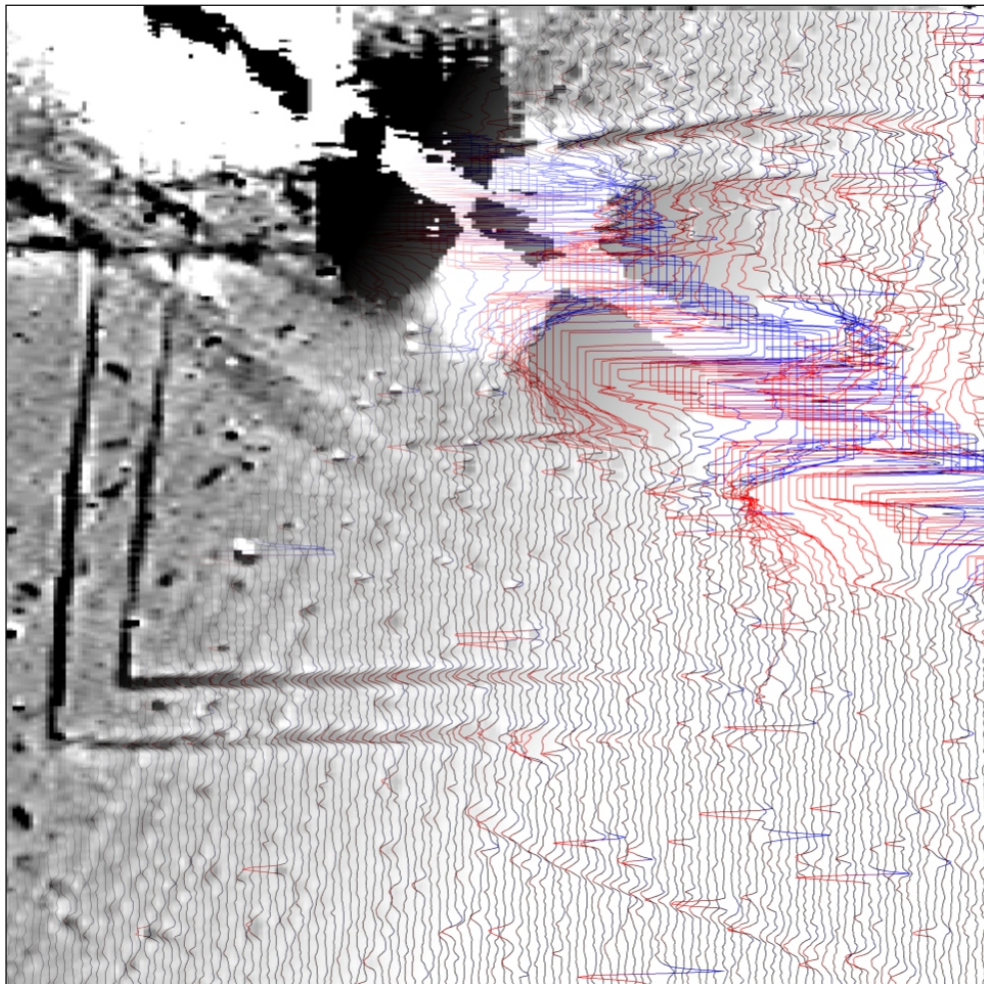




making sense of heritage

# Manydown Basingstoke, Hampshire

Detailed Gradiometer Survey Report



Ref: 1041101.01  
June 2014



**Manydown,  
Basingstoke, Hampshire**

**Detailed Gradiometer Survey Report**

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# Manydown, Basingstoke, Hampshire

## Detailed Gradiometer Survey Report

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# Manydown, Basingstoke, Hampshire

## Detailed Gradiometer Survey Report

### Summary

A detailed gradiometer survey was conducted over land off Rooksdown Lane, Basingstoke. The project was commissioned by URS Infrastructure and Environment UK Limited, on behalf of their client Hampshire County Council, with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site ahead of a proposed development.

The site comprises arable fields to the northwest of Basingstoke and approximately 1.8km east of Wootton Saint Lawrence. The site occupies land on the summit of a gently sloping hill. The geophysical survey was undertaken between 8<sup>th</sup> and 12<sup>th</sup> May 2014, and covered 4.9ha. The survey has demonstrated the presence of anomalies of likely, probable and possible archaeological interest within the survey area, along with regions of increased magnetic response, many plough lines and signs of previous settlement.

Two complexes of enclosures have been detected that closely mirrors the results of the aerial photography carried out with the addition of detecting smaller features not previously seen. There is a large modern service cutting through the eastern of the two enclosures, with associated magnetic disturbance that is likely to have obscured other archaeological features.



# **Manydown, Basingstoke, Hampshire**

## **Detailed Gradiometer Survey Report**

### **Acknowledgements**

The detailed gradiometer survey was commissioned by URS Infrastructure and Environment UK Limited, on behalf of their client Hampshire County Council. The assistance of Annie Calder of URS is gratefully acknowledged in this regard.

The fieldwork was directed by Alistair Salisbury and assisted by Clara Dickinson and Ross Lefort. Ross Lefort processed and interpreted the geophysical data. This report was written by Ross Lefort and Alistair Salisbury. The geophysical work was quality controlled by Ben Urmston. Illustrations were prepared by Ross Lefort and Karen Nichols. The project was managed on behalf of Wessex Archaeology by Ben Urmston.



# Manydown, Basingstoke, Hampshire

## Detailed Gradiometer Survey Report

### 1 INTRODUCTION

#### 1.1 Project background

1.1.1 Wessex Archaeology was commissioned by Hampshire County Council to carry out a geophysical survey of land adjacent to Rooksdown Lane, near Basingstoke, Hampshire (**Figure 1**), hereafter “the Site” (centred on NGR 460850, 153475). The survey forms part of an ongoing programme of archaeological works being undertaken ahead of proposed development at the Site.

1.1.2 The general aim of the geophysical survey was to establish the presence/absence, extent and character of detectable archaeological remains within the survey area. The specific aim of the survey is to clarify the location and extent of detectable archaeological features relating to the ploughed out remnants of Scheduled Monument HA316 at Catern Crossroads on the National Heritage List for England (NHLE, 1001855).

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

#### 1.2 Site Location and Topography

1.2.1 The survey area comprises two arable fields containing the cropmarks comprising the Scheduled Monument that are located some 3km west of the centre of Basingstoke in Hampshire, in the area known locally as Worting. The survey areas lie in the fields directly west of the Catern Crossroads of the A339 and the Kingsclere Road (**Figure 1**), centred upon OS National Grid References (460975, 153555) & (460755, 153430) respectively.

