

An archaeological gradiometer survey

Land to the north of Crediton Road Okehampton, Devon

Ordnance Survey (E/N): 259900,96110 (point)

Report: 140129

Ross Dean BSc MSc MA MIfA 29 January 2014

Substrata Archaeological Geophysical Surveyors 15 Horizon View, Bath Hotel Road Westward Ho! Bideford Devon EX39 1GX Tel: 07788627822 Email: geophysics@substrata.co.uk Web: substrata.co.uk Client: AC Archaeology Ltd 4 Halthaies Workshops Bradninch Nr Exeter Devon EX5 4QL Tel: 01392 882410

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Accompanying CD-ROM

Report	Adobe PDF format
Copies of report figures	Adobe PDF format
Raw and processed grid & composite files	DW Consulting TerraSurveyor 3 formats
Minimal processing data plots and metadata	Adobe PDF format
GIS project, shape files and classification schema	
GIS project	
GIS shape files	ESRI standard
GIS classification schema	Adobe PDF format
AutoCAD version of the survey interpretation	AutoCAD DXF

1 Survey description and summary

Type of survey: twin-sensor fluxgate gradiometer Date of survey: December 2013 Area surveyed: 14 ha Lead surveyor: Ross Dean BSc MSc MA MIfA

<u>Client</u>

AC Archaeology Ltd, 4 Halthaies Workshops, Bradninch, Nr Exeter, Devon EX5 4QL

Location	
Site:	Land to the north of Crediton Road, Okehampton
Civil Parish:	Okehampton and Belstone
District:	West Devon
County:	Devon
Nearest Postcode:	EX20 1RT
NGR:	SX 599 961 (point)
Ordnance Survey E/N:	259900,96110 (point)
OASIS number:	substrat1-171848
Archive:	At the time of writing, the archive of this survey will be held by
	Substrata.

Summary

This report was commissioned by AC Archaeology Ltd on behalf of Hannard Developments Ltd and was prepared by Substrata as supporting information for a forthcoming planning application for a proposed residential development and associated infrastructure. The location of the site is shown in figure 4, appendix 1. The survey area is part of a larger area which was the subject of an Historic Environment Assessment produced by AC Archaeology Ltd in support of the forthcoming application during February and March 2013 (Kerr-Peterson, 2013).

The plot numbers used in this report (figure 1) are taken from the Assessment.

The magnetic contrast across the survey areas was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses.

A total of seventy magnetic anomaly groups were identified as relating to potential archaeology. Of these, three groups are likely to represent former field boundaries mapped on the 1841 Okehampton tithe map and on all Ordnance Survey maps from 1881 to at least 1991. Four groups are very likely to relate to a former Roman road associated with the Roman military fort to the west of the western boundary of the survey area. There are a number of clusters of possible pits or large postholes to the north and south of the likely Roman road. Two groups, just to the south of the likely Roman road, are typical of anomalies caused by the presence of in-situ heated deposits such as that produced by former kilns, hearths or furnaces. Two groups on the western side of the survey area may represent former ridge-and-furrow cultivation. The remaining anomaly groups characterised as representing potential archaeological deposits are linear, multilinear and curvilinear groups that typically represent former field boundaries, enclosures or similar structures of unknown date. A number of these groups are have different alignments to the current field system.

2 Survey aims and objectives

Survey aims

- 1. Define and characterise and detectable archaeological remains on the site.
- 2. Inform any future archaeological investigation of the area.

Survey Objectives

1. Complete a gradiometer survey across agreed parts of the survey area.

- 2. Identify any magnetic anomalies that may be related to archaeological deposits, structures or artefacts.
- 3. Within the limits of the techniques and dataset, archaeologically characterise any such anomalies or patterns of anomalies.
- 4. Accurately record the location of the identified anomalies.
- 5. Produce a report based on the survey that is sufficiently detailed to inform any subsequent development on the site about the location and possible archaeological character of the recorded anomalies.

