Geophysical Survey of the Black Down Enclosure, near Sheep Down, Winterbourne Steepleton, Dorset

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ABSTRACT

Black Down enclosure, near Sheep Down, Winterbourne Steepleton, Dorset, was partially excavated in 1970 (Putnam 1971) and has been recently reassessed as a possible Roman signal station (Hewitt et al 2016). However, questions remained unanswered about the exact date of its use and therefore its relationship with other features in the area. This report describes a geophysical survey which aimed to clarify the nature and date of the site.

This 2016 survey showed there are no additional internal structures (other than those tentatively attributed during the 1970 excavation). Thus perhaps the site was a temporary encampment rather than a fortlet or signal station, just with some significant earthworks surrounding tents, which also would suggest a first century date.

We recommend further non-invasive surveys of the ostensibly similar nearby sites to confirm their similarity, and thus to see if their distribution would imply a signalling network.

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Summary

Black Down enclosure, near Winterbourne Steepleton, Dorset, was partially excavated in 1970 (Putnam 1971) and has been recently reassessed as a possible Roman signal station (Hewitt et al 2016). However significant questions remain unanswered. These predominantly concern the exact date of its use and therefore its relationship with other features in the area. This report describes the findings of three geophysical surveys designed to shed further light on the site. The aim of these surveys is to determine whether there are any indications inside the banks which may help clarify the period and nature of the monument. This will enable it to be situated into its landscape context.

Site location

Black Down is an area of the South Dorset Ridgeway, about 9km west of Dorchester. The exact delineation of the area (Riley 2012 figure 1) encompasses the Black Down enclosure. North of the enclosure, though outside the Black Down delineated area, is Sheep Down, which is the nomenclature used in the Section 42 licence to carry out a geophysical survey.

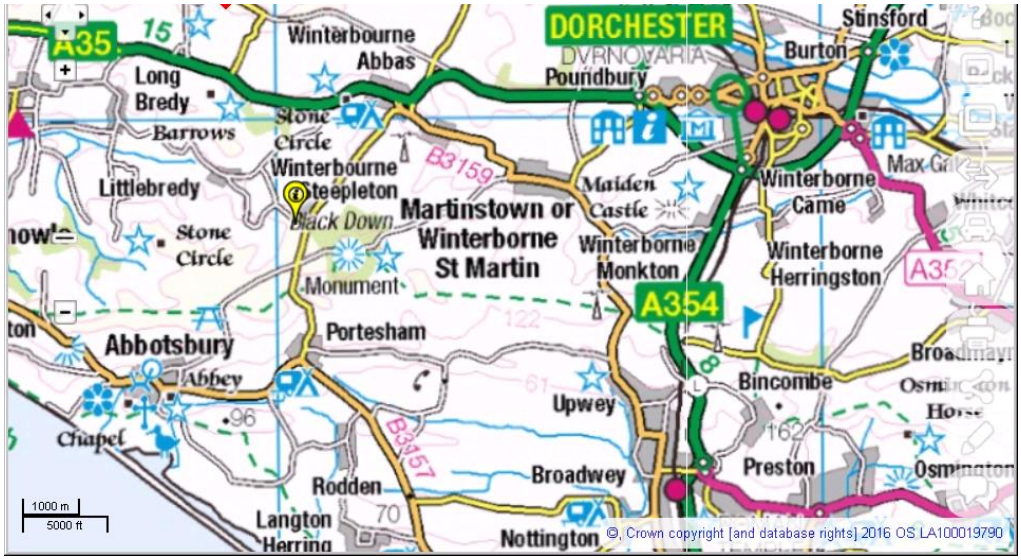


Figure 1. Map showing general location of Black Down – from Dorset Explorer

The site location is given as SY 603881 in the Historic England notes but has been readjusted here to SY 6033288077 (see Figure 1). It is bounded by woodland to the north and west with roads on the other two sides. The ground is uneven and overgrown in summer with bracken, nettles and brambles. Dog-walkers and ramblers have created numerous narrow paths.

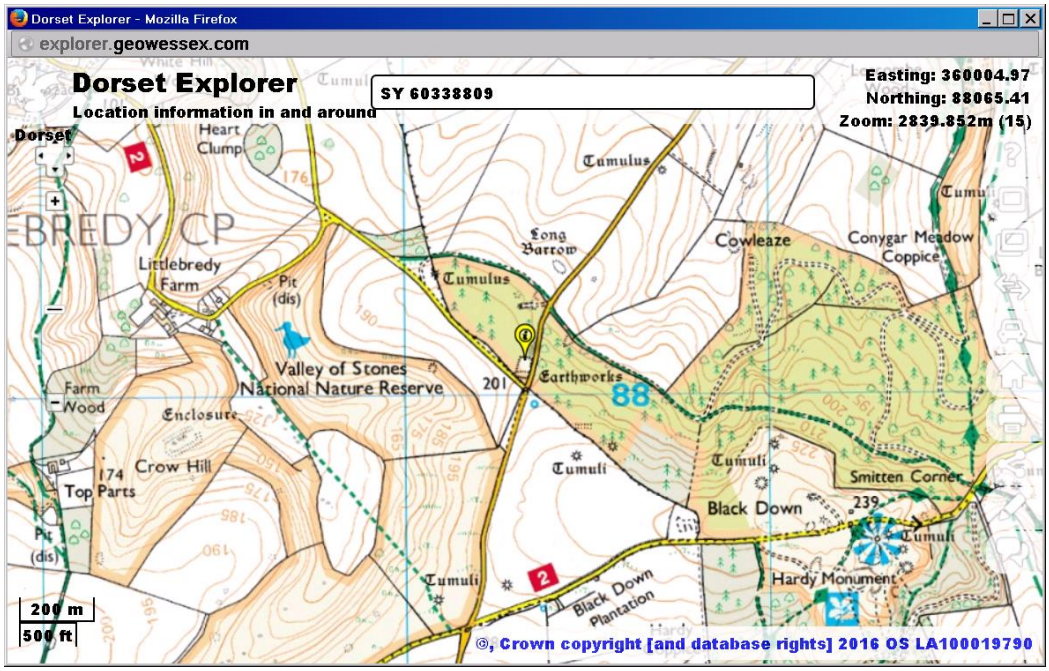


Figure 2. Map showing precise location of Black Down Roman enclosure – from Dorset Explorer

