TIGERGEO

Land North of Ingham, Suffolk

Geophysical Survey Report
(Caesium Vapour Magnetic - Archaeology)
Version 1.1

Project code: NIS161
HER Parish Code: ING 035
OASIS: tigergeo1-368103

Produced for: Armour Heritage

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REGISTERED CIfA ORGANISATION

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Environmental Geophysics – Survey, Research and Consultancy

TIGERGEO

Land North of Ingham, Suffolk

Digital data

Item	Sent to	Sent date
CAD – Vector Elements	Sue Farr	20th January, 2017

Audit

Version	Author	Checked	Date
Interim			
Draft Final	MJ Roseveare, D Lewis	ACK Roseveare	20th January, 2017
Final			
Revision	D Lewis		30th September, 2019
OASIS Form Completion	D Lewis		30th September, 2019

Project metadata

Project Name	Land North of Ingham, Suffolk
Project Code	NIS161
Client	Armour Heritage
Fieldwork Dates	11th - 12th January, 2017
Field Personnel	K Cunningham, J Wild
Data Processing Personnel	K Cunningham, ACK Roseveare
Reporting Personnel	MJ Roseveare, D Lewis
Draft Report Date	20th January, 2017
Final Report Date	30th September 2019

TigerGeo Limited

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Non-Technical Summary

A magnetic survey was commissioned by Armour Heritage to prospect Land North of Ingham, Suffolk, for buried structures of archaeological interest.

Survey was undertaken using a GNSS-tracked ATV-towed array of caesium vapour magnetometers in non-gradiometric configuration, a pseudo-gradient data set being subsequently calculated from this to aid interpretation.

Nothing of archaeological interest was seen in the data, although there are signs of a depression, perhaps a former marl pit, having been filled with debris. A further spread of debris, extending right across the field and constrained within a rectangular area, may result from the spreading of contaminated green manure. Two large pit-fill type anomalies seem likely to have a natural origin, as does a small area of anomalous magnetic texture near the northeast corner of the field.

Table of Contents

1 Introduction

Land North of Ingham, Suffolk was magnetically surveyed to prospect for buried structures of archaeological interest.

The survey was successful and achieved full coverage across a single agricultural field, with 20.35 hectares covered by magnetic survey.

Country	England
County	Suffolk
Nearest Settlement	Ingham
Central Co-ordinates	584900,272400

2 Context

2.1 Background information

The following paragraphs are extracted from a planning, design and access statement for the proposed development Ingham North Solar Farm (Solarfields, 2016).

Paragraph 3.10 states that:

"The Suffolk HER records just one find within the site boundary: "ING 018 (monument) Neolithic aretefact - scatter of worked flint found on the surface whilst metal detecting in 2001" which is indicated as being found within the north western part of the site. Some similar finds were also recorded in the adjoining fields to the north (ING021) and east (ING010). An assessment for the adjoining Gamma Solar project (SE13/0905/FUL) to the south identified 'potential for Prehistoric and Roman, and for peripheral remains associated with agricultural activity from the Saxon, Medieval and Post-Medieval periods, although no direct evidence of such remains being present within the study site are currently known from nearby archaeological investigations'."

The regular field boundaries of the site and the area immediately surrounding it have been maintained from at least the late 19th century, as depicted on early editions of the Ordnance Survey. The 1883-4 edition also depicts former extraction pits of varying sizes, some of which appear to be adjacent to the survey area. A number of these have vanished from Ordnance Survey mapping by the 1905 edition although reappear (marked as disused) on the 1983-4 edition.

2.2 Environment

Soilscapes Classification	Freely draining sandy Breckland soils (11)
Superficial 1:50000 BGS	Cover Sand (CSD) and Lowestoft Formation – Diamicton (LOFT)
Bedrock 1:50000 BGS	Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation and Culver Chalk Formation (LCCK)
Topography	Relatively flat (approximately 55m AOD)
Hydrology	Natural (potential additional agricultural drains)
Current Land Use	Agricultural - Arable
Historic Land Use	Agricultural - Mixed
Vegetation Cover	Stubble / old crop
Sources of Interference	None expected

The geological basis of the site is magnetically fairly complex as it depends upon the location of two quite different superficial deposits, Cover Sand (CSD) and the Lowestoft Formation Diamicton (LOFT). The former is unlikely to support significant natural magnetic susceptibility and hence anomaly strengths from buried structures of archaeological interest are likely to be weak. In contrast the Diamicton could promote enhancement of susceptibility and the clay decomposition product of chalk can benefit magnetic survey. If at any location these deposits are thin, and the chalk therefore close to the surface, a relatively high magnetic contrast may be evident where features are cut into the chalk itself.

