



**PRE-DETERMINATION
ARCHAEOLOGICAL GEO-
PHYSICAL SURVEY**

**Land at Park Field, Royston
Hertfordshire
SG8 7NJ**

Planning • Heritage

Specialist & Independent Advisors to the Property Industry

December 2016

**Planning Authority:
North Hertfordshire District
Council**

**Site centred at:
536920, 240640**

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1.0 INTRODUCTION

- 1.1 This document provides a pre-determination archaeological geo-physical survey for Land at Park Field, Royston Hertfordshire SG8 7NJ (Figure 1) undertaken on behalf of Countryside Properties plc.
- 1.2 The requirement for pre-determination geo-physical survey was communicated in pre-application responses from North Hertfordshire District Council.
- 1.3 The pre-application response indicated that both geo-physical survey and trial trenching would be required pre-determination.
- 1.4 However the results of the geo-physical survey do not reveal archaeology of the significance assumed in the pre-application response and as such it is considered that, in conformity with National and Local Planning Policy, any further archaeological requirements can be secured by archaeological planning condition(s).
- 1.5 There is no evidence from the geo-physical survey or the Hertfordshire Historic Environment Records search, undertaken as part of the archaeological desk-based assessment for the site (Figure 2) to support the assertion that the site is “*in the middle of a large scale prehistoric funerary landscape*”.

2.0 NATIONAL & LOCAL POLICY FRAMEWORK

The National Planning Policy Framework (Conserving and enhancing the historic environment)

- 2.1 The National Planning Policy Framework (NPPF) states that planning should operate to encourage and not act as an impediment to sustainable growth. Section 12: Conserving and enhancing the historic environment) indicates that in determining applications local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting.

“The level of detail should be proportionate to the assets’ importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.” (Paragraph 128)

- 2.3 In addition to the information that is required to be submitted with a planning application, the NPPF indicates that local planning authorities should identify and assess the particular significance of any heritage asset that may be affected by a proposal (including by development affecting the setting of a heritage asset) taking account of the available evidence and any necessary expertise (Paragraph 129).

- 2.4 In determining planning applications, local planning authorities should take account of:

- *“the desirability of sustaining and enhancing the significance of heritage assets;*
- *the positive contribution that conservation of heritage assets can make to sustainable communities; and*
- *the desirability of new development making a positive contribution to local character and distinctiveness.” (Paragraph 131)*

- 2.5 The NPPF also provides that, when considering the impact of a proposed development on the significance of a designated heritage asset, weight should be given to the asset’s conservation. The more important the asset, the greater the weighting should be. The NPPF states that the significance of a heritage asset can be harmed or lost through alteration or destruction of the heritage asset or development within its setting and sets out that;

“As heritage assets are irreplaceable, any harm or loss should require clear and convincing justification. Substantial harm to

or loss of a grade II listed building, park or garden should be exceptional. Substantial harm to or loss of designated heritage assets of the highest significance, notably scheduled monuments, protected wreck sites, battlefields, grade I and II listed buildings, grade I and II* registered parks and gardens, and World Heritage Sites, should be wholly exceptional.” (Paragraph 132)*

- 2.6 The NPPF (Paragraph 135) also sets out that the effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that affect directly or indirectly non designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset.
- 2.7 Paragraph 139 sets out that non-designated heritage assets of archaeological interest that are of equivalent significance to scheduled monuments, should be considered subject to the policies for designated heritage assets.

North Hertfordshire District Council Local Plan (adopted 1996/written statement 2007)

2.8 The introduction to the North Hertfordshire District Council Local Plan states;

"Following the publication of the National Planning Policy Framework (NPPF) in March 2012, policies in the North Hertfordshire District Council Local Plan need to be considered alongside those of the NPPF. Policies which are inconsistent with the NPPF will have less weight applied to them. The Council believes that most policies in the Local Plan remain broadly consistent with the NPPF and therefore still have significant weight in determining applications."

2.9 The North Hertfordshire District Council Local Plan (adopted 1996/written statement 2007) includes the following regarding archaeological remains

"Policy 16: Areas of Archaeological Significance and other Archaeological Areas.

For Archaeological Areas, the Council may require a preliminary evaluation of any potential archaeological remains before deciding to permit or to refuse development proposals. For Areas of Archaeological Significance, a preliminary evaluation will be required as part of the application for development which could disturb any possible archaeological remains. To assess the archaeological value of specific sites, the Council will seek expert advice.

If the site is judged to be nationally important, and the remains should be left undisturbed, the Council will normally refuse development proposals which adversely affect the site or its setting.

On other sites, the Council may permit development proposals with conditions and/or a formal or informal agreement, depending on the archaeological value, to provide:

i. an excavation before development; and/or

ii. facilities and an agreed period of time for access to the site for an investigation and/or a for 'observation' of the groundworks as development progresses by someone appointed by the Council; and/or

iii. other measures as necessary; and/or

iv. a contribution from the developer towards the funding of any relevant investigation."

2.10 The Proposals Plan with the North Hertfordshire District Council Local Plan does not identify that the development site is in an Area of Archaeological Significance.

3.0 RESULTS OF THE GEO-PHYSICAL SURVEY

- 3.1 The archaeological background to the site was set out in the desk-based assessment (CgMS 2015).
- 3.2 Geo-physical survey (Tigergeo 2016b) – see Appendix 1 - concludes that there is little of archaeological interest in the magnetic data aside from the activity recorded in the north-east corner of the site.
- 3.3 As a result of this data it is considered that in line with Local and National; Planning Policy, the Local Planning Authority could secure any further archaeological requirements through the placing of archaeological planning condition(s) on any consent that may be granted.

4.0 SUMMARY AND CONCLUSIONS

- 4.1 Pre application planning requirements have resulted in a pre-determination geo-physical survey being undertaken on the site.
- 4.2 The geo-physical survey (Tigergeo 2016b) – see Appendix 1 - concludes that there is little of archaeological interest in the magnetic data aside from the activity recorded in the north-east corner of the site.
- 4.3 The Council believes that most policies in the Local Plan remain broadly consistent with the NPPF and therefore still have significant weight in determining applications.
- 4.4 Local Planning Policy states that for Archaeological Areas, the Council may require a preliminary evaluation of any potential archaeological remains before deciding to permit or to refuse development proposals. The Proposals Plan with the North Hertfordshire District Council Local Plan does not identify that the development site is in an Archaeological Area or Area of Archaeological Significance.
- 4.5 The Local Plan also states that on other sites, the Council may permit development proposals with conditions and/or a formal or informal agreement, depending on the archaeological value. This is considered appropriate on this site.

