

LAND NORTH-WEST OF GROVE, OXFORDSHIRE

GEOPHYSICAL SURVEY REPORT

commissioned by Environmental Dimension Partnership Ltd on behalf of Persimmon Homes (Wessex)

November 2020





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PROJECT SUMMARY

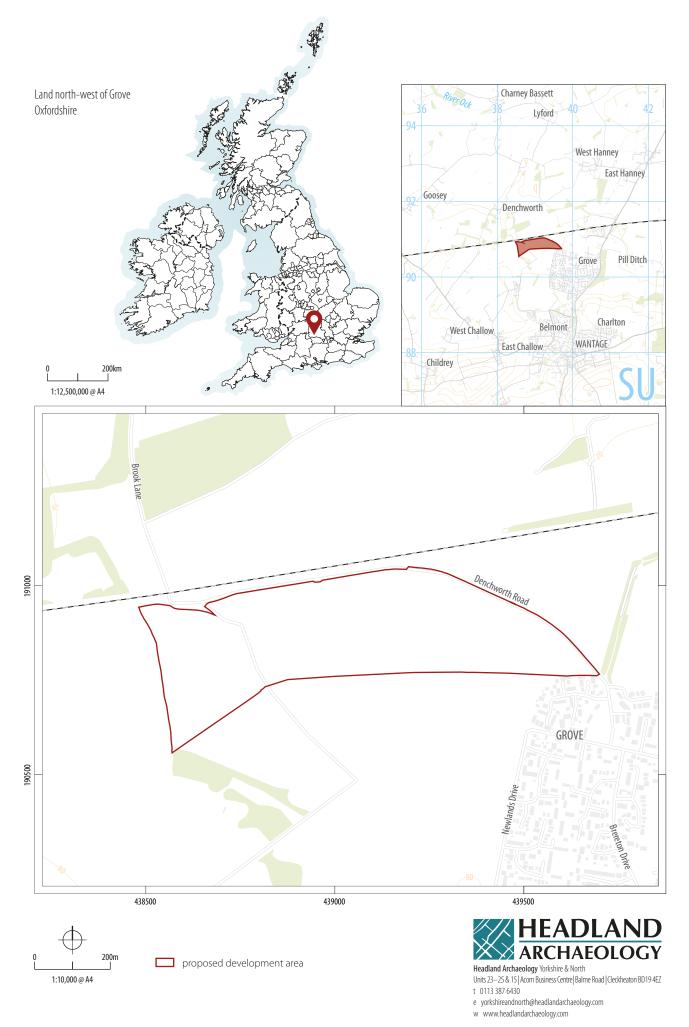
Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 28.4ha site on land north-west of Grove, Oxfordshire, where a residential development is proposed. The eastern and western parts of the site were previously within the perimeter of RAF Grove, an airfield which was decommissioned at the end of World war II. Broad areas of ferrous contamination across the west of the site suggest that the remediation was fairly superficial prior to the site being brought back into agricultural production in the late 1940s. Amongst this ferrous 'noise' the survey has identified taxiways and 'frying pan' dispersals whilst large ferrous 'spikes' in the data are likely also due to the sub-surface remains of other airfield infrastructure. Despite the broad areas of ferrous contamination, a localised area of previously unknown archaeological activity has been identified along the western edge of the site. This comprises numerous linear and curvilinear anomalies describing a system of ditched enclosures suggestive of smallscale Romano-British settlement and enclosure. This localised area is assessed as of moderate to high archaeological potential. In the central part of the site ridge and furrow cultivation trends reflect medieval and later farming practices but a second smaller area of archaeological activity is also identified adjacent to the southern site boundary comprising the three or four small enclosures. This area is assessed as having moderate archaeological potential. Outside of these two localised and well-defined areas, no other anomalies reflective of potential buried archaeological remains were recorded, and the majority of the site is considered to have a low potential.

CONTENTS

1	INTRO	INTRODUCTION		
	1.1	SITE LOCATION, TOPOGRAPHY AND LAND-USE	1	
	1.2	GEOLOGY AND SOILS	1	
2	ARCHAEOLOGICAL BACKGROUND			
3	AIMS, METHODOLOGY AND PRESENTATION			
	3.1	MAGNETOMETER SURVEY	2	
	3.2	REPORTING	2	
4	RESULTS AND DISCUSSION			
	4.1	FERROUS ANOMALIES	3	
	4.2 AIRFIELD ANOMALIES		3	
	4.3	AGRICULTURAL ANOMALIES	4	
	4.4	GEOLOGICAL ANOMALIES	4	
	4.5	ARCHAEOLOGICAL AND POSSIBLE ARCHAEOLGICAL ANOMALIES	4	
5	CONCL	USION	5	
6	REFER	ENCES	5	
7	APPENDICES			
	APPEN	DIX 1 MAGNETOMETER SURVEY	25	
	APPEN	DIX 2 SURVEY LOCATION INFORMATION	26	
	APPEN	DIX 3 GEOPHYSICAL SURVEY ARCHIVE	26	
	APPEN	DIX 4 DATA PROCESSING	26	
	APPEN	DIX 5 OASIS DATA COLLECTION FORM: ENGLAND	27	

LIST OF ILLUSTRATIONS

ILLUS 1 SITE LOCATION (1:10,000)	VIII
ILLUS 2 F2, LOOKING SOUTH	2
ILLUS 3 F3, LOOKING EAST	3
ILLUS 4 F4, LOOKING SOUTH-WEST	4
ILLUS 5 F4, LOOKING SOUTH	5
ILLUS 6 SURVEY LOCATION SHOWING GPS SWATHS (1:4,000)	7
ILLUS 7 PROCESSED GREYSCALE MAGNETOMETER DATA (1:4,000)	9
ILLUS 8 INTERPRETATION OF MAGNETOMETER DATA (1:4,000)	11
ILLUS 9 PROCESSED GREYSCALE MAGNETOMETER DATA, SECTOR 1 (1:2,000)	13
ILLUS 10 XY TRACE PLOT OF MINIMALLY PROCESSED MAGNETOMETER DATA, SECTOR 1 (1:2,000)	15
ILLUS 11 INTERPRETATION OF MAGNETOMETER DATA, SECTOR 1 (1:2,000)	17
ILLUS 12 PROCESSED GREYSCALE MAGNETOMETER DATA, SECTOR 2 (1:2,000)	19
ILLUS 13 XY TRACE PLOT OF MINIMALLY PROCESSED MAGNETOMETER DATA, SECTOR 2 (1:2,000)	21
ILLUS 14 INTERPRETATION OF MAGNETOMETER DATA, SECTOR 2 (1:2,000)	23



LAND NORTH-WEST OF GROVE, OXFORDSHIRE

GEOPHYSICAL SURVEY REPORT

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by the Environmental Dimension Partnership (the Consultant) on behalf of Persimmon Homes (Wessex) (The Client), to undertake a geophysical (magnetometer) survey on land north-west of Grove, Oxfordshire, where a new residential development is proposed. The results of the survey will inform future archaeological strategy at the site.

