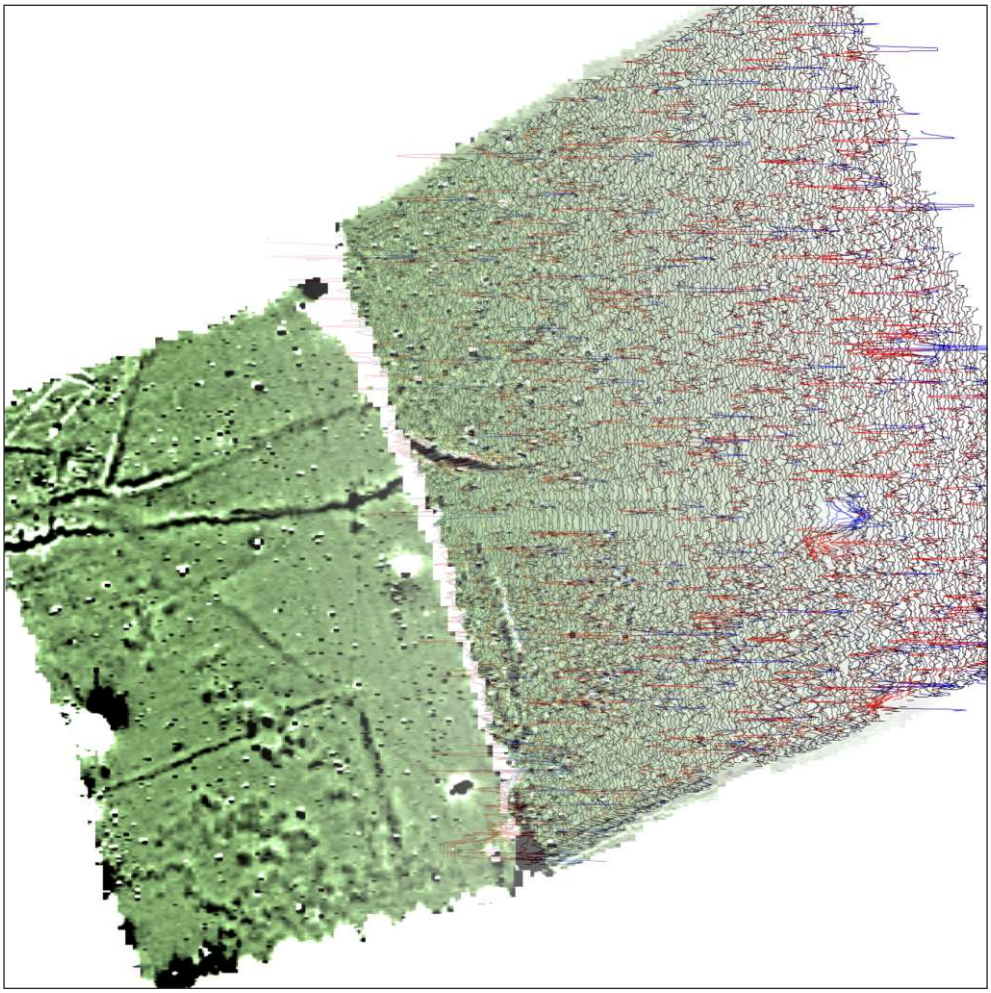
making sense of heritage

Caves Farm
Pitney, Langport, Somerset

Detailed Gradiometer Survey Report



Ref: 89030.02
May 2013

geoservices

Caves Farm
Pitney, Langport, Somerset

Detailed Gradiometer Survey Report

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May 2013

Report Reference 89030.02

Quality Assurance

Project Code	89030	**Accession Code**		**Client Ref.**	
Planning Application Ref.		**Ordnance Survey (OS) national grid reference (NGR)**	345088, 128671		

Version	Status*	Prepared by	Checked and Approved By	Approver's Signature	Date
v02	E	*BCU*	*DDR*		17/05/2013
File:	X:\Projects\89030\Geophysics\Report\89030_Geophysics_Report.docx				
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* I = Internal Draft; E = External Draft; F = Final

Caves Farm, Pitney, Langport, Somerset

Detailed Gradiometer Survey Report

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Detailed Gradiometer Survey Report

