1550

MAES Y FELIN, GLAN CONWY

Gwerthusiad Archeolegol (Arolwg Geoffisegol) / Archaeological Evaluation (Geophysical Survey)

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

MAES Y FELIN, GLAN CONWY

Gwerthusiad Archeolegol (Arolwg Geoffisegol) / Archaeological Evaluation (Geophysical Survey)

Yr Amgylchedd Hanesyddol yn Cofnodi Prif Gyfeirnod /
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Ysgrifenwyd gan / Written by: Dave Hopewell

Cyhoeddwyd gan Ymddiriedolaeth Achaeolegol Gwynedd
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Comisiynwyd Ymddiriedolaeth Archaeolegol Gwynedd gan Brenig Construction i gynnal arolwg geoffisegol yn cefnogi cais cynllunio ar gyfer datblygiad preswyl arfaethedig yn Maes y Felin, Glan Conwy. Roedd ardal yr arolwg yn mesur 5.59ha ac fe'i cynhaliwyd ym Mai 2020. Datgelodd yr arolwg nodweddion archaeolegol posib sydd angen ymchwiliad pellach er mwyn penderfynu eu tarddiad. Roedd rhain yn cynnwys anomaledd mawr a ddehonglwyd fel twmpath llosg (man coginio yr Oes Efydd) gerllaw ffrwd sydd ond yn ddiweddar wedi ail ymddangos. Mae'n bosib mai rhagor o dwmpathau llosg yw nifer o anomaleddau eraill tebyg, ond llai, sydd gerllaw. Efallai bod modd dehongli anomaledd ar wahân sydd gerllaw'r twmpath llosg mawr fel aelwyd gydoesol. Ar draws ardal gyfan yr arolwg, cafwyd hyd i ffiniau system cae aml-gyfnod posib, gyda rhannau ohoni'n rhagddyddio map degwm 1842. Yn llai sicr, gellid dehongli ardal o actifedd magnetig uwch, ynghyd ag anomaleddau cylchog cysylltiedig, fel aneddiad cytiau crwn cynhanesyddol, er bod aflonyddiad mwy diweddar efallai'n ddehongliad mwy tebygol. Mae'n bosib bod anomaledd unionlin byr o darddiad ansicr, nodwedd sydd efallai'n nodi tarddiad y ffrwd, o arwyddocad archaeolegol hefyd. Byddai ymchwiliad yn gallu cynnwys agor ffosydd prawf neu gloddfa darged, a dylid eu cynnal cyn cychwyn gosod unrhyw sylfaenwaith yn ymwneud â'r adeiladu arfaethedig.

NON-TECHNICAL SUMMARY

Gwynedd Archaeological Trust was commissioned by Brenig Construction to undertake a geophysical survey in support of a planning application for a proposed residential development on Maes y Felin, Glan Conwy*. The survey area measured 5.59ha and was undertaken in May 2020. The survey detected possible archaeological features that require further investigation to determine origin. This included a large anomaly interpreted as a burnt mound (Bronze Age cooking place) alongside a recently re-emerged spring. Several similar but smaller anomalies in the vicinity could be further burnt mounds. A discrete anomaly adjacent to the large burnt mound could be interpreted as a contemporary hearth. The boundaries of an extensive possible multi-period field system, parts of which predate the 1842 tithe map, were detected across the whole survey area. Less certainly, an area of increased magnetic activity with associated circular anomalies could be interpreted as a prehistoric hut circle settlement although more recent disturbance is perhaps a more likely interpretation. A short linear anomaly of uncertain origin, a feature possibly marking the source of the spring may also be of archaeological significance Investigation could include trial trenching or targeted excavation, which should be undertaken prior to the commencement of any proposed construction related groundwork.*

1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) was commissioned by Brenig Construction to undertake a geophysical survey in support of a planning application for a proposed residential development at Maes y Felin, Glan Conwy (NGR SH8027075250; postcode: LL28 5NR; Figure 01). The survey area measured 5.59ha and included an irregular shaped plot incorporating agricultural land. The archaeological mitigation was monitored by the Gwynedd archaeological Planning Service (GAPS) and undertaken in May 2020 in accordance with and approved written scheme of investigation (cf. Appendix I) and the following guidelines:

- *Guidelines for digital archives* (Royal Commission on Ancient and Historic Monuments of Wales, 2015);
- *Management of Archaeological Projects* (English Heritage, 1991);
- *Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide* (Historic England, 2015); and
- *Standard and Guidance for Archaeological Geophysical Survey* (Chartered Institute for Archaeologists, 2014).

In line with the Gwynedd Historic Environment Record (HER) requirements, the HER was contacted at the onset of the project to ensure that any data arising was formatted in a manner suitable for accession to the HER and follows the guidance set out in *Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs)* (The Welsh Archaeological Trusts, 2018). The GAT HER Enquiry Number for this project is GATHER1249 and the Event PRN is 45819.

2 BACKGROUND

GAT completed an archaeological assessment of the proposed development area in 2019 (GAT Report 1486). The regional Historic Environment Record (HER) did not show any known assets within the confines of the assessment plots and the local area was mostly characterised by post-medieval activity. No other archaeological project work was listed within the HER as having been completed within the proposed development area, but GAT completed an assessment along the A470 road to the immediate southwest for the proposed A470 Trunk Road Pentrefelin to Bodnant Improvement Scheme (Evans & Smith, 2008). The report characterised that local area as "representing a farming landscape with a field pattern little changed from the 18th century, but with some fragments of landscape and possible trackways surviving from earlier periods" (ibid, 04).

In total 23 assets were identified within a 1km radius of the centre point of the proposed development area, with two assets in close proximity:, Hafod (PRN 66870) and the garage adjacent to Hafod (PRN 66875), both of which were Grade II listed buildings. A partial walkover survey was completed of the study area as part of the assessment as not all fields were accessible at the time of completion. This walkover survey did not identify any new archaeological assets although they may have been obscured by high grass and vegetation. It was recommended in the report that a full geophysical survey of the area was conducted in order to ascertain the survival of any sub-surface archaeological assets.

A copy of the assessment report was consulted as part of the survey to assist with interpretation of the results.

3 METHODOLOGY

3.1 Introduction

The survey area measured 5.59ha and included an irregular shaped plot incorporating agricultural land ((NGR SH8027075250; postcode: LL28 5NR; Figure 01). The survey was undertaken in May 2020 and completed by GAT team members.

3.2 Geophysical Survey

3.2.1 Summary

The survey was carried out in a series of 20m grids, which was tied into the Ordnance Survey grid using a Trimble R8 high precision GPS system. The survey was conducted using a Bartington Grad 601-2 dual fluxgate gradiometer with a 1.0m traverse interval and a 0.25m sample interval.

