Ogle Hill Geophysical Survey

Data Report

March 2015

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Survey undertaken by Jamie Barnes and Joss Durnan on behalf of SERF

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Summary

As part of the Strathearn Environs and Royal Forteviot (SERF) project a geophysical survey was conducted on Ogle Hill. The survey was undertaken between the 4th and 6th March 2015. The main aims of the survey were to define the character of the hill fort and to record any unknown features. Both gradiometric and earth resistance techniques were employed. The results of the geophysical survey revealed a large igneous dyke cutting across the S side of the hill. Outside of this area, in the E and W, traces of the outer ramparts were detected. Possible evidence for the outer face of the inner enclosure was recorded on the summit. A putative circular kiln was detected in the NW end of the survey are on a terraced area within the second rampart.

1.0 Introduction

A geophysical survey was carried out at Ogle Hill *(*NN 9694 1148; NMRS NN91SE 3) by Jamie Barnes and Joss Durnan, between the 4th and 6th March 2015, on behalf of the SERF research project.

1.1 Aims

The aims of the geophysical survey were:

- to detect and characterise the archaeological features identified as upstanding earthworks;
- to identify and characterise any previously unknown archaeological features.

1.2 Archaeological Description & Background

Ogle Hill fort (NMRS: NN91SE 3) is defined by two outer ramparts and an inner enclosure. The outer ramparts are largely reduced to terraces except on the E side where the banks with accompanying outer ditches are visible. Enclosing the summit of the hill, within an area approximately 40m by 20m, are the much reduced remains of a bank or wall. Quarrying is visible on the steep NW end of the hill.

Prior to SERF field investigations no known previous archaeological work had been carried out on Ogle Hill. The site had been surveyed at a large scale by the Ordnance Survey and labelled as a "Roman Outpost" on the 1st edition, but this attribution is unfounded (Figure 1).

Figure 1: Ordnance Survey 1st edition 25 inch to a mile map of Ogle Hill (OS 1866)

At the turn of the 20th century antiquarian Christison recorded Ogle Hill as part of his field survey of Scottish forts (Christison 1900). He described the summit to have the possible remains of a collapsed stone wall. He noted a rampart just below these ruinous remains and an outer work with a possible outer ditch further down slope on the E side of the hill.

In 1956, as part of the Marginal Land survey by the Royal Commission on Ancient and Historical Monument of Scotland (RCAHMS), Ogle Hill was revisited by Kenneth Steer. His observations coincided with Christison's (CANMORE: NN91SE 3). When the Ordnance Survey examined the site in 1967 it was largely overgrown and no differentiation was made of the character of the ramparts (*ibid*).

In February 2015 RCAHMS conducted a detailed earthwork survey of Ogle Hill fort as part of the SERF project (Figure 2). This survey characterised the variable preservation of the banks surrounding the hill. The outer two banks appear more substantial on the E side of the hill in the direction of easiest approach to the site. At this point outer ditches to the banks are visible. These ramparts, however, can be traced all around the hill, though in most places largely reduced to terracing. No entrances could be clearly deciphered. The NW end of the fort has been heavily quarried, removing part of the outer two banks. A low bank following the crest of the summit, again without a clear entrance gap, was recorded. No internal features relating to the occupation of the fort were identified.

The RCAHMS survey also revealed the evidence of a previously unknown excavation trench cutting across the outer two banks in the E end. According to the owner Richard Haldane this may be antiquarian excavations undertaken in the first half of the 20th century.

1.3 Geology, Topography & Vegetation

The fort lies at the end of a spur of the Ochils, running NNW-SSE, and located on the W side of the Pairney Burn, approximately 240m above sea level.

The underlying geology is igneous of the Ochil Volcanic Formation (BGS 1:50,000).

The site had been with a wooded area since the 19th century. Large trees surrounding the site were cut down several years ago with the brash left at the base of the hill. In the intervening period smaller, self-seeded, coniferous trees, broom, bracken, gorse bushes and grass grew across the site. Prior to the survey larger vegetation, such as the broom and small trees, were cut down with agreement from Historic Scotland.

2.0 Methodology

2.1 Survey Methodology

Two techniques of geophysical survey were employed: gradiometry and resistivity. The gradiometry survey was conducted using a single sensor Bartington Grad 601. A gradiometer detects and records variations in relative magnetic strength across a surveyed area. Where possible 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 2800m^2 (*see Figure 3*).

Resistivity was measured within a smaller survey area focussing on the summit of the hill. The survey was undertaken with a GeoScan RM15 with 0.5m probe separation. Readings were taken every 0.5m by 0.5m. By sending an electrical current between the probes this technique records the relative electrical resistance across the survey area. The total area surveyed was about 1000m^2) (*see Figure 3*).

The location of the survey grids were recorded using a Leica Viva dGPS with SmartNet.

2.2 Processing Methodology

The gradiometry survey data was downloaded using Grad 601 software and then imported into GeoPlot v3 for processing. Results were visualised as grayscale images and then georeferenced and interpreted in ArcGIS.

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 -50nT and a maximum of +50nT. Several grids were destaggered to compensate for differences in the surveryor's pace during survey. The NW most grid was rotated 90 degrees as this was surveyed in a different direction. No other processing was required.

The resistivity data was downloaded directly into GeoPlot v3 software. Like the gradiometry survey results the NW most grid was rotated 90 degrees as this was surveyed in a different direction. No further processing was required.

3.0 Results

3.1 Gradiometry Survey

(Figures 4 & 5)

The results of the gradiometry revealed extremely strong magnetic responses in the SE corner of the survey area. The main feature here is a linear band of strong positive and negative magnetism, approximately 8.5m wide. To the S of this there are further strong magnetic readings characterised by less coherent bands alternating between positive and negative. These strong magnetic readings are likely the responses of a geological igneous dyke. This may be a continuation of a dyke recorded just over 100m to the E of the site (see Discussion and Figure 8). Due to the magnetic strength of this feature the identification of more subtle archaeological features in this area is impossible.

In the E end of the survey area, N of the igneous dyke, traces of the outer rampart and ditches are suggested. The outer ditch appears to be characterised by a short 2m wide band of negative magnetism with the outer rampart defined as a more neutral feature, yet with a slightly stronger magnetic the core. Immediately W of the outer bank there is another band of negative magnetism in alignment with second ditch. The outer face of the second rampart is distinctly characterised at this point by a band of variable strong positive and negative magnetism. It is possible that the facing, or material within the bank, is composed of either igneous stones or materials that have been subject to high heat. Two small positive anomalies about 3.5m to the W of this line of anomalies may also be stone and perhaps defines the line of the inner face of the rampart.