1.2.2 The Site occupies the eastern side of a large arable field on the summit of a gently sloping hill neighboured by the A339; the land slopes from over 130m above Ordnance Datum (aOD) at the western corner to 125m aOD at the eastern corner of the site. The survey extents are defined by the limits of the two Scheduled Monuments with a 10m buffer applied around the Designations in order to cover features that may extend away from the Monuments; these areas were then subdivided into 30m grids, enlarging the survey areas where necessary.

#### 1.3 Geology and Soils

1.3.1 The solid geology on Site is recorded as undifferentiated deposits of Lewes nodular chalk formation, Seaford chalk formation and Newhaven chalk formation. No superficial deposits are recorded on Site but clay with flints (clay, silt, sand and gravel) is recorded a short distance to the southwest (BGS).



- 1.3.2 The soils underlying the Site are likely to be the brown rendzinas of the 343h (Andover 1) association overlying chalk, although elements of the typical palaeo-argillic brown earths of the 581d (Carstens) association over plateau drift and clay-with-flints may appear further west (SSEW 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

## 1.4 Archaeological Background

- 1.4.1 The Scheduled Monument comprises two groups of cropmarks first identified in 1936; a double-ditched rectangular enclosure to the northeast and two smaller enclosures to the southwest. These features have been noted on later aerial photographs and surface finds of pottery, tile and glass over the double-ditched cropmark suggest it may relate to a Romano-British building, perhaps a villa (EH240626).

## 2 METHODOLOGY

### 2.1 Introduction

- 2.1.1 The detailed magnetometer survey was conducted using a Bartington Grad601-2 dual fluxgate gradiometer system. 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 8<sup>th</sup> and 12<sup>th</sup> May 2014. Field conditions at the time of the survey were variable, with a mature crop covering the entire survey area; none of these issues had any apparent effect on the data quality.

### 2.2 Method

- 2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS instrument, which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).
- 2.2.2 The magnetometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, 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 ( $\pm 15$ nT thresholds) 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. These two steps were applied to all survey areas, with no interpolation applied.
- 2.2.4 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.





### 3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

#### 3.1 Introduction

- 3.1.1 The gradiometer survey has been successful in identifying anomalies of likely, probable and possible archaeological interest across the Site, along with two modern services. Results are presented as a series of greyscale and XY plots at a scale of 1:1,000 (**Figures 2 to 8**). 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 (**Figures 4, 7 and 8**). 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 Gradiometer Survey Results and Interpretation

- 3.2.1 The eastern survey area contains a trapezoidal shaped enclosure at **4000** and **4001** that has a parallel internal ditch running along the northern, western and southern sides but not on the eastern side. The enclosure is aligned WSW-ENE and is partially obscured by a modern pipe that runs through the data at **4002**. The enclosure is defined by ditches that possess magnetic values over +3nT but there are weaker regions with values around +1.5nT. These boundary ditches have been interpreted as either archaeology or probable archaeology depending on the strength of their magnetic response.
- 3.2.2 The interior of the enclosure contains few features with a ditch running roughly along the centre at **4003** and a couple of curved ditches in the northeast corner around **4004**. These ditches appear to extend outside of the enclosure to the east around **4005** and possibly form small enclosures; their relationship to the larger enclosure is unclear. All of these ditches possess magnetic values over +2nT. There may be other internal features in this corner but the magnetic disturbance associated with the modern service at **4002** and linear anomalies **4007** and **4008** prevent any assessment of this area's archaeological potential. These ditches have been interpreted as either archaeology or probable archaeology depending on the strength of their magnetic response.
- 3.2.3 The northern internal ditch of the trapezoidal enclosure appears to line up with a ditch that extends out to the west at **4006**. This ditch has magnetic values over +3nT and may form an agricultural boundary, possibly contemporary with the enclosure. Budgen's 1808 map of the area shows a boundary that runs along a similar line to this ditch and later Ordnance Survey (OS) maps show this boundary remains as a parish boundary. This ditch has been interpreted as archaeology due to its close association with the enclosure.
- 3.2.4 A linear band of increased magnetic response, weak positive ditch-like anomalies and weak linear trends extend WNW-ESE between **4007** and **4008**, running through the enclosure from corner to corner. The northwestern corner of the enclosure is open where the linear band crosses it but the southeastern corner appears to have been closed suggesting the two features may not be contemporary. The ditch-like anomalies in this band have weak values around +1nT with some stronger areas over +3nT and two run parallel at a slightly varying separation of around 5m This band lines up with Wellington Terrace to the east and may form a former track or road running perpendicular to the nearby Roman road. This track does not coincide with any features in any of the maps consulted. The ditch-like anomalies have been interpreted as probable archaeology.



- 3.2.5 Another ditch is visible further south of the enclosure at **4009**; this ditch is slightly curved and has magnetic values around  $+2nT$ . The ditch extends beyond the southern limits of the survey area and it is not clear how it relates to the other anomalies discussed. It does not share an alignment with either the enclosure or the possible track and may not be directly related. The strongest region of this ditch has been interpreted as archaeology with weaker regions as probable archaeology.
- 3.2.6 The remaining anomalies include weak linear trends such as those at **4010** and small sub-oval positive pit-like anomalies such as those around **4011**. The possible pits around **4011** are classed as possible archaeology as they are common across the whole survey area suggesting they may be natural features such as tree throws. Another modern service is visible in the data at **4012**.
- 3.2.7 An existing field boundary extends NNE-SSW through the dataset in the western survey area at **4013** and **4014**; this boundary forms a noticeable earthwork on the ground. The boundary has magnetic values over  $+3nT$  and runs parallel to the modern and Roman road to the east. This feature has been interpreted as archaeology due in part to its shared alignment to the Roman road but also due to the occurrence of other features that appear to respect this boundary that will be discussed below.
- 3.2.8 An enclosure ditch is visible at **4015** that seems to run through the modern boundary discussed above but there is a small enclosure extending from this ditch at **4016** that seems to be partly defined by the seemingly recent boundary. The small enclosure is roughly square and measures roughly 13m across.
- 3.2.9 The larger enclosure ditch at **4015** links up with ditch sections at **4017** to **4022** to form a large enclosure with numerous sub-divisions measuring approximately 140m in length and 67m in width with a NNE-SSW alignment. The enclosure is sub-rectangular in shape with its longest sides set on a curve. The northeast corner appears to be open with ditches running east out of the survey area north-east of **4019** and at **4020**; it is possible that this enclosure or complex of enclosures extends out further east. A series of breaks in the ditches is visible north of **4015**; these may represent entrances although it is possible they relate to later truncation. These ditches have magnetic values typically over  $+3nT$  but there are weaker regions with lower values around  $+1nT$ . These ditches have been interpreted as either archaeology or probable archaeology depending on the strength and clarity of their magnetic response.
- 3.2.10 Inside this enclosure group, some weaker ditch segments at **4023**, **4024** and near **4018** may form sub-divisions of the larger enclosures. These anomalies have somewhat weaker magnetic values around  $+1.5nT$  and have been interpreted as probable archaeology as a result.
- 3.2.11 A clear pit is visible at **4025** with magnetic values over  $+5nT$  and a negative halo around it measuring  $-2nT$ . The pit is sub-oval in shape and the positive anomaly measures 6m in length and is classed as archaeology. Two, less clear, sub-oval pits are visible further west at **4026** and **4027** with magnetic values over  $+3nT$  and lengths of 3m and 5m respectively. These anomalies have been classed as probable archaeology.
- 3.2.12 There are two concentrated clusters of pit-like anomalies further south at **4028** and **4029** that fall within areas of increased magnetic response. All of the pit-like anomalies have magnetic values around  $+3nT$  and are sub-oval in shape with the largest measuring over 5m in length. It is unclear whether these anomalies are concentrations of tree throws or belong with the enclosures. They have been interpreted as probable archaeology rather than archaeology due to the small possibility they may prove to be natural.



