Archaeology South-East

ASE

RESULTS FROM A MAGNETOMETER SURVEY OF LAND AT HEMPSTEAD LANE, HAILSHAM

NGR: TQ 557800 110300

ASE Project No: 4146

ASE Report No. 2010006
OASIS ID: archaeol6-70919

By Chris Russel BA (Hons)

January 2010

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Abstract

Archaeology South East was commissioned by CgMs to carry out a detailed fluxgate gradiometer survey on land at Hempstead Lane, Hailsham in advance of the development of the site. The survey covered two hectares and took place on the 15th of December 2009 and the 20th of January 2010. The survey area consisted of short grass pasture bounded by hedges and mature woodland. There were several anomalies consistent with buried archaeology in the results with the strongest evidence coming from the north of the survey area where a large rectilinear enclosure appears to pre-date the remnant field boundary.

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1.0 INTRODUCTION

1.1 Site Background

1.1.1 Archaeology South-East was commissioned by CgMs to conduct a Magnetometer survey on land at Hempstead Lane, Hailsham hitherto referred to as 'the site' (NGR TQ 557800 110300 ; Fig. 1).

1.2 Geology and Topography

1.2.1 The geology of the site consists of Weald Clay Deposits which connect the Pevensey peninsular to the Downs and Low Weald (BGS Sheet 319, Solid & Drift Edition, 1:50,000).

1.3 Planning Background

1.3.1 The site has planning consent (Ref: WD/2008/0631 MRM) and the survey was undertaken as part of an archaeological planning condition attached to proposed work at the site. A Written Scheme of Investigation for the work was prepared by CgMs (Darton 2009).

1.4 Aims of Geophysical Investigation

1.4.1 The purpose of the geophysical survey was to detect any buried archaeological anomalies that might provide a measurable magnetic response.

1.5 Scope of Report

1.5.1 The scope of this report is to report on the findings of the survey. The project was conducted by Chris Russel and Vincenzo Poppiti with the assistance of Lesley Davidson; project managed by Neil Griffin (fieldwork) and by Jim Stevenson (post excavation).

2.0 ARCHAEOLOGICAL BACKGROUND

2.1 No archaeological sites or find spots have been recorded on the site. There is medieval activity to the north of the site in the form of moated enclosures and post medieval tile works and buildings close to the site. (Darton, 2009).

3.0 SURVEY METHODOLOGY

3.1 Summary of Methodology

3.1.1 A Bartington Grad 601-2 fluxgate gradiometer was used to survey an area of 2.0 hectares. The survey grid was set out using a differential GPS (Global Positioning Systems). A 30 metre grid was set out across the survey area and transects were walked every meter across these grids. Samples for the magnetometry survey were taken at 0.25m intervals along each transect.

3.2 Geophysical Survey Methods Used

3.2.1 The magnetometry survey was undertaken in the areas depicted in Figures 1 and 2.

3.2.2 Clay type geologies will normally provide a poor-average result for magnetic survey techniques, however sand geologies generally respond well to magnetic prospection techniques (David 1995: 10; Gaffney & Gater 2003: 79). A 100% detailed area survey is the desirable strategy for any given area of land and has the potential to provide the best possible information on all types of feature including those where no significant occupation may have occurred. The fluxgate gradiometer method of magnetic detail survey was chosen as this instrumentation balances speed with quality of data collection. The survey grid consisted of 30m x 30m grids. Each grid was surveyed with 1m traverses; samples were taken every 0.25m for the magnetometry survey and every 1.0m for the resistance survey. The survey was undertaken over the course of two non-consecutive days and the weather consisted mostly of moderate to heavy rain interspersed with the occasional period of sunshine and showers.

3.3 Applied Geophysical Instrumentation

3.3.1 The Fluxgate Gradiometer employed was the Bartington Instrumentation Grad 601-2. This consists of two separate Fluxgate Gradiometers joined to work as a pair. The Fluxgate Gradiometer is based around a pair of highly magnetic permeable cores made out of an alloy called ‘Mu-metal’. They are driven in and out of magnetic saturation by the solenoid effect of an alternating ‘drive current’ in the coils wrapped around them. Every time the coils come out of saturation external fields can enter them; this will cause an electrical pulse in the detector coil proportional to the field strength. Two cores are used, with the cores in opposite direction, so that the drive current has no net magnetic effect arising on the sensor coil (Clark 1996, 69). A single sensor is very sensitive to tilt, which causes the amount of ambient field flux along its axis to change, which will then alter the reading. The problem is solved by using two sensors arranged as a gradiometer with one sensor subtracting the output of the other (Clark 1996: 70). Before use the instrument is required to be ‘balanced’. That is the fine tuning of the detector alignment that reduces direction sensitivity to a minimum. The Grad 601-2 has an internal memory and a data logger that store the survey data. This data is downloaded into a PC and is then processed in a suitable software package.

3.3.2 The Fluxgate Gradiometer is an efficient technique of archaeological prospecting (Gaffney et al 1991: 6). It is suitable for detecting ditches, walls, kilns, hearths and ovens. The Fluxgate Gradiometer will pick up areas of a magnetic field that differ from the ‘background’ magnetic field of the local geology. A zero point is set over a magnetically stable area of the site to be surveyed. This is termed as balancing. A cut feature such as a ditch will have a different magnetic field to the local geology therefore will elicit a greater response from the sensors. The response will be positive if the fill has a higher magnetic gradient than the surrounding soil. Areas of burning or a ceramic dump (e.g. collapsed tile roof) will have a drastically different magnetic field. Modern rubbish, concrete and other modern activity can have an adverse effect upon the sensors during magnetic survey. Buildings may not be readily detected unless there was a high proportion of brick/tile used in their construction.

3.3.3 The Fluxgate Gradiometer uses a NanoTesla (nT) as a unit of measurement. A Tesla is a unit of magnetic measurement. NanoTeslas must be used as the deviation of the magnetic field due to buried archaeology can be very small. The Earths background magnetic field is in the region of 48000 nT.

3.3.4 The Fluxgate Gradiometer, in common with almost all geophysical techniques, is better at detecting archaeological sites from the Late Prehistoric period onwards. It should always be borne in mind that earlier periods of prehistory that have had less impact upon the landscape (e.g. in the form of significant boundaries, structures etc.) may not be detected by most geophysical techniques.

3.4 Instrumentation Used for Setting out the Survey Grid

3.4.1 It is vitally important for the survey grid to be accurately set out. The English Heritage guidelines (David 1995) state that no one corner of any given survey grid square should have more than a few centimetres of error. The survey grid for the site was set out using a Leica TCRA 1205 total station. The grid points were then geo-referenced using a Leica System 1200 Differential Global Positioning System (DGPS). The GPS base station collects satellite position to determine its position. This data is processed in survey specific software to provide a sub centimetre Ordnance Survey position and height for the base station. The survey grid is then tied in to this known accurate position by using a roving satellite receiver that has its position corrected by the static base station. Each surveyed grid point has an Ordnance Survey position; therefore the geophysical survey can be directly referenced to the Ordnance Survey National Grid.

