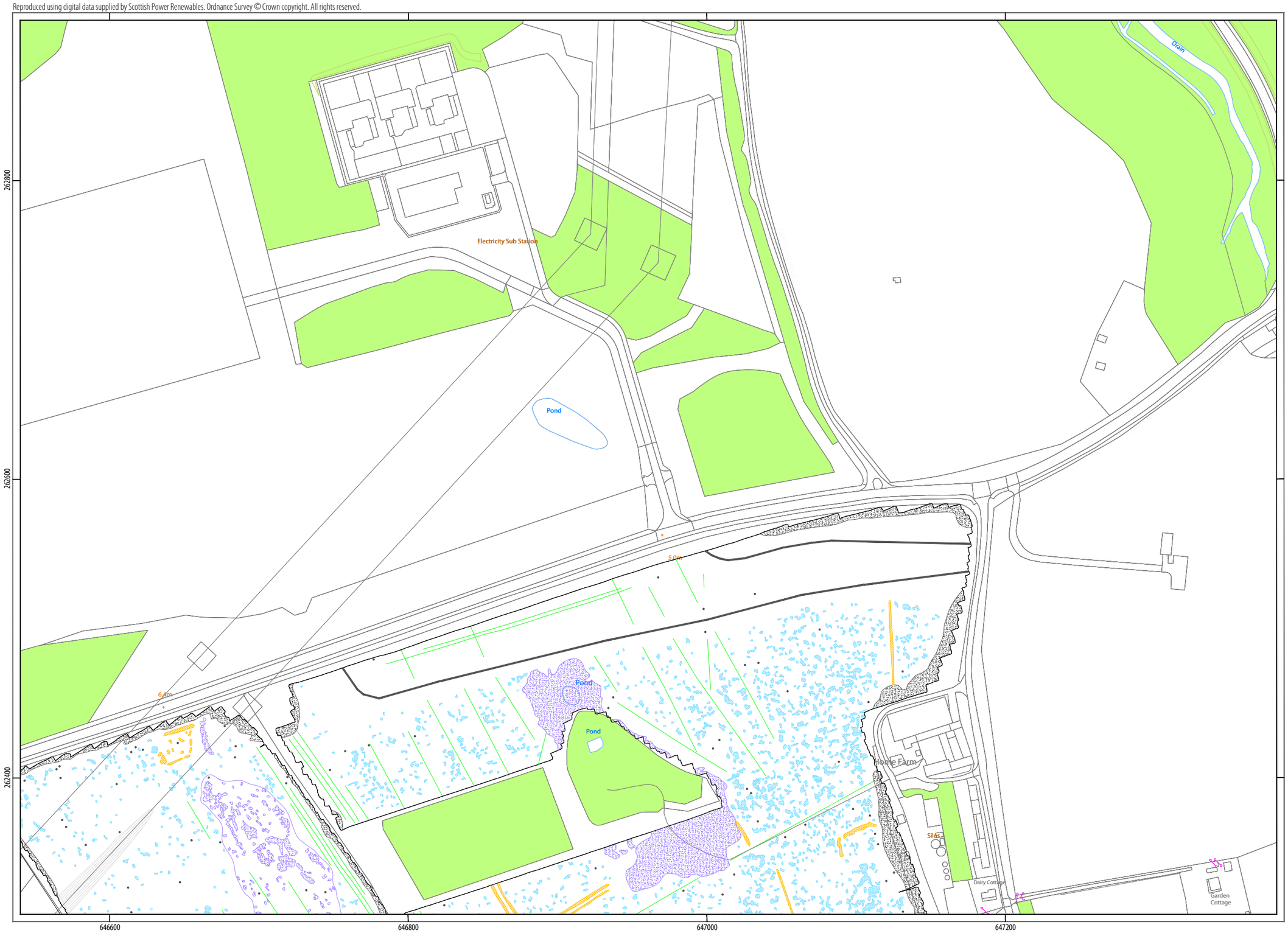
ILLUS 23 XY trace plot of minimally processed magnetometer data; Sector 5



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
null value	overhead cables
magnetic disturbance	quarrying
linear trend	agricultural
magnetic enhancement	geology
magnetic enhancement	archaeology?

0 500m
1:2,500 @ A3

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ILLUS 24 Interpretation of magnetometer data; Sector 5

nT
-1.0 1.0

0 50m
1:2,500 @ A3

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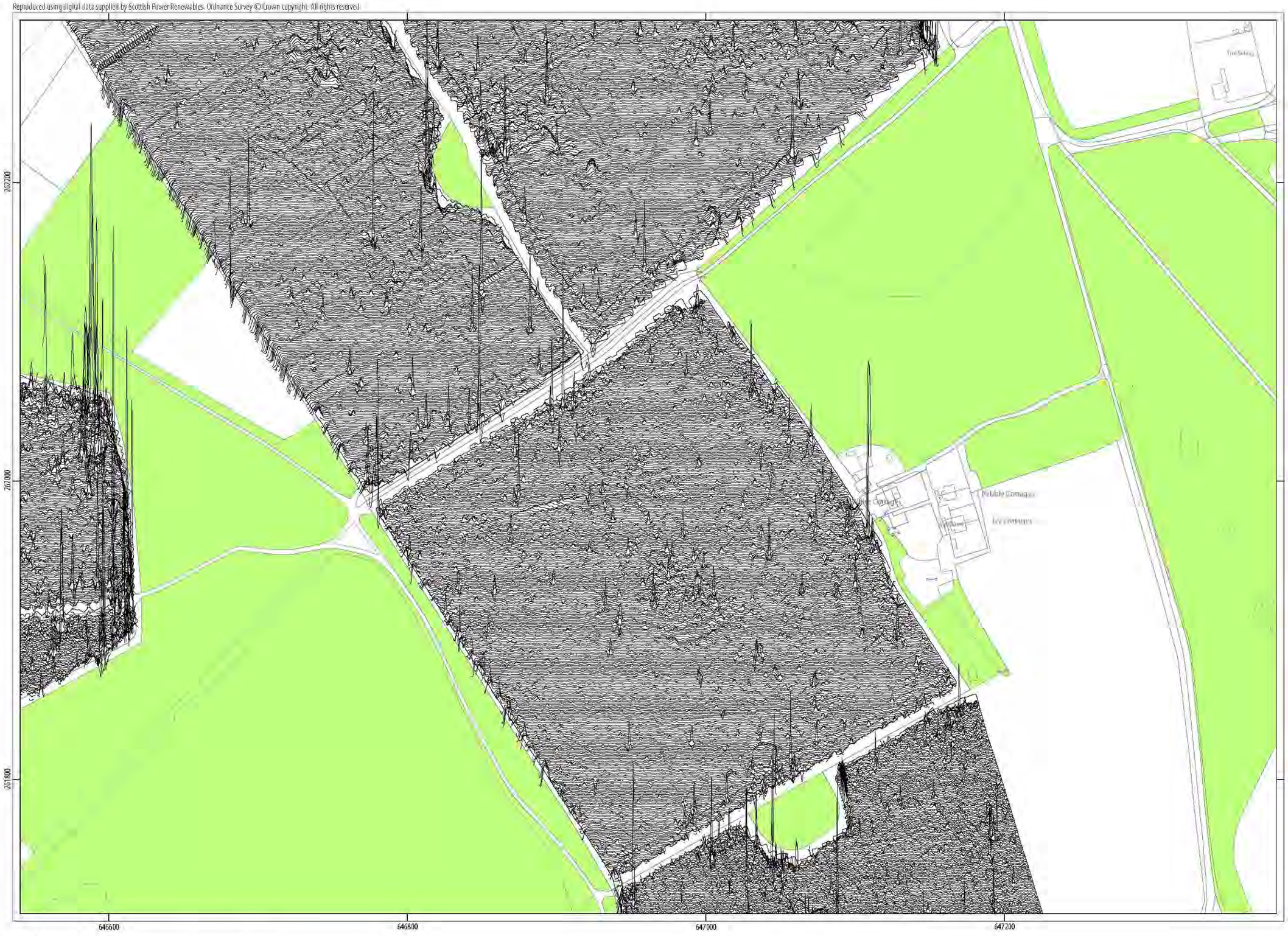
ILLUS 25 Processed greyscale magnetometer data; Sector 6



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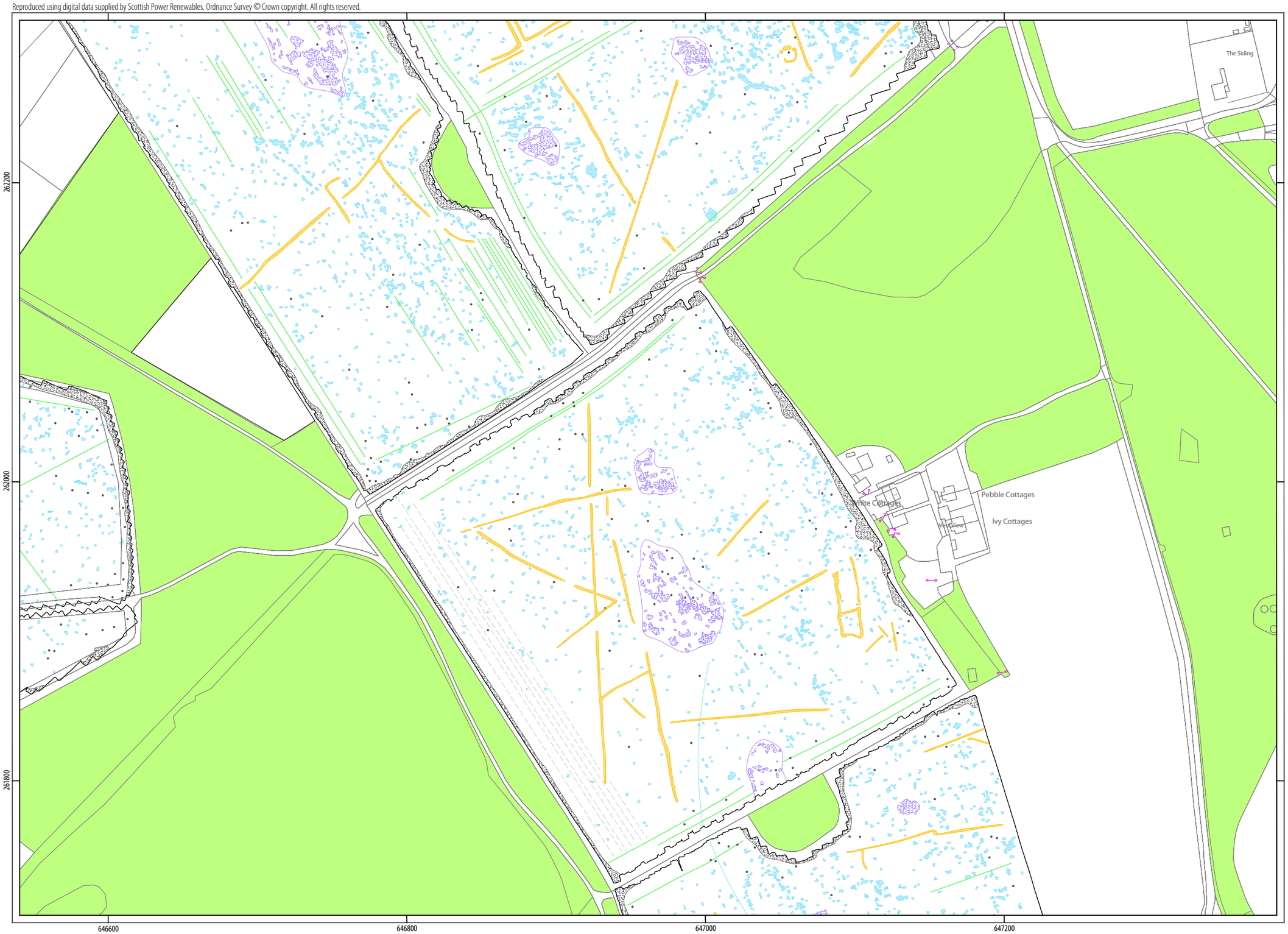
ILLUS 26 XY trace plot of minimally processed magnetometer data; Sector 6



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
magnetic enhancement	geology
magnetic enhancement	archaeology?

0 500m
1:2,500 @ A3

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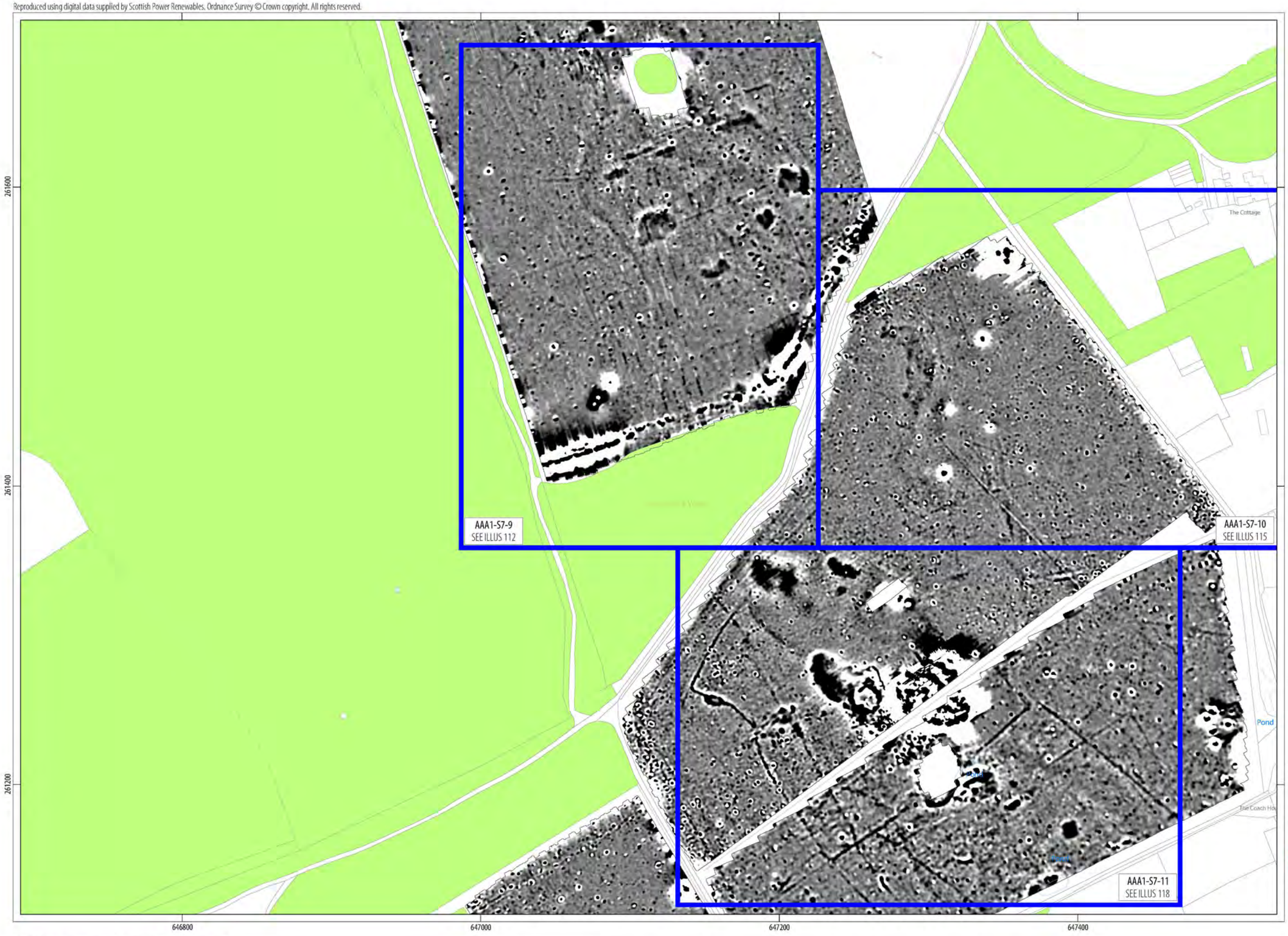
ILLUS 27 Interpretation of magnetometer data; Sector 6



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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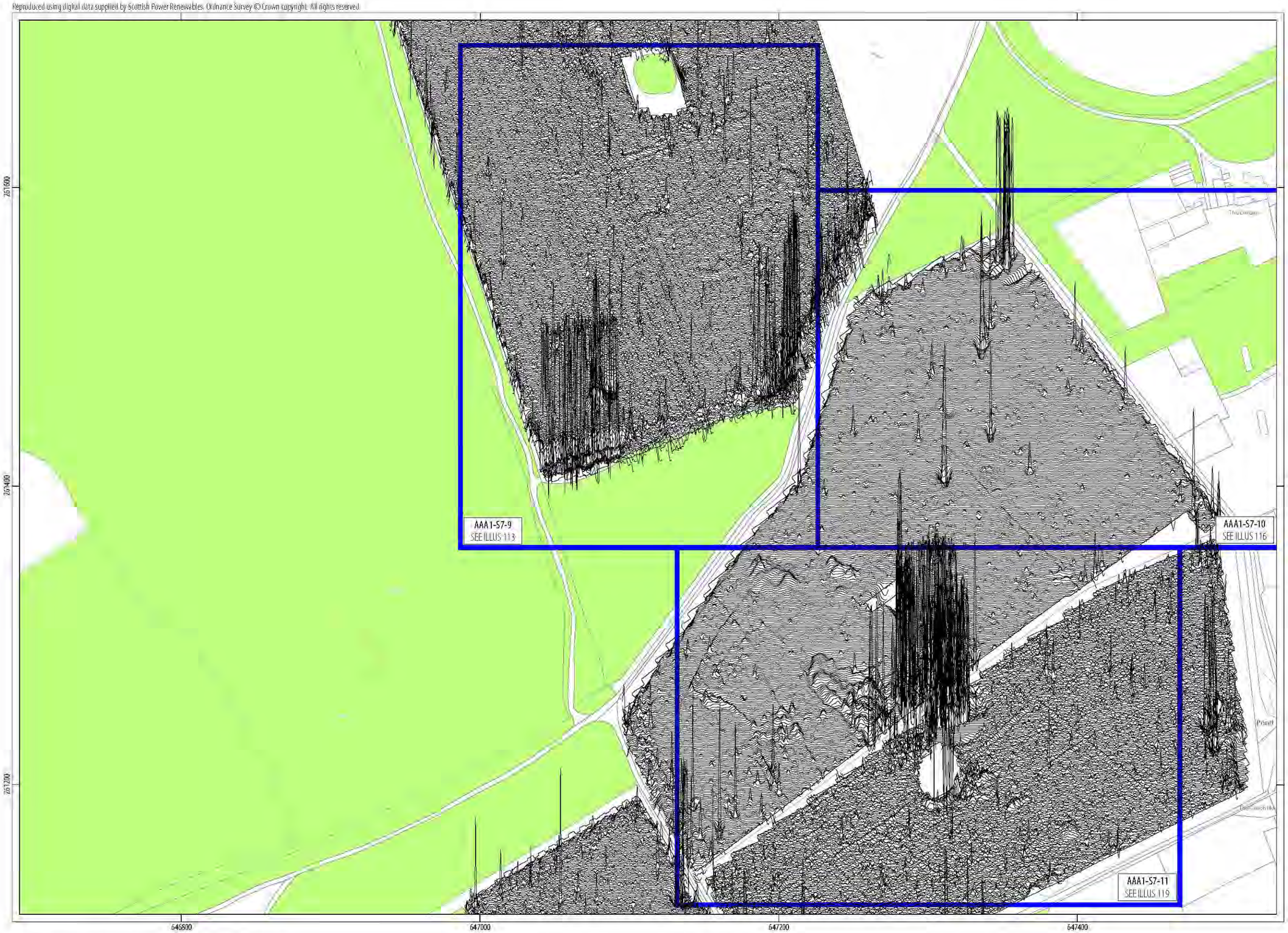
ILLUS 28 Processed greyscale magnetometer data; Sector 7



