

ARCHAEOLOGICAL  
SERVICES  
DURHAM UNIVERSITY

on behalf of  
AMEC  
for  
Defence Infrastructure Organisation

Worthy Down Camp and  
Service Families Accommodation  
Winchester  
Hampshire

geophysical survey

report 3013  
October 2012

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## 1. Summary

### The project

- 1.1 This report presents the results of a geophysical survey conducted in advance of proposed development at Worth Down, near Winchester, Hampshire. The works comprised geomagnetic survey of four areas totalling approximately 15ha.
- 1.2 The works were commissioned by AMEC, on behalf of Defence Infrastructure Organisation at the MoD, and conducted by Archaeological Services Durham University.

### Results

- 1.3 Probable former ditches were identified in Area 1, close to a known Iron Age settlement. These features may include part of a ditched enclosure and a possible roundhouse. Some of the features correspond to transcribed cropmarks while others have been recorded for the first time.
- 1.4 Potential archaeological features have also been identified in Areas 2 and 3, in the form of linear and curvilinear ditches.
- 1.5 A feature comprising three concentric circles was identified in the north of Area 2, as well as a large arc-shaped feature. These are probably relatively recent features, probably associated with the site's former use as an airfield.
- 1.6 Anomalies which probably reflect landscaping have been identified in Areas 2 and 4. These activities may have been associated with the site's use as an airfield, or more recently to create the sports pitches, and could have truncated archaeological features.
- 1.7 Land drains have been identified in Areas 2 and 4.
- 1.8 Services have been identified in Areas 2, 3 and 4.

## 2. Project background

### Location (Figure 1)

- 2.1 The proposed development area (PDA) was split into two main sections, both at Worthy Down, near Winchester, Hampshire: land at the Main Camp (NGR centre: SU 4744 3503), comprising playing fields and lawns bounded by the Camp boundary, roads and buildings; land off Connaught Road, north of existing service families accommodation (SFA) (NGR centre: SU 4669 3500).
- 2.2 Four surveys were conducted in four land parcels totalling approximately 15ha.

### Development proposal

- 2.3 Project Wellesley proposes the redevelopment of Worthy Down Camp to fulfil training and accommodation requirements along with a new SFA housing development to the west of the main camp.

### Objective

- 2.4 The principal aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in relation to the development.

### Methods statement

- 2.5 The surveys have been undertaken in accordance with instructions from the client and national standards and guidance (see para. 5.1 below).

### Dates

- 2.6 Fieldwork was undertaken between 1st and 5th October 2012. This report was prepared for 24th October 2012.

### Personnel

- 2.7 Fieldwork was conducted by Jamie Armstrong and Richie Villis (Supervisor). The geophysical data were processed by Richie Villis. This report was prepared by Richie Villis and Duncan Hale (the Project Manager), with illustrations by David Graham and Janine Watson.

### Archive/OASIS

- 2.8 The site code is **WWD12**, for **Winchester Worthy Down 2012**. The survey archive will be supplied on CD to the client for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **Online Access to the Index of archaeological investigationS project (OASIS)**. The OASIS ID number for this project is **archaeol3-135903**.

### Acknowledgements

- 2.9 Archaeological Services Durham University is grateful for the support of Armed Forces and security personnel of Worthy Down Camp in facilitating this scheme of works.



### **3. Historical and archaeological background**

- 3.1 A desk-based assessment (DBA) has been undertaken for the proposed development (Townend 2012); the following information is taken from this.
- 3.2 Four scheduled monuments and two Grade II listed buildings are noted within 1km of the site, the nearest of which is a World War II Pickett-Hamilton Fort on the former Worthy Down Airfield, approximately 130m north of the proposed SFA development. Worthy Down Ditch, a scheduled monument dating to the Bronze Age is located approximately 400m south-west of the existing SFA.
- 3.3 Most of the heritage assets recorded within the proposed development area relate to later prehistoric-to-Roman settlement evidence, including a possible Roman cremation burial.
- 3.4 The HER records a number of sites and findspots within the vicinity of the PDA, which are supplemented by aerial photographic cropmark evidence indicating significant prehistoric settlement activity.
- 3.5 A 'Gussage' type Iron Age settlement has been excavated in the vicinity, and is likely to extend into the PDA for the SFA. It is one of only three of this type of settlement which has been excavated and it is important in the understanding of the development of Iron Age settlement in central southern England.
- 3.6 Previously the site has been a racetrack and an airfield. Extensive evidence of the airfield survives, including airfield defensive structures. Airfield buildings from the late 1920s to the 1950s, including the Officers' Mess, still survive in the Main Camp.