Within the outer banks, running along the crest of the E side of the summit and heading towards the mid slope, there is curvilinear band of negative magnetism. This may represent a ditch or quarry of the underlying bedrock.

Overall the magnetic responses on the summit are variable with no clear structure and may largely reflect near surface bedrock. There is, however, a short narrow curvilinear positive magnetic anomaly which runs along the edge of the crest of the summit on the E side, curving slightly into the interior and possibly *in situ* stone facing of the interior enclosure. A series of small positive anomalies, forming two rough parallel lines, extending from this feature towards the W, may further define the edge of the inner enclosure. Negative amorphous anomalies immediately within these features may be a result of quarrying.

In the NW end of the survey there is a circular anomaly, about 3.5m in diameter, defined by a ring of positive magnetism with a central small positive feature set within a halo of negative magnetism. The shape and size suggest a structure which has been subject to high temperatures. This feature is situated in the same area as a circular feature of similar size depicted both on the Ordnance Survey 1st edition and 1st revision (see Discussion and Figures 10 & 11).

Down slope, in the NW end of the survey, the magnetic signature is generally neutral, but the inner line of the second rampart is visible as slightly more positive curvilinear response. Stronger positive anomalies further downslope may be igneous stones within or part of the outermost rampart.

3.2 Resistivity Survey

(*Figures 6 & 7*)

The resistivity survey focussed on the summit of the hill with the aim of detecting any internal features associated with the fort. The results revealed high resistance features in the SW end of the survey area, one of which appears curvilinear; however, this does not match the orientation of any know archaeological feature. This feature may characterise an annex within the inner enclosure, or, more likely, correspond to near surface bedrock outcrops. In any case, it cannot be certain whether this is structural or natural or a combination of both. Towards the NW some of the higher resistance areas may define the inner enclosure, but this is unclear from the limited area surveyed.

In the NW end of the survey, just offset from the ring of positive magnetic identified in the gradiometric survey, is a circular anomaly of high resistance anomaly, about 3.5m in diameter. Perhaps this is architectural remains or ruins of the structure collapsed to the NW.

Downslope there are two distinct areas of high resistance which appears to define the slope of the outer two ramparts, indicating consistent high resistant material such as bedrock or structural *in situ* material.

4.0 Discussion

Geology

An igneous basaltic dyke of the Central Scotland Late Carboniferous Tholeiitic Dyke Swarm lies approximately 100m to the E of Ogle hill (Figure 8) (BGS 1:50,000). This dyke is in line with the strong magnetic feature that cuts across the S slope of Ogle hill and is therefore likely continues further than previously recorded.

A raised area on the summit of the hill recorded during the RCAHMS survey was thought to be outcropping bedrock. The results of the geophysical survey, revealing variable magnetic and resistance readings, appear to corroborate this suggestion.

Ramparts

Only small areas of the ramparts were detectable within the survey area due to the magnetic interference of the igneous dyke. Nonetheless, in the E end the results of the gradiometry survey suggest that the characters of the outermost and middle rampart are different. The outer rampart had a positive magnetic core with a more neutral slope indicating different elements comprising the structure of the rampart or signalling the distinction between *in situ* and disturbed rampart material. The bulk of the middle rampart was characterised by a more consistent magnetism with very strong magnetic signatures defining the outer edge or face. These readings suggest that this rampart has a distinct edge facing, perhaps composed of igneous stone or this *in situ* burnt materials.

The results of the gradiometric survey support the presence of corresponding outer ditches on the E end of the site, where the approach is easiest. On the NW side of the hill the area between the outer ramparts is defined by a more positive magnetism, a very different response and therefore suggesting the construction of the ramparts are different on this side. The results of the resistivity survey show the slopes of the ramparts to be of higher resistance of the crest. This may reflect the remains of a coherent stone structure defining the bank, but may also be a response of the underlying bedrock close to the surface and therefore suggesting the banks may not survive to a great height here.

Inner Enclosure and Internal Features

Christison (1900) describes the inner enclosure as a scarp of loose stone, but such a feature was not differentiated in the geophysical survey results. Nonetheless, within the gradiometric survey results a possible line of *in situ* stone, characterised by small positive anomalies and a curvilinear feature, defining the remains of the inner enclosure was detected. The curvilinear feature curves inwards and may suggest a possible entrance.

There are several amorphous anomalies within the inner enclosure of the fort, but no other clear structural features were identifiable.

Circular Feature – Possible Kiln

A possible kiln or circular structure, about 3.5m in diameter, was identified through the gradiometry survey. A similar sized circular feature is depicted on the Ordnance Survey 1st edition map (1866). A track curves around this feature and rides up and over the hill towards the E. Another similar feature is depicted about 500m to the NW situated in the middle of the same track. The high magnetic response suggests that this feature has been affected by a high temperature which has altered its magnetic character, perhaps a kiln. The function or reason for a possible kiln on the hill is unclear.

5.0 Acknowledgements

The author would like to thank Richard Haldane of Cloan for kindly giving us permission to conduct this survey. The survey was heroically undertaken by Jamie Barnes and Joss Durnan in very windy conditions with the help of Leonie Teufel. SERF is sponsored by Historic Scotland.

6.0 References

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OS (Ordnance Survey) 1866 25 inch to a mile ‘Perth and Clackmannan Perthshire Sheet CXVIII.7 (Combined)’ Surveyed 1860.

OS (Ordnance Survey) 1901 25 inch to a mile ‘Perth and Clackmannanshire Sheet 118.07’ Revised *c.* 1899.

