WPWP/01
DRAFT

WYLFA POTABLE WATER PIPELINE
ANGLESEY

Geophysical Survey

for SWECO on behalf of DCWW

May 2017

HEADLAND
ARCHAEOLOGY

WYLFA POTABLE WATER PIPELINE ANGLESEY

Geophysical Survey

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May 2017

HA Job no.:	WPWP/01
NGR:	SH 3750 8550 (Llyn Alaw) to SH 3550 9250 (Wylfa)
Community / Ward:	Tref Alaw / Llantrisant & Llanbabo Mechell / Carreg-lefn & Llanfechell Llanbadrig / Camaes
Council:	Isle of Anglesey
Project Manager:	Alistair Webb BA MCIfA
Author:	David Harrison BA MSc MCIfA
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Graphics:	David Harrison Caroline Norrman Rafael Maya-Torcelly
Approved by:	Alistair Webb BA MCIfA

CONTENTS

LIST OF ILLUSTRATIONS

WYLFA POTABLE WATER PIPELINE, ANGLESEY

GEOPHYSICAL SURVEY

Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey, covering approximately 38 hectares, along the route off the proposed Wylfa Potable Water Pipeline. The work was undertaken at the request of SWECO on behalf of Dwr Cymru Welsh Water (DCWW) in order to assess the impact of the proposed scheme on any potential sub-surface archaeological remains. This report presents the results and interpretation of the magnetic survey data.

The survey has identified linear anomalies suggestive of former field systems in two distinct areas; to the immediate south and east of Llyn Alaw, and within a single field in the north of the scheme. The field systems are not depicted on any available historical maps and are therefore likely to be post-medieval or earlier in origin. Localised clusters of high magnitude anomalies, perhaps being due to burnt mounds, have also been located adjacent to streams at six sites across scheme. In addition, two further isolated areas of archaeological potential have been identified including a large curving ditch at Llanbabo and a possible small enclosure near to Llyn Alaw. Anomalies caused by modern field boundaries, drainage and modern cultivation have been identified across the southern and northern parts of the scheme whilst anomalies caused by near-surface geological variation occur throughout, but are particularly prevalent across the more rugged central section where bands of igneous intrusions are recorded and outcropping is common.

There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions and therefore, based on the results and interpretation of the magnetic data and on information collated as part of a forthcoming Desk-Based Assessment, the overall archaeological potential along the route is considered to be low with a locally moderate potential in the vicinity of the identified anomalies.

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by SWECO on behalf of DCWW to undertake a geophysical (magnetometer) survey along the proposed Wylfa Potable Water Pipeline in Anglesey. The geophysical survey is the second phase of a staged programme of archaeological works for the scheme. This report presents the results and interpretation of the geophysical survey and is informed by the first phase of works, a Desk-Based Review (Headland Archaeology *In Prep*). The survey was undertaken in accordance with a Design Brief issued by Gwynedd Archaeological Planning Service (GAPS) and with a Written Scheme of Investigation (Headland Archaeology 2017) which was issued to and approved by GAPS. Guidance contained within Planning Policy Wales (Edition 9, November 2016), Ch.6 Conserving the Historic Environment and within Welsh Office Circular 60/96 Planning and the Historic Environment: Archaeology was also followed. Current best practice (Chartered Institute for Archaeologists 2014; English Heritage 2008) was adhered to throughout.

The survey was carried out between March 20th and March 31st 2017 to help inform future decision making and manage risk in advance of any development.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The proposed pipeline is approximately 9km long and commences at the Alaw Water Treatment Works (WTW) (SH 3750 8550) skirting the south-eastern edge of Llyn Alaw before heading northwards, passing close to the villages of Llanbabo and Carreglefn (see Illus 1). Here, the scheme turns north-westwards passing south and west of the village of Llanfechall and north of Tregele to Wylfa Nuclear Power Station (SH 3550 9250). The proposed pipeline may need to adopt an alternative route at several key locations along the route, most notably to the west and north of Llanfechell where two alternative routes have been identified.
The geophysical survey area (GSA) is centred upon the 25m working width of the pipeline corridor, and includes all alternative routes as well as four temporary compounds (see Illus 9).

The scheme passes through 82 fields (F1-F82) within an undulating landscape with frequent rocky outcrops, short steep gradients and winding minor watercourses. Generally the topography rises from 46m above Ordnance Datum (aOD) at the Alaw WTW to 93m aOD at the highest point of the scheme, south-west of

Carreglefn, in the uplands known as Mynydd Mechell. From here the topography drops to 24m aOD at Tregele. At the time of the survey nearly all the fields were under pasture (see Illus 2 to Illus 8) with the exception of a single field containing a young wheat crop (F15). Four fields (F33, F34, F38 and F80) contained dense overgrown vegetation and were unsuitable for survey (see Illus 4) whilst F82 contained a haul road (see Illus 8).

It is proposed that the new pipeline will run parallel to the route of an existing water main along much of its length, although the exact route of the existing pipeline is not recorded accurately.

1.2 GEOLOGY AND SOILS

The underlying bedrock geology consists of New Harbour Group - Mica Schist and Psammite to the north, South Stack Formation - Psammite and Pelite with bands of unnamed igneous intrusions running through the middle section, and Ordovician Rocks - Mudstone and Sandstone to the south. The superficial geology is mainly recorded as till – diamicton across the site with the exception of isolated elevated pockets and the central Mynydd Mechell upland area where none are recorded (NERC 2017).

The soils are classified in the Soilscape 6 association, characterised as freely draining slightly acid loamy soils to the north and central areas, and Soilscape association 17, characterised as slowly permeable seasonally wet acid loamy and clayey soils, to the south (Cranfield University 2017).

2 ARCHAEOLOGICAL BACKGROUND

The Design Brief (GAPS 2017) has identified that between Llyn Alaw and Llanfechell, very limited or no archaeological investigation has been undertaken and although historical monuments have been located in the landscape, they are not thought to be indicative of any archaeological presence in the area. The Brief expected there to be currently unknown archaeological discoveries in this area.

The area around Llanfechell and the recent Wylfa Newydd archaeological evaluation have revealed much more of the archaeological landscape at the northern end of the route, illuminating prehistoric funerary, as well as Roman and early Medieval discoveries. Burnt mounds appear to be common along water courses with enclosed settlements more often found on higher ground.

Analysis of historical mapping indicates that the layout and division of land within the GSA has altered considerably since the publication of Llantrisant (1845), Llanbabo (1842) and Llanfechell (1845) tithe maps (Cynefin 2017) with larger landholdings being sub-divided into numerous smaller fields. Farm boundaries, however, particularly those which match with parish boundaries have remained unchanged up to the present day.

3 AIMS, METHODOLOGY AND PRESENTATION

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

The general archaeological objectives of the geophysical survey were:

- to provide information about the nature and interpretation of any magnetic anomalies identified; and
- to therefore model the presence/absence and extent of any buried archaeological features, either known or previously unknown; and
- to prepare a report summarising the results of the survey.

3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. A feature such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the Earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney 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 was programmed to take readings at a frequency of 10Hz (allowing for a 10-15cm sample interval) on roaming traverses (swaths) 4m apart. These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software was used to collect and export the data. Terrasurveyor V3.0.31.4 (DWConsulting) software was used to process and present the data).

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:40,000. Illus 2 to 8 inclusive are general field condition photographs. Illus 9 is a large scale (1:12,500) survey location plan showing the proposed and alternative pipeline routes and the location of Illus 10 to Illus 39. Detailed data plots of the fully processed data (greyscale), the minimally processed data (XY traceplot) and an accompanying interpretative plot, are presented at a scale of 1:2,500 in Illus 10 to Illus 39 inclusive.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. Data processing details are presented in Appendix 4.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Headland Archaeology 2017) and guidelines outlined by Historic England (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

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

4 RESULTS AND DISCUSSION

The magnetic background across the GSA is extremely variable, almost certainly as a consequence of the nature and depth of the solid geology and the overlying glacial deposits. Extreme positive and negative magnetic values throughout the Mynydd Mechell uplands and south-west of Llanfechell dominate the magnetic datasets. It is unlikely that any archaeological deposits, if present, will manifest with any clarity, if at all, in this magnetic background. Against this variable background numerous anomalies have been identified and cross-referenced to specific examples depicted on the interpretative figures.

4.1 FERROUS ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on most sites, often being present as a consequence of manuring or tipping/infilling.

A linear dipolar anomalies, **SP1**, has been identified mainly on a north/south alignment throughout most of the GSA. This locates the route of the existing water main. Three further linear dipolar anomalies are identified on differing alignments across F16 (**SP2**; Illus 16-18), F44 (**SP3**; Illus 25-27) and F73 (**SP4**; Illus 34-36). The anomalies are also caused by buried ferrous pipes.

A broad area of magnetic disturbance within the centre of F2 (Illus 10-12) corresponds closely to a building (**B1**) which is shown on historic mapping. The disturbance is probably due to demolition material (e.g. brick, concrete, iron etc.) within the topsoil. A short distance to the west of **B1** an area of high magnitude magnetic disturbance, **Q1**, corresponds to a former quarry pit. This disturbance is due to magnetic material within the material used to infill the pit. These anomalies are unlikely to be of any more than local historical interest.

The site of another former building which is shown on the Llanfechall tithe map (1845) is identified within the north of F82 as a broad area of magnetic disturbance (**B2**; Illus 37-39).

Areas of magnetic disturbance at field edges is caused by ferrous material within, or forming part of, the adjacent field boundaries and is of no archaeological potential.

4.2 AGRICULTURAL ANOMALIES

A clear rectilinear anomaly (**FB1**; see Illus 10-12) has been identified within the centre of F2 bounding the site of a former building; **B1**. The anomaly corresponds to a former boundary which is shown on the First Edition Ordnance Survey map of 1889 and is caused by the magnetic contrast between the soil fill of a ditch and the surrounding soils. Two further former field boundaries have been identified on an east-west alignment in F9 (**FB2**; Illus 13-15) and on a north/south alignment in F81 (**FB3**; Illus 37-39).

Although the majority of the fields are currently permanent pasture, closely-spaced parallel linear trend anomalies have been identified within F9, F11, F12, F15, F48, F53, F58, F63 and F70 indicating that at least these fields have been cultivated in the recent past; these anomalies are caused by ploughing.

All other linear trend anomalies (shown in green), not specifically referenced above, are also interpreted as of likely agricultural origin (e.g. ploughing headlands, vehicle ruts, drainage) and are not considered to be of any archaeological significance.

4.3 GEOLOGICAL ANOMALIES

As noted above, the magnetic background is extremely variable across the study area as a result of the varying nature and depth of the underlying bedrock and glacial superficial deposits. Numerous high magnitude anomalies are recorded throughout the GSA. The anomalies are probably due to the solid geology outcropping closer to the surface than at other parts of the survey area.

Numerous lower magnitude discrete anomalies recorded throughout the survey area are also likely to be due to variation in the composition of the soils.

4.4 POSSIBLE ARCHAEOLOGICAL ANOMALIES

Six amorphous areas of magnetic enhancement (**BM1 – BM6**) have been identified in low-lying areas adjacent to minor watercourses in F4 (Illus 10-12), F23 (Illus 22-24), F53 (Illus 31-33), F71 and F72 (Illus 34-36). It is possible that these anomalies are due to burnt mounds. However, given the varying and unpredictable nature of the underlying geology, a geological origin cannot be dismissed.

Linear anomalies (**D1** to **D30**) on varying alignments have been identified within two distinct areas to the immediate south and east of Llyn Alaw (Illus 10-18), and within a single field in the north of the scheme (Illus 37-39). The anomalies are thought to be caused by soil-filled ditches perhaps forming parts of former field systems. The anomalies do not correspond to any features on any available historical maps and are therefore likely to be post-medieval or earlier in origin. A curvilinear anomaly (**D20**; Illus 16-18) at Llanbabo is particularly worthy of note and may be due to the western part of a circular ditched enclosure.

An isolated small sub-rectangular anomaly (**E1**; Illus 13-15) within F9 may be of interest, perhaps being due to a small enclosure. However, interpretation is cautious given the variable magnetic background, near-surface geology and narrow survey corridor and it is possible that this anomaly is also geological in origin.

5 CONCLUSION

Unenclosed settlement and discrete features, such as isolated pits and spreads, are particularly difficult to identify with remote sensing surveys without other supporting information, particularly within a narrow survey corridor and over particularly magnetic geology. The extremely variable magnetic background caused by near surface geology across the Mynydd Mechell uplands and at Llanfechell is likely to mask any archaeological deposits, if present, within these areas, and no confident assessment of the archaeological potential of these areas can be provided. However, soil-filled features have been identified across most other parts of the scheme and it is considered probable that had there been major settlement activity within these areas that this would also have manifested in the data.

Isolated anomalies of archaeological potential have been identified at several locations across the pipeline corridor including six possible burnt mounds, a large curving ditch at Llanbabo, a small enclosure near to Llyn Alaw and possible post medieval field systems in the south and far north of the corridor respectively. These anomalies are ascribed a moderate archaeological potential. There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions and therefore, based solely on the results and interpretation of the data, the archaeological potential along the majority of the proposed pipeline corridor is considered to be low to moderate.

6 REFERENCES

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7 APPENDIX 1

7.1 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 haemetite. 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.

7.2 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.

8 APPENDIX 2

8.1 SURVEY LOCATION INFORMATION

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

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

9 APPENDIX 3

9.1 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises:-

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

The digital archive will be submitted to The National Monuments Record of Wales (NMRW) in accordance with the RCAHMS Guidelines for Archiving of Archaeological Projects (V13, 2013). The project will also be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 DATA PROCESSING

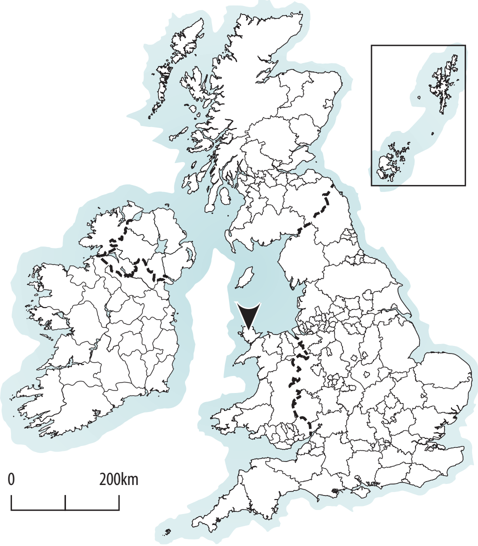
The gradiometer data has been presented in this report in processed greyscale and minimally processed XY trace plot format.

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.

