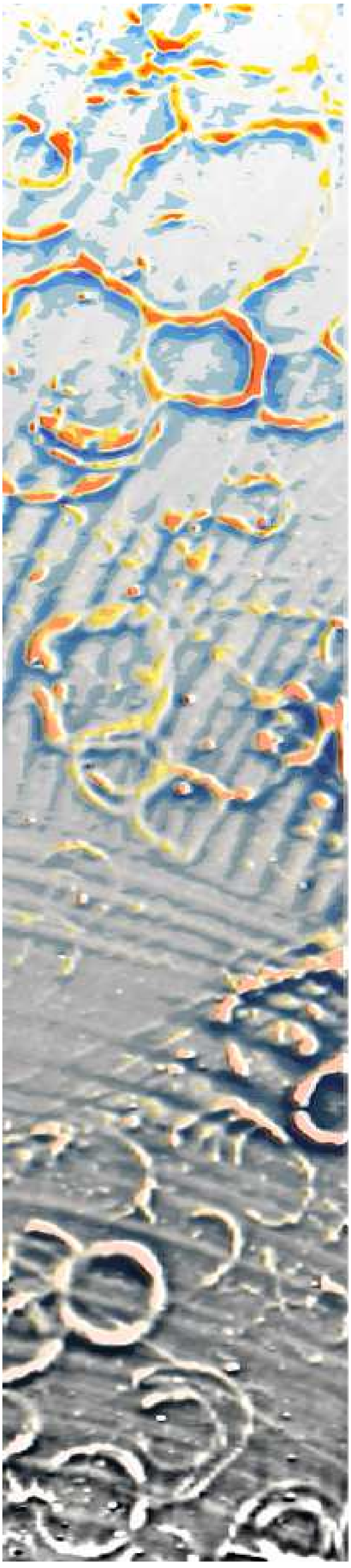

Appletree Close
Chudleigh Knighton, Devon

Geophysical Survey Report
(Caesium Vapour Magnetic - Archaeology)

Produced for Cotswold Archaeology

Project code CKD151
OASIS archaeop1-216310

30th June 2015

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Non-Technical Summary

A magnetic survey was commissioned by Cotswold Archaeology to prospect land at Appletree Close, Chudleigh Knighton, Devon for buried structures of archaeological interest.

The survey successfully identified features relating to past agricultural use of the land, including a previously unknown former field system, but little evidence for past settlement or industrial activity.

Digital Data

Item	Sent to	Sent date
CAD – Vector Elements	Duncan Coe	30th June 2015
	Sally Evans	1st July 2015

Audit

Version	Author	Checked	Date
Interim			
Draft Final	MJ Roseveare, D Lewis	MJ Roseveare	1st July 2015
Final	MJ Roseveare, D Lewis	D Lewis	8th July 2015
Revision			
OASIS Form Started			1st July 2015

In line with Historic England guidance (David et al, 2008) we appreciate feedback from any subsequent work that provides insight into the nature of the ground and which can be used to better understand its geophysical properties. Photographs and reports are welcome and will of course be treated in confidence.

Table of Contents

1 Introduction

Land at Appletree Close, Chudleigh Knighton, Devon was magnetically surveyed to prospect for buried structures of archaeological interest.

Country	England
County	Devon
Nearest Settlement	Chudleigh Knighton
Central Co-ordinates	284115,77836

Approximately 10.2 hectares of land was surveyed across six pasture fields.

2 Context

2.1 Archaeology

The results of the desk-based assessment for this site are not yet available. The following paragraphs have been researched using online archaeological and cartographic resources.

The Devon Historic Environment Record (HER), accessed via Heritage Gateway, confirms that there are no previously recorded heritage assets within the proposed survey area. In the wider environs, the Devon HER references field names from the Henlock tithe apportionment of 1838. The places names are associated with the medieval and post-medieval agricultural and industrial use of the land and are characteristic of the agricultural regimes during these periods.

Online cartographic sources suggest that the extant field boundaries have been maintained from the late 19th century and that the north-east field within the proposed survey area was formerly an orchard plantation.