3.5 Data Processing

3.5.1 All of the geophysical data processing was carried out using Geoplot V3 published by Geoscan Research. Data processing must be undertaken on the raw survey data to produce a meaningful representation of the results so that they can then be further interpreted. However, it is important that the data is not processed too much. Data processing should not replace poor field work. The Fluxgate Gradiometer data has had four stages of processing applied to it. Due to the very high positive readings of some of the magnetic disturbance the values were replaced with a dummy value so as to avoid detrimentally affecting the dataset when further processed. The first process carried out upon the data was to CLIP it. CLIP can be used to limit data to specified maximum and minimum values for improving graphical presentation. It also has the effect of removing some of the 'iron spikes' that occur with fluxgate gradiometer survey data. ZERO MEAN TRAVERSE was then applied to survey data. This removes stripe effects within grids and ensures that the survey grid edges match. Next DESPIKE was applied to the data set which removes the remaining random 'iron spikes' that occur within fluxgate gradiometer survey data. LOW PASS FILTER was then applied to the data. LOW PASS FILTER removes high frequency minor scale spatial detail. This is particularly useful for smoothing data or for enhancing larger weak features. INTERPOLATE smoothes the data by creating extra data points based upon collected values. INTERPOLATE was carried out upon the survey data in the Y axis. INTERPOLATE improves the data presentation. This was all the processing that was applied to the survey data. Figures 3 and 4 display the processed survey data.

4.0 GEOPHYSICAL SURVEY RESULTS (Figs 3-9)

4.1 Site description

4.1.1 The survey area consisted of approximately two hectares of short scrub grassland adjacent to Hempstead Lane close to its junction with the A22. The survey took place across two fields divided by mature trees with the remnants of former field boundaries visible in the larger field in the form of dry ditches. The land sloped down from east to west with the poorest drainage witnessed in the smaller of the two fields.

4.1.2 The vegetation of the site consisted of short grass pasture bounded by hedgerows in the west and mature woodland around the rest of the site.

4.2 Survey Limitations

4.2.1 There were few barriers to the geophysical survey. Those that were present are listed below and were omitted from the survey.

4.2.2 To the west of the largest field there is was ditch marking the course of a former field boundary. This ditch was filled with brambles and was omitted from the survey. Several areas on the periphery of the site were overgrown with scrub and woodland and were omitted from the survey. The field boundary dividing the two fields proved an impenetrable barrier and was omitted from the survey.

4.3 Introduction to results

4.3.1 The results should be read in conjunction with the figures at the end of this report. The types of features likely to be identified are discussed below.

4.3.2 Positive Magnetic Anomalies
Positive anomalies generally represent cut features that have been in-

filled with magnetically enhanced material.

4.3.3 Negative Magnetic anomalies
Negative anomalies generally represent buried features such a banks that have a lower magnetic signature in comparison to the background geology

4.3.4 Magnetic Disturbance
Magnetic disturbance is generally associated with interference caused by modern ferrous features such as fences and service pipes or cables.

4.3.5 Dipolar Anomalies
Dipolar anomalies are positive anomalies with an associated negative response. These anomalies are usually associated with discreet ferrous objects or may represent buried kilns or ovens.

4.3.6 Bipolar Anomalies
Bipolar anomalies consist of alternating responses of positive and negative magnetic signatures. Interpretation will depend on the strength of these responses; modern pipelines and cables typically produce strong bipolar responses.

4.4 Interpretation of Fluxgate Gradiometer Results (Figs 3-9)

4.4.1 There were several anomalies visible in the results displaying both high and low magnetic signatures. The highest concentration of anomalies may be seen in the west of the survey area close to Hempstead Lane. The interpretation of the results are shown on Figure 5 with different shades of orange used to clearly define the various anomalies under discussion. Areas of modern disturbance are shown as a different colour.

4.4.2 There are concentrations of magnetic disturbance seen at A and B which represent modern activity on the site. There is a linear bipolar anomaly running approximately southeast to northwest at B which represents the remnant field boundary noted above. The large negative anomaly noted at C is a modern telegraph pole. There were several areas of burning noted on site along with back-filled test pits; these appear as discrete anomalies within the survey.

4.4.3 There is a negative rectilinear anomaly seen at M1 which appears to be divided into two roughly square enclosures. These appear to form a relationship with the positive anomalies noted at M2 an M3. M3 forms a large rectilinear enclosure. The southern arm of this enclosure is less distinct in the shade plot but may be seen to better effect in the trace plot (Fig.6). The northern and southern arms of M3 appear to be cut by the remnant field boundary suggesting that M3 pre-dates this feature. An additional rectilinear positive anomaly is noted at M2, immediately west of M3. Details of this group of anomalies are shown in Figure 6.

4.4.4 To the east of this group of anomalies there is a subtle double linear anomaly at M4 (Fig. 7). M4 shows a weak positive response and appears to respect the remnant field boundary strongly suggesting a relationship between the two.

4.4.5 Northeast of M4 are two apparently intercutting anomalies at M5 and M6 (Fig. 8). M5 consists of two strong positive anomalies roughly 10m apart. The origin for these anomalies is unclear though it should be noted that they run towards an access route between the two fields and, therefore contemporary. These linear anomalies appear to cut a more subtle positive circular anomaly the origin of which is also unclear.

4.4.6 The smaller of the two fields appears relatively devoid of features in comparison. There is a slight negative anomaly at M7 (Fig. 9) which appears to run east to west before turning north at approximately ninety degrees to itself. This may form an association with M4 or be related to the extant field boundaries.

5.0 CONCLUSIONS

5.1 The magnetometry survey successfully detected anomalies of possible archaeological origin across the site. The densest concentration of anomalies is seen in the north of the survey area around anomaly M1. Anomalies become less concentrated and frequent towards the east of the survey area. M3 appears to form a rectilinear enclosure with other anomalies forming an association. This anomaly appears to be cut by the remnant field boundary and may pre-date the enclosure of this field. Where linear anomalies share a similar orientation to the existing boundaries it may be inferred that these are broadly contemporary in origin.

5.4 Statement of Indemnity

5.4.1 Geophysical survey is the collection of data that relate to subtle variations in the form and nature of soil. Magnetic and resistance detail survey may not always detect sub-surface archaeological features. This is particularly true when considering earlier periods of human activity, for example those periods that are not characterised by sedentary social activity. These periods may include but are not necessarily restricted to the earlier Bronze Age, Neolithic, Mesolithic and Palaeolithic.

Bibliography

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British Geological Survey. Lewes. Sheet 319 Solid and Drift Edition. 1:5000 series.

Acknowledgements

Archaeology South-East would like to thank CgMs for commissioning the survey and Mr Alex Osborn and Mr Alan Tibbs for their kind assistance in its undertaking.