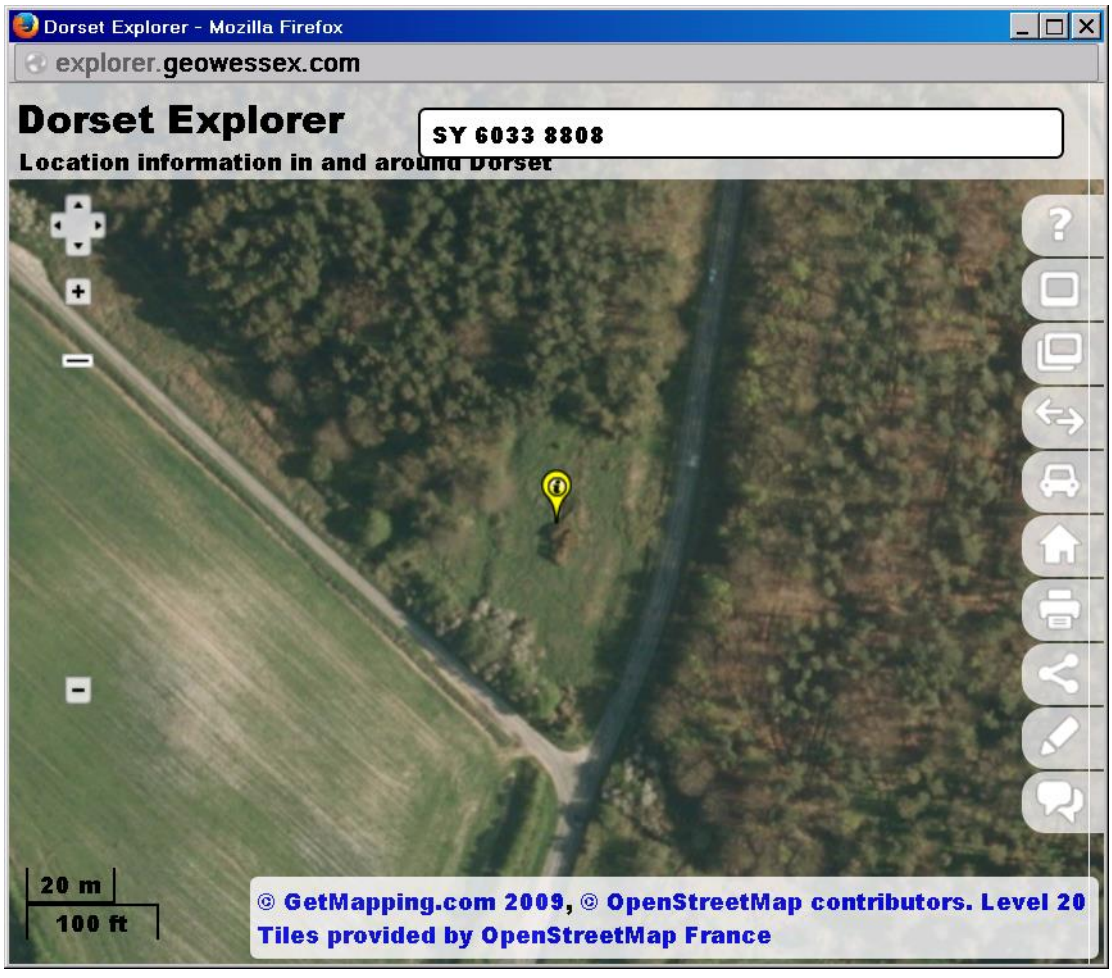


Figure 3. Aerial imagery of Black Down Roman enclosure – from Dorset Explorer

Designations

The site is a scheduled ancient monument no.1016912, identified in the Dorset Historic Environment Record as a Roman signal station. It sits within the Dorset Area for Outstanding Natural Beauty (AONB) and is owned by Dorset County Council (DCC), who acquired it from the Forestry Commission. Under the Ancient Monuments and Archaeological Areas Act of 1979 no disturbance of the ground is permitted and no artefacts are to be removed from the site. Although the site itself is not designated as a site of scientific interest it is within an Impact Risk Zone. This is a designation that only impacts upon planning decisions, although the methodology for this survey does make provision for the natural environment in accordance with Goff (2015).

Geological/geomorphological and topographical background

The site is on Poole Formation Sand known as the Bagshot beds (British Geological Survey 2015). It stands at around 240m elevation.

Archaeological and Historical Background

The Black Down enclosure is situated within an archaeologically important landscape, the South Dorset Ridgeway. It is predominantly chalk downland and contains one of the densest clusters of prehistoric funerary monuments in the UK (Woodward 1991). Most recently the National Mapping Programme conducted an analytical survey of the landscape using aerial photographs (Royall 2011). They discovered 3453 archaeological sites, of which 2,500 were previously unrecorded. Forty six prehistoric enclosures were identified covering the whole landscape but only 20 Roman sites, of all types. The majority of these Roman sites lie within the Frome Valley, there is a notable paucity located on the Ridgeway itself.

The site of the enclosure is immediately located within an area known as Black Down that, since the 1970s, has been planted by the Forestry Commission. The land, currently owned by DCC, is no longer intensively managed for wood. DCC and the AONB, through the South Dorset Ridgeway Landscape Partnership (SDRLP) are currently undertaking a Heritage Lottery Funded programme of habitat restoration and management (South Dorset Ridgeway 2013). This also has a focus to improve access and to encourage local community and volunteer involvement.

The enclosure was first recorded by the Royal Commission who described it as a sub-rectangular enclosure comprising a bank and ditch that are about 14 feet across, with an entrance on the east side (RCHME 1970). The Historic England designation record notes its rounded corners. These and potential sub-divisions led the Recorder to conclude that it is probably later prehistoric in date and possibly associated with the surrounding field systems.

In 1970 the enclosure was excavated by WG (Bill) Putnam and Weymouth College of Education and an interim report published (Putnam, 1971). This report suggested that it was a fortlet dated to the Roman conquest. Recently the Putnam excavation has been reconsidered and Hewitt (in press) concludes that the 'Black Down fortlet offers sufficient evidence to consider it as a possible Roman signal station of uncertain date' (Hewitt et al. 2006).

