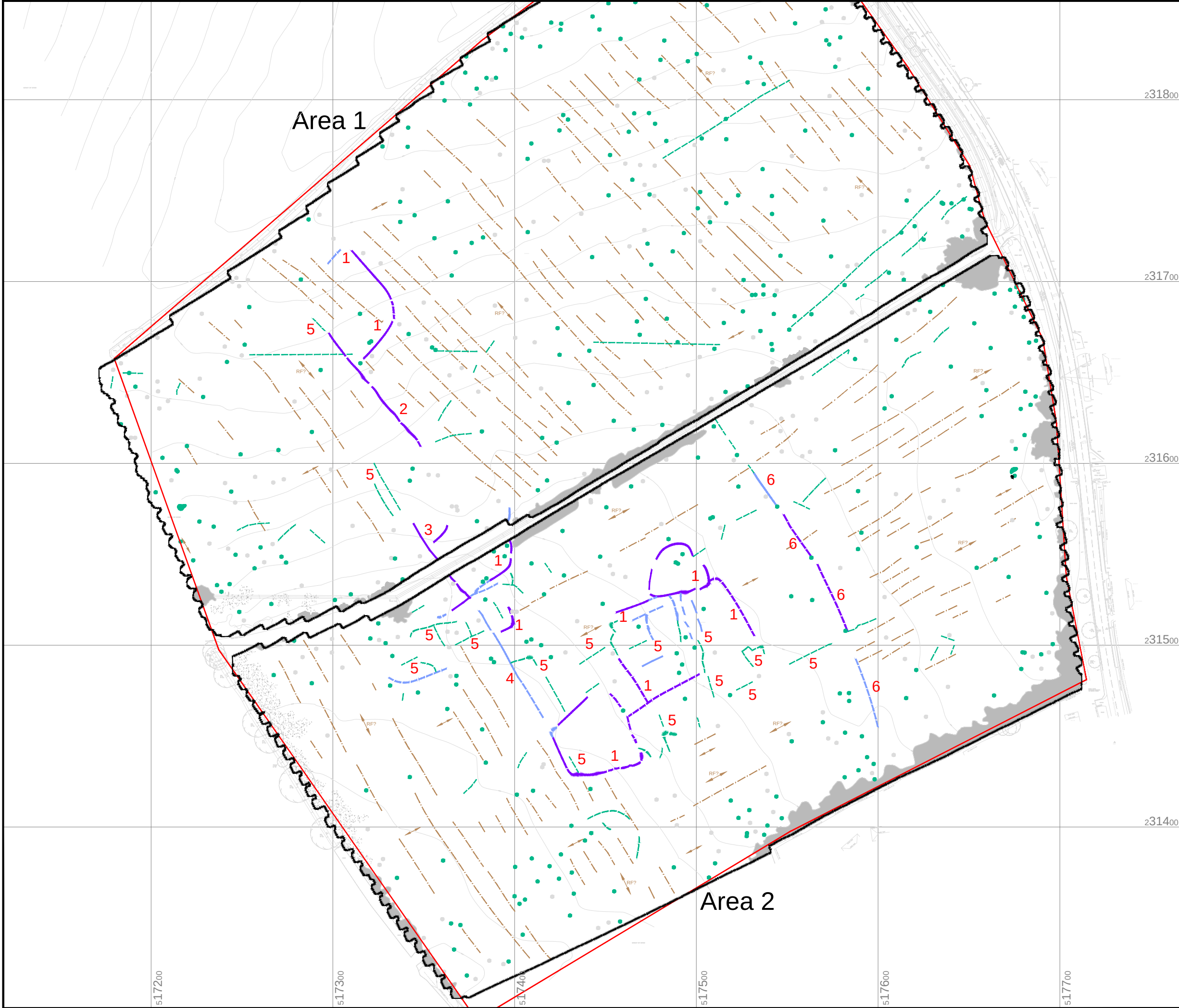




NOTES

1. This drawing is based upon drawing '35089.dwg' provided by the client. The Ordnance Survey co-ordinates obtained for this survey were measured using the UK OSTN15 transformation. This transformation should be taken into account if the survey data is relocated.
2. SUMO GeoSurveys cannot accept responsibility for the reliability or accuracy of any information provided by a third party.
3. This drawing and the information contained therein is issued in confidence and is the copyright of SUMO GeoSurveys. Disclosure of this information to third parties and unauthorised copying or replication of this data without approval is forbidden.