- 3.2.13 Two short ditch-like anomalies are visible at **4030** and **4031**; they both have magnetic values above +3nT and extend beyond the western limits of the survey area. They have no direct relationship with the enclosure but represent clear archaeological anomalies.
- 3.2.14 The remaining anomalies are weak linear trends and small positive anomalies such as those around **4031**. Some are large and have been interpreted as probable archaeology but most are less than 2m in length. These small positive anomalies are spread fairly uniformly across the survey area and have been classed as possible archaeology; their distribution suggests they are more likely to represent natural features such as tree throws rather than pits.

### **3.3 Gradiometer Survey Results and Interpretation: Modern Services**

- 3.3.1 There are two modern services located in the data at **4002** and **4012**. Both are located in the eastern survey area close to the edge of Basingstoke and are considered to represent pipes.
- 3.3.2 It is not clear from the geophysical data whether any of the services identified are in active use. It should also be noted that gradiometer survey may not detect all services present on 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 on site.

## **4 CONCLUSION**

- 4.1.1 The detailed gradiometer 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 two modern services. The geophysical survey has revealed the cropmark enclosures identified from aerial photography along with a number of smaller features and sub-divisions not identified through aerial photography. The geophysical data shows that the archaeology continues in nearly all directions from the two survey areas.
- 4.1.2 Map evidence shows the northern side of the eastern trapezoidal enclosure partially defines a current parish boundary. The alignment of this enclosure seems to follow more recent landscape features; this could either suggest that these seemingly recent features are more ancient, or could suggest the enclosure is not as old as previously thought. It is not possible to determine which may be the case from the geophysical data alone.
- 4.1.3 Away from the magnetic disturbance caused by the modern service, the geophysical data shows few magnetic anomalies of interest within the interior of the eastern enclosure, aside from a few ditches; the texture of the interior is similar to the magnetic background across the whole site. The reason for this apparent lack of features may be due to the construction materials used for features within; if stone buildings made from local chalk or flint are present then there would be no magnetic anomaly to detect. To find such features another technique such as earth resistance would be required; this would also allow the opportunity to investigate the region masked by magnetic disturbance.
- 4.1.4 The western group of cropmarks reveals a sub-divided enclosure that is set parallel to the Roman road further east. Unlike the eastern enclosure this one seems to have many more internal features including several pit clusters suggesting a division of the interior into different areas of activity. The northeast corner of the enclosure appears to extend further east beyond the limits of the geophysical survey. It is unclear whether this represents a continuation of the enclosure complex further east or forms an entrance into the complex.



- 4.1.5 It is tempting to view the track detected at **4007** and **4008** as a Roman road given that it is straight and running perpendicular to the known Roman road but it should be noted that it is not possible to date anomalies from the geophysical dataset alone. This linear feature seems to run through the trapezoidal enclosure that is thought to be Roman based on cropmark evidence and surface finds. It would seem from the data that the two features are not contemporary but further work would be required to clarify this.
- 4.1.6 The significance of the existing boundary detected at **4013** and **4014** is unclear. The data show that some of the ditches of the enclosure complex respect it and some enclosed areas inside are partially defined by it. It runs parallel to the Roman road but as this road remains in use today may not mean it is of archaeological significance and may relate to a historic field boundary.
- 4.1.7 The greatest area of uncertainty in the assessment of this data lies in the interpretation of the numerous small positive anomalies interpreted as possible archaeology. Geophysical surveys carried out by Wessex Archaeology on similar geology have revealed similar anomalies and follow up excavation has shown that most are tree throws although a very small number were revealed to be of archaeological significance (WA 2012, 2013). It is concluded that the vast majority of these responses relate to natural tree throws although a very small number may prove to be isolated pits or may be tree throws that contain deliberately placed anthropogenic deposits. Considering geophysical data alone, it is therefore not possible to differentiate conclusively between natural tree throws, tree throws from human deforestation or pits that happen to possess similar dimensions, in this particular geological setting.
- 4.1.8 The relative dimensions of the modern services identified by the gradiometer 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 gradiometer survey.
- 4.1.9 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.



## 5 REFERENCES

### 5.1 Bibliography

English Heritage, 2008. *Geophysical Survey in Archaeological Field Evaluation*. Research and Professional Service Guideline No 1, 2nd edition.

Wessex Archaeology, 2013. *Amesbury, Phase 4: King's Gate (658 Unit) Area: Archaeological Evaluation Report*. Report reference: 65537.04

Wessex Archaeology, 2012. *Amesbury, Phase 4: King's Gate (658 Unit) Area: Recorded Scanning and Detailed Gradiometer Survey Report*. Report reference: 65537.01

### 5.2 Cartographic Sources

British Geological Survey

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

Budgen, C. 1808. *Kingsclere*. From the British Library Online Collection. Available at: <http://www.bl.uk/onlinegallery/onlineex/ordsurvdraw/k/002osd00000001u00055000.html> [Accessed: 2<sup>nd</sup> June 2014].

Soil Survey of England and Wales, 1983. *Sheet 5, South West England*. Ordnance Survey, Southampton.

### 5.3 English Heritage PastScape Records

EH240626 – Roman building, Catern Crossroads



## APPENDIX 1: SURVEY EQUIPMENT AND DATA PROCESSING

### *Survey Methods and Equipment*

The magnetic data for this project was acquired using a Bartington 601-2 dual magnetic gradiometer system. This instrument has 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  $\pm 100$ 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.