The survey was undertaken in order to assess the impact of the proposed development on the historic environment. It was undertaken in accordance with an Archaeological Written Scheme of Investigation (WSI) (Harrison 2020) which was submitted to and approved by Richard Oram (Lead Archaeologist at Oxfordshire County Council), with guidance within the National Planning Policy Framework (MHCLG 2019) and in line with current best practice (Chartered Institute for Archaeologists 2014, Europae Archaeologia Consilium 2016).

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The Proposed Development Area (PDA) comprises four fields (F1– F4) within an irregularly shaped block of land north-west of Grove, Oxfordshire, centred on SU 3906 9087 (Illus 1). The PDA is bounded to the north and east by Denchworth Road, and by hedgerows to the west. The southern site boundary is unbound and extends onto arable farmland.

At the time of the survey the fields were under short grass (Illus 2–3) with F4 being mostly cleared of overgrown vegetation to facilitate

the survey (Illus 4). A 3ha area in the west of F4 remained overgrown and unsuitable for survey (Illus 5).

Topographically, the site is flat with only minor undulations between 74m Above Ordnance Datum (AOD) in the east and 77m AOD in the west.

1.2 GEOLOGY AND SOILS

The bedrock geology mostly comprises Gault Mudstone with some Ampthill Clay and Kimmeridge Clay (mudstone) extending into the north-east of the PDA. The mudstone bedrock is overlain in the east and west by Summertown-radley Sand and Gravel and by a northeast/south-west band of alluvium along a minor watercourse in the centre of the PDA (NERC 2020).

The soils are classified in the Soilscape 18 Association, characterised as slowly permeable, seasonally wet loams and clays (Cranfield University 2020).

2 ARCHAEOLOGICAL BACKGROUND

An Archaeological and Heritage Assessment (EDP 2020) has established that the site does not contain any designated heritage assets. The only previously recorded non-designated asset within the PDA relates to a former military airfield (RAF Grove) which formerly occupied the eastern and western parts of the PDA.



ILLUS 2 F2, looking south

The Assessment concluded that:

'previous investigations to the east and south (of the PDA) suggest that there is a moderate potential for Bronze Age, Iron Age and Roman period remains, which are most likely to relate to former field systems. There is a low potential for the Site to contain remains from the early medieval to modern periods, other than 'negligible' value remains related to medieval and later farming practices and the Site's partial inclusion in the former extent of the RAF Grove aerodrome.'

3 AIMS, METHODOLOGY AND PRESENTATION

The general aim of the geophysical survey was to provide enough information to establish the presence/absence, character and extent of any archaeological remains within the PDA. This will therefore enable an assessment to be made of the impact of the proposed development on any sub-surface archaeological remains, if present.

The specific archaeological objectives of the geophysical survey were:

- to gather enough information to inform the extent, condition, character and date (as far as circumstances permit) of any archaeological features and deposits within the PDA;
- to obtain information that will contribute to an evaluation of the significance of the scheme upon cultural heritage assets; and
- > to prepare a report summarising the results of the survey.

3.1 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. A feature 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 and strengths (Gaffney & 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 was programmed to take readings at a frequency of 10Hz (allowing for a 10–15cm sample interval) on roaming traverses (swaths) 4m apart. These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was 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 was used to collect and export the data. Terrasurveyor V3.0.35.1 (DWConsulting) software was used to process and present the data.

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:10,000. Illus 2–5 are site condition photographs. Illus 6 shows the survey location and the direction of traverse as GPS swaths. Illus 7 and Illus 8 are overall greyscale and interpretative illustrations, at 1:4,000. Largescale, fully processed (greyscale) data, minimally processed data (XY



ILLUS 3 F3, looking east

trace plot) and interpretative plots are presented at a scale of 1:2,000 in Illus 9 to Illus 14 inclusive.

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. Data processing details are presented in Appendix 4. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 5.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Harrison 2020), with guidelines outlined by Europae Archaeologia Consilium (EAC 2016) and by the Chartered Institute for Archaeologists (ClfA 2014). All illustrations from Ordnance Survey (OS) mapping are reproduced 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.

4 RESULTS AND DISCUSSION

Ground conditions were good (where survey was possible) and have contributed to a high standard of data throughout. The survey has detected a low level of background magnetic variation (over those parts of the PDA not previously part of the airfield) which is a likely consequence of the homogenous properties of the clay soils. The magnetic background across F2 is highly elevated and is directly associated with military activity during World War II. Against these backgrounds numerous anomalies have been identified and cross-referenced to specific examples on the interpretation illustrations, where appropriate.

4.1 FERROUS 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 is common on most sites, often being present due to manuring or tipping/infilling.

There are three obvious clusters of ferrous anomalies that coalesce into areas of magnetic disturbance which require further comment. Two are due to the former airfield (see below) and the third comprises a strip within the north-west of F4 which is suggestive of modern tipping/infilling. Any low magnitude anomalies of archaeological potential within this area, if present, may be masked beneath this extremely elevated background.

Limited bands of magnetic disturbance around the field edges is due to ferrous material within, or adjacent to the boundaries, and road or track verges, and is of no archaeological interest.

4.2 AIRFIELD ANOMALIES

The data across most of F2 is dominated by broad bands of ferrous contamination which are directly associated with RAF Grove. The anomalies are due to magnetic material (such as bricks, tile, concrete, iron, or any other strongly magnetic material) which still remains



ILLUS 4 F4, looking south-west

in the plough soil following remediation of the RAF site back into agricultural production following the closure of the airbase in 1946.

At least four curving taxiways are clearly identified in F2 with each terminating at an area of 'frying pan' dispersal hardstanding (see Illus 9–11). A large circular anomaly, 215m in diameter, is also visible within the south of the field. The anomaly is due to an infilled ditch and corresponds to a feature, likely military, which is depicted on late 20th century Ordnance Survey maps.

A similarly dense area of high magnitude magnetic disturbance is identified towards the south-eastern corner of F4 and this corresponds to the northern limit of the former main airfield runway.

Elsewhere, a symmetrical cluster of five 'spikes' in the south of F3 (within AA2) is probably due to a buried footing or installation and is likely also of military origin.

4.3 AGRICULTURAL ANOMALIES

Two former field boundaries, depicted on historical Ordnance Survey maps, have been detected as linear anomalies in the southeast of F4. The anomalies are due to infilled ditches.

Parallel, slightly sinuous linear trends are visible throughout the PDA. These anomalies are characteristic of the medieval and postmedieval practice of ridge and furrow cultivation and are caused by the magnetic contrast between the soil-fill of the former furrows and the surrounding soils. Four different ploughing regimes are visible within F3 divided by at least two former boundaries.

4.4 GEOLOGICAL ANOMALIES

Occasional and sporadic discrete low magnitude anomalies throughout the PDA are probably due to localised variation in the depth and composition of the topsoil and are not thought to be of any archaeological potential.