KEY

	Probable archaeology (linear or curvi-linear) / trend
	Possible archaeology (linear or curv-linear / trend)
	Uncertain origin (discrete / linear or curvi-linear / trend)
	Ridge and furrow
	Possible ridge and furrow regime but some responses could be modern ploughing
	Former field boundary (corroborated)
	Agriculture. Orientation of modern ploughing regime. Some responses could be ridge and furrow
	Magnetic disturbance - usually related to a spread / concentration of modern material
	Ferrous and / or fired material (probable modern)
	Site boundary



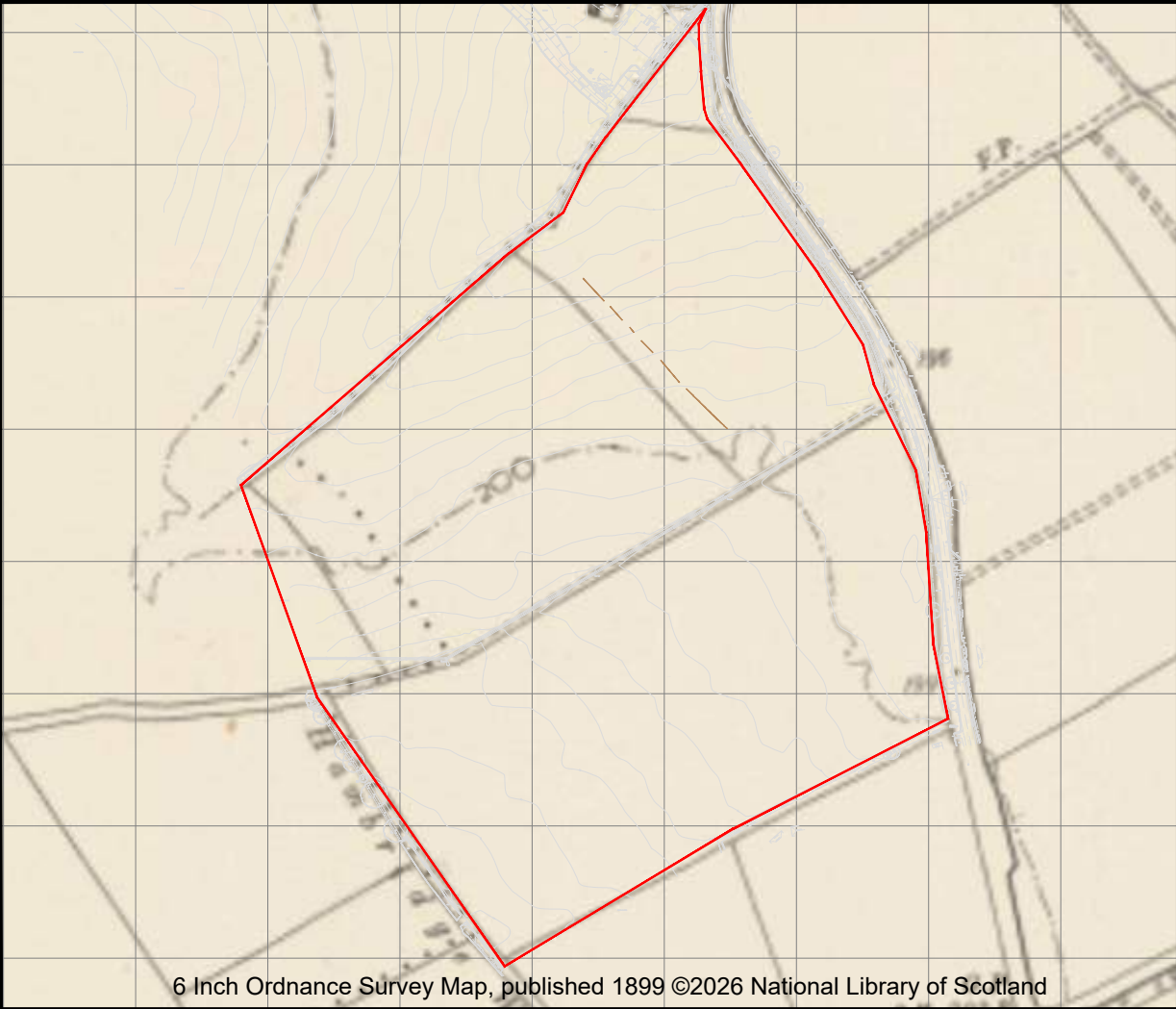
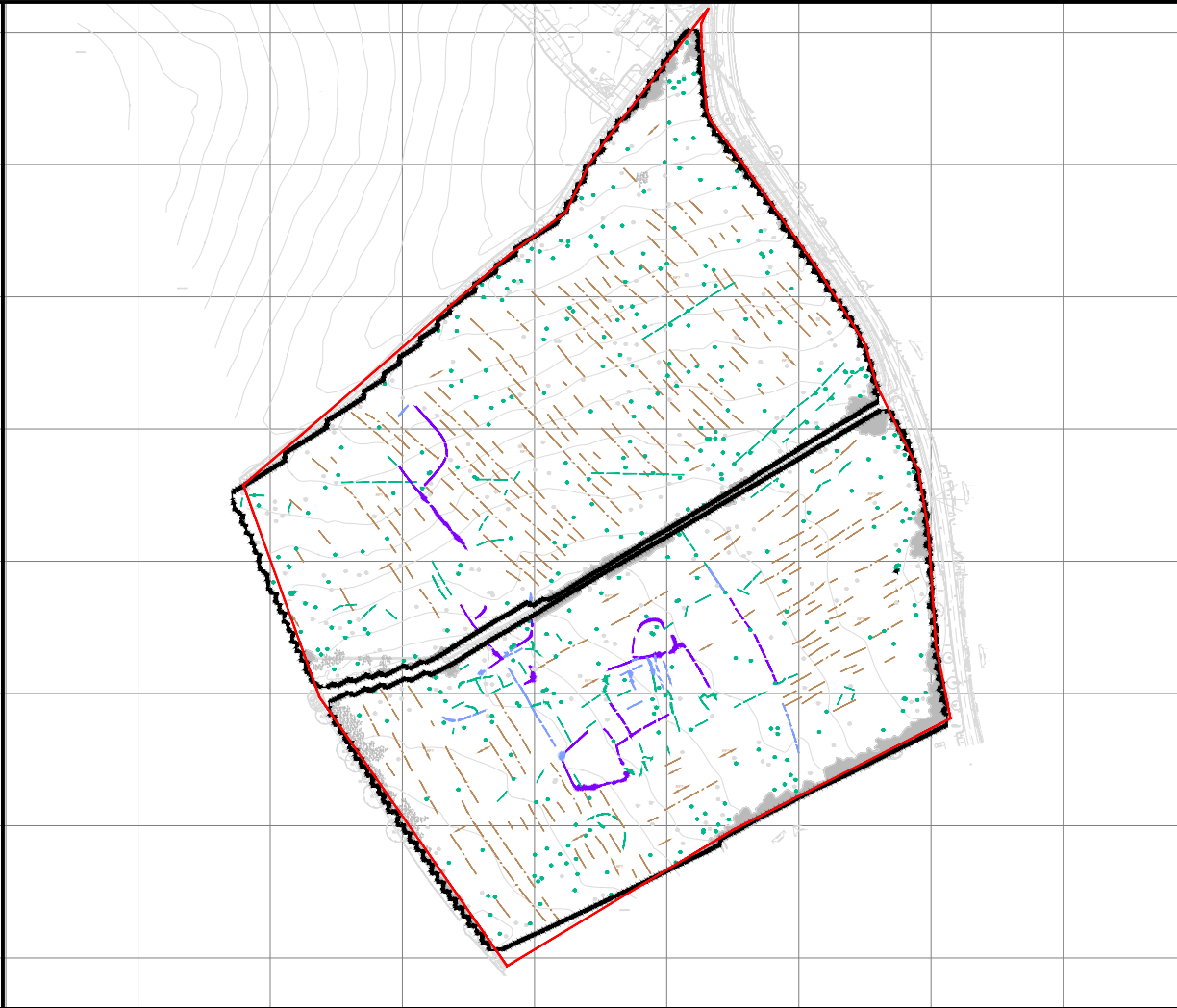
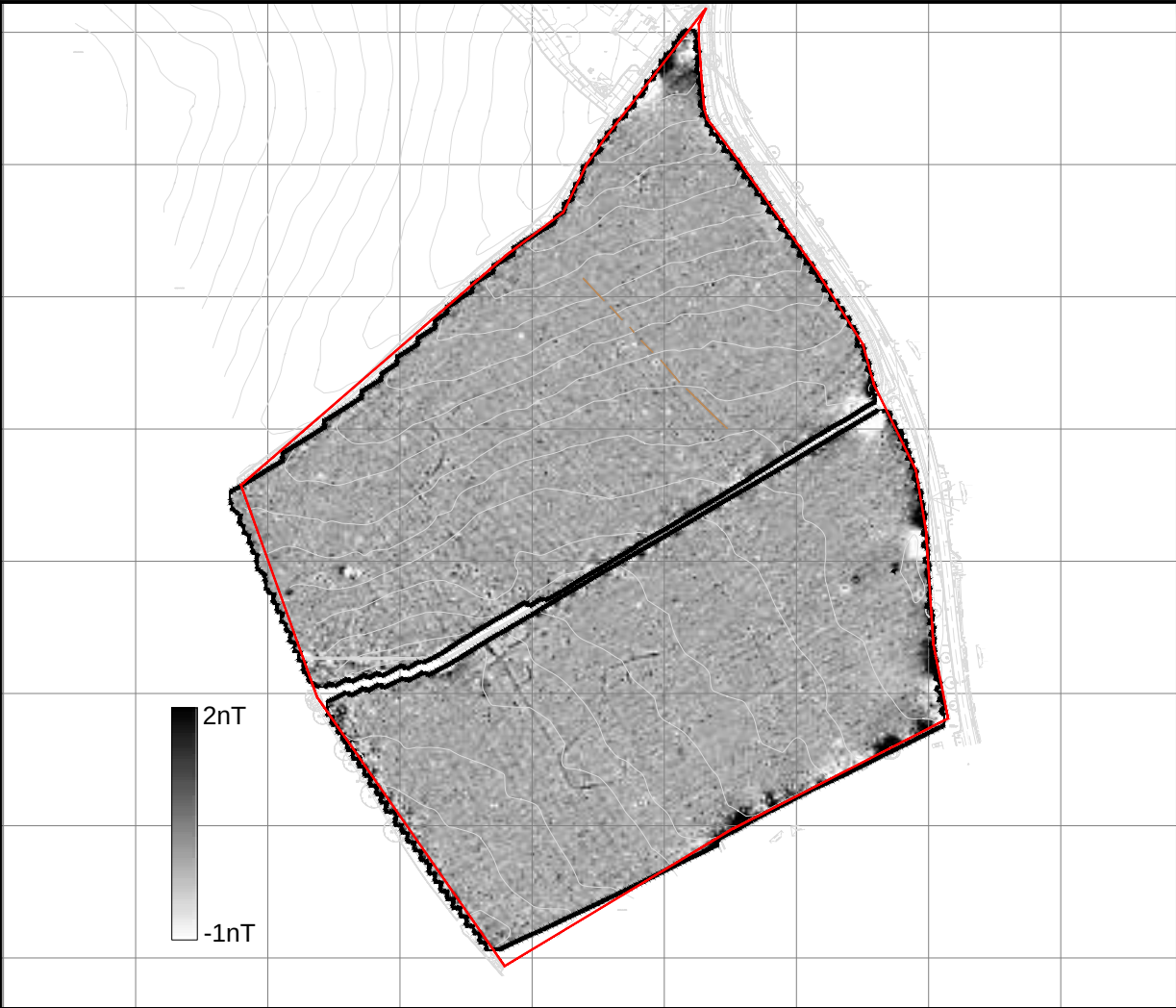
Title: Magnetic gradient data - interpretation
Area 2 and part of Area 1

