

CASTELL PANT-Y-PHILLIP, SCLEDDAU, PEMBROKESHIRE: GEOPHYSICAL, TOPOGRAPHICAL AND PHOTGRAPHIC SURVEY



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**CASTELL PANT-Y-PHILLIP, SCLEDDAU, PEMBROKESHIRE:
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CASTELL PANT-Y-PHILLIP, SCLEDDAU, PEMBROKESHIRE: GEOPHYSICAL, TOPOGRAPHICAL AND PHOTOGRAPHIC SURVEY

SUMMARY

Castell Pant-y-Phillip (NGR SM 9532 3353) is a Scheduled Ancient Monument (PE 138) recorded as an Iron Age defended enclosure. An application was successfully made to Cadw for grant-aid to fund the recording of the site to ascertain the extent of erosion caused by badgers, which is slowly destroying parts of earthworks. The badgers were confined to the southeast corner of the site, but they were clearly very active and it seems likely that their sett could expand along the rest of the bank in the near future.

The project aimed to make a record of the site, which would lead to the production of a report, website entry and archive of the project, and provide information to assist future management plans for the monument. A geophysical (magnetometry), topographical and photographic survey of Castell Pant-y-Phillip was carried out with successful results. The topographic survey covered c.2.46ha and the geophysical survey, c.0.48ha.

The magnetometry survey demonstrated the presence of a number of buried features, which have been illustrated, described and interpreted. Many linear features showed the presence of buried ditches and walls enclosing the probable hillfort throughout the area surveyed. Evidence for associated Iron Age features was discovered: entranceways through the ramparts, round houses, pits and other signs of settlement activity such as areas of burning.

Linear anomalies also coincided with part of a circular feature to the north of the enclosure that was visible as a whole in a RCAHMW aerial photo. Another main feature was a circular, negative anomaly in the west of the enclosure making a small peak in the topography, possibly representing a collapsed stone-built round house, a clearance cairn or a Bronze Age cairn.

Badger damage at Castell Pant-y-Phillip is severe and ongoing. The information presented in this report can now be used to develop mitigation strategies and a management plan for the Scheduled Ancient Monument, such as fencing-off the worst affected areas in order to prevent access to farm animals that have been observed to compound the badger damage.

INTRODUCTION

Castell Pant-y-Phillip is a Scheduled Ancient Monument (PE 138) and is also recorded in the HER and NMR databases (PRN 2590; NPRN 305187; also recorded as Parc-y-Castell). From its form the monument appears to be an Iron Age defended enclosure. No geophysical survey or excavation is known to have previously taken place at the site.

Erosion by badgers is slowly destroying parts of earthworks of Castell Pant-y-Phillip. A site visit late in 2016 showed that a sett had become established on the southeast corner of the defensive bank. The badger damage was clear on the grass-covered top of the bank, but less obvious on the flanks as it was masked by gorse and other low scrub. Although the badgers were confined to this part of the site, they were clearly very active and it seemed likely that their sett would expand along the rest of the bank in the near future.

Because of this damage, an application was successfully made to Cadw for grant-aid to fund the recording of the site to ascertain the present extent of disturbance at the site before further destruction took place. It was decided that the record should take the form of topographical, geophysical (magnetometric) and photographic surveys.

The **aim** of the project was:

1. to make a record of the site

The **objectives** of the project were:

1. to provide information to assist in future management plans
2. to produce a report and archive of the project

The wider potential value of this project was that it could address general research themes for the Later Bronze Age and Iron Age in Wales such as settlement, land use and regionalitly. These have been set out as objectives in the *Research Framework for the Archaeology of Wales*.

The topographic survey covered approximately 2.46ha and the geophysical survey, c.0.48ha (Figure 2). This report is fully representative of the results of the fieldwork and is complemented by an entry on the Dyfed Archaeological Trust website. All data recovered during the fieldwork will be collated into a site archive structured in accordance with specifications in *Archaeological Archives: a guide to best practice in creation, compilation, transfer and curation* (Brown 2011), and the procedures recommended by the National Monuments Record, Aberystwyth.

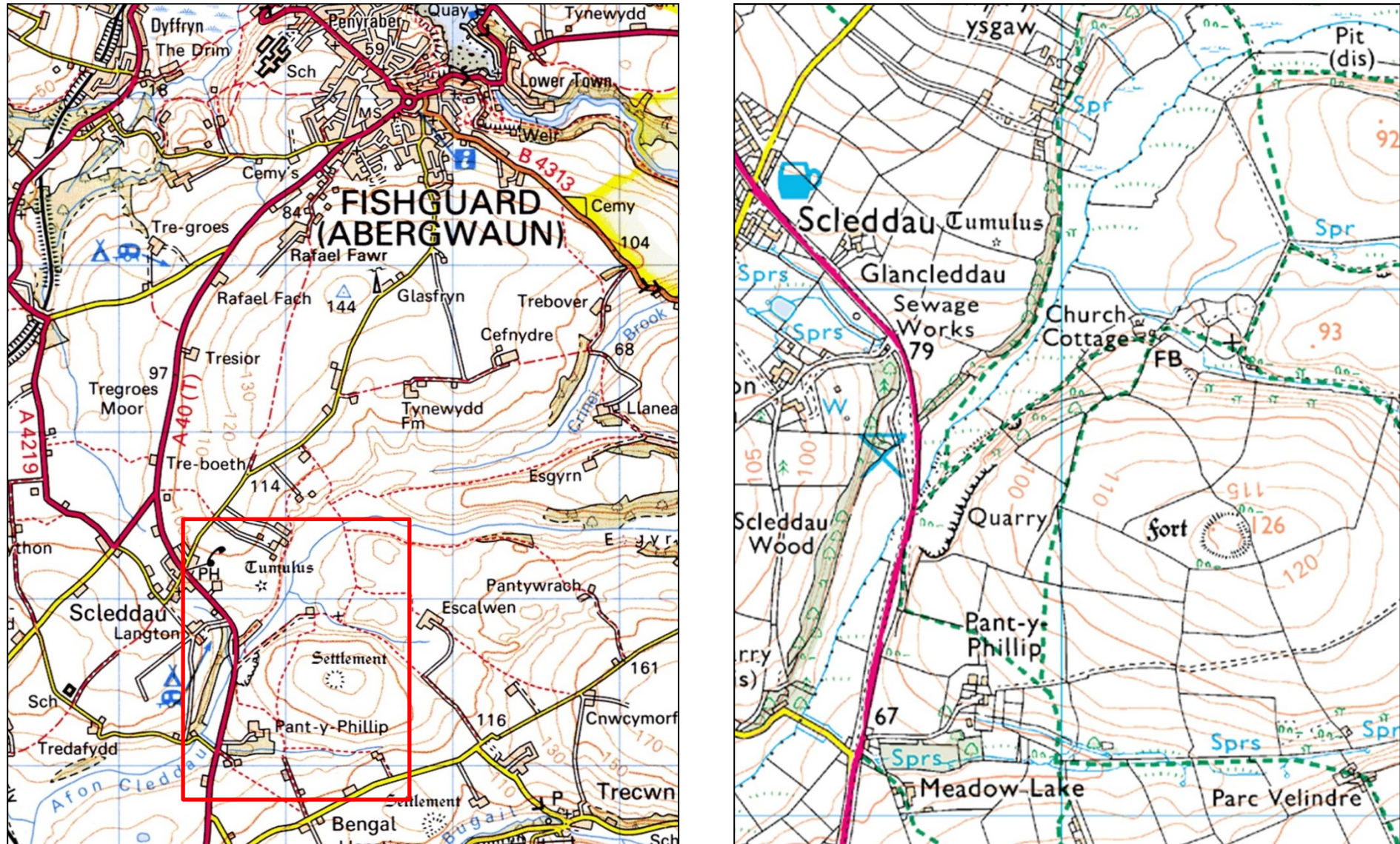


Figure 1: OS Location Maps for Castell Pant-y-Phillip, Scleddau (1:50,000 on left and 1:25,000 on right). The map on the right is an enlargement of the area in red box in the map on the left.

