Geophysical Survey at Cresswell Tower, Cresswell, Northumberland

View north-west towards Cresswell Tower

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EXECUTIVE SUMMARY

This report presents the results of a geophysical survey undertaken on land adjacent to Cresswell Tower, Cresswell, Northumberland on behalf of Cresswell Parish Council and the Greater Morpeth Development Trust as part of a Heritage Lottery funded project, 'Restore and Open Cresswell's Pele Tower Including Archival and Archaeological Projects'.

The geophysical survey was completed with the help of a number of volunteers during the weeks commencing 2nd and 9th January 2017. The results of the geophysical survey are considered to be accurate and reliable and only minimal processing of the raw data was necessary. The results have not revealed any definite evidence for significant buried archaeological remains within the survey area.

A number of weak linear anomalies on the sloping part of the field could be of interest but are most likely to be agricultural in origin. In particular there is some correlation between a linear anomaly on a west-north-west/ east-south-east alignment and a putative holloway identified from aerial photographs (Brogan et al*. 2003). Although the anomaly does not suggest or confirm the presence of a holloway it may indicate the edge of a feature or boundary but may also represent a more ordinary agricultural remnant.*

Two areas of disturbance in the north-west of the survey area were recorded close to the tower and also in the general area identified as the possible site of the original medieval village. It is possible that the areas of disturbance indicate the presence of historical building remains and debris but could equally be likely to indicate modern tipped material or general disturbance close to the gated entrance of the field and around the depression which surrounds an open spring.

A greater density of discrete anomalies were recorded on the plateau in the south-west than were recorded on the sloping part of the field. It is most likely that the discrete anomalies are a result of variations in the underlying superficial deposits of till although the presence of archaeological pits or truncated remains on the plateau cannot be completely discounted. The absence of such anomalies on the slope could suggest the presence of colluvial or wind-blown deposits on its lower margin. Although this is speculative such deposits could mask buried archaeological remains sealed below and it would therefore be worth testing the lowest part fo the field by evaluation trenching.

It is known that the field has recently been returned to arable cultivation after many years of pasture. The extensive evidence of ridge and furrow cultivation that has previously been transcribed from aerial photographs was largely undetected by the geophysical survey. This may indicate that the remains have been destroyed by the recent ploughing.

1.0 INTRODUCTION

1.1 Background

1.1.1. The Heritage Lottery funded Cresswell Tower project is led by Cresswell Parish Council and the Greater Morpeth Development Trust and will conserve the tower for future generations to enjoy. As part of the project a programme of archaeological works will be undertaken aimed at removing the tower from the Historic England 'Heritage at Risk' register and providing public access, as well as volunteer and public engagement activities. The programme of archaeological work in te project's 'Development Phase' includes geophysical survey, fieldwalking, archaeological evaluation trenching, recording of the tower's floor and a watching brief on preliminary works on the tower. All aspects of the archaeological work are to be conducted in collaboration with the local community allowing for local engagement with the project and the tower, and providing training in heritage skills.

1.1.2 This report presents the results of the geophysical survey. The aim of the survey was to identify any anomalies of archaeological origin on the land adjacent to the tower. The most significant anomalies will then be targeted by evaluation trenches in order to identify and confirm the presence/absence, location, nature and extent of any surviving below-ground archaeological remains.

1.2 Location, Topography and Geology

1.2.1 The geophysical survey covered one large irregular field known as Fisheries Field (Fig. 1). The field comprises a total of *c.* 11.5ha. and rises moderately from an elevation of *c.* 10m aOD adjacent to the north-eastern boundary to a plateau, where the field narrows in the south-west, and which lies at an elevation of *c.* 18m aOD. The field is bounded by stone walls or timber post and wire fencing which separates the field from: the coast road to the north-east and east; Sea Lodge in the south-east corner; Stank Letch to the south; woodland to the south-west; Cresswell Pele Tower and surrounding woodland to the west and Cresswell village green to the north-west.

1.2.2 The underlying solid geology consists of mudstone, siltstone and sandstone of the sedimentary Pennine Middle Coal Measures Formation that formed approximately 309 to 312 million years ago in the Carboniferous period. This is overlain by superficial deposits of Devensian – Diamicton Till (British Geological Survey 2016) which gives rise to the heavy clay soils that mantle the field.