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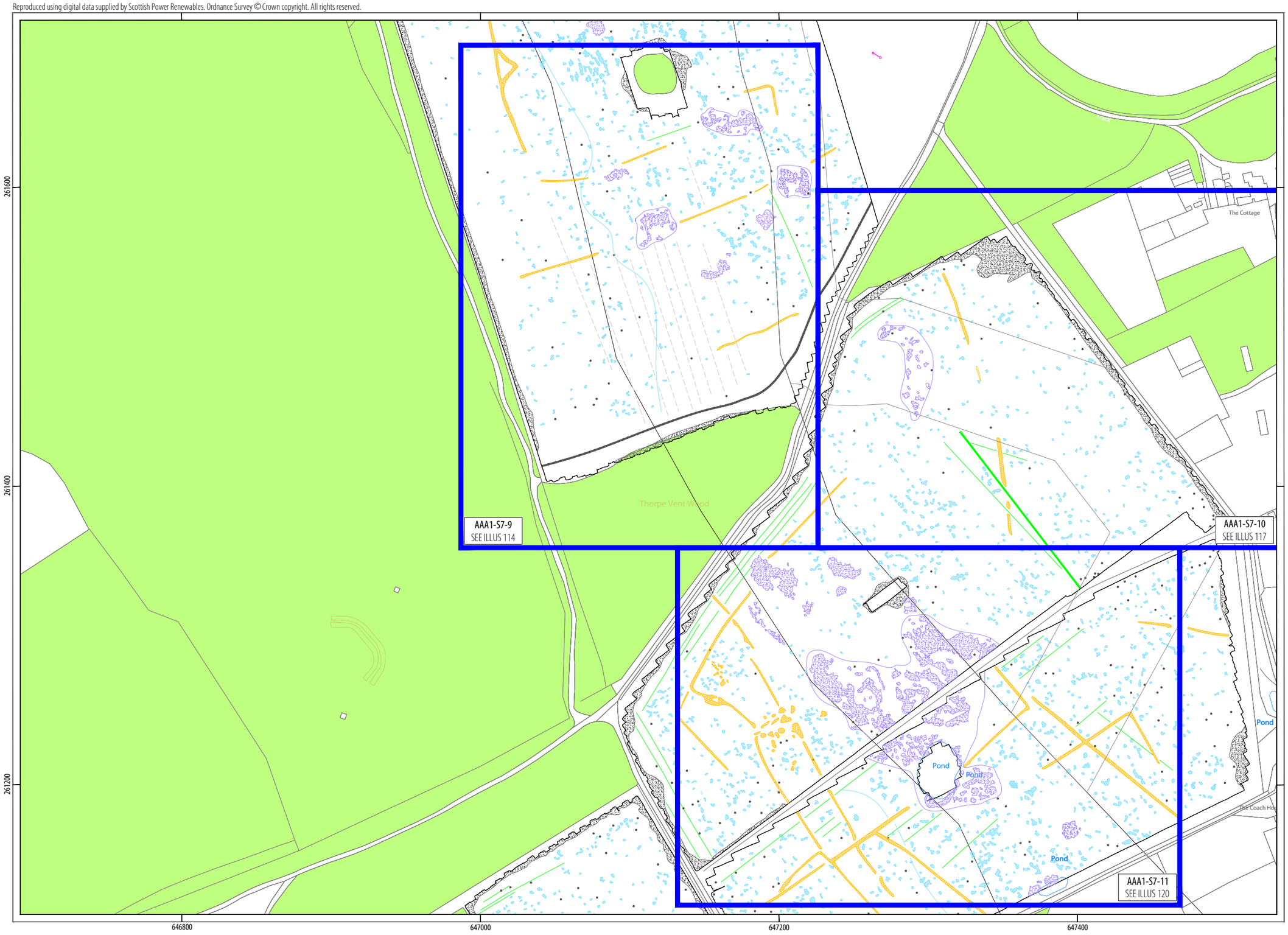
ILLUS 29 XY trace plot of minimally processed magnetometer data; Sector 7



ILLUS 30 Interpretation of magnetometer data; Sector 7

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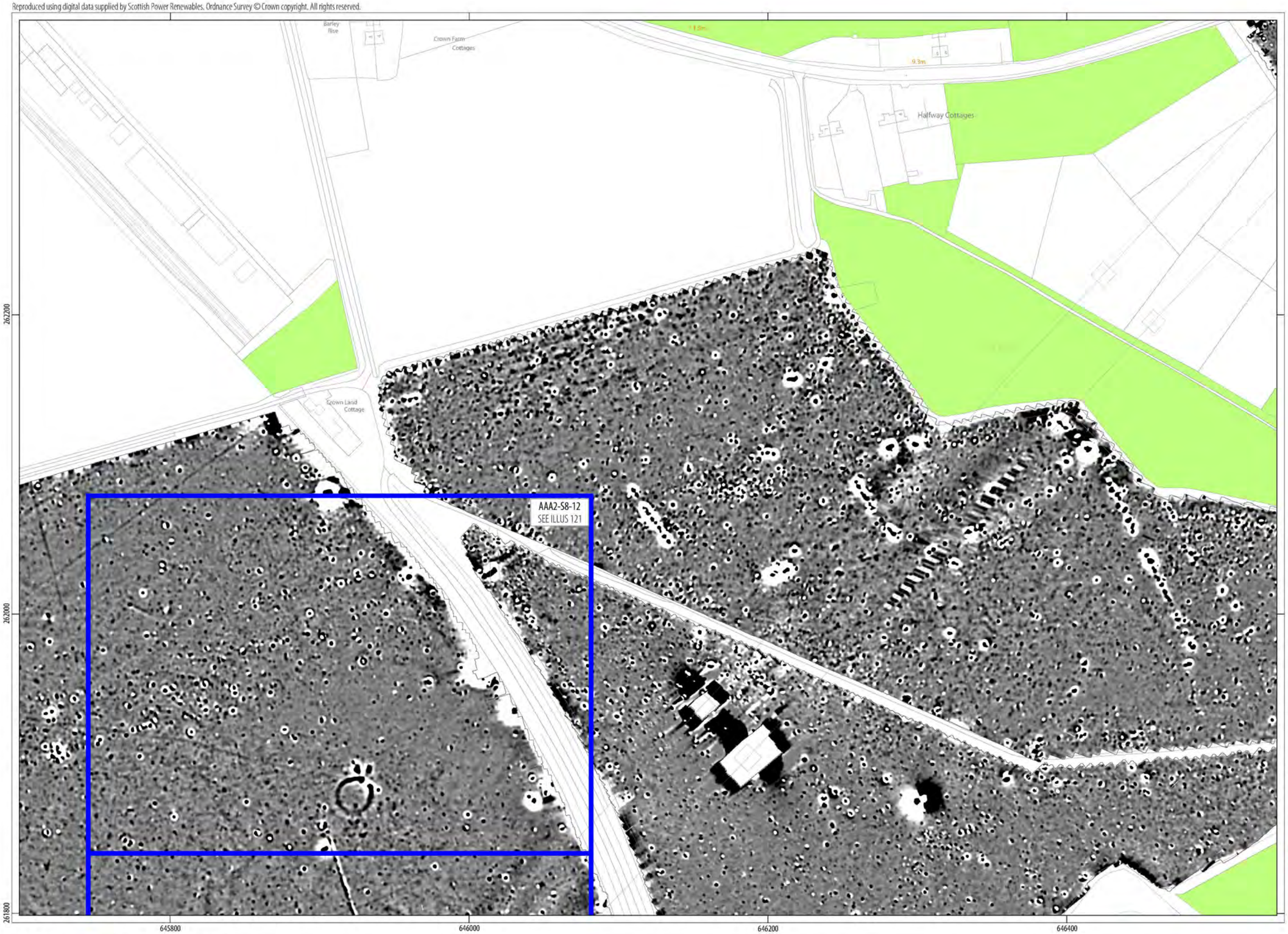

nT
-1.0 1.0

0 50m
1:2,500 @ A3

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ILLUS 31 Processed greyscale magnetometer data; Sector 8

AAA2-S8-12
SEE ILLUS 122

262200
262000
261800
645800
646000
646200
646400

18.0nT/cm

0 500m
1:2,500 @ A3

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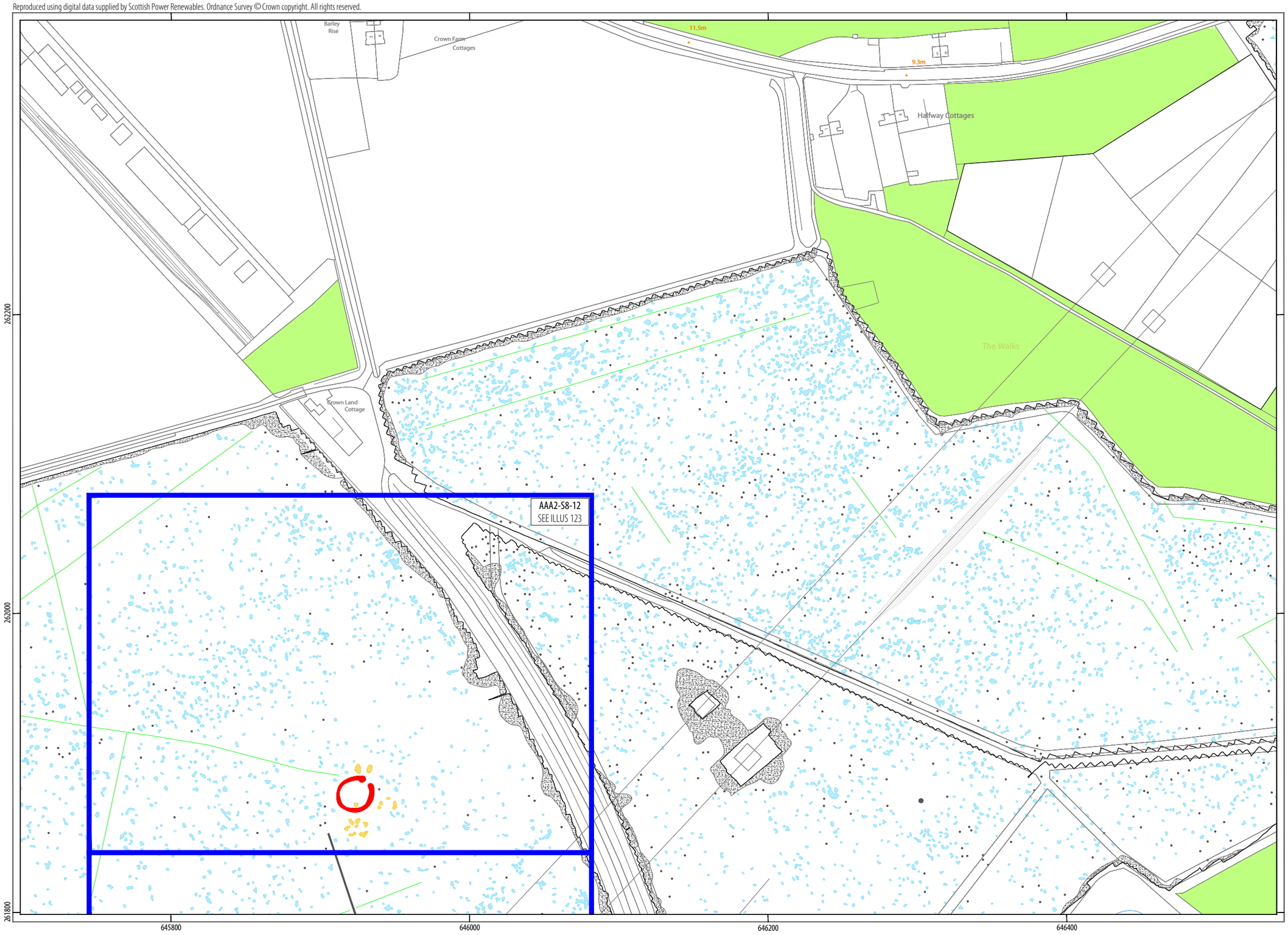
ILLUS 32 XY trace plot of minimally processed magnetometer data; Sector 8



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
null value	overhead cables
linear trend	agricultural
magnetic enhancement	geology
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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ILLUS 33 Interpretation of magnetometer data; Sector 8

nT
-1.0 1.0

0 50m
1:2,500 @ A3

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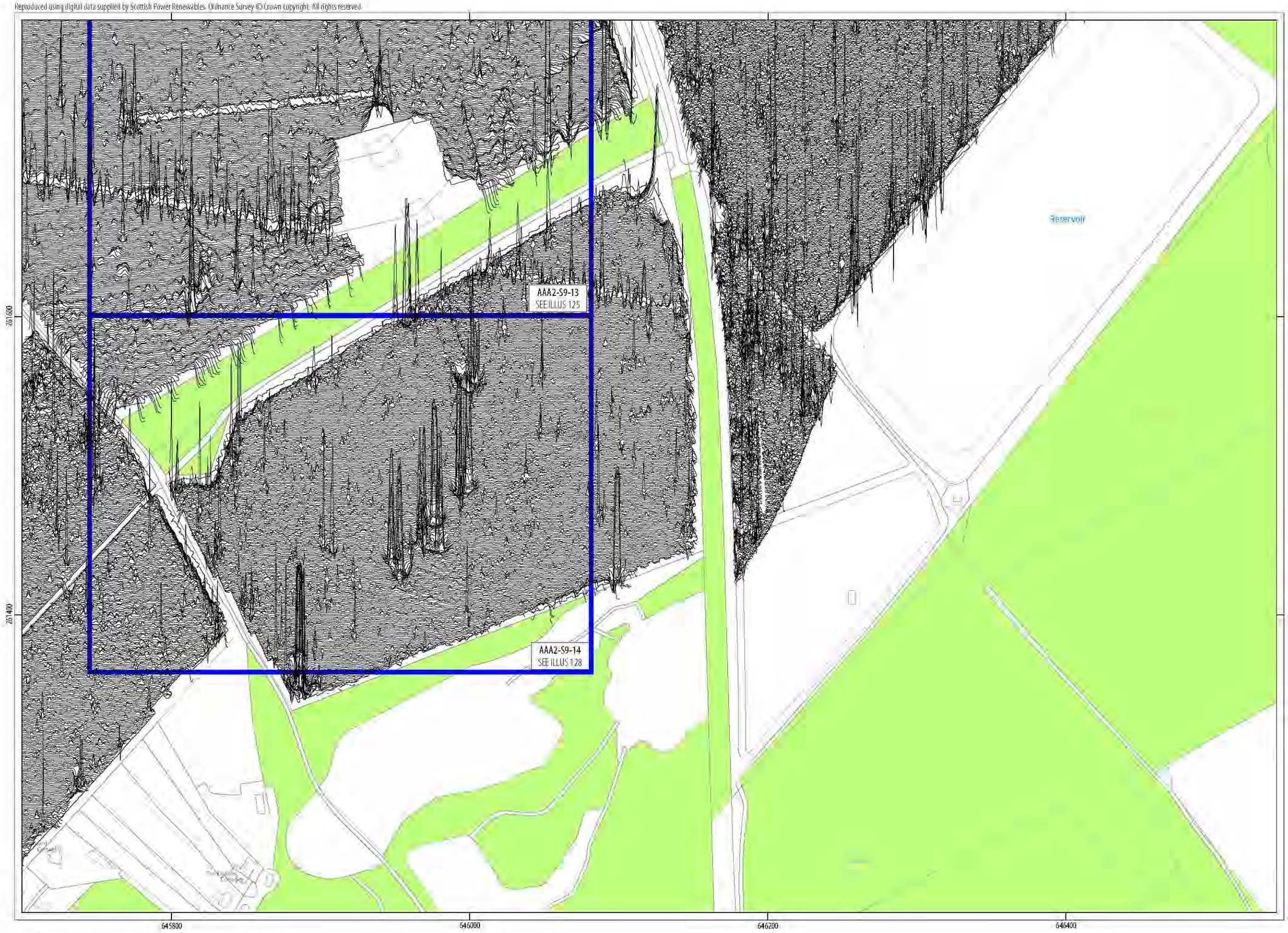
ILLUS 34 Processed greyscale magnetometer data; Sector 9



18.0nT/cm

0 500m
1:2,500 @ A3

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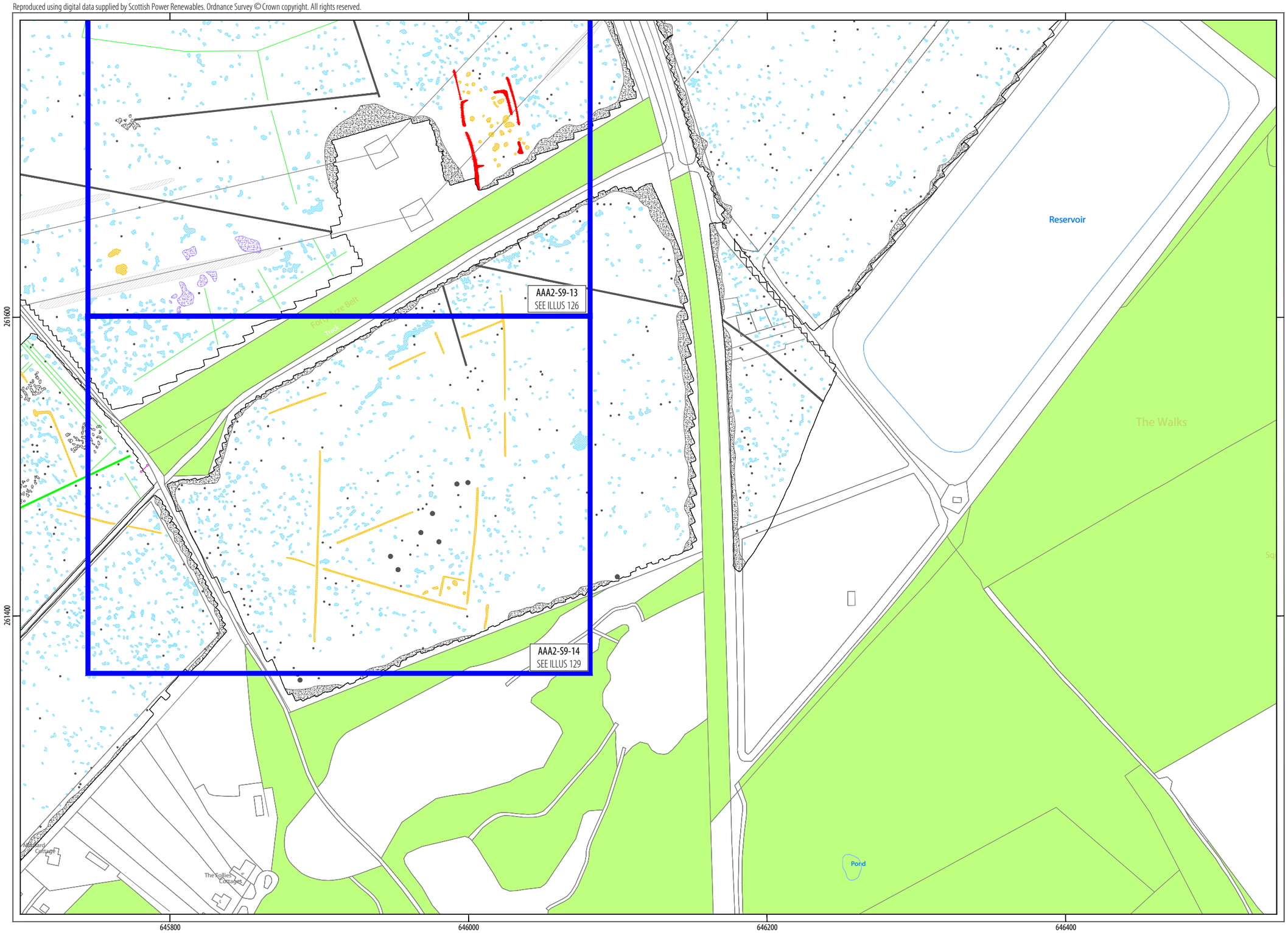
ILLUS 35 XY trace plot of minimally processed magnetometer data; Sector 9



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
null value	overhead cables
magnetic disturbance	quarrying
linear trend	agricultural
magnetic enhancement	geology
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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ILLUS 36 Interpretation of magnetometer data; Sector 9

nT
-1.0 1.0

0 50m
1:2,500 @ A3

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ILLUS 37 Processed greyscale magnetometer data; Sector 10

18.0nT/cm

0 500m
1:2,500 @ A3

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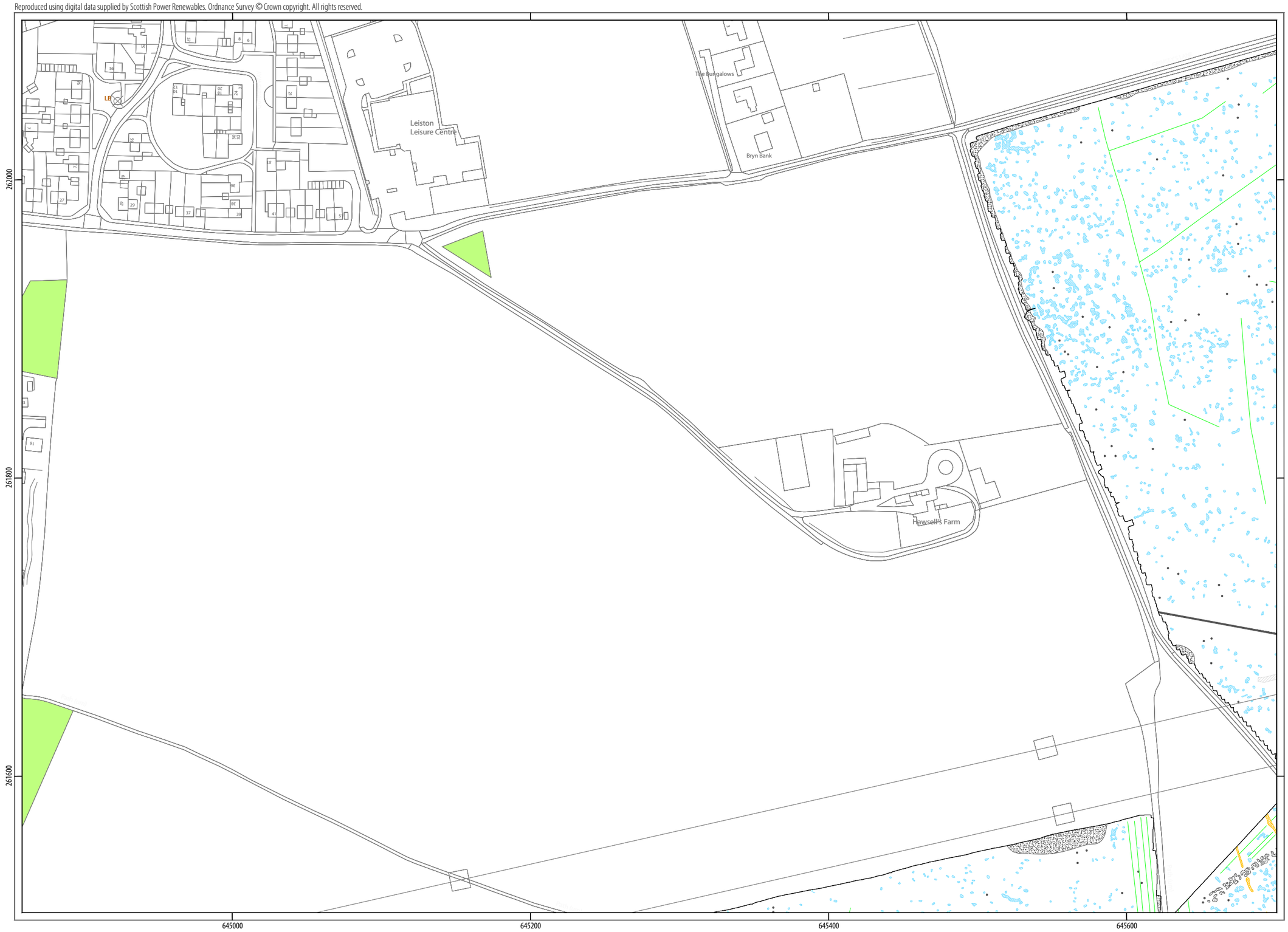
ILLUS 38 XY trace plot of minimally processed magnetometer data; Sector 10



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
null value	overhead cables
linear trend	agricultural
magnetic enhancement	geology
magnetic enhancement	archaeology?

