ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
Persimmon Homes North East

Chilton Moor
Fence Houses
Tyne and Wear

geophysical survey

report 3460
June 2014

Durham University

Contents

Figures

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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 Chilton Moor, Fence Houses, Tyne and Wear. The works comprised 3.9ha of geomagnetic survey.

1.2 The works were commissioned by Persimmon Home North East and conducted by Archaeological Services Durham University.

Results

1.3 The remains of the Rainton Waggonway and the later railway, with adjacent coal depot and terraced buildings, were detected in the central part of the survey area.

1.4 Two anomalies which might reflect land boundaries, ditches or drains were detected in the west of the survey area.

1.5 The ferrous and fired materials which have been detected across the north-east of the survey area may reflect made-ground.

1.6 Former ploughing was recorded in the west of the area.

1.7 A service was detected in the north-east of the survey area.

2. Project background

Location (Figure 1)

2.1 The survey area was located at Chilton Moor, Fence Houses, Tyne and Wear (NGR centre: NZ 3240 4922). A survey measuring 3.9ha was conducted. The survey area is roughly triangular in plan and is bounded to the west and north by housing estates. To the east is the B1284 and agricultural land. To the south is a nature reserve, with the Rainton Bridge Industrial Estate to the south-east.

Development proposal

2.2 The proposal is for a residential development.

Objective

2.3 The principal aim of the survey 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

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

Dates

2.5 Fieldwork was undertaken on 11th June 2014. This report was prepared for June 2014.

Personnel

2.6 Fieldwork was conducted by Richie Villis (supervisor) and Patricia Voke. The geophysical data were processed by Patricia Voke. This report was prepared by Patricia Voke, with illustrations by David Graham, and edited by Duncan Hale, the Project Manager.

Archive/OASIS

2.7 The site code is **SCM14**, for **S**underland **C**hilton **M**oor 20**14**. The survey archive will be supplied on CD to Persimmon Homes North East for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (**OASIS**). The OASIS ID number for this project is **archaeol3-181396**.

3. Historical and archaeological background

3.1 A desk-based assessment was undertaken by Archaeological Services in 2013. The following historical and archaeological background is taken from the summary of this report. A more detailed account is given in (Archaeological Services 2013, 3-8).

Previous archaeological works

3.2 No previous archaeological works have been identified in the proposed development area. However, there have been four schemes of archaeological work identified within a 1km radius of the survey area. Approximately 450m to the south-east of the proposed development boundary, on the present Rainton Bridge

Industrial Estate, three phases of archaeological works were undertaken. Initially a desk-based assessment and geophysical survey identified the potential of the site to contain colliery and waggonway remains dating to the 18th century. A subsequent trial trenching evaluation recorded extensive remains, which were further investigated through excavation.

3.3 A cultural heritage assessment was undertaken in 2006 for the construction of a single two-lane carriage way to link the A182 Washington Highway and the B1284 west of Rainton Bridge. The assessment identified sites of archaeological potential in the wider area including the site of the Annabella Pit, some 350m to the east of the proposed development boundary.

The prehistoric period (up to AD 70)

3.4 There is no direct evidence for prehistoric activity in the proposed development area. There is limited evidence that the surrounding area was exploited in prehistory.

The Roman period (AD 70 to 5th century)

3.5 There is no evidence for Roman activity in the proposed development area.

The medieval period (5th century to 1540)

3.6 There is no direct evidence for medieval activity in the proposed development area. However, medieval records exist for the nearby settlements at Houghton-le-Spring to the east and Rainton to the south.

The post-medieval period (1541 to 1899)

3.7 Approximately 600m to the north-west of the proposed development boundary is an area of ancient woodland (HER 11228) which has been in existence since at least AD 1600. It is over 2ha in size and comprises ancient broadleaved trees.

3.8 The Houghton-le-Spring Parish Registers record coal extraction at the 'Renton Pitts' in 1614. Further historical references to mines at Rainton are known in 1683 for leases from the Dean and Chapter of Durham to Sir John Duck.