2.2 Environment

Soilscapes Classification	Slightly acid loamy and clayey soils with impeded drainage.
Superficial 1: 50000 BGS	None recorded
Bedrock 1:50000 BGS	Crackington Formation (CKF) – Mudstone and Sandstone, interbedded. Bovey Formation (BOF) – Sand Silt and Clay
Topography	Ascending east to west
Hydrology	Locally impeded drainage with stream course to the east
Current Land Use	Mixed agricultural
Historic Land Use	Mixed agricultural
Vegetation Cover	Rough pasture/grass
Sources of Interference	None

There are two members within the Crackington Formation, a sandstone and the mudstone found at this site. Surveys over both have revealed soils over them to have two different magnetic characters with the data from over the mudstone exhibiting strong changes in apparent magnetic susceptibility and hence background texture. Overall, anomalies from sources of archaeological interest are of variable but useful strength and especially larger or likely rock cut examples. In general the soil over the mudstone contains less iron than that over the sandstone, 2-3% rather than 3-4%. There is also an apparent correlation between soil drainage and apparent magnetic susceptibility and therefore dependence upon iron minerals in addition to the normal haematite.

Anomalies due to features cut into subsoil or top of the bedrock are often clearly defined by magnetic survey. Although anomalies due to geological variation can be strong, they are usually readily identifiable as such.

3 Methodology

3.1 Survey

3.1.1 Technical equipment

Measured variable	Magnetic flux density / nT
Instrument	Array of Geometrics G858 Magmapper caesium magnetometers
Configuration	Non-gradiometric transverse array (4 sensors, ATV towed)
Sensitivity	0.03 nT @ 10 Hz (manufacturer's specification)
QA Procedure	Continuous observation
Spatial resolution	1.0m between lines, 0.25m mean along line interval

3.1.2 Monitoring & quality assessment

The system continuously displays all incoming data as well as line speed and spatial data resolution per acquisition channel during survey. Rest mode system noise is therefore easy to inspect simply by pausing during survey, and the continuous display makes monitoring for quality intrinsic to the process of undertaking a survey. Rest mode test results (static test) are available from the system.

3.2 Data processing

3.2.1 Procedure

All data processing is minimised and limited to what is essential for the class of data being collected, e.g. reduction of orientation effects, suppression of single point defects (drop-outs or spikes) etc. The processing stream for this data is as follows:

Process	**Software**	**Parameters**
Measurement & GNSS receiver data alignment	Proprietary	
Temporal reduction, regional field suppression	Proprietary	Bandpassed 0.3 – 5.0s
Gridding	Surfer	Kriging, 0.25m x 0.25m
Smoothing	Surfer	Gaussian lowpass 3x3 data (0.75m)
Imaging and presentation	Manifold GIS	

The initial processing uses proprietary software developed in conjunction with the multisensor acquisition system. Gridded data is ported as data surfaces (not images) into Manifold GIS for final imaging and detailed analysis. Specialist analysis is undertaken using proprietary software.

General information on processes commonly applied to data can be found in standard text books and also in the 2008 English Heritage Guidelines "Geophysical Survey in Archaeological Field Evaluation" at http://www.helm.org.uk/upload/pdf/Geophysical_LoRes.pdf.

ArchaeoPhysica uses more advanced processing for magnetic data using potential field techniques standard to near-surface geophysics. Details of these can be found in Blakely, 1996, "Potential Theory in Gravity and Magnetic Applications", Cambridge University Press.

All archived data includes process metadata (see Appendix 5.1).

3.3 Interpretation resources

Numerous sources are used in the interpretive process which takes into account shallow geological conditions, past and present land use, drainage, weather before and during survey, topography and any previous knowledge about the site and the surrounding area. Old Ordnance Survey mapping is consulted and also older sources if available. Geological information is sourced only from British Geological Survey resources and aerial imagery from online sources. Topographic data is usually sourced from the Environment Agency (LiDAR) unless derived from original ArchaeoPhysica survey.

