GEOPHYSICAL SURVEY REPORT

Project

ARCHAEOLOGICAL MAGNETIC GRADIOMETRY SURVEY

Location

LAND OFF LLANRWST ROAD, CONWY

Client

Archaeology Wales

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Archaeological consultant: T Young MA PhD FGS FSA
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1 EXECUTIVE SUMMARY

1.1 This report presents the results of an archaeological magnetic gradiometry survey conducted on land off Llanrwst Road, Conwy, Wales, completed on July 21st, 2025. The survey covered approximately 5 hectares across three livestock grazing fields located 1 km south-southwest of Conwy and Conwy Castle.

1.2 The primary objective was to identify and characterise potential archaeological features to enhance understanding of the site's archaeological potential before proposed residential development. Using a SENSYS MAGNETO MXV3 magnetic gradiometer array, high-resolution data were collected across all accessible parts of the survey area.

1.3 The results reveal numerous linear anomalies, suggesting pre-modern land division unconnected to current field boundaries. Linear features identified in the central and southern areas are inferred to be levelled boundary ditch features, possibly representing field boundaries predating Ordnance Survey mapping. A series of parallel lineations present in the southern fields, evident in both magnetometry data and the digital terrain model, is interpreted as resulting from deep ploughing connected to previous farming practices.

1.4 Multiple curvilinear features identified in the central and northern parts of the survey area have been assessed as having no significant archaeological importance. The geophysical data show strong evidence of agricultural activity, with plough marks visible in both southern and northwestern portions of the study area.

1.5 No sites or features of significant archaeological importance were identified.

2 INTRODUCTION

2.1 This report describes a geophysical magnetic gradiometry survey conducted at land off Llanrwst Road, Conwy, Wales. The fieldwork was conducted on July 21st 2025, under contract to Archaeology Wales (the Client). The site is being considered for future residential housing development and requires an archaeological geophysical survey.

2.2 The geophysical survey forms part of an archaeological investigation to provide archaeology advisors with information relevant to the proposed development site. This survey will enhance understanding of the area's archaeological potential.

2.3 The survey area encompasses three livestock grazing fields, providing approximately 5 hectares of surveyable area. A high-resolution magnetic gradiometry survey covering all accessible parts of the survey area is proposed to identify geophysical features of archaeological origin.

2.4 The fieldwork and this reporting adhere to the standards set out in the Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Geophysical Survey (2020) and the Europae Archaeologiae Consilium (EAC) Guidelines for the Use of Geophysics in Archaeology (2016). The digital archive will be prepared in accordance with The National Standard and Guidance to Best Practice for Collecting and Depositing Archaeological Archives in Wales 2017 (National Panel for Archaeological Archives in Wales).

2.5 TerraDat complies with BS EN ISO 9001:2010 for Quality Management, ISO 14001:2004 for Environmental Management, OHSAS 18001 for Health and Safety, and BS 5930:2015 for Site Investigation. The company's data management practices are guided by Schmidt and Ernenwein (2013) protocols for digital archiving and the ADS Guidelines for Depositing Geophysical Data.

2.5.1 Site Description

The site is located approximately 1 km south-southwest of Conwy, Wales, centred on OSGB coordinates [277788, 376521], as illustrated in Plate 1. The survey area currently comprises four pastoral fields covering approximately 5 hectares, shown in greater detail in Plate 2. The site occupies semi-rural terrain on the southern edge of Conwy, characterised by gently to moderately sloping topography with a northeast-

facing aspect. Llanrwst Road (B5106) forms the western boundary, with existing residential developments to the north, open grazing land extending to the south, and forested hillslopes rising to the east. The surrounding landscape consists of mixed agricultural land interspersed with scattered residential properties, typical of the semi-rural fringe environment.