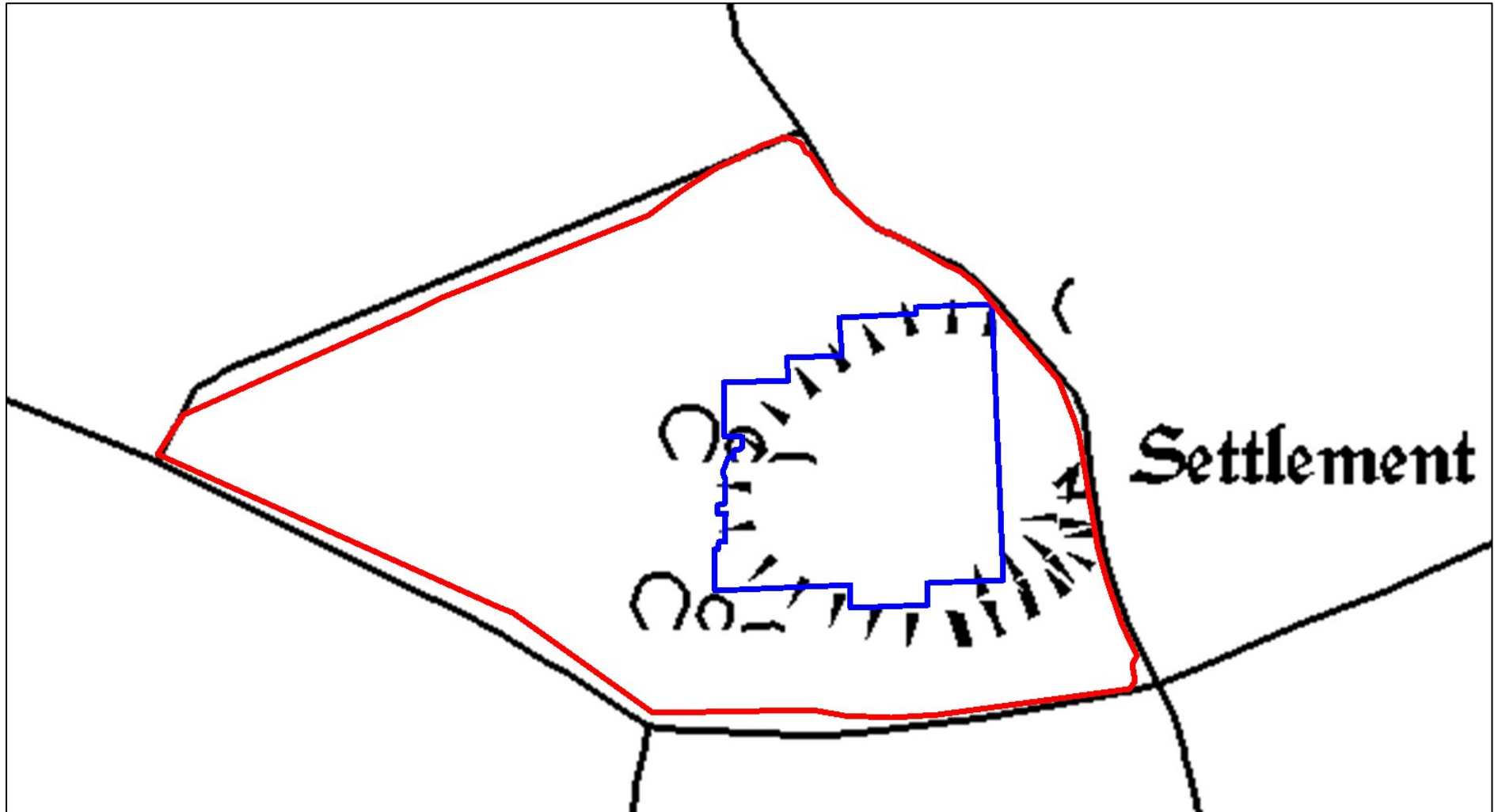


Figure 2: OS 1:10,000 Scale map showing outlines of actual areas of topographical survey (red) and magnetometry survey (blue), superimposed on the modern OS 1:10,000 map

SITE DESCRIPTION

Castell Pant-y-Phillip is sited on the western side of a rounded summit at 120m above sea level, 1km southeast of the village of Scleddau, near Fishguard in Pembrokeshire (NGR SM 9532 3353; Figures 1 and 2). The site is under pasture in gently rolling farmland and is known to have been ploughed over in the past. Scrub and small trees cover the large bank and ditch along the east and south sides of the enclosure.

The geology of the site is mixed, with two bedrock types and no superficial deposits. The bedrock of the majority of the enclosure and surrounding fields is formed of dark blue cleaved mudstones of the Penmaen Dewi Shale Formation, dating to the Arenig Series. The second bedrock type is an Unnamed Igneous Intrusion of Ordovician age, which is mapped by the British Geological Society as running in a band about 100m wide in a roughly east-west direction through the site.

The monument was included in the prehistoric defended enclosures project (Murphy *et al.* 2007). It was described as:

.....a small, sub-circular, earthwork defended enclosure.....internal area is c.65m diameter. The earthworks are best preserved on the east and south-east sides where the bank stands up to 1m above the interior and 2m-2.3m above the exterior and the ditch is well-marked. On the north, south and west sides the earthworks are reduced to a scarp. Parch marks on aerial photographs show the bank continuing round on these two sides. An entrance lies on the east side. Other than the bank and ditch on the east side, the site is under improved pasture.

The NMR database records that RCAHMW aerial photography of the site shows at least four circular features, c.10m in diameter, three within the enclosure and one just outside to the west.

The first map of Castell Pant-y-Phillip is thought to be the Llanstinan Parish tithe Map of 1843 (Figure 3), upon which it is drawn as two concentric circles and labelled 'encampment.'

With the advent of Ordnance Survey (OS) mapping, the earthwork was labelled 'Castell,' the Welsh for castle, and remained thus until 1974 since when it has been shown as 'settlement.' The earliest OS map of 1889 is shown in Figure 4. This is the only OS map that shows two standing stones in nearby fields. The westernmost of these two stones appears to still be standing, but is not recorded in the HER or the NMR. There is also now a standing stone in the north-south hedgerow about 10m southeast of the Castell Pant-y-Phillip, which the farmer said he had erected himself not long ago.

