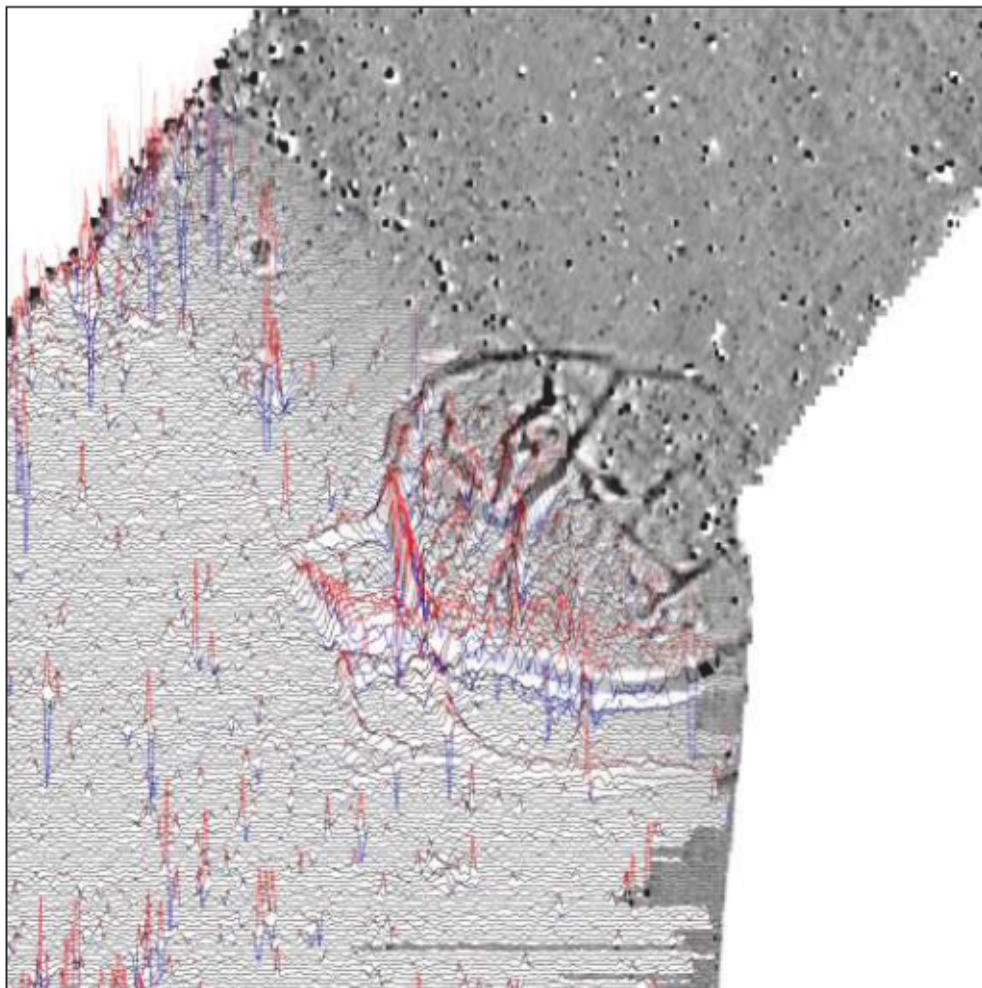




making sense of heritage

A14 Cambridge to Huntingdon Improvement Geophysical Survey and Archaeological Trial Trenching

Detailed Magnetometer and UAV Survey Report



Ref: 105760.15
November 2014



A14 Cambridge to Huntingdon Improvement Geophysical Survey and Archaeological Trial Trenching

Detailed Magnetometer and UAV Survey Report

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Summary

Wessex Archaeology was commissioned by Jacobs UK Ltd, on behalf of the Highways Agency, to undertake a detailed magnetometer and UAV survey over the area of three proposed borrow pits that are to be used for the proposed A14 Cambridge to Huntingdon improvements scheme (centred on NGR 530300, 267900, NGR 534300, 265200 and NGR 540250, 262900). The survey was undertaken with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site as part of a programme of archaeological works, ahead of proposed development.

The three borrow pit sites are located between Cambridge and Huntingdon, close to the A14 and near to Fenstanton and Bar Hill. All three sites occupy arable agricultural land and each is targeted over different geological formations. The land is largely flat with the exception of borrow pit 5 that occupies a low ridge of land. Detailed magnetometer survey was undertaken over all accessible parts of each site, a total of 69.4ha, and has demonstrated the presence of anomalies of likely, probable and possible archaeological interest in addition to several modern services.

Magnetometer survey over half of borrow pit 3 and the whole of borrow pit 5 was not possible due to access restrictions.

The archaeological features detected include two enclosure complexes, one of these clearly relates to a settlement area demonstrated by ring gullies of round houses identified within the enclosure. There are also isolated ditch sections scattered throughout the data; some relate to fairly recent former field boundaries but others may indicate earlier field systems. Ridge and furrow was detected across most of the proposed site of borrow pit 6 with a smaller spread identified within the borrow pit 3 area.

The survey was undertaken between the 22nd September and 10th October 2014 by Wessex Archaeology's in-house geophysics team.

Although not originally included in the WSI, further UAV survey was carried out on the 30th and 31st of October by Callen-Lenz with the assistance of Wessex Archaeology. A total of 31 features were identified in the UAV datasets across the three Borrow Pit areas, with ten in borrow pit 3, thirteen in borrow pit 5 and eight in borrow pit 6. For the most part, these features appear to be large scale earthworks, probably associated with field boundaries, however features **1025** and **1030** located at the site of borrow pit 5, are sub-circular features and may be the remains of ploughed out mounds or structures, possibly related to Bronze Age or Anglo Saxon activity in the area. All three borrow pit areas are areas of arable farming and have been ploughed regularly in the past. It should also be noted that some areas were under crop at the time of the survey. Given the current ground surface and previous ploughing there is minimal surface expression of potential archaeological features, and those noted in the UAV datasets do not appear to be identifiable in the magnetometer data.



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Acknowledgements

The detailed magnetometer survey was commissioned by Jacobs UK Ltd. The assistance of Adam Brossler and Nigel Page is gratefully acknowledged in this regard. The assistance of Rose Bowdery and Sarah Hassam of Mouchel Plc is also gratefully appreciated.

The fieldwork was carried out by Jen Smith, Alistair Salisbury and Laura Andrews. The geophysical data was processed and interpreted by Ross Lefort. The UAV data was acquired by Callen-Lenz and was processed and interpreted by Patrick Dresch and Richard Milwain. This report was written by Ross Lefort and Patrick Dresch. The geophysical work was quality controlled by Dr. Paul Baggaley and the UAV work by Nicholas Cooke. Illustrations were prepared by Ross Lefort and Karen Nichols. The project was managed on behalf of Wessex Archaeology by Andy Crockett.



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Detailed Magnetometer and UAV Survey Report

1 INTRODUCTION

1.1 Project Background

1.1.1 Wessex Archaeology was commissioned by Jacobs UK Ltd, on behalf of the Highways Agency, to carry out a programme of geophysical and an Unmanned Aerial Vehicle (UAV) survey over the sites of three proposed borrow pits that are to be used for the proposed A14 Cambridge to Huntingdon improvements scheme (centred on NGR 530300, 267900, NGR 534300, 265200 and NGR 540250, 262900) (**Figure 1**).

1.1.2 The survey forms part of an ongoing programme of archaeological works being undertaken ahead of the proposed improvement of the section of the A14 between Cambridge and Huntingdon. The improvement scheme includes widening of the A14 and A1, the creation of a southern bypass around Huntingdon, the removal of the A14 viaduct over the mainline railway and Brampton Road, constructing local access and link roads, improvement of junctions and creation of new ones in addition to other improvements (Jacobs 2014a and 2014b).

1.1.3 This survey covers three proposed borrow pit sites named **BP3**, **BP5** and **BP6** that will be used for at least part of the proposed construction project. The combined area of the three borrow pits comes to 166.6ha. Progress of the geophysical survey in terms of area surveyed is detailed in Table 1 below:

Survey Area Name	Proposed Area (ha)	Surveyed Area (ha)	Surveyable	Survey Completed
BP3	40.0	24.7	Mostly, some small unsurveyable areas	Partially, access refused for southern half
BP5	81.9	0.0	Yes, arable land	No, access refused
BP6	44.7	44.7	Mostly, some small unsurveyable areas	Yes
Total	166.6	69.4		

Table 1: Survey area names, size, condition and progress of geophysical survey

1.1.4 The UAV survey achieved full coverage at all three borrow pit sites whereas coverage of the geophysical survey was limited to **BP6** and over half of **BP3** (**Figure 1**).

1.2 Project Aims

1.2.1 A Written Scheme of Investigation (WSI) was prepared by Wessex Archaeology (2014) that set out the following aims for the magnetometer survey:

- *to identify (so far as possible) the presence or absence of buried archaeological remains in the survey area;*

- *to clarify the extent and layout of known sites of archaeological interest within or adjacent to the study area;*
- *to clarify the extent and layout of previously unknown buried remains within the survey area; and*
- *to interpret any geophysical anomalies identified by the survey.*

1.2.2 This report presents a brief description of the methodology followed, the detailed survey results and the archaeological interpretation of the geophysical data.

1.3 Site Location and Topography

1.3.1 Borrow Pit 3 (**BP3**) is located south of the A14 approximately 1.75km WSW of the centre of Fenstanton and 7.5km southeast of the centre of Huntingdon (NGR 530300, 267900). **BP3** comprises three arable fields located between Hilton Road to the east and Potton Road (B1040) to the west (**Figures 1a, 1b and 1c**). The land in this region is flat at a height of around 10m above Ordnance Datum (aOD) and sits on an area of floodplain close to the River Great Ouse. A small stream named West Brook runs along the western and northern edge of the survey area before it runs north to join the river. The survey extents are defined by field boundaries to the north, east and west and by the limits of the proposed development at the south.

1.3.2 Borrow Pit 5 (**BP5**) is located south of the A14 approximately 4.1km WNW of the centre of Bar Hill and 12.5km northwest of the centre of Cambridge (NGR 534300, 265200). **BP5** comprises three arable fields located west of Elsworth Road (**Figures 1a, 1b and 1d**). The site is spread across a ridge of land aligned NNW-SSE. The highest point of the survey area is a little over 40m aOD and falls to less than 25m aOD at the western and eastern corners of the site. The survey extents are defined by field boundaries in all directions.

1.3.3 Borrow Pit 6 (**BP6**) is located north of the A14 approximately 2.3km ESE of the centre of Bar Hill and 6.4km northwest of the centre of Cambridge (NGR 540250, 262900). **BP6** comprises three arable fields located east of Dry Drayton Road (**Figures 1a, 1b and 1e**). The site is fairly flat with the highest point of the survey area is at the eastern edge at a little over 15m aOD but much of the site is at a height around 10m aOD. The survey extents are defined by field boundaries in all directions with the A14 defining the southwest edge.

1.4 Soils and Geology

1.4.1 The bedrock geology underlying **BP3** is composed of Oxford clay formation mudstone dating to the Jurassic. The superficial geology recorded under the site is recorded as river terrace deposits of sand and gravel dating to the Quaternary (BGS). The soils underlying **BP3** are mostly recorded as typical calcareous pelosols of the 411c (Evesham 3) association with typical argillic brown earths of the 571u (Sutton 1) association located at the northern edge of the site (SSEW 1983).

1.4.2 The bedrock geology underlying **BP5** is recorded as Kimmeridge clay formation mudstone along the top of the ridge running through the site with West Walton formation and Amphill clay formation (undifferentiated) located along the lower lying ground either side. Both geologies date to the Jurassic period. Superficial deposits of Oadby member diamicton (Quaternary) are recorded along the ridge of high ground with no deposits recorded over the lower ground either side (BGS). The soils underlying **BP5** are recorded as typical calcareous pelosols of the 411d (Hanslope) and 411c (Evesham 3) associations; the former is recorded along the ridge of high ground with the latter located over the lower ground either side (SSEW 1983).



- 1.4.3 The bedrock geology underlying **BP6** is recorded as Gault formation mudstone with the possibility of Woburn sands formation sandstone at the far northwest edge of the site. Both geologies date to the Cretaceous period. No superficial deposits are recorded over the site although deposits of Oadby member diamicton are recorded a short distance to the southwest (BGS). The soils recorded under **BP6** are typical calcareous pelosols of the 411c (Evesham 3) association. There is a possibility that typical brown earths of the 541A (Bearsted 1) association extend into the northwest edge of this survey area (SSEW 1983).
- 1.4.4 Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey. Areas of gravel, such as those recorded within **BP3**, can result in strong background magnetic values and in this case have likely obscured archaeological features.

1.5 Archaeological Background

- 1.5.1 The overarching archaeological and historical background for the entire Scheme has previously been considered, and is repeated below for information.
- 1.5.2 A number of studies have been undertaken for the previous A14 Ellington to Fen Ditton scheme and the current A14 Cambridge to Huntingdon Scheme, including:
- *Aerial photographic assessment in 2003 (Air Photo Services);*
 - *A watching brief on Ground Investigation works in 2008 (Patenall, M., 2008);*
 - *Geophysical survey in 2004, 2008, 2009 and 2010 (Sabin, D J 2004, Bunn, D., 2008, Bartlett, A.D.H., 2008, Bartlett, A.D.H., 2009a, Bartlett, A.D.H., 2009b, Marsh, B, Biggs, M and Wright, A 2010);*
 - *Surface Artefact Collection in 2009 (Anderson, K., Hall, D. & Standing, R., 2009);*
 - *Archaeological trial trenching in 2010 (Patten, R., Slater, A, & Standing, R., 2010);*
 - *A14 Ellington to Fen Ditton Environmental Statement (Highways Agency 2009); and*
 - *A14 Cambridge to Huntingdon – Environmental Impact Assessment Scoping Report (Highways Agency 2014).*
- 1.5.3 A total of 493 heritage assets were identified in a 300m study area around the Scheme footprint.
- 1.5.4 The archaeological activity in the Scheme area includes notable concentrations of Prehistoric and Roman remains on the gravel areas at the west of the Scheme, particularly to the west and south of Brampton. These comprise extensive crop mark complexes identified through aerial photography and geophysical survey and verified by trial trenching. As non-intrusive survey techniques are very effective on the gravels, it is unlikely that substantial Prehistoric or Roman period archaeological remains would be identified on the gravels outside the major complexes noted above.
- 1.5.5 Remains from the Prehistoric and Roman periods are also found on the clay land areas to the east, but these are fewer, less complex and less robust than their counterparts on the gravels. It is unlikely that further substantial complexes survive unidentified outside the complexes already identified on the clay lands; however, dispersed remains may exist. Late Iron Age and Roman activity is represented by the Roman settlement of Godmanchester (*Gumecestre*) is believed to have been founded as a Roman station along the former course of the Roman road known as Ermine Street; this is believed to run along the route of the present A14. The town was a walled agricultural settlement

founded in the 1st century AD. A substantial Roman villa complex with a late Roman and Early Medieval cemetery was located at Whitehall's south of Mill Common and the existing A14.

- 1.5.6 Evidence of early medieval activity is more limited. There are known centres of activity within Huntingdon such as the Danish Burgh and a cemetery at White Hill, however, there is only limited evidence for early medieval activity in the study area and it is unlikely that extensive buried archaeological remains from this period lie within the footprint of the Scheme. This pattern continues into the medieval period where the majority of evidence is contained within the major historic settlements, particularly Huntingdon. This was a major centre of medieval settlement, trade and industry. The form and layout of its historic core was largely established in this period and it contains notable remains including the Scheduled Monument of Huntingdon Castle and Scheduled earthwork on Mill Common.
- 1.5.7 The following information is summarised for each borrow pit from the Heritage Gateway website (www.heritagegateway.org.uk); a search was performed for all heritage assets within 500m of the three borrow pit sites. Record numbers referred to in the following text are bracketed with records consulted detailed in the references section of the report.
- 1.5.8 Heritage assets within or close to **BP3** include cropmark features revealed in 2003 that are considered to be late prehistoric to Romano-British in date with later field systems dating to the post-medieval also identified (08819 and 09192). The former gravel pits located to the north of this proposed borrow pit revealed several flint tools and flakes dating to the Palaeolithic (MCB19254). Traces of ridge and furrow were identified nearby during previous geophysical survey (MCB20038).
- 1.5.9 A fairly large number of heritage assets are recorded close to **BP5** with the majority relating to occupation from the Saxon to the post-medieval period at the nearby village at Boxworth. Previous geophysical survey was carried out on the old village green that revealed a number of interesting anomalies including an undated ladder settlement and possible kiln (MCB17880 and MCB18143). Some work was undertaken within the current survey area for a proposed wind farm development that revealed Bronze Age flint and at least two ditches (MCB15933 and MCB15934). A rectangular enclosure was identified in the area from 2013 aerial photographs that is considered to be Iron Age in date (EH1587378). Ridge and furrow is also recorded in numerous locations around the village of Boxworth.
- 1.5.10 By contrast there are very few heritage assets recorded within or close to **BP6** with the most extensive of these remains relating to ridge and furrow observed from the analysis of aerial photography carried out in 2003 (11459). An evaluation carried out near Oakington in 2007 revealed some sterile ditches tentatively ascribed a Romano-British date (MCB17673). A Second World War heavy anti-aircraft battery is also recorded near Poplar Farm although few details are available (EH1471830).



2 METHODOLOGY

2.1 Introduction

- 2.1.1 The detailed magnetometer survey was conducted using Bartington Grad601-2 dual fluxgate gradiometer systems and the Geomatrix Geophysical Exploration Equipment Platform (GEEP) system mounted with four Geometrics G858 caesium vapour sensors. The survey was conducted in accordance with English Heritage guidelines (2008).
- 2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between the 22nd September 2014 and the 17th October 2014. Survey of the total area was not completed over **BP3** and no survey took place at all over **BP5** due to restricted access; the only borrow pit to be fully surveyed was **BP6**. Field conditions at the time of the survey were good in the two borrow pits surveyed with the survey areas either ploughed flat or left under stubble.

2.2 Method: Magnetometer Survey

- 2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS instrument for the Bartington surveys, which is precise to approximately 0.02m. A Leica Viva base and rover system was used to provide positioning for the GEEP system; this is precise to approximately 0.01m. Both methods of positioning give an accuracy that exceeds both English Heritage recommendations (2008) and the requirements set out by Jacobs (2014b).
- 2.2.2 Some of the magnetometer survey was conducted using Bartington Grad601-2 fluxgate gradiometer instruments, which has a vertical separation of 1m between sensors. Data were collected at 0.25m intervals along transects spaced 1m apart with an effective sensitivity of 0.03nT, in accordance with EH guidelines (2008). Data were collected in the zigzag method.
- 2.2.3 Data from the survey was subject to minimal data correction processes. These comprise a zero mean traverse function ($\pm 5nT$ thresholds typically) applied to correct for any variation between the two Bartington sensors used, and a de-step function to account for variations in traverse position due to varying ground cover and topography. The deslope and multiply functions were used in certain instances to process out grid edge discontinuities and account for differences in sensor height between different operators. These four steps were applied to all survey areas, with no interpolation applied.
- 2.2.4 The GEEP system's four G858 caesium vapour magnetometers are set up for single sensor survey with four sensors mounted on the cart at a horizontal separation of 1m. The system was set to collect ten samples per second along transects spaced at least 1m apart with an effective sensitivity of 0.01nT, in accordance with EH guidelines (2008).
- 2.2.5 The data acquisition software used by the GEEP system was Geometrics MagLog with Geometrics MagMap and MagPick subsequently used to carry out coordinate conversions and to apply some basic data correction. These corrections include a manual despike to remove dropped readings and smoothing to remove slight differences between the four sensors used, heading errors, diurnal variation and broad geological responses.
- 2.2.6 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

2.3 Method: UAV Survey

- 2.3.1 Photogrammetry data were acquired on the 30th and 31st of October 2014 by Callen-Lenz in the Red Green Blue (RGB) and Near Infra-Red (NIR) spectral ranges (**Figures 28, 30 and 32**) over the areas **BP3, BP5 and BP6** using a G2 Fixed-Wing UAS equipped a Sony NEX5n with a 23mm Lens (34.5mm equivalent). The data were provided as Tiff files with a 0.1m horizontal resolution, which were converted to ASCII files for ArcGIS 10.1. The ASCII files were then processed using the IVS Fledermaus (v. 7.3.6) suite, which allows full 3D visualisation. This allowed Digital Terrain Models (DTM) to be created whilst maintaining the 0.08m horizontal resolution. These data could then be interpreted based on height and rugosity while also allowing the RGB and NIR data to be overlain onto the 3D surface. These datasets were used to digitise the archaeological interpretation in ArcGIS 10.1 and assign WA ID numbers, starting at **1000** for the UAV interpretation.

3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

3.1 Introduction

- 3.1.1 The magnetometer survey has been successful in identifying anomalies of likely, probable and possible archaeological interest across the three borrow pit sites, along with a number of modern services. Results are presented as a series of greyscale plots, XY trace plots, and archaeological interpretations, at a scale of 1:2000 (**Figures 2 to 22**) with additional greyscale and interpretation plots produced to a scale of 1:500 where dense archaeology has been detected (**Figures 23 to 25**). Overall interpretation plans have been produced at a scale of 1:4000 for each of the two borrow pits surveyed (**Figures 26 and 27**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale image and $\pm 25\text{nT}$ at 25nT per cm for the XY trace plots.
- 3.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 4 to 27**). Anomaly numbers from **4000** are assigned to geophysical anomalies discussed in the text below. Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.
- 3.1.3 Numerous ferrous anomalies are visible throughout the detailed survey dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

3.2 Magnetometer Survey Results and Interpretation: Borrow Pit 3 (BP3)

- 3.2.1 Only the northern field of the **BP3** area was surveyed due to access constraints. The magnetometer data shows that this area is dominated by strong geological responses but there are some quiet areas where it has been possible to detect archaeological remains (**Figures 2 to 7**). There are some clear archaeological remains around **4000** and **4001** with positive linear ditches and at least two phases of sub-rectangular enclosures observed (**Figure 23**). The ditches are aligned roughly east-west and have magnetic values ranging between +1.5nT and +5nT. The enclosures both measure over 15m in length and show no clear internal features. These ditches have been classed as either archaeology or probable archaeology according to the strength of their magnetic response.
- 3.2.2 An L-shaped negative anomaly can be seen within the strong geological spread further south at **4002**. The identity of this anomaly is unclear but as it runs in an opposing direction to the observed geological responses, and has some regularity, to its plan is

considered to be a potential archaeological feature and is therefore classed as possible archaeology.

