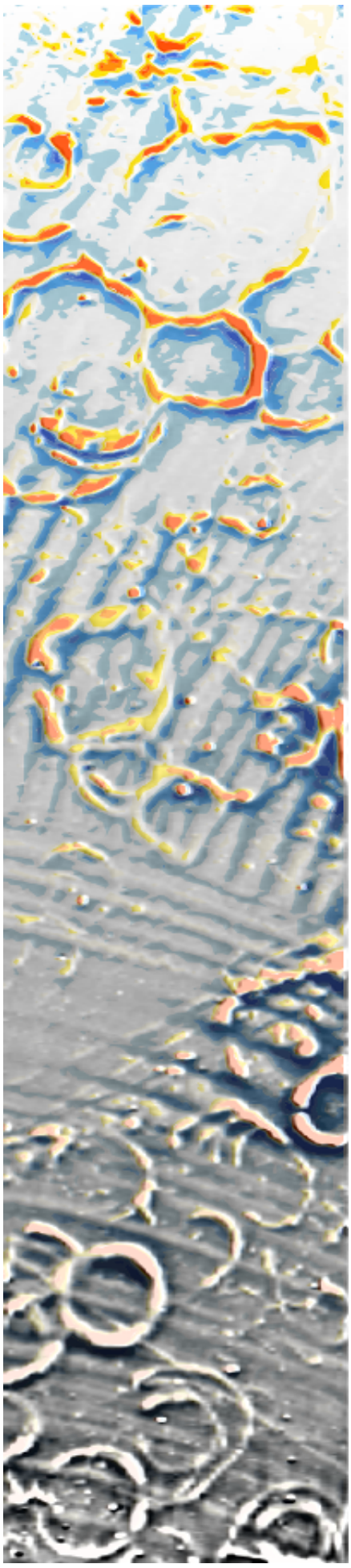

Godrevy Headland, Cornwall

Geophysical Survey Report

Produced for the National Trust

Unlocking Our Coastal Heritage Project

Project code NTC125

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Non-Technical Summary

A magnetic survey was commissioned by the National Trust to prospect the headland of Godrevy for buried structures of archaeological interest, under the aegis of the Unlocking Our Coastal Heritage project.

Few, if any features of archaeological were detected, partly perhaps due to the nature of the soil on the headland but also likely to be due to a paucity of detectable features. Signs of former cultivation were found.

Digital Data

Item	Sent to	Sent date
CAD – Vector Elements	Jim Parry email	01/08/13

Audit

Version	Author	Checked	Date
Interim	MJR		
Draft Final	MJR, ACKR	ACKR	01/08/13
Final			
Revision			
OASIS			

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1 Introduction

Godrevy headland was surveyed using a fluxgate gradiometer as part of the National Trust's Unlocking our Coastal Heritage project to prospect for buried structures of archaeological interest.

1.1 Location

Country	England
County	Cornwall
Nearest Settlement	Gwithian
Central Co-ordinates	158125, 43245

Approximately 1.4 hectares were surveyed across the open ground of the headland.

1.2 Constraints & variations

Some areas were too overgrown to be surveyed and survey was not conducted close to cliff edges, to safeguard personnel. The three barrows are within the overgrown central part of the site.

2 Context

2.1 Archaeology

The following information is quoted verbatim from the brief (Parry, 2012):

2.1.1 Prehistoric

"The earliest indications of human activity within the survey area are represented by a lithic scatter recovered across the headland within the scheduled area including Neolithic and Mesolithic forms. This matches the nature and pattern of prehistoric activity recorded along this part of the coastline. Beneath the barrow (see below) a potential Mesolithic horizon was uncovered.

A round barrow (1 (92169)) is extant on the highest point of Godrevy headland. It is marked on current OS editions as a Tumulus; earlier maps do not show the barrow but record an OS triangulation station sited here.