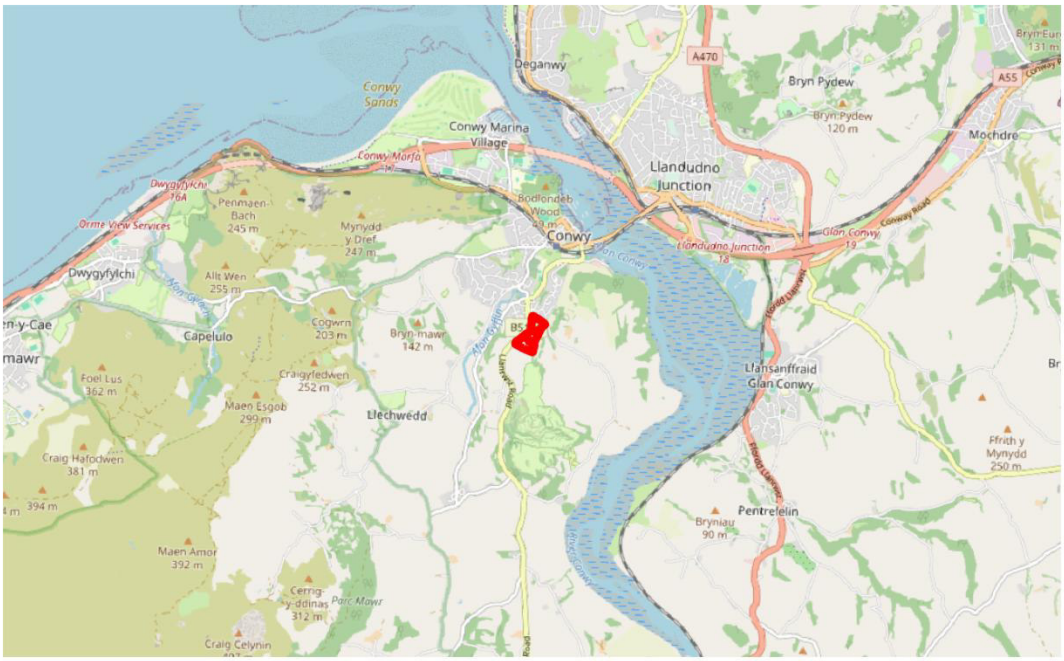

Plate 1: *Site Location (OSM Map 2025)*

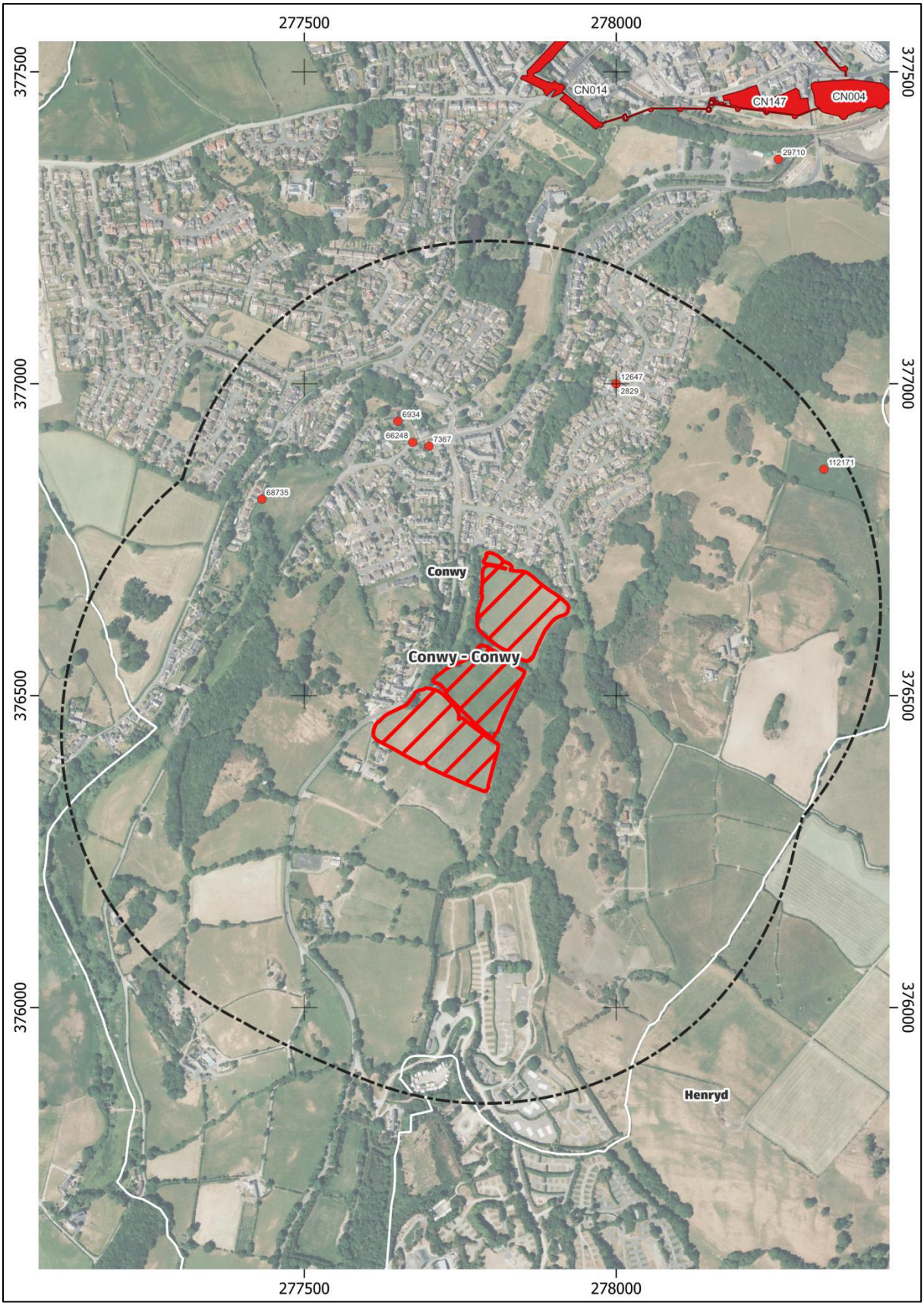

Plate 2: *Detail of the survey area with site in red and nearby sites of archaeological interest as red dots.*

2.5.2 Geology

2.5.2.1 Quaternary Geology

The British Geological Survey mapping indicates that the superficial deposits across the site predominantly comprise glacial till of Devensian age, with localised areas of alluvium consisting of clay, silt, sand and gravel deposits along watercourses, as indicated in the geological mapping. The till was deposited during the last major glaciation and consists of unsorted and unstratified material, including clay, sand, gravel, and boulders derived from local and more distant bedrock sources. The till deposits create the undulating topography characteristic of glaciated landscapes in North Wales. The alluvial deposits represent more recent Holocene sedimentation within valley bottoms and alongside present-day drainage channels, indicating areas of ongoing or recent fluvial activity that may have reworked the glacial deposits.

