

Gradiometry Survey at Torpel Manor Field, August 2013

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Summary

This note reports a geophysical survey of the medieval settlement site of 'Torpel Manor' in Bainton CP, in the City of Peterborough. The work was conducted as part of a programme of archaeological research being undertaken on the site of Torpel Manor Field, Bainton, Cambs.

Project background

The survey area consisted of a single field presently under pasture, and measuring roughly 3.4ha in area, centred at TF11140540 (fig 1). Its boundaries consist of fencing and hedges with some sections of rubble stone banks beneath. The site is bounded to the east by King Street (the B1443, and a former Roman road). Land to the north, south and west is under cultivation, while to the immediate north the site is bounded by a metalled paddock area, on which the newly constructed Interpretation Centre now stands.

Earthwork preservation in the survey area itself is very high, with a relatively low level of modern interference or agricultural improvement, other than a small paddocked area at the north end of the field. This is in stark contrast to the evidence in all the surrounding fields, which have been levelled by agricultural improvements (Fradley et al. 2013). The local geology consists predominantly of limestone of the Cornbrash Formation, with a small intrusion of the Kellaways Clay Member in the south-east corner of the field (British Geological Survey 2014).

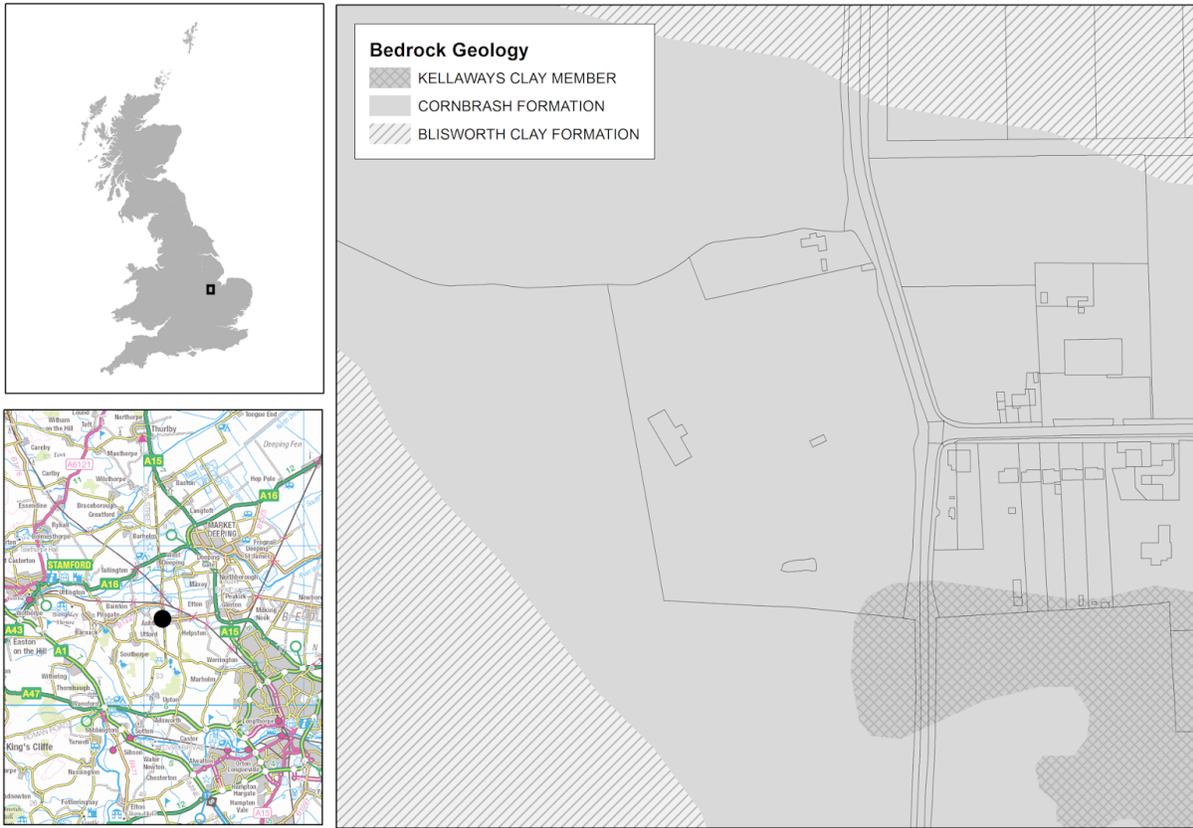


Figure 1. Location of the survey area showing bedrock geology (British Geological Survey 2014, Ordnance Survey 2014). Contains Ordnance Survey data © Crown copyright and database right 2014.

