

GEOPHYSICAL SURVEY REPORT

Preston Farm, Taunton, Somerset

Client

Orion Heritage Ltd

For

Engena Ltd

Survey Report

05562

OASIS Ref. No.

sumogeop1-504681

Date

17 February 2022



Survey Report 05562: Preston Farm, Taunton, Somerset

Survey dates	17 – 24 January 2022
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3 SURVEY TECHNIQUE

3.1 Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site.

Bartington Grad 601-2	Traverse Interval 1.0m	Sample Interval 0.25m
Bartington Cart System	Traverse Interval 1.0m	Sample Interval 0.125m

The only processes performed on data are the following unless specifically stated otherwise:

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes instrument striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors 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.

4 SUMMARY OF RESULTS

- 4.1 A magnetometer survey of approximately 33h of land at Preston Farm, Taunton has identified a number of enclosures and ring features of probable and possible archaeological interest. The adjacent fields have aerial photographs which indicate similar enclosures and field systems dating to the Iron Age / Romano-British period. Therefore, it seems likely that the features identified in the geophysical data are associated with a number of archaeological sites scattered across the landscape. The survey has also identified numerous former field boundaries and a few uncertain responses. A natural valley with possible alluvial deposits is visible in the results along with a couple of water pipes.

5 INTRODUCTION

- 5.1 **SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey in advance of a new solar farm. This survey forms part of an archaeological investigation being undertaken by **Orion Heritage Ltd** on behalf of **Engena Ltd**.

5.2 Site Details

NGR / Postcode	ST 1357 2704 / TA4 1PQ
Location	The site under investigation lies approximately 9km west of Taunton and 5km east of Wiveliscombe. The survey covers 3 fields north the B3227 at Preston Bowyer. Cooks Lane forms the southern boundary and the site is surrounded by agricultural fields on all side.
HER	Somerset
OASIS Ref. No.	sumogeop1-504681
District	Taunton Deane
Parish	Milverton CP (south); Halse CP (north)
Topography	Undulating between 64m aOD and 95m aOD
Land Use	Arable agriculture
Geology (BGS 2022)	Bedrock: Helsby Sandstone Formation – sandstone (south); Chester Formation – conglomerate (north); Mercia Mudstone Group - mudstone and halite-stone (east). Superficial: None recorded.
Soils (CU 2022)	Soilscape 8: slightly acid loamy and clayey soils with impeded drainage (south); Soilscape 6: freely draining slightly acid loamy soils (north).
Archaeology	There are no scheduled sites or recorded heritage assets within the survey area, but the Somerset HER identifies two assets within close proximity. 44571: adjacent fields to the west of the site. Aerial photographs show clearly a series of small rectangular fields together with some less clear features which appear to be curvilinear enclosures of a different date. The incomplete cropmark of a possible later prehistoric oblong enclosure can be seen on HE Reconnaissance aerial photographs taken in 2010. This is a multiple ditched enclosure consisting of two and on the southern side three ditches. There is a smaller enclosure at the south-west corner, partly defined by one of the larger enclosure ditches but cut or cutting the inner ditch. 44351: adjacent fields to east of the site. Infra-red aerial photographs show a rectilinear cropmark enclosure crossed by field boundaries.
Survey Methods	Magnetometer survey (fluxgate gradiometer)
Study Area	33 ha

5.3 ***Aims and Objectives***

- 5.3.1 To locate and characterise any anomalies of possible archaeological interest within the proposed development.

6 **RESULTS**

- 6.1 *The survey has been divided into three survey areas (Areas 1- 3) and specific anomalies have been given numerical labels [1] [2] which appear in the text below, as well as on the Interpretation Figure(s).*

6.2 ***Probable / Possible Archaeology***

- 6.2.1 Linear and curvilinear anomalies [1] appear to form a ditch with a D-shaped, segmented enclosure attached; the D measures 40m by 25m. It is unclear whether the segmentation is original or a result of later plough damage, but the enclosure is clearly of archaeological interest.
- 6.2.2 Curvilinear and ring responses [2] are magnetically weak but nonetheless still discernible in the data. They appear to indicate two ring ditches (c10-11m in diameter) set within larger oval shaped enclosures. The responses are classified as possible archaeology.
- 6.2.3 A polygonal response [3] measures approximately 32m E-W and 30m N-S; inside is a linear anomaly some 17m in length. The results indicate a ditched enclosure which is partitioned centrally by a ditch or gully, perhaps a structural feature. The enclosure appears to be appended to a long linear response [4] which extends across the field; this ditch isn't visible on early OS maps or the Tithe map and therefore could be an ancient feature.
- 6.2.4 A well-defined curved anomaly [5] forms a partial enclosure whose southern extent lies outside of the survey area, but it could be preserved in the field boundary which demonstrates a clear 'dog leg' at this point. The enclosure measures c40m E-W and there is an outer arc anomaly [6] indicating a double ditch on the eastern side.

6.3 ***Uncertain***

- 6.3.1 It is inevitable that in a survey of this size that several responses will be classified as being uncertain in origin. Given the known archaeological context such an origin cannot be ruled out, but it is perhaps more likely that agricultural practices or modern activity will be the cause of the anomalies. Most of the responses are linear or curvilinear in nature.

6.4 ***Former Field Boundary – Corroborated / Conjectural***

- 6.4.1 There are numerous linear anomalies in the data which are associated with former boundaries visible on the Tithe or OS maps and hence interpreted as such. The existing parish boundary between Milverton and Halse coincides with the curving response [7]. Other magnetic responses which run between known boundaries are marked as conjectural.

6.5 ***Agricultural –Ploughing***

- 6.5.1 Parallel closely spaced linear trends are visible across the fields; they are a result of mainly modern ploughing.

6.6 ***Natural / Geological / Topographic***

- 6.6.1 A narrow band of amorphous magnetic responses meanders across Area 1 and is typical of anomalies associated with former alluvial deposits or other localised topographic variations.

The band follows a natural valley and leads to a small 'drain' marked on the map in the west and which feeds into a small pond.

6.7 ***Pipes / Magnetic Disturbance / Ferrous***

- 6.7.1 Linear chains of dipole anomalies mark the course of two small water pipes; one aligned N-S in Areas 1 and 2, with an E-W extension running into Area 1.
- 6.7.2 A small area of magnetic disturbance [8] (cut by one of the water pipes) coincides with a former pond now backfilled.
- 6.7.3 Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and are characteristic of small pieces of ferrous debris (or brick / tile) in the topsoil; they are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

7 **DATA APPRAISAL & CONFIDENCE ASSESSMENT**

- 7.1 Historic England guidelines (EH 2008) Table 4 states that the typical magnetic response on the local soils / geology is variable. The results from this survey indicate the presence of a range of archaeological features; as a consequence, the technique is deemed to have worked successfully.

