

Trenching in the Ise Valley, Northamptonshire. Kettering East Trunk Sewer Pipeline



Archaeological Evaluation Report



September 2011

Client: Anglian Water

OA East Report No: 1298

OASIS No: oxfordar3-108605

NGR: SP 894 738 - SP 908 633

**Trenching in the Ise Valley, Northamptonshire.
Kettering East Trunk Sewer Pipeline**

Archaeological Evaluation

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HER Event No: n/a
Date of Works: August 2011
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Summary

Oxford Archaeology East undertook an archaeological evaluation on behalf of Anglian Water along the route of a proposed sewer pipeline between Burton Latimer and Wellingborough, Northamptonshire. This route largely followed that of the River Ise, a tributary of the River Nene. Geophysical survey had previously indicated the possible presence of buried archaeological remains. Twenty-three 30m long trenches were excavated along the length of the proposed pipeline. No archaeological remains of any antiquity were revealed in the trenches. Traces of ridge and furrow were, however, present in several trenches and a single Iron Age pottery sherd was recovered from one of the furrows. Some evidence for later post-medieval activity was discovered, which is likely to have been associated with nearby industrial workings in Wellingborough and the Ise valley.

1 INTRODUCTION

1.1 Location and scope of work

- 1.1.1 An archaeological evaluation was conducted by Oxford Archaeology East (OA East) to the south of Kettering and immediately east of Wellingborough along the proposed route of a new sewer pipe. This approximately north-south route is c.6km long and extends between an existing pumping station, immediately east of Wellingborough railway station, to Burton Latimer (SP 894 738 - SP 908 633; Fig. 1).
- 1.1.2 The trenching phase followed a geophysical survey of an area encompassing 5km x 30m of the proposed pipeline route, undertaken by Cranfield University in May 2011. The results of the survey indicated few archaeological remains along the length of the proposed route, with most anomalies probably being associated with modern ferrous debris. Some, however, may have indicated the presence of pit-like features and ditches of either archaeological or natural origin (Enright 2011).
- 1.1.3 This archaeological evaluation was undertaken in accordance with a Brief issued by Lesley-Ann Mather of Northamptonshire County Council (NCC) supplemented by a Specification prepared by OA East.
- 1.1.4 The work was designed to assist in defining the character and extent of any archaeological remains within the proposed redevelopment area, in accordance with the guidelines set out in *Planning Policy Statement 5: Planning for the Historic Environment* (Department for Communities and Local Government 2010). The results will enable decisions to be made by NCC, on behalf of the Local Planning Authority, with regard to the treatment of any archaeological remains found.
- 1.1.5 The site archive is currently held by OA East as there is currently no provision for archival storage within Northamptonshire.

1.2 Geology and topography

- 1.2.1 The pipeline passes through varied geology including Northamptonshire sand and ironstone, Upper Lias clays, terrace gravels and alluvium associated with the River Ise. The evaluated part of the route varies in height between 45m and 50m OD.

1.3 Archaeological and historical background

- 1.3.1 The Brief prepared by Northamptonshire County Council Archaeology Advice Team highlights the following points of archaeological significance:
- The pipeline crosses through a landscape rich in archaeological activity, although a large area of the northern part of the route has been quarried.
 - A Roman road cuts north-south through Barnfield Lodge Farm and is thought to continue to the east of the proposed pipeline.
 - Prehistoric and Romano-British activity has been identified to the west of the proposed route.
 - Little Harrowden Ironworks at the Furnace Lane Industrial Estate is located to the west of the route. A former ironstone railway and embankment is crossed by the proposed pipeline.
 - The Historic Environment Record records a number of cropmarks to the east of the route, south of the Harrowden Road. Extensive archaeological activity

ranging from possible Bronze Age activity through Romano-British to medieval is focused around Harrowden Road and to the south of Hillside Farm, to the east of the pipeline.

- Prehistoric finds have been recorded around the Ise Valley Pumping Station.

1.4 Acknowledgements

1.4.1 Anglian Water commissioned the evaluation; it was monitored by Lesley-Ann Mather of Northamptonshire County Council and managed by Aileen Connor of OA East. Fieldwork was carried out by Pete Boardman and Tom Lyons. The site survey was undertaken by Gareth Rees; report illustration and production was by Lucy Offord.

2 AIMS AND METHODOLOGY

2.1 Aims

- 2.1.1 The objective of this evaluation was to determine as far as reasonably possible the presence/absence, location, nature, extent, date, quality, condition and significance of any surviving archaeological deposits within the line of the proposed sewer pipe.
- 2.1.2 A number of national and local research agendas and aims were identified in the Specification to provide a framework for the interpretation of any archaeological remains found along the proposed pipeline route. These included the study of 'landscape zones' and the development of ceremonial landscapes in the Neolithic to Bronze Age periods; establishing more specific chronologies for the Late Bronze Age/Iron Age; the association of Roman settlements in relation to Iron Age predecessors; and the Roman/Saxon transition.

2.2 Methodology

- 2.2.1 The Brief required that a suitable programme of archaeological investigation be undertaken along the route of the proposed pipeline, concentrating on those areas with higher archaeological potential.
- 2.2.2 Machine excavation was carried out under constant archaeological supervision with a wheeled JCB 3CX excavator using a toothless ditching bucket.
- 2.2.3 The site survey was carried out by Gareth Rees using a Leica GPS 1200.
- 2.2.4 Spoil, exposed surfaces and features were scanned with a metal detector. All metal-detected and hand-collected finds were retained for inspection, other than those which were obviously modern.
- 2.2.5 All archaeological features and deposits were recorded using OA East's *pro-forma* sheets. Trench locations, plans and sections were recorded at appropriate scales and colour and monochrome photographs were taken of all relevant features and deposits.

3 RESULTS

3.1 Introduction

- 3.1.1 The majority of the twenty-three trenches (numbered 1-23, south to north; Fig. 2) were devoid of either archaeological deposits or features, consequently most trenches are therefore omitted from this results section. A full list of trench summaries is included in Appendix A.

3.2 Summary of Trenches (Figs 1-3; Plates 1-4)

- 3.2.1 All trenches were 30m in length and 1.5m wide; all had a topsoil and/or ploughsoil up to 0.3m thick and some had traces of subsoil. None of the trenches revealed any evidence for alluvial or colluvial deposits, or palaeochannels.
- 3.2.2 Trench 3 contained traces of ridge and furrow agriculture along its base (Plate 1). This was oriented east-west and was also visible on the ground surface at the edge of the field approximately 30m to the east.
- 3.2.3 Trench 6 contained significant deposits (up to 1.5m) of modern upcast or make-up material. Upon examination of the immediate area around Trench 6 it was clear that

some form of raised platform had been created; no truncation of underlying levels had taken place.

- 3.2.4 Trenches 7, 8 and 9 contained traces of further modern activity in the form of very shallow cuts which contained modern bricks and a piece of post-medieval bloom slag (Pete Boardman pers. comm.).
- 3.2.5 Trench 10 contained a single large feature backfilled with what appeared to be the remainder of quarried ironstone. It measured 13m across and was investigated in a machine-excavated sondage, which revealed it to be at least 1.4m deep from ground level.
- 3.2.6 Trenches 19 and 20 were excavated perpendicular to surviving remains of ridge and furrow agriculture (Figs 2 and 3; Plate 4). These earthworks were oriented east-west and were present in the western parts of those fields to the north of Finedon Road and west of the River Ise. No other earthworks, features, artefacts or buried horizons were encountered in either trench.

3.3 Finds Summary

- 3.3.1 Artefacts recovered by the evaluation included modern pottery, brick fragments and a small quantity of slag. These were found in the field immediately to the north of the A510, on the flood plain where Trenches 6-9 were located. A single piece of probable Late Iron Age pottery was recovered from a furrow in Trench 3.

3.4 Environmental Summary

- 3.4.1 No deposits suitable for environmental sampling were identified.

4 DISCUSSION AND CONCLUSIONS

4.1 General

4.1.1 Evidence for post-medieval and modern activity recovered from those trenches in the field to the north of the A510 attests to the industrial activity centred around Wellingborough and the lower Ise Valley, and includes possible ironstone quarrying. A north-east to south-west oriented 'tramway' is shown on the 1900 Enclosure map (not illustrated), the construction and use of which would no doubt have resulted in much disturbance of the surrounding ground.

4.1.2 It is perhaps not surprising, given its topographical location, that no archaeology of any antiquity (other than ridge and furrow) was revealed along the route of the proposed pipeline. The evaluated route is located within the flood plain of the River Ise, which is mostly pasture and is therefore unlikely to have been used for much other than agricultural purposes. However, the surrounding area is clearly high in archaeological potential and it is possible that further evidence for settlement and occupation may be present a little higher up the valley slopes. The discovery of a single sherd of probable Iron Age pottery from a furrow in Trench 3 provides tentative evidence for activity of this date in the vicinity.

4.2 Significance

4.2.1 Areas containing little or no archaeological remains are not without significance as they contribute to the wider understanding of land use and occupation in the past.

4.3 Recommendations

4.3.1 Recommendations for any future work based upon this report will be made by the County Archaeology Office.

5 BIBLIOGRAPHY

Enright, C., 2011, *Geophysical Pipeline Survey of Kettering East Trunk Sewer* Cranfield University Forensic Institute Report No. 2011/0502

APPENDIX A. TRENCH DESCRIPTIONS

NB: All trenches were 30m long and 1.5m wide.

Trench No.	Topsoil depth	Subsoil depth	Total depth	Height OD Top	Natural Geology	Comments
1	0.2m	0.2m	0.4m	43m	Compacted silts (brickearth)	Blank trench
2	0.1m	0.2m	1m	43m	Sandy silt with gravel	Contained clay horizon from previous Anglian Water works as well as possible ironstone quarry pit.
3	0.25m	0.3m	0.6m	43m	Compacted silts (brickearth)	Furrow bases visible in trench bottom; existing ridge and furrow visible at edge of field.
4	0.3m		0.4m	43m	Clay	Blank trench
5	0.15m		0.30m	43.3m	Clay	Blank trench
6	0.2m	0.2m	1.5m	44.6m	Clay	Trench contained significant post-medieval / modern make-up levels
7	0.3m		0.5m	43.1m	Clay	Blank trench
8	0.2m		0.4m	43.1m	Clay	Contains some modern shallow holes assoc with industry around River Ise
9	0.3m		0.45m	43.5m	Clay	Contains some modern shallow holes assoc with industry around River Ise
10	0.3m	0.3m	0.6m	44.3m	Silty clay	Contains probable large ironstone quarry pit
11	0.25m	0.1m	0.35m	44.6m	Silty clay	Blank trench
12	0.2m	0.3m	0.5m	45.5m	Clay	Blank trench
13	0.22m	0.15m	0.4m	45.5	Clay	Contains eastern edge of previous Anglian Water pipe easement
14	0.25	0.15m	0.4m	45.5m	Clay	Contains eastern edge of previous Anglian Water pipe easement
15	0.2m	0.2m	0.4m	46.5m	Clay	Blank trench
16	0.2m	0.1m	0.3m	47.1m	Clay	Blank trench
17	0.2m		0.3m	47.7m	Clay	Blank trench
18	0.2m		0.3m	48.2m	Clay	Blank trench
19	0.2m	0.2m	0.4m	50.6m	Sandy silt	Ridge and Furrow, otherwise blank trench.
20	0.2m	0.25m	0.5m	50.5m	Sandy silt	Ridge and Furrow, otherwise blank trench.
21	0.2m	0.2m	0.4m	50.5m	Clay	Blank trench
22	0.2m		0.3m	50.3m	Clay	Blank trench
23	0.2m		0.3m	50.3m	Clay	Blank trench

APPENDIX B. OASIS REPORT FORM

All fields are required unless they are not applicable.

Project Details

OASIS Number	oxfordar3-108605		
Project Name	East Kettering Trunk Sewer		
Project Dates (fieldwork) Start	10-08-2011	Finish	24-08-2011
Previous Work (by OA East)	No	Future Work	Unknown

Project Reference Codes

Site Code	XNNKES11	Planning App. No.	n/a
HER No.	n/a	Related HER/OASIS No.	n/a

Type of Project/Techniques Used

Prompt	Direction from Local Planning Authority - PPS 5
Development Type	Pipelines/Cables

Please select all techniques used:

<input type="checkbox"/> Aerial Photography - interpretation	<input type="checkbox"/> Grab-Sampling	<input type="checkbox"/> Remote Operated Vehicle Survey
<input type="checkbox"/> Aerial Photography - new	<input type="checkbox"/> Gravity-Core	<input checked="" type="checkbox"/> Sample Trenches
<input type="checkbox"/> Annotated Sketch	<input type="checkbox"/> Laser Scanning	<input type="checkbox"/> Survey/Recording Of Fabric/Structure
<input type="checkbox"/> Augering	<input type="checkbox"/> Measured Survey	<input checked="" type="checkbox"/> Targeted Trenches
<input type="checkbox"/> Dendrochronological Survey	<input type="checkbox"/> Metal Detectors	<input type="checkbox"/> Test Pits
<input type="checkbox"/> Documentary Search	<input type="checkbox"/> Phosphate Survey	<input type="checkbox"/> Topographic Survey
<input type="checkbox"/> Environmental Sampling	<input type="checkbox"/> Photogrammetric Survey	<input type="checkbox"/> Vibro-core
<input type="checkbox"/> Fieldwalking	<input type="checkbox"/> Photographic Survey	<input type="checkbox"/> Visual Inspection (Initial Site Visit)
<input checked="" type="checkbox"/> Geophysical Survey	<input type="checkbox"/> Rectified Photography	

Monument Types/Significant Finds & Their Periods

List feature types using the [NMR Monument Type Thesaurus](#) and significant finds using the [MDA Object type Thesaurus](#) together with their respective periods. If no features/finds were found, please state "none".

Monument	Period	Object	Period
ridge and furrow	Uncertain	pottery/CBM	Post Medieval 1540 to 1901
quarry	Post Medieval 1540 to 1901	pottery/CBM	Modern 1901 to Present
	Select period...	pottery	Iron Age -800 to 43

Project Location

County	Northamptonshire	Site Address (including postcode if possible)
District	Wellingborough	
Parish	Multi	
HER	Northamptonshire	
Study Area	6km	National Grid Reference
		SP 894 738 - SP 908 633

Project Originators

Organisation	OA EAST
Project Brief Originator	Lesley-Ann Mather
Project Design Originator	Aileen Connor
Project Manager	Aileen Connor
Supervisor	Thomas Lyons

Project Archives

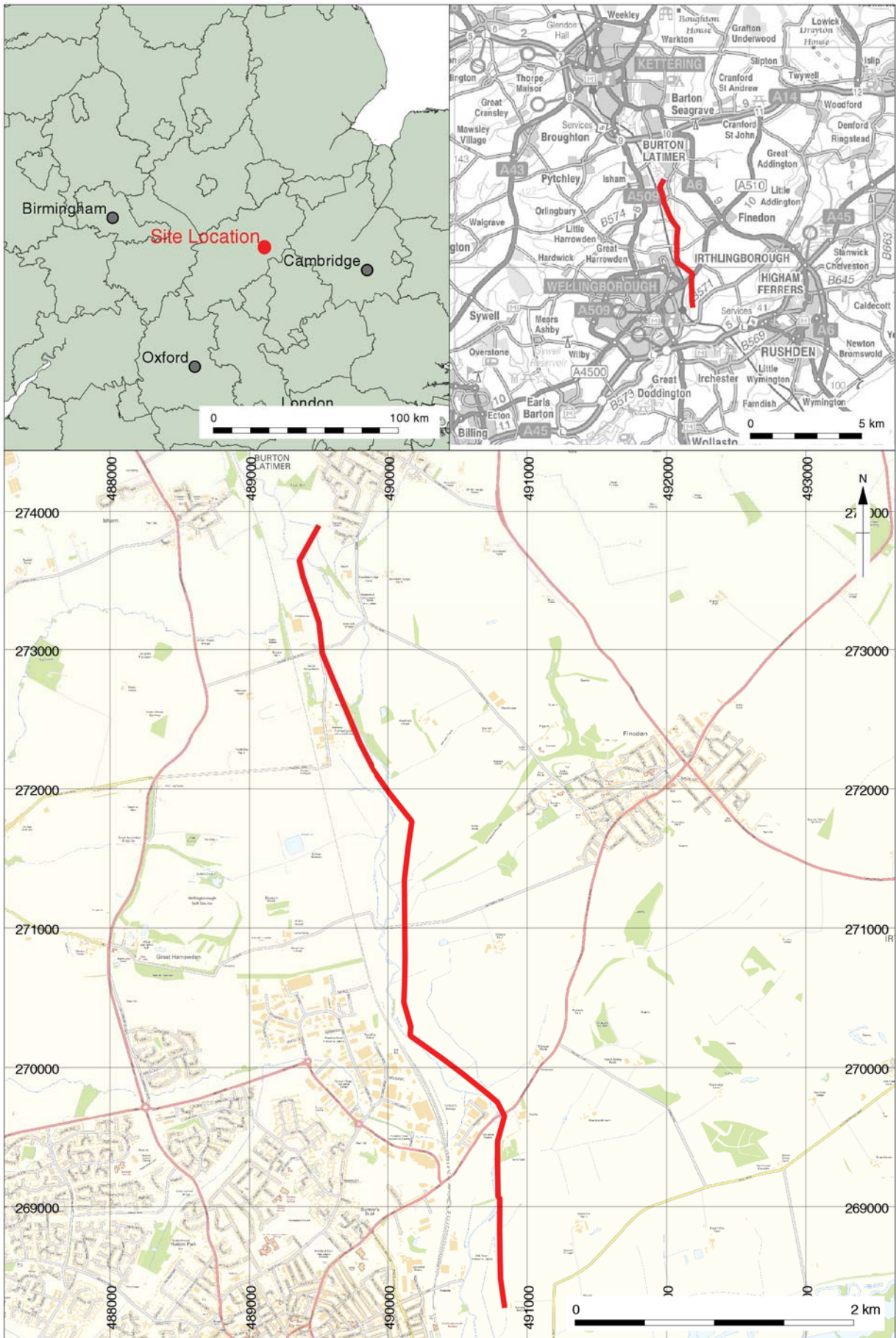
Physical Archive	Digital Archive	Paper Archive
OA EAST	OA EAST	OA EAST
XNNKES11	XNNKES11	XNNKES11