Previous Work and Findings

As the site has not previously been subject to any substantive level of research, an analytical earthwork survey was conducted in November 2012 (Fradley *et al.* 2013). This survey allowed us to better characterise the topography of the site, to construct a tentative three-phase chronology for the features recorded, and to inform the planning of future work, including geophysical investigation on the site, and wider landscape survey (fieldwalking and test-pitting) beyond the scheduled area.

Objectives

The objectives of the survey were to build on the earthwork survey, and in detail:

- To determine whether linear earthwork features conceal subterranean wall footings

- To clarify the pattern of settlement and activity on the mound in the south-east of the field.
- To clarify the complex organisation of earthworks to the north of the mound
- To identify any extant evidence for activity in the relatively flat and featureless north end of the field, where previous investigations (Fradley et al. 2013 highlighted the potential for evidence of an early (? pre-Norman) phase of activity.
- To investigate the possibility that the remains of the post-medieval Torpel House are to be found on the field.

Methods

Based on the results of topographic survey (Fradley et al. 2013), photographic evidence (Google Earth), and knowledge of analagous sites, it seemed likely that ditches and pits, and the remains of walls and hearths might be preserved below the ground surface. Given the likely shallowness of these targets, and the site's well understood sedimentary geology, it was decided that the sensible starting point for geophysical survey was fluxgate gradiometry, which is used to identify anomalies in the earth's magnetic field caused by geological and human activity.

The gradiometry survey was undertaken over two days in August 2013 using a Bartington Dual Sensor Grad-601 Magnetic Gradiometer System. The survey covered two hectares of the field, utilising grids of 30m x 30m, at a resolution of 0.5 x 0.125m samples. Instrument sensitivity of the gradiometer was set to 0.1nT, and data was collected in a zig-zag traverse scheme. Certain areas, particularly over the large earthwork in the south of the field, were not surveyed due to obstruction from vegetation, and the presence of a large pylon traversing the field roughly N-S also affected data collection and processing. The results were processed in the Geoplot software package and basic processing functions were applied as in Table 1.

Zero mean traverse	This process sets the background mean of each traverse within each grid to zero, thereby removing striping effects and edge discontinuities over the whole of the data set.
Destaggering	Destaggering corrects staggered data which arises due to irregularities in walking during collection by shifting traverses, and are applied on a line-by-line basis as and where needed.
Clipping	Clipping improves data display and statistical calculations by removing outlying high or low values from strong ferrous responses.
Despike	Despiking locates and removes random spurious readings in resistance data, or iron spikes in gradiometry data, and replaces with the mean of surrounding pixels.
Interpolation	Interpolation can also be used to give a smoother appearance to the data and can improve the visibility of larger, weak archaeological features. However, it does this at the expense of increasing the number of data points and is purely a cosmetic change

Table 1. Processes applied to the geophysical data (after Geoscan Research, 2005)

The work was undertaken by a team from the Department of Archaeology, University of York, comprising by Helen Goodchild, Hayley Saul, Steve Ashby and Aleks McClain. The project was directed by Ashby and McClain, with the survey designed by Goodchild and Ashby, and undertaken by Goodchild and Saul (with assistance from Ashby). A small number of trained volunteers were also on site to assist in laying out grids. Results were processed and interpreted by Goodchild. The report was prepared by Steve Ashby and Helen Goodchild. All illustrations by Dr Helen Goodchild.

All surveys undertaken as part of the Torpel Manor Archaeological Research Project have been undertaken in accordance with English Heritage guidelines (David et al. 2008). The data have been archived locally and on central University servers, which are protected by systematic tape back-up.

Results

Magnetometry dataplots are presented in fig 2, and interpreted in fig 3.

Our grids covered much of the field, though topography and undergrowth in the steeply banked and heavily overgrown areas on the southern and western margins of the field, as well as on the western end of the mound plateau, remained inaccessible.

