

**YCCCART 2019/Y24**

**Geophysical survey and terrain modelling of the Roman road at Haydon Grange, Priddy**

**YATTON, CONGRESBURY, CLAVERHAM AND CLEEVE ARCHAEOLOGICAL  
RESEARCH TEAM (YCCCART)**

General Editor: Vince Russett



*The Roman road running across the drive north of Haydon Grange*

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## **Abstract**

As part of a study of Roman roads and potential Roman roads around Charterhouse-on Mendip, geophysical and terrain modelling surveys were carried out on the visible road earthwork at Haydon Grange, Priddy. The aim was to characterise this earthwork and explore to what extent these surveys might apply to other, less visible, Roman roads.

## **Acknowledgements**

YCCCART is grateful for a Heritage Lottery Grant for the purchase of a Geoscan RM 15 resistivity meter; and to the late M Campbell, for the purchase of an electronic, hydrostatic level (NIVCOMP) with a data reader, for the terrain model, without which this survey could not have been undertaken. We thank Golden Software, California, USA, for the kind donation of Surfer 13.

This survey was carried out with the kind permission of the landowner, Ms. Philippa Harris, and her tenant, Mr Elliot Davis.

The authors are grateful for the hard work by the members of YCCCART in performing the surveys and Vince Russett for editing.

## **Introduction**

Yatton, Congresbury, Claverham and Cleeve Archaeological Research Team (YCCCART) is one of a number of Community Archaeology teams across northern Somerset, formerly supported by the North Somerset Council Development Management Team.

Our objective is to undertake archaeological fieldwork to enable a better understanding and management of the heritage of the area while recording and publishing the activities and locations of the research carried out.

## Site location



*Fig 1: Location, showing line of the Roman road*

Haydon Grange is located at ST52565421, down a (private) drive off the B3134, in the parish of Priddy, in Somerset. The Roman road can be seen as a low linear earthwork either side of the drive at ST52835433, some 370m from the B3134.

## Land use and geology

The section of the Roman road in question lies in permanent pasture used for grazing. At the south eastern side of the field, the road passes into the Yoxter Ranges, an active military site. **Do not enter this site, used for live firing exercises, without prior permission.** There is no public access to the survey site. It lies within the Mendip Hills Area of Outstanding Natural Beauty (AONB).



## Historical & archaeological context

The knowledge and use of the Roman road from Old Sarum to Charterhouse was never really lost, with it gaining local names (Shepton's Brode Way; heydon wey and so on). It seems to have been used until the Inclosures of Ubley (1773), West Harptree (1790) and East Harptree (1796), and indeed, this section is recorded on Day and Master's map of Somerset as 'unfenced road' in 1782 (Somerset Record Society 76 1981).

The earliest mention of the name hydon/haydon is from the mid-12th century. Unfortunately, the document of King Stephen granting a meadow called 'hidena' to Walter Malherbe is only preserved in a poor, 17th century copy at Longleat House.

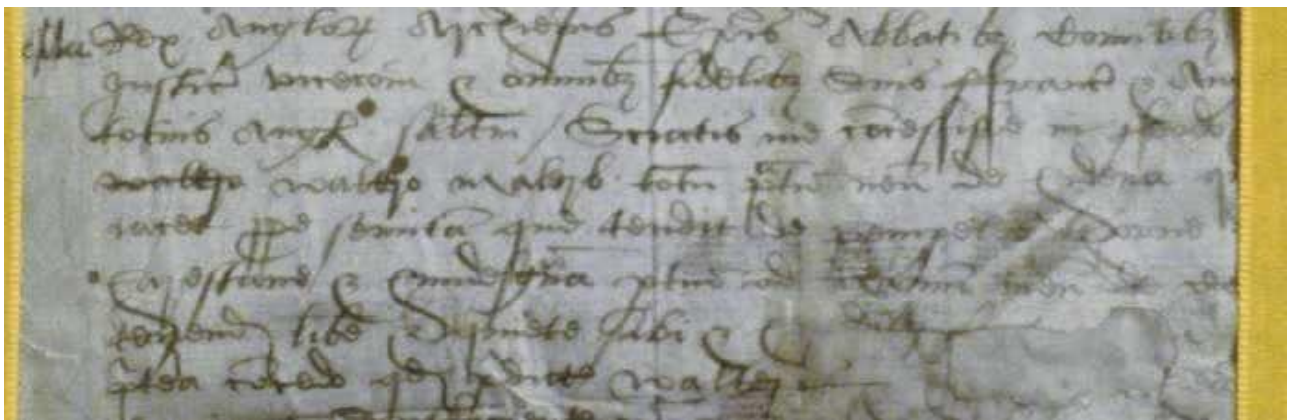


Fig 2: The earliest written mention of 'hidena' (circa 1135x1154)

