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CASTLE HILL, MOTTISTONE, ISLE OF WIGHT A GEOPHYSICAL SURVEY

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Abstract *As part of a larger archaeological study of the National Trust Mottistone Estate, the Isle of Wight Natural History and Archaeological Society conducted a survey of the scheduled ancient monument known as Castle Hill. A combination of new geophysical data and accurate LiDAR surface data revealed an array of new features. These could not be explained by the natural surface topography or subsurface geology of the site and are now considered to be archaeologically significant. The survey included a study of the wider setting of the earthwork and its possible relationship to an historic landscape. The results of the survey support a case for further investigation to establish the date and purpose of the earthwork.*

Keywords: Archaeology, Isle of Wight, Mottistone, geophysics, LiDAR, Iron Age

INTRODUCTION

Aims and purpose

The Isle of Wight Natural History and Archaeology Society continues to conduct its extensive landscape survey of the Mottistone Estate. The purpose of this survey is to inform and assist the Trust's nature recovery plans. These are now shaping long-term land management prescriptions throughout the estate.

The estate includes the Castle Hill earthwork, a scheduled ancient monument that has already been subject to changing land-use regimes. The non-invasive survey, described here, has sought new geophysical data and LiDAR (LIght Detection And Ranging) data with the purpose of gaining a better understanding of this hilltop monument and its vulnerabilities. The study also considers the wider landscape setting of this hilltop earthwork.

Past evaluations

Past evaluations of the Castle Hill earthwork have ranged from Iron Age to medieval, the former being commonly favoured. The suggested function of the monument has ranged from defended settlement to stock enclosure. Basford (1980) suggests an Iron Age date; in a detailed discussion by Currie (2003), a similar conclusion has been drawn. Unfortunately, there are no contextual artifacts to support any of these proposals. The new geophysical survey has enhanced discussion while still leaving the questions of date and purpose unresolved.

Site Location and Description

The Castle Hill earthwork is located on a high ridge of Upper Greensand in the south-west sector of the Isle of Wight. It is 470 metres north of the village of Mottistone, now in the parish of Brighstone, formerly known as Brixton (Fig.1). Long known as Castle Hill it is a Scheduled Monument (Historic England 1995, SAM 22063; NGR: SZ 4088 8407). The earthwork lies 1.8 kilometres inland on a hilltop offering extensive southerly views over the coastal plain and sea. To the north, it is overlooked by the Island's central range of chalk downs.

Castle Hill earthwork is sub-rectangular in shape and aligned approximately north-south. The internal area of 0.3 hectare, c.55 metres long and c.58 metres wide, is enclosed by a bank c.5 metres wide and c.0.3 metres high. Beyond this is a ditch that is now seen to be c.5.75 metres wide and c.0.5 metres deep. A shallow counterscarp bank is c.10 metres wide and c.0.5 metres high. The earthwork does not appear to survive beyond an historic field boundary on its east side.

Damage and attrition

In a summary of past land-use, Currie (2003) records that the site was planted with conifers by the Forestry Commission circa 1930. Storms in 1987 and 1991 uprooted trees in the plantation, damaging the structure of the earthwork. Further damage was likely caused during the removal of the remaining trees in 1998. Currie estimates the total damage amounts to 50% of the total earthwork.

Although the site has been restored to heathland, it is unprotected. There is ongoing damage from human and animal activity; particularly from free-roaming cattle. Sometime shortly before 1973, a service trench was cut across the site to serve

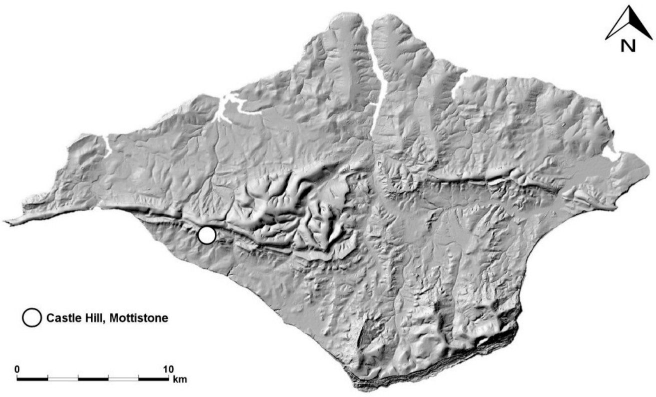

Fig. 1: Location of Castle Hill, Mottistone, Isle of Wight GR SZ409841

Fig. 2: Aerial photograph of Castle Hill – viewed from the north, looking south

Longstone Cottage. The impact of this trench was not recorded. These past and present disturbances to the site, will likely have impacted the imagery of the geophysical data, particularly in the upper soil levels.