This site was recorded in 1916, by which point the barrow had been damaged by a flagpole inserted in its centre. The mound was excavated in the 1950s as part of a wider research programme concerned with multi-period sites in the Gwithian area (see Fowler and Thomas, 1962; Thomas, 1964). The excavation records for the barrow have, unfortunately, not been published (along with the other later prehistoric sites examined as part of the Gwithian programme); some site notes are in existence but no drawings have been located (Nowakowski, 1989).

Recent fieldwork carried out has revealed that the mound is c.14m in diameter and is 1.5m high. It is built of soil (probably originally a turf mound) and there is no sign of an external ditch. An excavation trench has been cut through the mound's centre, apparently to the level of the bedrock; this is probably the 1950s excavation which has been left un-backfilled. Erosion has since occurred to the trench sides and slumped material has built up in the base of the hollow. This barrow is in an exposed and windswept location and vegetation comprises short grasses, which grow on the southern, more sheltered side. The northern side (including the excavation trench) has a patchy cover of short heather with areas of bare soil. In the longer term this lack of vegetation will accelerate degradation of the site.

A small crescent shaped mound of excavation spoil, now grown over with short grasses, is situated to the east of the barrow (2).

Another overgrown circular mound c.3m diameter and 0.4m high is visible c.3m away to the south of the barrow (3). This might be a spoil heap from an antiquarian excavation (but there is no visible sign of an earlier trench), a dump of material arising from the removal of a former OS triangulation point or, given its more regular shape, may be another prehistoric mound built as a satellite to the larger barrow (Report by Craze,CAU 2003 - This mound is a spoil heap from an earlier excavation Charles Thomas pers comm.)."

2.1.2 Medieval

"During this period we have little evidence as to what was occurring however it is likely that the area was subject to animal grazing as was happening across much of Cornwall's coastal margins."

2.1.3 Post-Medieval

"During this period the landscape continues to be managed to varying degrees through grazing. The wider area shows evidence of post-medieval land division and agriculture."

2.2 Environment

Superficial 1: 50000 BGS	None recorded
Bedrock 1:50000 BGS	Mainly Frasnian to Famennian Mylor Slate Formation - Slate and Siltstone
Topography	Variable
Hydrology	Free draining
Current Land Use	Heathland
Historic Land Use	Mixed agricultural
Vegetation Cover	Grass and low scrub
Sources of Interference	None of significance

The Devonian bedrock is likely to support sufficient natural susceptibility enhancement to allow the detection of features cut into the bedrock or with fills containing former topsoil although there will be some difference in response over the slate and sandstone.

Use of a vertical gradiometer at this site will have suppressed deep variation from the bedrock geology and hence most anomalies will have their origin in the soil, or be due to variations in the surface of the bedrock if the soil is shallow. Magnetic debris in the soil can be expected to have a major effect upon the measurement.

3 Methodology

3.1 Survey

3.1.1 Technical equipment

Measured variable	Vertical component of vertical magnetic field component nT/m
Instrument	Bartington Grad 601-2
Configuration	Carried dual gradiometer
Sensitivity	0.1 nT
QA Procedure	Continuous observation
Spatial resolution	1.0m between lines, 0.25m along line interval

3.1.2 Monitoring & quality assessment

Quality monitoring is by continuous observation during data collection and examination of the data after download.

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**
Shear collection	ArcheoSurveyor	
Heading correction	ArcheoSurveyor	Zero median line
Cross line interpretation	Surfer	0.25m x 0.25m cubic spline
Imaging and presentation	Manifold GIS	

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.

All archived data includes process metadata.

3.3 Interpretation framework

3.3.1 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.

3.3.2 Magnetic

Interpretative logic is based on structural class and examples are given below. For example a linear field or gradient enhancement defining an enclosed or semi-enclosed shape is likely to be a ditch fill, if there is no evidence for accumulation of susceptible material against a non-magnetic structure. Weakly dipolar discrete anomalies of small size are likely to have shallow non-ferrous sources and are therefore likely to be pits. Larger ones of the same class could also be pits or 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. Reduced field strength (or gradient) linear anomalies without pronounced dipolar form are likely to be caused by relatively low susceptibility materials, e.g. masonry walls, stony banks or stony or sandy ditch fills.