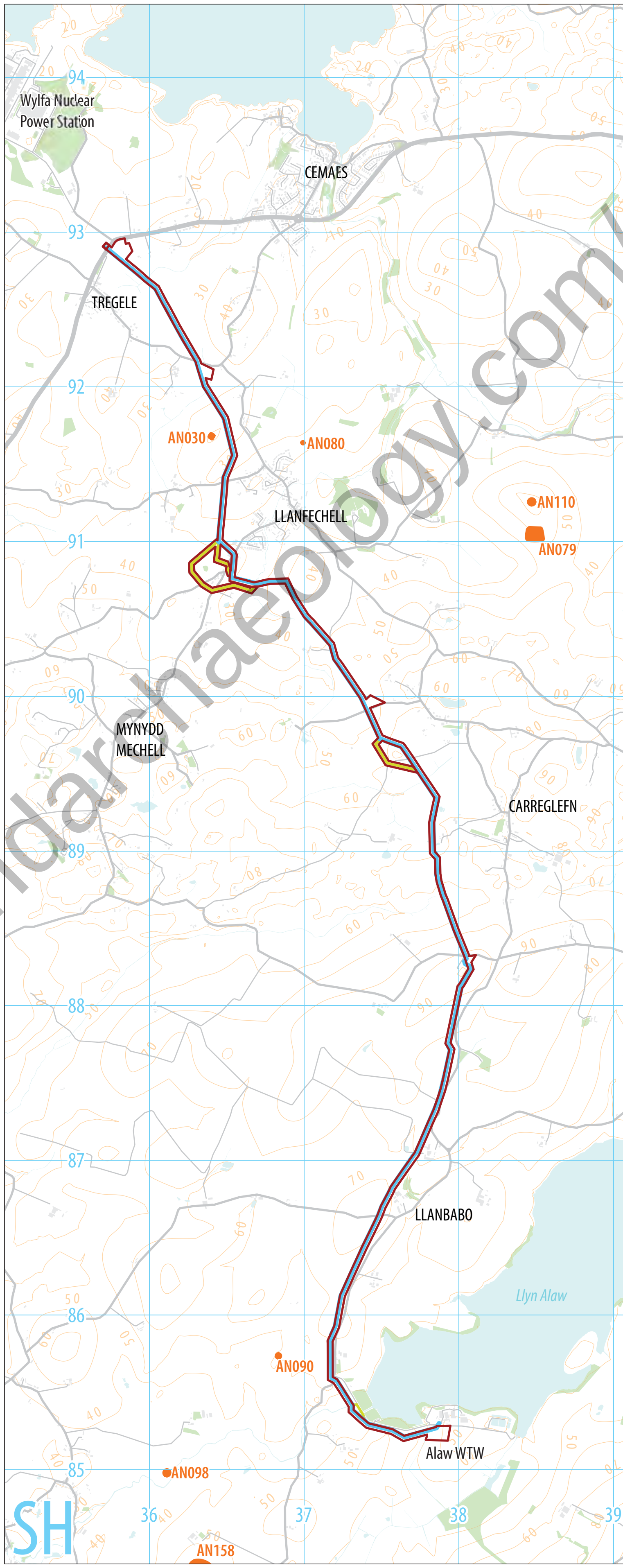
The data has also been clipped to remove extreme values and to improve data contrast.

WPWP/01
Wylfa Potable Water Pipeline
Isle of Anglesey



- geophysical survey area
- proposed water main
- alternative route
- scheduled monument

0
800m
1:40,000 @ A4



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ILLUS 1 Site location

ILLUS 2 Field 2, looking east

ILLUS 3 Field 13, looking south

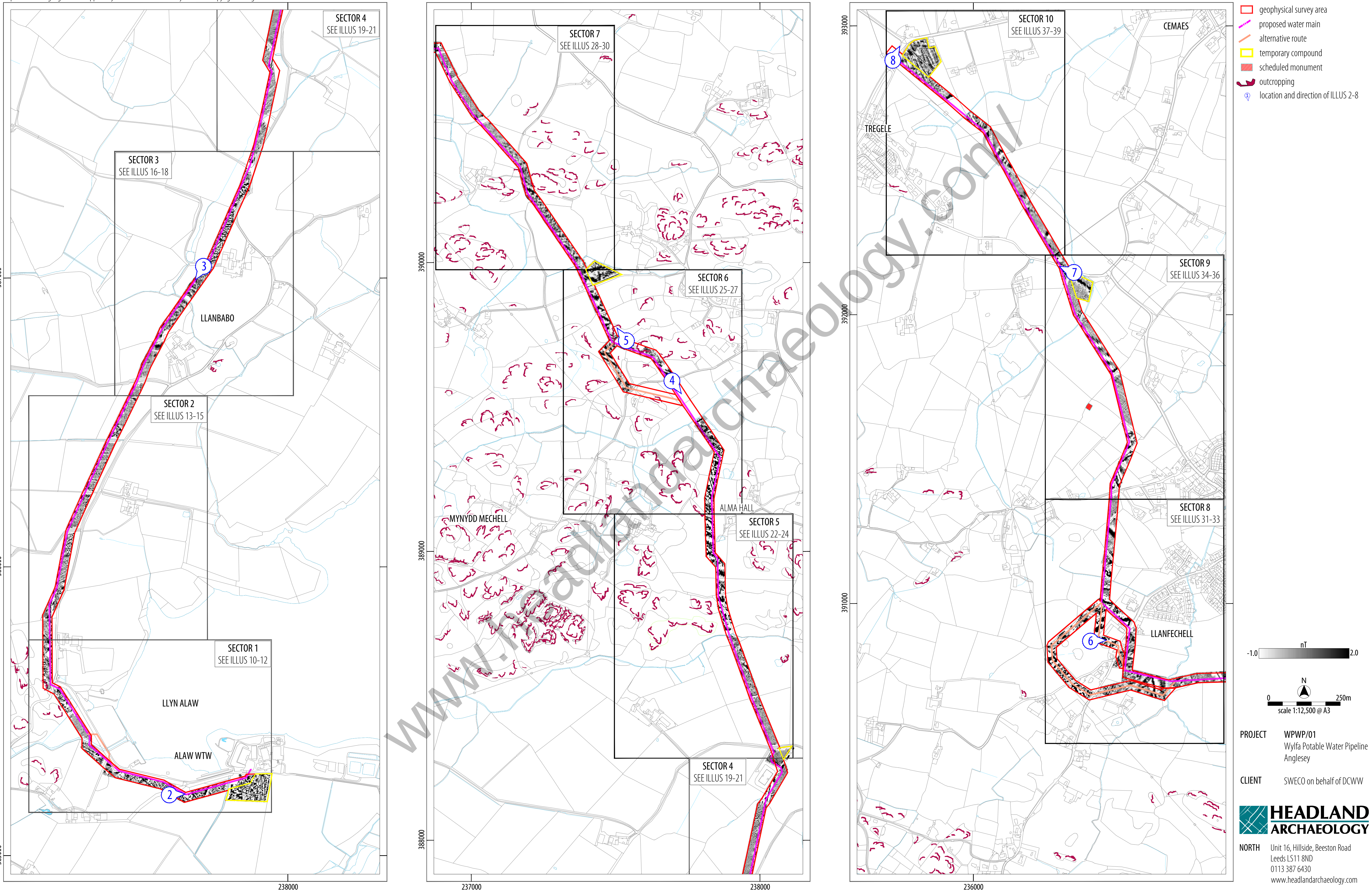
ILLUS 4 Area unsuitable for survey in Field 34, looking south

ILLUS 5 Area unsuitable for survey in Field 34, looking south

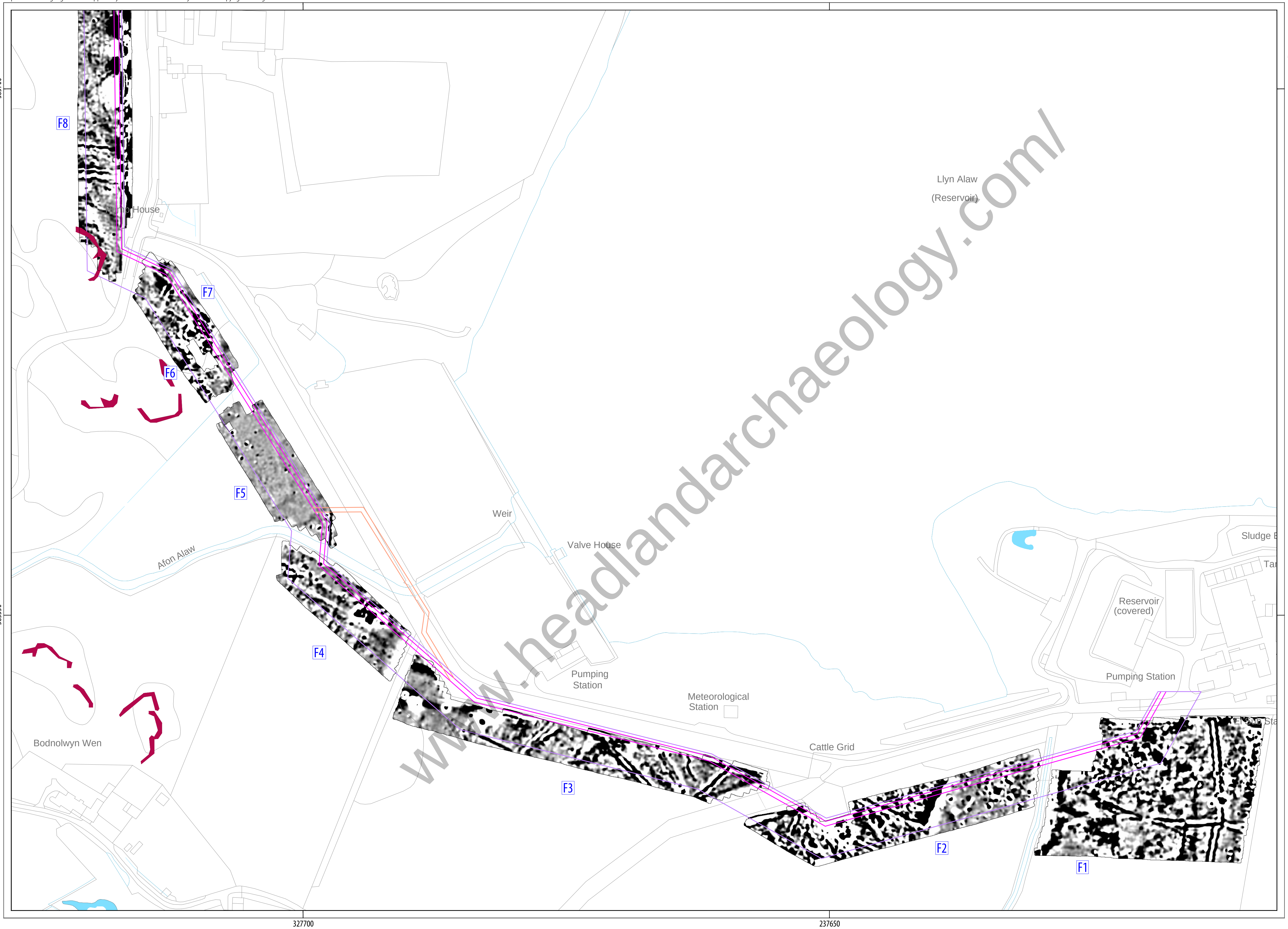
ILLUS 6 Field 34, looking south

ILLUS 7 Field 73, looking north-west

ILLUS 8 Area unsuitable for survey in Field 82, looking north



ILLUS 9 Survey location showing processed greyscale magnetometer data, proposed pipeline and location of Illus 10-39



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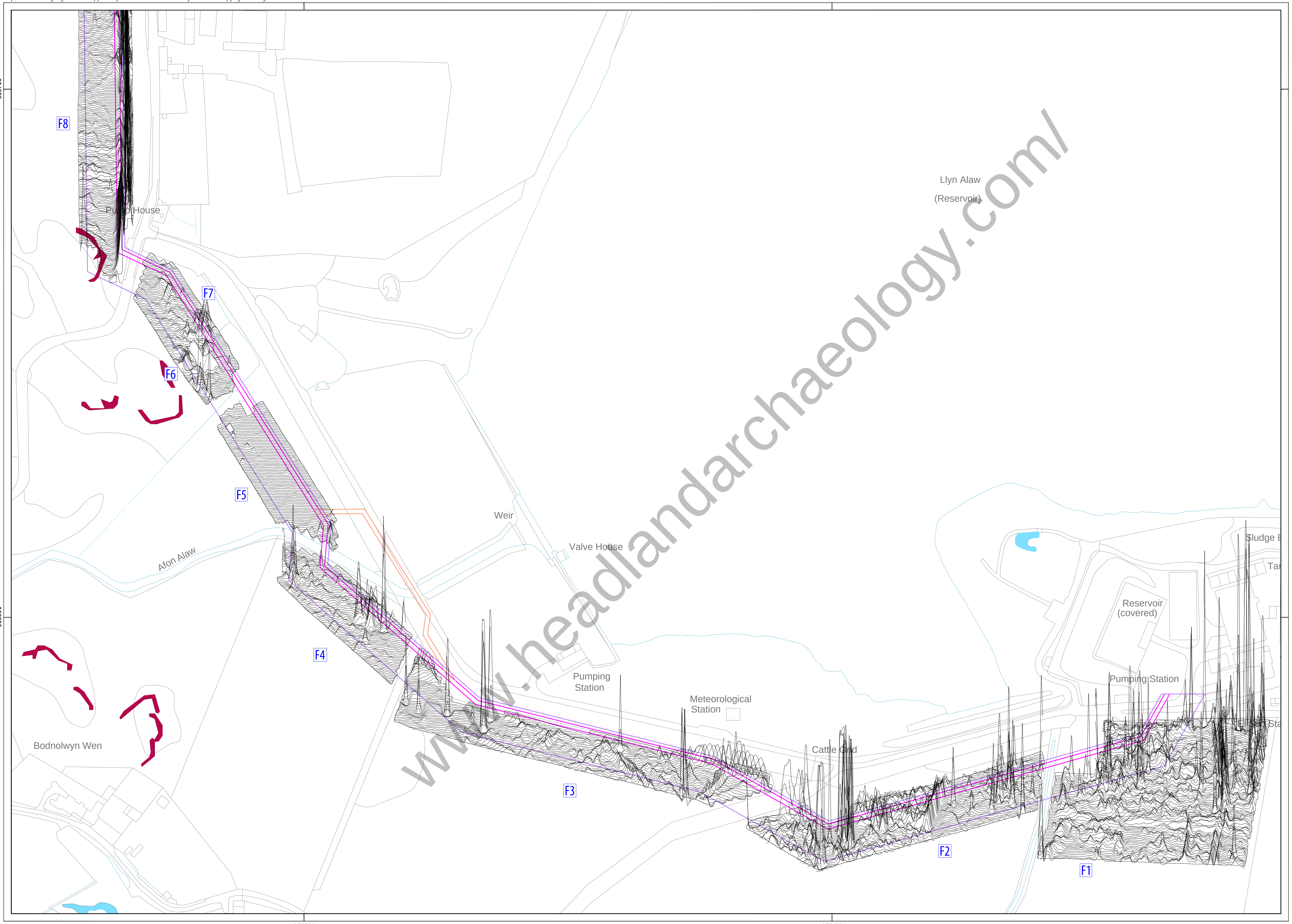
ILLUS 10 Processed greyscale magnetometer data; Sector 1