0 500m
1:2,500 @ A3

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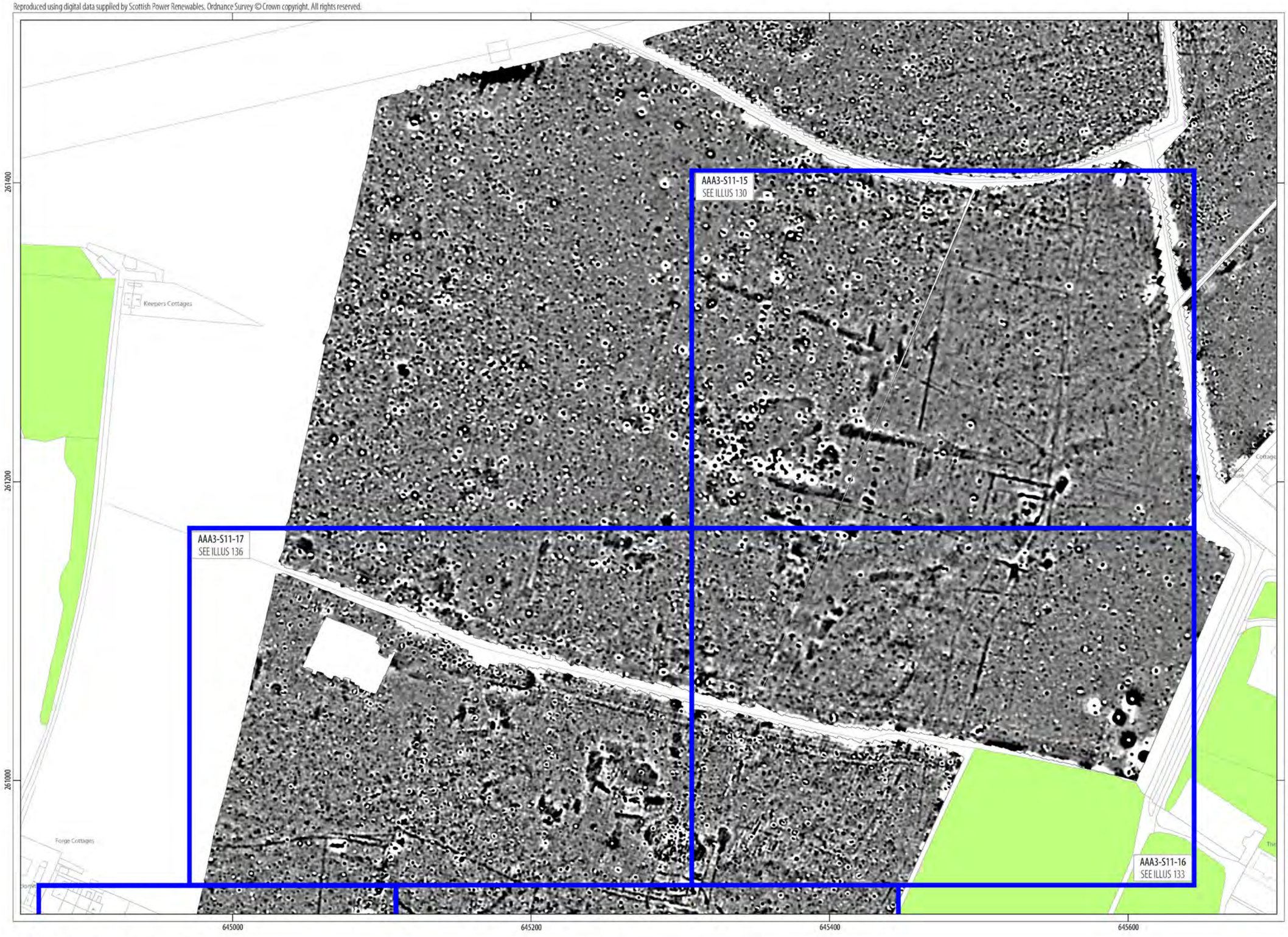
ILLUS 39 Interpretation of magnetometer data; Sector 10



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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ILLUS 40 Processed greyscale magnetometer data; Sector 11

AAA3-S11-15
SEE ILLUS 131

AAA3-S11-17
SEE ILLUS 137

AAA3-S11-16
SEE ILLUS 134

18.0nT/cm

0 500m
1:2,500 @ A3

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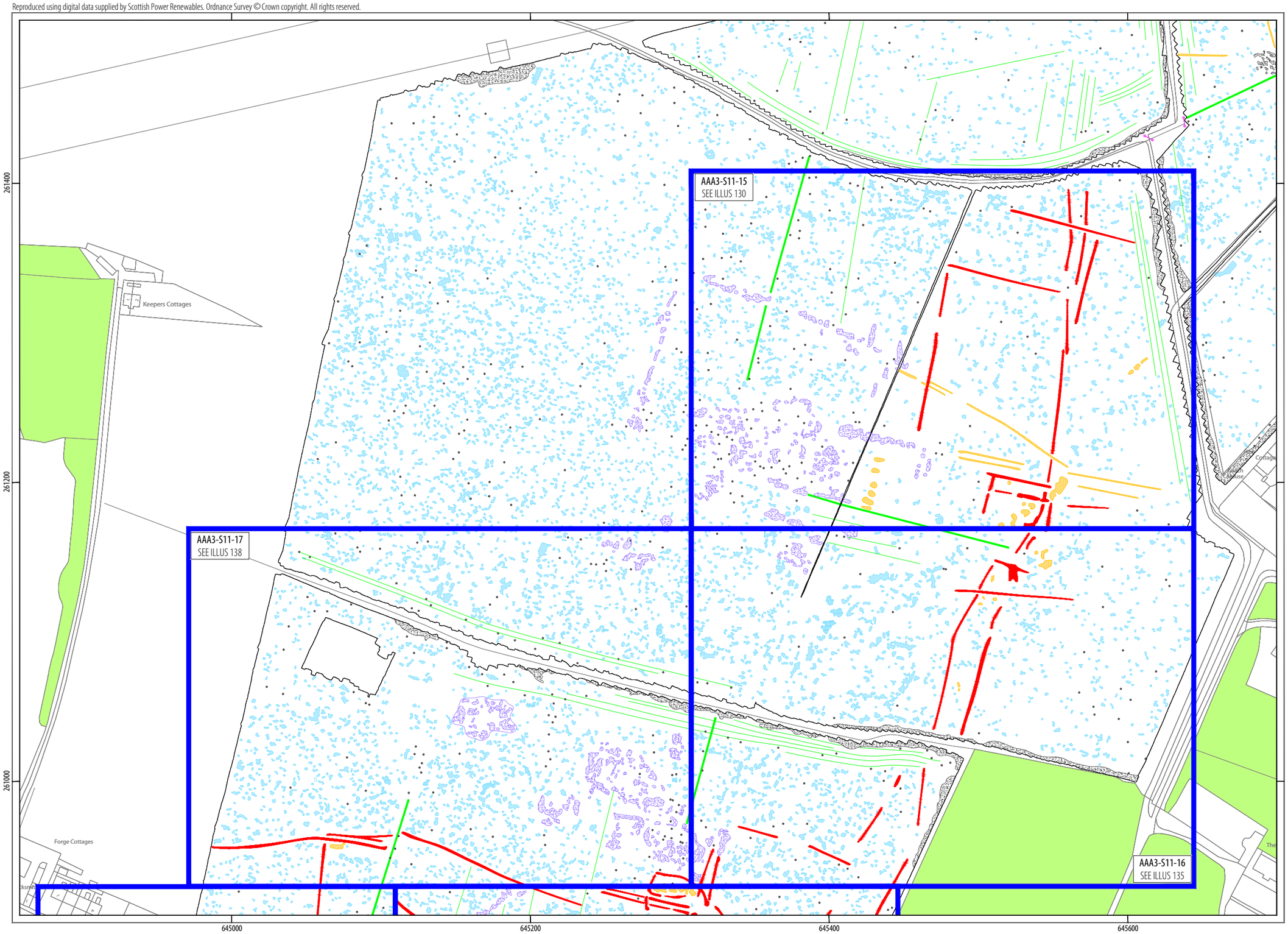
ILLUS 41 XY trace plot of minimally processed magnetometer data; Sector 11



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear	former field boundary
magnetic enhancement	geology
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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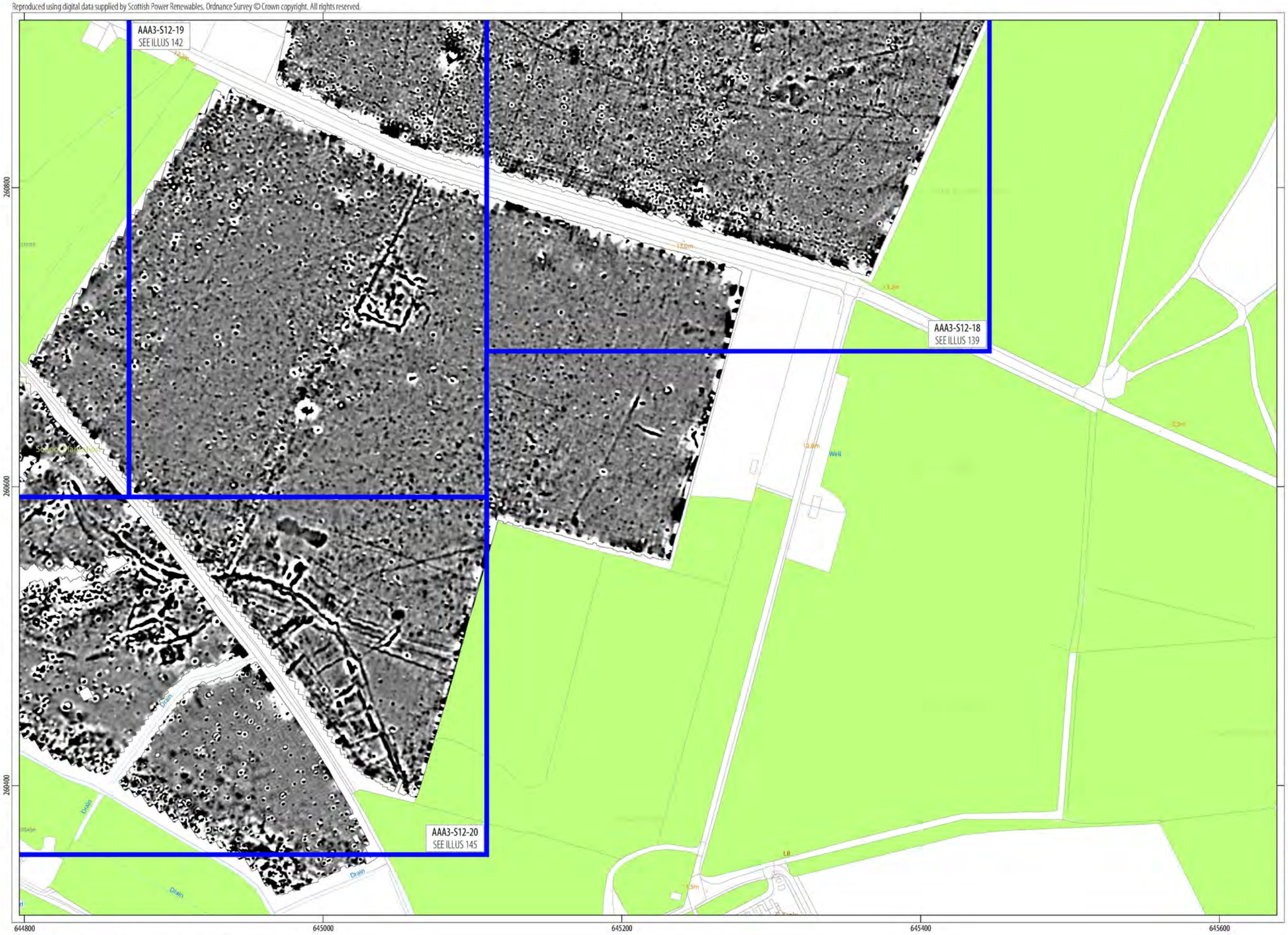
ILLUS 42 Interpretation of magnetometer data; Sector 11



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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ILLUS 43 Processed greyscale magnetometer data; Sector 12

18.0nT/cm

0 500m
1:2,500 @ A3

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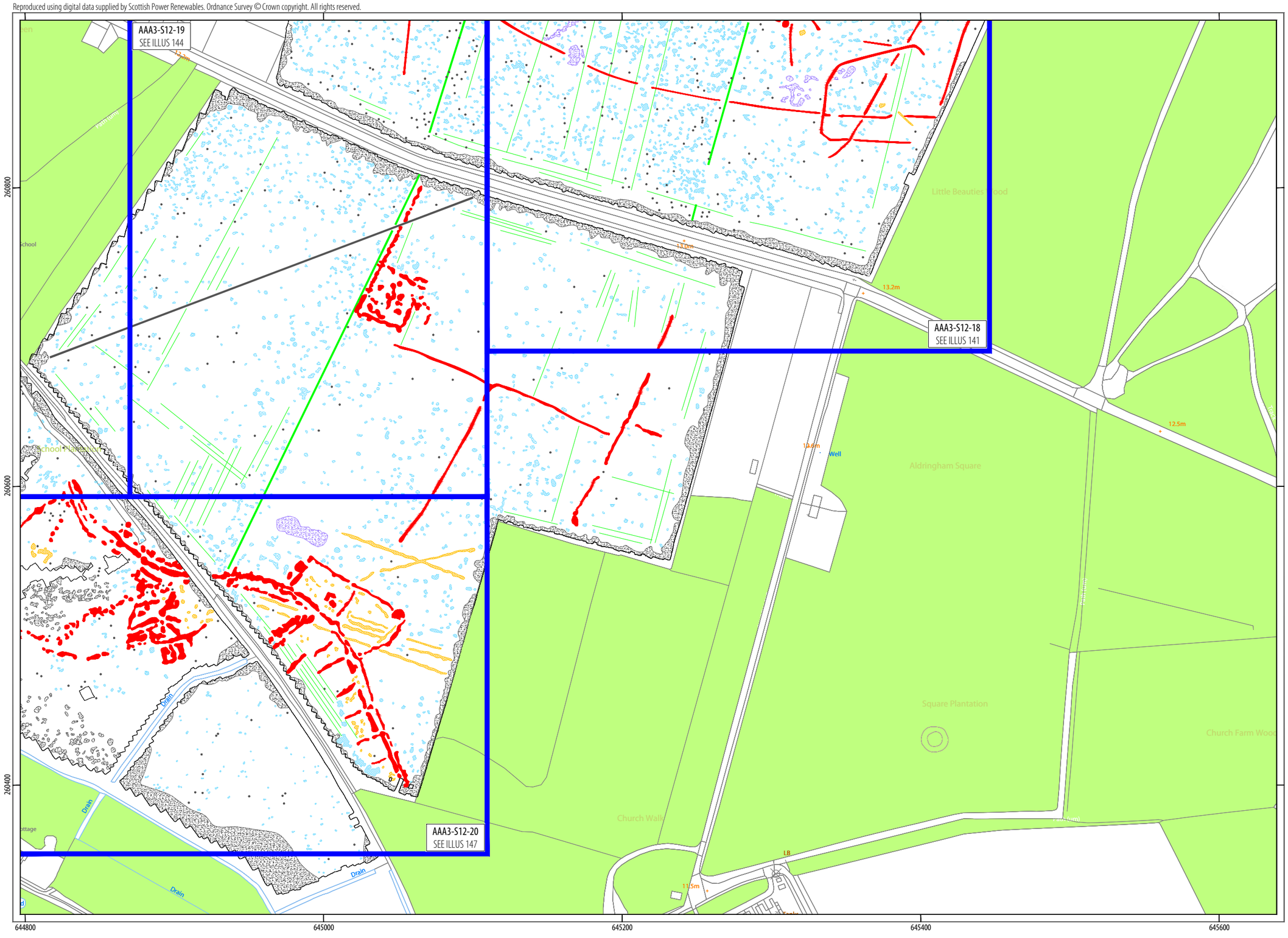
ILLUS 44 XY trace plot of minimally processed magnetometer data; Sector 12



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
magnetic disturbance	quarrying
linear trend	agricultural
linear	former field boundary
magnetic enhancement	geology
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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ILLUS 45 Interpretation of magnetometer data; Sector 12

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ILLUS 46 Processed greyscale magnetometer data; Sector 13

18.0nT/cm

0 500m

1:2,500 @ A3

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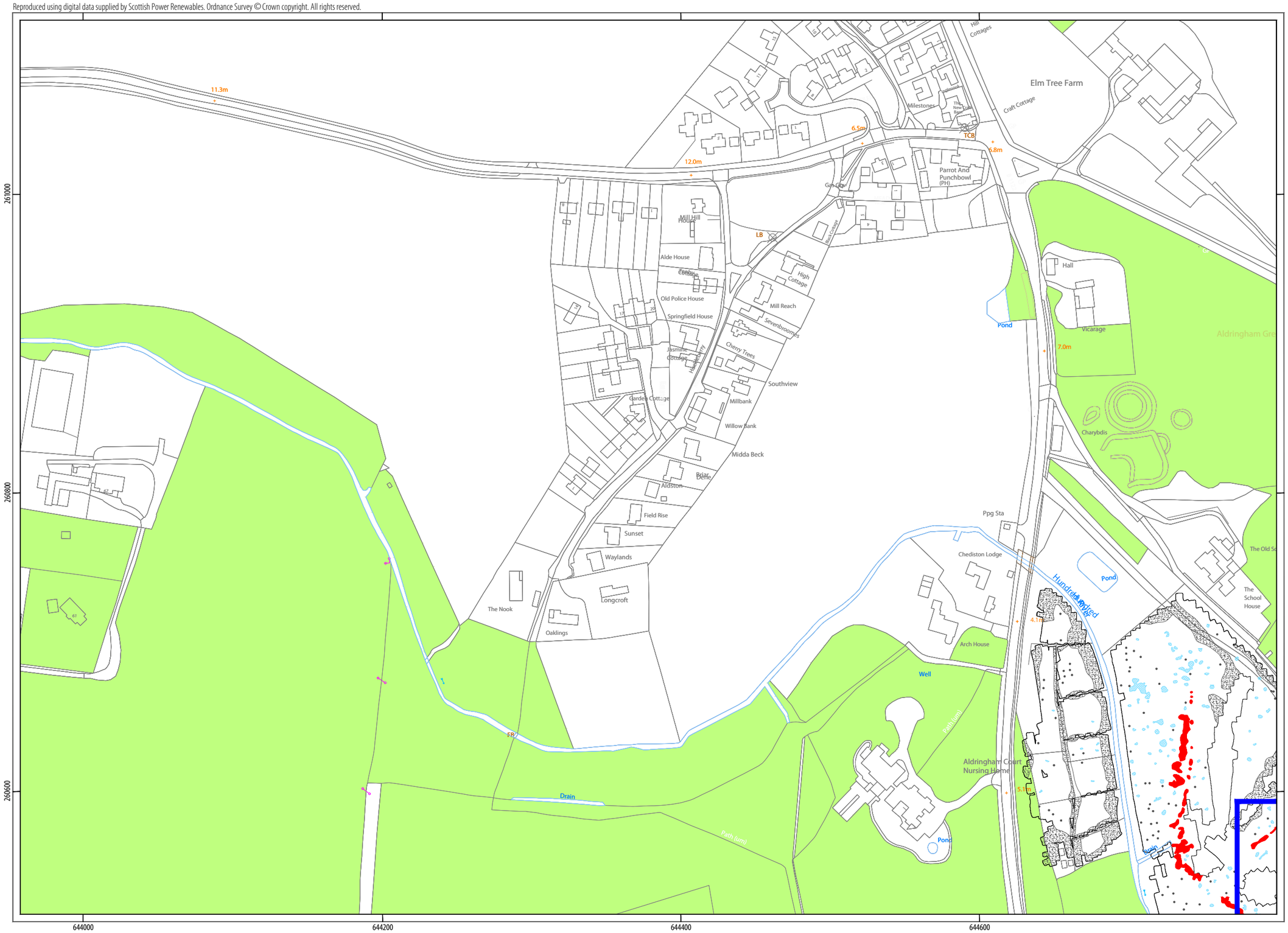
ILLUS 47 XY trace plot of minimally processed magnetometer data; Sector 13