8 **CONCLUSION**

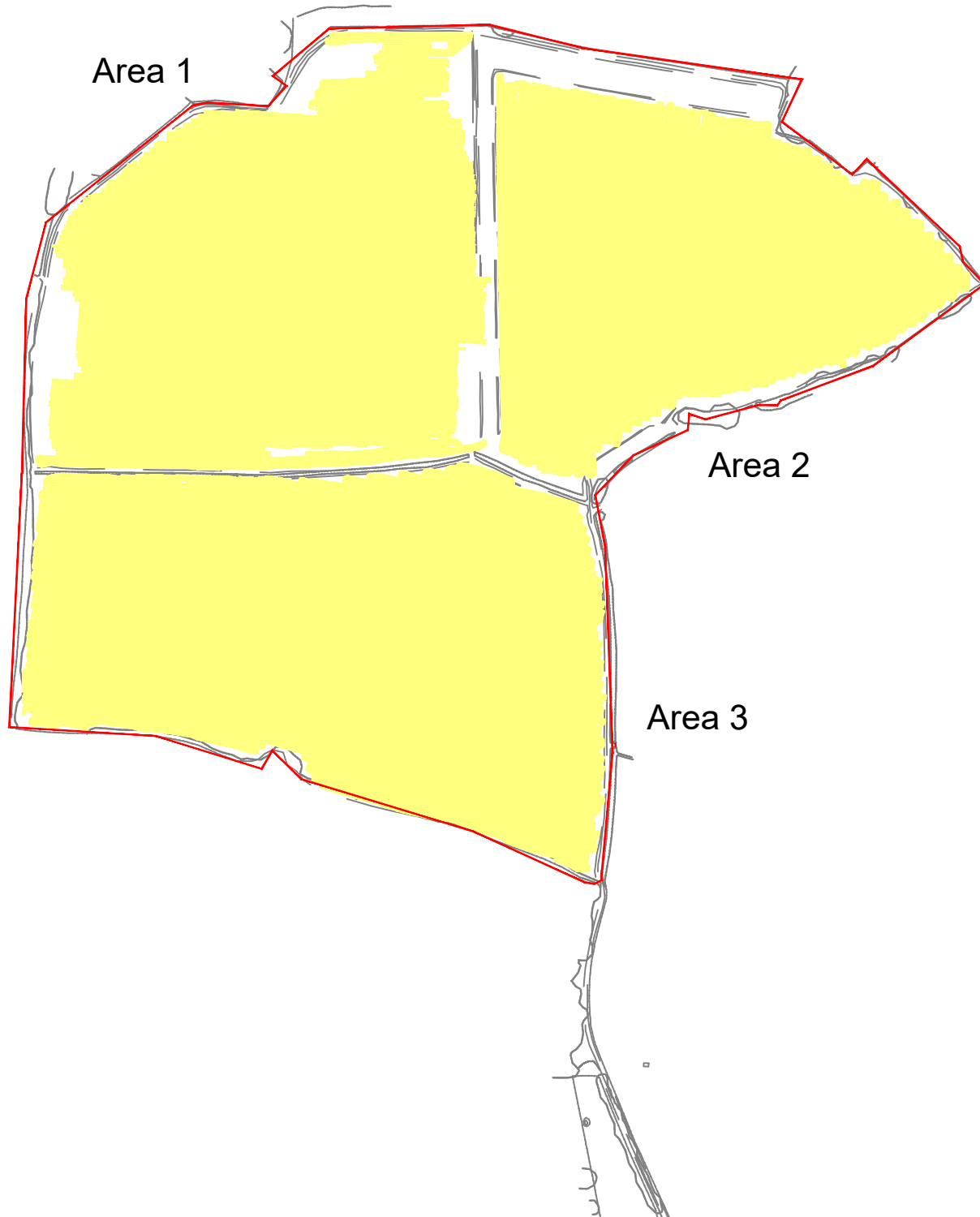
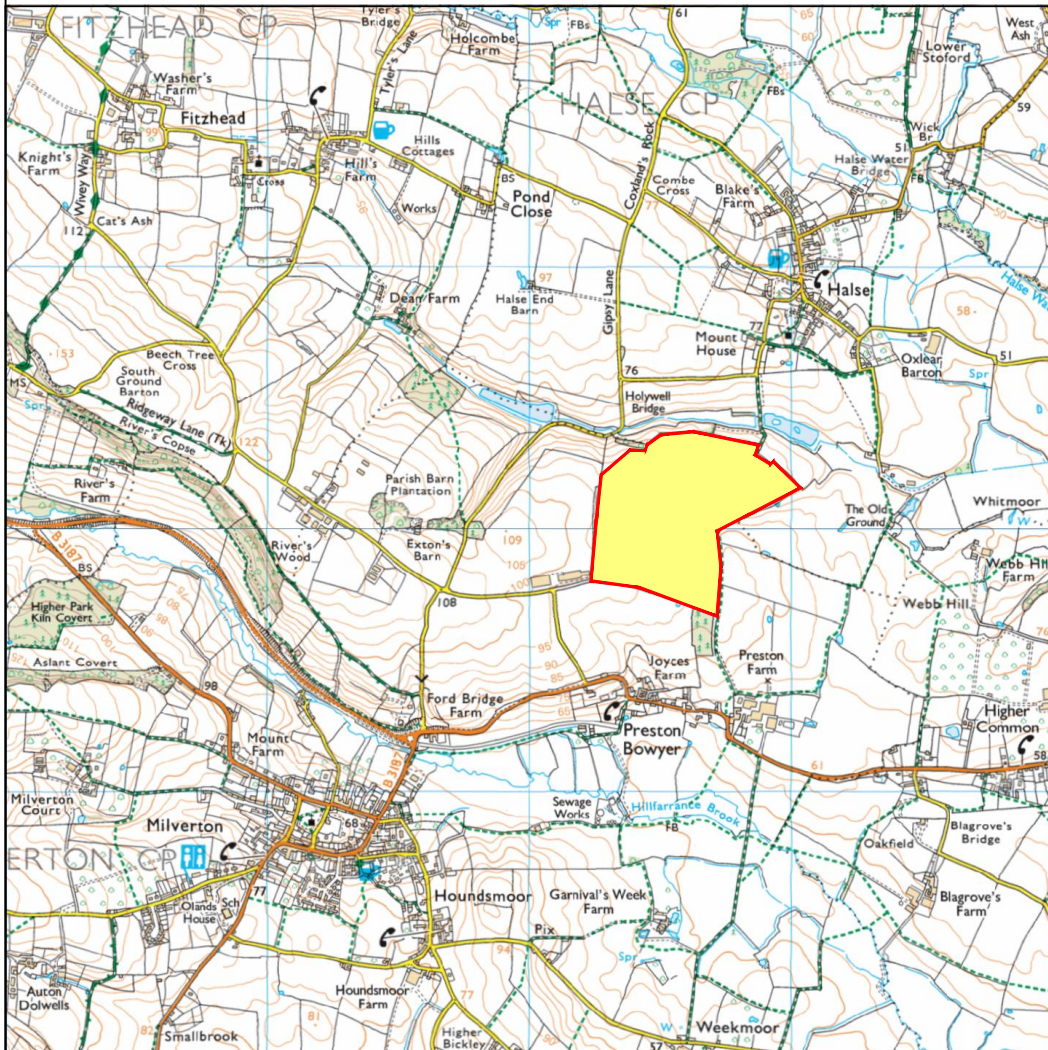
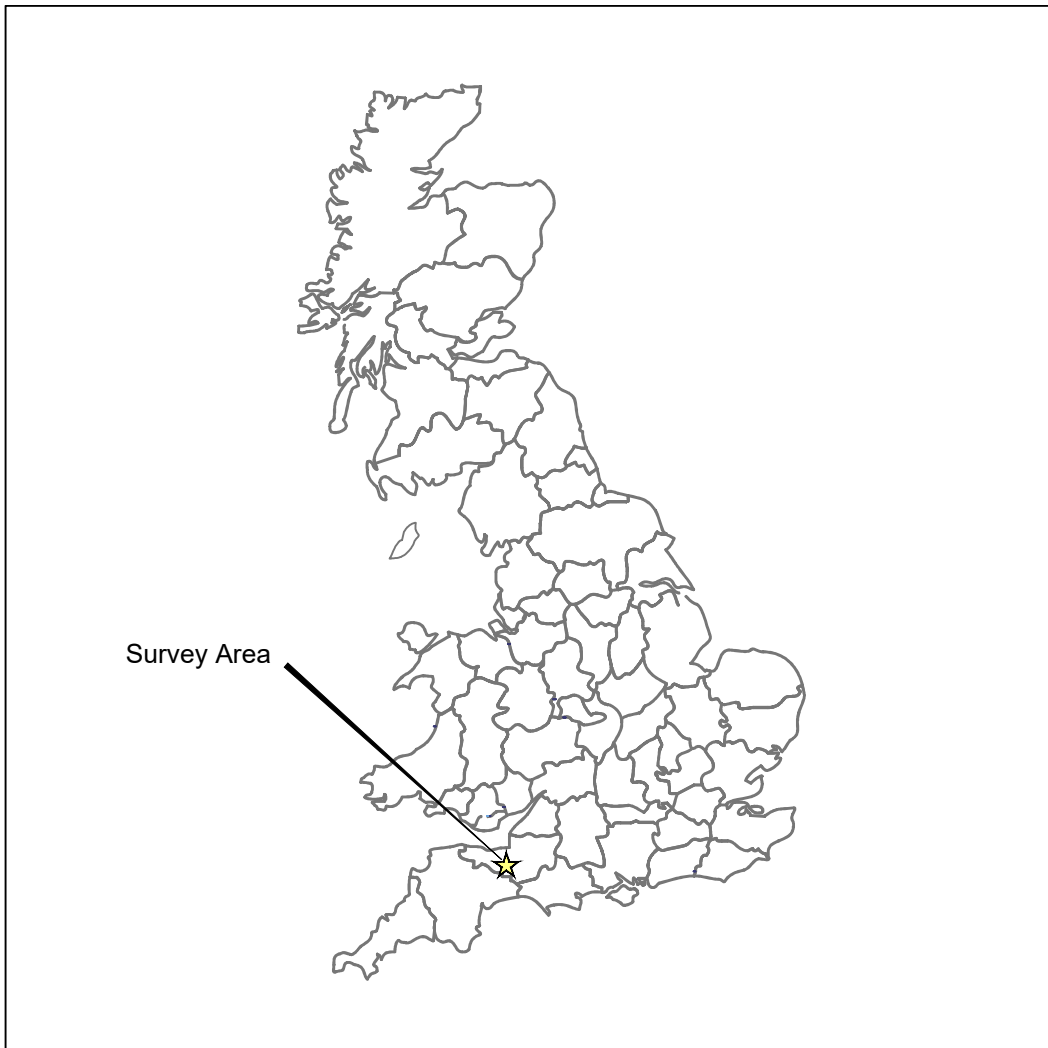
- 8.1 The magnetometer survey has identified several magnetic responses that are of clear archaeological interest. These include three enclosures or partial enclosures, which are possibly of Iron Age or Romano-British date. An additional area, comprising much weaker magnetic responses indicative of enclosures and ring ditches, has been classified as being of possible archaeological interest. Numerous former boundaries, both corroborated and conjectural, have been mapped, including the existing parish boundary between Milverton and Halse. Several uncertain responses have also been recorded.