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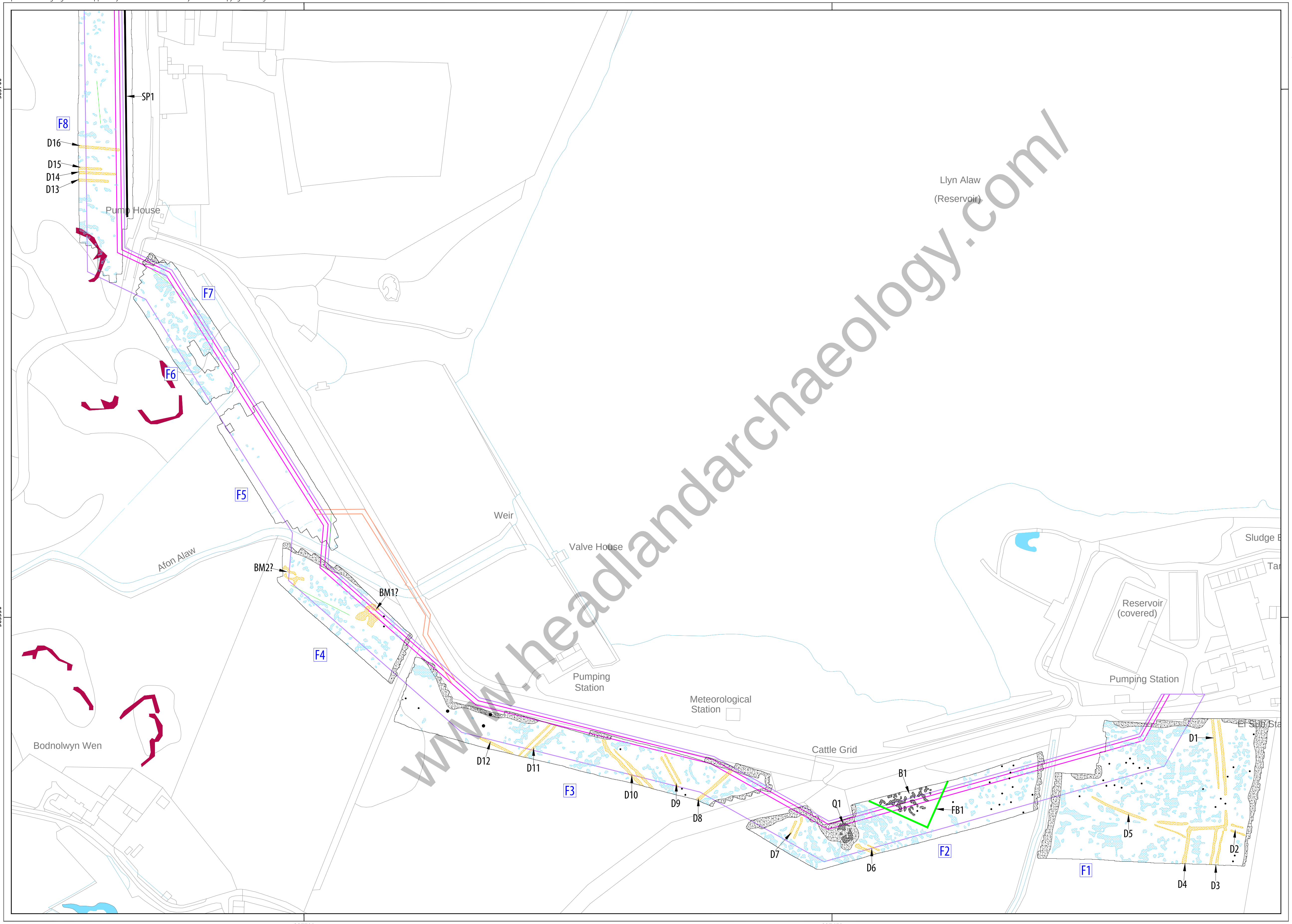
ILLUS 11 XY trace plot of minimally processed magnetometer data; Sector 1



proposed water main
alternative route
working corridor
outcropping

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

ABBREVIATIONS

B	building
BM	bound mound
D	ditch
Q	quarry

N
0 50m
scale 1:2,500 @ A3

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ILLUS 12 Interpretation of magnetometer data; Sector 1

proposed water main
working corridor

nT
-1.0 2.0

N
0 50m
scale 1:2,500 @ A3

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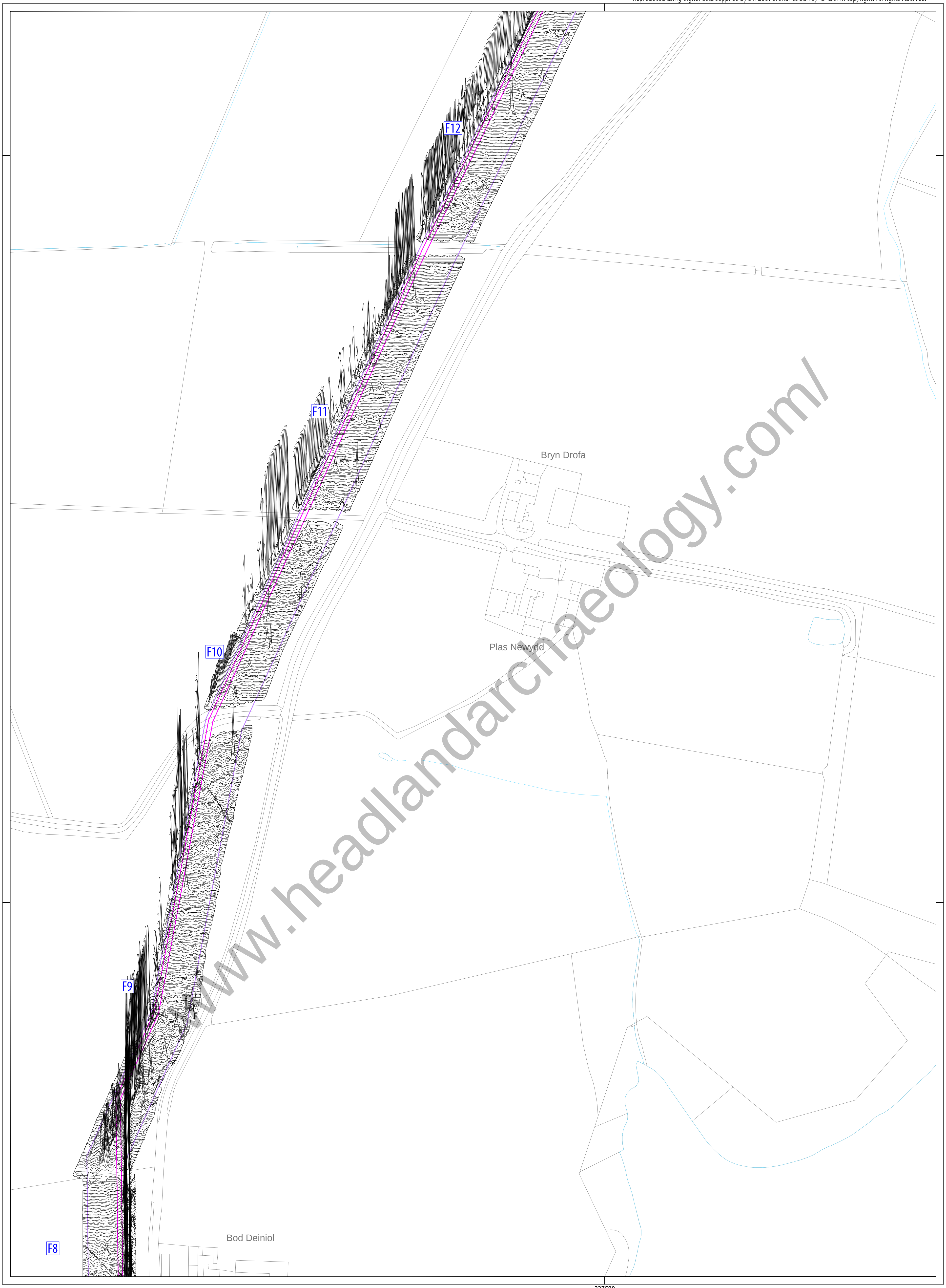
ILLUS 13 Processed greyscale magnetometer data; Sector 2



proposed water main
working corridor

33.0nT/cm

N
0 50m
scale 1:2,500 @ A3

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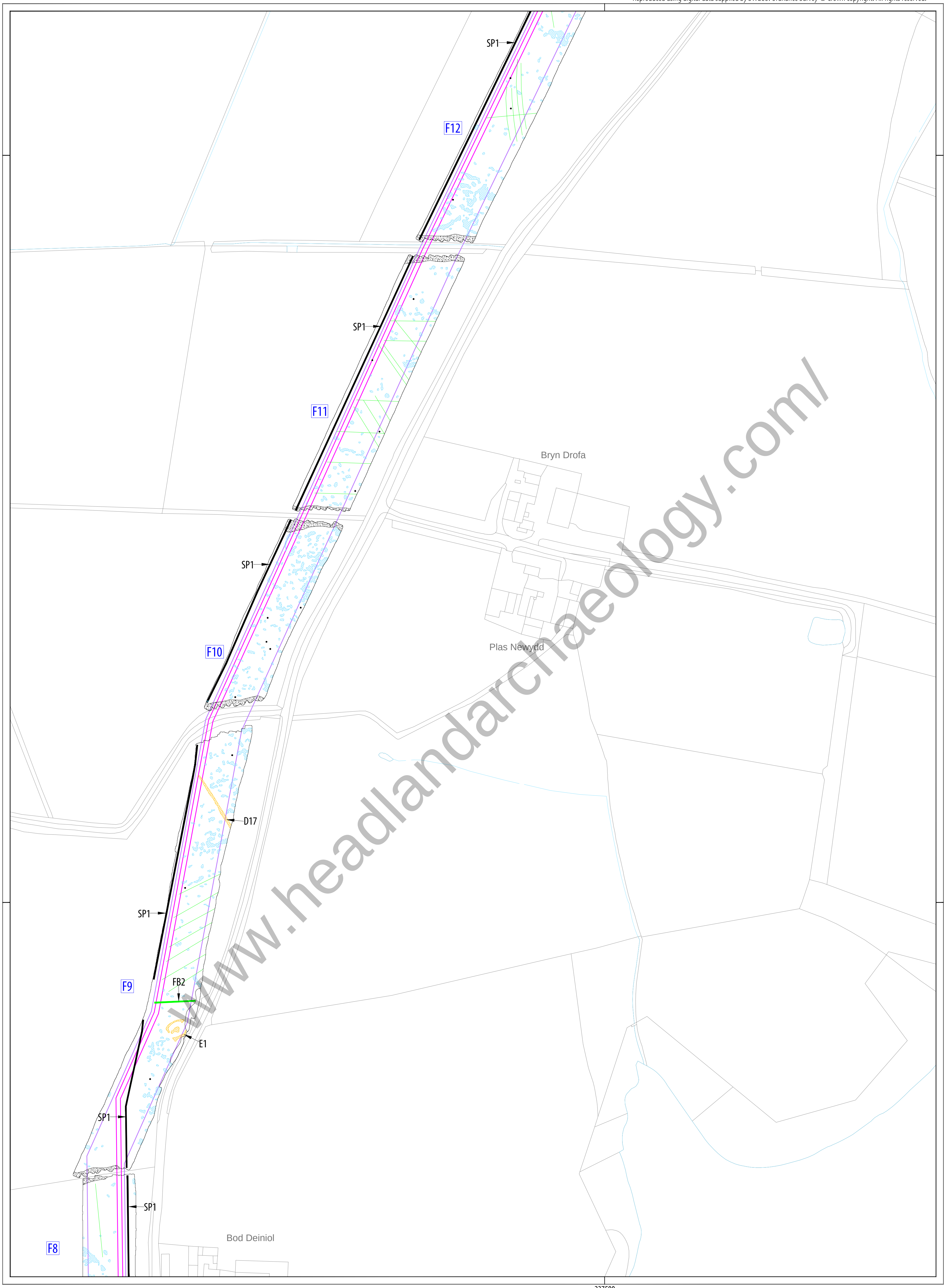
ILLUS 14 XY trace plot of minimally processed magnetometer data; Sector 2



proposed water main
working corridor

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

TYPE OF ANOMALY	INTERPRETATION
magnetic enhancement	archaeology?

ABBREVIATIONS

D ditch
E enclsoure
FB field boundary
SP service pipe

N

0 50m
scale 1:2,500 @ A3

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Wylfa Potable Water Pipeline
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ILLUS 15 Interpretation of magnetometer data; Sector 2

proposed water main
working corridor
outcropping

nT
-1.0 2.0

N
0 50m
scale 1:2,500 @ A3

PROJECT WPWP/01
Wylfa Potable Water Pipeline
Anglesey

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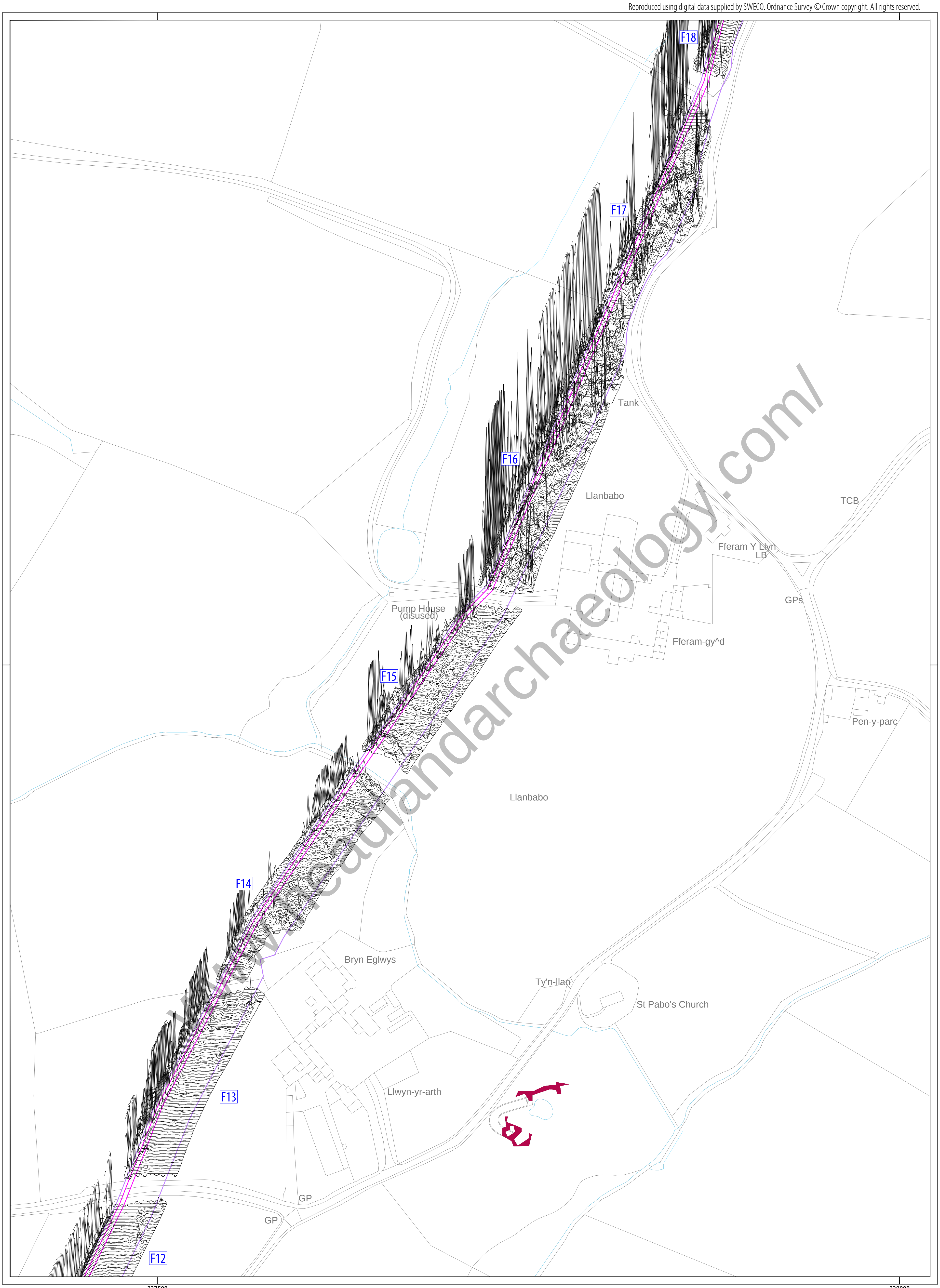
ILLUS 16 Processed greyscale magnetometer data; Sector 3