### **4. Landuse, topography and geology**

- 4.1 At the time of survey the proposed development area comprised one arable field off Connaught Road, to the west of the Main Camp (Area 1), and playing fields including rugby, football and cricket pitches within the Main Camp (Areas 2-4). It was not possible to collect data in the north-east corner of Area 2 due to previous development (field mess tents).
- 4.2 Area 1 sloped gently down from approximately 105m OD in the north to 100m OD in the south. The survey areas in the Main Camp sloped downwards from approximately 97m OD in the north-west to about 83m OD in the south-east.
- 4.3 The underlying solid geology of the area predominantly comprises Late Cretaceous chalk of the Seaford Chalk Formation, with a narrow band of Stockbridge Rock Member limestone running broadly south-east/north-west through the east of Area 1 and the centre of Area 2.

### **5. Geophysical survey Standards**

- 5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Institute for Archaeologists (IfA) *Standard and Guidance for archaeological geophysical survey* (2011); the IfA Technical Paper No.6, *The use of*

*geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the *Archaeology Data Service Guide to Good Practice: Geophysical Data in Archaeology* (Schmidt & Ernenwein 2011).

### **Technique selection**

- 5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.
- 5.3 In this instance, based on desktop and aerial photographic cropmark evidence, it was considered likely that cut features such as ditches and pits would be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.
- 5.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

### **Field methods**

- 5.5 A 30m grid was established across each survey area and related to known, mapped Ordnance Survey points and the National Grid using a Leica GS15 global navigation satellite system (GNSS) with real-time kinematic (RTK) corrections typically providing 10mm accuracy.
- 5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 3,600 sample measurements per 30m grid unit.
- 5.7 Data were downloaded on site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

### **Data processing**

- 5.8 Geoplot v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw (minimally processed) data. The greyscale images and interpretations are presented in Figures 2-6; the trace plots are provided in Figure 7. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla.



5.9 The following basic processing functions have been applied to each dataset:

<i>clip</i>	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
<i>zero mean traverse</i>	sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities
<i>destagger</i>	corrects for displacement of geomagnetic anomalies caused by alternate zig-zag traverses
<i>interpolate</i>	increases the number of data points in a survey to match sample and traverse intervals; in this instance data have been interpolated to 0.25m x 0.25m intervals

#### **Interpretation: anomaly types**

5.10 Colour-coded geophysical interpretation plans are provided. Three types of geomagnetic anomaly have been distinguished in the data:

<i>positive magnetic</i>	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches
<i>negative magnetic</i>	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids
<i>dipolar magnetic</i>	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths

#### **Interpretation: features**

##### **General comments**

- 5.11 Colour-coded archaeological interpretation plans are provided.
- 5.12 Except where stated otherwise in the text below, positive magnetic anomalies are taken to reflect relatively high magnetic susceptibility materials, typically sediments in cut archaeological features (such as ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.
- 5.13 Small, discrete dipolar magnetic anomalies have been detected in each of the survey areas. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments, and in most cases have little or no archaeological significance. A sample of these is shown on the geophysical interpretation plans, however, they have been omitted from the archaeological interpretation plans and the following discussion.