3 Standards

The standards used to complete this survey are defined by the Institute for Archaeologists (2011). The codes of approved practice that were followed are those of the Institute for Archaeologists (2008 and 2009) and Archaeology Data Service/Digital Antiquity Guides (undated). The document text was written using the house style of the Institute for Archaeologists (Institute for Archaeologists, undated).

4 Site description

Landscape

The survey area (figures 1 and 4) was situated within four fields surrounded by open fields to the west and east, Barton Farm and outbuildings to the north (Devon Historical Environment Record (DHER) entry 16928 discussed below), a residential estate bordering the south-west and southern boundaries and a new residential development along the south-eastern boundary. A Roman fort, listed as a Scheduled Ancient Monument (number 1015829) is situated on the western boundary of the survey area (DHER entry 4751 discussed below). The land lies at approximately 170m O.D. with a south to north area of wet ground through the centre of the survey area with a spring at its head. This wet ground becomes a small stream on the northern side of the survey area.

Land use at the time of the survey Grass pasture.

Geology

The site is located on a solid geology of mudstone and siltstone of the Carboniferous Ashton Mundstone Member and Crackington Formation (British Geological Survey, undated).

The superficial geology is not recorded in the source used (British Geological Survey, undated).

5 Archaeological background

A Historic Environment Assessment was produced by AC Archaeology Ltd in support of the forthcoming application during February and March 2013 (Kerr-Peterson, 2013). The reader is referred to this document for a comprehensive assessment of the archaeological potential of the site and the surrounding area.

What follows is a summary of the findings of the Assessment relevant to the interpretation of the geophysical survey data. Historical mapping and aerial photographs are considered when relevant in the discussion of the survey results (section 6).

The terms 'designated heritage asset' refers to scheduled monuments and listed buildings. 'Non-designated heritage assets' refers to archaeological find spots, sites, investigations, historic buildings, and cartographic and other documented resources.

The following archaeological periods may be referred to below: Prehistoric: Palaeolithic (c. 500,000 BC – c.10.000 BC) Prehistoric: Mesolithic (c. 10,000 BC – c. 4,300BC) Prehistoric: Neolithic (c. 4,300 BC – c. 2,300BC) Prehistoric: Bronze Age (c. 2,300 BC – c. 600 BC) Prehistoric: Iron Age (c. 600 BC – c. AD 43) Romano-British (c. AD 43 – c. AD 410) Early Medieval/Anglo-Saxon (c. AD 410 – AD 1066) Medieval (AD1066 – AD 1485) Post-Medieval (AD1485 to AD 1900) Modern (AD 1901 to present)

The heritage asset reference codes given below refer to Devon County Council Historic Environment Record (DHER) entries.

<u>Relevant heritage assets within the survey fields</u> There are no designated heritage assets within the survey area.

Non-designated heritage assets:

- MDV4753: NGR SX 5986 9622. Possible former location of a church suggested by field name evidence from the tithe apportionment of fields called Church Park & Great Church Park. There is no evidence of a church on the site from Benjamin Donn's map of 1765 and no visible evidence on the ground. *No evidence for church found in the survey dataset.*
- MDV12874: NGR SX 5999 9608. Oval enclosure visible as soilmark. Possibly prehistoric in date.
- No evidence for oval enclosure found in the survey dataset. MDV57367: NGR SX 5985 9600. A rapid examination of aerial photographs suggests the presence of a probable road, of Roman date, associated with the Roman military fort (MDV4751 and National Monument Number 1015829. The road is visible as a cropmark, apparently aligned to the east entrance of the fort. *Strong evidence for road found in the survey dataset.*

Relevant heritage assets close to the survey field

Designated heritage assets:

MDV4751: National Monument Number 1015829, NGR SX 5963 9604, approximately 5m to the west of the survey area.

