1531

TY'N FFYNNON, LLANERCHYMEDD

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

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

TY'N FFYNNON, LLANERCHYMEDD

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

Yr Amgylchedd Hanesyddol yn Cofnodi Prif Gyfeirnod /
Historic Environment Record Event Primary Reference Number 45799

Prosiect Rhif / Project No. G2645

Adroddiad Rhif / Report No. 1531

Wedi'i baratoi ar gyfer / Prepared for:
Mr & Mrs Thomas

Mawrth 2020 / March 2020

Ysgrifenwyd gan / Written by: Neil McGuinness BA MA MCIfA

Cyhoeddwyd gan Ymddiriedolaeth Achaeolegol Gwynedd
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Approvals Table				
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Reviewed by	Document Reviewer	John Roberts		14/04/2020
Approved by	Principal Archaeologist	John Roberts		14/04/2020

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

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CRYNODEB ANHECHNEGOL

Comisiynwyd Ymddiriedolaeth Archeolegol Gwynedd gan Mr a Mrs Thomas i gynnal arolwg geoffisegol ar lain glaswelltir 0.71 ha yn Nhŷ Ffynnon, Llanerchymedd, Ynys Môn cyn datblygiad preswyl arfaethedig. Mae'r arolwg geoffisegol wedi nodi tystiolaeth ar gyfer 'Archeoleg Debygol' ar ffurf dau gae anheddiad is-betryal cydgysylltiedig yng ngogledd ardal yr arolwg gyda system gaeau petryal hirsgwar ynghlwm wrth eu de-orllewin. Mae'r holl nodweddion hyn yn rhagddyddio'r mapio hanesyddol sydd ar gael ar gyfer ardal yr arolwg. Nodwyd olion amaethyddiaeth crib a rhych hefyd: nid ydynt yn gyfoes â'r llociau cynnar ac mae hefyd yn bosibl eu bod yn gysylltiedig â gweithgaredd amaethyddol modern. Mae nifer o dueddiadau llinellol syth gwan wedi'u neilltuo i'r categori Ansicr a gallant fod yn nodweddion amaethyddol modern neu'n ddraeniau tir. O ystyried nodi gweddillion archeolegol tebygol, argymhellir gweithredu rhaglen arall o werthuso archeolegol (ffosio treialon neu gloddio wedi'i dargedu) i wirio bodolaeth yr anomaleddau archeolegol tebygol a phenderfynu ar eu cymeriad, eu swyddogaeth a'u dyddiad.

NON-TECHNICAL SUMMARY

Gwynedd Archaeological Trust was commissioned by Mr and Mrs Thomas to undertake a geophysical survey on an 0.71 ha grassland plot at Ty'n Ffynnon, Llanerchymedd, Ynys Môn in advance of a proposed residential development. The geophysical survey has identified evidence for Probable Archaeology in the form of two conjoined sub-rectangular ditched settlement enclosures in the north of the survey area with an attached rectilinear ditched field system to their southwest. All of these features predate the available historic mapping for the survey area. Traces of Ridge and Furrow agriculture have also been identified: they are not contemporary with the early enclosures and it is also possible that they are associated with modern agricultural activity. A number of weak straight linear trends have been assigned to the Uncertain category and may be modern agricultural features or land drains. Given the identification of probable archaeological remains, it is recommended that a further programme of archaeological evaluation (trial trenching or targeted excavation) is implemented to verify the existence of the probable archaeological anomalies and determine their character, function and date.

1 INTRODUCTION

Gwynedd Archaeological Trust was commissioned by Mr and Mrs Thomas to undertake an archaeological evaluation (geophysical survey) in advance of a proposed residential development on land at Ty'n Ffynnon, Llanerchymedd, Ynys Môn (NGR SH41508408; postcode: LL71 7AD; Figure 01). The development area measures 0.71 ha and will include 16 dwellings located within a field of improved open pasture at the western end of Llanerchymedd. The evaluation was undertaken in February 2020 in accordance with the following guidelines:

- *Geophysical Survey in Archaeological Field Evaluation* (English Heritage, 2008);
- *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);
- *Guidelines for the Use of Geophysics in Archaeology: Questions to Ask and Points to Consider* (European Archaeological Council, 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).