Summary

A detailed gradiometer survey was conducted over land off Stowey Road, near Caves Farm in Pitney, Somerset. The project was commissioned by AEE Renewables Plc (Cave Farm Solar Ltd). 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 seven arable and pasture fields to the west and east of Stowey Road, approximately 3 km south-west of Langport and 2.7 km south-east of the town of Somerton. The site occupies the south-west facing slope of the Low Ham Rhyne Valley, which lies within the Mid Somerset Hills. The land within the site slopes gently, from an elevation of c. 35m above Ordnance Datum (aOD) in the south, to c. 40m aOD at the northernmost extent. At the time of survey the fields were under pasture or lying fallow. The gradiometer survey covered 10.8 ha and has demonstrated the presence of anomalies of archaeological interest within the survey area, along with a region of increased magnetic response and several geological features.

Two dense clusters of anomalies of archaeological interest lie to the east and west of Stowey Road. Those to the west comprise the northern circuit of a clearly defined rectangular enclosure, although its response is lost within a complex of pit-like and other amorphous anomalies. Linear responses consistent with a former track or drove apparently extend E-W across the survey area from Stowey Road to the enclosure, perhaps suggesting that it relates to a former agricultural settlement.

Further rectilinear ditches can be seen to the east of the road, with dense clusters of pit-like anomalies nearby. A number of well-defined linear anomalies are thought to relate to a former field system or complex of enclosures.

Further east, localised regions of geological changes can be seen forming sinuous patterns within the data. A number of short linear and pit-like anomalies can be seen, which are thought to be of possible archaeological interest given their isolated distribution.

Ploughing trends can be seen within most of the survey areas, some of which are consistent with remnants of ridge and furrow. Other linear and curvilinear trends are of uncertain origins, and may be associated with geological changes or historic agricultural activity.

Caves Farm, Pitney
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Detailed Gradiometer Survey Report

Acknowledgements

The detailed gradiometer survey was commissioned by AEE Renewables Plc. (Cave Farm Solar Ltd). The assistance of Rolland Billington is gratefully acknowledged in this regard.

The fieldwork was directed by Rachel Chester and assisted by Clara Dickinson and Patrick Dresch. Clara Dickinson processed and interpreted the geophysical data and Ben Urmston wrote this report. The geophysical work was quality controlled by Dr. Paul Baggaley. Illustrations were prepared by Ben Urmston and Kenneth Lymer. The project was managed on behalf of Wessex Archaeology by Damian De Rosa.

Caves Farm, Pitney
Langport, Somerset

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by AEE Renewables Plc (Cave Farm Solar Ltd). to carry out a geophysical survey over land at Caves Farm, Pitney, near Langport in Somerset (**Figure 1**, hereafter 'the Site'), as part of the proposed development of a solar farm. The site is approximately centred on Ordnance Survey National Grid Reference 345088 128671.

1.1.2 The aim of the geophysical survey was to establish the presence/absence, extent and character of detectable archaeological remains within the survey areas.

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

1.1.4 This report along with a desk-based assessment (WA 2013) is required to accompany a planning application for the development of the Site as a solar array, to be submitted to South Somerset District Council.

1.2 The Site

1.2.1 The Site is located on arable and pasture fields 4km northeast of Langport and some 300m north of Pitney (**Figure 1**). Detailed gradiometer survey was undertaken over all accessible parts of the Site, a total of 10.8 ha.

1.2.2 The Site occupies gently undulating farmland to the north of Pitney either side of Stowey Road. The land slopes from 40m above Ordnance Datum (aOD) in the north, to 35m aOD at the southern boundary. The Site is bordered on all sides by agricultural land, comprising fences, hedgerows and trees.

1.2.3 The soils underlying the Site are likely to be calcareous clayey soils of the 343d (Sherborne) association (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.

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 from 9th April 2013 to 12th April 2013. Field conditions at the time of the survey were good, with the survey area either under pasture or lying fallow prior to the survey.

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 (±5nT 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 possible archaeological interest across the Site. Results are presented as a series of greyscale and XY plots, and archaeological interpretations, at a scale of 1:2,000 (**Figures 2** and **3**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale image and ±25nT at 25nT per cm for the XY trace plots.

