ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
Professor Dawn Hadley
University of Sheffield

Sheffield Manor Lodge
Sheffield
South Yorkshire

geophysical surveys

report 2685
July 2011

Durham University

Contents

Figures

South Road · Durham · DH1 3LE · tel 0191 334 1121 · fax 0191 334 1126
archaeological.services@durham.ac.uk · www.dur.ac.uk/archaeological.services

1. Summary

The project

1.1 This report presents the results of geophysical surveys conducted as part of a continued scheme of investigation at Sheffield Manor Lodge (Scheduled Monument No: SY360), Sheffield, South Yorkshire. The works comprised one hectare of both geomagnetic and earth electrical resistance survey.

1.2 The works were commissioned by Professor Dawn Hadley of the University of Sheffield and conducted by Archaeological Services Durham University.

Results

1.3 Structural remains of features identified during excavations in the 1970s were detected in the south-east corner of the survey.

1.4 The former paved road surface, leading from the Turret House in the west to the gatehouse in the east, has been identified.

1.5 Structural remains and other features relating to 18th-century farm buildings were detected around the Turret House in the west of the outer courtyard.

1.6 Former field boundaries and a possible farm track identified by Fairbank's survey of 1781, and a previously excavated 18th-century farm building, were also identified.

1.7 Possible former agricultural cultivation has been detected.

1.8 A modern service has been detected.

2. Project background

Location (Figure 1)

2.1 The survey area was located in the outer courtyard of Sheffield Manor Lodge (Scheduled Monument No. SY360), Sheffield, South Yorkshire (NGR centre: SK 3751 8648). The outer courtyard lies to the west of the former Tudor hunting lodge's main gate and long gallery. The Turret House stands in the west of the survey area.

2.2 The survey area was bounded on the north and west by stone walls; by a stone wall and metal railings to the south; and by the wall of the long gallery to the east. Housing on Southend Road bounded the west and north-west of the survey area; to the south was Manor Lane; and to the east beyond Manor House was open parkland.

Proposal

2.3 The surveys were carried out as part of ongoing schemes of works and archaeological investigations for enhancing the preservation of the Scheduled Monument. Fieldwork at Manor Lodge is part of a HEIF-4 (Higher Education Innovation Fund) Knowledge Exchange Project run by the University of Sheffield in partnership with Green Estate Ltd.

Objective

2.4 The principal aim of the surveys was to assess the nature and extent of previously recorded archaeological features within the outer courtyard area in order to: 1. aid in the location of the 2011 season excavation trench; 2. to enhance understanding of the supposed later medieval structure in the south-east corner of the inner courtyard; 3. to provide information of sub-surface archaeological features for any future development plans; and 4. inform general maintenance of the outer courtyard area.

Methods statement

2.5 The surveys have been undertaken in accordance with a methods statement provided by Archaeological Services Durham University (ref. DS11.141) as part of a Written Scheme of Investigation (WSI) and Scheduled Monument Consent Application for the wider scheme of works written by Professor Dawn Hadley of the University of Sheffield. Since the survey area encompassed part of a Scheduled Monument the surveys were undertaken in accordance with a licence granted by English Heritage under Section 42 of the Ancient Monuments and Areas Act 1979 (as amended by the National Heritage Act 1983).

Dates

2.6 Fieldwork was undertaken on the 1st and 2nd June 2011. This report was prepared for 22nd July 2011.

Personnel

2.7 Fieldwork was conducted by Paul Murtagh and Richie Villis (Supervisor). The geophysical data were processed by Richie Villis. This report was prepared by Richie Villis, with illustrations by Janine Watson, and edited by Duncan Hale, the Project Manager.

Archive/OASIS

2.8 The site code is **SMP11**, for **S**heffield **M**anor **P**ark 20**11**. 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 **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (**OASIS**). The OASIS ID number for this project is **archaeol3-102726**.

Acknowledgements

2.9 Archaeological Services Durham University is grateful for the assistance of personnel of Green Estate Ltd in facilitating this scheme of works.

3. Historical and archaeological background

3.1 Sheffield Manor Lodge is a medieval and 16th-century Hunting Lodge. The site is currently listed by English Heritage as a Scheduled Monument (SM No. SY360). Archaeological surveys and excavations have been conducted at the site from 1968 to the present. The University of Sheffield's current HEIF-4 Knowledge Exchange Project, of which this geophysical survey is a part, currently runs a field school at the Lodge. The following information is a summary taken from their website 'Archaeology @ Manor Lodge' (http://manor-lodge.dept.sheffield.ac.uk/) and from excavations conducted in 2007 (McCoy 2007, 7-8).

3.2 There is little evidence for prehistoric or Roman activity in the vicinity, apart from some unstratified Mesolithic flints and a few sherds of Roman pottery recovered during excavations between 1968 and 1974. There is also little or no evidence of early medieval activity in the area.