3.9 A waggonway is recorded in documents dating to 1697-1703, which refer to the wayleaves (consent in writing that allows work on privately-owned land) for a waggonway to the Jane Pit. It is unclear whether the Jane pit was part of the Rainton Colliery or of the Newbottle Colliery.

3.10 In the 1830s several railways were constructed in the wider area. The Londonderry Railway (HER 3180) was opened in 1831 and Durham Junction Railway (later the North Eastern Railway) (HER 2625) was opened in 1833/4.

The modern period (1900 to present)

3.11 The 1920 Ordnance Survey (OS) map shows little change within the proposed development boundary (see Figure 5). The remaining coal pits across the study area are now disused and the railway line to the west of the proposed development area is now a road.

3.12 Aerial photography of the 1940s clearly depicts the line of the waggonway extending through the proposed development area and continuing in the fields to the south-east.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised a single field of rough pasture with the Red Burn extending along the field's southern edge. It was not possible to collect data in the south and the north-west of the survey area due to deep standing water. There were several small areas throughout the site where it was not possible to collect data due to dense vegetation.

4.2 The area was predominantly level with a gradual upwards slope from south to north. The elevation rose from 45m OD in the southern part of the field adjacent to the Red Burn to 49m OD in the north-western corner of the field.

4.3 The underlying solid geology of the area comprises Permian Middle Coal Measures with mudstone, sandstone and siltstone, which are overlain by Devensian glaciolacustrine deposits of clays and silts (British Geological Survey 2014).

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 & Digital Antiquity *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2013).

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 previous work, it was considered likely that cut features such as ditches and pits might be present on the site, and that other types of feature such as waggonways, 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 the survey area and related to the Ordnance Survey 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 a continuous tone greyscale image and a trace plot of the raw (minimally processed) data. The greyscale image and interpretations are presented in Figures 2-5; the trace plot is provided in Figure 6. In the greyscale image, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.9 The following basic processing functions have been applied to the geomagnetic data:

clip	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
zero mean traverse	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
destagger	corrects for displacement of geomagnetic anomalies caused by alternate zig-zag traverses
interpolate	increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.25m x 0.25m intervals

Interpretation: anomaly types

5.10 A colour -coded geophysical interpretation plan is provided. Two types of geomagnetic anomaly have been distinguished in the data:

positive magnetic	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

dipolar magnetic	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

5.11 A colour-coded archaeological interpretation is provided.

5.12 Concentrations of strong dipolar anomalies have been detected in the east of the survey area. Within this area there is a broad linear dipolar anomaly aligned north-west/south-east. This linear corresponds with the Rainton Waggonway and the subsequent railway depicted on 1870s OS editions. Immediately east of the waggonway are further dipolar magnetic anomalies. These almost certainly correspond to a coal depot and terraced buildings, labelled as Corving Row and Overmans Row on historic OS editions.

5.13 To the north-east of the Rainton Waggonway a chain of dipolar magnetic anomalies aligned north-east/south-west has been detected. This almost certainly reflects a service. Surrounding the service is an area of further dipolar anomalies. These anomalies almost certainly reflect ferrous or fired materials, such as colliery waste, for example.

5.14 In the west of the survey area two interconnecting linear positive magnetic anomalies have been detected. They are aligned broadly north-south and north-west/south-east, and probably reflect the remains of soil-filled features, such as ditches or drains, perhaps associated with former field boundaries.

5.15 A series of narrow, parallel positive magnetic anomalies has been detected in the west of the area. The anomalies are aligned north-west/south-east and almost certainly reflect former ploughing.

5.16 In the north-west of the survey area discrete areas of dipolar magnetic anomalies have been detected. These probably reflect ferrous and fired materials, possibly associated with the construction of the nearby housing estate to the north. Concrete and metal building debris was noted on the ground surface here during survey.