3.4 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 Field Evaluation", Institute for Archaeologists, 2008.

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 Catalogue

Label	Anomaly Type	Feature Type	Description	Easting	Northing
1	Area reduced gradient	Natural	Aligned along a path to the shore, presumably therefore shallower soil over rock	158050.6	43310.9
2	Linear enhanced gradient	Fill? / natural?	Uncertain, perhaps a shallow fill associated with a former line of the path, or natural	158062.0	43296.9
3	Area strongly variable gradient	Structure	Path; presumably magnetic material has been used in its construction	158067.3	43288.1
4	Linear enhanced gradient	Fill - Ditch?	Possible path, or perhaps a small ditch fill?	158039.3	43256.4
5	Linear reduced gradient	Fill? / structure?	A continuation of [4]? If so, interpretation of [4] as a fill is difficult unless the nature of the fill changes, perhaps here being sand? A former path is also possible	158051.4	43218.8
6	Linear reduced gradient	Structure?	Aligned along a path, presumably therefore shallower soil over rock or materials used in path construction?	158054.3	43262.5
7	Linear weak enhanced gradient	Fill?	This and [8] appear to radiate from a common point near the existing path and might be filled erosion hollows along former paths. Weakly magnetic ditch fills are a possibility	158074.7	43252.4
8	Linear weak enhanced gradient	Fill?	See [7]	158087.7	43252.4
9	Area strongly variable gradient	Structure	Path, see [3]	158164.9	43337.6
10	Area strongly variable gradient	Structure	Path, see [9]	158212.0	43320.7

5 Discussion

5.1 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 catalogue (ibid) in conjunction with the graphical elements of this report.

5.2 Principles

In general, topsoil is more magnetic than subsoil which can be slightly more magnetic than parent geology, whether sands, gravels or clays, however, there are exceptions to this. The reasons for this are natural and are due to biological processes in the topsoil that change iron between various oxidation states, each differently magnetic. Where there is an accumulation of topsoil or where topsoil has been incorporated into other features, a greater magnetic susceptibility will result.

Within landscapes soil tends to accumulate in negative features like pits and ditches and will include soil particles with thermo-remanent magnetization (TRM) through exposure to heat if there is settlement or industry nearby. In addition, particles slowly settling out of stationary water will attempt to align with the ambient magnetic field at the time, creating a deposit with depositional remanent magnetization (DRM).

As a consequence, magnetic survey is nearly always more a case of mapping accumulated magnetic soils than structures which would not be detected unless magnetic in their own right, e.g. built of brick or tile. As a prospecting tool it is thus indirect. Fortunately, the mechanisms outlined above are commonplace and favoured by human activity and it is nearly always the case that cut features will alter in some way the local magnetic field.

5.2.1 Instrumentation

The use of a vertical gradiometer sensitises the measurement process to within a particular depth extent governed by the instrument sensitivity and the sensor separation. In this case the extent is approximately one meter, i.e. sufficient for the detection of buried archaeological structures of normal magnetic susceptibility. As especially strong response will be measured from magnetic sources at the surface; conversely variations in deep alluvium or within the shallow geology will not normally be detected.

5.3 Character & principal results

5.3.1 Geology

Soils over Devonian Mylor slate are usually moderately to strongly magnetic depending upon their exact composition. Here most of the rock is slate, however a sandstone body passes across the site from northeast to southwest, interrupted midway by a fault. Soil derived from the sandstone will likely be differently magnetic though not invariably so.

There are major differences in the magnetic background texture across site, with strongly magnetic former cultivation apparent in some places but not others. Over the sandstone the texture is more uniform and the cultivation nearly invisible. The separation of these two areas of more uniform texture presumably approximately coincides with the fault and hence the two sandstone masses.