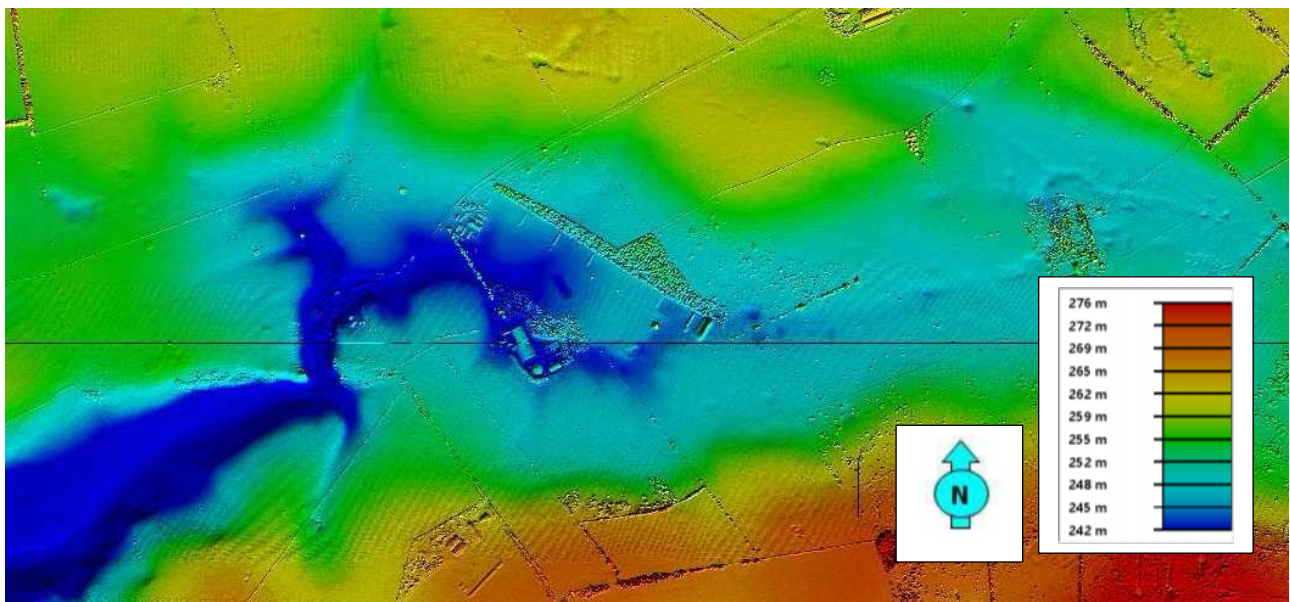


Fig 3: The 'hidena' at Haydon Grange. Scale is height in metres. (Above Ordnance Datum).

Ann Cole has ingeniously pointed out that 'dene' names almost always refer to 'a long valley with two steeper sides and a gently sloping floor' (Gelling 1984),

and a perfect example, partly followed by the B3371 road from Cheddar Gorge to the top of Mendip, can be seen on the lidar plot above (Fig 3).

The 'hidena' can be seen as the blue sinuous feature running past Yoxter Rock, then curving away from the modern road, across the military ranges and up to the back of the modern Haydon Grange.

The Roman road, of course, ignores topography and runs past the very top of the valley. The name 'hydon' later became (after the grant of Charterhouse and

Witham to the Carthusians by King Henry II in 1181) Charterhouse Hydon, synonymous with today's Charterhouse-on-Mendip. This often causes confusion in the records with Hinton Charterhouse, another Carthusian house south of Bath, also with land on Mendip at Green Ore.

A charter of William, son of John de Harpentr' (c 1138) of 'common of all pasture on Mendep that is to say for a thousand sheep and 60 beasts' survives in the Templar archives at Winchester, and a subsequent Quitclaim of Robert de Gournay of all lands with meadow and pasture on Hidon made to the Knights of the Temple, confirms this was a Templar grange.

A final concord, which can be dated to 1230x1249 (on internal evidence), between 'Brother Robert de Sanford, master of the Knights of the Temple in England complainant and Robert de Gurnay, deforciant, of 20 acres of land with appurtenances in Harpetr' and with pasture for a thousand sheep and 60 beasts in Menedep' seals this identification.

This land would have passed to the Hospitallers when the Templars were forcibly disbanded in the early 14th century.

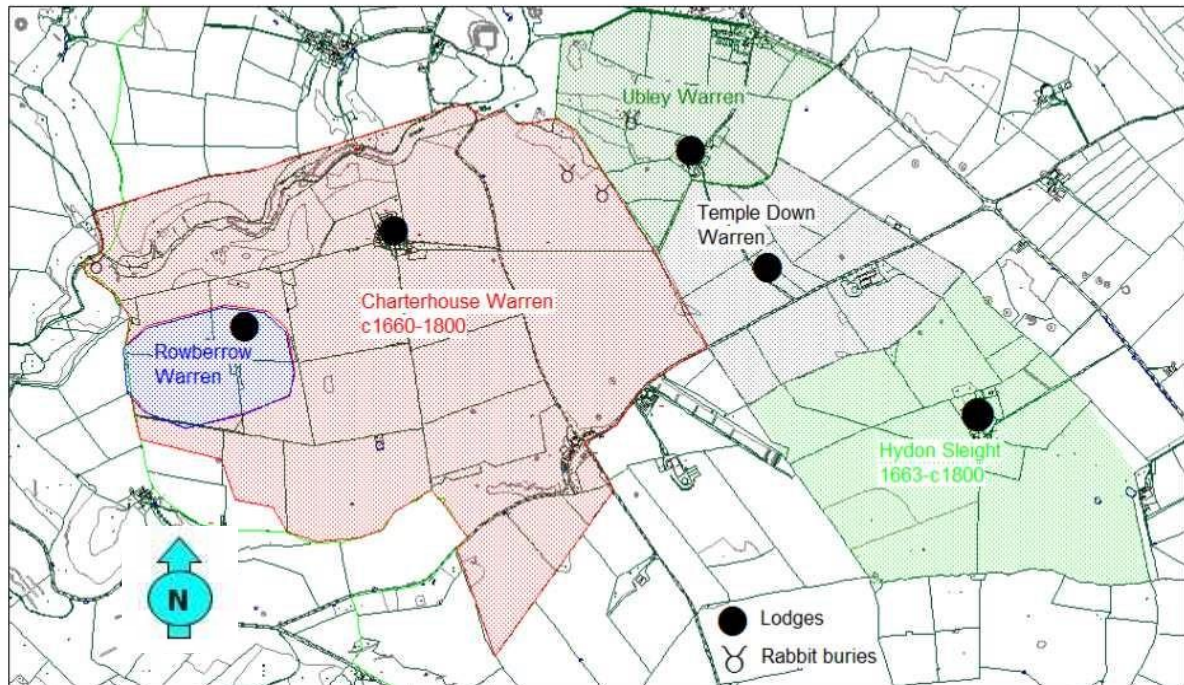
An early reference to lead mining at Hydon is in 'Letters present of John Biconyll [the bishop] and Robert Botyll, prior of St John of Jerusalem (Hospitallers) 12 May 17 Edward 4, [1478] Richard Marshall and Isabel his wife grant to William Powton, his wife Joan and Joan his daughter the lead mines in their manor of Templehidon'.

Powton was also (at an unknown but late C15 date) granted lease of a 'capital messuage' (manor house) at Temple Hidon, confirmed in 1505 (SHC DD/S/HY 170; Lane 2008; Nathan 1935).

This is of great relevance to the Roman and later road, since the mineral riches of the area would have been fairly difficult to exploit without good transport which the road provided until the late 18th century.