3.3 Thirteenth and 14th-century documents refer to the site being within a medieval hunting park. Excavations at the Scheduled Monument between 1968 and 1980 provided evidence for the remains of a possible medieval hunting lodge. The first documentary evidence for a lodge in the park dates to 1479-1480, although excavated evidence suggests the remains of the hunting lodge date to the 12th or 13th century. The excavator suggested that this lodge was similar in size to the royal hunting lodge of Clarendon Palace, in Wiltshire, although less grand. These investigations identified a total of ten buildings pre-dating 1708, six pre-dating a visit by Wolsey in 1529, and five as standing ruins above ground.

3.4 Manor Lodge's heyday probably dates to the 16th century, with building work possibly being started by the fourth Earl of Shrewsbury (1516-1520), coinciding with the rising status of the Talbot family under Henry VIII. Most of the building work had been completed by 1530, probably including the long gallery and the tower. When Wolsey visited Sheffield in 1530 he stayed at the Manor Lodge rather than the castle, suggesting that the lodge had become the Talbot's principal residence in Sheffield.

3.5 The Turret House was probably constructed around 1574, and is the only complete surviving 16th century building at the site. Between 1570 and 1584 Mary Queen of Scots was in the custody of George Talbot, sixth Earl of Shrewsbury, and she spent part of her captivity at Manor Lodge, possibly in the Turret House.

3.6 The Lodge passed to the Dukes of Norfolk and fell into disrepair; a parliamentary order for demolition was granted in 1708. A year later the majority of the Lodge had

been demolished. As Sheffield developed Manor Lodge took on an industrial character. In 1715 a potter constructed a kiln and workshops in Wolsey's Tower. Later in the 18th century the Turret House was extended and became a farmhouse with attached barns. Coal mining started at the Manor site in the latter part of the 18th century and continued throughout the 19th century. In 1840 a 142m shaft was sunk behind Wolsey's Tower as part of the opening of Manor Castle Colliery. By the middle of the 19th century Manor Lodge was occupied by farmer's cottages, poor housing and the Norfolk Arms public house, which was actually built into the ruins in the east. Manor Lodge Village housed an early mining community and included a row of shops, a Methodist Chapel and a school. This activity went into decline and eventually disappeared in the late 19th and early 20th century.

4. Landuse, topography and geology

4.1 At the time of survey the area comprised one field of grass. Parts of the field had been left unmown. The Turret House stood in the west of the area with a *c*. 12m x 6m paved area in front of it to the east. A gravel track led from the paved area to a gate in the wall on the south of the area. Flower beds had recently been planted around the southern and western edges of the area. The ground rose steeply up to the road along the south edge and up to the gravel track. The previously excavated gatehouse, with a set of metal steps leading down from the higher ground of the inner courtyard to the east, and the wall of the long gallery occupied the east edge of the survey area. A restored horse-drawn plough stood in the centre of the survey area. Two new telegraph poles stood in the south-west corner of the area, with a recently dug and back-filled service trench running from these to the Turret House. Concrete and stone inspection covers were noted in the south-east and north-east corners. A metal inspection cover was noted just to the north of the Turret House. A stockpile of architectural fragments stood in the north-west. A number of stones, open culverts and other features were noted to the north of the Turret House. A number of established trees and recently planted saplings stood in the west of the area.

4.2 Other than the steep rise to the road at the south edge and along the south-east edge of the gravel track, the area was predominantly level with a mean elevation of between 155-160m OD.

4.3 The underlying solid geology of the area comprises Carboniferous mudstone, sandstone and siltstone of the Pennine Lower Coal Measures (Lower Westphalian A + B, mainly "Productive Coal Measures").

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) *Draft Standard and Guidance for archaeological geophysical survey* (2010); 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* (draft 2nd edition, Schmidt & Ernenwein 2010).

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 known that cut features such as ditches and pits might be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) would 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.

5.5 Given the likely presence of wall-footings, floors and tracks an electrical resistance survey was also considered appropriate. Earth electrical resistance survey can be particularly useful for mapping stone and brick features. When a small electrical current is injected through the earth it encounters resistance which can be measured. Since resistance is linked to moisture content and porosity, stone and brick features will give relatively high resistance values while soil-filled features, which typically retain more moisture, will provide relatively low resistance values.

Field methods

5.6 A 20m grid was established across the survey area and tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system with real-time correction.

5.7 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 20m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 1,600 sample measurements per 20m grid unit.

5.8 Measurements of earth electrical resistance were determined using Geoscan RM15D resistance meters and MPX15 multiplexers with a mobile twin probe separation of 0.5m. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was 0.5ohm, the sample interval was 1m and the traverse interval was 1m, thus providing 400 sample measurements per 20m grid unit.

5.9 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

5.10 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 3-5; the trace plots are provided in Figure 6. In the greyscale images, positive magnetic and high resistance anomalies are displayed as dark grey, while negative magnetic and low resistance anomalies are displayed as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla for the geomagnetic data and ohm for the electrical resistance data.