Roman fort on the west side of Chichacott Lane in Okehampton shown as a soilmark on the hill top. Apparent entrance faces east. First noted 1976. Large rectangular earthwork delineated on the surface by a broad band of clay. The south-east rampart was sectioned in 1976, showing that the clay surface mark was caused by ploughing over the top of a buried rampart base. Pottery recovered was not closely dateable, but of the 1st or 2nd century. Associated single ditched fortlet c. 50m square thought to be sited with reference to the fort. Also under 28945. Four likely associated rectangular and sub-circular enclosures to northeast of the fort. Also under 28946. L-shaped feature to the south which may represent the south-west corner of an enclosure. Also under 56731.

Non-designated heritage assets:

- MDV16159: NGR 5977 9633, approximately 80m to the northwest of the survey area. Rectangular shaped enclosure visible as soil mark on RAF photos. Approximately 50 by 30m. No visible evidence. Possibly Prehistoric or Romano -British enclosure.
- MDV16928: NGR SX 5992 9636, approximately 50m to the north of the survey area. Barton Barn. Possible demesne farm of Chichacott manor. Before the first half of the 19th century the farm was served by what is now a green lane to the northwest.

Historic Landscape Characterisation (see figure 1 for location of plots)

Plot 1 to the west of the parish boundary: Post-Medieval enclosure: 'Enclosures of postmedieval date. Fields laid out in the C18th and C19th commonly have many surveyed deadstraight field boundaries'.

Plot 1 to the east of the parish boundary and plot 2: Modern enclosures adapting medieval fields: 'Modern fields that have been created out of probable medieval enclosures. The sinuous medieval boundaries survive in places'

Plots 3 and 4: Medieval enclosures based on strip fields: '*The curving form of the hedge-banks suggests that earlier it may have been farmed as open strip-fields*'.

(Devon County Council, undated)

6 Results, discussion and conclusions

This survey was designed to record magnetic anomalies. The anomalies themselves cannot be regarded as actual archaeological features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeological features. The analysis presented below attempts to identify and characterise anomalies and anomaly groups that may pertain to archaeological deposits and structures.

The reader is referred to section 7.

6.1 Results

Figure 1 (this section) shows the interpretation of the survey across all survey areas including the anomaly groups identified as pertaining to archaeological deposits along with their numbers. Table 1 is an extract from a detailed analysis of the survey data provided in the attribute tables of the GIS project on the accompanying CD-ROM.

Only those anomaly groups considered to be associated with archaeological deposits or features are recorded in figure 1 and table 1.

Figure 1 and table 1 comprise the analysis of the survey data.

Plots of the processed data are provided in figures 2 and 3 (appendix 1).

Site: An archaeological gradiometer survey Land to the north of Crediton Road, Okehampton, Devon Ordnance Survey (E/N): 259900,96110 (point) Report 140129