Information from nearby ArchaeoPhysica surveys is consulted to inform upon local data character, variations across soils and near-surface geological contexts. Published data from other contractors may also be used if accompanied by adequate metadata.

3.4 Interpretive classes

3.4.1 Introduction

Key to interpretation is separation of each anomaly into broad classes, namely whether caused by agricultural processes (e.g. ploughing, composting, drainage etc.), geological factors or whether a feature of archaeological interest is likely. These anomalies are in turn classified by whether they are likely to represent a fill or a drain, or a region of differing data texture, etc. Interpretation always proceeds in a strict sequence of identifying the anomaly type, then the feature type and then finally the description. For both anomaly and feature types a fixed list of terms is used to ensure sufficient precision of categorisation and description.

The actual means of classification is based upon geophysical understanding of anomaly formation, the behaviour of soils, landscape context and structural form. For example, weakly dipolar discrete magnetic anomalies of small size are likely to have shallow non-ferrous sources and are therefore likely to be discrete fills, potentially of pits. Larger ones of the same anomaly class could also be fills or pockets of locally deeper topsoil but if strongly magnetic could also be hearths. Strongly dipolar discrete anomalies are in all cases likely to be ferrous or similarly magnetic debris, although small repeatedly heated and *in-situ* hearths can produce similar anomalies.

The following categories are used to describe anomalies of relevance to the interpretation:

- Environmental
  - geological contact - linear - e.g. between alluvial and other superficial deposits
  - geological or soil body - area - e.g. a soil-filled pocket within gravel
- Land use
  - cultivation-related - linear / area - e.g. ridge and furrow, headlands, etc.
  - land drainage - linear - might be ceramic or gravel-filled trenches, or plastic pipes
  - former boundary - linear - only identified if known to exist from Ordnance Survey and other historic mapping
  - former structure - area - used to highlight where buildings etc. have been removed
- Services
  - services (approximate line) – linear - includes pipes, cables and ducts, underground or above
- Archaeological or structural
  - void - area - self explanatory
  - discrete fill - area - commonly pit fills
  - linear fill - linear / area - typically ditch fills or accumulated soil

  - ferrous - point / linear - used only for significant sources
  - structure - area - used for masonry, platforms, floors, etc.
  - debris spread - area, used where there is definite evidence for material
- Other
  - reduced variable - used where no more detailed interpretation is possible but there is data to highlight
  - enhanced variable – as above

3.4.2 Geological sources – magnetic character

On some sites, e.g. some gravels and alluvial contexts, there will be anomalies that can obscure those potentially of archaeological interest. They may have a strength equal to or greater than that associated with more relevant sources, e.g. ditch fills, but can normally be differentiated on the basis of anomaly form coupled with geological understanding. Where there is ambiguity, or relevance to the study, these anomalies will be included in this category.

Not all changes in geological context can be detected at the surface, directly or indirectly, but sometimes there will be a difference evident in the geophysical data that can be attributed to a change, e.g. from alluvium to tidal flat deposits, or bedrock to alluvium. In some cases the geophysical difference will not exactly coincide with the geological contact and this is especially the case across transitions in soil type.

Geophysical data varies in character across areas, due to a range of factors including soil chemistry, near surface geology, hydrology and land use past and present. These all contribute to the texture of the data, i.e. a background character against which all other anomalies are measured.

3.4.3 Agricultural sources - magnetic character

Coherent linear dipolar enhancement of magnetic field strength marking ditch fills, narrow bands of more variable magnetic field or changes in apparent magnetic susceptibility, are all included within the category of former field boundaries if they correlate with those depicted on the Tithe Map or early Ordnance Survey maps. If there is no correlation then these anomaly types are not categorised as a field boundaries.

Banded variations in apparent magnetic susceptibility caused by a variable thickness of topsoil, depositional remanent magnetisation of sediments in furrows or susceptibility enhancement through heating (a by product of burning organic matter like seaweed) tend to indicate past cultivation, whether ridge-based techniques, ridge and furrow or 'lazy beds'. Modern cultivation, e.g. recent ploughing, is not included.