4.5 ARCHAEOLOGICAL AND POSSIBLE ARCHAEOLGICAL ANOMALIES

Unless specified all the linear anomalies described are likely to be due to soil filled cut features, such as ditches, forming clear patterns of enclosure and land division. Against a variable magnetic background such as that within F2, it is difficult to confidently discriminate between discrete anomalies which may be due to archaeological features, such as pits, which may be indicative of occupational activity and those that are probably due to more recent activity. For this reason, most of the discrete anomalies within enclosures have been ascribed a possible archaeological origin with those outside, except where the responses are particularly broad or high in magnitude, interpreted as of non-archaeological origin.

Two distinct, localised and well-defined areas of archaeological activity (AAA) have been identified which are discussed below.

AAA 1

AAA1 locates a complex of interlinking enclosures at the western limit of the PDA extending 170m north/south and 67m east/west and centred on SU 3857 9078. Numerous discrete anomalies within the interior of the enclosures may be due to pits, whilst a broader high magnitude anomaly within the centre of the complex may be due to burning, perhaps a kiln. Despite the 'noise' from the 20th century activity masking part of the complex, its north, south and eastern limits seem well-defined with the archaeology extending beyond the western limits of the PDA.

AAA2

AAA2 defines at least two adjacent fragmented sub-rectangular enclosures in the south of F3, centred on SU 3901 9078. The enclosures likely locate small-scale Romano-British activity, possibly cattle enclosures.



ILLUS 5 F4, looking south

A very faint circular anomaly 100m north-west of AAA2, also in F3, is assessed as of moderate archaeological potential and may locate a ring-ditch. However, the anomaly is very low magnitude and this interpretation is considered tentative.

5 CONCLUSION

The survey has successfully evaluated the PDA and has identified two areas of previously unknown archaeological activity comprising conjoined ditched enclosures suggestive of small-scale Romano-British settlement and enclosure. These well-defined and localised areas are in the west (AAA1) and south (AAA2) of the PDA and are assessed as of moderate to high and moderate archaeological potential respectively.

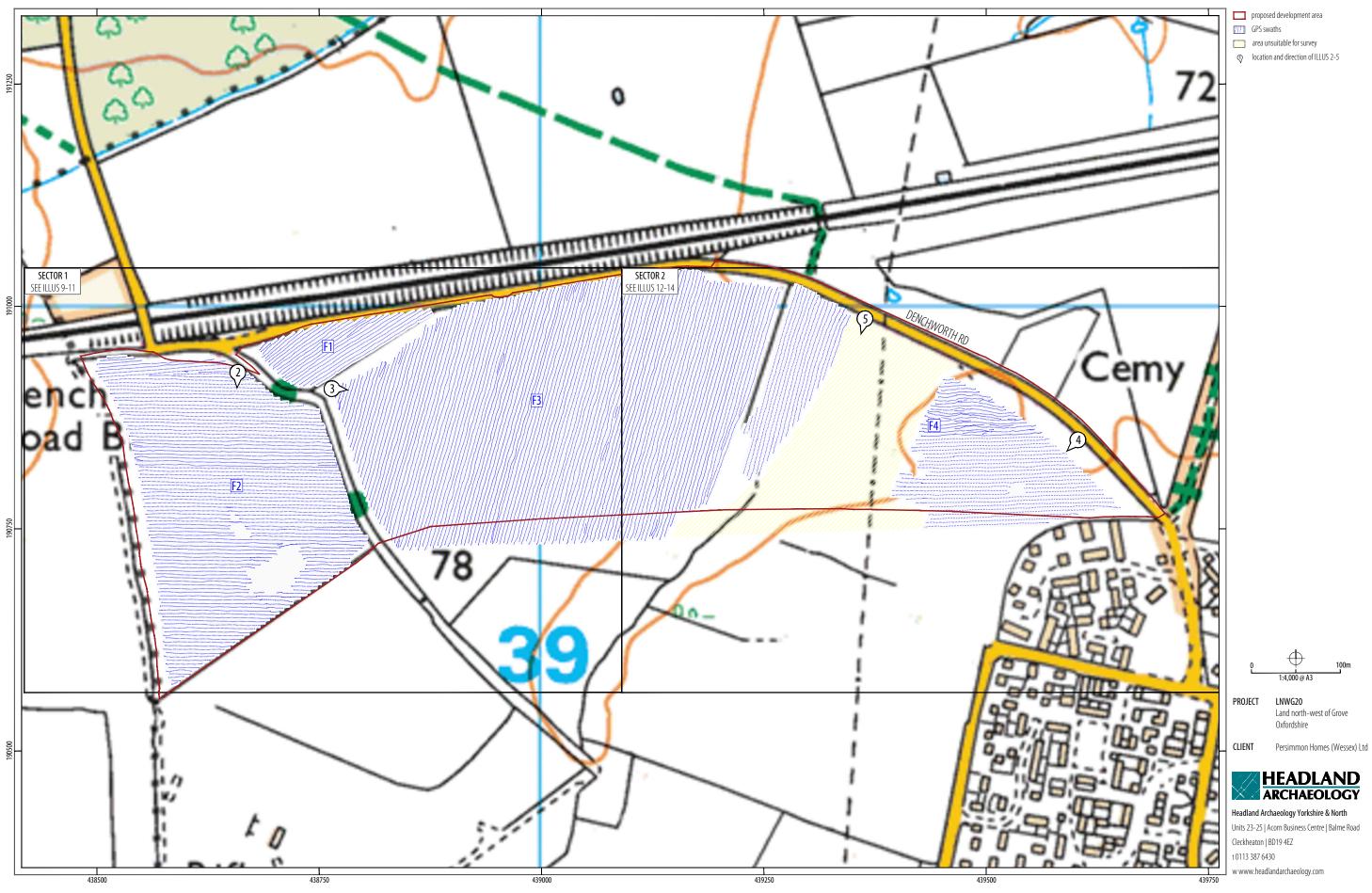
Broad areas of ferrous contamination across the west of the PDA (and to a much lesser extent at the east of the PDA) are due to the remediation of features at the northern edge of RAF Grove. The extent of the anomalies indicates that the site was only superficially remediated before being brought back into agricultural production. Amongst this ferrous 'noise' the survey has clearly defined several airfield features such as taxiways and 'frying pan' dispersals whilst large ferrous 'spikes' in the data may be due to other minor airfield installations.

Ridge and furrow cultivation trends across the central part of the PDA are due to medieval and later farming practices.

