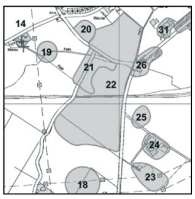
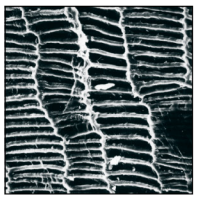
PHMY/01










# LAND AT PEASEY HILLS, MALTON NORTH YORKSHIRE

## GEOPHYSICAL SURVEY

commissioned by Prospect Archaeology

January 2016

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

# LAND AT PEASEY HILLS, MALTON NORTH YORKSHIRE

## GEOPHYSICAL SURVEY

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project info

| | |
|---|---|
| **HA JOB NO.** | PHMY/01 |
| **NGR** | SE 7940 7280 |
| **PARISH** | Malton |
| **LOCAL AUTHORITY** | North Yorkshire |
| **OASIS REF.** | headland5-236248 |

project team

| | |
|---|---|
| **PROJECT MANAGER** | Sam Harrison |
| **AUTHOR** | David Harrison |
| **FIELDWORK** | Alex Schmidt, David Harrison, Ross Bishop |
| **GRAPHICS** | Caroline Norrman, David Harrison, Rafael Maya-Torcelly |
| **APPROVED BY** | Sam Harrison – Project Manager |

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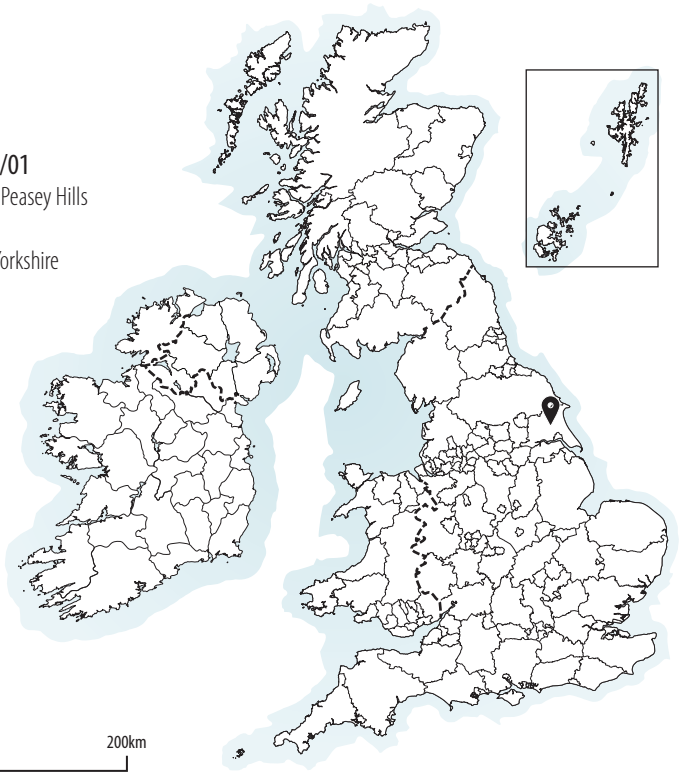
# PROJECT SUMMARY

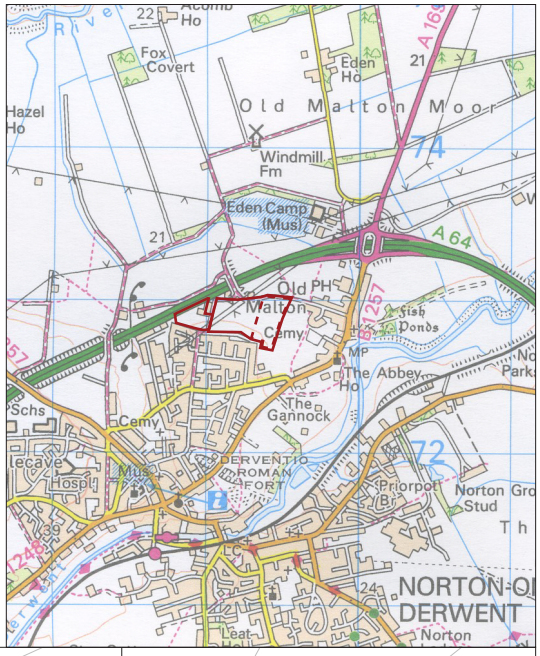
Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 5 hectares of agricultural land to the west of Old Malton to provide information about the archaeological potential of land proposed for residential development. No anomalies of definite archaeological potential have been identified by the survey although anomalies have been identified at the western survey boundary which may indicate the continuation of an enclosure which was identified by a previous geophysical survey in the adjacent field. In particular, a rectangular anomaly may be of interest, perhaps being due to a structure. However, the anomaly may also be caused by localised extraction, evidence for which is recorded within the current survey data and within the wider landscape. Linear anomalies (soil-filled ditches) have been detected which appear to reflect the agricultural landscape predating the nineteenth century. In addition, anomalies due to ridge and furrow cultivation have been identified throughout the survey area. There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions within the survey area. Therefore, based on the results and interpretation of the data, the archaeological potential across most of the site is considered to be low, with a moderate potential at the western site boundary.