SOURCES

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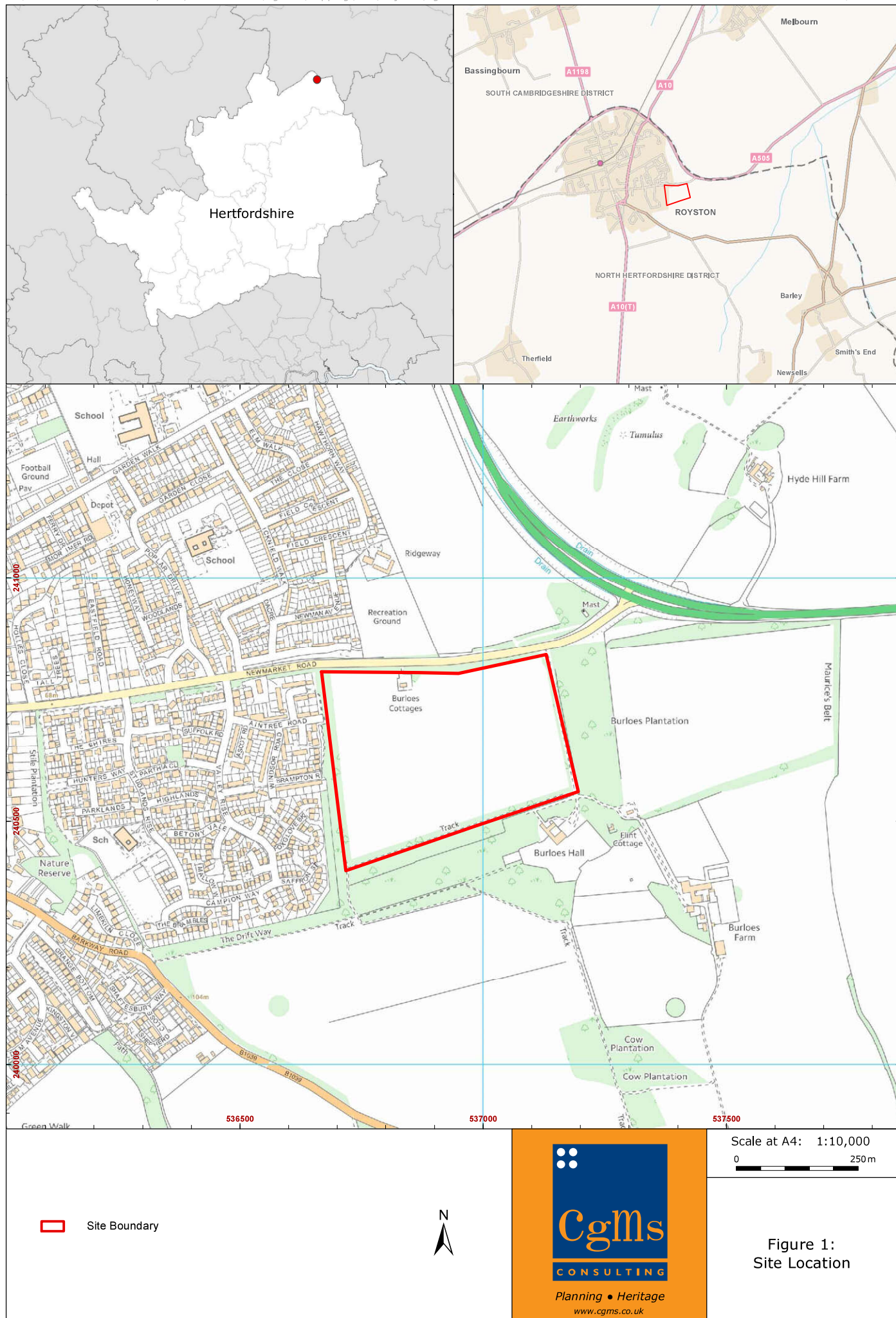
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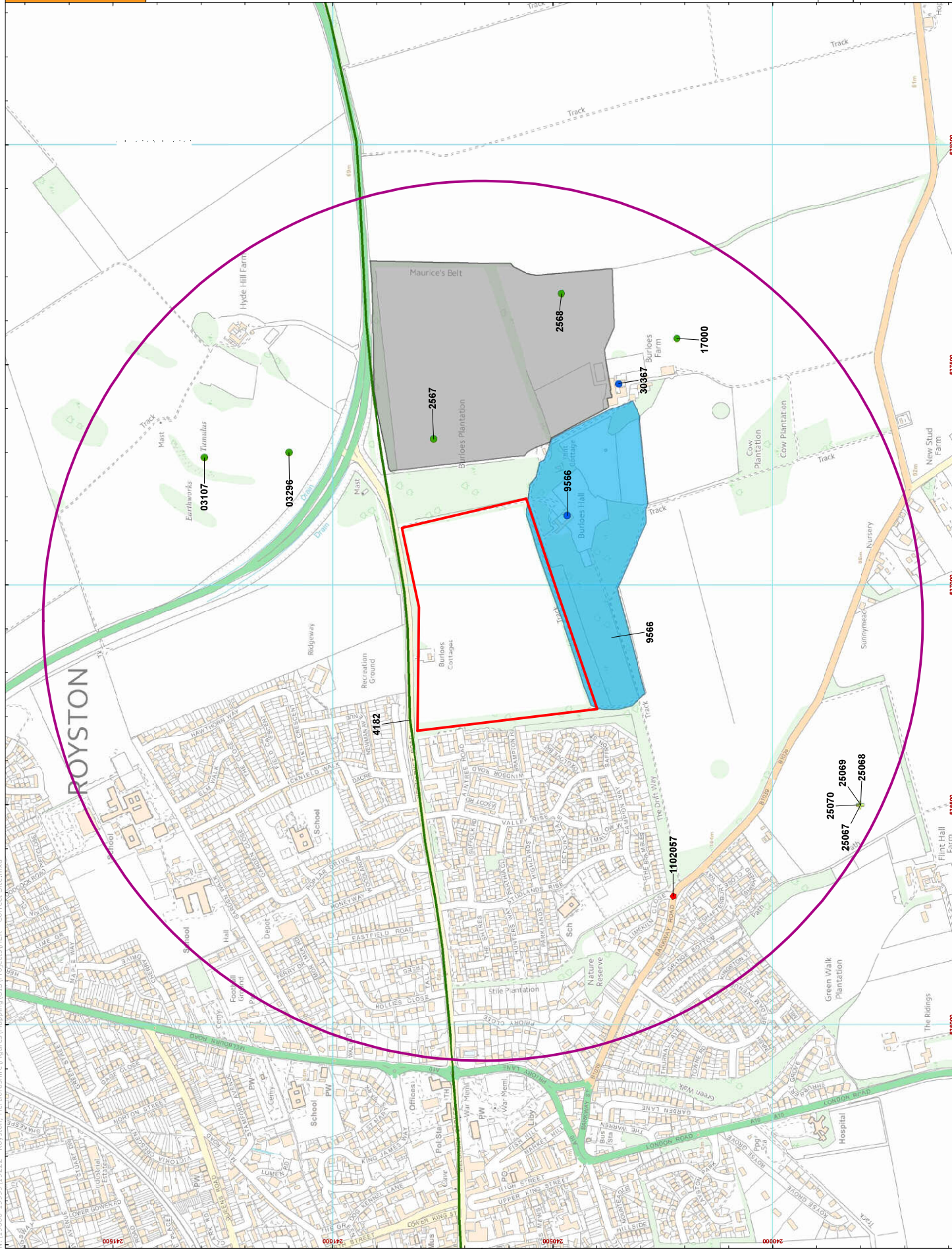
Tigergeo, 2016a, Land at Park Field, Newmarket Road, Royston Hertfordshire: Specification for Geo-physical Survey

Tigergeo, 2016b, Land at Park Field, Newmarket Road, Royston Hertfordshire: Geo-physical Survey Report

APPENDIX 1:

Tigergeo Geo-physical Survey Report





APPENDIX 1:

Tigergeo Geo-physical Survey Report



Land at Park Field, Royston, Hertfordshire

Geophysical Survey Report
(Caesium Vapour Magnetic – Archaeology)

Project code: PFR161

Produced for:

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Land at Park Field, Royston, Hertfordshire

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Non-Technical Summary

A magnetic survey was commissioned by RPS Group to prospect land at Park Field, Royston, Hertfordshire for buried structures of archaeological interest. Survey was undertaken using an ATV-towed and GNSS-tracked array of caesium vapour magnetometers in a non-gradiometric configuration.