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 03 onwards.

3.3.1 Data

Data quality is high with no significant defects and is everywhere of a uniform albeit weak texture. Strong anomalies from ferro-magnetic debris are present throughout much of the southern half of the field but elsewhere the natural texture [1] predominates.

3.3.2 Geology

The overall weak magnetic contrast would be in keeping with either the Cover Sands or the Diamicton Lowestoft Formation and it has not been possible to reliably identify which is predominant beneath the survey area. However, the superficial deposits appear to completely mask the underlying chalk, with the possible exception of an area at [7], with an east – west trend that suggests a transition exists between them. The magnetic texture at the western edge is more typical of Cover Sand than the Lowestoft Formation which is implied at the eastern edge.

There is significant north-west to south-east banding [1] across the entire survey and this is also apparent beneath the scatters of debris in the southern part of the field where there is a hint that the debris may be concentrated in amorphous bands at the same angle. This being the case the topography of the field might at some stage have been influenced by the banding within these superficial deposits.

It is possible that small features of archaeological interest in the absence of strong means of susceptibility enhancement (like the redox cycling associated with hearths) may not be producing detectable magnetic anomalies. However, the presence of possible fills [8] and [9] would suggest that larger features would be detected if of sufficient depth extent or magnetisation.

3.3.3 Land use

There is no evidence for former systems of enclosure but none are known from the Ordnance Survey mapping since the first edition. Temporary divisions have existed in recent times, one set associated with pig arcs and pens, since removed and a second is implied by the hard northern edge to the band of texture [2].

Both [2] and [3] represent areas of texture anomalous to the natural with [2] being a dense scatter of small items of debris, either material imported as a soil improver or the result of spreading contaminated green manure. Texture [3] is essentially the same as [2] but at a lower density and might represent a different episode or material.

Against the western field boundary more debris [5] may be the remnants of a pile of this material or deliberate infilling.

At [6] there are strong magnetic fields typical of steel that are associated with ground now occupied by small trees. There is presumably debris buried at this location.

3.3.4 Archaeology

There is nothing of obvious archaeological interest apparent in the data but there are four areas of possible disturbed ground that being anomalous to the texture of the superficial geology might warrant further attention. However, with the exception of [4], a natural origin is equally likely.

At [4] there is a large concentration of magnetic debris with two distinct magnetic textures. At the small scale the remanent magnetisation of each item is dominant, reinforcing interpretation as small items of brick or tile debris, perhaps also some ferrous content. At the larger scale, the induced magnetisation of the overall mass is evident which suggests the material to have a significant depth extent, i.e. to be technically a fill rather than a scatter. It seems likely that this is the location of a former hollow or perhaps a large sandpit that has been reclaimed.

At [7], near the northern edge of the site, there is a small area of discrete enhanced field anomalies that could represent a group of pit fills. Natural pit-like features, e.g. silt-filled pockets within the upper part of the superficial or the bedrock geology can also create anomalies like this. See also the note about chalk, above.

Two larger examples [8] and [9] of the same type of anomaly exist, each being up to 10m across and therefore perhaps small sand or marl pits. Prolonged and perhaps cyclic heating and cooling might also create anomalies like this if the associated soils have remained undisturbed.

3.4 Conclusions

The data is of good quality and full coverage of the site was achieved. There is a clear impression throughout of the superficial geological deposits beneath the site and there are no obvious signs of features of archaeological interest superimposed upon this.

There is a lot of strongly magnetic debris in the southern part of the field which has the potential to mask weaker magnetic sources although in this case the data from further north gives no reason to suppose such sources exist.

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)
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 0.25 – 10.0s
Gridding	Surfer	Kriging, 0.25m x 0.25m
Smoothing	Surfer	Gaussian lowpass 3x3 data
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.

4.4 Bibliography & selected reference

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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.

4.6 Acknowledgements

Thanks are due to the farmer for straightforward access.

