HICKLING LANE,
LONG CLAWSON
LEICESTERSHIRE

Report on geophysical survey conducted in May 2016

Prepared by P. Johnson

June 2016

TPA Project Code – LHI1

TPA Report No. 053/2016

Trent & Peak Archaeology ©
Unit 1, Holly Lane
Chilwell
Nottingham
NG9 4AB
0115 8967400 (Tel.)
0115 925 9464 (Fax.)

Prepared by	Paul Johnson, Project Manager
Date	10th June 2016
Checked by	Ed Taylor, TPA – Project Manager
Signed	
Date	13th June 2016
Approved by	Howard Jones, TPA – Regional Director
Signed	
Date	14th June 2016
Report Number	053/2016
Status	DRAFT Report

Disclaimer

This Report has been prepared solely for the person/party which commissioned it and for the specifically titled project or named part thereof referred to in the Report. The Report should not be relied upon or used for any other project by the commissioning person/party without first obtaining independent verification as to its suitability for such other project, and obtaining the prior written approval of York Archaeological Trust for Excavation and Research Limited ("YAT") (trading as Trent & Peak Archaeology) YAT accepts no responsibility or liability for the consequences of this Report being relied upon or used for any purpose other than the purpose for which it was specifically commissioned. Nobody is entitled to rely upon this Report other than the person/party which commissioned it. YAT accepts no responsibility or liability for any use of or reliance upon this Report by anybody other than the commissioning person/party.

SUMMARY

- Trent & Peak Archaeology was commissioned by the Hazleton Group, to conduct a geophysical survey on land off Hickling Lane, Long Clawson, Leicestershire, centred on NGR SK 71742 26974 at a height of c. 75m OD (Fig. 1).

- The work was carried out between the 3rd and 4th May in accordance with standard, accepted practices for archaeological geophysical surveys (EH 2008).

- The site is situated on deposits of Brandon Sandstone Formation and Charmouth Mudstone Formation, with no superficial deposits recorded.

- The site was composed of a single area immediately to the west of Hickling Lane, Long Clawson, Leicestershire.

- Ground conditions for the survey were generally satisfactory. The land had been in use as pasture prior to the survey.

- Geophysical survey demonstrated the presence of potential buried archaeological features, these comprised:

    - Probable archaeological features relating to field-boundaries [5], [11], & [16]; [14], [15], [25], & [39]; [2].
    - Probable remains of ridge and furrow cultivation [1], [3]. [13], [12]; [17], [19], & [20]; [24], [23]; [26], [27], & [28]; [32]. [31], & [30]; [33], [34], & [35]; [37], [38], & [39]; [40], & [41]; [47], [42], [43], & [44]; [48].
    - Possible evidence for an enclosure [7], [8], & [10].

Report on the geophysical survey of land off Hickling Lane, Long Clawson, Leicestershire. NGR SK 71742 26974

CONTENTS

LIST OF FIGURES

ACKNOWLEDGEMENTS

The Project Manager for the work undertaken was Paul Johnson. The Project advisor was Lee Elliott. The Project Team comprised Tom Hooley, and Annica Wika.

1. INTRODUCTION

1.1. Trent & Peak Archaeology was commissioned by the Hazleton Group, to conduct a geophysical survey on land off Hickling Lane, Long Clawson, Leicestershire, centred on NGR 71742 26974 at a height of c. 75m OD (Fig. 1).

1.2. The fieldwork was conducted in May of 2016 on an approximately 1 hectare area of land to the west of Hickling Lane, Long Clawson, Leicestershire.

1.3. The site is located on deposits of Brandon Sandstone Bed and Charmouth Mudstone Formation; Sedimentary Bedrock formed approximately 190–197, and 183–197 million years ago, respectively, in the Jurassic and Triassic periods. No superficial deposits are recorded overlying the bedrock (British Geological Survey).