Geology and Soils

The solid geology of the site comprises the Cretaceous Sandrock Formation of the Lower Greensand Group (Fig. 3: British Geological Survey, 2013). This, comprises a yellow sandstone interbedded with harder argillaceous rock. Some large ferruginous concretions noted on the site may possibly derive from the degraded bank.

The surface covering of the site comprises a light sandy loam, capped by shallow humus. The loam is derived from a bedrock that transitions into a 'pale yellow sub-soil' (Basford 1999).

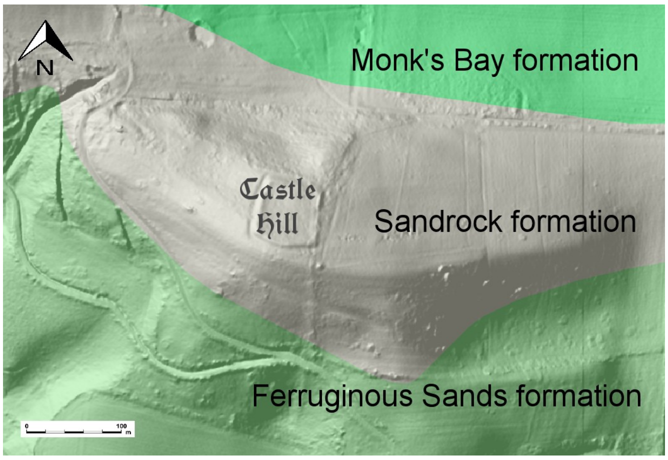

Fig. 3: Bedrock geology around Castle Hill (based on British Geological Survey 2013)

Viewshed

A viewshed is the geographic area visible from a specific location. Fig. 4 shows the viewshed from Castle Hill when observed from its highest point, 143 metres OD. This sweeps a wide arc south from St Catherine's Down (A), in the east, across the coastal plain to West High Down (B), in the west. Further west, a partial view of the Dorset coastline depends upon the prevailing atmospheric visibility. The northern viewshed is limited by the chalkland summit of Mottistone Down. This rises to 201 metres OD at its highest point.

The Neolithic long barrow with its megalithic standing stone (The Longstone) is sited some 200 metres west from Castle Hill. Both lie in convenient proximity to a ponded spring at SZ 40808425 (Figs. 7 & 8). The Longstone is considered to be the location of an Anglo-Saxon 'moot', accessed by an ancient sunken pathway leading from the south (Figs. 7-9; Mills, 2001,72).

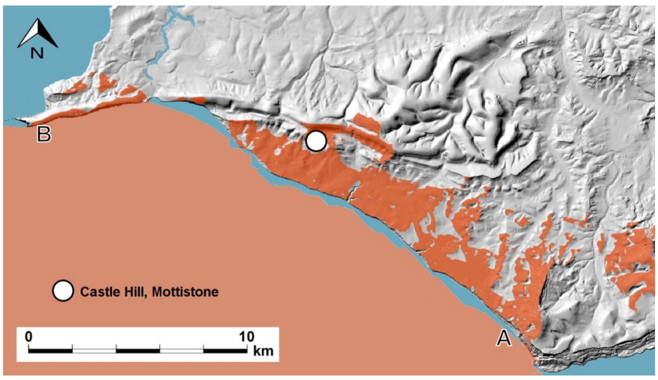

Fig. 4: Viewshed from the southern bank of Castle Hill

Map analysis

The LiDAR model (Fig.10) shows a sub-rectangular enclosure with a complete boundary bank and an external ditch now surviving on all but its eastern side. The eastern boundary is coterminous with an

Fig. 5: Castle Hill location from 1793 OS drawing (OSD 70, British Library) 6 inches:1 mile (not to scale)

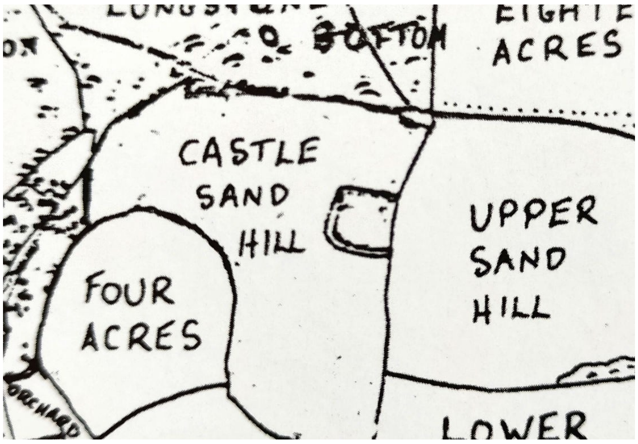

Fig. 6: Castle Hill location with field names, taken from tithe and estate maps of c.1820