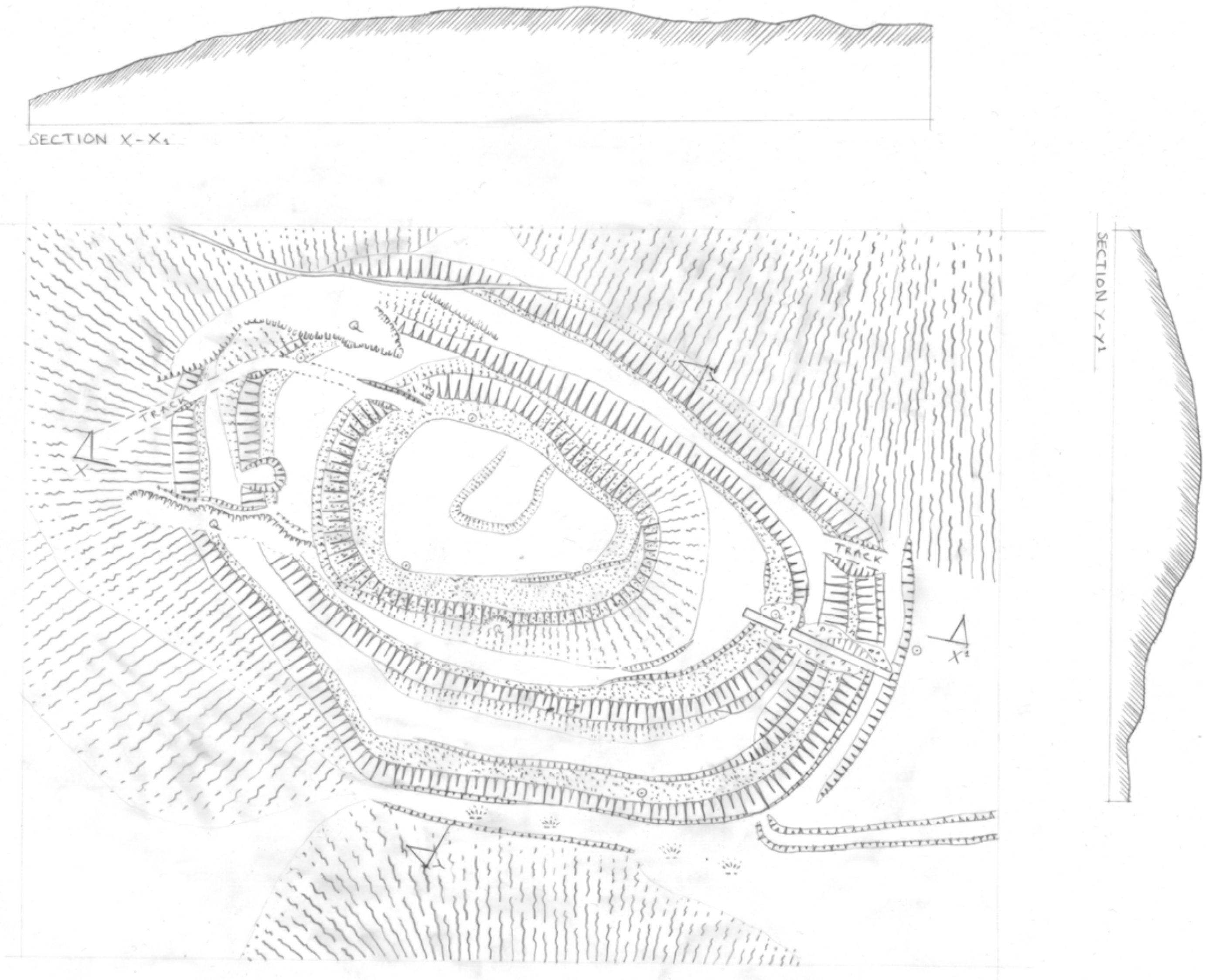

Figure 2: Draft earthwork survey of Ogle Hill (field drawing) by RCAHMS ©Crown Copyright

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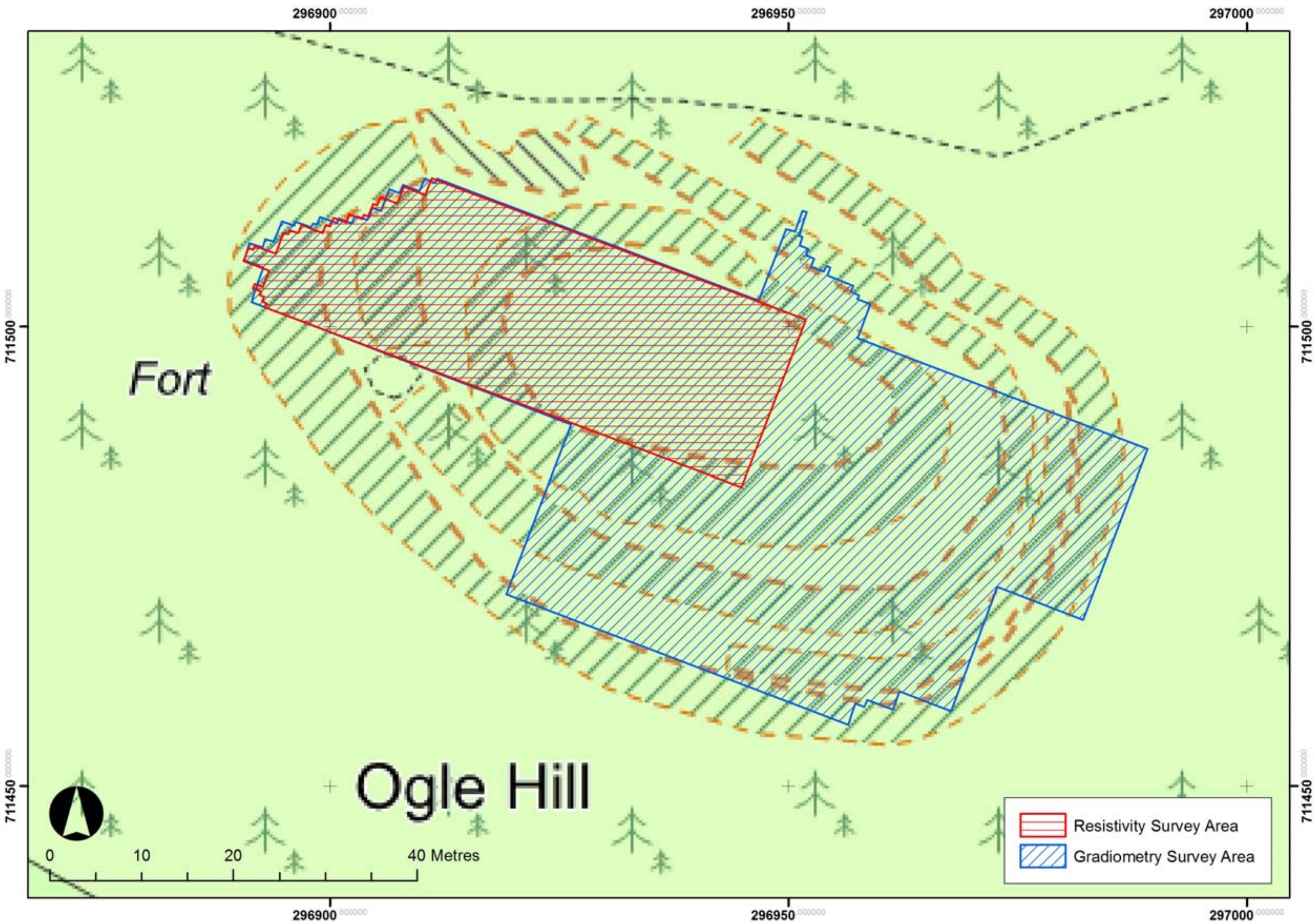