In some cases it is possible to identify drainage networks either as ditch-fill type anomalies (typically 'Roman' drains), noisy or repeating dipolar anomalies from terracotta pipes or reduced magnetic field strength anomalies from culverts, plastic or non-reinforced concrete pipes. In all cases identification of a herring bone pattern to these is sufficient for inclusion within this category.

3.4.4 Archaeological sources – magnetic character

Any linear or discrete enhancement of magnetic field strength, usually with a dipolar character of variable strength, that cannot be categorised as a field boundary, cultivation or as having a geological origin, is classified as a fill potentially being of archaeological interest. Fills are normally earthen and include an often invisible proportion of heated soil or topsoil that augments local magnetic field strength. Inverted anomalies are possible over non-earthen fills, e.g. those that comprise peat, sand or gravel within soil. This category is subject to the 'habitation effect' where, in the absence of other sources of magnetic material, anomaly strength will decrease away from sources of heated soil and sometimes to the extent of non-detectability.

Former enclosure ditches that contained standing water can promote enhanced volumetric magnetic susceptibility through depositional remanence and remain detectable regardless of the absence of other sources of magnetic enhancement.

Anything that cannot be interpreted as a fill tends to be a structure, or in archaeological terms, a feature. This category is secondary to fills and includes anomalies that by virtue of their character are likely to be of archaeological interest but cannot be adequately described as fills. Examples include strongly magnetic bodies lacking ferrous character that might indicate hearths or kilns. In some cases anomalies of ferrous character may be included.

On some sites the combination of plan form and anomaly character, e.g. rectilinear reduced magnetic field strength anomalies, might indicate the likely presence of masonry, robber trenches or rubble foundations. Other types of structure are only included if the evidence is unequivocal, e.g. small ring ditches with doorways and hearths. In some circumstances a less definite category may be assigned to the individual anomalies instead.

It is sometimes possible to define different areas of activity on the basis of magnetic character, e.g. texture and anomaly strength. These might indicate the presence of middens or foci within larger complexes. This category does not indicate a presence or absence of discrete anomalies of archaeological interest.

4 Discussion

4.1 Introduction

The sections below first discuss the geophysical context within which the results need to be considered and then specific features or anomalies of particular interest. Not all will be discussed here and the reader is advised to consult the graphical elements of this report.

4.2 Principles

Magnetic survey for any purpose relies upon the generation of a clear magnetic anomaly at the surface, i.e. strong enough to be detected by instrumentation and exhibiting sufficient contrast against background variation to permit diagnostic interpretation. The anomaly itself is dependent upon the chemical properties of a particular volume of ground, its magnetic susceptibility and hence induced magnetic field, the strength of any remanent magnetisation, the shape and orientation of the volume of interest and its depth of burial. Finally the choice and configuration of measurement instrumentation will affect anomaly size and shape.

Archaeological sites present a complex mixture of these factors and for some the causative affects are not known. However, depth of burial and size are usually fairly constrained and background susceptibility can be estimated (or measured). The degree of remanent magnetisation is harder to predict and depends on both the natural magnetic properties of the soil and any chemical processes to which it has been subjected. Fortunately heat will raise the susceptibility of most soils and topsoil tends to be more magnetic than subsoil, by volume.

It is hard to draw reliable conclusions about what sort of geology is supportive of magnetic survey as there are many factors involved and in any case magnetic response can vary across geological units as well as being dependent upon post-deposition and erosional processes. In general a relatively non-magnetic parent material contrasting with a magnetisable erosion product, i.e. one which contains iron in the form of oxides and hydroxides, will allow archaeological structures to exhibit strong magnetic contrast against their surroundings and especially if the soil has been heated or subjected to certain processes of fermentation. In the absence of either, magnetic enhancement becomes entirely reliant upon the geochemistry of the soil and enhancement will often be weaker and more variable.