HER Summary Form

Site Code	HLH09					
Identification Name and Address	Fluxgate gradiometer survey on land at Hempstead Lane, Hailsham					
County, District &/or Borough	East Sussex					
OS Grid Refs.	TQ 557800 110300					
Geology	Weald Clay					
Arch. South-East Project Number	4146					
Type of Fieldwork	Eval.	Excav.	Watching Brief	Standing Structure	Survey ✓	Other
Type of Site	Green Field ✓	Shallow Urban	Deep Urban	Other		
Dates of Fieldwork	Eval.	Excav.	WB.	Other 15/10/2009 and the 20/01/2010		
Sponsor/Client	CgMs					
Project Manager	Neil Griffin					
Project Supervisor	Chris Russel					
Period Summary	Palaeo.	Meso.	Neo.	BA	IA	RB
	AS	MED	PM	Other		

100 Word Summary.

Archaeology South East was commissioned by CgMs to carry out a detailed fluxgate gradiometer survey on land at Hempstead Lane, Hailsham in advance of the development of the site. The survey covered two hectares and took place on the 15th of December 2009 and the 20th of January 2010. The survey area consisted of short grass pasture bounded by hedges and mature woodland. There were several anomalies consistent with buried archaeology in the results with the strongest evidence coming from the north of the survey area where a large rectilinear enclosure appears to pre-date the remnant field boundary.

OASIS ID: archaeol6-70919

Project details

Project name	Magnetometry Survey of Land at Hempstead Lane, Hailsham
Short description of the project	Detailed magnetometry survey over 2 hectares on land adjacent to Woodside FArm, Hempstead Lane, Hailsham, East Sussex.
Project dates	Start: 15-12-2009 End: 20-01-2010
Previous/future work	No / Yes
Type of project	Recording project
Site status	None
Current Land use	Grassland Heathland 1 - Heathland
Monument type	NONE None
Significant Finds	NONE None
Investigation type	'Geophysical Survey'
Prompt	Planning condition
Solid geology	WEALD CLAY
Drift geology	Unknown
Techniques	Magnetometry

Project location

Country	England
Site location	EAST SUSSEX WEALDEN HAILSHAM Hempstead Lane, Hailsham
Postcode	BN27 3AE
Study area	2.00 Hectares
Site coordinates	TQ 557800 110300 50.8771571528 0.214534464201 50 52 37 N 000 12 52 E Point

Project creators

Name of Organisation	Archaeology South East
Project brief originator	CgMs Consulting
Project design originator	CgMs Consulting
Project director/manager	Neil Griffin
Project supervisor	Chris Russel
Type of sponsor/funding body	CgMs Consulting

Project archives

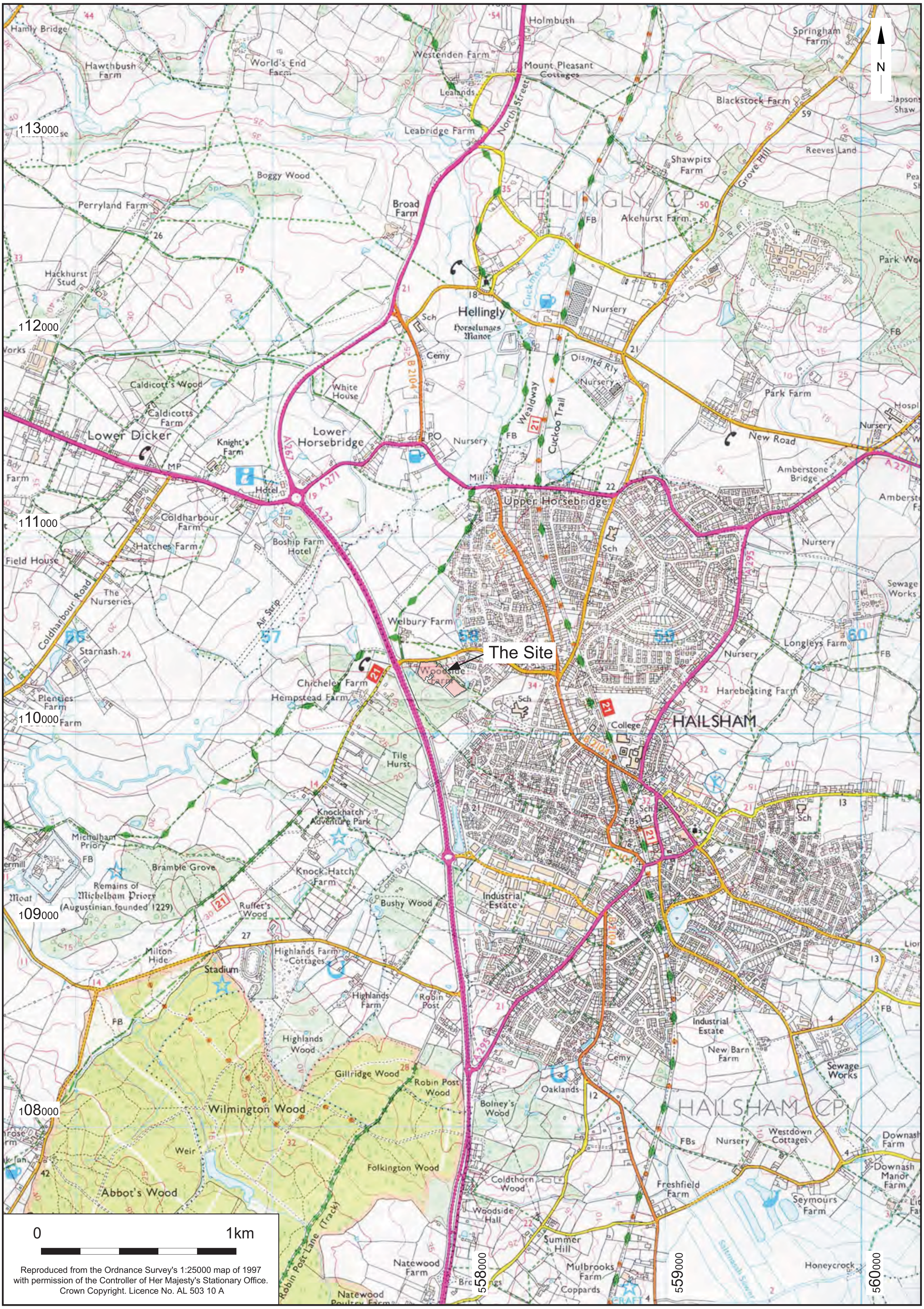
Physical Archive Exists?	No
Digital Archive recipient	CgMs
Digital Media available	'Geophysics'

Paper Archive recipient	CgMs
Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	Results From a Magnetometry Survey on Land at Hempstead Lane, Hailsham.
Author(s)/Editor(s)	Chris Russel
Other bibliographic details	Report Number 2010006
Date	2010
Issuer or publisher	Archaeology South East
Place of issue or publication	Portslade
Entered by	Chris Russel (mrchris20042000@yahoo.co.uk)
Entered on	22 January 2010