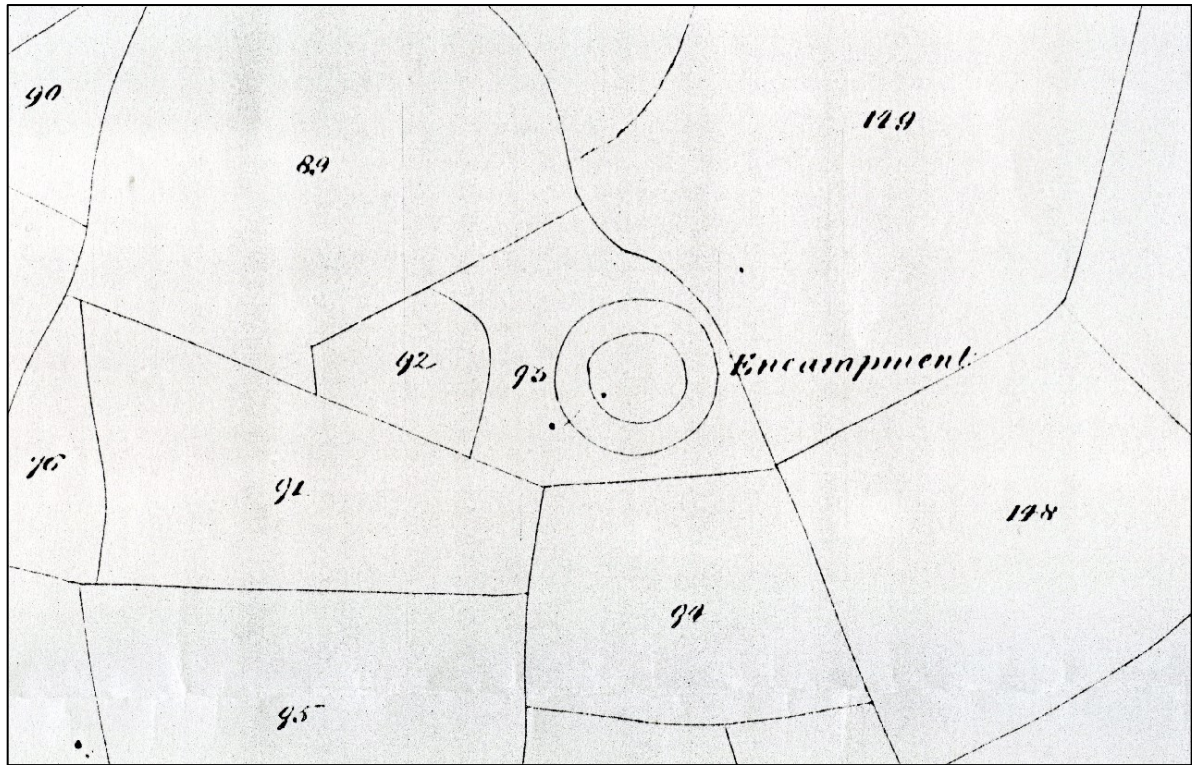


Figure 3: Extract of the Llanstinan Parish tithe Map of 1843

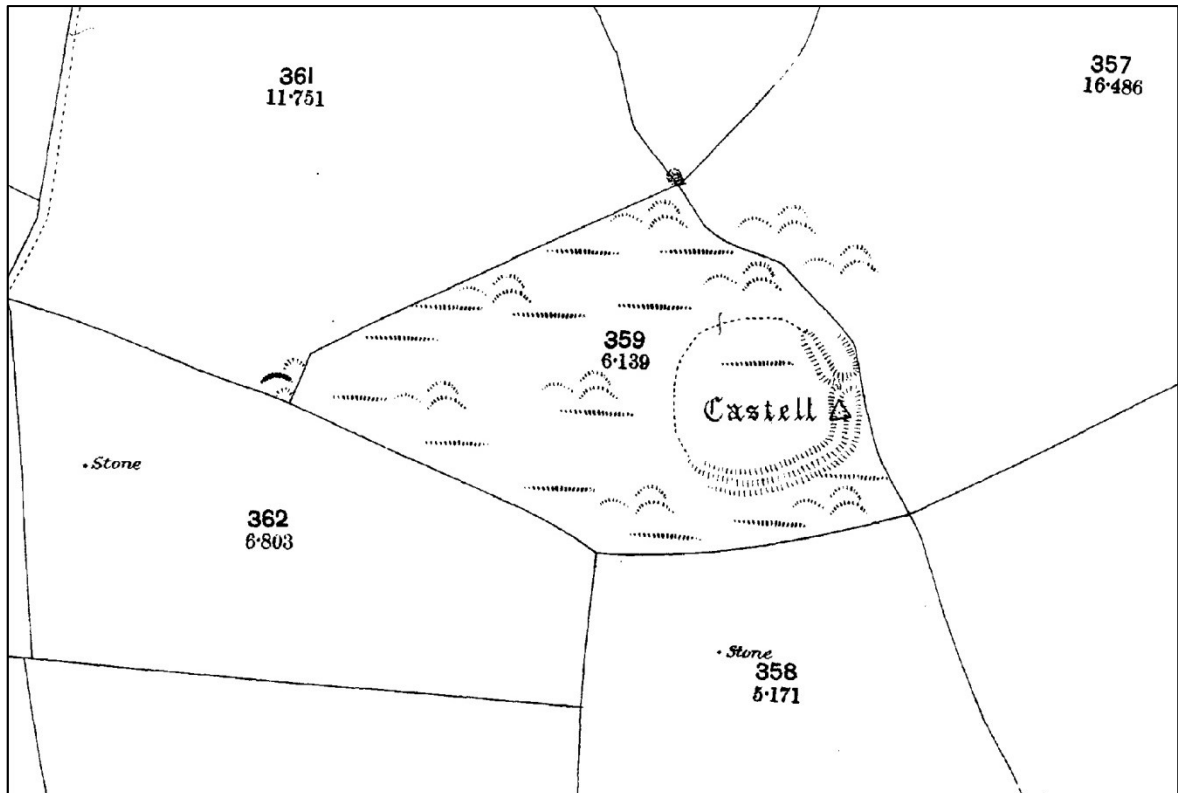


Figure 4: Extract of the 1st edition 1:2500 OS map of 1889

TOPOGRAPHICAL SURVEY

Methodology

The survey was undertaken using a Trimble DR200 Electronic Distance Measuring (EDM) Total Station. An EDM Total Station combines a theodolite to record vertical and horizontal angles, and an electronic distance measurement device, to enable the acquisition of 3-Dimensional coordinate data. Total stations work by reflecting an infra-red laser against a prism. EDM total stations also provide sub-centimetre relative accuracy for recordings.

Data is tied in to the local OS grid by the recording of mapped points on the earth's surface. The survey was undertaken using a subjective survey technique, relying on the expertise of the surveyor to analyse the earthworks and to record them. Subjective survey allows the user to record features in as much detail as they require. For this procedure, the EDM Total Station was used to record the tops and bottoms of slopes and spot levels evenly spread across the area.

A survey station was set up at an arbitrary point near to the desired survey area to provide suitable coverage and visibility both for topographic survey and for setting out grids for the geophysical survey. From this point further survey stations were set up to allow the topographical survey to include additional location data hidden from the original position and also known mapped features such as hedge lines. The data was downloaded onto a computer and processed using Trimble GeoSite 5.1 software.

Results

Figures 5-7 show 2D plan-view representations of the results of the topographical survey.