Client: Tetra Tech
(for Bugler Homes Ltd)

Project: Land at Pound Farm, Ickleford
Hertfordshire SG5 3RS

Scale: 1:2000@A3

Figure:
05

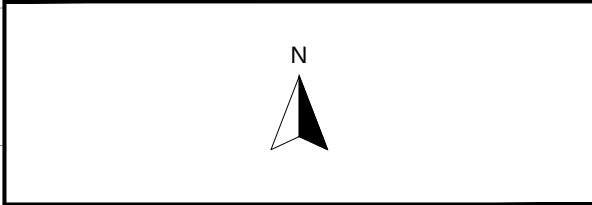


- NOTES
1.

This drawing is based upon drawing '35089.dwg' provided by the client. The Ordnance Survey co-ordinates obtained for this survey were measured using the UK OSTN15 transformation. This transformation should be taken into account if the survey data is relocated.
2.

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3.

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KEY

Site boundary



Title: Illustrative plots of magnetic gradient data, interpretation and selected historic map and LiDAR images

Client:

Tetra Tech
(for Bugler Homes Ltd)

Project:

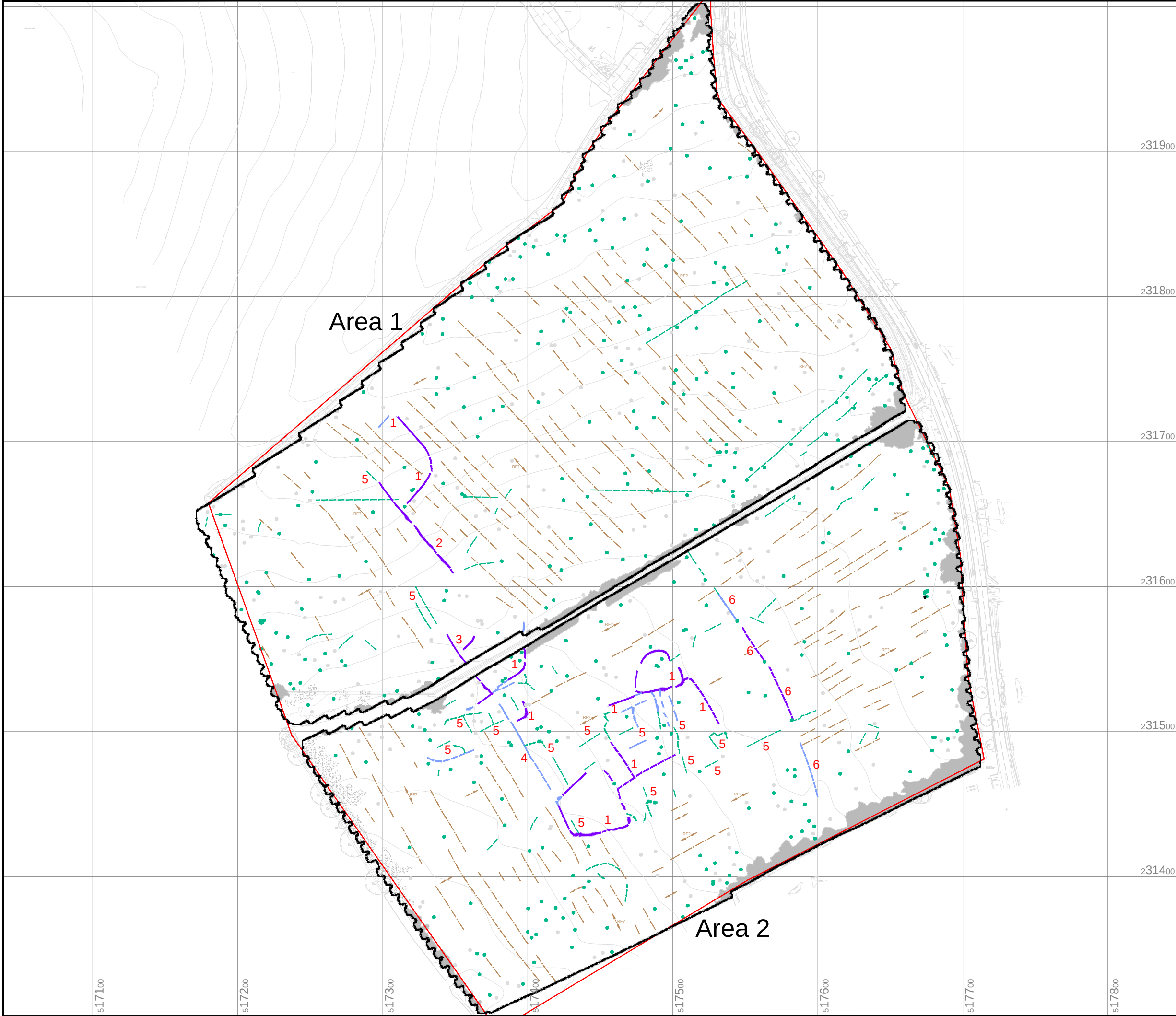
Land at Pound Farm, Ickleford
Hertfordshire SG5 3RS

Scale:

Not to scale

Figure:

06



NOTES

- 1. This drawing is based upon drawing '35089.dwg' provided by the client. The Ordnance Survey co-ordinates obtained for this survey were measured using the UK OSTN15 transformation. This transformation should be taken into account if the survey data is relocated.
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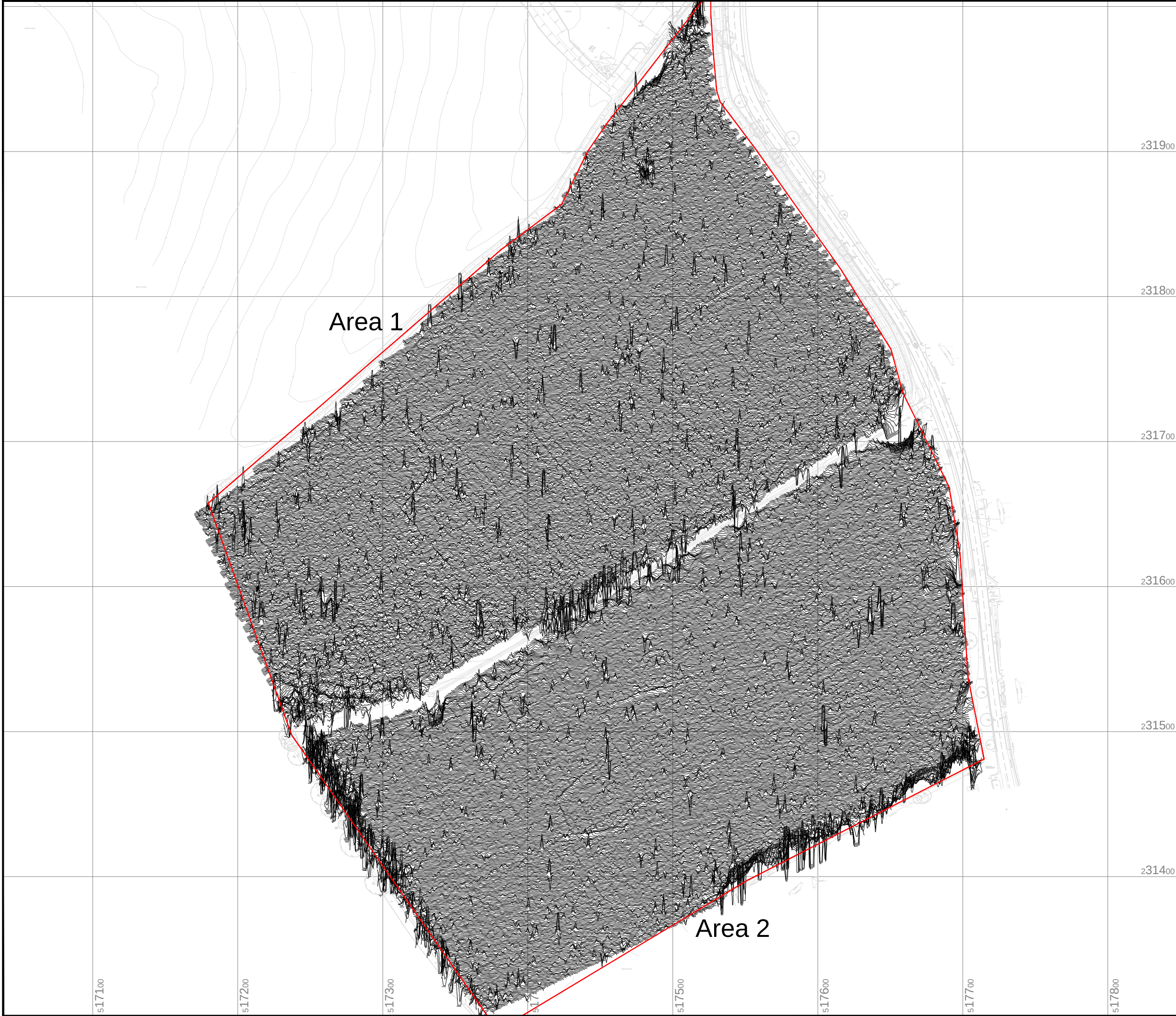