The most dominant feature within the data is a dendritic pattern of buried natural drainage features occupying much of the central region of the site. Weak evidence for known former field boundaries was observed and also a number of probable linear fills that might relate to earlier field systems. Within the northeast corner of the site there is evidence for a possible oval enclosure, perhaps with internal features. Overall magnetic contrast is weak and hence further features may exist but lack detectable magnetic anomalies.

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1 Introduction

Land at Park Field, Royston was magnetically surveyed to prospect for buried features of potential archaeological interest. Approximately 12.7 ha was surveyed within a single arable field with a small area in the southeast corner not surveyed due to ongoing geotechnical investigations.

Country	England
County	Hertfordshire
Nearest Settlement	Royston
Central Co-ordinates	536920, 240640

2 Context

2.1 Background information

The paragraphs below are based on pre-application advice from North Hertfordshire District Council (Simon Blatherwick, *pers. comm.*):

Consultation with the County archaeologist confirmed the requirement for geophysical survey on the grounds that the site *"..... lies within landscape containing extensive prehistoric archaeological remains. It is located on a prominent chalk escarpment used extensively during pre-history for funerary activity."*

The Hertfordshire Historic Environment Record (HER) records funerary monuments in the wider environment and their density in the immediate area suggest *"... the site sits in the middle of a large scale prehistoric funerary landscape."*

2.2 Environment

Soilscapes Classification	Shallow lime-rich soils over chalk or limestone (3)
Superficial 1:50000 BGS	Head – Clay, Silt, Sand and Gravel (HEAD) (small area in north of site)
Bedrock 1:50000 BGS	New Pit Chalk Formation – Chalk (NPCH)
Topography	The ground rises gently from north to south
Hydrology	Presumed natural
Current Land Use	Agricultural - arable
Historic Land Use	Agricultural - mixed
Vegetation Cover	Maize stubble
Sources of Interference	Overhead cables crossing the western part and possible minor interference from ferrous structures to the west and moving vehicles to the north, on Market Road

Magnetic response is fairly muted although the close proximity of the site to long-established settlement will likely mean that factors other than the geology will also be affecting soil magnetic susceptibility, e.g. manuring, intensive cultivation, etc. The BGS G-Base soil iron concentration (5km sample) is only 2.5%, so fairly low. The underlying chalk geology usually provides a uniform background magnetic contrast, although variations within the Head deposits may be apparent within the magnetic data.

The survey area comprises a single, large almost rectangular field. There are residential properties to the west, and a small residential property to the north, adjacent to the road. Some anomalies could be expected from the buildings, boundary structures and any services to them, though, as with vehicles on Newmarket Road, this is likely to be minimal as the site is surrounded by a belt of woodland.

3 Discussion

3.1 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.

3.2 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.

3.2.1 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.

3.3 Character & principal results

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

3.3.1 Data

Data quality is overall high though there are occasional and very narrow gaps in coverage caused by a GNSS issue. These are all so narrow as to be considered insignificant in terms of interpretation. There is no significant magnetic disturbance from passing traffic and apart from a possible pipe or cable [7] crossing the site there are few anomalies of sufficient strength and extent to obscure others of archaeological relevance.

The first data set plotted in this report is the total magnetic intensity which is the non-directional strength of the magnetic field at a location, here after removal of the diurnal (temporal) component, hence not being expressed as values around 47,000 nT. The second data set is the shallow field model which results from subtracting the simulated magnetic field at 3m height from the total magnetic intensity, thus suppressing broad anomalies originating from sources at greater depths and larger scales than of interest to archaeologists.

3.3.2 Geology

There is an east to west trend of increasing small scale variation within the background texture which might imply the head deposits are more extensive than supposed, or that there is a steady change in soil depth across the area. The texture of the western area is perhaps slightly more typical of shallow soil over chalk than further east.

Across the central and western parts of the site there is a distinct dendritic pattern [6] of buried natural drainage channels passing downslope to the north towards a visible depression. These are not obvious on the surface and are probably filled in natural drainage features, perhaps eroded into the top of the chalk. Their fill may simply be colluvium from arable use of the land.

The soil is fairly clearly only weakly magnetic, as would be expected from the G-Base iron concentration of 2.5%, but the lack of strong magnetic variation from geological sources has aided the detection of weak magnetic anomalies.

3.3.3 Land use

Various linear anomalies fit into this category as likely to be former field divisions, e.g. [1] in the northwest corner of the site. Likewise, [3] and [2] both relate to probable cultivation although how these relate to possible field boundaries cannot be determined.

At [5] a short section of linear anomaly corresponds to a field boundary depicted on the 1st Edition OS map as continuing right across the present field. It is not magnetically detectable for most of this length and might have lost any magnetic element to subsequent ploughing. The map shows a perpendicular boundary extending westwards, parallel to but not coincident with anomaly [4].

In the eastern half of the site two further linear anomalies [8] and [9] may be more former boundaries but if

so had been removed prior to the 1st Edition OS map.

3.3.4 Heritage

Included in this section as not aligned with likely former boundaries [8] and [9] and of different magnetic character are three linear bands [10] – [12] of raised magnetic intensity. Together these apparently describe the east-pointing corner of an enclosure, the rest of which has not been seen in the data. Whether this is an element of an earlier field system, or a discrete enclosure, is uncertain.

Of potential interest is a pair [13] of broad curving anomalies that might partly enclose an oval area of ground perhaps 60m long (east to west) by 30 or 40m wide. In themselves they are not diagnostic of any particular type of feature except generically fills and indeed, a natural or partly natural origin could be possible.

Within the southern part of this oval area is a cluster [14] of small discrete anomalies that could be interpreted as pit fills or hearths, perhaps the former in this context.

3.4 Conclusions

Overall there is little of archaeological interest within the magnetic data with the obvious exception of the possible activity focus represented by [13] and [14] in the northeast corner and perhaps also the possible enclosure hinted at by [10], [11] and [12]. Elsewhere there are fragmentary remains of former field systems demarcated by likely ditch fills.

3.5 Caveats

Geophysical survey is reliant upon the detection of anomalous values and patterns in physical properties of the ground, e.g. magnetic, electromagnetic, electrical, elastic, density and others. It does not directly detect underground features and structures and therefore the presence or absence of these within a geophysical interpretation is not a direct indicator of presence or absence in the ground. Specific points to consider are:

- some physical properties are time variant or mutually interdependent with others;
- for a buried feature to be detectable it must produce anomalous values of the physical property being measured;
- any anomaly is only as good as its contrast against background textures and noise within the data.

TigerGeo will always attempt to verify the accuracy and integrity of data it uses within a project but at all times its liability is by necessity limited to its own work and does not extend to third party data and information. Where work is undertaken to another party's specification any perceived failure of that specification to attain its objective remains the responsibility of the originator, TigerGeo meanwhile ensuring any possible shortcomings are addressed within the normal constraints upon resources.

4 Methodology

4.1 Survey

4.1.1 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 handcart)
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

4.1.2 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.

4.2 Data processing

4.2.1 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 – 10.0s
Gridding	Surfer	Kriging, 0.25m x 0.25m
Smoothing	Surfer	Gaussian 0.75m lowpass
Shallow field model	Proprietary	Anomalies present within 3m of ground level
Imaging and presentation	Manifold GIS	

Potential field processing procedures are used where possible on gridded data from the above processing, allowing simulation of vertical gradient data, separation of deep and shallow magnetic sources, etc. 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.

4.3 Interpretation

4.3.1 Introduction

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 (for the UK) is sourced only from British Geological Survey resources and aerial imagery from online sources. LiDAR data is usually sourced from the Environment Agency or other national equivalents, SAR from NASA and other topographic data from original survey.