Later use of the area as a rabbit warren in the 17th and 18th century, deeply affected the common rights of grazing of adjacent parishes, especially as there were several warrens all adjacent in this small area on Mendip from the 1660s (Fig 4).

In other documents (such as the Compton Martin Inclosure map of 1791) the area is referred to as 'Hayden Farm Common'. The continuing use of the road, and the non-intensive use of the area, is probably the reason why the road survives in good condition to this day.



*Fig 4: Warrens at Haydon / Yoxter in the 17th century.*

Disagreements between Compton Martin and West Harptree, caused by rival perambulations, led to sketch maps being made in the late 17th century, identifying the road, and as late as 1777, were able to refer to The Old Road:

August 14th 1777: From the east of High field Gate to Black Rock thence to a stone call's the Leaping Stock therefrom to a barrow at Cuckow rakes, up thro' Cuckow Rakes to Wriddle Stones, from Rigglesstones to Knights Barrow & thence to Lodmoor Pool, along the Old Road from Wells to Wrington through part of Mr Whalley's Enclosures to the Font Stone and therefrom (Winding a little to the South) to the South end of Ash Ditch at the Foss Road (SHC DD/X WIAM 4.1)

The area has today been recovered from any mining scars, except for occasional patches of surface quarrying, which could be of any age.

## Survey objectives

The Roman road at Haydon Grange is a surviving earthwork of a road which can be traced on air photographs across many adjacent fields.

The survey work was carried out to:

- 1) Understand the resistivity response of a known Roman road
- 2) Use digital, terrain modelling to record and interpret the surviving earthwork.
- 3) Use these results to help interpret surveys where there is no longer a visible earthwork, but a Roman road is suspected.

## Methodology

The survey of the field was undertaken during the period December 2018 to January 2019 by teams from YCCART using a Geoscan RM-15 resistivity meter for the geophysical survey and an electronic, hydrostatic level (NIVCOMP) with a data reader, for the terrain model.

### *Resistivity*

Four grids, each 20 x 20 m, were laid out over the feature as shown in the Appendix

The completed survey was downloaded to a TerraSurveyor programme and the resultant composite adjusted using the following filters:

- Band weight equaliser
- Grad shade
- Despiked
- Clip SD2
- High Pass filter.

### *Terrain modelling*

The terrain model surveys of the feature were undertaken using an electronic, hydrostatic level (NIVCOMP) and computer software (Surfer 13, Golden Software, California, USA).

The survey was undertaken, using three, separate grids within two RM-15 Grids (Grids 1 and 2 Dec 13). The grid, designated Roman road 1, was within Grid 1 Dec 13 and the grids designated Roman roads 2 and 3 were within Grid 2 Dec 13 (Appendix). For each survey, tapes were laid out using the RM-15 survey baseline and heights were measured at 1m intervals for each grid, northerly along the X axis, (8 columns, Roman road 1; 5 columns, Roman road 2, and 4 columns, Roman road 3), and westerly along the Y axis, (21 columns, Roman roads 1, 2 and 3). The zero



reference point for Roman road 1 was at the SE corner of Grid 1 Dec 13, and for Roman Roads 2 and 3 it was 8m from the SE corner along the eastern edge of Grid 2 Dec 13. The zero point for Roman roads 2 and 3 was +215mm above the zero point for Roman road 1. This difference was noted but not used in the calculations for Roman roads 2 and 3. The Z axis for all grids was the height above, (+), or below, (-), the zero point for each survey in mm. The survey for Roman road 1 was started using the incorporated data logger. However, problems were encountered at row X3. The survey was recommenced at X3 (which then became X0) and individual readings were recorded on paper. For Roman roads 2 and 3 readings were recorded on both the data logger and on paper. The manually recorded data for Roman road 1 and the electronic data for Roman roads 2 and 3 were entered into Excel (Microsoft), and used in the Surfer 10 programme, to produce 2-dimensional contour and 3dimensional images, including contours (Appendix). The report was written in Libre Office 5 Writer.

Photographs were taken by members of YCCCART and remain the copyright of YCCCART.

## Results

The feature is in a field adjacent to the northerly edge of the farm road, and approximately at right angles to it (Fig 5). The field sloped gently down from east to west. Looking north along the feature from the farm road, a slight, rounded raised area could be discerned. Standing within the field, at the western side of the feature and looking east, a raised, linear, area could be seen (Fig 6).



*Fig 5: The road earthwork: the two figures are each standing on the brow of the ridge*

## Resistivity

The two right hand grids (Grids 1 and 2, Dec 13), aligned along the road, consist of two, parallel, dark bands of variable resistance with a central band of low resistance (Fig 6). In the two left-hand grids (Grids 3 and 4 Dec 13), irregular, low and high density features could be seen, in clear contrast with grids 1 and 2.

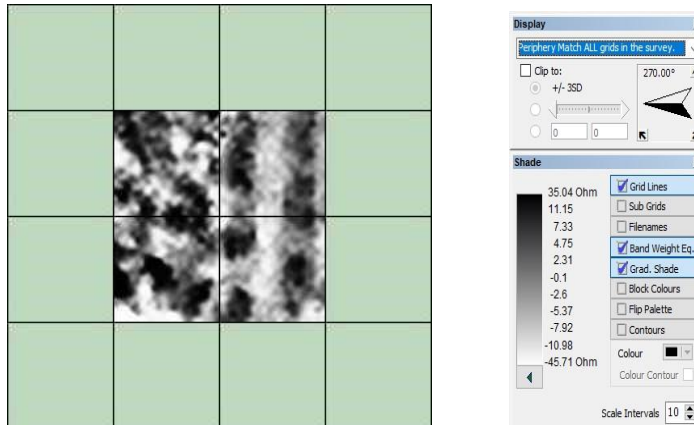


Fig 6: Resistivity results. The Roman road is seen in the two right hand grids, (Grids 1 and 2 Dec 13)

## Terrain modelling

The results are shown in Figures 7 and 8. The contoured areas, Roman road 1, Roman road 2, and Roman road 3, are laid over the RM 15 results; the corresponding, three dimensional images of the surface are shown at the side, and the cross sections of the 'models' are shown below.