3.1.2 The interpretation of the datasets (**Figure 4**) highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends. 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 Rectilinear anomaly **4000** lies near the northeastern extent of the southernmost field and appears to extend northwards under the extant boundary; whilst it appears to be sub-annular in plan, its incomplete nature suggests that it is probably archaeological in origin.

3.2.2 Curvilinear anomaly **4001** is oriented approximately NW-SE to the south of **4000**, and is of possible archaeological interest. Nearby, linear anomalies **4002** form a V-shaped response, apparently extending eastward under the extant boundary; only weakly defined from the magnetic background, it is possible that they are ditches and form part of an enclosure.

3.2.3 At the southeastern extent of the southernmost field, curvilinear anomaly **4003** does not exhibit clear contrast from the magnetic background. A further curvilinear anomaly **4004** can be seen to the northwest, although it is not definitively archaeological in origin; two well-defined pit-like anomalies lie close by to the southwest.

3.2.4 A rectangular region of magnetic disturbance **4005** lies towards the southwestern extent of the southernmost field; whilst these responses are typically associated with modern disturbance, there is some coherency to their distribution, suggesting that they may relate to a former structure. Two amorphous pit-like anomalies **4006** lie close to the southern boundary, although no association can be demonstrated.

3.2.5 To the west of centre of the northern field west of Stowey Road, rectilinear ditch **4007** extends from the western boundary before turning south. Its response becomes interrupted by a dense concentration of pit-like and linear anomalies **4008**, which are considered to be of probable archaeological interest; their lack of coherent distribution makes their interpretation less definitive although they appear to be anthropogenic in origin and a region of increased response encloses the region in which they lie. These pit-like anomalies do not have a defined boundary to the southwest, although a region of quieter magnetic background **4009** indicates their likely extent. A further region of quiet magnetic background **4010** marks a similar gap in the pit-like responses.

3.2.6 Towards the southeastern extent of the field, linear anomalies **4011** are of probable archaeological interest and are consistent with the course of a former track or drove; they extend WNW-ESE from Stowey Road towards the centre of the survey area and appear to demarcate the northern extent of the pit-like anomalies, suggesting they may be associated. Further amorphous and pit-like responses **4012** can be seen at the southeastern corner of the field and are considered to be of probable archaeological interest; it is not clear whether they are associated with **4000** to the south of the field boundary.

3.2.7 At the centre of the field, region of magnetic disturbance **4013** has some coherent elements, suggesting that it may relate to a thermoremnant, or fired, feature; however, it is also consistent with a hollow backfilled with magnetic debris. A similar cluster of strongly magnetised anomalies **4014** lies to the east and immediately north of probable track or drove **4011**.

3.2.8 To the north of **4007**, rectilinear anomalies **4015** exhibit only weak contrast with the magnetic background although their form in plan suggests that they may be of some archaeological interest.

3.2.9 Coherent region of magnetic disturbance **4016** appears sub-circular in plan and may indicate a thermoremnant feature such as a kiln; it is conceivable that this is the result of modern magnetic debris, however.

3.2.10 To the east of Stowey Road, rectilinear ditch **4017** extends NE-SW across the westernmost field, apparently turning towards the south at **4018** before its response becomes weaker and interrupted at **4019**. A region of increased magnetic response **4020** extends across the southern portion of the field and is consistent with near-surface geological changes. Ditches **4017** and **4018** are also separated by cluster of pit-like anomalies **4021**; the relative appearance of the magnetic responses of these anomalies suggests that the ditches represent an earlier phase of activity, although this cannot be demonstrated conclusively.

3.2.11 To the east of **4018**, weakly defined linear anomaly **4022** extends NW-SE across the survey area, marked to the southeast by a region of magnetic disturbance; it is likely that linear anomaly **4023**, on the same orientation, forms a continuation of the anomaly to the northwest. The weak response suggests that it may be a former field boundary and appears to be earlier than **4018**, although the difference in magnitude of response masks the relationship. Further to the northwest, a stronger linear anomaly extends E-W across the field and is apparently earlier than **4023**, given the characteristics of the responses at their intersection.