### **Area 1**

- 5.14 Several linear positive magnetic anomalies have been detected in this area. These almost certainly reflect the remains of soil-filled ditch features and could be associated with the Iron Age settlement on the ridge to the north. Some anomalies in the east of the area could reflect the remains of further enclosures.
- 5.15 A curvilinear, weak positive magnetic anomaly has been detected at the south-east corner of the survey area. This could reflect the remains of a small soil-filled ring-ditch, such as may be associated with roundhouses. A sub-circular positive magnetic anomaly has been detected within the centre of this curvilinear feature, which could reflect a soil-filled pit or hearth.
- 5.16 Some of the potential archaeological features identified by the geophysical survey correspond to cropmark features noted on aerial photographs, while others have not been identified previously. One or two of the transcribed cropmarks have only been detected as extremely weak geomagnetic anomalies.
- 5.17 Parallel weak positive magnetic anomalies aligned north/south across the area reflect the current ploughing regime; perpendicular anomalies at the south of the area reflect a change in the plough direction.
- 5.18 Dipolar magnetic anomalies detected along the southern edge of the area reflect a metal boundary fence separating the field from gardens and communal areas.
- 5.19 A small artillery shell, possibly an anti-aircraft device, was noted on the ground in the east end of the survey and corresponds to one of the many discrete dipolar magnetic anomalies in this area. Other similar anomalies here could reflect similar items. The object was reported to the Gatehouse and Guardroom at the Camp, and dealt with by military personnel.
- 5.20 A few large and intense dipolar magnetic anomalies were also detected across this area. These could reflect larger ferrous objects, or possibly burnt areas such as bonfire sites.

### **Area 2**

- 5.21 Many linear positive and negative magnetic anomalies have been detected across this area. The regular pattern and straight, narrow nature of the majority of these anomalies almost certainly indicates a system of land drainage.
- 5.22 Many weak and diffuse positive magnetic anomalies, most evident in the south-eastern part of this area, aligned broadly north-south (and also evident in the west of Area 4), probably reflect former ground-levelling activities such as the actions of bulldozers or graders. This landscaping may have been associated with the construction of the airfield runways, or possibly with the later construction of the sports pitches.
- 5.23 Several smaller positive magnetic anomalies may reflect the truncated remains of soil-filled features of archaeological interest. The presence of so many other anomalies in this area has hindered the identification of features of possible archaeological origin, however, several linear and smaller curvilinear ditch remains may be present.



- 5.24 Curvilinear negative magnetic anomalies have been detected in the north of this area. These types of anomalies typically reflect voids or sedimentary stone, or even non-reinforced concrete. The regular pattern of these anomalies, including three concentric circles, may reflect relatively recent features, possibly associated with the former use of the area as airfield. The large arc recorded in the survey may be part of an airfield feature visible on an aerial photograph of 1930.
- 5.25 Three chains of dipolar magnetic anomalies have been detected, which almost certainly reflect buried services.
- 5.26 Many intense dipolar magnetic anomalies have been detected in this area. Some of these correspond to playing field features, such as football and rugby posts, sockets for further posts, a scrum machine and other exercise equipment. A rectangular concentration of small dipolar magnetic anomalies detected in the southern part of the area, measuring c. 25m x 5m, almost certainly reflects a former cricket wicket.
- 5.27 Strong dipolar magnetic anomalies detected along the eastern and western edges of the area correspond to metal fences; some anomalies on the southern edge reflect metal signs, lamp posts and associated cables.

### **Area 3**

- 5.28 A few linear positive magnetic anomalies detected in this area, aligned broadly east-west, could reflect former ditch features.
- 5.29 A number of dipolar magnetic anomalies have been detected in this area. The strong dipolar magnetic anomalies along the western edge reflect an adjacent wire fence around an all-weather pitch; the anomalies along the southern edge correspond to a reinforced concrete wall with a metal container at the east end. Three linear dipolar magnetic anomalies almost certainly reflect buried services. The large concentration of anomalies in the western part of the area reflects an area of made-ground; an inspection chamber cover was noted on the ground at the north-west corner.

### **Area 4**

- 5.30 A number of linear negative magnetic anomalies have been detected across this area. These almost certainly reflect land drains. A linear positive magnetic anomaly, comprising many small anomalies, aligned broadly north-west/south-east, could reflect either a drain made of short lengths of fired clay pipe, or possibly a former fenceline.
- 5.31 Chains of strong dipolar magnetic anomalies have been detected at the edges of the survey area, where inspection chamber covers were also noted on the ground, and also across the area; these almost certainly reflect buried services.
- 5.32 Very strong dipolar magnetic anomalies have been detected at the north-eastern and south-eastern corners of the area; these reflect the adjacent buildings.
- 5.33 The unsurveyed area in the centre corresponds to the location of a roped off cricket square, which had recently been re-seeded. Dipolar magnetic anomalies around the edges of this reflect metal posts.