Severe disturbance was detected in the north-east corner of the survey area, which seems to have been used as a dumping area in recent years, while a N-S linear feature is visible as a dipolar anomaly close to the eastern edge of the field. This is probably a modern service pipe or cable. A marked, subcircular dipolar anomaly of approximately 27m in diameter, centrally placed in the northern half of the field, reflects the placement of an electricity pylon.

A number of negative magnetic anomalies were identified across the site, which may indicate the partial subterranean survival of walling or stone revetment for earthen banks. These anomalies predominantly align with visible earthworks and linear features identified in previous topographic survey work; in particular the linear negatives that underlie the E-W banks flanking the pathway into the site from King Street, and the irregular bank projecting NW from the area of the pylon. Though undated, it seems that at some point the former was a recognisable entrance way (Fradley et al. 2013), whilst the latter could represent an outer bank for an enclosure (?bailey) related to the mound. The earthwork survey, however, shows that the outer earthwork which roughly aligns with the western field boundary cuts through this bank feature, and could therefore represent an earlier phase. The remaining negative features could potentially represent remains of small building structures, though the associated earthworks appear irregular. This is further complicated by the presence of overlying positive features. Additional survey using resistance is recommended for clarification of these features.

A number of positive magnetic anomalies are present, and may be assumed to indicate the presence of materials characterised by relatively high magnetism. Such results typically reflect either the ferrous nature of the deposits, or the infill of cut archaeological features, wherein the magnetism of these sediments has been elevated by either burning a material beyond its Curie temperature, or induced by the presence of

decomposed organic matter. Linear positive anomalies probably reflect soil-filled features such as ditches, or infilled plough scars, while more discrete, subcircular features may represent pits. A particularly notable example of the former is visible in the upper part of the field running NE-SW on figure 2, and likely relates to some form of ditch - perhaps a drainage ditch - of unknown date. Additional parallel lines may alternatively suggest ploughing, though the limited extent of these casts doubt on this interpretation. They appear to be cut by the medieval earthworks to the south, so likely predate them, but this cannot be confidently ascertained at present.

In the area of the mound, towards the south of the field, one may discern a rather complicated area of dipolar anomalies, which show as strong black and white features. This signature is indicative of a high ferrous signature, typically relating to buried metal objects (e.g. pipework), or similar strongly magnetic features such as fired brick walls. The potential for the recovery of preserved wall alignments in this area lying outwith the mound is tantalising, and would certainly repay further investigation.