proposed water main
working corridor
outcropping

33.0nT/cm

N
0 50m
scale 1:2,500 @ A3

PROJECT WPWP/01
Wylfa Potable Water Pipeline
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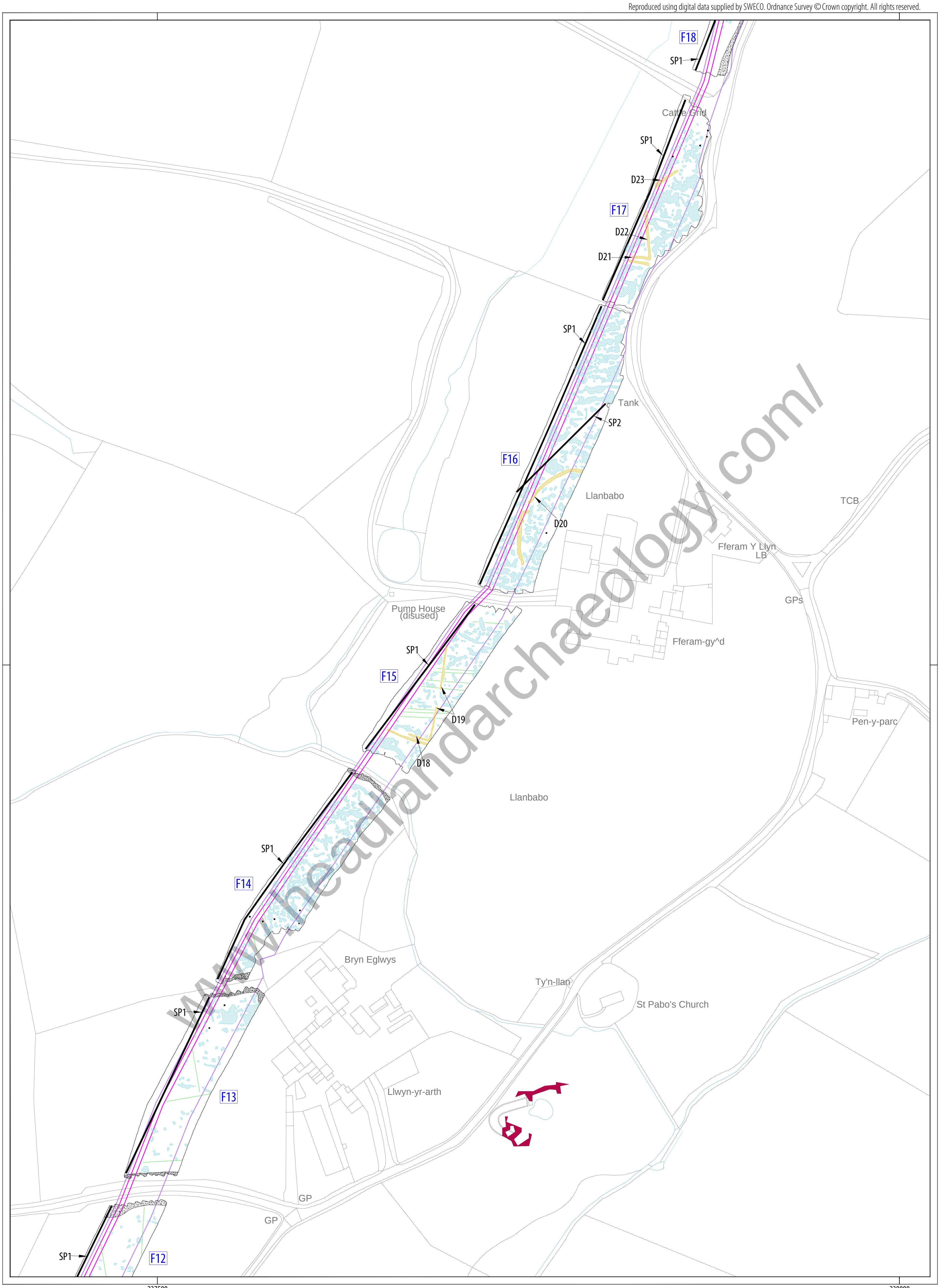
ILLUS 17 XY trace plot of minimally processed magnetometer data; Sector 3



proposed water main
working corridor
outcropping

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

ABBREVIATIONS
D ditch
SP service pipe

N
0 50m
scale 1:2,500 @ A3

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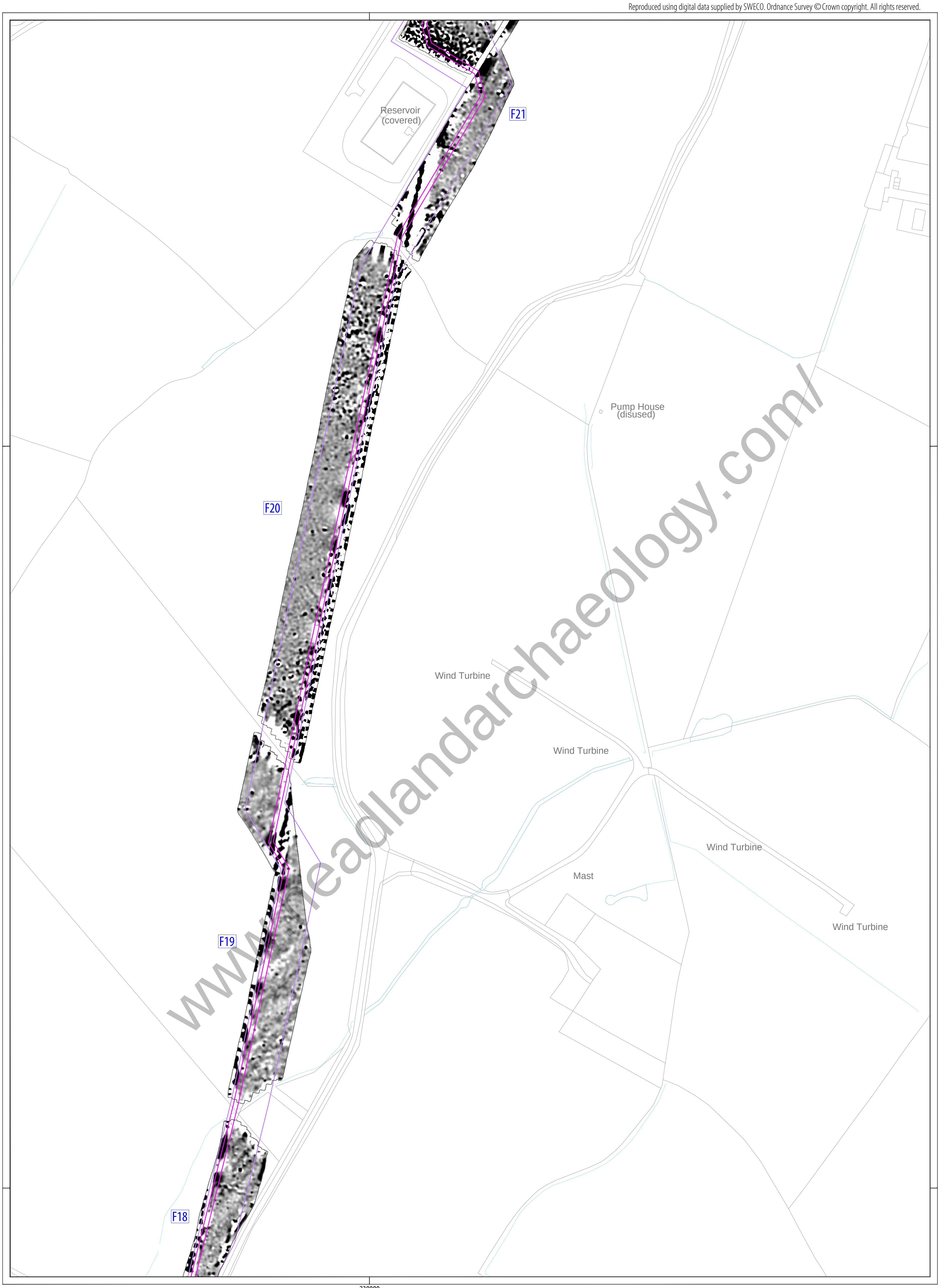
ILLUS 18 Interpretation of magnetometer data; Sector 3



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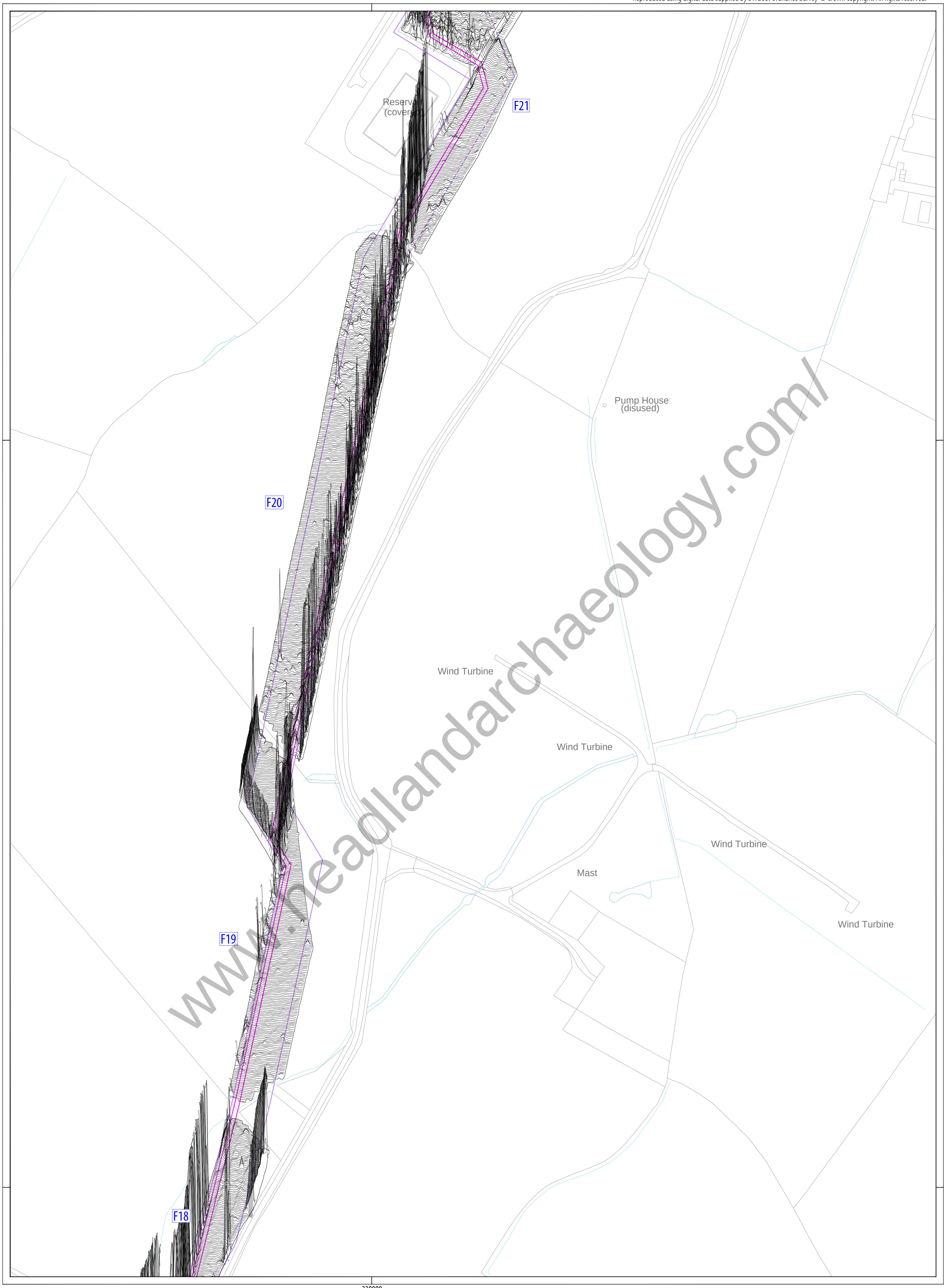
ILLUS 19 Processed greyscale magnetometer data; Sector 4



proposed water main
working corridor

33.0nT/cm

N
0
50m
scale 1:2,500 @ A3

PROJECT WPWP/01
Wylfa Potable Water Pipeline
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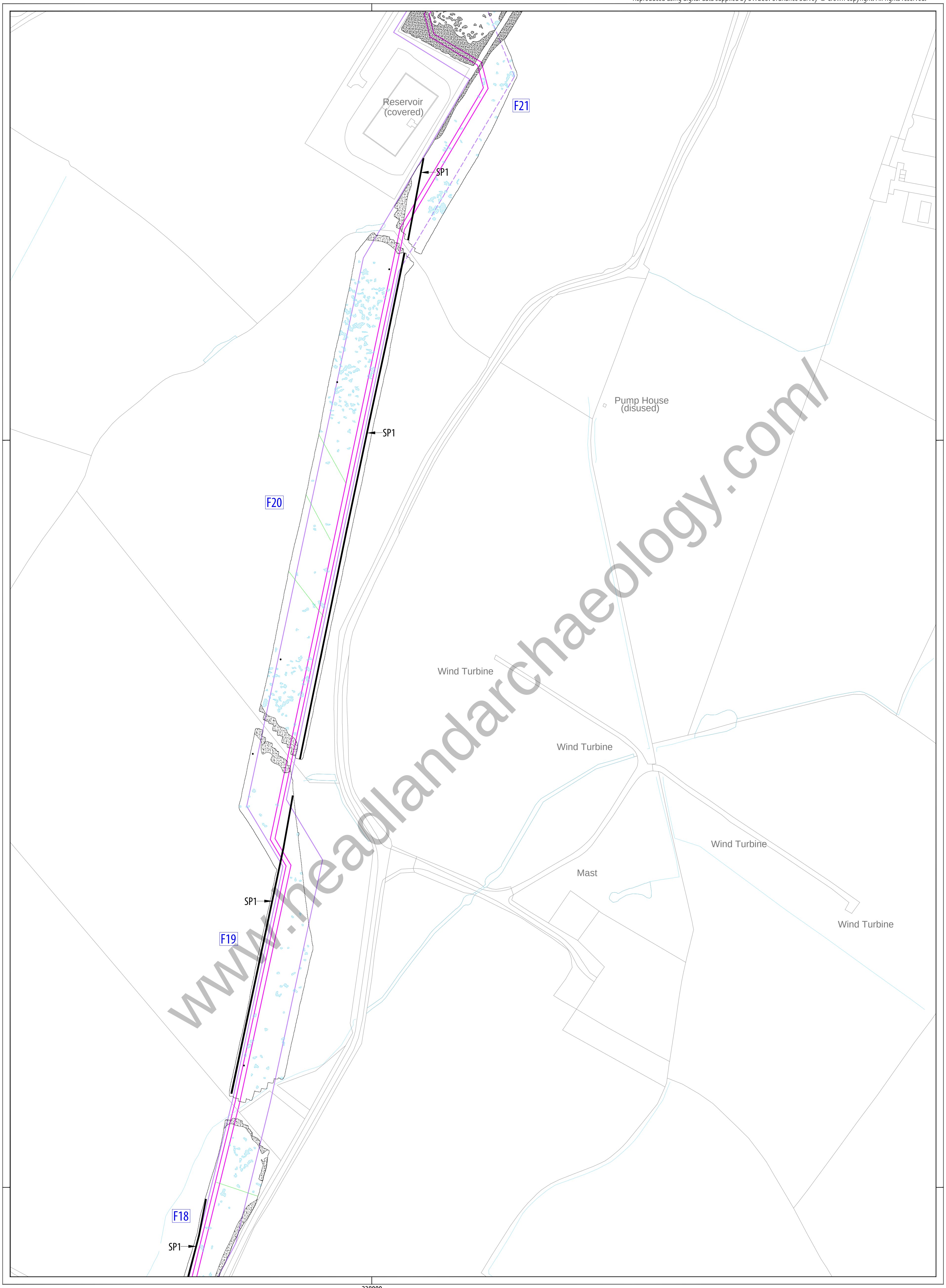
ILLUS 20 XY trace plot of minimally processed magnetometer data; Sector 4