KEY

- Probable archaeology (linear or curvi-linear) / trend
- Possible archaeology (linear or curv-linear / trend)
- Uncertain origin (discrete / linear or curvi-linear / trend)
- Ridge and furrow
- Possible ridge and furrow regime but some responses could be modern ploughing
- Former field boundary (corroborated)
- Agriculture. Orientation of modern ploughing regime. Some responses could be ridge and furrow
- Magnetic disturbance - usually related to a spread / concentration of modern material
- Ferrous and / or fired material (probable modern)
- Site boundary



Title: Magnetic gradient data - interpretation Full site	
Client: Tetra Tech (for Bugler Homes Ltd)	
Project: Land at Pound Farm, Ickleford Hertfordshire SG5 3RS	
Scale: 1:2500@A3 	Figure: 07



NOTES

1. This drawing is based upon drawing '35089.dwg' provided by the client. The Ordnance Survey co-ordinates obtained for this survey were measured using the UK OSTN15 transformation. This transformation should be taken into account if the survey data is relocated.
2. SUMO GeoSurveys cannot accept responsibility for the reliability or accuracy of any information provided by a third party.
3. This drawing and the information contained therein is issued in confidence and is the copyright of SUMO GeoSurveys. Disclosure of this information to third parties and unauthorised copying or replication of this data without approval is forbidden.



KEY

 Site boundary

VERTICAL SCALE FOR X-Y PLOTS:
1 cm = 34 nT (@1:2500)



Title: Magnetic gradient data - X-Y trace plots
(clipped at +/-15nT)

Client: Tetra Tech
(for Bugler Homes Ltd)

Project: Land at Pound Farm, Ickleford
Hertfordshire SG5 3RS

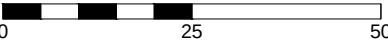
Scale: 1:2500@A3


Figure:
08

Appendix A - Technical information: Magnetic survey

Instrumentation:

Fluxgate gradiometers were used for the magnetic survey. These are systems that have two fluxgate magnetometers a set distance apart in a vertical sensor each of which measures the vertical component of the earth's magnetic field. The difference in measurements between the two magnetometers indicates the gradient of the earth's magnetic field.

Generally, features up to 1 m deep may be detected using fluxgate gradiometers, though strongly magnetic objects may be visible at greater depths and features / material that produce relatively weak magnetic responses may only be detected at shallower depths.

Data points and survey grids are georeferenced using using an RTK GNSS (Real-Time Kinematic Global Navigation Satellite System) to an accuracy usually in the order of +/- 0.05 m, and at all times better than 0.1 m. Positional data is converted to the Ordnance Survey National Grid co-ordinates, using the UK OSTN15 transformation.

SUMO GeoSurveys utilise Bartington or Foerster fluxgate gradiometers in several different configurations, depending on the client's requirements, survey objectives and site specific conditions. These include:

Bartington cart system

Cart survey: Four Grad601 sensors, with a sensor spacing of 1.0 m, are mounted on a non-magnetic cart. Readings are taken at nominal 0.125 m intervals. The sensors and an on-board RTK GNSS are connected to a control unit / data logger which allows each data point to be geo-referenced and related to Ordnance Survey National Grid. Readings are triggered at time intervals so the speed of survey can affect how often a reading is taken but the frequency a reading is taken and the speed of survey are set so that on average a reading will be taken at the required interval or better.

Bartington Grad 601-2

Hand-held: In this configuration two paired sensors, connected to a control unit / data logger, are carried by hand. The sensor are spaced 1 m apart and readings are taken at 0.25 m centres along traverses. Regular 30 m grids are set out across the survey area and the data is collected over these.