An archaeological survey of Black Down Area was commissioned by the SDRLP (Riley 2012). Carried out with input from local volunteers it discovered evidence of human activity spanning all periods, identified through 63 different archaeological features. These range from Bronze Age round barrows and prehistoric linear earthworks and field systems, to a Medieval pond and Post-Medieval stone quarries (ibid). The Fortlet in this report is assigned a later prehistoric date (BD26).

Hewitt et al (2016) have identified within the Putnam archive confusion over the existence of internal structures within the fortlet. The excavation record is unclear. Geophysical survey may help to answer this question and may therefore also help to clarify the date and purpose of the fortlet.

If the fortlet could be positioned more confidently within the Roman landscape of the South Dorset Ridgeway it would be of significant interest. Hewitt et al (2016) have also called for further research into signalling stations across the wider landscape. It is intended that this geophysical survey at Black Down will be a precursor to this research.

Objectives of the survey

Aim: To further our understanding of this enclosure and its relation to other nearby earthworks.

Objectives:

- To identify any internal or immediate external features
- To locate the 1970 excavations
- To enable a more accurate dating of the site
- To inform potential future research.

Methodology

Geophysical prospecting was developed initially for oil exploration but the techniques have since been adapted to other disciplines where information is needed from below the surface of the ground. In particular geophysical surveys have proved useful in archaeology as they can provide evidence of structures without disturbing them. However a geophysical survey can only detect variations in the physical properties of the sub-surface and not prove or disprove the existence of archaeological remains. There are several techniques available, each with advantages and disadvantages so the most appropriate methods for a particular site depend on the local conditions, the possible findings and the purpose of the survey.

It was felt that the entire monument should be surveyed with the two techniques detailed below. This gave the greatest chance of achieving the objectives of the project design. In order to perform the survey the area was sub-divided into 10 m grid squares using 50 m tapes. Application of Pythagoras' theorem was used to generate right angles. The grid was deliberately aligned at an angle to the visible ditches. It was located using a Leica VIVA GPS, accurate to 0.10m. All marker pegs were removed at the end of each survey day (Historic England 2008).

The resistivity survey used a twin-probe TR/CIA resistivity meter. The setup is to position two fixed probes away from the monument and move another two probes across the survey taking readings at every 1m along lines 1m apart. Subsequently the central part of the site was re-surveyed taking readings at 0.5m along lines 0.5m apart. The spacing of the movable probes determines the maximum depth of buried features that can be detected and also the resolution of the survey. The 0.5m spacing of this instrument can detect structures up to 0.75m deep. The method works by supplying a fixed current from a remote probe and measuring the potential difference created. By Ohm's law the measurement is proportional to the electrical resistance of the ground. This is a good method for finding the remains of walls, rubble and trackways (Gaffney et al 2002).

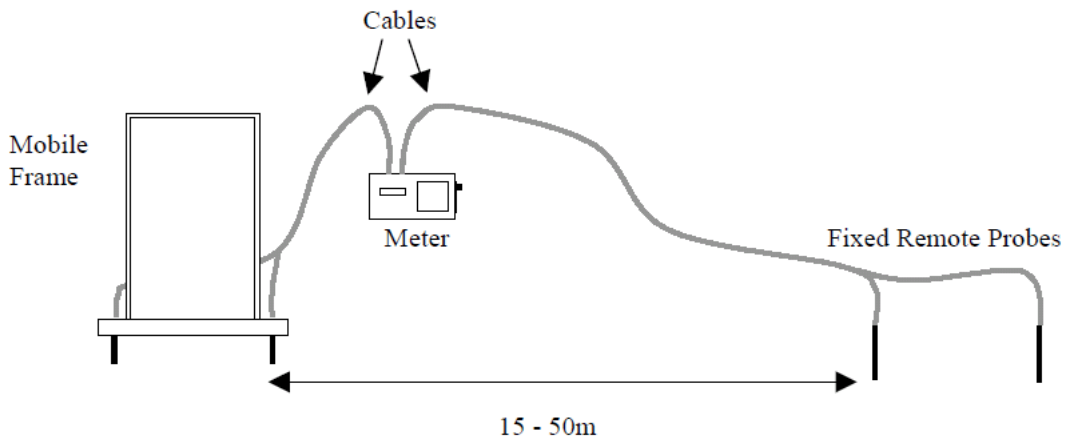


Figure 4. The TR/CIA instrument setup (diagram TR systems)

Figure 5. The TR/CIA instrument in operation (photo DDCAG)

Figure 6. Geoscan Fluxgate Gradiometer (photo Geoscan Research website)

For magnetometry, two instruments were used; a Bartington 601 and a Geoscan FM36 fluxgate gradiometer. The Bartington was operated by students from Bournemouth University and the FM36 by the Dorset Diggers who borrowed the machine and were trained by, Bournemouth University through their LoCATE project. Readings were taken at 0.25m intervals on lines 1m apart. Each end of the bar contains a copper coil. As the coil is moved, the earth's magnetic field induces a small current in the wire which is measured. The bar is carried vertically so that the coil nearest the ground detects the changes in the magnetic field caused by subsurface features. As there is no need for contact with the ground this is particularly useful over rough ground. The instrument takes a reading at fixed time intervals which means that the operator has to walk at a particular constant speed to translate them into spatial locations. The magnetic field is affected by features in the ground, such as hearths, or pits and ditches filled with soil and waste (Oswin 2009).

Each survey method was completed over successive weekends in August 2016. After reviewing the initial results, the resistivity survey was repeated in the central area at half-metre by half-metre resolution in October 2016. The work was done by volunteers from Dorset Diggers Community Archaeology Group who have been trained by GeoFlo. The work was supervised by professional archaeologist Chris Tripp with assistance from Bournemouth University.

At the end of each day, the grid data was downloaded to a laptop computer. The raw data was emailed to BU for archiving; both as a numeric file suitable for input into any processing software and as a digital image.

Site Preparation and Views

Prior to the survey starting, a considerable amount of clearance of brambles and gorse was necessary. Dorset County Council Rangers carried out the work as part of the SDRLP monument management programme and abide by their methodology (Goff 2015). They were assisted by volunteers from EuCAN.

Although the brambles and gorse were cleared, the grid squares shown in Figure 9 could not be completely surveyed due to surrounding bands of woodland, and the road at the east.