- 5.34 The large concentration of dipolar magnetic anomalies detected to the west of the cricket square almost certainly reflects buried ferrous or fired waste, perhaps used to infill a hollow or former pond.
- 5.35 A north-west/south-east alignment of 11 individual, intense, dipolar magnetic anomalies reflects a row of metal posts which divide the area between cricket square and football pitch.
- 5.36 Two large and strong dipolar magnetic anomalies, approximately 100m apart, detected in the south-west of the area correspond to football goal posts.
- 5.37 Some diffuse anomalies in the west of the area may be associated with landscaping activities, as in Area 2.
- 5.38 No anomalies of likely archaeological significance have been identified in this area.

## **6. Conclusions**

- 6.1 Fifteen hectares of geomagnetic survey were undertaken at Worthy Down, Winchester, Hampshire, prior to proposed development.
- 6.2 Probable former ditches were identified in Area 1, close to a known Iron Age settlement. These features may include part of a ditched enclosure and a possible roundhouse. Some of the features correspond to transcribed cropmarks while others have been recorded for the first time.
- 6.3 Potential archaeological features have also been identified in Areas 2 and 3, in the form of linear and curvilinear ditches.
- 6.4 A feature comprising three concentric circles was identified in the north of Area 2, as well as a large arc-shaped feature. These are probably relatively recent features, probably associated with the site's former use as an airfield.
- 6.5 Anomalies which probably reflect landscaping have been identified in Areas 2 and 4. These activities may have been associated with the site's use as an airfield, or more recently to create the sports pitches, and could have truncated archaeological features.
- 6.6 Land drains have been identified in Areas 2 and 4.
- 6.7 Services have been identified in Areas 2, 3 and 4.

## **7. Sources**

- David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage
- Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*. Technical Paper 6, Institute of Field Archaeologists
- IfA 2011 *Standard and Guidance for archaeological geophysical survey*. Institute for Archaeologists

- Schmidt, A, & Ernenwein, E, 2011 *Guide to Good Practice: Geophysical Data in Archaeology*. Archaeology Data Service
- Townend, S, 2012 *Worthy Down Camp and Service Families Accommodation, Hampshire: historic environment desk study and heritage significance evaluation*. Unpublished report 29161rr102i1 AMEC