Information from nearby 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.

4.3.2 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.

4.3.3 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, medieval ridge and furrow or post medieval '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.

4.3.4 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.

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4.5 Archiving and dissemination

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

The client will determine the distribution path for reporting, including to the end client, other contractors, local authority etc., and will determine the timetable for upload of the project report to the OASIS Grey Literature library or supply of report or data to other archiving services, taking into account end client confidentiality.

TigerGeo reserves the right to display data rendered anonymous and un-locatable on its website and in other marketing or research publications.

5 Supporting information

5.1 Standards and quality (archaeology)

TigerGeo 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 management team at TigerGeo have over 30 years of combined experience of near surface geophysical project design, survey, interpretation and reporting, based across a wide range of shallow geological contexts. Added to this is the considerable experience of our lead geophysicists in a variety of commercial and academic roles. All geophysical staff have graduate and in many cases also post-graduate relevant qualifications pertaining to environmental geophysics from recognised centres of academic excellence.

A high standard of client-centred professionalism is maintained in accordance with the requirements of relevant professional bodies including the Geological Society of London (GeoSoc) and the Chartered Institute for Archaeologists (CIfA). Senior members of TigerGeo are professional members of the GeoSoc (FGS), CIfA (MCIfA & ACIfA grades) and other appropriate bodies, including the European Association of Geoscientists and Engineers (EAGE) Near Surface Division (MEAGE) and the Institute of Professional Soil Scientists (MISoilSci).

During fieldwork there is always a fully qualified (to graduate or post-graduate level) supervisory geophysicist leading a team of other geophysicists and geophysical technicians, all of whom are trained and competent with the equipment they are working with. Data processing and interpretation is carried out by a suitably qualified and experienced geophysicist under the direct supervision and guidance of the Senior Geophysicist. All work is monitored and reviewed throughout by the Senior Geophysicist who will appraise all stages of a project as it progresses.

Data processing and interpretation adheres to the scientific principles of objectiveness and logical consistency. A standard set of approved external sources of information, e.g. from the British Geological Survey, the Ordnance Survey and similar sources of data, in addition to previous TigerGeo projects, guide the interpretive process. Due attention is paid to the technical constraints of method, resolution, contrast and other geophysical factors.

There is a strong culture of internal peer-review within TigerGeo, for example, all reports pass through a process of authorship, technical review and finally proof-reading before release to the client. Technical queries resulting from TigerGeo's work are reviewed by the Senior Geophysicist to ensure uniformity of response prior to implementing any edits, etc.

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

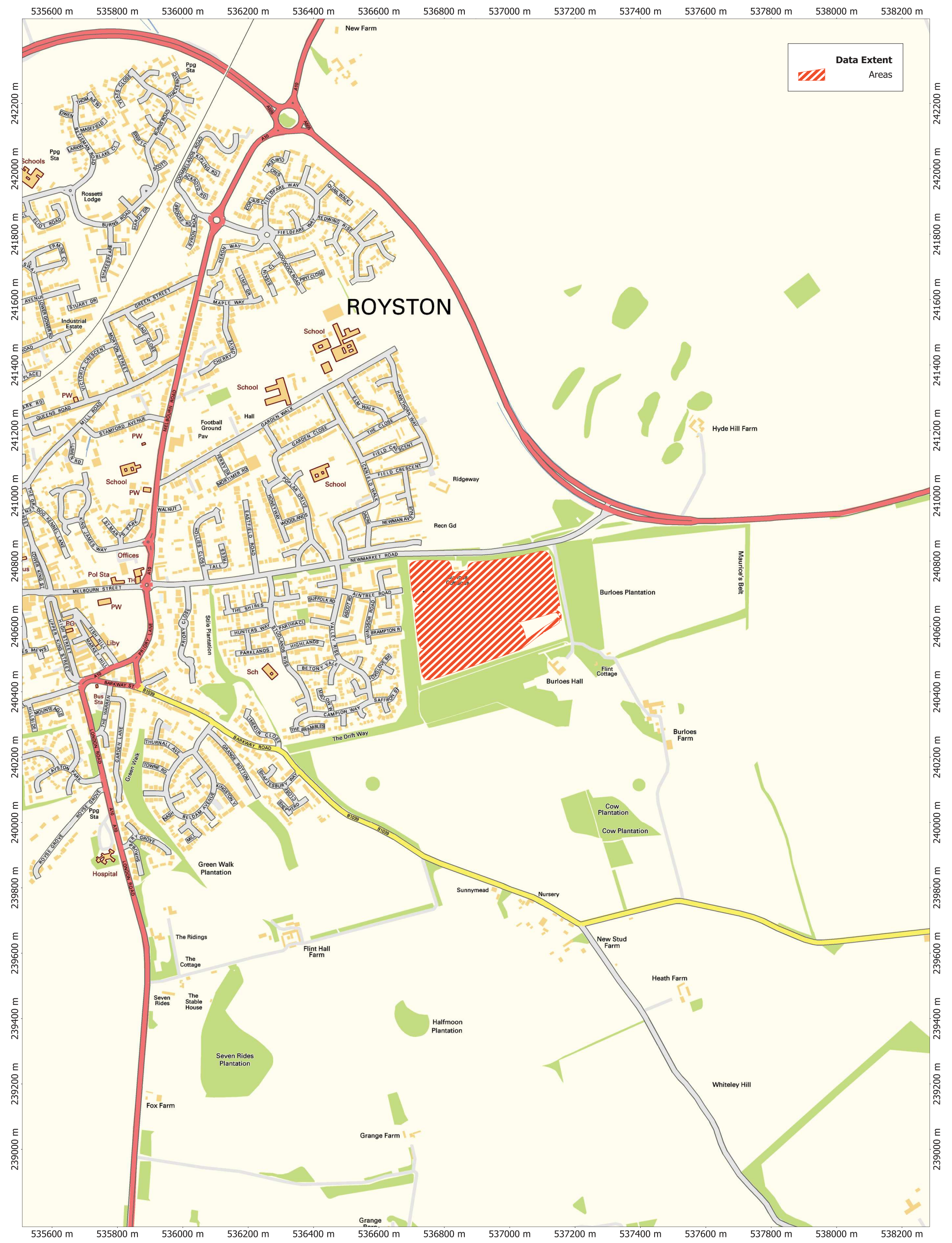
- David et al, "Geophysical Survey in Archaeological Field Evaluation", English Heritage, 2008;
- "Standard and guidance for Archaeological Geophysical survey", Chartered Institute for Archaeologists, 2014;

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.

TigerGeo is in the process of applying to the Chartered Institute for Archaeologists to become a Registered Organisation. ISO 9001 and 14001 accreditation is also sought.

