Rossie Law Geophysical Survey

SERF

Data Report

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Tessa Poller

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Summary

As part of the Strathearn Environs and Royal Forteviot (SERF) project a geophysical survey on Rossie Law hillfort was conducted between March 7th and 9th 2012 and on March 17th 2012. The underlying volcanic geology dominated the results of the gradiometry survey on the summit of the hill and therefore any potential subtle magnetic archaeological features could not have been detected here. However, lower down the slope, along the inner edge of the enclosing bank, possible traces of an internal ditch were noted. Opposite the entrance several potential archaeologically significant anomalies were also detected. A small area of resistivity on the summit of the hill highlighted the edge and centre of a circular hollow as an area of higher resistance.

Introduction

A geophysical survey was carried out on Rossie Law (NN 99771 12416), between March 7th and 9th 2012 and on March 17th 2012, in advance of proposed excavations on the fort as part of the SERF hillfort programme.

Aims

The aims of the geophysical survey were to use geophysical techniques:

- to detect and characterise any potential archaeological features within the fort of Rossie Law.
- to assist in the selection of areas for further archaeological investigation through excavation.

Archaeological Description & Background

The fort (NMRS NN91NE 1) is set on the steep prominence of Rossie Law, over 300m OD. Defined by a single bank, the fort encloses a large area measuring approximately 200m E-W by 125m transversely. The only entrance is on the east side where the slope to the summit is most gradual.

As part of his account of the forts and 'camps' in Perthshire Christison (1899) noted that a bank was clearly visible on the east, north and north-west sides of Rossie Law, but that on the south and east sides, where the hill slope is steeper, the edge is characterised instead by a narrow terrace. During his visit Christison also recorded, on the north side of the hill, a visible row of stones marking the outer edge of a small stretch of the bank. Christison did not comment on any internal features of the fort and only stated that "the actual top is a level, dry, grassy, pleasant space…" (1899, 72). In 1963 Richard Feachem identified slight traces of platforms or scoops within parts of the interior; however, the locations of these were not mapped (Feachem 1963, 146). A circular hollow, approximately 10m in diameter and 1.5m in depth (as documented by John Sherriff (1978, 114 & Fig. 41), was depicted on the first edition Ordnance Survey map (OS 1866, 1:10560).

At the time of the geophysical survey outlined in this report, the enclosing bank, situated around a lower contour of the hill, was largely covered by grass. At least one substantial stone is visible at the entrance of the fort, but no clear stone edging to the bank was identified. Approximately 20m to the south of the entrance there was a 'scoop' within the bank revealing some large stones which may be a quarry or intramural structure. On the summit of the hill the circular hollow was clearly visible with a smaller sunken area of reeds at its centre. There were other shallow hollows and scoops in the interior, but they did not have the characteristic front bank or 'apron' which would identify them as hut platforms and may instead be erosion scars or quarry scoops.

Rossie Law is distinct from other forts within the area of research because of its large size and morphology of the enclosing bank. This distinction may be a reflection of its chronology and function. Hillforts in Scotland can date to various times, but predominantly within the Early Iron Age and the early medieval periods. It is interesting to note that an axe-hammer (NMRS NN91 NE 2) of possible Bronze Age origin was "…found among loose stones at the foot of a scaur on the north side of Rossie Law" (Callander 1926). This find suggests that the hill may have had significance prior to the construction of the bank.

Geology, Topography & Vegetation

The underlying solid geology of Rossie Law is trachyandesite (BGS 1:50,000). This volcanic rock is high in mafic minerals and therefore highly magnetic. Such volcanic geology has the potential to greatly affect the magnetic readings of the gradiometry survey; however, it was decided that such a survey could still be useful in identifying any potential archaeological features cut within the geology and was backfilled with other material.

The superficial geology is likely to have derived from glacial deposits, with greater accumulation of hillwash down slope.

As mentioned above, the fort is situated on a steep sided hill with the most gradual approach from the east. The interior of the fort is not uniform. On the north side the slope is defined by a steady and steep gradient as it reaches the summit. The summit itself, is a relatively flat area at the south end of the fort, but is marked with smaller undulations. To the northeast of the summit, separated by a linear hollow running NW-SE, there is another smaller relatively flat area. This flat area may be where Feachem could envision later prehistoric timber structures were built.