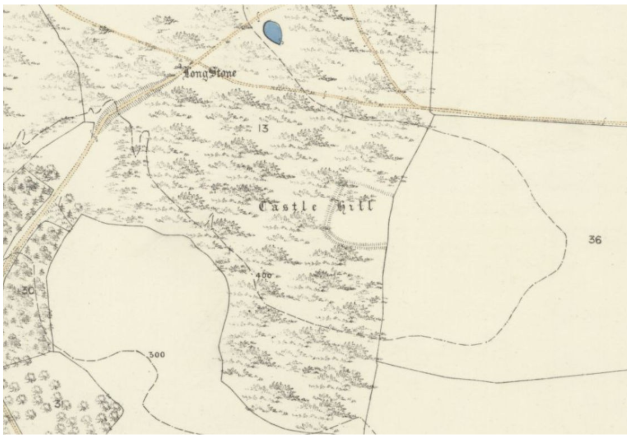

Fig. 7: Castle Hill, The Longstone, and the ponded spring. Shown on the 1862, First Edition of the Ordnance Survey Map drawn at 25 inches to 1 mile

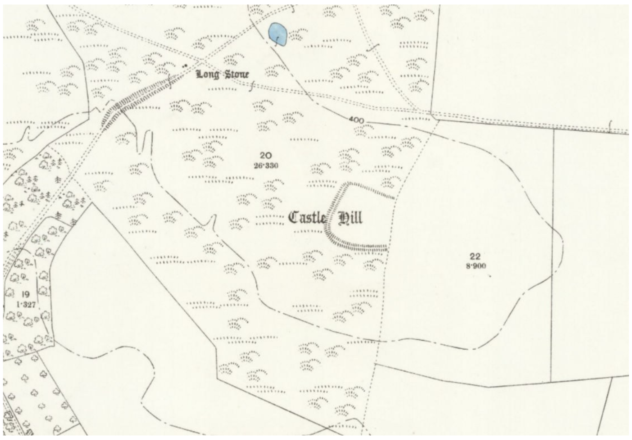

Fig. 8: Castle Hill, taken from Ordnance Survey Map 25 inches to 1 mile of 1898, showing Longstone, pond and hollow way.

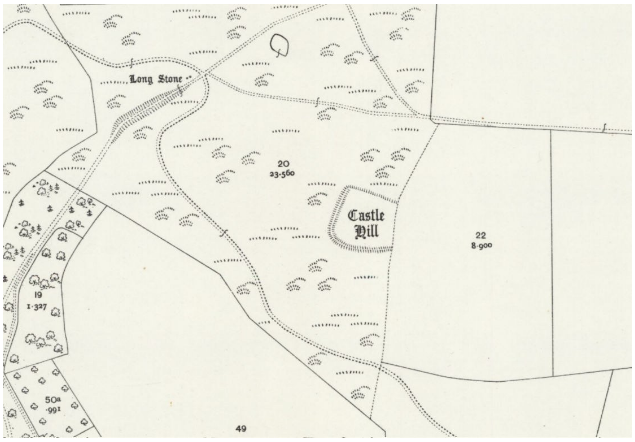

Fig. 9 Castle Hill;, taken from Ordnance Survey map 25 inches to 1 mile of 1908

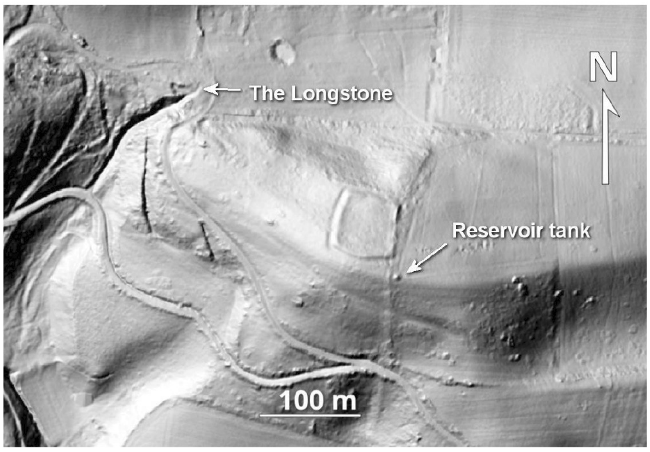

Fig. 10: Castle Hill area 1m LiDAR Digital Terrain Model

historic north-south field boundary. The maps of 1820 to 1862 (Figs. 6 and 7), show a continuous field boundary line along the eastern side, with no bank indicated. This suggests by 1820, the original eastern bank had all but disappeared. On the later two maps of 1898 and 1908 (Figs. 8 and 9), the eastern side is shown by a broken line while elsewhere on the maps field boundaries are shown to be continuous.