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic enhancement	geology
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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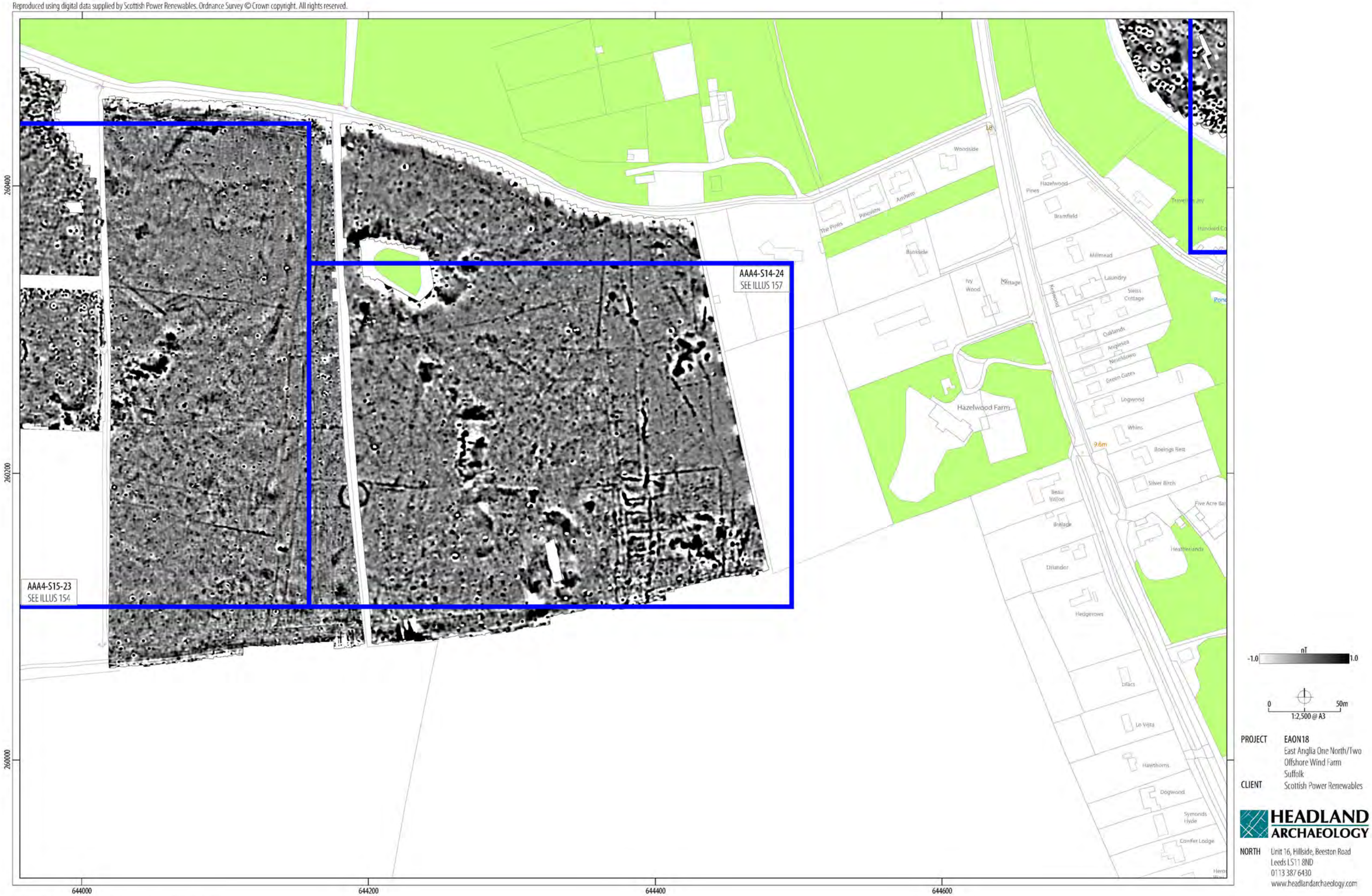
ILLUS 48 Interpretation of magnetometer data; Sector 13



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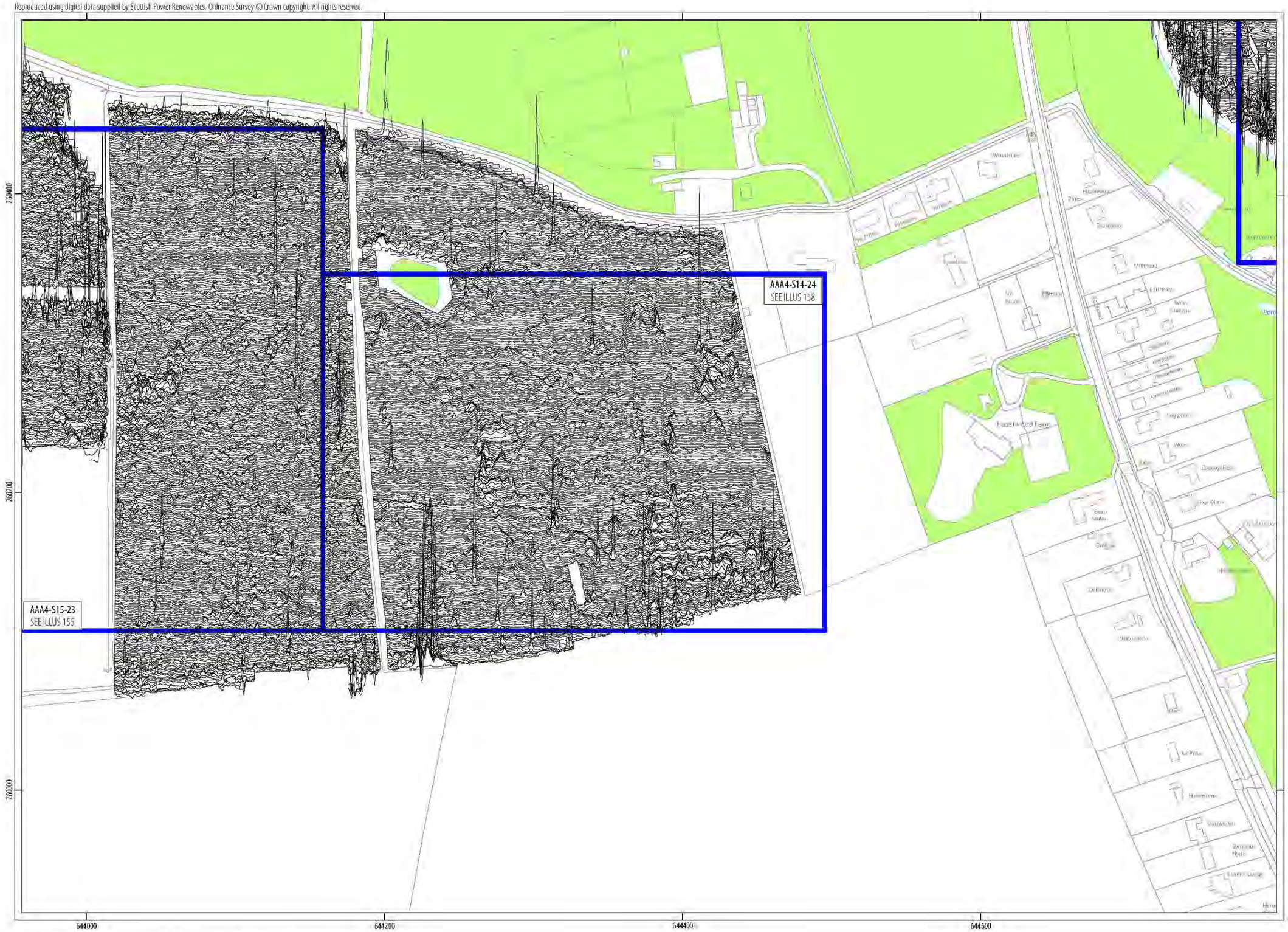
ILLUS 49 Processed greyscale magnetometer data; Sector 14



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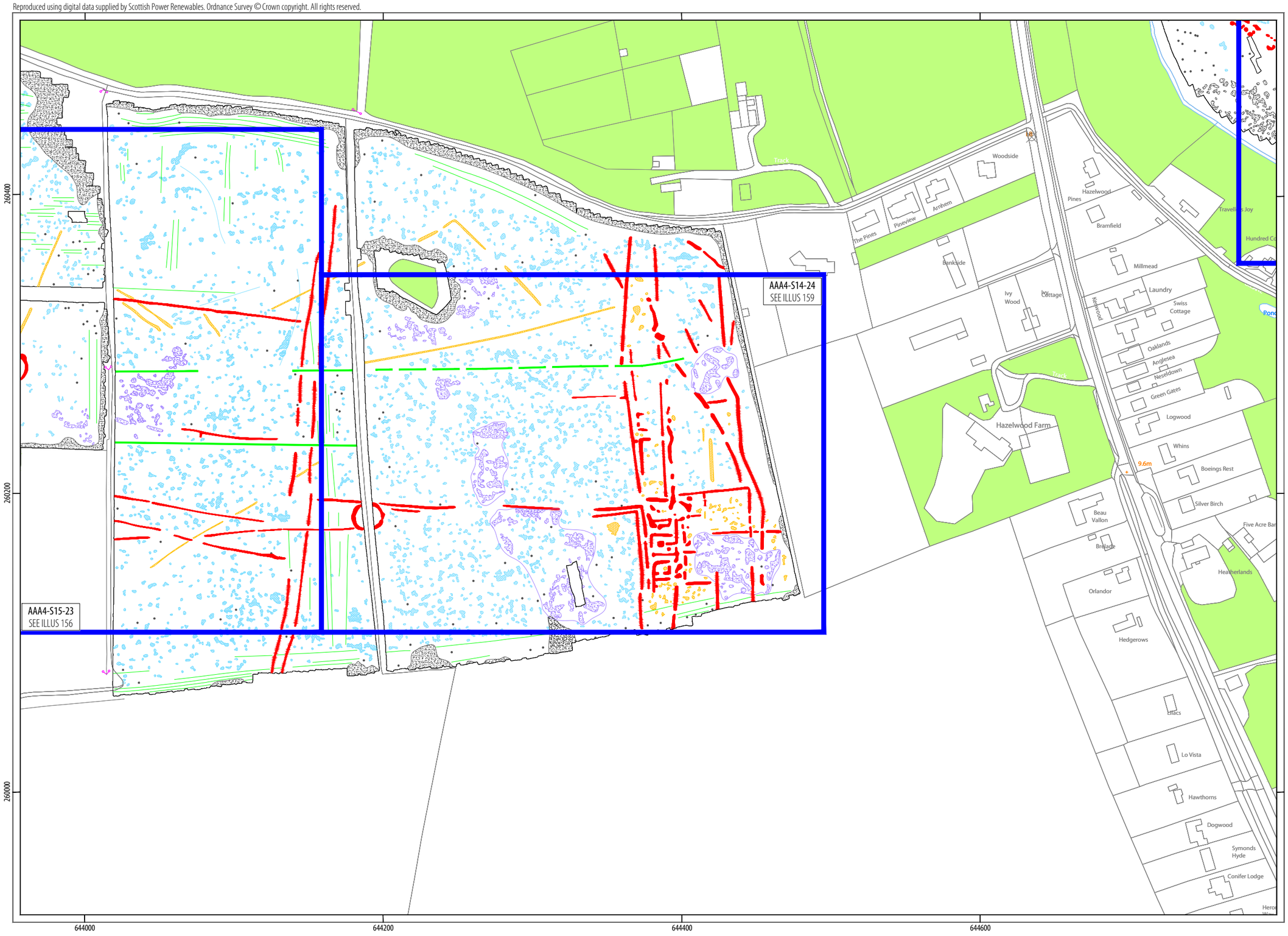
ILLUS 50 XY trace plot of minimally processed magnetometer data; Sector 14



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear	former field boundary
linear	former field boundary?
magnetic enhancement	geology
linear	geological variation
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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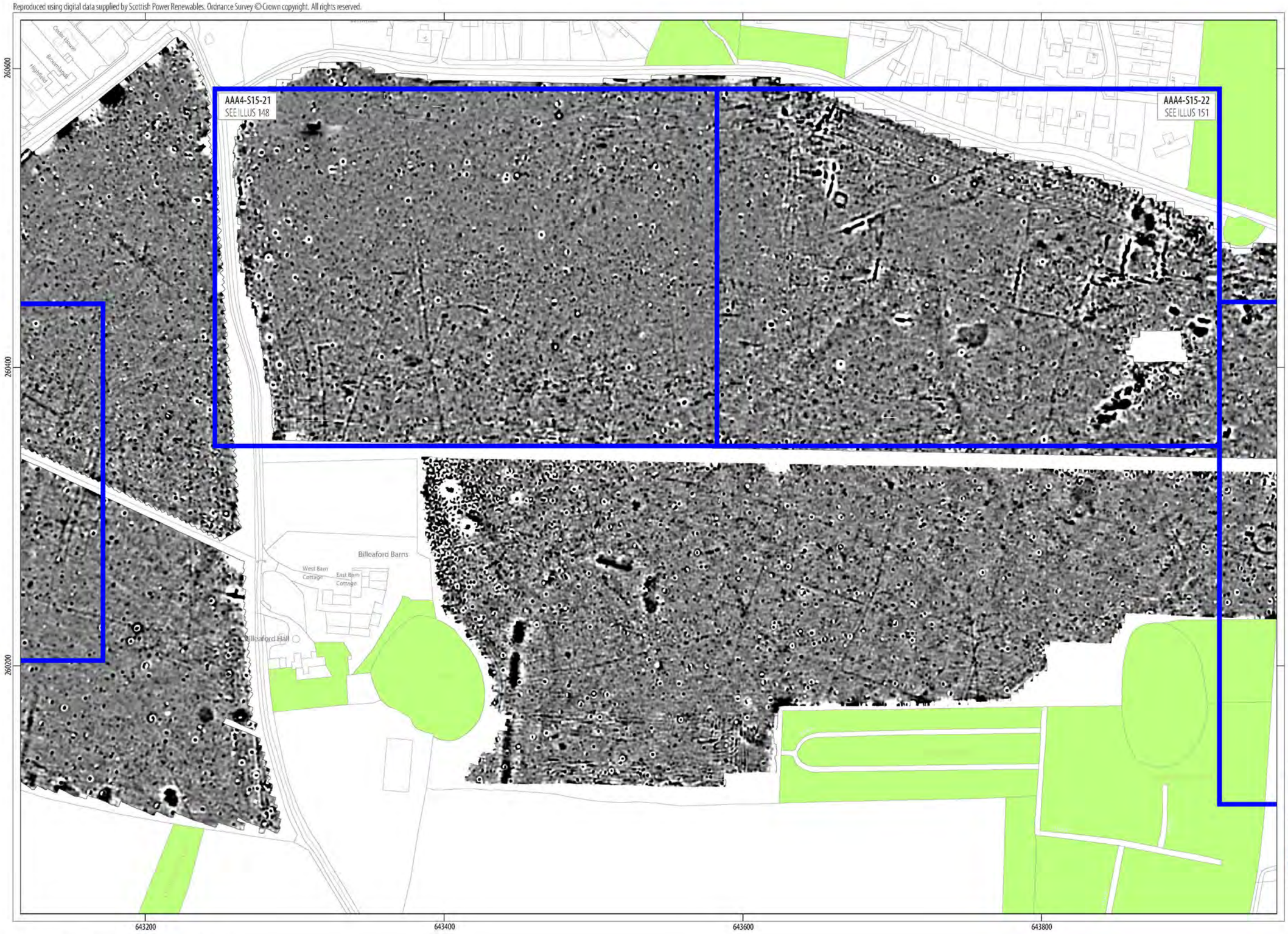
ILLUS 51 Interpretation of magnetometer data; Sector 14



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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ILLUS 52 Processed greyscale magnetometer data; Sector 15

AAA4-S15-21
SEE ILLUS 149

AAA4-S15-22
SEE ILLUS 152

260600

260400

260200

643200

643400

643600

643800

18.0nT/cm

0 500m
1:2,500 @ A3

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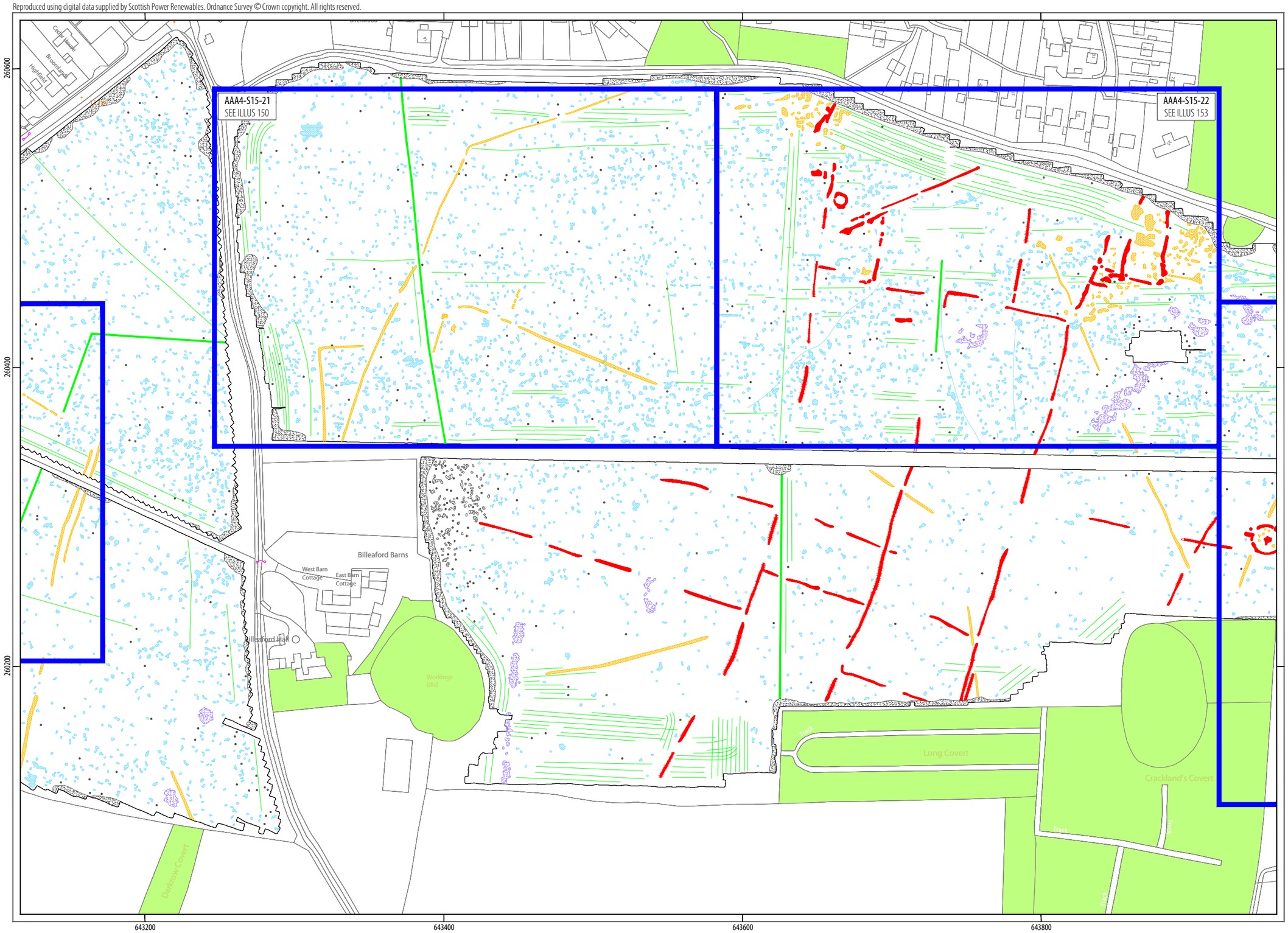
ILLUS 53 XY trace plot of minimally processed magnetometer data; Sector 15



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear	former field boundary
magnetic enhancement	geology
magnetic enhancement	geological variation
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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ILLUS 54 Interpretation of magnetometer data; Sector 15

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ILLUS 55 Processed greyscale magnetometer data; Sector 16