- 3.2.3 An isolated ditch section can be seen at **4003**; this has magnetic values over +3nT and has been interpreted as probable archaeology as its north-south alignment does not respect any mapped agricultural features.
- 3.2.4 A sub-oval pit-like anomaly with positive magnetic values has been detected at **4004**; this anomaly measures roughly 3.5m in length and has been classed as probable archaeology.
- 3.2.5 Two linear features can be seen at **4005** and **4006**; the former is located within the strong area of geological responses and the latter runs near parallel to the nearby field boundary. Both have been classed as possible archaeology as they may prove to be agricultural or geological.
- 3.2.6 A long ditch at **4007** and **4008** corresponds to a former field boundary marked on the 1888 edition Ordnance Survey (OS) map. A weak trend at **4009** also follows the line of a mapped field boundary. A ditch-like anomaly at **4010** runs parallel to a mapped field boundary but does not correspond with the mapped position so has been classed as agricultural rather than as a former field boundary. These field boundaries are no longer present on the 1976 edition OS map, indicating removal prior to this date.
- 3.2.7 A number of weak linear anomalies can be seen around **4011**; the appearance of these anomalies suggests that they may be agricultural in origin and may represent ridge and furrow.
- 3.2.8 A modern service can be seen at **4012** (**Figure 7**) but this will be discussed in more detail in a later section of the report (**3.4**).
- 3.2.9 As was mentioned above a broad area of strong geological responses runs across most of the survey area and can be seen at **4013** to **4015**. These areas are characterised by alternating bands of positive and negative responses with typical strength between $\pm 10\text{nT}$. These bands most likely correspond to the gravel deposits recorded beneath the site by BGS; the palaeochannels identified show the direction of flow. These deposits are easily strong enough to mask any archaeological features that may be present and based on the results of previous aerial photography assessments there are likely to be further archaeological features within these areas.

3.3 Magnetometer Survey Results and Interpretation: Borrow Pit 6 (BP6)

- 3.3.1 The southern field of BP6 contains the greatest concentration of archaeological remains; the main feature of interest is an oval settlement enclosure at **4016** (**Figures 24 and 25**). The main foci of this settlement are the east and south sides of the enclosure which is evidenced from the greater concentration of internal features and the higher magnetic responses measured here. The settlement appears to extend beyond the proposed borrow pit area to the north. The main oval enclosure measures 75m in length and 60m in width.
- 3.3.2 The enclosure is sub-divided by ditches into distinct areas marked by **4016** to **4021**. The area around **4016** shows evidence of settlement with at least three ring ditches likely to correspond to the positions of roundhouses. A possible fourth roundhouse is observed to the south as a crescent ditch within **4019**. The divisions at **4017** and **4018** contain no clear structures but similar to **4016** and **4019** contain pit-like anomalies. Their enclosing ditches

have strong magnetic values over +5nT that possibly indicate a higher concentration of magnetically enhanced domestic refuse.

- 3.3.3 The sub-divisions in the northwest at **4020** and **4021** contain fewer pit-like anomalies and their enclosing ditches have weaker magnetic values around +1.5nT. This difference may suggest that these areas were not a focus for domestic activity that would result in the generation of magnetically enhanced material such as burning and deposition of waste. It is possible that this side of the enclosure served as stock paddocks rather than settlement areas.
- 3.3.4 There are five sub-enclosures extending from the exterior southern and eastern sides of the oval enclosure at **4022** to **4026**. The enclosures at **4024** and **4025** have a few internal features in the form of ditches but the rest look to be fairly empty. The magnetic values of their enclosing ditches are seen to weaken the further they extend from the core settlement area. This may indicate that they also served an agricultural function rather than a domestic function. Further out from these enclosures are some weak curvilinear trends; it is possible that these could also represent very weakly magnetic ditch sections.
- 3.3.5 Two strongly magnetic pits are visible a little further from the settlement at **4027** and **4028**. Both measure roughly 5m in length with magnetic values over +5nT and are considered to relate to the nearby settlement.
- 3.3.6 Elsewhere within this field (**Figures 8** to **10**) there are other possible pits at **4029** to **4031** that are classed as probable archaeology.
- 3.3.7 A pair of short ditch-like positive anomalies can be seen within a small patch of increased magnetic response at **4032**. The identity of these anomalies is unclear and both have been classed as possible archaeology to reflect this uncertainty in interpretation.
- 3.3.8 Two former field boundaries have been detected at **4033** and **4034** that can be seen on the 1887 edition OS map up to the 1970 edition OS map. These boundaries are likely to have taken the form of drainage ditches.
- 3.3.9 An area of ridge and furrow has been detected around **4035** but the coverage of ridge and furrow in this field is much lower compared to the two fields to the north (discussed below).
- 3.3.10 A modern service has been detected at **4036** but this will be discussed in the next section of the report.
- 3.3.11 The central field of BP6 (**Figures 11** to **16**) contains few anomalies of archaeological interest. A number of former field boundaries can be seen at **4037** to **4042** that correspond to boundaries marked on the 1887 edition OS map. There are trends at **4043** and **4044** that also correspond to the position of former field boundaries. These former boundaries most likely took the form of drainage ditches.
- 3.3.12 There are some modern ploughing trends visible around **4045** but these are not as widespread as the ridge and furrow that can be seen across the entire field.
- 3.3.13 The modern service observed in the southern field continues into this field at **4046** with a possible second service observed at **4047** but this will be discussed in the next section of the report. The spread of increased magnetic response near the A14 at **4048** is likely to relate to magnetic noise from passing traffic and metallic material introduced from the construction of the road.



- 3.3.14 The northern field (**Figures 17 to 22**) similarly contains few clear archaeological features with the only anomaly of probable archaeological interest being a small pit-like anomaly at **4049 (Figure 22)**.
- 3.3.15 A pair of parallel ditch-like anomalies is present around **4050**; these ditches mark a change in the direction of the ridge and furrow visible and are likely to be contemporary to this earlier field system. It is possible that they define a route through the former field system and have been classed as possible archaeology as they are likely to be early agricultural features rather than relatively modern ones.
- 3.3.16 Another ditch-like anomaly is visible at **4051** which is aligned with the direction of the ridge and furrow. This has stronger magnetic values around +3nT and is clearly different from the ridge and furrow. This feature is classed as possible archaeology due to its likely association with an earlier field system.
- 3.3.17 A short section of a former field boundary marked on the 1887 edition OS map is visible at **4052**. Two weak ditch-like anomalies can be seen at **4053** and **4054** that run along an alignment similar to other mapped modern agricultural features. Neither of these is marked on any of the maps consulted but they have been classed as agricultural due to their alignments. Ceramic field drains have also been detected in the western half of this field.
- 3.3.18 The modern service seen in the two fields further south runs through the corner of this field at **4055**; this service will be discussed in the next section of this report.

3.4 Magnetometer Survey Results and Interpretation: Modern Services

- 3.4.1 There are numerous services scattered throughout the data with major services detected in **BP3** at **4012** and in **BP6** at **4036, 4046** and **4055 (Figures 26 and 27)**. Both of these services appear to represent pipes and both extend beyond the limits of the geophysical survey data although their function is unclear. A third possible service was detected in **BP6** at **4047** but as this runs along the length of the concrete path may simply represent reinforcing steel used in the path's construction.
- 3.4.2 It is not clear from the geophysical survey data whether any of the services identified are in active use. It should also be noted that magnetometer survey may not detect all services present on a site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any trenches are opened in the proposed borrow pit areas.

4 UAV SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

- 4.1.1 A total of 31 features were identified across the three borrow pit areas, with ten in **BP3**, 13 in **BP5** and eight in **BP6**. For the most part, these features appear to be large scale earthworks, probably associated with field boundaries and also areas of ridge and furrow. All three borrow pit areas are now areas of arable farming and have been ploughed regularly. In addition, some areas were under crop at the time of the survey. As such there is minimal surface expression, often less than a 20cm change in height, of potential archaeological features. A full summary of the features identified in the UAV data can be found in **Appendix 3**.



4.2 UAV Results and Interpretation: Borrow Pit 3 (BP3)

- 4.2.1 The **BP3** survey area is divided between two fields, one to the south and one to the north (**Figures 28 and 29**). In the southern field there are two features, **1000** and **1003**. Feature **1000** is located on the western side of the field and is a linear feature aligned approximately south-west by north-east. This feature measures approximately 200m long by 25m wide. This may be a possible earlier field boundary, corresponding to the 1887 OS map, and may form an enclosed area with **1001** and **1003**. At its western end, feature **1003** is aligned perpendicularly to **1000** and runs parallel to the modern field boundary before turning to the north and extending into the northern field. **1003** is a curvilinear feature extending from the south-west to the north-east, with minimal surface expression and measures approximately 865m long by 25m wide.
- 4.2.2 In the northern field, feature **1001** is aligned parallel to the western part of **1003**, approximately 40m north of the modern field boundary, and measures approximately 489m long by 22m wide. As noted earlier this feature appears to form the northern limit of an enclosed area formed with features **1000** and **1003**. This field boundary may be related to the separation of land used for different purposes as there appears to be an area of ridge and furrow to the north (**1004**), but none has been identified to the south. The area of ridge and furrow **1004** seems to be limited by the modern field boundaries to the west and north, and by features **1001** and **1003** to the south and east. The ridges of **1004** are aligned approximately south-west by north-east and are spaced at approximately 29m intervals.
- 4.2.3 Within the area of ridge-and furrow there are five features (**1002, 1005 – 1008**) which may be the remains of earlier field boundaries, although **1006** and **1007** are on a similar alignment to the ridge and furrow and may be better preserved examples of ridges. **1006** is a linear aligned approximately north-west to south-east which measures 67m long by 15m wide. **1007** is on a similar alignment to **1006** and measures approximately 275m long by 15m wide, and may also correspond to a field boundary shown in the 1887 OS map. **1002** and **1005** run parallel to **1001** and are located approximately 110m north of it. **1002** measures approximately 67m long by 15m wide and lies to the west of **1005**, which measures approximately 209m long by 15m wide. Feature **1008** measures 27m long by 14m wide and is located to the east of **1007**, following the same alignment as **1002** and **1005**.
- 4.2.4 Feature **1009** is located to the east of the area of ridge and furrow **1004**, and measures approximately 240m long by 25m wide. This feature appears to be the remains of an earlier field boundary corresponding to the 1887 OS map, however it does not appear to be part of the same field system as the other features identified in the northern field as it is on a more north-south alignment than the ridge and furrow.

4.3 UAV Survey Results and Interpretation: Borrow Pit 5 (BP5)

- 4.3.1 The **BP5** survey area covers three fields, to the north-west, south-west and east (**Figures 30 and 31**). Among these, the fields to the north-west and east were under crop at the time of the survey. Features **1018** and **1019** are the furthest west of the features identified in **BP5**. Feature **1018** is the possible remnant of an earlier field boundary, aligned approximately north by south and measuring 167m long by 30m wide. Feature **1019** is a curvilinear feature extending from the west to south-east and measuring approximately 349m long by 29m wide. This may be the remains of an earlier field boundary or the eastern limit of an enclosure which extends outside of the survey area.
- 4.3.2 Of the remaining features, seven (**1020 -1024, 1028 and 1029**) are on a similar north-west by south-east alignment and may be the remains of an earlier field system. Features **1020**

and **1021** are the furthest west of these, located approximately 133m and 65m from **1022**. Between **1020** and **1022**, **1023** measures 150m long by 20m wide. Feature **1022** is the largest of the features, extending between the modern field boundaries at the north and south-east, over a distance of approximately 967m, and measuring 30m wide. This linear may correspond to a field boundary seen in the 1887 OS map. Features **1023**, **1024** and **1028** appear to be in line with each other and are located approximately 144m north-east of **1022**. Feature **1029** follows the same alignment as the modern field boundary at its northern end, and extends across the eastern field to the modern field boundary to the south-east. Feature **1029** is approximately 102m to the north-east of **1023** and measures 405m long by 19m wide and may correspond to a field boundary seen in the 1887 OS map.

- 4.3.3 In the space between features **1024** and **1028** there are three features (**1025-1027**) which do not follow the dominant alignment. Feature **1025** is a sub-circular feature with minimal surface expression, measuring approximately 90m in diameter. This feature is slightly raised and appears to have an irregular surface, possibly indicating the remains of a ploughed out mound. Feature **1026** is a negative linear feature aligned approximately south-west by north-east and primarily identified in the NIR dataset. The feature measures 187m long by 7m wide and may be the partially in-filled remains of a drainage ditch. Feature **1027** is a linear aligned approximately north-west by south-east, measures 341m long by 21m wide, and is possibly the remains of an earlier field boundary.
- 4.3.4 Feature **1030** is the most easterly of the features identified in **BP5**, located approximately 59m from the southern end of **1029**, adjacent to the modern field boundary. This is a sub-circular feature which appears to have been avoided by ploughing and measures approximately 9m in diameter. This may be the remains of a mound or structure related to Bronze Age or Anglo Saxon activity in the area, however it is ephemeral and requires further investigation.

4.4 UAV Survey Results and Interpretation: Borrow Pit 6 (BP6)

- 4.4.1 The **BP6** survey area is split between three fields; north, central and south (**Figures 32 and 33**). Most of the features identified within **BP5** are located in the northern field (**1010**, **1011**, **1013**, **1015** and **1017**) and are primarily comprised of the remains of possible earlier field boundaries, although none appear to correspond to the 1886 OS map, with the addition of **1015** which is an area of ridge and furrow with the ridges aligned approximately north by south and spaced at 30m intervals. This area of ridge and furrow is enclosed by the modern field boundaries to the north and south-west, but may have been ploughed out to the east where its limit is difficult to define. Feature **1010** and **1011** are located within this area at the western limit of the field. Feature **1010** is a linear aligned approximately north-west by south-east and measuring approximately 67m long by 20m wide whilst **1011** is a curvilinear feature aligned approximately north by south and measuring approximately 131m long by 26m wide. Although both features have similar alignments to the ridge and furrow, it is also possible that they are the remains of field boundaries. Feature **1011** may form the western limit of an enclosed area with **1013** and **1017**. Features **1013** and **1017** have similar west-north-west by east-south-east alignments, with **1013** possibly truncated by the modern field boundary and **1017** located 100m to the south. **1013** is the smaller of these features measuring 123m long by 27m wide, compared to **1017** which measures 698m long by 25m wide.
- 4.4.2 An area of ridge and furrow, **1012**, covers both the central and southern fields of **BP5**, with its limits coinciding with the modern field boundaries on all sides. The ridges of **1012** are aligned approximately south-west by north-east and are spaced at 30m intervals. There are two features within this area in the southern field, **1014** and **1016**. Feature **1014**

is the possible remains of an earlier field boundary, extending west in a similar alignment to the modern field boundary to the east and measuring 113m long by 25m wide. Feature **1016** is a curvilinear feature extending from south-west to east and measuring approximately 95m long by 19m wide. This may be the remains of an earlier field boundary or enclosure.

5 CONCLUSION

- 5.1.1 The geophysical and UAV surveys have fulfilled the aims set out in the WSI by identifying archaeological features, both known and unknown, and establishing the extent and layout of these features as well as interpreting them according to their potential archaeological significance.
- 5.1.2 The detailed magnetometer survey has been successful in detecting anomalies of likely, probable and possible archaeological interest within the Site, in addition to regions of increased magnetic response and several modern services. A large area of **BP3** is dominated by strong geological deposits that are strong enough to mask archaeological features.
- 5.1.3 The UAV survey has been shown to be an effective complementary system to use in conjunction with the magnetometer survey, identifying large features with little magnetic variation with the surrounding geology. Features detected include probable former field boundaries and possible archaeological features.
- 5.1.4 The clearest archaeological features detected in the magnetometer survey are the complexes of enclosures observed in **BP3** around **4000** and the oval enclosure in **BP6** around **4016**. Both complexes extend beyond the range of the survey area and it is likely that the enclosures in **BP3** continue into the nearby strong geological area rendering them undetectable.
- 5.1.5 The enclosure within **BP6** clearly relates to settlement with internal features detected that include four possible roundhouses, numerous sub-division ditches, pits/postholes and some empty looking enclosures that may have served an agricultural function.
- 5.1.6 The enclosures within **BP3** are not so clearly relatable to settlement activity with few internal features detected but there are at least two phases of occupation demonstrated by the two overlapping rectangular enclosures. These enclosures may lie adjacent to a main area of settlement, either outside of the area of proposed works or within the area of strongly magnetised geological deposits.
- 5.1.7 Possible archaeological features at **1025** and **1030** within **BP5** are sub-circular in shape and, although ephemeral and poorly defined, may be the remains of ploughed out mounds or structures. Considering the HER evidence of both Bronze Age and Anglo Saxon activity in the area it is possible that one or both may be burial mounds, however this would require further investigation to determine
- 5.1.8 Remnants of medieval and post-medieval use of this land were detected in the form of ridge and furrow in both the UAV and magnetometer data with large spreads of such features detected within all three borrow pits.
- 5.1.9 The geological maps suggested that gravel deposits were present across parts of **BP3**. The geophysical survey has detected broad areas of strong deposits in this proposed pit

site that are likely to relate to gravel deposits. Given that broad areas of cropmark features are recorded here from aerial photography it is likely that the geological responses have obscured some weaker archaeological deposits.

- 5.1.10 The relative dimensions of the modern services identified by the magnetometer survey are indicative of the strength of their magnetic response, which is dependent upon the materials used in their construction and the backfill of the service trenches. The physical dimensions of the services indicated may therefore differ from their magnetic extents in plan; it is assumed that the centreline of services is coincident with the centreline of their anomalies, however. Similarly, it is difficult to estimate the depth of burial of the services through magnetometer survey.
- 5.1.11 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be encountered than have been identified through geophysical survey. This is particularly true at this Site as some of the archaeology detected has had very weak magnetic values and have appeared to gradually fade into the background in places. It should also be noted that while it is possible to detect cut features such as ditches through magnetometer survey it is not always possible to identify the footings of stone buildings where local stone is used in construction.
- 5.1.12 All three borrow pit areas are now areas of arable farming and have been ploughed regularly and some areas were under crop at the time of the survey. As such there is minimal surface expression of potential archaeological features and there is the possibility that further excavation would identify features with little surface expression not identified in the UAV datasets. It should also be noted that the nature of the survey meant that no existing crop was damaged during the UAV survey

6 REFERENCES

6.1 Bibliography

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Wessex Archaeology, 2014. *A14 Huntingdon to Cambridge Improvement, Geophysical Survey and Archaeological Trial Trenching: Written Scheme of Investigation*. Unpublished client report ref. 105760.02

6.2 Cartographic Sources

British Geological Survey

<http://www.bgs.ac.uk/discoveringgeology/geologyofbritain/viewer.html>

Soil Survey of England and Wales (SSEW), 1983: Sheet 4, Soils of Eastern England. Ordnance Survey: Southampton.

Ordnance Survey, 1887. Cambridgeshire and Isle, 1:2500



Ordnance Survey, 1888. Huntingdonshire, 1:2500

Ordnance Survey, 1970. Cambridgeshire and Isle, 1:2500

Ordnance Survey, 1976. Cambridgeshire and Isle, 1:2500

6.3 Cambridgeshire HER Records

08819 – Cropmarks, Fenstanton

09192 – Post-medieval field system, Fenstanton

11459 – Ridge and furrow, Oakington and Westwick

MCB15933 – Bronze Age ditches, Boxworth wind farm site

MCB15934 – Bronze Age flints, Boxworth wind farm site

MCB17673 – Ditches of possible Romano-British date, Oakington

MCB17880 – Ladder enclosures, Spring Close, Boxworth

MCB18143 – Pottery kiln, Spring Close, Boxworth

MCB19254 – Middle Palaeolithic flints, Fenstanton

MCB20038 – Ridge and furrow anomalies, Fenstanton

6.4 English Heritage PastScape Records

EH1471830 – Heavy anti aircraft battery, Cambridge H4

EH1587378 – Rectangular enclosure, Boxworth



APPENDIX 1: SURVEY EQUIPMENT AND DATA PROCESSING

Survey Methods and Equipment

The magnetic data for this project was acquired using Bartington 601-2 dual magnetic gradiometer systems and the Geomatrix Geophysical Exploration Equipment Platform (GEEP).

The Bartington instruments have two sensor assemblies fixed horizontally 1m apart allowing two traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation, and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03nT over a ± 100 nT range, and measurements from each sensor are logged at intervals of 0.25m. All of the data are stored on an integrated data logger for subsequent post-processing and analysis.

The Bartington survey depends upon the establishment of an accurate 30m Site grid, which is achieved using a Leica Viva RTK GNSS instrument and then extended using tapes. The Leica Viva system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by English Heritage (EH 2008) for geophysical surveys.

The Bartington survey consists of collecting data over 30m x 30m grids with data collected at 0.25m intervals along traverses spaced 1m apart. This strategy gives 3600 measurements per 30m grid, and are the recommended methodologies for archaeological surveys of this type (EH 2008).

The GEEP system has four single G858 caesium vapour sensors fixed horizontally 1m apart allowing four traverses to be recorded simultaneously. As the sensors are mounted as single sensors and not gradiometers as is the case for the Bartingtons therefore diurnal and low frequency effects are not suppressed.

The G858 sensors have an effective sensitivity of 0.01nT when they are run at a cycle rate of 10Hz and when the cart is pulled at a speed of 6-7kmph logs readings at intervals smaller than 0.25m. Together with a 1m separation between traverses this system can achieve coverage that exceeds the minimum requirements set out for this type of survey by EH (2008). The GEEP system records a GPS string to accurately locate the data which removes the need to establish a site grid. All data is recorded to a laptop running Geometrics MagLog for subsequent post-processing and analysis.

A Leica Viva base and rover system was used to provide positioning for the GEEP system. A Leica Viva RTK GNSS instrument receiving corrections from a network of reference stations is first used to establish an accurate position for a selected base station point in the field. The base station is then setup over this point and is used to establish the error in the raw GPS positioning to establish a correction. This correction can then be sent to a rover GPS antenna mounted on the GEEP system via a radio connection to improve accuracy. This method of positioning is precise to approximately 0.01m in real time and exceeds the level of accuracy recommended by EH (2008) for geophysical surveys.



Post-Processing

The gradiometer data collected during the gridded survey are downloaded from the Bartington system for processing and analysis using both commercial software (Geoplot) and in-house software. The single sensor caesium vapour data collected using the GEEP system is processed using Geometrics MagPick. These software packages allow for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

Typical data and image processing steps may include:

- Deslope – Used to remove a linear trend from data. This is typically used to remove grid edge discontinuities that result from the application of other processing techniques;
- Destripe – Applying a zero mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data);
- Multiply – This function multiplies the data by a positive or negative value. This is most typically used to normalise data in instances where minor differences in the texture of gradiometer data arise from the collection of data by different operators.
- Smooth – This function fits a curve to the data that can then be subtracted from the raw values. This is used to remove diurnal variations, low frequency responses, heading errors and differences between the multiple sensors used.

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.

APPENDIX 2: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Agricultural ditches – used for ditch sections that are aligned parallel to existing boundaries and former field boundaries that are not considered to be of archaeological significance.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative or broad bipolar (positive and negative) anomalies.