Wessex Archaeology undertakes two types of magnetic surveys: scanning and detail. Both types depend upon the establishment of an accurate 20m or 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 (2008) for geophysical surveys.

Scanning surveys consist of recording data at 0.25m intervals along transects spaced 10m apart, acquiring a minimum of 80 data points per transect. Due to the relatively coarse transect interval, scanning surveys should only be expected to detect extended regions of archaeological anomalies, when there is a greater likelihood of distinguishing such responses from the background magnetic field.

The detailed surveys consist of 20m x 20m or 30m x 30m grids, and data are collected at 0.25m intervals along traverses spaced 1m apart. These strategies give 1600 or 3600 measurements per 20m or 30m grid respectively, and are the recommended methodologies for archaeological surveys of this type (EH, 2008).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125m intervals along traverses spaced up to 0.25m apart, resulting in a maximum of 28800 readings per 30m grid, exceeding that recommended by English Heritage (2008) for characterisation surveys.



### *Post-Processing*

The magnetic data collected during the detail survey are downloaded from the Bartington system for processing and analysis using both commercial and in-house software. This software allows 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.

As the scanning data are not as closely distributed as with detailed survey, they are georeferenced using the GPS information and interpolated to highlight similar anomalies in adjacent transects. Directional trends may be removed before interpolation to produce more easily understood images.

Typical data and image processing steps may include:

- 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)

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 two main categories: archaeological and unidentified responses.

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:

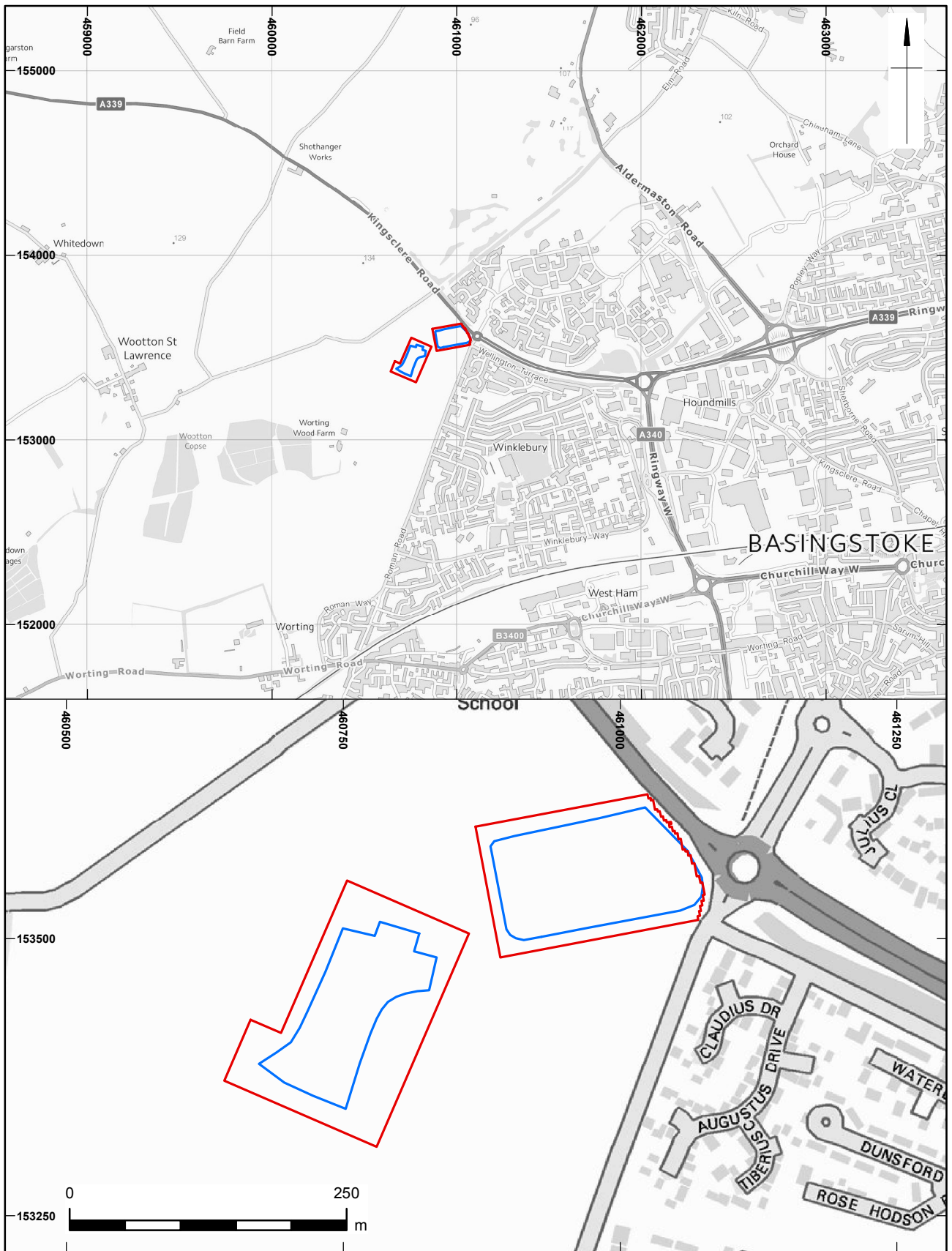
- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern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




The unidentified 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.
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.

Finally, services such as water pipes are marked where they have been identified.