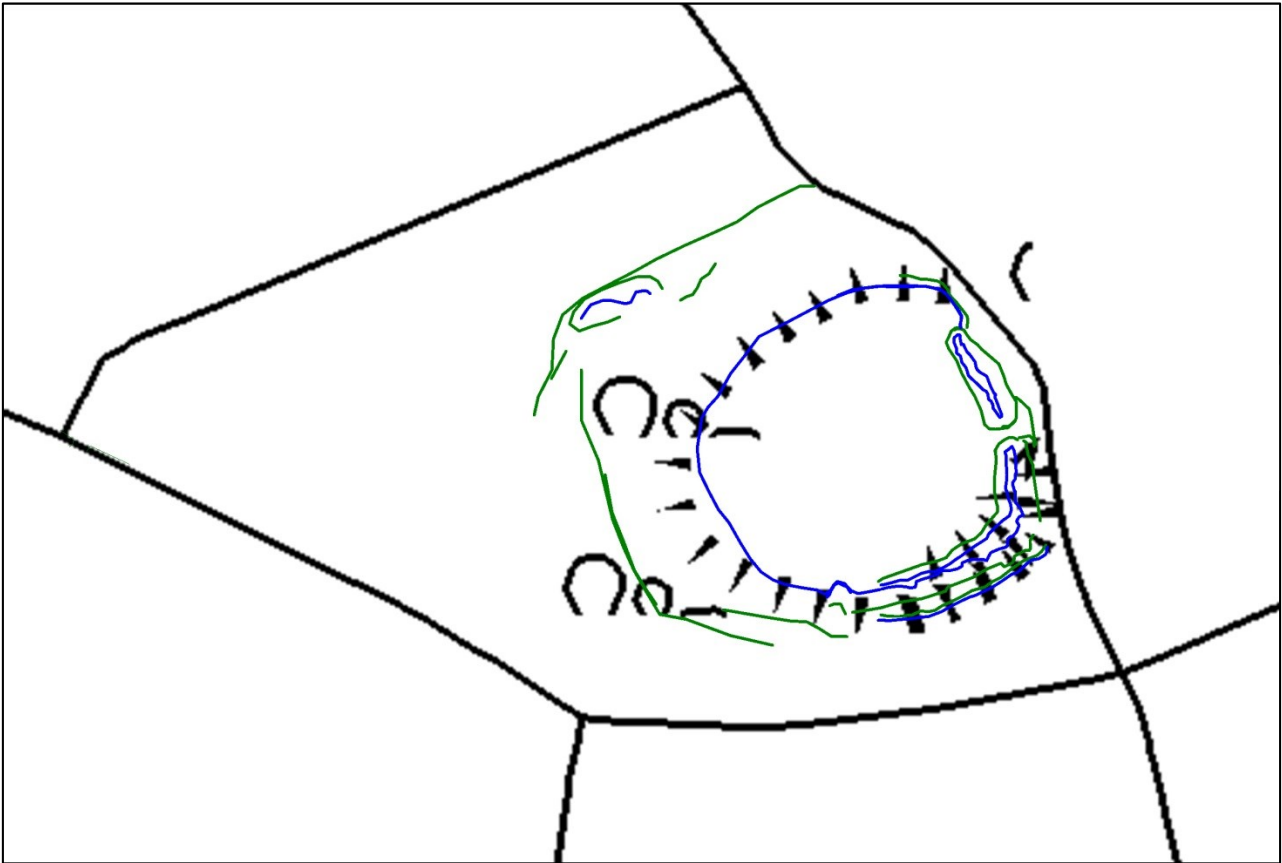


Figure 5: Topographical survey results for Castell Pant-y-Phillip, showing surveyed bank-bottoms (green) and bank-tops (blue), superimposed on the modern OS 1:10,000 map

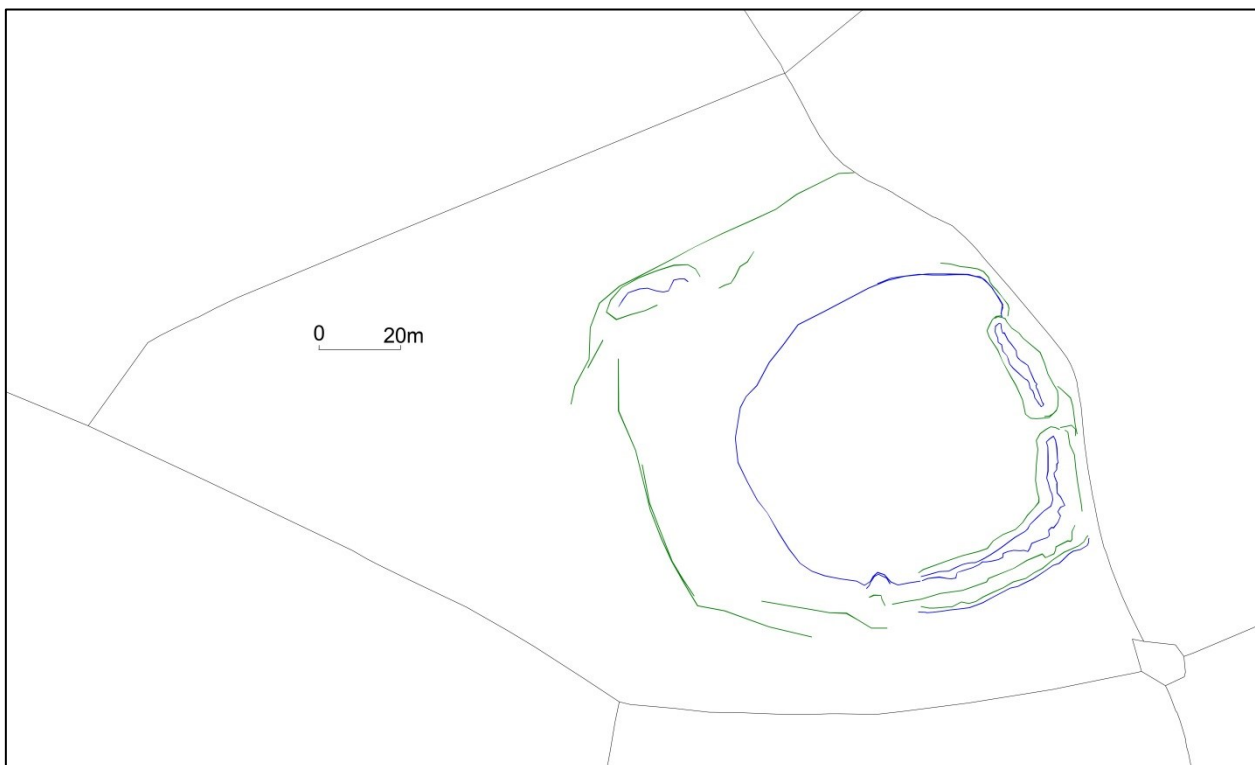


Figure 6: Topographical survey map for Castell Pant-y-Phillip, showing surveyed bank-bottoms (green) and bank-tops (blue)