Figure 1: Site location



site location



survey area

0 1km  
scale 1:25 000 for A4 plot



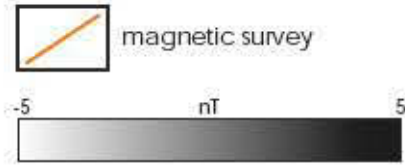


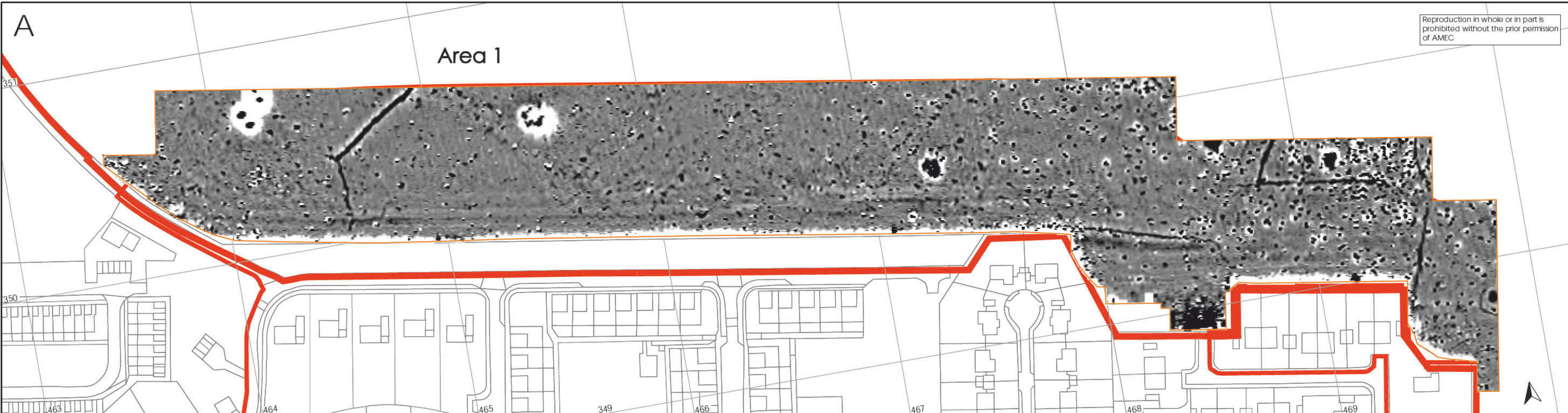
Figure 2: Geophysical survey overview

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A - geophysical survey

- magnetic survey

5 nT

B - geophysical interpretation

- dipolar magnetic anomaly
- positive magnetic anomaly
- negative magnetic anomaly

C - archaeological interpretation

- soil-filled feature

0 50m  
scale 1:1000 for A1 plot

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Figure 3: Area 1 geophysical survey and interpretations



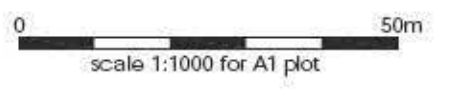
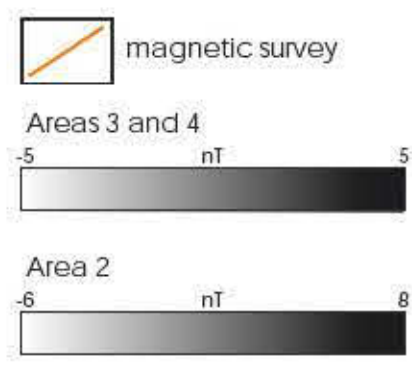
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Area 3

Area 2

Area 4



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Figure 4: Areas 2-4 geophysical survey







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- magnetic survey
- soil-filled feature
- former cricket wicket
- made ground
- service pipe
- 20th-century features
- land drain
- football/rugby goal post
- metal post
- scrum machine