The principal magnetic iron mineral is the oxide magnetite which sometimes occurs naturally but is more often formed during the heating of soil. Subsequent cooling yields a mixture of this, non-magnetic oxide haematite and another magnetic oxide, maghaemite. Away from sources of heat, other magnetic iron minerals include the sulphides pyrite and greigite while in damp soils complex chemistry involving the hydroxides goethite and lepidocrocite can create strong magnetic anomalies. There are thus a number of different geochemical reaction pathways that can both augment and reduce the magnetic susceptibility of a soil. In addition, this susceptibility may exhibit depositional patterns unrelated to visible stratigraphy.

Most structures of archaeological interest detected by magnetic survey are fills within negative or cut features. Not all fills are magnetic and they can be more magnetic or less magnetic than the surrounding ground. In addition, it is common for fills to exhibit variable magnetic properties through their volume, basal primary silt often being more magnetic than the material above it due to the increased proportion of topsoil within it. However, a fill containing burnt soil may be much more magnetic than this primary silt and sometimes a feature that has contained standing water can produce highly magnetic silts through mechanical depositional processes (depositional remanent magnetisation, DRM).

A third structural factor in the detection of buried structures is the depth of topsoil over the feature. As fills sink, the hollow above accumulates topsoil and hence a structure can be detected not through its own magnetisation but through the locally deeper topsoil above it. The volume of soil required depends upon the magnetic susceptibility of the soil but just a few centimetres are often sufficient. Such a thin deposit can, however, easily be lost through subsequent erosion by natural factors or ploughing.

4.2.1 Instrumentation

The use of the magnetic sensors in non-gradiometric (vertical) configuration avoids measurement sensitisation to the shallowest region of the soil, allowing deeper structures, whether natural or otherwise to be imaged within the sensitivity of the instrumentation. However, this does remove suppression of ambient noise and temporal trends which have to be suppressed later during processing. When compared to vertical gradiometers in archaeological use, there is no significant reduction in lateral resolution when using non-gradiometric sensor arrays and the inability of gradiometers to detect laminar structures is completely avoided.

Caesium instrumentation has a greater sensitivity than fluxgate instruments, however, at the 10 Hz sampling rate used here this increase in sensitivity is limited to about one order of magnitude.

The array system is designed to be non-magnetic and to contribute virtually nothing to the magnetic measurement, whether through direct interference or through motion noise.

4.3 Character & principal results

The following paragraphs represent an interpretive summary of the survey. The numbers in square brackets refer to individual magnetic anomalies described in detail in Appendix 5.2 and shown on DWG 04 onwards.

4.3.1 Data

Strong disturbance of the magnetic field was observed across much of the survey area, with a change in geology from the Crackington to Bovey Formations probably responsible for the weaker field in the western parts [1]. It is stronger in the central area [2] and strongest in the upper and lower eastern parts where an agricultural process, apparently partly constrained by a former field system, has increased the magnetic susceptibility of the soil [3-4].

Strong magnetic anomalies associated with past cultivation may mask weaker magnetic anomalies typical of archaeological features.

4.3.2 Geology

As expected, there are variations in the magnetic texture across the survey area caused by near surface geological changes and especially between the mudstones and clays. There are also variations in anomaly strength that seem likely to originate in different background soil magnetic susceptibility. This is especially apparent in the western part where the same features exhibit different anomaly strengths along their length.

In the extreme western parts it is possible that soil magnetic susceptibility may be sufficiently low for some forms of archaeological feature to not be detected.

4.3.3 Land use

The orientation of cultivation at [4] fits into the extant field boundaries but at [3] it is not aligned with any known boundaries although it exhibits a much stronger anomaly east of former boundary [6] than west of it. The reason for this is unclear but will result from artificial enhancement of the soils magnetic susceptibility, e.g. by processes like repeated heating or introduction of a magnetic material. The cultivation itself appears to be ridge and furrow but whether this process is contemporary with this or later is unknown, although a later process may explain how the magnetic material appears to be present in a (presumably) later ditch fill [6].

A previous field system is evident as a series of single and double ditches [5] and [17] which may or may not relate to another system represented by parallel ditch fills [9] to [12] and possibly also fills [7] and [8]. A further pair of ditches [13] seem to relate to the adjacent ridge and furrow cultivation while an ambiguous ditch like feature [15] is parallel with [17].