Figure 3: Location of the geophysical survey overlain on OS mapping (OS mapping from EDINA Digimap)

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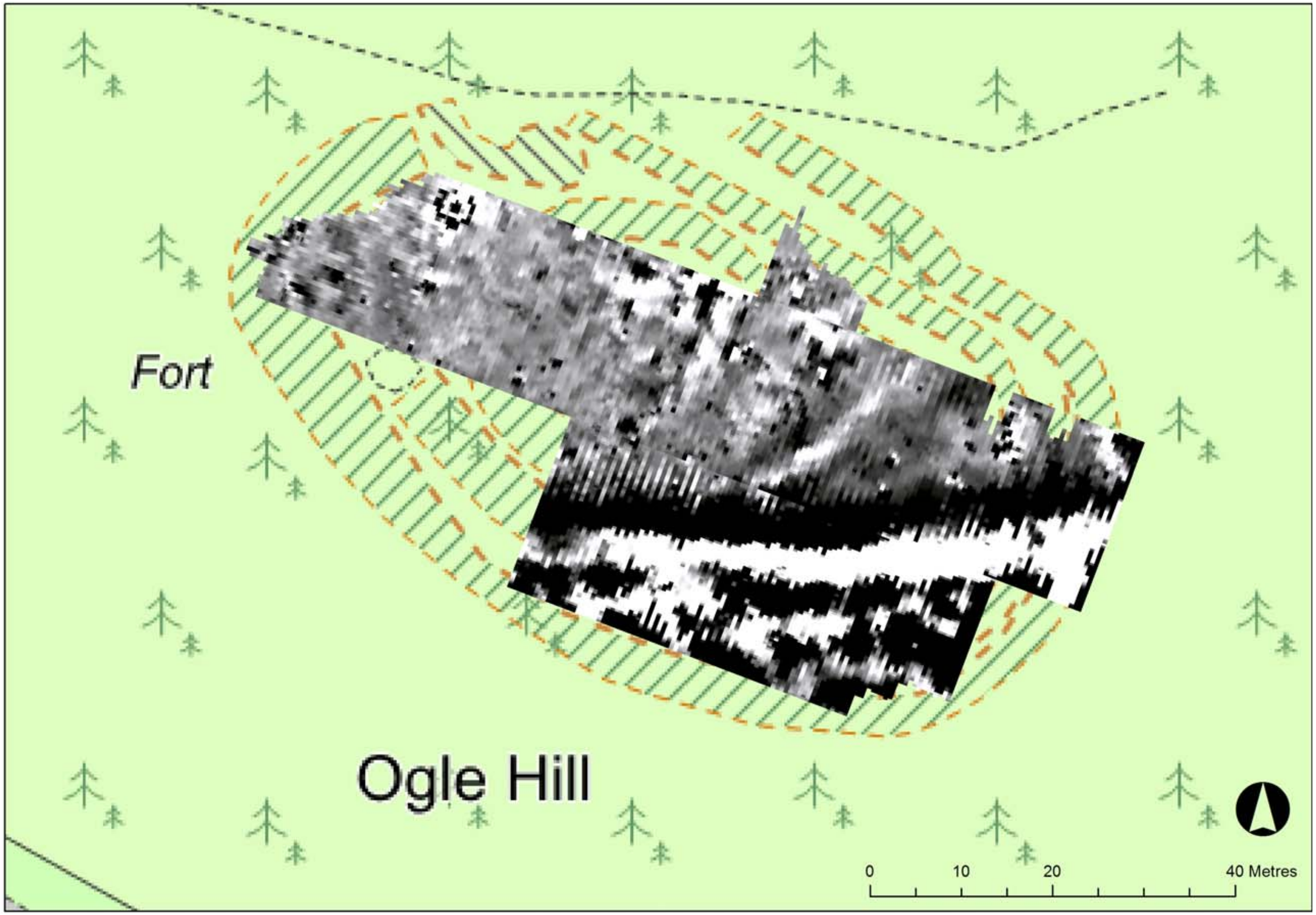