5.2 Who we are

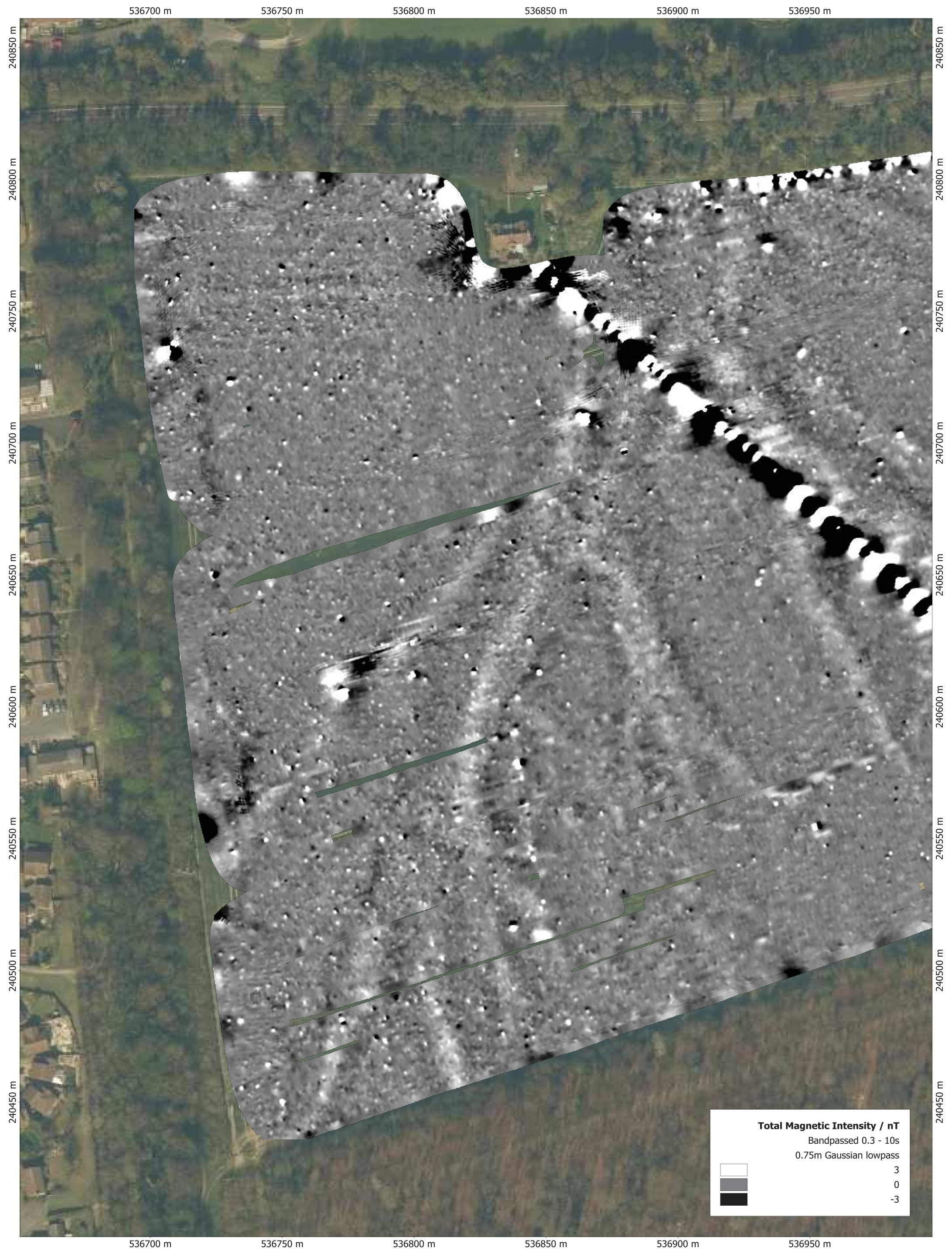
Senior Geophysicist (Quality manager)	Martin Roseveare MSc BSc(Hons) MEAGE FGS MCIfA
Martin specialised (MSc) in geophysical prospection for shallow applications at the University of Bradford in 1997 and has worked in commercial geophysics since then. He was elected a Fellow of the Geological Society of London in 2009 and is now working towards achieving CSci. He is a full member of the Chartered Institute of Archaeologists and a member of the Near Surface division of the European Association of Geoscientists & Engineers. He serves on the EuroGPR and CIfA GeoSIG committees and has served on the scientific committees of the 10th and 11th Archaeological Prospection conferences, has reviewed papers for the EAGE Near Surface conference, was a technical reviewer of the Irish NRA geophysical guidance and is also a founding member of the ISSGAP soils group. Martin is also a former tutor for archaeological geophysics at Birkbeck College, London. Professional interests include the application of geophysics to agriculture and the environment, e.g. groundwater and geohazards. He is also a software writer and equipment integrator with significant experience of embedded systems. Beyond the day job Martin has worked in technical theatre, is an aspirant lighting designer and is being classically trained in tabla playing.	
Operations Manager (Safety manager)	Anne 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 member of the British Society of Soil Science and is interested in the use of agricultural applications of geophysics. Anne was the founding editor of the International Society for Archaeological Prospection (ISAP) and has spent many years walking fields in parallel lines. Much of her time now is spent managing complicated scheduling and logistics, overseeing safety procedures and data handling, while dreaming of interesting places around the world to undertake surveys, including researching the urban archaeology of Asia. Closer to home she is a student of the classical Indian dance form, kathak and is learning Hindi.	
Archaeological Consultant	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. Here he ensures that geophysical work within the heritage sector is well grounded in the archaeology. His spare time includes much running up mountains.	
Geophysicist	Kathryn Cunningham BSc(Hons) FGS
Kathryn's interest in geology began while working as a nature guide in the Kruger National Park in South Africa. This motivated her to earn a BSc (Hons) in Applied Geology at Plymouth University (GeolSoc accredited degree) with interests in field work, GIS and engineering geology. Upon graduating in 2015, she then joined TigerGeo and has not looked back. Her role in TigerGeo primarily involves ensuring the smooth running of field work in a range of methods, with increasing responsibilities involving processing and interpretation. Outside of the working week, she usually enjoys acrobatics and jigsaws.	
Geophysicist	Jack Wild BSc(Hons)
Down to earth and a recent Plymouth University graduate in geology (GeolSoc accredited degree) Jack entered the world of shallow geophysics with an Atkinson Leapfrog. Happiest when in the field he has undertaken geological projects Europe wide including in Sicily and the Spanish Pyrenees and closer to home has studied much of the Cornish and Devon coast. The mystery of what lies below drives his interest in the collection and interpretation of high quality data - be it from magnetometry or GPR he just can't resist(ivity)!	