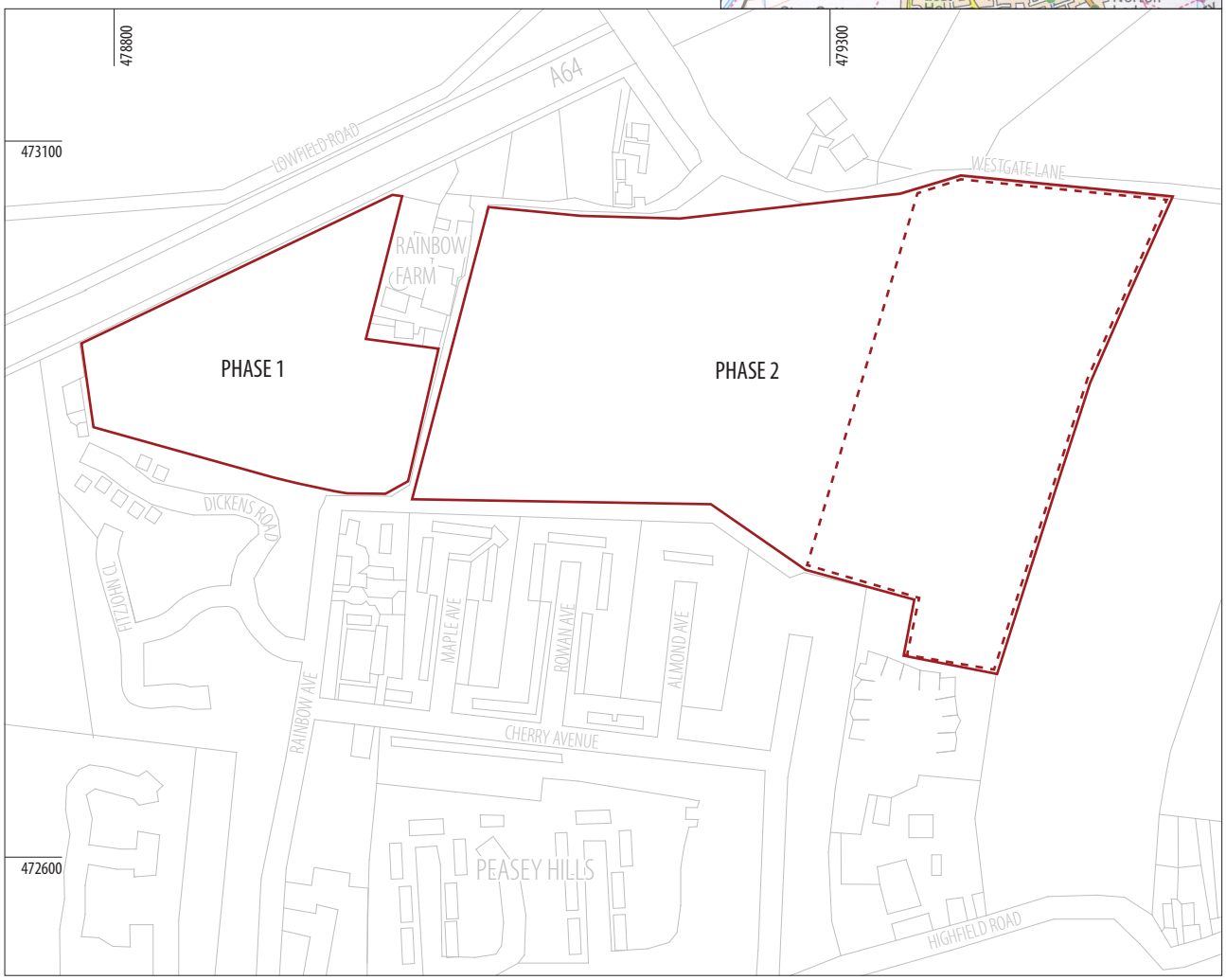
# CONTENTS

# LIST OF ILLUSTRATIONS

**PHMY/01**
land at Peasey Hills
Malton
North Yorkshire






KEY
development boundary
geophysical survey boundary

N
0 250m
scale 1:5,000 @ A4

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**ILLUS 1** Site location

# LAND AT PEASEY HILLS, MALTON

# NORTH YORKSHIRE

## GEOPHYSICAL SURVEY

## 1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Prospect Archaeology (The Client) to undertake a geophysical (magnetometer) survey on land which is proposed for residential development to the west of Old Malton, North Yorkshire. The survey forms part of a wider archaeological assessment being undertaken by Prospect Archaeology on behalf of Commercial Development Projects (CDP). The work was undertaken in accordance with a Written Scheme of Investigation (Headland Archaeology 2015) with guidance within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (David et al. 2008). The survey was carried out on 23rd and 24th November 2015 in order to provide additional information on the archaeological potential of the site.

### 1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The geophysical survey area comprises of a single field to the west of Old Malton, North Yorkshire, centred at SE 794 728 (see **ILLUS 1**). The survey is located within the east of the second phase of proposed development. The survey area is bound to the north by Westgate Lane, to the south by a disused quarry and residential properties fronting onto Hawthorn Avenue and to the east and west by field boundaries comprising of low banks and partial hedgerows (see **ILLUS 2**).

The site is generally located on a north-facing gradient being at 28m above Ordnance Datum (aOD) in the south and becoming flat at 20m aOD in the north.

At the time of the survey the field was under a short cereal crop (see I**LLUS 2**).

### 1.2 GEOLOGY AND SOILS

The underlying bedrock geology consists of Coralline Oolite Formation – Limestone with superficial deposits of alluvium being recorded across the northern half of the survey area.