Figure 4: Gradiometry data

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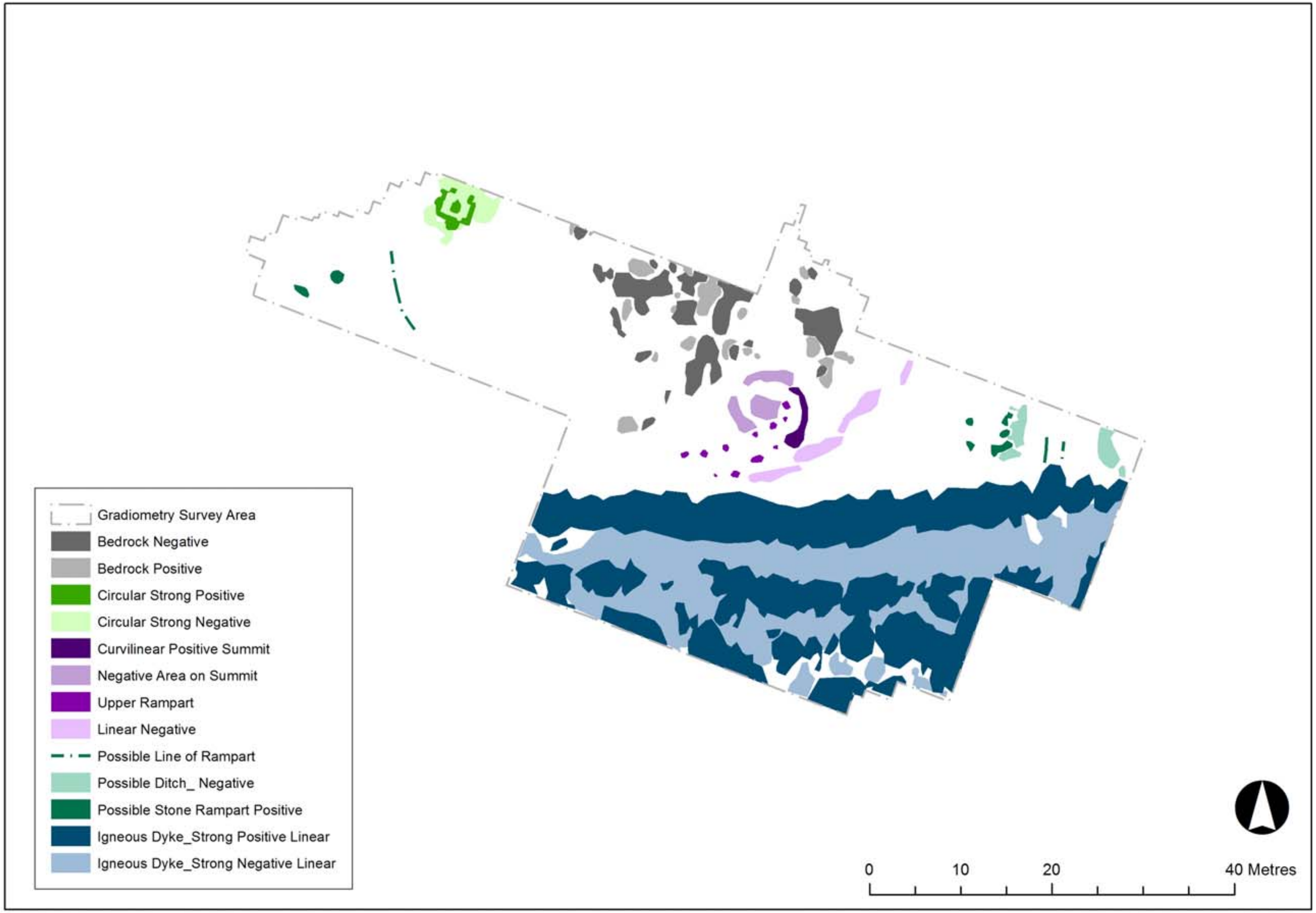

Figure 5: Interpretation of Gradiometry Data

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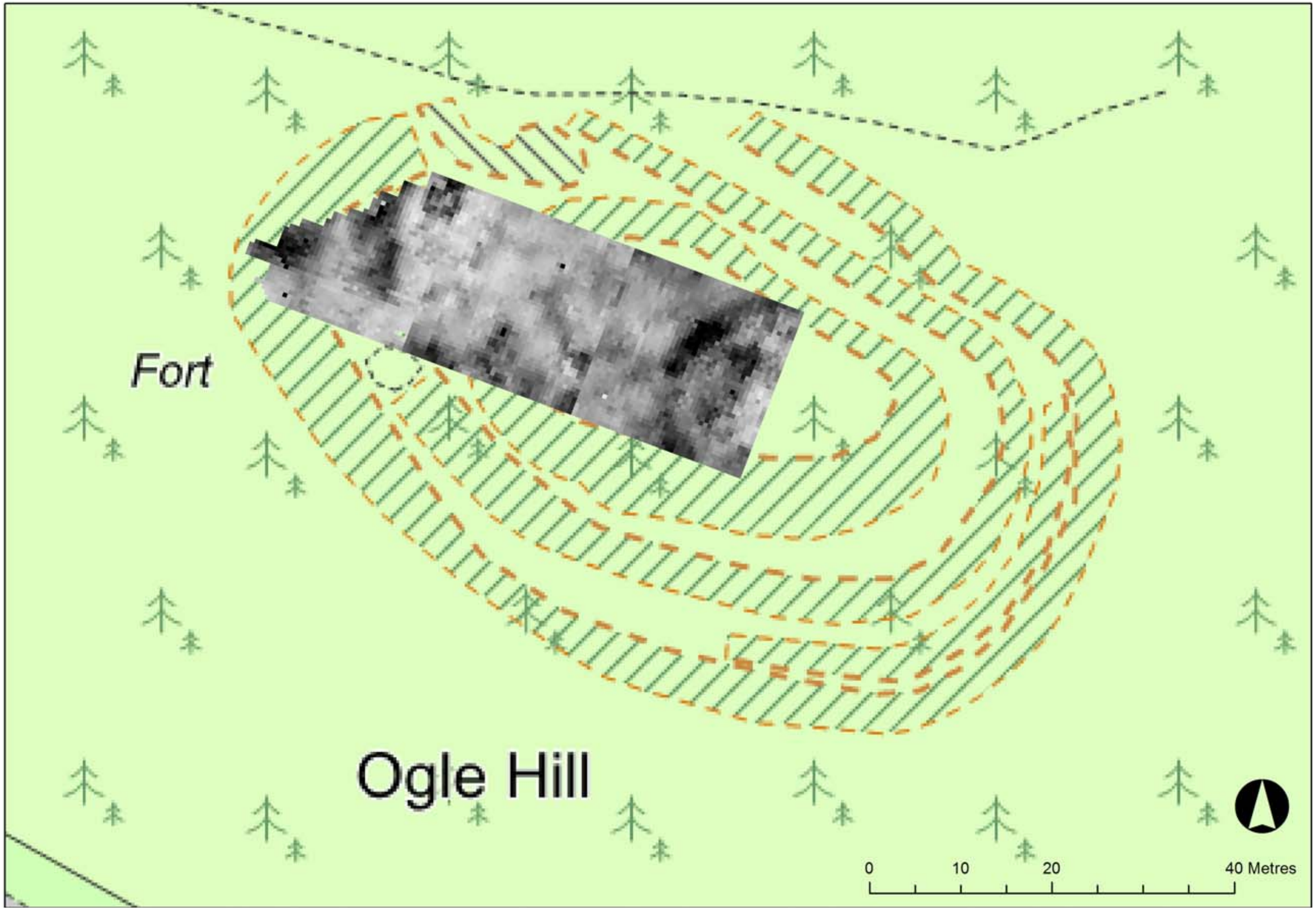