3.2.2 Instrumentation

The Bartington Grad 601-2 dual fluxgate gradiometer uses a pair of Grad-01-100 sensors. These are high stability fluxgate gradient sensors with a 1.0m separation between the sensing elements, giving a strong response to deeper anomalies. The instrument detects variations in the earth's magnetic field caused by the presence of iron in the soil. This is usually in the form of weakly magnetized iron oxides which tend to be concentrated in the topsoil. Features cut into the subsoil and backfilled or silted with topsoil, therefore contain greater amounts of iron and can therefore be detected with the gradiometer. This is a simplified description as there are other processes and materials which can produce detectable anomalies. The most obvious is the presence of pieces of iron in the soil or immediate environs which usually produce very high readings and can mask the relatively weak readings produced by variations in the soil. Strong readings are also produced by archaeological features such as hearths or kilns as fired clay acquires a permanent thermo-remnant magnetic field upon cooling. This material can also get spread into the soil leading to a more generalized magnetic enhancement around settlement sites. Not all surveys can produce good results as results can be masked by large magnetic variations in the bedrock or soil or high levels of natural background "noise" (interference consisting of random signals produced by material with in the soil). In some cases, there may be little variation between the topsoil and subsoil resulting in undetectable features. The Bartington Grad 601 is a hand

held instrument and readings can be taken automatically as the operator walks at a constant speed along a series of fixed length traverses. The sensor consists of two vertically aligned fluxgates set 500mm apart. Their cores are driven in and out of magnetic saturation by a 1,000Hz alternating current passing through two opposing driver coils. As the cores come out of saturation, the external magnetic field can enter them producing an electrical pulse proportional to the field strength in a sensor coil. The high frequency of the detection cycle produces what is in effect a continuous output. The gradiometer can detect anomalies down to a depth of approximately one meter. The magnetic variations are measured in nanoTeslas (nT). The earth's magnetic field strength is about 48,000 nT; typical archaeological features produce readings of below 15nT although burnt features and iron objects can result in changes of several hundred nT. The machine is capable of detecting changes as low as 0.1nT.

3.2.3 Data Collection

The gradiometer includes an on-board data-logger. Readings are taken along parallel traverses of one axis of a 20m x 20m grid. The traverse interval is 1.0m and readings are logged at intervals of 0.25m along each traverse. Marked guide ropes are used to ensure high positional accuracy during the high resolution survey. The data is transferred from the data-logger to a computer where it is compiled and processed using ArchaeoSurveyor2 software. The data is presented as a grey scale plot where data values are represented by modulation of the intensity of a grey scale within a rectangular area corresponding to the data collection point within the grid. This produces a plan view of the survey and allows subtle changes in the data to be displayed. This is supplemented by an interpretation diagram showing the main feature of the survey with reference numbers linking the anomalies to descriptions in the written report. It should be noted that the interpretation is based on the examination of the shape, scale and intensity of the anomaly and comparison to features found in previous surveys and excavations etc. In some cases the shape of an anomaly is sufficient to allow a definite interpretation e.g. a Roman fort. In other cases all that can be provided is the most likely interpretation. The survey will often detect several overlying phases of archaeological remains and it is not usually possible to distinguish between them. Weak and poorly defined anomalies are most 4 susceptible to misinterpretation due to the propensity of the human brain to define shapes and patterns in random background "noise". An assessment of the confidence of the interpretation is given in the text.

3.2.4 Data Processing

The data is presented with a minimum of processing although corrections are made to compensate for instrument drift and other data collection inconsistencies. High readings caused by stray pieces of iron, fences, etc. are usually modified on the grey scale plot as they have a tendency to compress the rest of the data. The data is however carefully examined before this procedure is carried out as kilns and other burnt features can produce similar readings. The data on some 'noisy' or very complex sites can benefit from 'smoothing'. Grey-scale plots are always somewhat pixellated due to the resolution of the survey. This at times makes it difficult to see less obvious anomalies. The readings in the plots can therefore be interpolated thus producing more but smaller pixels and a small amount of smoothing based on a low pass filter can be applied. This reduces the perceived effects of background noise thus making anomalies easier to see. Any further processing is noted in relation to the individual plot.

3.2.5 Aims

The report includes a discussion of the grey scale plot and an interpretation of the any anomalies identified; these anomalies are presented as either positive or negative, suggesting whether they could be cut features (ditches, pits etc.), or built sub-surface features (e.g., banks). Figures are included for the grey scale plot and for the anomaly interpretation. The results of the geophysical survey has been used to inform further recommendations for archaeological investigation.

3.2.6 Presentation of results and interpretation

The results of the survey are presented as a minimally processed greyscale plot (raw data clipped to +/- 15nT) and a processed greyscale plot if further processing or enhancement has been performed. X-Y trace plots of the collected data may also be included if they are necessary to support the interpretation of specific anomalies visible on the greyscale plots. It is usually sufficient to record the magnitude of the anomalies in the text.

Magnetic anomalies are identified, interpreted and plotted onto an interpretative plot with reference numbers linking the anomalies to descriptions in the written report. When interpreting the results, several factors are taken into consideration, including the shape, scale and intensity of the anomaly 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*.

3.2.7 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 (e.g., Roman Fort, 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.

Table 1: Geophysical survey anomalies identified

Interpretation Category	**Description**
Archaeology / Probable Archaeology	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.
Possible Archaeology	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.
Industrial / Burnt-Fired	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, metalworking areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
Former Field Boundary (probable and possible)	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.
Ridge and Furrow	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
Agriculture (ploughing)	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.

Interpretation Category	Description
Land Drain	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.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
Magnetic Contamination	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
Service	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.
Ferrous	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.
Uncertain Origin	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning give little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *Possible Archaeology / Natural* or (in the case of linear responses) *Possible Archaeology / Agriculture*; 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: low and poorly defined).

4 RESULTS

The geophysical survey results are presented as a grey-scale plot of the raw data clipped to +-15nT (Figure 05). Trace plots were not informative beyond demonstrating the magnitude of the anomalies. This is recorded in the text in cases where it is important to differentiate between low magnitude archaeological anomalies with a range of +- 15nT, thermoremnant anomalies with a range of +-50nT and ferrous anomalies with a range of at least +-3000 nT. The survey was completed in drought conditions and comprised five mostly level fields with few obstructions to survey. Buildings and fences produced strong ferrous magnetic anomalies around the edges of the fields. Bedrock was visible and was not strongly magnetic; the natural levels of magnetic noise were low. Anomalies were detected and generally produced low intensity responses. There were very large numbers of small magnetic dipoles indicating ferrous rubbish in the topsoil; this is commonly caused by material introduced into the soil from farmyards by manuring. The survey area was very heavily trampled by cattle and disturbed by tractors. This resulted in some parts of the fields being very uneven and rutted as a result of large areas of ground that were formerly very muddy being baked hard by the drought. This hindered data collection and will have resulted in minor although largely insignificant positional inaccuracies in the survey. The trampling was extensive and deep enough to produce geophysical anomalies around the site of cattle feeders. A more unexpected result was the emergence of running water in the very heavily trampled area in the lowest part of the field which is currently a muddy bog and stream. This was not identified in the archaeological assessment (GAT Report 1486). Modern Ordnance Survey maps show a spring close to the field boundary. It is suggested that the spring originates close to the centre of the field and had been culverted. The trampling may have broken into the culvert and blocked it thus producing the stream. The area around the stream was very wet and muddy and was not surveyed. Much of the southern field was steeply sloping, forming a natural bowl around the spring and stream. This probably caused some striping in the data as a result of one sensor being closer to the ground when walking across a slope (see discussion below).

Specific anomalies were allocated numerical labels. These are shown on the interpretation plots (Figure 07), listed in a table for each area and discussed in the text.