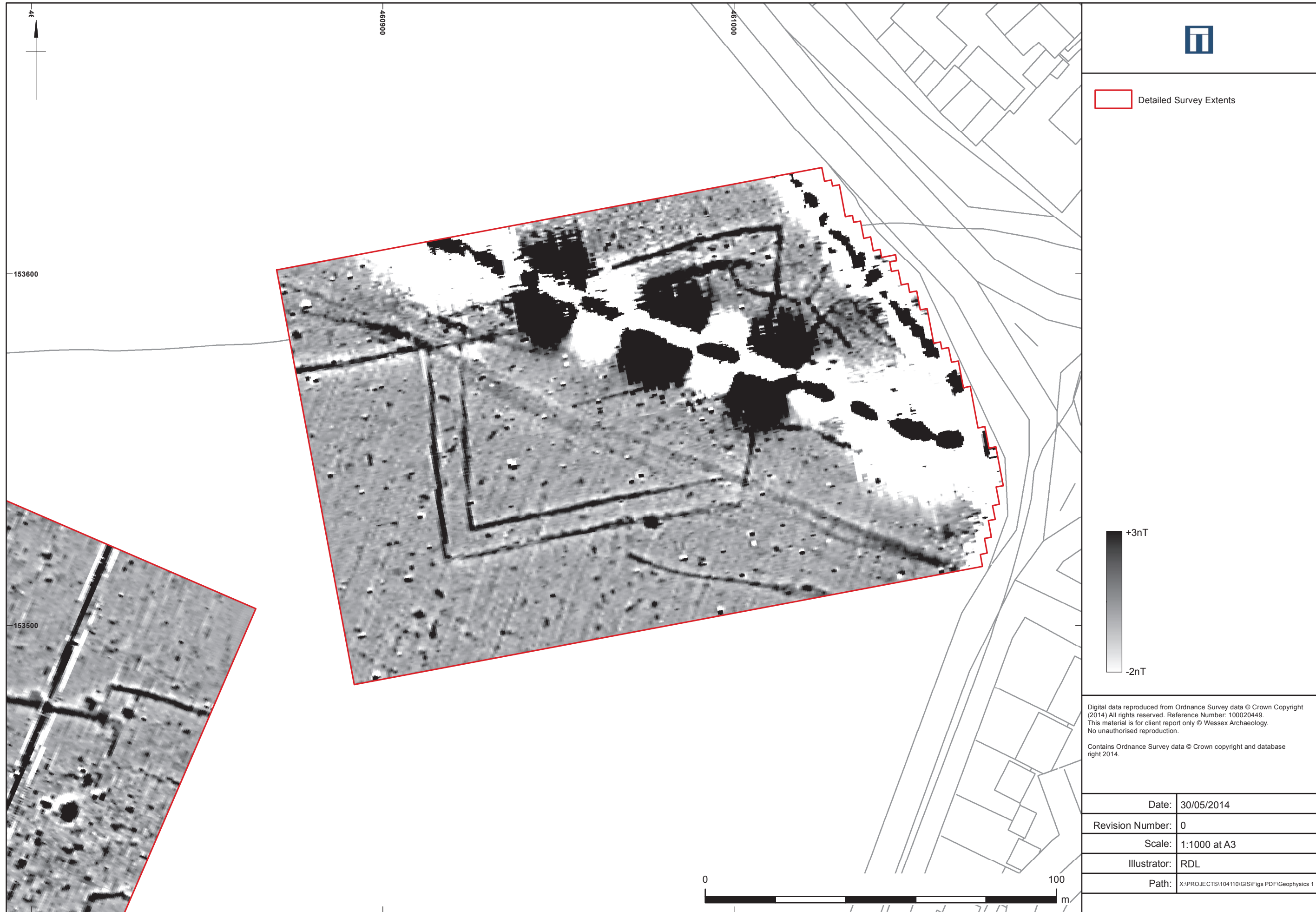




 Detailed Survey Extents  Scheduled Areas	This material is for client report only © Wessex Archaeology. No unauthorised reproduction. Contains Ordnance Survey data © Crown copyright and database right 2014.			
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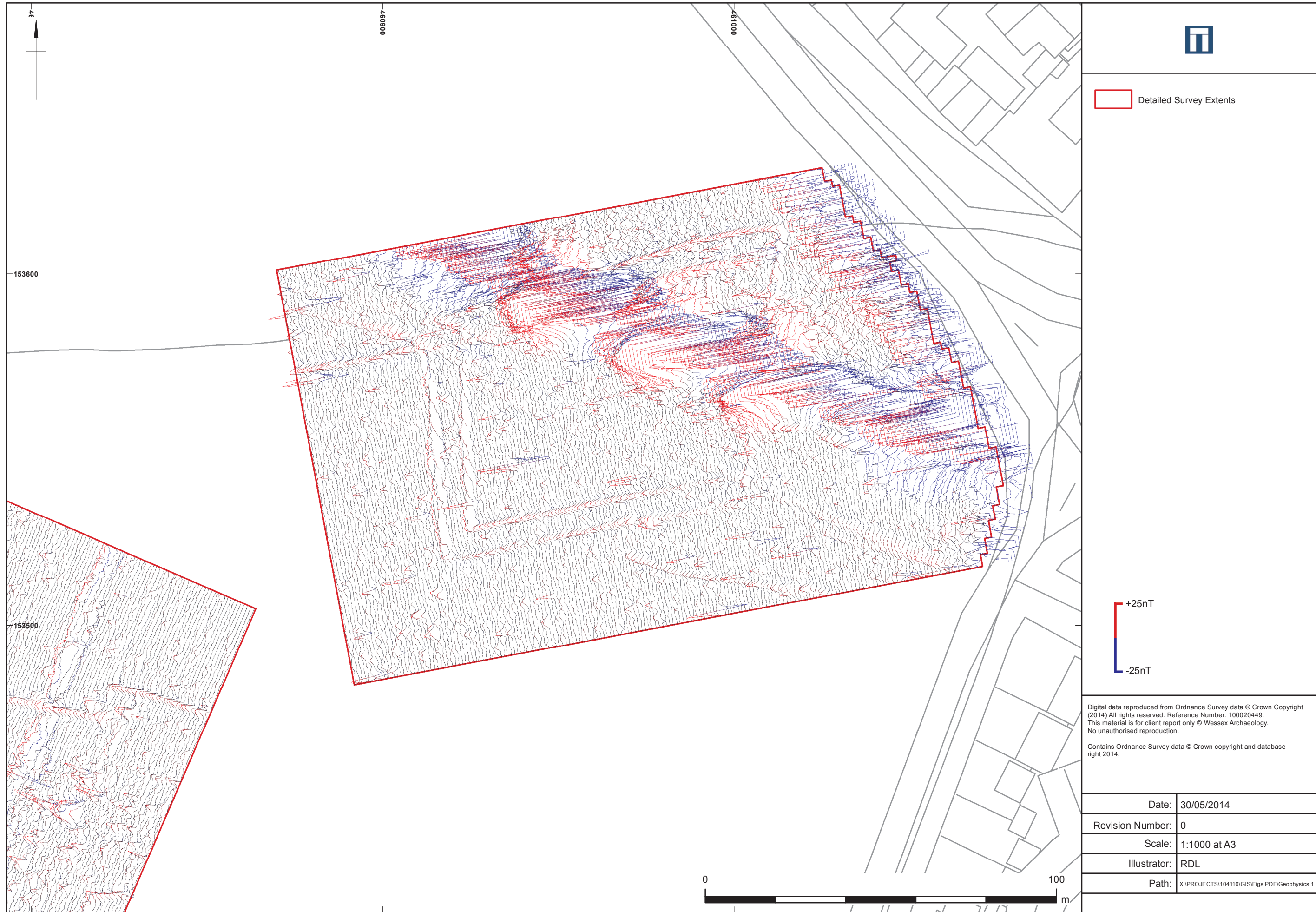
Site location and detailed survey extents