3.2.12 Immediately to the north, strong linear anomalies **4025** are similar in character to field boundaries although the intersection is unclear and the anomalies are somewhat amorphous in form. A complex of positive and negative linear anomalies **4026** lies at the northwestern extent of the survey area, although its function is not clear; it is considered to be of probable archaeological interest. Region of increased response **4027** extends northwest from **4025** towards the extant eastern boundary, suggesting that it represents a former enclosed field.

3.2.13 A cluster of pit-like anomalies **4028** lies to the east of **4018** and north of **4022** and is considered to be of probable archaeological interest. A further cluster of ferrous anomalies can be seen north of **4028**, although these are more characteristic of modern debris.

3.2.14 In the middle of the three northernmost fields, linear anomaly **4029** extends parallel with the western boundary. Its function is unclear, although it is consistent with a former boundary or part of an enclosure. To the north of this, a short segment of probable ditch **4030** curves approximately eastward from the boundary; it is likely to relate to anomaly **4024** to the west of the boundary.

3.2.15 Towards the southern extent of this survey area, loose cluster of linear and pit-like anomalies **4031** can be seen lying on a similar orientation to the extant boundary. They are only weakly defined from the magnetic background but are considered to be of possible archaeological interest.

3.2.16 Several linear and rectilinear anomalies are apparent across the northern portion of the field (**4032**, **4033** and **4034**). Their responses are consistent with geological features such as former channels; whilst an archaeological interpretation cannot be excluded entirely, it is considered more likely that they relate to natural features.

3.2.17 Region of magnetic disturbance **4035** is associated with an electricity pylon; evidence of magnetic interference can be seen as linear regions of periodic noise extending to the east and west.

3.2.18 At the northern extent of the northeasternmost field, rectilinear anomalies **4036** and **4037** are thought to be of possible archaeological interest, although they extend outside the survey area. Linear anomaly **4038** is consistent with a former boundary or ploughing headland, although its response is only weakly defined from the magnetic background. Its response is apparently interrupted by sinuous anomaly **4039**, which extends NE-SW across the centre of the survey area and is likely to extend into the field to the west. Sub-annular anomaly **4040**, situated at the southeastern extent of this field, contrasts weakly with the background although its form in plan suggests it may be of archaeological interest.

3.2.19 Within the small field immediately east of Stowey Road, curvilinear anomaly **4041** exhibits weak contrast with the magnetic background but may be of archaeological interest. Pit-like anomalies **4042** and **4044** appear at the northwestern and southeastern extents

respectively, whilst rectilinear anomalies **4033** may relate to part of a former enclosure, although their responses are rather ephemeral.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of definite, probable and possible archaeological interest within the Site, in addition to regions of increased magnetic response, geological responses and several possible thermoremnant anomalies.

4.1.2 The clearest concentration of anomalies of definite and probable archaeological interest is located across the southern portion of the northernmost field to the west of Stowey Road. Whilst it is difficult to ascribe a function or period to these anomalies, they are consistent with anthropogenic features and are likely to be of archaeological interest. Elements of these anomalies are consistent with a track or droveway and it is therefore possible that they represent a former agricultural settlement.

4.1.3 A series of anomalies in the northern field immediately east of Stowey Road are of archaeological interest and appear to relate to a system of former fields or enclosures. It is interesting to speculate over the possible relationships between these groups of anomalies, although no definite sequence can be determined from the geophysical data alone; it is possible for a more magnetic anomaly from an earlier period to appear to overlie a later yet weaker response, for instance.

4.1.4 The magnetic background of the survey areas is rather variable, with the northeasternmost field being the quietest and containing fewest ferrous anomalies and the westernmost fields being the noisiest. This is likely to indicate different agricultural uses of the fields over time, although an archaeological interpretation should not be dismissed.

4.1.5 Ploughing trends can be seen in each of the survey areas, typically oriented parallel with extant boundaries. Those in the easternmost fields are consistent with the remnants of ridge and furrow, given their regular spacing curvilinear form.

4.1.6 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

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

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

Wessex Archaeology 2013. *Caves Farm, Pitney, Langport, Somerset. Archaeological Desk-Based Assessment*. WA Ref: 89030.01

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 ±100nT 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.