Figure 6: Resistivity Data

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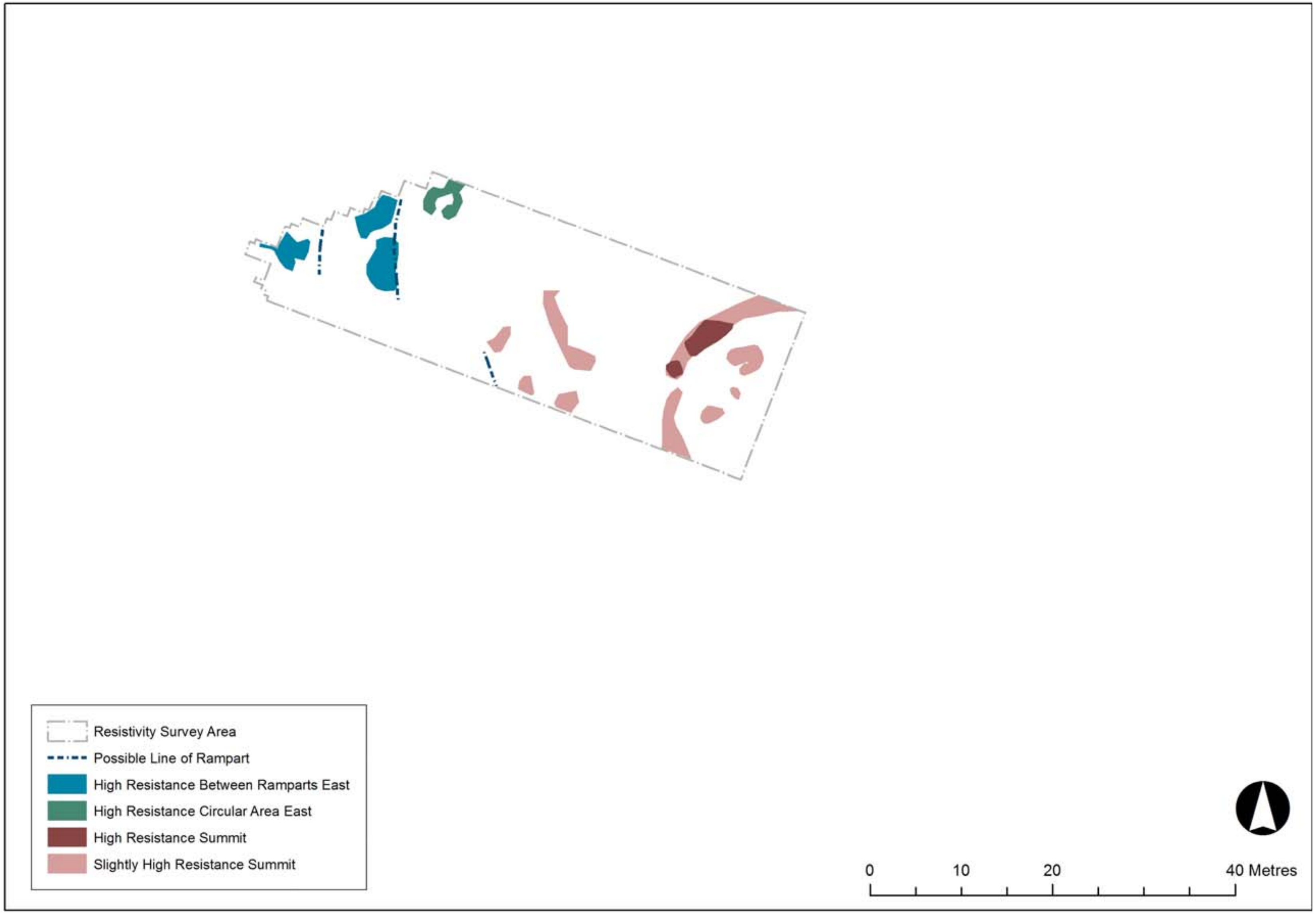

Figure 7: Interpretation of Resistivity Data

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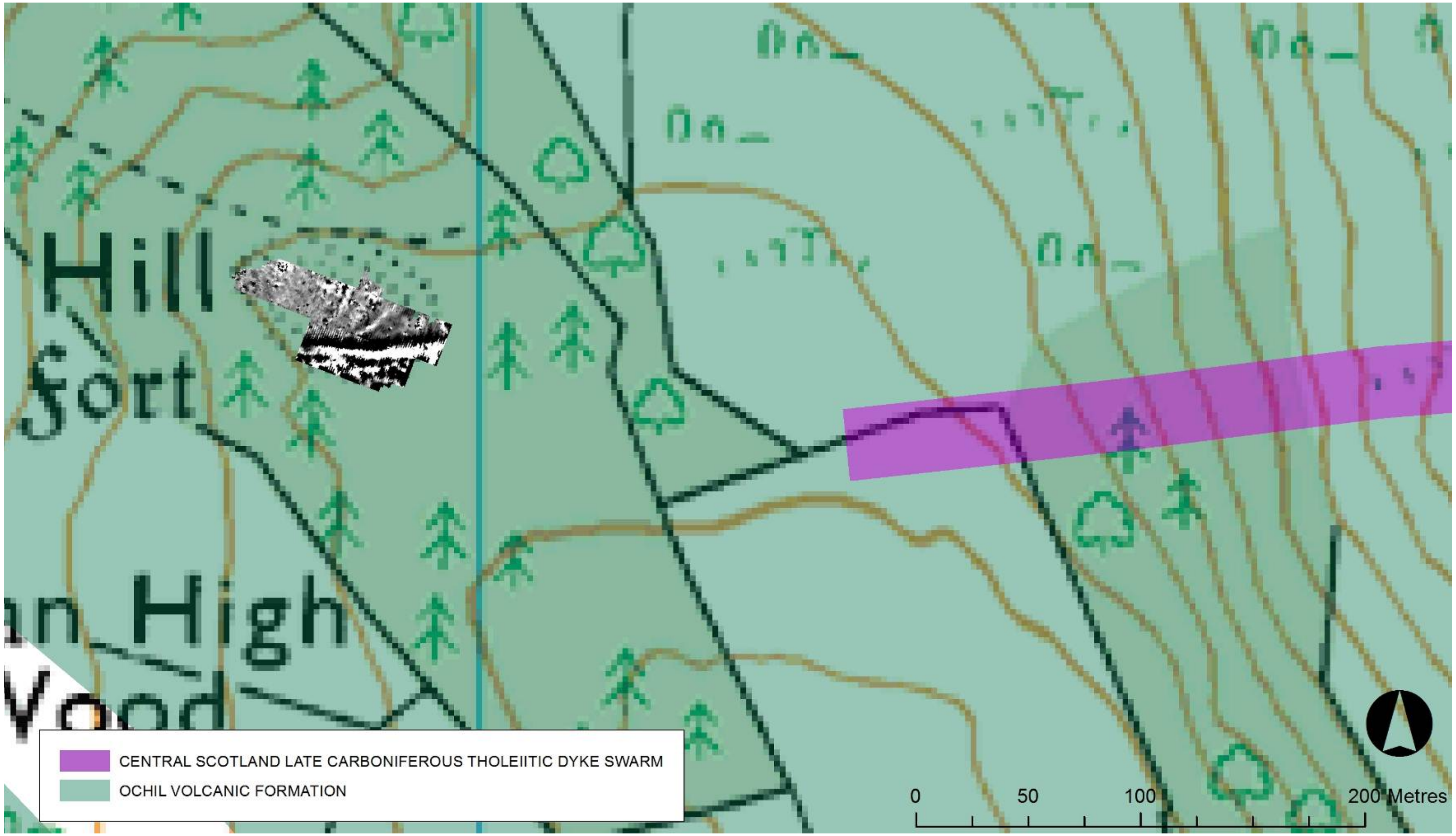