Archive Contents/Media

	Physical Contents	Digital Contents	Paper Contents
Animal Bones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ceramics	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human Bones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Industrial	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leather	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stratigraphic		<input type="checkbox"/>	<input type="checkbox"/>
Survey		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Textiles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Worked Bone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Worked Stone/Lithic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Digital Media	Paper Media
<input type="checkbox"/> Database	<input type="checkbox"/> Aerial Photos
<input type="checkbox"/> GIS	<input checked="" type="checkbox"/> Context Sheet
<input type="checkbox"/> Geophysics	<input type="checkbox"/> Correspondence
<input type="checkbox"/> Images	<input type="checkbox"/> Diary
<input type="checkbox"/> Illustrations	<input type="checkbox"/> Drawing
<input type="checkbox"/> Moving Image	<input type="checkbox"/> Manuscript
<input type="checkbox"/> Spreadsheets	<input type="checkbox"/> Map
<input checked="" type="checkbox"/> Survey	<input type="checkbox"/> Matrices
<input type="checkbox"/> Text	<input type="checkbox"/> Microfilm
<input type="checkbox"/> Virtual Reality	<input type="checkbox"/> Misc.
	<input type="checkbox"/> Research/Notes
	<input checked="" type="checkbox"/> Photos
	<input checked="" type="checkbox"/> Plans
	<input checked="" type="checkbox"/> Report
	<input checked="" type="checkbox"/> Sections
	<input type="checkbox"/> Survey

Notes:



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Figure 1: Site Location showing route of pipeline (red)

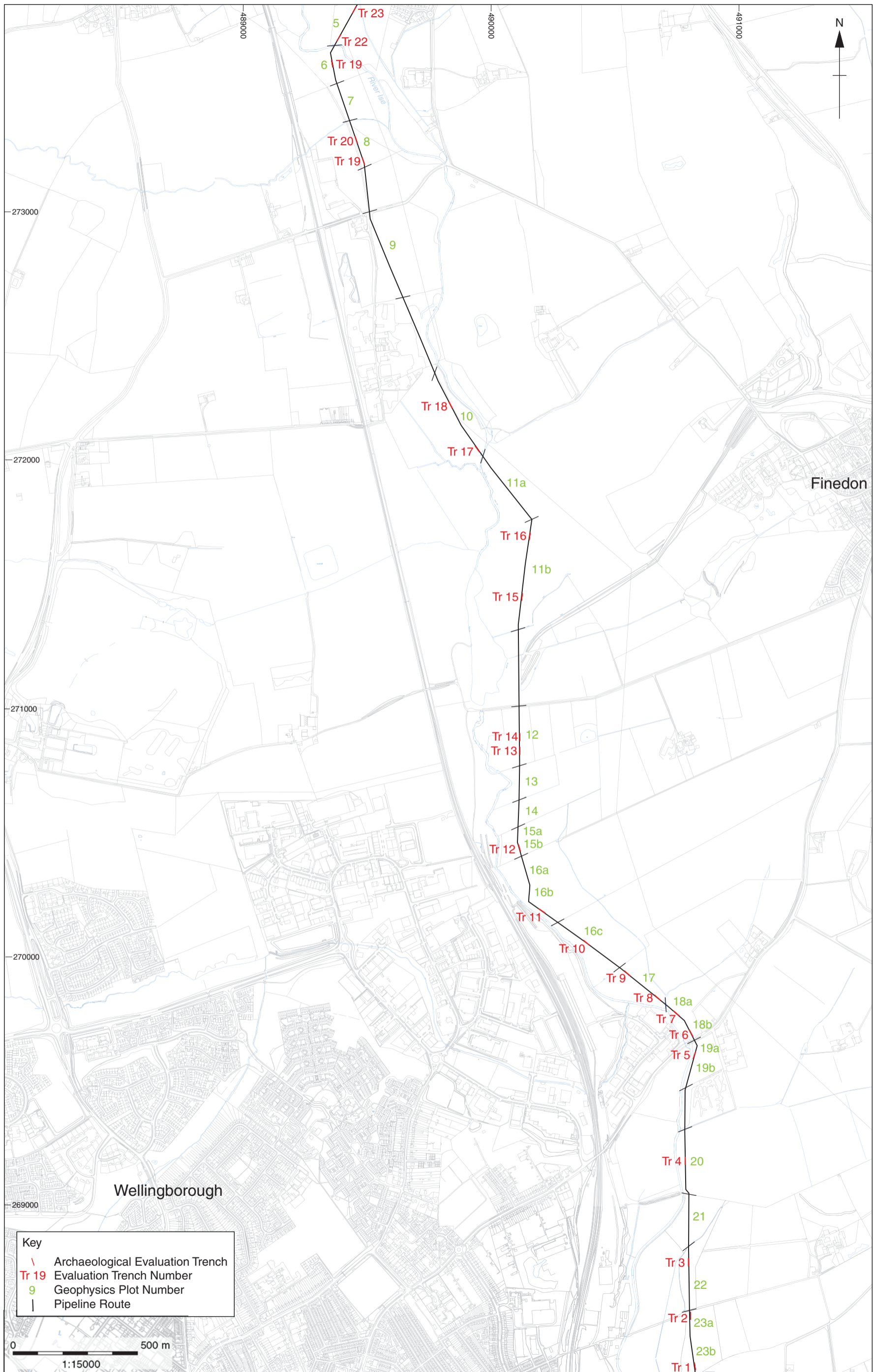


Figure 2: Trench Locations

The plan is produced by Anglian Water Services Ltd from Ordnance Survey Crown Copyright 100018507. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other use of the map data or further copies are not permitted.

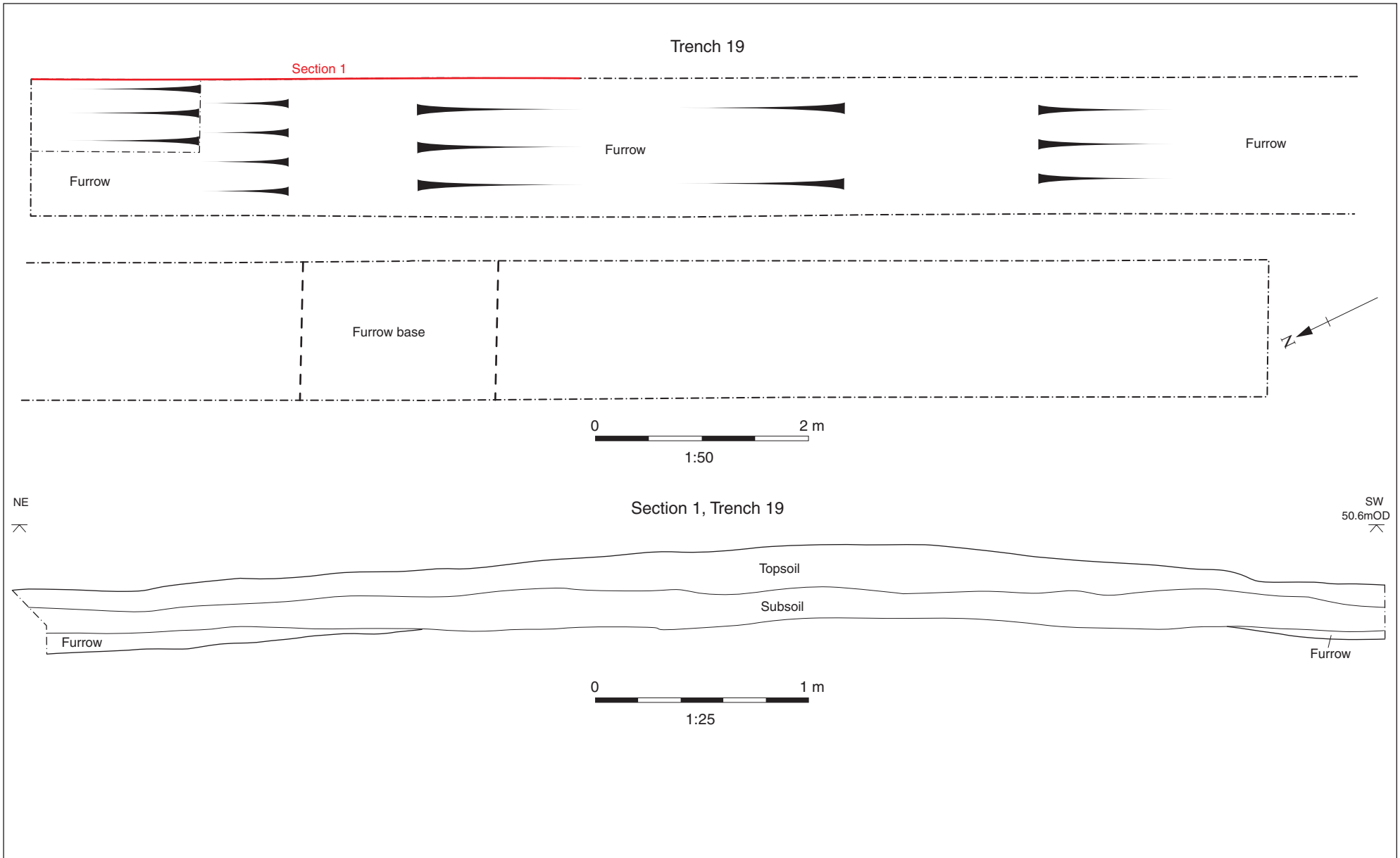


Figure 3: Trench 19 plan & section



Plate 1: Trench 3



Plate 2: Trench 7



Plate 3: Trench 16



Plate 4: Trench 20

APPENDIX C. GEOPHYSICS REPORT



GEOPHYSICAL PIPELINE SURVEY OF KETTERING EAST TRUNK SEWER

Cranfield Forensic Institute Report No. 2011/0502

Charles Enright

17/06/2011

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Abstract

A fluxgate gradiometer survey was conducted along the proposed route of a pipeline between and to the east of Burton Latimer (SP 894 738) and Wellingborough (SP 908 633), Northamptonshire.

The survey took place in May 2011 on behalf of Oxford Archaeology as part of a planning proposal for future development.

A total of 15ha (5km x 30m wide) was surveyed of the proposed pipeline route.

The gradiometer survey results show little evidence of archaeological remains with most anomalies likely to be associated to modern ferrous debris.

A number of linear/discrete ditch and pit like anomalies were detected in fields 2, 4, 8, 12, 17 and 18. Some of these probably indicate natural features such as paleochannels and isolated pockets of ferrous rich minerals with enhanced magnetism. These deposits tend to resolve in a similar fashion to pits and ditches.

1 Introduction

Oxford Archaeology East, acting on behalf of Anglican Water Services Ltd, commissioned the Centre for Archaeological and Forensic Analysis, Cranfield University to undertake a fluxgate gradiometer survey of land along a 5km section of proposed water pipeline in Northamptonshire. The survey was conducted in May 2011.

The survey methodology described in this report was based on guidelines set out in the English Heritage document 'Geophysical Survey in Archaeological Field Evaluation' (EH 2008).

2 Location and Description

Sections 2 and 3 contain information extracted from an archaeological desk based assessment of the site by Oxford Archaeology East.

Anglican Water Services intend to install a water pipeline between and to the east of Burton Latimer (NGR SP 894 738) and Wellingborough (NGR SP 908 633), Northamptonshire. At several points along its course the pipeline crosses the River Ise.

On its route the pipeline passes through varied geology including Northamptonshire sand and ironstone, upper lias clays terrace gravels and alluvium associated with the River Ise.

3 Background Information

The pipeline passes through a landscape that is rich in archaeological activity. At Barnfield Lodge Farm close to the start of the pipeline at Burton Latimer a Roman road runs north/south and is believed to continue to run parallel to the east of the pipeline. To the west of the proposed route Prehistoric and Romano British activity has been identified. A number of Prehistoric finds have been recorded around the Ise Valley Pumping Station.

A number of crop circles have been identified to the east of the route just south of Harrowden Road. Extensive archaeological activity is focused around Harrowden road and to the south of Hillside Farm which lie to the east of the pipeline. This activity includes possible Bronze Age activity through Romano British and up to Medieval.

4 Methodology

Magnetometry is a non-invasive scientific prospecting technique used to determine the presence/absence of some classes of sub-surface archaeological features (e.g. pits, ditches, kilns and occasionally stone walls). By surveying the soil surface, geophysical operators can identify areas of varying magnetic properties and by presenting the data in various graphical formats, identify features that share morphological affinities with diagnostic archaeological as well as more modern structures (Clark 1990).

In order to minimise the influence of variations in the earth's magnetic field, a gradiometer was used. A gradiometer is a combination of at least two magnetometers, which are mounted vertically. While the upper sensor measures the earth's magnetic field, the lower sensor measures the earth's magnetic field and any influence the soil has

on it. By subtracting the two values measured from each other, the soil's magnetic properties are isolated.

A detailed survey was conducted using a Bartington Grad 601 dual fluxgate gradiometer with DL601 data logger set to take 4 readings per metre (a sample interval of 0.25). The zigzag traverse method of survey was used, with 1m wide traverses across 30m x 30m grids. The sensitivity of the machine was set to detect magnetic variation in the order of 0.1 nanoTesla. A corridor of 5km by 30m wide was surveyed, this included 15m either side of the central line of the pipeline. These parameters were kept to wherever possible.

The data was processed using *Archeosurveyor*v.2.5.7.19. The results were plotted as greyscale and trace plot images.

The enhanced data was processed by using zero-mean functions to correct the unevenness of the image in order to produce a smoother graphical appearance. It was also processed using an algorithm to remove magnetic spikes, thereby reducing extreme readings caused by stray iron fragments and spurious effects due to the inherent magnetism of soils. The data was also clipped to reduce the distorting effect of extremely high or low readings caused by discrete pieces of ferrous material.

5 Interpretation of Results

A detailed fluxgate gradiometer survey was carried out within the proposed development area covering approximately 15 hectares. The survey was undertaken across 23 fields (1 – 23). These were surveyed from north to south and the results are presented consecutively, commencing with **Field 1**).

A series of isolated individual anomalies have been observed to occur across the entire survey area (Pink circles). These reflect areas of modern ferrous debris such as brick and tile fragments as well as horse shoes and plough shares, which lie just below or on the surface of plough soil.

5.1 Field 1 (figs 1, 2 & 6)

Field 1 contains a number of pit-like anomalies (red circles) that may reflect buried pits of archaeological origin. However, it is also feasible to suggest that they represent natural features of isolated pockets of ferrous rich alluvium associated to the river Ise.

In the mid section a zone of high magnetism has been detected (Green rectangle), it would appear that this is more likely to be a result of underlying geology and silt build up as opposed to anything of archaeological interest.

5.2 Field 2 (Figs. 1, 2 & 6)

The gradiometer has detected a ditch like feature (red line). This may reflect a buried ditch feature, but again it is more likely to be a similar anomaly as the pit like features in **Field 1** and be a result of highly magnetic silt build up.

5.3 Field 3 (Fig 1, 2 & 7)

The curvilinear high magnetic feature on the east of the survey area may account for a paleochannel, a now redundant creek that once meandered along the flood plains. Heavy deposits of highly magnetic alluvium would explain its strong magnetic response. A second, similar anomaly has been detected to the west of this.

5.4 Field 4 (Fig 1, 2 & 7)

A number of isolated individual anomalies were recorded in the resultant grey scale image (red circles). They appear to be similar to those already recorded in previous fields. It is possible that they do hold archaeological potential but may resolve as nothing more than the geology typical of the area.

Other anomalies in the area defined by the green rectangle do not appear to reflect anything of archaeological interest and are most likely to be an affect of the underlying geology.

5.5 Field 5 (Fig 1, 2 & 8)

More scatterings of pit-like anomalies have been detected throughout this survey area, some of which may hold a archaeological significance. Others or even all may be of natural form.

The magnetic disturbance detected in the north east corner (blue square) is a typical response caused by interference from modern services. In this particular case it has been caused by a service pipe on the surface.

5.6 Field 6 (Fig 1, 2 & 9)

Along the Western border of this field strong magnetic interference was created by the presence of a modern day sub-surface service pipe (Blue lines).

A weak magnetic linear feature (yellow dashed line) has been detected truncating the survey area in an east to west orientation. This appears to be very ephemeral in nature and possibly denotes a former track way or field boundary.

Centrally located in the survey area is a strong dipolar anomaly (orange circle). This could indicate an area of burning or industrial activity resulting in enhanced magnetism. It does not share the common similarities associated to kilns and it is possible that it could represent modern ferrous material such as a large metal object.

5.7 Field 7 (Fig 1, 2 & 10)

The survey detected a strong linear anomaly (blue line) in the mid section of the field. This strong magnetic variation will almost certainly represent the signature of a modern service pipe.

In the southern corner of the field the magnetic interference is likely to be a response from a second service that runs along the boundary of the field as depicted on the surface by raised man hole covers.

A zone of low magnetism (Green circle), possibly indicates an area of enhanced magnetism in the topsoil or could be caused by underlying geology or a post processing artefact.

5.8 Field 8 (Fig 1, 2 & 11)

Aside from a scattering of ferrous debris (pink circles) the survey detected nothing of archaeological potential in this area. The strong magnetic linear anomaly along the southern boundary is a result of a modern day service.

5.9 Field 9 (Fig 1, 2 & 12)

Only the first two grids were surveyed in this area as the centre line of the survey virtually lined up with raised man hole covers. This would have caused significant magnetic interference from the sub surface pipe connecting the man holes masking any archaeological features.

The magnetic variation (blue line) is an example of a typical response from close proximity to a modern utility service.

5.10 Field 10 (fig 1, 3 & 13)

For this area a corridor of 15m wide was used as opposed to the 30m used in other areas. This was so as to avoid close contact with a modern sub surface utility which was depicted on the service by the raised man hole covers. Magnetic interference from this would have almost certainly masked more subtle archaeological features.

A number of strong magnetic anomalies (orange circles) have been detected across this survey area. It is possible they represent areas of burning which result in enhanced magnetism. However they may resolve as large items of ferrous debris.

Towards the eastern edge of the surface a linear feature (red line) has been detected. It is possible to suggest that this reflects a buried ditch, although it is also feasible that it signifies an isolated pocket of ferrous rich silts associated to the River Ise.

5.11 Field 11 Fig 1, 3, 14 & 15)

The survey area in this field was largely affected by the modern service pipe (blue lines). In Field 13a (Figure 14, 1) a discrete area of high magnetic variation has been observed. Due to the magnetic signature of this it is most probably associated with modern ferrous debris.

In the second half of this survey area (Field 13b, Figure 15) magnetic interference from the modern service continues to be observed. At the mid section a faint linear feature orientated in a south/east to north/west trajectory (yellow dashed line) has been detected. The signature of this anomaly is faint and may represent a ephemeral feature such as a track way or field boundary.

5.12 Field 12 (Fig 1, 4 & 16)

A number of individual pit-like features have been recorded scattered throughout the survey area. It is difficult to determine their origin as archaeological pits or natural features typical of this geology due to the similarities between them. Their potential may be enhanced due to the scattering of ferrous debris (pink circles) interspersed around them. Some of these have strong magnetic signatures which may indicate that they represent an area of burning.

5.13 Field 13 (Fig 1, 4 & 17)

Strong magnetic interference has been detected along the eastern boundary of the survey area (blue line) due to close proximity to the modern service pipe occupying the area.

A second service pipe can be seen truncating the survey area along a east to west orientation.

There is little evidence of archaeological remains in this area.