PFR161 Land at Park Field, Royston, Hertfordshire
DWG 01 Site Location

Orthographic Scale: 1:10000 @ A3 Spatial Units: Meter. Do not scale off this drawing
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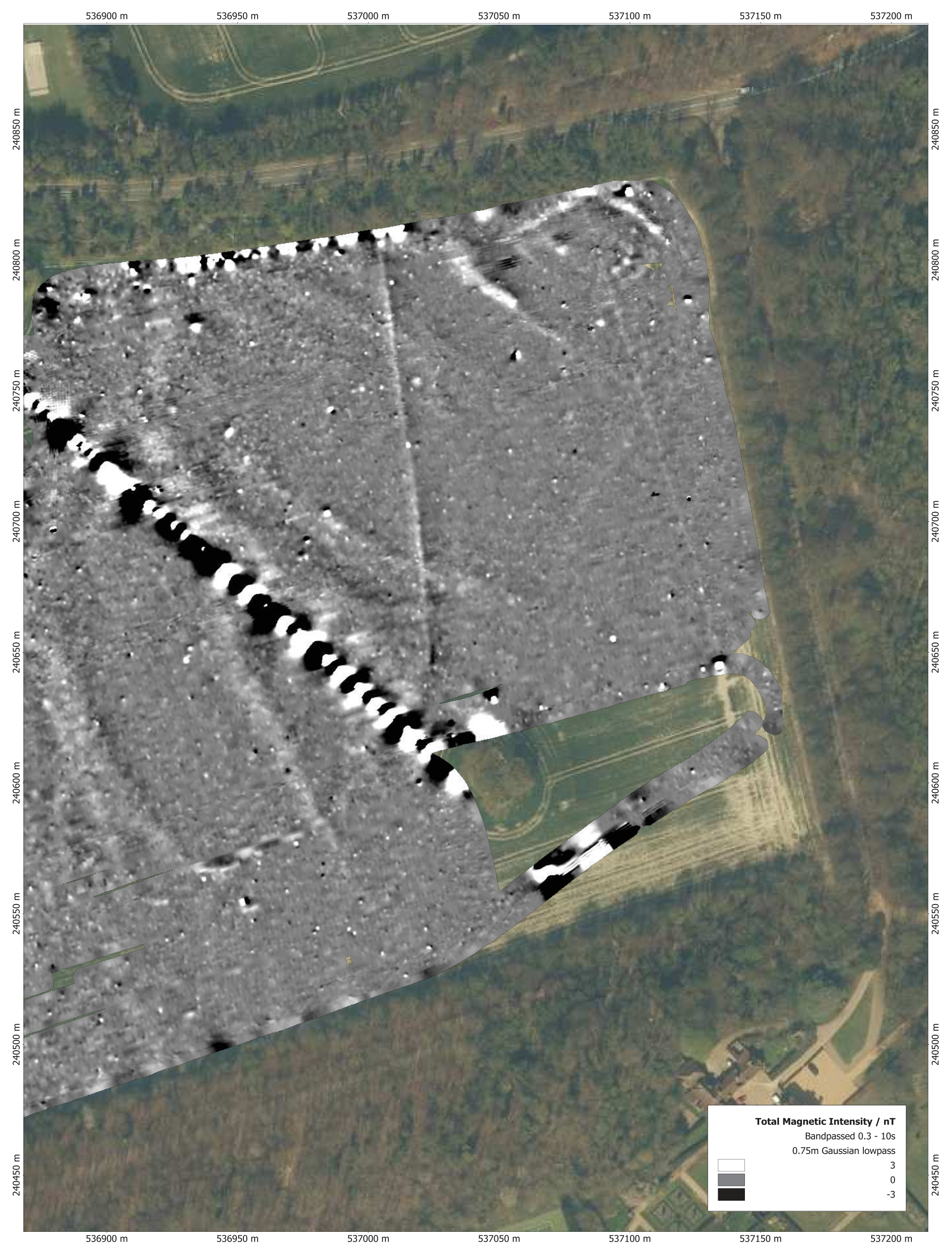




PFR161 Land at Park Field, Royston, Hertfordshire
DWG 02a Magnetic Data - Total Magnetic Intensity - West

Orthographic Scale: 1:1250 @ A3 Spatial Units: Meter. Do not scale off this drawing
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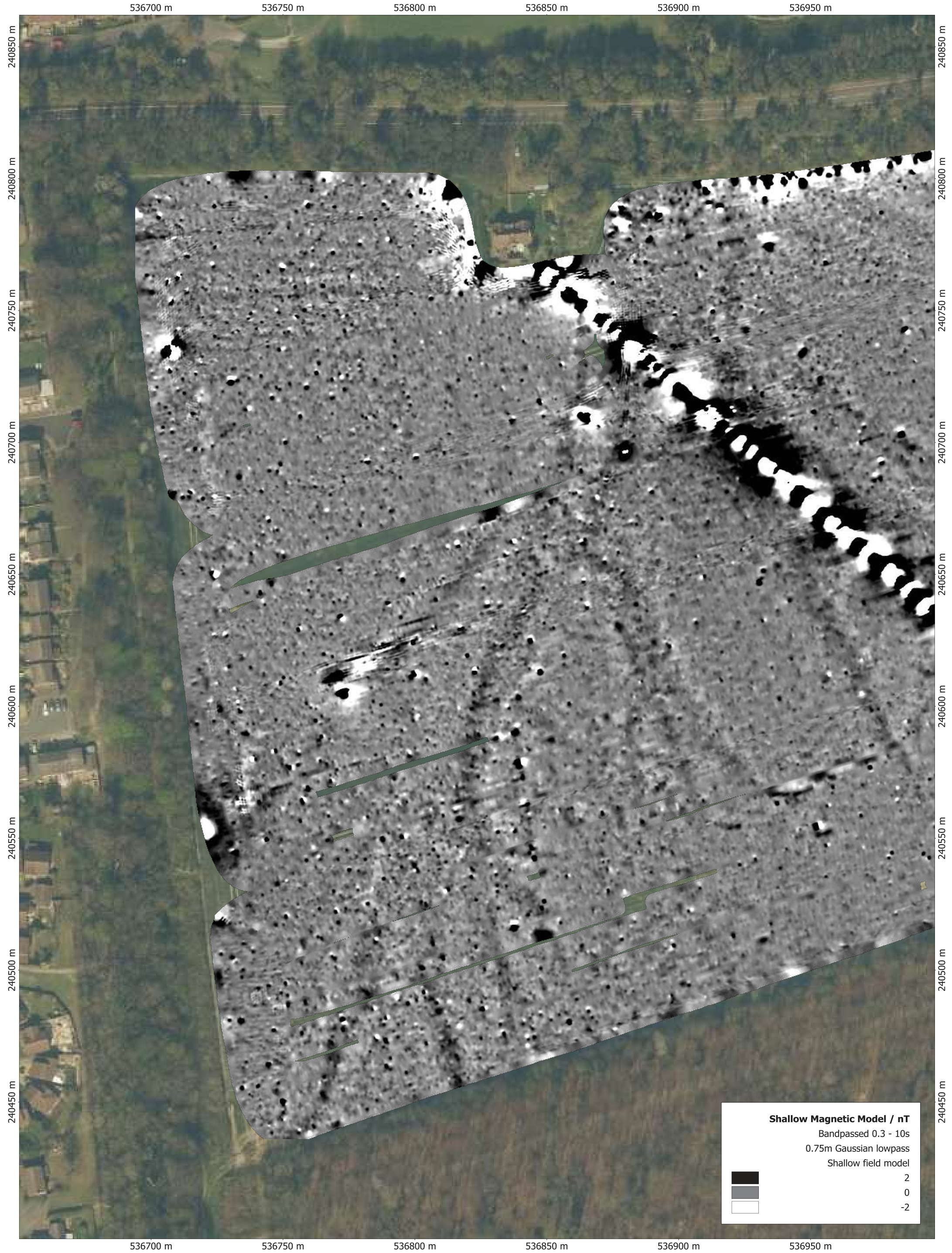




PFR161 Land at Park Field, Royston, Hertfordshire
DWG 02b Magnetic Data - Total Magnetic Intensity - East