Foerster cart system (MACS)

Cart survey: A multi-sensor array cart system (MACS) utilising 4 or 8 Foerster 4.032 Ferex CON 650 gradiometers that are mounted on a non-magnetic cart. Readings are taken at between 0.1 and 0.15 m intervals. The sensors and an on-board RTK GNSS are connected to a control unit / data logger (an Eastern Atlas digitiser) which allows each data point to be geo-referenced and related to Ordnance Survey National Grid. Readings are triggered at time intervals so the speed of survey can affect how often a reading is taken but the frequency a reading is taken and the speed of survey are set so that on average a reading will be taken at the required interval or better.

Foerster cart system (MACS)

Cart survey: A multi-sensor array cart system (MACS) utilising 4 Foerster 4.032 Ferex MG-10-550 gradiometers that are mounted on a non-magnetic cart. Readings are taken at between 0.1 and 0.15 m intervals. The sensors and an on-board RTK GNSS are connected to a control unit / data logger which allows each data point to be geo-referenced and related to Ordnance Survey National Grid. Readings are triggered at time intervals so the speed of survey can affect how often a reading is taken but the frequency a reading is taken and the speed of survey are set so that on average a reading will be taken at the required interval or better.

Data processing

The processing sequence used for the data will depend on the instrument and configuration used.

Bartington Grad601 cart survey data

Zero Mean	This process sets the background mean of each traverse to zero. The operation
Traverse	removes striping effects and edge discontinuities caused by individual sensors having slightly different values when zeroed or where striping errors occur due to instrument drift or are a product of data collection.

Bartington Grad601-2 hand-held data

Zero Mean	This process sets the background mean of each traverse within each grid to zero.
Traverse	The operation removes striping effects and edge discontinuities caused by individual sensors having slightly different values when zeroed or where striping errors occur due to instrument drift or are a product of data collection.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors or stagger can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

Foerster cart system (MACS)

ealdec	This process decodes the raw data and converts it to a csv file. Positional values are assigned to each data point based on data from the GNSS and the offset of each sensor relative to the GNSS.
Ealmat.m	This is the equivalent of a zero mean traverse, wherein the data is normalised and a drift correction applied for each probe.
Ealgrid.m	This grids the data by merging each profile file. Parameters are set by based on the sensor spacing and resolution required.

Foerster cart system (MACS)

Zero Mean	This process sets the background mean of each traverse to zero. The operation
Traverse	removes striping effects and edge discontinuities caused by individual sensors having slightly different values when zeroed or where striping errors occur due to instrument drift or are a product of data collection.

Display

Greyscale plot	A greyscale plot of magnetic data is a visual representation of magnetic field strength variations over a given area. Magnetic gradient measurements are converted into a two-dimensional image where different shades of grey correspond to different magnetic values. This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. In this instance black is used for the maximum intensity values and white for the minimum.
X-Y trace plot	An X-Y trace plot of magnetic data is a visual representation of magnetic field strength variations over a given area. Magnetic gradient measurements along a single traverse are displayed as a graph where the X-axis represents the distance along a traverse and the Y-axis is the measured magnetic gradient value at that point. Plots for each traverse are stacked to produce the X_Y trace plot for an area. The main advantage of the shape of individual anomalies can be viewed, and if required the full range of data can be viewed, although the data is often clipped at +/- 15 nT to +/- 20 nT.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall, etc.*) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the magnetic gradient data.

<i>Archaeology / probable archaeology</i>	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
<i>Possible archaeology</i>	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth or plough damage.
<i>Industrial / Burnt / fired</i>	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal- working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
<i>Ridge and furrow</i>	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.
<i>Uncertain origin</i>	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of <i>Possible Archaeology / Natural</i> or (in the case of linear responses) <i>Possible Archaeology / Agriculture</i> ; occasionally they are simply of an unusual form.
<i>Former field boundary (probable and possible)</i>	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
<i>Agriculture (ploughing)</i>	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes. The general orientation of the cultivation regime is shown but, for the sake of clarity, each individual anomaly has not been shown.
<i>Agriculture (land drain)</i>	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
<i>Natural (e.g. geological / pedological)</i>	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
<i>Magnetic disturbance</i>	Areas of strong dipolar / bipolar anomalies, usually related to a spread / concentration of modern magnetic including ferrous and fired (e.g. brick or tile rubble) material.
<i>Service (e.g. pipe, cable or drain)</i>	Magnetically strong anomalies, usually forming linear alignments are indicative of ferrous pipes cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
<i>Ferrous</i>	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

Appendix B - Technical information: Magnetic theory

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning, soil formation, weathering, erosion and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

A magnetic survey is carried out using a magnetometer which can measure these small changes in magnetic properties, which are referred to as anomalies. Magnetometers can either measure the total field or the gradient. Measuring the gradient of the earth's magnetic field can suppress any diurnal or regional effects and makes the instrument sensitive to smaller, localised anomalies, which is critical for archaeological surveys. The total field or magnetic gradient are measured in Tesla (T) with the small variations detected in archaeological surveys recorded in nanoTesla (nT).