2.0 ARCHAEOLOGICAL BACKGROUND

2.1 Cresswell Tower House is a Scheduled Monument (NHLE: 1014509) and a Grade II Listed Building (NHLE: 1042148). The tower is centred at NGR NZ 29364 93356 (Figure 1), at the south end of Druridge Bay. It is currently closed to the public and is

included in Historic England's Heritage at Risk Register with its principal vulnerability being recorded as vandalism.

2.2 Creswell Tower House is thought to date to the 14th or 15th century and represents a well-preserved example of a border tower house or 'Pele'. The tower is unlikely to have stood in isolation, and probably had an associated external hall and other ancillary structures that have not survived. The tower was first shown on historic mapping on Armstrong's map of 1769 when it was labelled as 'Cresswell Hall'. By this time the tower had an adjoining mansion house. By 1840 the mansion house had been demolished, but the tower was retained as a feature in the landscaped grounds of a new hall. This hall's carriage ride ran past the tower and a mounting block was built in order to allow visitors to disembark and view the old building. In the 20th century the estate was sold to the Ashington Coal Company after a decline in fortunes of the Barker-Cresswell family. The new hall was demolished in the 1930s, but the tower remained and was used occasionally for parties and local events. After the Second World War, however, the tower went into a period of general decline (Ryder 2003, 73-4). In recent years the tower has stood on the edge of a caravan park, closed to visitors, but subject to vandalism.

2.3 The tower was surveyed by Peter Ryder as part of a small conservation programme undertaken in 2000 (Ryder 2003). Ryder's survey of the tower followed the opening up of blocked access on the ground floor allowing for inspection of the tower's interior. The survey includes drawn plans, cross sections and elevations of all walls and it provides a description of the fabric and historical development of the building (Ryder 2003).

2.4 The tower was the subject of an archaeological watching brief in 2014 undertaken as part of preliminary investigations into the structural integrity of the building. This monitored the removal of a build-up of soil and debris at first floor level, exposing a flag-stone floor, the date of which could not be established at the time of the watching brief (Eadie 2014).

3.0 METHODOLOGY

3.1 Magnetometry is a non-intrusive scientific prospecting technique that is the preferred geophysical technique used to determine the presence or absence of buried archaeological features when site and geological conditions are favourable. It is an efficient and effective method for locating anomalies corresponding with archaeological features. The instrument chosen for this survey was a Bartington Grad 601 dual sensor fluxgate gradiometer which can detect weak changes in the Earth's magnetic field caused by buried features.

3.2 All fieldwork and reporting was undertaken following Historic England and Chartered Institute for Archaeologists (CIfA) standards and guidance (Gaffney *et al*. 2008; CIfA 2013; 2014).

3.3 The 30m by 30m survey grids were located to cover the entire field and aligned as shown in Figure 2. In total 139 survey grids, including partial grids, were set out and accurately positioned using a Leica Zeno 10 GNSS field controller with GS05 antenna cap which was connected to Leica Smartnet to receive corrections resulting in an accuracy of typically 0.6m or better. Each grid was then surveyed at 1m traverse intervals with the sampling at 0.25m (4 readings per metre) intervals. The survey was carried out in 'zigzag' mode with each alternate traverse walked in opposite directions. The range of the instrument was set at 100nT (0.01nT resolution).

3.4 The geophysical survey was completed with the help of a number of volunteers during the weeks commencing 2nd and 9th January 2017 in, mostly, unseasonably mild and dry conditions. At the time of the survey the field had been harrowed and was saturated which made for difficult walking conditions.

3.5 Prior to commencing the survey the gradiometer was balanced and calibrated to the local conditions and this was repeated regularly throughout each day. At the end of each day, the data was downloaded into a computer, checked and archived on the ARS Ltd server. The data was downloaded using Bartington Instruments' *Grad 601 Communication Application.*

4.0 GEOPHYSICAL SURVEY RESULTS

4.1 Introduction

4.1.1 The data was minimally processed using Geoplot software. The data was "clipped" (clipping parameters selected on the mean and standard deviation data values), "de-staggered" and the striping that can often appear in gradiometer data was removed by utilising the "zero mean traverse" function with thresholds applied. Finally the data was interpolated. To enhance the visibility of subtle features the data was viewed under a number of different clip plotting parameters.

4.1.2 Occasionally processing the data to compensate for directional sensitivity or to remove iron spikes caused by miscellaneous ferrous objects can also inadvertently disguise anomalies that may be of archaeological origin, particularly long linear features in the direction of the traverses. To take account of this the data has been analysed in a number of different formats and at each stage of processing.