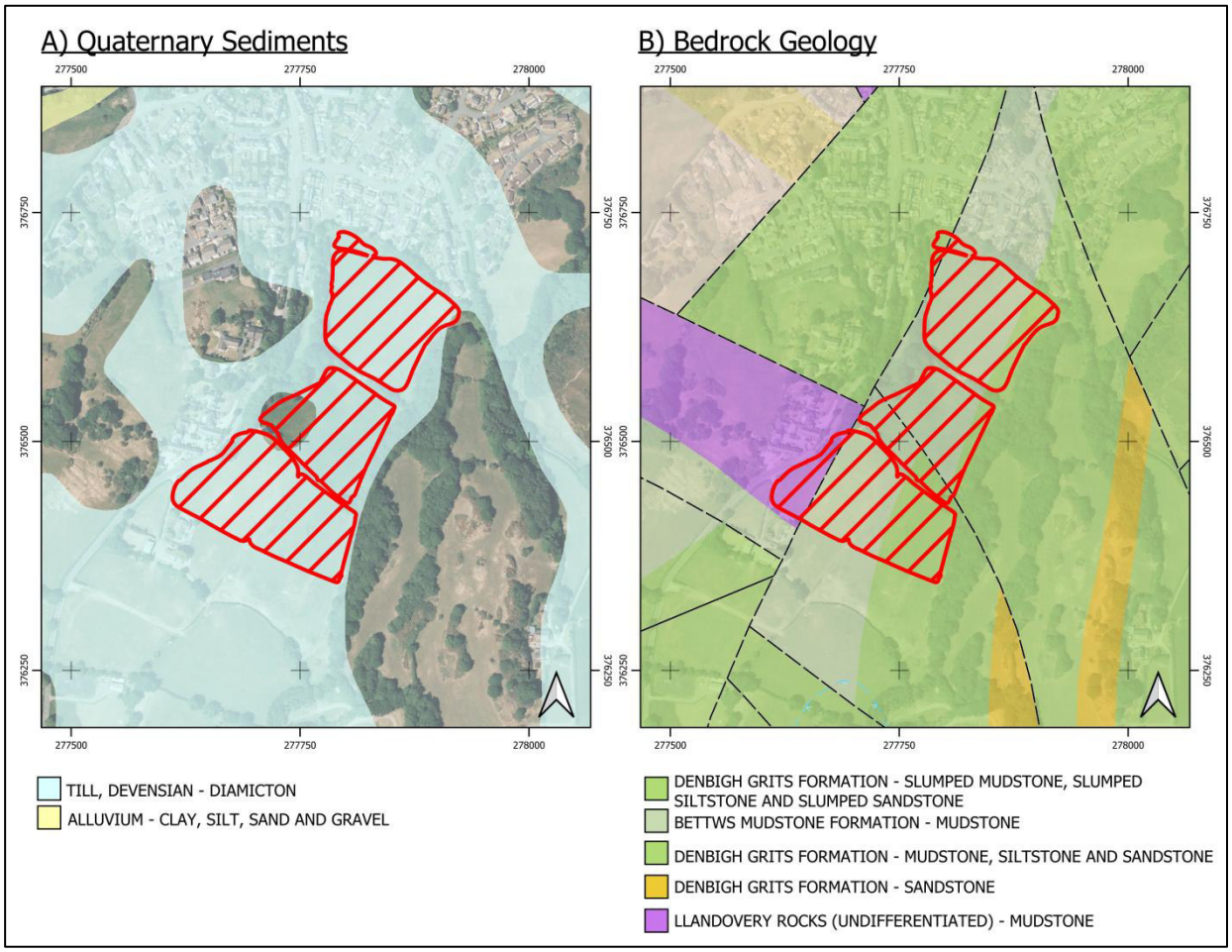

Plate 3: *Superficial geology (A) and solid geology (B) of the site and surrounding area (BGS 2025)*

2.5.2.2 Bedrock Geology

The bedrock geology comprises primarily Denbigh Grits Formation (slumped mudstone, siltstone and sandstone) with areas of Bettws Mudstone Formation, both dating to the Silurian period (420-440 million years ago). These marine sedimentary sequences reflect deposition in variable marine environments, with the Denbigh Grits indicating deeper water conditions with periodic mass-wasting events. Llandovery Rocks (undifferentiated mudstone) occur to the west. The complex depositional history involving slumping and mass movement creates variable bedrock conditions beneath the site (BGS 2025)

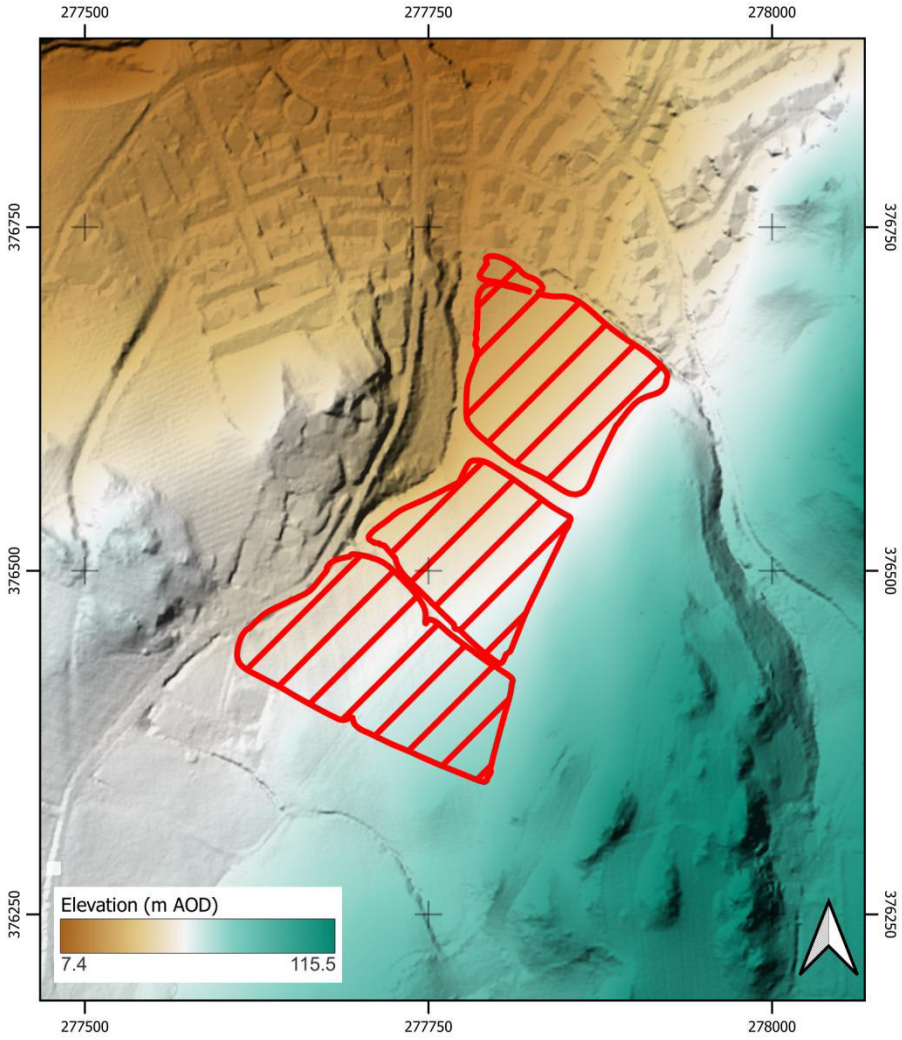

Plate 4: *Hill shaded LIDAR digital terrain model with survey area(red) (DataMapWales, 2025)*

2.5.2.3 Soil

The soils across the site are classified as Soilscape 6, characterised as freely draining, slightly acid loamy soils.

2.5.2.4 Topography

The hillshaded digital terrain model displays topography with elevations ranging from approximately 7.3m to 115.5m above Ordnance Datum across the wider area. The site itself comprises gently to moderately sloping terrain with an aspect facing northeast.

2.5.2.5 Effects of Geology on Geophysics

The glacial till, though appearing uniform in BGS mapping, likely contains a heterogeneous mix of locally-derived Silurian sedimentary material and more distant glacially-transported rocks. The freely draining loamy soils provide favorable survey conditions, though their slightly acidic nature may have enhanced chemical weathering of magnetic minerals in the upper profile. The site's relatively low topographic position and proximity to alluvial deposits may create areas of enhanced magnetic contrast due to variations in soil moisture and organic content. The gentle topography should minimize slope-related effects in the magnetic data.

2.6 Archaeological setting

2.6.1 This section overviews the site's archaeological context to support the geophysical survey results. It is not intended to be a detailed desk-based assessment (DBA) of the site.

2.6.2 The survey area is located within the historic parish of Gyffin in an archaeologically rich landscape that has seen continuous human occupation from prehistoric times through to the modern period.