Figure 1





Greyscale plot, east

Figure 2



 Detailed Survey Extents

 +25nT  
 -25nT

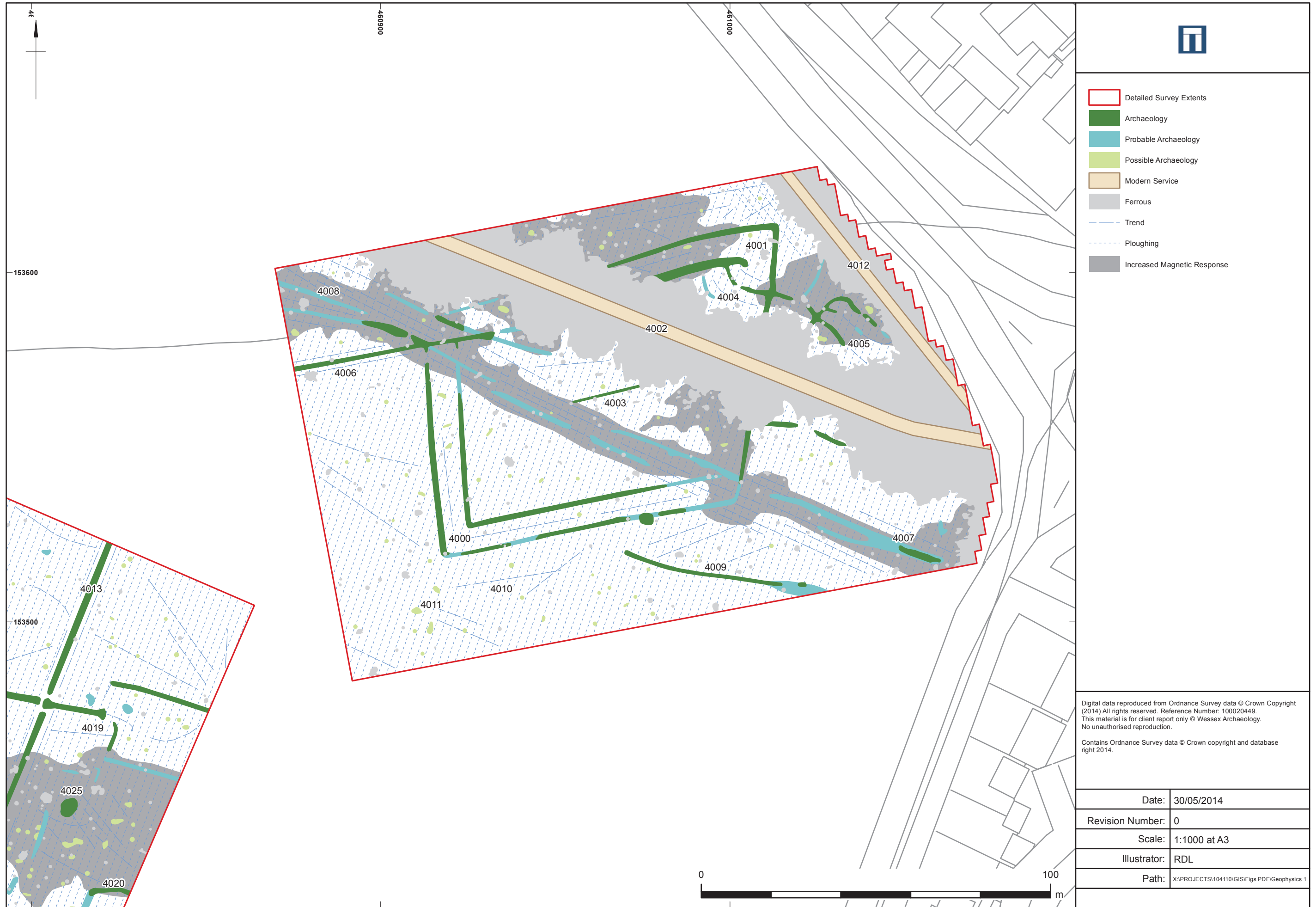
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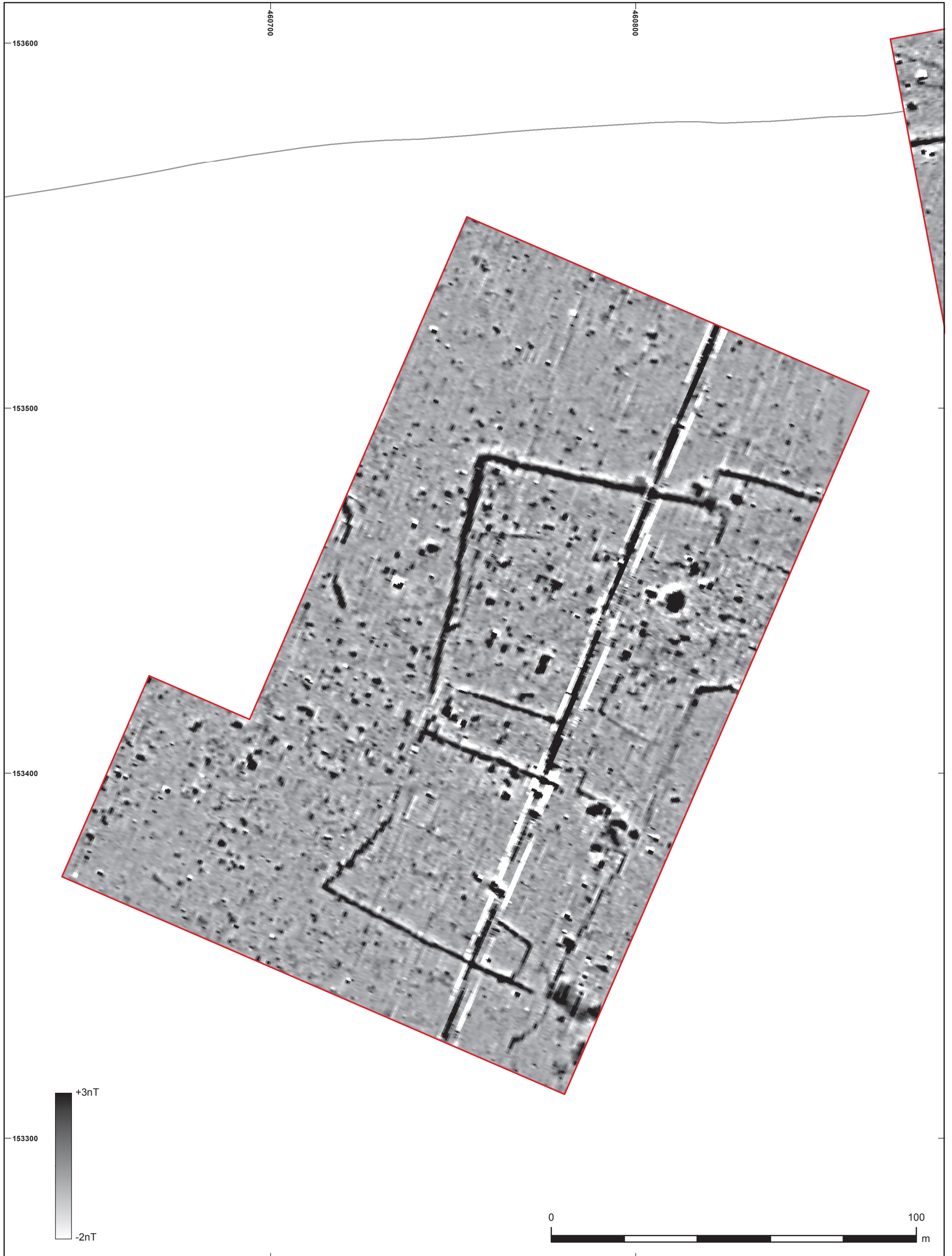
XY trace plot, east