Appendix

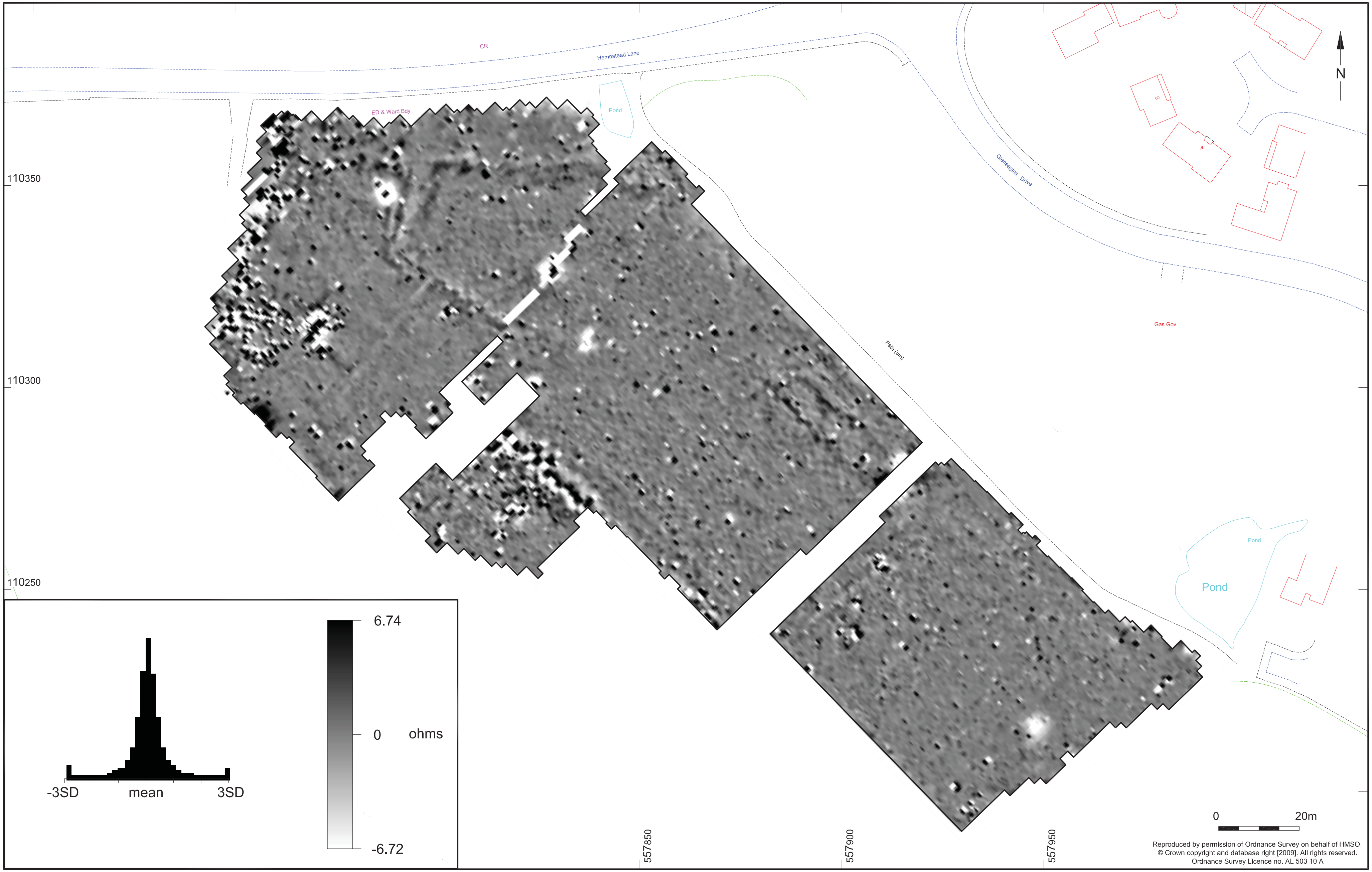
Included on C.D

1. Raw Magnetometry Data

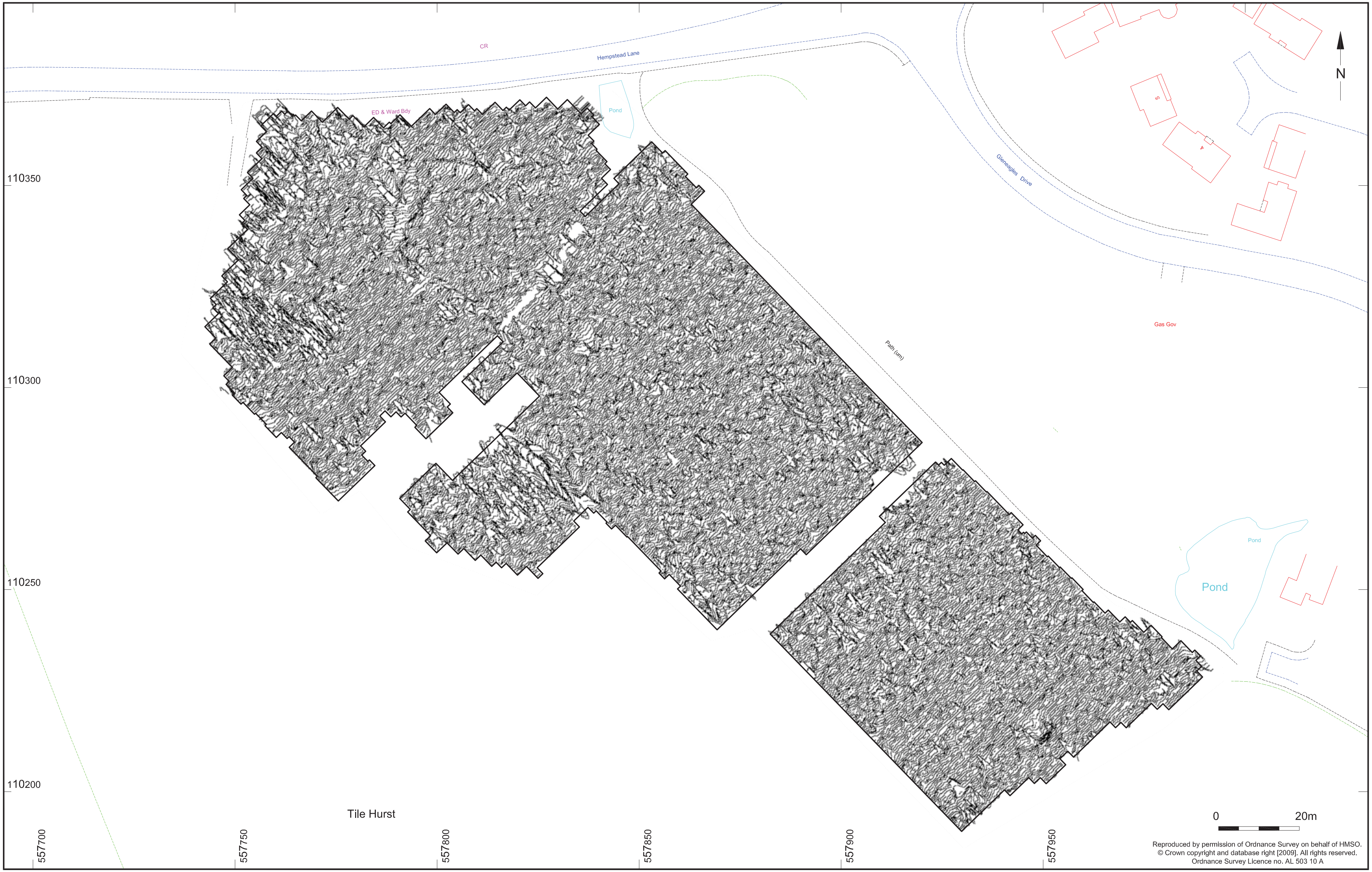


© Archaeology South-East		Hempstead Lane, Hailsham	Fig. 1
Project Ref: 4146	Jan 2010	Site location	
Report Ref: 2010006	Drawn by: JLR		