5.14 Field 14 (Fig 1, 4 & 18)

Field 14 is a relatively featureless landscape in terms of anything that can be considered archaeologically significant.

A strong magnetic interference has been detected along the eastern edge of the survey area (blue line) caused by the modern service pipe.

5.15 Field 15 (Fig 1, 4 & 19)

There is no evidence of anything in this survey area that may pertain to archaeological remains. The anomalies detected appear to be caused by modern day interference of ferrous debris and service pipes.

5.16 Field 16 (fig 1, 4, 20 & 21)

Through the midsection of area 16a the modern service pipe has caused significant interference (blue line). The strength of this magnetic variation is likely to have masked any subtle variations caused by archaeological remains.

In the second section of the survey area (16b) a second service pipe can be seen truncating the area at the mid section (blue line).

In the final section of this survey area (16c) a zone containing a scattering of dipolar anomalies have been detected (pink circles). These 'spikes' in the data do not appear to be akin to archaeological remains and may resolve as nothing more than geological or modern ferrous debris. In the eastern corner the effects of the modern service pipe have been detected (blue line).

5.17 Field 17 (fig 1, 4 & 22)

Two individual ditch like features have been detected truncating the survey area (red lines) as well as a pit like feature (red circle). It is not possible to determine any relationship between these features and it is possible that they reflect buried ditches and a pit. However, caution must be taken with this interpretation as it is also feasible that they are natural features caused by a build up of silts and peaty deposits caused by flooding of the nearby River Ise

5.18 Field 18 (fig 1, 4 & 23)

Isolated areas of enhanced magnetism have been detected across this field. Many of them exhibit a dipolar response (examples pink circles) and most likely signify modern ferrous debris. Towards the mid section a particularly strong dipole response has been recorded. This may represent an area of burning,

More pit like features have been detected in the second half of this field (18b, red circles). As mentioned previously caution must be taken when interpreting these as archaeological or natural.

5.19 Field 19 (Fig 1, 4 & 24)

In section 19a more pit like anomalies have been detected (red circles). In section 19b a modern service utility pipe has caused magnetic interference along the northern border (blue line).

5.20 Field 20 (Fig. 1, 5 & 25)

A relatively featureless survey area with a few scatterings of isolated dipolar anomalies that will most likely resolve as nothing more than ferrous debris (pink circles).

Towards the mid section a high magnetic anomaly has been detected, a response similar to that exhibited by pit like features. This may well represent a natural feature due to a build up of alluvium.

5.21 Field 21 (Fig. 1, 5 & 26)

Along the eastern border of the survey area the magnetic variation is a typical response from modern ferrous material.

Other anomalies detected include a scattering of dipolar responses (pink circles) resulting from modern ferrous debris.

5.22 Field 22 (1, 5 & 27)

This survey area appears to contain no remains that may relate to anything archaeological. A number of dipole anomalies (pink circles) were detected but these will most probably be associated to modern ferrous debris.

5.23 Field 23 (Fig 1, 5 & 28)

Strong dipolar anomalies have been detected throughout the survey area caused by modern ferrous debris. Two anomalies to the south of section 23A exhibit strong dipolar responses and may represent areas of burning. However they may resolve as more ferrous debris such as large metal objects.

In section B of this field the strong magnetic variation is caused by close proximity to modern services.

There appears to be nothing that may correspond to archaeological remains in this area.

6 Conclusions

The survey appears to have identified little evidence of archaeological remains. The majority of anomalies appear to be the remains of modern ferrous debris, effects from a service pipe and natural geological features.

Other anomalies (red lines and red circles) possibly indicate the presence of pit-like features and ditches, some of which may have an archaeological origin but they could also represent natural features considering the very nature of this type of geology. The close proximity of archaeological remains as discussed in the **Background Information** section does enhance their potential significance.

Based on the results it is concluded that for the most part the archaeological potential is low. It is likely that if archaeological remains do exist on the site, they may have been masked by the modern ferrous disturbances or are too weak to be detected by the fluxgate gradiometer.

7 Acknowledgements

The Cranfield Forensic Institute would like to thank Richard Aileen Connor from Oxford Archaeology East for the commission of this report.

8 Bibliography

British Geological Survey, 2011, map for Newton-on-Trent on

http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html

Clark, A.J., 1990, Seeing Beneath the Soil. London: Batsford

Appendix A: Overview Map

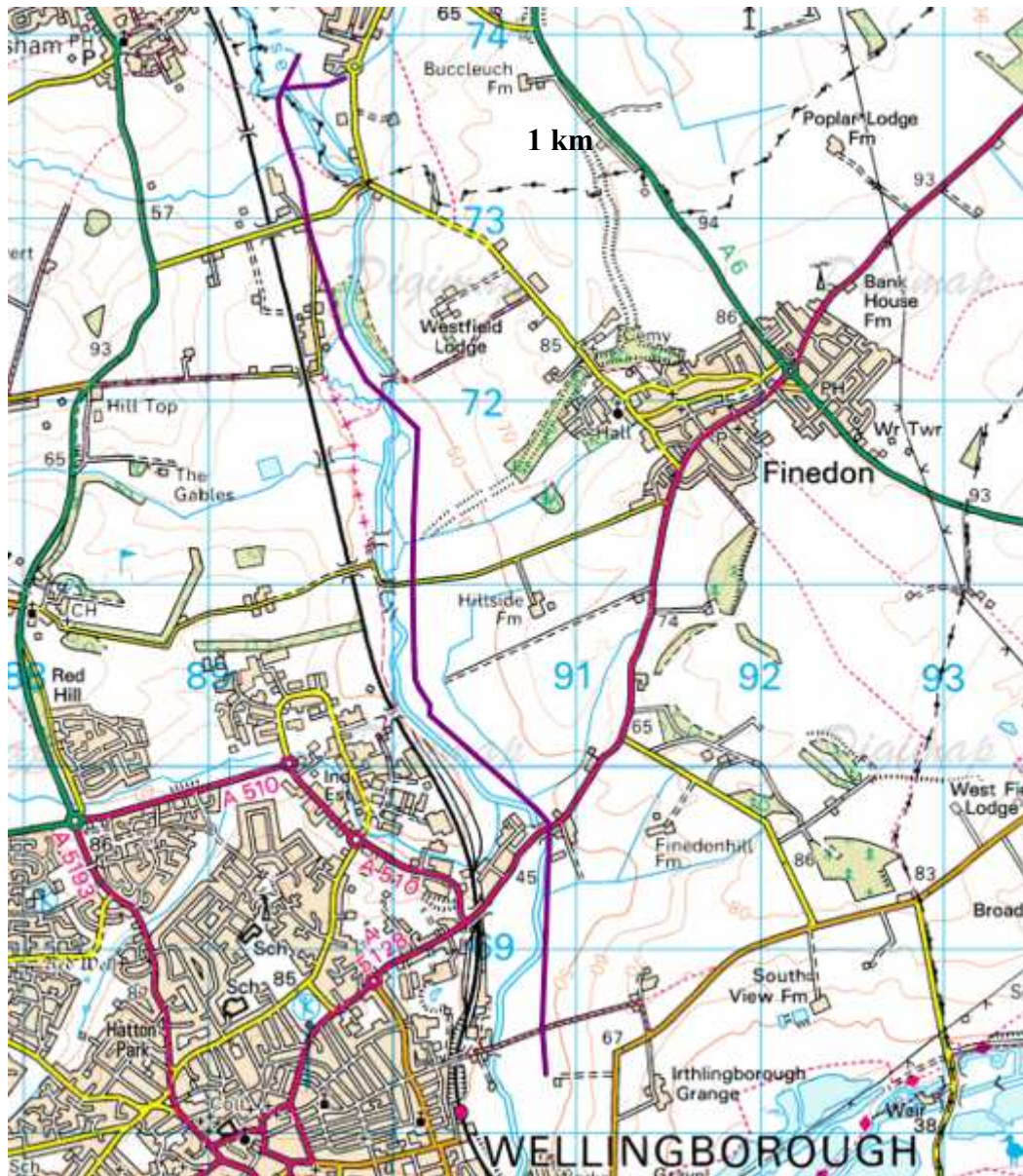


Figure 1: Overview map of surveyed area (Crown Copyright 2011 Ordnance Survey Map; Grid reference: SP 894 738 to SP 908 633).

— Pipeline Route

Appendix B: Location of Survey (A)

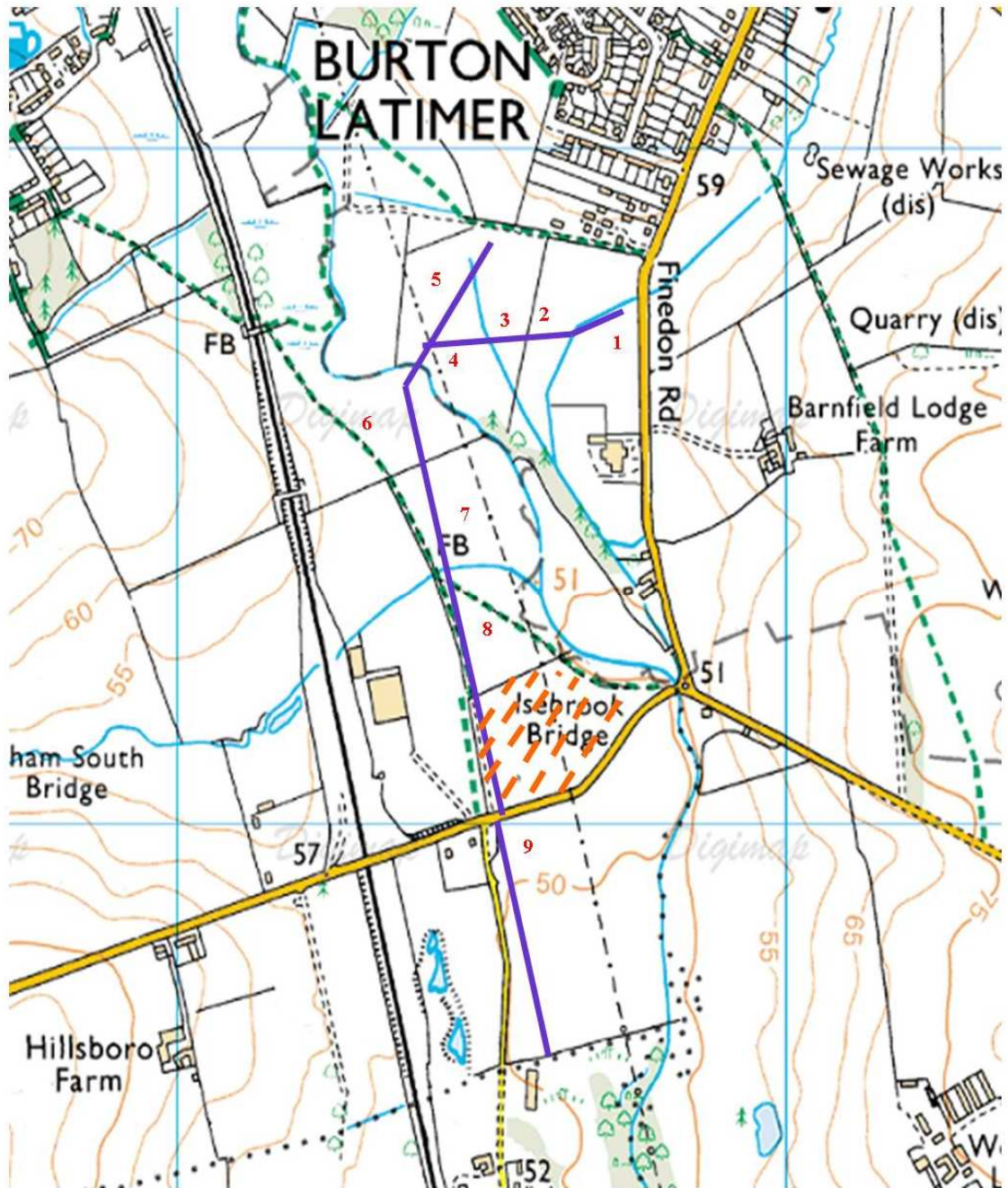




Figure 2: Location of survey part A (Crown Copyright 2011 Ordnance Survey Map).

-  Pipeline route
-  Area not surveyed/unsurveyable

Appendix C: Location of survey (B)

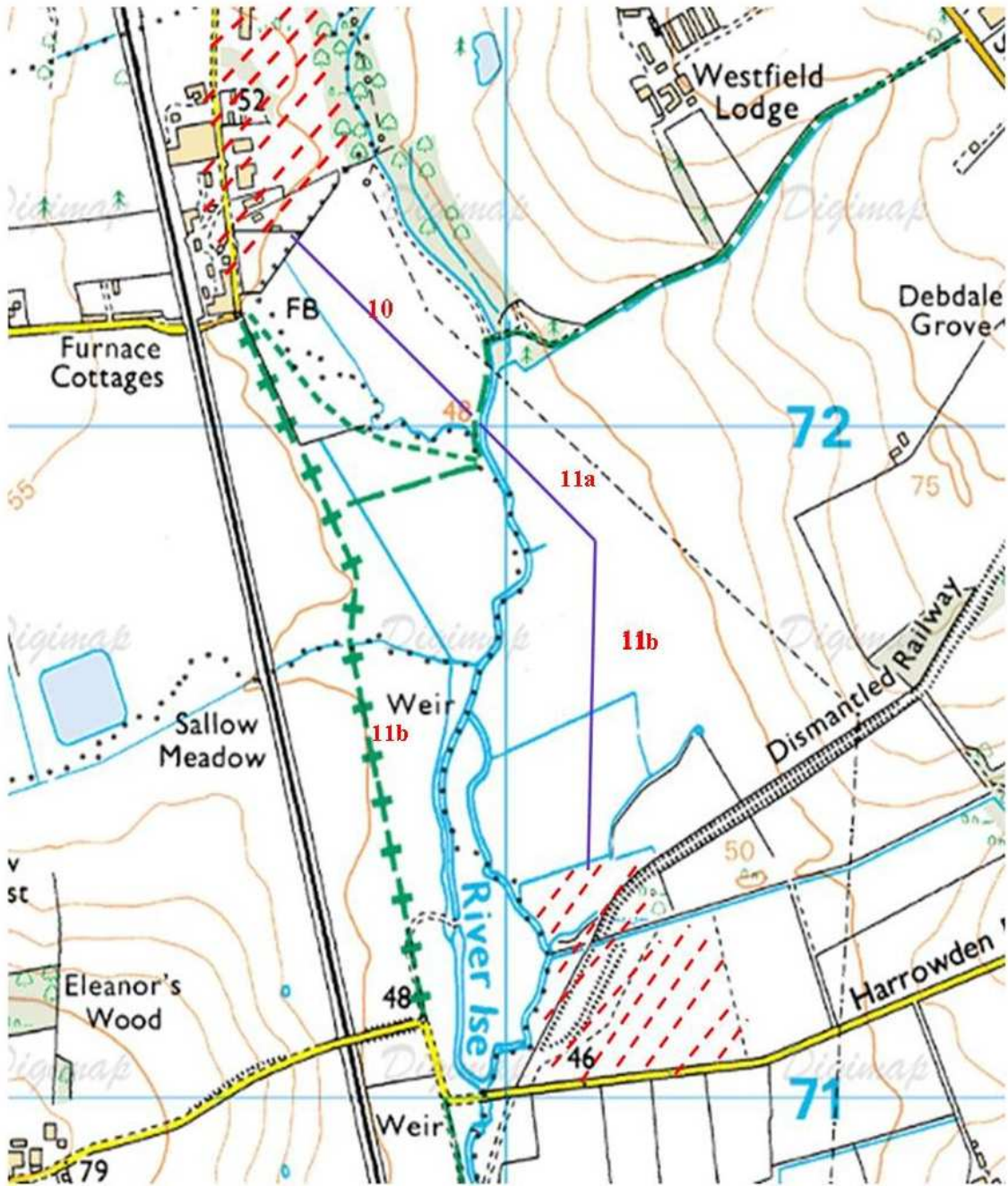




Figure 3: Location of Survey part B (Crown Copyright 2011 Ordnance Survey Map.

-  Pipeline route
-  Area not surveyed/unsurveyable

Appendix D: Location of Survey (C)

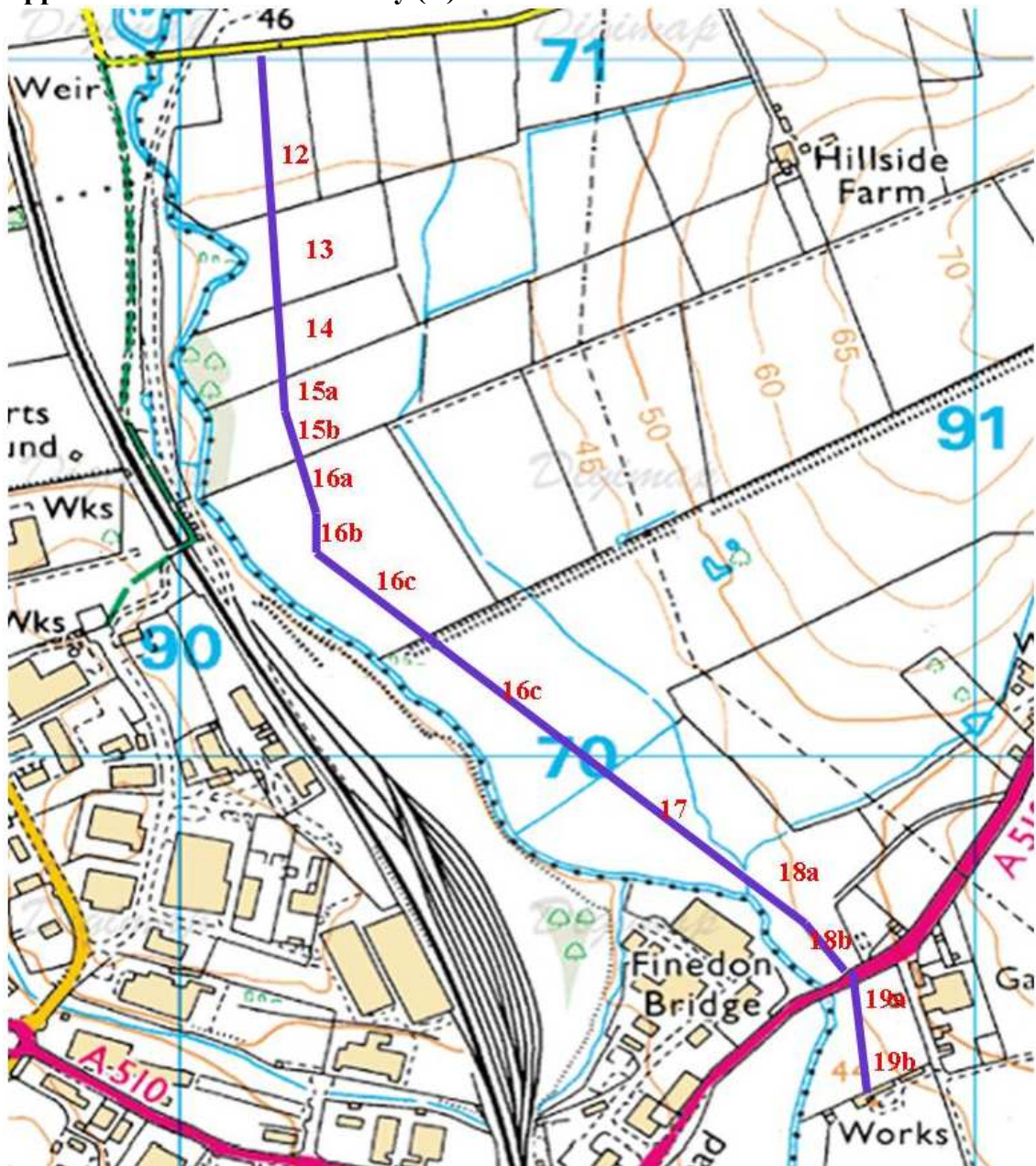




Figure 4: Location of Survey Part C (Crown Copyright 2011 Ordnance Survey Map).