The current vegetation on the hill is characterised largely by tussocks of grass with areas of heather and rushes, particularly across the north and western slopes.

Methodology

Survey Methodology

Two techniques of geophysical survey were employed: gradiometry and resistivity. The gradiometry survey was conducted using a dual sensor Bartington Grad 601. Readings were recorded within 20m by 20m grids and taken every 0.5m (traverse) by 0.25m (sample). The total area surveyed by gradiometry was approximately 10,000m^2 (*see Figure 1*).

A small area on the summit of the hill was selected for resistivity survey. The resistivity survey was conducted using a GeoScan RM15 with 0.5m probe separation. Four 20m by 20m grids, positioned over the circular hollow, was surveyed taking readings every 1m by 1m (*see Figure*

1). An additional 20m by 20m grid was surveyed to the east of this area, but here readings were taken every 0.5m by 0.5m.

The location of the survey grids were recorded using a GeoTX Trimble sub-metre GPS and corrected using Ordnance Survey online data. The GPS was also used to record visible topographic features such as the inner edge of the enclosing bank of the fort and the circular hollow on the summit of the hill.

Processing Methodology

All the gradiometry survey data was first downloaded using Grad 601 software and then imported into GeoPlot v3 for processing. Results were produced as grayscale images.

In order to reduce the effect of the very high magnetic readings the data was processed by setting the absolute readings to a minimum of -25nT and a maximum of 25nT. Furthermore, to compensate for the slight discrepancy between the 'balancing' of the two sensors of the Bartington Grad 601, which produced a 'striped' appearance, a 'zero mean' process was applied to all the grids. Also there was an occasional staggered effect between the readings of individual lines due to the large number of measurements taken every metre and the difficulty of absolute consistency in the surveyor's walking pace. Therefore a 'destagger' was applied to the data.

Table 1: Processing Flow for Gradiometer Survey
Absolute -25nT/25nT
Zero Mean Traverse
Destagger (1)

The resistivity data was downloaded directly into GeoPlot v3 and no further processing was required.

Results

Gradiometry Survey

(*Figures 2, 3 & 4*)

The effects of the highly magnetic solid geology are visible in the both the raw and processed greyscale plots of the gradiometry survey. Once processed the magnetic response of the bedrock appears as short bands of strong positive (black) and strong negative (white) magnetism, some in aligned in parallel groups. The alignment of these strong readings probably relates to the magnetic orientation of minerals as they cooled during the volcanic formation of the hill. These strong readings also correspond to the locations where the bedrock is closer to the surface. The detection of any subtle magnetic archaeological features within these areas is impossible. Nonetheless, it is worth noting that a circular area of negative magnetism, bounded by more discrete strong positive readings, is coincident to the location of circular hollow on the summit of the hill.

The more neutral magnetic areas (gray) are likely to correlate to areas of greater soil accumulation on the lower slopes and hollows of the hill. Amongst these neutral readings the inner edge of the bank of the fort is discernible as a curvilinear thin band of positive magnetism, perhaps relating to the stone component of the bank. Just within the edge of the bank in the south-east corner of the survey area there are discontinuous bands of slightly negative and positive magnetic readings which may be the remains of an internal ditch and counterscarp or material built up against the bank.

Another area of potential archaeological significance is located opposite the entrance on the east side of the hill. Here there is a series of discrete circular positive magnetic anomalies, several of which form an arc. These anomalies may relate to a stone structure or formation relating to the entrance and further access into the fort.

Resistivity Survey

(*Figures 5 & 6*)

The resistivity survey was limited to the summit of the hill where the main purpose was to explore the character of the circular hollow. The results show a circular arc of high resistance just within the edge of the hollow, perhaps reflecting a stone bank or rubble on the north and east sides. From the north-east corner of the arc there is a short faint line of slightly high resistance which corresponds to a possible ramp that is just visible on the surface. Within the arc of high resistance there is a narrow circular area of lower resistance, but at the centre of the hollow, where there is a smaller sunken area, the readings again are high, suggesting a potential stone-lined feature.