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 (GeolSoc) and the Chartered Institute for Archaeologists (CIfA). Senior members of TigerGeo are professional members of the GeolSoc (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 and since 1997 has worked in commercial geophysics. Elected a GeolSoc Fellow in 2009 he is now working towards achieving CSci. A member of the European Association of Geoscientists & Engineers, he has served on the EuroGPR and CIfA GeoSIG committees and on the scientific committees of the 10th and 11th Archaeological Prospection conferences. He has reviewed papers for the EAGE Near Surface conference, was a technical reviewer of the Irish NRA geophysical guidance and is a founding member of the ISSGAP soils group. 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.	
Operations Manager (Safety Manager)	Anne Roseveare BEng(Hons) DIS MISoilSci
On looking beyond engineering, Anne turned her attention to environmental monitoring and geophysics. She is a Member of the British Society of Soil Science (BSSS) and has specific areas of interest in soil physics & hydrology, agricultural applications and industrial sites. Amongst other contributions to the archaeological geophysics sector over the last 18 years, Anne was the founding Editor of the International Society for Archaeological Prospection (ISAP) and is a founding member of the ISSGAP soils group. Specifications, logistics, safety, data handling & analysis are integral parts of her work, though she is happily distracted by the possibilities of discovering lost cities, hillwalking and good food.	
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 he 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, gaining an 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.	
Environmental Geophysicist – Field Management	Kathryn Cunningham BSc(Hons) FGS
Kathryn has been with TigerGeo for more than 18 months and has undertaken over 100 surveys comprising total field magnetometry, twin probe resistivity, electrical resistance tomography, ground penetrating radar and laser-scanning. Her particular role is to ensure all aspects of fieldwork run smoothly, including site-specific paperwork, liaison, internal auditing and risk assessment. In addition she has increasing responsibilities in data processing and interpretation. She graduated with a BSc (Hons) in Applied Geology in 2015 from the University of Plymouth, is a Fellow of the Geological Society and enjoys acrobatics and sunny days.	
Environmental Geophysicist - Systems	Jack Wild BSc(Hons) FGS
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 cannot resist(ivity)!	

6 Appendices

6.1 Appendix 1 - OASIS summary page

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: tigergeo1-368103

Project details

Project name	Land North of Ingham, Suffolk
Short description of the project	A magnetic survey was commissioned by Armour Heritage to prospect Land North of Ingham, Suffolk, for buried structures of archaeological interest. Survey was undertaken using a GNSS-tracked ATV-towed array of caesium vapour magnetometers in non-gradiometric configuration, a pseudo-gradient data set being subsequently calculated from this to aid interpretation. Nothing of archaeological interest was seen in the data, although there are signs of a depression, perhaps a former marl pit, having been filled with debris. A further spread of debris, extending right across the field and constrained within a rectangular area, may result from the spreading of contaminated green manure. Two large pit-fill type anomalies seem likely to have a natural origin, as does a small area of anomalous magnetic texture near the northeast corner of the field.
Project dates	Start: 13-12-2016 End: 31-03-2017
Previous/future work	Not known / Not known
Any associated project reference codes	NIS161 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	NONE None
Monument type	NONE None
Significant Finds	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology	CHALK (INCLUDING RED CHALK)
Drift geology	GLACIAL SAND AND GRAVEL
Techniques	Magnetometry

Project location

Country	England

Site location	SUFFOLK ST EDMUNDSBURY INGHAM Land North of Ingham, Suffolk
Postcode	IP31 1PH
Study area	20.3 Hectares
Site coordinates	TL 584900 272400 51.9206247327 0.30494749454 51 55 14 N 000 18 17 E Point

Project creators

Name of Organisation	TigerGeo Ltd
Project brief originator	Consultant
Project design originator	TigerGeo Ltd
Project director/manager	MJ Roseveare
Project supervisor	J Wild
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	TigerGeo Ltd
Digital Contents	"none"
Digital Media available	"GIS","Geophysics","Text"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land North of Ignham, Suffolk
Author(s)/Editor(s)	Roseveare, M, Lewis, D
Date	2017
Issuer or publisher	TigerGeo Limited
Place of issue or publication	TigerGeo Limited