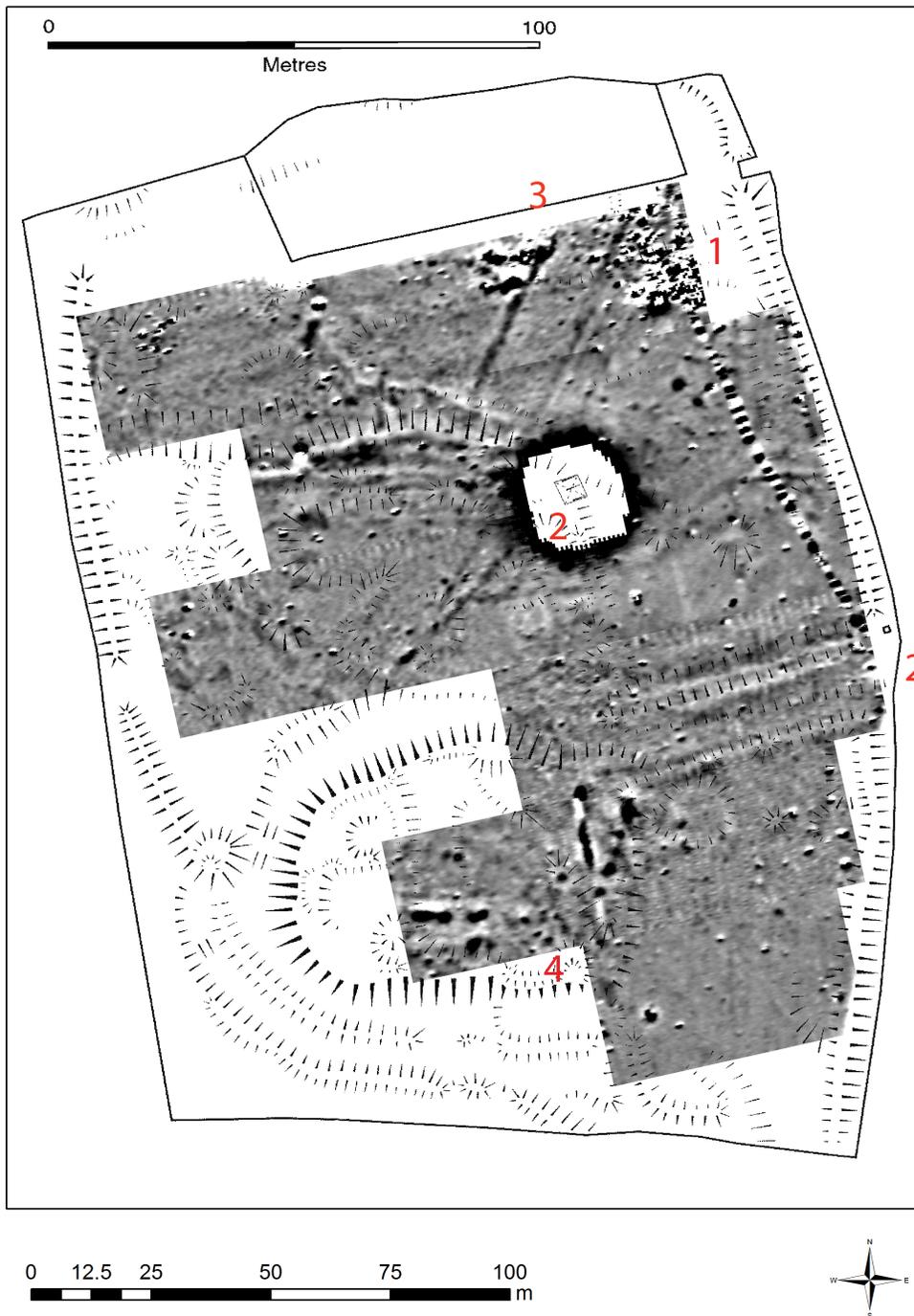


Figure 2 Gradiometry dataplot, overlain on earthwork survey undertaken in 2012 (Fradley et al. 2013)