5.17 Small, discrete dipolar magnetic anomalies have been detected across the survey area. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as colliery waste, horseshoes and brick fragments, and in most cases have little or no archaeological significance. A sample of these is shown on the geophysical interpretation plan, however, they have been omitted from the archaeological interpretation plan. Strong dipolar magnetic anomalies detected along the southern edge of the area reflect the adjacent metal fence.

6. Conclusions

6.1 3.9ha of geomagnetic survey was undertaken at Chilton Moor prior to a proposed housing development.

6.2 The remains of the Rainton Waggonway and the later railway, with adjacent coal depot and terraced buildings, were detected in the central part of the survey area.

6.3 Two anomalies which might reflect land boundaries, ditches or drains were detected in the west of the survey area.

6.4 The ferrous and fired materials which have been detected across the north-east of the survey area may reflect made-ground.

6.5 Former ploughing was recorded in the west of the area.

6.6 A service was detected in the north-east of the survey area.

7. Sources

Archaeological Services 2013 *1-11 Chilton Moor, Fence Houses: archaeological desk-based assessment*. Unpublished report **3181**, Archaeological Services Durham University

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, 2013 *Geophysical Data in Archaeology: A Guide to Good Practice*. Archaeology Data Service & Digital Antiquity, Oxbow

Websites

British Geological Survey 2013 - http://mapapps.bgs.ac.uk/geologyofbritain/home.html

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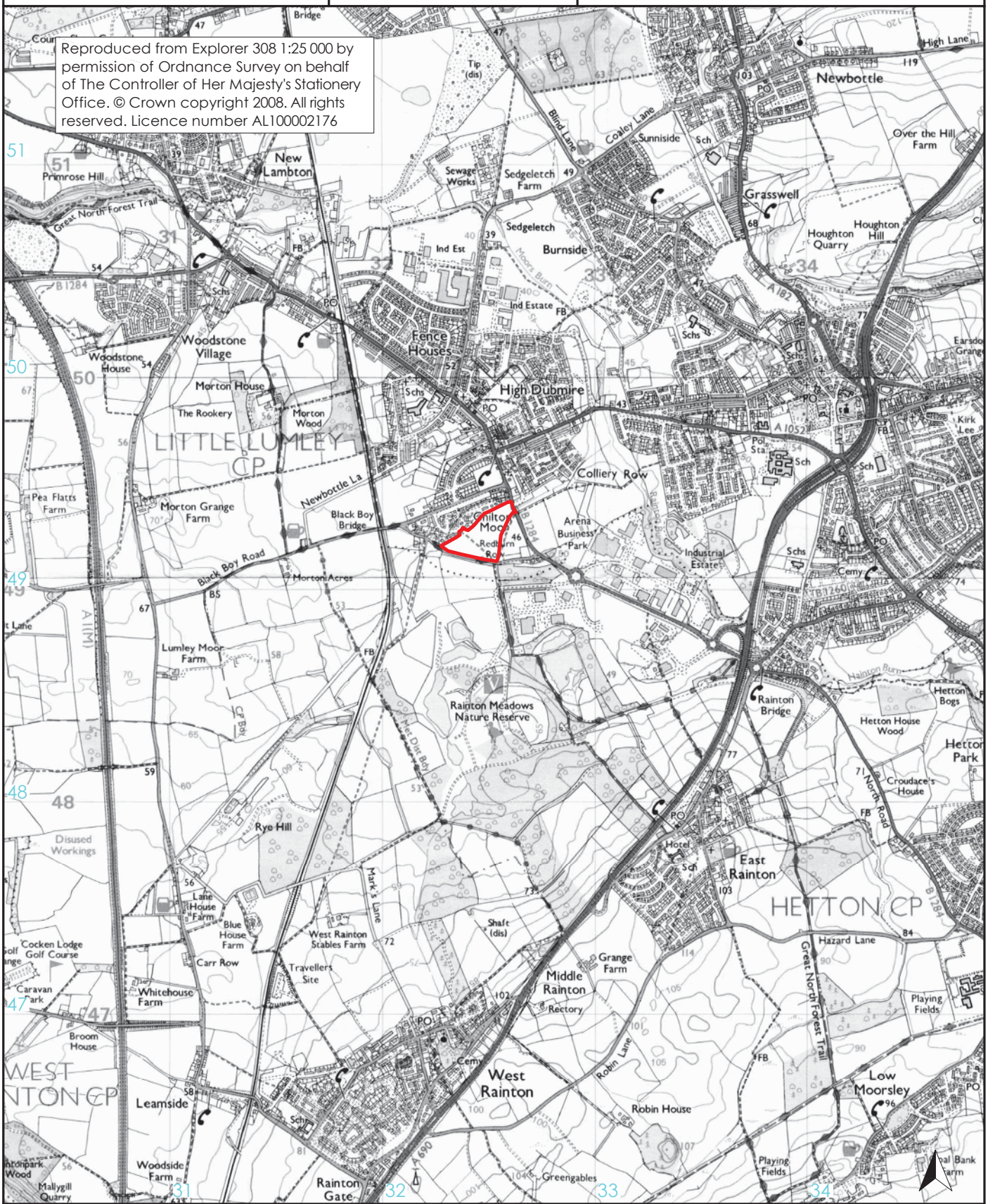
Figure 1: Site location