In all 3 areas, the ground to the eastern edge of the feature is slightly higher than the western edge, confirming the slope of the field, and a clear, bow-shaped, approximately central, raised area can be seen. The maximum measurements, above and below the two zero points were Roman road 1, -84mm to +439mm; Roman road 2, -248 to +178mm, and Roman road 3, -184 to +127mm. Comparing these findings with the RM15 results, in Roman road 1, the higher point was slightly to the east of the central, clear area. However, the raised areas for Roman roads 1 and 2 were, generally, located centrally over the clear area. The raised area was at its maximum height, +439mm, above the zero point at its southerly edge, decreasing to 127mm above the zero point at its northerly edge (i.e. less than half a metre, to approximately 13 cm).

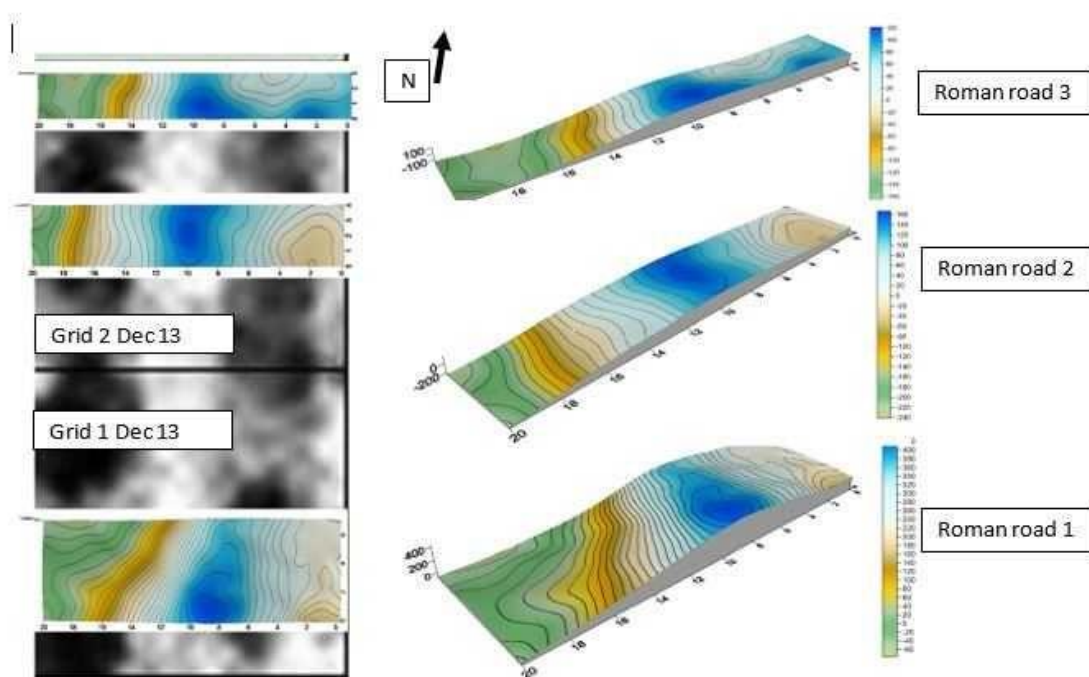


Fig 7: Contoured (laid over the RM-15 result), 3-dimensional terrain models, (Roman road 1-3)

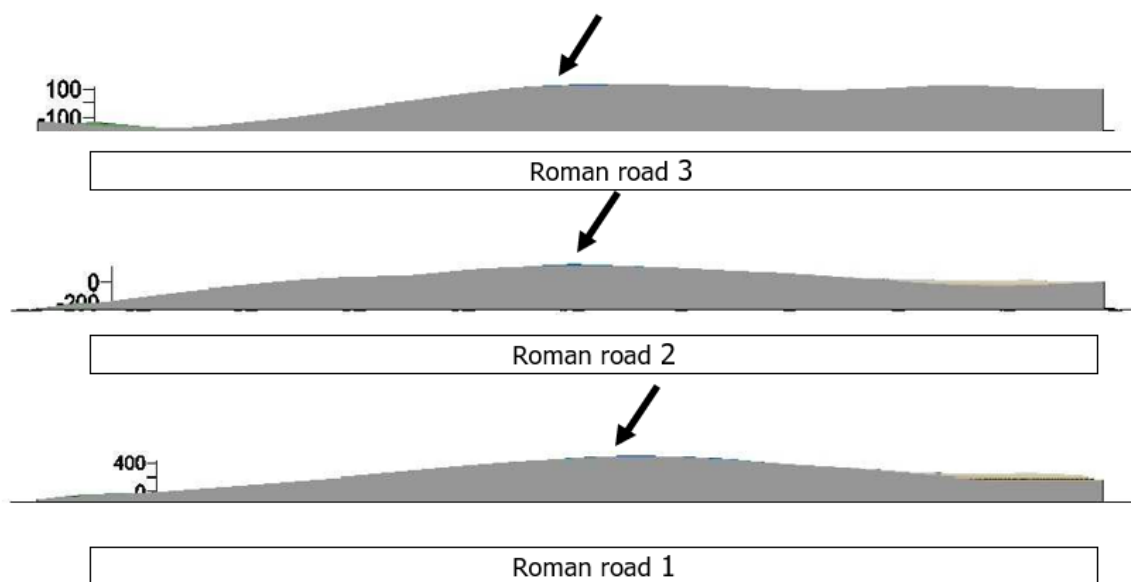


Figure 8. 'End on' view of the 3-dimensional images shown in figure 7. Arrows point to the Agger of the road.

## Comments

The resistivity results for the road show structures on the same alignment, and of the same width, as the features visible on aerial photographs. However, perhaps counter-intuitively, the centre of the road shows low resistance, while the parallel bands on either side show higher resistance. Furthermore, the high resistance seems to be variable. A similar appearance with parallel lines of high resistance, where the bed of the road had been ploughed away, leaving the ditches full of gravel from the road has been observed previously (Gaffney and Gater, 2003). Caution should be taken in accepting this at face value in the present case, since it may never have been, or perhaps only lightly, ploughed since the Roman period.