0 50m  
scale 1:1000 for A1 plot

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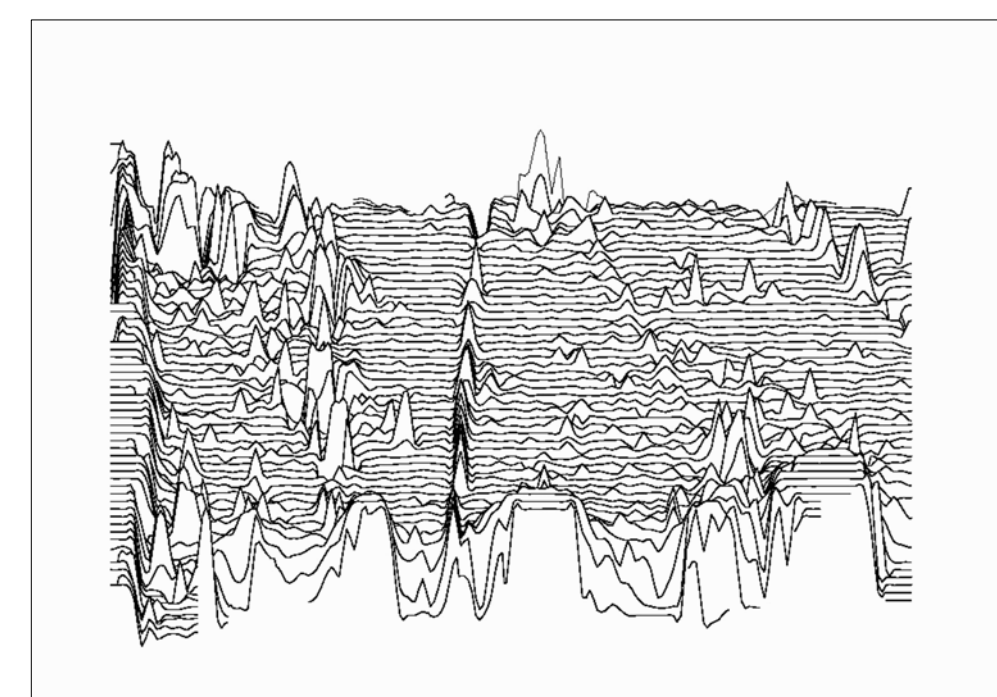
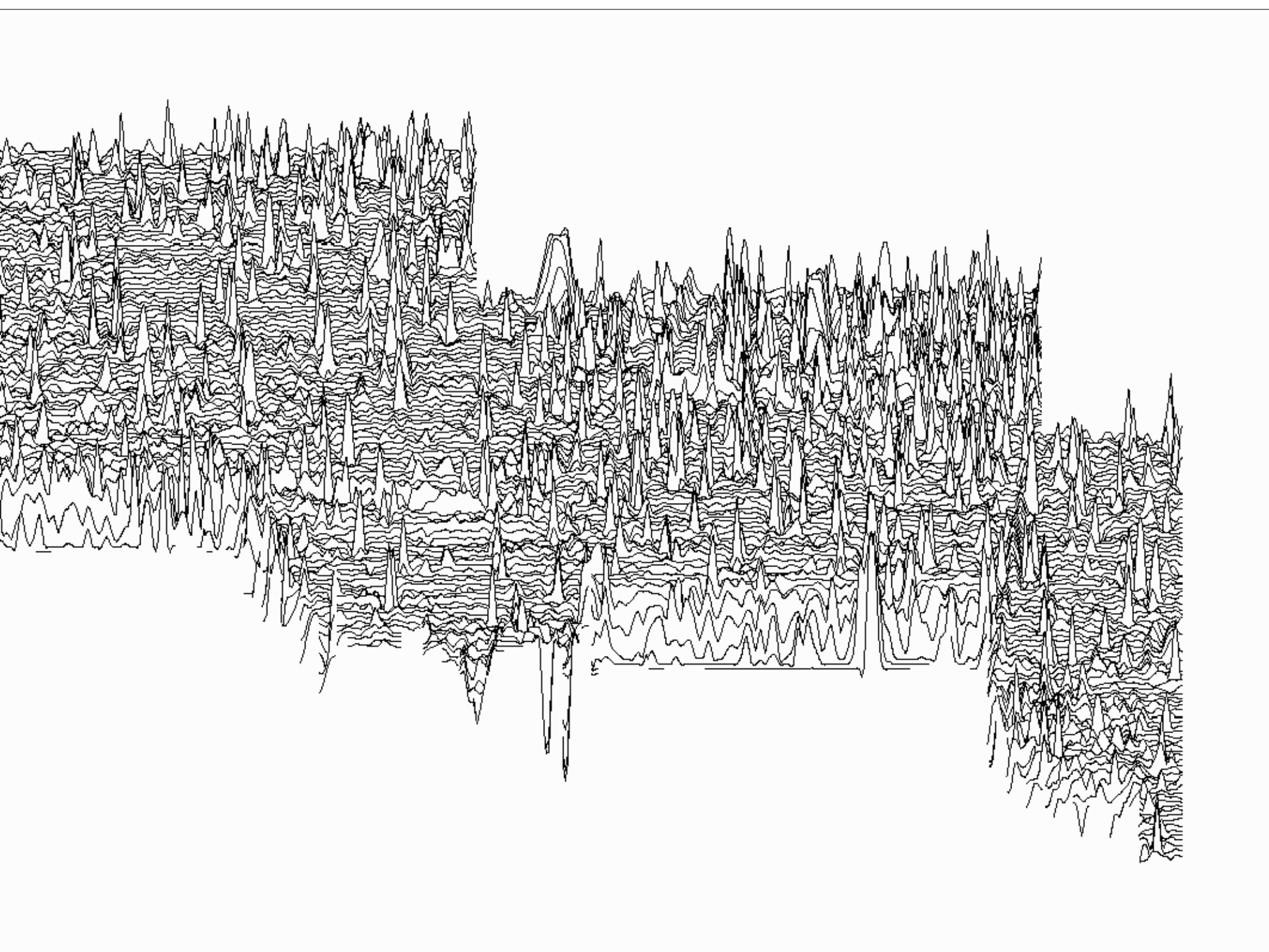
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