proposed development area

0 1km
scale 1:25 000 for A4 plot

494

493

492

323

324

325

326

Ryton House

Brinkburn

48.5m

Play Area

Flooded Area

ATHERTON DRIVE

Yarmouth

Flooded

47.8m

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Figure 2: Geophysical survey overview

0 50m
scale 1:1250 for A3 plot

magnetic survey

-5 nT 5

site boundary

494

493

492

491

323

324

325

326

327

site boundary

magnetic survey

-5 nT 5

0 50m

scale 1:1000 for A2 plot

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Figure 3: Geophysical survey

494

493

492

491

323

324

325

326

327

site boundary

magnetic survey

dipolar magnetic anomaly

positive magnetic anomaly

negative magnetic anomaly

0 50m

scale 1:1000 for A2 plot

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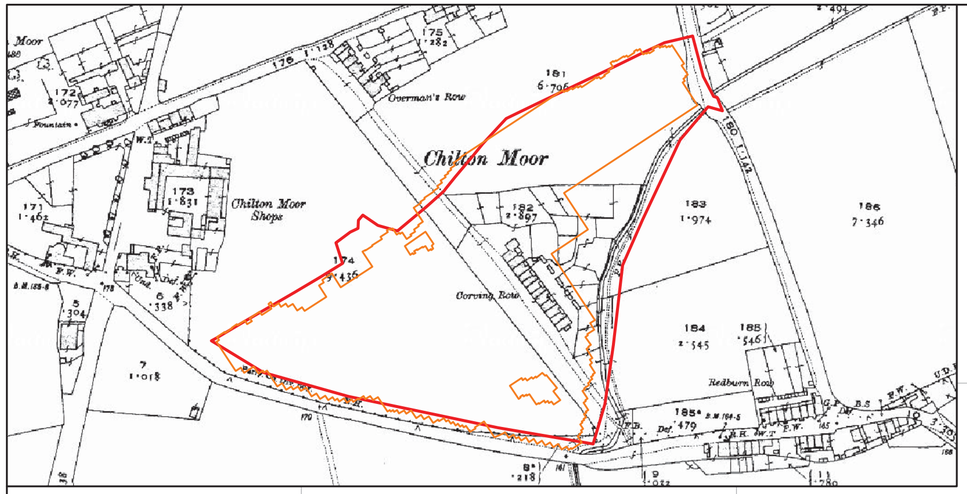
Figure 4: Geophysical interpretation