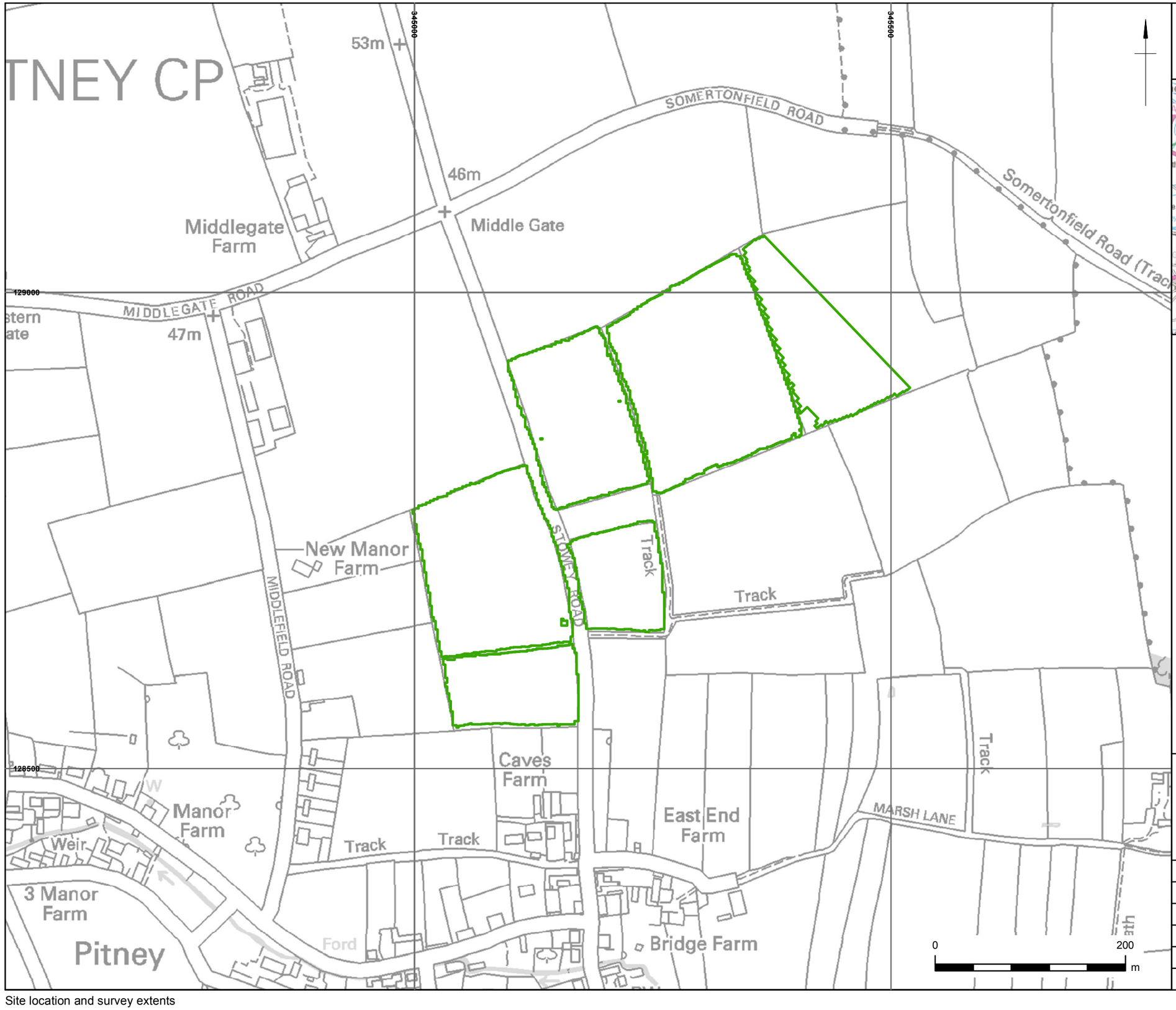
The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided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