proposed water main
working corridor

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

ABBREVIATIONS
SP service pipe

N
0 50m
scale 1:2,500 @ A3

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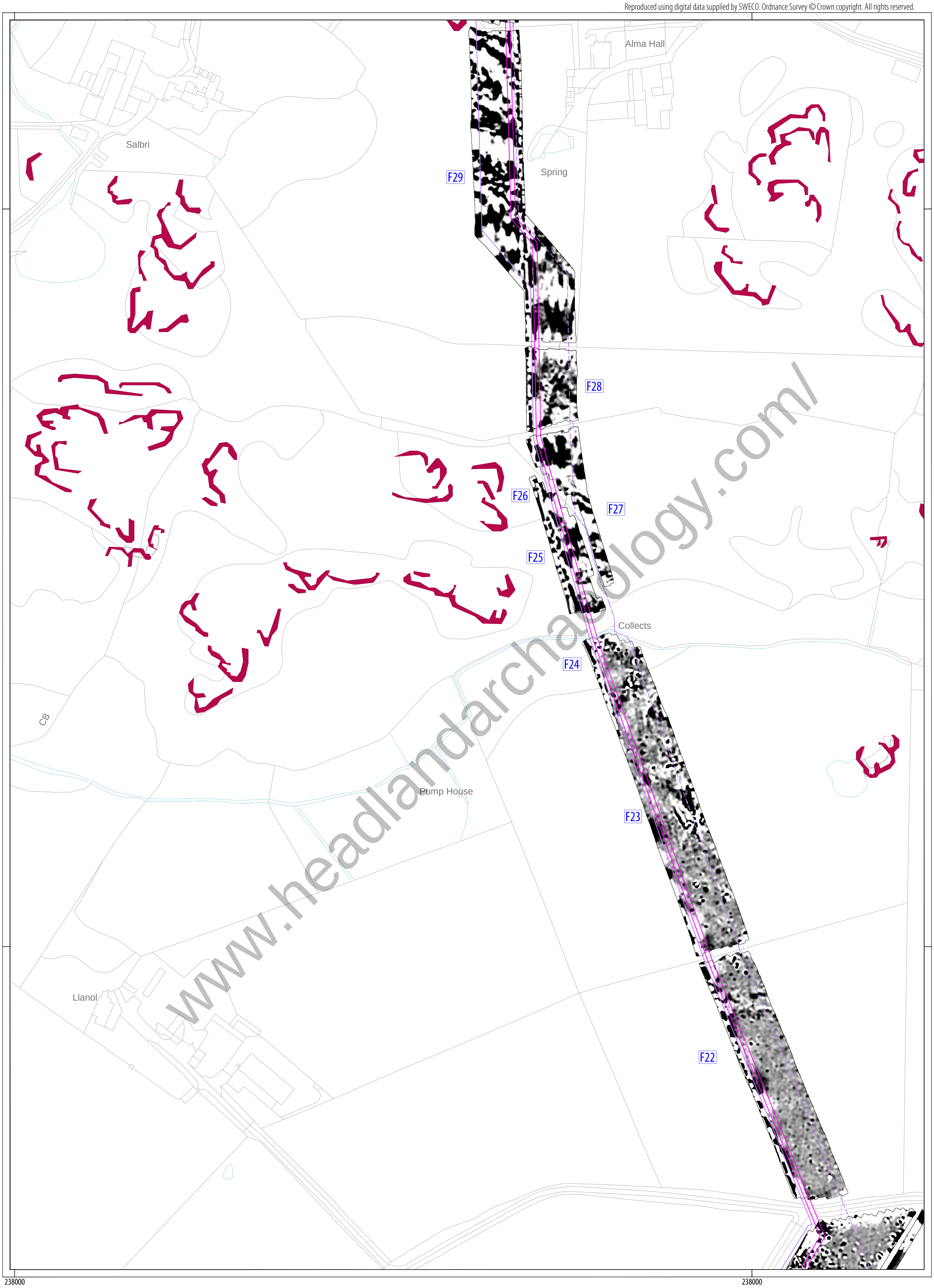
ILLUS 21 Interpretation of magnetometer data; Sector 4



proposed water main
working corridor
outcropping

-1.0 nT 2.0

N
0 50m
scale 1:2,500 @ A3

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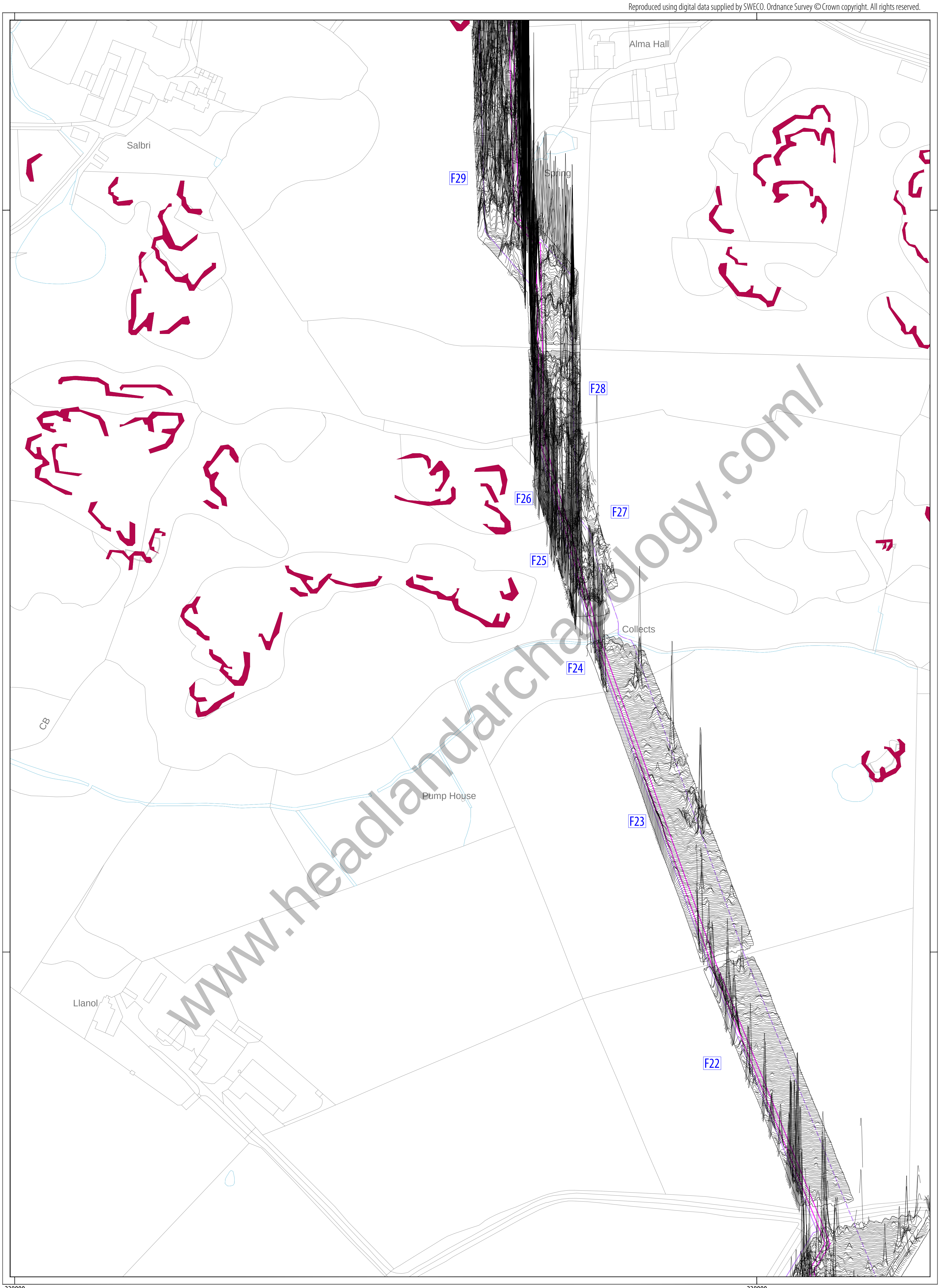
ILLUS 22 Processed greyscale magnetometer data; Sector 5



proposed water main
working corridor
outcropping

33.0nT/cm

N

0 50m
scale 1:2,500 @ A3

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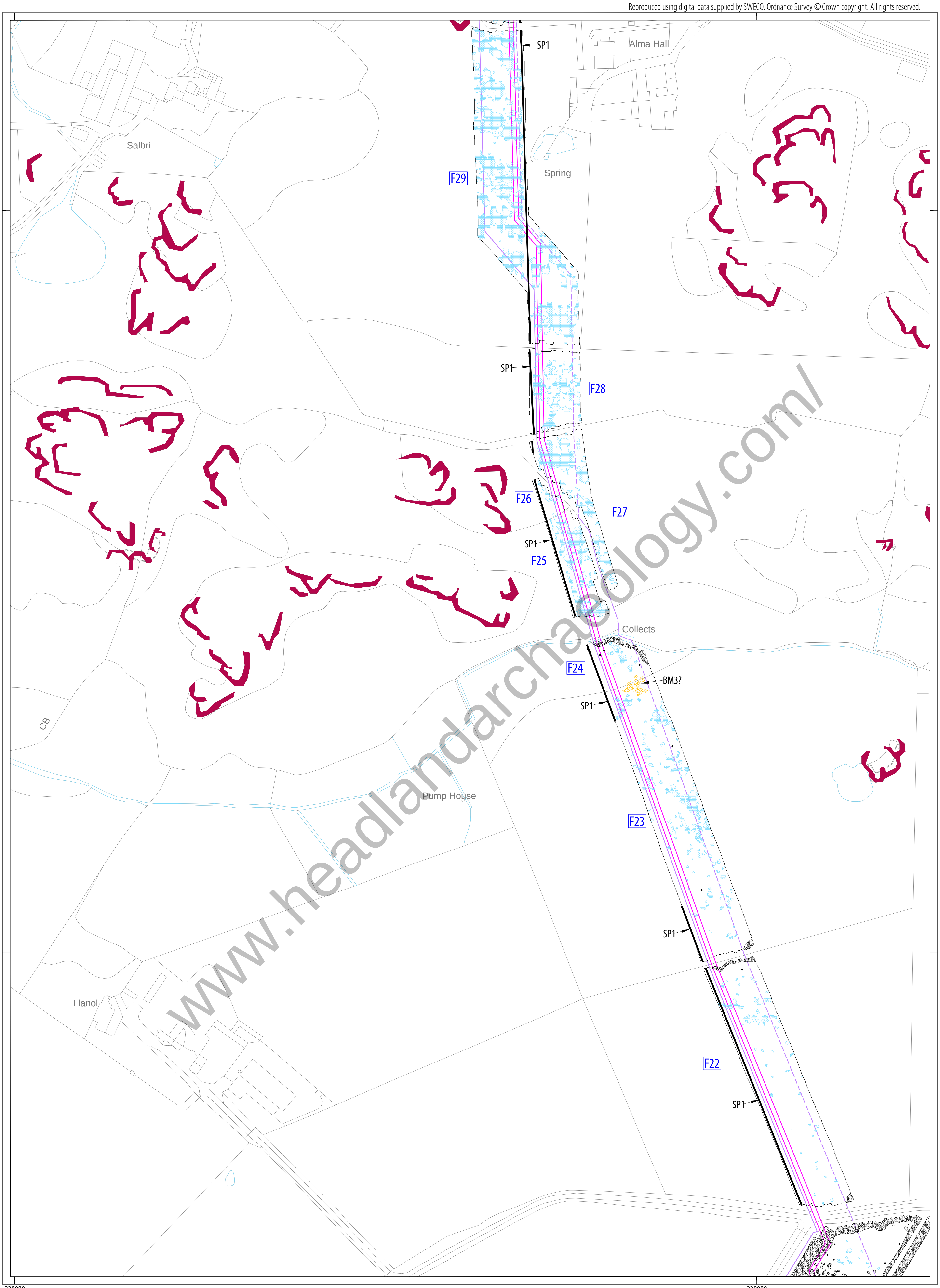
ILLUS 23 XY trace plot of minimally processed magnetometer data; Sector 5



- proposed water main
- working corridor
- outcropping

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
magnetic enhancement	geology?
magnetic enhancement	archaeology?

ABBREVIATIONS

BM burnt mound

SP service pipe

N

0 50m

scale 1:2,500 @ A3

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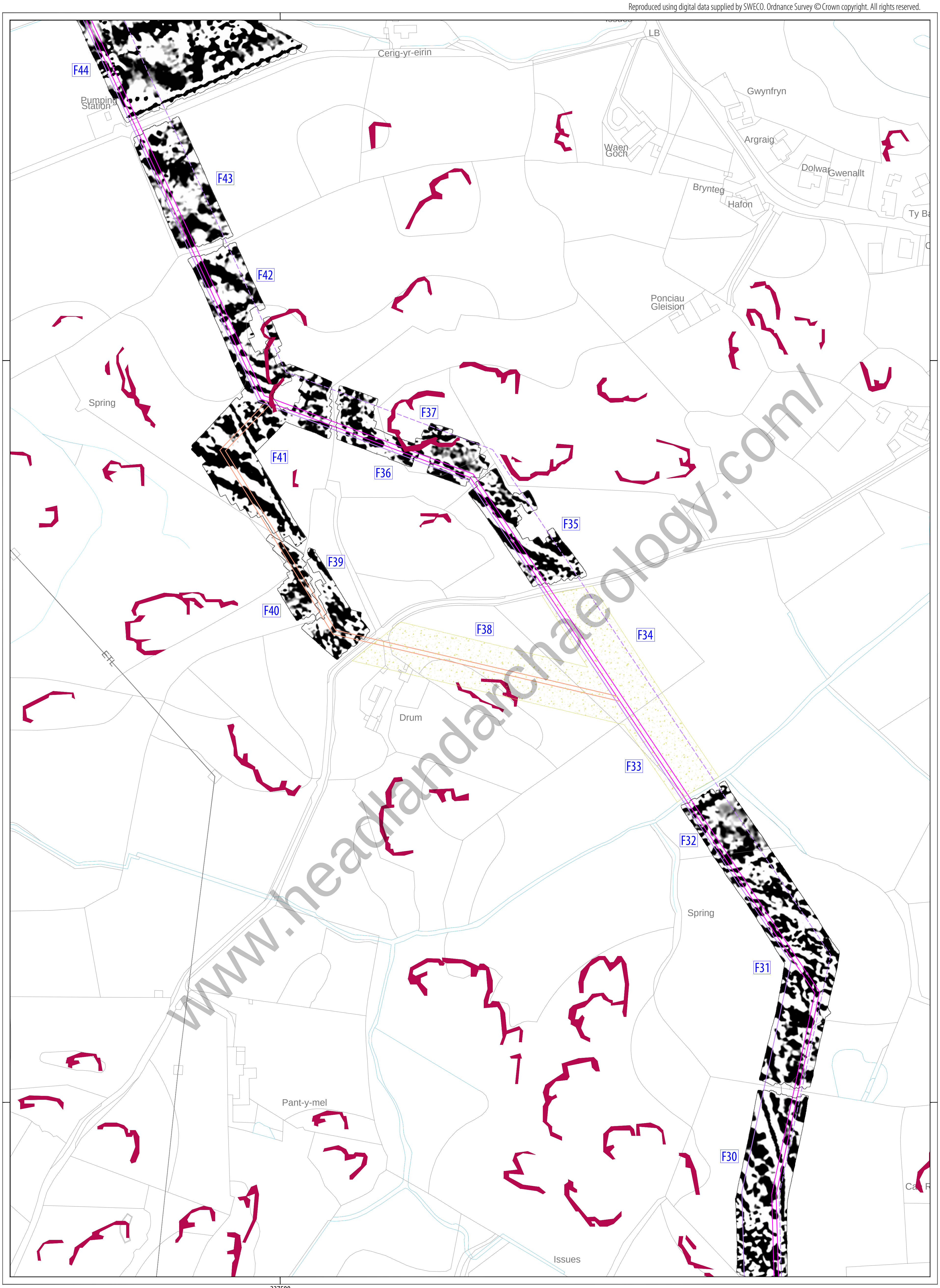
ILLUS 24 Interpretation of magnetometer data; Sector 5



proposed water main
alternative route
working corridor
outcropping
area unsuitable for survey