2.7 Prehistoric

2.7.1 Evidence for prehistoric activity in the vicinity includes a small flint flake (PRN 68735) recovered approximately 400m southeast of the survey area, indicating probable prehistoric occupation. Additionally, a Neolithic flint blade findspot (PRN 81811) has been recorded in the broader area, suggesting early human presence dating to the Neolithic period.

2.7.2 A potentially significant prehistoric feature has been identified on LiDAR imagery as an oval enclosure or ring ditch (PRN 112171) located approximately 600m

northeast of the survey area. This feature, with associated outer structures, may represent a Bronze Age burial monument or settlement enclosure..

2.8 Medieval Period

2.8.1 The most significant medieval monument in the vicinity is St. Benedict's Parish Church, Gyffin (PRN 6934), located approximately 250m northeast of the survey area. The Cistercian Monastery of Aberconwy formerly owned this church and was possibly founded in the 12th or 13th centuries. The church consists of a long nave extended c.1500 and a chancel with north and south chapels, notable for its 15th-century painted panels and original medieval fabric.

2.8.2 The survey area lies within the medieval township of Gyffin (PRN 7367), indicating the longstanding settlement significance of this landscape. Medieval activity is further evidenced by a well (PRN 12647) recorded along the River Gyffin, constructed of 19th-century stone rubble but possibly of medieval origin.

2.8.3 Conwy Castle, located approximately 1.2km northeast of the survey area, was built by Edward I between 1283 and 1287 as part of his conquest of Wales. Designed by Master James of Saint George, this UNESCO World Heritage Site is considered one of "the finest examples of late 13th-century and early 14th-century military architecture in Europe".

2.8.4 The castle was constructed on the site of the former Cistercian Abbey of Aberconwy, demonstrating the area's longstanding religious and strategic importance. An Early Medieval bronze cup (PRN 2829) found near the castle provides evidence of continued occupation from the early medieval period through to the Norman conquest.

2.9 Post Medieval Period

2.9.1 The post-medieval period saw intensive agricultural and industrial development in the area. Several historic farmsteads are recorded in the vicinity, including Bryn-Iocyn (PRN 80461) and Bryn-glorian-mawr (PRN 80471), representing the area's agricultural heritage.

2.9.2 Industrial activity is evidenced by multiple mill sites, including a flour mill complex (PRN 34618) located approximately 750m north of the survey area, complete with mill race, dam, and tail race systems. Water management features associated with milling activities include a water mill site at Gyffin (PRN 68734) with associated mill pool and cast iron marker posts.

2.9.3 The area retains several post-medieval domestic buildings of architectural significance, including listed structures such as Cyffredin (PRN 12111), an 18th-

century house, and Pant y Graianog (PRN 11382), a late 17th to 18th-century cottage, demonstrating the continuity of settlement in this landscape.

2.10 Survey objectives

2.10.1 The primary objective of the geophysical survey is to locate and describe any detectable archaeological features present. The survey will provide context and insight as a standalone document and facilitate any subsequent fieldwork phase by indicating the detected features' location, character, extent, and potential significance.

2.10.2 The geophysical survey results will inform any subsequent archaeological investigation.

2.11 Quality control

2.11.1 The geophysical data were collected per standard operating procedures outlined by the instrument manufacturer and TerraDat company policy. All services and reports are undertaken to the highest standards to BS 5930:2015 (site investigation) and meet the standard required by The Chartered Institute for Archaeologists' Standard and Guidance for Archaeological Geophysical Survey (2020). TerraDat complies with BS EN ISO 9001:2010 for Quality Management, ISO 14001:2004 for Environmental Management, and OHSAS 18001 for Health and Safety.

2.11.2 On completion of the survey, the data were downloaded from the survey instrument onto a computer and backed up appropriately. The acquired data set was initially checked for errors that may be caused by instrument noise, low batteries, positional discrepancies, etc., and any field notes were either written up or incorporated in the initial data processing stage. The data set was then processed using standard processing routines. Once processed, the resulting plots are subject to peer review to ensure the integrity of the interpretation.

2.11.3 Our quality control standards are BS EN ISO 9001:2015 certified. The digital archive of this project will be registered with the Welsh Historic Environment Records (HER) and OASIS, with all relevant identifiers included in the final report and archive documentation.

3 SURVEY DESCRIPTION

3.1 The survey was conducted using magnetic gradiometry. The results are presented as interpreted data plans indicating the' location and physical characteristics of identified anomalous features.

3.2 The survey was conducted under a Written Scheme of Investigation (WSI) that was submitted to and approved by Heneb Gwynedd Archaeology Planning Services via Archaeology Wales before the survey.

3.3 Topographic survey/grid layout

3.3.1 The *SENSYS MAGNETO MXV3* data acquisition is controlled by proprietary software *MONMX,* which provides a real-time graphical display of ground coverage based on the RTK GPS positioning system mounted on the trailer. Survey traverses are acquired to provide as little overlap between traverses as possible while minimising any gaps between the traverses. Survey traverses are driven as straight as is reasonably practicable until the entire field is covered, after which 'headland' files are acquired at the field edges to ensure maximum coverage.

3.4 Magnetic survey

3.4.1 Magnetic surveys are designed to exploit the subtle deviation in the Earth's magnetic field caused by variable magnetic properties in the subsurface of objects/materials. These properties include ferromagnetism, remanent magnetism, and magnetic susceptibility. In an archaeological setting, these tend to be buried ferrous objects, burnt materials, or the disturbance or accumulation of naturally occurring ferrous minerals within the soil. The recorded data value is the magnetic gradient (the difference in the magnetic field strength recorded by two vertically separated fluxgate magnetometers).

3.4.2 A plan image showing the variation in the magnetic gradient of the site survey area is produced. Based on the recorded magnetic variation, it is possible to identify buried archaeological features such as walls, hearths, kilns, ditches, and pits.

3.4.3 Magnetic survey - field activity

The magnetic gradiometry data were acquired using a multi-sensor array (8 fluxgate gradiometer probes installed at 0.5 m sensor separation) mounted on a specialist modular (Sensys Magneto MXV3; Plate 5). Network-corrected RTK GPS provides real-time GPS positioning. The trailer is towed across the survey area behind an ATV

(John Deere Gator, Plate 5) at speeds of <15 km/h. This system allows for the acquisition of 0.5 m horizontal resolution gradiometry data within a 3.5 m wide swathe. The data were acquired at a rate of 200 Hz, nominally providing data at 0.025 m intervals along each traverse. This approach enhances resolution (double that of a conventional hand-held instrument in both x and y directions) and acquisition rate; However, a trade-off can be a poorer signal-to-noise ratio. The survey was conducted on July 21st, 2025, by a team of 2 surveyors covering approximately 5 hectares of accessible area.