Table 2: Geophysical survey anomalies identified

Anomaly Number	Description	Category
22	Field boundary shown on 1842 tithe map	Former Field Boundary
23	Field boundary shown on 1842 tithe map.	Former Field Boundary
24	Former field boundary predating the 1842 tithe map	Former Field Boundary
25	Slight remains of field boundary predating the 1842 tithe map	Former Field Boundary
26	Slight remains of field boundary predating the 1842 tithe map	Former Field Boundary
27	Fragmentary remains of field boundary shown on 1842 tithe map	Former Field Boundary
28	Possible remains of field boundary predating the 1842 tithe map	Former Field Boundary
29	Possible fragment of field boundary shown on 1842 tithe map	Former Field Boundary
30	Area of moderately strong magnetic responses up to +-50nT. Thermoremnant, very likely to be a burnt mound. 21 m in diameter	Archaeology
31	A recently re-emerged spring. Running water visible in the field	Natural
32	Short linear anomaly. Moderately strong (up to 100nT). Possibly a pipe or culvert at the source of spring 31	Possible Archaeology
33	Area of moderately strong magnetic responses 6m diameter. Possibly a small burnt mound	Possible Archaeology
34	Small moderately strong magnetic response. Either part of burnt mound 30 or a hearth	Possible Archaeology

Anomaly Number	Description	Category
35	Oval area of moderately strong magnetic responses with dimensions of 16m x 10m. Either a small burnt mound or more recent infilling alongside the stream.	Possible Archaeology or Magnetic Contamination
36	Irregular area of moderately strong magnetic responses. Either a disturbed burnt mound or more recent infilling alongside the stream	Possible Archaeology or Magnetic Contamination
37	Irregular area of moderately strong magnetic responses. Either a disturbed burnt mound or more recent infilling alongside the stream	Possible Archaeology or Magnetic Contamination
38	Sub oval area of moderately strong magnetic responses. Possibly a small burnt mound.	Possible Archaeology
39	Circular area of moderately strong magnetic responses, 8m in diameter. Either a small burnt mound or a geological response.	Possible Archaeology or Natural
40	A short poorly-defined linear anomaly. Origin unknown	*Uncertain Origin*
41	A series of circular and rectangular anomalies corresponding to heavy trampling around animal feeders	Agriculture
42	A short isolated linear anomaly. Best interpreted as a drain	Field Drain
43	An area of increased magnetic noise with poorly defined circular anomalies. This is probably a result of modern trampling and animal feeders but a degrade roundhouse settlement cannot entirely be discounted	Agriculture or Possible Archaeology
44	Increased magnetic noise due to weakly metamorphosed mudstones being close to the ground surface	Natural

Anomaly Number	Description	Category
45	Multiple linear anomalies. Probable plough marks of unknown date. See discussion in text	Agriculture
46	A somewhat diffuse linear anomaly, either a fragment of former field boundary (possibly a continuation of anomaly 27 shown on the tithe map of 1834) or upcast from cleaning the adjacent stream bed	*Former Field Boundary*
47	Fragmentary linear anomaly. Possibly a continuation of field boundary 26. Predates the tithe map of 1843	*Former Field Boundary*
48	Linear anomaly, corresponds to a boundary on the tithe map of 1834.	*Former Field Boundary*
49	Well-defined negative linear anomaly running across the field from the roadside gate. Probably a service trench with a plastic pipe.	Service
50	A short length of weak linear anomaly. Probably a land drain	*Land Drain*
51	A short length of weak linear anomaly. Probably a land drain	*Land Drain*

The most obvious archaeological feature within the survey appears to be a large burnt mound (anomaly 30) in the centre of the field. A burnt mound is a pile of heat shattered stones and charcoal usually surrounding a trough. These are thought to be prehistoric, usually Bronze Age, communal cooking sites. Stones were heated in a fire and put into a water-filled trough to boil the water. They were then discarded on the mound. They are usually found near water sources. This example is 21m in diameter and is visible on the ground as a distinctly grey mound in the field. A cattle feeder had been sited on it until quite recently. The magnetic anomaly consisted of randomly orientated thermoremnant responses (typically +-50nT) produced by the heat- affected stones. An adjacent small discrete thermoremnant response (anomaly 34) could be interpreted as an associated hearth. The trampling in the field has restored a watercourse (anomaly 31) that may have influenced the

siting of the mound. A spring probably emerged from the foot of the nearby slope to form a stream. Anomaly 32 may indicate the beginning of a culvert that subsequently carried the water to the field boundary to the north where its emergence is marked on modern Ordnance Survey maps as a spring. Several other smaller anomalies (35 to 39) produced responses of similar magnitude and character to the burnt mound. These could either be the remains of smaller burnt mounds or later dumps of moderately magnetic material.

The survey revealed field boundaries, mostly running along the breaks of slope in the field that can be resolved into a system of small fields (anomalies 22 to 28 and 46 to 48). The majority of these predate the boundaries on the tithe map of 1842 (Figure 02) and later mapping (Figures 03 and 04) and are probably post-medieval. The survey is also crossed by parallel anomalies that are probably the result of ploughing. The evidence for this is somewhat compromised by the anomalies running almost exactly parallel to the geophysical survey traverses. Surveying on steep slopes usually produces some striping and a slightly imperfect zero reference point resulted in some slight striping across the whole survey (Figure 05). A destriping process that compensates for any mismatch in the calibration of the sensors removed most of the striping in the northern field but not across the southern (Figure 06). Definite ploughing at a slight angle to the traverses can be seen after processing particularly on the western side. This is aligned with the modern boundaries and does not respect the earlier fields. It is best interpreted as modern ploughing, perhaps indicating that the field has been deep-ploughed in recent years.

A series of quite well-defined circular and rectangular anomalies were detected in the southern half of the survey (anomaly 41). These were superficially similar to archaeological anomalies but were found to correlate to the former sites of circular and rectangular cattle feeders. The deep trampling presumably caused mixing of the topsoil and underlying substrate thus producing anomalies.

An area of increased noise at the west of the survey (anomaly 43) also contained some circular anomalies and may be cattle disturbance from a previous grazing season. There is, however a slight possibility that these slight anomalies are the remains of a roundhouse settlement so further investigation is recommended.

The only other possible archaeological feature was a short linear of uncertain origin (anomaly 40).

Several field drains (anomalies 42, 50 and 51) and one possible service pipe (anomaly 49) were identified. The bedrock, which is exposed in places, at the east of the survey produced slightly increased levels of magnetic noise (anomaly 44).

5 DATA APPRAISAL AND CONFIDENCE ASSESSMENT

Background levels of noise were generally low from both the geology and the glacial till. Archaeological features produced weak but clearly-defined anomalies and thermoremnant anomalies were very clearly-defined. The survey was therefore effective and would be expected to have identified most detectable archaeological anomalies. As in all geophysical surveys this cannot be a taken to mean that all archaeology has been identified as some features produce no anomalies or are too small to be detected.

6 CONCLUSIONS

The survey detected a range of possible archaeological features all of which would require further characterisation or verification by a further programme of archaeological evaluation (trial trenching or targeted excavation). This should include the large burnt mound, the spring and surrounding features (anomalies 30 and 32 to 34), along with the other possible smaller burnt mounds (anomalies 35 to 39). Further assessment of the field boundaries would allow their character and level of survival to be recorded and could produce dating evidence and allow some assessment of phasing. The survey produced different responses from different boundaries and some may belong to an earlier phase to those shown on the tithe map, as opposed to simply being subdivisions of the same system that had been removed prior to 1842. Anomalies 40 (uncharacterised) and 43 (possible prehistoric settlement) were identified as possible archaeological features and would require further evaluation to demonstrate their character and level of survival

Any further archaeological evaluation should take place prior to the commencement of any proposed construction related groundwork.