1.4. Topographically the site lays immediately to the west of Hickling Lane, and immediately to the south of Broughton Road as they meet to the northeast of the site. The site is bounded by agricultural fencing and comprised of land currently used for pasture. The site displays little topographical variation.

1.5. The presence of remains of mediaeval ridge & furrow agriculture is indicated within the site of the survey (Hayes 2015: 15).

2. PROJECT BACKGROUND

2.1. Potential Remains

2.1.1. The archaeological potential of the site is considered to be high as a result of its proximity to known heritage assets.

- *Prehistoric*
  No prehistoric features are known within the survey area.
- *Roman*
  No known Roman-period features are recorded within the area of the survey. However, evidence for small-scale activity in the Roman period is recorded at the site of an archaeological Watching Brief c. 800m to the east of the site (Hayes 2015: 13), and a number of PAS finds of Roman date have been noted within 750m of the site (Hayes 2015: 13).

- *Mediaeval*
  Long Clawson is recorded in the Domesday Book, and ridge & furrow agriculture is extant within the site of the survey (Hayes 2015: 14; Fig 7).

- *Post-Mediaeval*
  No known post-mediaeval remains are located within the survey area, although a number of sites are situated in close proximity to the survey area.

2.2. Proposed Fieldwork

2.2.1. In order to evaluate the potential archaeological remains in this area, the following fieldwork investigation was proposed:

- Geophysics – Geomagnetic survey at standard (1m x 0.25m) sampling density across an area totalling c. 1 ha.

3. OBJECTIVES

3.1. In light of the archaeological potential of the site, the Principal Planning Archaeologist for Leicestershire County Council recommended a scheme of archaeological evaluation, by geophysical survey in the first instance, to be carried out.

3.2 The aim of the present work is to provide an evaluation and understanding of any potential archaeological remains through an evaluation by geophysical survey (geomagnetic) to determine the presence and location of any sub-surface remains, in accordance with NPPF para' 128.

3.3. The archaeological work undertaken through this project aims to provide information that will enable the remains to be placed within their local, regional, and national context, and for their significance to be assessed.

3.4. The survey results will be used to inform the planning application/decision and the necessity or otherwise of any further archaeological conditions.

4. METHODOLOGY

4.1. Geophysical Survey: Geomagnetic

4.1.1. The decision to use magnetic gradiometry to survey the site was based on its efficiency as a survey technique suitable for detecting the buried remains of a range of materials based on differences in their magnetic characteristics as compared to the geological background of the area (Gaffney et al. 1991, 6; 2003).

4.1.2. The results of this method are, however, severely restricted in areas of modern disturbance and by the presence of ferrous material (Scollar et al. 1990, 362ff). Because of the presence of metal fencing within the field boundaries, these features were given a wide-berth with an average distance of 3m being allowed to limit their effect on the archaeological data. Although a number of alternative geophysical survey techniques could be applied to the site (Appendix B), magnetometry represented the best compromise between speed and quality of data retrieval for an initial investigation.

4.1.3. The magnetometer survey was undertaken, within the guidelines advocated by English Heritage (David et al. 2008), by a two-person team using a Bartington Instruments Grad 601-2 fluxgate gradiometer. This equipment allowed the survey to be conducted rapidly as the area was relatively free of obstructions. Readings were taken at 0.25m intervals along traverses of 1m spacing walking east. This enabled a sufficiently high density of data for the purposes of archaeological evaluation to be collected across the site in the relatively short time allotted for the survey to be completed.

4.1.4. The geophysical survey grids of 30m by 30m were set out using a Leica GS15 GPS with SmartNet, in the Ordnance Survey National Grid coordinate system. The use of a north-south orientation for the survey grids was employed in the expectation that any surviving remains would be intersected by the survey traverses at an angle of approximately 30°.

4.1.5. The geophysical survey data were processed in Geoplot 3.0 software to remove any environmental disturbances or variations produced in the course of the survey. Firstly data were manipulated to remove any distorting 'spikes' from the survey results. A high-pass filter was then also used to reduce the effect of geological anomalies in the data-set. Low-pass filtering was then used to improve the resolution of larger archaeologically derived anomalies. Finally the data were interpolated to produce uniform data-densities equivalent to 0.25m x 0.25m.