Figure 3



Interpretation, east

Figure 4



 Detailed Survey Extents

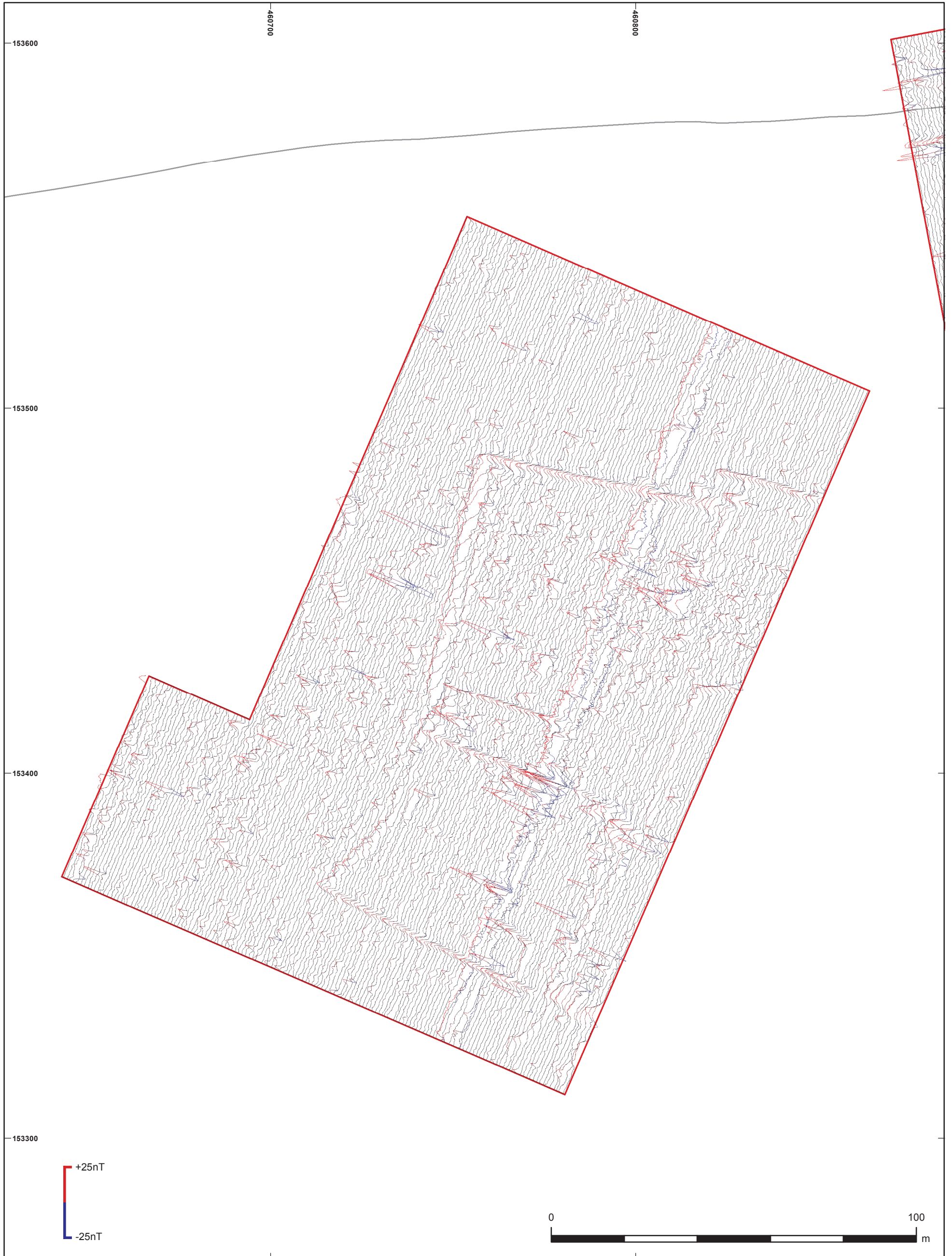



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Scale:	1:1000 at A3	Illustrator:	RDL
Path:	X:\PROJECTS\104110\GIS\Figs PDF\Geophysics 1		