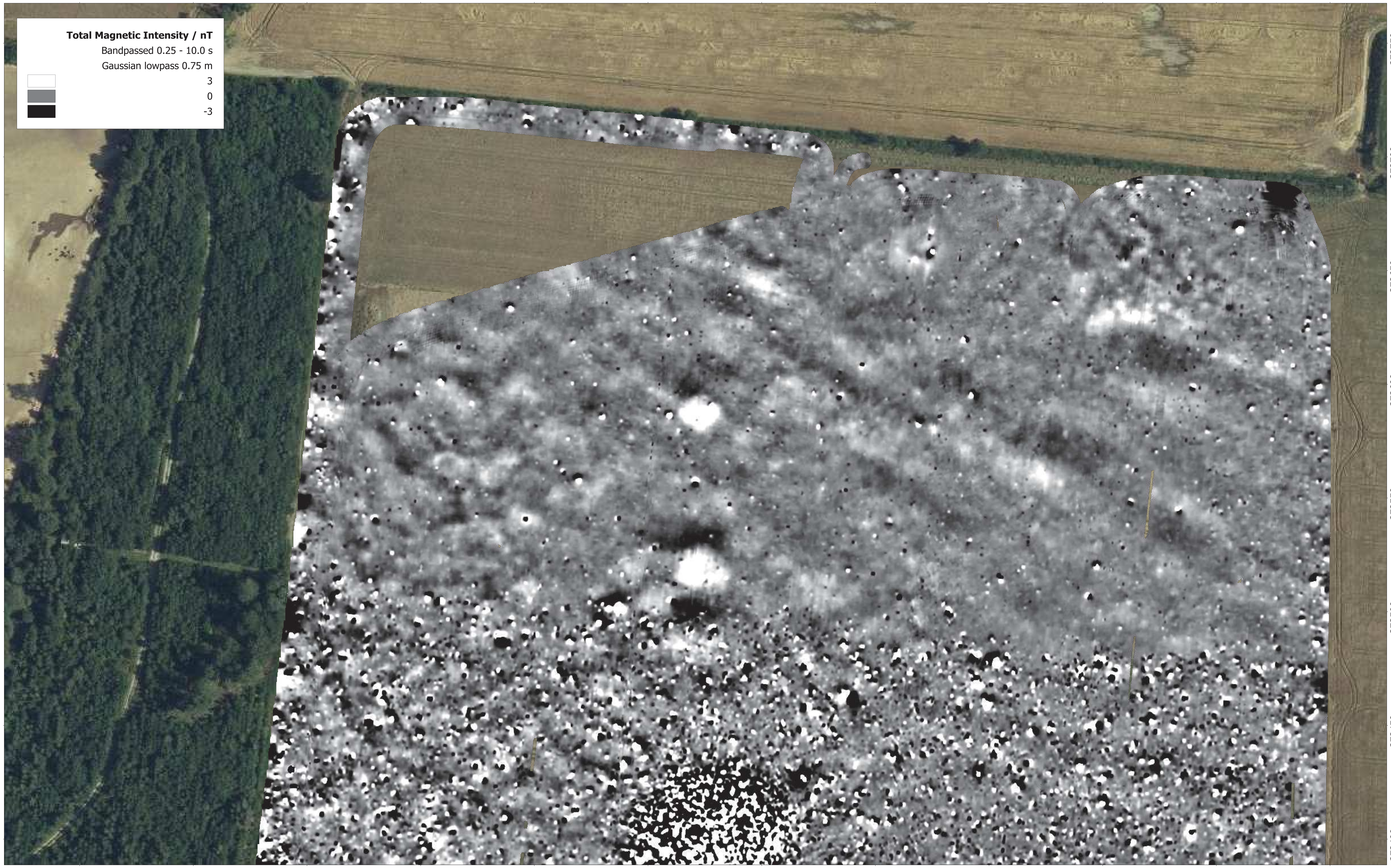
Entered by	Daniel Lewis (d.lewis@tigergeo.com)
Entered on	25 September 2019

OASIS:

NIS161 Land North of Ingham, Suffolk
DWG 01 Location Map

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

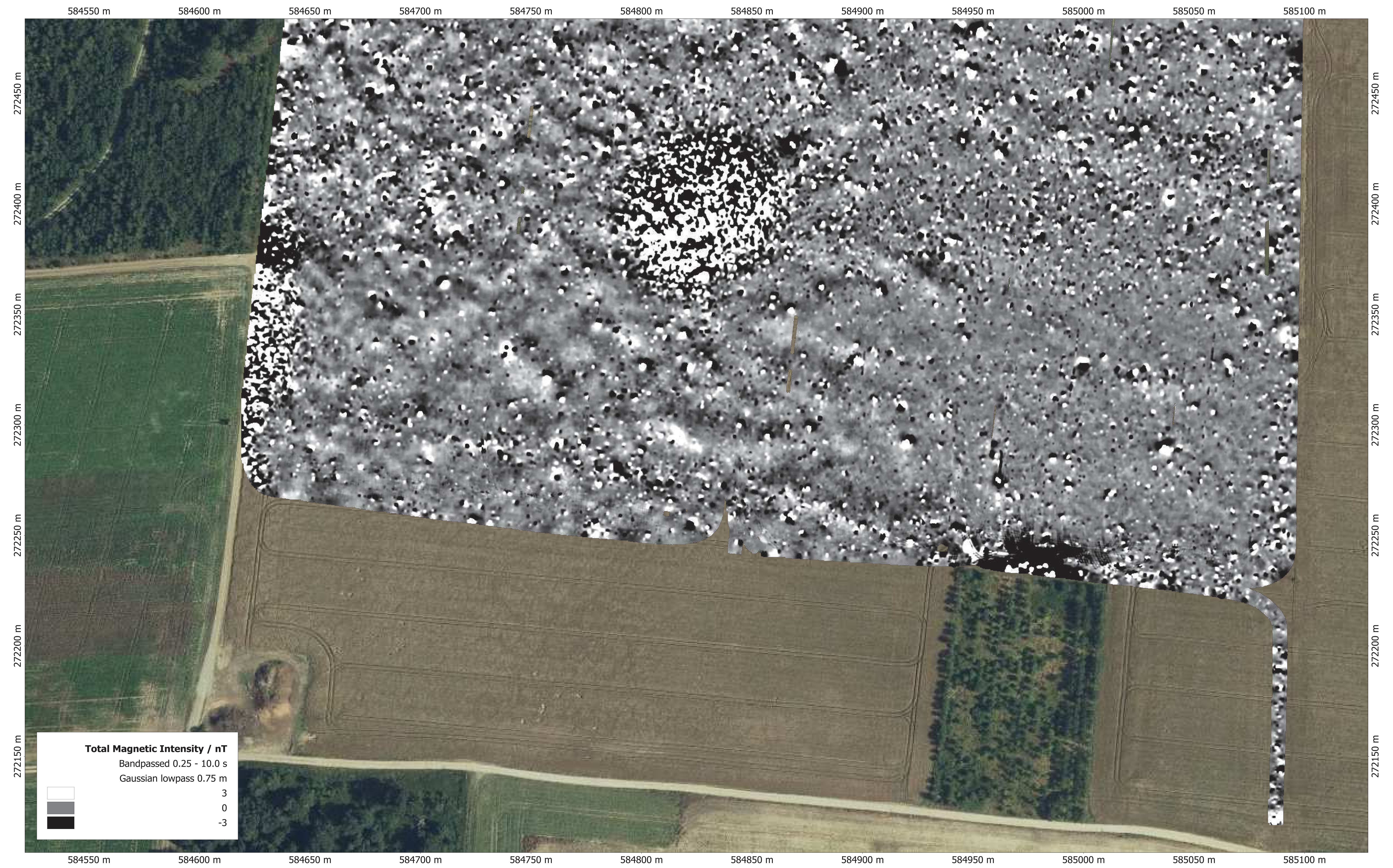
TIGERGEO



NIS161 Land North of Ingham, Suffolk
DWG 02a Magnetic Data - Total Magnetic Intensity - N

Orthographic Scale: 1:1500 @ A3 Spatial Units: Meter. Do not scale off this drawing

TIGERGEO



NIS161 Land North of Ingham, Suffolk
DWG 02b Magnetic Data - Total Magnetic Intensity - S