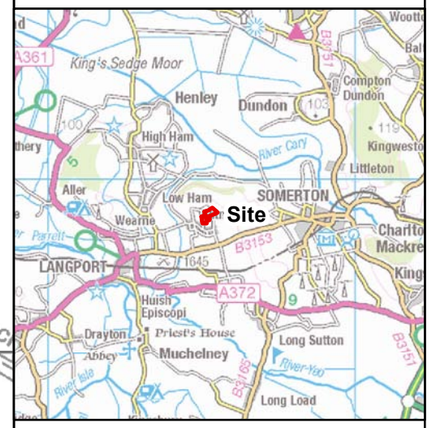
- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern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





Geophysics survey extents

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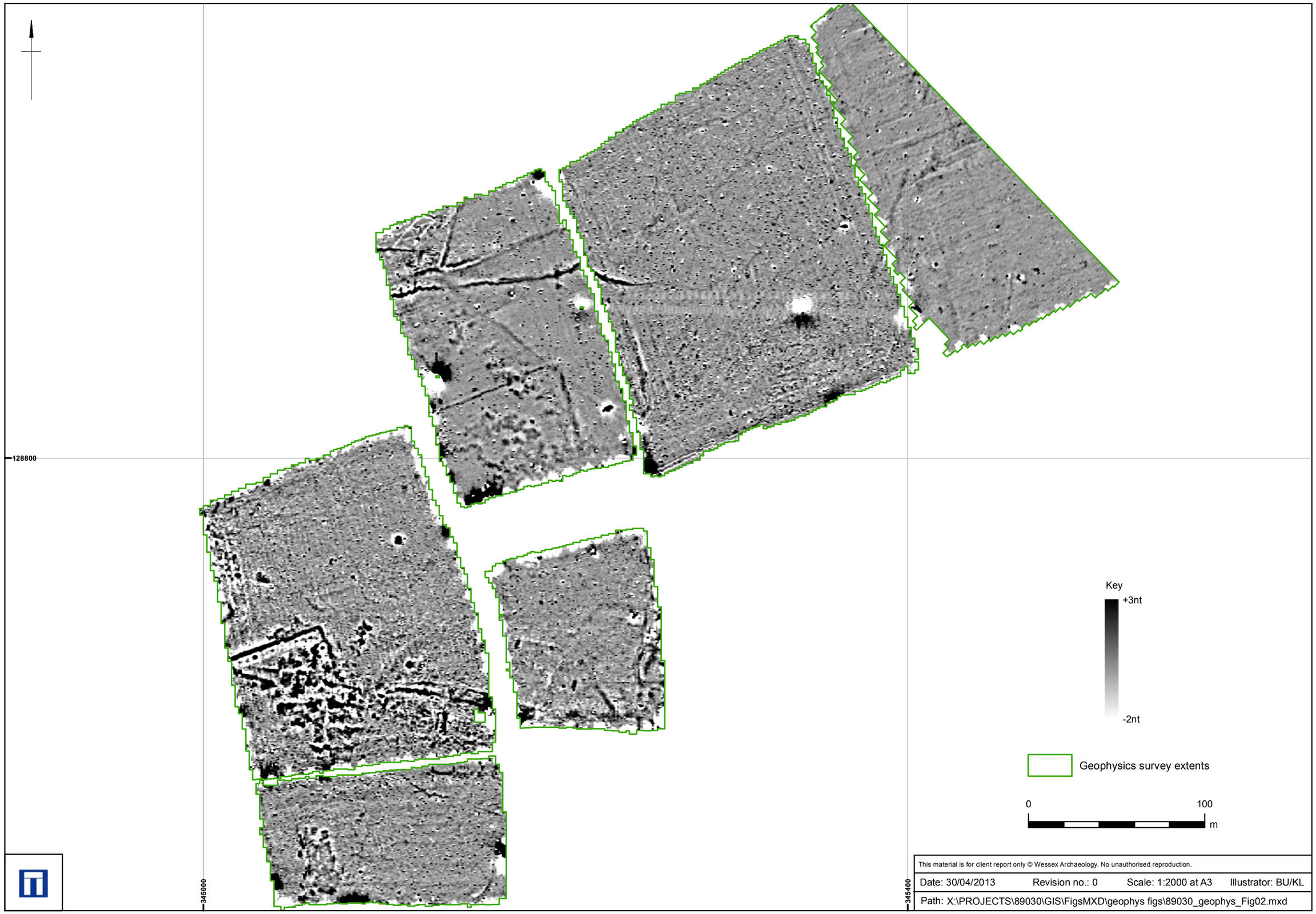
Site location and survey extents