Figure 7. The cleared site looking North, surrounded by woodland. The road is on the left

Figure 8. Looking South along the Eastern ditch. The bank is on the right.

Site Geometry: Coordinates of the Geophysics Grid Squares

The principal baseline was set by GPS to be exactly North-South. There were six rows and five columns of 10m x 10m grid squares (see Figure 9). By design, a continuation of this baseline passed through a distinctive signpost (see Figures 10 & 11).

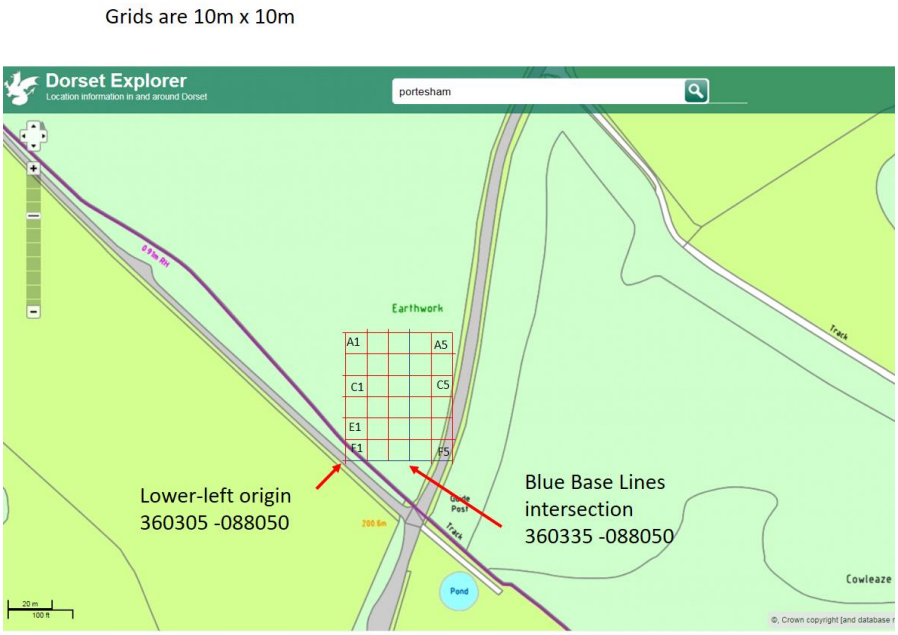


Figure 9. Map showing Geophysics grid squares at Black Down Roman fortlet – from Dorset Explorer. The baselines are shown as blue lines.

Whilst the grid squares were located by GPS, a convenient guide to subsequent re-laying of the grid makes use of the signpost (Figure 10). Thus, the lower-left origin of the Grid squares is 360305-088050 i.e. SY 6030588050.

Figure 10. Photo identifying the "LITTLEBREDY" signpost

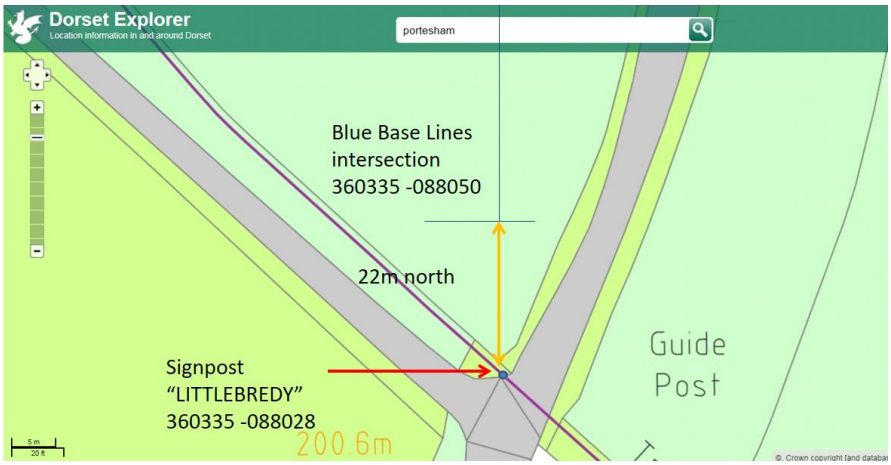


Figure 11. Map showing location of signpost at Black Down Roman fortlet – from Dorset Explorer

Resistivity Results

The resistivity results using one-metre sampling are shown in Figure 12. The broad pale outline occurs where there are visible banks. This can also be appreciated in Figure 13, which shows the Royal Commission drawing (page 508: see bibliography) superimposed on the resistivity results. Additionally, there are indications of internal features, but these are related to the 1970 excavation (see below).