The soils in the north of the survey area are classified in the Soilscape 5 association, characterised as freely draining lime-rich loams. Within the south of the soils are classified in the Soilscape 3 association which are shallower lime-rich loams (LandIS 2015).

## 2 ARCHAEOLOGICAL BACKGROUND

No detailed archaeological background is available at the time of writing. However, a previous geophysical survey on land to the immediate west of the survey area identified 'the presence of enclosures, possibly buildings, and potentially small-scale industrial activity in the form of ovens or kilns' (GSB Prospection 2014).

### 2.1 AIMS, METHODOLOGY AND PRESENTATION

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of any proposed development on potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended.

The general archaeological objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore model the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

### 2.2 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. Features such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the Earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes

**ILLUS 2** General site condition

and strengths (Gaffney and Gater, 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system is programmed to take readings at a frequency of 10Hz (allowing for a 10-15cm sample interval) on roaming traverses 4m apart. These readings are stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system is linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software has been used to collect and export the data. Terrasurveyor V3.0.27.1 (DWConsulting) software has been used to process and present the data.

## 2.3 REPORTING

A general site location plan is shown in **ILLUS 1** at a scale of 1:5,000. **ILLUS 2** is a general site condition photograph. **ILLUS 3** is a large scale (1:5,000) survey location plan showing the processed greyscale magnetometer data and the previous geophysical survey data (after GSB 2014). Detailed data plots ('raw' and processed) and an interpretative illustration are presented at a scale of 1:1,000 in **ILLUS 4**, **ILLUS 5** and **ILLUS 6**.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 4.