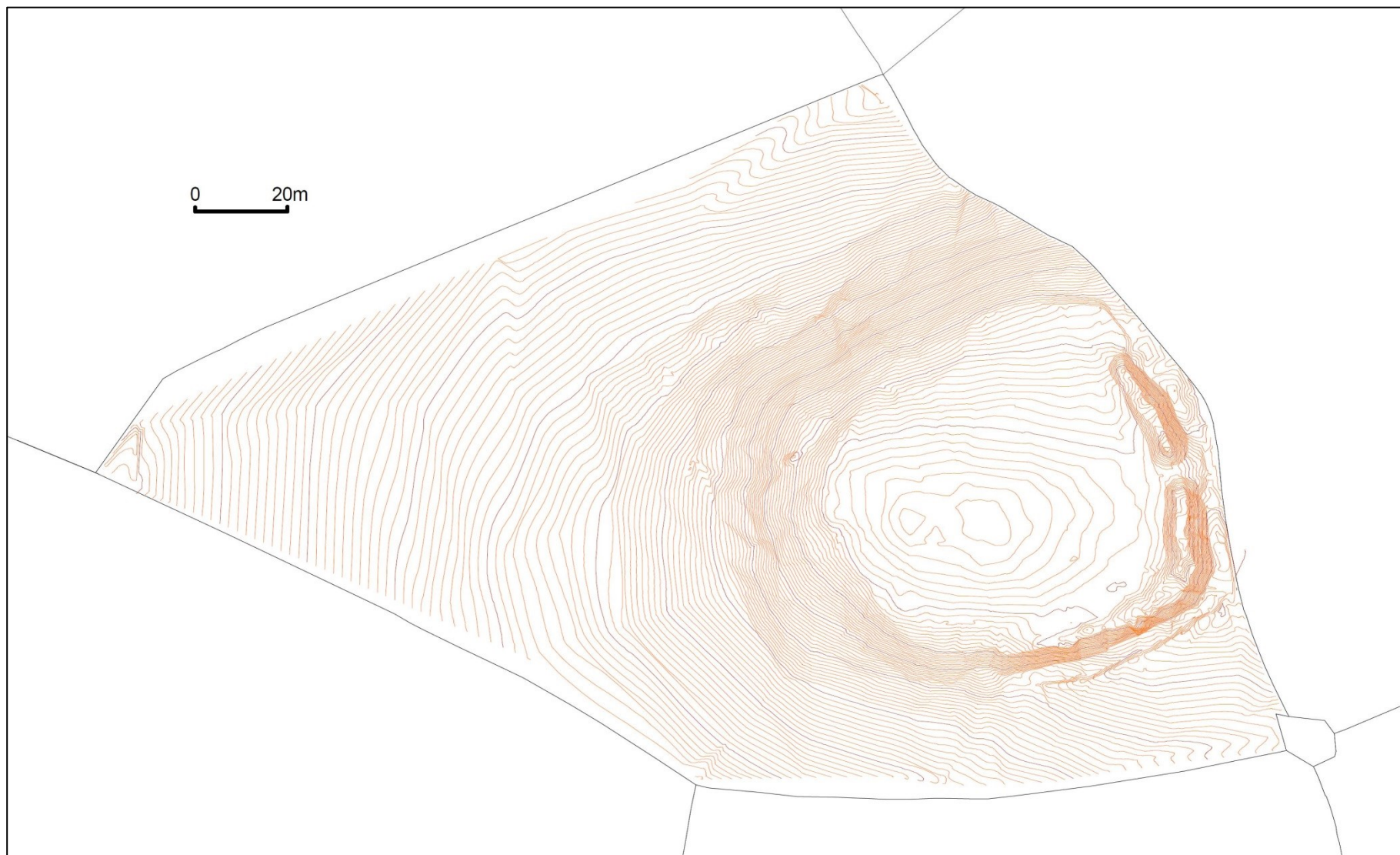


Figure 7: Topographical contour map for Castell Pant-y-Phillip

GEOPHYSICAL SURVEY

Methodology

A fluxgate gradiometer was used for the survey, which detects variations in the earth's magnetic field (full specifications are in Appendix I). Readings were taken at a high resolution on traverses 0.5m wide and every 0.25m within 20m x 20m grids across the site.

The site was surveyed over three days in February 2017. An area of c.0.48ha was surveyed (Figure 2). A Trimble TST was used to tie the survey grid into the local Ordnance Survey grid.

Limitations

Weather conditions were fine and generally dry. The area within the fort's banks was generally flat and under short pasture. Some gently sloping areas outside the banks were included in the survey.

Remnant magnetism in the bedrock may have contributed to readings taken during the survey. The Mudstone bedrock is unlikely to have been magnetic, but the Igneous Intrusion may have been. Its rock type was not recorded by the BGS, but it is known that some igneous rocks, such as basalts, contain enough magnetism to preclude magnetometric survey.

Processing, presentation and interpretation

Processing was performed using *TerraSurveyor 3.0.31*. A detailed explanation of the processing involved is described in Appendix I. The data is presented with a minimum of processing. The presence of high values caused by ferrous objects tends to hide fine details and obscure archaeological features, so the extreme values were 'clipped' to allow the finer details to show through.

The processed data is presented as greyscale plots overlaid on local topographical features (Figure 8). The main magnetic anomalies have been identified and plotted onto the local topographical features as a level of interpretation (Figures 10 and 11).

The survey results and interpretation diagrams should not be seen as a definitive model of what lies beneath the ground surface, as not all buried features will have provided a magnetic response that can be identified by the gradiometer. In interpreting those features that are recorded the shape is the principal diagnostic tool, along with comparison with known features from other surveys. The intensity of the magnetic response could provide further information - a strong response, for example, indicates burning, high ferric content or thermoremnancy in the geology. The context may provide further clues but the interpretation of many of these features is still largely subjective.

All measurements given are approximate because accurate measurements are difficult to capture during fluxgate gradiometer surveys, and the width and length of identified features can be affected by their relative depth and magnetic strength.

Results

Figure 8 shows a greyscale plot of the surveyed area. The igneous geology does not appear to have caused any major distortions of the geophysical survey results, but the overall results show an uneven but consistent pattern of small areas of positive and negative magnetism that may be due to the bedrock, and are probably strong enough to prevent delicate archaeological features from showing through.

Many plough lines are evident in the data (highlighted in Figure 9), and another interpretation for the coarse-grained pattern seen across the site (described above) is that it derives from the disruption and scattering of dense settlement activity (stones and stonework as discrete negative features, pits as positive features and disturbed hearths as weakened dipolar features).

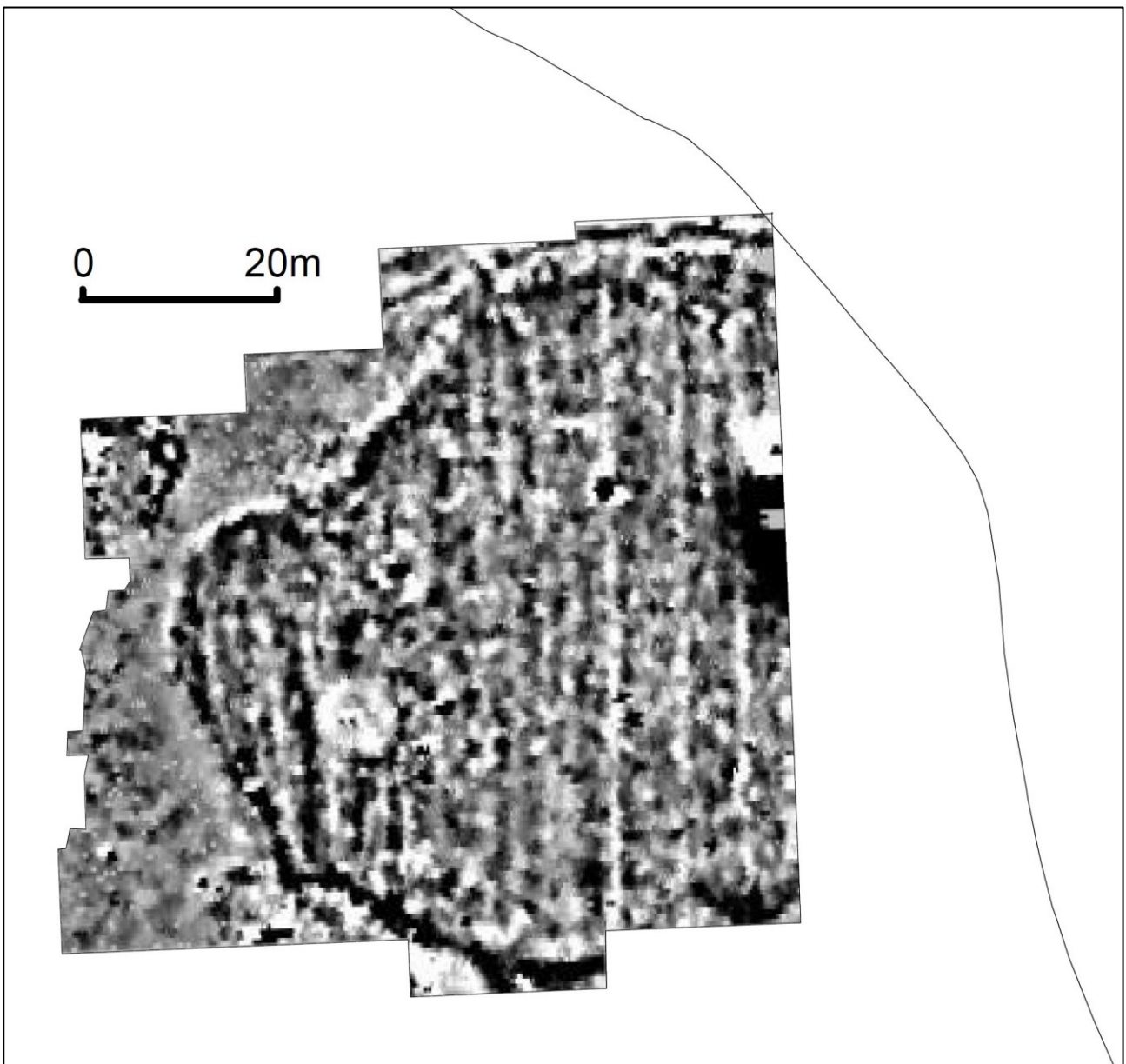


Figure 8: Processed data as a grey-scale plot, overlaid on local topographical features. The results are presented over a range of $\pm 7\text{nT}$ around the local average value of magnetic field strength.