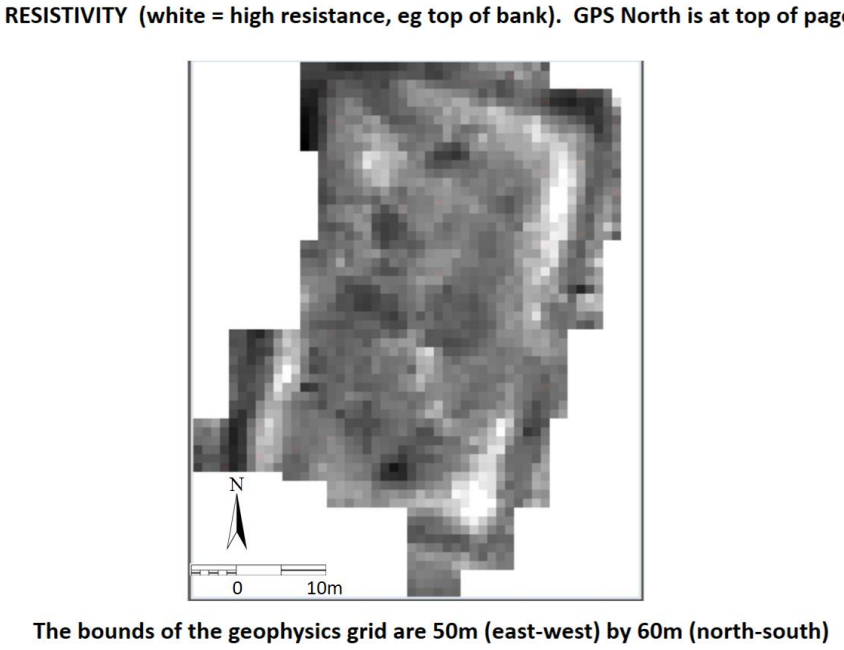


Figure 12. The resistivity results

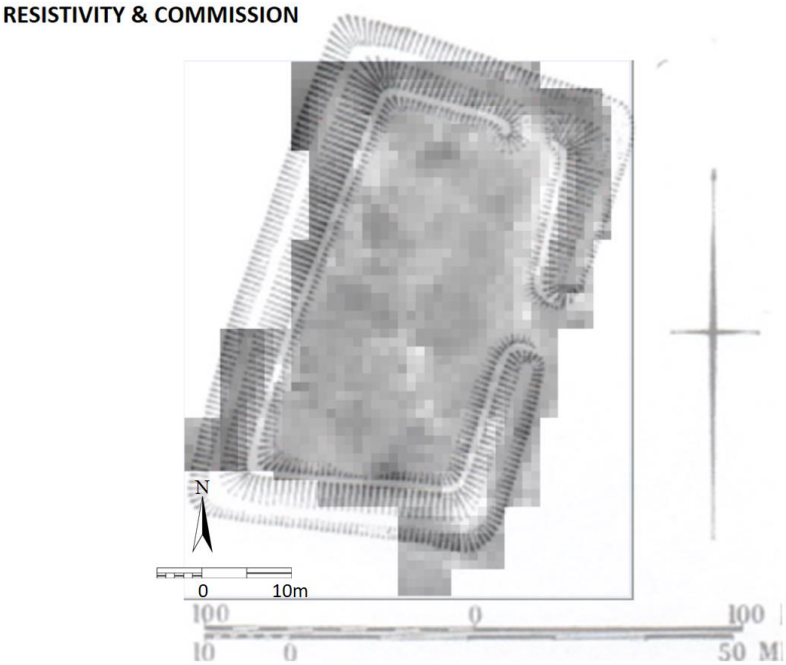


Figure 13. The Royal Commission drawing superimposed on the resistivity results

We conducted a subsequent resistivity survey in the central area, this time at half-metre sampling (Figure 14).

This confirmed the one-metre results, but with better resolution.

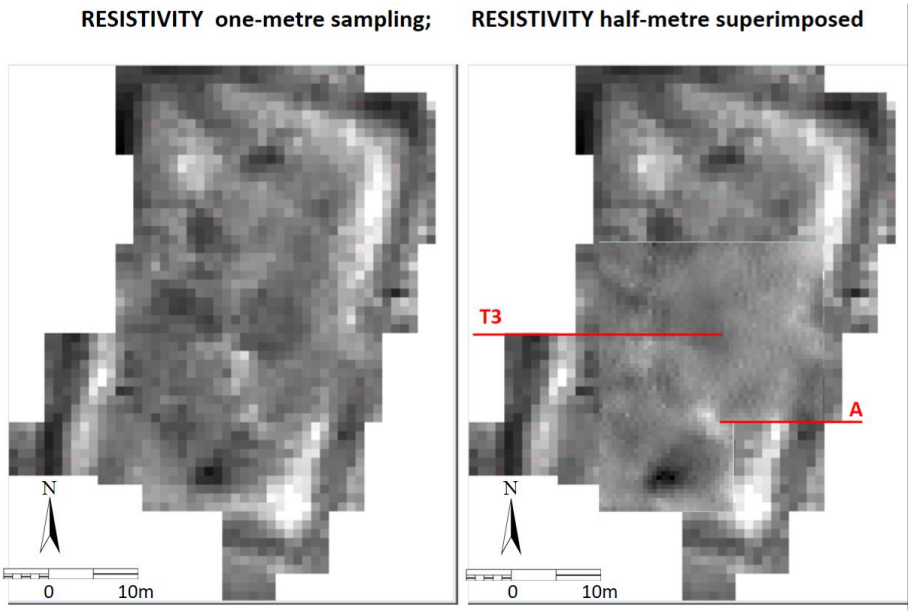


Figure 14. (left) Resistivity results at one-metre sampling (as Figure 12); (right) the central area repeated at half-metre sampling

FM 36 Magnetometry Results

The raw data was processed in the following sequence:

- Smoothing of the stride pattern, by taking a moving average over one metre
- Edge-matching of the results of the two successive survey days
- De-striping using the Snuffler program
- Interpolation using the Snuffler program

The only feature (Figure 15) is the curve at the north-east corner of the bank.

The surrounding ditch gives no visible magnetic response, apart from at the very top of the figure.

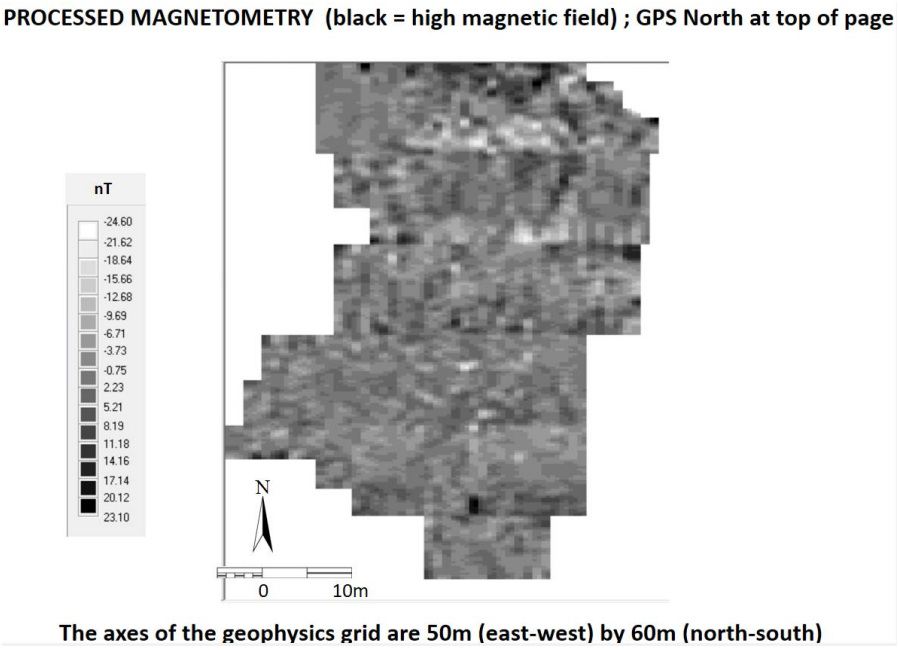


Figure 15. The FM 36 magnetometry results

The Bartington 601 magnetometry results

This data has been processed and presented by Luke Hooper. It is presented with a clip at 3.00SD and destriped along the median traverse. There is only one visible feature, a possible pit close to the western edge of the survey. The ditch and bank of the enclosure are not visible.