7 SOURCES CONSULTED

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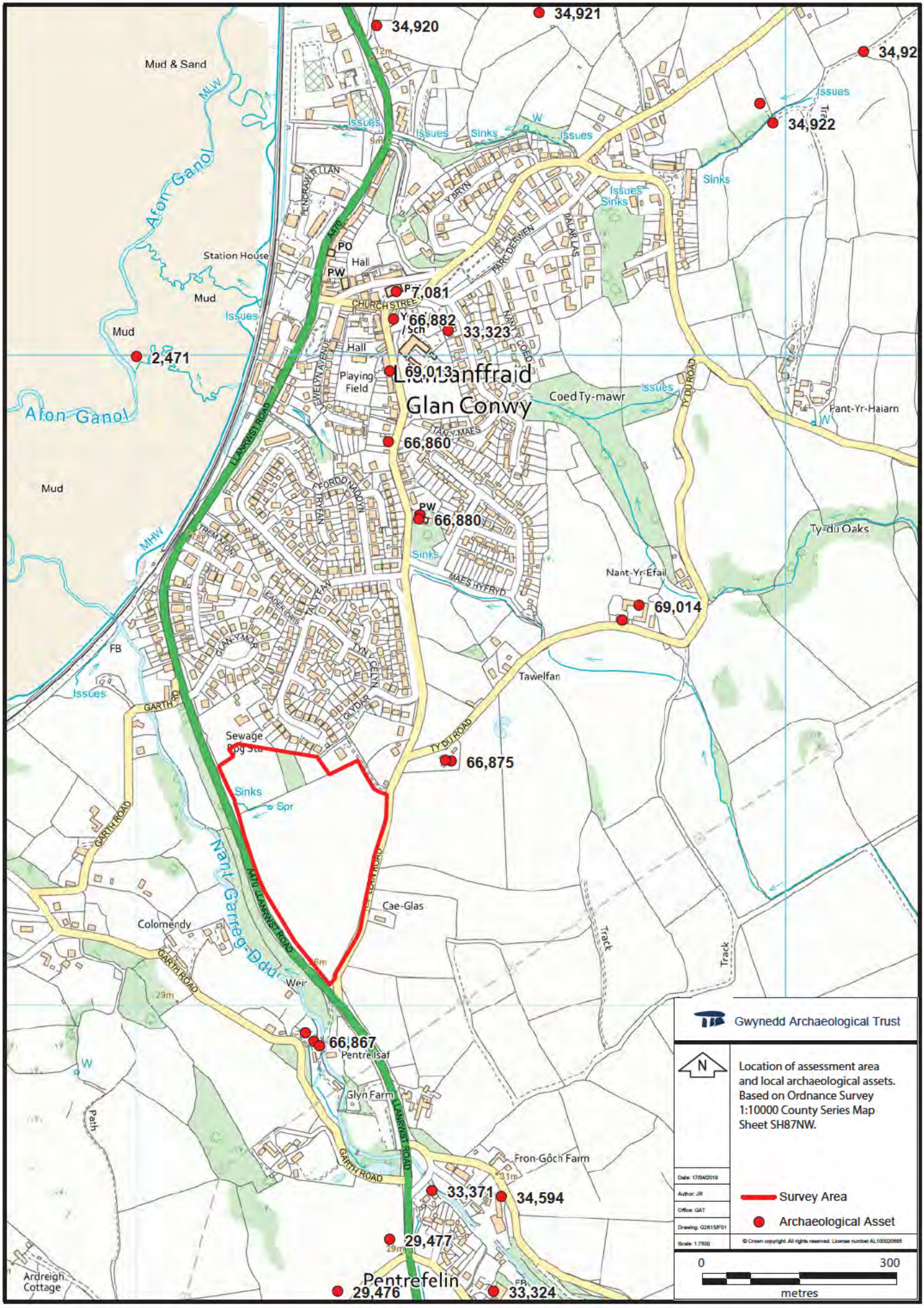
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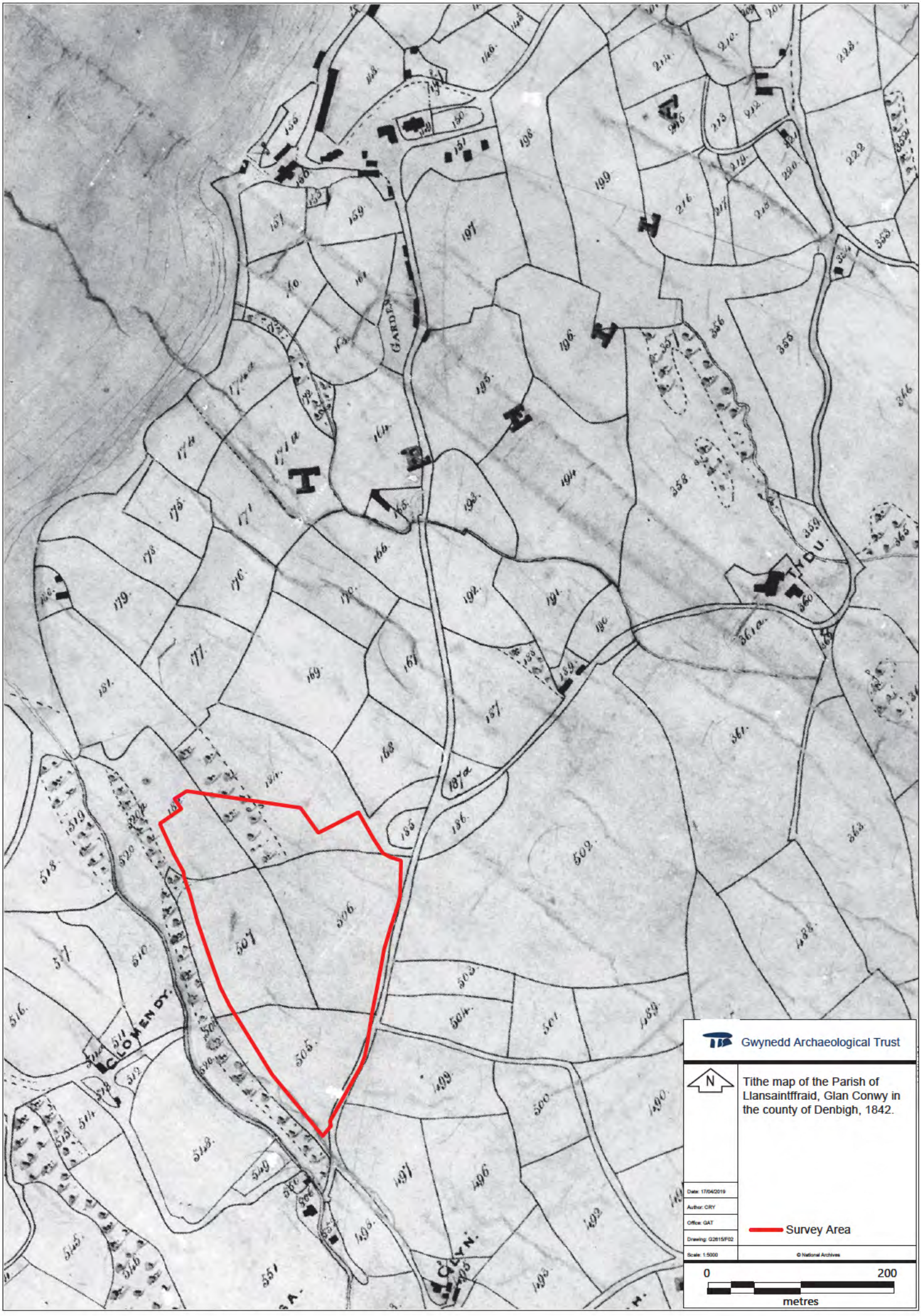
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Date: 17/04/2019
Author: CRY
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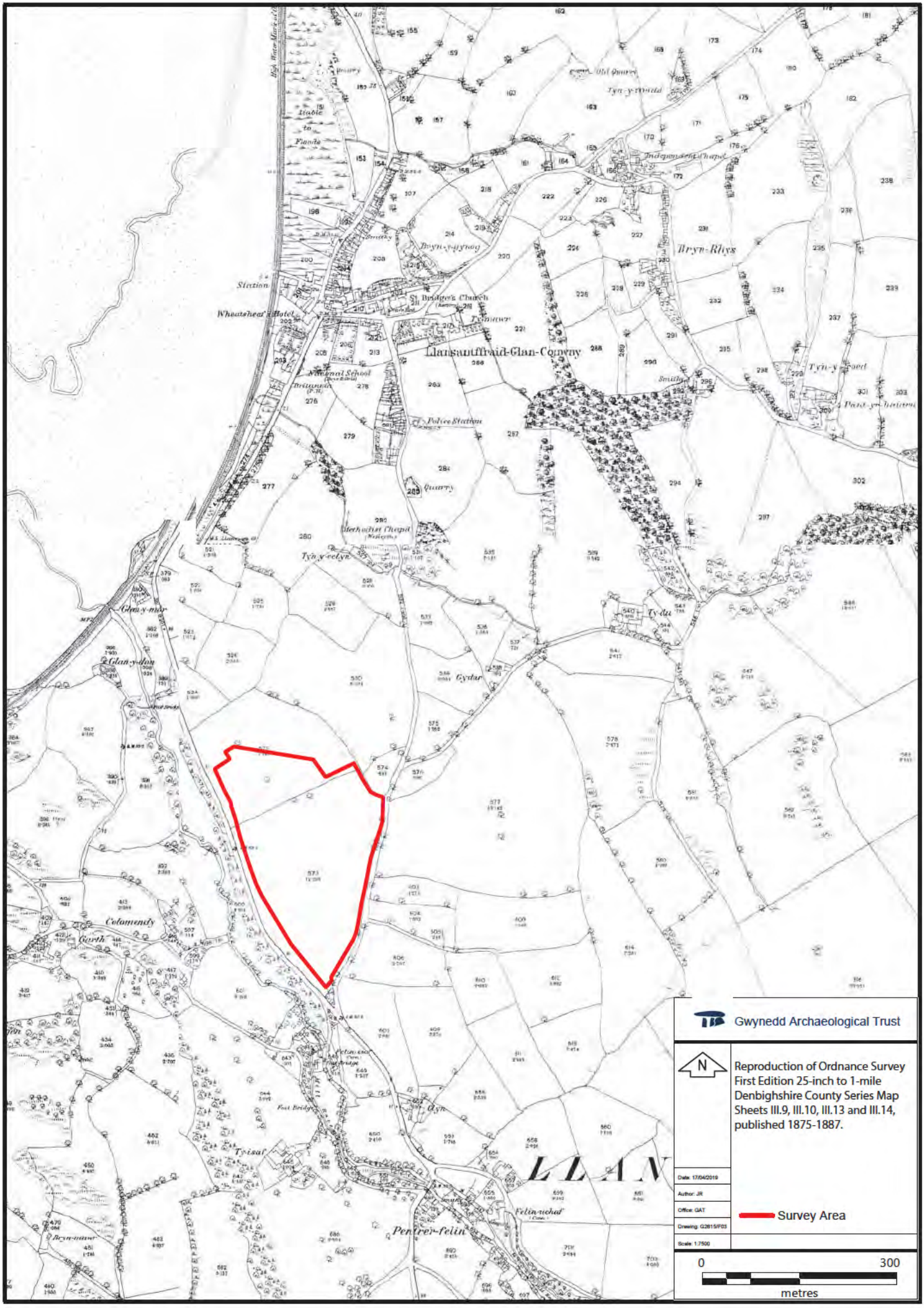
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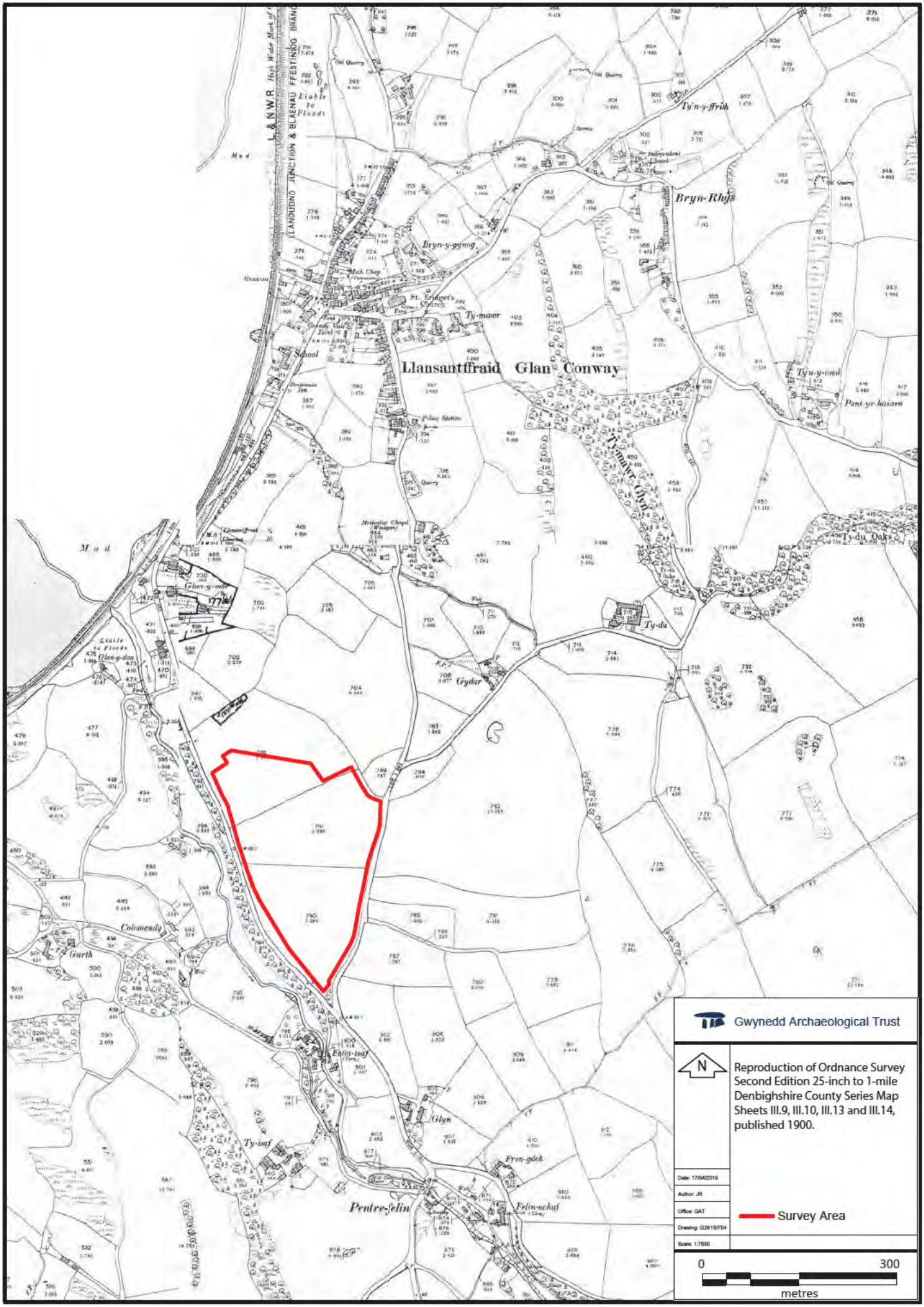
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Ty-u-y-coed
L.& N.W.R. (LLANDUDNO JUNCTION & BLAENAU FFESTINIOG BRANCH)
Liable to Floods
Mud
Gwynedd Archaeological Trust
N
Reproduction of Ordnance Survey Second Edition 25-inch to 1-mile Denbighshire County Series Map Sheets III.9, III.10, III.13 and III.14, published 1900.
Date: 17/04/2019
Author: JR
Office: GAT
Drawing: G2615/F04
Scale: 1:7500
Survey Area
0
300
metres