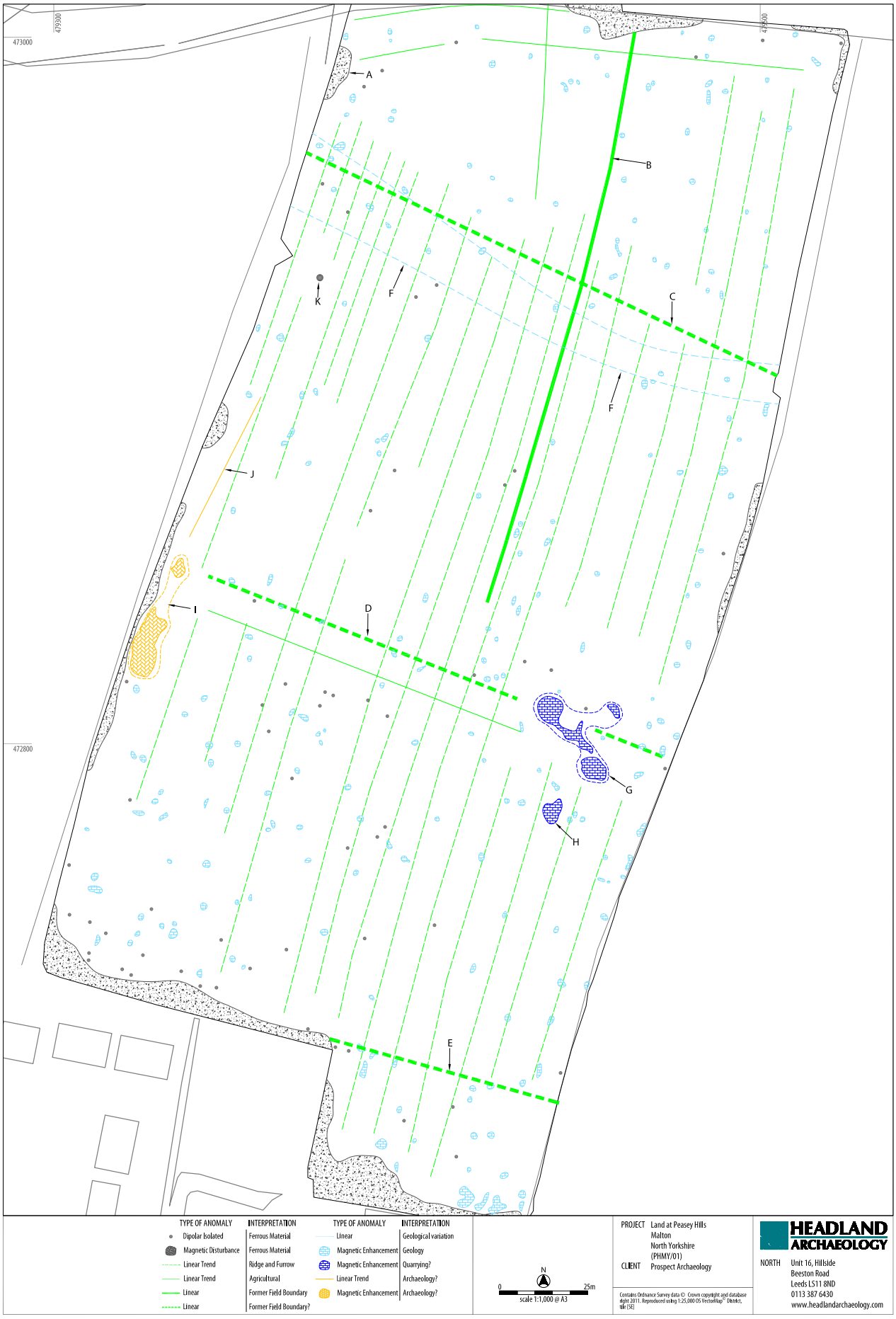
The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Headland Archaeology 2015) and guidelines outlined by English Heritage (David et al. 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (©Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.


**ILLUS 3** Survey location showing greyscale magnetometer data


**ILLUS 4** Processed greyscale magnetometer data


**ILLUS 5** XY trace plot of minimally processed magnetometer data




**ILLUS 6** Interpretation of magnetometer data

# 3 RESULTS AND DISCUSSION

Generally, the geophysical survey has recorded a variable magnetic background response across most of the survey area with an area of reduced variation in the north. This difference is due to the presence of alluvial deposits immediately south of Westgate Lane. Within this magnetic background numerous anomalies have been identified. These are discussed below and cross-referenced to specific examples depicted on the interpretative figures, where appropriate.

## 3.1 FERROUS/MODERN ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on most sites, often being present as a consequence of manuring or tipping/infilling.

The square area of magnetic disturbance, A, within the north-west of the field corresponds to a pond which is depicted on the first edition Ordnance Survey map (1854). The disturbance is caused by the magnetic material used to back-fill the former pond.

Other areas of magnetic disturbance around the periphery of the field are caused by ferrous material within, or forming part of, the adjacent field boundaries and by the presence of gardens/ buildings in the south.

## 3.2 AGRICULTURAL ANOMALIES

Analysis of historical OS mapping indicates that one field boundary has been removed since the publication of the first edition OS map in 1854. The boundary manifests in the data as a faint, generally negative, linear anomaly, B aligned north/south. The negative response suggests that the anomaly may be due to a ploughed-down bank rather than a soil-filled ditch.