4.1.3 Not all anomalies have been included in the results and discussion. Positive discrete anomalies that can, in certain circumstances, indicate the presence of archaeologically significant features such as pits were recorded in many areas of the site. Without supporting evidence, an obvious pattern to their distribution or a clear relationship with other archaeological features, this type of anomaly has not been analysed in detail at this stage. Any anomalies that have potential to be archaeologically significant have been included in the results.

4.1.4 Dipolar anomalies with no clustering or pattern to their distribution are common on most sites and almost certainly relate to natural variations in the pedology and geology, agricultural disturbance and miscellaneous ferrous litter on the surface of the field. These types of anomalies have also not been analysed further.

4.1.5 The data analysis is presented graphically in Figures 3 to 5. A greyscale shade plot of the processed gradiometer data is presented in Figure 3 and an interpretative plan in Figure 4. A Trace plot of the processed gradiometer data is presented in Figure 5.

4.2 Anomalies

4.2.1 A substantial but relatively weak and slightly sinuous linear anomaly (1) was recorded in the east of the field and is of unknown origin. At the south-western tip the anomaly appears to originate from, or be located close to, an abandoned manhole and although this may be fortuitous it could also indicate that the anomaly is associated with a modern service or drain. Alternatively the anomaly respects the general alignment of part of the broad rigg field system identified in the 'Archaeological Assessment of Cresswell, Northumberland' (Brogan *et al*. 2003, Fig. 12) and may represent a plough furrow. No other clues to the origin of the anomaly have been identified in the survey or in the research which can now only be tested by invasive investigation.

4.2.2 A weak, very straight linear anomaly was recorded to the north of centre of the field (2). The anomaly was recorded on a west-north-west/ east-south-east alignment which respects the alignment and the approximate location of a putative holloway identified in the archaeological assessment (Brogan *et al*. 2003, Fig. 12). Notwithstanding the holloway the aforementioned document does suggest, from the evidence of aerial photography, that the ridge and furrow cultivation terminated in this approximate location and on an alignment that respects the anomaly so, although the anomaly is not entirely reminiscent of a holloway, it could indicate the edge of a feature or alternatively the 'headland' (boundary earthwork) within a ridge and furrow field system. To the north, east and south of anomaly 2, there is a subtle hint of further linear anomalies (3, 4, 5 and 6) but these are barely discernable and too weak to fully delimit or interpret with any confidence.

4.2.3 Adjacent to the north-west boundary a large depression surrounding an open spring had to be omitted from the survey although around the edge of the depression various anomalies were recorded. A group of three approximately parallel and possibly intermittent linear anomalies on a west-north-west/ east-south-east alignment and weak perpendicular linear anomaly (group 7) are most likely to be agricultural in origin but this can only be tested by invasive investigation and an archaeological origin cannot be discounted. To the north-east of the depression a small area of disturbance (8), represented by a collection of dipolar anomalies, most likely represents modern disturbance, but could also represent building debris as this general area has been identified as the possible location of the original medieval Cresswell village. This can be tested by invasive investigation.

4.2.4 To the south and south-west of the depression a more substantial area of disturbance (9) could represent modern disturbance or a tip of modern materials particularly considering the location at the entrance to the field. However, for the reasons stated in 4.2.1.3, it is possible that the collection of dipolar anomalies indicate the presence of building rubble of historic origin and this can also be tested by invasive investigation. A further area of disturbance on the north-eastern boundary (10) is very likely to be modern in origin.

4.2.5 There is a notable change in the geophysical survey results to the south-west of the break of slope, where the field narrows, on the aforementioned plateau. Here a much higher density of positive discrete anomalies were recorded although the anomalies are widely dispersed with no signs of clustering or a pattern to their distribution (groups 11 and 12). For these reasons it is most likely that the anomalies represent natural variations and the presence of boulders in the underlying superficial deposits of till. However, the presence of pits of possible archaeological origin cannot be discounted but such an interpretation remains very speculative based on the geophysical survey results alone.

4.2.6 A bipolar anomaly on a north-east/ south-west alignment which originates from an abandoned manhole (13) represents a modern pipe and is not of archaeological interest. There is a subtle hint in the data that the pipe has been detected all the way to the north-eastern boundary (13a) but as the response is almost indistinguishable the pipe could be present but buried at a greater depth within the sloping section of the field.

4.2.7 A small group of extremely weak parallel anomalies to the west of anomaly 1 (group 14) almost certainly represent the remains of the broad rigg field system identified in the archaeological assessment (Brogan *et al.* 2003, Fig. 12) and as this is all that has been detected it probably suggests that the remaining evidence of ridge and furrow has been destroyed by the plough.