75400
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75200
75100
80200
80300
A470 LLANRWST ROAD
TOP LLAN ROAD
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N
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SH
Figure 05: Geophysical survey greyscale plot, raw data clipped to +/-10nT
Scale: 1:1,333@A4
Background mapping reproduced from Ordnance Survey VectorMap Local with the permission of H.M.S.O.
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75400
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A470 LLANRWST ROAD
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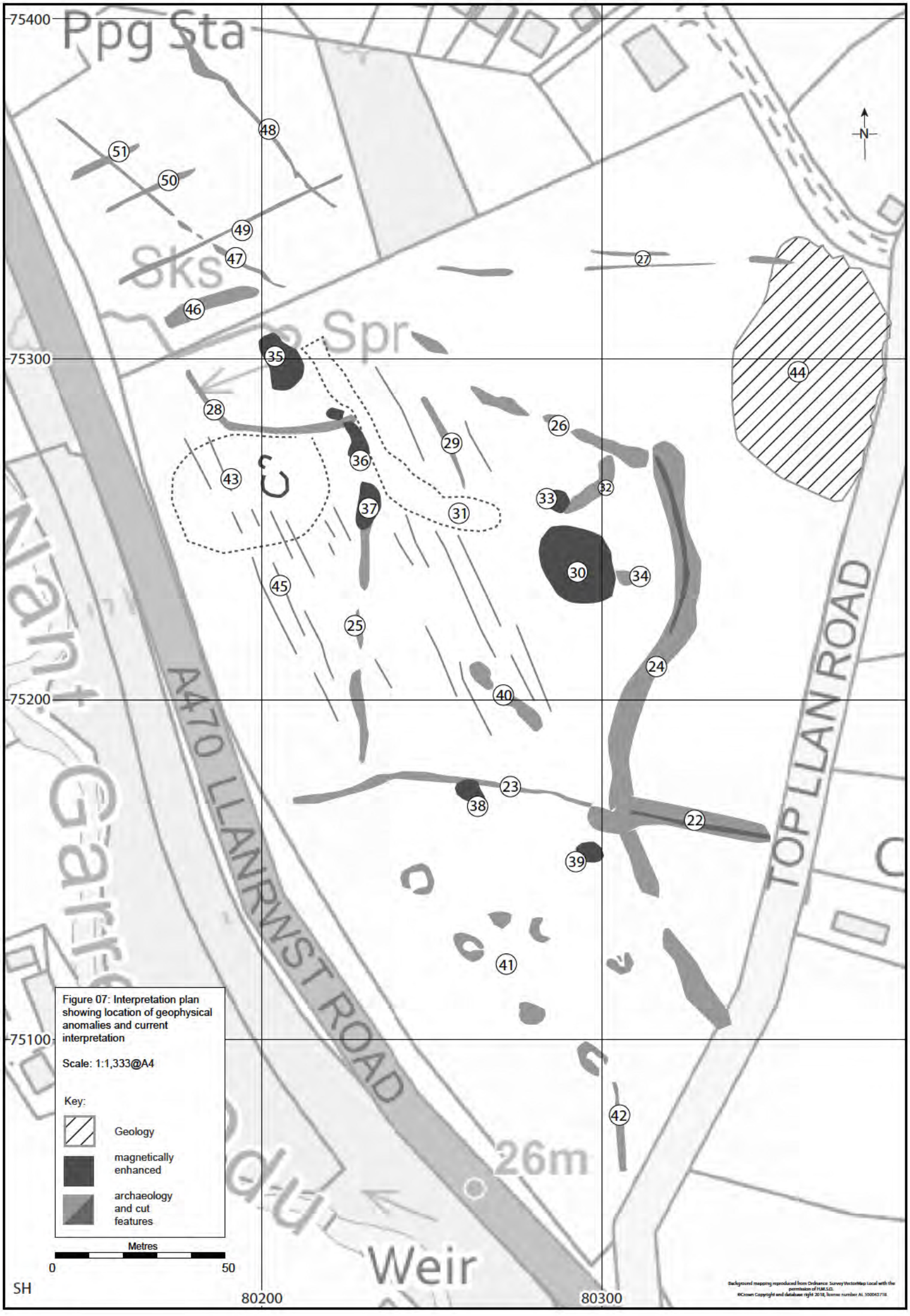
Figure 06: Geophysical survey greyscale plot, data clipped to +/-10nT destriped and destaggered 25cm shift
Scale: 1:1,333@A4
Background mapping reproduced from Ordnance Survey VectorMap Local with the permission of H.M.S.O.
©Crown Copyright and database right 2018, license number AL 100043718