9 REFERENCES

- BGS 2022 British Geological Survey, Geology of Britain viewer [accessed 11/02/2022] *website:* (<http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps>)
- ClfA 2014* *Standard and Guidance for Archaeological Geophysical Survey.* *Amended 2020. ClfA Guidance note. Chartered Institute for Archaeologists, Reading
http://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics_2.pdf
- CU 2022 The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. [accessed 11/02/2022] *website:* <http://mapapps2.bgs.ac.uk/ukso/home.html>
- EAC 2016 *EAC Guidelines for the Use of Geophysics in Archaeology*, European Archaeological Council, Guidelines 2.
- EH 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage, Swindon
<https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/>
(now withdrawn)

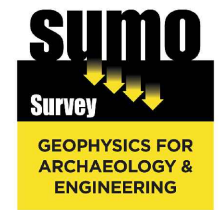
10 ARCHIVE

- 10.1 The minimally processed data, data images, XY traces and a copy of this report are stored in **SUMO Geophysics Ltd.'s** digital archive, on an internal RAID configured NAS drive in the Midland's Office. These data are also backed up to the Cloud for off-site storage.
- 10.2 The Grey Literature will be archived with OASIS and the relevant HER within a period of 12 months



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	Survey Areas	
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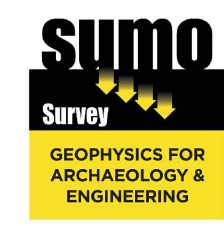
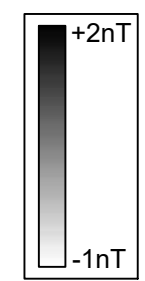
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Project:	05562 - Preston Farm, Taunton, Somerset
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Area 1

Area 2

Area 3



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Magnetometer Survey - Greyscale Plots

Client:
Orion Heritage Ltd

Project:
05562 - Preston Farm, Taunton, Somerset

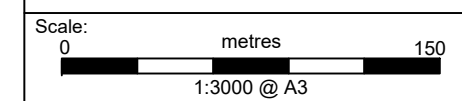


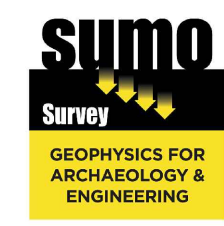
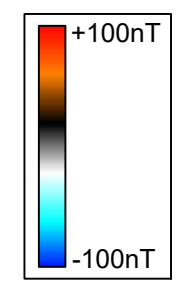
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Area 1

Area 2

Area 3



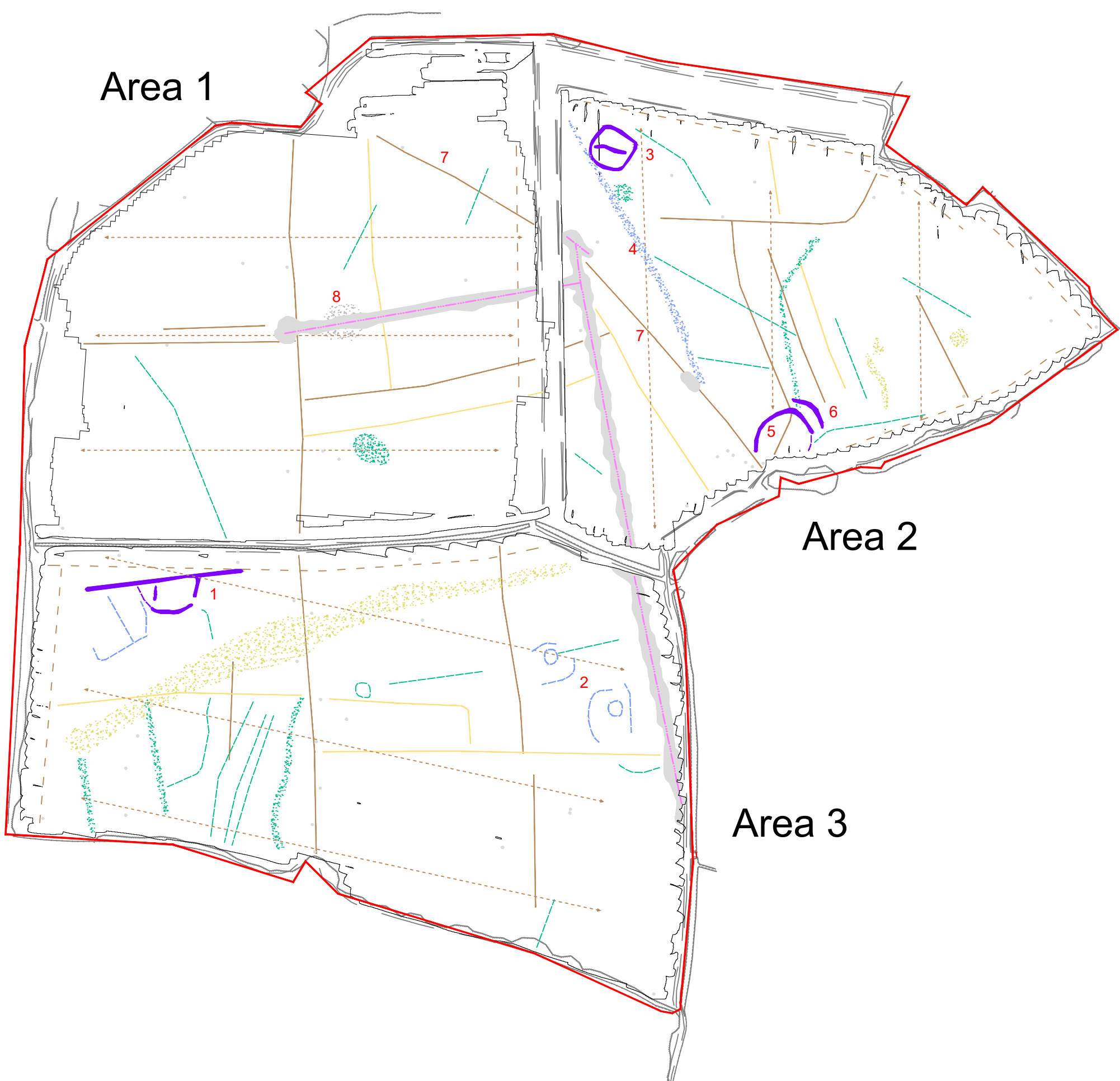
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Client:
Orion Heritage Ltd