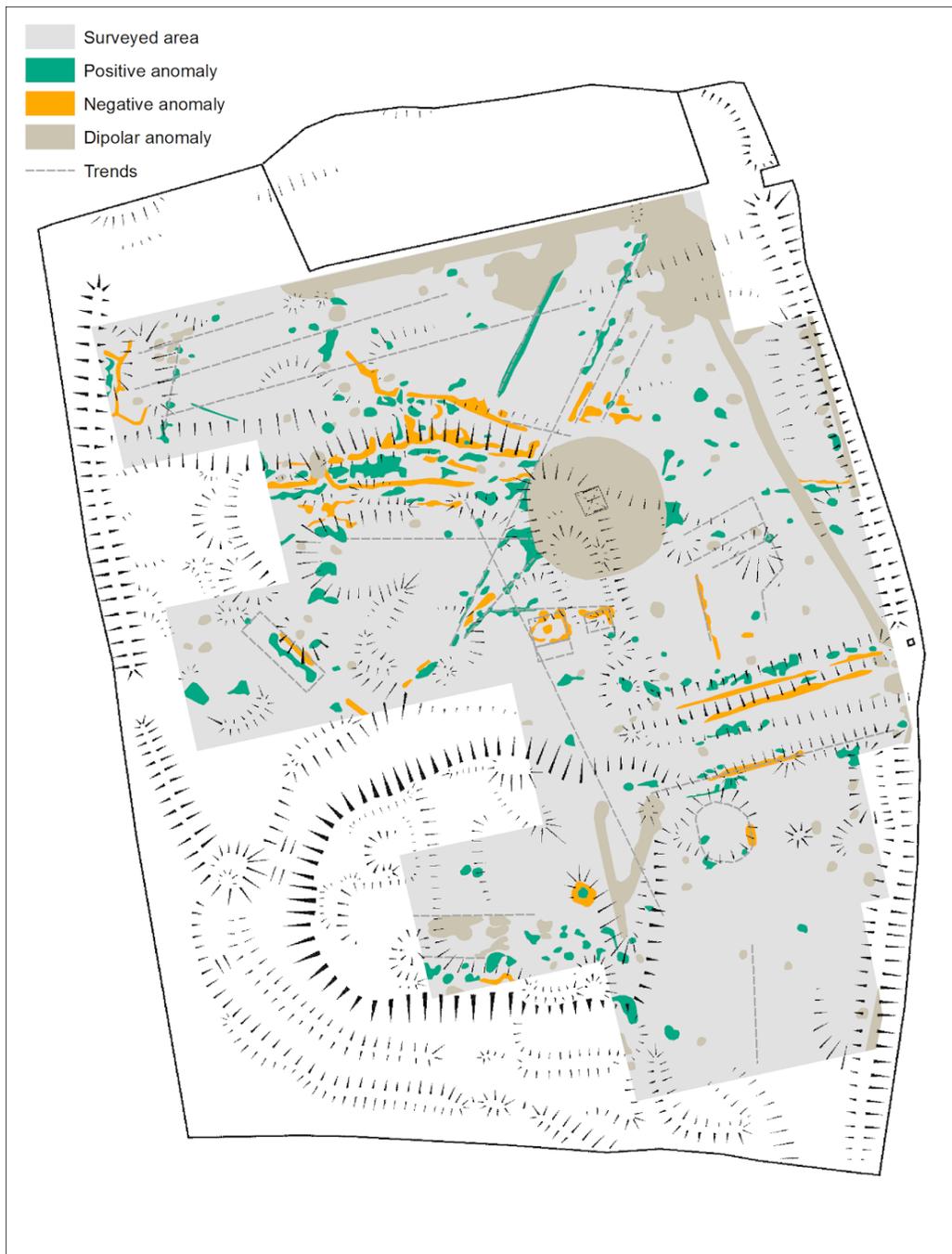


Figure 3 Interpretation of Gradiometry survey (Goodchild)

Finally, there are a number of subcircular anomalies associated with earthworks on the mound itself. While a number of these are clearly dipolar, there is also a suite of positive

anomalies which are probably archaeological in origin. These cut features are likely not strong enough to be hearths, though some demonstrating higher magnetism (those with white haloes) could arguably be interpreted as such.

The only other anomalies detected are very small, discrete dipolar anomalies. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as agricultural equipment and ceramic building materials. Finally, one might note what has not been identified. The area to the north of the field - identified as perhaps the most likely site for pre-Norman activity - appears largely featureless. However, very faint E-W linear trends 6-8m apart, and following the line of the northern fence, may reflect ridge and furrow. Additionally, the south-east corner was posited as a potential post-medieval stock enclosure, and the lack of evidence for the construction of architecture within it is consistent with this interpretation. Most tellingly of all, nowhere on the field is there clear evidence for the remains of the post-medieval Torpel House. It is recommended that resistance survey, which will identify structural features more clearly than gradiometry, be targeted on key areas (particularly the potential brick structure on the mound) to establish any surviving building layouts.

Conclusions

In relation to the objectives outlined above:

- A number of linear earthwork features appear to conceal subterranean wall footings
- The mound appears to preserve evidence of some form of poorly resolved activity, whether pit-digging, hearths, or structures. Further investigation, using targeted resistivity survey would be beneficial.
- The earthwork complex to the north of the mound appears to consist of a complex palimpsest of positive and negative linear anomalies, perhaps relating to episodic building and robbing. Further investigation, using targeted resistivity survey would be beneficial.
- No evidence likely to indicate either structural features or burning activity was identified in the northern end of the field.

- There is no evidence for the siting of the postmedieval torpel House on this field. Though extensive stone robbing is highly likely to have taken place, the absence of any evidence for such a substantial historic-era building on the site is telling. It is possible that this building was built on another, perhaps adjacent, plot of land. It is notable that fields on all sides of the site have been heavily ploughed.

Agenda for Research: Targets for Further Survey

The next step, having covered much of the area of the field, is to target a number of more tightly defined zones, investigating them by means of resistance survey. It would be beneficial, in particular, to focus on anomalies over the mound and to its east, and to attempt to better characterise the disturbance close to the pylon, in order to determine if any suggestion of structures is preserved. The project team plan to undertake such research in 2014.

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