75400
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A470 LLANRWST ROAD
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45
25
24
40
23
38
22
39
41
42
Figure 07: Interpretation plan showing location of geophysical anomalies and current interpretation
Scale: 1:1,333@A4
Key:
Geology
magnetically enhanced
archaeology and cut features
Metres
0
50
SH
Background mapping reproduced from Ordnance Survey VectorMap Local with the permission of H.M.S.O.
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APPENDIX I

Gwynedd Archaeological Trust Written Scheme of Investigation, March 2020

MAES Y FELIN, GLAN CONWY (G2643)

WRITTEN SCHEME OF INVESTIGATION FOR GEOPHYSICAL SURVEY

Prepared for Brenig Construction

March 2020

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Approvals Table				
	Role	Printed Name	Signature	Date
Originated by	Document Author	JOHN ROBERTS		13/03/20
Reviewed by	Document Reviewer	STUART REILLY	Reilly	13/03/20
Approved by	Principal Archaeologist	JOHN ROBERTS		13/03/20

Revision History			
Rev No.	Summary of Changes	Ref Section	Purpose of Issue

All GAT staff should sign their copy to confirm the project specification is read and understood and retain a copy of the specification for the duration of their involvement with the project. On completion, the specification should be retained with the project archive:

Name Signature Date

MAES Y FELIN, GLAN CONWY (G2643)

WRITTEN SCHEME OF INVESTIGATION FOR GEOPHYSICAL SURVEY

Prepared for *Brenig Construction*, March 2020

CONTENTS

1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) has been asked by Brenig Construction to prepare a written scheme of investigation for a geophysical survey in support of a planning application for a proposed residential development at Maes y Felin, Glan Conwy (NGR SH8027075250; postcode: LL28 5NR; Figure 01). The survey area measures 5.59ha and includes an irregular shaped plot incorporating agricultural land. Based on the results of the geophysical survey, further archaeological works may be recommended, which could include targeted trial trenching. Any such works will be defined in future written schemes of investigation further to client and stakeholder agreement.

The geophysical survey will be undertaken from March 2020 and will conform to the following guidelines:

- *Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs)* Version 1.1 (The Welsh Archaeological Trusts, 2018);
- *Guidelines for digital archives* (Royal Commission on Ancient and Historic Monuments of Wales, 2015);
- *Management of Archaeological Projects* (English Heritage, 1991);
- *Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide* (Historic England, 2015); and
- *Standard and Guidance for Archaeological Geophysical Survey* (Chartered Institute for Archaeologists, 2014).

GAT is certified to ISO 9001:2015 and ISO 14001:2015 (Cert. No. 74180/B/0001/UK/En) and is a Registered Organisation with the Chartered Institute for Archaeologists and a member of the Federation of Archaeological Managers and Employers (FAME).

1.1 Monitoring Arrangements

The archaeological mitigation will be monitored by the Gwynedd archaeological Planning Service (GAPS). The content of this WSI and all subsequent reporting by GAT must be approved by GAPS prior to final issue.