Project:
05562 - Preston Farm, Taunton, Somerset

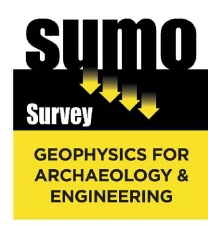
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Fig No:
03



KEY

	Probable archaeology (discrete anomaly / trend)
	Possible archaeology (increased response / trend)
	Uncertain Origin (increased response / trend)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Service
	Ferrous



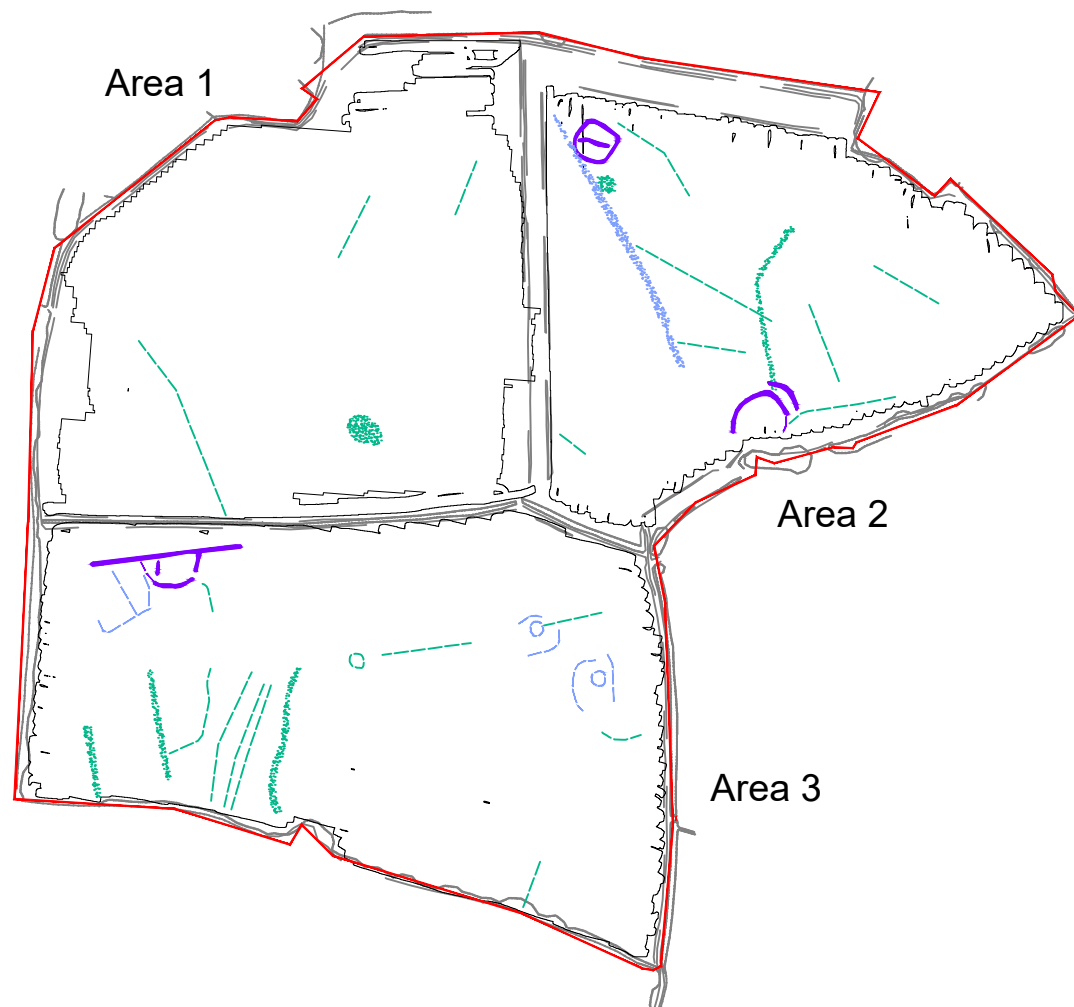
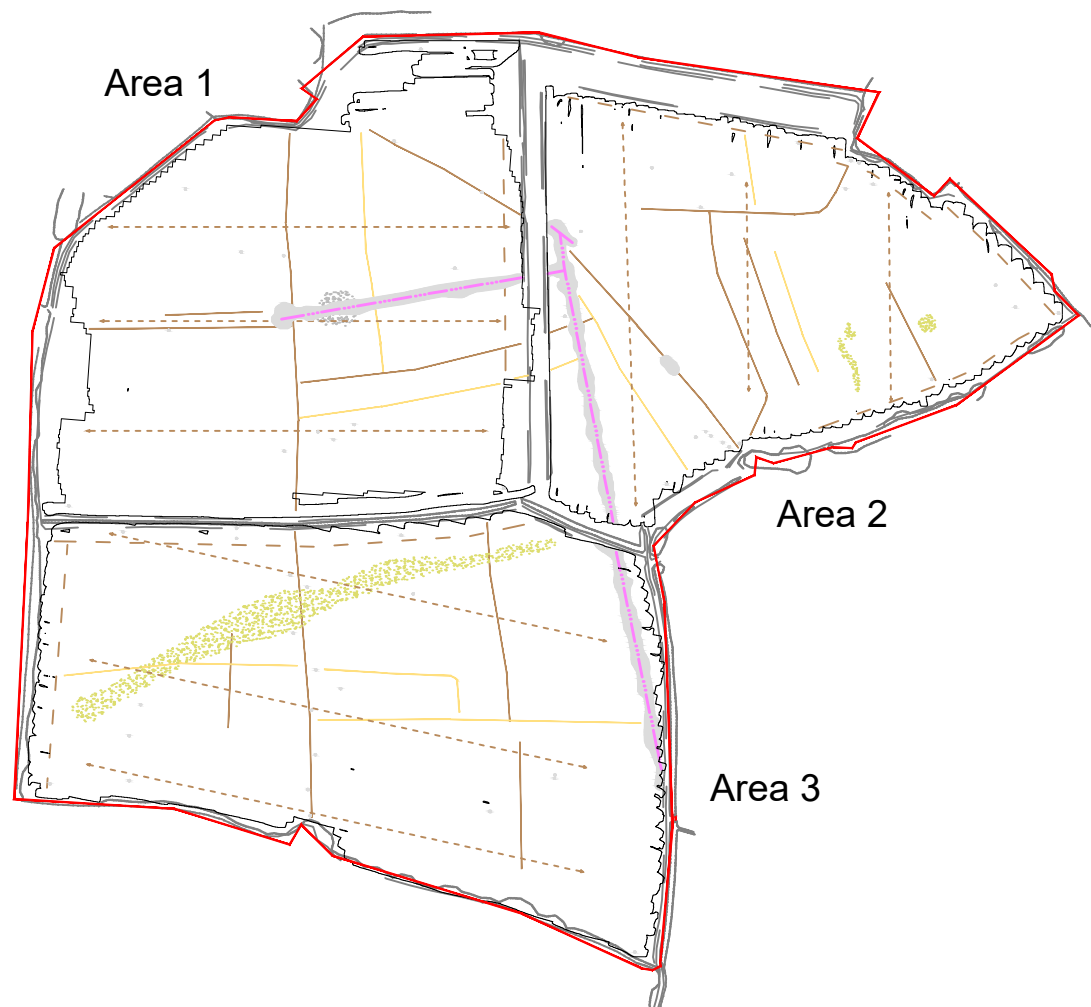
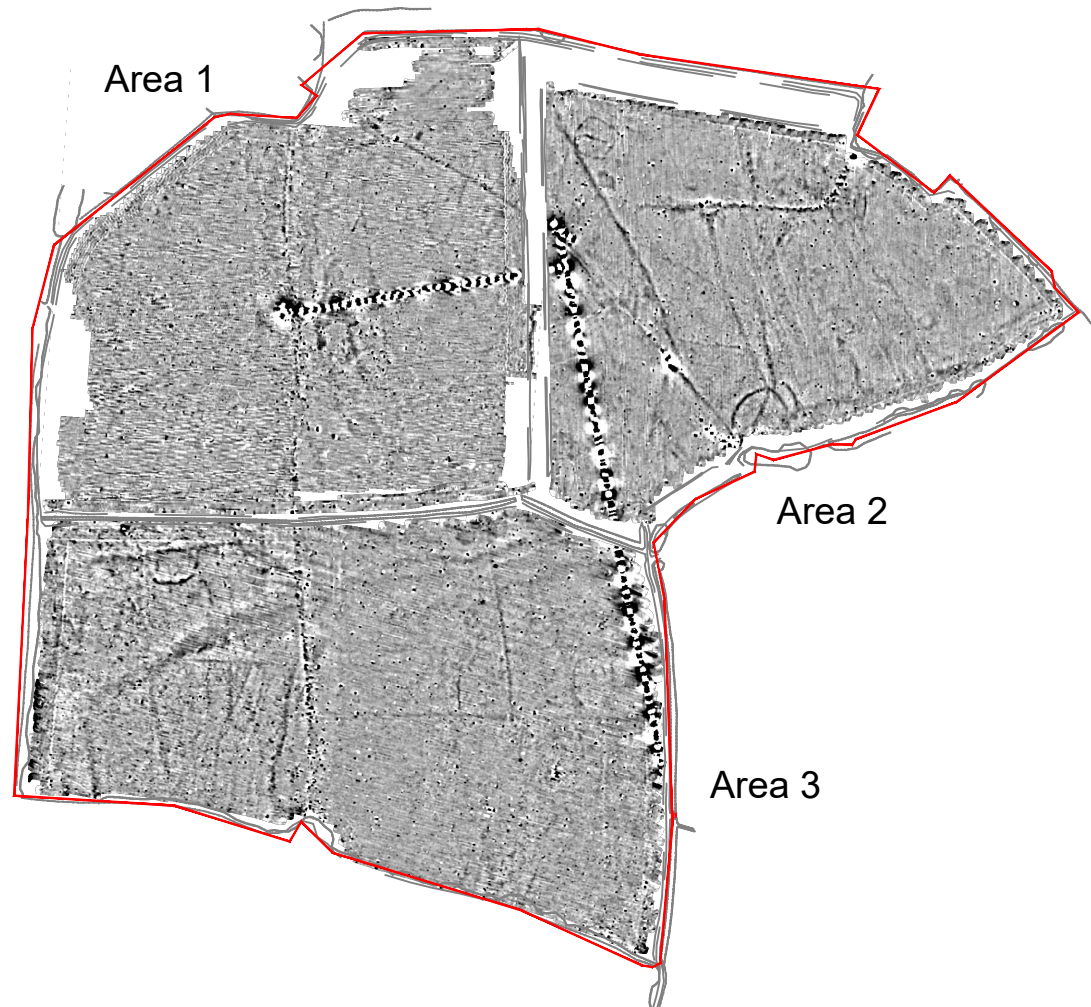
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Project: 05562 - Preston Farm, Taunton, Somerset