© Archaeology South-East		Hempstead Lane, Hailsham	Fig. 2
Project Ref: 4146	Jan 2010	Location of survey	
Report Ref: 2010006	Drawn by: JLR		



© Archaeology South-East		Hempstead Lane, Hailsham	Fig. 3
Project Ref: 4146	Jan 2010	Processed shade plot	
Report Ref: 2010006	Drawn by: JLR		



© Archaeology South-East		Hempstead Lane, Hailsham	Fig. 4
Project Ref: 4146	Jan 2010	Processed trace plot	
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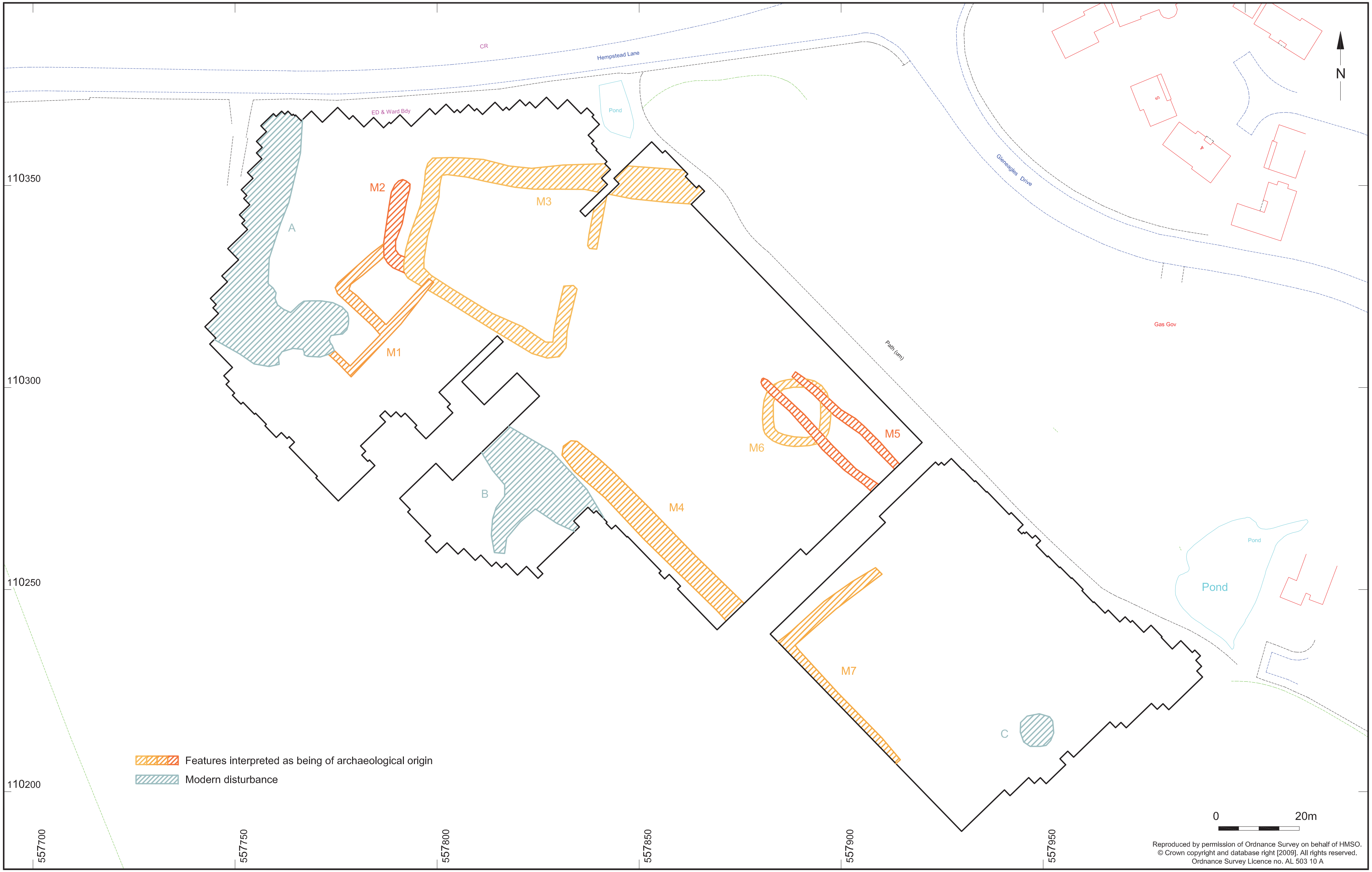
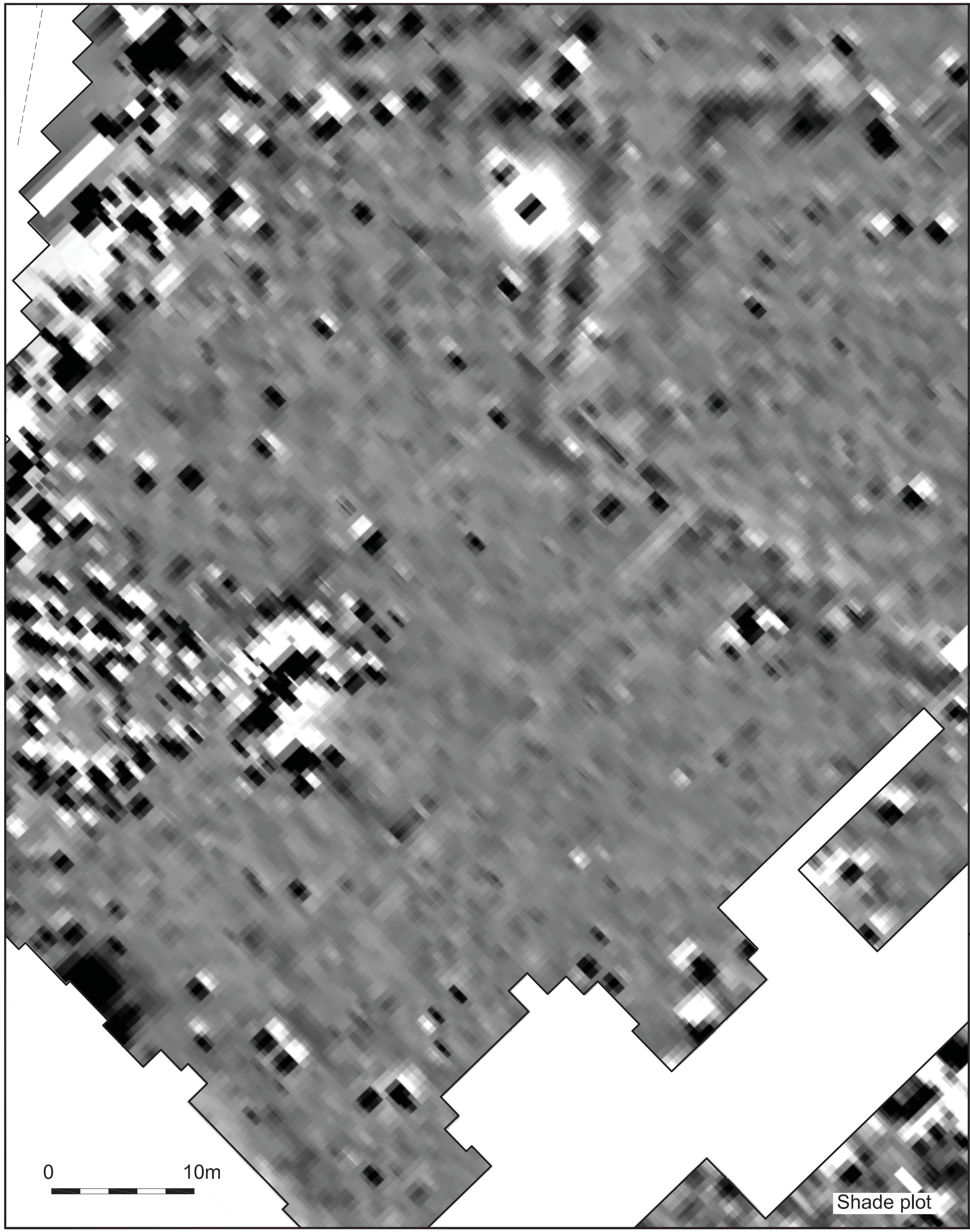
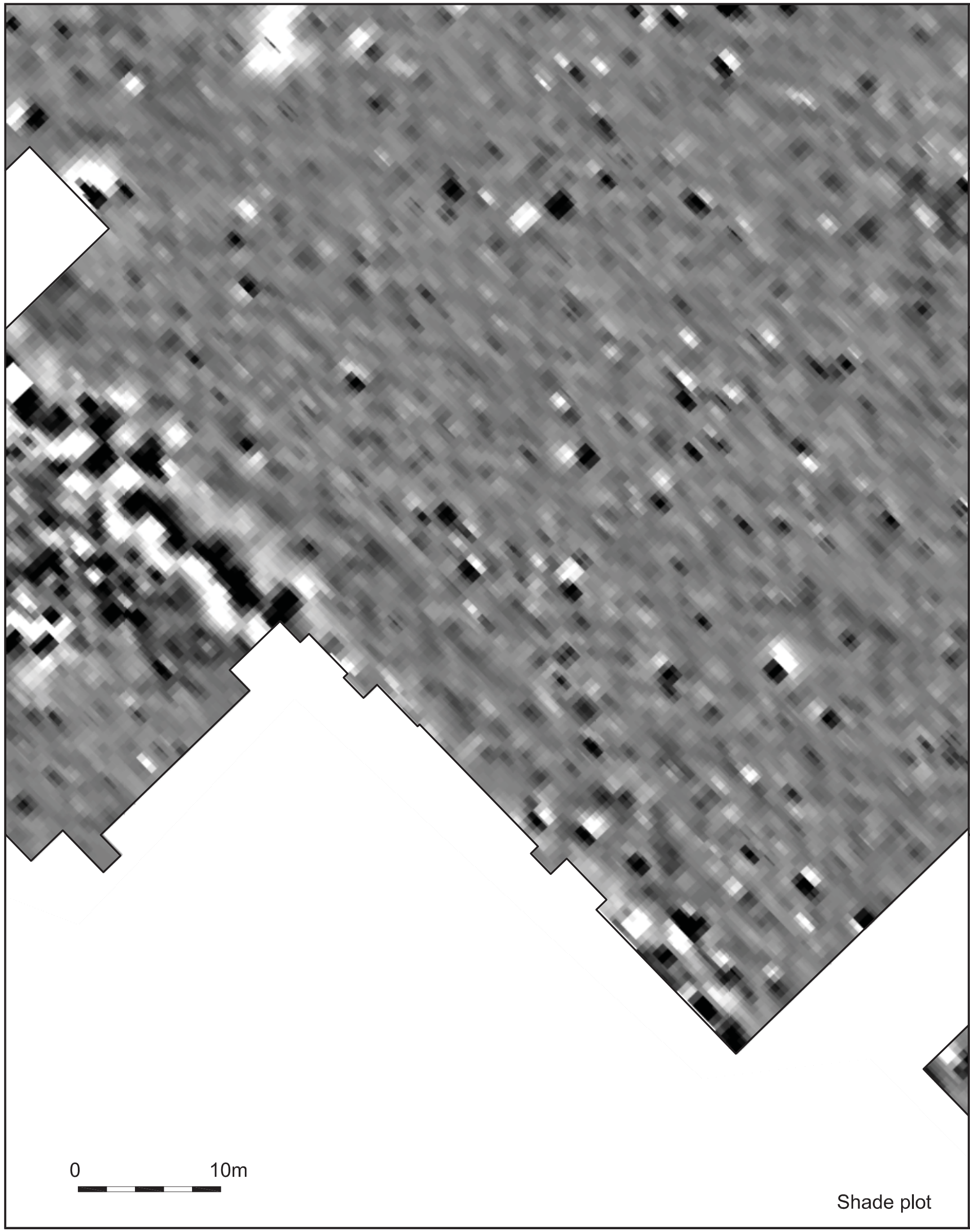
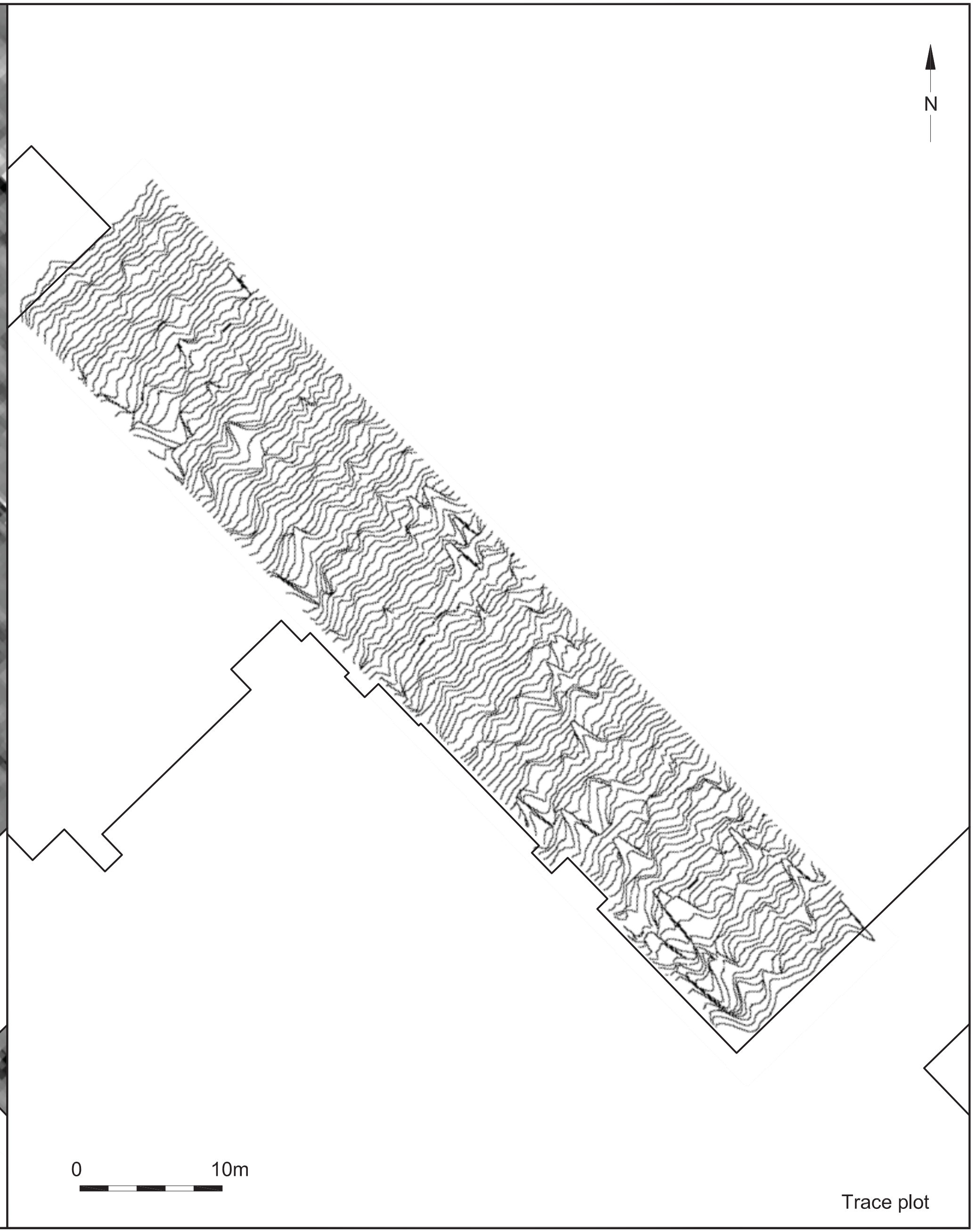