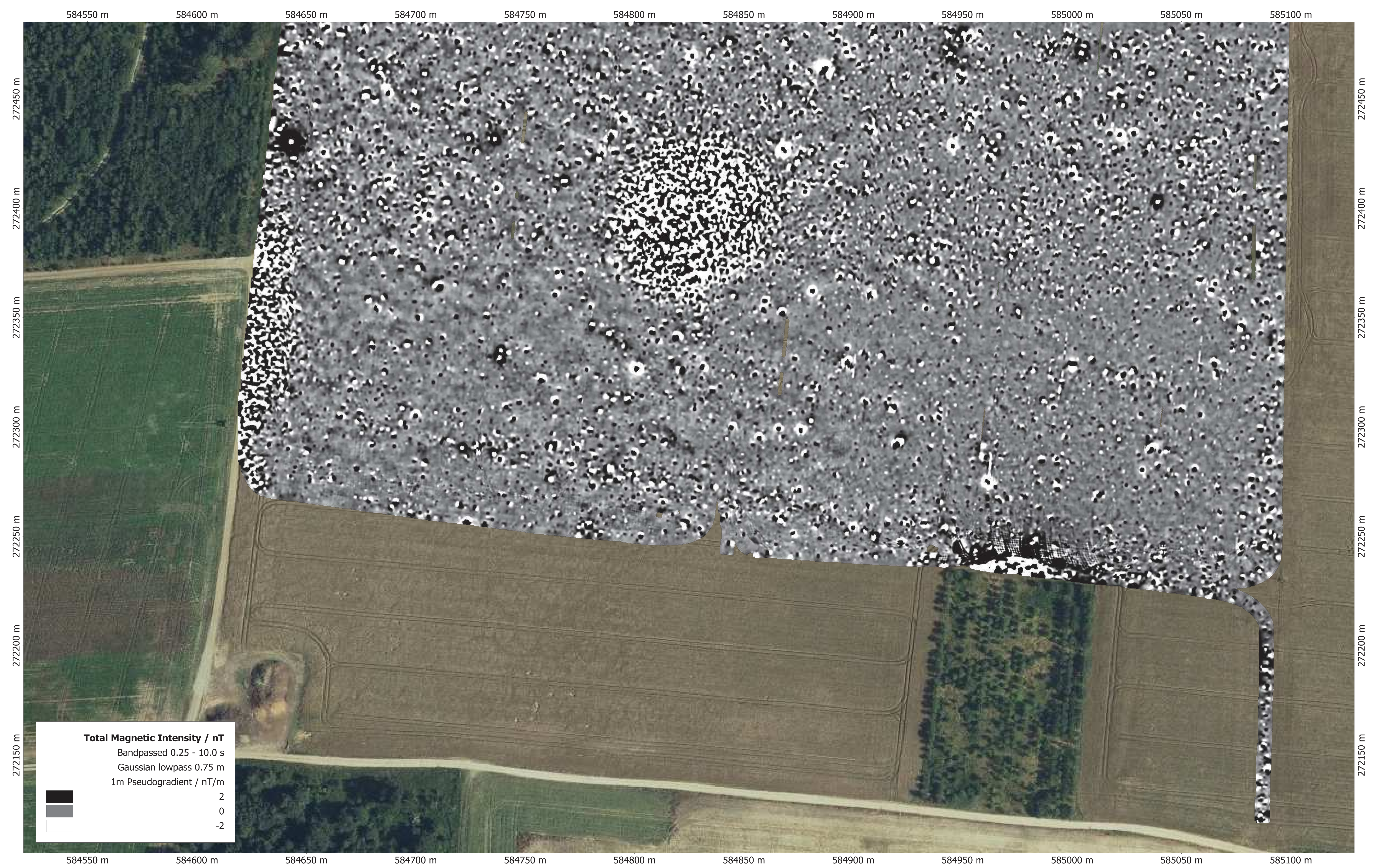
Orthographic Scale: 1:1500 @ A3 Spatial Units: Meter. Do not scale off this drawing

TIGERGEO

NIS161 Land North of Ingham, Suffolk
DWG 03a Magnetic Data - Pseudogradient 1m - N

Orthographic Scale: 1:1500 @ A3 Spatial Units: Meter. Do not scale off this drawing