APPENDIX 3: ARCHAEOLOGICAL FEATURES IDENTIFIED IN UAV DATA

WA ID	BP Area	NMP Form	Description	Easting	Northing
1000	BP3	BANK	Linear feature aligned approximately south-west by north-east and measuring 200m long by 25m wide. Possibly an earlier field boundary.	529831	267809
1001	BP3	BANK	Linear feature aligned approximately north-west by south-east, parallel to modern field boundary. Possible earlier field boundary approximately 489m long by 22m wide.	530146	267905
1002	BP3	BANK	Linear feature aligned approximately north-west by south-east and measuring 67m long by 15m wide.	530193	268029
1003	BP3	BANK	Curvilinear feature extending from the south-west to the north-east. Possibly the remains of an earlier field system. Feature has minimal surface expression and is approximately 865m long by 25m wide.	530208	267748
1004	BP3	RIGDOTSEWK	Area of ridge and furrow with minimal surface expression. Ridges are aligned approximately south-west by north-east and are spaced at approximately 29m intervals.	530304	267982
1005	BP3	BANK	Linear feature aligned approximately north-west by south-east and measuring approximately 209m long by 15m wide. Possibly remains of earlier field boundary.	530350	267994
1006	BP3	BANK	Linear feature aligned approximately north-east by south-west and measuring 87m long by 15m wide. Possibly the remains of an earlier field boundary or ridge and furrow.	530425	268030
1007	BP3	BANK	Linear feature aligned approximately south-west by north-east and measuring approximately 275m long by 15m wide. Possibly an earlier field boundary or ridge and furrow.	530454	267941
1008	BP3	BANK	Linear feature aligned approximately north-west by south-east and measuring 27m long by 14m wide.	530492	267953
1009	BP3	BANK	Linear feature aligned approximately north by south and measuring 240m long by 25m wide. Possibly the remains of an earlier field boundary.	530670	267906
1018	BP5	BANK	Linear feature aligned approximately north by south and measuring 167m long by 30m wide. Possibly the remains of an earlier field boundary.	533742	265443
1019	BP5	BANK	Curvilinear feature extending from the west to south-east and measuring approximately 349m long by 29m wide. Possible remains of earlier field boundary or eastern limit of enclosure outside of survey area.	533759	265304

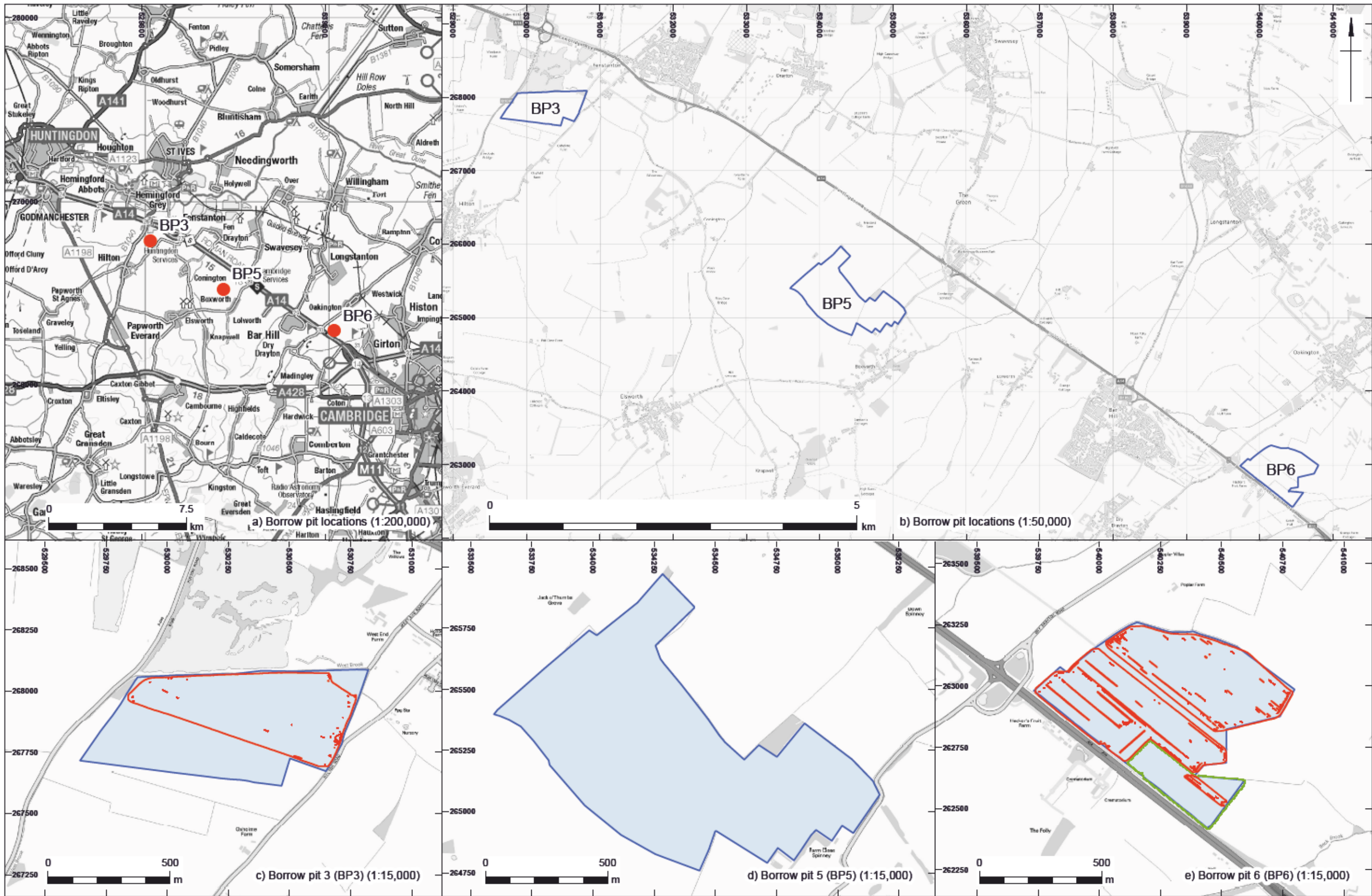


WA ID	BP Area	NMP Form	Description	Easting	Northing
1020	BP5	BANK	Linear feature aligned approximately north-west to south-east and measures 136m long by 25m wide. Possibly the remains of an earlier field boundary.	533855	265386
1021	BP5	BANK	Linear feature aligned approximately north-west by south-east and measuring 150m long by 20m wide. Possibly the remains of an earlier field boundary.	533866	265539
1022	BP5	BANK	Curvilinear feature extending from north-west to south east and measuring approximately 967m long by 30m wide. Possibly the remains of an earlier field boundary.	534153	265242
1023	BP5	BANK	Linear feature aligned approximately north-west by south-east and measuring 146m long by 30m wide. Possibly the remains of an earlier field boundary.	534190	265499
1024	BP5	BANK	Linear feature aligned approximately north-west by south-east and measuring 267m long by 36m wide. Possibly the remains of an earlier field boundary.	534314	265289
1025	BP5	BANK	Sub-circular feature with minimal surface expression measures approximately 90m in diameter. Possibly the remains of a ploughed out mound.	534437	265059
1026	BP5	LARGE_CUT_FEATURE	Linear feature with minimal surface expression. Aligned approximately south-west by north-east and measures 187m long by 7m wide. Possibly the partially infilled remains of a drainage ditch. Identified in NIR.	534443	265205
1027	BP5	BANK	Linear feature aligned approximately east by west and measuring 132m long by 19m wide. Possibly the remains of an earlier field boundary.	534450	264993
1028	BP5	BANK	Linear feature aligned approximately north-west by south-east and measuring 341m long by 21m wide. Possibly the remains of an earlier field boundary.	534692	264931
1029	BP5	BANK	Linear feature aligned approximately north-west by south-east and measuring 405m long by 19m wide. Possibly the remains of an earlier field boundary.	534753	265052
1030	BP5	BANK	Sub-circular feature which has been avoided by ploughing and measures approximately 9m in diameter. Possibly the remains of a mound or structure although it could also be the remains of a tree.	534963	264913



WA ID	BP Area	NMP Form	Description	Easting	Northing
1010	BP6	BANK	Linear feature aligned approximately north-west by south-east and measuring approximately 67m long by 20m wide. Possibly the remains of an earlier field boundary.	540049	263161
1011	BP6	BANK	Curvilinear feature aligned approximately north by south and measuring approximately 131m long by 26m wide. Possibly the remains of an earlier field system or ridge and furrow.	540097	263169
1012	BP6	RIGDOTSEWK	Area of possible ridge and furrow with minimal surface expression. Ridges are aligned approximately south-west by north-east and spaced at 30m intervals.	540176	262809
1013	BP6	BANK	Linear feature aligned approximately west-north-west by east-south-east and measuring 123m long by 27m wide. Possible remains of an earlier field boundary.	540189	263220
1014	BP6	BANK	Linear feature aligned approximately east by west and measuring approximately 113m long by 25m wide. Possibly the remains of an earlier field boundary.	540256	262687
1015	BP6	RIGDOTSEWK	Area of possible ridge and furrow with minimal surface expression, with eastern limit difficult to identify. Ridges are aligned approximately north by south and spaced at approximately 30m intervals.	540374	263054
1016	BP6	BANK	Curvilinear feature extending from south-west to east and measuring approximately 95m long by 19m wide. Possibly the remains of an earlier field boundary.	540449	262479
1017	BP6	BANK	Linear feature aligned approximately east to west and measuring 698m long by 25m wide. Possibly the remains of an earlier field boundary.	540468	263052

Coordinates expressed in OSGB 1936 British National Grid.



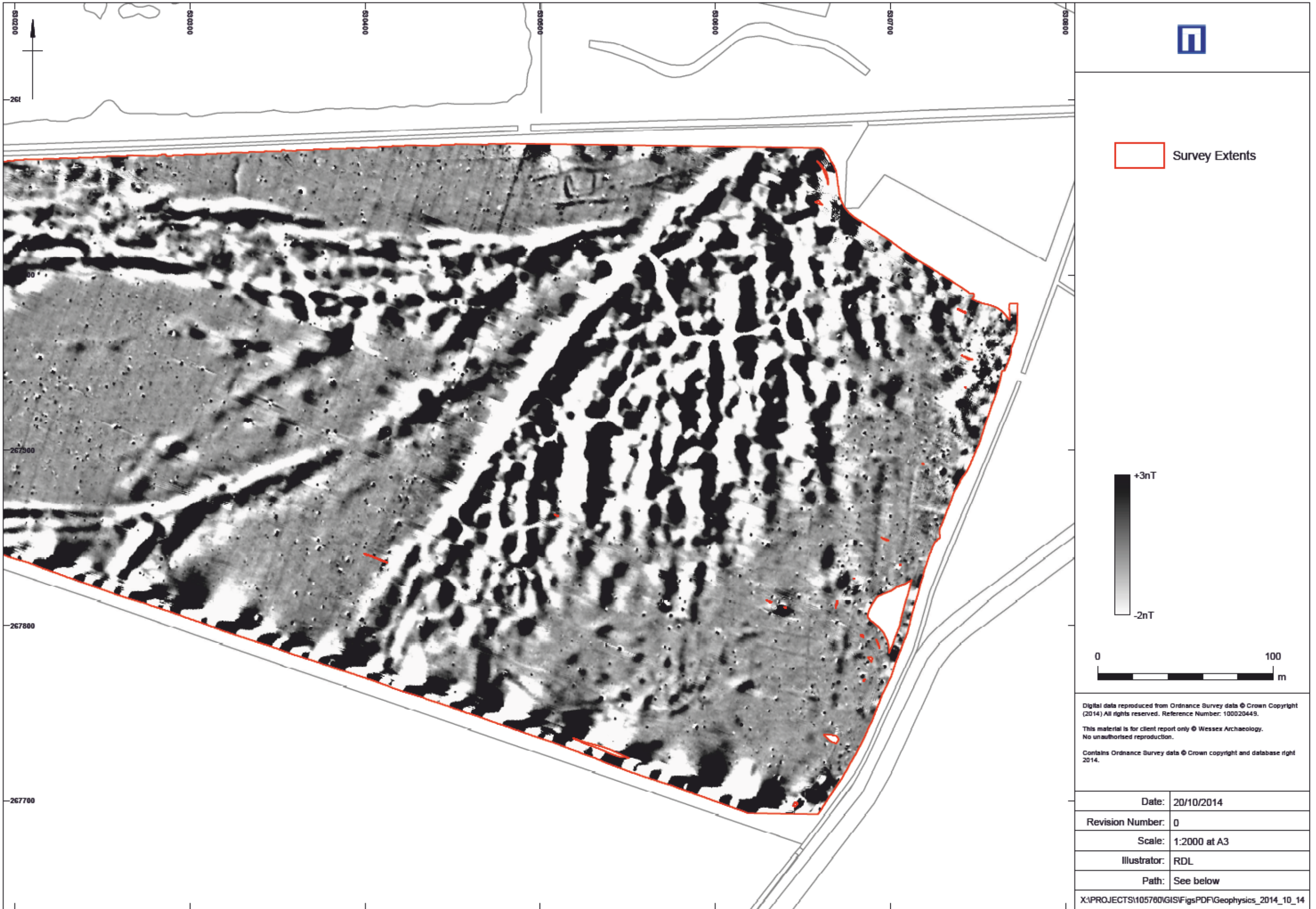
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- GEEP Magnetometer Survey Extents
- UAV Survey Extents
- Bartington Survey Extents
- Site Boundary

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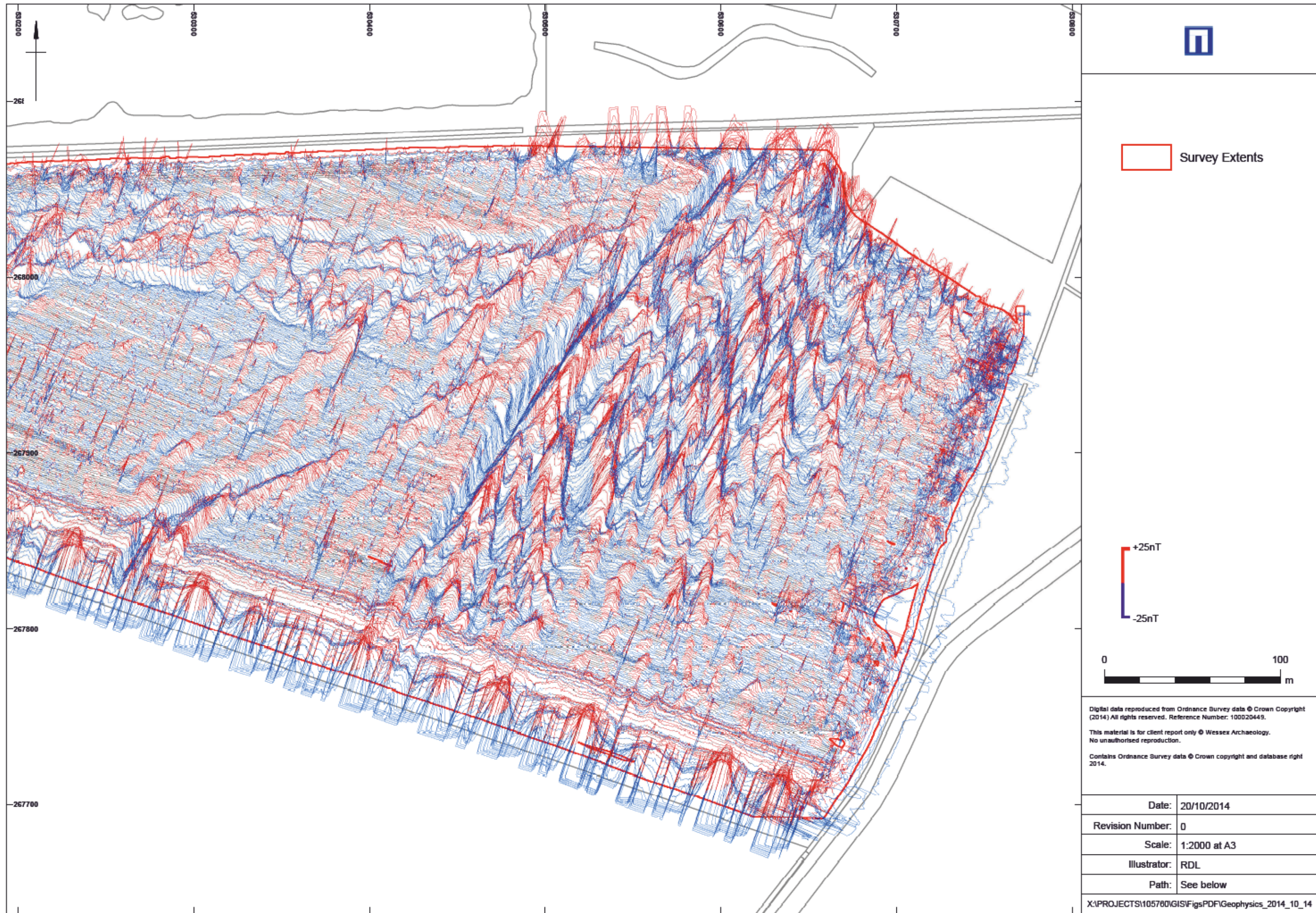
Site location and survey extents

Figure 1



Greyscale plot, BP3, northern field (east)

Figure 2



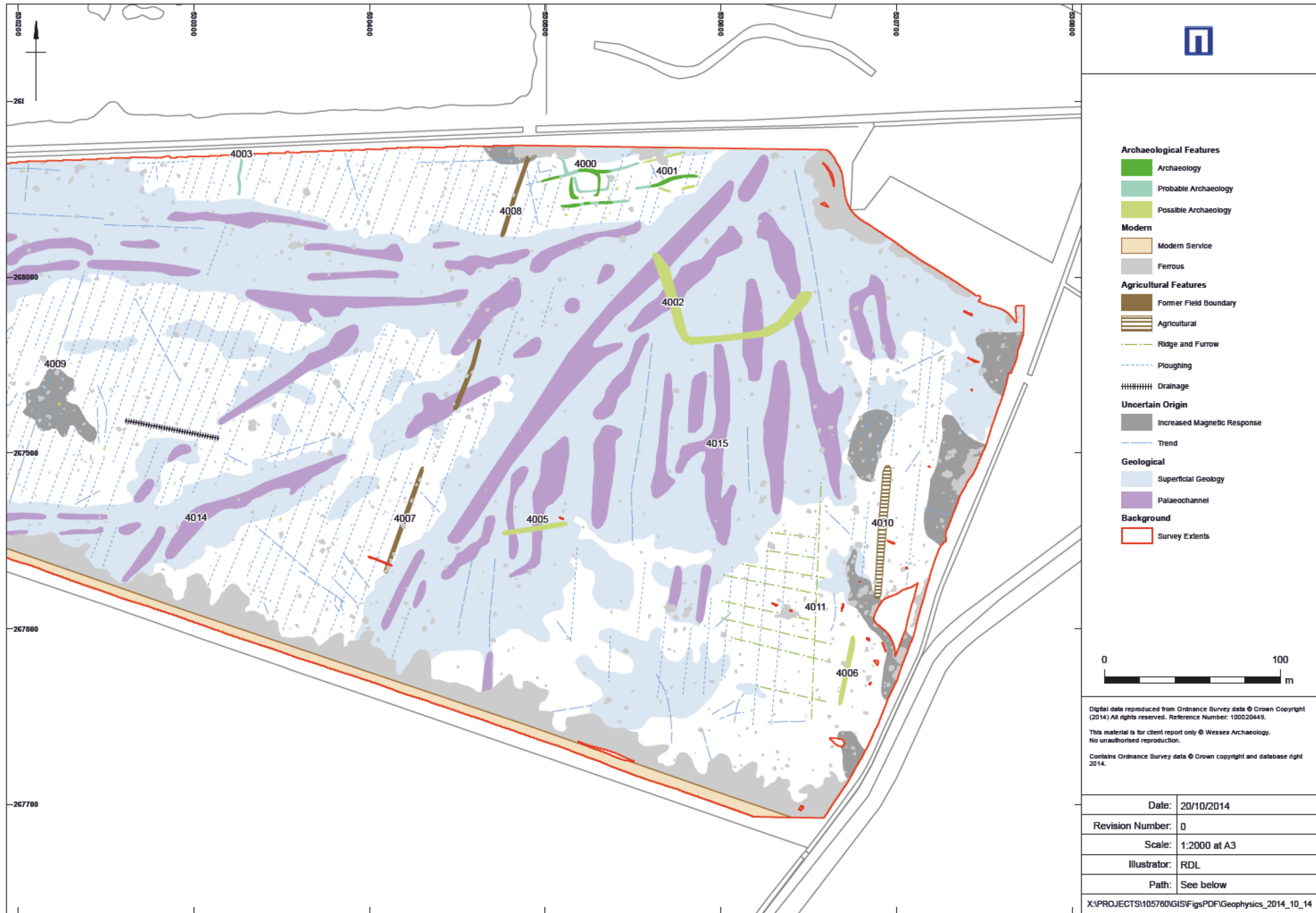
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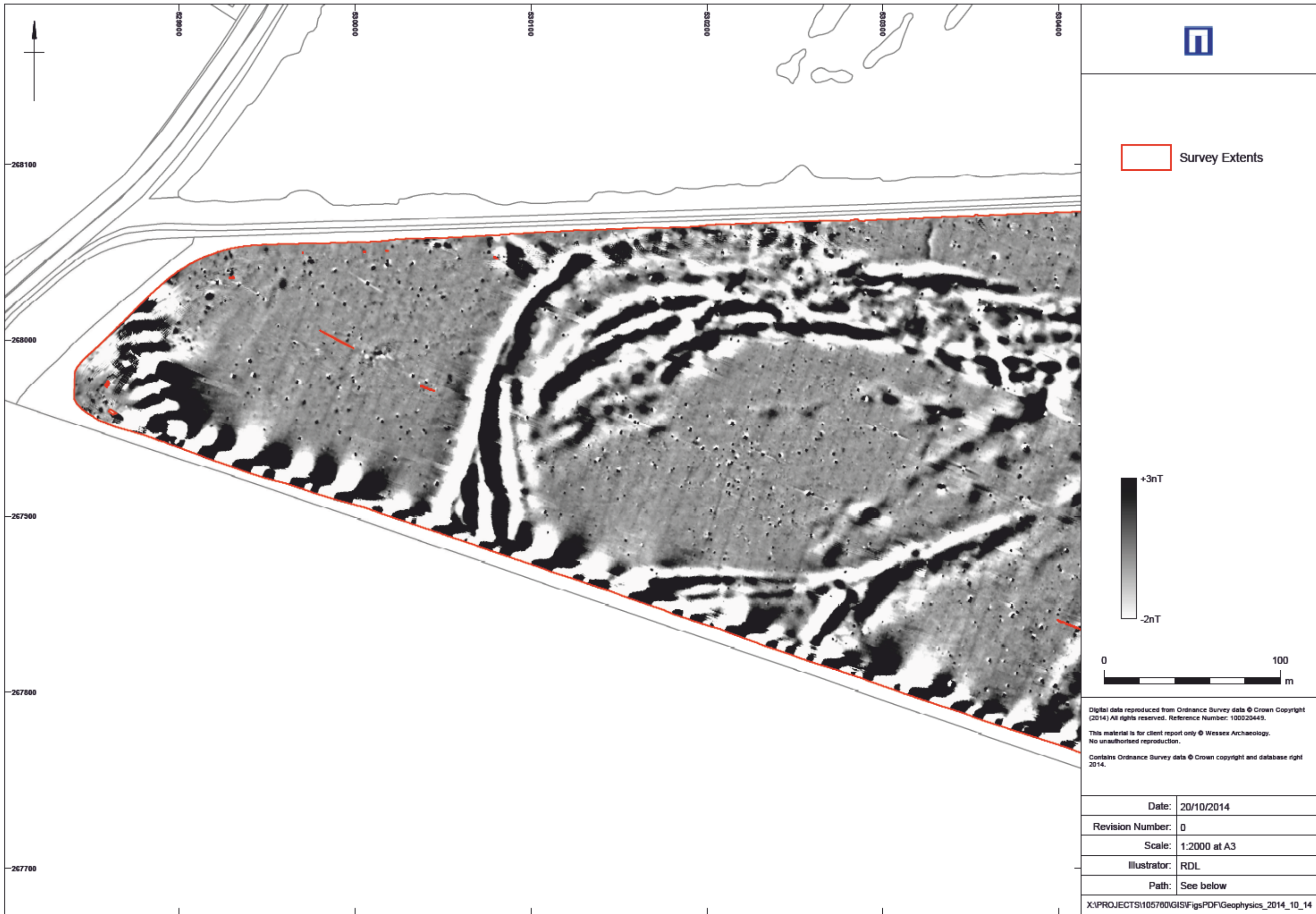
XY trace plot, BP3, northern field (east)