All four maps are consistent in the depiction of the eastern boundary as they are with the northern boundary. From the map evidence, the eastern 'bank' shown in Fig.10 appears to be a more recent construction. Unlike the western and southern boundary enclosures, the northern enclosure boundary largely comprises a northern facing slope but no bank to match those on the western and southern sides. It could be the presence of this dip slope made it unnecessary to build a ditch on this side. Alternatively, the ditch may have been naturally in-filled by down-slope soil-creep.

LiDAR

LiDAR data offer a further means of examining this site. Within the area enclosed by the bank and ditch, slope analysis (Fig. 11) shows that this surface slopes towards the north This leaves a relatively level area covering the northern third of the enclosure. Within this area there is a sub-circular feature of approximately 30 metres diameter. This occupies the same central north-south axis as the similar features observed in the geophysical data. This could be the result of more recent activity related to the forestry industry or may have some archaeological significance.

The north boundary beyond the edge of the enclosed area is expressed as a steep slope followed by a levelling, before resuming the steep dip slope into the valley.

The abrupt and very straight change of slope on the east side appears to confirm our suspicion that the original bank and ditch arrangement has been lost to ploughing along the field boundary. Bailey (1985) states 'Farmer no longer ploughs [the] N-E strip about 11m wide next to site, due to large lumps of 'limestone' being pulled up causing damage to plough'. (Note: local geology indicates sandstone not 'limestone'). The ground surface here is further complicated by the works carried out to install the water pipe from the reservoir tank (Fig. 10). It is likely the original alignment of the bank and ditch was a few degrees clockwise, i.e. more parallel to the western boundary.

Immediately to the north-east of the enclosed area there is a levelling of the terrain showing a possible platform which could correspond to an entranceway into the enclosure. The down-slope movement of soil due to ploughing damage to the east bank may offer an alternative explanation for this feature.

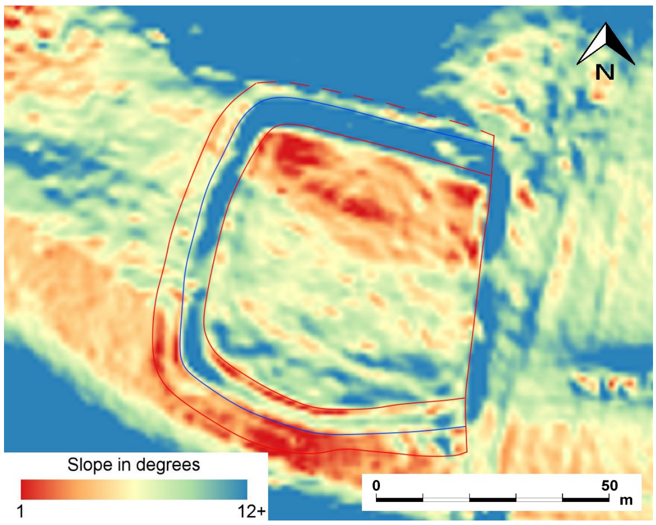

Fig.11: Slope analysis of LiDAR data

GEOPHYSICAL SURVEY

Introduction

The two methods employed in the geophysical survey were Ground Resistance and Magnetic Gradiometry. Both had the potential to reveal a broad range of sub-surface anomalies that could include features of archaeological interest. Distinction has proved to be a challenge where other disturbances had occurred during the history of the site.

In the 1930s the area was planted with conifers by the Forestry Commission. This plantation was well established when, in 1987 and 1991, storms caused major damage, uprooting many mature trees. The resulting damage from these storms, together with the subsequent use of heavy machinery, in 1997/98, for the removal of the trees, will have disturbed the ground within the top metre or so. This damage has likely adversely limited the quality of the geophysical data.

Immediately prior to the survey, the site was covered with brambles and bracken, up to a height of 1m. This was cleared by the National Trust ground maintenance team to allow access for the survey.

The survey grid was planned using the LiDAR terrain data (Fig. 12). A total of 16 grid squares, each 20m by 20m, were positioned to cover the earthwork. Several additional grid squares around the periphery were planned as possible additions, subject to initial results and accessibility.

Methodology

In the field, the grid was positioned using a baseline defined by GPS and calibrated with measuring tapes. Each grid corner was marked with a numbered softwood post that remained in-situ throughout the survey. A GPS location was recorded for each post.

The earth resistance survey was carried out using a Geoscan Research RM15-D Resistance Meter. Data points were acquired at 1m intervals along traverses of 1m spacing across each 20m x 20m grid square (i.e 400 data samples per grid square).

The magnetic gradient survey was carried out using a Bartington Grad601 high-resolution fluxgate gradiometer. Data points were acquired at 0.25m intervals along traverses of 1m spacing across each 20m x 20m grid square (i.e. 1600 data samples per grid square).