-  Pipeline route
-  Area not surveyed/unsurveyable

Appendix E: Location of Survey (D)

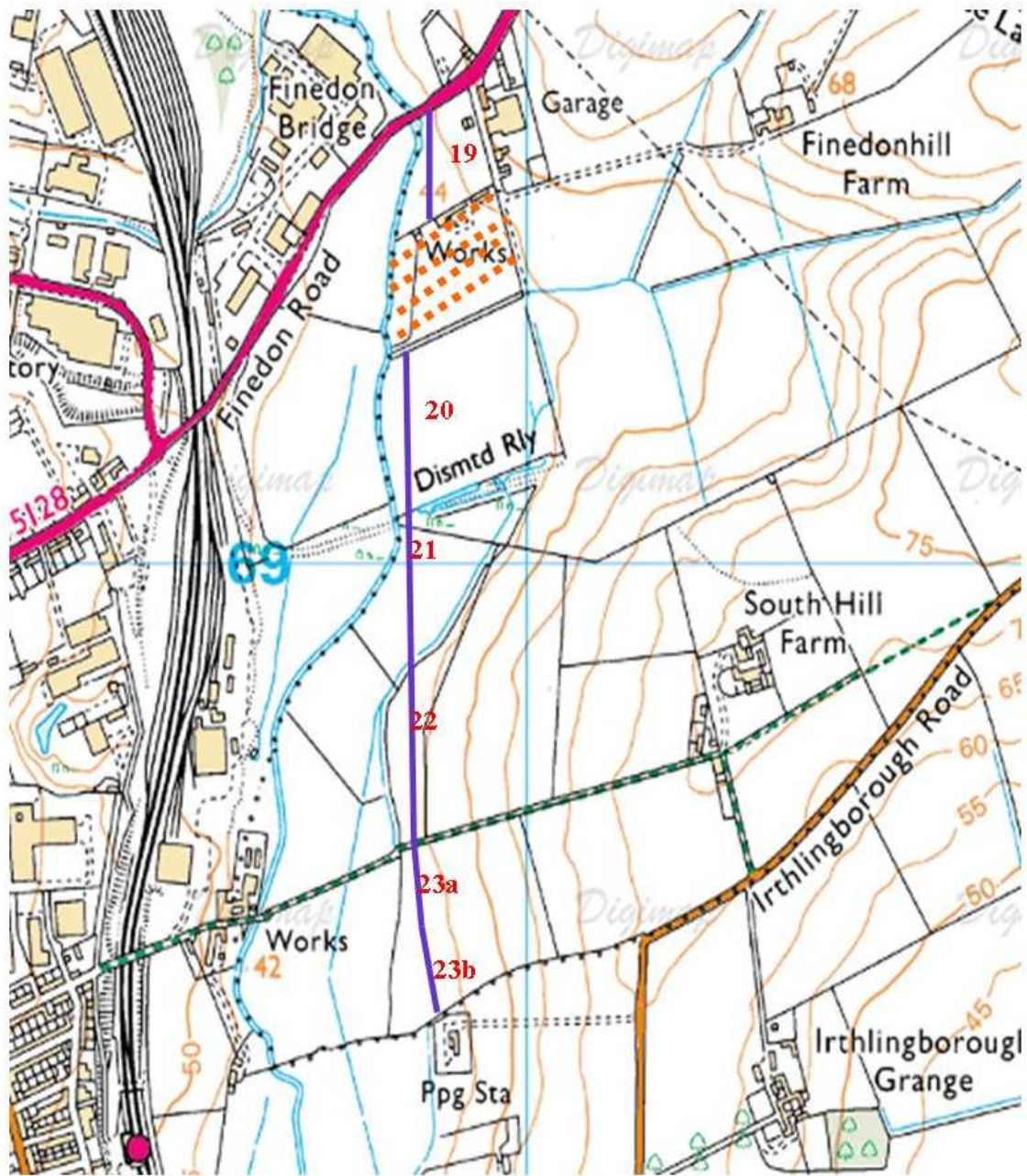




Figure 5: Location of Survey Part D (Crown Copyright 2011 Ordnance Survey Map).

-  Pipeline route
-  Area not surveyed/unsurveyed

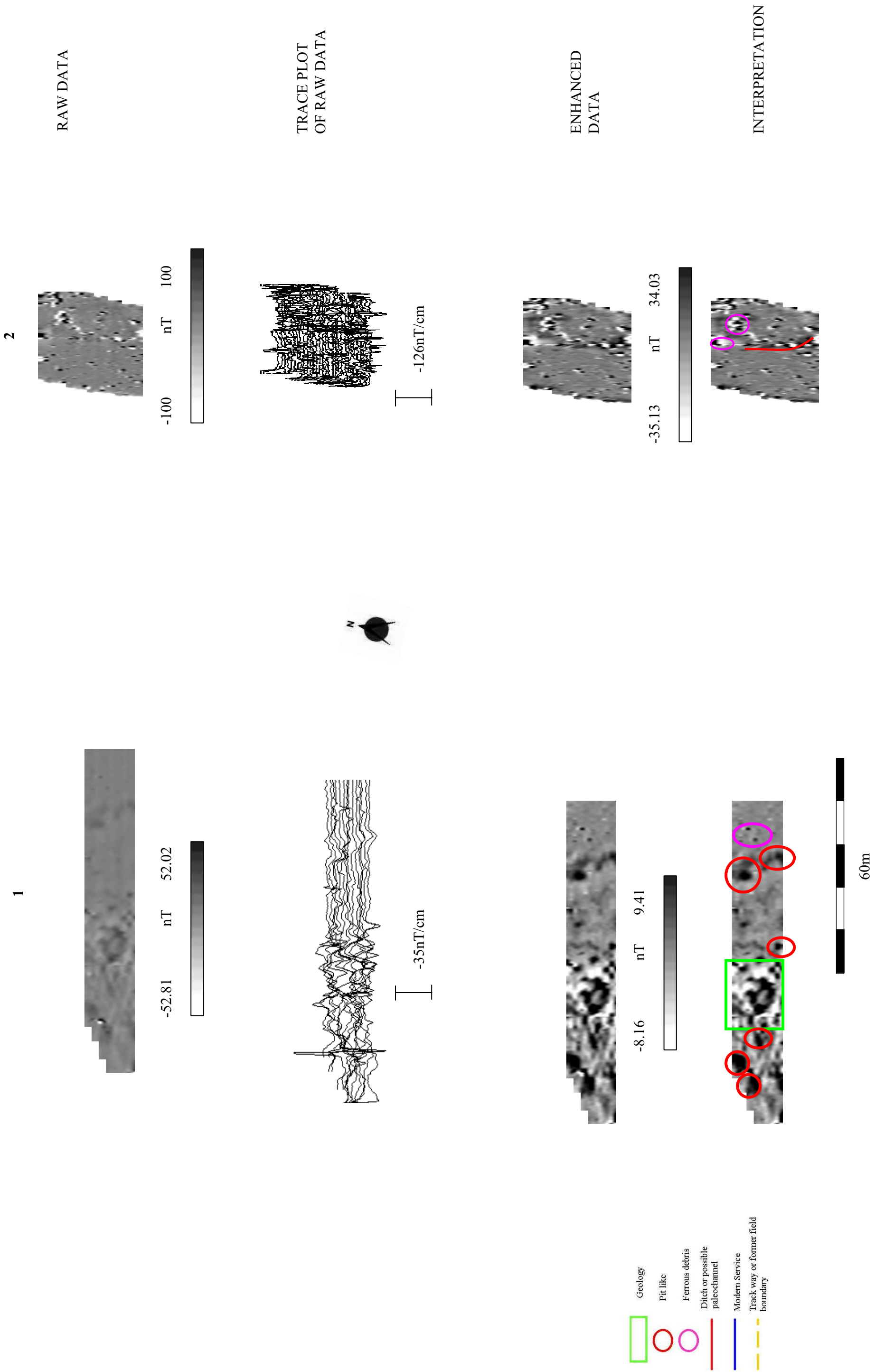
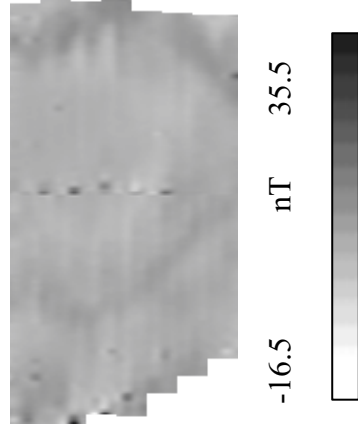
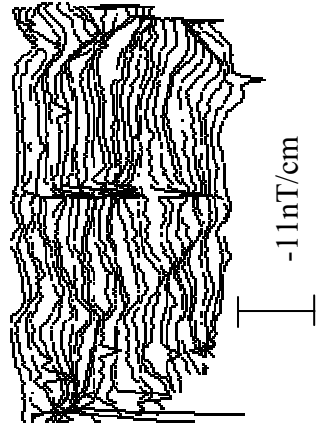


Figure 6: Greyscale and trace plots of raw and enhanced data for fields 1 and 2. Scale 1:1000

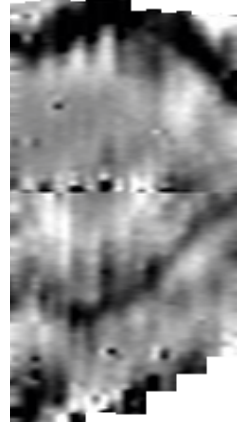
3



RAW DATA

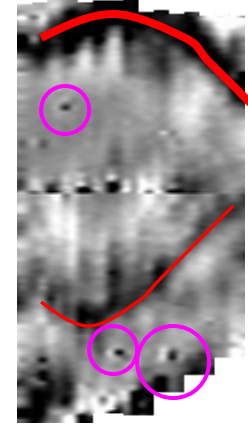


TRACE PLOT OF RAW DATA



ENHANCED DATA

-2.99 nT 3.71

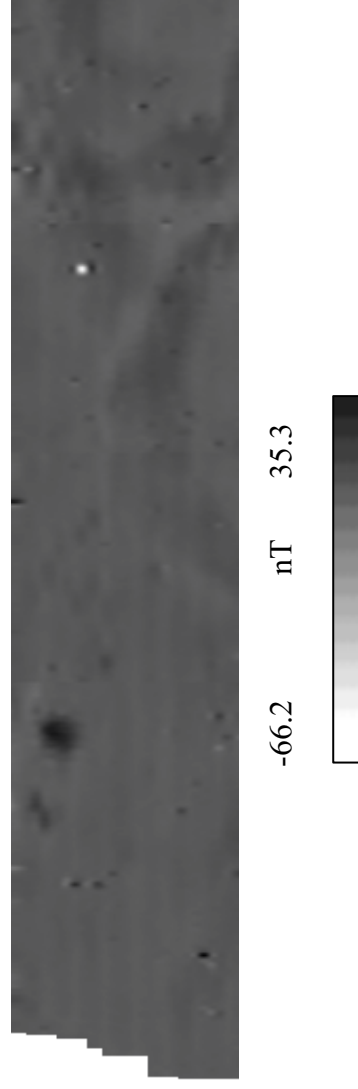


- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary

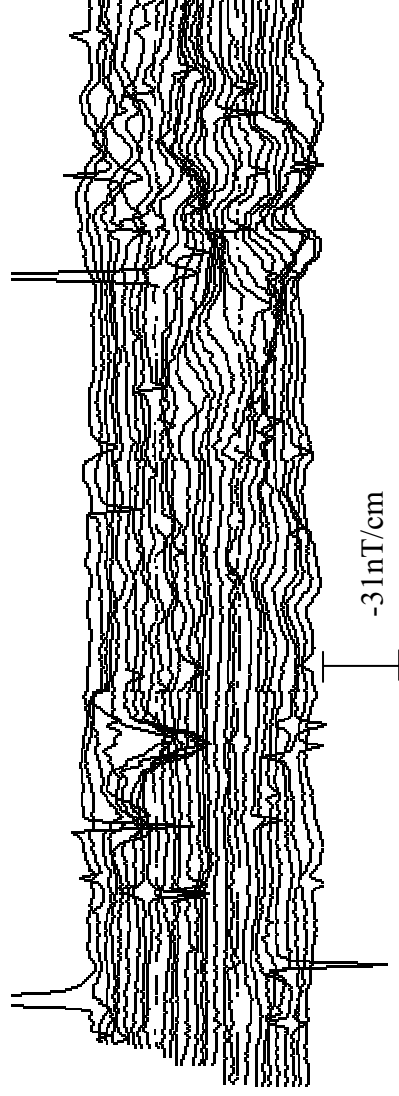
60m



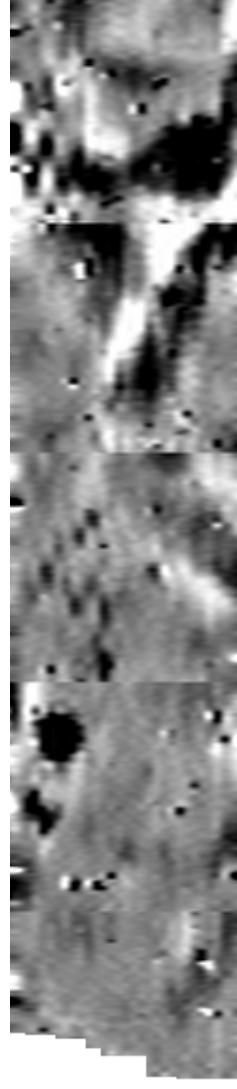
4



RAW DATA



TRACE PLOT OF RAW DATA



ENHANCED DATA

-3.22 nT 3.55



- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary

60m



Figure 7: Greyscale and trace plots of raw and enhanced data for fields 3 and 4. Scale 1:1000

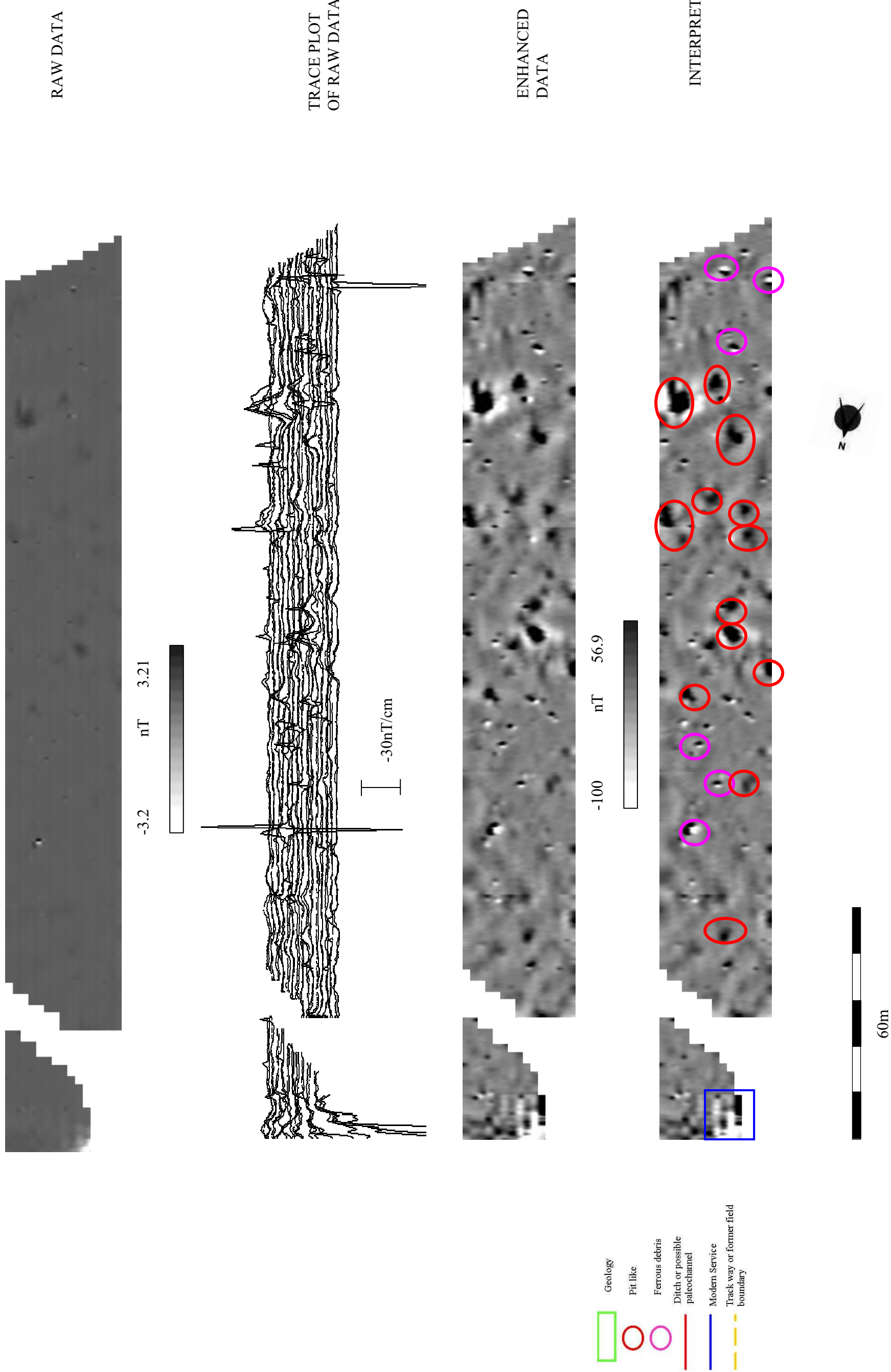
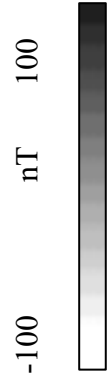
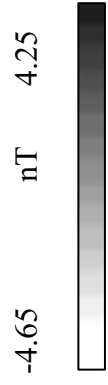
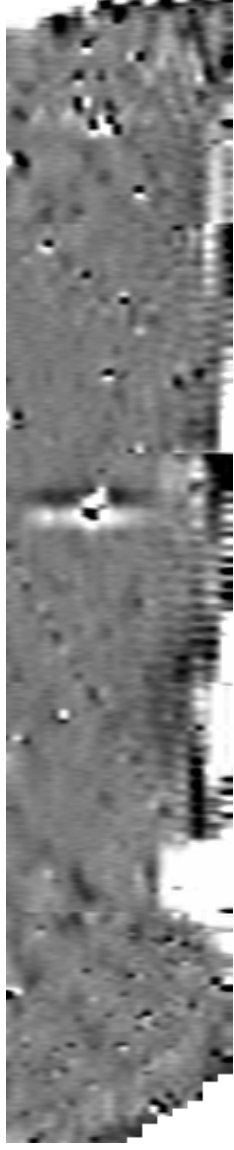