Figure 3



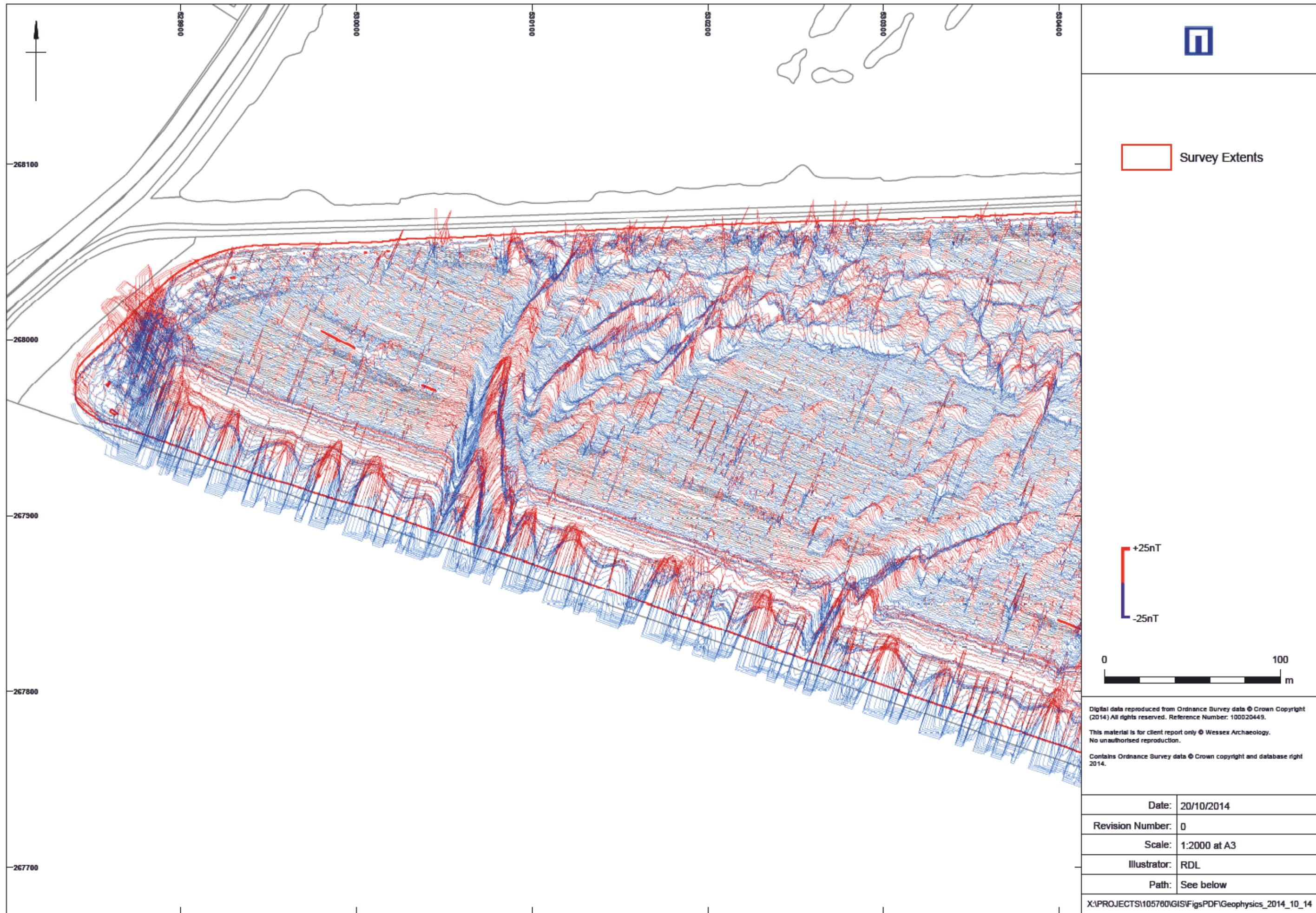
Interpretation, BP3, northern field (east)

Figure 4



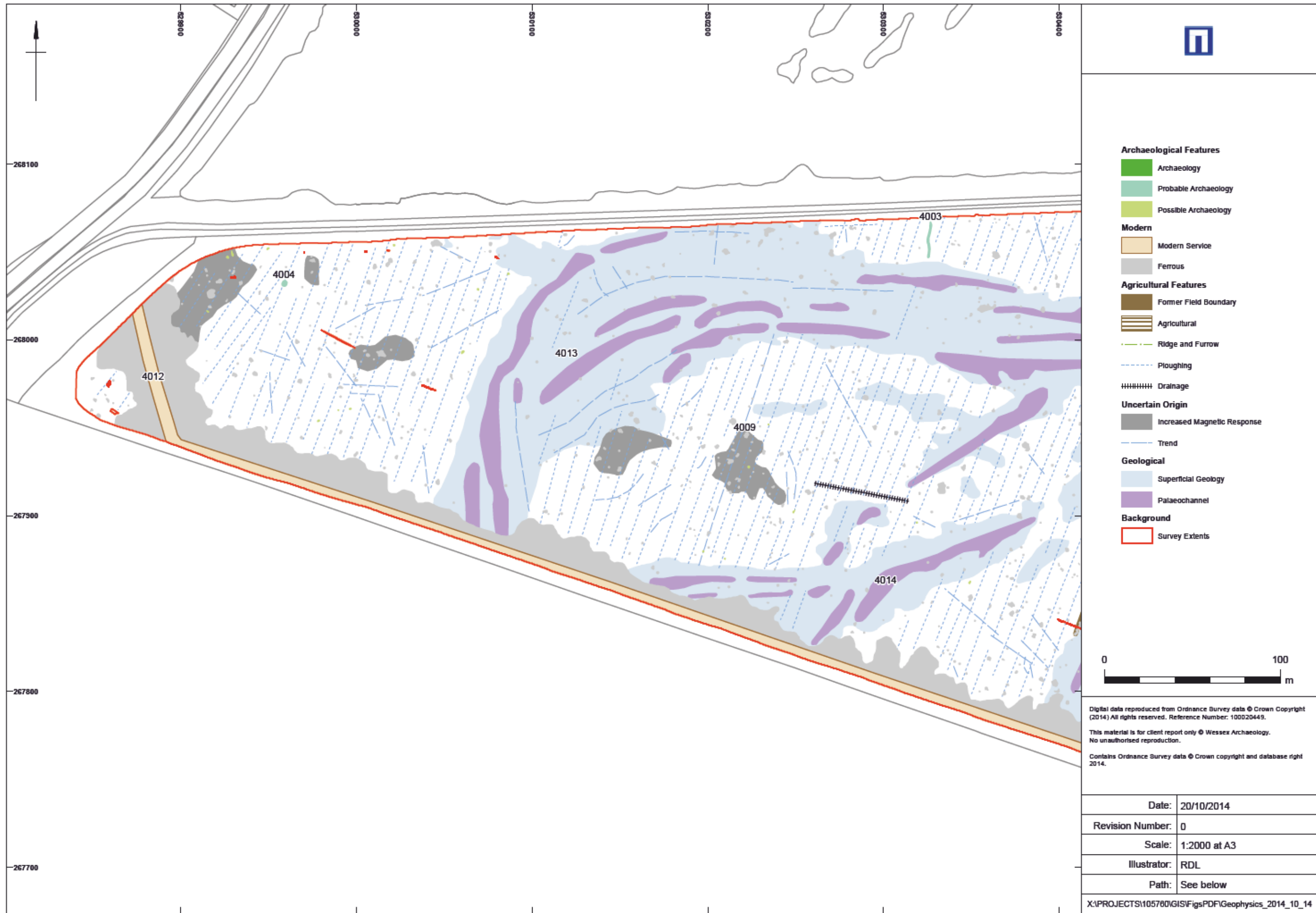
Greyscale plot, BP3, northern field (west)

Figure 5



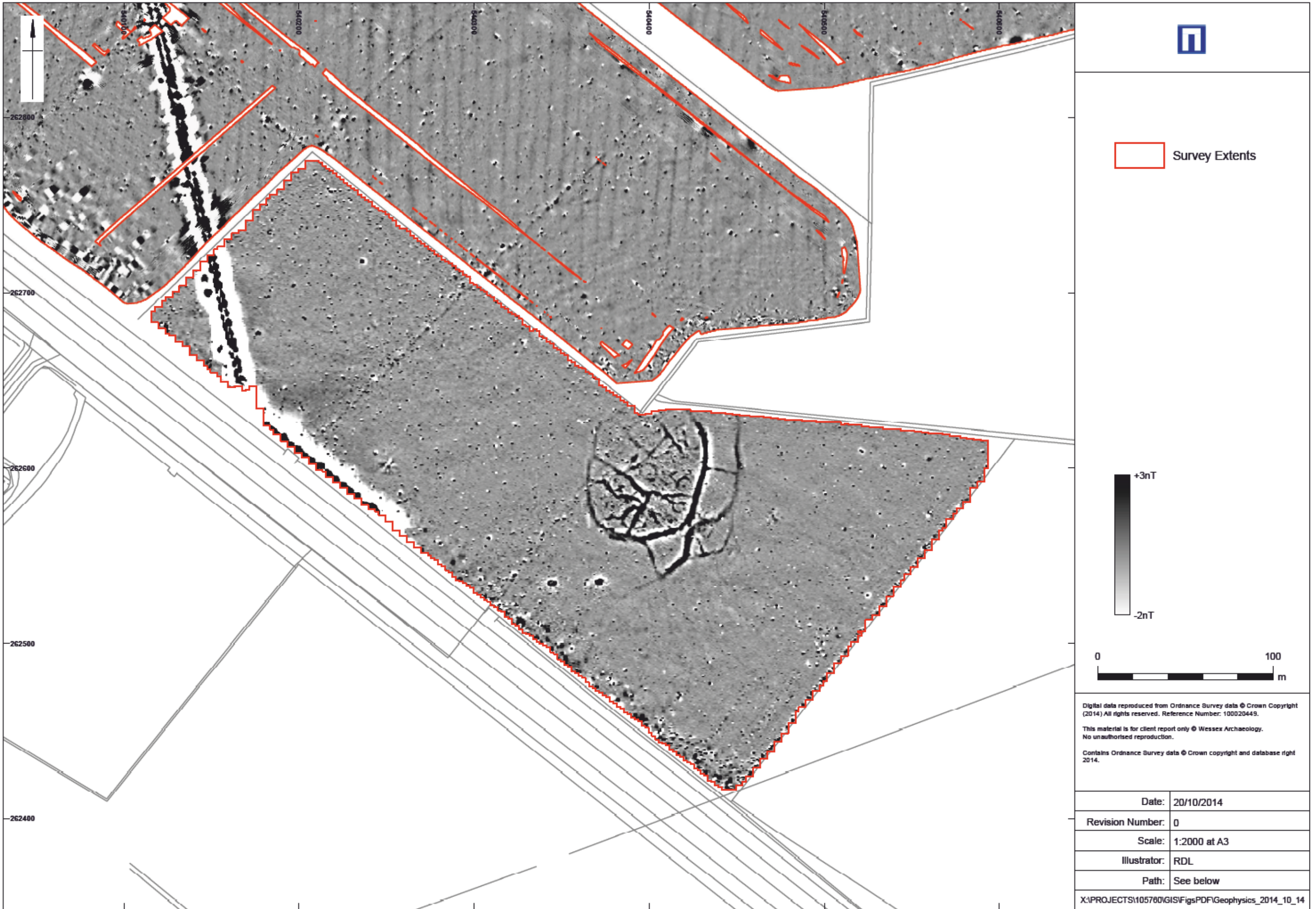
XY trace plot, BP3, northern field (west)

Figure 6



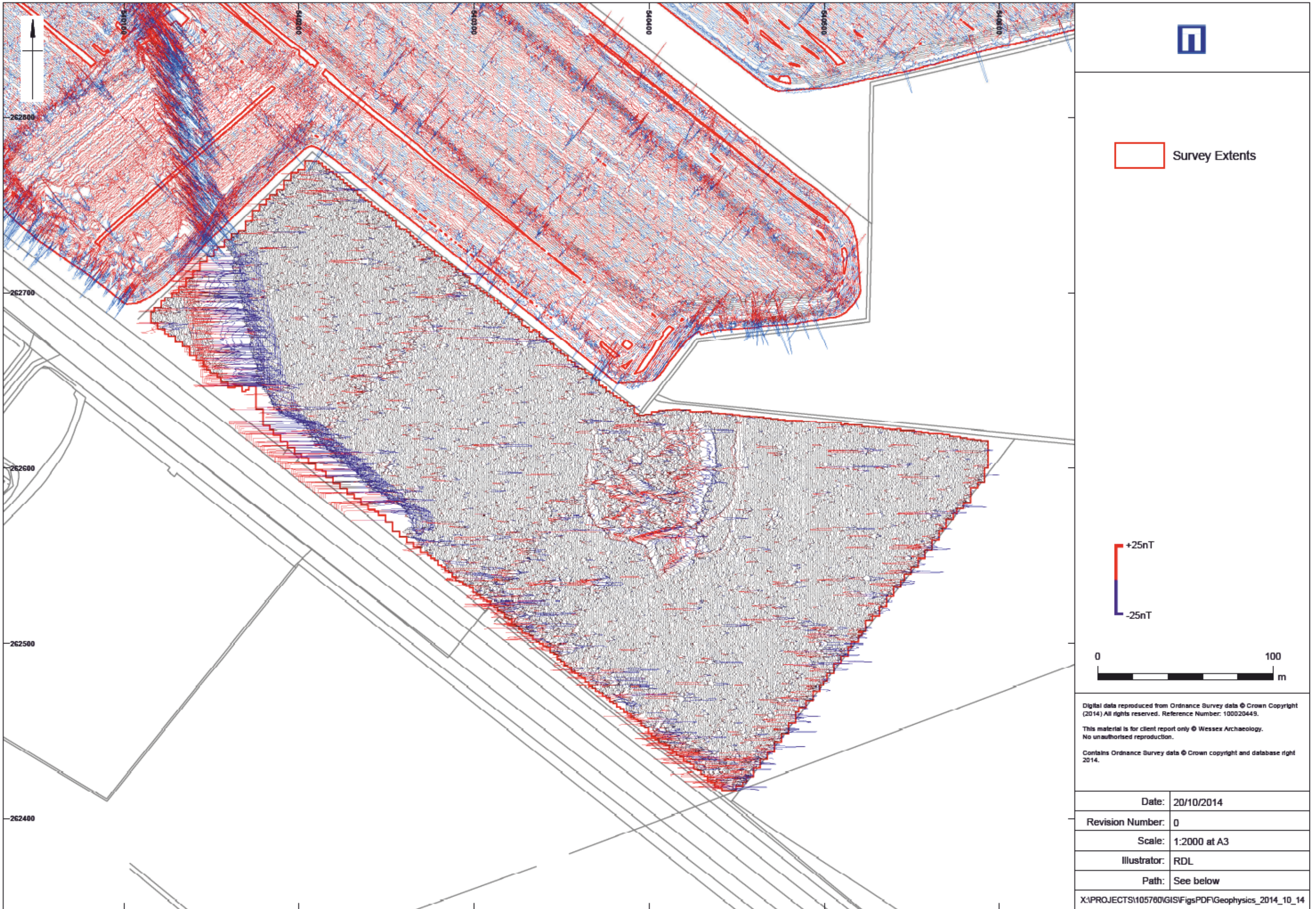
Interpretation, BP3, northern field (west)

Figure 7



Greyscale plot, BP6, southern field

Figure 8



XY trace plot, BP6, southern field

Figure 9



Interpretation, BP6, southern field

Figure 10



 Survey Extents



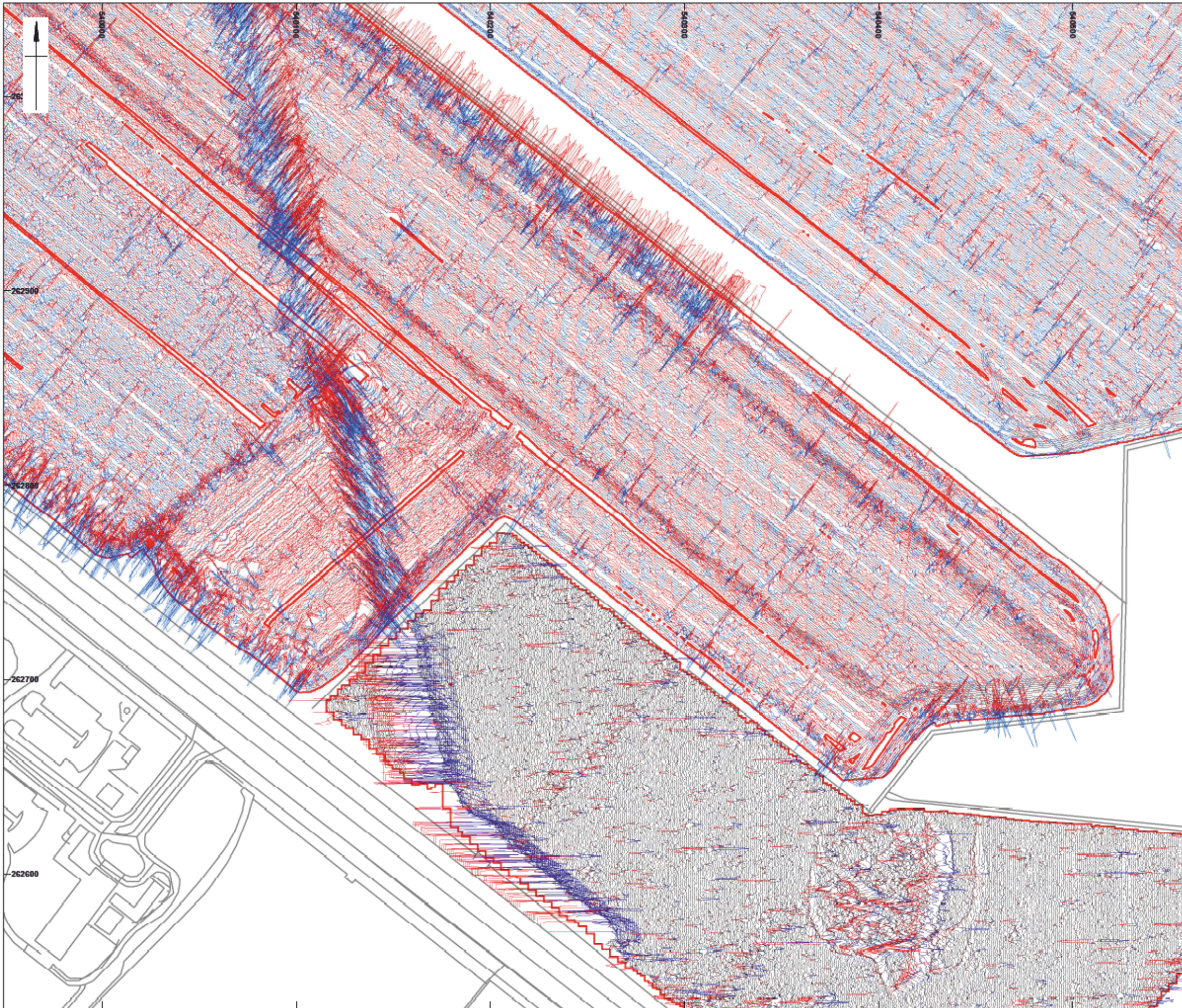
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Greyscale plot, BP6, central field (east)