To the south of the circular hollow is an area of high resistance which clearly corresponds to an outcrop of bedrock. However, to the north-west of the circular hollow there is another discrete circular area of very high resistance. This area perfectly correlates to another circular hollow, which has the potential to be the remains of a hut-platform as noted by Feachem (1963) and Sherriff (1978). If it is a hut platform, the resistivity results suggests it is likely to have little soil accumulation in its interior and would have been dug into the bedrock.

Conclusion & Recommendations

Despite the disappointing results of the gradiometry survey in detecting archaeological features on the summit of the hill, the identification of a possible inner ditch and bank on the lower slopes of the hill has been rewarding and provides a target for further archaeological work. The gradiometric survey also detected the possible evidence for a more elaborate entrance or access way, leading people into the fort. It is recommended that more work is conducted on the access routes within the interior, combining the geophysical data with 3D modelled images and more detailed topographic survey of the site.

The results from both survey techniques, but the resistivity survey in particular, highlighted the distinctiveness of the circular hollow feature on the summit of the hill, further supporting the suggestion that it was constructed or modified by humans. It is recommended that this feature is explored through further archaeological investigation.

Acknowledgements

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Figure 1: Location of the geophysical survey areas and GPS survey of the inner edge of the bank, overlain on Ordnance Survey mapping data