The terrain modelling results correspond well with the resistivity results, indicating that the raised areas for Roman roads 1 and 2 were, generally, located over the area of low resistance on resistivity, corresponding to the agger. This was more prominent in Roman roads 1 and 2, becoming flatter on Roman road 3, where the raised area was beginning to become less obvious.

A previous resistivity survey has been carried out along this stretch of Roman road at Haydon Grange, by the Charterhouse environs Research Team (CHERT) (Thompson, 2011). However, the precise site was not indicated. To our knowledge, this is the first time that a 3-dimensional, terrain model, correlated with a resistivity survey, has been used on a Roman road.

Thus, the first two aims of the study were fulfilled, and the combined results may be helpful in interpreting further examples.

## Recommendations for further work

It would be of interest to expose, record and section a part of this road, to compare any findings with the resistivity and terrain modelling results. In addition, it would be of interest to determine, if possible, how much of the archaeology is original Roman and how much later patching, or other activity. Further geophysical and terrain modelling surveys, along the established line of the road, may also be helpful in the search for further roads.

## References

- Gaffney, C. & Gater, J. (2003). *Revealing the Buried Past*. Tempus.  
 Lane, B. (2008) The Knights Templar. In, Blagdon. *Unpub script in CHERT archive*.  
 Nathan, M. (1935) *Somerset & Dorset Notes & Queries* 31, 86.  
 Thompson, A (2011) *Praesidium on Mendip*. In, *The Archaeology of Mendip*, Ed J Lewis. Heritage, 201.