18.0nT/cm

0 500m

1:2,500 @ A3

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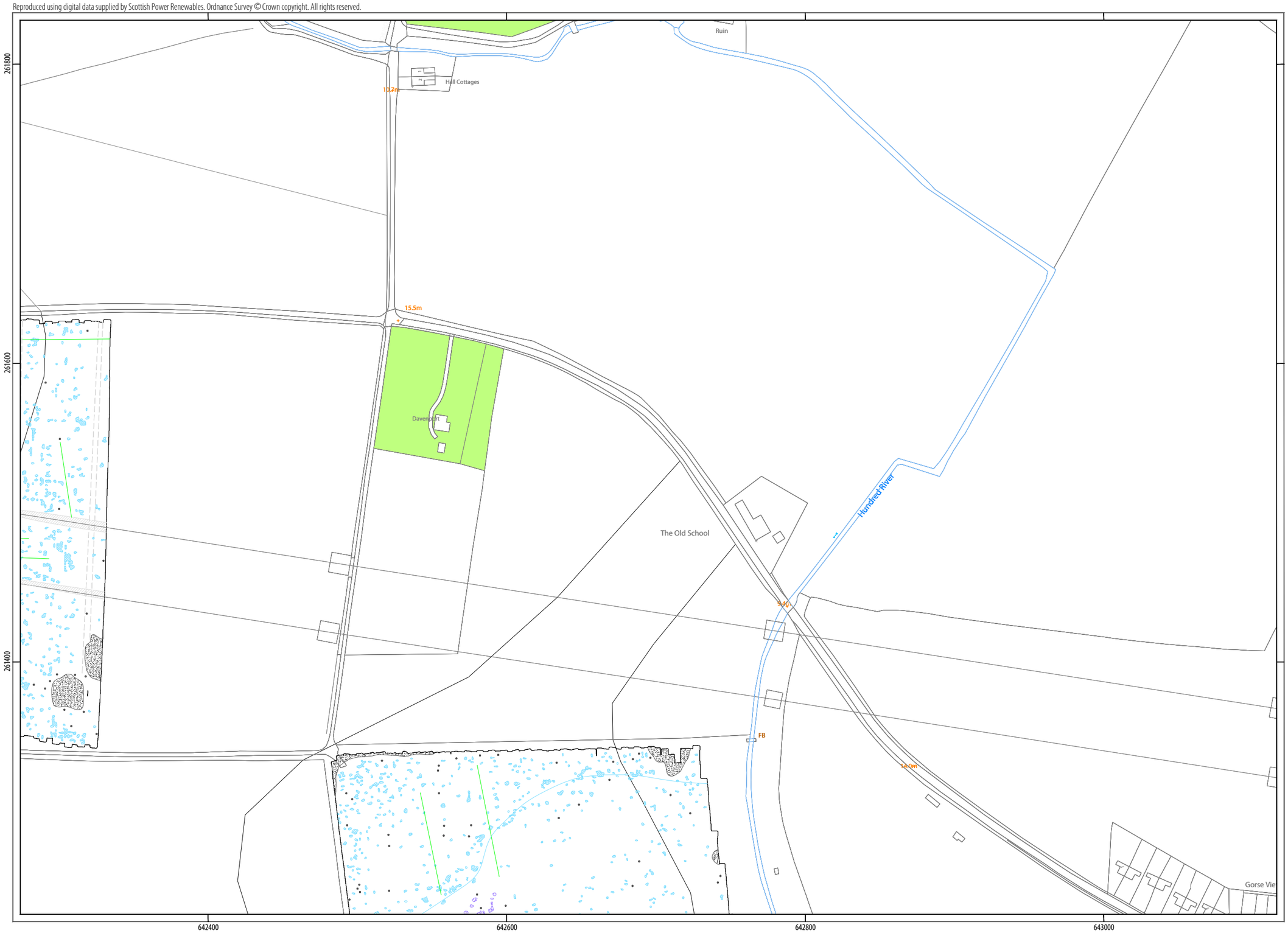
ILLUS 56 XY trace plot of minimally processed magnetometer data; Sector 16



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
magnetic enhancement	geology
linear trend	geological variation

0 500m
1:2,500 @ A3

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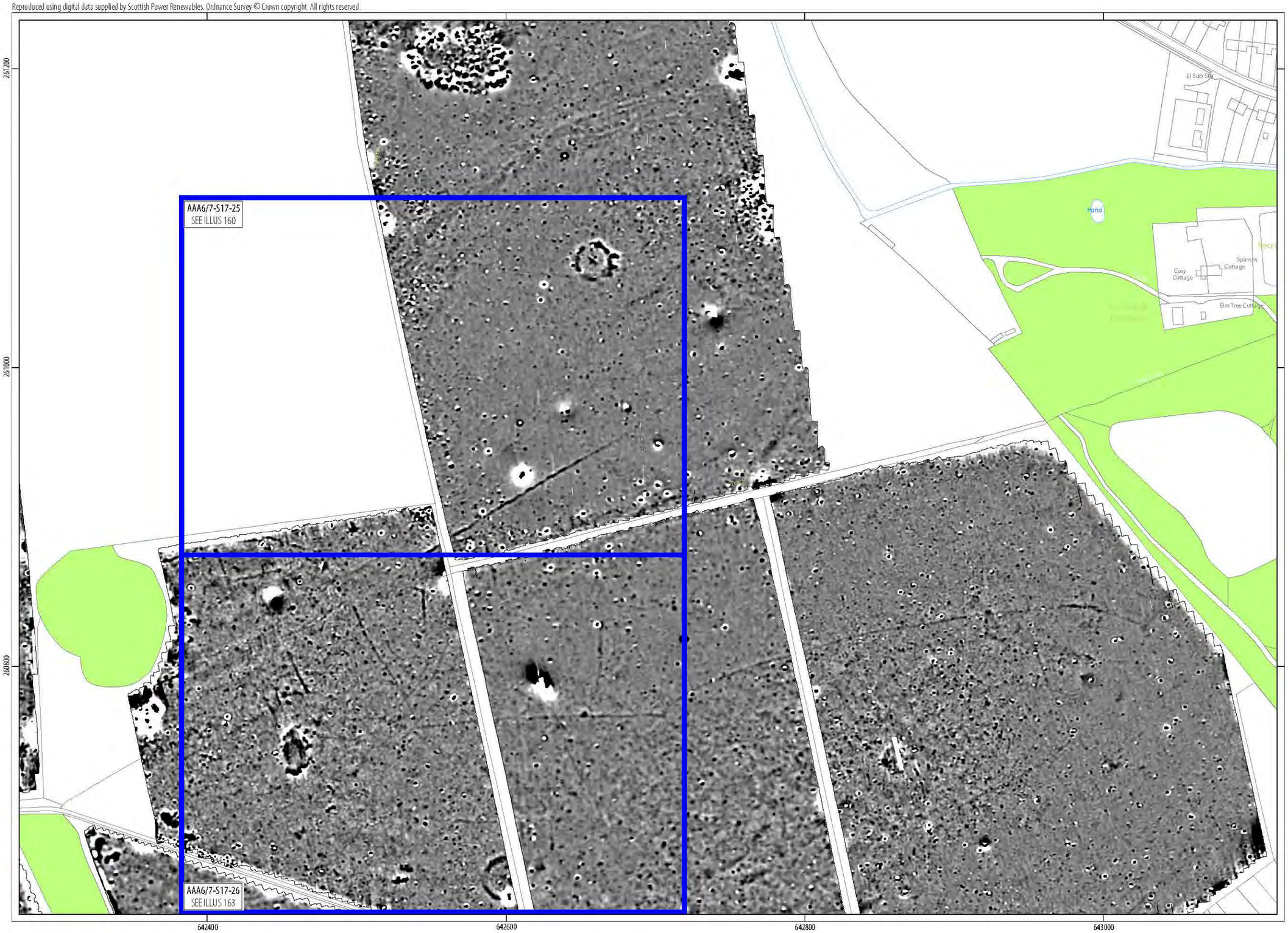
ILLUS 57 Interpretation of magnetometer data; Sector 16



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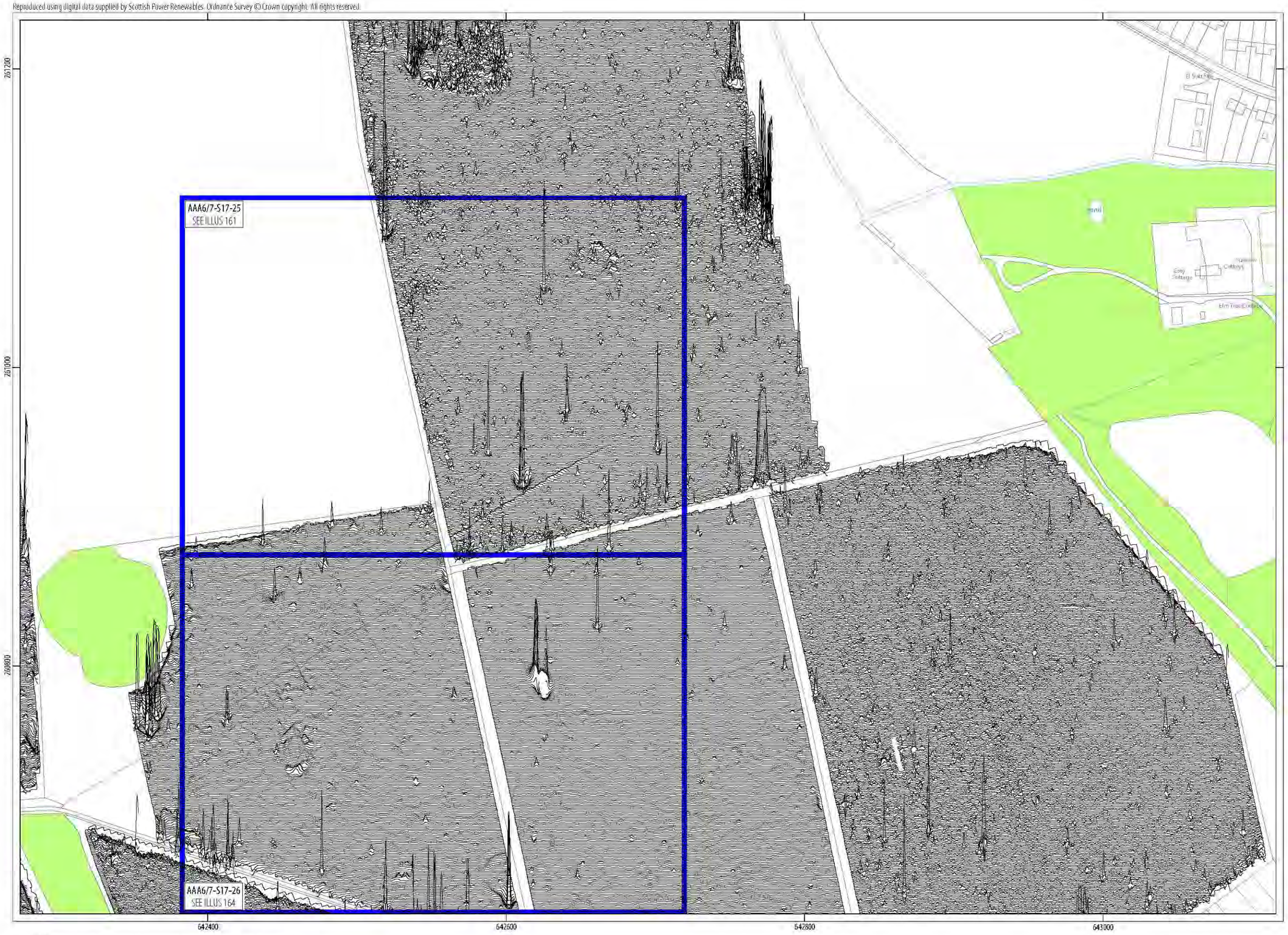
ILLUS 58 Processed greyscale magnetometer data; Sector 17



18.0nT/cm

0 500m
1:2,500 @ A3

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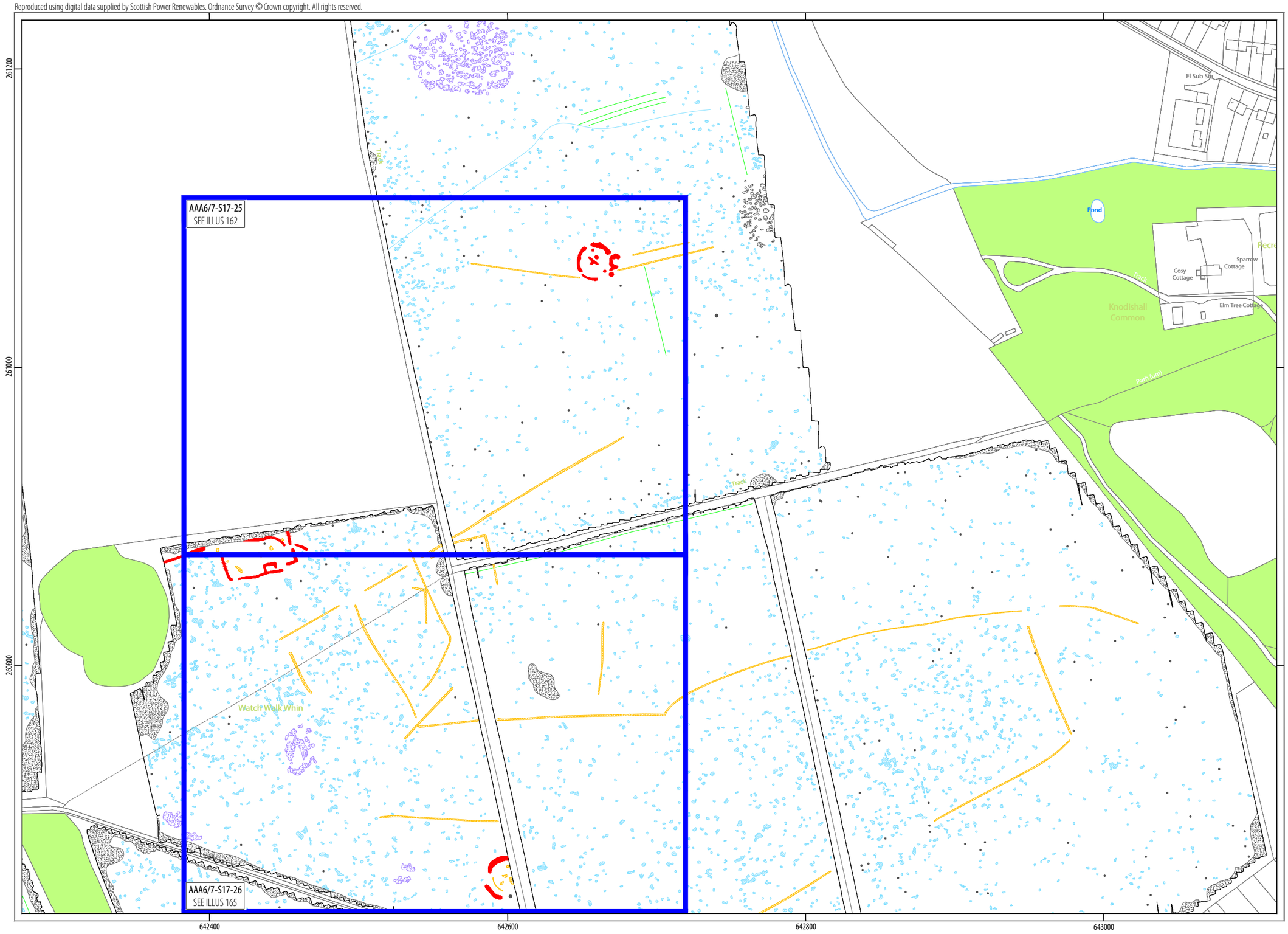
ILLUS 59 XY trace plot of minimally processed magnetometer data; Sector 17



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
magnetic enhancement	geology
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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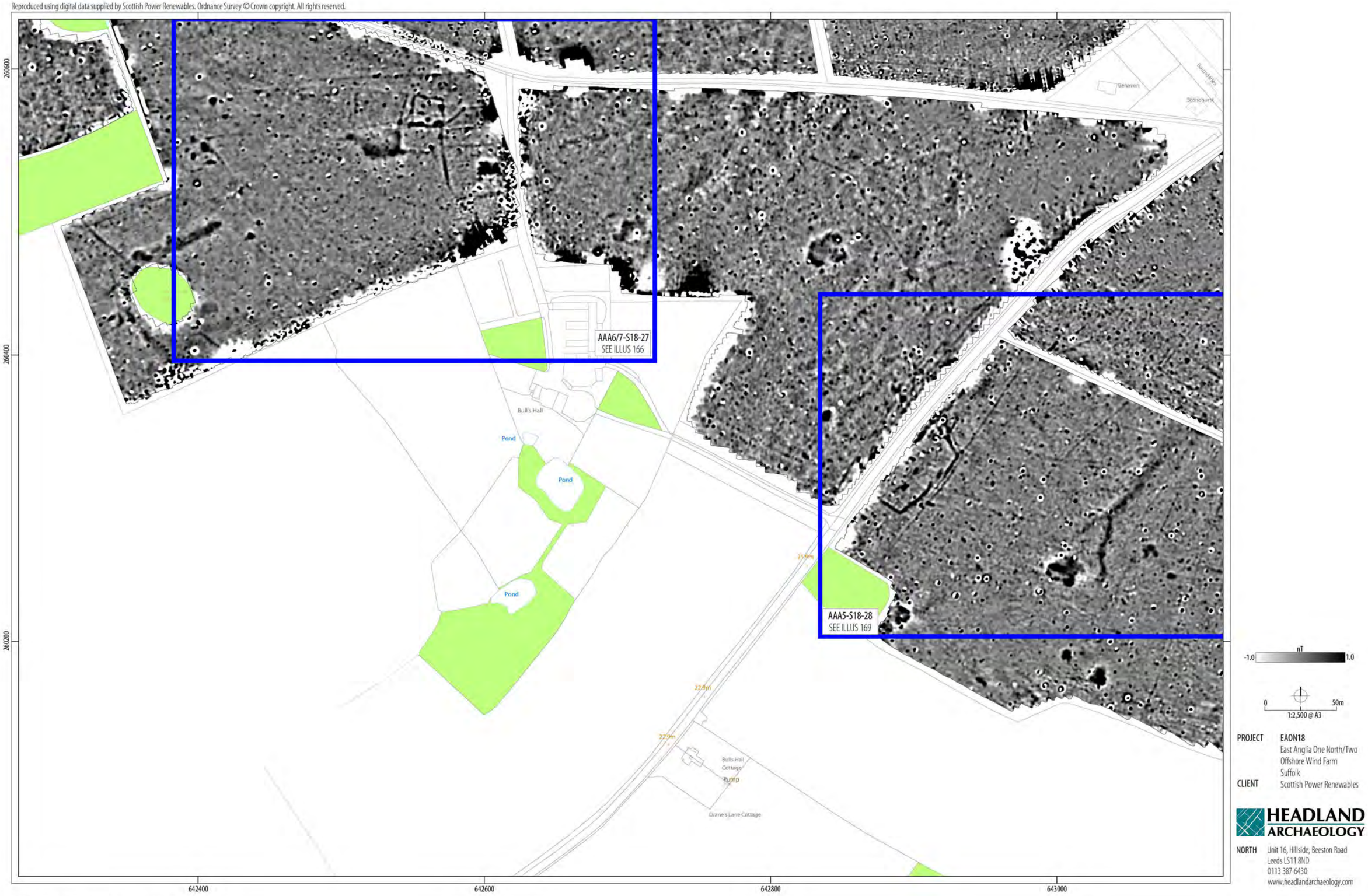
ILLUS 60 Interpretation of magnetometer data; Sector 17



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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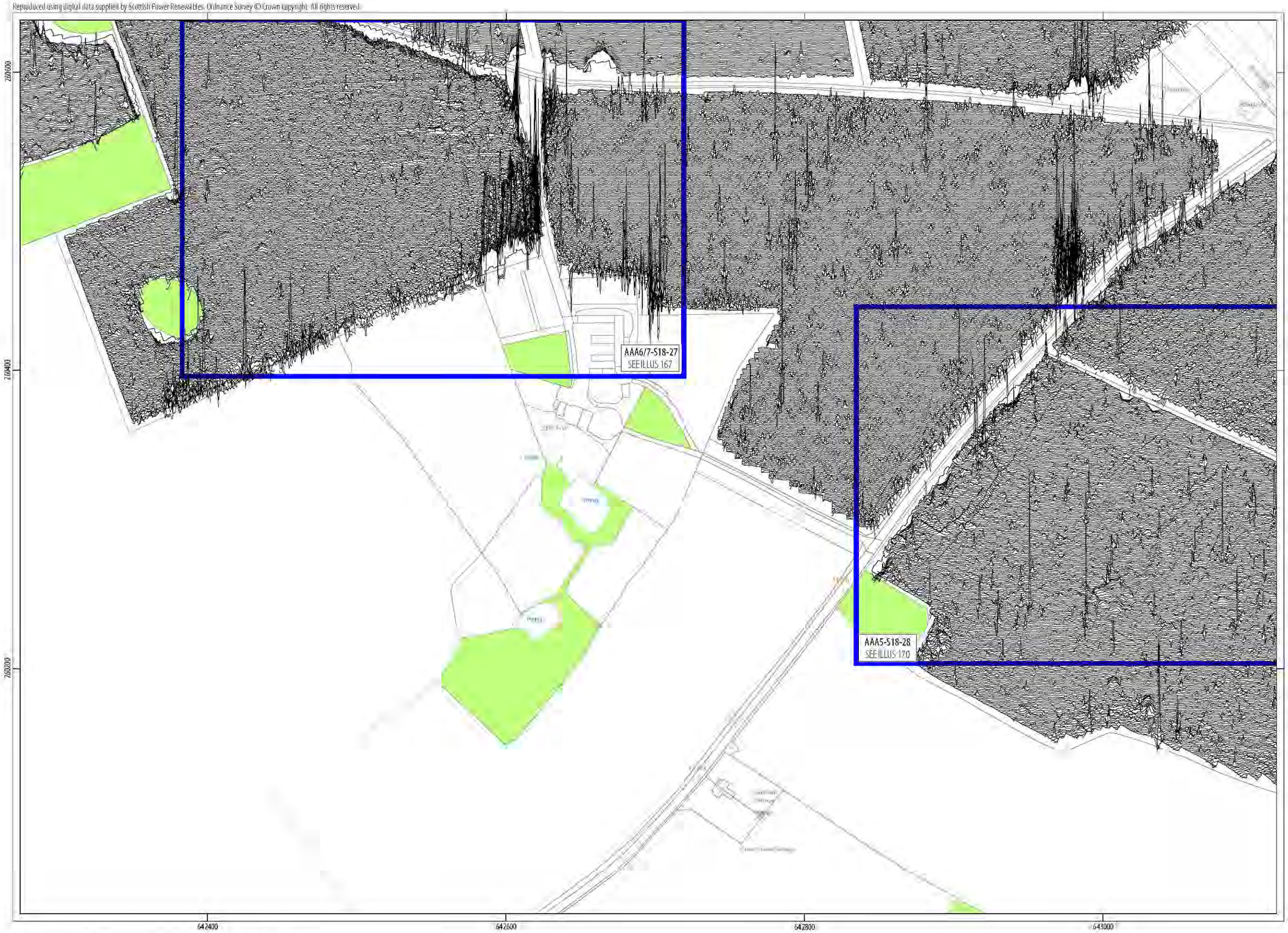
ILLUS 61 Processed greyscale magnetometer data; Sector 18