Orthographic Scale: 1:1250 @ A3 Spatial Units: Meter. Do not scale off this drawing
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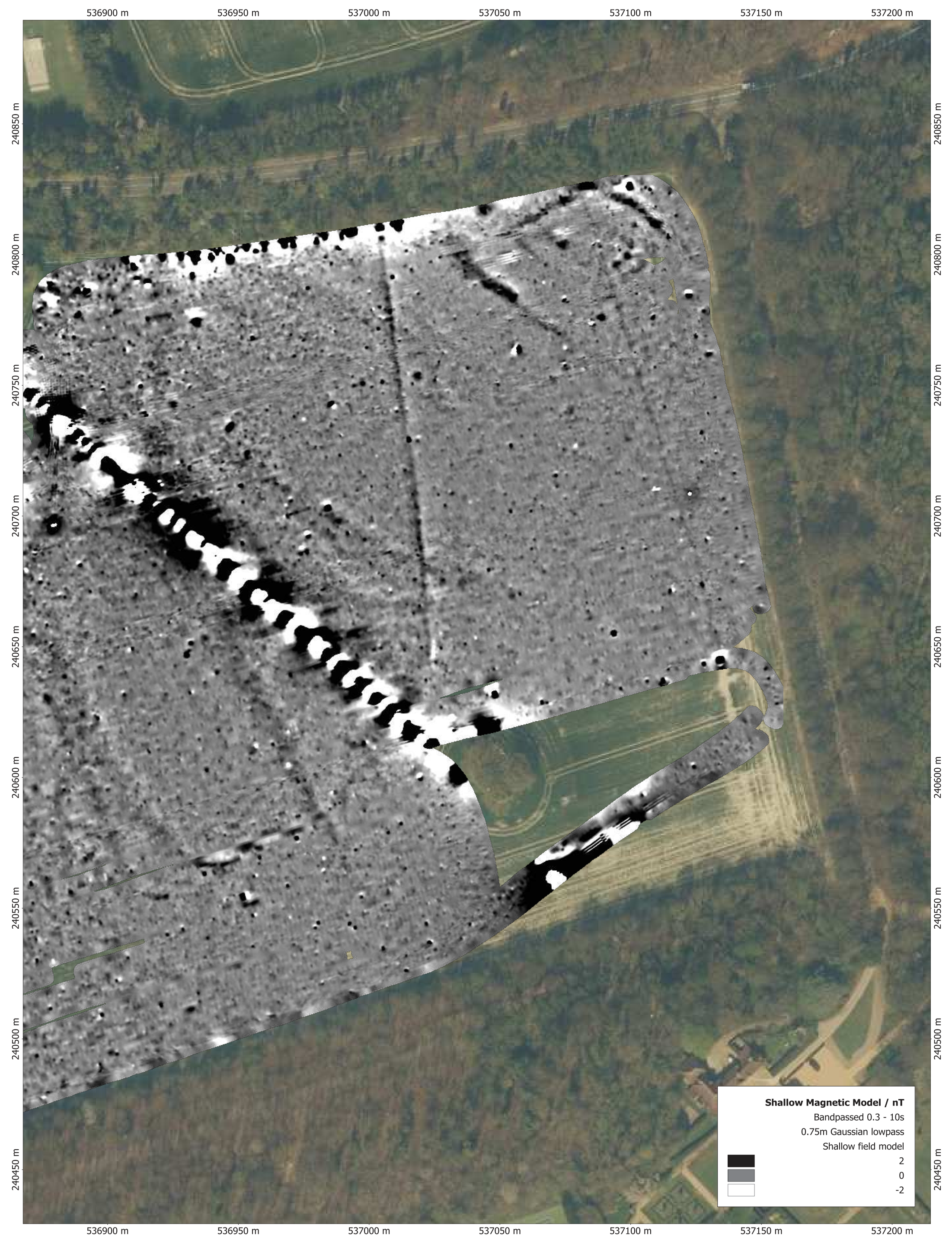




PFR161 Land at Park Field, Royston, Hertfordshire
DWG 03a Magnetic Data - Shallow - West

Orthographic Scale: 1:250 @ A3 Spatial Units: Meter. Do not scale off this drawing
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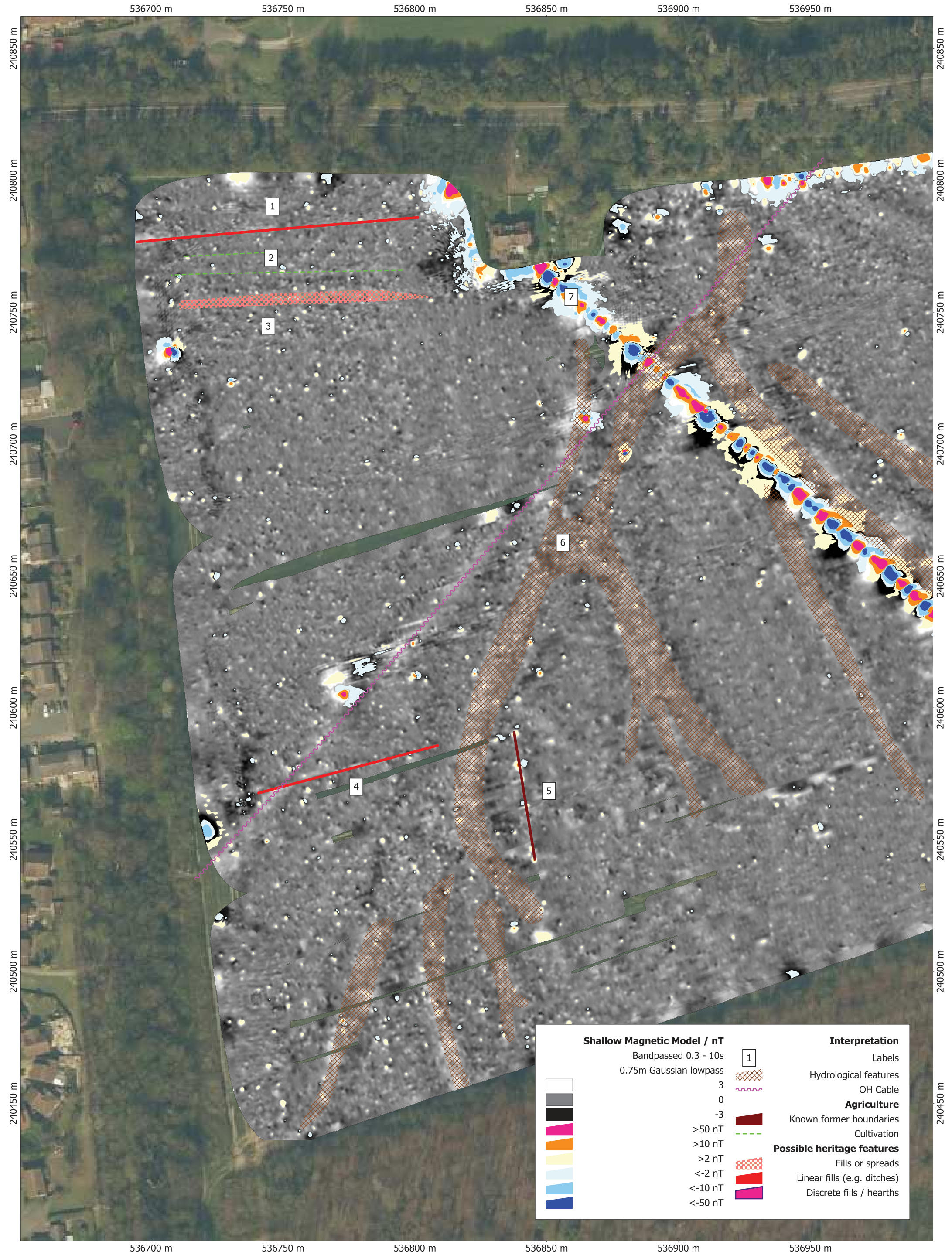




PFR161 Land at Park Field, Royston, Hertfordshire
DWG 03b Magnetic Data - Shallow - East