**Authors**

Vince Russett  
Geoff Pearson  
Chris Short

**Date** (this version) 2020-09-03



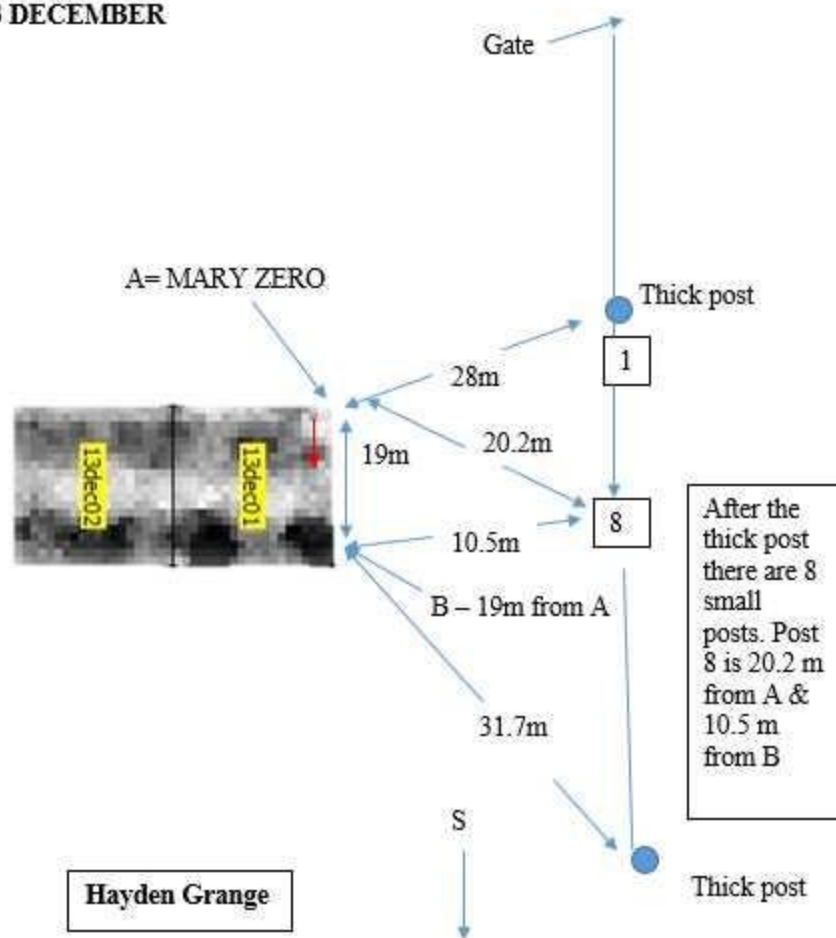
## Appendix 1

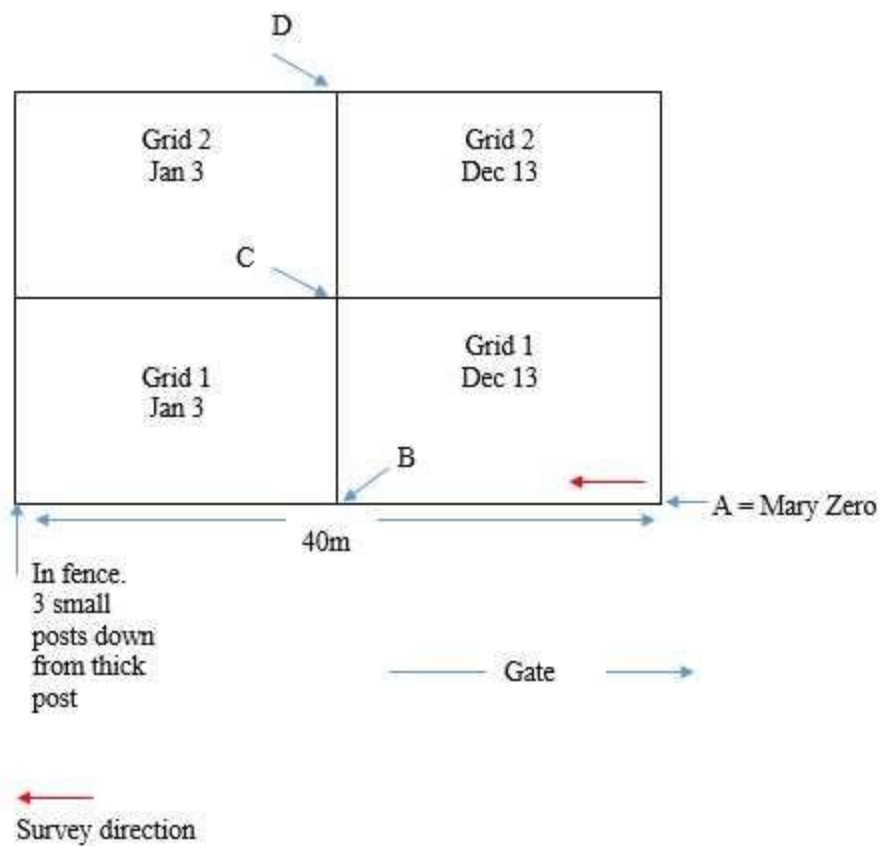
### Resistivity

YCCCART Site Survey	
Project: - Roman Rd, Hayden Grange	
Survey date	3 January 2019
Report date	3 January 2019
Type /Instrument	RM15
Location	Hayden Grange, <u>Mendip</u>
Landowner	<u>Ms</u> Phillipa Harris
Tenant	<u>Mr</u> Elliot Davis
HER ref	<u>TBC</u>
Site type	Grass
Description	
Period	? Roman
Geology	
Land use	
Survey team and conditions	
13 <u>December</u> 2018	John Wilcox, Pete English, Colin Campbell, Vince <u>Russett</u> Chris Short, Bev Knott <i>Weather: Dry. Very cold.</i>
3 January 2019	Vince <u>Russett</u> , John Evans, Geoff Pearson, Peter English & Chris Short <i>Weather. Dry. Very cold</i>

Survey area		Notes	
		Size	Walk direction
13 December 2018	Grids 1 - 2	20x20m	SW
3 January 2019	Grids 1 - 2	20x20m	SW

## LAYOUT 13 DECEMBER



**LAY OUT JANUARY 3****GPS**

A	352810.15	154340.32
B	352800.48	154322.64
C	352783.45	154332.43
D	352766.39	154348.76

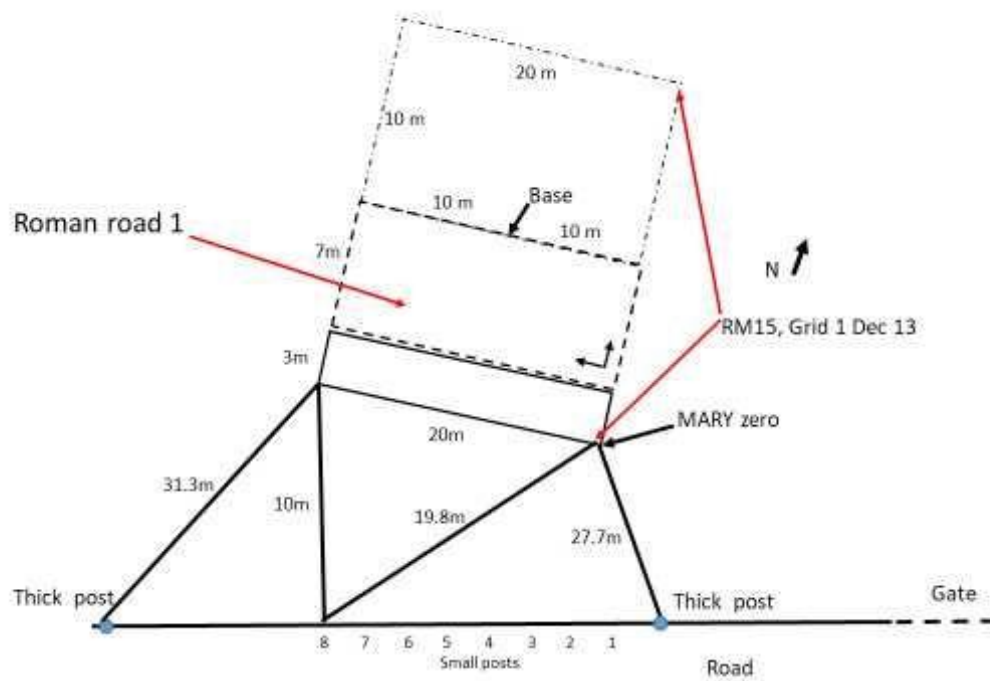
## Appendix 2.

### Terrain modelling

#### Roman road 1

YCCART Site Survey	
Project – Roman Road, Hayden Grange	
Survey date	22/11/18
Location	Hayden Grange, Mendip
Site name	Roman road 1, Grid1 Dec13
Reference	
Type / Instrument	NIVCOMP electronic hydrostatic level
Survey area	<p>7 x 20m grid</p> <p>X axis, northerly, 8 columns @ 1 m intervals</p> <p>Y axis, easterly, 21 columns @ 1 m intervals</p> <p>Z axis: height above (+), or below (-) Zero point in mm.</p> <p>Zero point: SE corner of RM-15, Grid 1 Dec 13</p>
Data files	<p>Raw data: Paper copy in Manual Folder</p> <p>Scanned copy in Roman Road.</p> <p>Surfer: Roman road 1.xls</p> <p>Roman road 1.rtf</p> <p>Roman road 1.grd</p>
Survey team and conditions	
Team	22/11/18; G Pearson, M Fox, J Wilcox, D Long, V Russett
Weather	Sunny, very cold
Additional information	
Landowner	
Tenant	
HER ref	
Site type	Meadow
Description	
Period	
Geology	
Land use	Grazing
Comments	On 13th Dec, the grid was surveyed using the RM15, and designated Grid1 Dec13. The terrain modelling survey, Roman road 1, was started in the 10 x 20m grid, starting at X0 Y0. Electronic recording failed in the X3 line. The survey was restarted at the X3 line (at Y0), using the same zero point, and continued to X10 Y20. Thus, the final survey was 7 x 20m.
Report date	19/3/19
Author	G Pearson