plot numbe	anomaly r group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1	1		possible positive	disrupted linear			
1	2		possible negative	disrupted linear		anomaly group may represent a former phase of field boundary mirroring the modern boundary - unlikely to represent modern ploughing or vehicle track	
1	3		possible positive	oval	pit		
1	4		possible positive	oval	pits or large postholes	adjacent anomalies that may represent large postholes or pits - relationship is spatial only, no other relationship implied	
1	5		possible positive	oval	pits or large postholes	adjacent anomalies inat may represent large positoles or pits - relationship is spatial only, no other relationship implied	
1	7		possible positive	oval	nits or large postholes	adjacent anomalies that may represent large positions or nits - relationship is spatial only, no other relationship implied	
1	8		possible positive	oval	pit		
1	9		possible positive	oval	pit		
1	10		possible positive	oval	pits or large postholes	adjacent anomalies that may represent large postholes or pits - relationship is spatial only, no other relationship implied	
1	11		possible positive	oval	pit		
1	12		possible positive	oval	pit		
1	13		possible positive	oval	pit		
1	14	16 44 45	likely positive & negative	disrupted linear	road or track	anomaly groups coincide with cropmarks thought to be an indication of a probable Roman road associated with the adjacent Roman fort	DCCHER MDV57367 (road)
1	16	15 44 45	likely positive spread	broad linear	road or track	- faint earthworks noted by archaeologists on site anomaly groups coincide with cropmarks thought to be an indication of a probable Roman road associated with the adjacent Roman fort	DCCHER MDV57367 (road)
-	10	10 11 10	interj positi re opreda	orodu miedi	Total of Habit	- faint earthworks noted by archaeologists on site	BeenErening (19750) (roud)
1	17		possible positive	oval	pits or large postholes	adjacent anomalies that may represent large postholes or pits - relationship is spatial only, no other relationship implied	
1	18		possible positive	oval	pit		
1	19		possible positive	oval	pit		
1	20		possible north-south high-le	<u>DW</u>	in-situ heated deposits		
1	21		possible dipole	ow T	ferrous material		
1	22		possible apole	oval	nits or large postholes	adjacent anomalies that may represent large postholes or nits - relationshin is spatial only, no other relationshin implied	
1	24		possible positive	oval	pits or large postholes	adjacent anomalies that may represent large positives or pits - relationship is spatial only, no other relationship implied	
1	25		possible positive	oval	pits or large postholes	adjacent anomalies that may represent large postholes or pits - relationship is spatial only, no other relationship implied	
1	26	38	likely positive	disrupted linear	field boundary	anomaly groups coincide with a field boundary mapped on the 1841 tithe map and on all Ordnance Survey maps until at least 1991	1841 Okehampton tithe map &
1	27		possible positive	curvilinear			
1	28		possible positive	multilinear			
1	29		possible positive	pit			
1	30		possible positive	pit			
1	31		possible positive	pit			
1	32		possible negative	linear			
1	34	35	possible negative	disrupted linear			
1	35	34	possible positive spread	broad linear	stony deposit or natural	extends into plot 2	
1	36		possible positive	disrupted linear	Storif deposite of Indiatai		
1	37		possible repeated parallels		ridge-and-furrow		
2	38	26	likely dipole spread	disrupted linear	field boundary	anomaly groups represent ferrous material & coincide with a field boundary mapped on the 1841 tithe map and all Ordnance Survey maps until at least 199	1 1841 Okehampton tithe map &
2	39		possible positive	linear			
2	40		possible positive	linear			
2	41		possible positive	curvilinear			
2	42		possible positive	linear	nit or large negthele		
2	43	15 16 45	likely positive	linear	road or track	anomaly groups coincide with cronmarks thought to be an indication of a probable Roman road associated with the adjacent Roman fort	DCCHER MDV57367 (road)
2		15 10 45	intery positive	linear	road of track	- faint earthworks noted by archaeologists on site	Decriek wie v57507 (road)
2	45	15 16 44	likely positive spread	broad linear	road or track	anomaly groups coincide with cropmarks thought to be an indication of a probable Roman road associated with the adjacent Roman fort - faint earthworks noted by archaeologists on site	DCCHER MDV57367 (road)
2	46		possible positive	linear			
2	47		possible positive	linear			
2	48		possible positive	linear			
2	49		possible positive	linear sequence of ovals		anomaly group indicate a linear sequence of pits and/or large postholes	
2	50		possible negative	linear			
2	51		possible positive	linear			
3	53		possible positive	curvilinear			
3	54		possible negative	linear		anomaly group may reflect an extension of an extant boundary to the northwest	
3	55		possible positive	disrupted linears	routeway	anomaly groups indicative of a linear trend which may define a former routeway and may relate to different phases of track along the route	
3	56		possible negative	disrupted linear	*		
3	57		possible positive	linear			
3	58		possible positive	linear			
3	59		possible repeated parallels	 	ridge-and-furrow		
3	60		possible positive	linear		anomaly group aligned along former possible ridge-and-turrow ploughing but stands out - possible held boundary or track but could be ridge-and-turrow	
3	61		possible positive	disrupted linear	ridge and furrows	anomaly group aligned along former possible ridge-and-furrow plougning but stands out - possible field boundary or track but could be ridge-and-furrow	
3	62		possible repeated parallels		ridge-and-furrow		
3	63		possible positive	disrupted linear	The second ration		
3	64		possible positive	linear			
4	65		possible positive	disrupted curvilinear	field boundary or track	anomaly groups may represent a former Devon bank field boundary mirroring the current field boundary or, less likely, a ditched track	
4	65		possible negative	disrupted curvilinear	field boundary or track	anomaly groups may represent a former Devon bank field boundary mirroring the current field boundary or, less likely, a ditched track	
4	65		possible positive	disrupted curvilinear	field boundary or track	anomaly groups may represent a former Devon bank field boundary mirroring the current field boundary or, less likely, a ditched track	
4	66		possible positive	linear			
4	66		possible positive	linear			
4	66		possible positive	disrupted linear			
4	66		possible negative	disrupted linear			
4	0/ 68		possible positive	linear			
4	69		likely positive	field boundary		anomaly groups represent coincide with a field boundary mapped on the 1841 tithe man and on all Ordnance Survey mans until at least 1991	1841 Okehampton tithe map &
4	70		possible positive	disrupted linear			
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Table 1: data analysis