Three possible former field boundaries (not depicted on historical Ordnance Survey mapping) have been identified as equidistant north-west/south-east aligned linear anomalies C, D and E. The orientation of these anomalies corresponds closely to the north-west/south-east pattern of land division which is visible in the landscape on historical mapping, and on current mapping to the immediate north of Westgate Lane (see **ILLUS 3**). Anomaly C appears to form the continuation of an extant boundary located 200m to the east. The appearance of this anomaly, being negative to the west of B, and positive to the east, is worthy of note and may be caused by differing land-use on either side of the former field boundary.

Linear anomalies D and E are also not shown on any historical Ordnance Survey maps. However, anomaly D corresponds to the projected extension of a boundary which is shown in the field to the immediate east on the 1805 Enclosure Award Map for Malton. The anomaly is very faint, perhaps reflecting a lack of magnetic contrast in the soils or an absence of enhanced deposits.

Widely-spaced, slightly curving parallel linear trends are identified across the field. These anomalies are typical of the medieval and post medieval practice of ridge and furrow cultivation. The characteristic striping in the data is due to the contrast between the former ridges and the in-filled furrows.

## 3.3 GEOLOGICAL ANOMALIES

As mentioned above, there is a low level of background variation within the north of the survey area which corresponds to the lowest-lying part of the field and is thought to be caused by the presence of alluvial deposits. This contrasts with the majority of the survey area where no superficial deposits are recorded. At the interface between the two magnetic backgrounds, and corresponding to the base of the gentle slope, a broad area of low-level magnetic enhancement, F, is identified.

Elsewhere low-magnitude discrete anomalies are identified throughout the survey area. In theory, any of these anomalies could be caused by a soil-filled pit, although their sheer number and even dispersal is suggestive of geological origins, probably being caused by localised variations in the composition of the soils.

## 3.4 POSSIBLE QUARRYING ANOMALIES

Broad, high-magnitude and amorphous anomalies, G and H have been identified within the south-east of the survey area. The anomalies are characteristic of quarry pits, being caused by the magnetically-enhanced soil-fill of the former pits. This interpretation is reinforced by the presence of a number of former quarries within the surrounding landscape including one to the immediate south of the survey area and a second to the west, south of Rainbow Farm (see **ILLUS 3**).

## 3.5 POSSIBLE ARCHAEOLOGICAL ANOMALIES

Another broad area of magnetic enhancement, I, is located close on the western site boundary. The anomaly is similar in magnitude to the possible quarry pits, G and H, discussed above and it may have similar origins. However, it is more rectangular in form and appears to align with, and respect, both the historical (and extant) pattern of land division and the pattern of anomalies recorded by the geophysical survey in the field to the immediate west (GSB 2014; see **ILLUS 3**). Therefore, the anomaly has been ascribed a possible archaeological interpretation and may be caused by the buried remains of a structure.

A faint linear trend, J, can be seen to the north of I, slightly oblique to the ridge and furrow anomalies. The anomaly appears to run parallel with a linear anomaly (ditch) which was identified in the adjacent field (GSB 2014) and may form the eastern extent of a rectangular ditched-enclosure. If so, the large ferrous 'spike', K, may be of interest, being located close to the projected northern extension of J. It is possible that the anomaly is caused by industrial activity although a modern origin (i.e. a deeply buried ferrous object) is also plausible.

# 4 CONCLUSION

No anomalies of definite archaeological potential have been identified within the current survey area although anomalies interpreted as possible enclosures, buildings and small-scale industry were recorded within the field to the immediate west.

Some archaeological potential has been attributed to a faint linear trend at the western survey boundary which may form the eastern extent of a rectangular enclosure. A broad rectangular on the same alignment may be caused by a structure, although the magnitude of the anomaly is similar to that of probable quarry pits which have been detected a short distance to the east, and this anomaly may have similar origins. Evidence of localised extraction is known within the immediate environs of the survey area.

The survey has identified anomalies which appear to correspond to the historical pattern of land division including a series of parallel anomalies indicative of ridge and furrow cultivation.

There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions within the geophysical survey area. Therefore, based solely on the results and interpretation of the geophysical data, the archaeological potential across most of the site is assessed to be low, with a moderate potential at the western site boundary.

# 5 REFERENCES

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# 6 APPENDICES

## APPENDIX 1 MAGNETOMETER SURVEY

### 1.1 MAGNETIC SUSCEPTIBILITY AND SOIL MAGNETISM

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected.