nT
-1.0 2.0

N
0 50m
scale 1:2,500 @ A3

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Wylfa Potable Water Pipeline
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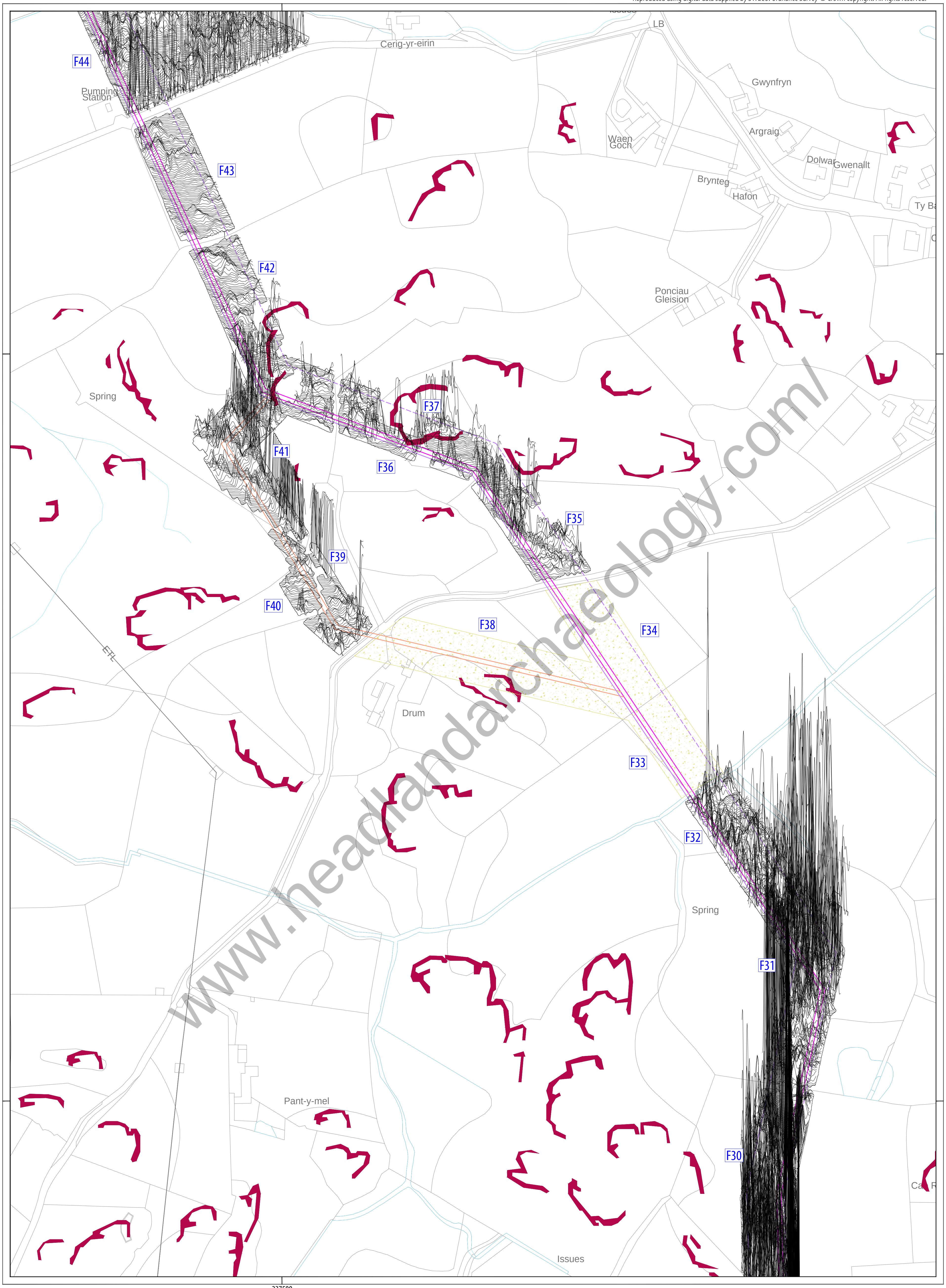
ILLUS 25 Processed greyscale magnetometer data; Sector 6



proposed water main
alternative route
working corridor
outcropping
area unsuitable for survey

33.0nT/cm

N
0 50m
scale 1:2,500 @ A3

PROJECT WPWP/01
Wylfa Potable Water Pipeline
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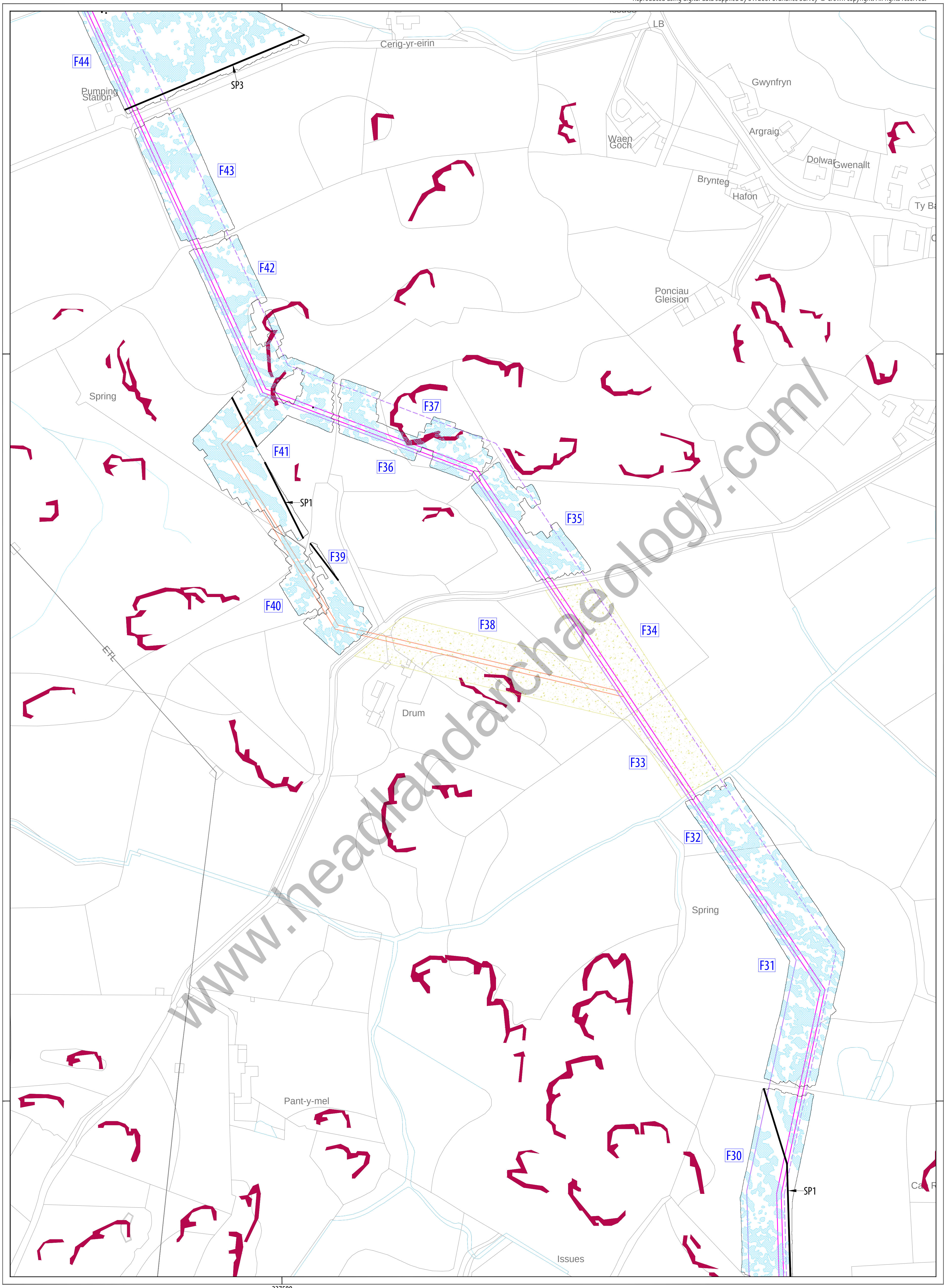
ILLUS 26 XY trace plot of minimally processed magnetometer data; Sector 6



proposed water main
alternative route
working corridor
outcropping
area unsuitable for survey

TYPE OF ANOMALY	INTERPRETATION
dipolar linear	service pipe
magnetic enhancement	geology?

ABBREVIATIONS

SP service pipe

N
0 50m
scale 1:2,500 @ A3

PROJECT WPWP/01
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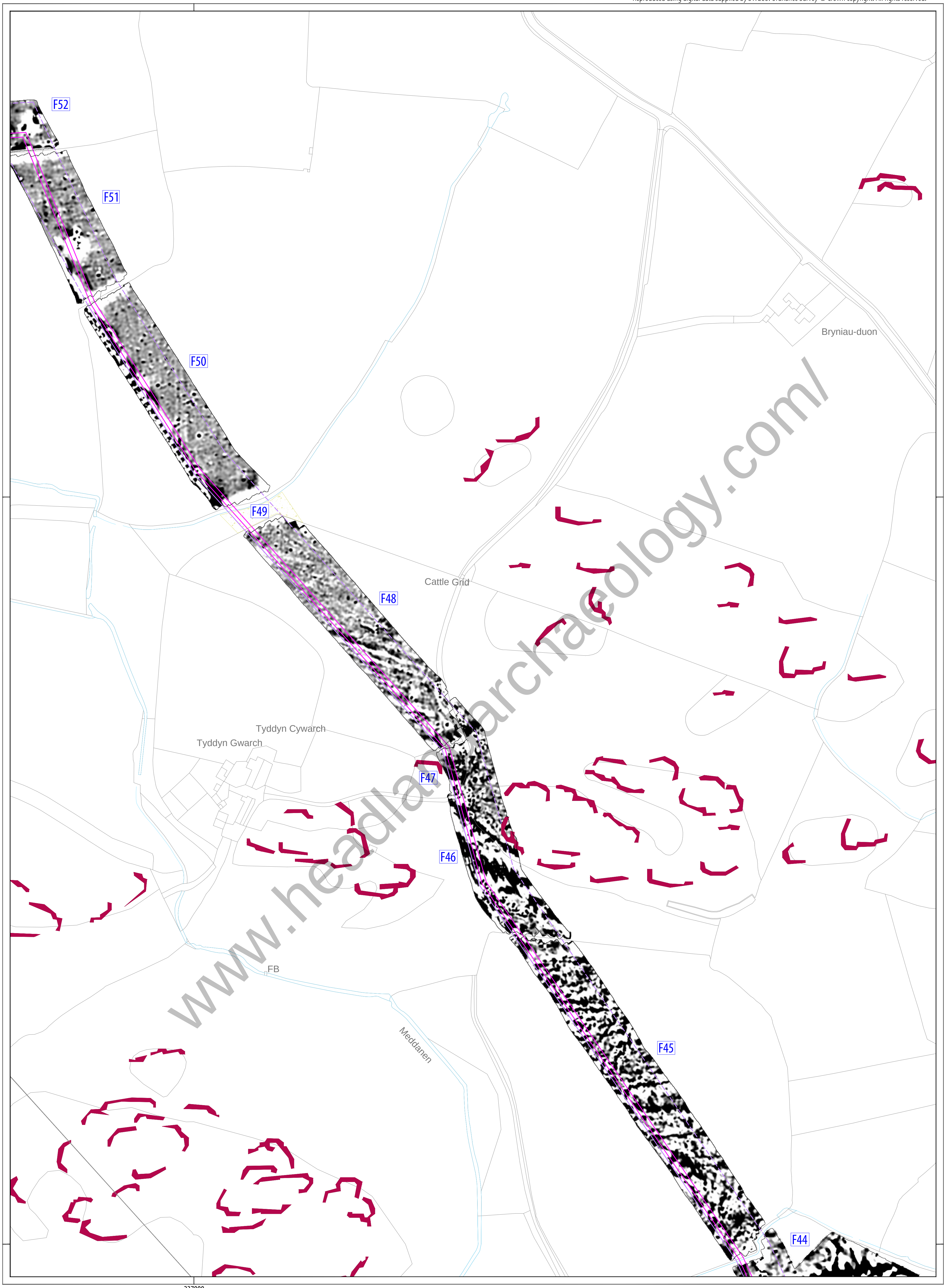
ILLUS 27 Interpretation of magnetometer data; Sector 6



proposed water main
working corridor
outcropping
area unsuitable for survey

nT
-1.0 2.0

N
0 50m
scale 1:2,500 @ A3

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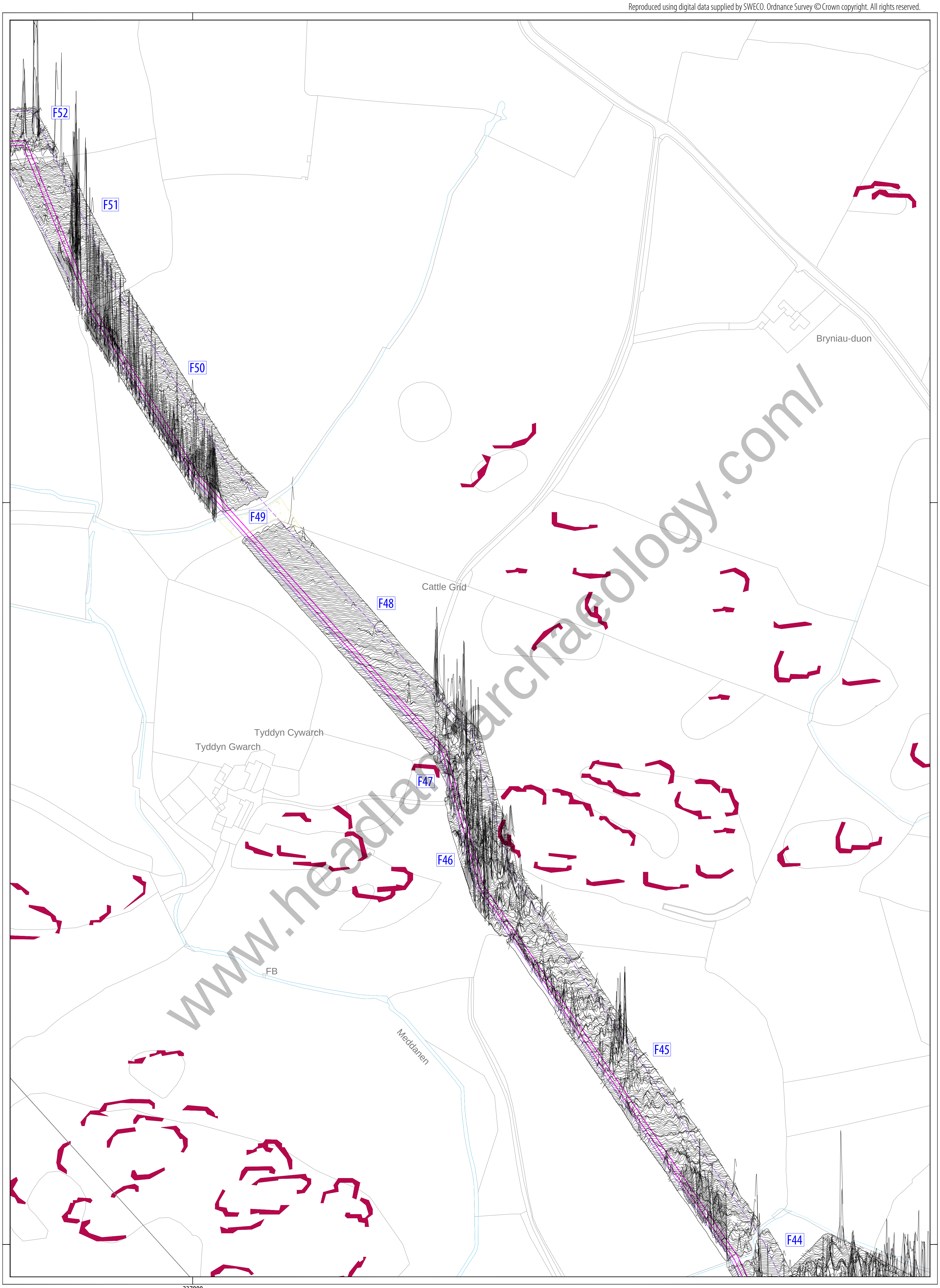
ILLUS 28 Processed greyscale magnetometer data; Sector 7