Other linear features on the same alignment include [18] and [20], although the dog-leg at the south-east corner of the latter may suggest it is earlier. To the east of this ditch a discrete strong magnetic response may represent industrial activity, such as a hearth or kiln [19], but equally an area of very magnetic debris.

There are traces [14] and [16] of a potentially older field system in the form of isolated ditch fills on a different alignment to those mentioned above.

4.3.4 Archaeology

With the exception of ditch fills [14] and [16], possibly [20] and perhaps also features [7] to [12], much that has been found relates to a former field system. These exceptions are also ditch fills but the evidence for these being post-medieval features is less clear and older origins are therefore possible, although there are few indications as to how these might relate apart from the obvious parallel group [7] to [12].

None of the linear features form enclosures relating to settlement activity and only one discrete feature [19], with a strong magnetic response but uncertain origin, was identified.

4.4 Conclusions

The survey successfully identified features relating to the agricultural use of the land but little evidence for settlement or industry related activity.

4.5 Caveats

Geophysical survey is a systematic measurement of some physical property related to the earth. There are numerous sources of disturbance of this property, some due to archaeological features, some due to the measuring method, and others that relate to the environment in which the measurement is made. No disturbance, or 'anomaly', is capable of providing an unambiguous and comprehensive description of a feature, in particular in archaeological contexts where there are a myriad of factors involved.

The measured anomaly is generated by the presence or absence of certain materials within a feature, not by the feature itself. For example, a ditch is not detected but the fill of it might be. Not all archaeological features produce disturbances that can be detected by a particular instrument or methodology. For this reason, the absence of an anomaly is not evidence for the absence of an archaeological feature.

Where the specification is by a third party ArchaeoPhysica will always endeavour to produce the best possible result within any imposed constraints and any perceived failure of the specification remains the responsibility of that third party.

Where third party sources are used in interpretation or analysis ArchaeoPhysica will endeavour to verify their accuracy within reasonable limits but responsibility for any errors or omissions remains with the originator.

Any recommendations are made based upon the skills and experience of staff at ArchaeoPhysica and the information available to them at the time. ArchaeoPhysica is not responsible for the manner in which these may or may not be carried out, nor for any matters arising from the same.

4.6 Standards & guidance

All work was conducted in accordance with the following standards and guidance:

- David et al, "Geophysical Survey in Archaeological Field Evaluation", English Heritage, 2008.
- "Standard and Guidance for Archaeological Geophysical Survey", Chartered Institute for Archaeologists, 2014.

In addition, all work is undertaken in accordance with the high professional standards and technical competence expected by the Geological Society of London and the European Association of Geoscientists and Engineers.

All personnel are experienced surveyors trained to use the equipment in accordance with the manufacturer's expectations. All aspects of the work are monitored and directed by fully qualified professional geophysicists.

4.7 Bibliography & selected reference

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4.8 Archiving and dissemination

ArchaeoPhysica maintains an archive for all its projects, access to which is permitted for research purposes. Copyright and intellectual property rights are retained by ArchaeoPhysica on all material it has produced, the client having full licence to use such material as benefits their project.

Project reports are usually submitted to the OASIS Grey Literature library as long as client confidentiality permits this. Where required, digital data and a copy of the report can be archived in a suitable repository, e.g. the Archaeology Data Service, in addition to our own archive.

The archive contains all survey and project data, communications, field notes, reports and other related material including copies of third party data (e.g. CAD mapping, etc.) in digital form. Many are in proprietary formats while report components are available in PDF format. In addition, there are paper elements to some project archives, usually provided by the client. Nearly all elements of the archive that are generated by ArchaeoPhysica are digital.

It is the client's responsibility to ensure that reports are distributed to all parties with a necessary interest in the project, e.g. local government offices, including the HER where present. ArchaeoPhysica reserves the right to display data rendered anonymous and un-locatable on its website and in other marketing or research publications.