Figure 11



 Survey Extents



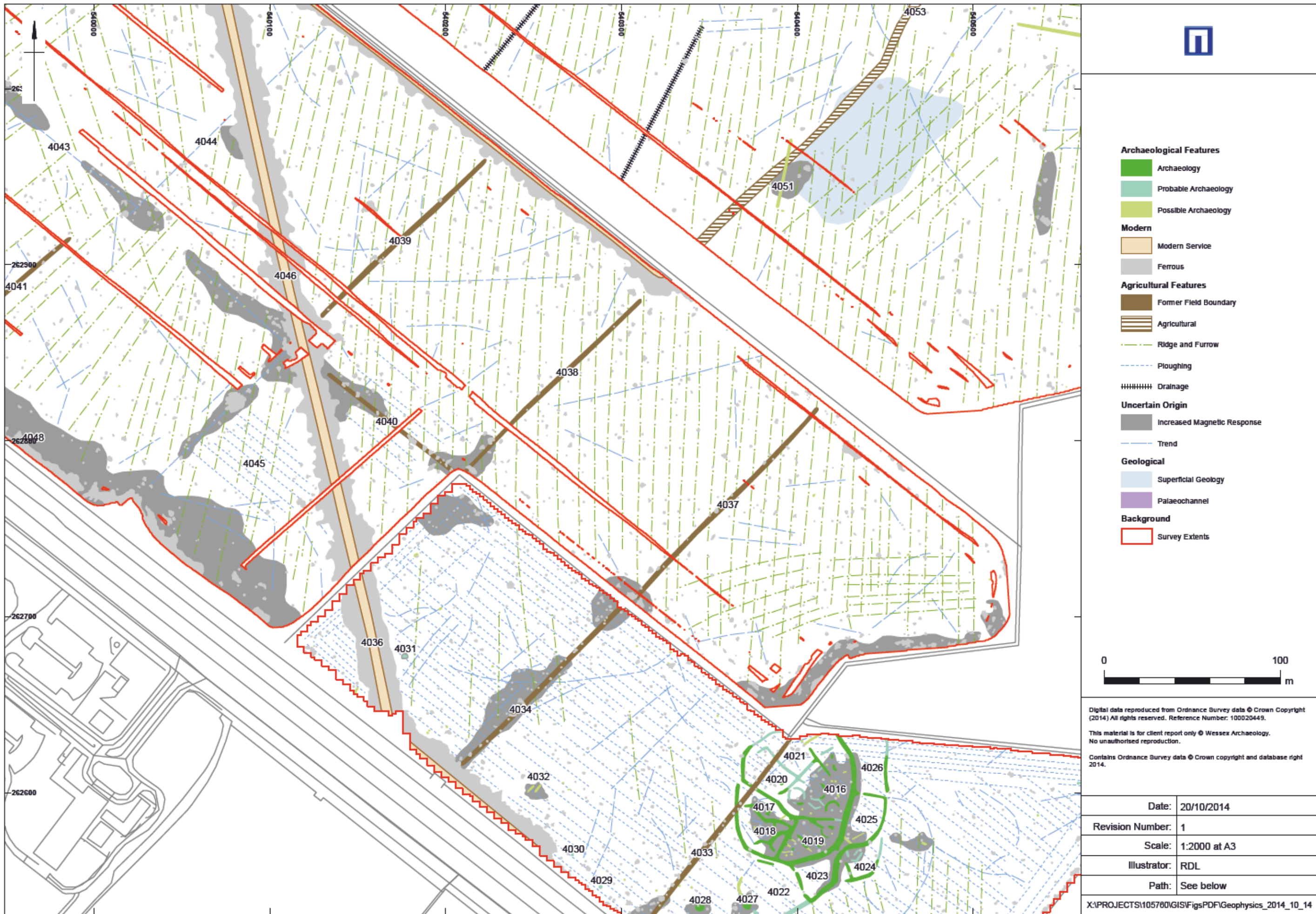
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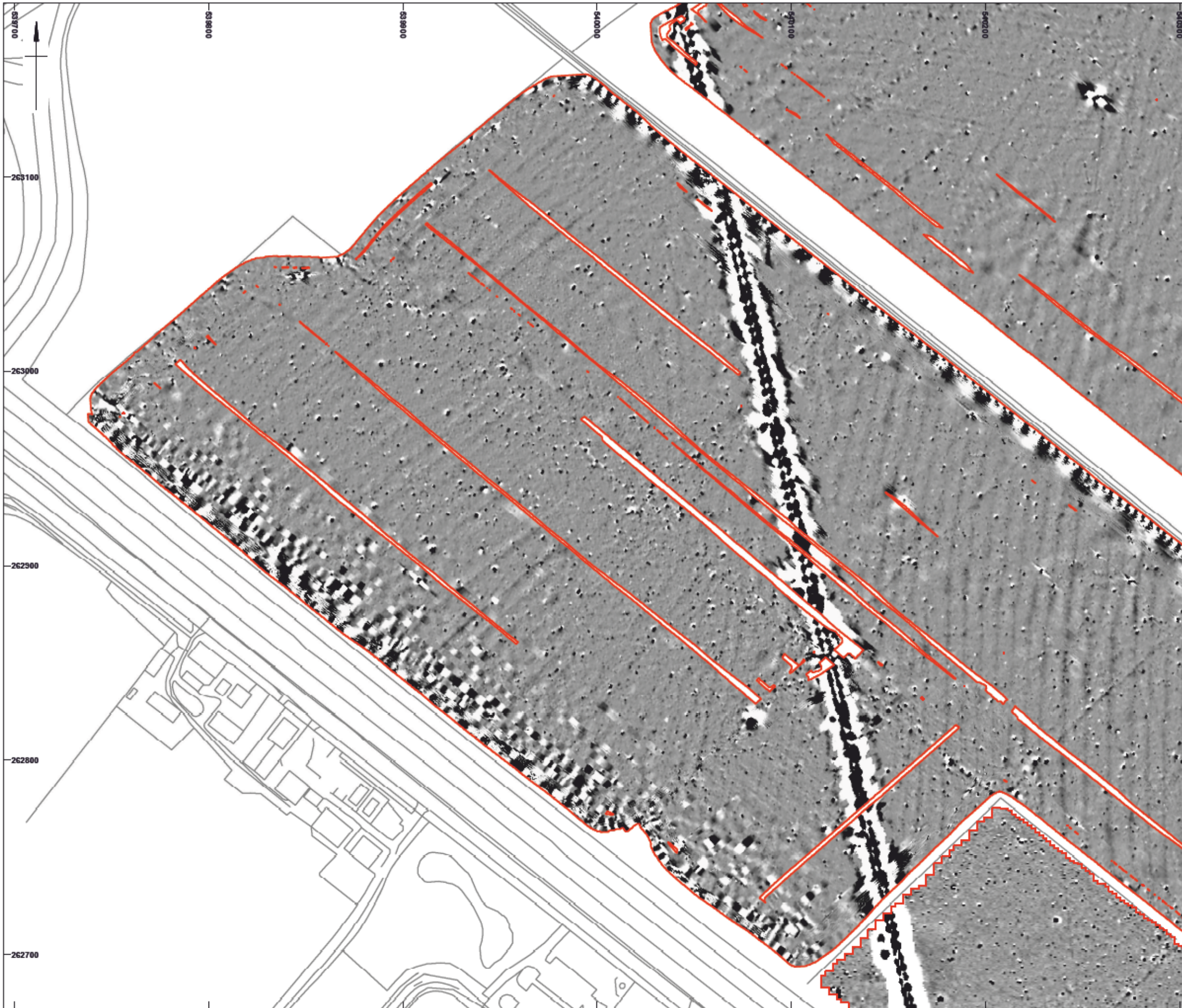
XY trace plot, BP6, central field (east)

Figure 12

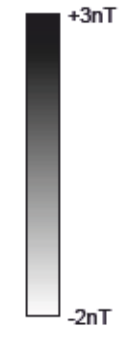


Interpretation, BP6, central field (east)

Figure 13



 Survey Extents



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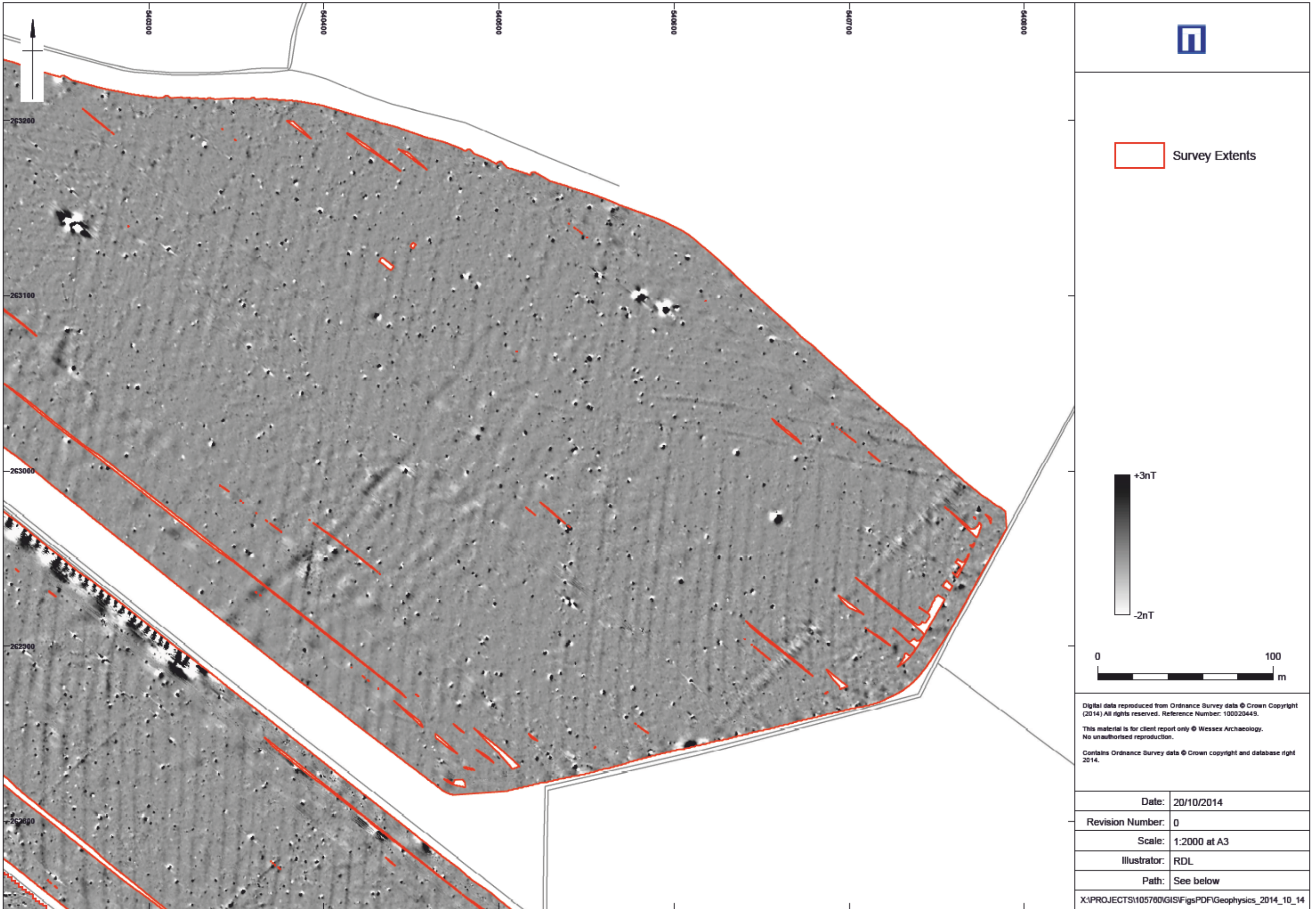
Greyscale plot, BP6, central field (west)

Figure 14



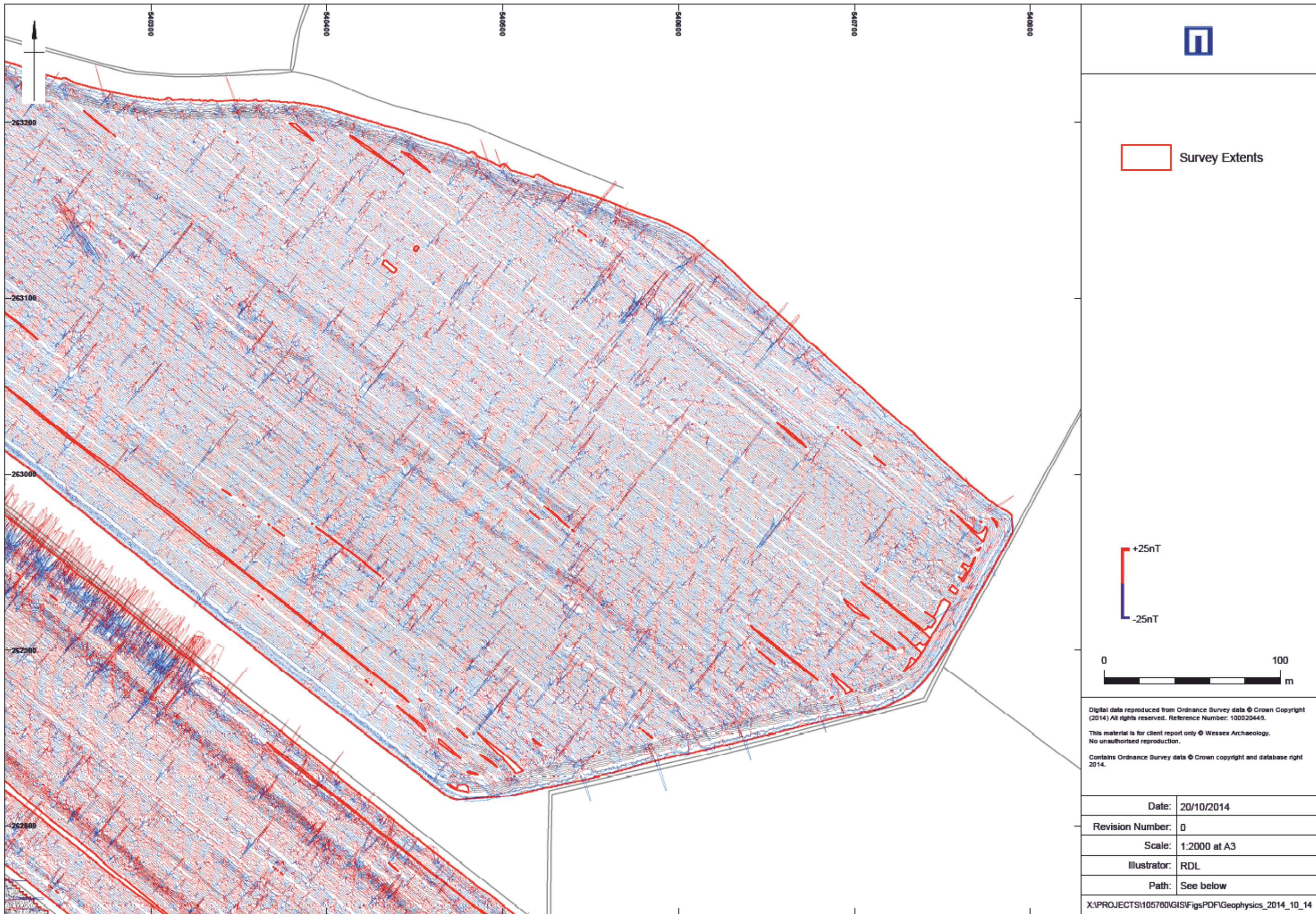
Interpretation, BP6, central field (west)

Figure 16



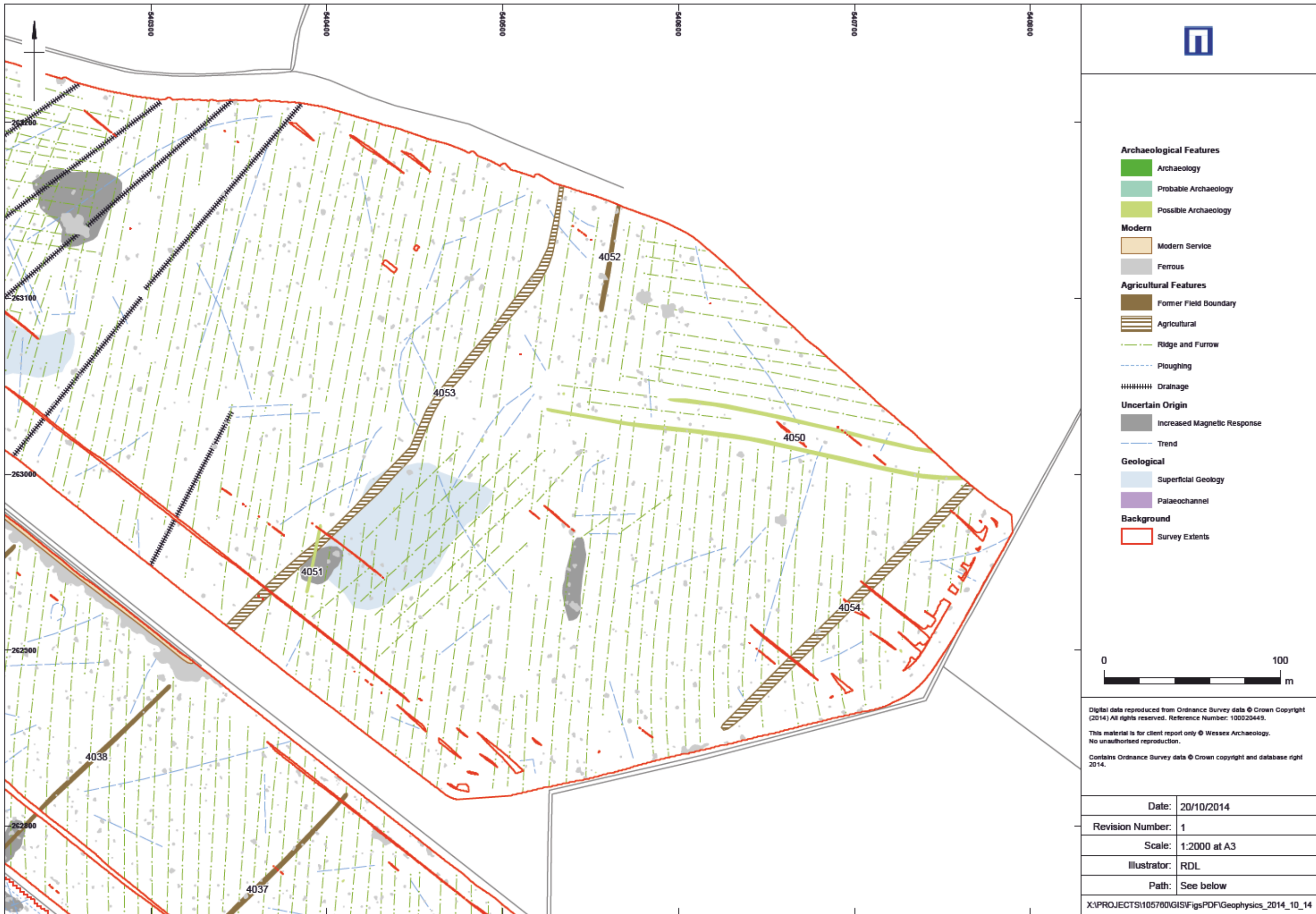
Greyscale plot, BP6, northern field (east)

Figure 17



XY trace plot, BP6, northern field (east)

Figure 18

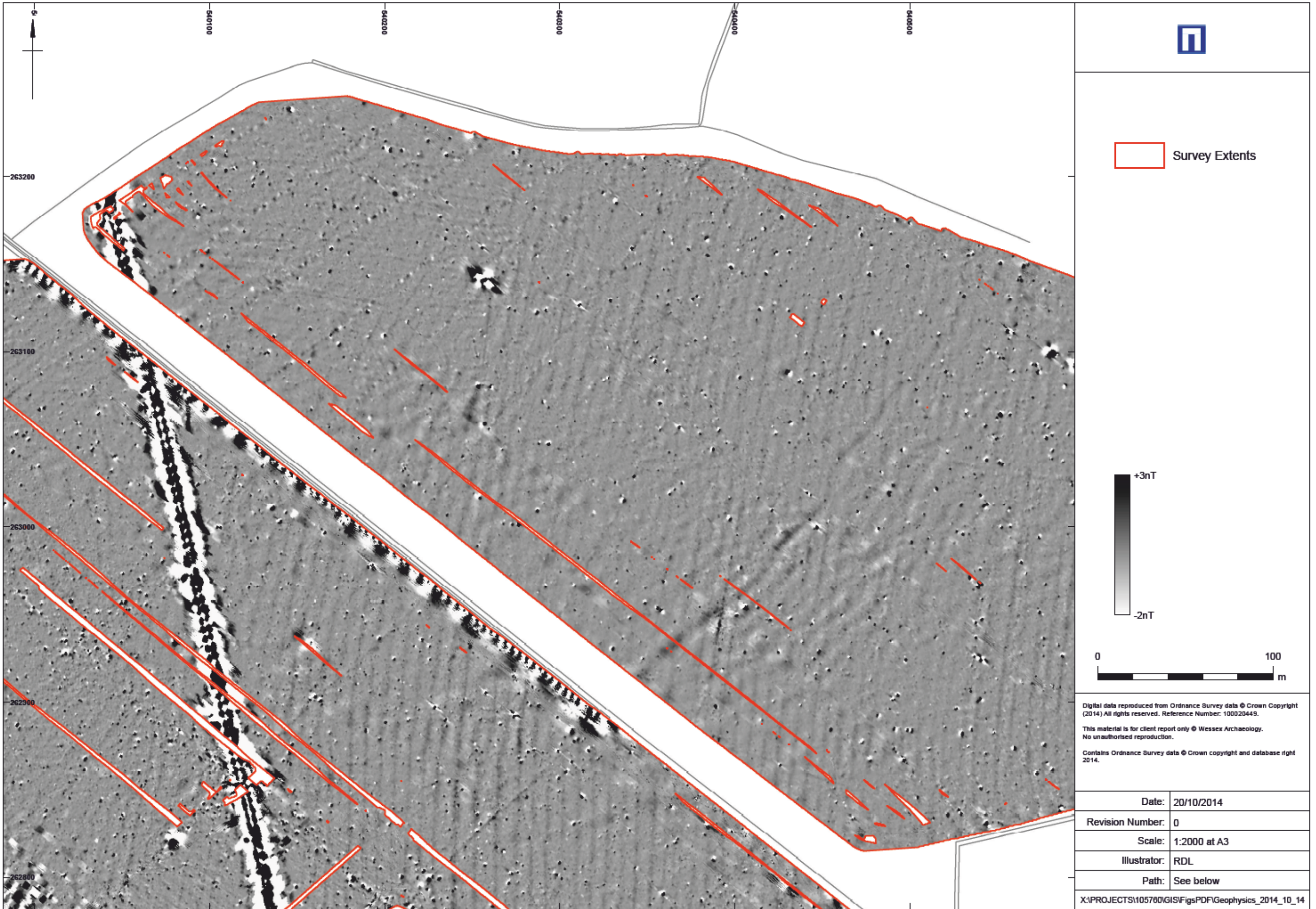


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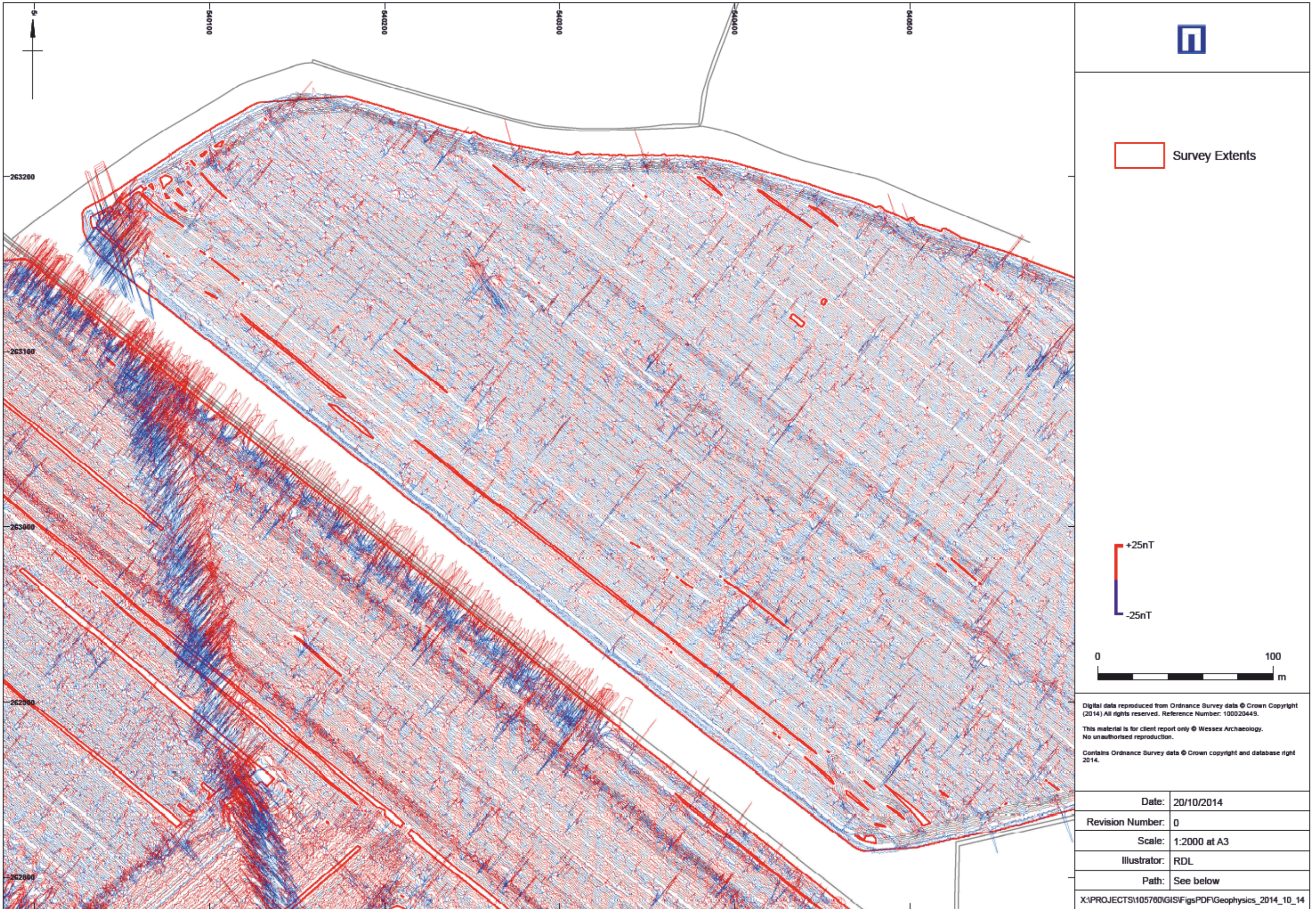
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Figure 19