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p & all Ordnance Survey maps 1881 to 1991 ad) & MDV4751 (fort) ad) & MDV4751 (fort) ad) & MDV4751 (fort)



Notes:

1. All interpretations are provisional and represent potential archaeological deposits.

2. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.

3. Representative; not all instances are mapped.

4. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposit

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Figure 1: survey interpretation, plot locations and relevant HER entry locations Substrata

15 Horizon View, Bath Hotel Road Westward Ho!, Bideford, Devon EX39 1GX Tel: 07788627822 Email: geophysics@substrata.co.uk Web: substrata.co.uk

6.2 Discussion

Refer to figures 1 (this section), 2 and 3 (appendix 1).

Not all anomalies or anomaly groups identified in the survey dataset are necessarily discussed below. All identified anomaly groups are recorded in the GIS project on the accompanying CD-ROM. Those anomaly groups possibly representing archaeological deposits are included in data analysis table 1.

General points

Any anomaly trends visible in the data not discussed below are likely to relate to relatively recent cultivation activities such ploughing or farm vehicle tracks.

The magnetically low contrast area in plot 2 (figures 2 and 3) is caused by the alteration and leaching of magnetic minerals in the soil by the action of water. There is a spring in the southern part of plot 2 now utilised as a water source for livestock which may have been part of a flowing water source or of a marshy area in the past (see the discussion of groups 15, 16, 44, 45, 39 to 42 and 46 to 48 below).

The strong striped anomaly pattern on the eastern side of plot 3 is caused by highly magnetic buried objects in the vicinity which are probably of fairly recent origin.

Data relating to historical maps and other records

Anomaly groups 15, 16 (plot 1), 44 and 45 (plot 2) coincide with cropmarks identified as likely to be the remains of a Roman road (DCCHER MDV57367) associated with the adjacent Roman military fort which lies just outside the western boundary of the survey area (DCCHER MDV57367 and National Monument Number 1015829, see section 4 above). The gap between the two sets of anomalies may indicate the presence of a bridge over a stream and/or marsh (see *General points* above) or the deposition of alluvium over the road after it went out of use. The abrupt end to group 44 on its eastern side will require further archaeological investigations to explain.

Groups 26 (plot 1), 38 (plot 2) and 69 (plot 4) are likely to represent former field boundaries mapped on the 1841 Okehampton tithe map and on all Ordnance Survey maps from 1881 to at least 1991.

Data with no previous provenance

There are a number of clusters of possible pits or large postholes in plot 1 to the north and south of the likely Roman road (groups 3 to13, 17 to 19, 23 to 25 and 29 to 31). These are grouped by their spatial proximity and no other archaeological reason is implied for this grouping.

Anomaly groups 20 and 21 (plot 1) are typical of anomalies caused by the presence of in-situ heated deposits such as that produced by former kilns, hearths or furnaces.

Group 35 (plots 1 and 2) may represent a stony archaeological deposit or a near-surface natural deposit.

Groups 37 (plot 1) and 69 (plot 3) represent cultivation patterns and may represent ridge-and-furrow ploughing.