4.1.6. The results were exported as greyscale, raster images and inserted into the AutoCAD plan of the site, generated from Ordnance Survey data, for georeferencing and production of a descriptive, vector overlay. The anomalies presented here were identified visually and manually digitised to produce the vectorised plans which are discussed in the results section of this report. The final print-versions of these plans were elaborated and prepared for printing in Adobe Illustrator CS6.

Ground Conditions

4.1.7. Ground conditions for the survey were satisfactory. The site is used as pasture.

5. RESULTS
(Figures 2-5)

5.1. Geomagnetic Survey
5.1.1. Within the area surveyed, the site exhibited a generally good response to the geomagnetic survey. Geophysical anomalies can be observed across the whole area surveyed, and buried features can be clearly discerned against the geological background. There is some noise in the dataset, particularly to the south and east of the site. The overall magnetic response is good, although spikes within the dataset extend the range of unfiltered values to +/- 100nT the standard deviation of the raw-data typically remained within c. 3 nT of the mean. Any cut features are likely to show against this background as areas of positive magnetism. Positively magnetic anomalies are likely to result from the presence of settlement activity and deposition of thermo-remanent, or depositionally-remanent magnetised material.

5.1.2. The results are presented below as a greyscale image of the processed data (Fig. 2), and a complementary numbered interpretative plan to which the following description relates (Fig. 3). This description is organised broadly from south to north. Unprocessed survey data are also presented below (Fig. 5). These data are unfiltered and hence show striping resulting from slight but consistent imbalances between the two sensors used for the survey.

5.1.3. The survey exhibited a degree of dispersed magnetic disturbance from probable ferrous material in the immediate subsurface.

5.1.4. The western part of the area surveyed was characterised by a largely uniform magnetic background. Within this area a number of geomagnetic anomalies can be discerned. The southern corner of the survey area exhibits a c. 2m-diameter, positively-magnetic macula [1]. Approximately 2.5m to the north of this feature is a c. 31m-long, positively-magnetic, linear anomaly [2], running east-northeast–south-southwest. Approximately 1.5m to the northwest of this feature is an irregular, roughly "T-shaped", 10.5m by 3.5m, positively-magnetic anomaly [3], running north-northwest–south-southeast. Approximately 5m to the east of this feature is a pair of c. 2.5m-diameter dipolar maculae [4]. Approximately 13m to the east of these anomalies, and immediately north of [2], is a distorted and inverted 16.5m by 7.5m, "L-shaped", positively-magnetic anomaly [5], running north-northwest–south-southeast. Immediately adjacent to this feature, running parallel to its east, is a c. 10m-long, irregular, curvilinear, negatively-magnetic anomaly [6]. Approximately 4m to the east of this feature is an irregular "L-shaped", 10.5m by 4m, positively-magnetic anomaly [7], orientated parallel to the previously discussed features [6], [5], and [3]. Immediately to the northwest of this feature is a 4m by 6m, irregular, positively-magnetic anomaly [8].

5.1.5. Approximately 5m to the east of [4], is a pair of c. 2m-diameter, positively-magnetic maculae [9]. These maculae appear to lie c. 3m southeast of, and parallel to, a 14.5m-long, northeast–southwest linear alignment comprising five, 2m-diameter, positively-magnetic maculae [10]. This alignment appears to return at 90°, to run northwest-southeast for c. 19.5m as described by a further six, 2m-diameter, positively-magnetic maculae [11], consistent with the alignment of [5]. Approximately 3.5m to the west of the line described by [11], is a c. 20m-long, linear, positively-magnetic anomaly [12], running northwest–southeast. Approximately 13m to the west of this feature, and running broadly parallel to it, is a c. 29m-long, linear, positively-magnetic anomaly [13]. Approximately 3m to the north of [12] is a c. 5m-diameter, dipolar macula [14]. Immediately to the east of this feature is a c. 3.5m-diameter, positively-magnetic macula [15]. Approximately 3.5m to the east of this feature is a 5.5m by 6m, "T-shaped", positively-magnetic anomaly [16], orientated parallel to [12]. Approximately 5.5m to the northeast of this feature is a pair of c. 3.5m-diameter, positively-magnetic maculae [17], forming an alignment orientated northwest–southeast. Approximately 1m to the east of these anomalies is a pair of c. 2.5m-diameter dipolar maculae [18]. Approximately 2m to the south of these anomalies is a c. 2.5m-diameter,