Greyscale plot, BP6, northern field (west)

Figure 20



 Survey Extents

 +25nT
 -25nT

0  100 m

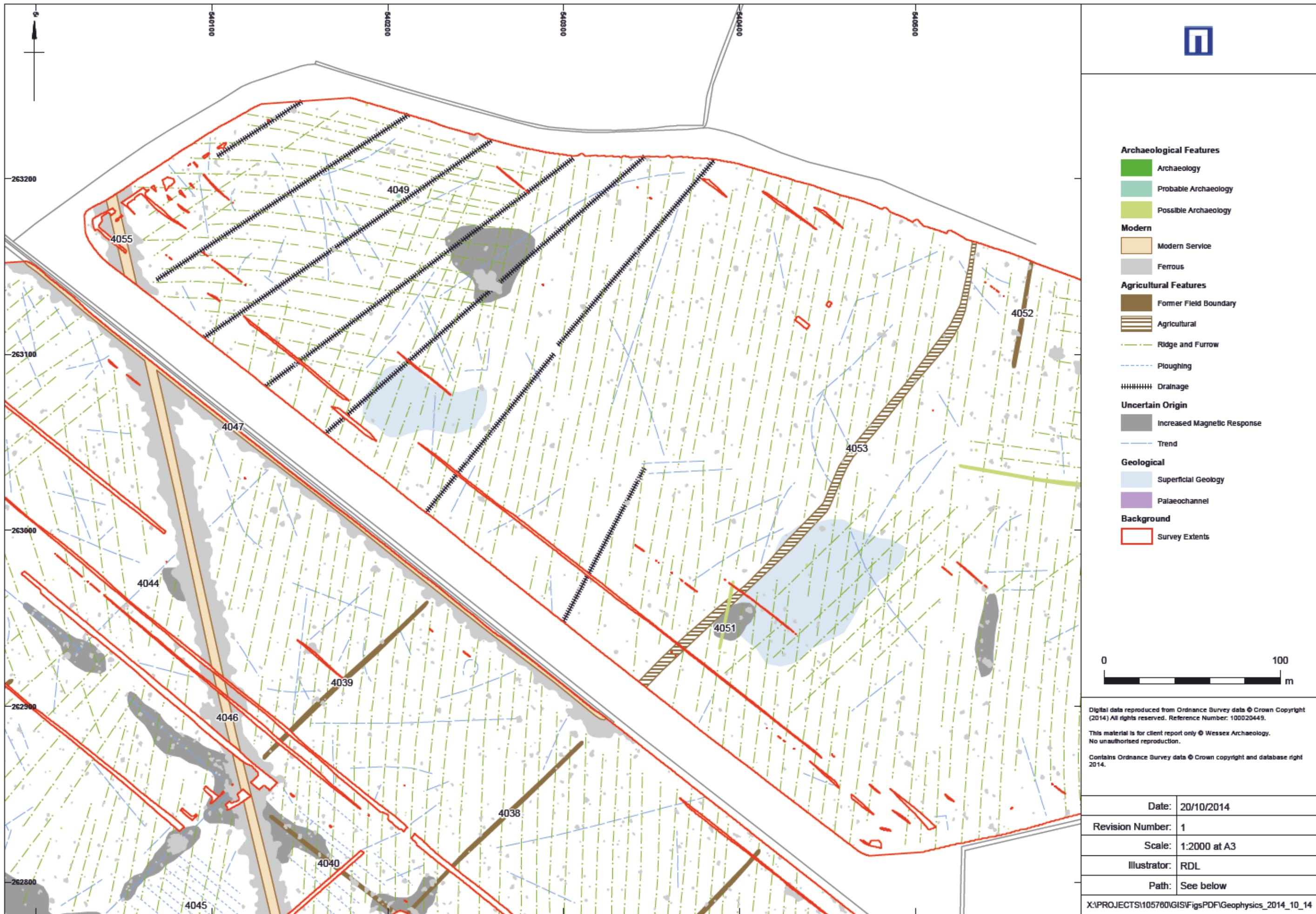
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XY trace plot, BP6, northern field (west)

Figure 21



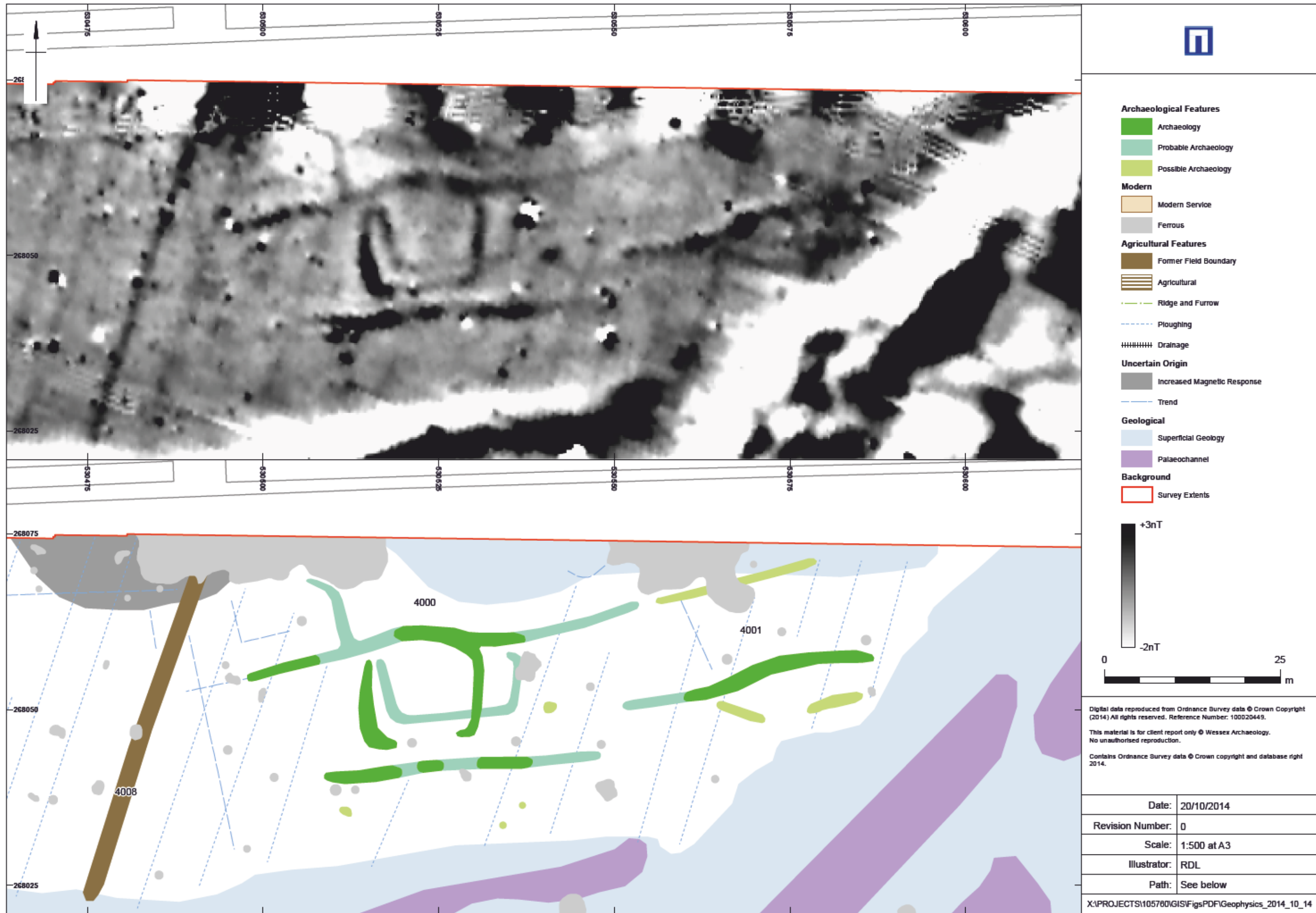
Interpretation, BP6, northern field (west)

Figure 22

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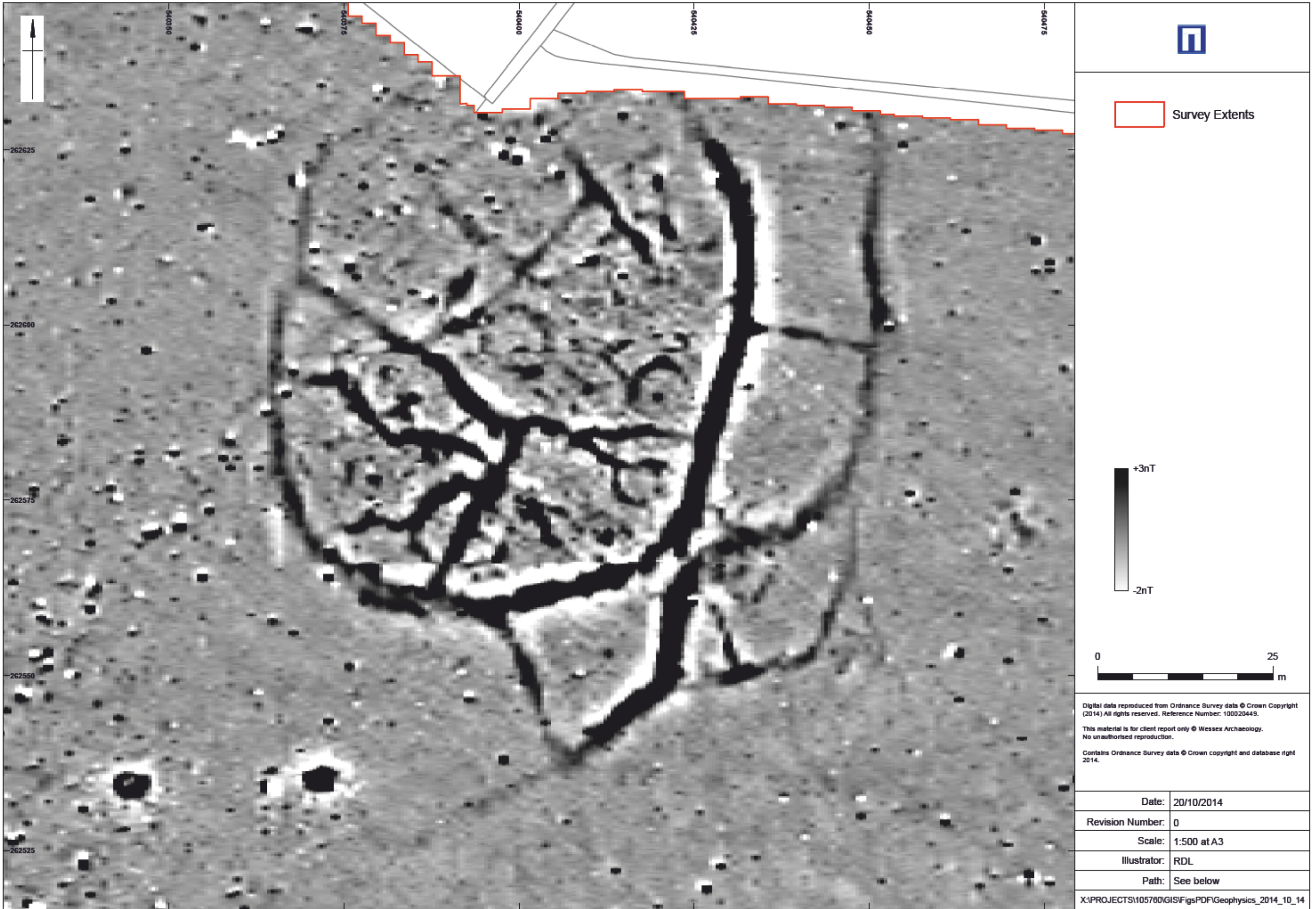
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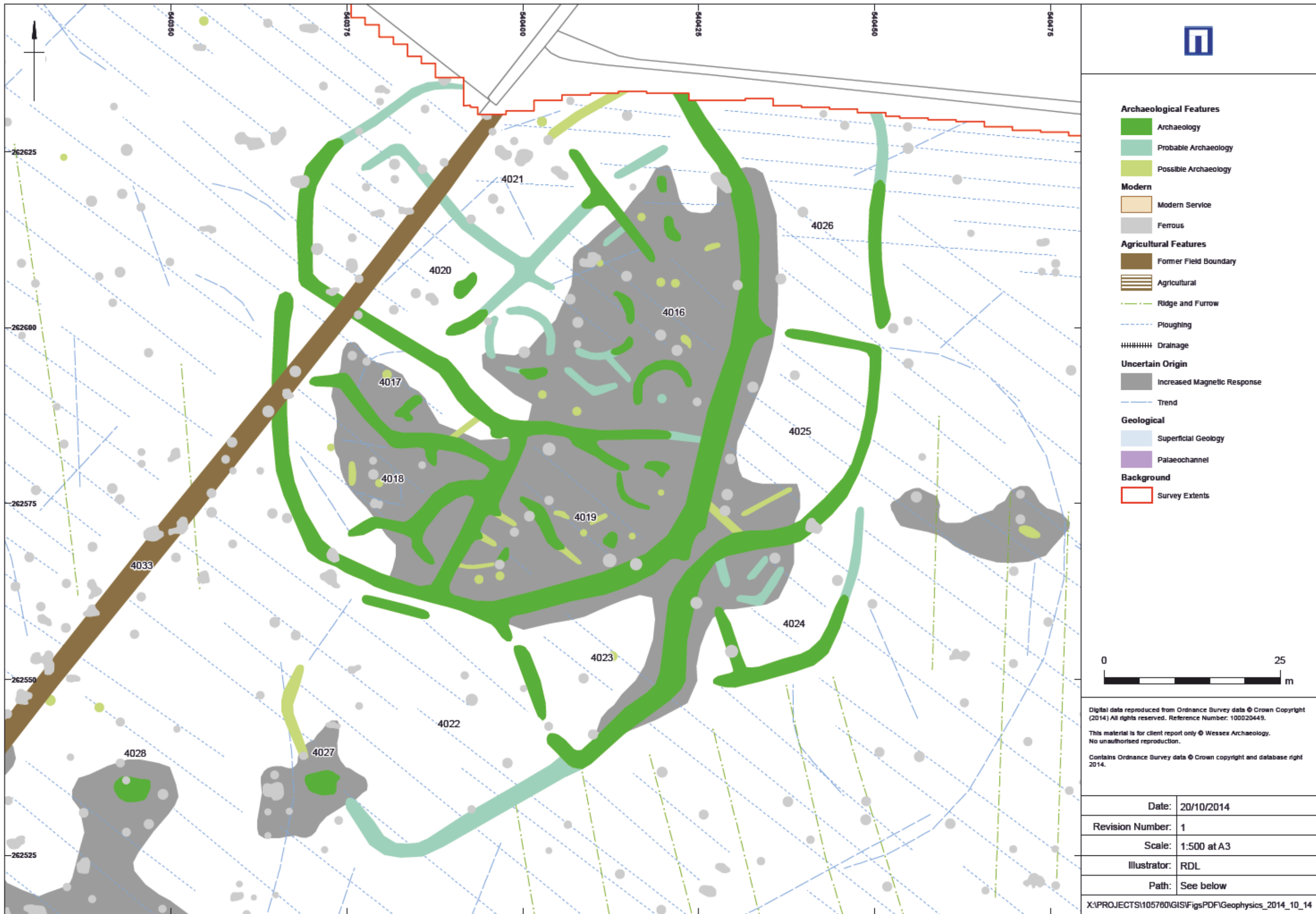
Greyscale plot and interpretation, BP3 archaeology