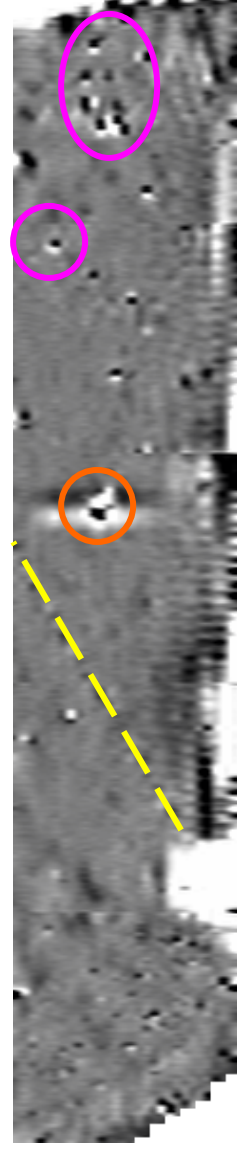
Figure 8: Greyscale and trace plots of raw and enhanced data for field 5. Scale 1:1000



ENHANCED DATA



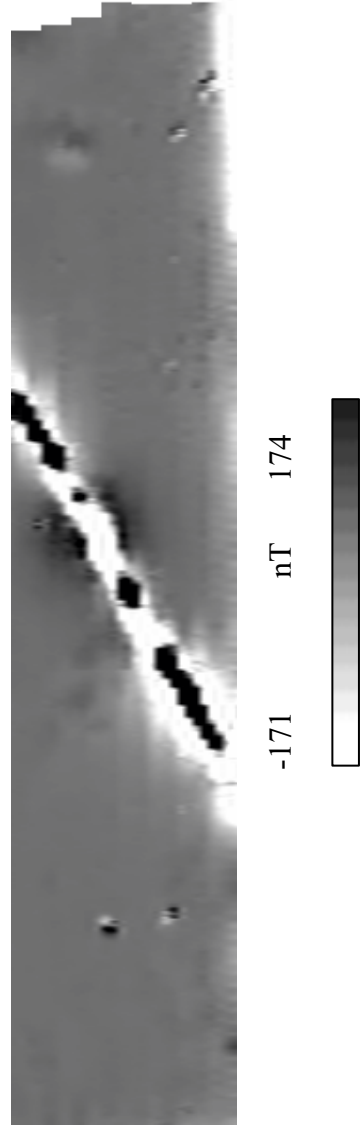
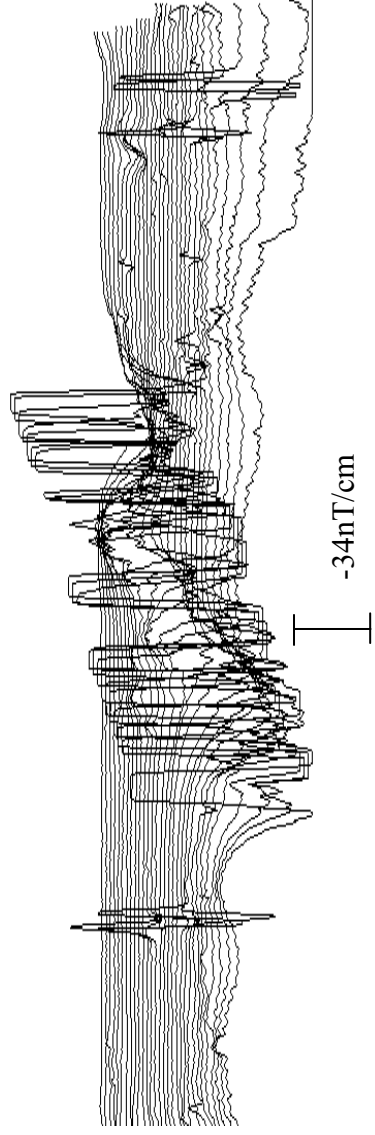
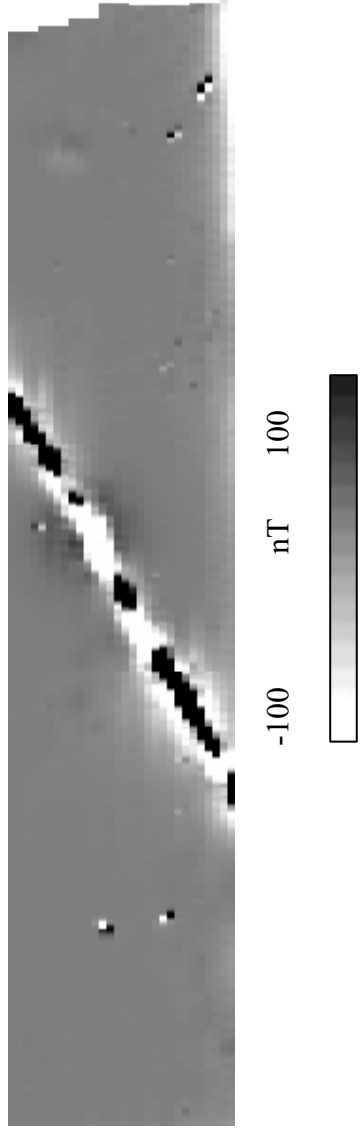
- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary



60m

Figure 9: Greyscale and trace plots of raw and enhanced data for field 6. Scale 1:1000

7



- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary

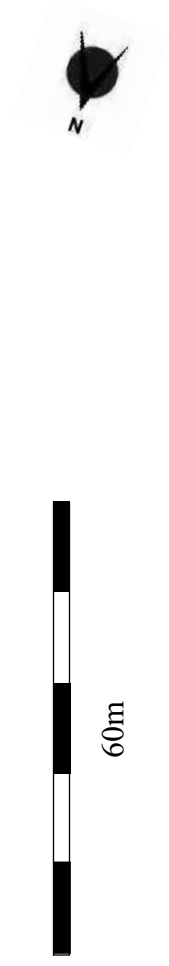
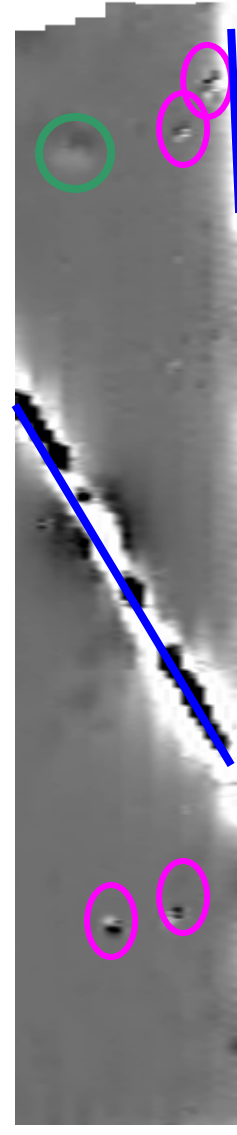


Figure 10: Greyscale and trace plots of raw and enhanced data for field 7. Scale 1:1000

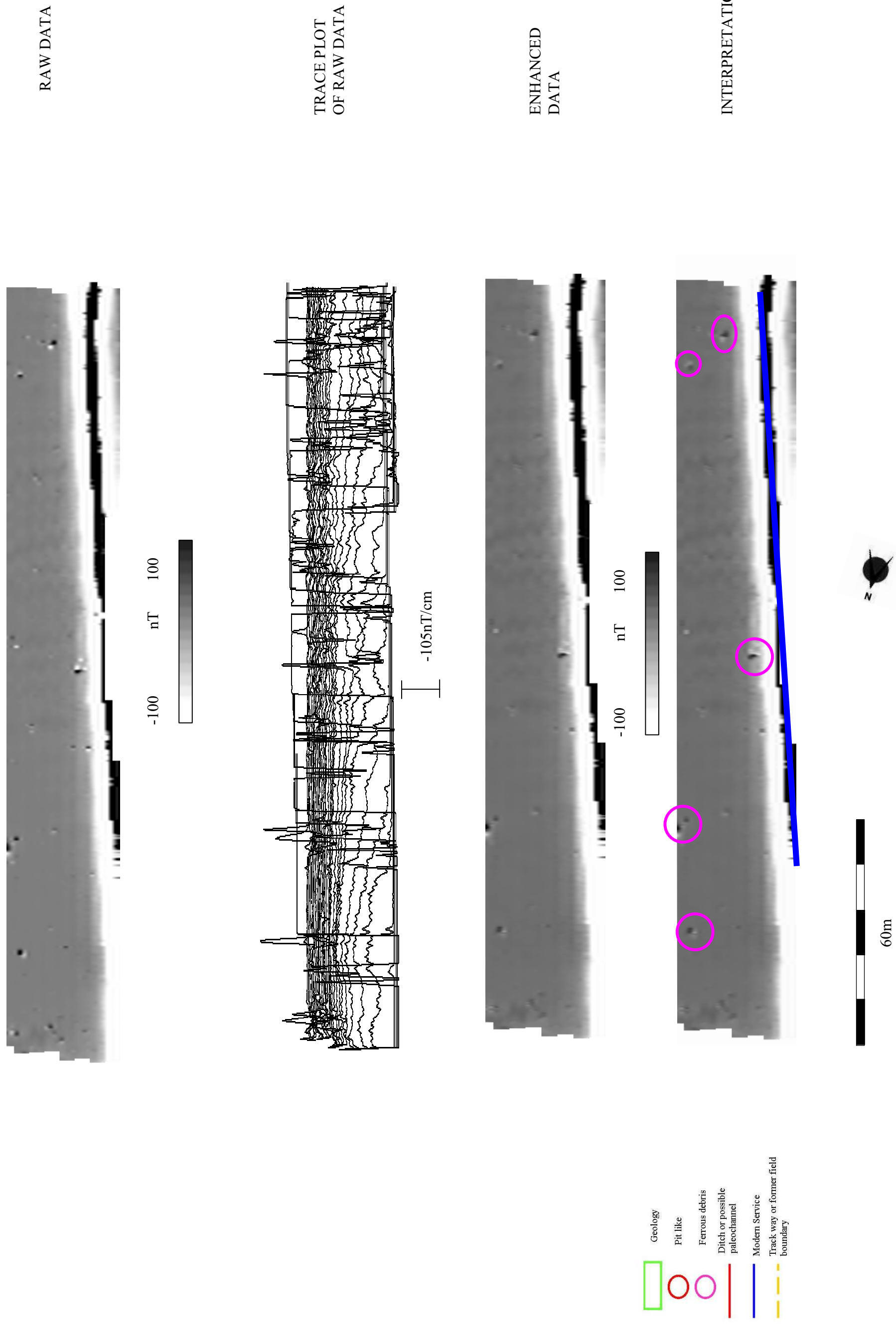
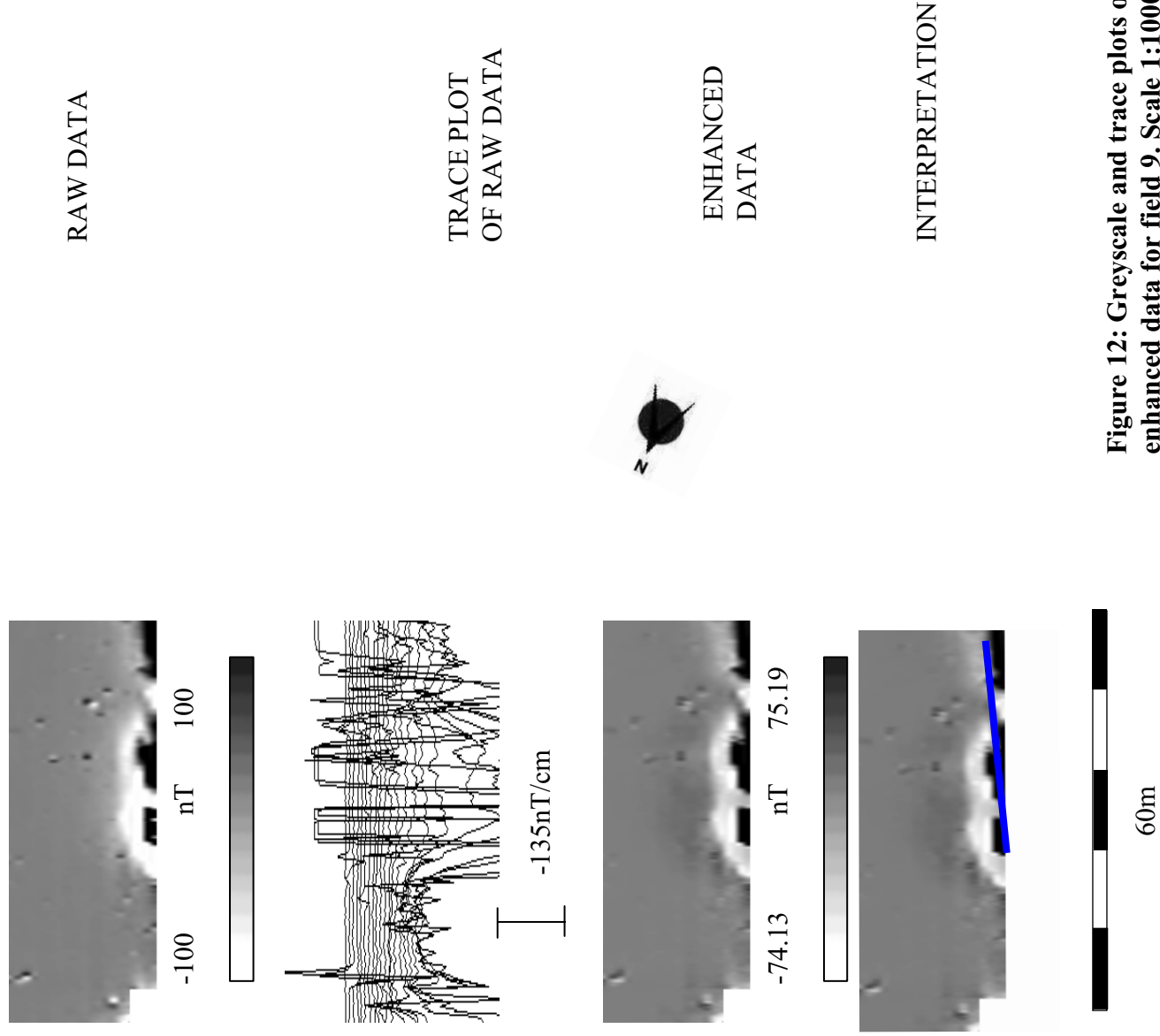


Figure 11: Greyscale and trace plots of raw and enhanced data for field 8. Scale 1:1000



- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary

Figure 12: Greyscale and trace plots of raw and enhanced data for field 9. Scale 1:1000

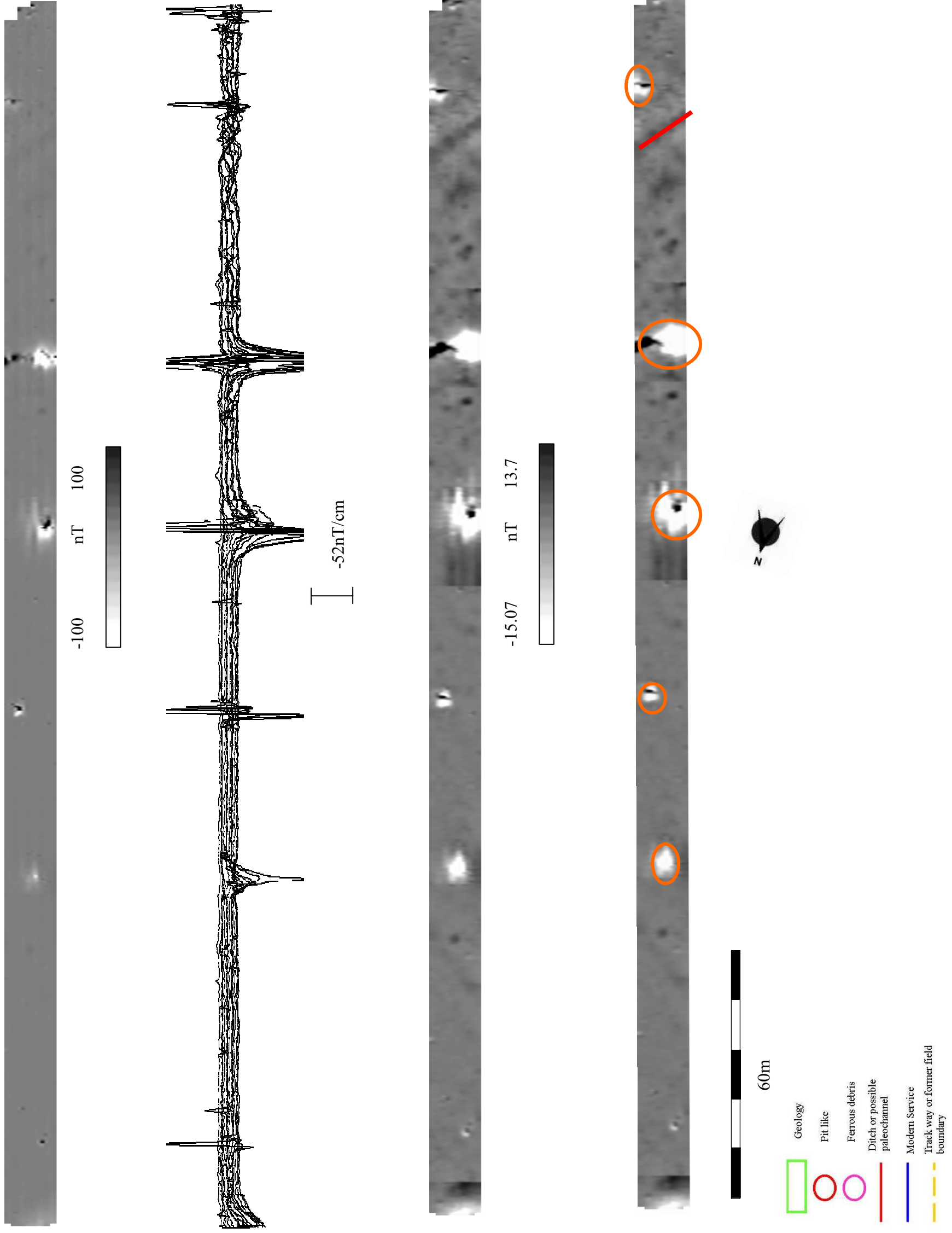
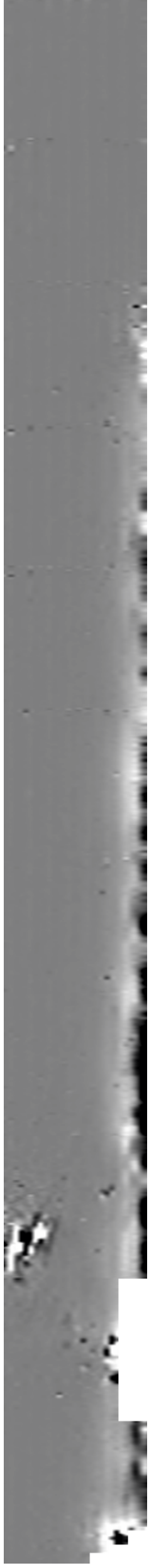


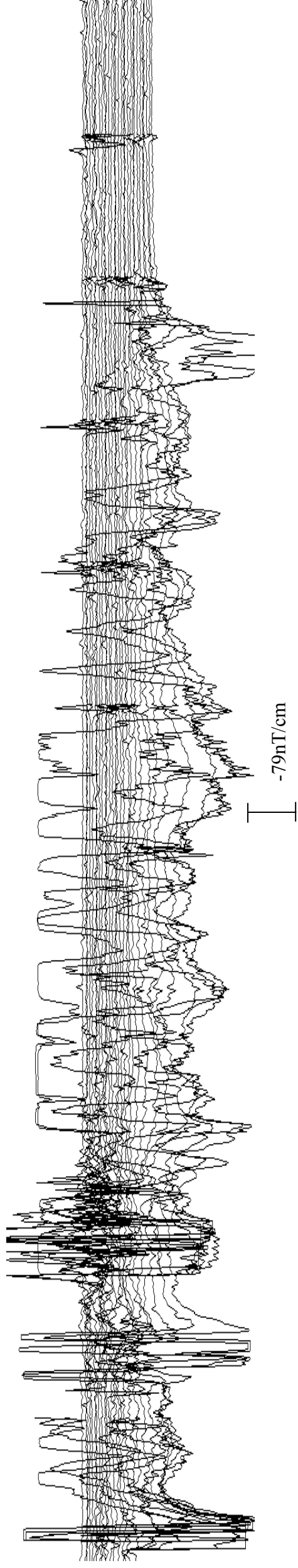
Figure 13: Greyscale and trace plots of raw and enhanced data for field 10. Scale 1:1250.