Figure 8: Gradiometry data with geology map and OS 1:25,000 base map (BGS and OS mapping from EDINA Digimap)

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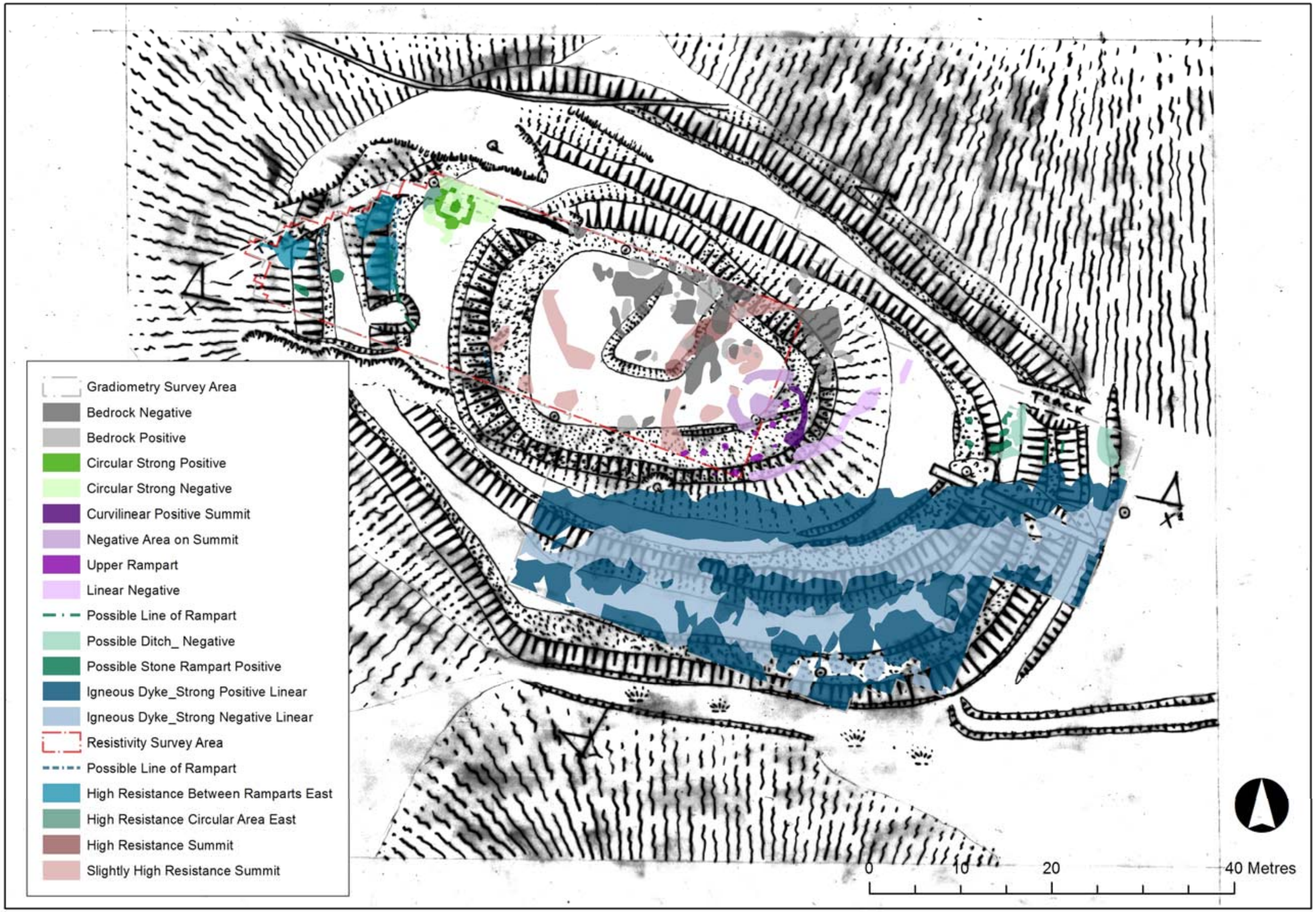

Figure 9: Geophysical interpretation with draft RCAHMS survey of Ogle Hill ©Crown Copyright