© Archaeology South-East		Hempstead Lane, Hailsham	Fig. 5
Project Ref: 4146	Jan 2010	Interpretation	
Report Ref: 2010006	Drawn by: JLR		

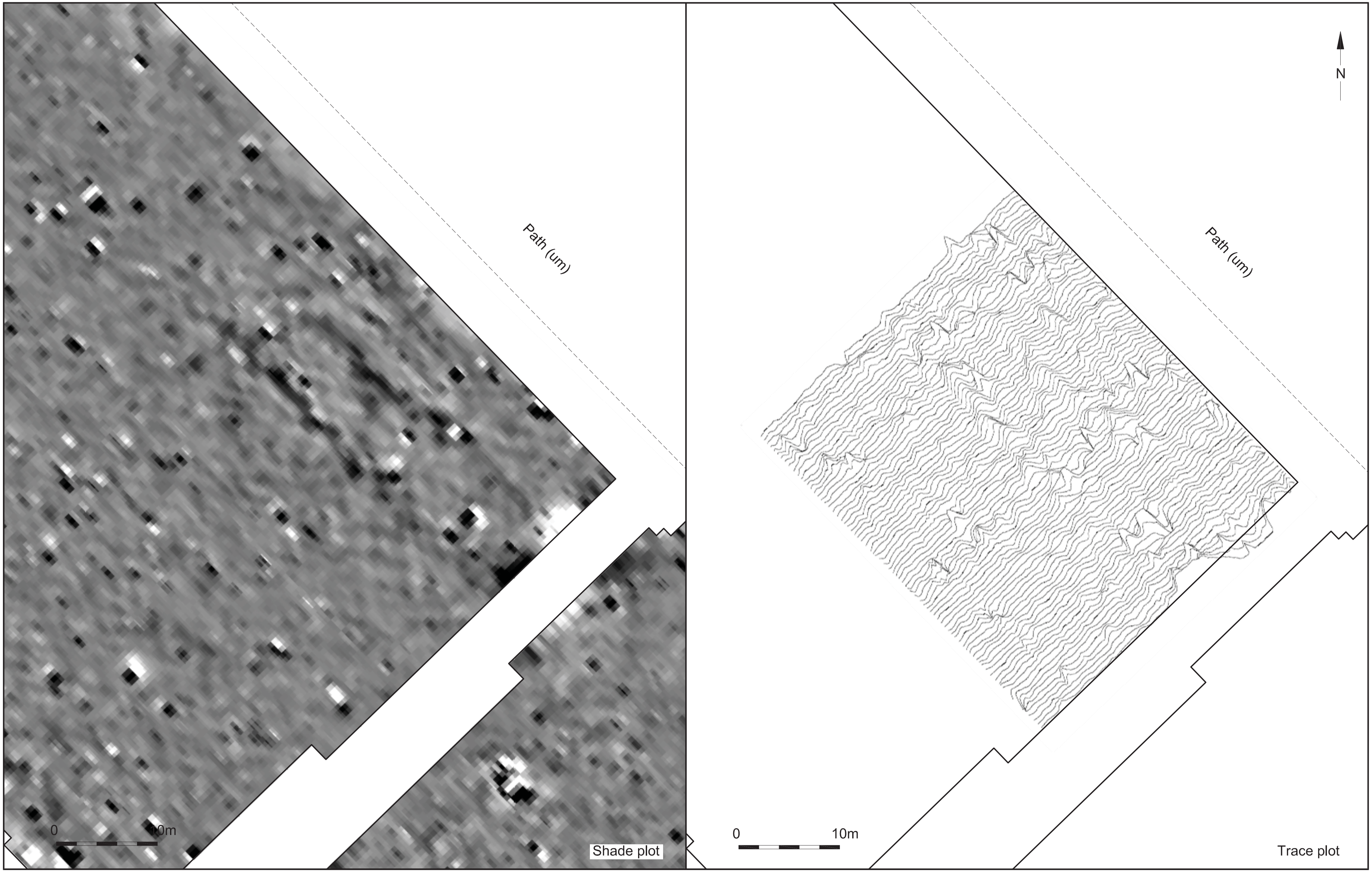


© Archaeology South-East		Hempstead Lane, Hailsham	Fig. 6
Project Ref: 4146	Jan 2010	Detail of anomaly M1 (Area A)	
Report Ref: 2010006	Drawn by: JLR		





© **Archaeology South-East**		Hempstead Lane, Hailsham	Fig. 7
Project Ref: 4146	Jan 2010	Detail of anomaly M4 (Area B)	
Report Ref: 2010006	Drawn by: JLR		