Greyscale plot, west

Figure 5



 Detailed Survey Extents

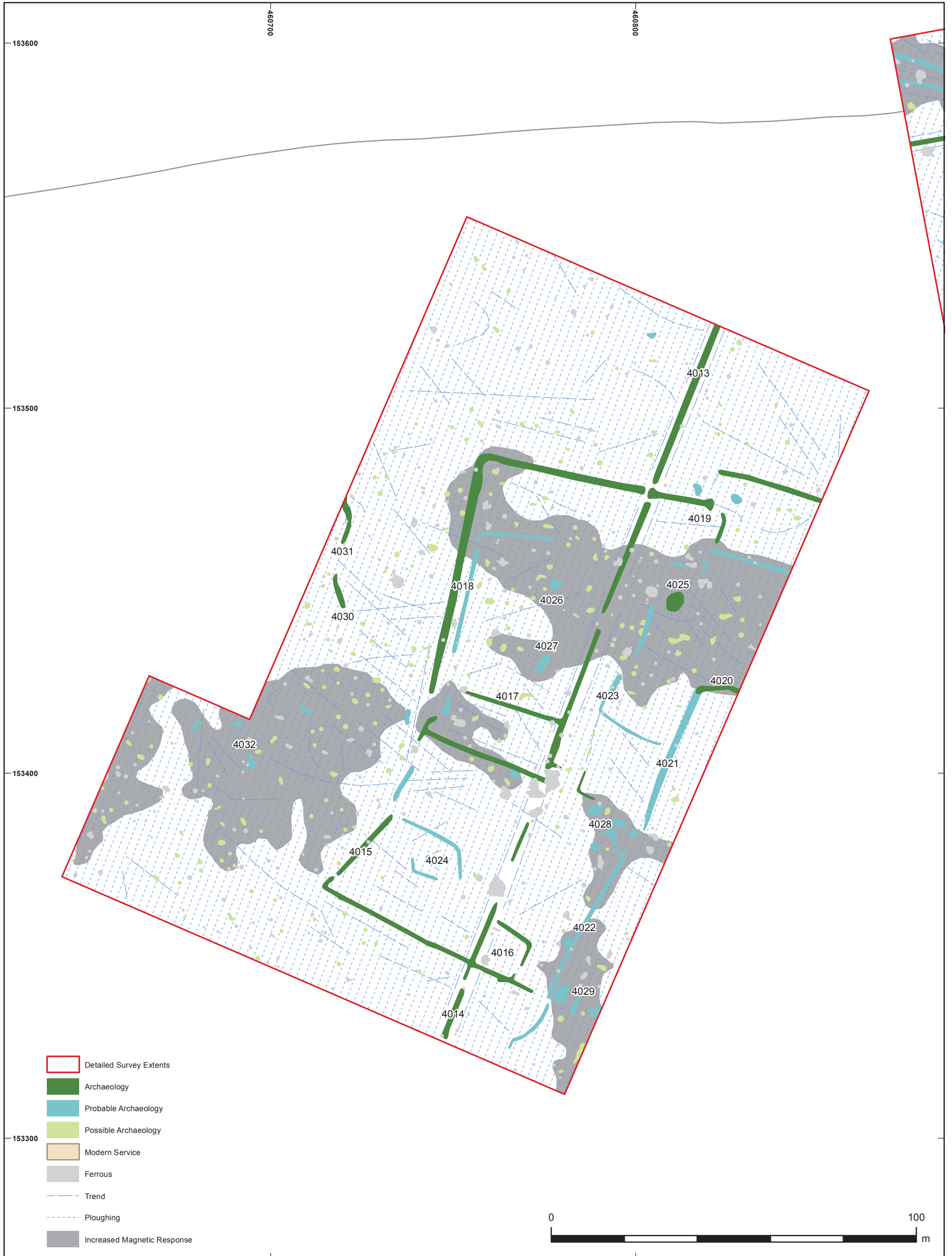


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XY trace plot, west

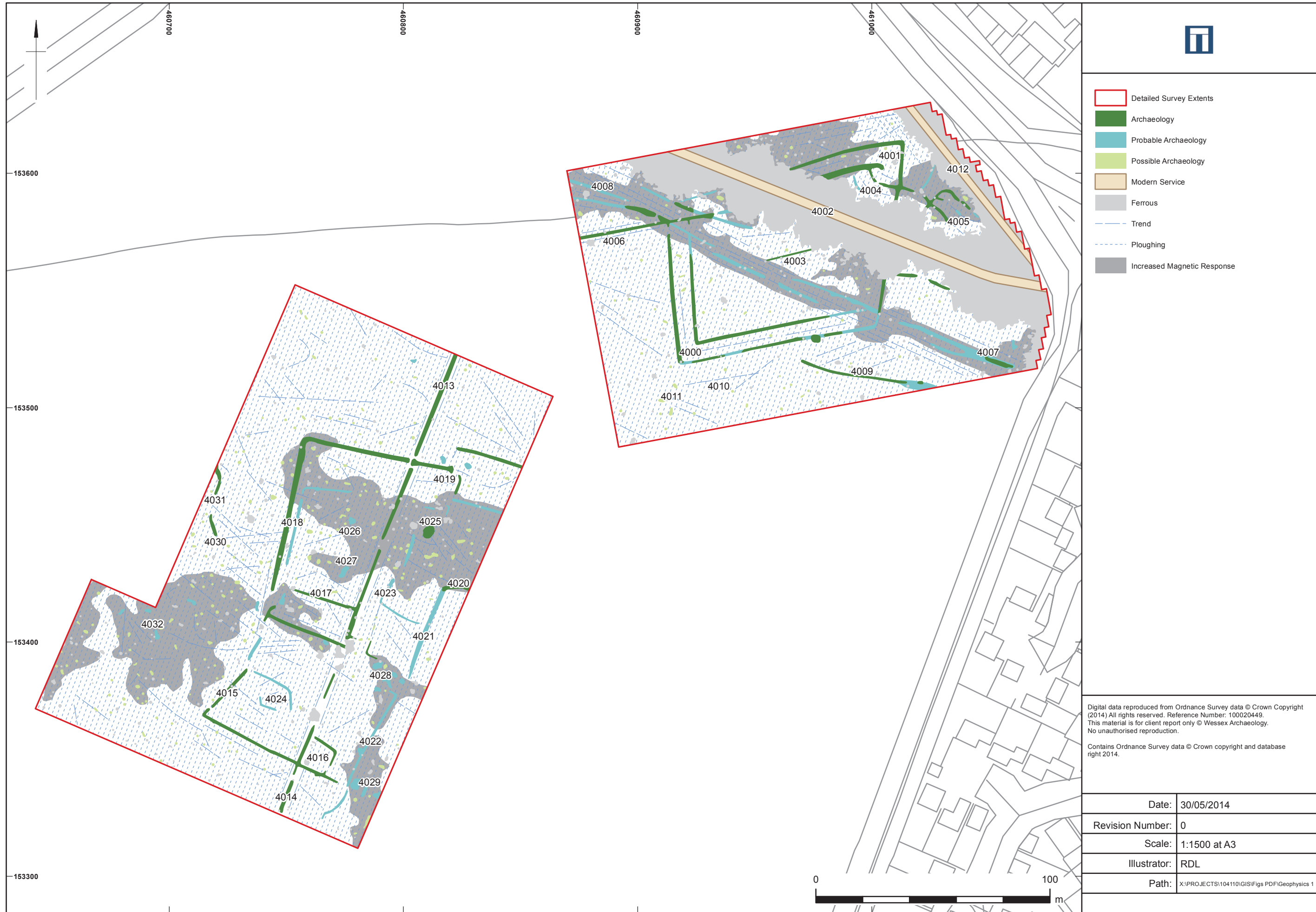
Figure 6



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- Detailed Survey Extents
- Archaeology
- Probable Archaeology
- Possible Archaeology
- Modern Service
- Ferrous
- Trend
- Ploughing
- Increased Magnetic Response

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Overall interpretation

Figure 8





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