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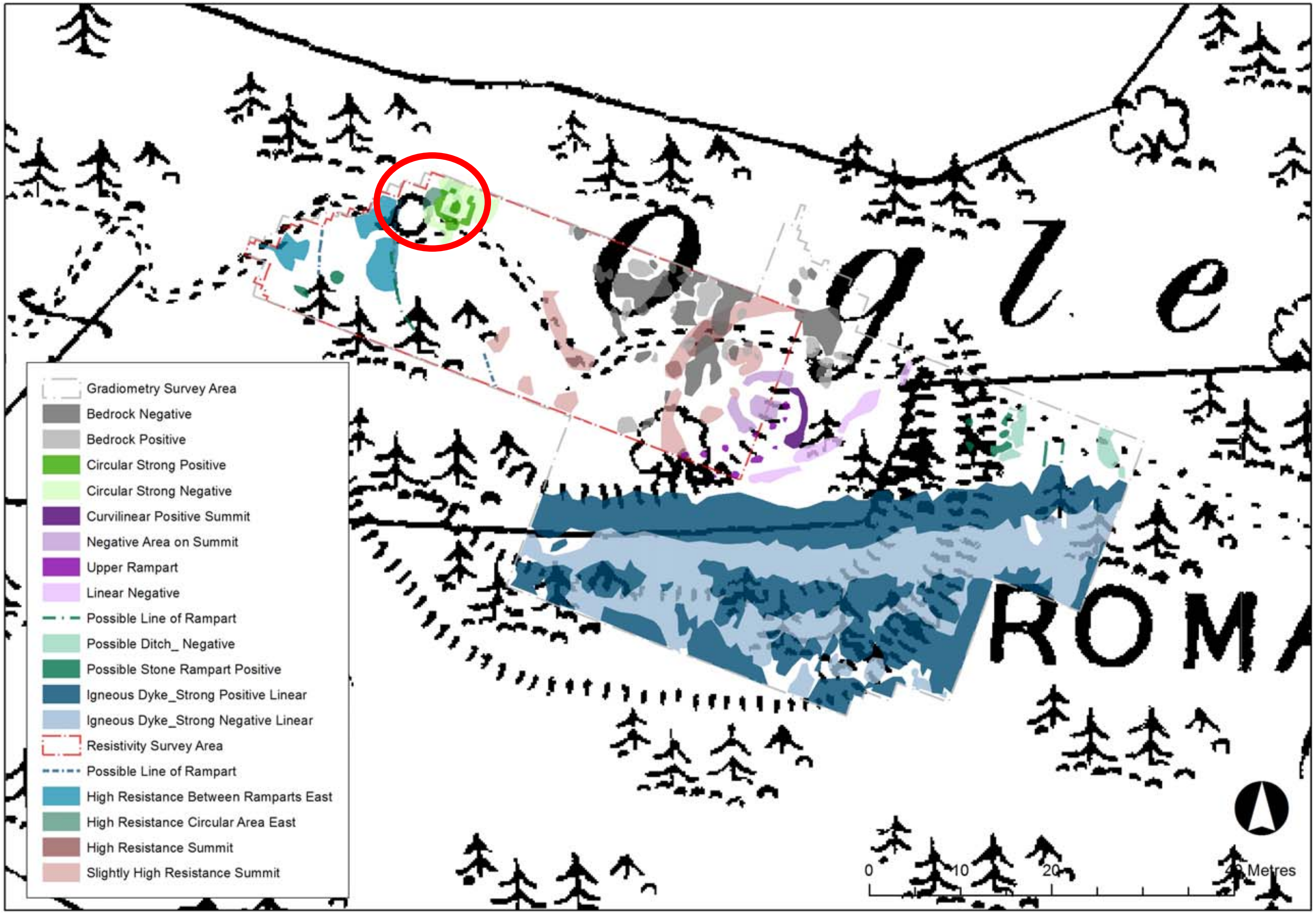

Figure 10: Geophysical interpretation with Ordnance Survey 1st edition 25 inch to a mile map (red circle showing possible kiln)

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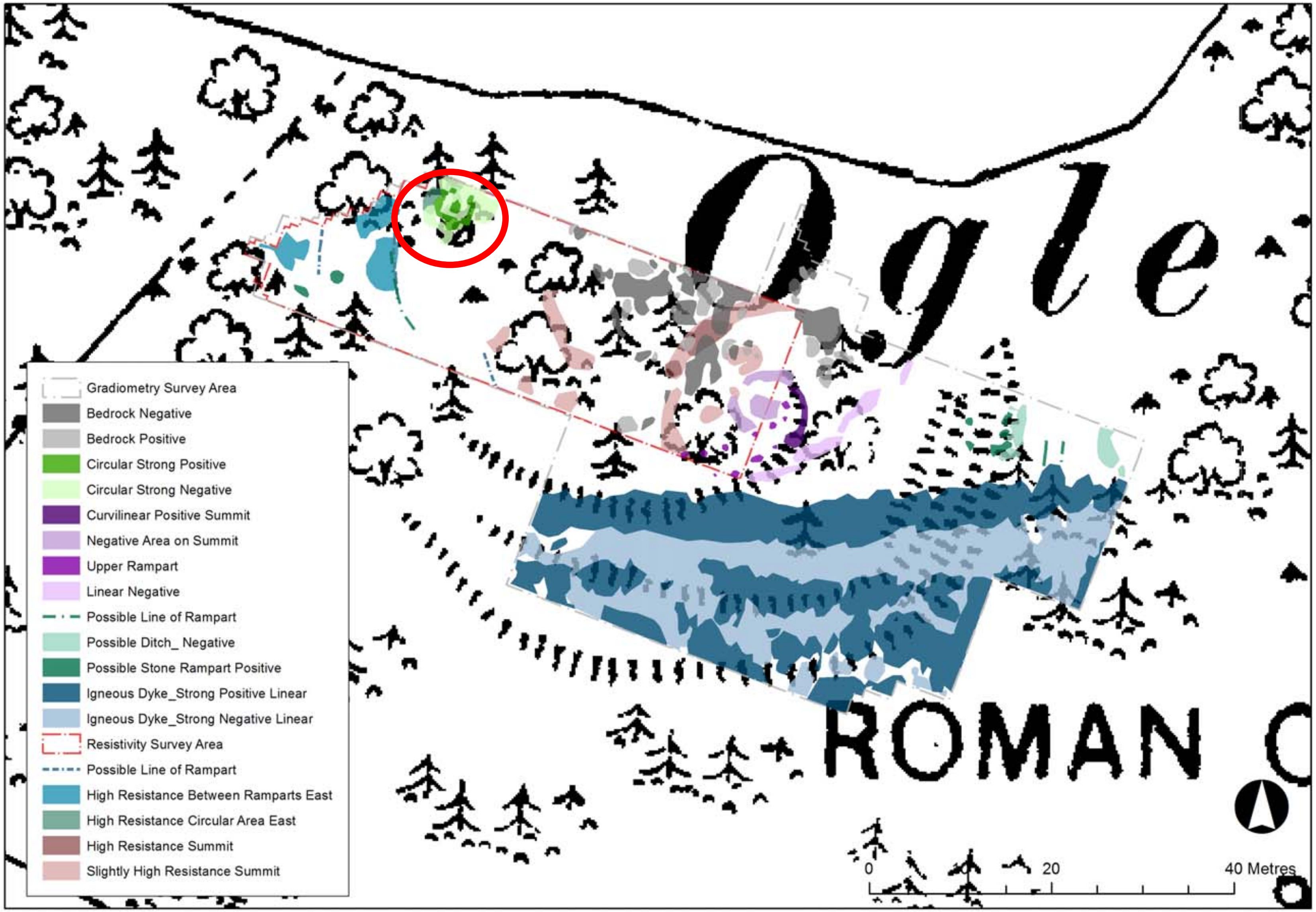

Figure 11: Geophysical interpretation with Ordnance Survey 1st revision 25 inch to a mile map (red circle showing possible kiln)