5.11 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
despike	locates and suppresses iron spikes in gradiometer data
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

5.12 The following basic processing functions have been applied to the resistance data:

clip	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
add	adds or subtracts a positive or negative constant value to defined blocks of data; used to reduce discontinuity at grid edges
despike	locates and suppresses spikes in data due to poor contact resistance
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

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

negative magnetic	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
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

5.14 Two types of resistance anomaly have been distinguished in the data:

high resistance	regions of anomalously high resistance, which may reflect foundations, tracks, paths and other concentrations of stone or brick rubble
low resistance	regions of anomalously low resistance, which may be associated with soil-filled features such as pits and ditches

Interpretation: features

5.15 A colour-coded archaeological interpretation plan is provided.

5.16 Many discrete dipolar magnetic anomalies have been detected. The high concentrations of these anomalies around the Turret House in the west of the area are likely to reflect brick rubble or other ground disturbance associated with the 18th-century farm buildings and later structures. Former pottery-making and coal mining in the area may also have contributed to the magnetic 'noise' here.

5.17 High resistance anomalies have been detected to the north of the Turret House. These are likely to reflect the locations of possible building foundations or other structural remains. When compared with the dipolar magnetic anomalies in this area it is highly likely that these anomalies reflect brick-built structural remains. Historic Ordnance Survey maps show structures in this area.

5.18 A number of possible soil-filled features, including both pit and ditch features, have been identified as areas of anomalously low resistance. These have not been detected in the magnetic data.

5.19 Two broadly parallel, north-east/south-west aligned, high resistance anomalies have been detected. These correspond to a broad band of dipolar magnetic anomalies. These anomalies almost certainly relate to former field boundaries, as shown on historic OS maps. These two anomalies are roughly 5m apart and may respect the course of an older farm track as recorded by Fairbank's survey in 1781. These anomalies turn to the south-west in the south part of the survey.

5.20 To the east of these former boundaries in the north part of the survey area a region of high electrical resistance has been detected. This broadly corresponds to a concentration of dipolar magnetic anomalies. This reflects the location of an 18th-

century farm building as recorded in Area C of the 1972 excavation season. The straight-sided area of very low electrical resistance associated with this feature almost certainly reflects part of the backfilled trenches from the 1970s.

5.21 Two almost square, high resistance anomalies have been detected to the east of this structure, which may reflect other structural remains or building rubble. Although they are anomalously high in relation to the background resistance values, they are not as strong as other structural anomalies.

5.22 Series of parallel high and low resistance anomalies have been detected to the east of the former farm structure. These may reflect a former agricultural practice, such as ridge and furrow cultivation.

5.23 A roughly rectangular, 6m x 3m area of high electrical resistance has been detected in the centre of the east edge of the survey, *c*. 5m north of the gatehouse. This may reflect structural remains or building rubble, although whether it is related to the hunting lodge or later structures is unknown.

5.24 A broadly east/west aligned high resistance anomaly and corresponding band of dipolar magnetic anomalies have been detected. These run from the south of the Turret House to the excavated gatehouse in the east and almost certainly reflect the former paved road surface which was excavated in 1969 and 1972. Regions of 'normal' background resistance there may reflect those parts of the former paved surface which have been excavated or otherwise removed.

5.25 The backfilled 1970s excavation trenches have been detected as a low resistance feature in the south-west corner of the survey area. Excavation in this area identified a brick structure, interpreted as an earlier phase of the hunting lodge. High resistance anomalies in this area reflect unexcavated structural remains, such as wall footings, floors, building rubble or pad stones.

5.26 A high resistance anomaly, *c*. 9m x 6m, has been detected just to the north-west of the 1970s trenches. This almost certainly reflects structural remains, which may be related to the building identified during the previous excavations.

5.27 A north/south aligned negative magnetic and low resistance anomaly has been detected in the east of the area. This almost certainly reflects a modern service trench.

6. Conclusions

6.1 Approximately one hectare of geomagnetic and earth electrical resistance survey was undertaken at Sheffield Manor Lodge (Scheduled Monument No: SY360), Sheffield, South Yorkshire, as part of an ongoing scheme of investigation by the University of Sheffield in partnership with Green Estate Ltd.

6.2 Structural remains of features identified during excavations in the 1970s were detected in the south-east corner of the survey.

6.3 The former paved road surface leading from the Turret House in the west to the gatehouse in the east has been identified.

6.4 Structural remains and other features relating to 18th-century farm buildings were detected around the Turret House in the west of the outer courtyard.

6.5 Former field boundaries and a possible farm track identified by Fairbank's survey of 1781, and a previously excavated 18th-century farm building, were also identified.