proposed water main
working corridor
outcropping
area unsuitable for survey

33.0nT/cm

N
0 50m
scale 1:2,500 @ A3

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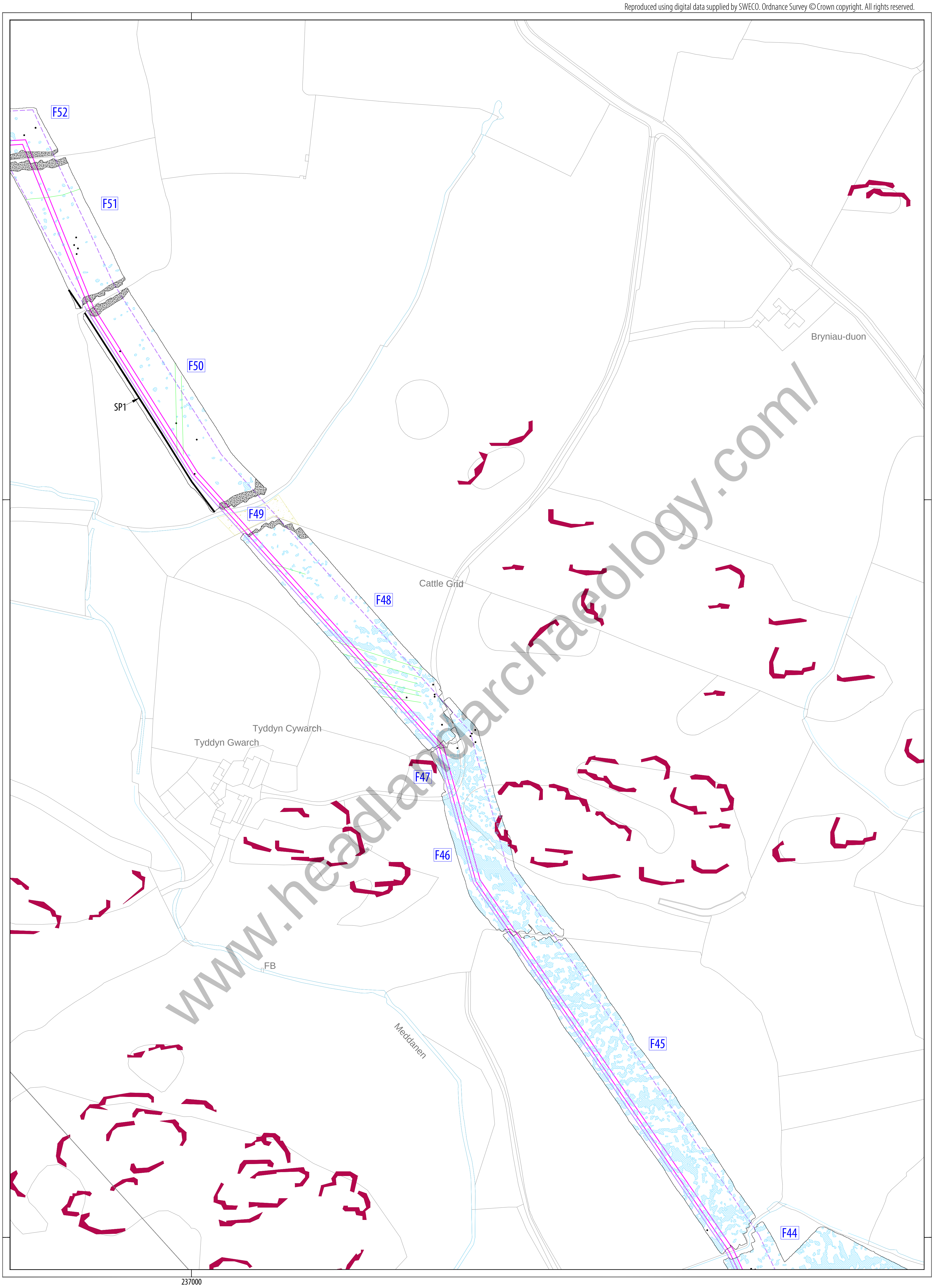
ILLUS 29 XY trace plot of minimally processed magnetometer data; Sector 7



	proposed water main
	working corridor
	outcropping
	area unsuitable for survey

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

ABBREVIATIONS

SP service pipe

N

0 50m

scale 1:2,500 @ A3

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ILLUS 30 Interpretation of magnetometer data; Sector 7

proposed water main
alternative route
working corridor

nT -1.0 2.0

N
0 50m
scale 1:2,500 @ A3

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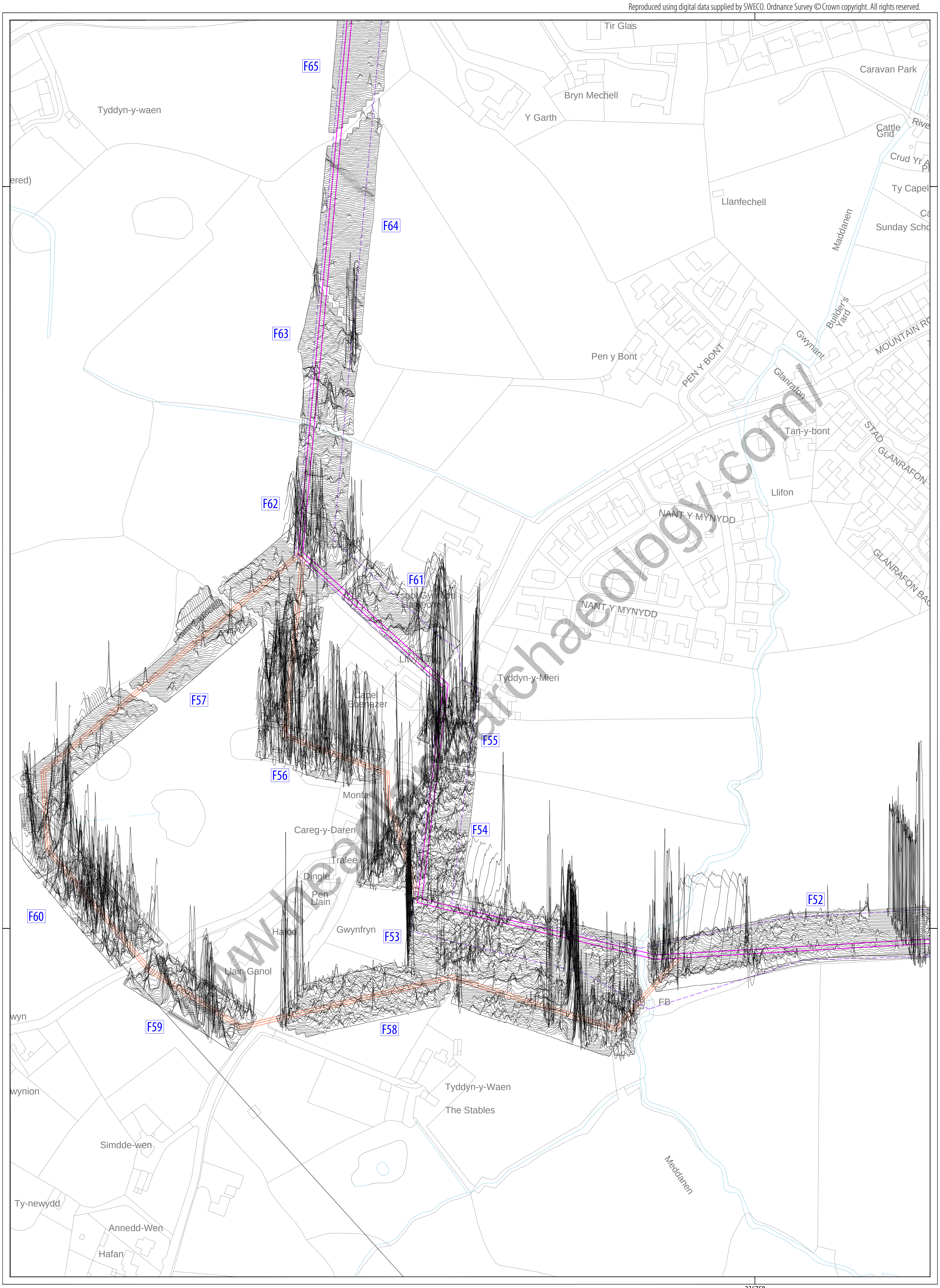
ILLUS 31 Processed greyscale magnetometer data; Sector 8



proposed water main
alternative route
working corridor

33.0nT/cm

N

0 50m
scale 1:2,500 @ A3

PROJECT	WPWP/01 Wylfa Potable Water Pipeline Anglesey
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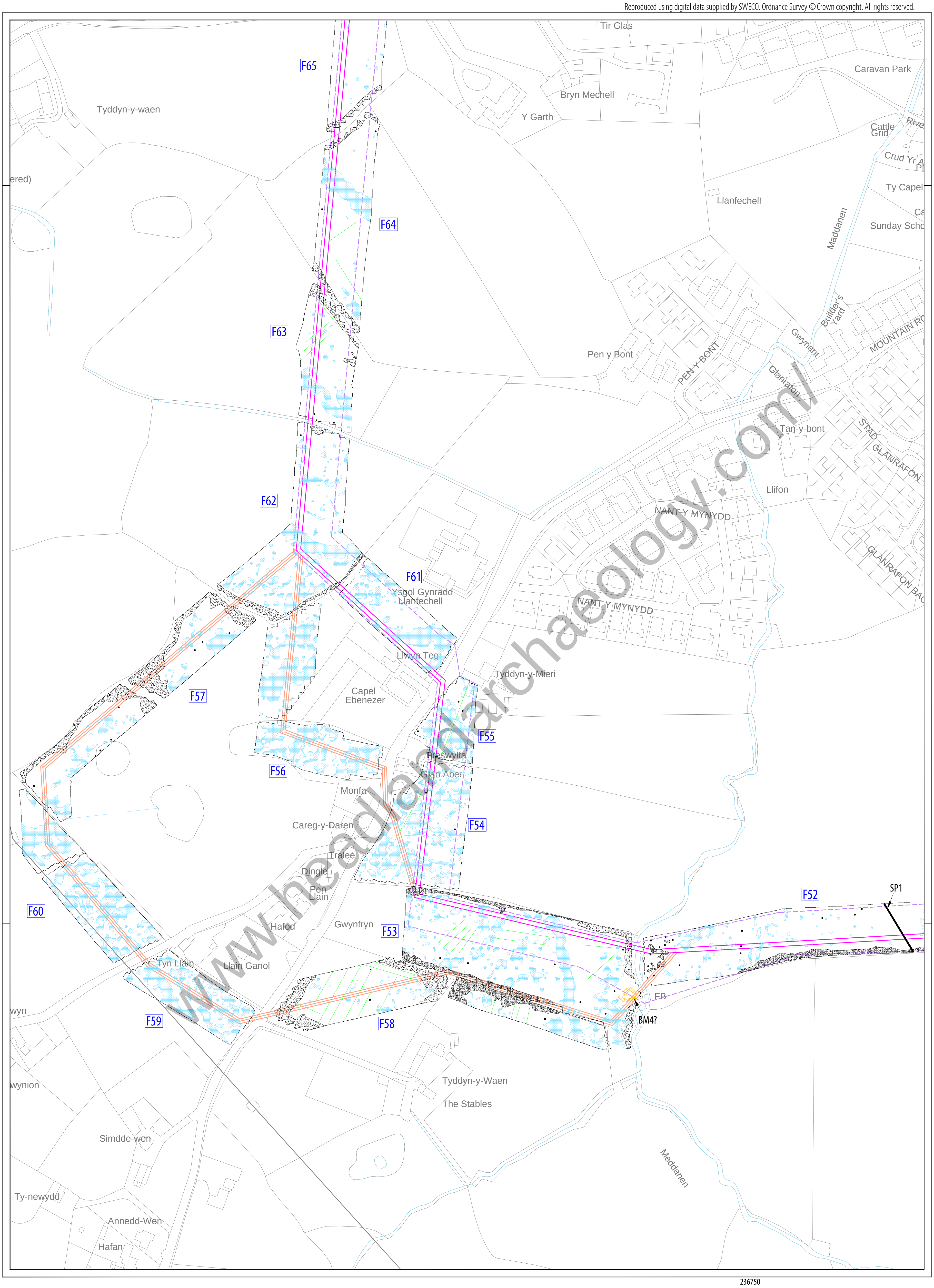
ILLUS 32 XY trace plot of minimally processed magnetometer data; Sector 8



proposed water main
alternative route
working corridor

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

TYPE OF ANOMALY	INTERPRETATION
magnetic enhancement	archaeology?

ABBREVIATIONS

BM burnt mound SP service pipe

N
0 50m
scale 1:2,500 @ A3

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ILLUS 33 Interpretation of magnetometer data; Sector 8

- proposed water main
- working corridor
- area unsuitable for survey
- scheduled monument

nT
-1.0 2.0

N
0 50m
scale 1:2,500 @ A3

PROJECT WPWP/01
Wylfa Potable Water Pipeline
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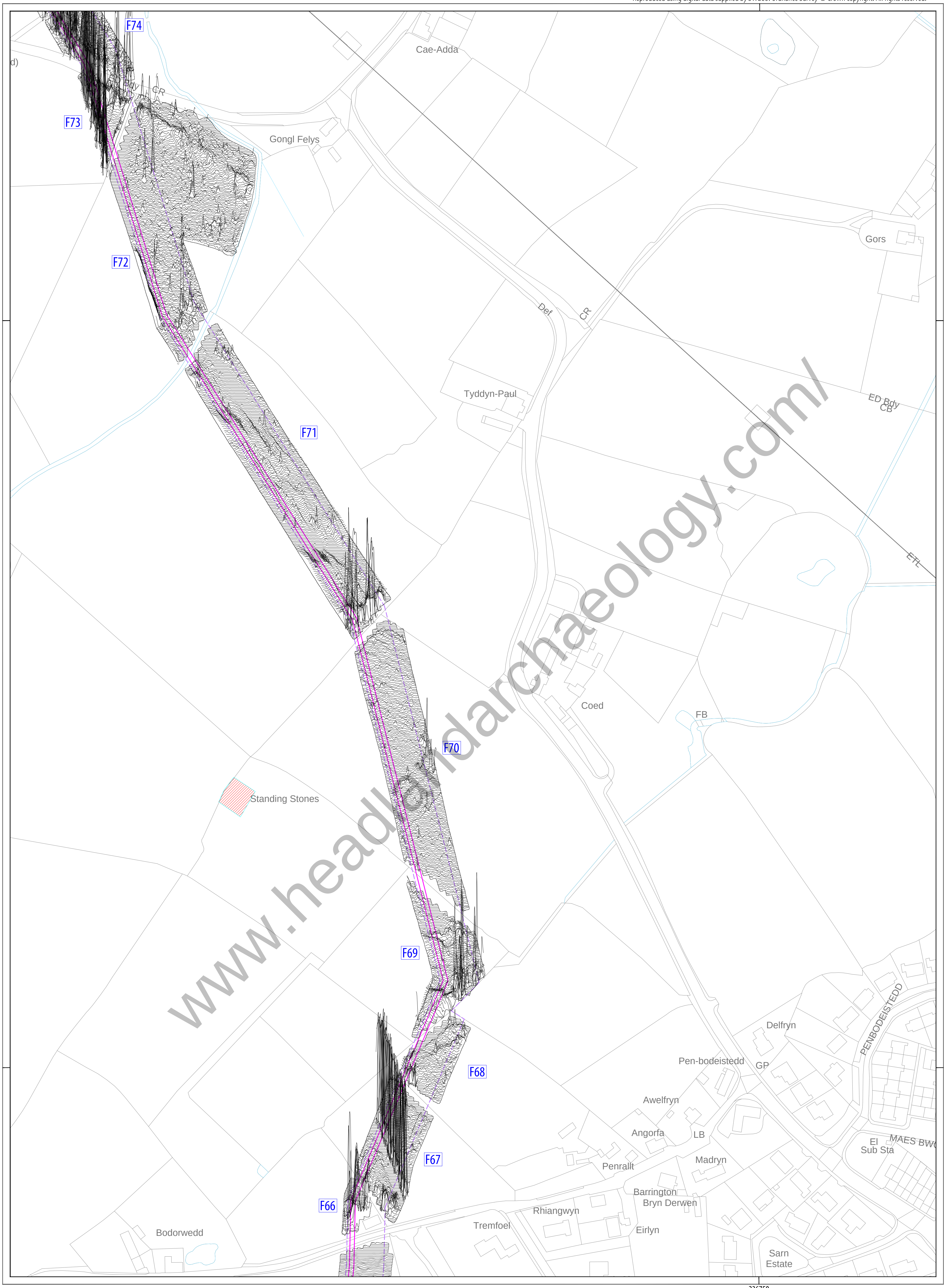
ILLUS 34 Processed greyscale magnetometer data; Sector 9



- proposed water main
- working corridor
- area unsuitable for survey
- scheduled monument