Groups 39 to 42 and 46 to 48 (all plot 2) may reflect enclosures along the edge of a marshy area discussed above.

Group 65 (plot 4) may represent a former Devon bank or, less likely, a ditched track.

The remaining anomaly groups characterised as representing potential archaeological deposits are linear and curvilinear groups that typically represent former field

boundaries, enclosures or similar structures of unknown date. A number of these groups are have different alignments to the current field system.

6.3 Conclusions

The magnetic contrast across the survey areas was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses.

A total of seventy magnetic anomaly groups were identified as relating to potential archaeology. Of these, three groups are likely to represent former field boundaries mapped on the 1841 Okehampton tithe map and on all Ordnance Survey maps from 1881 to at least 1991. Four groups are very likely to relate to a former Roman road associated with the Roman military fort to the west of the western boundary of the survey area. There are a number of clusters of possible pits or large postholes to the north and south of the likely Roman road. Two groups, just to the south of the likely Roman road, are typical of anomalies caused by the presence of in-situ heated deposits such as that produced by former kilns, hearths or furnaces. Two groups on the western side of the survey area may represent former ridge-and-furrow cultivation. The remaining anomaly groups characterised as representing potential archaeological deposits are linear, multilinear and curvilinear groups that typically represent former field boundaries, enclosures or similar structures of unknown date. A number of these groups are have different alignments to the current field system.

7 Disclaimer and copyright

The description and discussion of the results presented in this report are the authors, based on his interpretation of the survey data. Every effort has been made to provide accurate descriptions and interpretations of the geophysical data set. The nature of archaeological geophysical surveying is such that interpretations based on geophysical data, while informative, can only be provisional. Geophysical surveys are a cost-effective early step in the multi-phase process that is archaeology. The evaluation programme of which this survey is part may also be informed by other archaeological assessment work and analysis. It must be presumed that more archaeological features will be evaluated than those specified in this report.

Ross Dean, trading as Substrata, will assign copyright to the client upon written request but retains the right to be identified as the author of all project documentation and reports as defined in the Copyright, Designs and Patents Act 1988 (Chapter IV, s.79).

8 Acknowledgements

Substrata would like to thank John Valentin of AC Archaeology Ltd for commissioning us to complete this survey.

9 Bibliography

Archaeology Data Service/Digital Antiquity Guides to Good Practice (undated): *Geophysical Data in Archaeology* [Online], Available: http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_Toc [October 2013]

British Geological Survey (undated) *Geology of Britain viewer* [Online], *Available: http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html* [February 2014]

Clark, A. (2000) Seeing Beneath the Soil, Prospecting methods in archaeology, London: Routledge

Dean, R. (2013) A gradiometer survey methodology statement, Land to the north of Crediton Road, Okehampton, Devon, Substrata unpublished document

Devon County Council (undated) *Historic Landscape Characterisation*, [Online], Available: http://gis.devon.gov.uk/basedata/viewer.asp?DCCService=hlc [February 2014]

Institute for Archaeologists (undated) *IfA house style*, [Online], Available: http:// www.archaeologists.net/sites/default/files/node-files/ifa house style.pdf [February 2014]

Institute for Archaeologists (2011) *Standard and guidance archaeological geophysical survey*. Reading: Author [Online], Available: http://www.archaeologists.net/sites/default/files/node-files/Geophysics2010.pdf [October 2013]

Institute for Archaeologists (2009) *Code of conduct*. Reading: Author [Online], Available: http://www.archaeologists.net/sites/default/files/node-files/code conduct.pdf [February 2014]

Institute for Archaeologists (2008) *Code of approved practice for the regulation of contractual arrangements in archaeology*. Reading: Author [Online], Available: http://www.archaeologists.net/sites/default/files/node-files/ifa code practice.pdf [February 2014]

Kerr-Peterson, K. (2013) Land to the north of Crediton Road, Okehampton, West Devon, centred on SX 60241 96104, Historic Environment Assessment, AC Archaeology Ltd unpublished document ACD630/1/2 October 2013

Appendix 1 Supporting plots

General Guidance

The anomalies represented in the survey plots provided in this appendix are magnetic anomalies. The apparent size of such anomalies and anomaly patterns are unlikely to correspond exactly with the dimensions of any associated archaeological features.