Figure 23



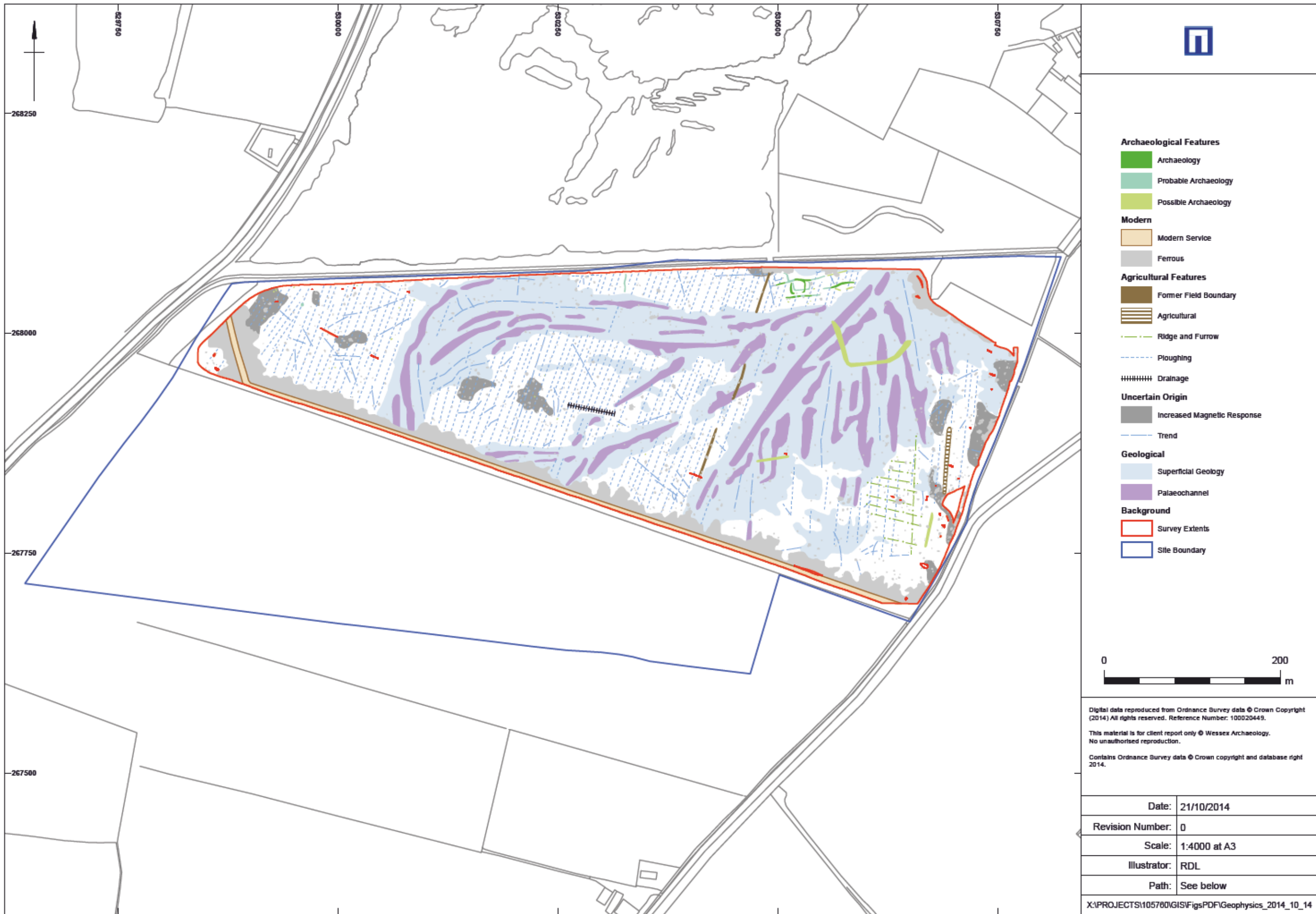
Greyscale plot, BP6 archaeology

Figure 24



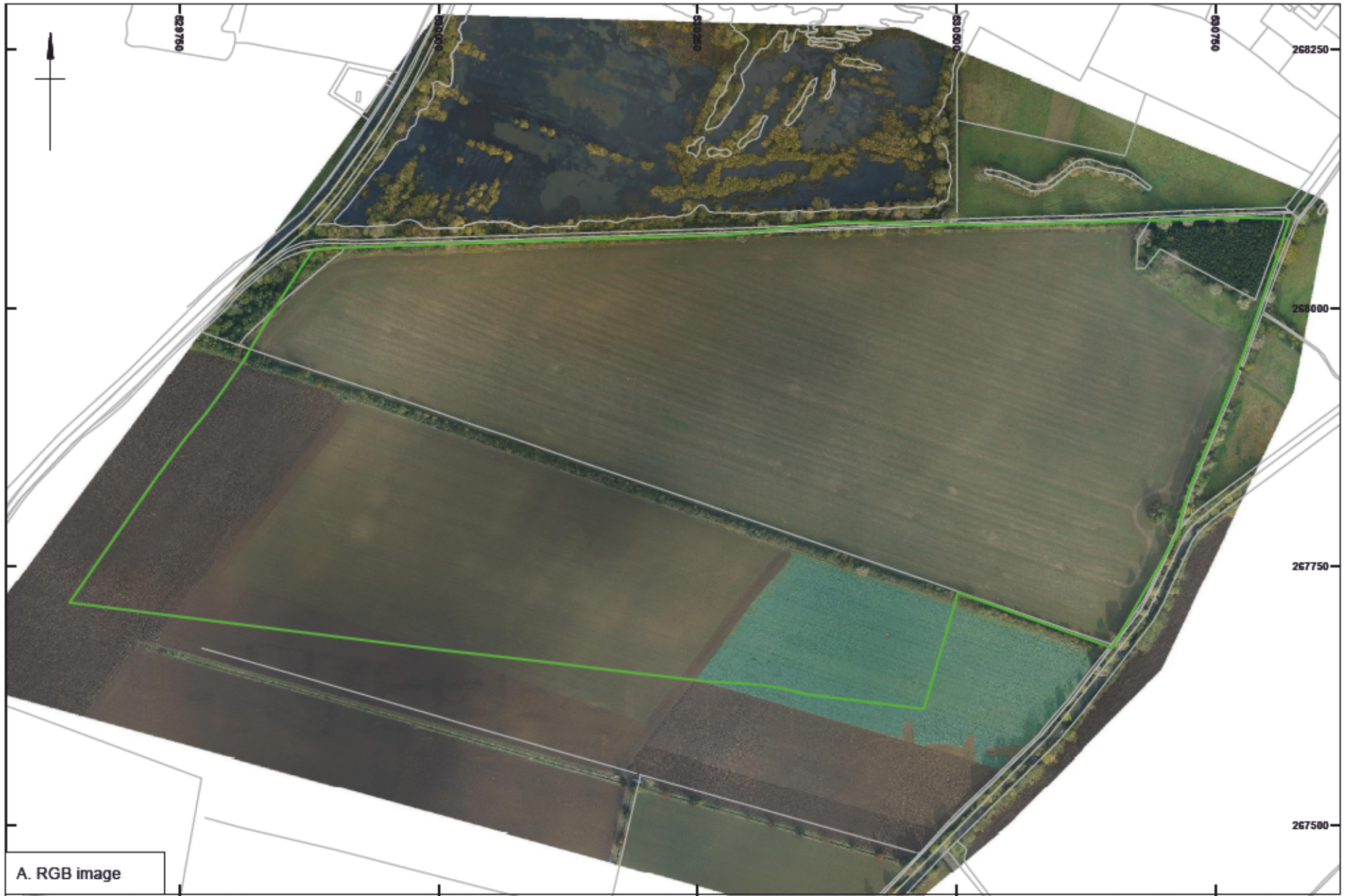
Interpretation, BP6 archaeology

Figure 25

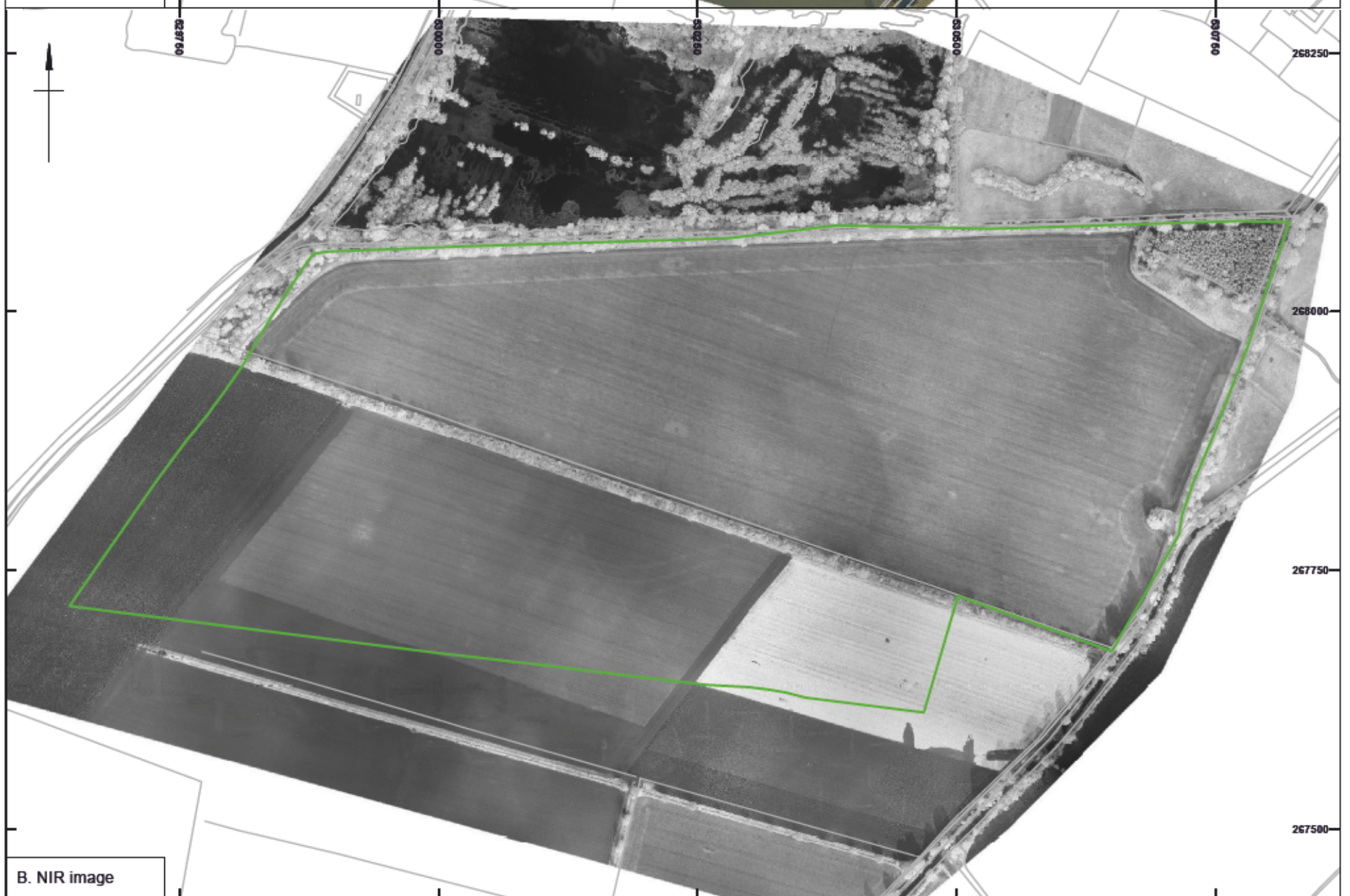


Overall Interpretation, BP3

Figure 26



A. RGB image



B. NIR image

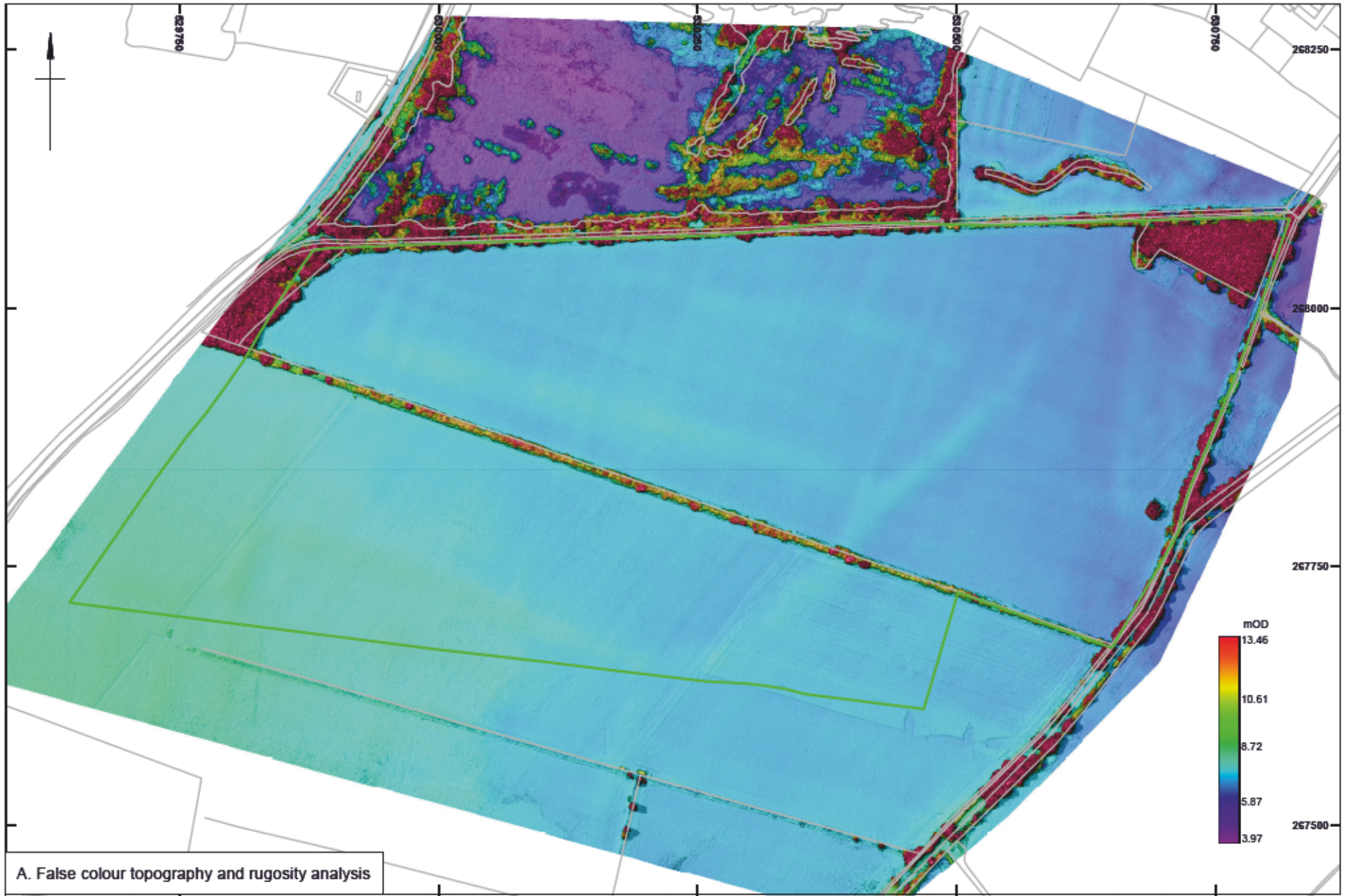


BP3

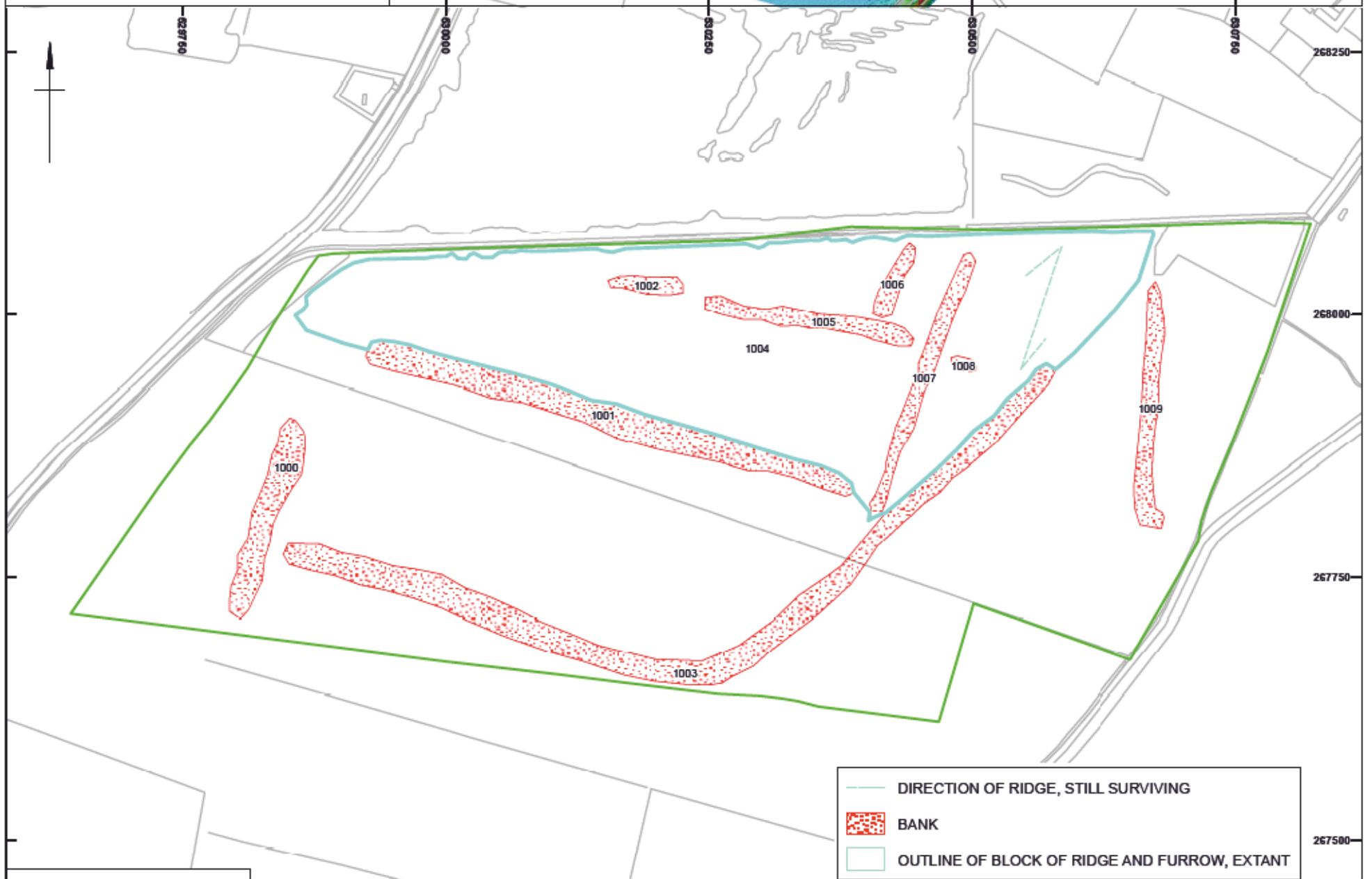
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A. False colour topography and rugosity analysis



B. Interpretation of UAV data

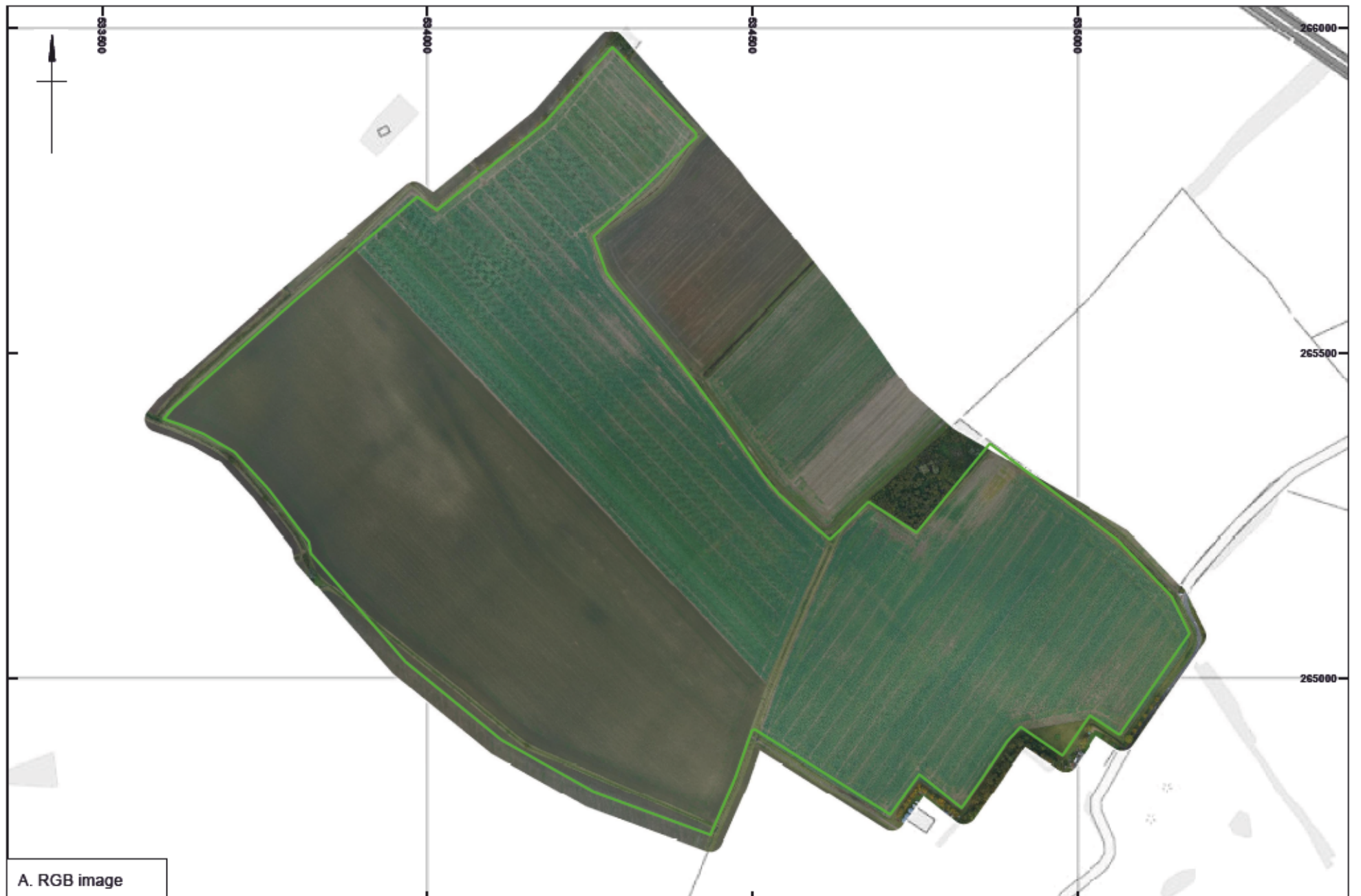
	DIRECTION OF RIDGE, STILL SURVIVING
	BANK
	OUTLINE OF BLOCK OF RIDGE AND FURROW, EXTANT



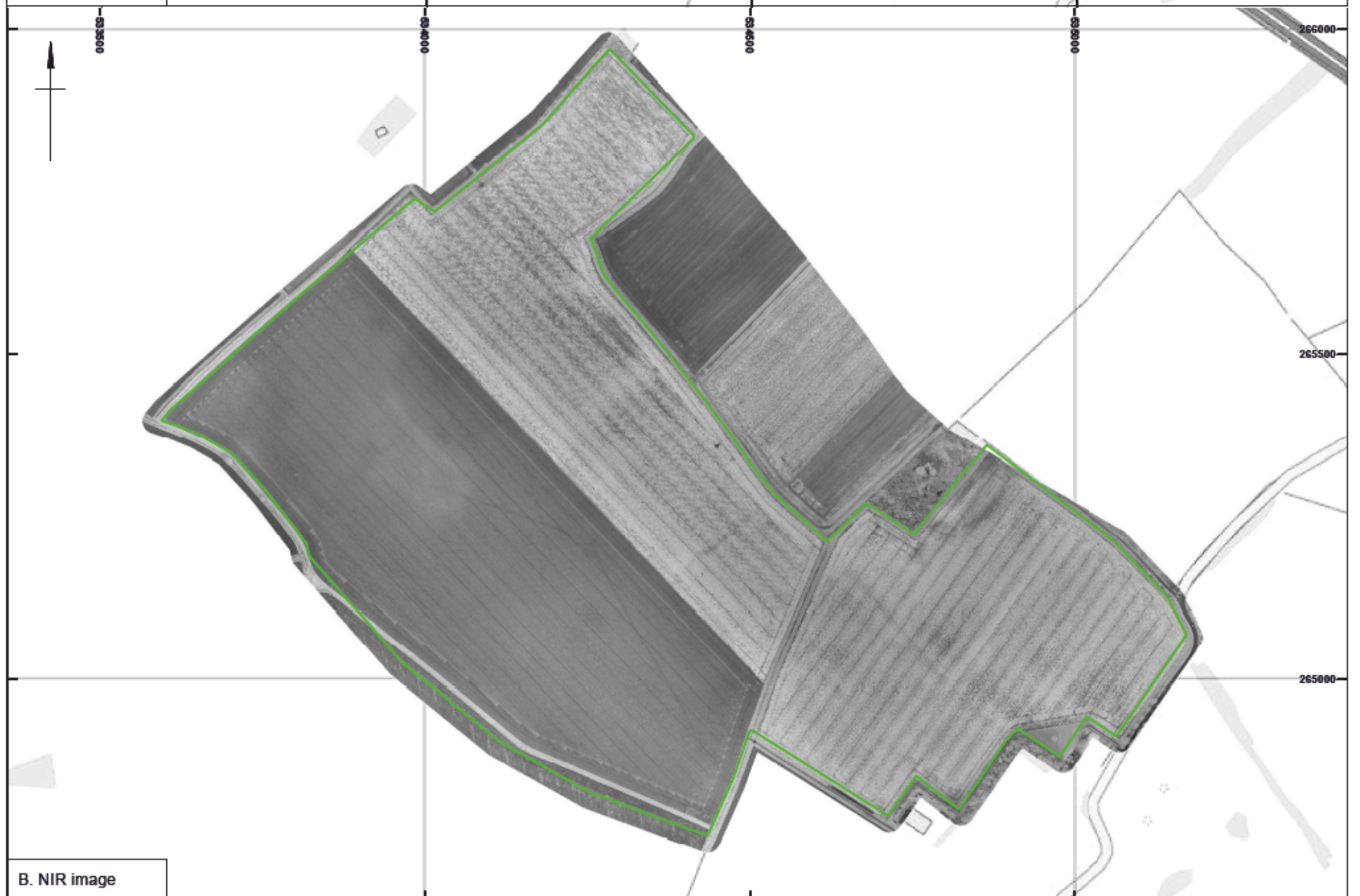
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A. RGB image