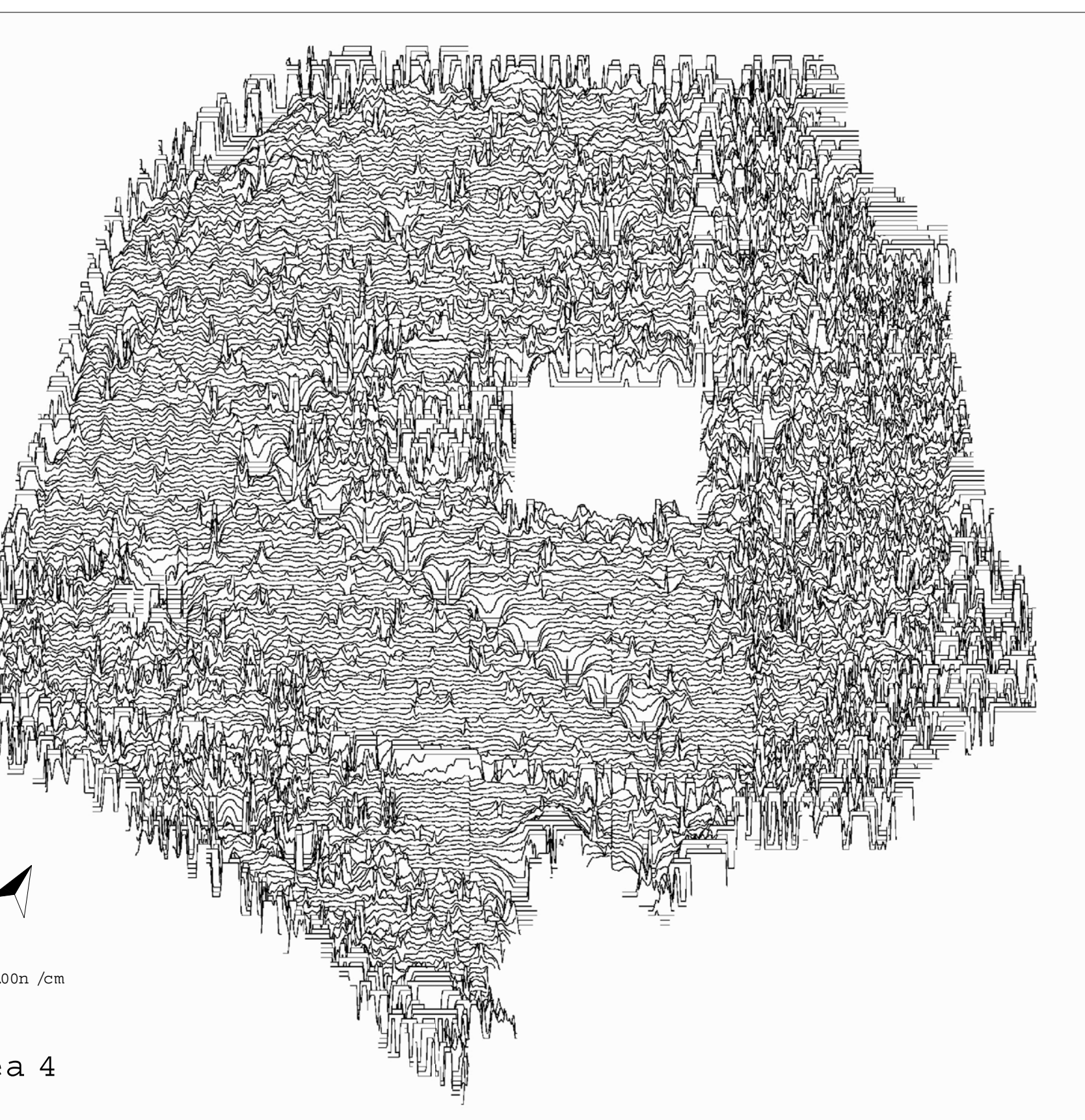
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Figure 6: Areas 2-4 archaeological  
interpretation





142.70m /cm  
Area 3



142.70m /cm  
Area 4