5.0 DISCUSSION AND CONCLUSIONS

5.1 Despite the difficult ground conditions there is no reason to consider the results to be anything other than accurate and reliable and only minimal processing of the raw data was necessary. Anomalies have been recorded across the field although these are generally weak or a probable result of the underlying geology and have not revealed any definite evidence for significant buried archaeological remains within the survey area.

5.2 A number of linear anomalies on the sloping part of the field may be of interest but are most likely to be agricultural in origin. In particular there is some correlation between a weak linear anomaly on a west-north-west/ east-south-east alignment and a putative holloway. Although the anomaly does not confirm the presence of a

holloway it may indicate the edge of a feature or boundary, but may also represent a more ordinary agricultural remnant.

5.3 Two areas of disturbance in the north-west of the survey area were recorded close to the general area identified as the possible the site of the original medieval village. It is possible that the areas of disturbance indicate the presence of historic building remains and debris but are equally likely to indicate modern tipped material or general disturbance. It would be worth testing these areas by invasive investigation.

5.4 The absence of the wide distribution of discrete anomalies on the sloping part of the field, which were clearly recorded on the plateau in the south-west, may indicate the presence of colluvium or possible wind-blown deposits of sand, particularly in the lower part of the field. Although this is speculative, such deposits could mask any archaeological remains which could be sealed below the colluvium or wind-blown deposits and it would be therefore be worth investigating this part of the field to establish the sedimentary sequence.

5.5 As the field has recently been returned to arable cultivation after many years of pasture. Very little of the ridge and furrow that was previously identified in the archaeological assessment (Brogan *et al.* 2003) was detected by the geophysical survey. This may indicate that the remains have been destroyed by recent ploughing or that the geophysical survey has not been able to pick up crop marks visible on aerial photographs.

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8.0 ACKNOWLEDGEMENTS

8.1 Archaeological Research Services Ltd would like to thank all those involved in the project for their help and assistance. In particular we would like to thank Barry Mead and Cresswell Parish Council and Greater Morpeth Development Trust for commissioning the survey, the Heritage Lottery Fund, and the Crown Estate and the tennant farmer for allowing access onto the land. Thanks is also due to all the volunteers who assisted with the geophysical survey.

9.0 REFERENCES

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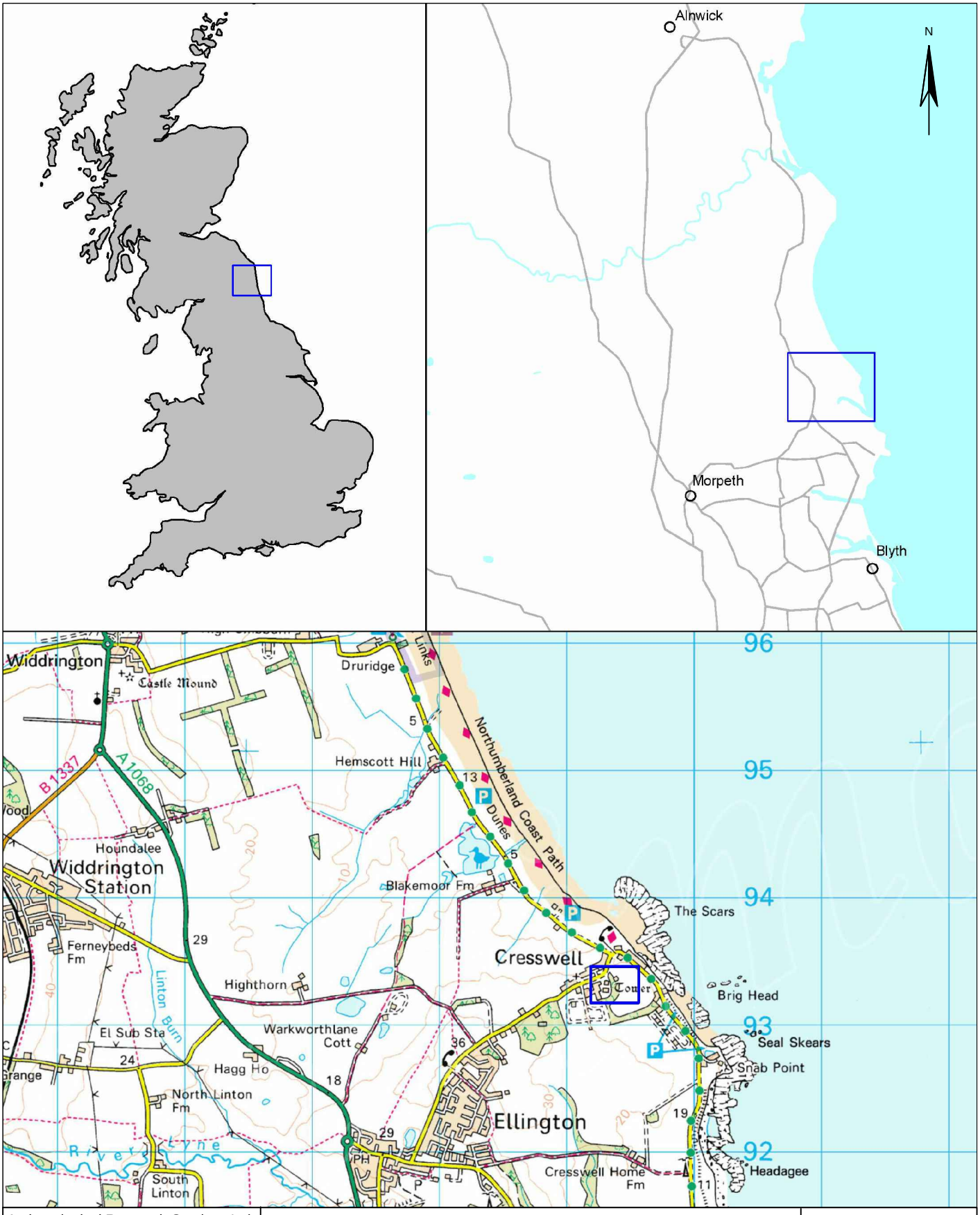
Appendix 1: Figures