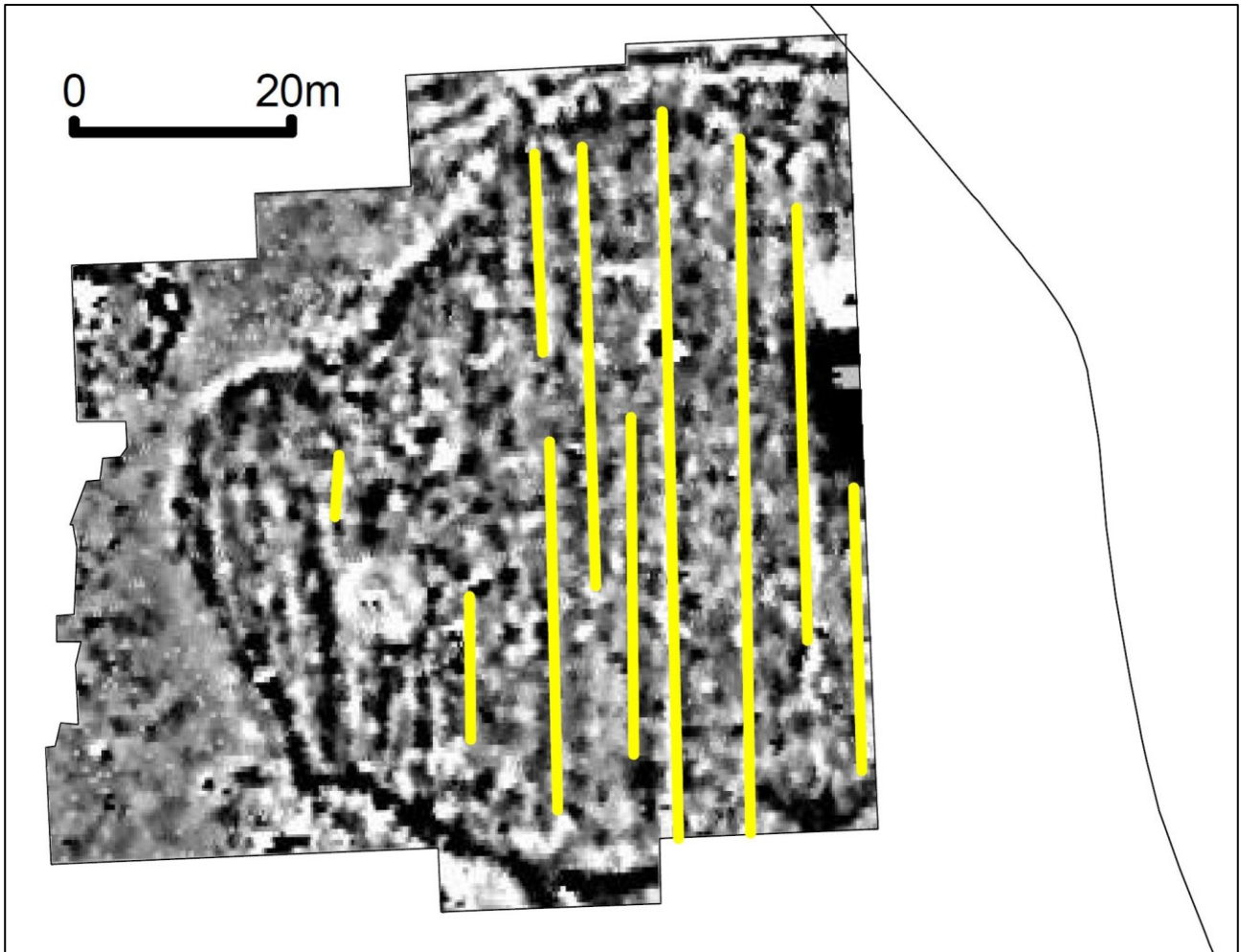


Figure 9: Processed data as a grey-scale plot, overlaid on local topographical features, with yellow lines indicating plough marks

Figures 10 and 11 show an interpretation of the geophysical anomalies detected in the data. Figure 11 shows that interpretation overlaid on the contour map produced from the topographical survey.

Dipolar features, shown in red, are mainly highly likely to be the result of ferrous items in the soil, often detritus of post-medieval and modern farming practices. The large dipole anomaly on the eastern edge of the survey area was caused by a solar and wind-powered aerial that stood on a trailer only 3m away. Another cause of a dipolar reading is a buried area of burning, and it is possible that the larger and more amorphously shaped dipolar features drawn are representative of this.

Small circular positive features (marked **A** in Figure 10) are most likely to signify the presence of soil-filled pits. A few of the positive features, annotated **B** in Figure 10, may show the positions of the eaves' drip ditches of round houses. One of them (**B1**), at the northern edge of the surveyed area, can be seen as a circular cropmark on a RCAHMW aerial photo.

The rest of the linear positive features, of which there are many, represent further soil-filled ditches. It can be seen in Figure 11 that lots of these coincide with the edge of the enclosure's relatively flat top, and thus are considered to show the position of the enclosure ditch. These positive linears are closely paralleled by negative linears of similar length, thought to show the position of

buried stone walls or banks supporting the defence-work of the ditches. The linear positive and negative features labelled **C** in Figure 10 seem to form an annexe against and within the western side of the enclosure. Some of them may actually represent plough lines. There was no evidence for these features on the surface.

Various other negative anomalies can be seen in Figure 10. Standing out is circular feature **D**, which could show the position of a buried, collapsed stone roundhouse. Figure 11 shows that it coincides with a small peak in the topography. It is also of a size to be a clearance cairn or possible a Bronze Age burial cairn.

The linear curved features marked **E** seem most likely to represent the buried walls of round houses. The set of three of them on the northern edge of the survey area, concentric with each other and also with positive linear **B1**, coincide in position with the circular feature previously described as showing in a RCAHMW photo.

Other small areas of negative magnetism either show where a stone, or stones, or a void is buried. The larger patch **F** at the south edge of the enclosure could well be a mass of buried stone originating from a perimeter wall or bank. Two gaps in the line of enclosure ditches and banks (marked **G**) could potentially indicate entrances.