TIGERGEO

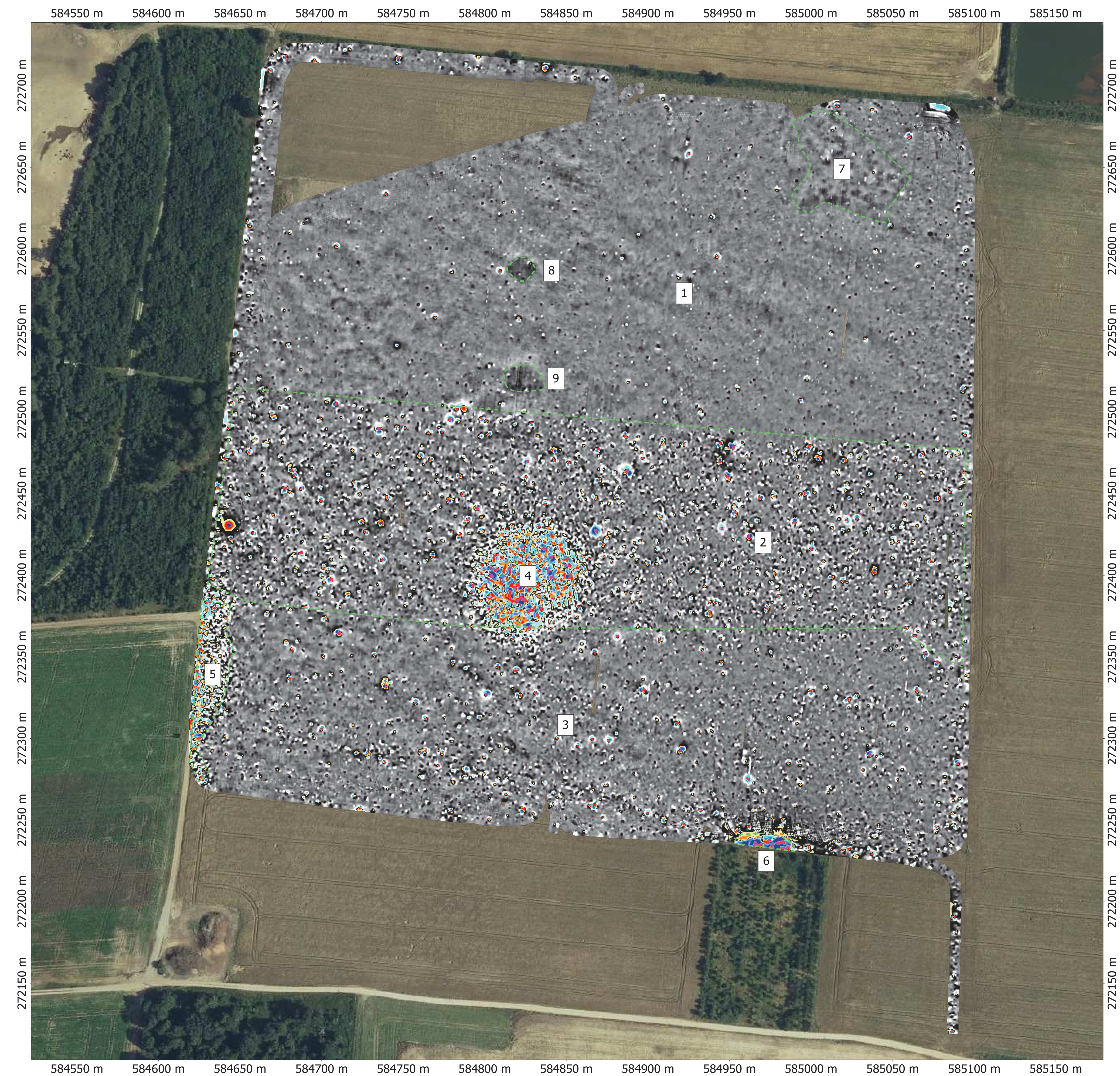


NIS161 Land North of Ingham, Suffolk

DWG 03b Magnetic Data - Pseudogradient 1m - S

Orthographic Scale: 1:1500 @ A3 Spatial Units: Meter. Do not scale off this drawing

TIGERGEO



Total Magnetic Intensity / nT
Bandpassed 0.25 - 10.0 s
Gaussian lowpass 0.75 m
1m Pseudogradient / nT/m

	2
	0
	-2
	> 50 nT
	> 20 nT
	> 10 nT
	> 5 nT
	< -5 nT
	< -10 nT
	< -20 nT
	< -50 nT