Plate 5: *John Deer Gator and Sensys Magneto MXV3 (Library photo).*

3.4.4 Magnetic survey - data processing

3.4.4.1 The gradiometry data were acquired using *SENSYS* proprietary software *MONMX*, which produces a data file for each acquired survey line. These files are compiled in *DLMGPS*, which associates each gradiometry data point with a GPS coordinate, calculated based on the location of each sensor within the array, thus creating a single swathe of gradiometry data up to 3.5 m wide. The software applies a constant median filter to normalise the data within each swath; the data are then exported as raw ASCII files.

3.4.4.2 The ASCII files output from *DLMGPS* were further processed using TerraDat's proprietary software, MultiMag (Plate 6), to remove any poor-quality data (sensor drop-outs/data spikes, etc/overlapping data) and apply 50 Hz and rolling median filters. The 50 Hz filter removes artefacts principally associated with electrical power lines, while the median filter equalises the background data across the swathes within a dataset, removing any apparent striping between them. Plate 7 shows an example of raw data alongside filtered data. Table 1 details the processing steps that are applied to the ASCII data;

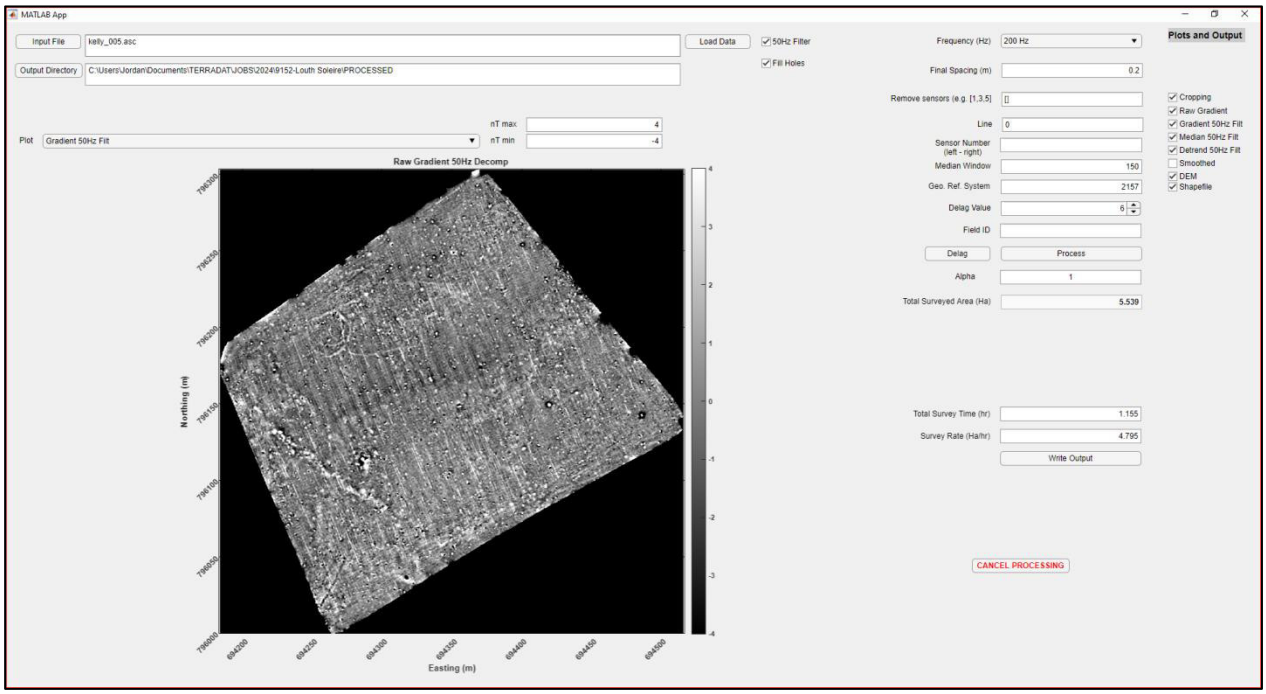

Plate 6: *TerraDat proprietary software MultiMag*

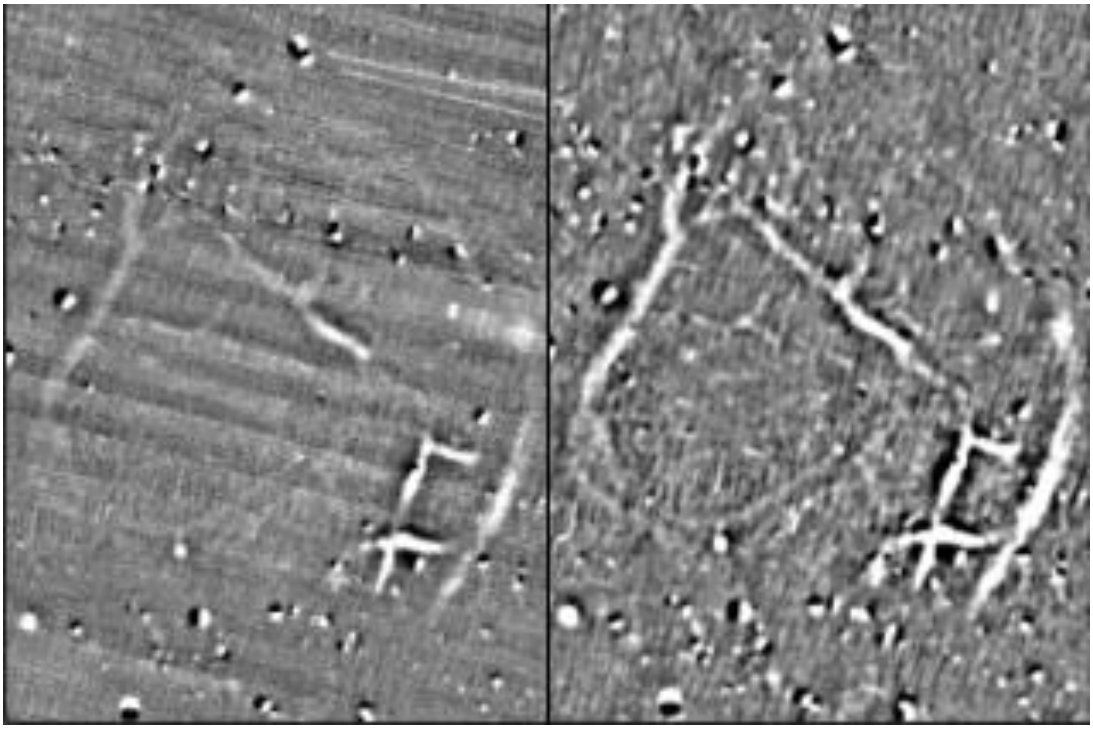

Plate 7: *Raw data (left) and filtered data (right)*

Processing Step	Description
Raw data input	Raw data (.asc) file is imported, and X,Y,Z,gradient,Time_stamp,sensor columns are retained. All other columns are removed.
Truncate Time_Stamp	Alphanumeric Time_stamp variable is truncated to the last digits (e.g. L1_20221007-095821_GZ.prm becomes 95821) to create unique IDs for each line.
Create line_number	Variable 'line_number' (i.e. 1 to #lines) is created by identifying all unique 'Time_stamp' values.
Rolling median	The median filter is calculated per line, per sensor, on values within -/+20nT and removed from the gradient to create a new 'GM' column. The rolling median filter has a window length of 400 data points centred on the input value. Therefore, the first and last 200 data points do not have sufficient information to calculate the median. In these cases, the first value calculated is applied back to the start of the line, and the last value calculated is filled forward to the end of the line. In practical terms, the median window length is equivalent to 10m of data acquisition.
Filter 50Hz Noise	50Hz noise from electrical utilities is removed through wavelet analysis, signal decomposition, and a 50Hz Bandstop filter. Both methods yield similar results. Multiple combinations of median and 50Hz filters are created (i.e. G50, G50M, G50BS and G50BSM) for comparison.
Calculate Mean Spacing	Mean along-track spacing is calculated.

Thin data	Data are thinned to specified output resolution using the calculated mean spacing
Crop overlapping data	Calculate bounding polygons around each line of data. Remove data located within reverse-ordered overlapping polygons.
Display Data	Plot thinned data and cropped areas, plot 50Hz filtered data, plot median filtered data.
Write output file	Write output file containing thinned data with X,Y,Z, gradient,Time_stamp,sensor,Gm,G50,G50M,linenum,G50BS,G50BSM.
Write output GPS	Write output X,Y,Z gps file using centre (actual GPS) data.