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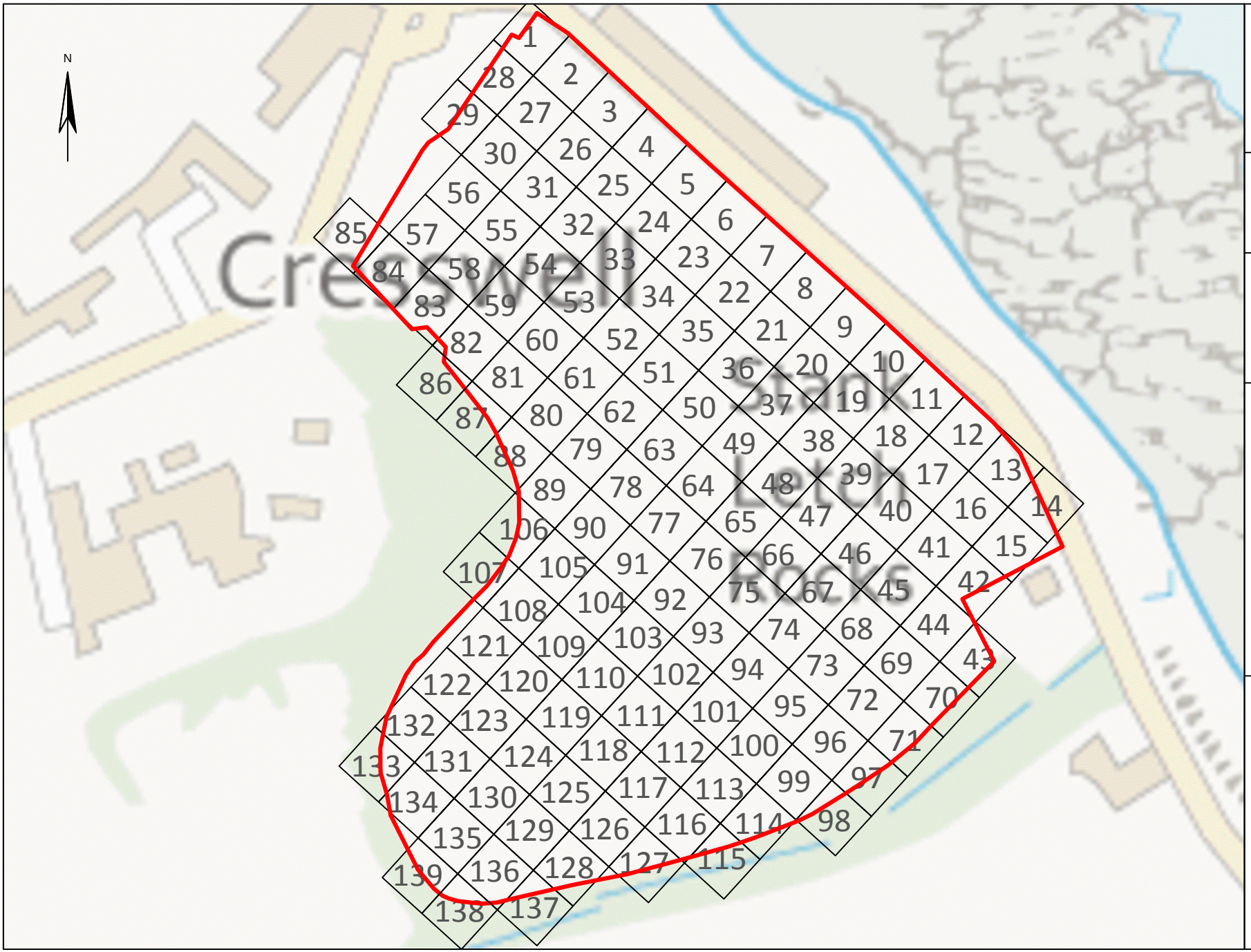
Site Code: Cresswell Tower
Date: January 2017
Drawn:RD
Scale: As shown