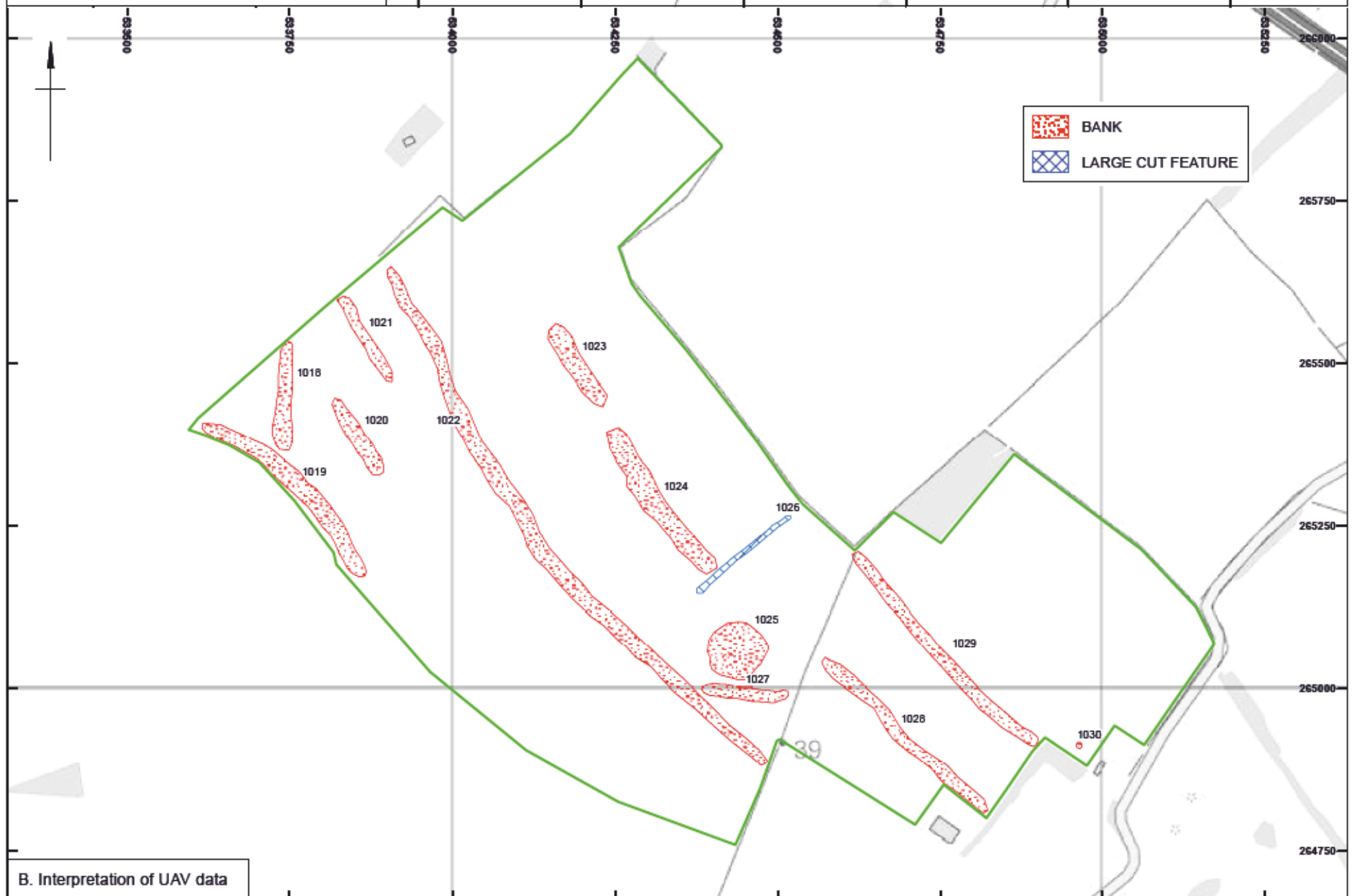
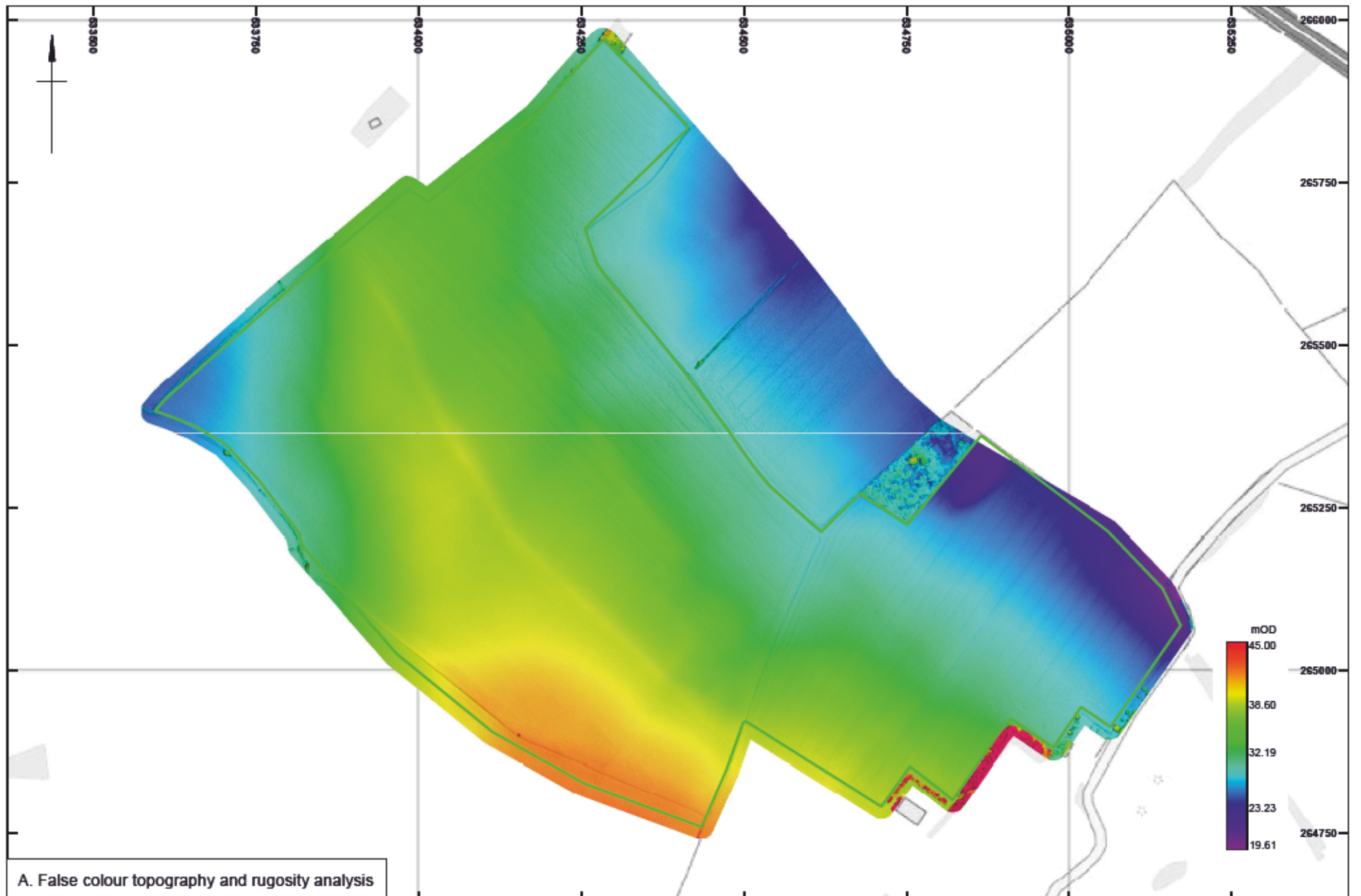
B. NIR image



BP5

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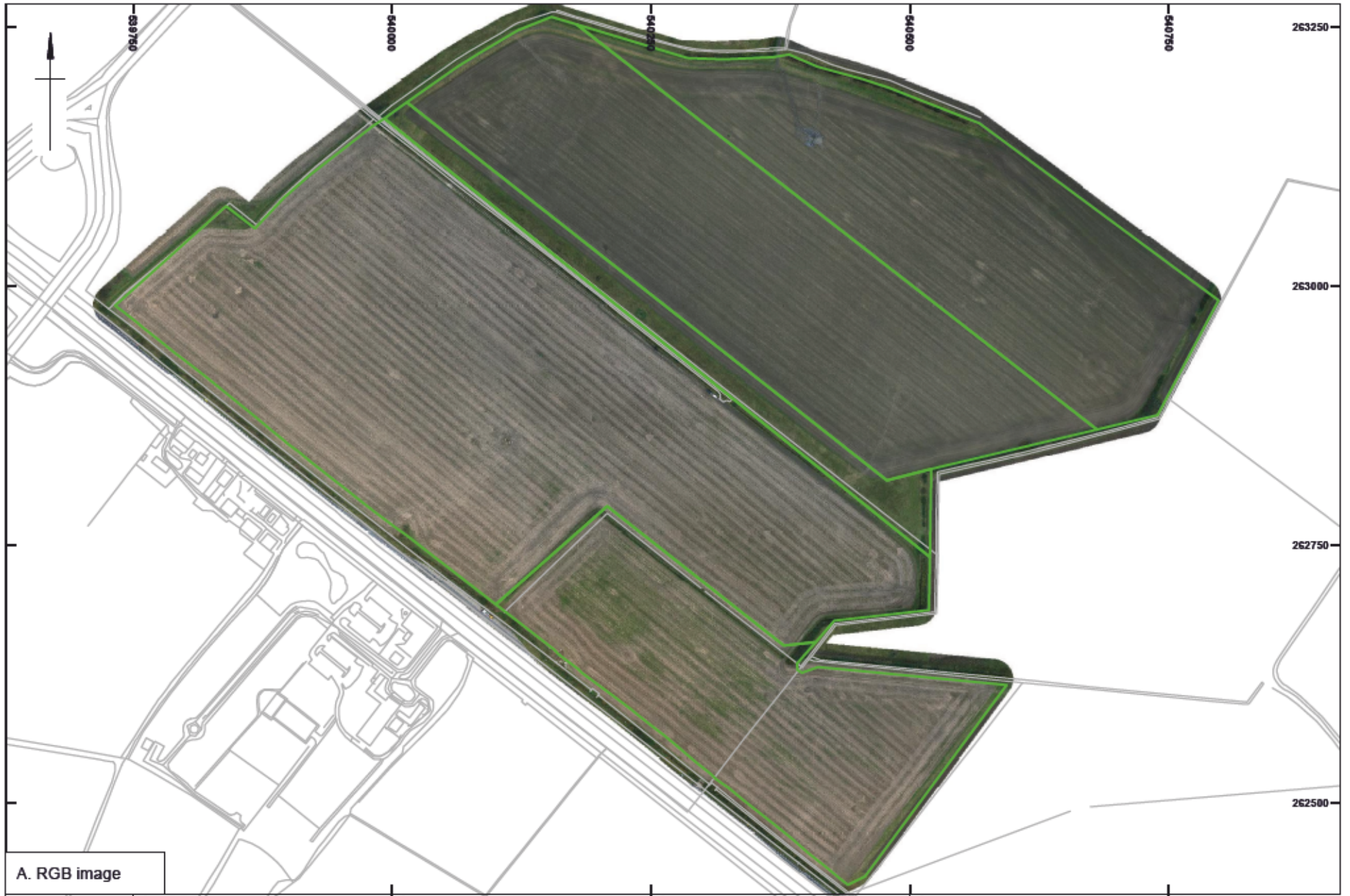
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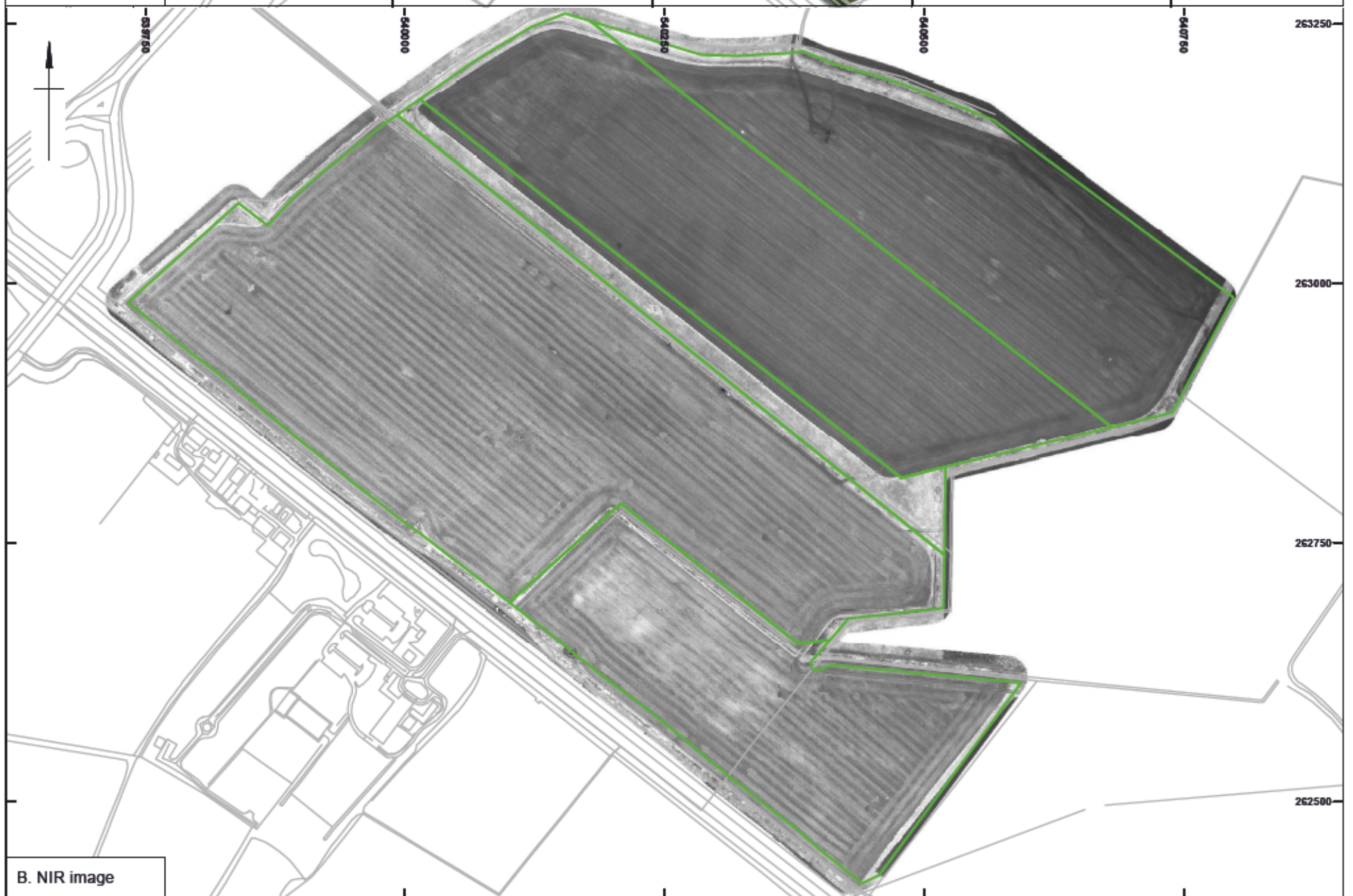
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BP5

0 400 m



A. RGB image



B. NIR image



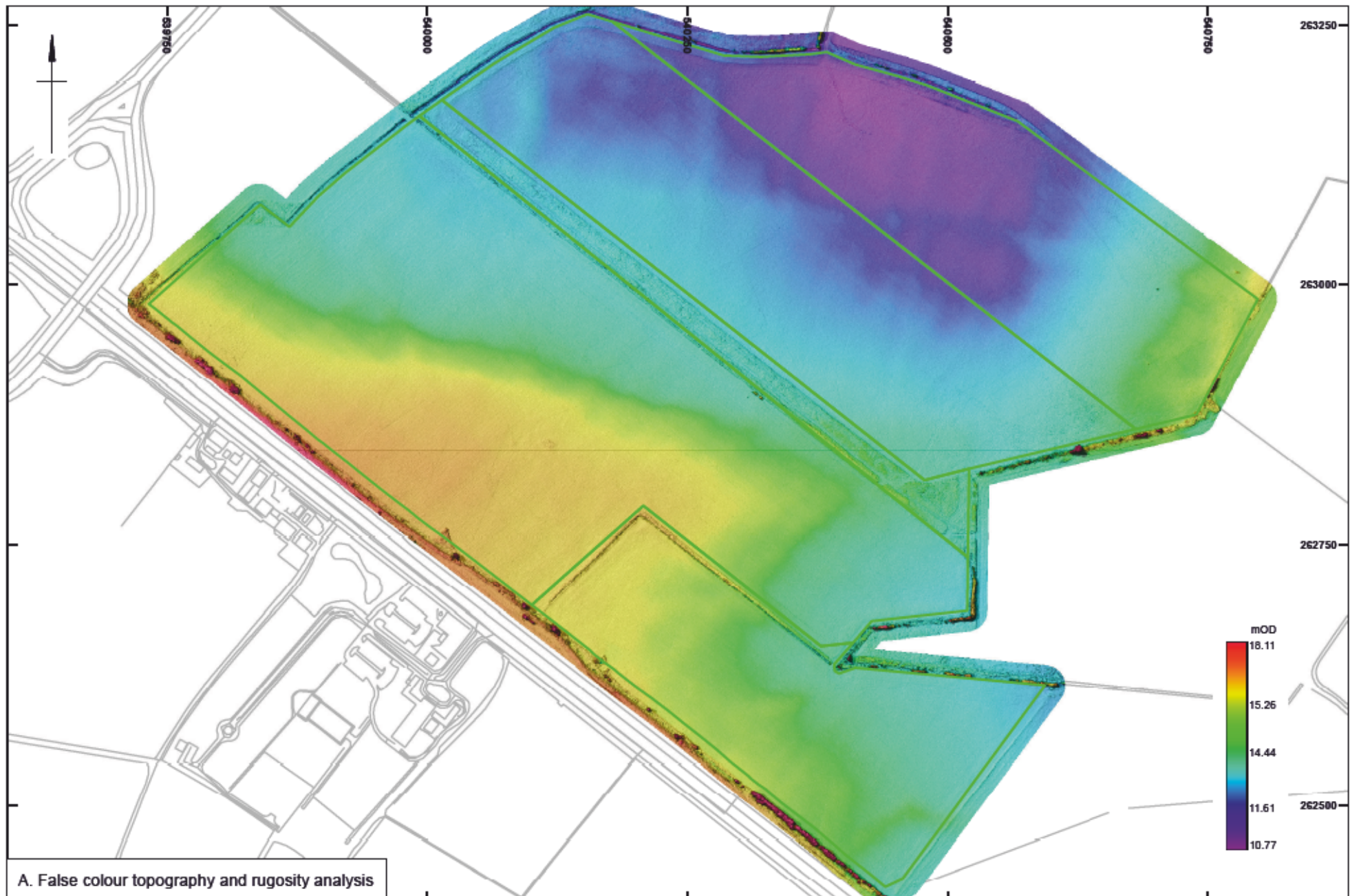
BP6



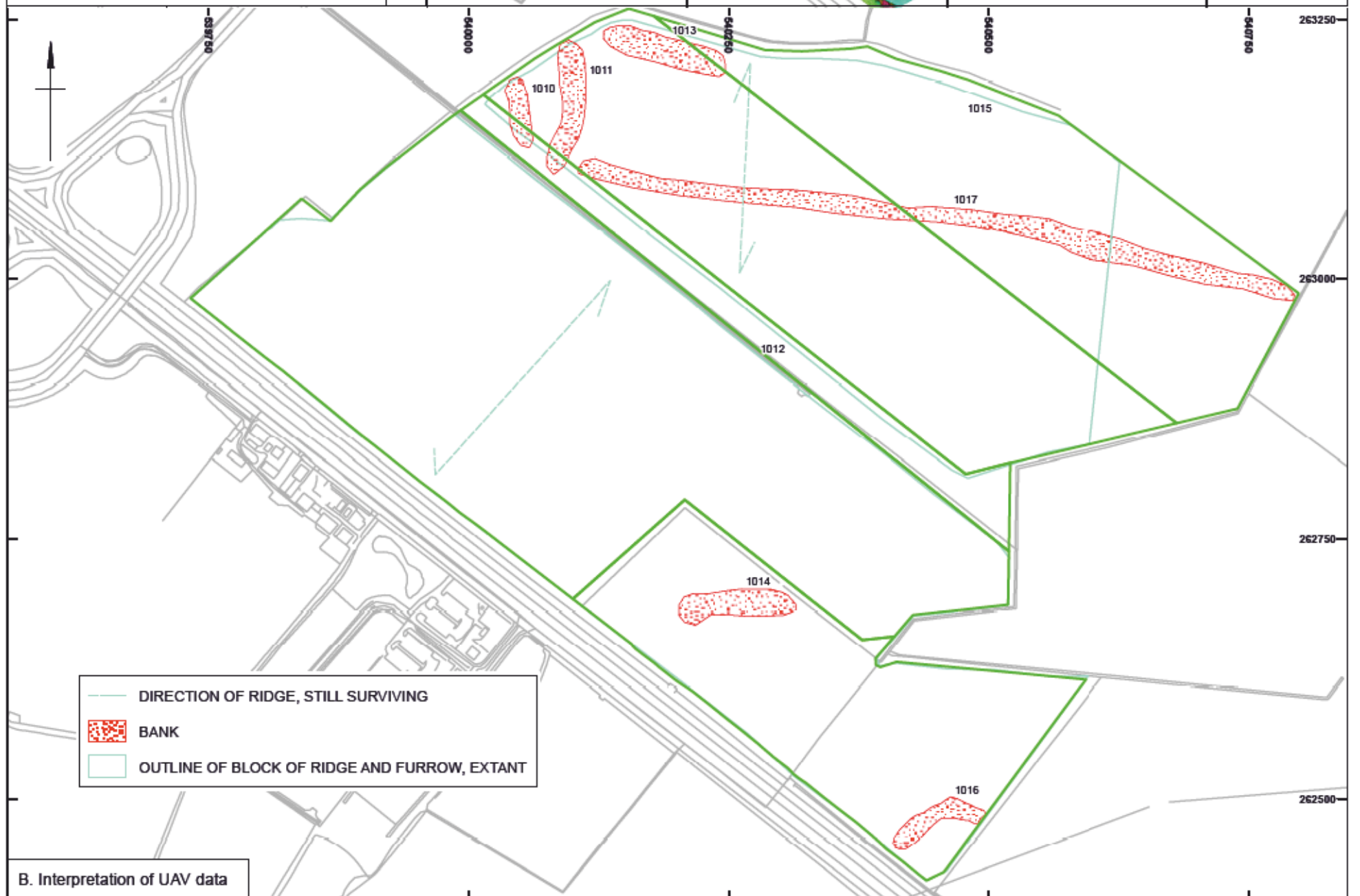
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A. False colour topography and rugosity analysis



B. Interpretation of UAV data



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