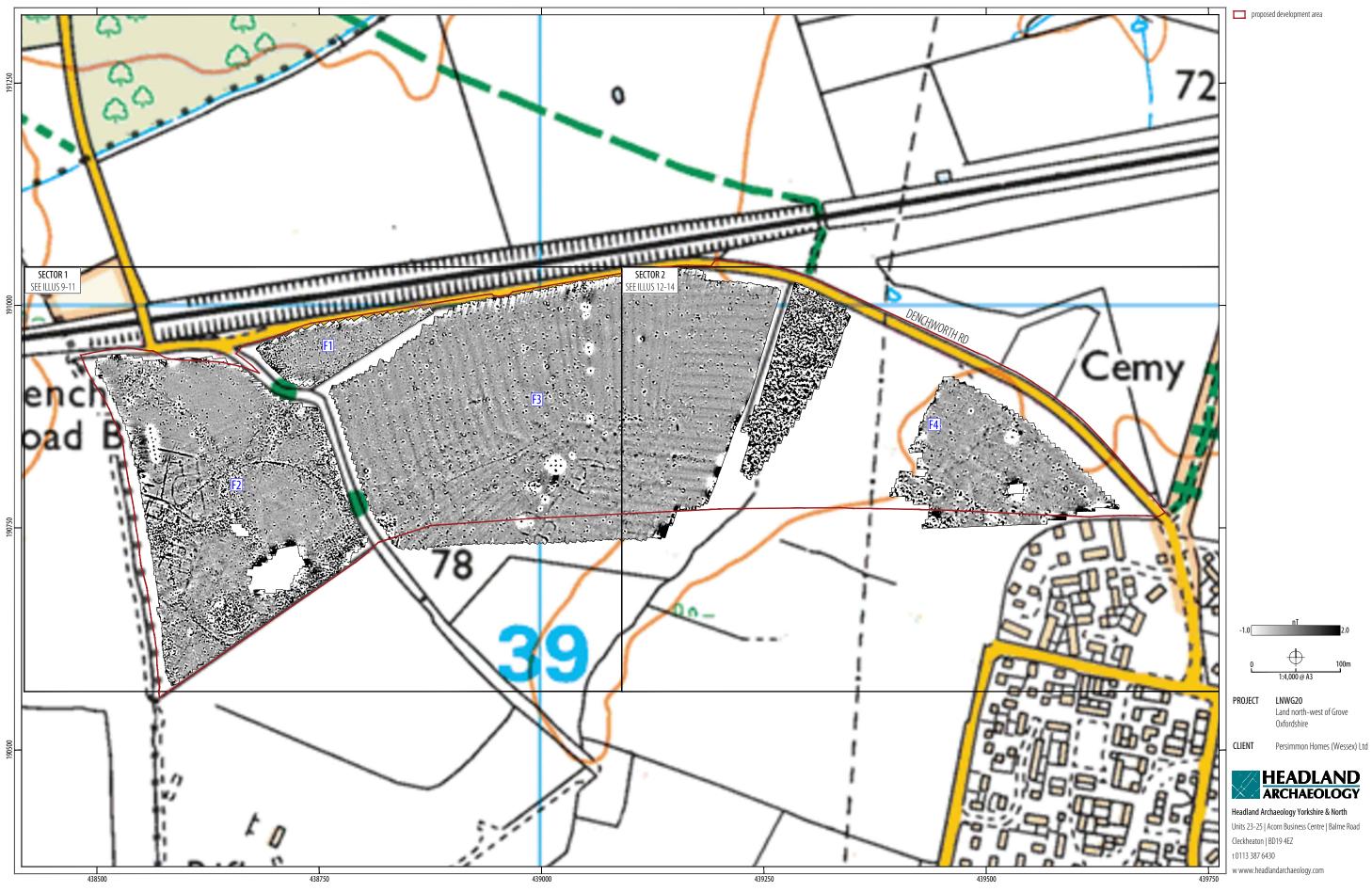
On the basis of the geophysical survey, the majority of the site is assessed as of low archaeological potential with two localised and well-defined areas of high/moderate potential (I,e AAA1 and AAA2) broadly corroborating the results of the Archaeological and Heritage Assessment.