6.6 Possible former agricultural cultivation has been detected.

6.7 A modern service has been detected.

7. Sources

Archaeology @ Manor Lodge http://manor-lodge.dept.sheffield.ac.uk/ Accessed: 07 June 2011

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

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McCoy, M, 2007 *Assessment Report on Archaeological Evaluation at Manor Lodge, Manor Lane, Sheffield, South Yorkshire*. Unpublished report **1107.3**, ARCUS

Schmidt, A, & Ernenwein, E, 2010 (draft) *Guide to Good Practice: Geophysical Data in Archaeology*. Archaeology Data Service

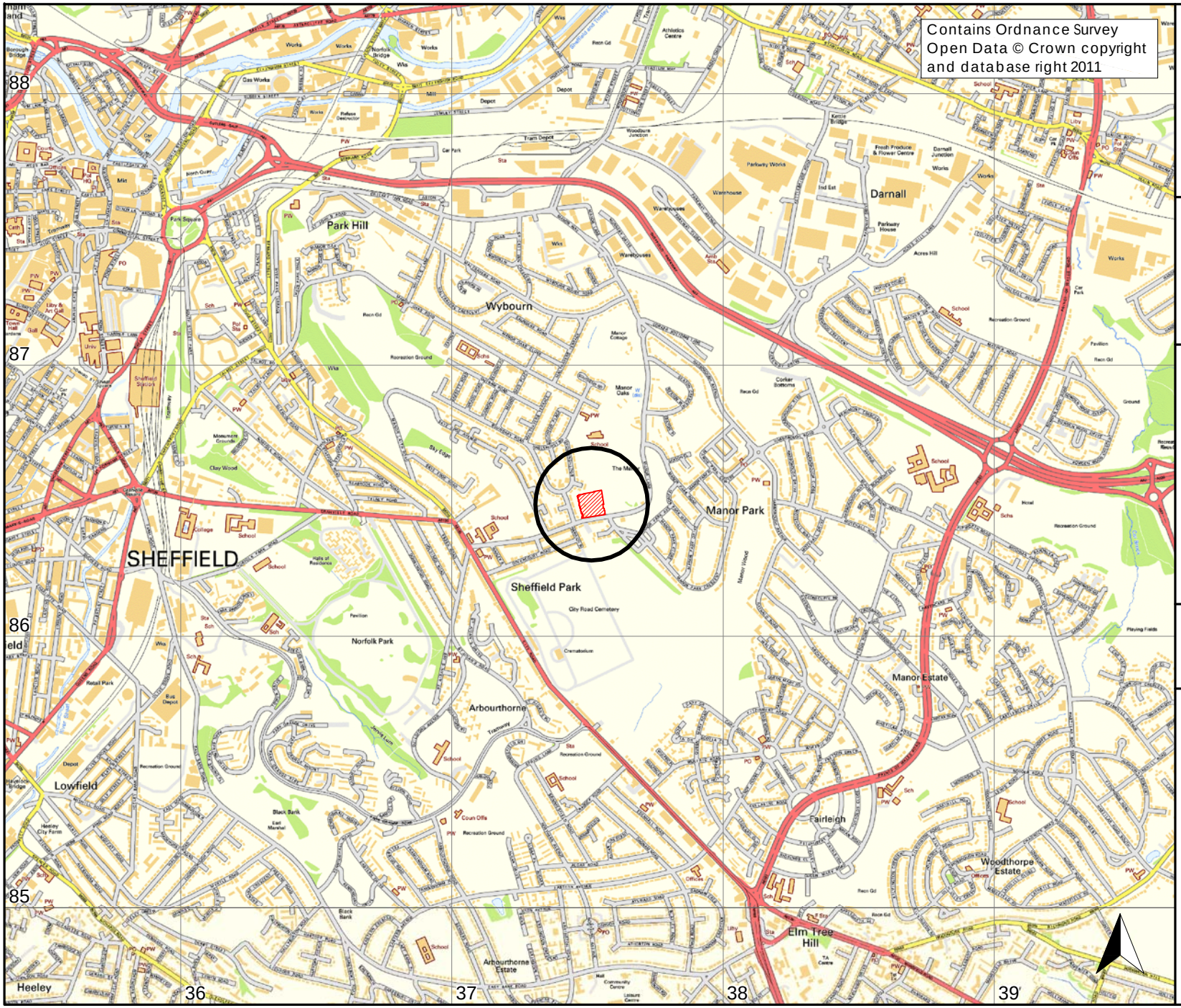

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Figure 1: Site location

0 1km
scale 1:20 000 for A4 plot

survey area

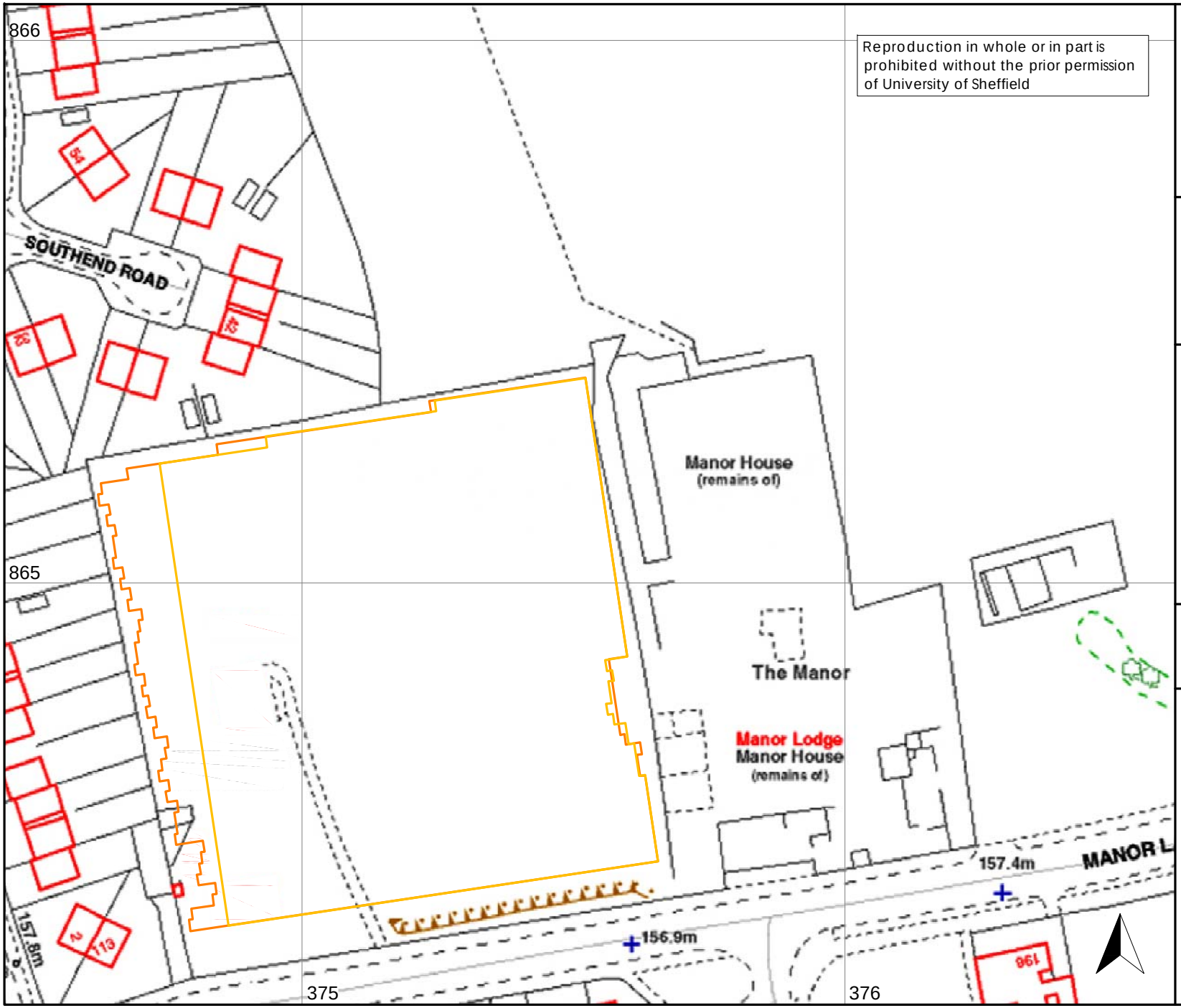