positively-magnetic macula [19]. Approximately 11m to the southeast of this feature, and possibly describing an alignment formed with [17] and [19], is a squat, c. 6.5m by 2.5m, positively-magnetic anomaly [20], running north-northwest–south-southeast. Approximately 6.5m to the south of this feature is a closely related pair of c. 3m-diameter, positively-magnetic maculae [21], consistent with a possible extension of the alignment described by [10]. Approximately 13m to the southeast of these anomalies is a cluster of dipolar maculae, covering a total area of approximately 50m^2.

5.1.6. Approximately 7m to the north of this cluster of dipolar responses is a c. 3m-diameter, positively-magnetic macula [23]. Approximately 16.5m to the northwest of this feature is a c. 20m-long, linear, positively-magnetic anomaly [24], running broadly parallel to [12] on what appears to be the predominant alignment of features visible within the dataset. Immediately adjacent, parallel to, and to the northeast of [24], is a c. 4m-long, linear, positively-magnetic anomaly [25]. Approximately 12m to the north of this feature, and parallel to it, is a c. 30m-long, linear, positively-magnetic anomaly [26], which intersects the northern edge of the survey area. Approximately 3.5m to the southeast of this feature, on the same alignment, is an irregular, 17.5m-long, broadly linear, positively-magnetic anomaly [27], with a protrusion of 25.5m^2 to the northeast. This alignment appears to be picked up c. 19m to the southeast by a c. 18m-long, linear, positively-magnetic anomaly [28], which intersects the southern edge of the survey area. Approximately 3.5m to the northeast of this feature, and parallel to it, is a c. 14m-long, linear, positively-magnetic anomaly [29]. Approximately 1m to the north of this feature is a c. 17m-long, linear, positively-magnetic anomaly [30], running parallel to [27]. The alignment of this feature appears to be picked up c. 20.5m to the northwest by a c. 9m-long, positively-magnetic anomaly [31]. This alignment may be further continued by a 13.5m^2 irregular, positively-magnetic macula [32], located 5.5m to the northwest of the previously discussed feature.

5.1.7. Approximately 3m to the east of [31] is a c. 13.5m-long, linear, positively-magnetic anomaly [33], running parallel to the predominant alignment within the survey area. Approximately 12m to the southeast of this feature is a c. 7m-long, linear, positively-magnetic anomaly [34], on the same alignment. Approximately 3.5m to the southeast and separated from [34] by a dipolar macula, is an approximately 8.5m-long, linear, positively-magnetic anomaly [35]. Approximately 1m to the northeast of the southern end of [33] is a c. 3m-diameter, dipolar macula [36]. Immediately to the north of this feature is a c. 15m-long, linear, positively-magnetic anomaly [37], running parallel to [33]. The alignment of this feature appears to be continued c. 4m to the southeast by a c. 11m-long, linear, positively-magnetic anomaly [38]. A further 6m to the southeast is a c. 2m-diameter, positively-magnetic macula [39].