1.2 Historic Environment Record

In line with the Gwynedd Historic Environment Record (HER) requirements, the HER will be contacted at the onset of the project to ensure that any data arising is formatted in a manner suitable for accession to the HER and follows the guidance set out in *Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs)* (The Welsh Archaeological Trusts, 2018). The HER will be informed of the project start date, location including grid reference, estimated timescale for the work, and further relevant information associated with the project.

The GAT HER Enquiry Number for this project is GATHER1249 and the Event PRN is 45819. If relevant, the HER will also be responsible for supplying Primary Reference Numbers (PRN) for any new assets identified and recorded.

2 BACKGROUND

GAT completed an archaeological assessment of the proposed development area in 2019 (GAT Report 1486). In total 23 features were identified within a 1km radius of the centre point of the proposed development area, with 2 features in close proximity to the study area: Grade II listed buildings, Hafod (PRN 66870) and the garage adjacent to Hafod (PRN 66875). A partial walkover survey was completed of the study area as part of the assessment as not all fields were accessible at the time of completion. This walkover survey did not identify any new archaeological assets although they may currently be obscured by high grass and vegetation. It was recommended that a full geophysical survey of the area be conducted in order to ascertain the survival of any sub-surface archaeological assets.

A copy of the assessment report will be consulted as part of the survey to assist with interpretation of the results.

3 METHODOLOGY

3.1 Introduction

The survey area measures 5.59ha and includes an irregular shaped plot incorporating agricultural land located at NGR SH8027075250 (Figure 01). The survey will be undertaken from March 2020 and will be completed by *Sumo Surveys* on behalf of GAT.

3.2 Geophysical Survey

3.2.1 Summary

The survey will be carried out in a series of 20m grids, which will be tied into the Ordnance Survey grid using a Trimble R8 high precision GPS system. The survey will be conducted using a Bartington Grad 601-2 dual fluxgate gradiometer with a 1.0m traverse interval and a 0.25m sample interval.

3.2.2 Instrumentation

The Bartington Grad 601-2 dual fluxgate gradiometer uses a pair of Grad-01-100 sensors. These are high stability fluxgate gradient sensors with a 1.0m separation between the sensing elements, giving a strong response to deeper anomalies. The instrument detects variations in the earth's magnetic field caused by the presence of iron in the soil. This is usually in the form of weakly magnetized iron oxides which tend to be concentrated in the topsoil. Features cut into the subsoil and backfilled or silted with topsoil, therefore contain greater amounts of iron and can therefore be detected with the gradiometer. This is a simplified description as there are other processes and materials which can produce detectable anomalies. The most obvious is the presence of pieces of iron in the soil or immediate environs which usually produce very high readings and can mask the relatively weak readings produced by variations in the soil. Strong readings are also produced by archaeological features such as hearths or kilns as fired clay acquires a permanent thermo-remnant magnetic field upon cooling. This material can also get spread into the soil leading to a more generalized magnetic enhancement around settlement sites. Not all surveys can produce good results as results can be masked by large magnetic variations in the bedrock or soil or high levels of natural background "noise" (interference consisting of random signals produced by material with in the soil). In some cases, there may be little variation between the topsoil and subsoil resulting in undetectable features. The Bartington Grad 601 is a hand

held instrument and readings can be taken automatically as the operator walks at a constant speed along a series of fixed length traverses. The sensor consists of two vertically aligned fluxgates set 500mm apart. Their cores are driven in and out of magnetic saturation by a 1,000Hz alternating current passing through two opposing driver coils. As the cores come out of saturation, the external magnetic field can enter them producing an electrical pulse proportional to the field strength in a sensor coil. The high frequency of the detection cycle produces what is in effect a continuous output. The gradiometer can detect anomalies down to a depth of approximately one meter. The magnetic variations are measured in nanoTeslas (nT). The earth's magnetic field strength is about 48,000 nT; typical archaeological features produce readings of below 15nT although burnt features and iron objects can result in changes of several hundred nT. The machine is capable of detecting changes as low as 0.1nT.

3.2.3 Data Collection

The gradiometer includes an on-board data-logger. Readings are taken along parallel traverses of one axis of a 20m x 20m grid. The traverse interval is 1.0m and readings are logged at intervals of 0.25m along each traverse. Marked guide ropes are used to ensure high positional accuracy during the high resolution survey. The data is transferred from the data-logger to a computer where it is compiled and processed using ArchaeoSurveyor2 software. The data is presented as a grey scale plot where data values are represented by modulation of the intensity of a grey scale within a rectangular area corresponding to the data collection point within the grid. This produces a plan view of the survey and allows subtle changes in the data to be displayed. This is supplemented by an interpretation diagram showing the main feature of the survey with reference numbers linking the anomalies to descriptions in the written report. It should be noted that the interpretation is based on the examination of the shape, scale and intensity of the anomaly and comparison to features found in previous surveys and excavations etc. In some cases the shape of an anomaly is sufficient to allow a definite interpretation e.g. a Roman fort. In other cases all that can be provided is the most likely interpretation. The survey will often detect several overlying phases of archaeological remains and it is not usually possible to distinguish between them. Weak and poorly defined anomalies are most 4 susceptible to misinterpretation due to the propensity of the human brain to define shapes and patterns in random background "noise". An assessment of the confidence of the interpretation is given in the text.

3.2.4 Data Processing

The data is presented with a minimum of processing although corrections are made to compensate for instrument drift and other data collection inconsistencies. High readings caused by stray pieces of iron, fences, etc. are usually modified on the grey scale plot as they have a tendency to compress the rest of the data. The data is however carefully examined before this procedure is carried out as kilns and other burnt features can produce similar readings. The data on some 'noisy' or very complex sites can benefit from 'smoothing'. Grey-scale plots are always somewhat pixellated due to the resolution of the survey. This at times makes it difficult to see less obvious anomalies. The readings in the plots can therefore be interpolated thus producing more but smaller pixels and a small amount of smoothing based on a low pass filter can be applied. This reduces the perceived effects of background noise thus making anomalies easier to see. Any further processing is noted in relation to the individual plot.

3.2.5 Aims

The report will include a discussion of the grey scale plot and an interpretation of the any anomalies identified; these anomalies will be presented as either positive or negative, suggesting whether they could be cut features (ditches, pits etc.), or built sub-surface features (e.g., banks). Figures will be included for the grey scale plot and for the anomaly interpretation. The results of the geophysical survey will be used to inform further recommendations for archaeological evaluation and/or mitigation (if relevant)

3.3 Report compilation

Following completion of the stages outlined above, a report will be produced incorporating the following:

1. Front cover;
2. Inner cover;
3. Figures and Plates List;
4. Non-technical summary (Welsh/English);
5. Introduction;
6. Methodology;
    i. Geophysical survey;
7. Results;
8. Conclusions and recommendations;
    a. Conclusion and recommendations;
9. Acknowledgements;
10. Bibliography;
    a. Primary sources;
    b. Secondary sources;
11. Figures; inc.:
    - location plan;
    - grey scale plot;
    - anomaly identification and interpretation;
12. Appendix I (approved written scheme of investigation);
13. Appendix II (Sites listed on GAT Historic Environment Record);
14. Appendix III (Definition of mitigation terms);
15. Back cover.

Illustrations will include plans of the location of the study area; historical maps, when appropriate and if copyright permissions allow, will be included.

A full archive including plans, photographs, written material and any other material resulting from the project will be prepared. The archaeological evaluation outlined in this written scheme of investigation will be submitted in draft format in April 2020; a final report will be submitted to the Historic Environment within six months of submitting the draft report.