***Table 1**: Processing steps applied to the raw magnetic gradiometry data.*

3.4.4.3 The magnetic gradiometry data is output as raw and filtered 'XYZ' files in .CSV format. The height data from the GPS is also output as an approximately 3 m x 0.125 m resolution DTM of the Site. These files are gridded in Oasis Montaj, using minimum curvature gridding and a grid cell size of 0.2 m. Once the data is gridded and an appropriate colour scale applied, the data is exported as high-resolution GeoTiff images (900 DPI) before being imported into the open-source GIS software qGIS. Features of interest are then digitised to produce summary archaeological interpretation plans. These are integrated with the DTM to allow consideration of any identified archaeological features within the site's topography. Final figures are created in CorelDraw.

4 RESULTS AND DISCUSSION

4.1 The final processed data is of generally good quality. Minor data gaps exist where adjacent traverses failed to overlap properly or where patches of vegetation along boundaries inhibited surveying. These inaccessible areas constitute only a small percentage of the total survey area and do not compromise the overall integrity of the results.

4.2 The data are presented as a series of grey-scaled plots showing variations in magnetic gradient intensity across the survey area. Positive values appear white in all plots, while negative values appear black. Both raw and processed magnetic data have been included to support the archaeological interpretation. The data are presented at a scale of: +/-4nT. All figures are presented at a map scale of 1:1250 when printed at A3.

4.3 Anomalous geophysical features of interest have been digitised and presented as summary interpretation plots (Plate 8). A table with descriptions of interpretive features is provided in the appendix.

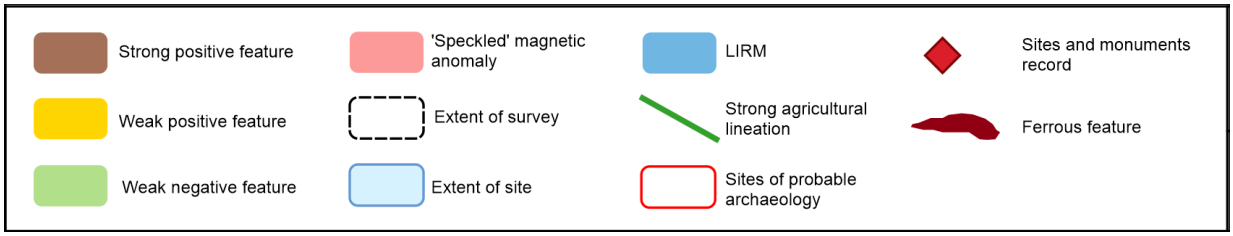

***Plate 8**: Key to be used in conjunction with the interpretive plots*

4.4 Magnetic gradiometry

4.4.1 Magnetic gradiometry (measurement of the vertical gradient of the Earth's magnetic field, using two sensors, one positioned above the other typically at 1.0m separation) developed from magnetometry (measurement of the Earth's magnetic field strength, using a single sensor) to free magnetic surveys from the constraint of requiring base-station measurements to compensate for diurnal variation in field strength.

4.4.2 The identified magnetic anomalies (i.e. areas with a magnetic gradient that deviates from that of the typical site background) may be due to the influence of one of three main magnetic properties: **ferromagnetism** (that exhibited by a magnetic object of ferrous metal), **remanent magnetism** (a permanent sympathetic magnetic field acquired during the cooling of a hot object, commonly seen in both fixed

archaeological features such as hearths, as well as portable materials, (such as ceramic building material [CBM]) and most importantly of all, **magnetic susceptibility** ([MS], a measure of the temporary sympathetic magnetic field generated by a body in an ambient field). Typically, weathering elevates the magnetic susceptibility, so soils have a higher MS than their parent rock. Anthropogenic processes (particularly heating) may also enhance MS. Thus, the fills of archaeological cut features typically show a higher magnetic susceptibility than the substrate into which they are cut (and thus appear as positive anomalies). There are exceptions to this sense of susceptibility contrast – for instance, where a cut feature is filled by stone with low magnetic susceptibility. For structures built of stone, there is typically a stronger contrast between the lower MS stonework and higher MS occupation deposits (meaning that stone walls, drains, etc., usually show negative magnetic anomalies).