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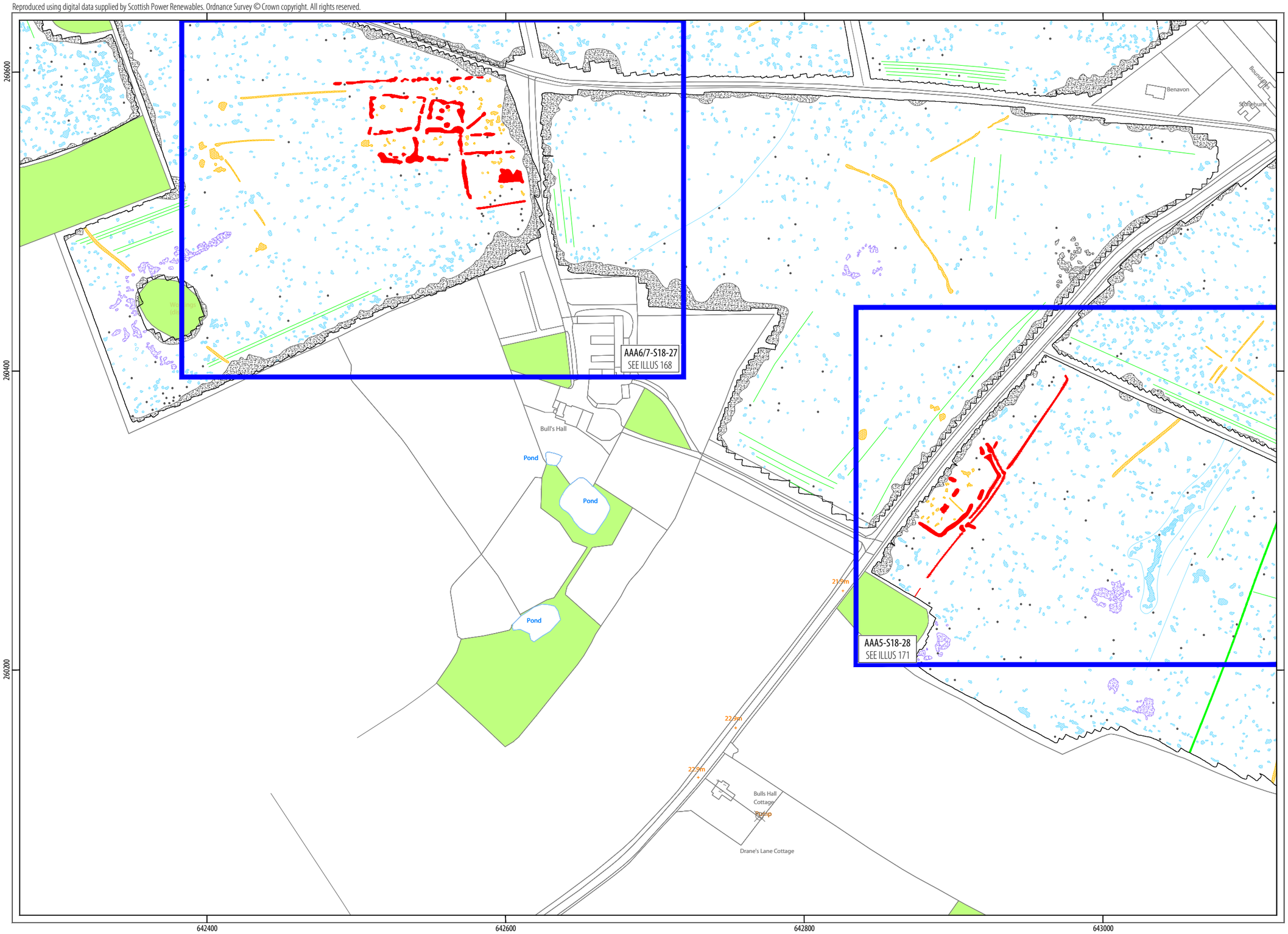
ILLUS 62 XY trace plot of minimally processed magnetometer data; Sector 18



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear	former field boundary
magnetic enhancement	geology
linear trend	geological variation
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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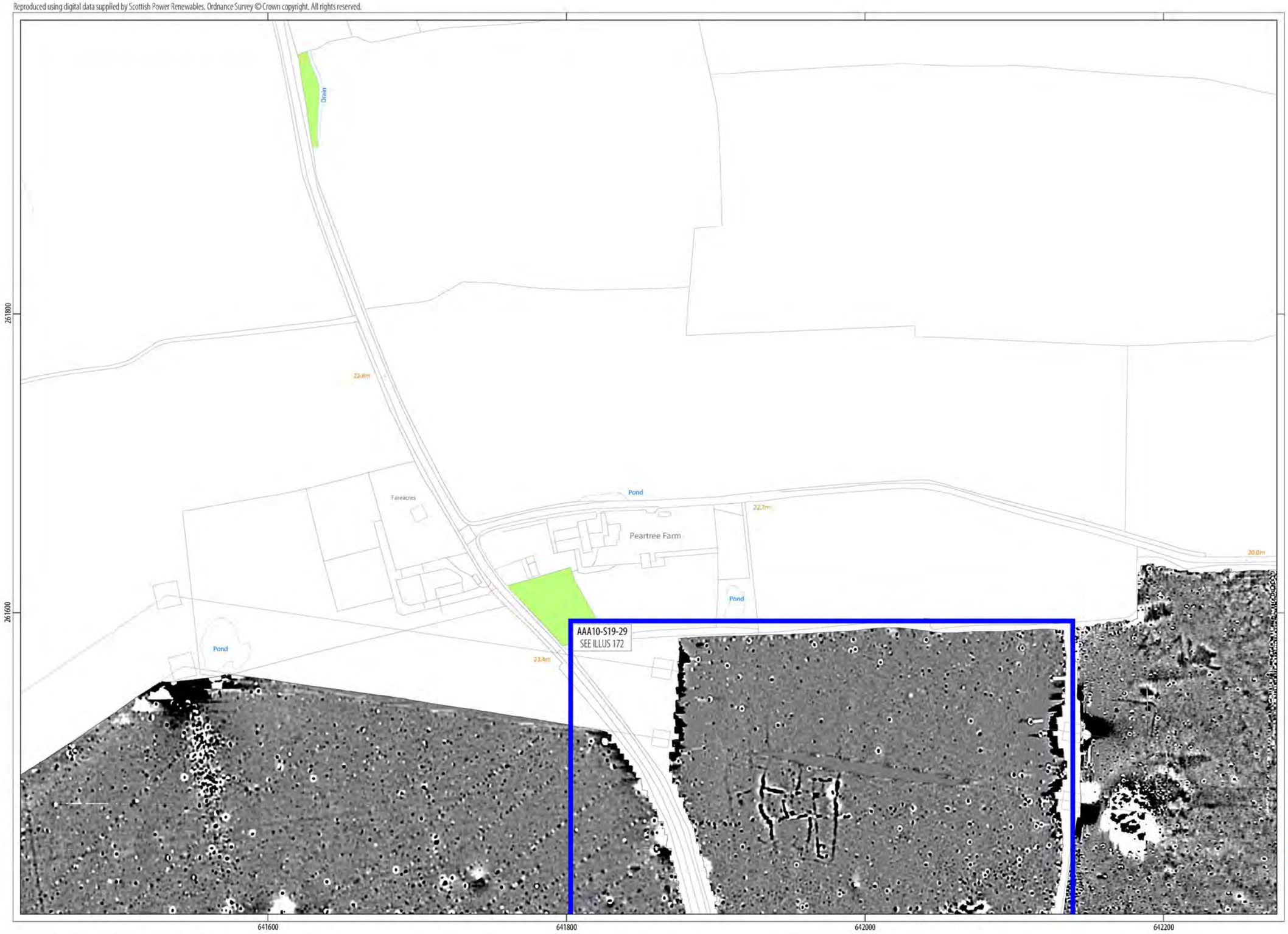
ILLUS 63 Interpretation of magnetometer data; Sector 18



-1.0 nT 1.0

0 50m
1:2,500 @ A3

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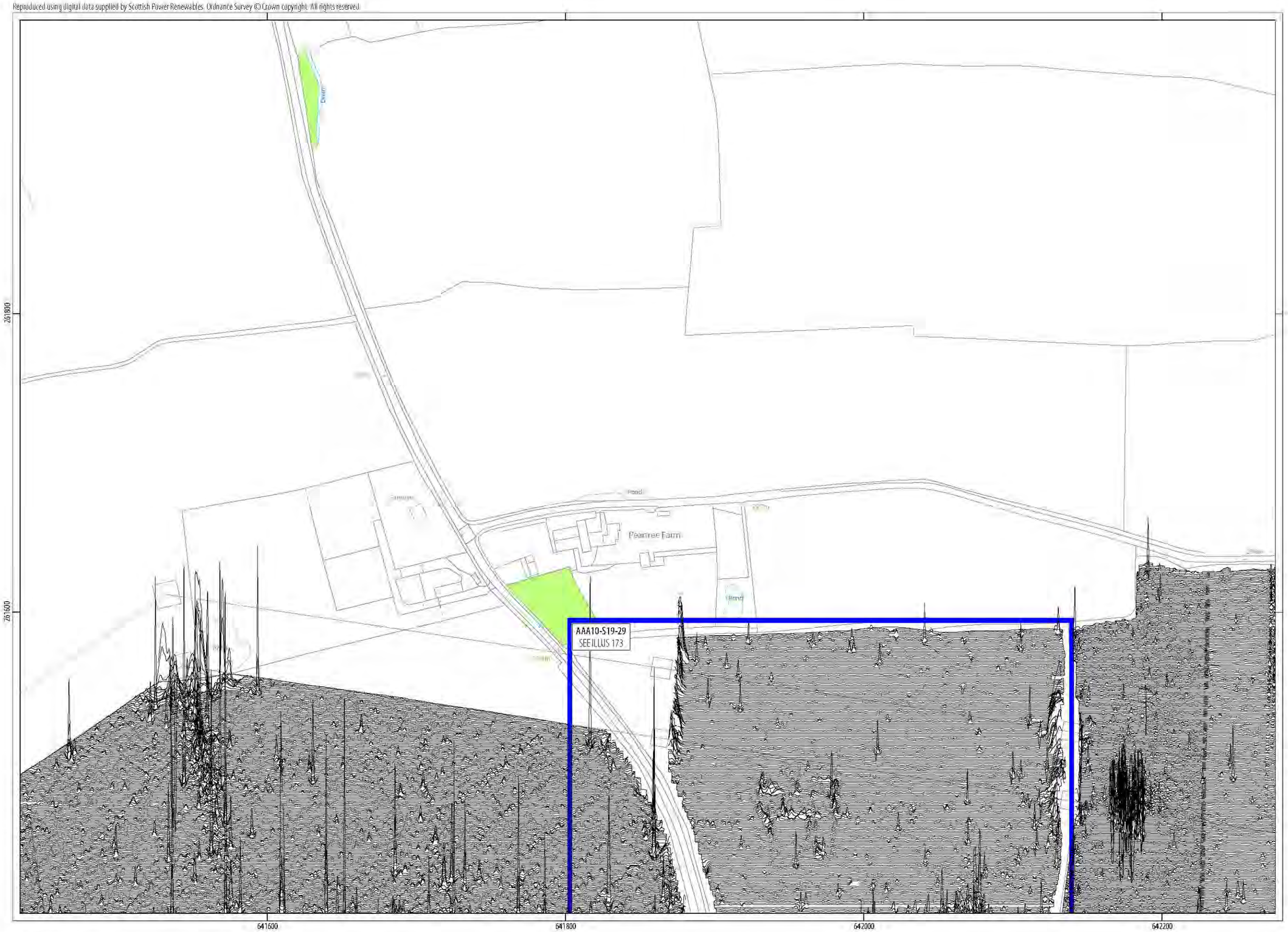
ILLUS 64 Processed greyscale magnetometer data; Sector 19



18.0nT/cm

0 500m
1:2,500 @ A3

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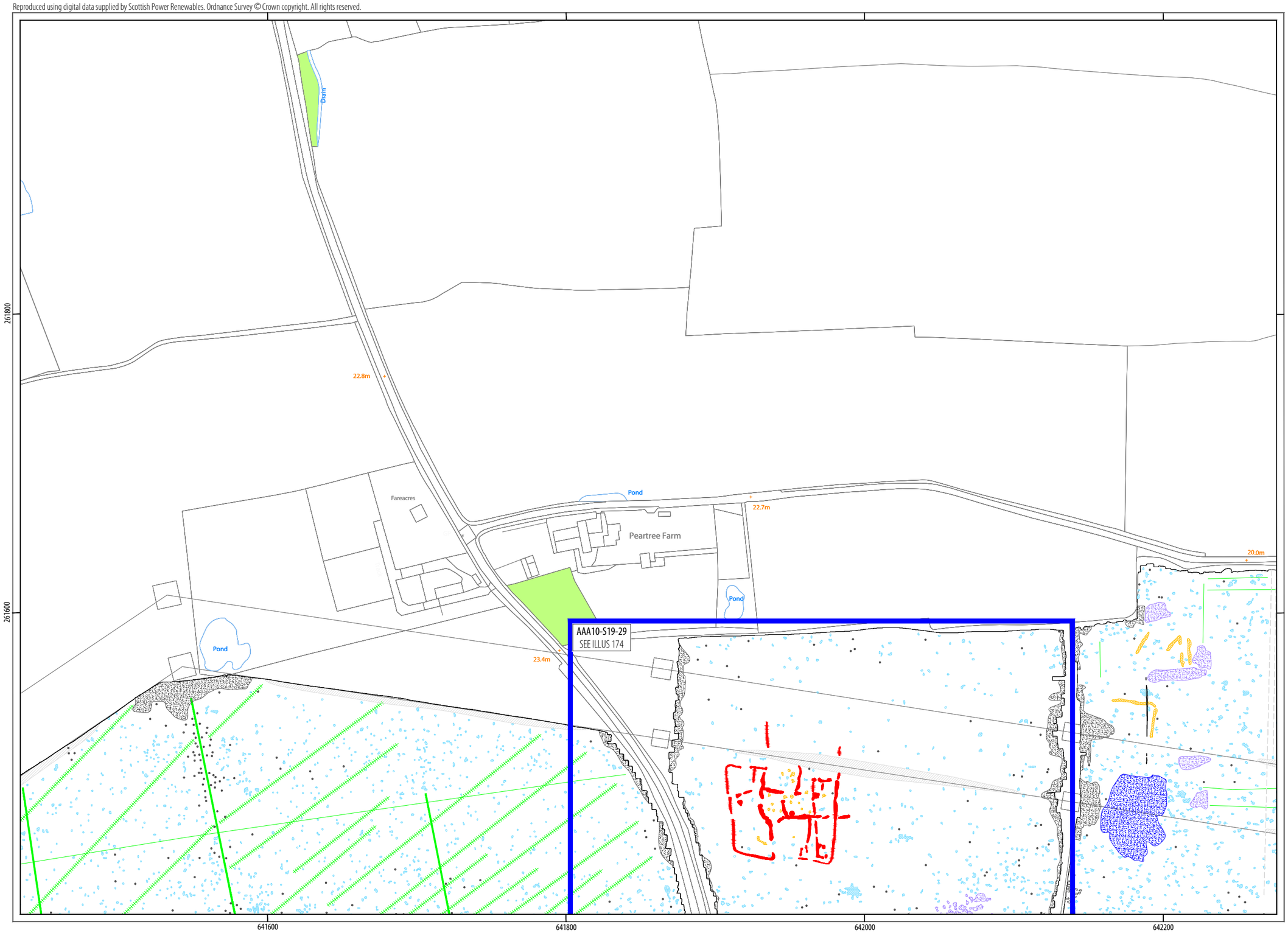
ILLUS 65 XY trace plot of minimally processed magnetometer data; Sector 19



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
linear trend	bad data
null value	overhead cables
magnetic disturbance	quarrying
magnetic disturbance	modern
linear trend	field drain
linear	former field boundary
magnetic enhancement	geology
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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ILLUS 66 Interpretation of magnetometer data; Sector 19

nT
-1.0 1.0

0 50m
1:2,500 @ A3

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ILLUS 67 Processed greyscale magnetometer data; Sector 20

261200

261000

Pond

Pond

Pond

Pond

Pond

Pond

AAA9-S20-30
SEE ILLUS 176

AAA9-S20-31
SEE ILLUS 179

641600

641800

642000

642200

18.0nT/cm

0 500m
1:2,500 @ A3

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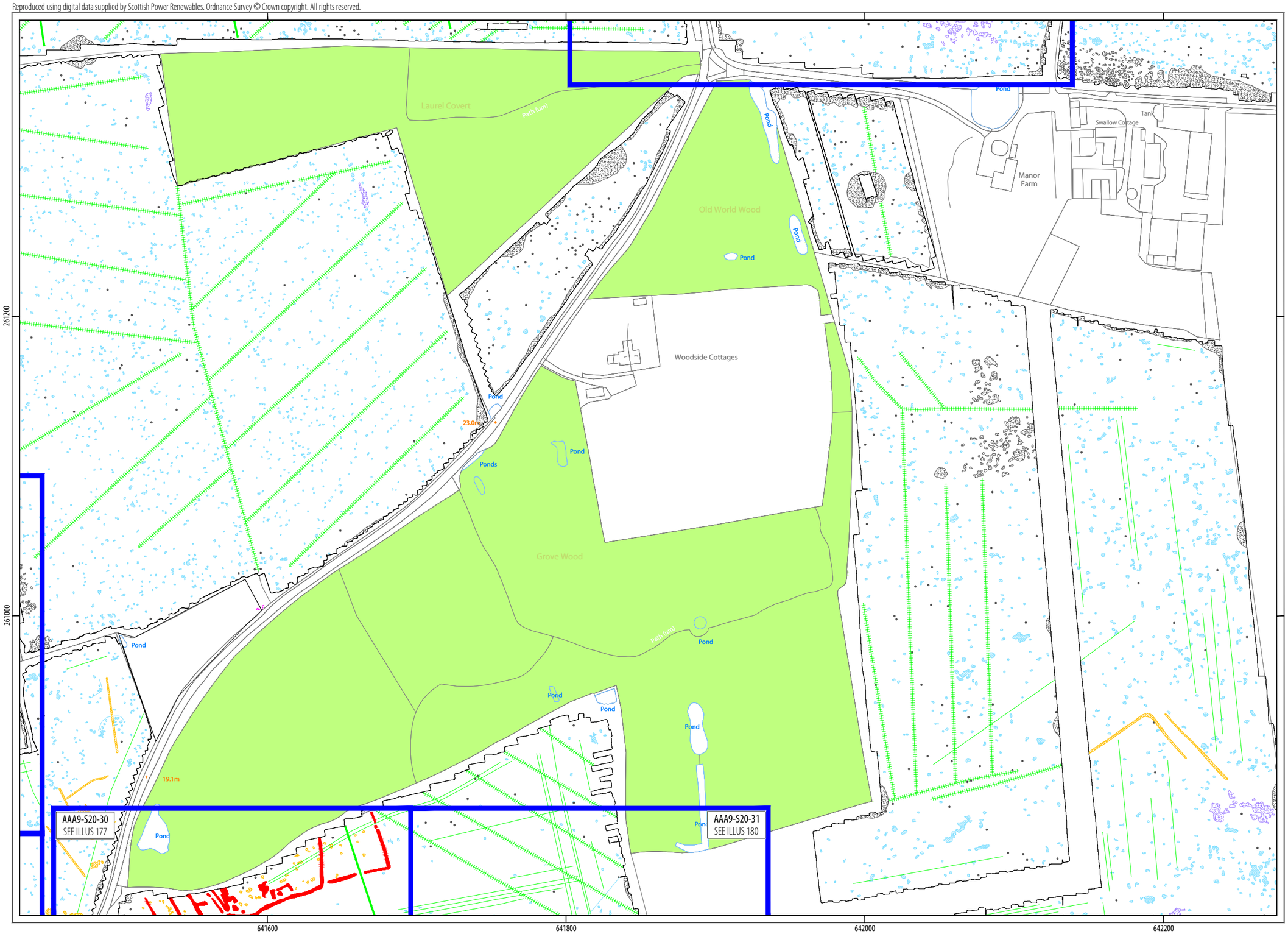
ILLUS 68 XY trace plot of minimally processed magnetometer data; Sector 20