Figure 1



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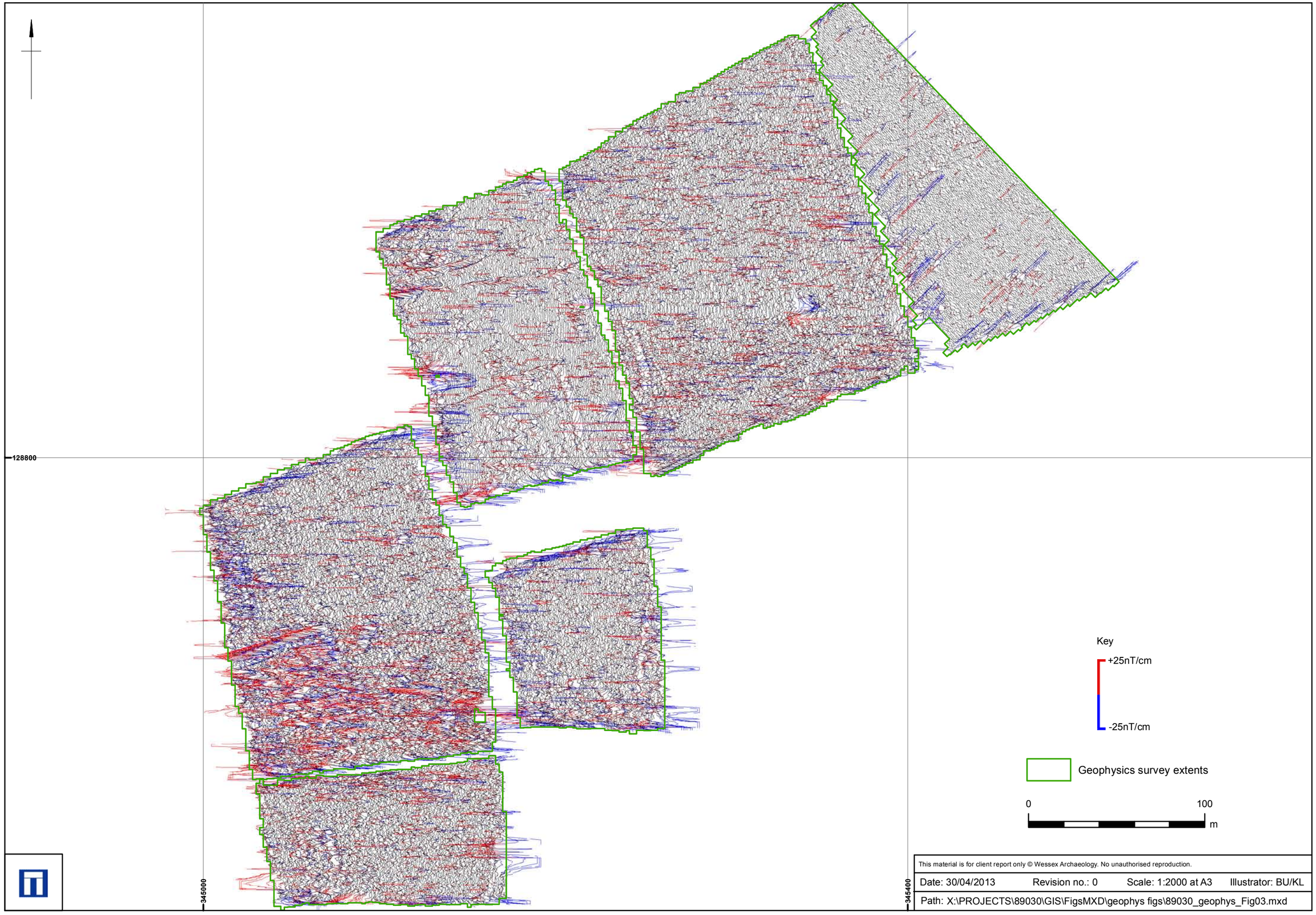
Greyscale