5 Appendices

5.1 Project metadata

Project Name	Appletree Close, Chudleigh Knighton, Devon
Project Code	CKD151
Client	Cotswold Archaeology
Fieldwork Dates	8th-9th June 2015
Field Personnel	ACK Roseveare, L Bromage, K Cunningham
Data Processing Personnel	ACK Roseveare
Reporting Personnel	MJ Roseveare, D Lewis
Draft Report Date	30th June 2015
Final Report Date	8th July 2015

5.2 Catalogue

The numbers in square brackets in this report refer to the catalogue below and DWG 4 and 5.

Label	Anomaly Type	Feature Type	Description
1	Texture	Geology	Weak magnetic response associated with a likely change to Bovey Formation
2	Texture	Geology & Cultivation?	There appears to be a mixture of characters here; a transition from less magnetic ground to the west plus potentially also cultivation (ridge and furrow), however, the latter is more widely spaced than might be expected
3	Texture	Cultivation	Region anomalously magnetic, implies field or area-specific agrcicultural processes have raised magnetic susceptibility. The cultivation appears to be ridge and furrow. This area was once, according to late 19th century OS mapping, an orchard. The cultivation here is aligned at an angle with all known field systems
4	Texture	Cultivation	Similar to [3], but to a lesser extent. Here the relict furrows are aligned with the extant field system. When viewed in conjunction with [3] either the cultivation has to be of different dates or the extant field system preserves elements of earlier systems
5	Linear dipolar enhanced (group)	Fills – ditches – field boundaries	There are numerous former ditches that are mostly paired in the typical 'Cornish hedge' pattern
6	Linear dipolar strongly enhanced (group)	Fills – ditches – field boundaries	As for [3], a process in this region has altered the soil's magnetic properties and hence the ditch fills [5] of the former field system are here significantly more magnetic
7	Linear enhanced	Fill – cultivation / natural	Uncertain interpretation, may be natural but their (with [8]) close alignment with probable ditch fills [9] - [12] suggest perhaps a cultivation-related origin, e.g. accumulated soil
8	Linear enhanced	Fill – cultivation / natural	See [7]
9	Linear dipolar enhanced	Fill – ditch – boundary?	Former strip field boundary ditch?
10	Linear dipolar enhanced	Fill – ditch – boundary?	See [9]

Label	Anomaly Type	Feature Type	Description
11	Linear dipolar enhanced	Fill – ditch – boundary?	See [9]
12	Linear dipolar enhanced	Fill – ditch – boundary?	See [9] and [8] with which this is parallel
13	Linear dipolar enhanced (group)	Fills – ditches? - Boundary / track?	What appear to be a pair of ditch fills approximately 5m apart pass through and parallel to an area of ridge and furrow cultivation. It is also possible that these are degraded furrows
14	Linear dipolar enhanced	Fill – ditch – boundary?	An isolated ditch fill potentially unrelated to the field system around it and overlaid (?) by the ridge and furrow
15	Linear enhanced	Fill – ditch / service trench?	Possible ditch but although the anomaly is certain interpretation is not. Parallel with [17].
16	Linear dipolar enhanced	Fill - ditch	This fill stands out as differently aligned to any others and therefore unrelated to any of the former field systems
17	Linear dipolar enhanced (group)	Fills – ditches - boundary	See also [5]
18	Linear enhanced	Fill – ditch?	To the north this corresponds with a known former field boundary but to the south this is unknown
19	Discrete strong dipolar (sample)	Ferrous? / Industrial?	Possible debris, alternatively a hearth or kiln?
20	Linear dipolar enhanced	Fill – ditch – boundary?	This seems likely to be a former field boundary but apart from being almost parallel with [18] there it is unclear to which system it may belong

6 Supporting information

6.1 Standards

ArchaeoPhysica meets with ease the requirements of English Heritage in their 2008 Guidance "Geophysical Survey in Archaeological Field Evaluation" section 2.8 entitled "Competence of survey personnel". The company is one of the most experienced in European archaeological prospection and is a key professional player. It only employs people in geophysical positions with recognised geoscience qualifications and capable of becoming Fellows of the Geological Society of London, the Chartered UK body for geophysicists and geologists.