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Figure 2: Study area

0 50m
scale 1:1000 for A4 plot

magnetic survey

resistance survey

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magnetic survey
-15 nT 15

resistance survey
20 ohm 150

0 30m
scale 1:600 for A3 plot

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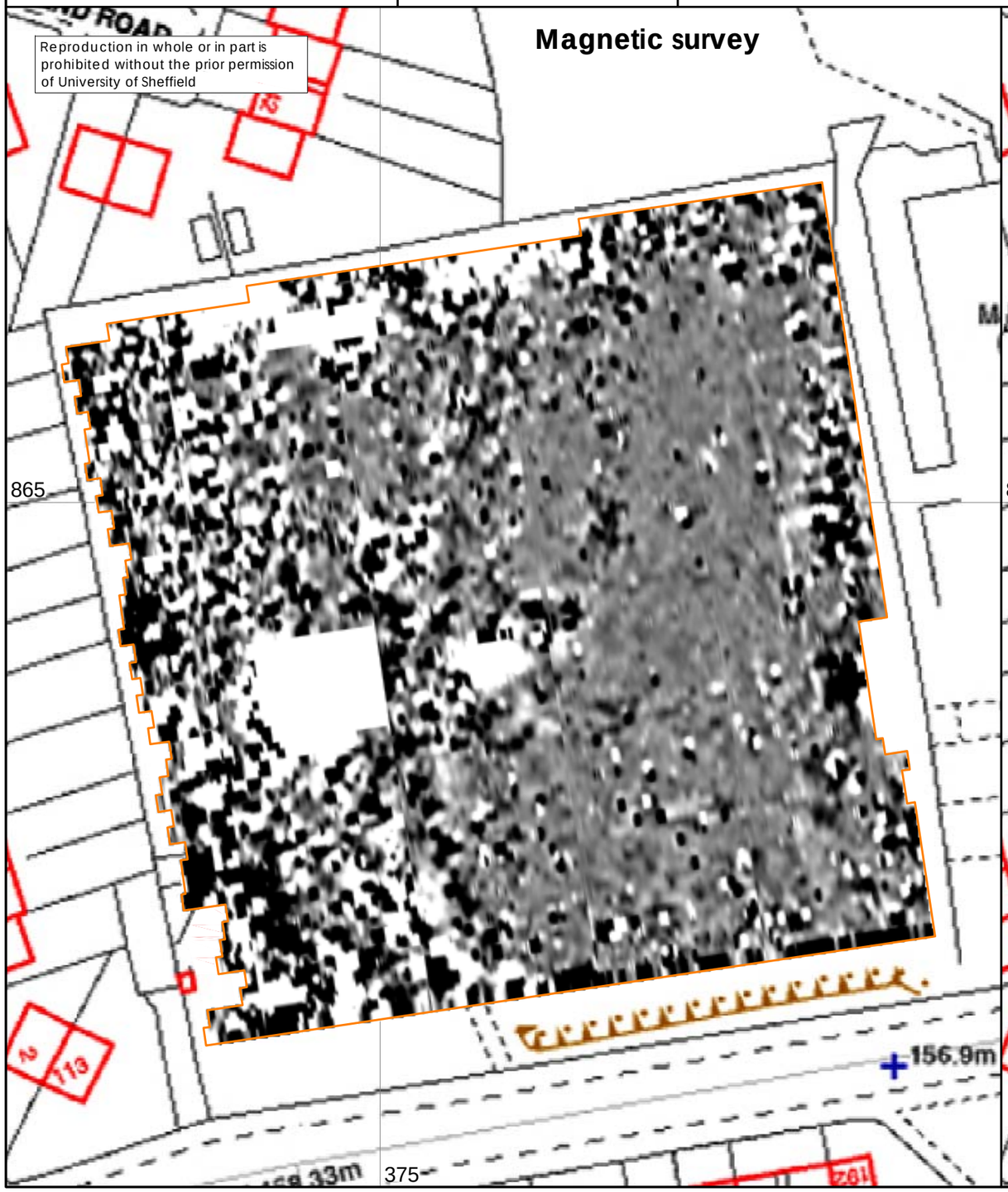
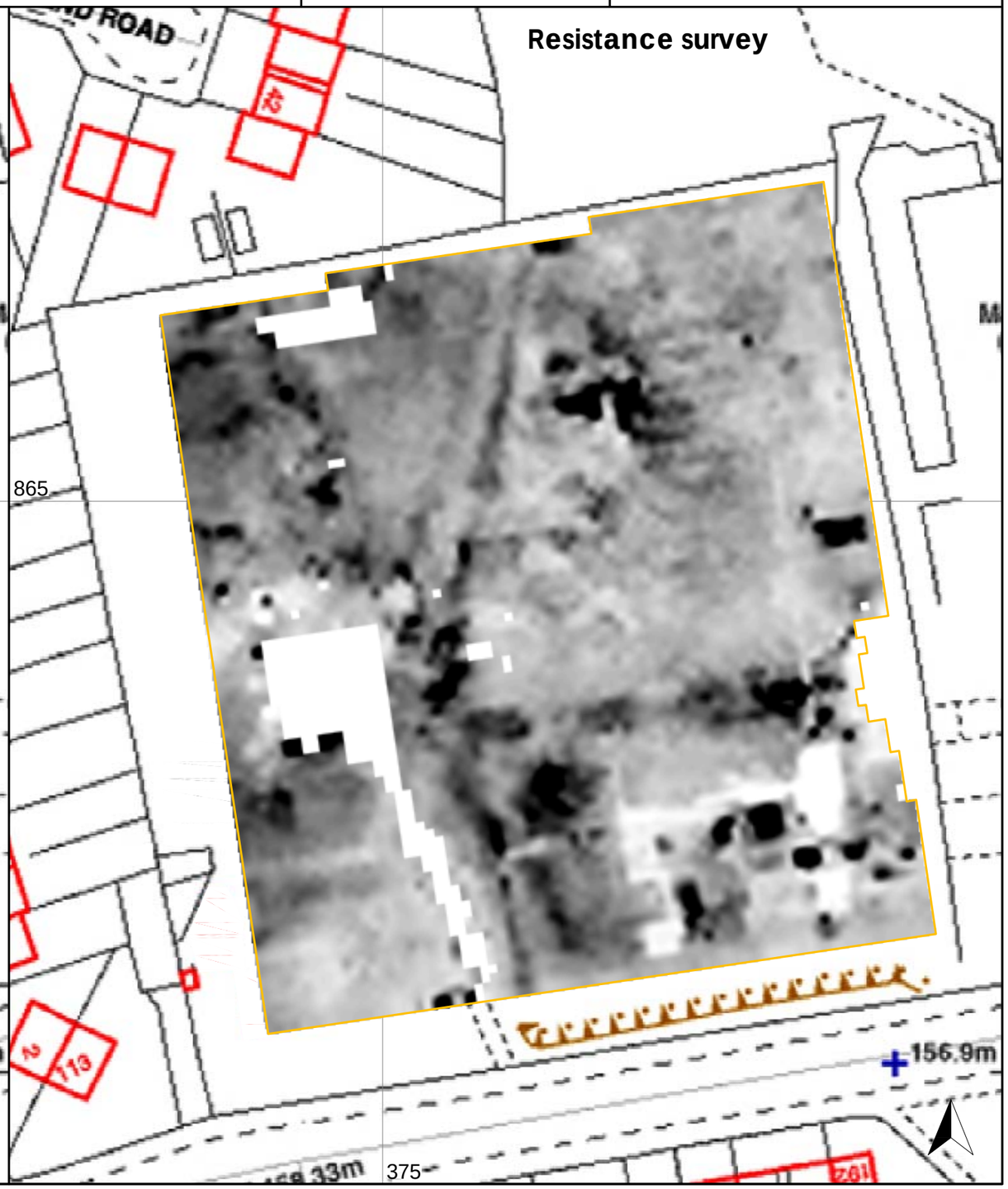
Figure 3: Geophysical surveys