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear trend	field drain
linear	former field boundary
magnetic enhancement	geology
linear trend	geological variation
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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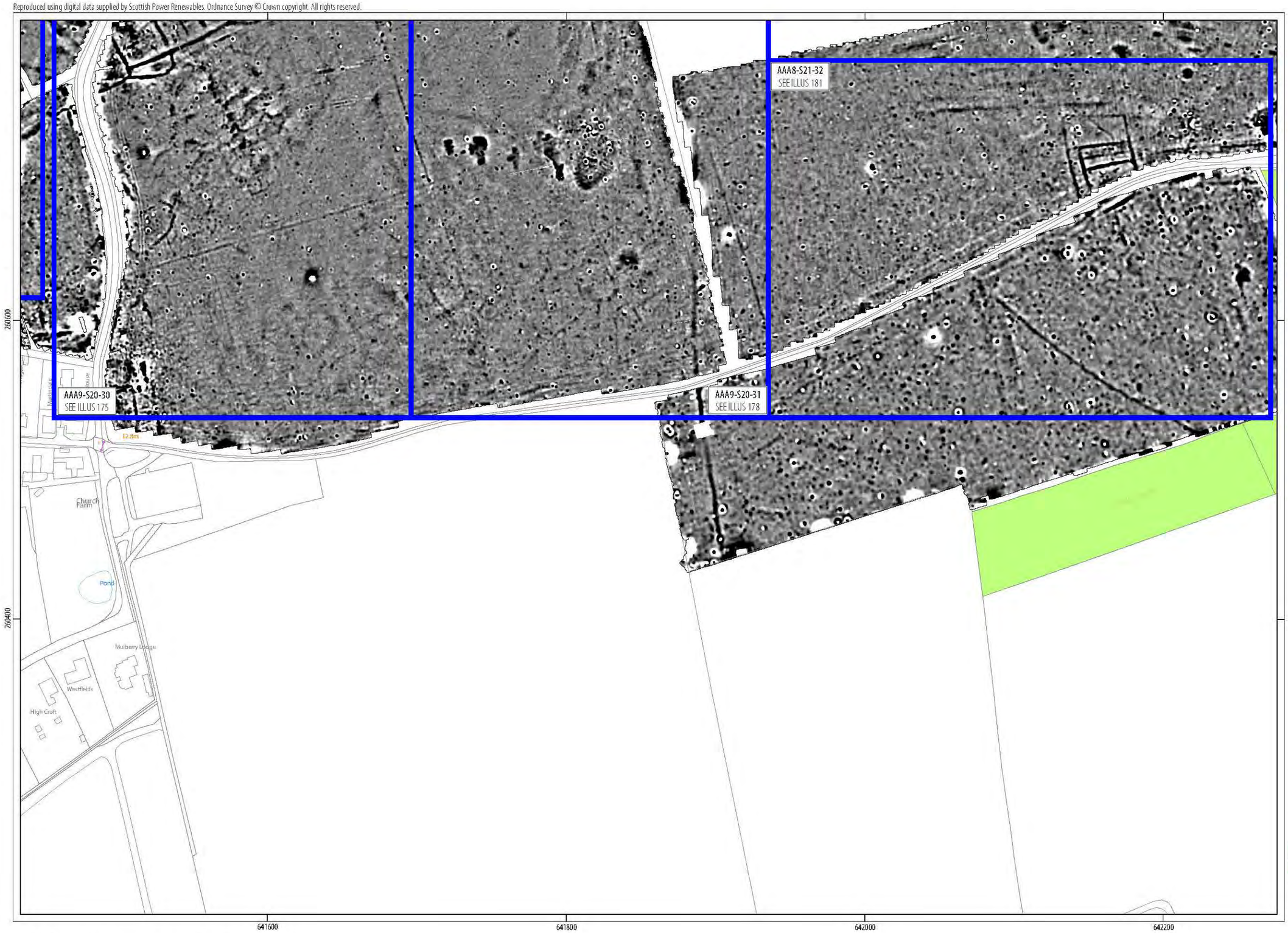
ILLUS 69 Interpretation of magnetometer data; Sector 20



-1.0 nT 1.0

0 50m
1:2,500 @ A3

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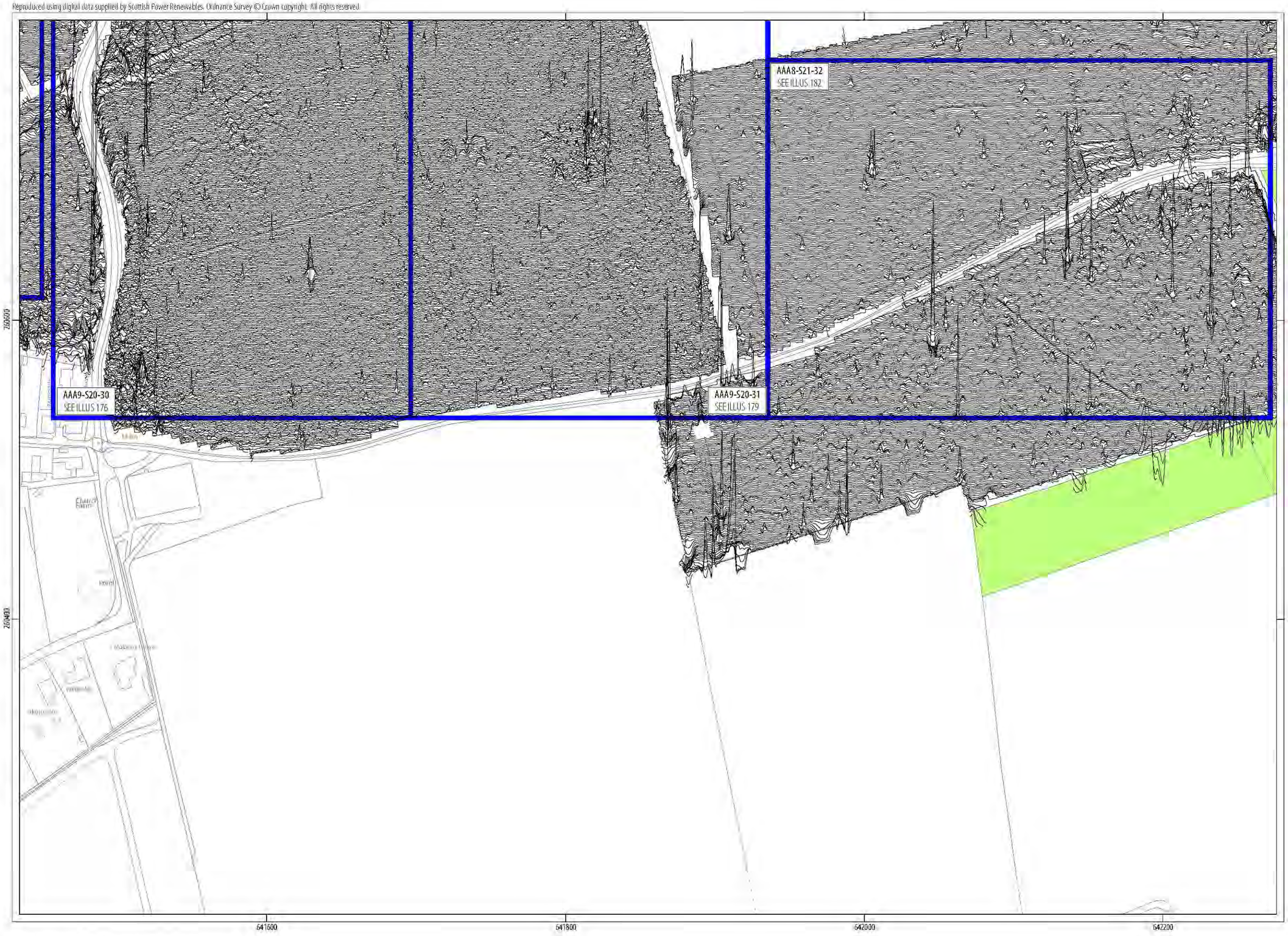
ILLUS 70 Processed greyscale magnetometer data; Sector 21



18.0nT/cm

0 500m

1:2,500 @ A3

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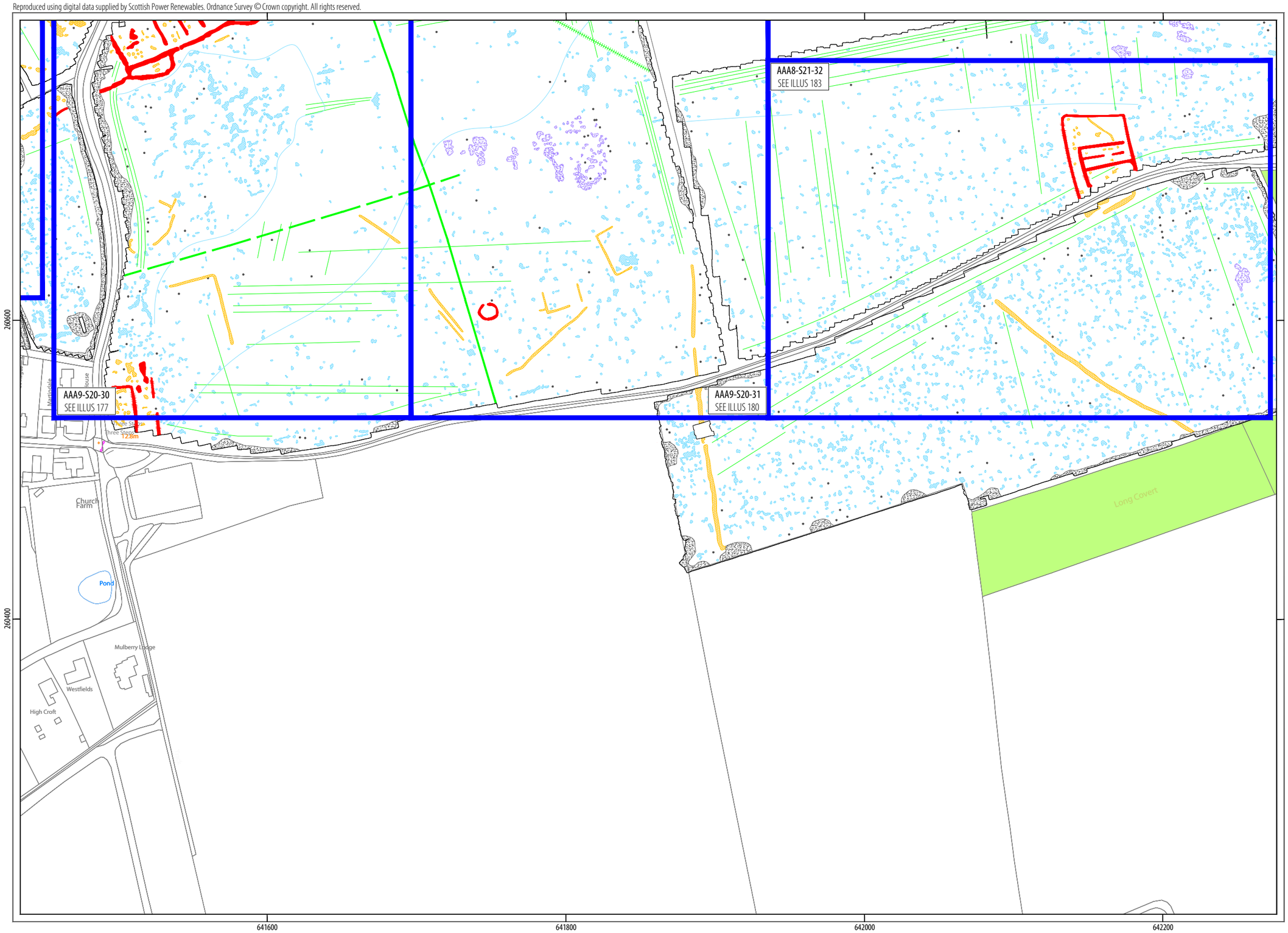
ILLUS 71 XY trace plot of minimally processed magnetometer data; Sector 21



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear trend	field drain
linear	former field boundary
linear	former field boundary?
magnetic enhancement	geology
linear trend	geological variation
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

0 500m
1:2,500 @ A3

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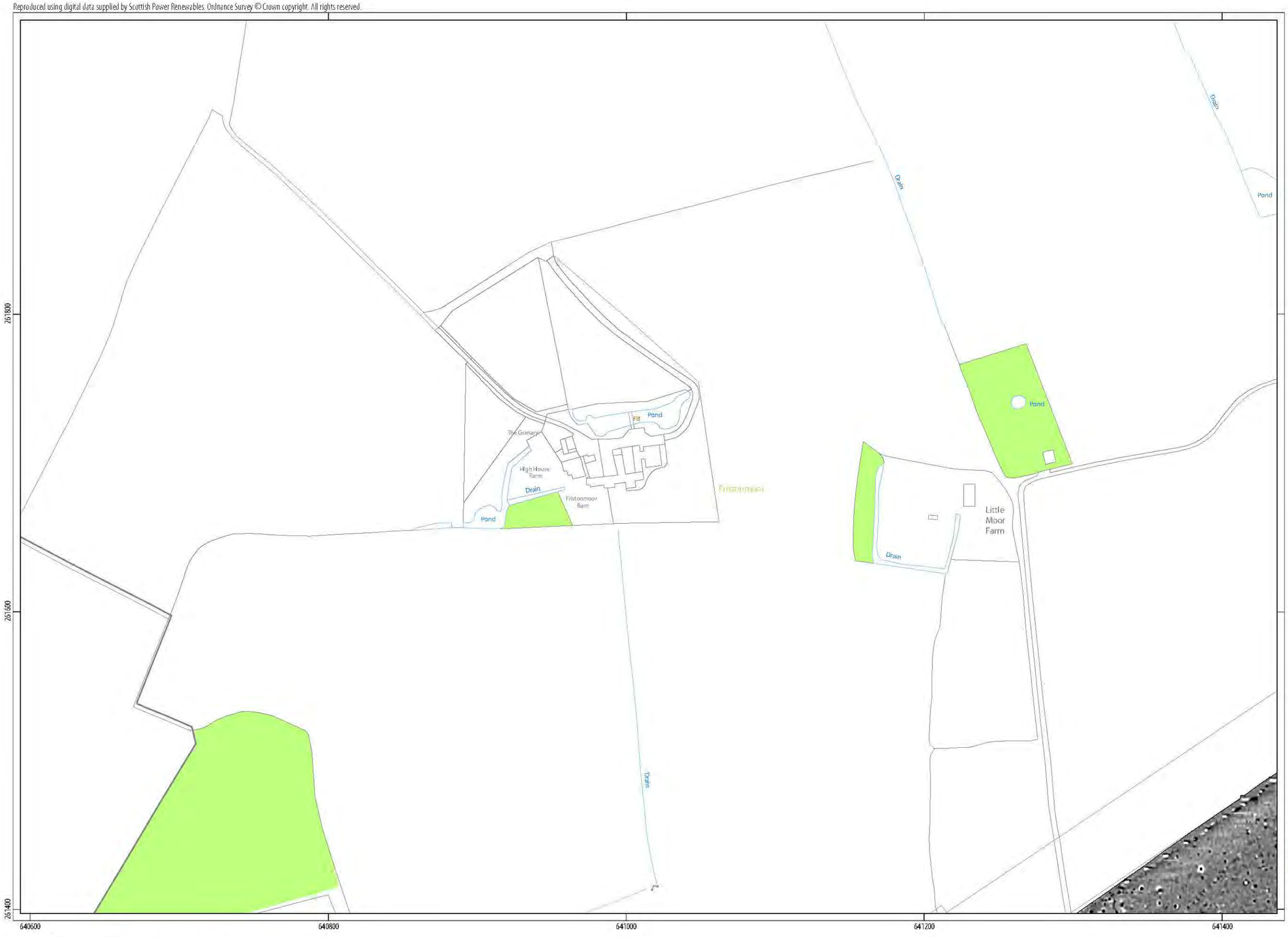
ILLUS 72 Interpretation of magnetometer data; Sector 21



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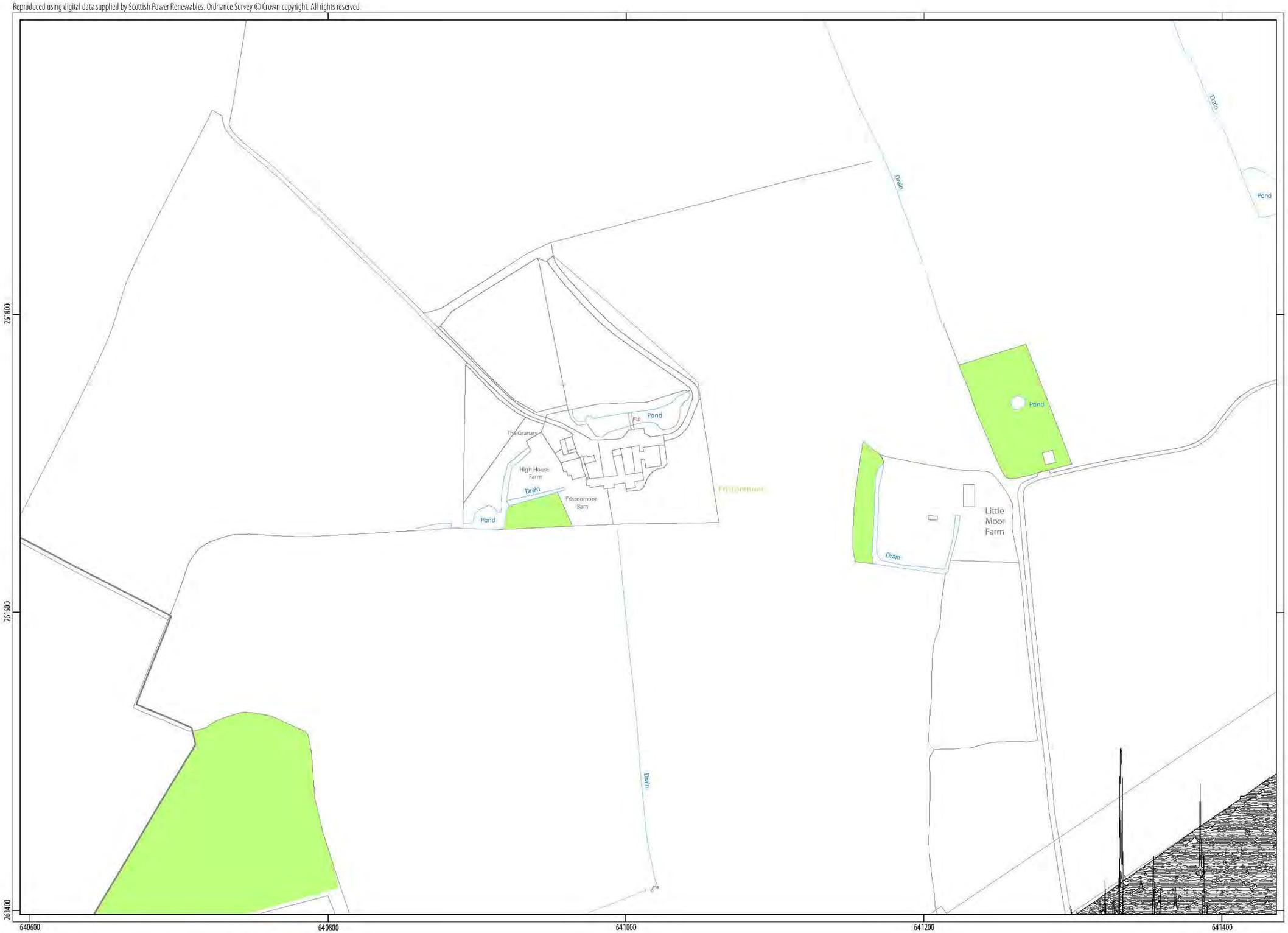
ILLUS 73 Processed greyscale magnetometer data; Sector 22



18.0nT/cm

0 500m

1:2,500 @ A3

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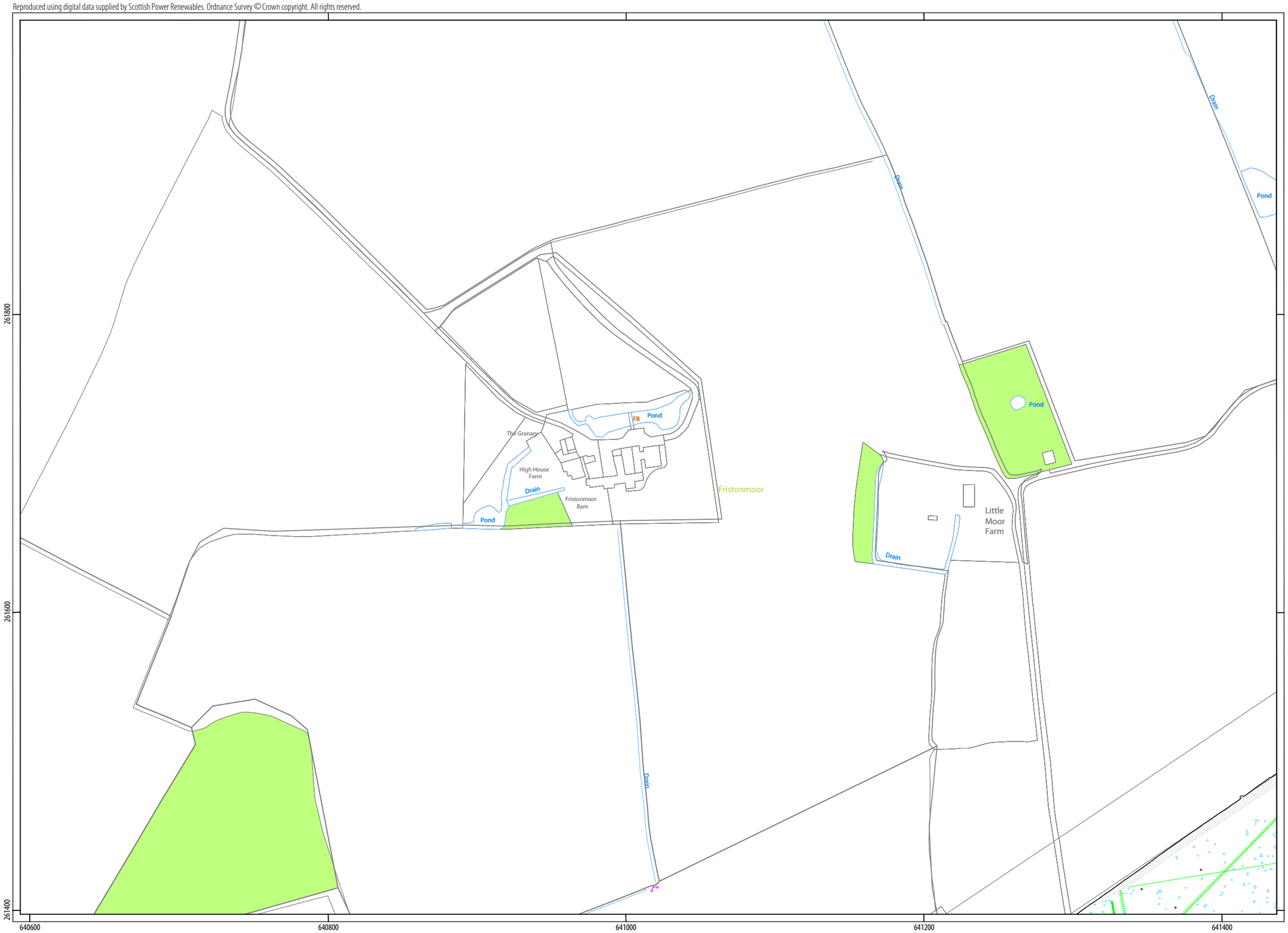
ILLUS 74 XY trace plot of minimally processed magnetometer data; Sector 22