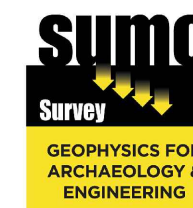
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Fig No: 04



KEY

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	Possible archaeology (increased response / trend)
	Uncertain Origin (increased response / trend)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Service
	Ferrous



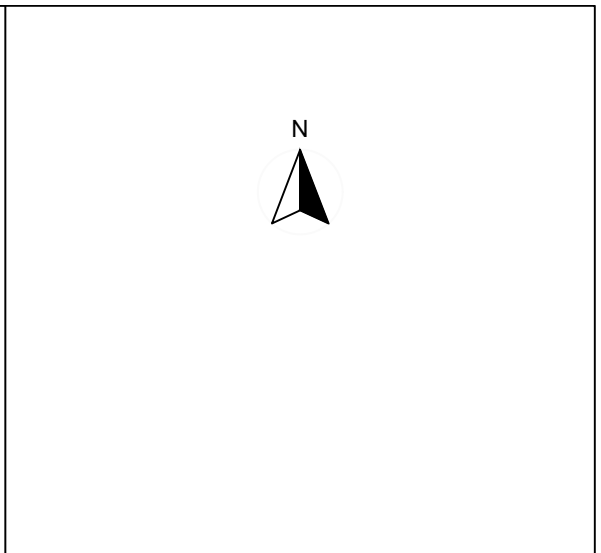
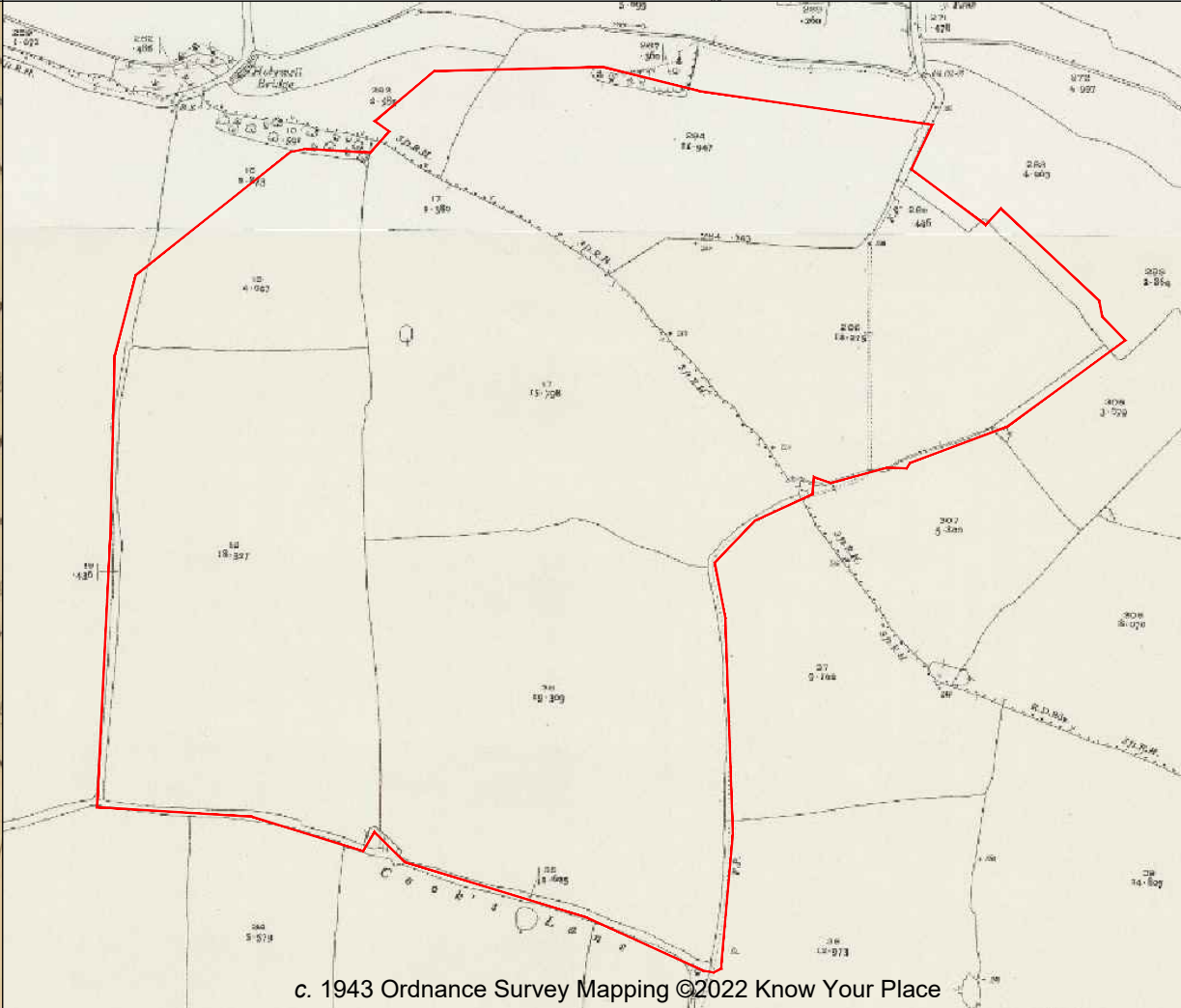
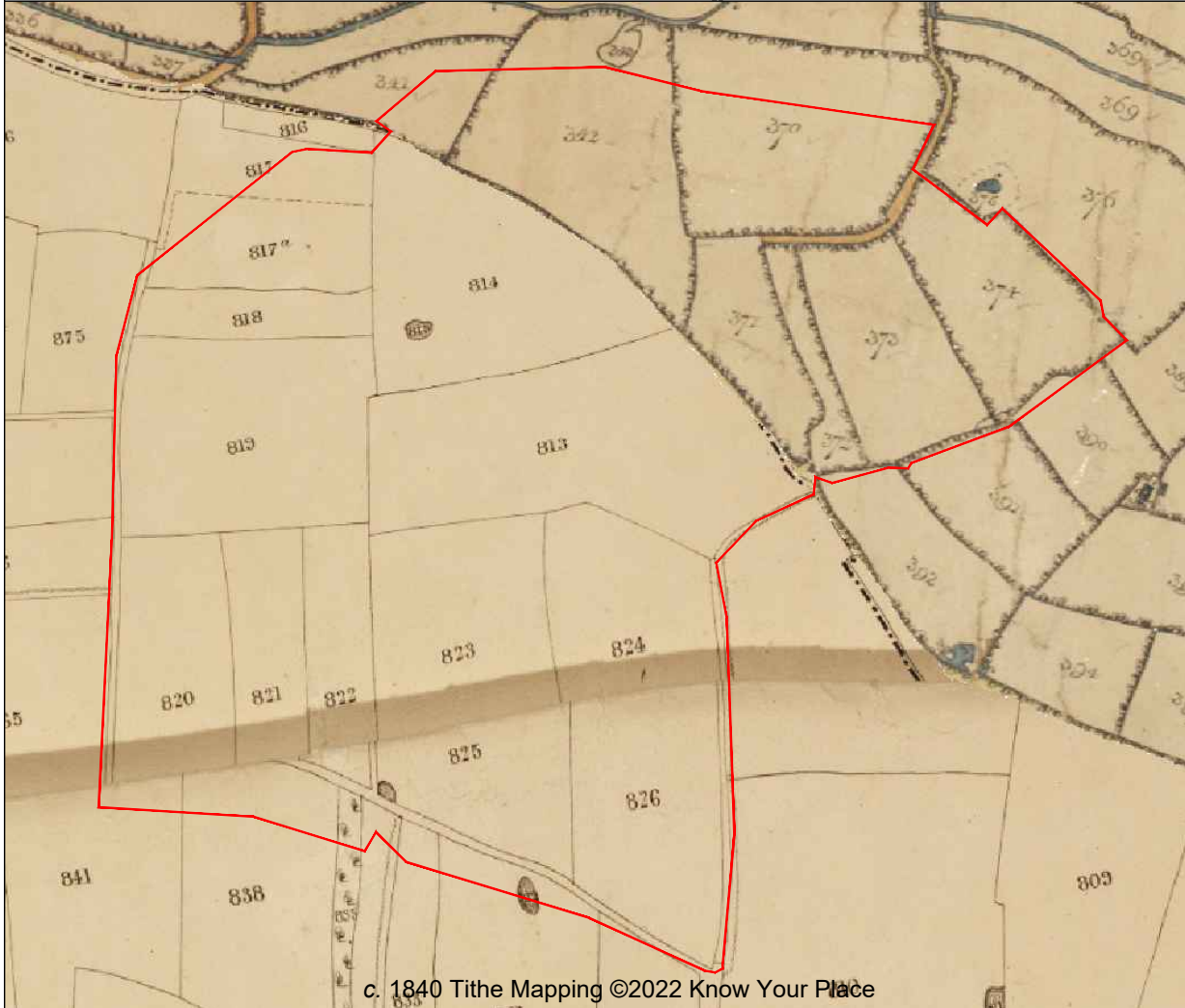
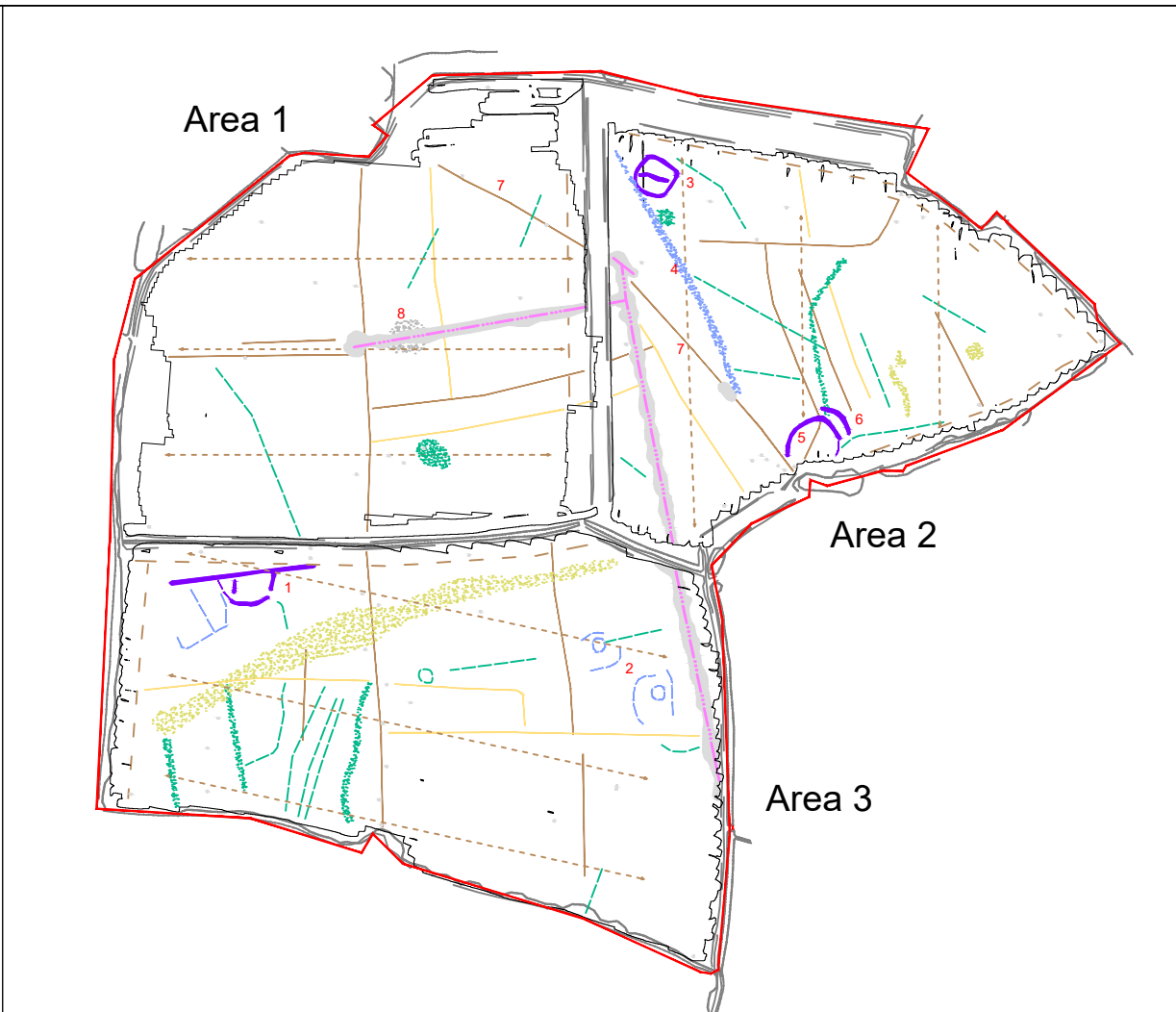
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Greyscale and Colour Plots / Interpretation