The following dissemination will apply:

- A digital report(s) will be provided to the client/consultant and GAPS (draft report then final report);
- A paper report plus a digital report will be provided to the regional Historic Environment Record, Gwynedd Archaeological Trust; this will be submitted within six months of project completion (final report only), along with any relevant, digital

information such as the project database and photographs. All digital datasets submitted will conform to the required standards set out in *Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs)* (Version 1.1); and

- A digital report and archive (including photographic and drawn) data will be provided to Royal Commission on Ancient and Historic Monuments, Wales (final report only), in accordance with the *RCAHMW Guidelines for Digital Archives Version 1*. Digital information will include the photographic archive and associated metadata.

4 PERSONNEL

The project will be managed by John Roberts, Principal Archaeologist GAT Contracts Section. The survey will be completed by *Sumo Surveys* who will have responsibility for completing and compiling the survey data, interpreting the results and preparing the subsequent report. The project manager will be responsible for reviewing and approving the report prior to submission and preparing the overall project for archive.

5 INSURANCE

5.1 Public/Products Liability

Limit of Indemnity- £5,000,000 any one event in respect of Public Liability
INSURER Aviva Insurance Limited
POLICY TYPE Public Liability
POLICY NUMBER 24765101CHC/UN/000375
EXPIRY DATE 21/06/2020

5.2 Employers Liability

Limit of Indemnity- £10,000,000 any one occurrence.
The cover has been issued on the insurers standard policy form and is subject to their usual terms and conditions. A copy of the policy wording is available on request.
INSURER Aviva Insurance Limited
POLICY TYPE Employers Liability
POLICY NUMBER 24765101 CHC / UN/000375
EXPIRY DATE 21/06/2020

5.3 Professional Indemnity

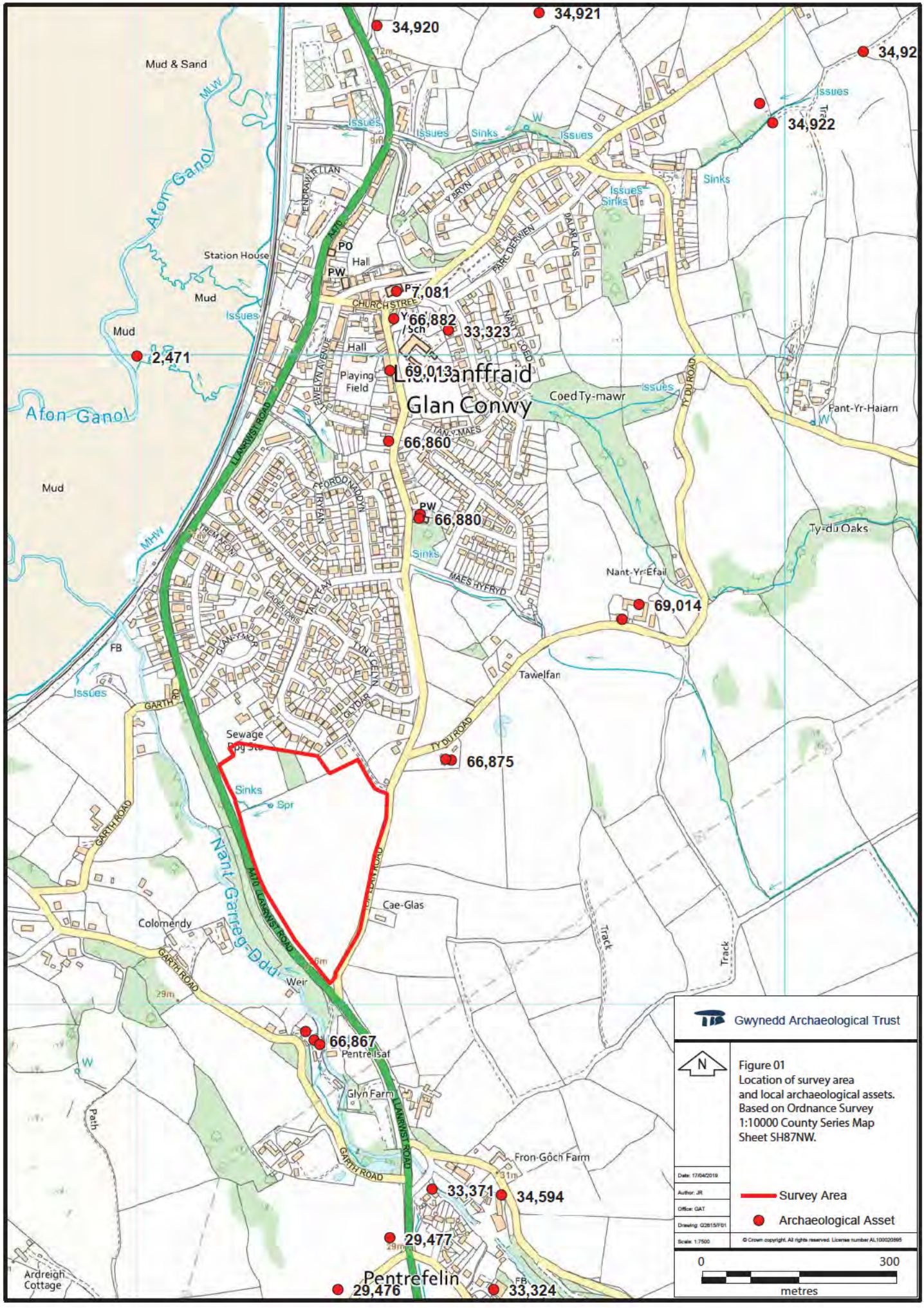
Limit of Indemnity- £5,000,000 in respect of each and every claim
INSURER Hiscox Insurance Company Limited
POLICY TYPE Professional Indemnity
POLICY NUMBER 9446015
EXPIRY DATE 22/07/2020

6 SOURCES CONSULTED

1. English Heritage, 1991, Management of Archaeological Projects
2. English Heritage, 2015, Management of Research Projects in the Historic Environment (MoRPHE).
3. *Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs)* (Version 1.1)
4. Royal Commission on Ancient and Historic Monuments of Wales 2015 *Guidelines for digital archives*
5. Ryan Young, C. 2019. *Maes y Felin, Glan Conwy Archaeological Assessment*. Gwynedd Archaeological Trust Report 1486.
6. Standard and Guidance for Archaeological Geophysical Survey (Chartered Institute for Archaeologists, 2014).

FIGURE 01

Location of Survey Area and Local Archaeological Assets. Based on Ordnance Survey 1:10000 County Series Map Sheet SH87NW.


34,920
34,921
34,92
34,922
Mud & Sand
MLW
Afon Ganol
Issues
Sinks
Station House
PO
Hall
PW
Mud
7,081
66,882
33,323
2,471
Llanfihangel
Glan Conwy
Playing Field
69,013
Coed Ty-mawr
Pant-Yr-Haiarn
66,860
66,880
Ty-du Oaks
Nant-Yr-Efail
69,014
Tawelfan
FB
Sewage
66,875
Spr
Nant Garreg-Ddu
Cae-Glas
Colomendy
Weir
Track
66,867
Pentrelsaf
Glyn Farm
Path
Fron-Goch Farm
33,371
34,594
29,477
Ardreigh Cottage
Pentrefelin
29,476
33,324
Gwynedd Archaeological Trust
N
Figure 01
Location of survey area
and local archaeological assets.
Based on Ordnance Survey
1:10000 County Series Map
Sheet SH87NW.
Survey Area
Archaeological Asset
0
300
metres

Gwynedd Archaeological Trust
Ymddiriedolaeth Archaeolegol Gwynedd

Craig Beuno, Ffordd y Garth, Bangor, Gwynedd. LL57 2RT
Ffon: 01248 352535. Ffacs: 01248 370925. email:gat@heneb.co.uk