Magnetic survey



Resistance survey



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dipolar magnetic anomaly

negative magnetic anomaly

high resistance anomaly

low resistance anomaly

0 30m
scale 1:600 for A3 plot

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Figure 4: Geophysical interpretations

Magnetic survey

Resistance survey

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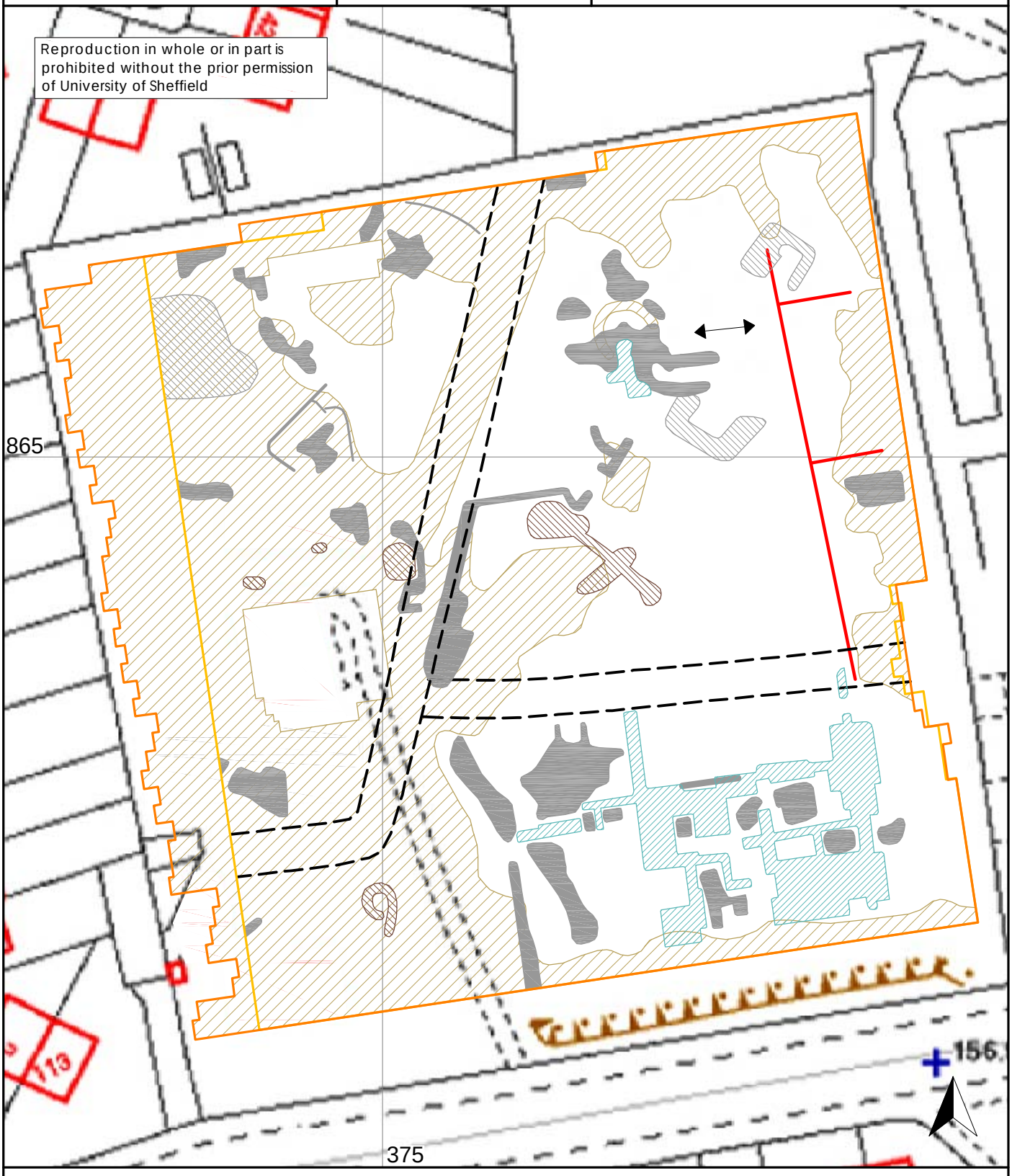
Figure 5: Archaeological interpretation