Layout 22/11/18





## Electronic data

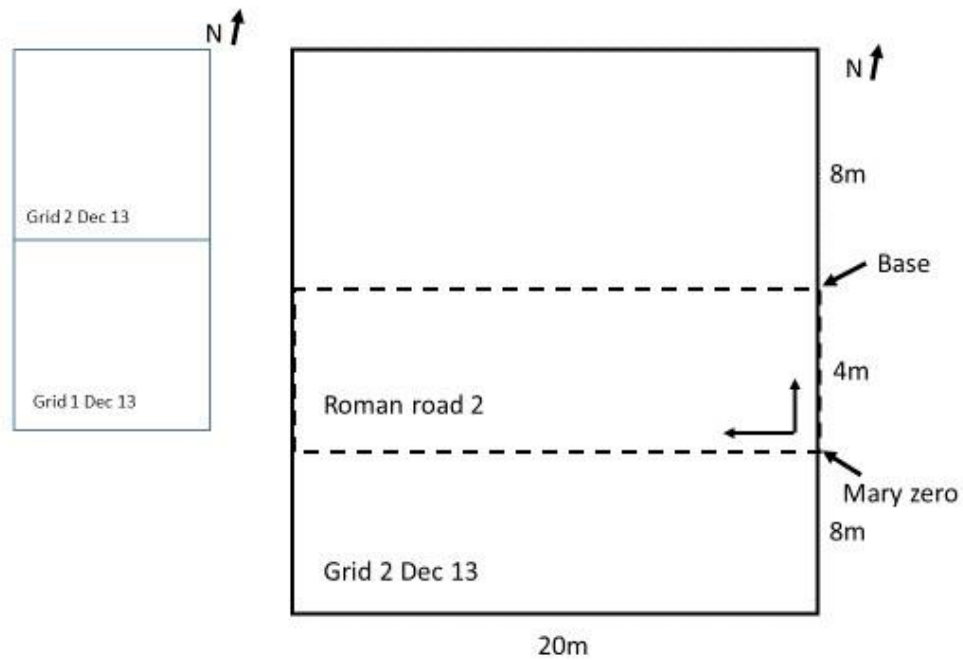
0	0	158	1	20	-25	3	19	2
0	1	167	2	0	228	3	20	-9
0	2	148	2	1	220	4	0	270
0	3	204	2	2	235	4	1	212
0	4	248	2	3	248	4	2	249
0	5	304	2	4	270	4	3	228
0	6	334	2	5	315	4	4	283
0	7	383	2	6	354	4	5	307
0	8	415	2	7	381	4	6	351
0	9	427	2	8	392	4	7	381
0	10	394	2	9	418	4	8	385
0	11	368	2	10	409	4	9	379
0	12	322	2	11	322	4	10	335
0	13	267	2	12	262	4	11	255
0	14	209	2	13	206	4	12	168
0	15	163	2	14	177	4	13	123
0	16	116	2	15	114	4	14	74
0	17	73	2	16	75	4	15	44
0	18	24	2	17	64	4	16	17
0	19	3	2	18	26	4	17	8
0	20	-57	2	19	4	4	18	-4
1	0	218	2	20	-8	4	19	-4
1	1	178	3	0	237	4	20	-3
1	2	198	3	1	199	5	0	216
1	3	234	3	2	243	5	1	227
1	4	294	3	3	251	5	2	225
1	5	313	3	4	273	5	3	244
1	6	351	3	5	297	5	4	256
1	7	415	3	6	344	5	5	288
1	8	433	3	7	403	5	6	348
1	9	439	3	8	407	5	7	387
1	10	415	3	9	406	5	8	379
1	11	352	3	10	355	5	9	343
1	12	281	3	11	288	5	10	298
1	13	237	3	12	220	5	11	233
1	14	194	3	13	172	5	12	147
1	15	129	3	14	127	5	13	72
1	16	94	3	15	64	5	14	34
1	17	39	3	16	41	5	15	-2
1	18	5	3	17	33	5	16	3
1	19	-11	3	18	29	5	17	-10

5	18	-26	6	12	124	7	6	341
5	19	-31	6	13	62	7	7	366
5	20	-5	6	14	22	7	8	346
6	0	231	6	15	-21	7	9	309
6	1	228	6	16	-49	7	10	223
6	2	239	6	17	-34	7	11	139
6	3	236	6	18	-47	7	12	66
6	4	260	6	19	-45	7	13	20
6	5	310	6	20	-47	7	14	-15
6	6	335	7	0	244	7	15	-29
6	7	347	7	1	243	7	16	-50
6	8	384	7	2	227	7	17	-84
6	9	328	7	3	252	7	18	-75
6	10	266	7	4	284	7	19	-64
6	11	194	7	5	325	7	20	-57

## Roman road 2

YCCCART Site Survey	
Project – Roman Road, Haydon Grange	
Survey date	13/12/18
Location	Haydon Grange, Mendip
Site name	Roman road 2, Grid2 Dec13
Reference	
Type / Instrument	NIVCOMP electronic hydrostatic level
Survey area	4 x 20m grid X axis, northerly, 5 columns @ 1 m intervals Y axis, westerly, 21 columns @ 1 m intervals Z axis: height above (+), or below (-) Zero point in mm.
	Zero point: 8m along SE edge, from SE corner of Grid 2 Dec13
Data files	Raw data: Paper copy in Manual Folder Scanned copy in Roman Road.  Surfer: Roman road 2.xls Roman road 2.grd Roman road 2.rtf
Survey team and conditions	
Team	G Pearson, C Campbell, B Knott
Weather	Cold, clear
Additional information	
Landowner	
Tenant	
HER ref	
Site type	Meadow
Description	
Period	
Geology	
Land use	Grazing
Comments	The zero point was 215 mm above the zero point for Grid1 Dec13. (Not used in the calculations for the terrain model – data considered to 'stand alone'). (results also recorded manually – not used)
Report date	19/3/19
Author	G Pearson

## Plan



## Electronic data

<u>Xm</u>	<u>Ym</u>	<u>Zmm</u>						
0	0		1	19	-18	3	18	-165
0	1	-3	1	20	-21	3	19	-211
0	2	-4	2	0		3	20	-221
0	3	-3	2	1	-2	4	0	31
0	4	1	2	2	-3	4	1	7
0	5	3	2	3	-1	4	2	26
0	6	7	2	4	-	4	3	35
0	7	9	2	5	3	4	4	47
0	8	12	2	6	8	4	5	86
0	9	13	2	7	9	4	6	97
0	10	14	2	8	11	4	7	104
0	11	13	2	9	14	4	8	149
0	12	10	2	10	17	4	9	155
0	13	4	2	11	14	4	10	155
0	14	4	2	12	9	4	11	137
0	15	2	2	13	6	4	12	86
0	16	-2	2	14	2	4	13	76
0	17	-6	2	15	-	4	14	47
0	18	-12	2	16	-2	4	15	2
0	19	-18	2	17	-8	4	16	-51
0	20	-23	2	18	-13	4	17	-113
1	0		2	19	-18	4	18	-176
1	1	-2	2	20	-18	4	19	-214
1	2	-3	3	0		4	20	-248
1	3	-2	3	1	-			
1	4	-1	3	2	-1			
1	5	3	3	3	1			
1	6	6	3	4	3			
1	7	9	3	5	6			
1	8	12	3	6	10			
1	9	14	3	7	11			
1	10	15	3	8	11			
1	11	11	3	9	14			
1	12	10	3	10	15			
1	13	4	3	11	14			
1	14	3	3	12	11			
1	15	-	3	13	7			
1	16	-4	3	14	4			
1	17	-6	3	15	1			
1	18	-12	3	16	-4			
			3	17	-9			