Over a deeper soil the effect of the two rock types would likely be less pronounced but here it is clear and their effect upon the magnetic susceptibility of the soil is obvious. It seems realistic to assume that structures in the soil over the sandstone would be less detectable than structures in the soil over the slate.

5.3.2 Land use

There is little evidence for past or present land use in the data except to note the presence of relict ridge and furrow or lazy bed type cultivation and the strong magnetic anomalies associated with past and present paths around the site. The coast path itself is prominent and has apparently been surfaced or reinforced with a magnetic material sourced from outside the site.

5.3.3 Archaeology

The contains little evidence for buried structures that are not directly cultivation-related. The exceptions are [7] and [8] which are possibly narrow ditch fills, however, they might also be the eroded course of former paths. There is no evidence for settlement, barrows or defensive structures, although is is possible that none of these are magnetically detectable here.

5.4 Conclusions

Overall the results are fairly disappointing in terms of detecting features of archaeological interest, however, the fact that cultivation furrows have been mapped does show that the headland has been in arable use in the past. If the soil is particularly thin, e.g. towards the edges of the site, then cultivation of these may have removed all detectable traces of former structures.

5.5 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. Not all archaeological features produce disturbances that can be detected by a particular instrument or methodology. For this reason, the absence of an anomaly must never be taken to mean the absence of an archaeological feature. The best surveys are those which use a variety of techniques over the same ground at resolutions adequate for the detection of a range of different features.

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.

5.6 Bibliography

Parry, 2012, "Unlocking Our Coastal Heritage Project: A Bronze Age Barrow, Godrevy Headland, Godrevy, Cornwall – Brief for Geophysical Survey", the National Trust, unpublished

5.7 Acknowledgements

Jim Parry, National Trust archaeologist, and the National Trust wardens are thanked for their help and support throughout the survey. The site-specific advice given by staff of Cornwall Council HES is gratefully acknowledged.

6 Appendices

6.1 Project metadata

Project Name	Godrevy Headland, Cornwall
Project Code	NTC125
Client	the National Trust
Fieldwork Dates	15th May 2013
Field Personnel	M Edwards
Data Processing Personnel	R Dean, MJ Roseveare
Reporting Personnel	MJ Roseveare, ACK Roseveare
Draft Report Date	31st July 2013
Final Report Date	

6.2 Qualifications & experience

All 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. There is always a geophysicist qualified to post-graduate level on site during fieldwork and all processing and interpretation is undertaken under the direct influence of either the same individual or someone of similar qualifications and experience.

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 with recognised geoscience qualifications and capable of becoming Fellows of the Geological Society of London, the Chartered UK body for geophysicists and geologists.

6.3 Safety

Safety procedures follow the recommendations of the International Association of Geophysical Contractors (IAGC).

Principal personnel have passed the Rescue Emergency Care – Emergency First Aid course and CSCS cards are being sought for those members of staff currently without them.

All personnel are issued with appropriate PPE and receive training in its use. On all sites health and safety management is performed by the Project Geophysicist under supervision by the Operations Manager.

Health and safety policy documentation is reviewed every 12 months, or sooner if there is a change in UK legislation, a reported breach of such legislation, a reported Incident or Near Miss, or changes to ArchaeoPhysica's activities. Anne Roseveare, Operations Manager, has overall responsibility for conducting this review and ensuring documentation is maintained.

We are happy to confirm that ArchaeoPhysica has suffered no reportable accidents since its inception in 1998.

6.4 Archiving

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.

Archive formation is in the spirit of Schmidt, A., 2001, "Geophysical Data in Archaeology: A Guide to Good Practice", ADS.

Access is by appointment only. Some content is restricted and not available to third parties. There is no automatic right of access to this archive by members of the public. Some material retains commercial value and a charge may be made for its use. An administrative charge may be made for some enquiries, depending upon the exact nature of the request.

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 from projects on its website and in other marketing or research publications, usually with the consent of the client. Information that might locate the project is normally removed unless otherwise authorised by the client.