11a



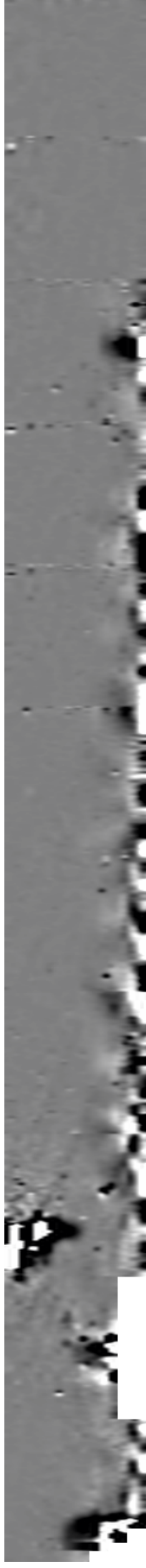
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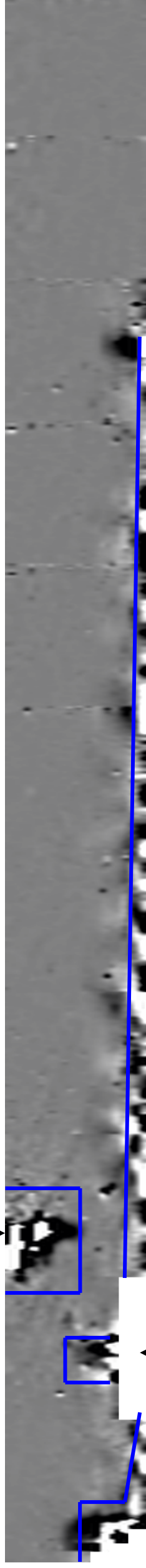
TRACE PLOT OF RAW DATA

-79 nT/cm



ENHANCED DATA

-24.6 nT 25.2



INTERPRETATION

- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- - - Track way or former field boundary

↑ Raised Man Hole



60m



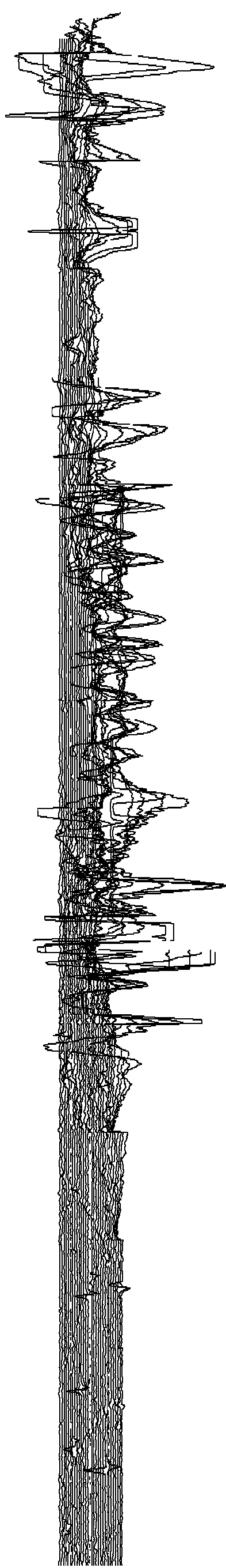
Figure 14: Greyscale and trace plots of raw and enhanced data for field 11a. Scale 1:1000

11b



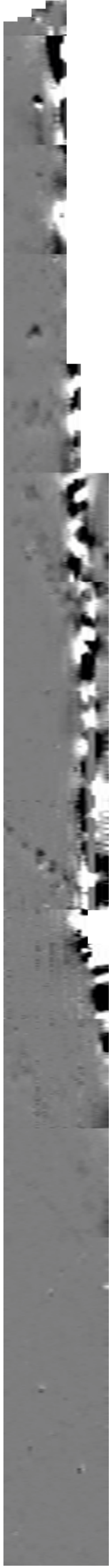
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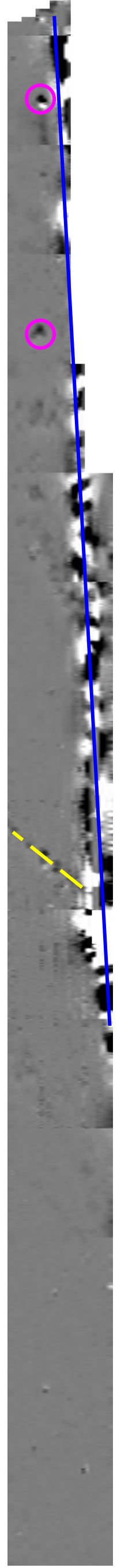
TRACE PLOT OF RAW DATA

-126nT/cm



ENHANCED DATA

-6.99 nT 7.11



INTERPRETATION

- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary



Figure 15: Greyscale and trace plots of raw and enhanced data for field 11b. Scale 1:1250.

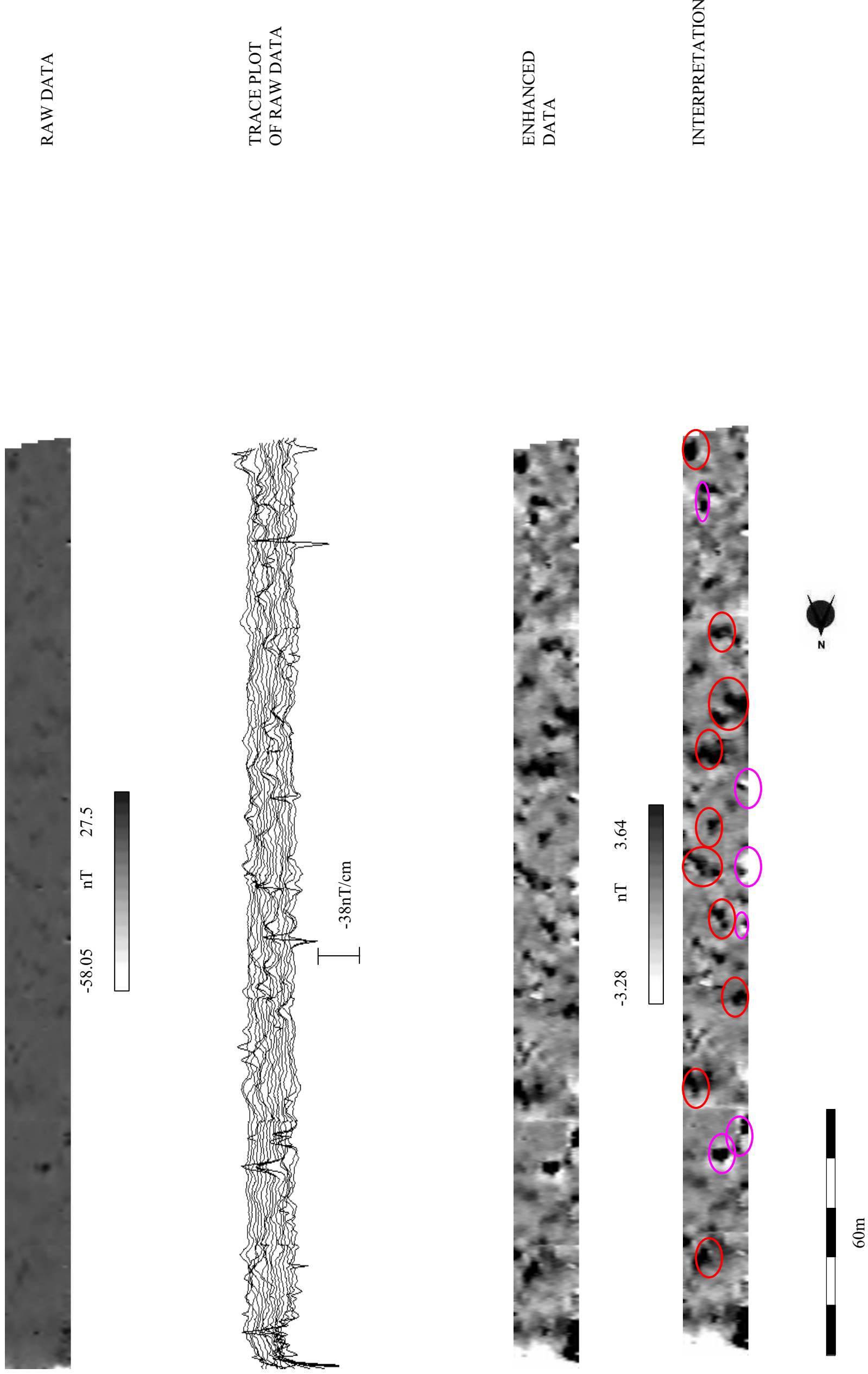
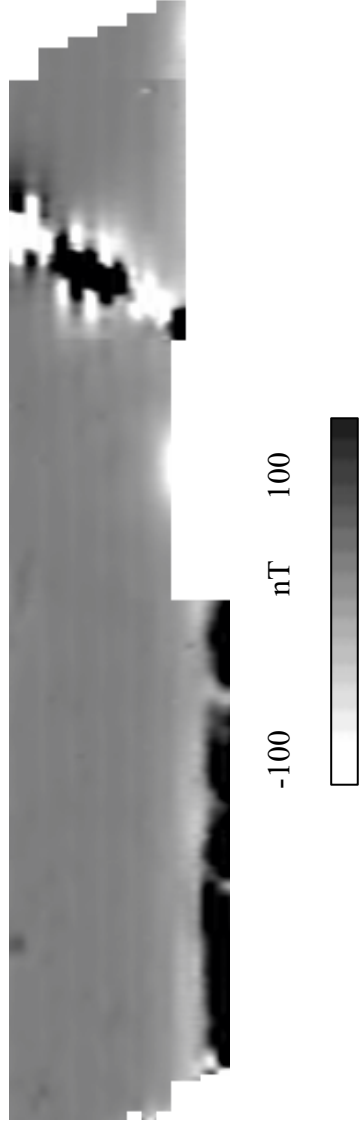
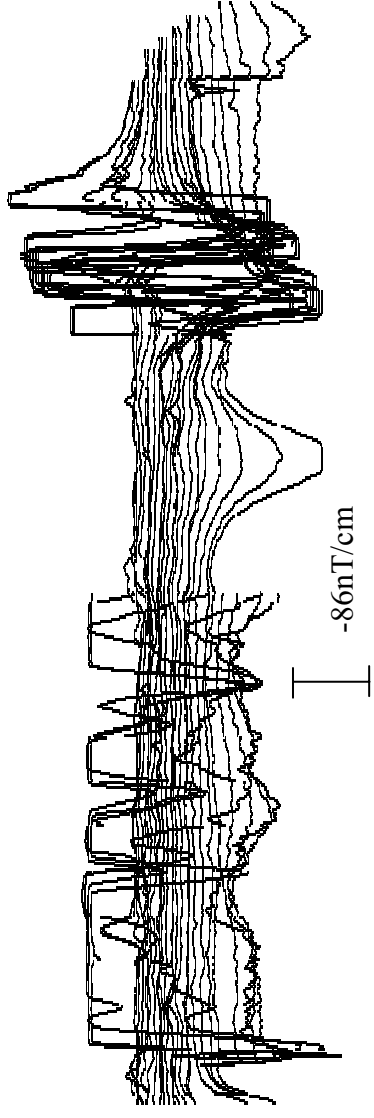


Figure 16: Greyscale and trace plots of raw and enhanced data for field 12. Scale 1:1000

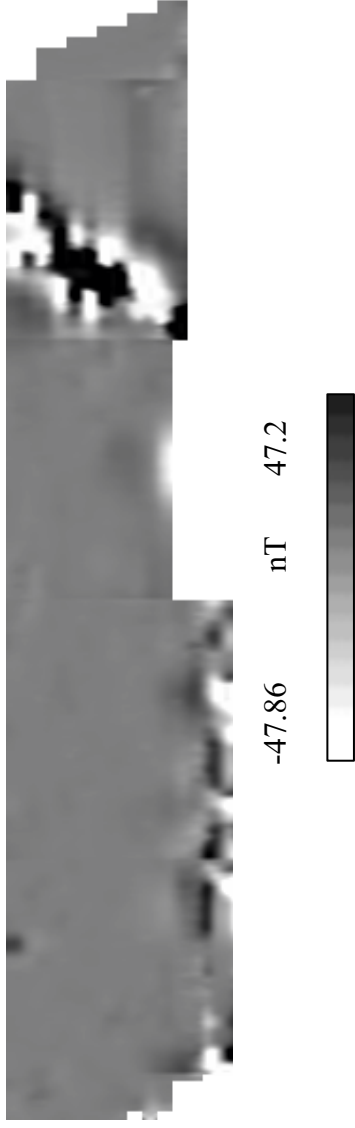
RAW DATA



TRACE PLOT OF RAW DATA



ENHANCED DATA



INTERPRETATION

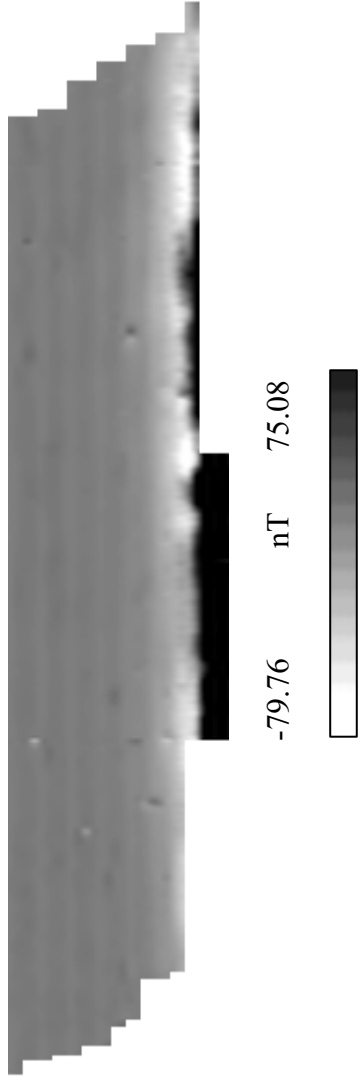
- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary



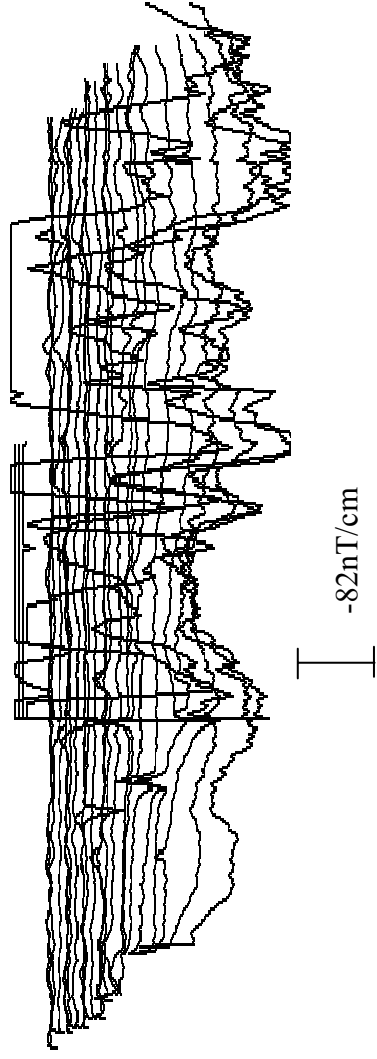
Figure 17: Greyscale and trace plots of raw and enhanced data for field 13. Scale 1:1000