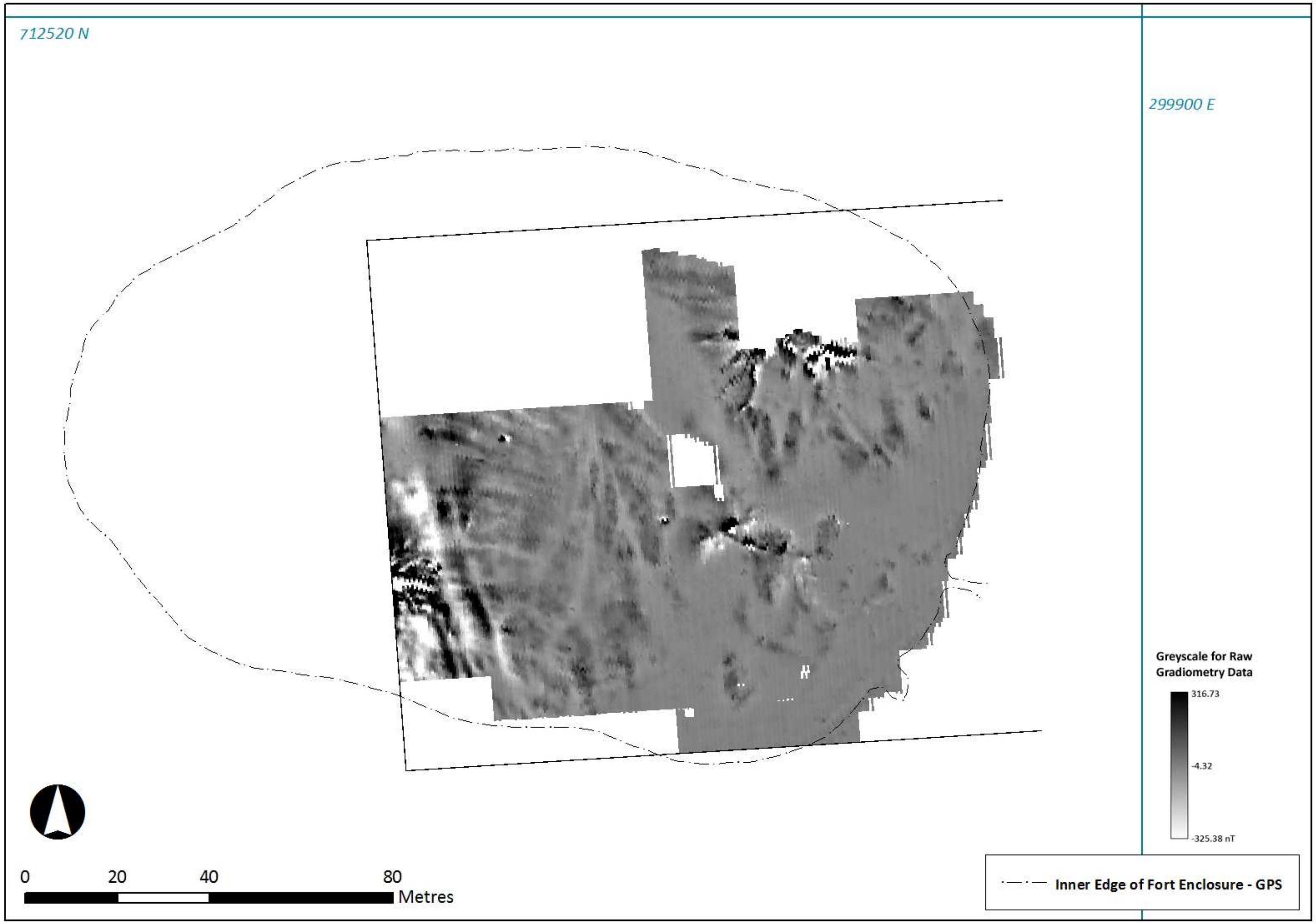

Figure 2: Raw gradiometry data

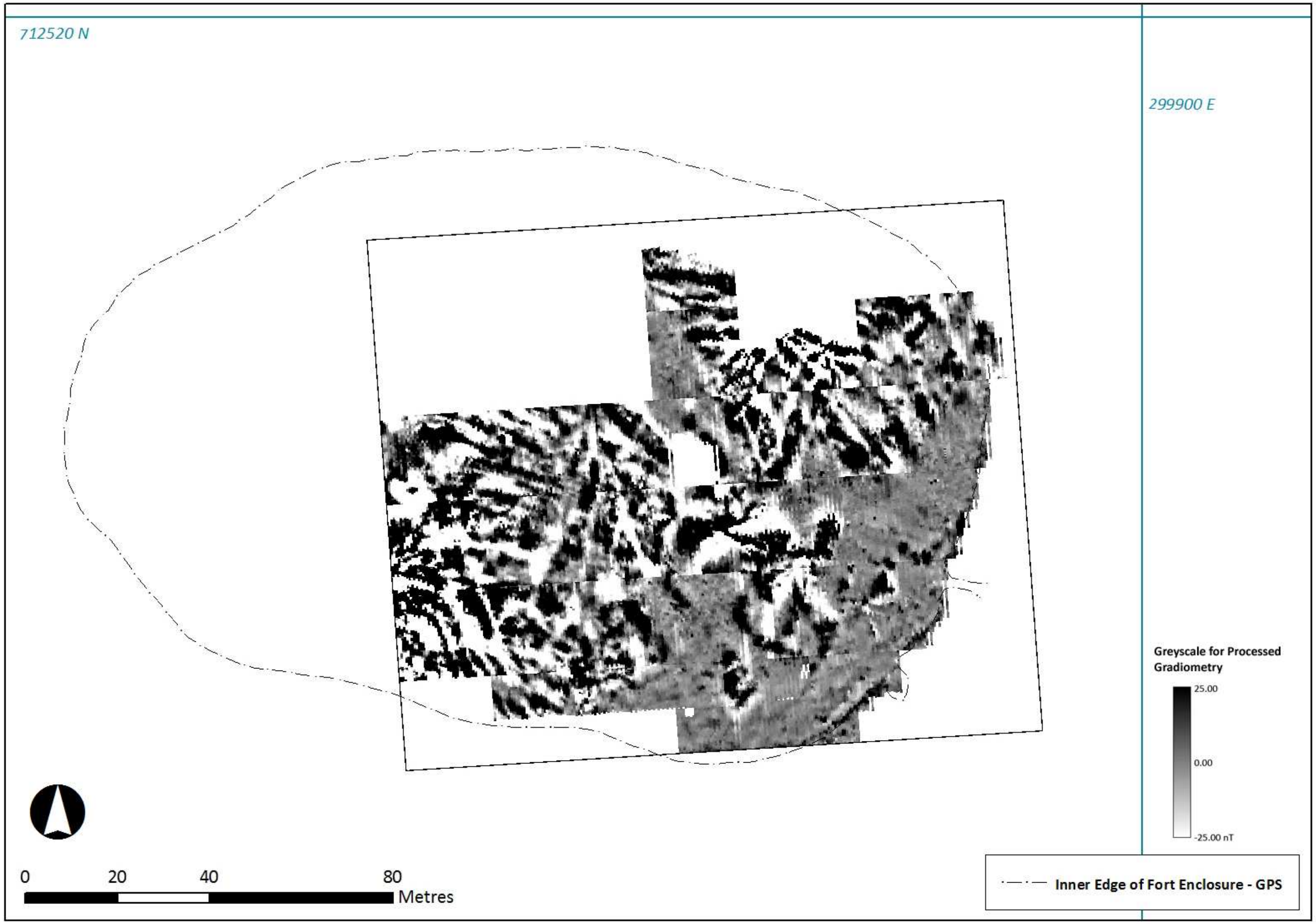

Figure 3: Processed gradiometry data