A rough rule for interpreting magnetic anomalies is that the width of an anomaly at half its maximum reading is equal to the width of the buried feature, or its depth if this is greater (Clark, 2000: 83). Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies. In northern latitudes the position of the maximum of a magnetic anomaly will be displaced slightly to the south of any associated physical feature.







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Figure 4: survey location

Substrata 15 Horizon View, Bath Hotel Road Westward Ho!, Bideford, Devon EX39 1GX Tel: 07788627822 Email: geophysics@substrata.co.uk Web: substrata.co.uk

Appendix 2 Methodology Summary

Table 2: methodology summary

Documents

Survey methodology statement: Dean (2013)

Methodology

- 1. The work was undertaken in accordance with the survey methodology statement. The geophysical (gradiometer) survey was undertaken with reference to standard guidance provided by the Institute for Archaeologists (2011) and Archaeology Data Service/Digital Antiquity Guides (undated).
- 2. The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system.
- 3. Data processing was undertaken using appropriate software, with all anomalies being digitised and geo-referenced. The final report included a graphical and textual account of the techniques undertaken, the data obtained and an archaeological interpretation of that data and conclusions about any likely archaeology.

Grid

Method of Fixing: DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates. *Composition:* 30m by 30m grids

Recording: Geo-referenced and recorded using digital map tiles.

DGPS used: Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program.

Data Capture Sample Interval: 0.25-metres Traverse Interval: 1 metre Traverse Method: zigzag Traverse Orientation: GN3
tware

Appendix 3 Data processing

Table 3: gradiometer survey - processed data metadata		
SITE Instrument Type: Units: Direction of 1st Tra Collection Method: Sensors: Dummy Value:	Bartington Grad 610 nT averse: 0 deg : ZigZag 2 @ 1.00 m spacing. 32702	
Stats Max: Min: Std Dev: Mean: Median: PROGRAM Name: Varian:	830.60 -685.07 17.19 0.13 0.01 TerraSurveyor	
Version: Processes: 82 1 Base Layer 2 Search & Replace From: -300 3 Move (Area: Top 100, Left 15 4 Clip at 3.00 SD 5 De Stagger: Grids: ckeamt3.0 8 De Stagger: Grids: ckeamt3.0 8 De Stagger: Grids: ckeamt3.0 9 De Stagger: Grids: ckeart1.3x 10 De Stagger: Grids: ckeart1.3x 11 De Stagger: Grids: ckeart1.3x 12 De Stagger: Grids: ckeart1.3x 13 DeStripe Median Traverse: 0 14 Move (Area: Top 93, Left 60 15 Move (Area: Top 91, Left 59 16 Move (Area: Top 91, Left 59 16 Move (Area: Top 91, Left 59 16 Move (Area: Top 101, Left 6 21 Move (Area: Top 101, Left 6 22 Move (Area: Top 101, Left 6 23 Move (Area: Top 101, Left 6 24 Move (Area: Top 101, Left 6 25 Move (Area: Top 101, Left 6 25 Move (Area: Top 101, Left 6 26 Move (Area: Top 101, Left 6 27 Move (Area: Top 101, Left 6 28 Move (Area: Top 101, Left 6 29 Move (Area: Top 101, Left 6 20 Move (Area: Top 101, Left 6 21 Move (Area: Top 101, Left 6 23 Move (Area: Top 101, Left 6 24 Move (Area: Top 101, Left 6 25 Move (Area: Top 101, Left 6 25 Move (Area: Top 101, Left 1 34 Move (Area: Top 102, Left 1 34 Move (Area: Top 103, Left 1 34 Move (Area: Top 104, Left 1 35 Move (Area: Top 104, Left 1 36 Move (Area: Top 104, Left 1 37 Move (Area: Top 104, Left 1 38 Move (Area: Top 104, Left 1 39 Move (Area: Top 104, Left 1 30 Move (Area: T	3.0.2.2.1 BT 1: 500 With Dammy (Area: Top 30, Lef 900, Bottom 22, Right 979) Queber 105, Span Top 100, Span Top 1	
Note: exporting the interpolation	processed data from TerraSurveyor into Manifold GIS for analysis imposes an 'x matches y' on the data which is reflected in the processed data figures.	