14

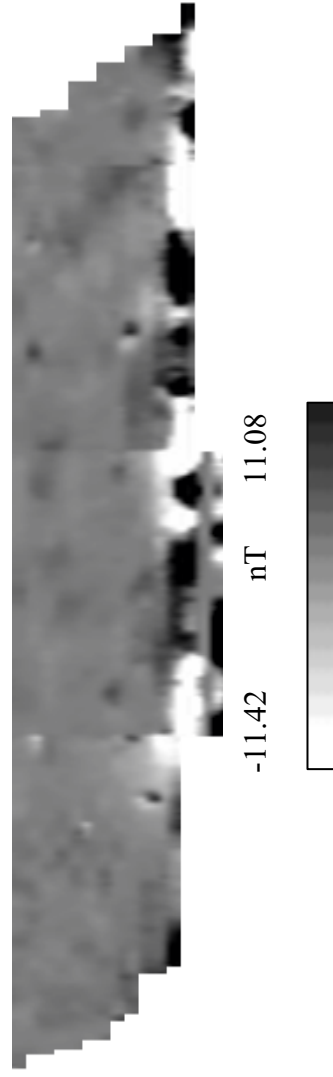
RAW DATA



TRACE PLOT OF RAW DATA

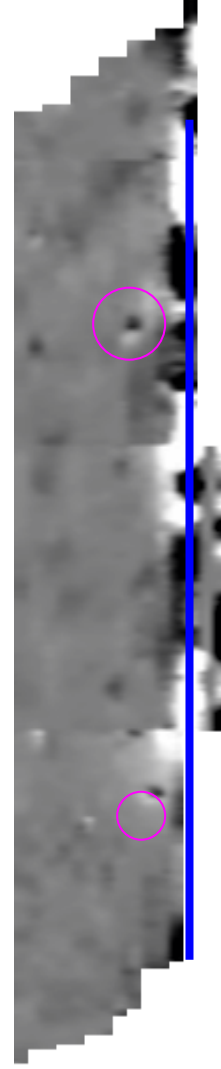


ENHANCED DATA



INTERPRETATION

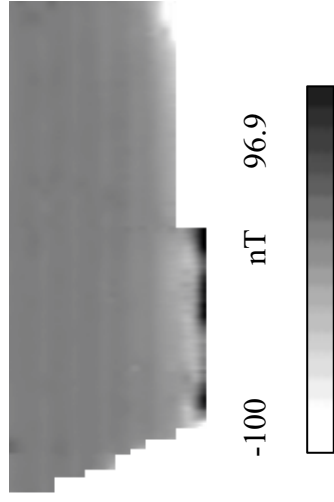
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- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary



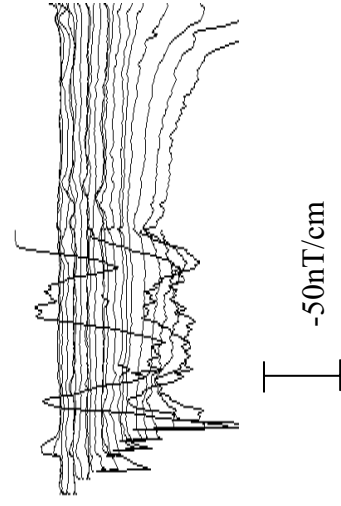
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Figure 18: Greyscale and trace plots of raw and enhanced data for field 14. Scale 1:1000

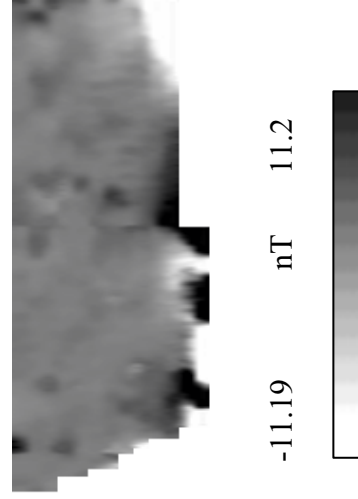
15a



RAW DATA

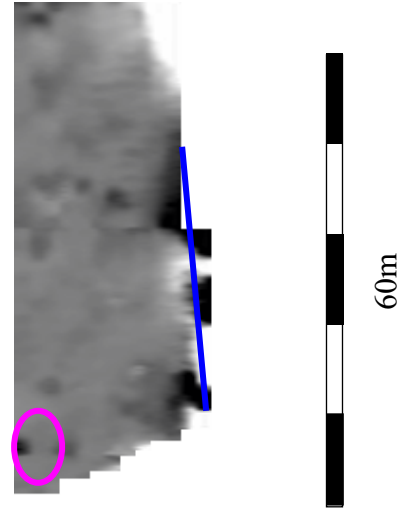


TRACE PLOT
OF RAW DATA



ENHANCED
DATA

- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary



INTERPRETATION

15b

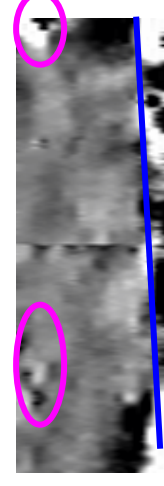
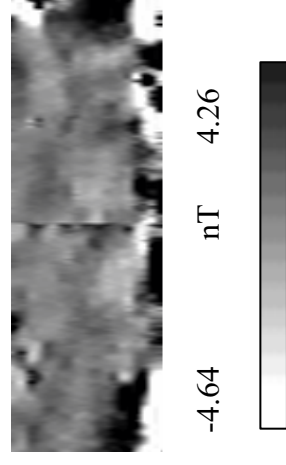
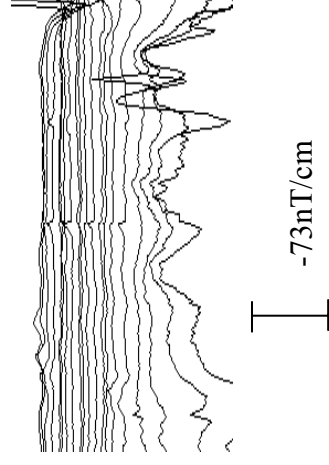
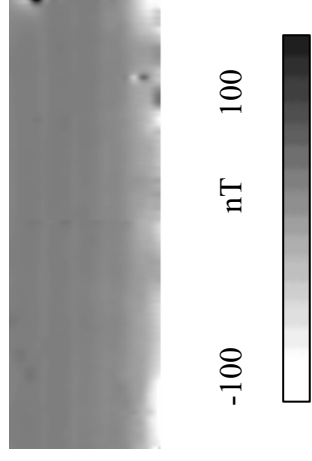


Figure 19: Greyscale and trace plots of raw and enhanced data for field 15. Scale 1:1000

16b

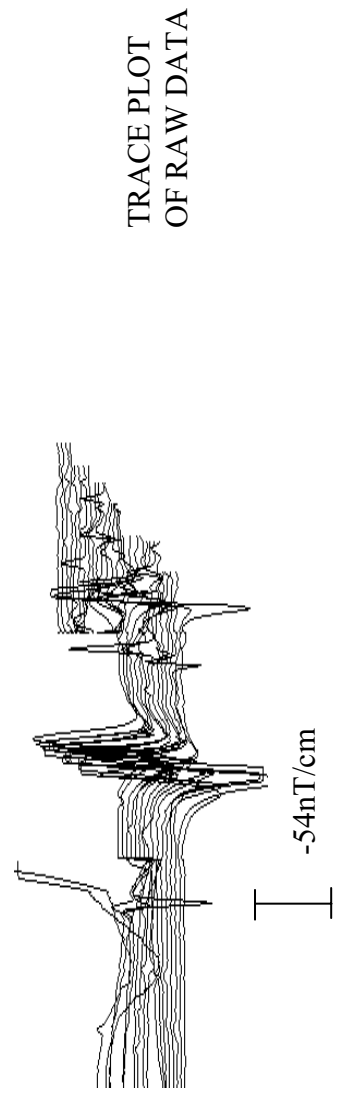
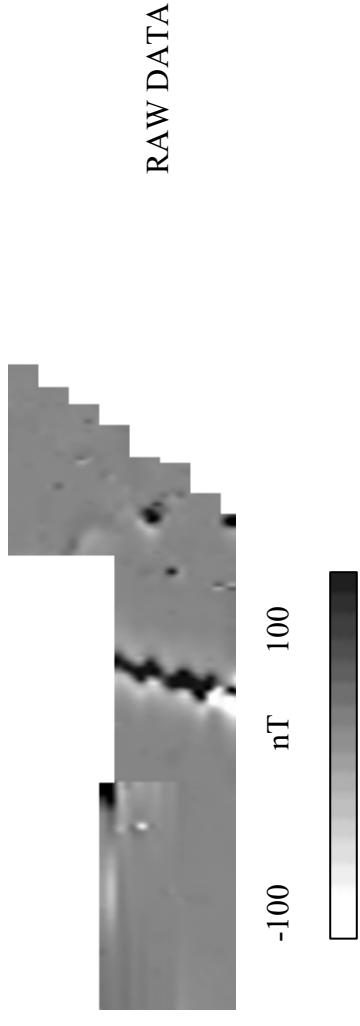
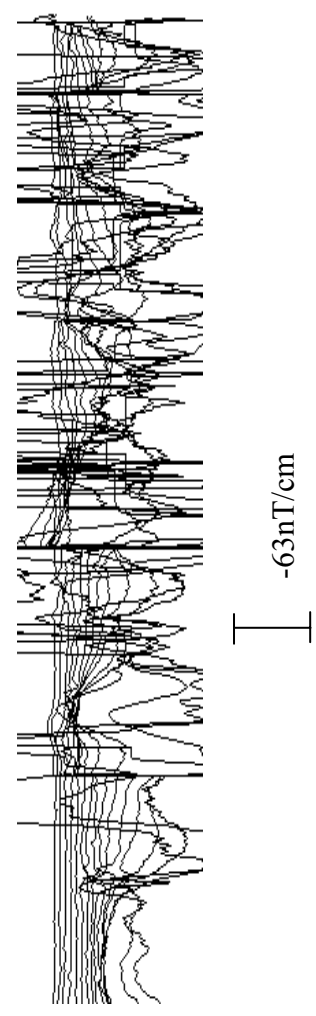
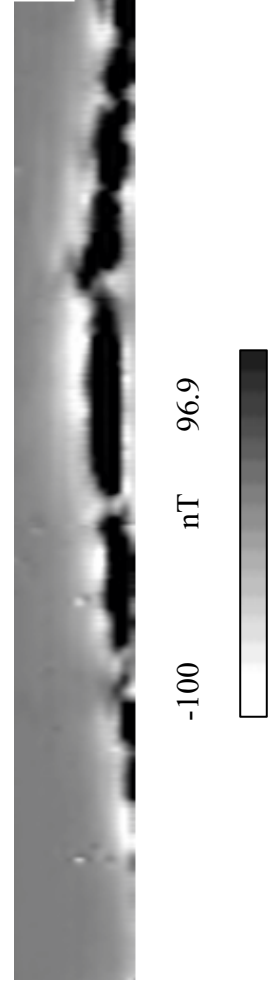


Figure 20: Greyscale and trace plots of raw and enhanced data for field 16. Scale 1:1000

16a



60m

- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary

16c

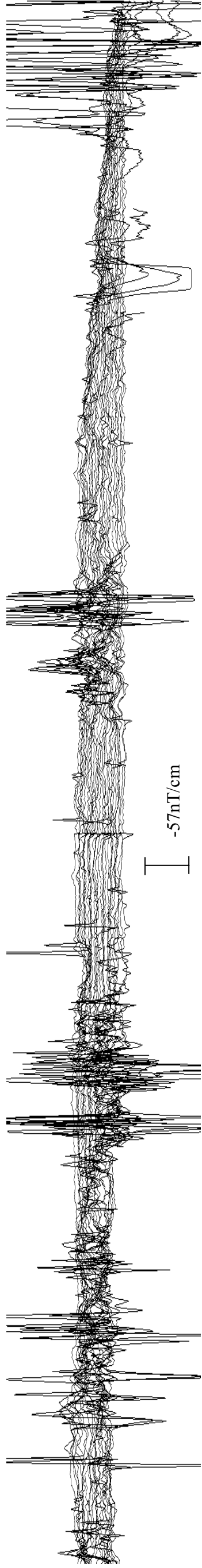
RAW DATA



-100 nT 100



TRACE PLOT OF RAW DATA



-57nT/cm



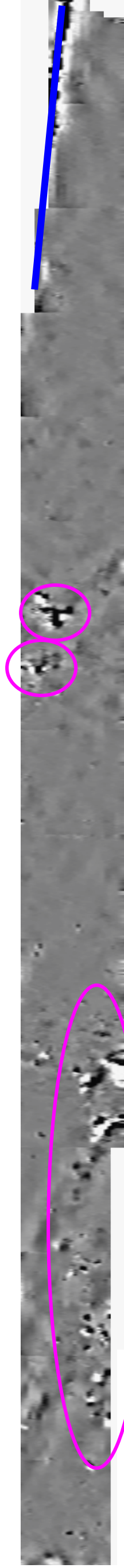
ENHANCED DATA



-17 nT 16.9



INTERPRETATION



- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary



60m



Figure 21: Greyscale and trace plots of raw and enhanced data for field 16c. Scale 1:1250

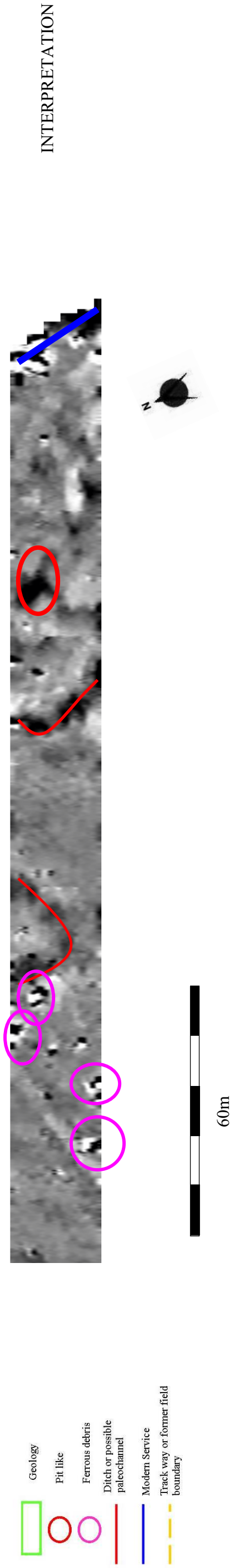
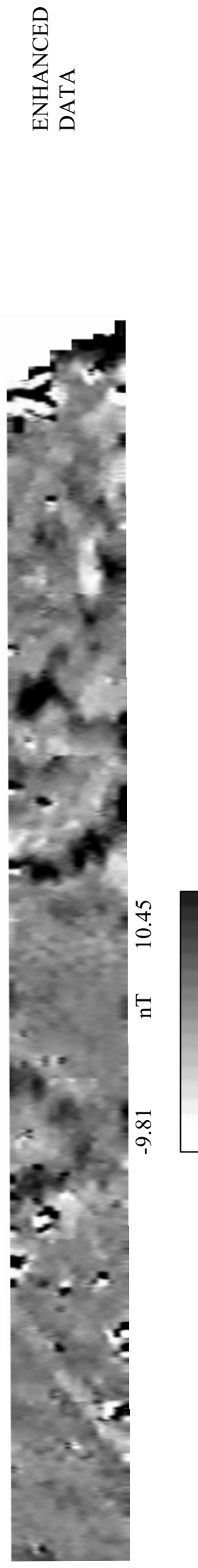
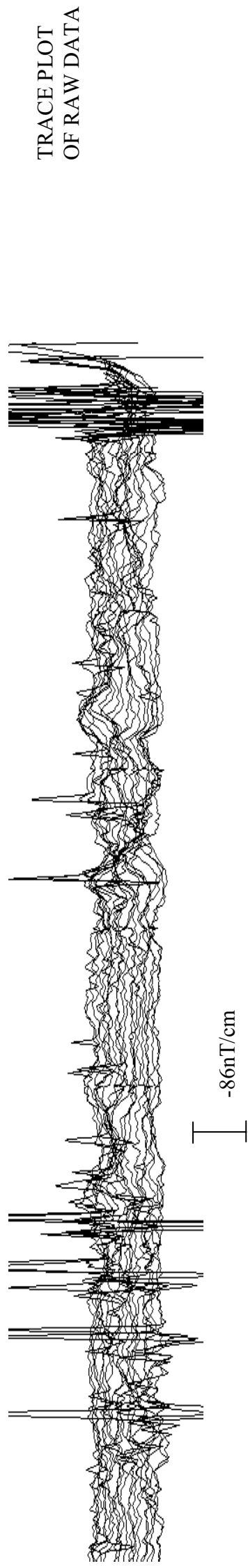
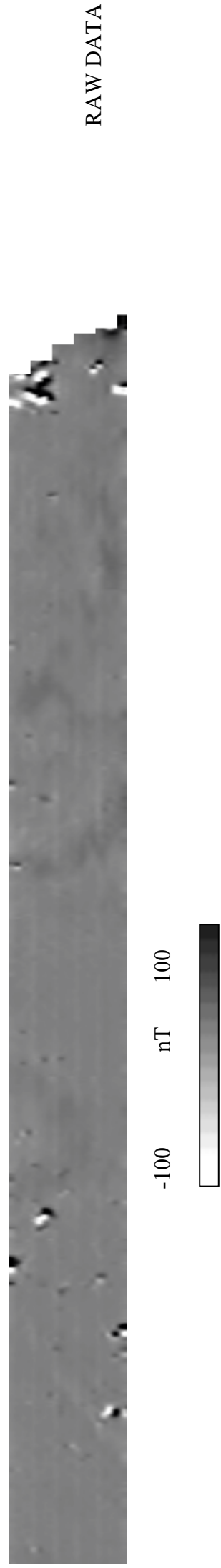


Fig 22: Greyscale and trace plots of raw and enhanced data for field 17. Scale 1:1000