possible soil-filled feature

probable structural remains and building rubble

1970s excavation trenches

ferrous/fired materials

service trench

probable ridge and furrow

track

0 30m

scale 1:600 for A4 plot

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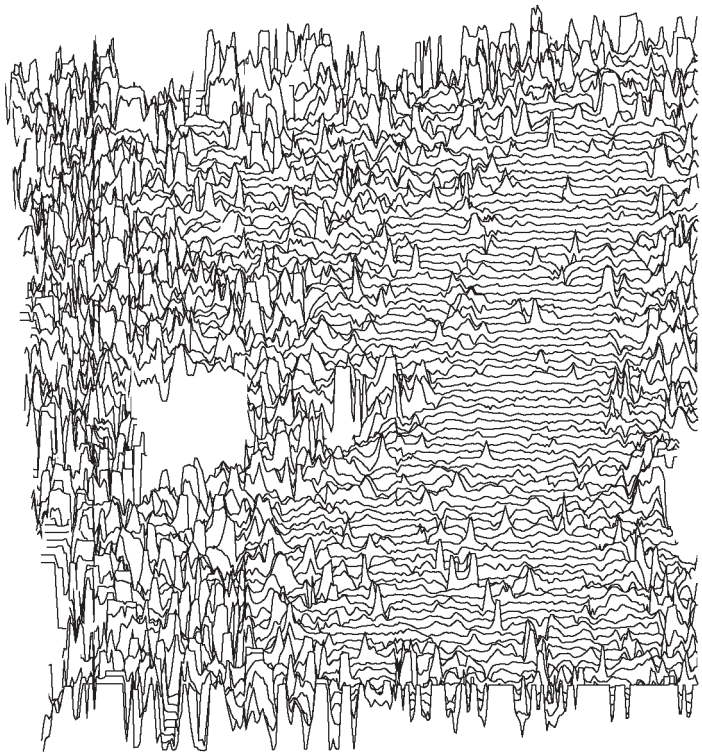
Figure 6:
Trace plots of geophysical data

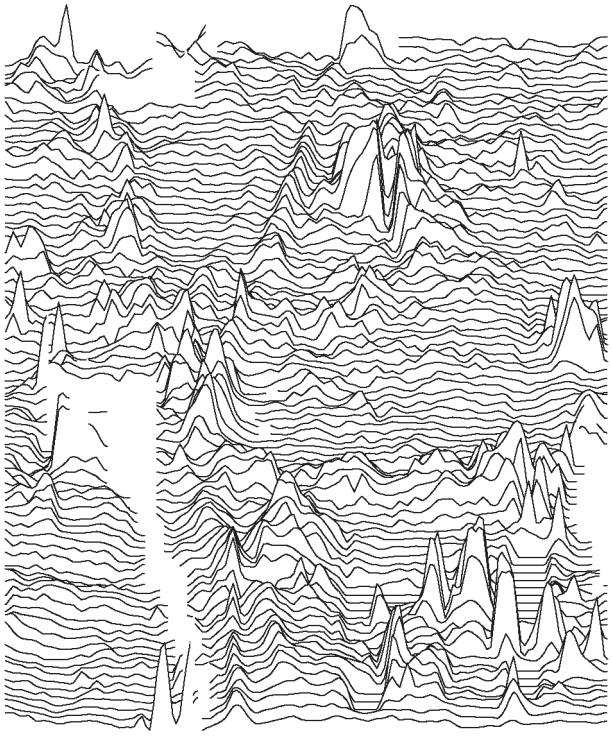


Magnetic data

114.90nT/cm

0 50m

scale 1:1000



Resistance data

185.20ohm/cm

0 50m

scale 1:1000