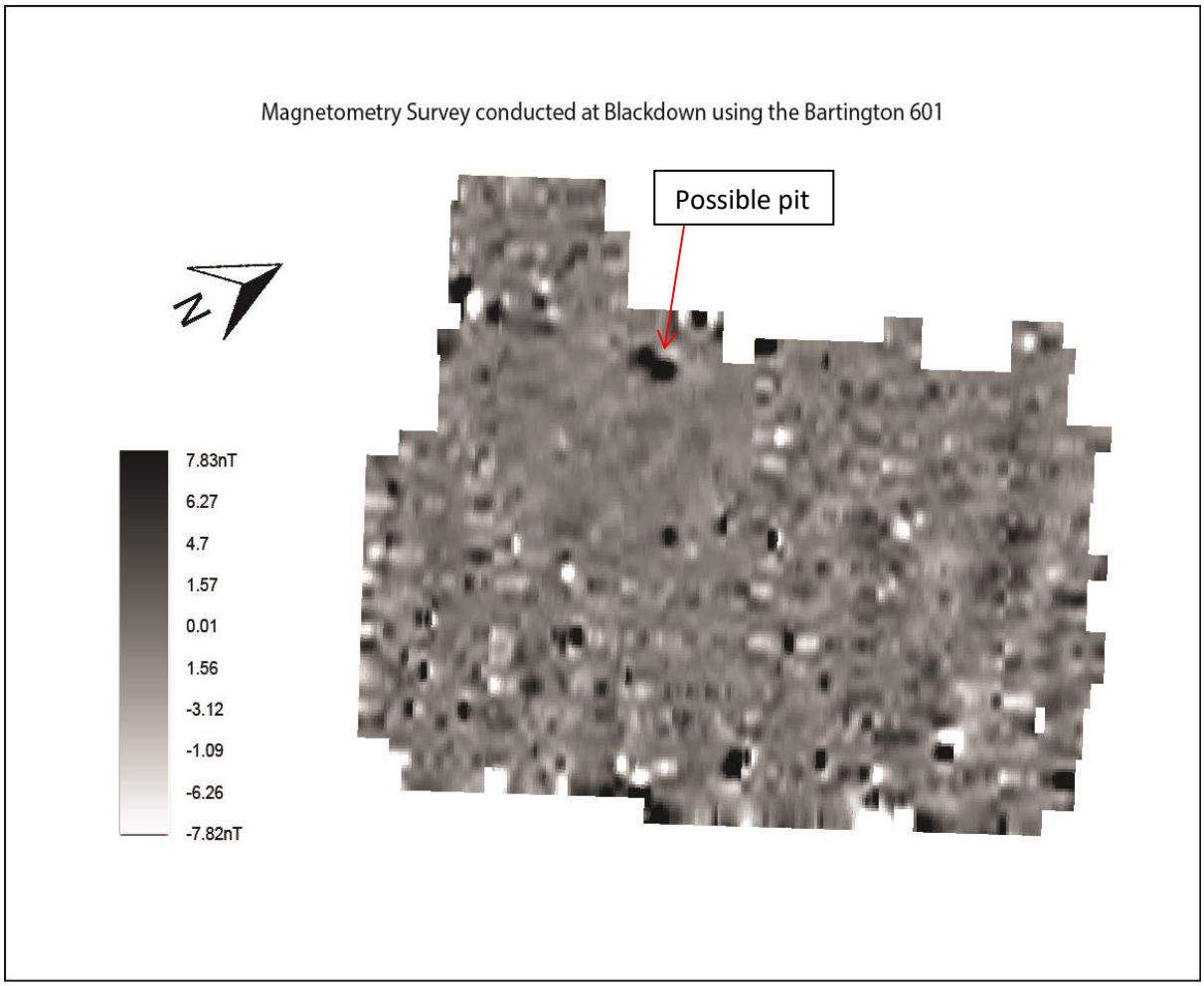


Figure 16

Discussion

Locating the 1970 excavations

Hewitt et al (2016) recorded the six trenches of the 1970 excavations in their Figure 2. The resistivity results appear to agree with Hewitt et al's (2016) predicted location of two of the Putnam trenches, 4 and 5. The rest of the trenches are not identifiable. The magnetometry surveys do not appear to show any of the trenches.