N
0 50m
scale 1:2,500 @ A3

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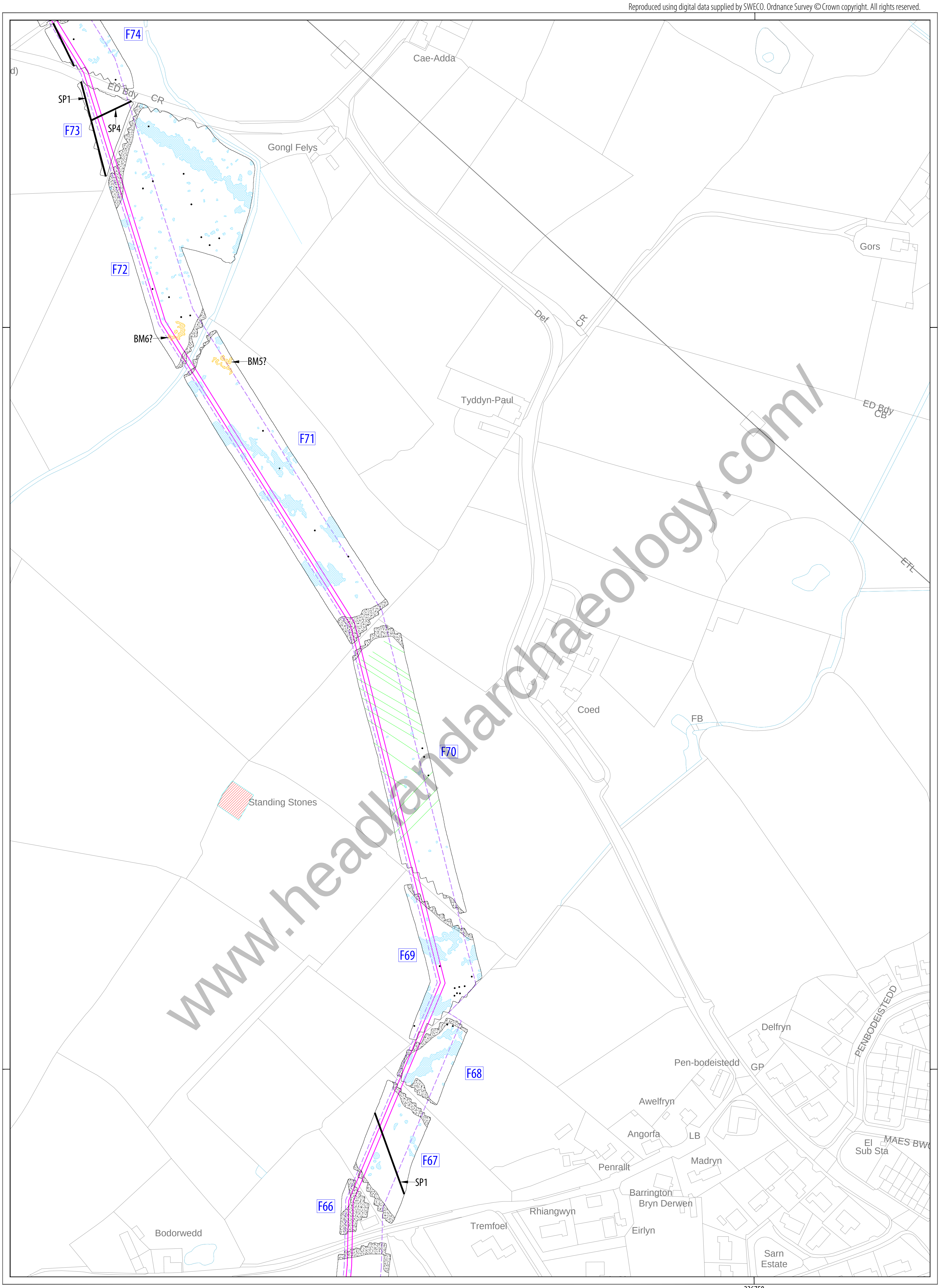
ILLUS 35 XY trace plot of minimally processed magnetometer data; Sector 9



proposed water main
working corridor
area unsuitable for survey
scheduled monument

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

ABBREVIATIONS
BM burnt mound
SP service pipe

N
0 50m
scale 1:2,500 @ A3

PROJECT WPWP/01
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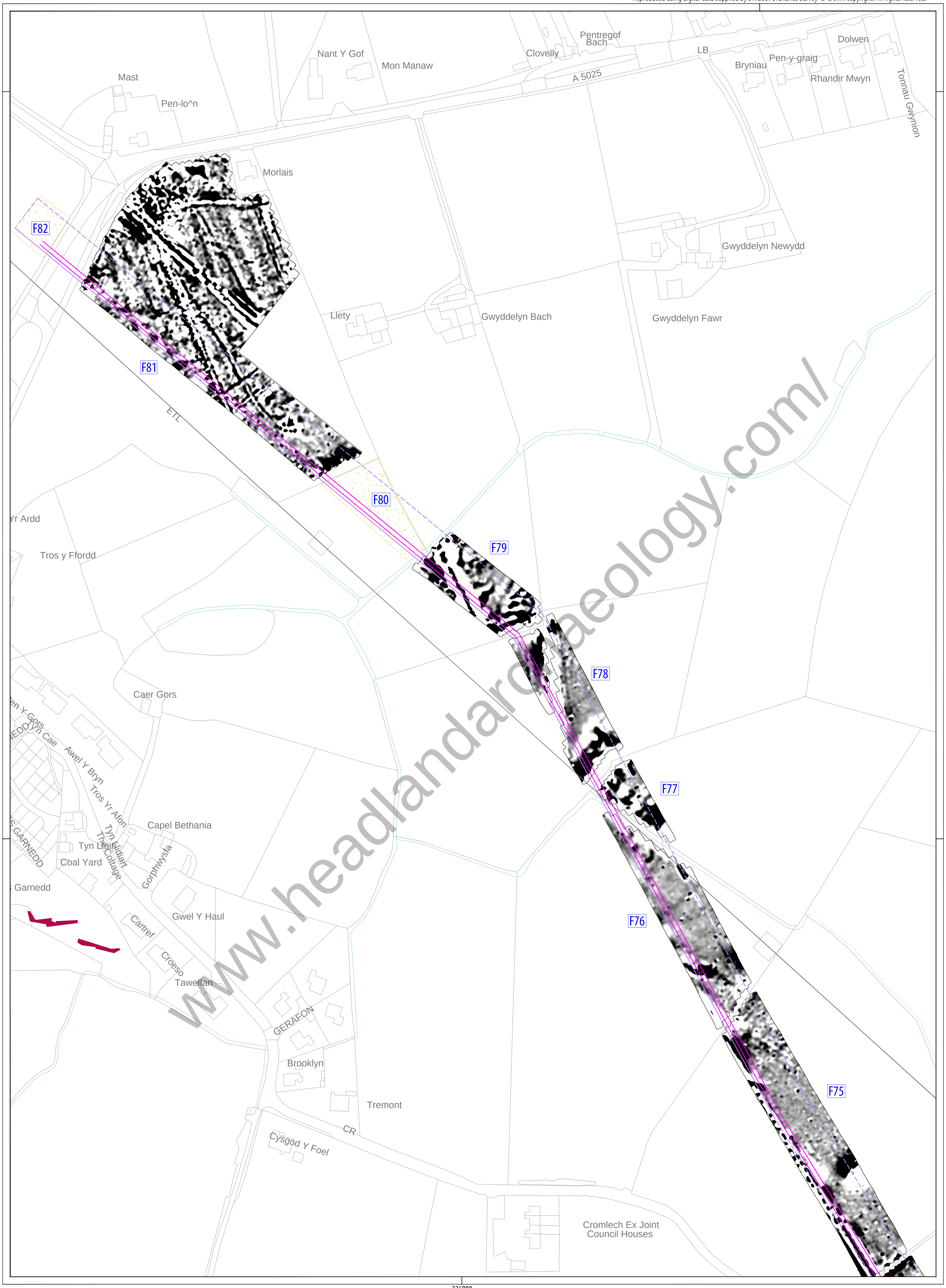
ILLUS 36 Interpretation of magnetometer data; Sector 9



proposed water main
working corridor
outcropping
area unsuitable for survey

nT
-1.0 2.0

N
0 50m
scale 1:2,500 @ A3

PROJECT WPWP/01
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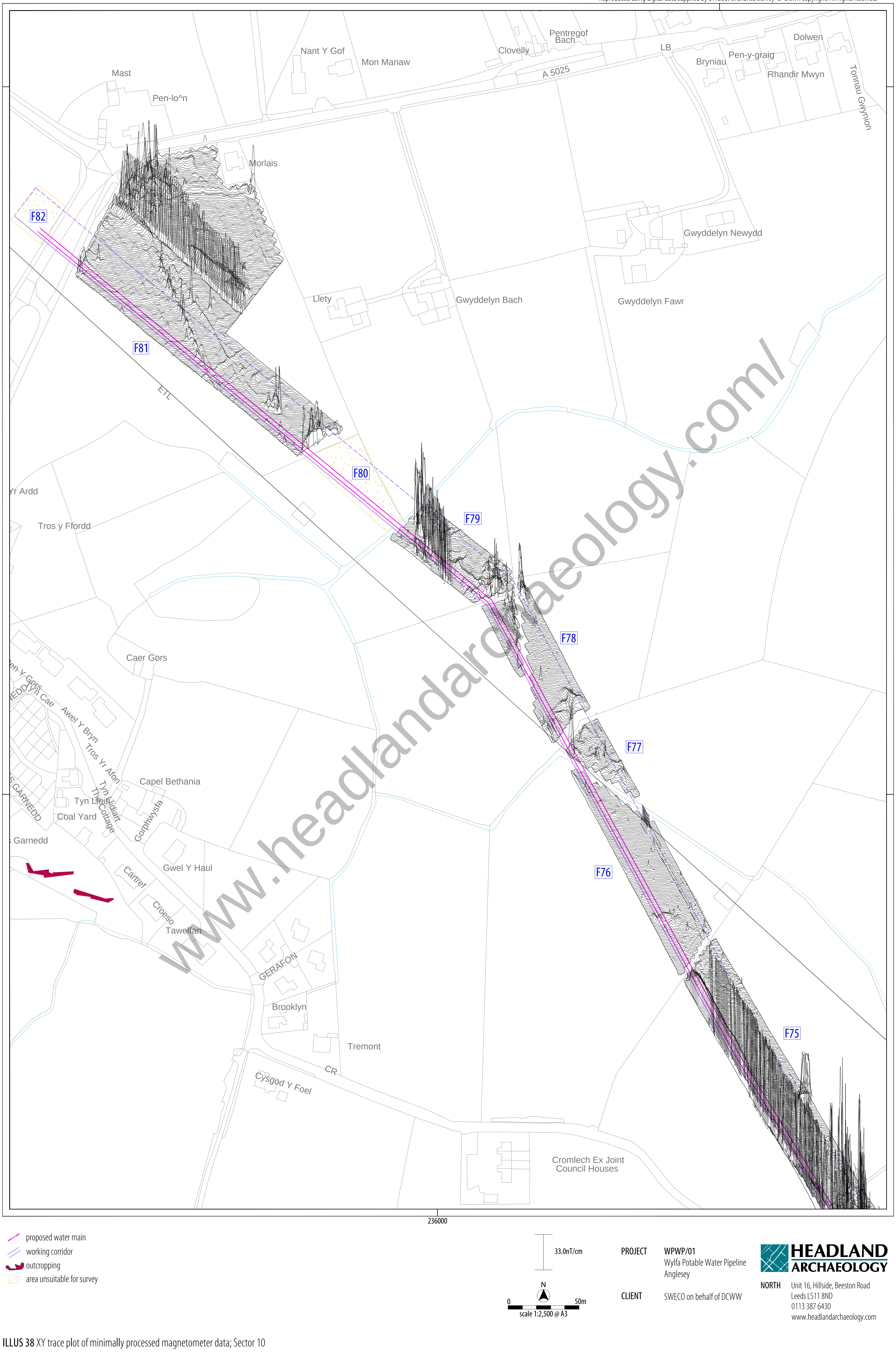
ILLUS 37 Processed greyscale magnetometer data; Sector 10



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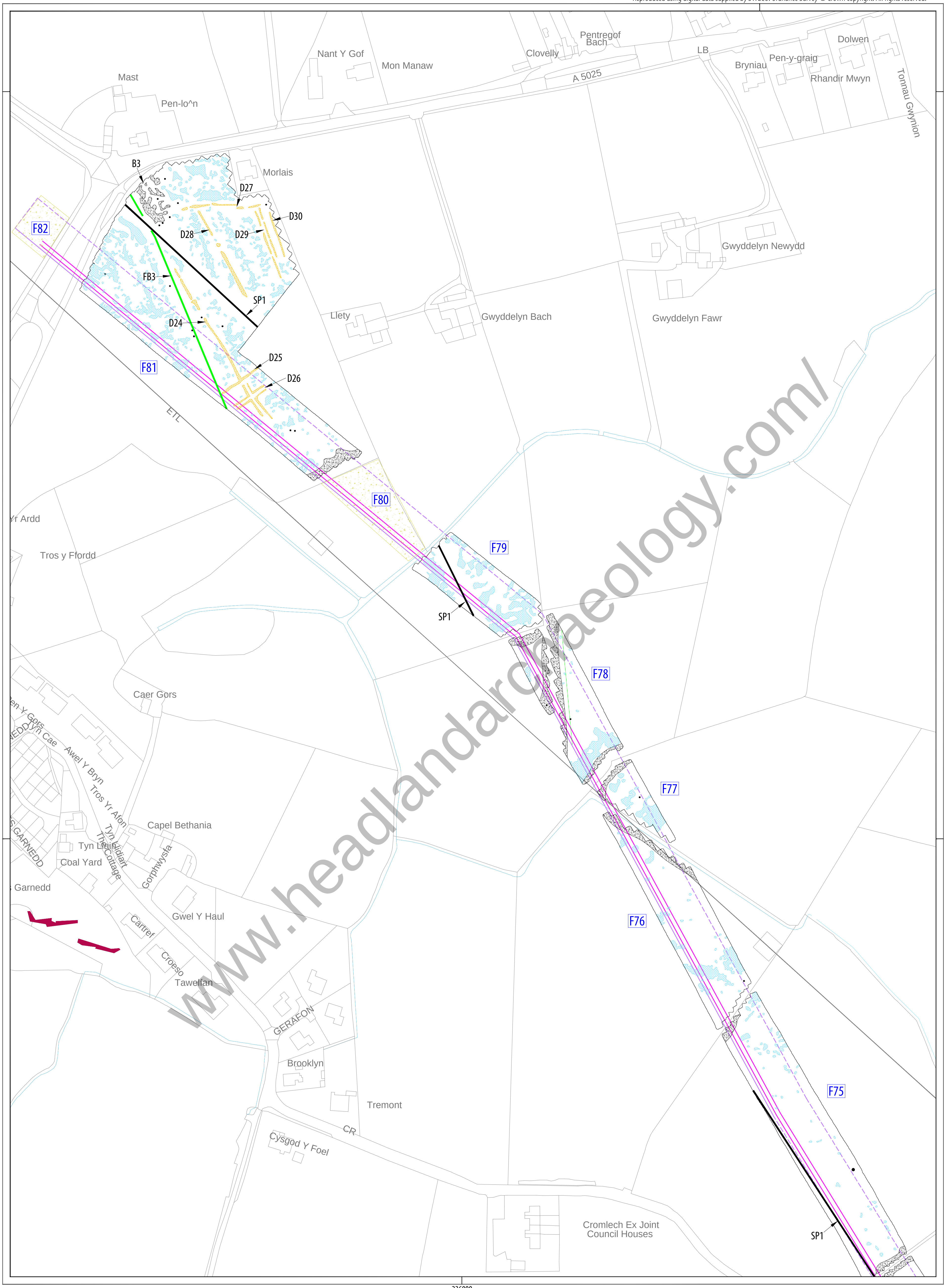
ILLUS 38 XY trace plot of minimally processed magnetometer data; Sector 10



proposed water main	
working corridor	
outcropping	
area unsuitable for survey	

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

TYPE OF ANOMALY	INTERPRETATION
magnetic enhancement	archaeology?

ABBREVIATIONS

B building
D ditch
SP service pipe

N

0 50m
scale 1:2,500 @ A3

PROJECT WPWP/01
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ILLUS 39 Interpretation of magnetometer data; Sector 10