Client:
Orion Heritage Ltd

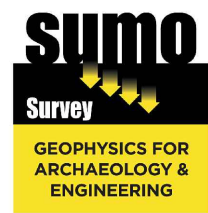
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05562 - Preston Farm, Taunton, Somerset

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KEY	
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	Uncertain Origin (increased response / trend)
	Former field boundary (corroborated)
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	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Service
	Ferrous

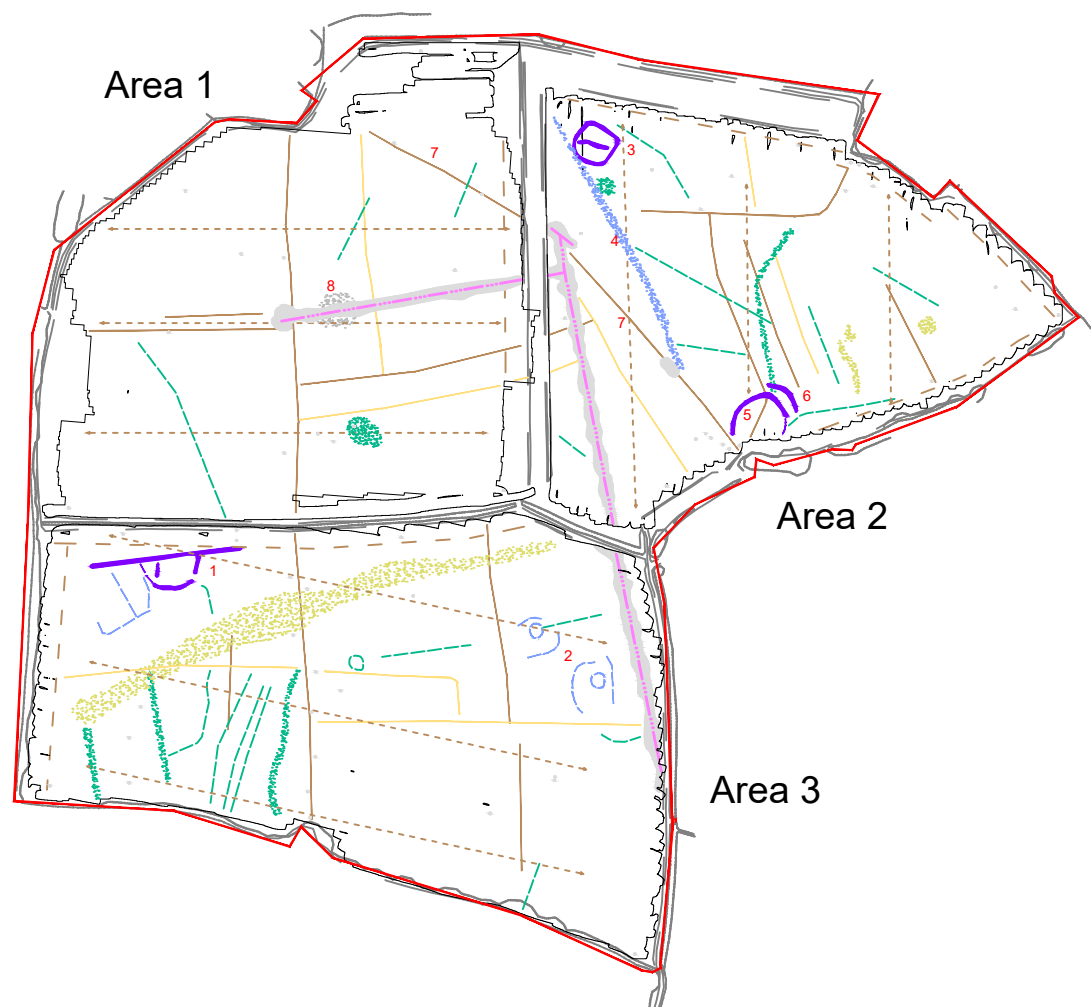
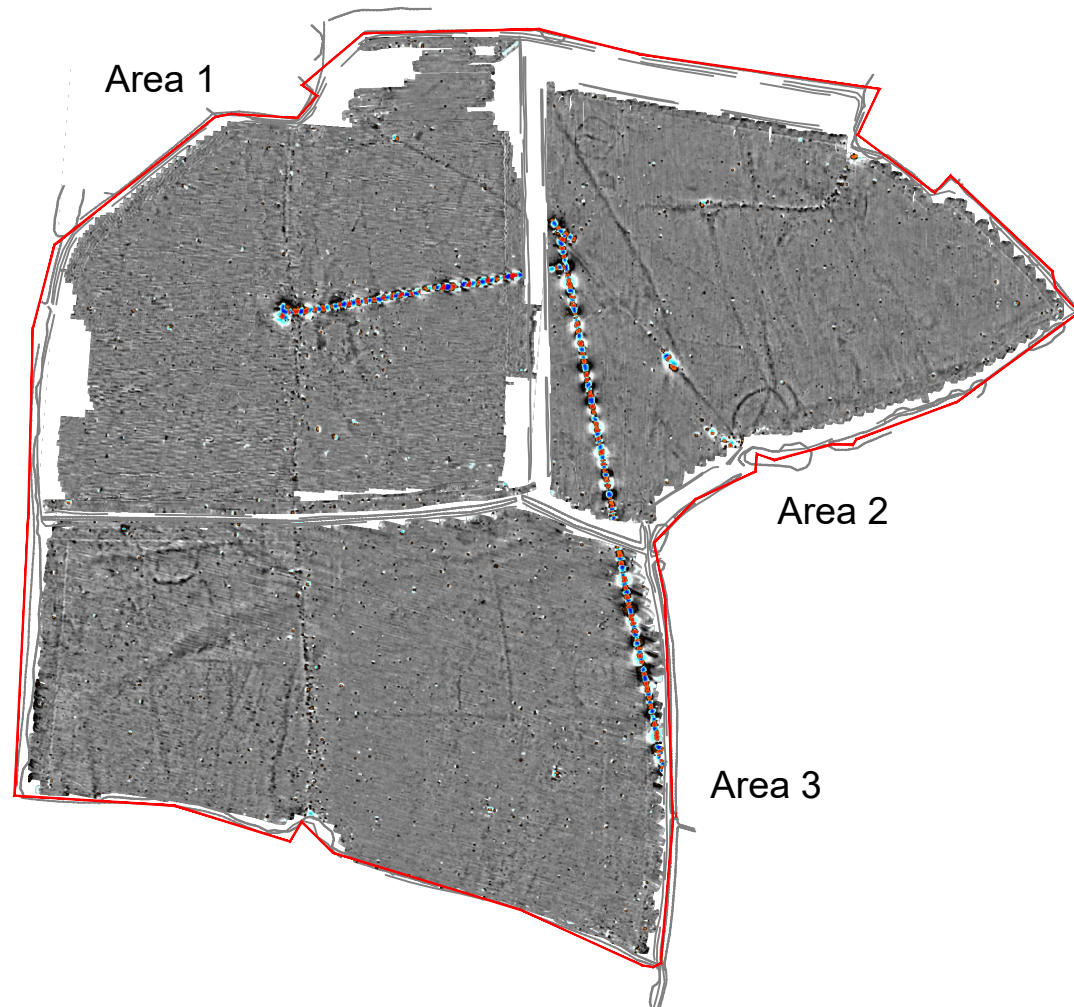


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Client: Orion Heritage Ltd

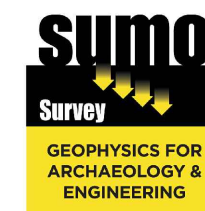
Project: 05562 - Preston Farm, Taunton, Somerset

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KEY

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	Possible archaeology (increased response / trend)
	Uncertain Origin (increased response / trend)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Service
	Ferrous



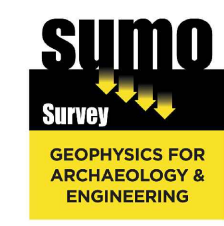
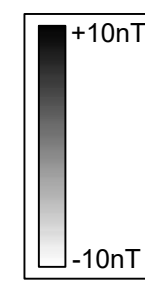
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Project: 05562 - Preston Farm, Taunton, Somerset