5.1.8. Approximately 8.5m to the north of the previously discussed feature is a c. 13m-long, linear, positively-magnetic anomaly [40], running parallel to [38], and c. 4m to the northeast of it. The alignment of this feature is possibly continued 1.5m to the southeast by a pair of c. 2m-diameter, positively-magnetic maculae [41], separated by c. 3m. Approximately 6m to the northeast of [40] is a slightly irregular, 8m-long, linear, positively-magnetic anomaly [42], running parallel to the predominant alignment within the survey area. The alignment of this feature appears to be continued c. 1.5m to its southeast by a pair of c. 3m-diameter dipolar maculae [43]. Immediately to the southeast of these features is a cluster of c. 2m-diameter positively-magnetic maculae [44], describing a "T-shaped" pattern 8m by 4.5m. Approximately 17m to the northwest of [42] is a squat, 5.5m by 2.5m, "T-shaped" positively-magnetic anomaly [45], which appears to respect the alignment of [42]. Approximately 8.5m to the north of this feature is a c. 5m-diameter, dipolar macula [46], abutting the northwestern edge of the survey area. Approximately 12m to the southeast of this feature is a group of three, c. 2m-diameter, positively-magnetic maculae [47], describing an irregular triangle c. 7m by 6m by 7.5m. Approximately 3.5m to the northeast of this group is a c. 7m-long, linear, positively-magnetic anomaly [48], running parallel to the predominant alignment/orientation of features within the survey area. Approximately 5m to the northeast of [43], is a group of

three, c. 2m-diameter, dipolar maculae [49]. Approximately 11m to the north of this group is a c. 3m-diameter, dipolar macula [50]. Approximately 6m to the northeast of [44], is a pair of c. 1.5m-diameter, positively-magnetic maculae [51], possibly aligned with the linear feature [48] to the northwest. The extreme eastern corner of the survey area exhibits a c. 3m-diameter, negatively-magnetic macula [52].

6. DISCUSSION

6.1. Geomagnetic Survey

6.1.1. The geomagnetic response to the survey revealed a high density of anomalies across the majority of the survey area, with a slightly increased clarity in the western part of the site. Several features with archaeological potential could be clearly recognised within the dataset (Fig, 4). The scale of these features is varied, with probable evidence for ridge/furrow cultivation across the whole of the area. Likely archaeological features were generally represented by positive magnetic anomalies. The overall character of the geophysical anomalies revealed by the survey suggests a possibility for the presence of archaeological remains within the area surveyed.

6.1.2. The group of features [7], [8], & [10], which may represent a possible enclosure.

6.1.3. The features [5], [11], & [16], which may represent a probable field-boundary ditch.

6.1.4. The group of features [14], [15], [25], & [39], which may represent a probable field-boundary ditch.

6.1.5. The groups of features [1], [3]. [13], [12]; [17], [19], & [20]; [24], [23]; [26], [27], & [28]; [32]. [31], & [30]; [33], [34], & [35]; [37], [38], & [39]; [40], & [41]; [47], [42], [43], & [44]; [48], which represent probable vestiges of ridge/furrow cultivation.

6.1.6. Feature [2] which represents a probable filed-boundary or enclosure ditch.

7. CONCLUSION

7.1. Geophysical survey suggested the presence of potential buried archaeological features.

These comprised:

- Probable archaeological features relating to field-boundaries [5], [11], & [16]; [14], [15], [25], & [39]; [2].

- Probable remains of ridge and furrow cultivation [1], [3]. [13], [12]; [17], [19], & [20]; [24], [23]; [26], [27], & [28]; [32]. [31], & [30]; [33], [34], & [35]; [37], [38], & [39]; [40], & [41]; [47], [42], [43], & [44]; [48].

- Possible evidence for an enclosure [7], [8], & [10].

7.2. The distribution of geophysical anomalies across the areas surveyed should probably be seen as representative of the presence of archaeological features within the survey area and no significant biases in survival/detection of these remains appear to be present within the dataset.

8. BIBLIOGRAPHY

David, et al. (2008) *Geophysical Survey in Archaeological Field Evaluation*. English Heritage

Gaffney, C., Gater, J. & Ovendon, S. 1991. *The Use of Geophysical Survey Techniques in Archaeological Evaluations*. Institute of Field Archaeologists Technical Paper No. 9.