Figure 1
Site Location

Key:

Site Location



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Site Code: Cresswell
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Figure 2
Location of survey grids

Key:

Survey area

1 30m x 30m survey grid

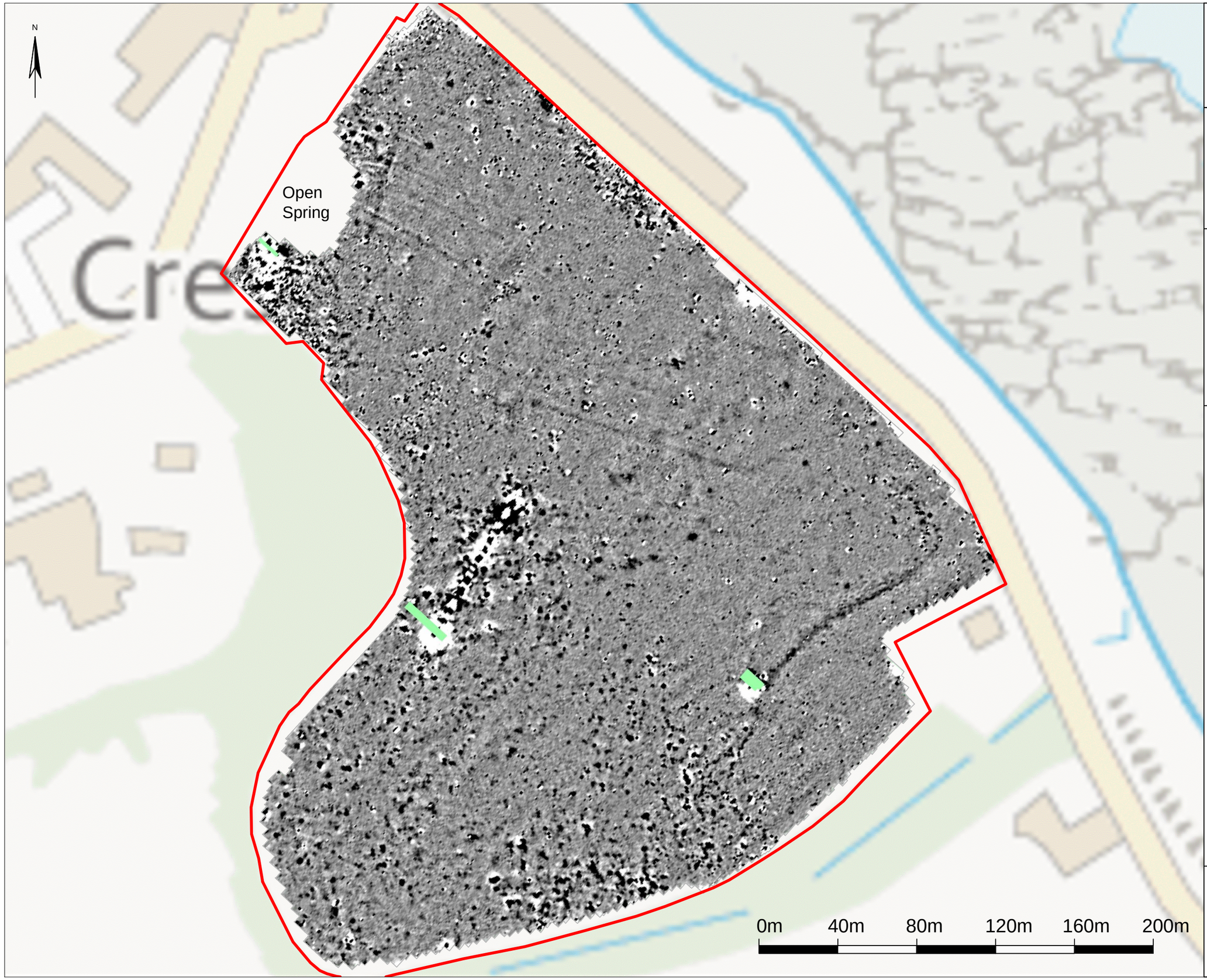