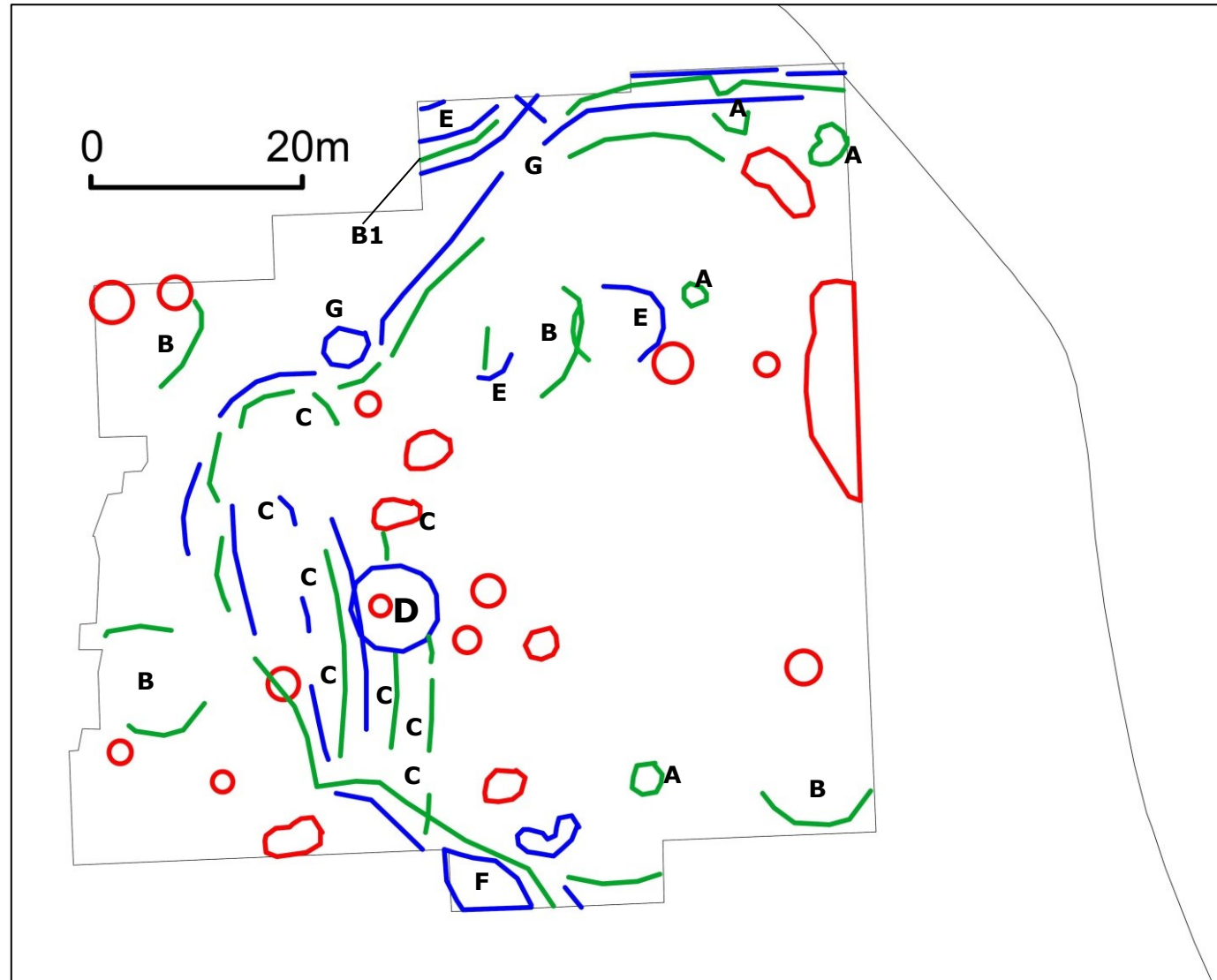


Figure 10: Interpretation plot of survey results, overlaid on local topographical features. Dipolar features are represented in red, positive features are represented in green and negative features appear in blue.

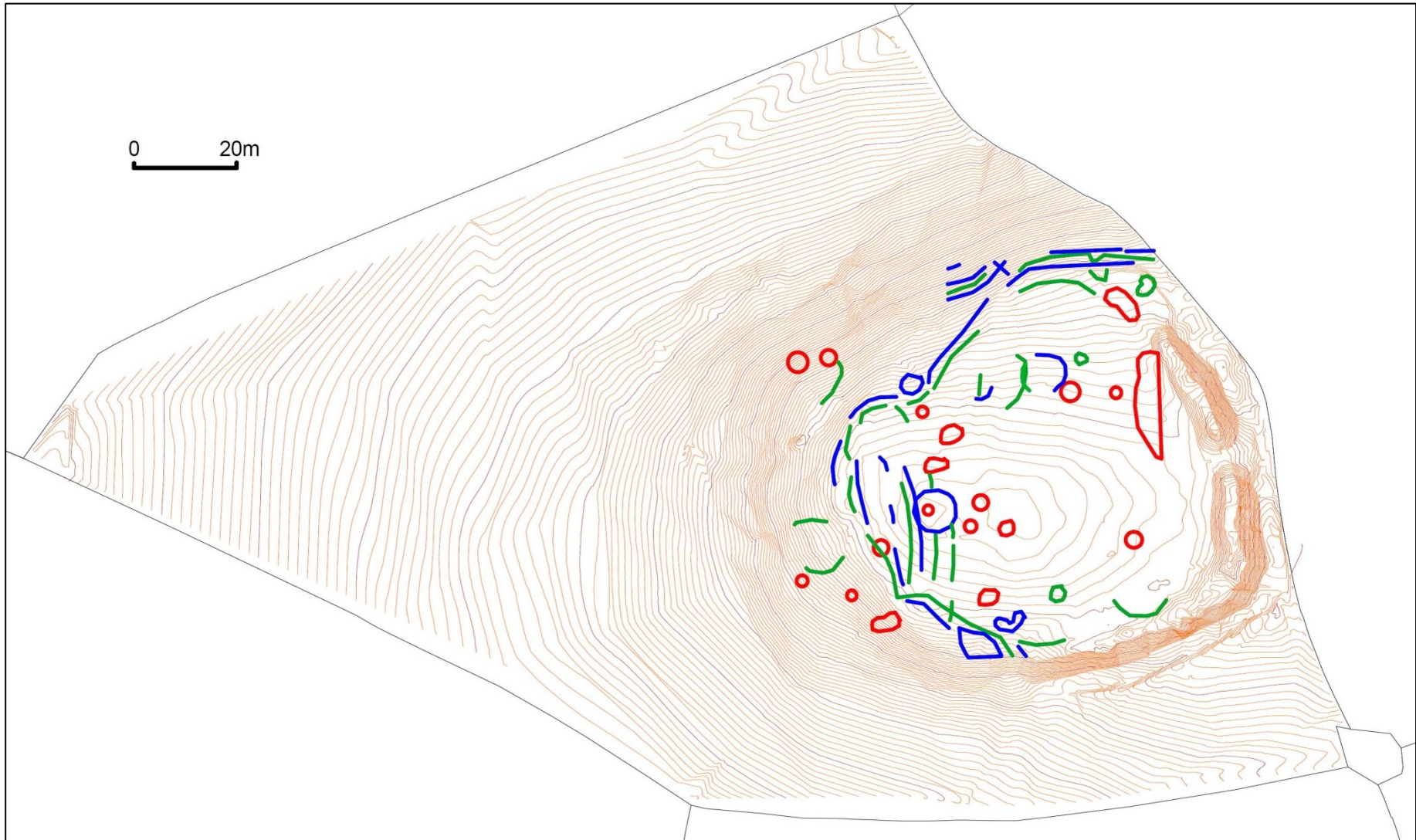


Figure 11: Interpretation of magnetic anomalies overlaid on the contour map derived from the topographical survey data. Dipolar features are represented in red, positive features are represented in green and negative features appear in blue.

PHOTOGRAPHIC SURVEY



Photo 1: Facing east-southeast. The slight remains of the north rampart where it meets the line of the later field boundary, with northern end of much larger remaining ditch and bank beyond



Photo 2: Facing south-southeast. The large bank and ditch on the east side of the enclosure, overgrown with scrub. The bank on the left is a later field boundary, although may incorporate an older bank.



Photo 3: Facing south. The large bank and ditch on the east side of the enclosure, overgrown with scrub. The bank on the left is a later field boundary, although may incorporate an older bank.



Photo 4: Facing east-northeast, from the interior of the enclosure. The entrance gap in east bank of rampart, framing the mountain Mynydd Dinas beyond.



Photo 5: Facing west. The interior of the enclosure, under pasture.
A solar farm can be seen in the hill beyond.



Photo 6: Facing south. The bank on east side of the enclosure,
taken from within the enclosure.



Photo 7: Facing south-southwest. The interior of the enclosure at its southeast corner, showing lumps and bumps and freshly disturbed earth caused by badgers digging along the top of the bank.



Photo 8: Facing north-northwest. Badger setts on the southern rampart.