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services (pipes, cables or drains) or other modern material / activity.

Appendix C - OASIS Summary Sheet

OASIS Summary for sumogeop1-538926

OASIS ID (UID)	sumogeop1-538926
Project Name	Geophysical Survey, Magnetometry Survey at Pound Farm, Bedford Road, Hitchin
Sitename	Pound Farm, Bedford Road, Hitchin
Sitecode	SUMO-25078
Project Identifier(s)	SUMO-25078 Pound Farm, Bedford Road, Hitchin
Activity type	Geophysical Survey, Magnetometry Survey
Planning Id	
Reason For Investigation	Planning: Pre application
Organisation Responsible for work	SUMO Geophysics Ltd.
Project Dates	05-Jan-2026 - 08-Jan-2026
Location	Pound Farm, Bedford Road, Hitchin NGR : TL 17596 31630 LL : 51.970710770011245, -0.289550443781131 12 Fig : 517596,231630
Administrative Areas	Country : England County/Local Authority : Hertfordshire Local Authority District : North Hertfordshire Parish : Ickleford
Project Methodology	The cart-based system can be towed by an all-terrain vehicle (ATV) or pushed by hand, depending on the ground conditions, accessibility and size of fields. The hand pushed option was used for this survey Marker canes were set-out along field boundaries (and at points within the field as required) at set intervals and these were used to align the profiles when pushed by hand. The survey profiles are usually offset from field boundaries, buildings and other metallic features by several metres to reduce the detrimental effect that these surface magnetic features have on the data. Gaps were also left adjacent to boundaries and surface obstructions to allow cart-based system sufficient space to safely pass and turn. The location of the cart-based survey data is converted direct to Ordnance Survey National Grid co-ordinates, using the UK OSTN15 transformation.
Project Results	The magnetometer survey has identified anomalies related to archaeological and possible archaeological features. These form parts of several enclosures and possibly boundary ditches. Anomalies related to the remnants of ridge and furrow, recent ploughing and modern material / features have also been identified. Numerous responses of uncertain origin are present. Archaeological origins for some of these cannot be discounted but the majority are probably due to modern activity / material, agricultural activity or natural variations. The soil conditions appear to vary across the site and it is possible that, in parts of the site, some types of feature(s) may not produce measurable / identifiable magnetic anomalies. This could mean that the full extent of archaeological features / activity within the site may not have been identified by the survey.
Keywords	Ditched Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types Boundary Ditch - UNCERTAIN - FISH Thesaurus of Monument Types Plough Marks - UNCERTAIN - FISH Thesaurus of Monument Types

Funder	Private or public corporation Tetra Tech
HER	Hertfordshire HER - unRev - STANDARD
Person Responsible for work	Rebecca Fradgley
HER Identifiers	
Archives	

Report generated on: 21 Jan 2026, 15:04

Appendix D – Data Management Plan & Archive Selection Strategy

Data Management Plan

Project ID / OASIS ID

SUMO-25078 / sumogeop1-538926

Project Name

Pound Farm, Bedford Road, Hitchin

Project Description

Detailed magnetic survey over approx. 21.5ha

Client

Tetra Tech

Project Manager

Rebecca Fradgley

Field Leader

Simon Lobel

Date DMP created

02/12/2025

Date DMP last updated

20/12/2026

Version

2

Technique - data

Detailed Magnetometry

Manual – cart - other

Cart

Documentation and metadata

All documentation and data produced so far are stored on SUMO servers in a specific job file.

Data storage, access and back-up

- SUMO Secure server during the project life set up in a RAID configuration (a RAID configuration incorporates a level of data redundancy meaning if a single hard drive in fails data can still be restored).
- Snap shots of the data will be made at several intervals during the day to allow data to be restored for up to 30 days if changed / deleted.
- Once the final report has been completed data will be moved onto NAS drive set up in a RAID configuration.
- All data is backed up to an off-site location (Cloud storage).
- The report and data will be uploaded to ADS.

Archive Selection Strategy

Digital Data

Selection

It is proposed that only the final version of all born digital documents (reports, images and CAD files) will be selected for inclusion in the Preserved Archive. All raw and processed survey data will be included in the preserved archive. Below is what will constitute the selected archive:

- Raw data in XYZ format .csv and .png plus .pgw world file
- Processed data as .png plus .pgw world file
- Final survey report .pdf
- CAD and Vector graphics (interpretations) in .dwg format

De-selected digital data

The de-selected material will be retained on the SUMO Secure server and Cloud storage.

Documents

Not applicable – no archive

Materials

Not applicable – no archive



- Archaeological Geophysics
- Engineering Geophysics
- Measured Building Services
- Utility and Topographic Services
- Aerial Surveys
- Rail Surveys

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SUMO Services Ltd, incorporated under the laws of England and Wales,
Company Registration No.4275993.
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