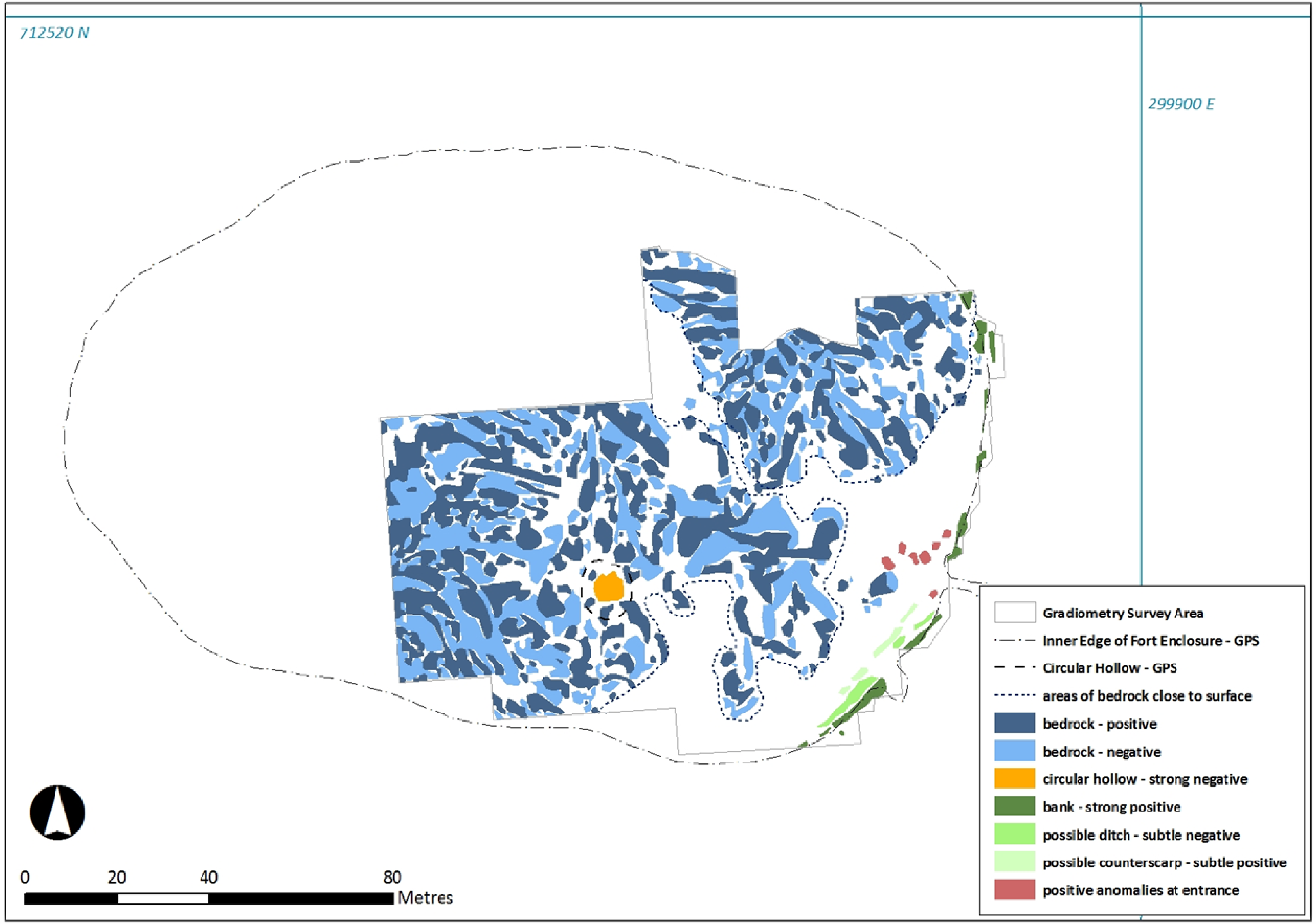

Figure 4: Interpretation of processed gradiometry data and location of hollow on summit mapped by GPS