Processing of Resistance Data

The earth resistance data (Figures 13 and 14) were processed using Geoplot 4 software. The following steps were applied:

· Edge matching of grids to correct bulk differences due to data acquisition covering several sessions over a number of weeks

· De-spiking to remove anomalous values caused by electrical ground contact issues due to rocks and organic material

· Data interpolation to aid visual interpretation

· Low Pass filtering to reduce local random noise

Processing of Magnetic Data

The magnetic gradiometer data (Fig.15 and 16)

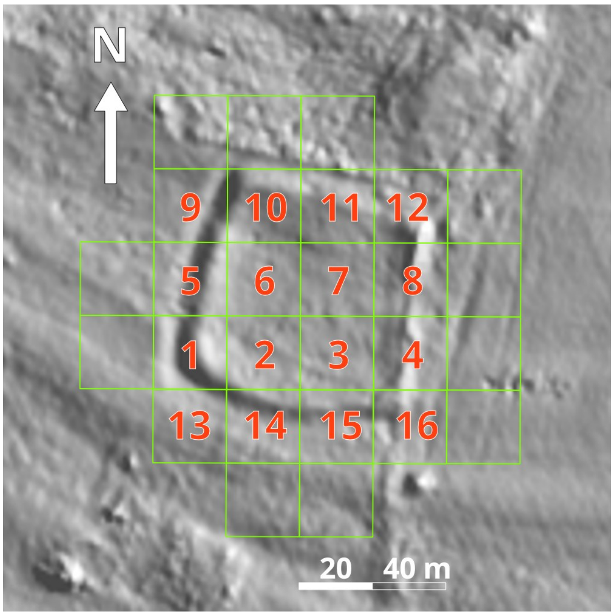

Fig. 12: Survey grid over LiDAR layer

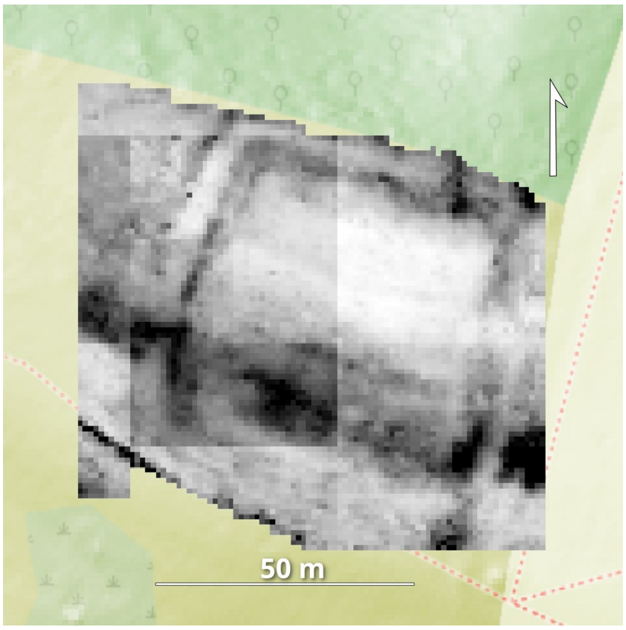

Fig. 13: Raw earth resistance data

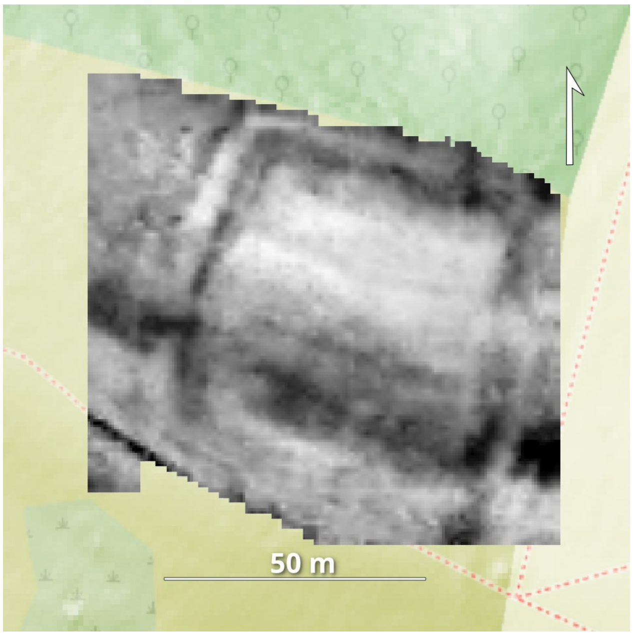

Fig.14: Processed earth resistance data

were processed using Geoplot 4 software. The following steps were applied:

· Data clipping to reduce high magnitude anomalous values from local ferrous objects such as modern debris and buried pipes
· Zero Mean Traverse to remove bulk variations between the magnetic sensors
· De-stagger to compensate for small positional errors caused by traversing rough ground using a zigzag pattern
· De-spike to reduce local anomalous values from soil minerals and farm debris
· Data interpolation to a regular grid to aid visual interpretation
· Low Pass Filtering to reduce local random noise

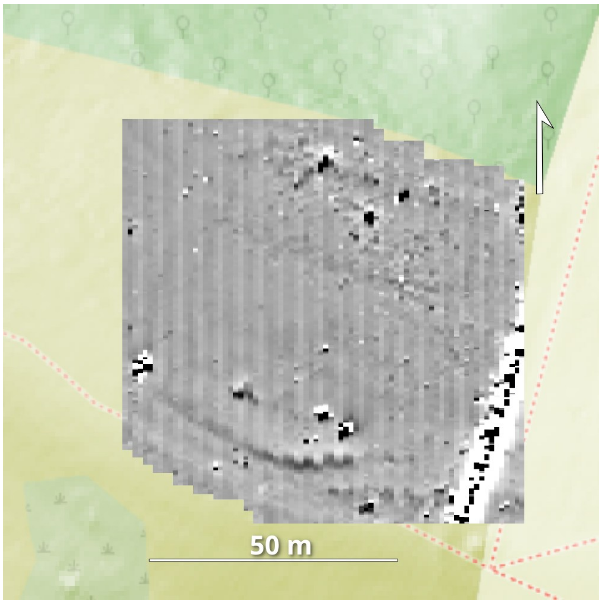

Fig. 15: Raw magnetic gradient data

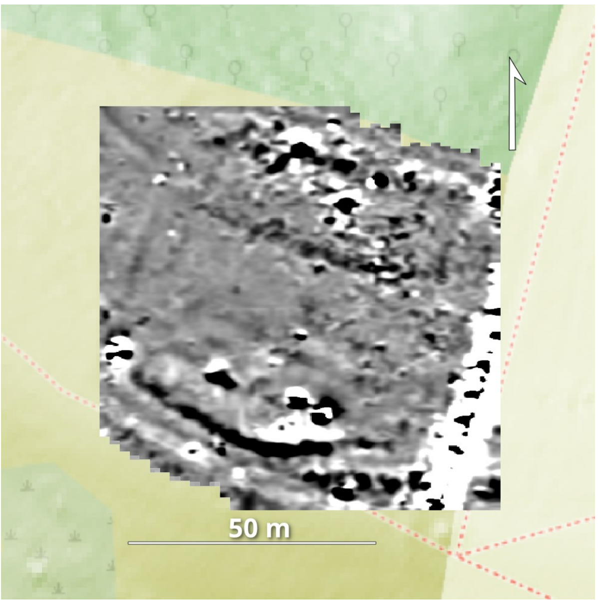

Fig. 16: Processed magnetic gradiometry data

OBSERVATIONS IN THE DATA

Accurate positions of the banks and ditches were plotted from contour and profile analysis of the LiDAR data (Fig. 17). This assisted the recognition of topographical features appearing in the geophysical plots.

The general bedrock geology strike alignment was also plotted to help associate features in the geophysical data with geological effects (Fig. 18).