Hayes, T. 2015. *Land off Hickling Lane, Long Clawson, Leicestershire. An Archaeological Desk-based Assessment*. Report No. R12221. London: Pre-Construct Archaeology.

Scollar et al. (1990) *Archaeological Prospecting and Remote Sensing*. Cambridge: Cambridge University Press.

Cartographic references

BGS British Geological Survey: England and Wales (online) Solid and Drift Geology: 1: 50,000

OS Ordnance Survey 1: 50,000 Landranger Map

Ordnance Survey Maps: All editions 1859-1992

Appendix A: Details of Survey Strategy

Date of Survey: 3rd–4th May 2016
Site: LHI1 – Land off Hickling Lane, Long Clawson (Leicestershire)
Region: Leicestershire
Grid Reference: NGR SK 71742 26974
Surveyor: Trent and Peak Archaeology
Personnel: Tom Hooley, Annica Wika
Geology: Brandon Sandstone and Charmouth Mudstone/no superficial deposits recorded
Survey Type 1: Geomagnetic, fluxgate gradiometry
Approximate area: 1 hectare
Grid size: 30m
Traverse Interval: 1m
Reading Interval: 0.25m
Instrument: Bartington Instruments Grad 601-2
Resolution: 0.1nT
Traverse mode: Zig-zag

Appendix B: Geophysical Prospection Methods

Magnetic Survey

Magnetic prospection of soils is based on the measurement of differences in magnitudes of the earth's magnetic field at points over a specific area. The iron content of a soil provides the principal basis for its magnetic properties. Presence of magnetite, maghaematite and haematite iron oxides all affect the magnetic properties of soils.

Although variations in the earth's magnetic field which are associated with archaeological features are weak, especially considering the overall strength of the magnetic field of around 48,000 nano-Tesla (nT), they can be detected using specific instruments (Gaffney et al. 1991).

Three basic types of magnetometer are available to the archaeologist; proton magnetometers, fluxgate gradiometers, and alkali vapour magnetometers (also known as caesium magnetometers, or optically pumped magnetometers).

Fluxgate Gradiometer

Fluxgate instruments are based around a highly permeable nickel iron alloy core (Scollar et al. 1990, 456), which is magnetised by the earth's magnetic field, together with an alternating field applied via a primary winding. Due to the fluxgate's directional method of functioning, a single fluxgate cannot be utilised on its own, as it cannot be held at a constant angle to the earth's magnetic field. Gradiometers therefore have two fluxgates positioned vertically to one another on a rigid staff. This reduces the effects of instrument orientation on readings.

Fluxgate gradiometers are sensitive to 0.5nT or below depending on the instrument. However, they can rarely detect features which are located deeper than 1m below the surface of the ground.

Archaeological features such as brick walls, hearths, kilns and disturbed building material will be represented in the results, as well as more ephemeral changes in soil, allowing location of foundation trenches, pits and ditches. The results are however extremely dependent on the geology of the particular area, and whether the archaeological remains are derived from the same materials.