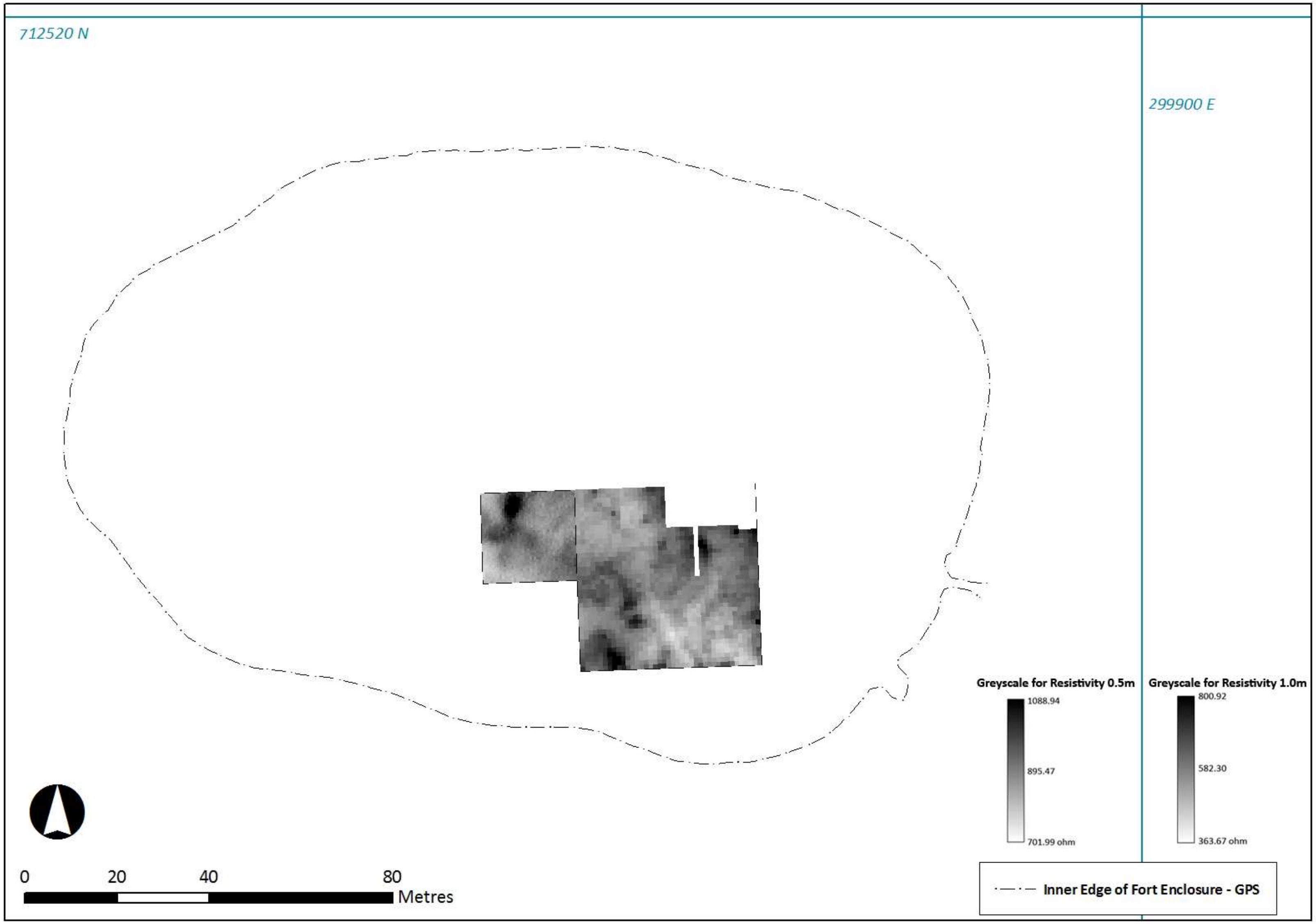

Figure 5: Raw resistivity data

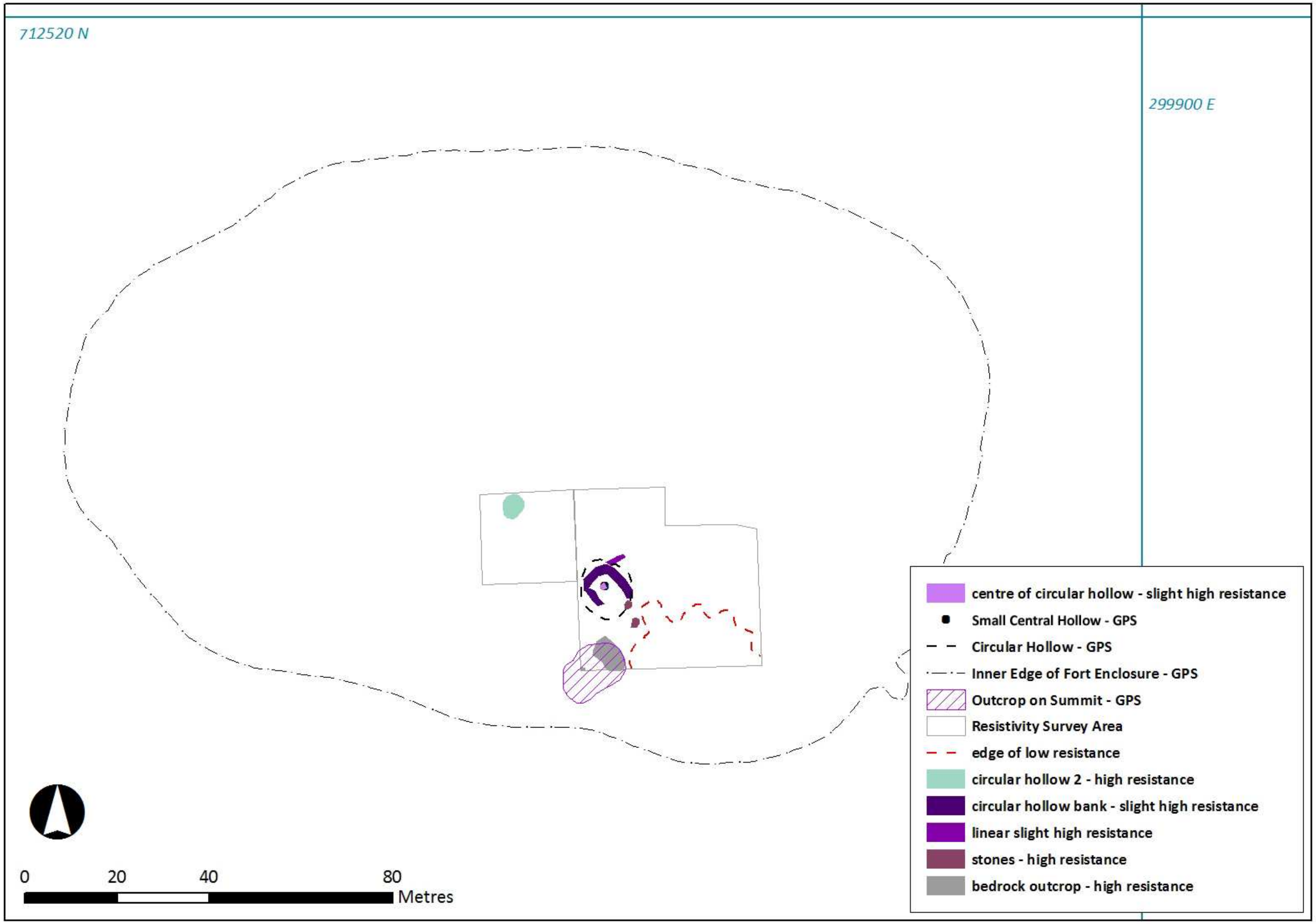

Figure 6: Interpretation of resistivity data and features on summit measured by GPS