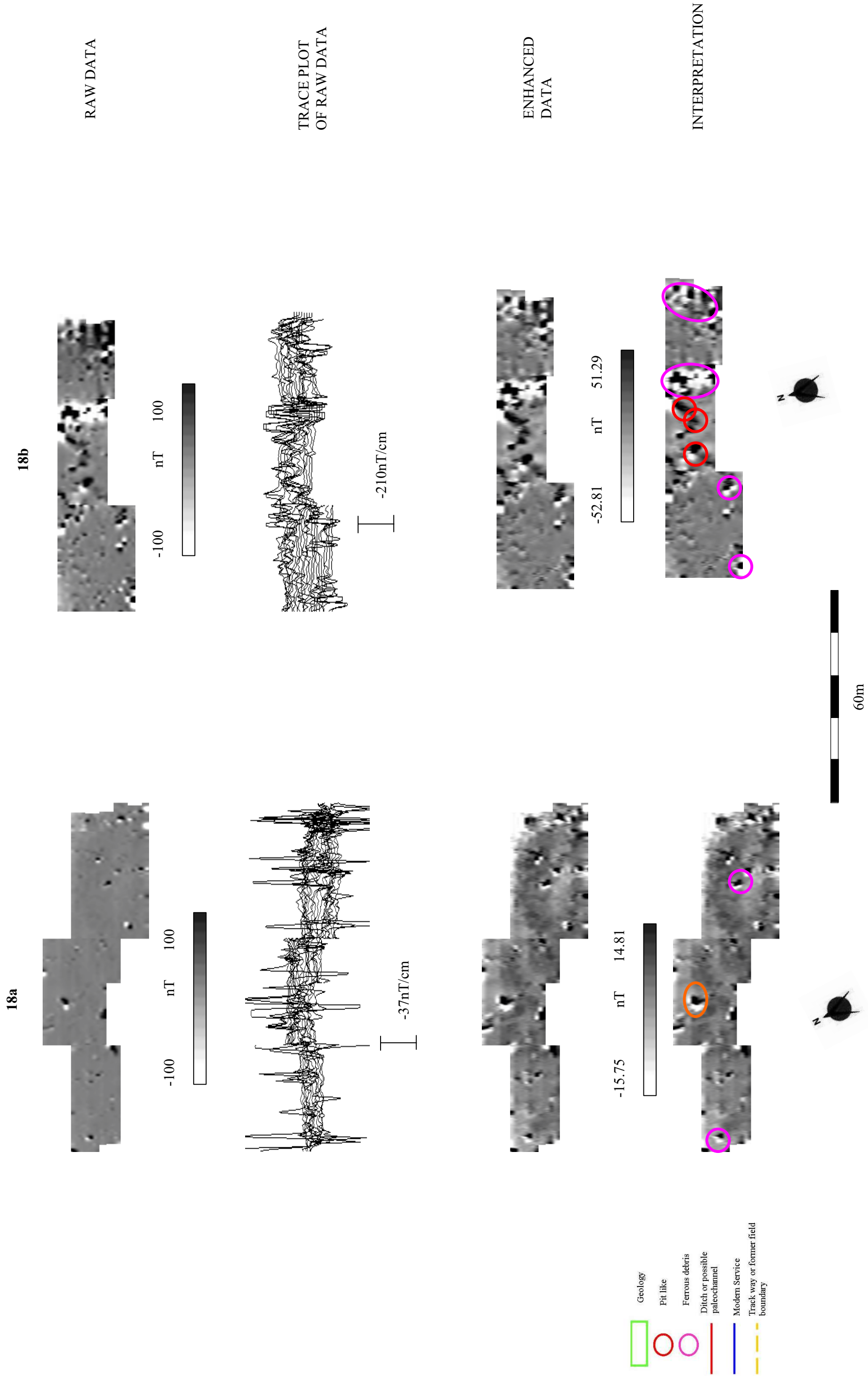
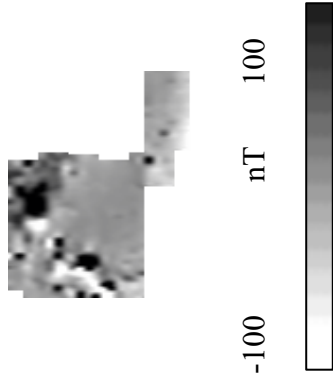
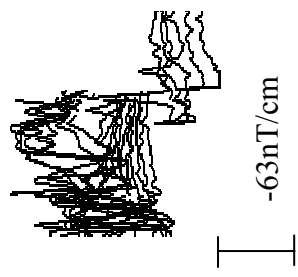


Figure 23: Greyscale and trace plots of raw and enhanced data for field 18. Scale 1:1000

19a









RAW DATA

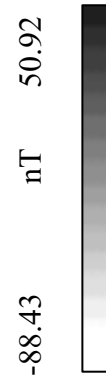


TRACE PLOT
OF RAW DATA



ENHANCED
DATA

-  Geology
-  Pit like
-  Ferrous debris
-  Ditch or possible paleochannel
-  Modern Service
-  Track way or former field boundary



INTERPRETATION



60m

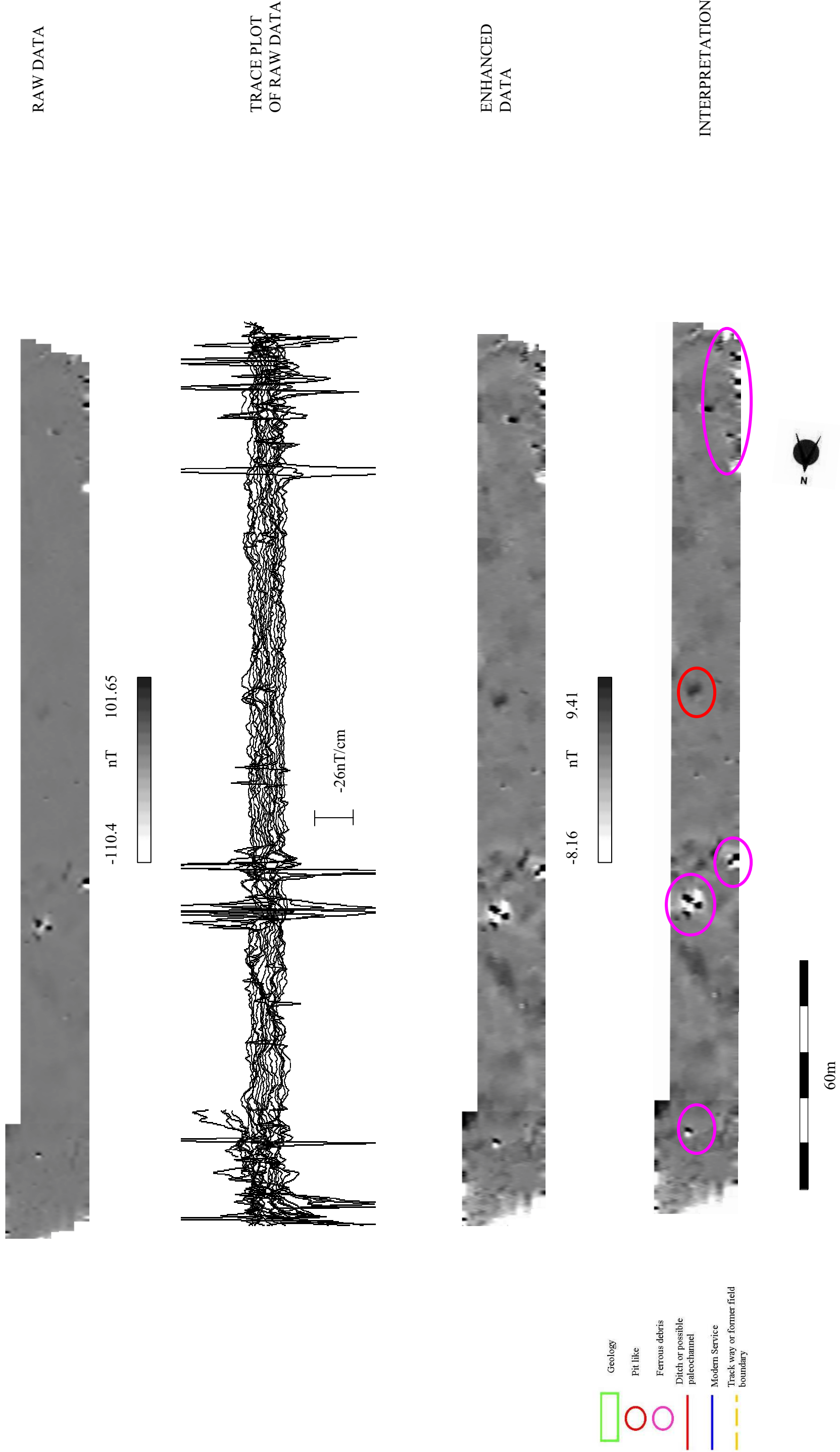


Figure 25: Greyscale and trace plots of raw and enhanced data for field 20 Scale 1:1000

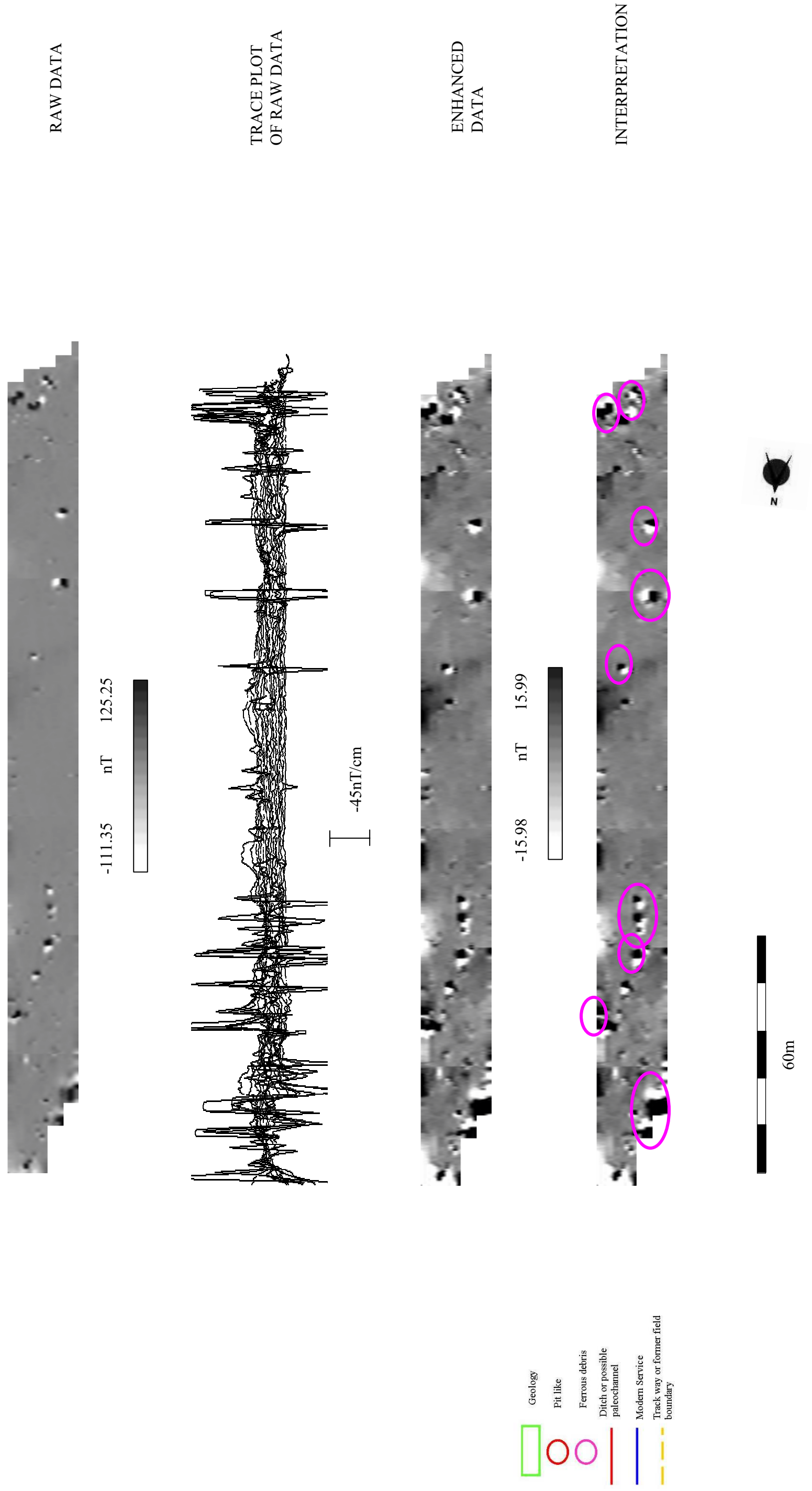


Figure 26: Greyscale and trace plots of raw and enhanced data for field 21 Scale 1:1000

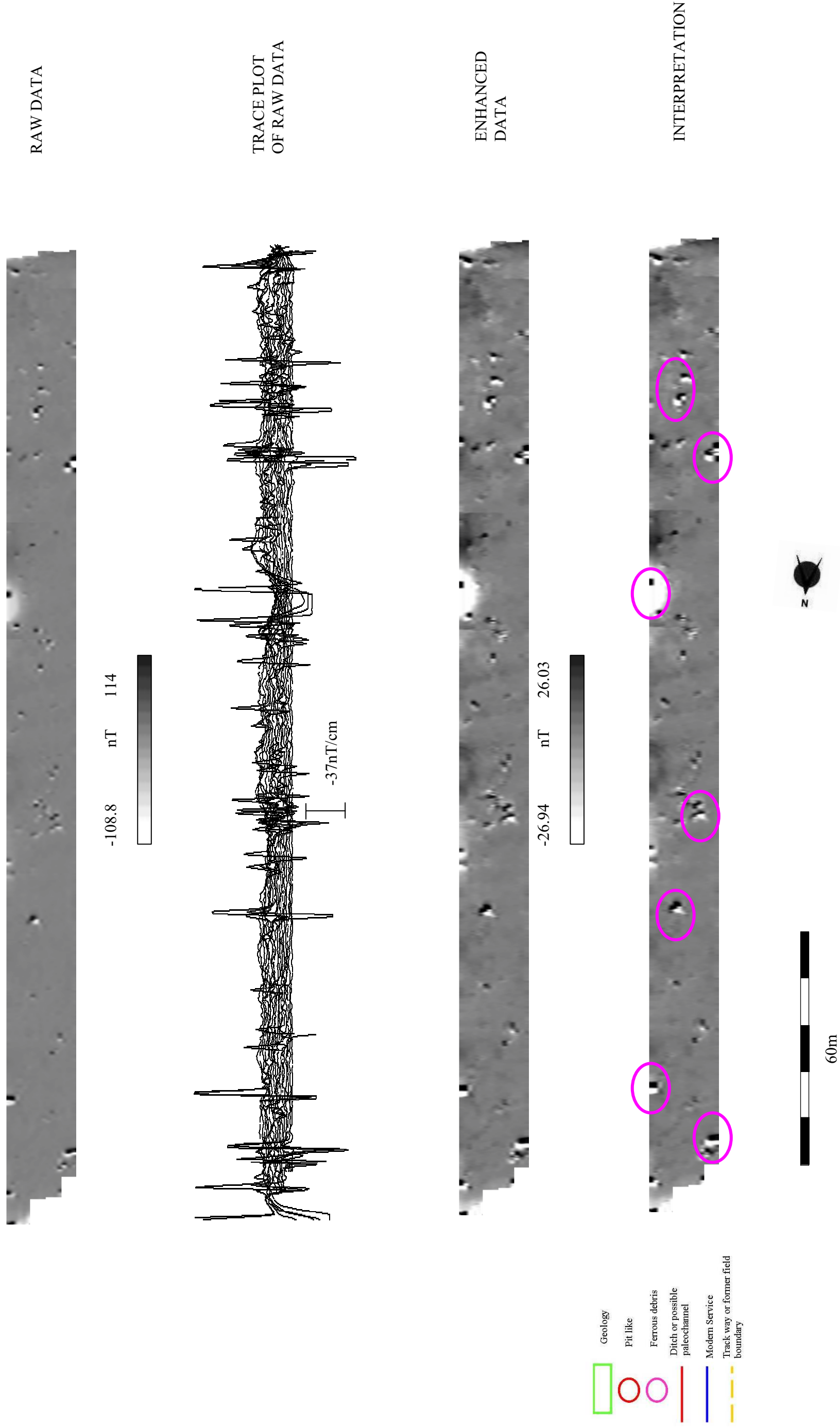
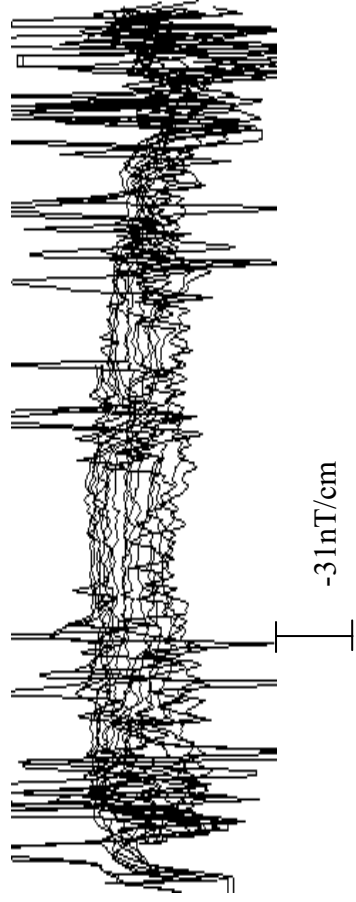


Figure 27: Greyscale and trace plots of raw and enhanced data for field 22 Scale 1:1000

23a



-100 nT 100



-31 nT/cm



-58.9 nT 57.7



- Geology
- Pit like
- Ferrous debris
- Ditch or possible paleochannel
- Modern Service
- Track way or former field boundary

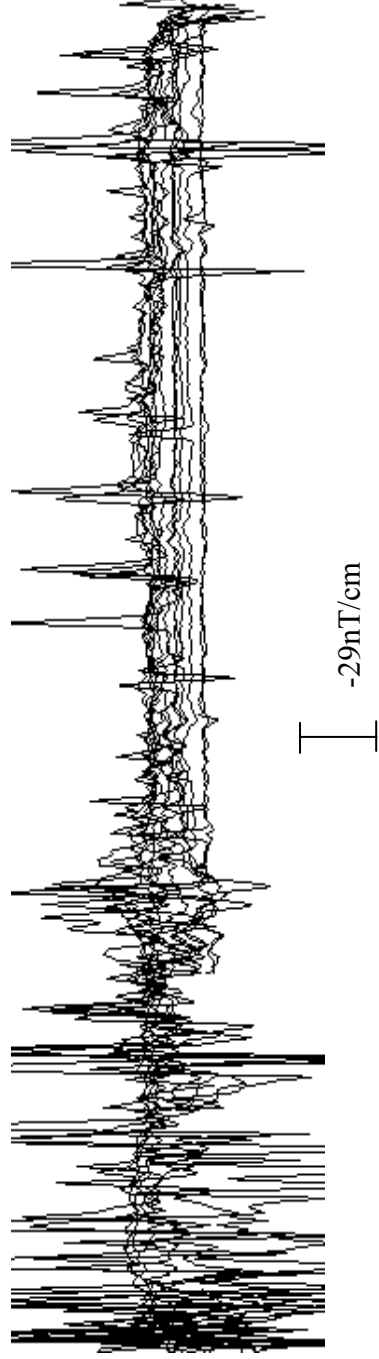


60m

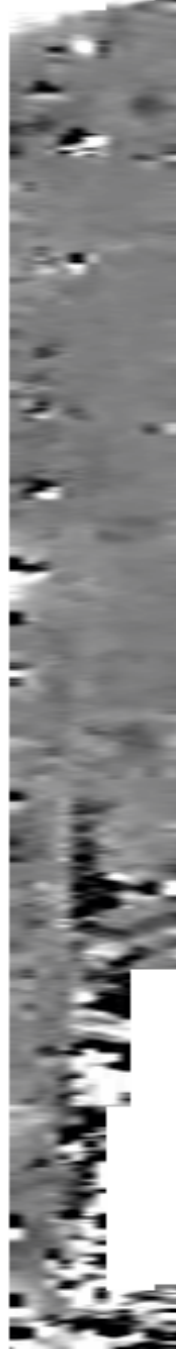
23b



-58.9 nT 57.7



-29 nT/cm



-58.9 nT 57.7



INTERPRETATION



60m

Figure 28: Greyscale and trace plots of raw and enhanced data for field 23 Scale 1:1000



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