All specification, data processing, interpretation and analysis work is undertaken by qualified and experienced geophysicists who have specialised in the detection and mapping of near surface structures in archaeology and other disciplines using a wide variety of techniques, usually to post-graduate level.

All field personnel are trained to use the equipment in accordance with the manufacturer's expectations and internal procedures, to collect good quality data. All aspects of the fieldwork are monitored and directed by geophysicists.

All work is conducted in accordance with the following standards and guidance:

- David et al, "Geophysical Survey in Archaeological Field Evaluation", English Heritage, 2008;
- "Standard and guidance for Archaeological Geophysical survey", Chartered Institute for Archaeologists, 2014;

and undertaken in accordance with the high professional standards and technical competence expected by the Geological Society of London and the European Association of Geoscientists and Engineers.

6.2 Who we are

6.2.1 ArchaeoPhysica

ArchaeoPhysica has provided geophysical survey to archaeologists since 1998 and is consequently one of the oldest specialist companies in the sector. It has become one of the most capable operations in the UK, undertaking 1000 hectares of magnetic survey per annum. In addition 2D & 3D electrical, low frequency electromagnetic and radar surveys are regularly undertaken across the UK, also overseas. ArchaeoPhysica is the most established provider of caesium vapour magnetic survey in Europe, and holds probably the largest archaeological archive of total field magnetic data in the world. Unusually for the archaeological sector, key staff are acknowledged qualified geophysical specialists in their own right and regularly contribute to in-house and other research projects. For a number of years the company taught applied geophysics to Birkbeck College (London) undergraduate and post-graduate archaeology students, and developed a new and comprehensive course for the College. For a number of years ArchaeoPhysica has assisted the development of new high performance multisensor arrays which have been deployed across the UK.

6.2.2 Senior Geophysicist: Martin J Roseveare, MSc BSc(Hons) MEAGE FGS MCIfA

Martin specialised (MSc) in geophysical prospection for shallow applications at the University of Bradford in 1997 and has worked in commercial geophysics since then. He was elected a Fellow of the Geological Society of London in 2009 and is also a full member of the Chartered Institute for Archaeologists. He has taught applied geophysics for Birkbeck College's archaeological degree students for a number of years. Professional interests outside archaeology include the application of geophysics to agriculture, also geohazard monitoring and prediction. He also has considerable practical experience of the improvement and integration of geophysical hardware and software. At ArchaeoPhysica Martin carries overall responsibility for all things geophysical and is often found writing reports or buried in obscure software and circuit diagrams.

He was elected onto the EuroGPR and CIfA GeoSIG committees in Autumn 2013.

6.2.3 Operations Manager: Anne CK Roseveare, BEng(Hons) DIS MISoilSci

On looking beyond engineering, Anne turned her attention to environmental monitoring and geophysics and has since been applying specialist knowledge of chemistry & fluid flow to soils. She is a member of the British Society of Soil Science (BSSS) and is interested in the use of agricultural applications of geophysics, also co-opted onto the CIfA GeoSIG committee in 2014 as liaison for soil science with BSSS. Anne was the founding Editor of the International Society for Archaeological Prospection (ISAP) and previously spent many years walking fields in parallel lines & analysing data. Much of her time now is spent managing complicated scheduling and logistics for ArchaeoPhysica, overseeing safety procedures and data handling.

6.2.4 Principal Archaeologist: Daniel Lewis, MA BA(Hons) ACIfA

Daniel studied archaeology at the University of Nottingham and worked in field archaeology for many years, managing urban and rural fieldwork projects in and around Herefordshire. When the desk became more appealing Dan jumped into the world of consulting, working on small and large multi-discipline projects throughout England and Wales. At the same time, he returned to University, studying a part time MA in Historic Environment Conservation. With over 15 years experience in the heritage sector, Daniel has a diverse portfolio of skills. At ArchaeoPhysica he ensures that our geophysical work is well grounded in the archaeology, honing our specifications and reports and ensuring everything makes sense!