6 **REFERENCES**

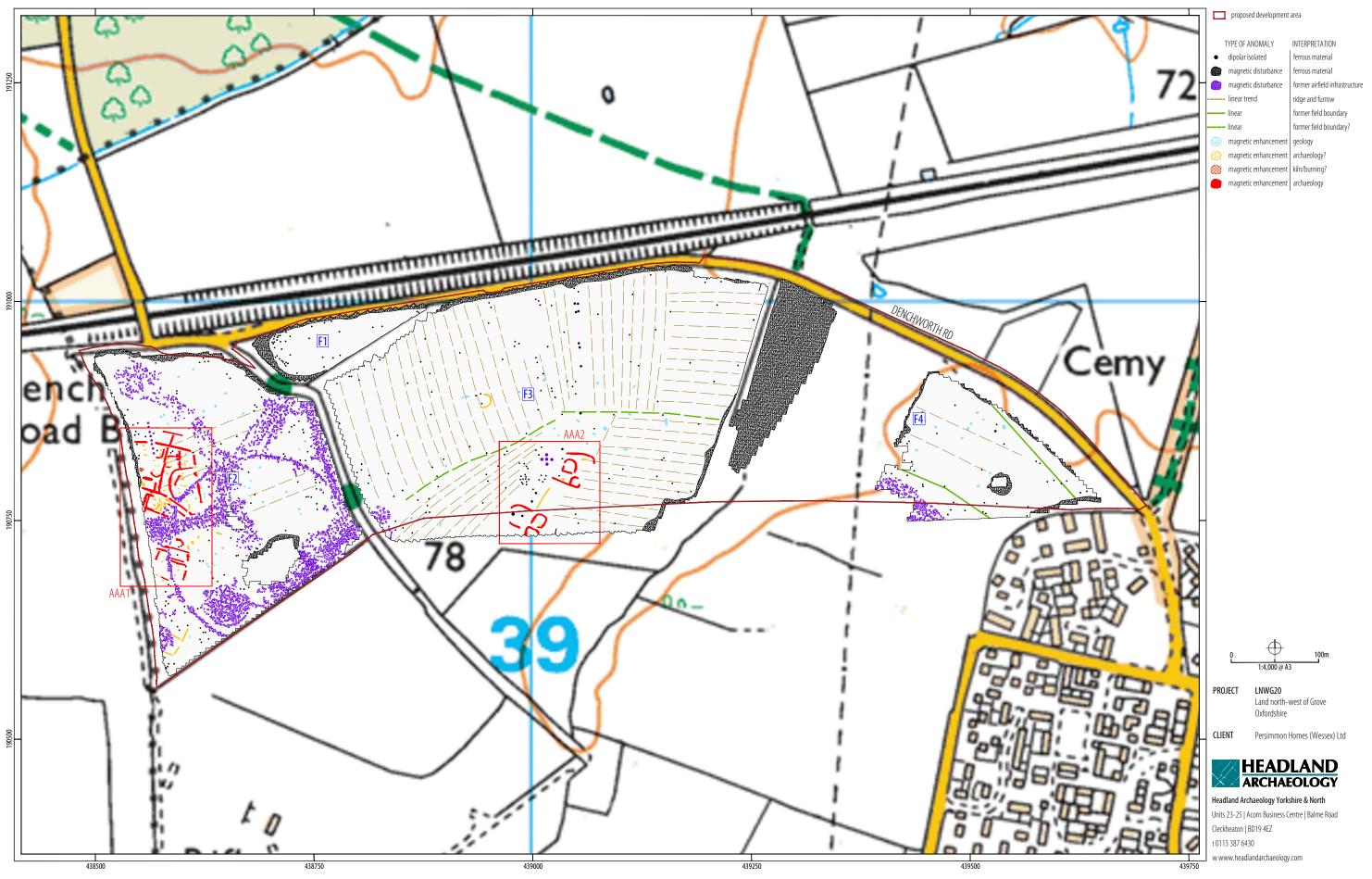
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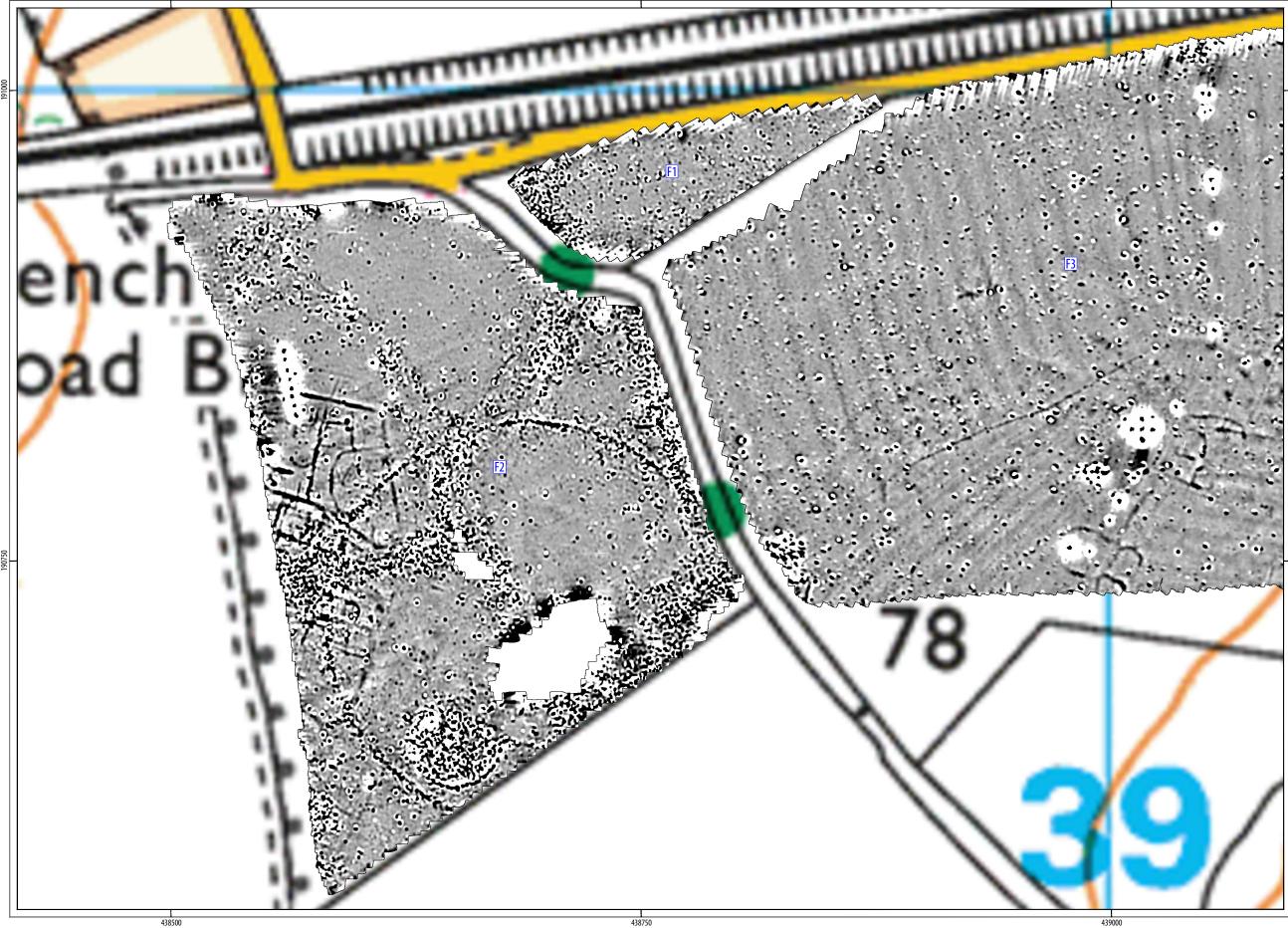
ILLUS 6 Survey location showing GPS swaths