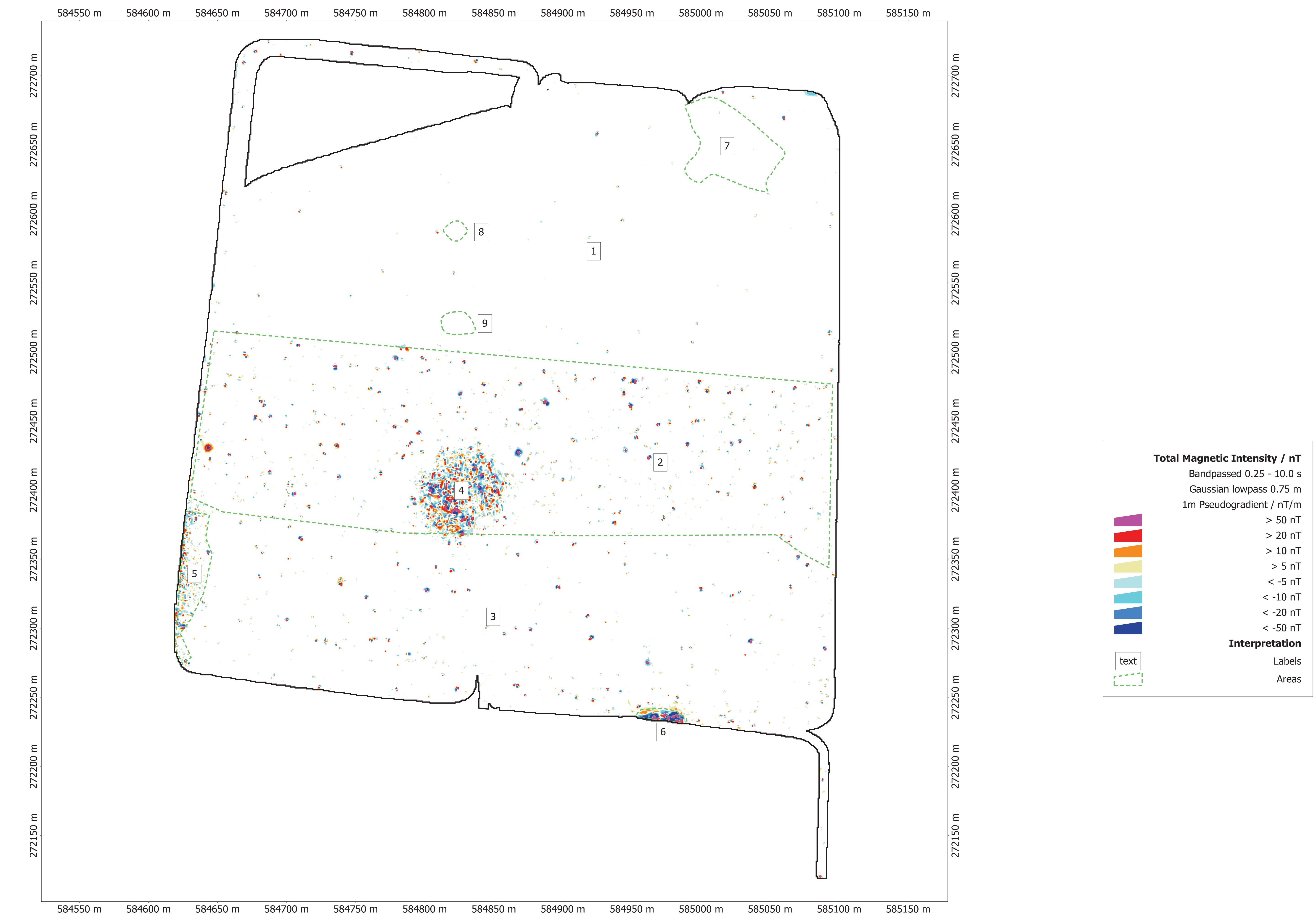
Interpretation

text	Labels
	Highlighted areas

NIS161 Land North of Ingham, Suffolk
DWG 04 Interpretation

Orthographic Scale: 1:2500 @ A3 Spatial Units: Meter. Do not scale off this drawing

TIGERGEO



NIS161 Land North of Ingham, Suffolk
DWG 05 Interpretation 2

Orthographic Scale: 1:2500 @ A3 Spatial Units: Meter. Do not scale off this drawing

TIGERGEO