Appendix 4 Geophysical surveying techniques

1 Introduction

Substrata offers magnetometer and earth resistance surveying. We also provide other archaeology-specific geophysical surveys such as ground penetrating radar and resistivity. The particular method or combination of methods used depends on local soil conditions and the survey requirements. These methods are capable of delivering fast and accurate assessments of the archaeology of both large and small sites.

Further details can be found on our website at www.substrata.co.uk.

2 Magnetometer surveying

Standard magnetometer surveys are the workhorse of archaeological surveying when speed and cost-effectiveness are important. Identifiable archaeological features include areas of occupation, hearths, kilns, furnaces, ditches, pits, post-holes, ridge-and-furrow, timber structures, wall footings, roads, tracks and similar buried features.

Magnetometer surveying is used to detect and map small changes in the earth's magnetic field caused by concentrations of ferrous-based minerals within the soil and subsoil, and by materials buried beneath the surface. While most of these changes are too small to affect a compass needle, they can be detected and mapped by sensitive field equipment. During surveys the different magnetic properties of top-soils, sub-soils, rock formations and archaeological features are recorded as variations against a background value. Subsequently magnetic anomalies resulting from potential archaeology can be identified and interpreted.

Bartington grad601-2 gradiometers

A gradiometer is a type of magnetometer and is sensitive to relatively small changes in the earth's magnetic field. Our primary surveying instruments are Bartington Grad601-2 (dual sensor) fluxgate gradiometers with automatic data loggers. They are specifically designed for field use by archaeologists. The Bartington gradiometers provide proven technology in archaeological magnetic surveying and offer fast, accurate set-up and survey rates. They are sensitive to depths of between 0 and 1.5m below ground level, with optimum sensitivity at depths of 1m or less.

Multiple sensor arrays

A technique relatively new to commercial archaeological surveying but well understood in academic circles involves the use of multiple magnetometer sensors towed behind a quad bike or similar vehicle. With multiple sensors and the use of on-board GPS units, it is possible to achieve faster survey rates at competitive commercial rates when compared to the use of multiple instruments and the techniques discussed above provided the ground is suitable for the vehicle and array. Substrata is pleased to announce that we now offer this service on suitable larger sites

3 Earth resistance surveying

Earth resistance surveying is an excellent tool for detecting buried archaeology. Its relatively slow rate of survey compared to magnetometer surveys means that it usually employed in commercial surveys when a detailed understanding of buried building remains is required. This technique measures changes in the electrical resistance of the ground being surveyed. In practice, the recording of differences in the electrical resistance of near-surface deposits and structures allows the detection and interpretation of masonry and brick foundations, paving and floors, drains and other cavities, large pits, building platforms, robber trenches, ditches, graves and similar buried features.

Resistance to electrical current flow in the ground depends on the moisture content and structure of the soil and other materials buried beneath the surface. For example, the higher the moisture content of a soil, the less resistant it is to electrical current flow. A ditch completely buried beneath the present ground surface is likely to have an infill soil different to that surrounding the ditch in terms of compactness and composition. As a result, the soil filling the buried ditch will retain moisture in a different way to the surrounding soil which means it will

have an electrical resistance at variance with the surrounding environment. By passing a small current through the ground it is possible to detect, record, plot and interpret such changes in electrical resistance.

For earth resistance surveying Substrata uses the Geoscan Research RM15 series multi-probe resistance meters and purpose-built automatic data-loggers. The Geoscan MPX15 multiplexer is an integral part to the instrument configuration and facilitates multi-probe arrays which speed up survey area coverage rates and, if required, facilitate simultaneous multiple-depth data collection.