ILLUS 7 Processed greyscale magnetometer data

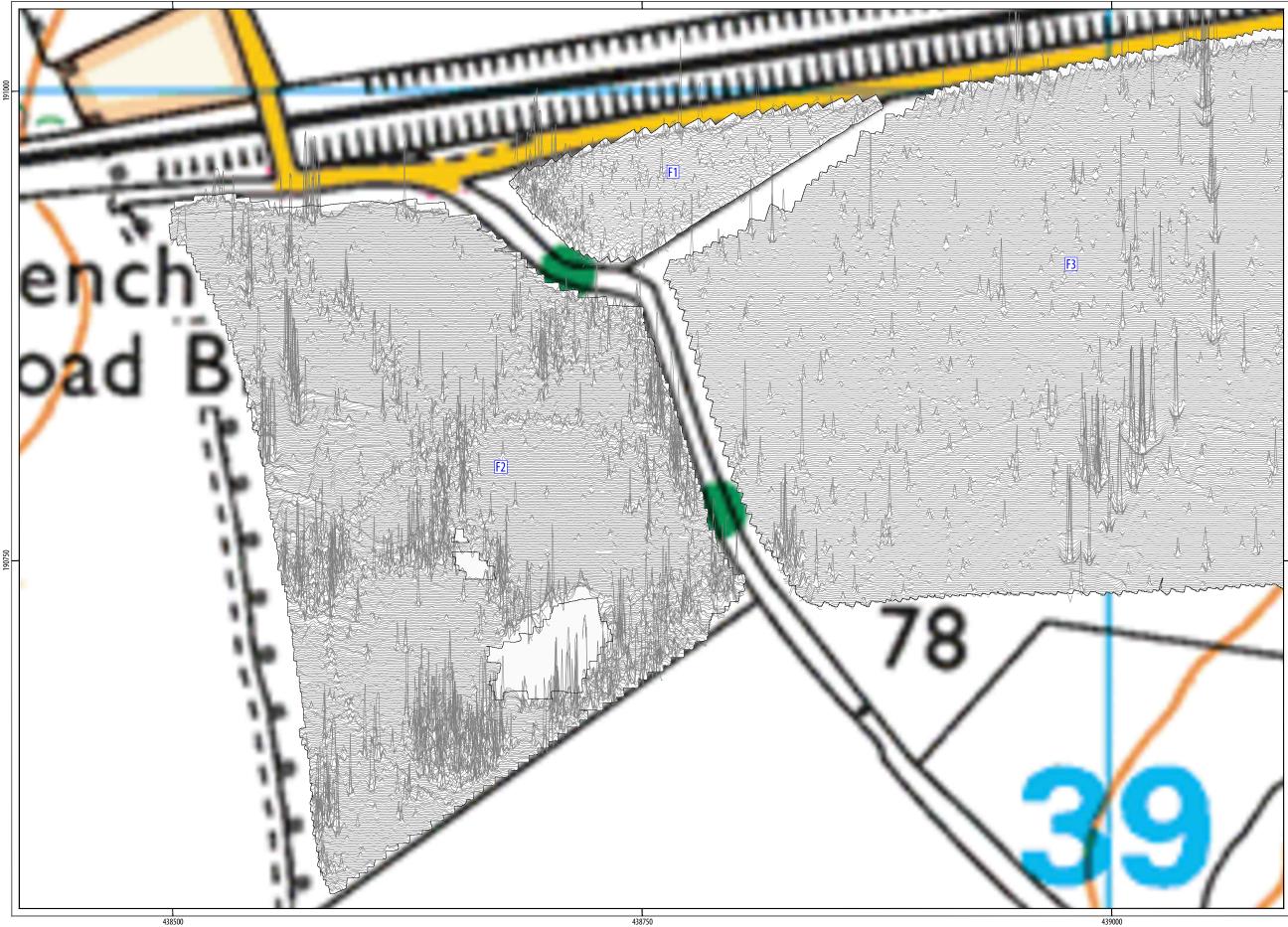


ILLUS 7 Processed greyscale magnetometer data

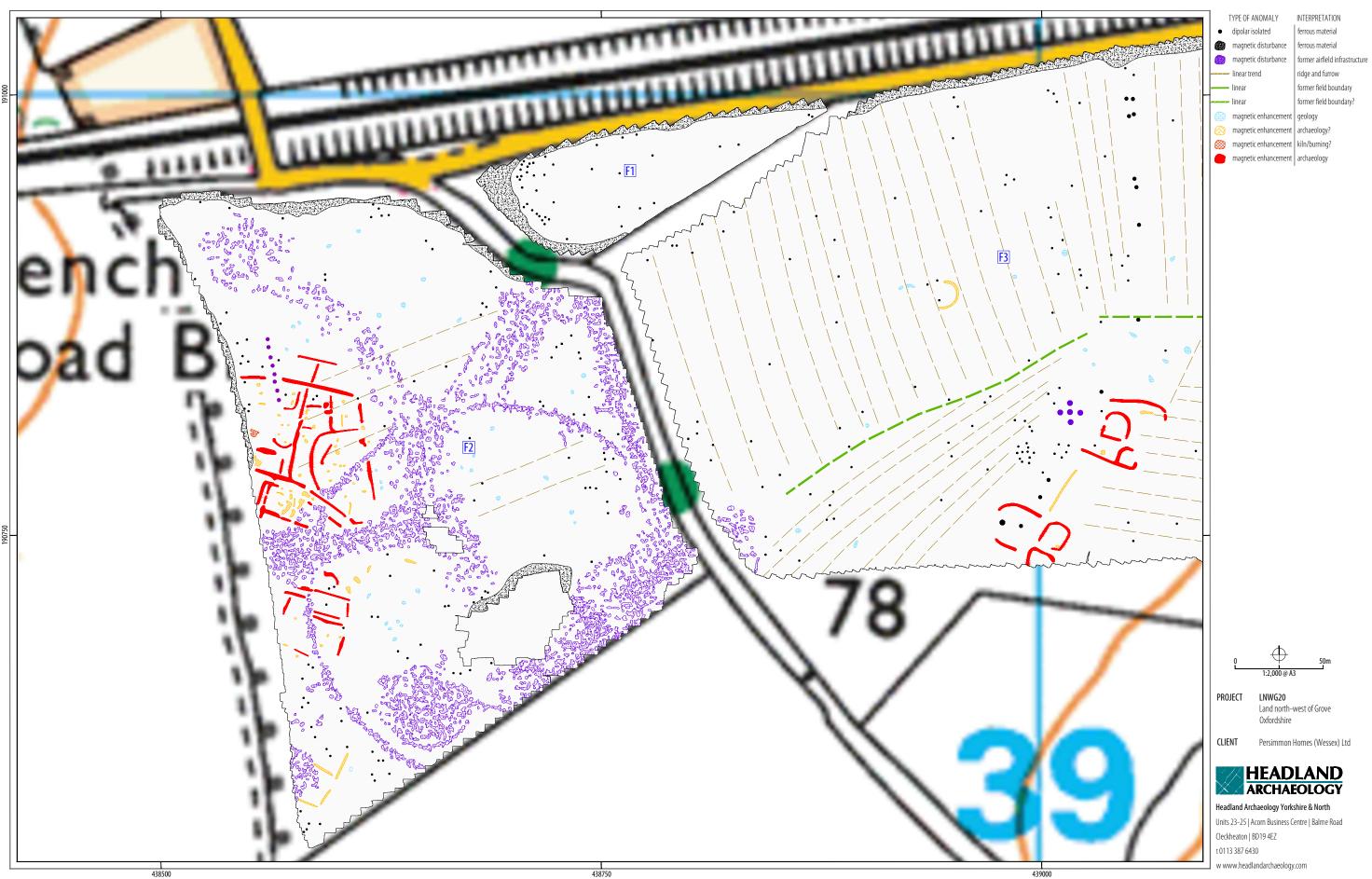