Figure 2



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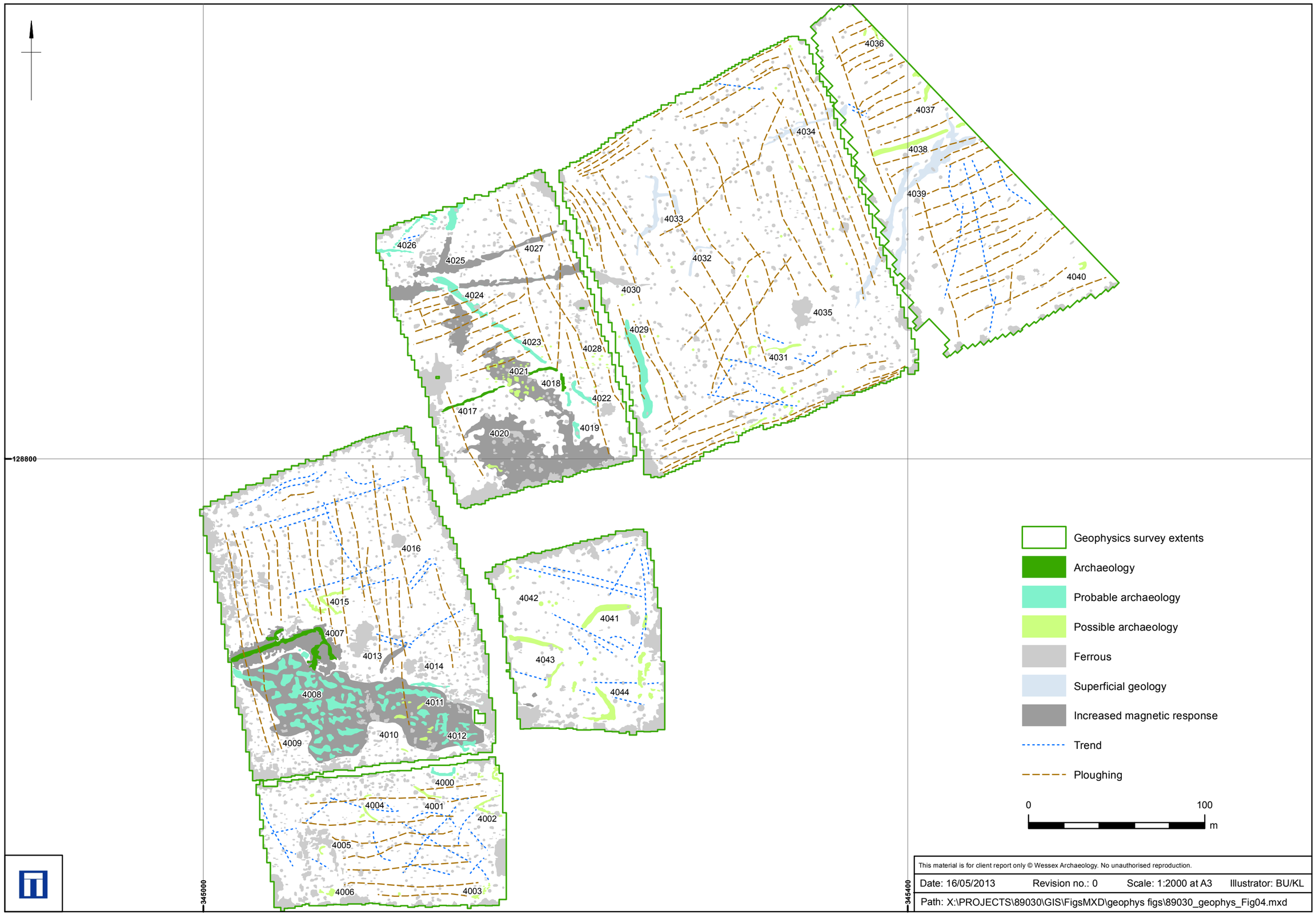
XY trace

Figure 3



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Interpretation

Figure 4

wessex archaeology

salisbury rochester sheffield edinburgh

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