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Figure 3
Greyscale Shade Plot of Processed Gradiometer Data

Key:

Survey area

Plotting parameters

3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
nT

Survey obstructed

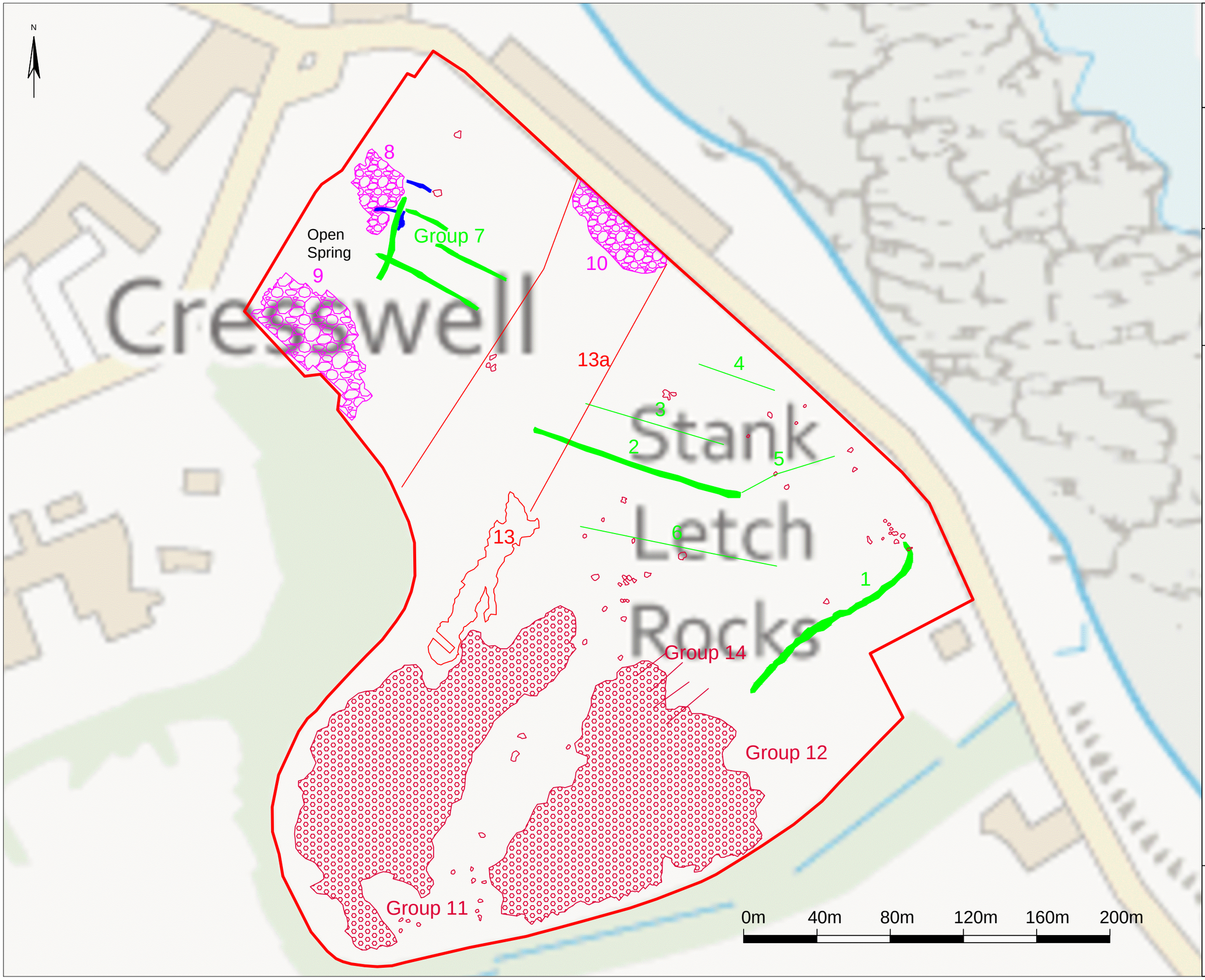

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Figure 4
Interpretative Plan