4.4.3 Ferrous materials will usually strongly influence the magnetic gradient but of a limited spatial extent. These anomalies typically show strong negative and positive components (so a small iron object appears as a black/white dot on the plots). Accumulations of iron objects may generate a speckled appearance – typical, for instance, of the sites of former wire fences. The remanent magnetic fields of CBM may also produce speckled textures – brick rubble will appear similar to a spread of ferrous debris but with lower magnitude 'spikes'.

5 GEOPHYSICAL INTERPRETATION

5.1 The survey extends over three fields, numbered here for ease of reference 1-4 from N to S. Devensian till underlies the site overlying the Lower Silurian Bettws Mudstone Formation, which crops out solely in the western part of Field 2. The topography rises from approximately 29m ASL in the NW to 71m ASL in the SE.

5.2 The modern land boundaries, in part, predate the Tithe Survey of c. 1840, with Field 1 being Cae leidr isaf (owned by Llanbedr Parish and occupied by Thomas Jones), Field 2 Cae leidr uchaf (owned by Llanbedr Parish and occupied by Robert Roberts), but fields 3 and 4 were part of an apparently unenclosed tract (Bryn glorion) owned by Lord Newborough and tenanted by Catherine Edwards.

5.3 By the period of the 1st Edition 1:2500, the local field boundaries were approximately in their current configuration. The property of Pen Bryn appears on OS cartography between 1964 and 1993, and with it the division of Field 3 from Field 4 (the two previously being part of a larger field with land to the south as well as the area around Pen Bryn.

5.4 This differential history of the fields is exhibited in the magnetic data by the strong NNW-SSE lineation across the southern fields, 3 and 4. This lineation is marked by negative magnetic anomalies, mainly on a spacing of approximately 5m. Such a pattern is typical of deep ploughing employed to break an iron pan or otherwise improve drainage. There is also a SW-NE lineation in the same fields marked by rather more closely-spaced positive magnetic anomalies, with a well-developed ploughing lineation close to the NW margin of Field 3. Close to the S boundary of fields 3 and 4, there are some WNW-ESE and NNE-SSW oriented linear negative anomalies. These features all suggest a protracted history of land improvement since the formerly unenclosed area was brought into cultivation in the mid- to late 19th century, but before subdivision of the original field in the late 20th century. The intensity of these lineations has the potential to mask any low-amplitude anomalies in this area.

5.5 Field 2 shows two marked NW-SE linear anomalies traversing the width of the field parallel to the N field boundary. The southern of these is a positive anomaly, the northern a negative anomaly. The southern anomaly closely corresponds to an area of dark cropmark on Google Earth imagery from Getmapping dated 20/4/2009. It is slightly oblique to a similar zone of imagery from Bluesky, Infoterra & COWI A/S dated 1/1/2006. The anomaly is very likely to be associated with drainage. The northern anomaly obliquely traverses a second dark area on the same Google Earth imagery; thus, it too is

interpreted to be drainage related. The line of the oblique cropmark on the 2006 image corresponds to the line of a bedrock fault mapped by BGS. Thus, it is suggested that these drains are positioned to remediate damp areas associated with aspects of the bedrock geology, which is itself mostly not imaged.

5.6 BGS also map an outcrop of the solid geology on the W side of Field 2. This is not imaged by the magnetic survey, except for its northern side, which is marked by a broad magnetic anomaly (running approximately from [277773, 376561] to [277785, 376538]).

5.7 Field 2 shows minor magnetic lineations oriented approximately N-S. NW-SE and SW-NE, all probably associated with ploughing.

5.8 Field 1 shows rather sharper magnetic anomalies than in the rest of the site. Particularly prominent is a negative magnetic anomaly running NNE-SSW, with a slight change in orientation where it crosses a less well-marked negative magnetic anomaly oriented NW-SE. These two anomalies are interpretable as being associated with drains.

5.9 Field 1 shows two sets of magnetic lineations, indicative of ploughing. The entire field shows evidence for a NW-SE lineation, but in the west (from a line about 10m to the W of the N-S drain), a NNE-SSW lineation is dominant – possibly suggesting a former division of the field into two.

5.10 Field 1 also displays some lower amplitude, more diffuse, positive linear magnetic anomalies. These include linear elements from [277782, 376633] to [277818, 376634] and from there to [277802, 376590]. Curvilinear elements extend from [277820, 376639] to [277853, 376685] and from [277792, 376657] to [277825, 376670]. It is unclear whether these represent anomalies of geological origin or are suggestive of archaeological cut features, although a geological origin appears the more likely.

5.11 A slight, similar, low-amplitude positive anomaly extends just to S of the northern field boundary from [277815, 376699] to [277898, 376656]. This is likely to be associated with the modern boundary rather than being of archaeological origin.

5.12 In summary, the magnetic survey has recorded multiple magnetic anomalies within the study area, but none of them are conclusively of archaeological origin.

6 REFERENCES

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Disclaimer

This report represents an opinionated interpretation of the geophysical data. It is intended to guide follow-up invasive investigation. Features that do not produce measurable geophysical anomalies or are hidden by other features may remain undetected. Geophysical surveys complement invasive/destructive methods and provide a tool for investigating the subsurface; they do not produce data that can be taken to represent all of the ground conditions found within the surveyed area. Areas that have not been surveyed due to obstructed access or any other reason are excluded from the interpretation.

Appendices

7 Appendix A: Glossary

A

Alluvium: Clay, silt, sand and gravel deposits laid down by flowing water, typically found along present-day or former watercourses

Anomaly: A deviation from the expected background geophysical reading that may indicate the presence of archaeological features, geological variations, or modern disturbance

Archaeological gradiometry: Geophysical survey technique measuring variations in the Earth's magnetic field gradient to detect buried archaeological features

B

Background signal: The typical magnetic reading for an area, against which anomalies are identified and interpreted

Bedrock geology: The solid geological formations beneath superficial deposits; at this site comprising Silurian period mudstones, siltstones and sandstones

Bettws Mudstone Formation: Silurian period geological formation (420-440 million years old) consisting primarily of marine mudstones

BGS: British Geological Survey - the UK's national geological survey organization

C

CIfA: Chartered Institute for Archaeologists - the professional body for archaeologists in the UK

Cut feature: Archaeological feature that has been excavated into the ground, such as ditches, pits, postholes, or foundation trenches

D

Denbigh Grits Formation: Silurian geological formation comprising slumped mudstone, siltstone and sandstone deposited in marine environments

Devensian: The most recent major glaciation in Britain (approximately 115,000-11,700 years ago), responsible for depositing the glacial till across the site

DTM: Digital Terrain Model - computer representation of ground surface elevation

E

EAC: Europae Archaeologiae Consilium - European archaeological organization providing professional guidelines