The magnetic susceptibility of a soil can also be enhanced by the application of heat. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

### 1.2. TYPES OF MAGNETIC ANOMALY

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

*Isolated dipolar anomalies (iron spikes)*

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

*Areas of magnetic disturbance*

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

*Linear trend*

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

*Areas of magnetic enhancement/positive isolated anomalies*

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

*Linear and curvilinear anomalies*

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

## APPENDIX 2 SURVEY LOCATION INFORMATION

An initial survey base station was established using a Trimble VRS differential Global Positioning System (dGPS). The magnetometer data was georeferenced using a Trimble RTK differential Global Positioning System (Trimble R8s model).

Temporary sight markers were laid out using a Trimble VRS differential Global Positioning System (Trimble R8s model) to guide the operator and ensure full coverage. The accuracy of this dGPS equipment is better than 0.01m.

The survey data were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

## APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises:-

- an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

# APPENDIX 4 OASIS DATA COLLECTION FORM: ENGLAND

| **Project Details** | |
|---|---|
| **Project name** | Land at Peasey Hills, Malton, North Yorkshire |
| **Short description of the project.** | Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 5 hectares of agricultural land to the west of Old Malton to provide information about the archaeological potential of land proposed for residential development. No anomalies of definite archaeological potential have been identified by the survey although anomalies have been identified at the western survey boundary which may indicate the continuation of an enclosure which was identified by a previous geophysical survey in the adjacent field. In particular, a rectangular anomaly may be of interest, perhaps being due to a structure. However, the anomaly may also be caused by localised extraction, evidence for which is recorded within the current survey data and within the wider landscape. Linear anomalies (soil-filled ditches) have been detected which appear to reflect the agricultural landscape predating the nineteenth century. In addition, anomalies due to ridge and furrow cultivation have been identified throughout the survey area. There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions within the survey area. Therefore, based on the results and interpretation of the data, the archaeological potential across most of the site is considered to be low, with a moderate potential at the western site boundary |
| **Project dates** | Start: 23-11-2015 End: 24-11-2015 |
| **Previous/future work** | Yes / Not known |
| **Any associated project reference codes** | PHMY15 |
| **Any associated project reference codes** | 001 - Contracting Unit No. |
| **Type of project** | Field evaluation |
| **Site status** | None |
| **Current Land use** | Cultivated Land 4 - Character Undetermined |
| **Monument type** | N/A None |
| **Monument type N/A None** | N/A None |
| **Significant Finds N/A None** | N/A None |
| **Significant Finds N/A None** | N/A None |
| **Methods & techniques** | Geophysical Survey' |
| **Development type** | Housing estate |
| **Prompt** | National Planning Policy Framework - NPPF |
| **Position in the planning process** | Not known / Not recorded |
| **Solid geology (other)** | Coralline Oolite Formation |
| **Drift geology** | Alluvium |
| **Techniques** | Magnetometry |

| **Project location** | |
|---|---|
| **Country** | England |
| **Site location** | NORTH YORKSHIRE RYEDALE MALTON Land at Peasey Hills, Malton |
| **Postcode** | YO17 7HF |
| **Study area** | 5 Hectares |
| **Site coordinates Point** | SE 794 728 54.144709737062 -0.78433678768 54 08 40 N 000 47 03 W |

| **Project creators** | |
|---|---|
| **Name of Organisation** | Headland Archaeology |
| **Project brief originator** | Consultant |
| **Project design originator** | Headland Archaeology |

| | |
|---|---|
| **Project director/manager** | Harrison, S |
| **Project supervisor** | Harrison, D |
| **Type of sponsor/funding body** | Developer |

| **Project archives** | |
|---|---|
| **Physical Archive Exists?** | No |
| **Digital Archive Exists?** | No |
| **Digital Media available** | Geophysics' |
| **Paper Archive Exists?** | No |
| **Paper Media available** | Report |

| **Project bibliography 1** | |
|---|---|
| **Publication type** | Grey literature (unpublished document/manuscript) |
| **Title** | Land at Peasey Hills, Malton, North Yorkshire: Geophysical Survey |
| **Author(s)/Editor(s)** | Harrison, D. |
| **Date** | 2016 |
| **Issuer or publisher** | Headland Archaeology |
| **Place of issue or publication** | Leeds |
| **Description** | A4 bound report |

| | |
|---|---|
| **Entered by** | David Harrison (david.harrison@headlandarchaeology.com) |
| **Entered on** | 5 January 2016 |

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