Orthographic Scale: 1:250 @ A3 Spatial Units: Meter. Do not scale off this drawing
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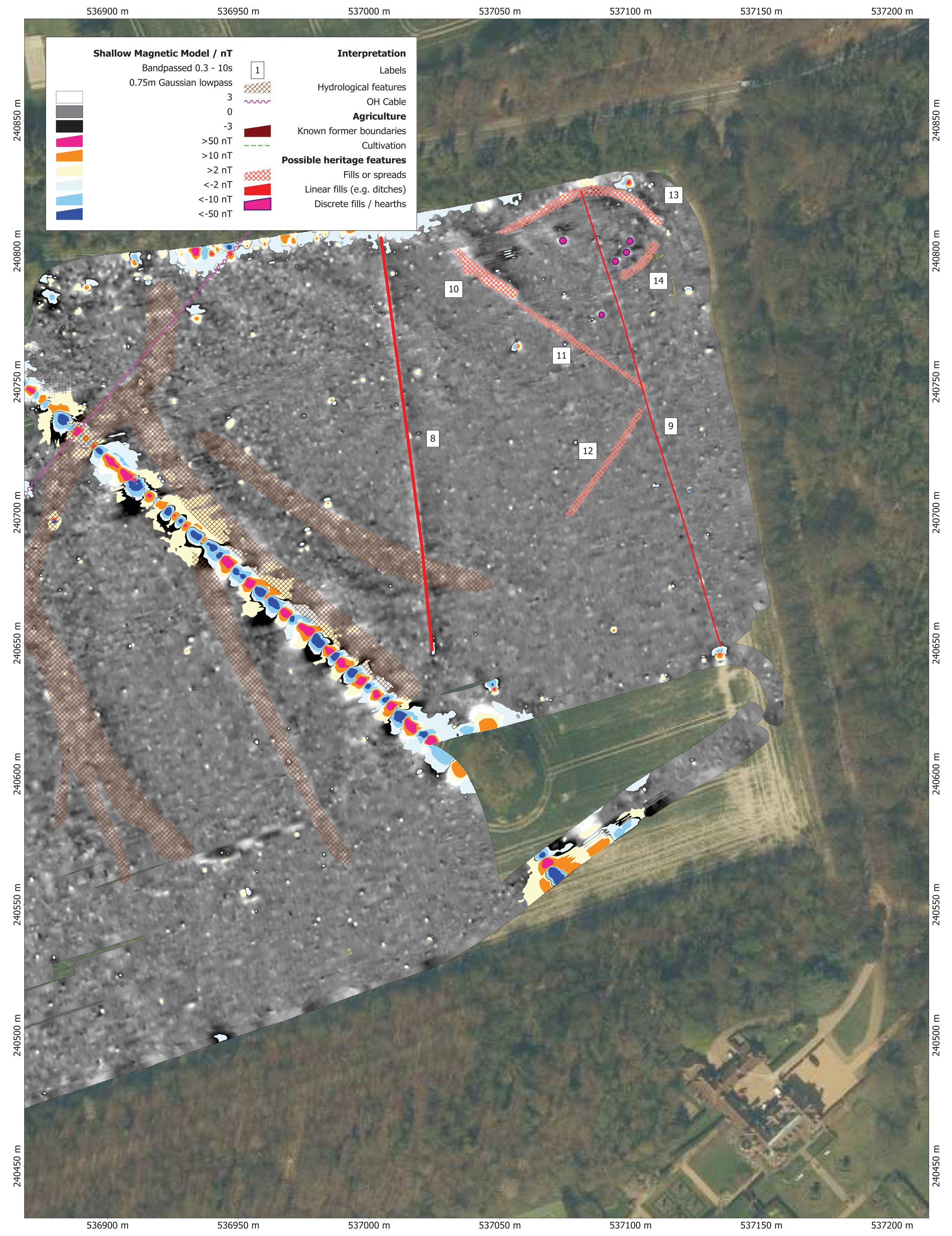




PFR161 Land at Park Field, Royston, Hertfordshire
DWG 04a Interpretation - West

Orthographic Scale: 1:1250 @ A3 Spatial Units: Meter. Do not scale off this drawing
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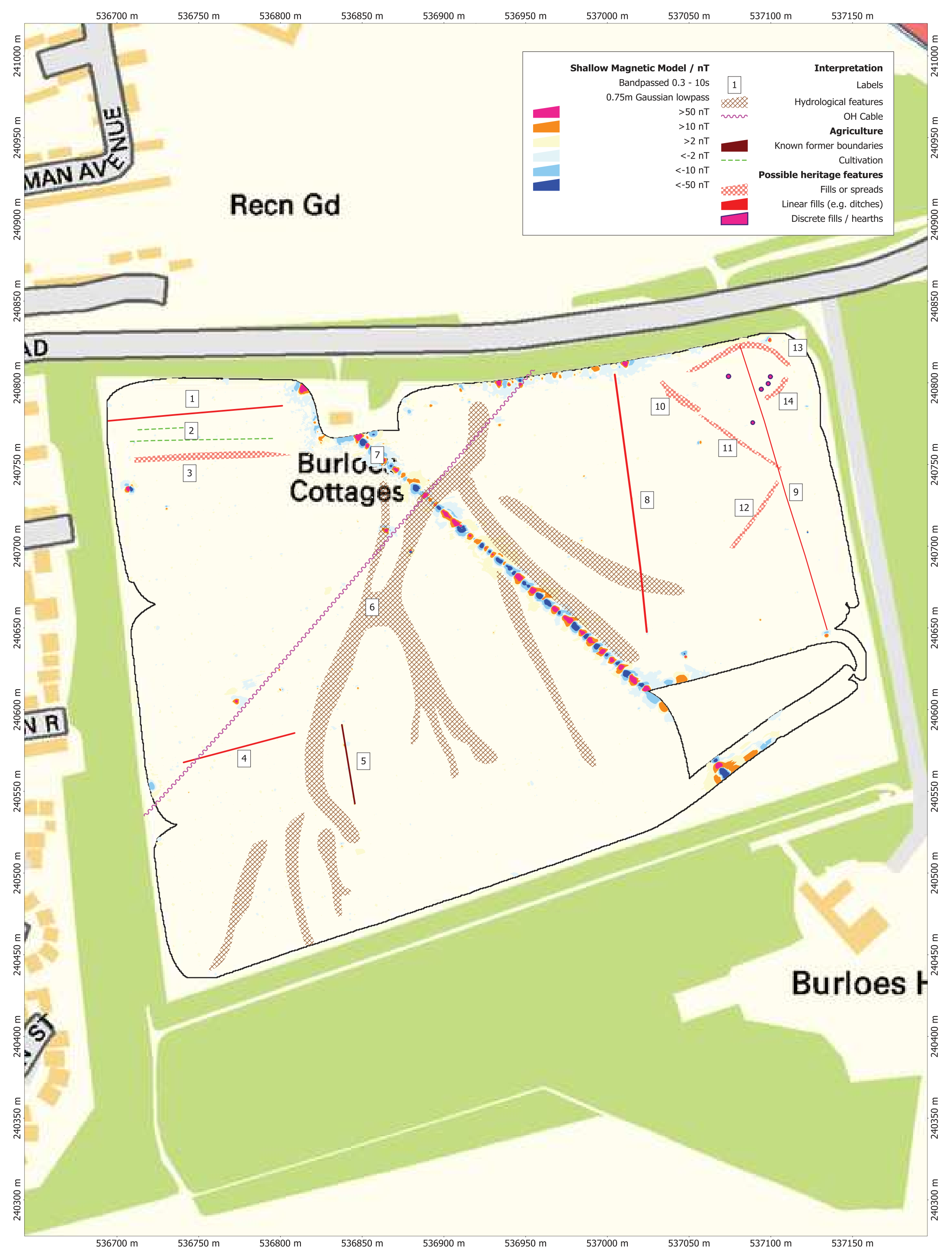




PFR161 Land at Park Field, Royston, Hertfordshire
DWG 04b Interpretation - East

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PFR161 Land at Park Field, Royston, Hertfordshire
DWG 05 Interpretation - Overview



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