Photo 9: Facing east. Bank and ditch at the southern side of the enclosure, overgrown with scrub, taken from the outside. A standing stone erected in the hedge line by the farmer can also be seen.



Photo 10: Facing west. Bank and ditch at southern side of the enclosure, overgrown with scrub, taken from outside.



Photo 11: Facing north-northeast. Close up of the bank and ditch at southern side of hillfort, taken from outside, showing badger setts.



Photo 12: Facing west. Looking along the outside of the bank on the southwest side of the enclosure.

CONCLUSION

A geophysical, topographical and photographic survey of Castell Pant-y-Phillip was carried out with successful results. A contour map of the topography was produced as well as a photographic record.

The magnetometry survey undertaken at the site demonstrated the presence of a number of buried features, which have been illustrated, described and interpreted. Many linear features showed the presence of buried ditches and walls enclosing the probable hillfort throughout the area surveyed. Potential evidence for associated Iron Age features was discovered: entranceways through the ramparts, round houses, pits and other signs of settlement activity such as areas of burning.

Linear anomalies also coincided with part of a circular feature to the north of the enclosure that was visible as a whole in a RCAHMW aerial photo. Another main feature was a circular negative anomaly in the west of the enclosure making a small peak in the topography, possibly representing a collapsed stone-built round house, a clearance cairn or a Bronze Age cairn.

Erosion caused by badgers digging their setts was observed on the defensive bank at the southeast corner of Castell Pant-y-Phillip. The damage was clear on the grass-covered top of the bank, but less obvious on the flanks as it was masked by gorse and other low scrub. Although the badgers are currently confined to this part of the site, it seems likely that they will expand their setts along the rest of the bank in the near future. The information gathered during this project and presented in this report can now be used to develop mitigation strategies and a management plan for the Scheduled Ancient Monument. At other sites it has been seen that sheep-scraping can compound badger damage once it has started, so one mitigation strategy might be to fence off the area most affected to prevent access to sheep (although this will not stop the badgers).

ACKNOWLEDGEMENTS

Ken Murphy made the initial site visit and described the badger damage. Hubert Wilson carried out the Topographical Survey and part of the Geophysical Survey with the author.

SOURCES

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Database

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Websites

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Cartographic

Llanstinan Parish Tithe Map and apportionment	1843
1 st Edition Ordnance Survey 1:2500 Map	1889

APPENDIX I: GEOPHYSICAL SURVEY METHODOLOGY AND INSTRUMENTATION

Instrumentation

A fluxgate gradiometer survey provides a relatively swift and completely non-invasive method of surveying large areas.

The survey was carried out using a Bartington Grad601-2 dual Fluxgate Gradiometer, which uses a pair of Grad-01-100 sensors. These are high stability fluxgate gradient sensors with a 1.0m separation between the sensing elements, giving a strong response to deeper anomalies.

The instrument detects variations in the earth's magnetic field caused by the presence of iron in the soil. This is usually in the form of weakly magnetised iron oxides, which tend to be concentrated in the topsoil. Features cut into the subsoil and backfilled or silted with topsoil therefore contain greater amounts of iron and can therefore be detected with the gradiometer. There are, however, other processes and materials that can produce detectable anomalies. The most obvious is the presence of pieces of iron in the soil or immediate environs which usually produce very high readings and can mask the relatively weak readings produced by variations in the soil. Archaeological features such as hearths or kilns also produce strong readings because fired clay acquires a permanent thermoremanent magnetic field upon cooling. This material can also get spread into the surrounding soil leading to a more generalised magnetic enhancement around settlement sites.

Not all surveys produce good results as anomalies can also be masked by large magnetic variations in the bedrock or soil or high levels of natural background "noise" (interference consisting of random signals produced by material within the soil). In some cases, there may be little variation between the topsoil and subsoil resulting in features being un-detectable. It must therefore be stressed that a lack of detectable anomalies cannot be taken to mean that there are no below ground archaeological features.

The Bartington Grad601 is a hand-held instrument and readings can be taken automatically as the operator walks at a constant speed along a series of fixed length traverses. The sensor consists of two vertically aligned fluxgates set 1.0m apart. Their Mumetal cores are driven in and out of magnetic saturation by an alternating current passing through two opposing driver coils. As the cores come out of saturation, the external magnetic field can enter them producing an electrical pulse proportional to the field strength in a sensor coil. The high frequency of the detection cycle produces what is in effect a continuous output (Clark 1996).

The gradiometer can detect anomalies down to a depth of approximately one metre. The magnetic variations are measured in nanoTeslas (nT). The earth's magnetic field strength is about 48,000 nT; typical archaeological features produce readings of below 15nT although burnt features and iron objects can result in changes of several hundred nT. The instrument is capable of detecting changes as low as 0.1nT.

Geophysical Survey Data Collection

The gradiometer includes an on-board data-logger. Readings in the surveys were taken along parallel traverses of one axis of a grid made up of 20m x 20m squares. The traverse intervals were either 0.5m apart. Readings were logged at intervals of 0.25m along each traverse giving 3200 readings per grid square (medium resolution on 0.5m traverses).

Geophysical Survey Data presentation

The data was transferred from the data-logger to a computer where it was compiled and processed using TerraSurveyor 3.0.31 software. The data is presented as greyscale plot where data values are represented by modulation of the intensity of a grey scale within a rectangular area corresponding to the data collection point within the grid. This produces a plan view of the survey and allows subtle changes in the data to be displayed. A separate grey-scale plot with interpretation of the main features is also included as necessary.

Geophysical Survey Data Processing

The data is presented with a minimum of processing although corrections are made to compensate for instrument drift and other data collection inconsistencies. High readings caused by stray pieces of iron, fences, etc. are usually modified on the greyscale plot as they have a tendency to compress the rest of the data. The data is however carefully examined before this procedure is carried out as kilns and other burnt features can produce similar readings. The data on some noisy or very complex sites can benefit from 'smoothing'. Grey-scale plots are always somewhat pixelated due to the resolution of the survey. This at times makes it difficult to see less obvious anomalies. The readings in the plots can therefore be interpolated thus producing more but smaller pixels and a small amount of low pass filtering can be applied. This reduces the perceived effects of background noise thus making anomalies easier to see. Any further processing is noted in relation to the individual plot.

Reliability

Geophysical survey is an immensely useful tool but it should be realised that while a survey will detect a wide range of features, it may not detect *all* buried features. A gradiometer survey detects changes in magnetic flux density and relies on there being a detectable difference between the archaeology and the substrate. This may not occur for many reasons (e.g. a cut feature being backfilled with subsoil). It must therefore be stressed that a lack of archaeological responses from a geophysical survey does not prove that there is no archaeology present.

Grid locations

A Trimble Total Station was used to tie the survey grid into the local Ordnance Survey grid.

Bibliography

Clark, A. J. 1996. *Seeing Beneath the Soil* (2nd edition). London: Batsford.

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Mawrth 2017
March 2017

Paratowyd yr adroddiad hwn gan / This report has been prepared by

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Swydd / Position: **Archaeologist**

Llofnod / Signature *Alice Day* Date: 30/Mar/2017

Mae'r adroddiad hwn wedi ei gael yn gywir a derbyn sêl bendith
This report has been checked and approved by

James Meek

ar ran Ymddiriedolaeth Archaeolegol Dyfed Cyf.
on behalf of Dyfed Archaeological Trust Ltd.

Swydd / Position: **Head of DAT Archaeological Services**

Llofnod / Signature *James Meek* Date: 30/Mar/2017

Yn unol â'n nôd i roddi gwasanaeth o ansawdd uchel, croesawn unrhyw sylwadau sydd gennych ar gynnwys neu strwythur yr adroddiad hwn

As part of our desire to provide a quality service we would welcome any comments you may have on the content or presentation of this report



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