FIGURES

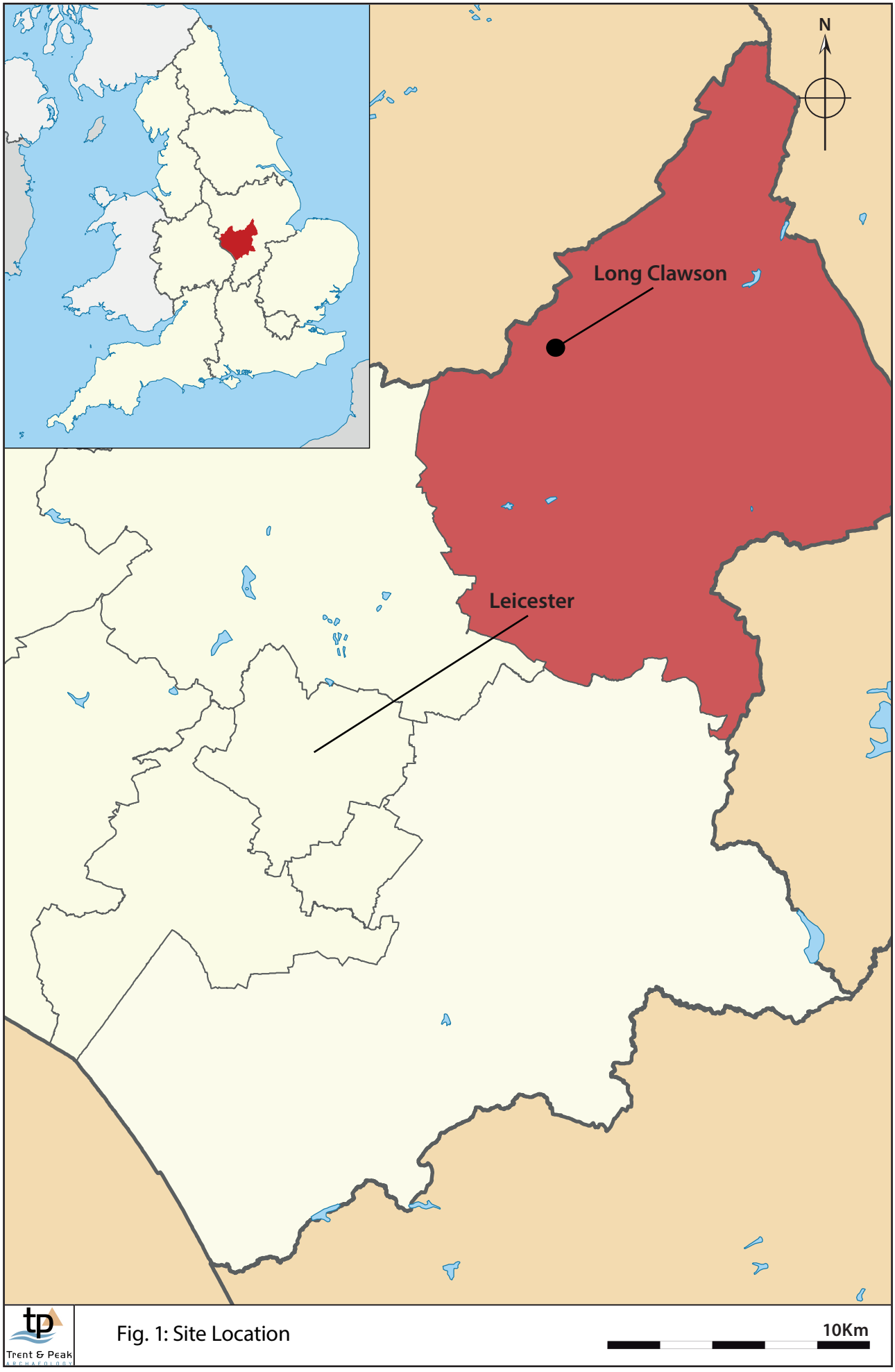

Fig. 1: Site Location

Fig. 2: Greyscale plot of geomagnetic survey results

Positive magnetic response

Negative magnetic response

Dipolar magnetic response

N

73.2m

Tanks

Dairy

Stokes Paddock

Stokes Barn

77.1m

75.0m

Headland Farm

75.0m

Highfield House

Ashfield House

Fig. 3: Vectorised plan of geomagnetic survey results

50m

Probable archaeological feature

Possible archaeological feature

Modern disturbance

No archaeological significance

N

73.2m

Tanks

Dairy

Stokes Paddock

Stokes Barn

77.1m

75.0m

Headland Farm

75.0m

Highfield House

Ashfield House

50m

Fig. 4: Archaeological interpretation plan of geomagnetic survey results

Trent & Peak Archaeology

Fig. 5: Unfiltered greyscale plot of geomagnetic survey results