F

Ferrous: Containing or relating to iron; ferrous objects create distinctive magnetic anomalies

Fluxgate gradiometer: Instrument used to measure magnetic field gradients, consisting of two vertically separated magnetic sensors

G

Glacial till: Unsorted mixture of clay, sand, gravel and boulders deposited directly by glacial ice during the Devensian glaciation

GPS: Global Positioning System - satellite navigation system providing precise location coordinates

Gradiometry: Measurement of the difference in magnetic field strength between two points, typically using vertically separated sensors

Gyffin: Historic parish within which the survey area is located, containing medieval church and settlement remains

H

HER: Historic Environment Record - database of archaeological sites and finds maintained by local authorities

L

LiDAR: Light Detection and Ranging - remote sensing technique using laser pulses to create detailed topographic maps

Linear anomaly: Elongated geophysical feature, often representing archaeological boundaries, ditches, walls, or agricultural features

Llandovery Rocks: Silurian geological formation of undifferentiated mudstone occurring west of the survey area

M

Magnetic gradient: The rate of change of magnetic field strength with distance, measured in nanotesla per meter

Magnetic susceptibility: Measure of how easily a material becomes magnetized in response to an applied magnetic field

Magnetometry: Geophysical technique measuring variations in the Earth's magnetic field to detect buried features

N

Nanotesla (nT): Unit of magnetic field strength used in archaeological geophysics (one billionth of a tesla)

Negative anomaly: Magnetic reading lower than the background level, often indicating stone structures, walls, or robbed-out features

O

OASIS: Online Access to the Index of Archaeological Investigations - national database of archaeological projects

Ordnance Datum: Standard sea level reference point used for elevation measurements in Britain

P

Positive anomaly: Magnetic reading higher than background level, typically indicating filled ditches, pits, hearths, or areas of enhanced magnetic susceptibility

PRN: Primary Record Number - unique identifier used in Welsh Historic Environment Records

Q

Quaternary: Most recent geological period covering the last 2.6 million years, including glacial and post-glacial deposits

R

Remanent magnetism: Permanent magnetization retained by materials after exposure to heat or strong magnetic fields

RTK GPS: Real-Time Kinematic Global Positioning System - high-precision satellite positioning achieving centimeter-level accuracy

S

SENSYS Magneto MXV3: Multi-sensor magnetometer array system used for high-resolution archaeological surveys

Silurian: Geological period 420-440 million years ago when the bedrock formations beneath the site were deposited

Superficial deposits: Geological materials overlying bedrock, including glacial till, alluvium, and other Quaternary deposits

T

Till: See Glacial till - unsorted sedimentary material deposited directly by glacial ice

Tithe Survey: Mid-19th century mapping and recording of land ownership and use for taxation purposes

W

WSI: Written Scheme of Investigation - document outlining proposed archaeological methodology and standards

8 Appendix B: Feature Description Table

Feature Type	Symbol Description	Archaeological Interpretation
MAGNETIC SIGNATURES		
Strong positive feature	Brown fill	Typically indicates thermoremanent features (hearths, kilns, furnaces), filled pits with organic/burnt material
Weak positive feature	Yellow fill	Often represents shallow cut features (ditches, pits, postholes), ploughed-out archaeological deposits
Weak negative feature	Light green fill	Usually indicates banks, walls, stone features, or soil displacement
'Speckled' magnetic anomaly	Pink/salmon fill	Areas of magnetic disturbance from modern debris burned material scatter
SURVEY BOUNDARIES		
Extent of survey	Black dashed line	Defines total area covered by geophysical survey
Extent of Site	Light blue dashed line	Indicates site boundary
ARCHAEOLOGICAL FEATURES		
Archaeological Site	Red outline	Area of archaeological interest based on survey evidence
Sites and monuments record	Red diamond	Known archaeological sites recorded in official databases
Possible archaeology	Black curved/shaded line	Potential archaeological features
HISTORICAL LANDSCAPE FEATURES		
Old field boundary	Brown dashed line	Former field boundaries from historical Ordnance Survey maps
Feature on historical AP	Dotted line	Features visible in aerial photographs
ACCESS INFORMATION		
Inaccessible area	Cross-hatched area	Areas where the survey was not possible
ADDITIONAL FEATURES		
Ferrous feature	Red fill	Modern metal objects, pipes, cables, historical metalwork
LIRM	Light blue fill	Lightning-Induced Remanent Magnetisation
Geology	Grey fill/text	Natural variations in bedrock or superficial geology
Agricultural lineation	Green line	Regular plough marks
Probable field drain	Blue line	Subsurface agricultural drainage systems
Pylon	Pink circle	Modern electrical infrastructure

Figures

376500

376500

N

Extent of site

Inaccessible area

Magnetic Gradient (nT)

-4 4

Title:

RAW MAGNETIC GRADIOMETRY DATA PRESENTED AT +-4 NT

Project:

LLANRWST ROAD - CONWY

TERRA DAT
down to earth geophysics
Tel: +44 (0) 2920 700127
Web: www.terradat.co.uk
Email: web@terradat.co.uk

Scale: 1:1250 at A3

Drawn by/Ref: JM/9570/1

Date: 22 JULY 2025

FIGURE 1

376500

376500

N

Extent of site

Inaccessible area

Magnetic Gradient (nT)

-4 4

Title:

PROCESSED MAGNETIC GRADIOMETRY DATA PRESENTED AT +-4 NT

Project:

LLANRWST ROAD - CONWY

TERRA DAT
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Scale: 1:1250 at A3

Drawn by/Ref: JM/9570/2

Date: 22 JULY 2025

FIGURE 2

376500

376500

N

Strong positive feature

Weak positive feature

Weak negative feature

'Speckled' magnetic anomaly

Extent of survey

Extent of site

Geology

Strong agricultural lineation

Ferrous feature

Title:

SUMMARY ARCHAEOLOGICAL INTERPRETATION

Project:

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Drawn by/Ref: JM/9570/3

Date: 22 JULY 2025

FIGURE 3

376500

376500

Elevation (m AOD)

23.7 75.6

N

Strong positive feature

Weak positive feature

Weak negative feature

'Speckled' magnetic anomaly

Extent of survey

Extent of site

Geology

Strong agricultural

Ferrous feature

Title:

SUMMARY ARCHAEOLOGICAL INTERPRETATION WITH TOPOGRAPHY

Project:

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Scale: 1:1250 at A3

Drawn by/Ref: JM/9570/4

Date: 22 JULY 2025

FIGURE 4