© **Archaeology South-East**		Hempstead Lane, Hailsham	Fig. 8
Project Ref: 4146	Jan 2010	Detail of anomalies M5 and M6 (Area B)	
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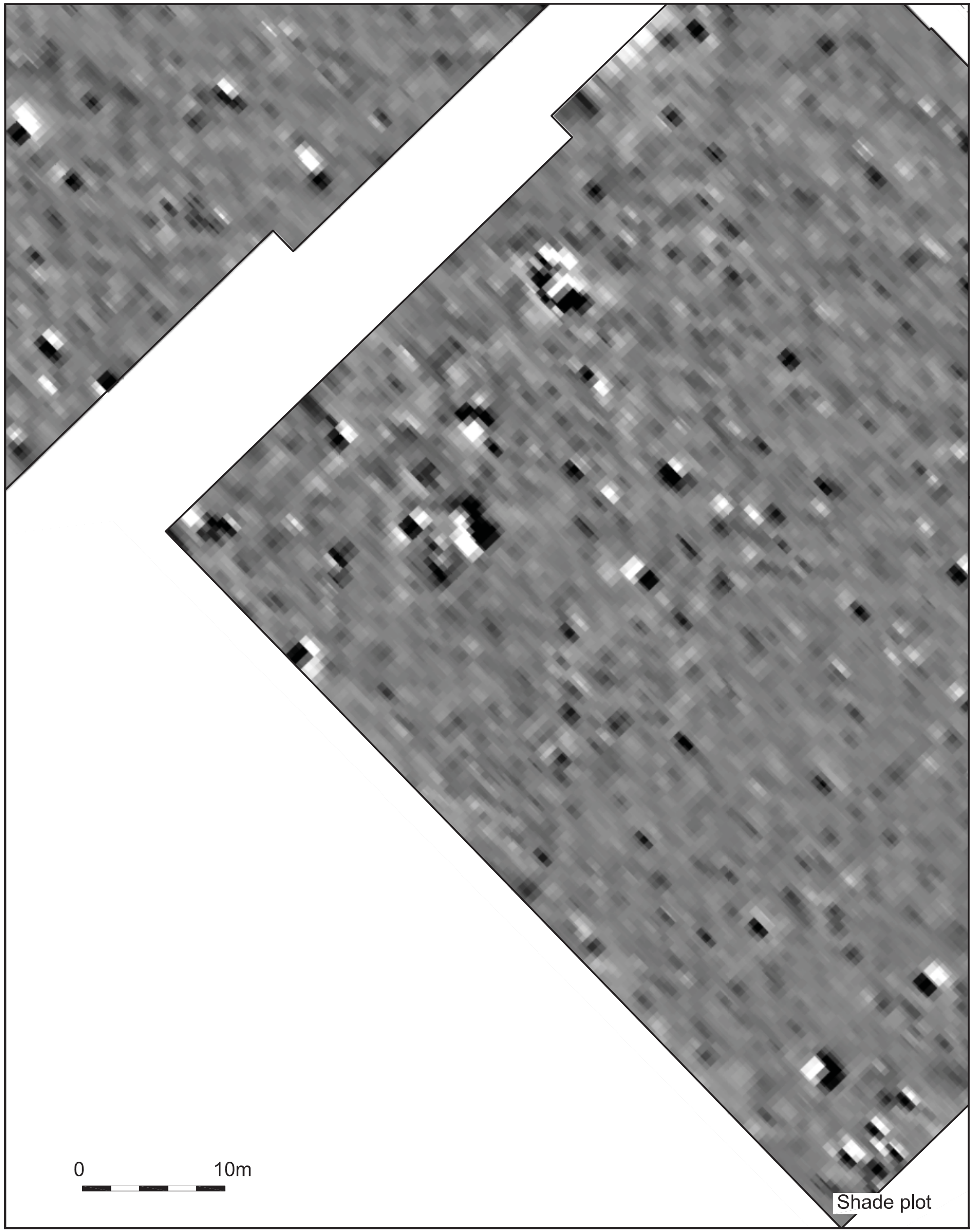

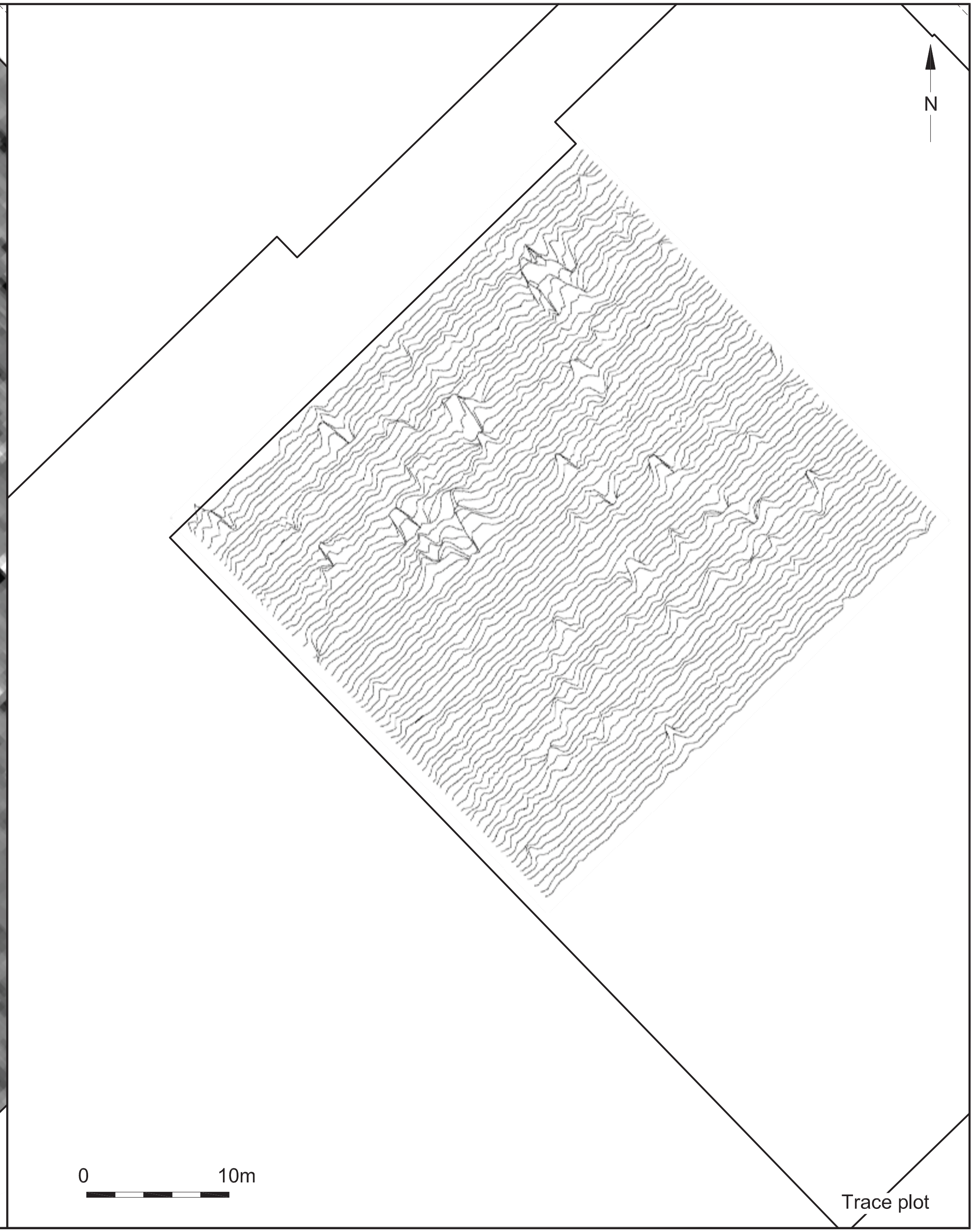

© Archaeology South-East		Hempstead Lane, Hailsham	Fig. 9
Project Ref: 4146	Jan 2010	Detail of anomaly M7 (Area C)	
Report Ref: 2010006	Drawn by: JLR		

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