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
null value	overhead cables
linear trend	agricultural
linear trend	field drain
linear	former field boundary
magnetic enhancement	geology

0 500m
1:2,500 @ A3

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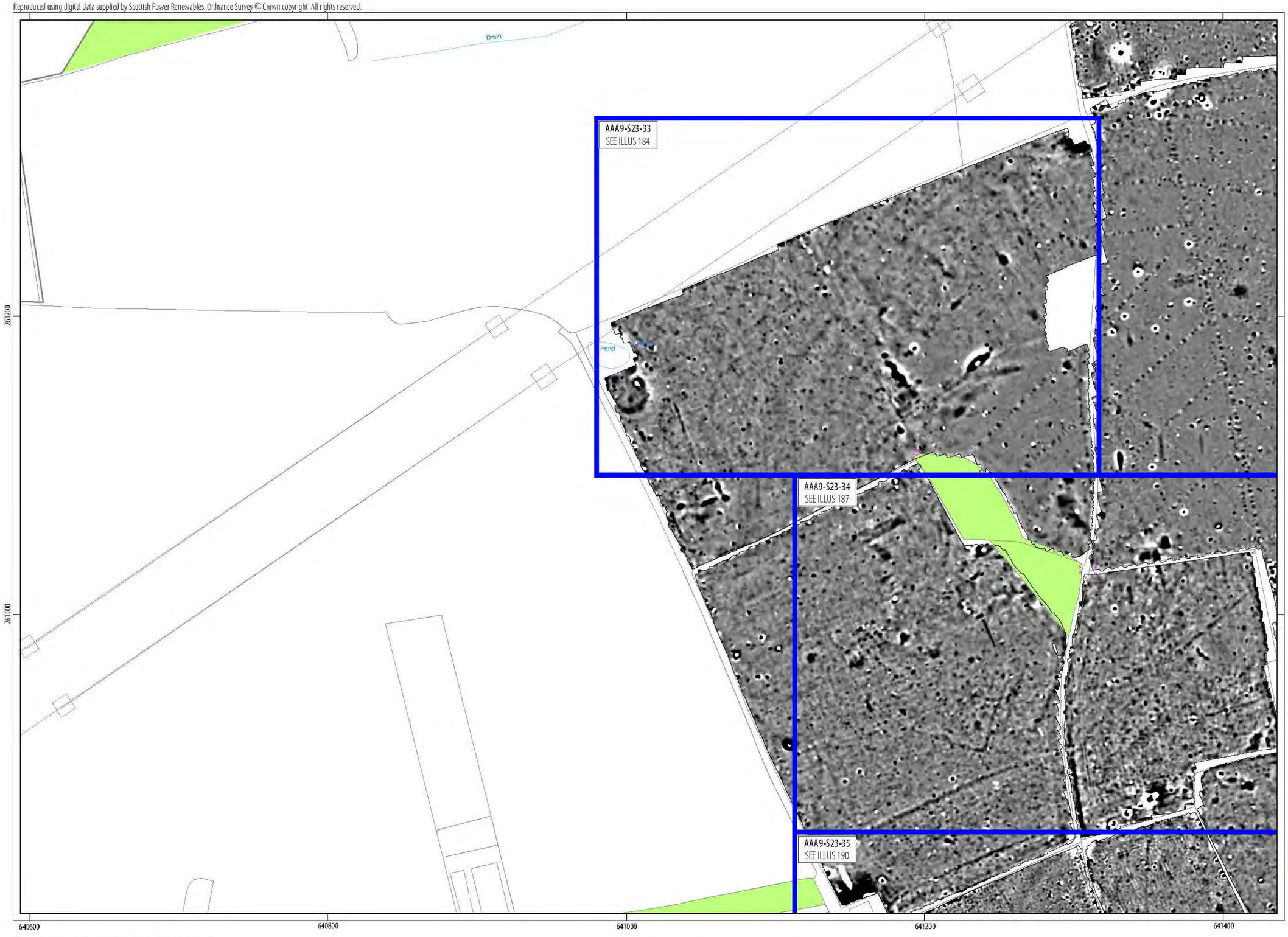
ILLUS 75 Interpretation of magnetometer data; Sector 22



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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ILLUS 76 Processed greyscale magnetometer data; Sector 23

18.0nT/cm

0 500m
1:2,500 @ A3

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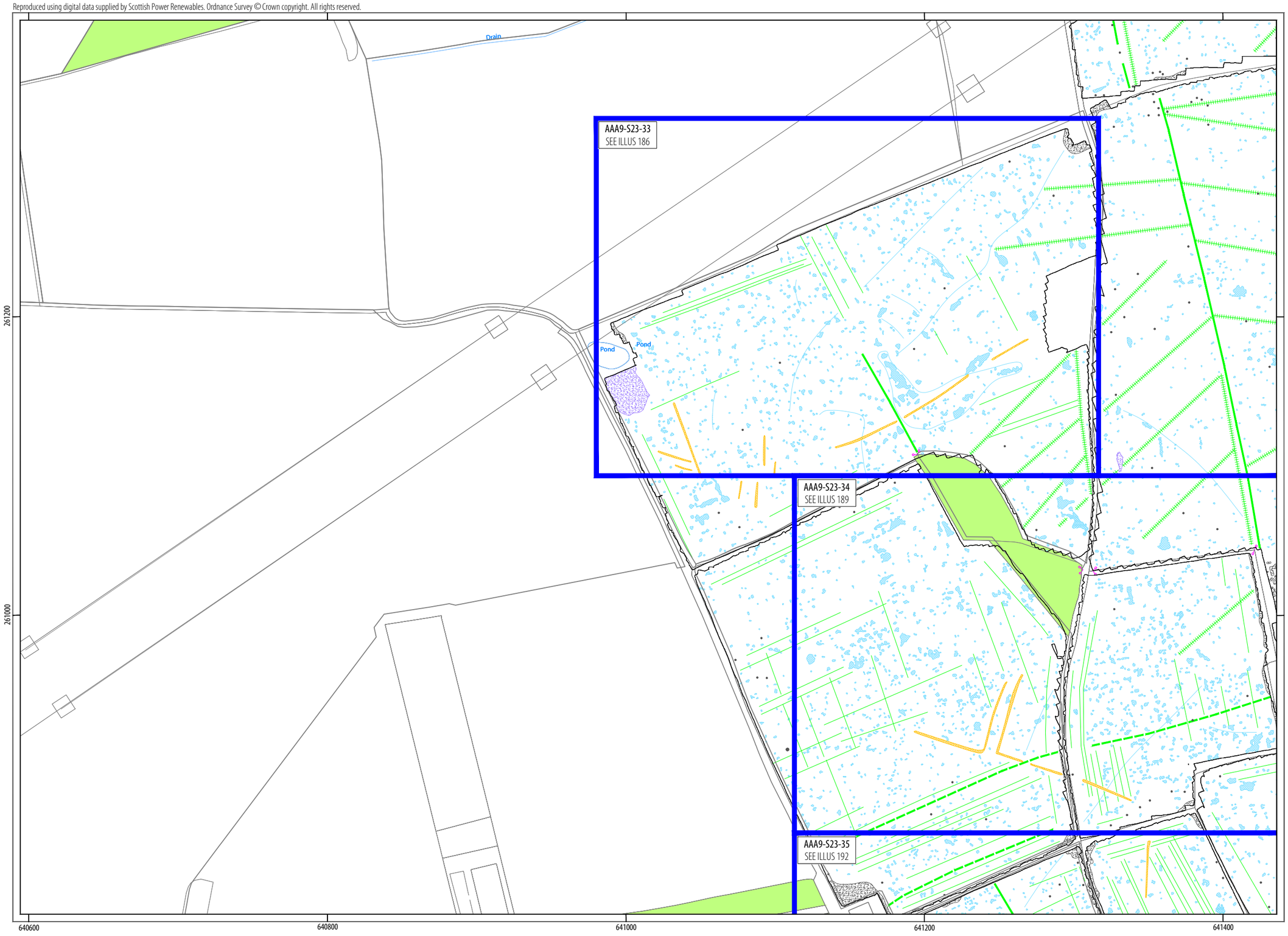
ILLUS 77 XY trace plot of minimally processed magnetometer data; Sector 23



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear trend	field drain
linear	former field boundary
linear	former field boundary?
magnetic enhancement	geology
linear trend	geological variation
magnetic enhancement	archaeology?

0 500m
1:2,500 @ A3

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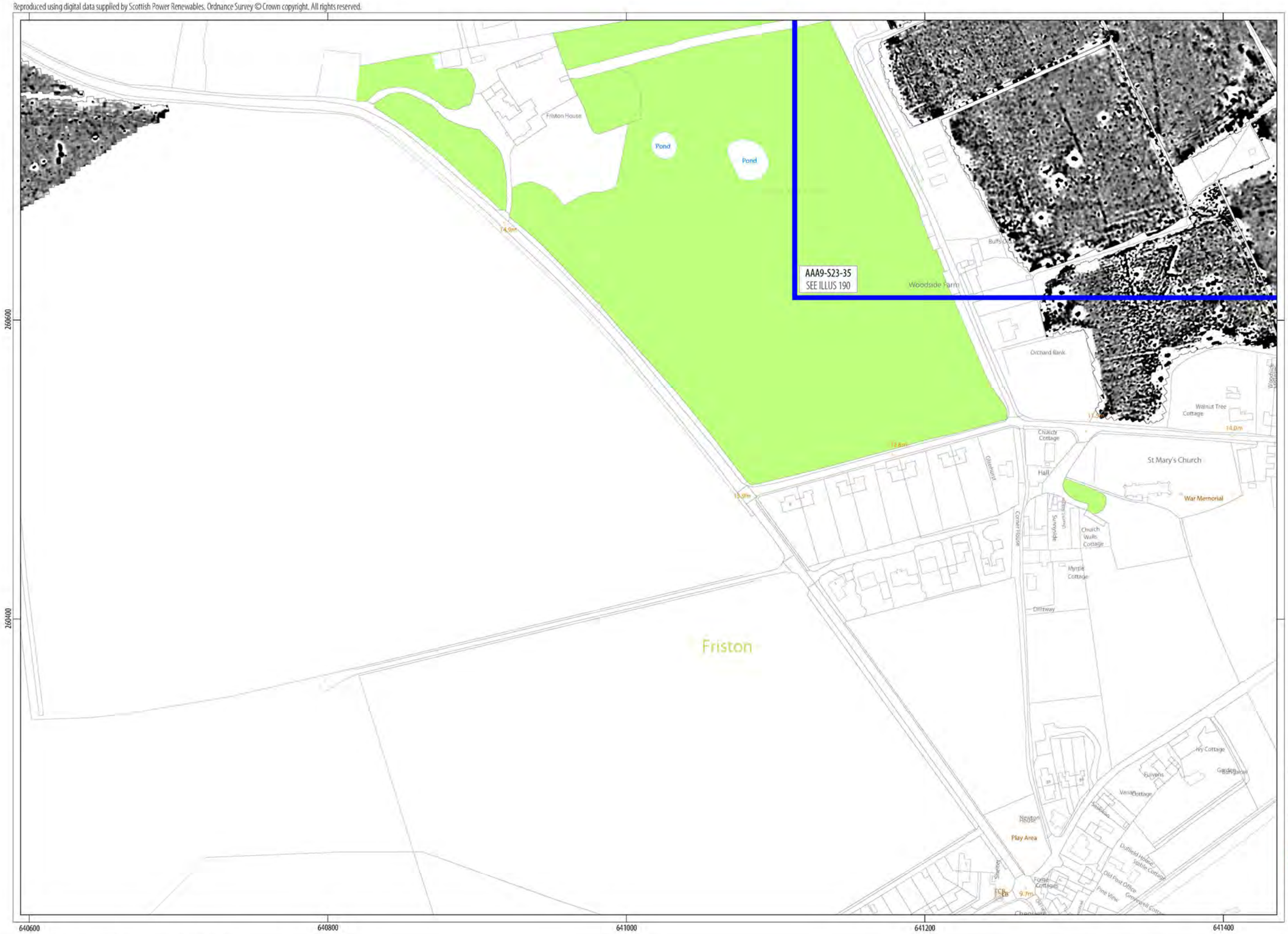
ILLUS 78 Interpretation of magnetometer data; Sector 23



nT
-1.0 1.0

0 50m
1:2,500 @ A3

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ILLUS 79 Processed greyscale magnetometer data; Sector 24

18.0m T/cm

0 500m

1:2,500 @ A3

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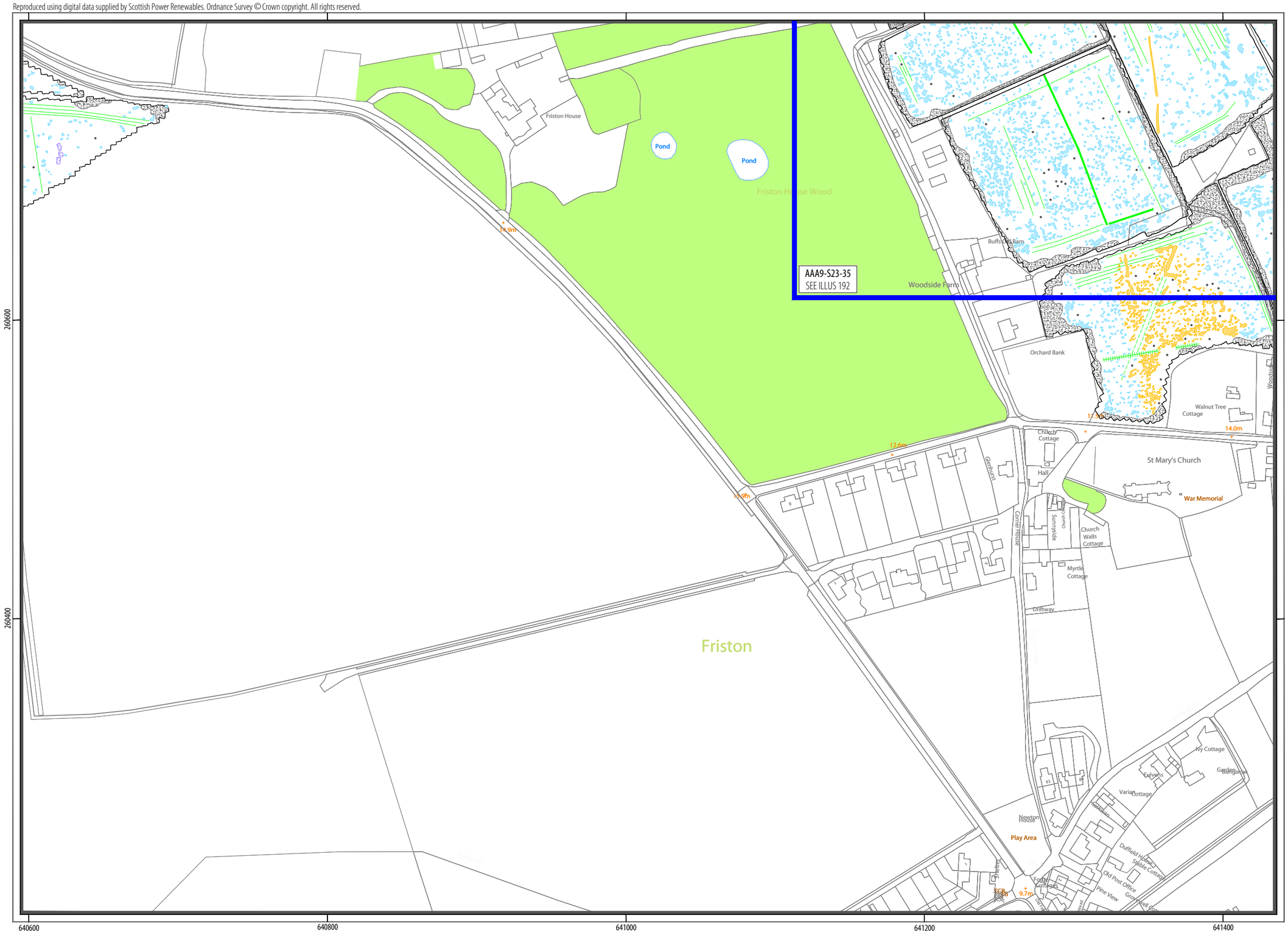
ILLUS 80 XY trace plot of minimally processed magnetometer data; Sector 24



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
linear trend	agricultural
linear	former field boundary
magnetic enhancement	geology
magnetic enhancement	archaeology?

0 500m
1:2,500 @ A3

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ILLUS 81 Interpretation of magnetometer data; Sector 24

nT
-1.0
1.0

0
50m
1:2,500 @ A3

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ILLUS 82 Processed greyscale magnetometer data; Sector 25

261200

261000

639800

640000

640200

640400

18.0nT/cm

0 500m

1:2,500 @ A3

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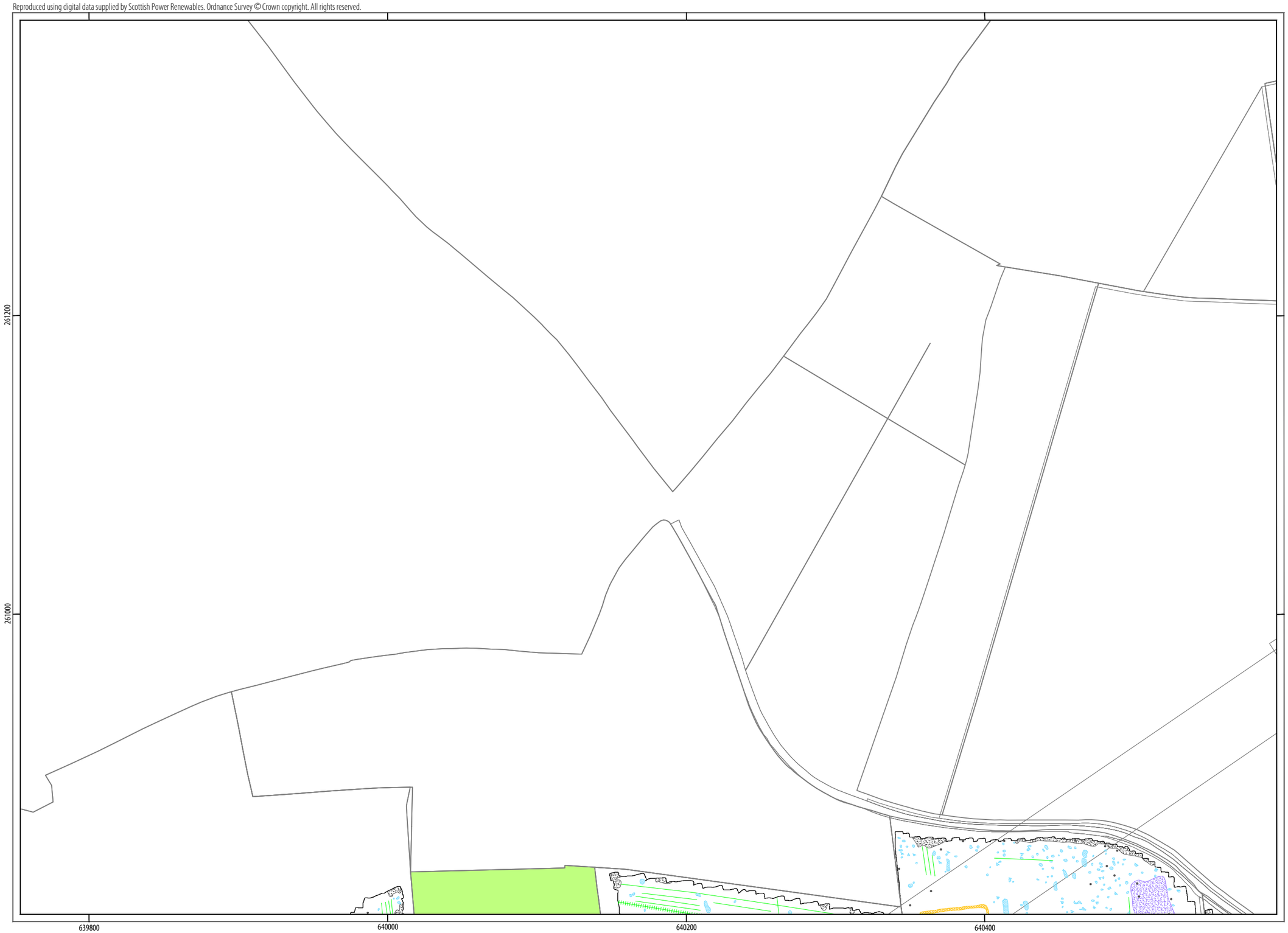
ILLUS 83 XY trace plot of minimally processed magnetometer data; Sector 25



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
magnetic disturbance	quarrying
linear trend	agricultural
linear trend	field drain
magnetic enhancement	geology
magnetic enhancement	archaeology?

0 500m
1:2,500 @ A3

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ILLUS 84 Interpretation of magnetometer data; Sector 25

Continued in Part 2 of 2.