493

492

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327

site boundary

magnetic survey

soil-filled feature

disturbed area (possible building debris)

service pipes

former plough

waggonway

0 50m

scale 1:1000 for A2 plot

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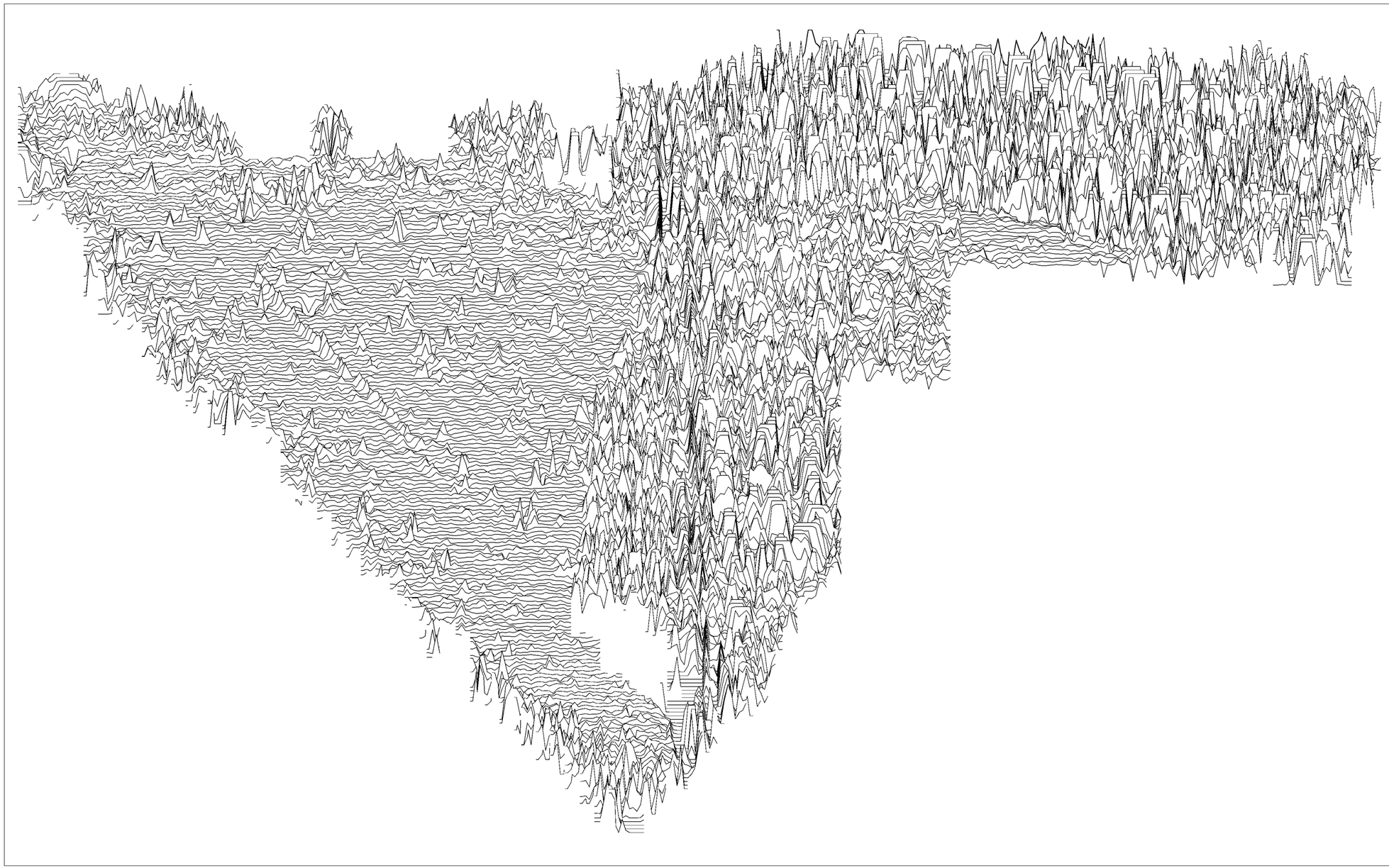
Figure 5: Archaeological interpretation and inset of Ordnance Survey map of 1920

36.80nT/cm



0 50m
scale 1:1000 for A2 plot

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Figure 6: Trace plot of geomagnetic data