Missing data for Z from above list

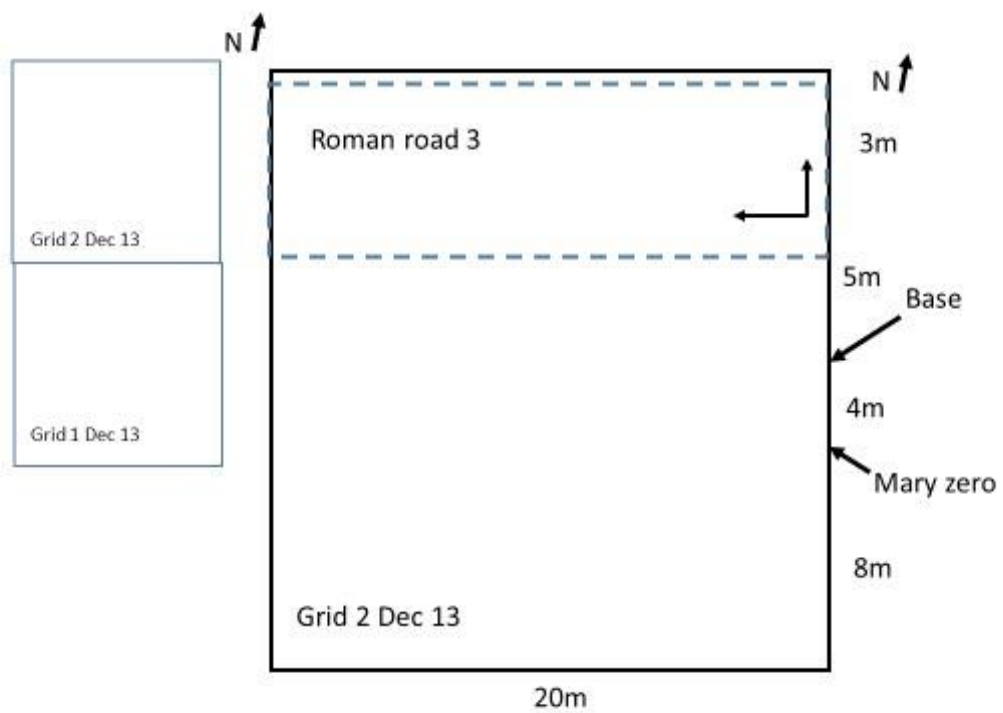
X0Y0 Z0; X1Y0 Z 1; X1Y15 Z -1; X2Y0 Z 0; X2Y4 Z -2; X2Y15 Z -9; X3Y0 Z 8; X3Y1 Z -6



## Roman road 3

YCCART Site Survey Project – Roman Road, Hayden Grange	
Survey date	13/12/18
Location	Haydon Grange, Mendip
Site name	Roman road 3, Grid2 Dec13
Reference	
Type / Instrument	NIVCOMP electronic hydrostatic level
Survey area	3 x 20m grid X axis, northerly, 4 columns @ 1 m intervals Y axis, westerly, 21 columns @ 1 m intervals Z axis: height above (+), or below (-) Zero point in mm.  Zero point: 8m along SE edge, from SE corner of Grid 2 Dec13
Data files	Raw data: Paper copy in Manual Folder Scanned copy in Roman Road.  Surfer: Roman road 3.xls Roman road 3.grd Roman road 3.txt
Survey team and conditions	
Team	G Pearson, C Campbell, B Knott
Weather	Cold, clear
Additional information	
Landowner	
Tenant	
HER ref	
Site type	Meadow
Description	
Period	
Geology	
Land use	Grazing
Comments	The zero point was 215 mm above the zero point for Grid1 Dec13. (Not used in the calculations for the terrain model – data considered to ' <u>stand alone</u> '). Results were also recorded manually (in case MARY failed, which happened on Roman road 1) and compared with electronic results
Report date	19/3/19
Author	G Pearson

Laid out according to the RM 15 plan



## Electronic data

Xm	Ym	Zmm						
0	0	7	1	19	-17	3	18	-184
0	1	8	1	20	-15	3	19	-165
0	2	10	2	0	7	3	20	-120
0	3	11	2	1	5			
0	4	8	2	2	5			
0	5	8	2	3	4			
0	6	8	2	4	3			
0	7	11	2	5	2			
0	8	11	2	6	2			
0	9	11	2	7	1			
0	10	10	2	8	6			
0	11	9	2	9	9			
0	12	5	2	10	9			
0	13		2	11	7			
0	14	-3	2	12	2			
0	15	-8	2	13	-1			
0	16	-11	2	14	-7			
0	17	-15	2	15	-9			
0	18	-17	2	16	-11			
0	19	-13	2	17	-16			
0	20	-10	2	18	-17			
1	0	9	2	19	-15			
1	1	8	2	20	-13			
1	2	9	3	0	8			
1	3	9	3	1	6			
1	4	6	3	2	5			
1	5	5	3	3	3			
1	6	7	3	4				
1	7	8	3	5	-			
1	8	10	3	6	3			
1	9	12	3	7	5			
1	10	12	3	8	7			
1	11	10	3	9	8			
1	12	5	3	10	8			
1	13	1	3	11	7			
1	14	-2	3	12	3			
1	15	-7	3	13	-1			
1	16	-13	3	14	-8			
			3	15	-12			

Missing Data for Z, from above list

X0Y13 Z 7; X3Y4 Z 9; X3Y5 Z -2