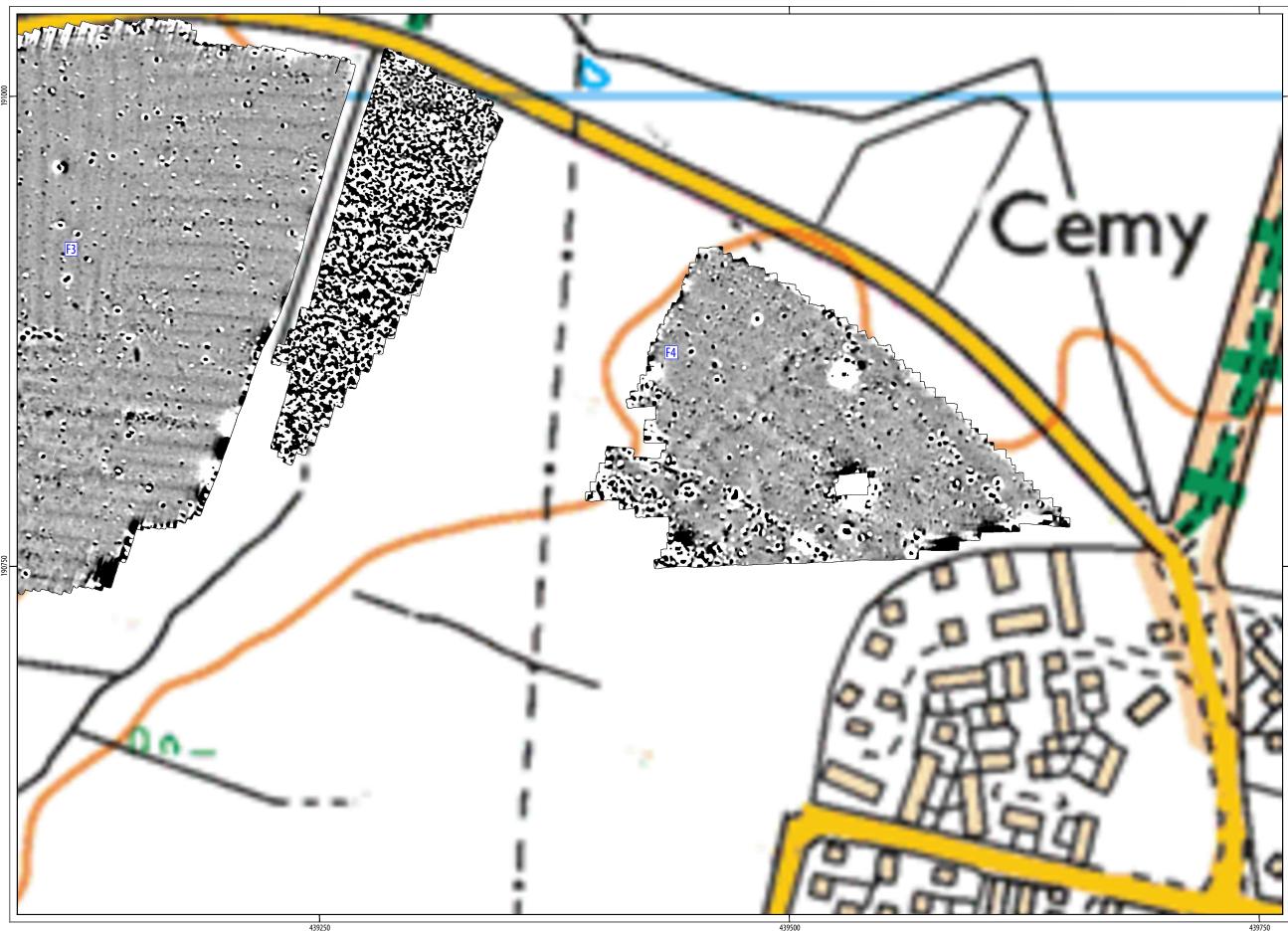


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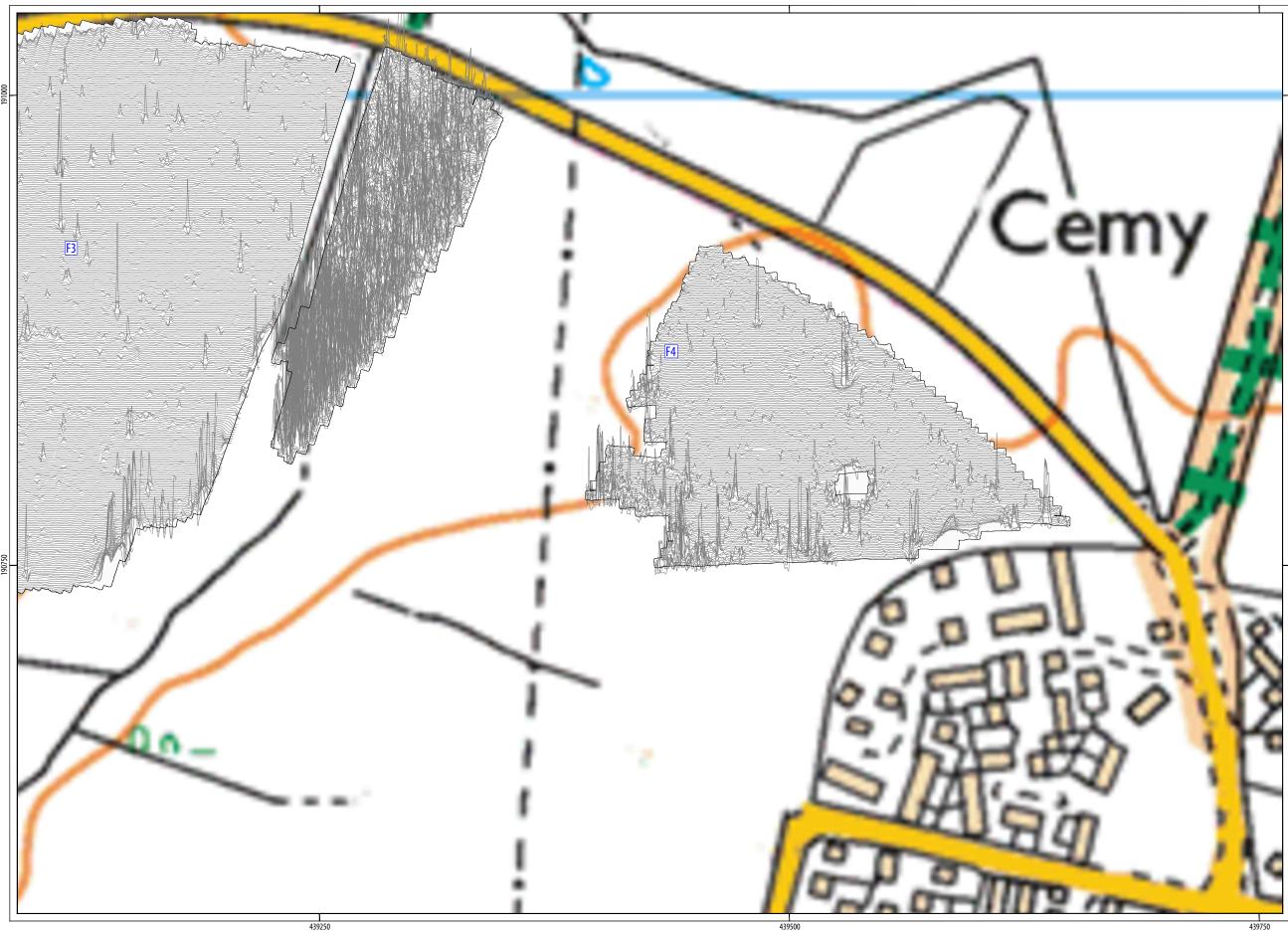