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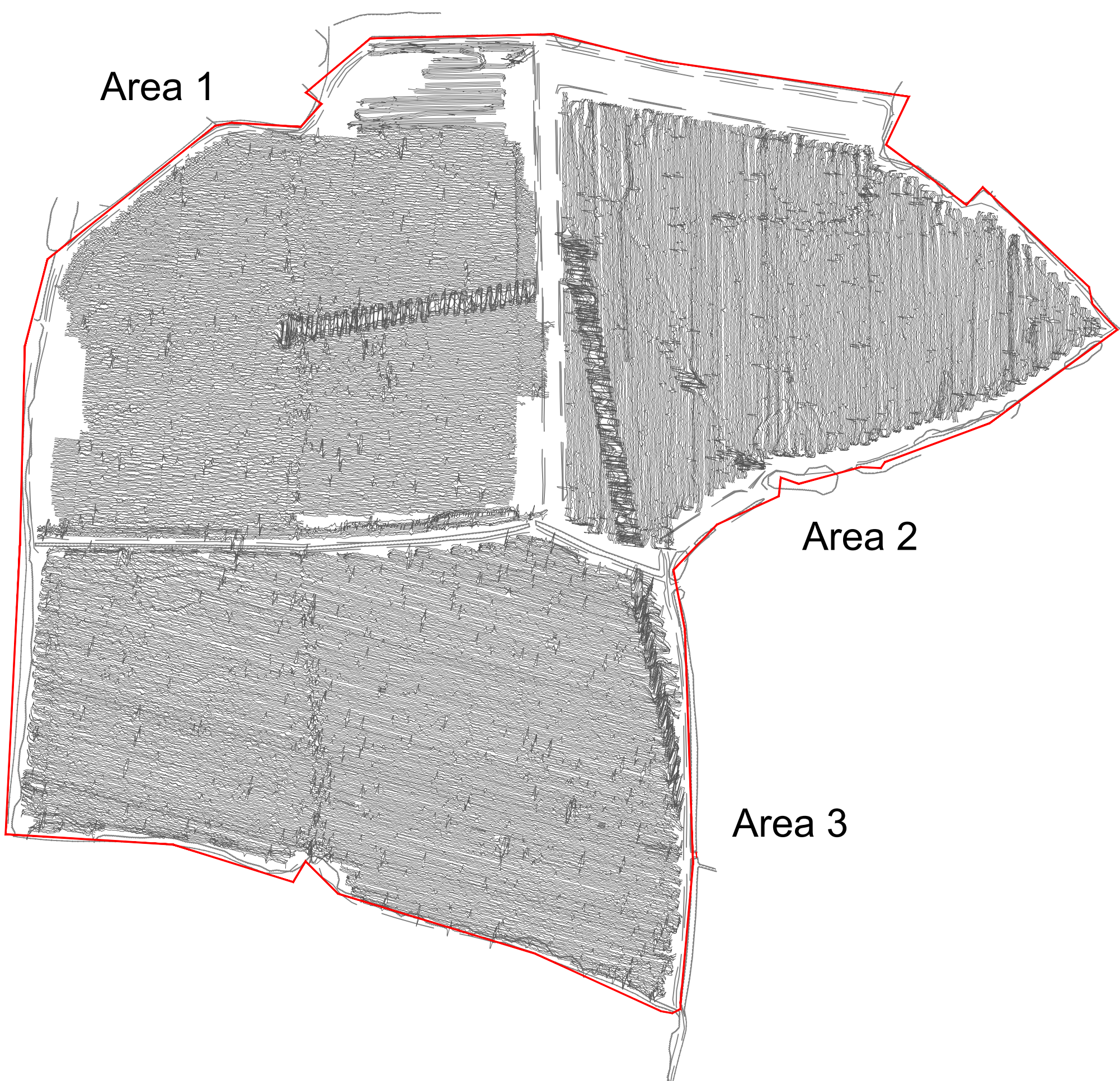
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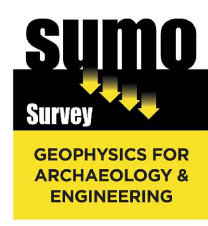
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Area 1

Area 2

Area 3



Title:
XY Trace Plots (clipped at +/-15nT)

Client:
Orion Heritage Ltd

Project:
05562 - Preston Farm, Taunton, Somerset

Scale:
0 metres 150
1:3000 @ A3

Fig No:
09

Standards & Guidance

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (EH 2008) (then English Heritage), the Chartered Institute for Archaeologists (CIfA 2014) and the European Archaeological Council (EAC 2016).

Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

Instrumentation: **Bartington Grad 601-2**

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

Data Processing

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 over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors 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.

Display

Greyscale/ Colourscale Plot	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. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.
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Presentation of results and interpretation

The presentation of the results includes a 'minimally processed data' and a 'processed data' greyscale plot. Magnetic anomalies are identified, interpreted and plotted onto the 'Interpretation' drawings.

When interpreting the results, several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to other existing evidence, the anomalies will be given specific categories, such as: Abbey Wall or Roman Road. Where the interpretation is based largely on the geophysical data, levels of confidence are implied, for example: Probable, or Possible Archaeology. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification Possible.

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 results.

<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, plough damage or even aliasing as a result of data collection orientation.
<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>Former Field Boundary (probable & 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>Ridge & 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>Agriculture (ploughing)</i>	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
<i>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</i>	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
<i>Magnetic Disturbance</i>	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
<i>Service</i>	Magnetically strong anomalies, usually forming linear features 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.
<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.

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 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.

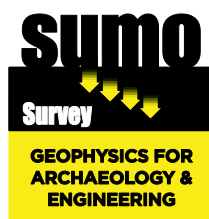
Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.

Summary for sumogeop1-504681

OASIS ID (UID)	sumogeop1-504681
Project Name	Geophysical Survey at Preston Farm, Taunton, Somerset
Activity type	Geophysical Survey, MAGNETOMETRY SURVEY
Project Identifier(s)	05562
Planning Id	
Reason For Investigation	Planning requirement
Organisation Responsible for work	SUMO Geophysics Ltd.
Project Dates	17-Feb-2022 - 24-Feb-2022
Location	Preston Farm, Taunton, Somerset NGR : ST 13614 27064 LL : 51.0364161653498, -3.23343269724456 12 Fig : 313614,127064
Administrative Areas	Country : England County : Somerset District : Somerset West and Taunton Parish : Halse Parish : Milverton
Project Methodology	A temporary grid system will be established over the site and marked out using canes. The location of the grid will be set out using an RTK GPS system theoretically accurate to some 0.01m and referenced to OS co-ordinates. Data will be collected using a cart carrying four paired Bartington magnetic sensors. Four sensors mounted 1m horizontally apart and very accurately aligned to nullify the effects of the earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. Each data point is geographically referenced using an on-board Trimble RTK survey grade GPS system. Readings will be taken at 0.125m centres along traverses 1.0m apart. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background.
Project Results	The magnetometer survey has identified several magnetic responses that are of clear archaeological interest. These include three enclosures or partial enclosures, which are possibly of Iron Age or Romano-British date. An additional area, comprising much weaker magnetic responses indicative of enclosures and ring ditches, has been classified as being of possible archaeological interest. Numerous former boundaries, both corroborated and conjectural, have been mapped, including the existing parish boundary between Milverton and Halse. Several uncertain responses have also been recorded.

Keywords	Field Boundary - POST MEDIEVAL - FISH Thesaurus of Monument Types Pipeline - 20TH CENTURY - FISH Thesaurus of Monument Types Plough Marks - POST MEDIEVAL - FISH Thesaurus of Monument Types Circular Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types D Shaped Enclosure - UNCERTAIN - FISH Thesaurus of Monument Types Ditch - UNCERTAIN - FISH Thesaurus of Monument Types Ring Ditch - UNCERTAIN - FISH Thesaurus of Monument Types
HER	Somerset HER - unRev - STANDARD
HER Identifiers	
Archives	



- Archaeological
- Geophysical
- Laser Scanning
- Measured Building
- Topographic
- Utility Mapping

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