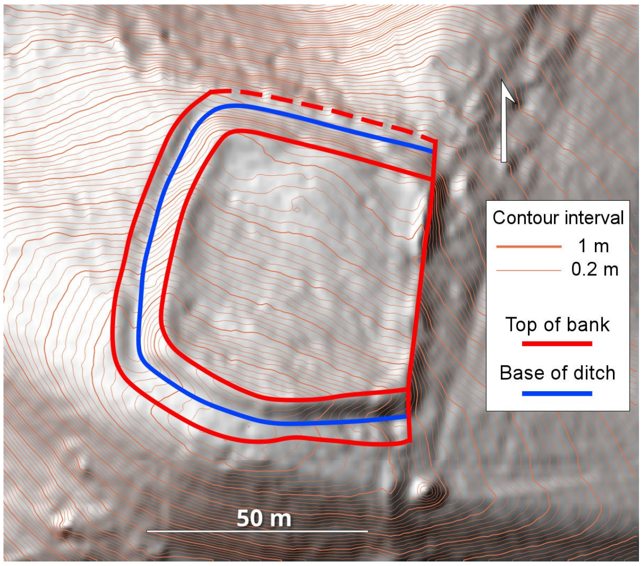

Fig.17: Bank and ditch locations

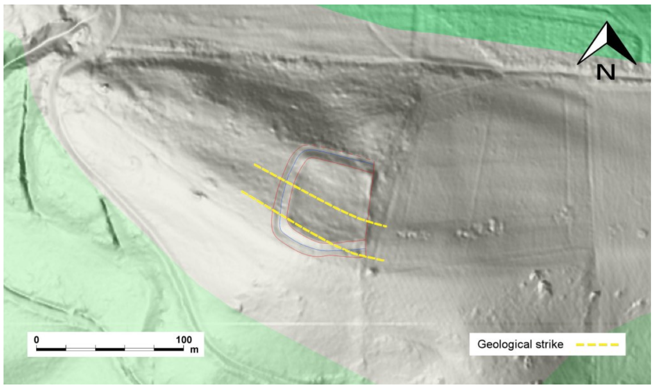

Fig.18: Bedrock geology strike alignment

The earth resistance data (Fig. 19) show alignments with the banks and ditches on the north and west sides. This alignment is less clear on the east side and absent on the south side. There is a very strong linear feature of high resistance on the extreme south-west edge of the survey. There are several linear features of similar orientation, aligned approximately south-east to north-west. The

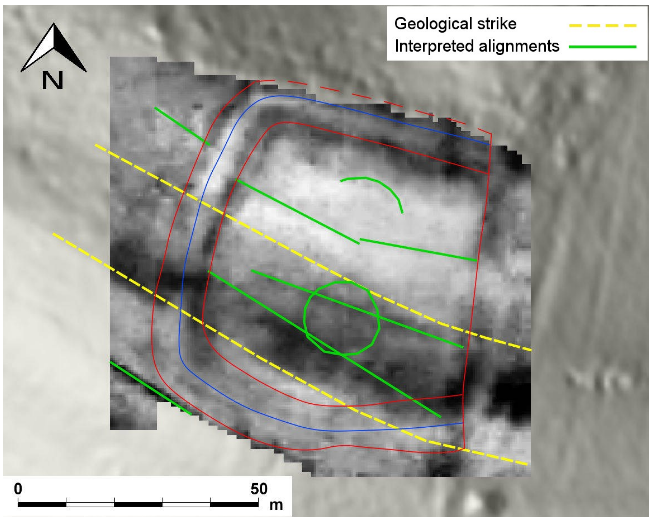

Fig. 19: Resistance data interpretation

southern-most one of these features has an angular offset from the geological orientation. There are two sub circular features aligned approximately to the central north-south axis of the earthwork.

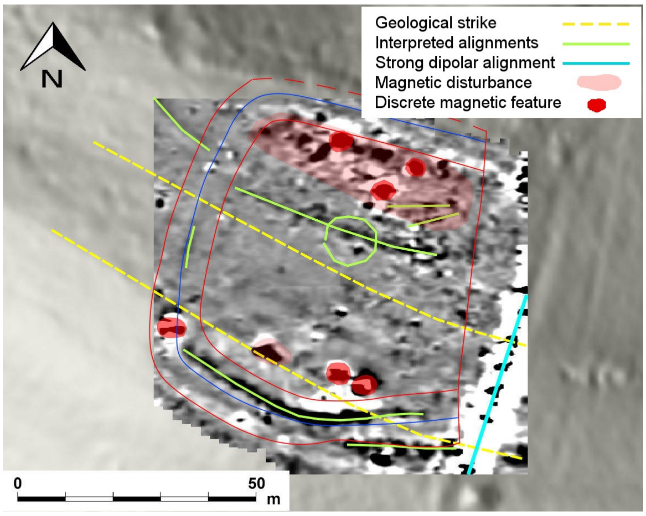

Fig. 20: Magnetic gradiometry interpretation

Most striking on the magnetic gradiometry data (Fig. 20) is the strong dipolar (positive and negative values) linear feature immediately to the east of the earthwork shown in blue. There is one sub circular feature in the northern half of the enclosure aligned with the central north-south axis. Bisecting this is a linear feature aligned approximately east-west. This feature has a possible expression extending further to the west, outside the earthwork boundary. There is a strong linear feature corresponding to the southern ditch and bank. This has a short parallel component in the south-east corner. There is a scatter of positive magnetic discrete features, including three of high value, in the northern third of the earthwork. There are two positive magnetic discrete features in the south, and a further discrete feature within the ditch, which is dipolar in nature.