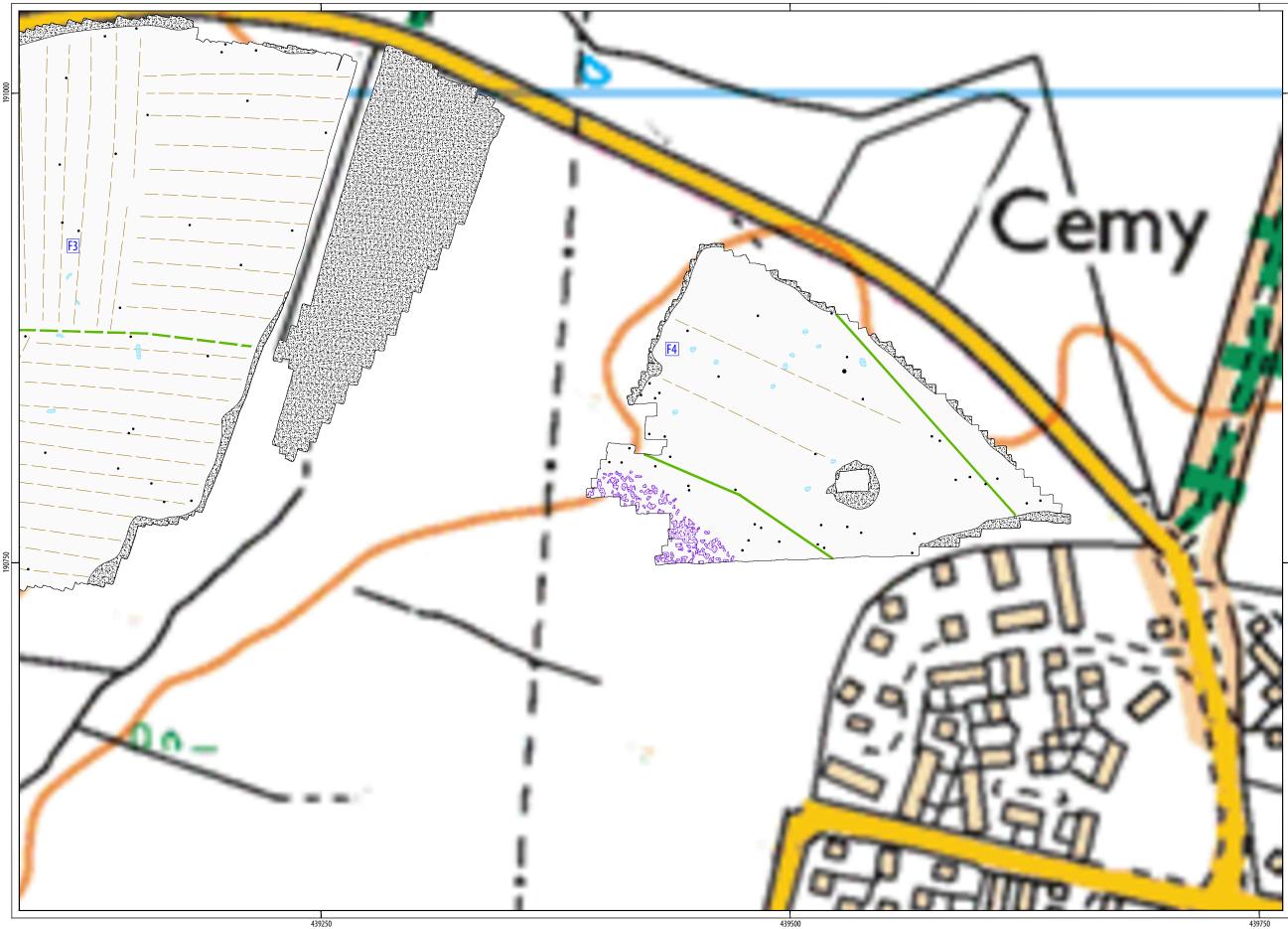






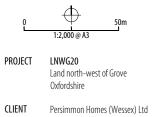






TYPE OF ANOMALY dipolar isolated magnetic disturbance magnetic disturbance linear trend linear – linear

INTERPRETATION ferrous material ferrous material former airfield infrastructure ridge and furrow former field boundary former field boundary? magnetic enhancement geology





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7 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

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 haematite. 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.

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.

Lightning-induced remnant magnetisation (LIRM) LIRM anomalies are thought to be caused in the near surface soil horizons by the flow of an electrical current associated with lightning strikes. These observed anomalies have a strong bipolar signal which decreases with distance from the spike point and often appear as linear or radial in shape.

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 DATA PROCESSING

The gradiometer data has been presented in this report in processed greyscale and minimally processed XY trace plot format.

Data collected using RTK GPS-based methods cannot be produced without minimal processing of the data. The minimally processed data has been interpolated to project the data onto a regular grid and de-striped to correct for slight variations in instrument calibration drift and any other artificial data.

A high pass filter has been applied to the greyscale plots to remove low frequency anomalies (relating to survey tracks and modern agricultural features) in order to maximise the clarity and interpretability of the archaeological anomalies.

The data has also been clipped to remove extreme values and to improve data contrast.

APPENDIX 5 OASIS DATA COLLECTION FORM: ENGLAND OASIS ID: headland5–408795

PROJECT DETAILS	
Project name	Land north-west of Grove, Oxfordshire
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 28.4ha site on land north-west of Grove, Oxfordshire, where a residential development is proposed. The eastern and western parts of the site were previously within the perimeter of RAF Grove, an airfield which was decommissioned at the end of World war II. Broad areas of ferrous contamination across the west of the site suggest that the remediation was fairly superficial prior to the site being brought back into agricultural production in the late 1940s. Amongst this ferrous 'noise' the survey has identified taxiways and 'frying pan' dispersals whilst large ferrous 'spikes' in the data are likely also due to the sub-surface remains of other airfield infrastructure. Despite the broad areas of ferrous contamination, a localised area of previously unknown archaeological activity has been identified along the western edge of the site. This comprises numerous linear and curvilinear anomalies describing a system of ditched enclosures suggestive of small-scale Romano-British settlement and enclosure. This localised area is assessed as of moderate to high archaeological potential. In the central part of the site ridge and furrow cultivation trends reflect medieval and later farming practices but a second smaller area of archaeological activity is also identified adjacent to the southern site boundary comprising the three or four small enclosures. This area is assessed as having moderate archaeological potential. Outside of these two localised and well-defined areas, no other anomalies reflective of potential buried archaeological remains were recorded, and the majority of the site is considered to have a low potential.
Project dates	Start: 10-08-2020 End: 27-08-2020
Previous/future work	No / Not known
Any associated project reference codes	LNWG20 – 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
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework – NPPF
Position in the planning process	Pre-application
Solid geology (other)	Gault Mudstone and Kimmeridge Clay
Drift geology	SAND AND GRAVEL OF UNCERTAIN AGE OR ORIGIN
Drift geology	ALLUVIUM
Techniques	Magnetometry
PROJECT LOCATION	
Country	England
Site location	Oxfordshire Vale of White Horse Grove Land North-West of Grove
Study area	28.4 Hectares
Site coordinates	SU 3906 9087 51.614830724374 -1.435803989798 51 36 53 N 001 26 08 W Point
PROJECT CREATORS	
Name of Organisation	Headland Archaeology
Project brief originator	Consultant

Project design originator	Headland Archaeology
Project director/manager	Harrison David
Project supervisor	Vansassenbrouck O.
Type of sponsor/funding body	Developer
PROJECT ARCHIVES	
Physical Archive Exists?	No
Digital Archive recipient	In house
Digital Contents	"other"
Digital Media available	"Geophysics"
Paper Archive Exists?	No
PROJECT BIBLIOGRAPHY 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	Land north-west of Grove, Oxfordshire
Author(s)/Editor(s)	Harrison David
Date	2020
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