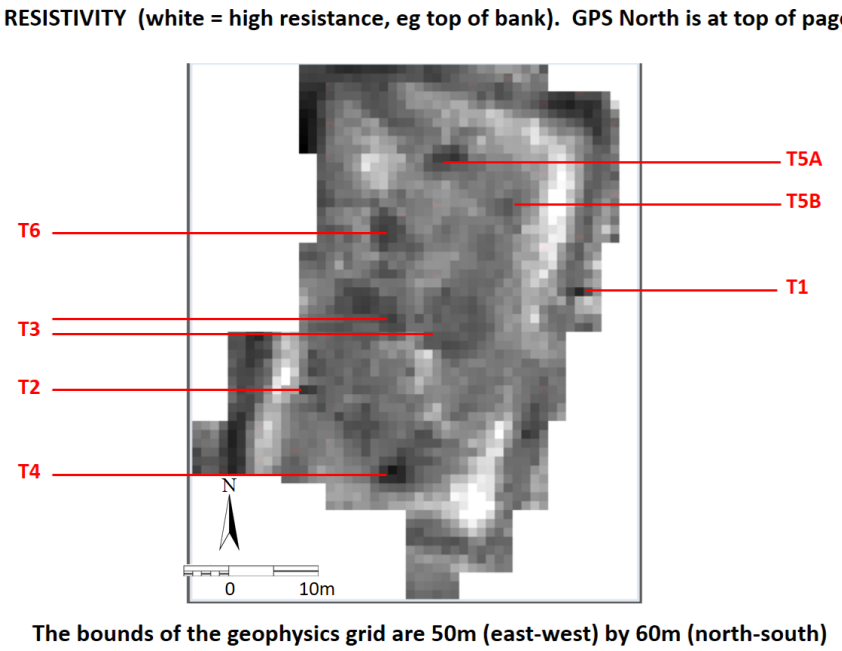
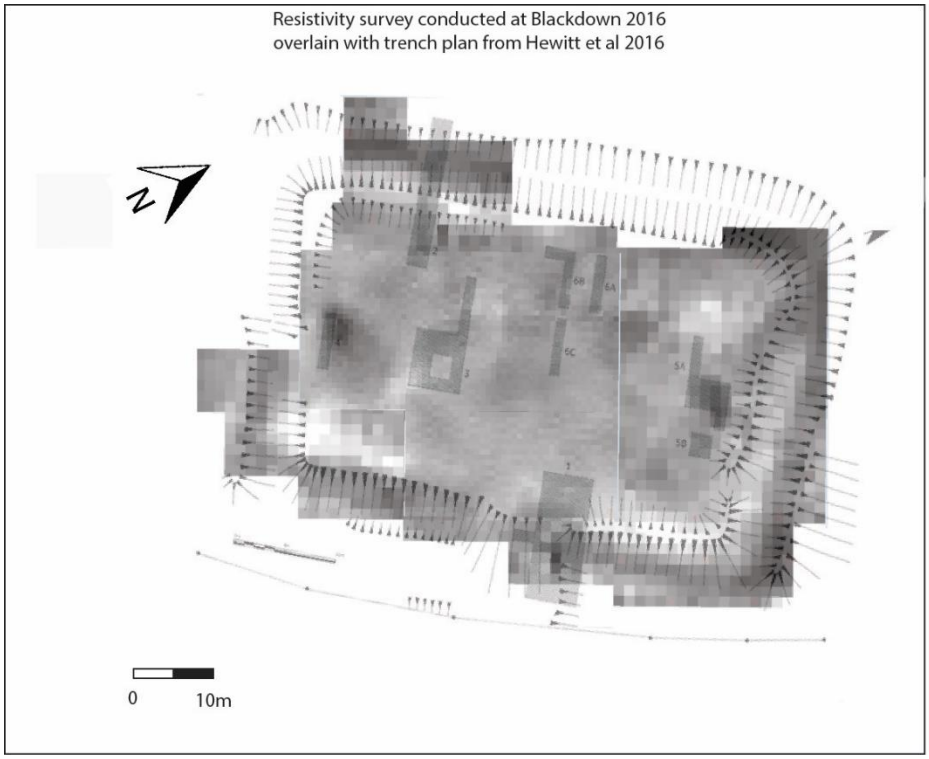


Figure 17. Identifying the trenches from the 1970 excavation.

T1 etc shows the position of trenches as recorded in Hewitt et al.


Resistivity survey conducted at Blackdown 2016
overlain with trench plan from Hewitt et al 2016
N
0
10m

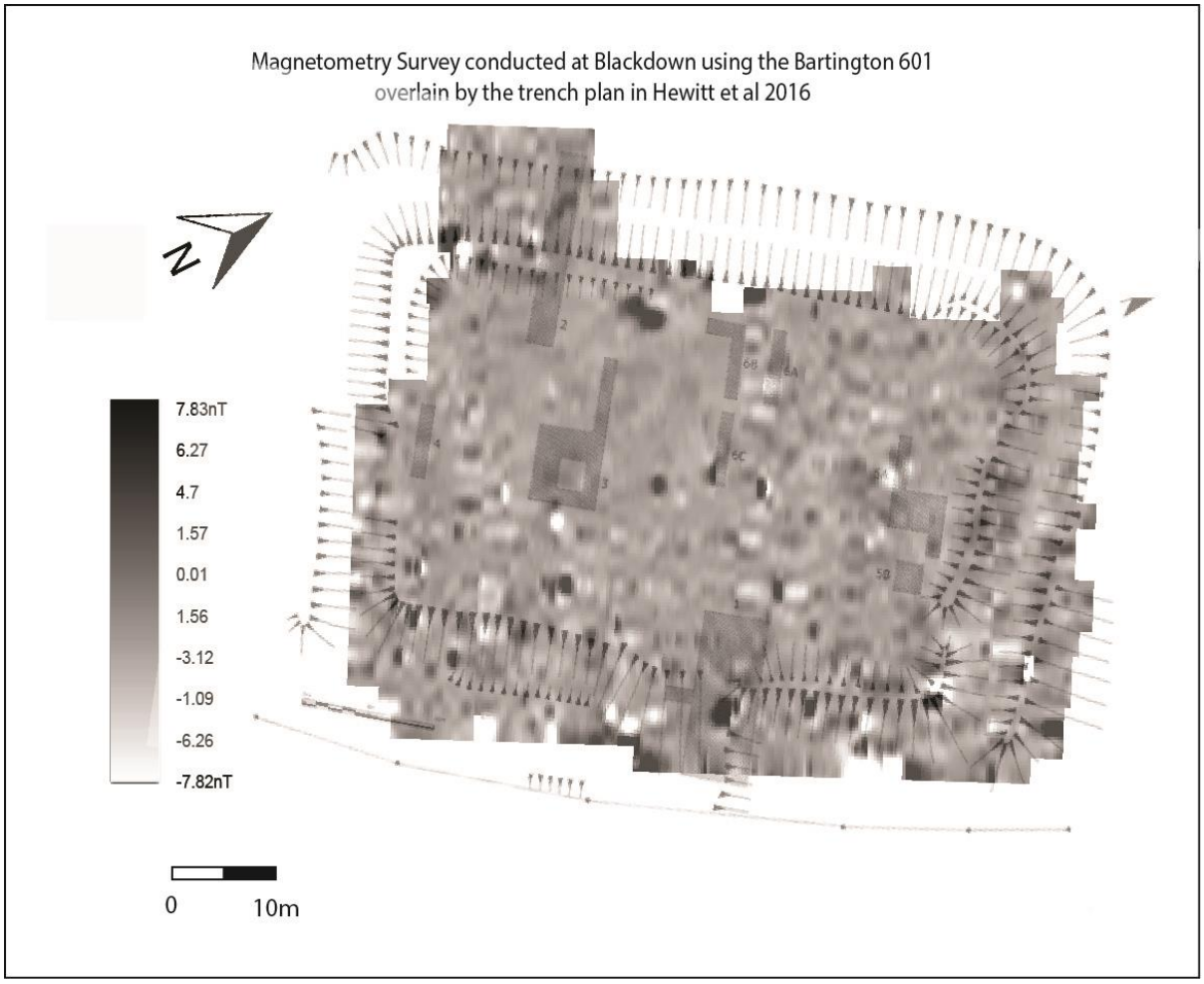

Magnetometry Survey conducted at Blackdown using the Bartington 601
overlain by the trench plan in Hewitt et al 2016
N
7.83nT
6.27
4.7
1.57
0.01
1.56
-3.12
-1.09
-6.26
-7.82nT
0
10m