Key:

- Survey area
- Positive linear anomaly
- Negative linear anomaly
- Weak positive linear anomaly
- Area of disturbance
- Concentration of discrete anomalies
- Discrete anomalies - probable geology
- Pipe or service
- Possible pipe or srvice

N

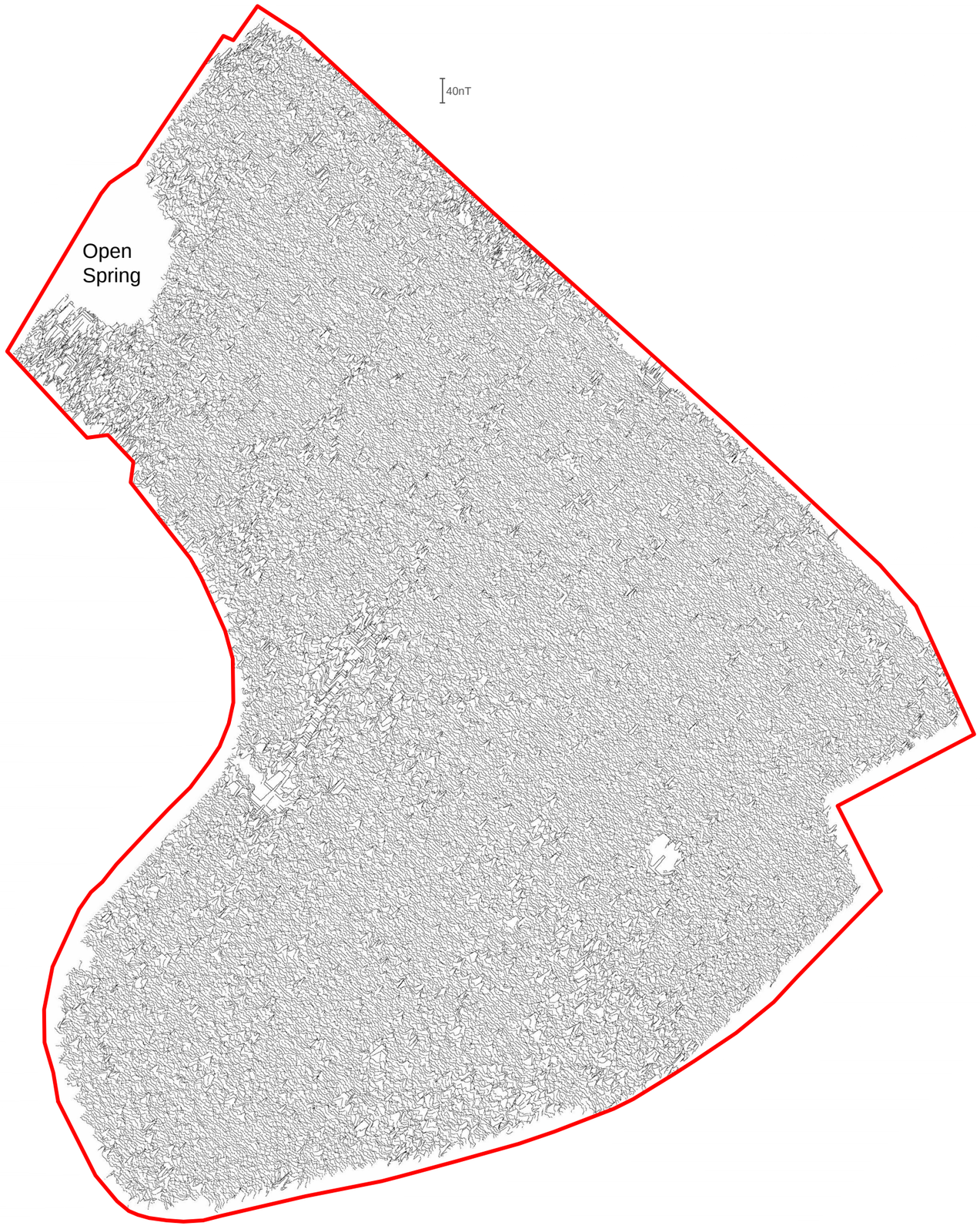

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Figure 5
Trace plot

Key:

Survey area