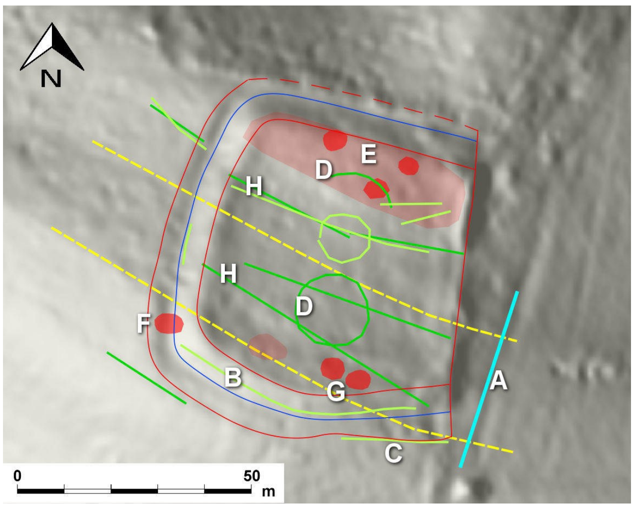

Fig. 21: Combined resistance and magnetic interpretation superimposed on the LiDAR terrain data

DETAILED INTERPRETATION

Fig. 21 combines the interpreted alignments from both the resistance and magnetic data.

The low resistance exhibited in the ditches is likely due to higher moisture content in organic rich soils accumulating through natural down-slope movement. Conversely, the top of the banks exhibit higher resistance likely due to lower moisture content from the natural thinning of these soils.

The very high amplitude dipolar feature to the east (21A) is a buried water pipe connected to the reservoir adjacent to the south-east corner of the earthwork.

There is a strong positive magnetic linear feature corresponding to the southern ditch and bank (21B). The absence of corresponding features for the other three sides may indicate the construction of this ditch involved cutting into the bedrock at the top of the natural ridge. If this feature is the result of cutting into the bedrock, the shorter parallel linear feature in the south-east corner (21C) could represent the construction of a defended entrance.

The weak sub circular features in the resistance data (21D) could be associated with tree-throws although their large size and alignment similarity with the magnetic data suggest they may be of archaeological interest.

The scatter of discrete positive magnetic features in the north of the earthwork (21E) may be due to tree-throws or large iron-rich rocks. Their particular concentration, compared to other areas, may suggest archaeological significance such as pits or burning.

Of the three strong discrete magnetic features in the south, the one in the ditch in the west (21F) is dipolar in nature and is likely to be a ferrous metal object, such as farm machinery debris, etc. The other two similar features further to the east (21G) are predominantly positive and could be thermoremanent in origin and are therefore of archaeological interest. This site has an extensive viewshed to the south over the English Channel which may have been helpful in providing both early warning of danger and the monitoring of seaborne activities such as trade. The use of this site for observation would have been important during the later medieval and post medieval with the navies of other countries intermittently threatening the English shoreline. There were several locations on the Isle of Wight which had beacons. These features in the magnetic data may be evidence of burning resulting from beacons.

The linear features with approximately east-west orientation, expressed in both the resistance and magnetic data (21H), generally align with the geological strike and are most likely natural in origin.

The existence of a trench crossing the site has been previously noted (Bailey 1985) and mentioned by David Tomalin (personal communication). The exact position of such a trench has not been recorded and the purpose of the trench has been variously stated as water pipe, telephone line and land drain. Such dearth of detail does not allow correlation of any one of the features observed in the data with such a trench.

The strong narrow linear high resistance feature on the south-west edge of the survey data (21I) is likely to be a modern service trench. There is a corresponding expression in the LiDAR data of a narrow linear ridge extending 160 metres to the north-west. Perhaps this is one of the trenches mentioned in the HER record.

CONCLUSIONS

The site occupies a commanding hilltop position with excellent views, but it is also highly exposed to adverse weather conditions. This exposure, coupled with the lack of artefacts, suggests that it is an unlikely location for a pastoral settlement. The banks and ditches alone would not suffice to contain animals without additional structures such as fences or palisades. Constructing such elaborate features would seem unnecessary for a simple stock enclosure. The prominent position, however, might plausibly have served as a lookout or signalling function, potentially associated with an as-yet unidentified nearby settlement.

The geophysical survey data did not reveal strong evidence of habitation. However, combined with the LiDAR digital terrain data, it has been instrumental in creating a more accurate model of the earthwork site. Several features of potential archaeological interest have been identified. Further investigation of these features is necessary to determine their origins and significance.

RECOMMENDATIONS

Despite the improved understanding of the local surface structure of the earthwork and the identification of subsurface features, it is not possible to infer any dates or sequences of activity at the site. The lack of dates and indication of the purpose for the site has a negative impact on its value as a heritage asset.

It is recommended that carefully targeted limited excavation would enable determination of valuable information on dates of occupation and method of construction. This may allow some understanding of the purpose of the earthwork. The following further works are recommended:

- A section trench through intact bank and ditch on the west side. This would provide an understanding of construction technique and allow sampling of material for Optically Stimulated Luminescence (OSL) dating.
- A section trench, sample coring or use of Ground Penetrating Radar to determine if bedrock was upcast to form the south bank and ditch structure.
- A test pit over possible thermoremanent feature(s) in the south.
- A test pit over north ‘platform’ area to examine linear and subcircular features.

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