Figure 18

Use of the site

Hewitt et al (2016) discussed the potential purpose of the site but with no firm conclusion. This geophysical survey provides little evidence to support a signalling station. There are no areas that may indicate burning activity, this includes within the enclosure ditch itself. This was not particularly visible on the magnetometry surveys indicating that it does not contain much charcoal.

Within Putnam's archive one of potential indicators of a signal station was the discovery of a patch of charcoal in Trench 5, this was not visible in the magnetometry survey.

Putnam identified flint alignments that he felt may have been indicative of linear features however Hewitt et al (2016) conclude these is were not visible in the trench photos. The geophysical survey does not support evidence for these.

The Bartington 601 Magnetometry survey is the only geophysical method conducted which indicated any feature, a possible pit shown on figure 16.

Dating the Site

Improved dating was one of the aims of the project. If the site was a Roman signalling station, a date in the middle third of the first century AD is discussed by Hewitt et al (2016). However, our project has shown there are no internal structures (other than those tentatively attributed during the 1970 excavation).

Conclusions

Apart from the enigmatic feature "A" in Figure 14, the resistivity survey (probing depths of up to about half a metre) did not show significant features other than the banks and the results of the 1970 excavation. Evidence for any internal linear features therefore is to be based solely on the Putnam excavation.

This evidence would seem to rest solely on interpretation of the 'flint alignments that were revealed in Trenches 3 and 6… the uncertain nature of the flint alignments' (Hewitt et al. 2016)

On balance, we conclude that there were no permanent internal structures.

We are confident that this is a genuine result because:

- the banks showed clearly,
- the re-survey at half-metre was consistent,
- the results of the 1970 excavations showed clearly.

The magnetometry showed a couple of features, but neither were internal to the embankment. Similarly, we are confident of this result because it:

- detected magnetic variation around the north-east corner of the embankment
- confirms the conclusions from the resistivity survey

Future Work

There are a number of similar sites in Dorset, of similar shape and/or candidates for possible locations within a signalling station network (Hewitt et al 2016). Similar non-invasive surveys at permitted sites would identify if the putative network had common features (e.g. with/without internal structures, having specific alignments, size). Consequently, the distribution and intervisibility map of these sites would suggest a meaning for them. From these results, usage and dating could be deduced.

Acknowledgements

Dorset County Council as landowner, for permission to assemble at the site.

Keith Miller, and Historic England, for permission to conduct the survey at the site, and for helpful guidance.

Iain Hewitt (Bournemouth University) for advice and generously sharing pre-publication information about the site.

The late Bill Putnam for conducting the 1970 excavations.

Jill Hearing, South Dorset Ridgeway Officer (Dorset County Council), Dorset Countryside, and Dave Searle (EuCAN) for clearing the site in preparation for the surveys.

Luke Hooper, Bournemouth University assisted with the data processing of the Bartington 601 magnetometry survey

Kate Welham (Bournemouth University), and Lawrence Shaw (New Forest National park) through their LoCATE program, for loaning a magnetometer.

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APPENDIX 1: Historic England Geophysical Survey Database Questionnaire

Survey Details

Name of Site: Enclosure on Sheep Down 930m south east of Heart Clump

County: DORSET

NGR Grid Reference: (Centre of survey to nearest 100m): SY 603881

Start Date: 1 June 2016 **End Date:** 31 December 2016

Geology at site: The site is on Poole Formation Sand known as the Bagshot Beds (British Geological Survey 2015).

Known archaeological Sites/Monuments covered by the survey: The site is a scheduled ancient monument no.1016912, identified in the Dorset Historic Environment Record as a Roman signal station.

Archaeological Sites/Monument types detected by survey: Earth banks forming a rectangle with rounded corners are currently clearly visible, as is the surrounding ditch. (These had been previously noted by the Royal Commission, and later by Putnam). Our results indicate that the site did not contain significant structures, other than those tentatively identified by the 1970 Excavations (see Hewitt et al.)

Surveyors:

- Ms Hayley Roberts, Bournemouth University
- Dorset Diggers Community Archaeology Group

Purpose of Survey:

To further our understanding of this enclosure and its relation to other nearby earthworks.

Objectives:

- To identify any internal or immediate external features
- To locate the 1970 excavations
- To enable a more accurate dating of the site
- To inform potential future research.

Land description:

Area Surveyed, if applicable: (In hectares to one decimal place): 0.3 ha

Land use at the time of the survey: Heathland

Technical Details for Resistivity Survey:

Type, Make and model of Instrumentation: The resistivity survey used a twin-probe TR/CIA resistivity meter.

Probe configuration: Two fixed probes away from the monument and moved another two probes across the survey taking readings.

Probe Spacing: The movable probes are always 0.5m apart.

Traverse Separation, Reading/Sample Interval: Every 1m along lines 1m apart. For the central part of the site, an additional survey was conducted taking readings at every 0.5m along lines 0.5m apart.

Technical Details for Magnetometry Survey:

Type, Make and model of Instrumentation: The instrument used was a Geoscan FM36 fluxgate gradiometer, from Bournemouth University through their LoCATE program operated by a group member who has been trained by Bournemouth University.

Traverse Separation, Reading/Sample Interval: Readings were taken at 0.25m intervals on lines 1m apart. Processing used the 'Snuffler' program.

Location of archive, data, and full report:

These are submitted into the OASIS index. Alternatively, contact the authors (details on front page)

APPENDIX 2: Raw data from the Resistivity Survey
(see below)

APPENDIX 3: Raw data from the Magnetometry Survey
(see below)