The archaeological evaluation was monitored by the Gwynedd Archaeological Planning Service and was undertaken according to the methodology set out in the approved Written Scheme of Investigation (Appendix I). 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 under 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 was informed of the project start date, location including grid reference and estimated timescale for the work. The GAT HER enquiry number is GATHER1228 and the event primary reference number is 45799. A

bilingual event summary has been prepared for submission to the HER in accordance with their guidance.

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 Site details

NGR / Postcode	SH41508408 / LL71 7AD
Location	The survey area is located on the western side of the village of Llanerchymedd. It is bounded by residential housing to the east; outbuildings, Goedwig Road and the residential property Tynffynon to the north; pasture fields to the west and the B5112 Holyhead Road to the south.
HER	Gwynedd Archaeological Trust HER
District	Ynys Môn
Parish	Rhodygeidio
Topography	The southern half of the area alongside the B5112 Holyhead Road is a fairly level plateau at a height of approximately 75m AOD. The ground then starts slope away towards the north; the lowest part of the survey area is in its northern corner adjacent to Goedwig Road which lies at a height of 69m AOD.
Current land use	The survey area is a field of semi-improved pasture bounded by dry and mortared stone walling, hedge banks and post and metal wire fencing.
Geology	Solid: Ordovician Rocks (undifferentiated) - Mudstone And Sandstone, Interbedded. Superficial: Till, Devensian - Diamicton (BGS, 2020).
Soils	Slowly permeable seasonally wet acid loamy and clayey soils (Soilscapes, 2020).
Survey methods	Magnetometer survey (fluxgate gradiometer)
Study area	0.71 ha

1.2 Geophysical survey aims and objectives

The key aim and objective of the geophysical survey is to:

- establish the extent to which potential archaeological remains survive at the location of the proposed development.

If previously unknown potential archaeological features are identified through geophysical survey, they may need to be evaluated with trial trenches to confirm their existence and to establish their date and function, and following on from this, to assess the implications of the findings on the current understanding of the historical development of the area. Any archaeological features encountered may require preservation by record, i.e. further investigation, or preservation in-situ that may require amending the layout of the proposed development.

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

A brief examination of the regional Historic Environment Record demonstrated that the evaluation area was part of a wider historic landscape associated with Llanerchymedd as well as within a general area of known archaeological activity, with two sites located within close proximity:

- The site of a Bronze Age earthwork associated with burial activity (Primary Reference Number (PRN) 3589) is located at NGR SH41308400, c.181m to the southwest; and
- St. Mary's Church (PRN 3578) is located at NGR SH4176084090, c.219m to the east, which includes possible early medieval elements within a later church, including a doorway between the nave and tower with a roughly round arch and square abaci.

In terms of post-medieval land use and development, an examination of the 1844 Rhodygeidio Tithe Award map shows the development plot at the northwestern end of a larger plot called Cae r ffynon, the boundaries of which appear to conform to the boundaries of the current field and the adjacent field to the southwest. By the time of the Ordnance Survey First (1889), Second (1900) and Third (1920/21) Edition 1-inch to 25-mile County Series Maps of the area (Sheets VII.9, VII.10, VII.13 & VII.14; Figure 02 to 04) the larger field appears to have been subdivided. The Ordnance Survey maps depict the development area as an enclosed field of open pasture at the western end of Llanerchymedd, adjacent to the main settlement area. Its boundaries generally match the current boundaries. This layout has not fundamentally changed into the present, beyond the subtraction of two building plots within the former eastern corner of the field.

3 METHODOLOGY

3.1 Technical detail

The survey was carried out in a series of traverses within a series of 20x20m grids covering the footprint of the proposed development area (Figure 05). The grids were tied into the Ordnance Survey National Grid using a Trimble R8S high precision GPS. The survey was conducted using a Barrington Grad 601-2 dual fluxgate gradiometer and carried out at standard resolution with a 1.0m traverse interval and 0.25m sample interval.

3.2 Instrumentation

The Bartington Grad 601-2 is a handheld dual fluxgate gradiometer which 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. Each sensor consists of two vertically aligned fluxgates set 1000mm 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 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 and anomalies down to a depth of approximately one meter.

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 within the soil). In some cases, there may be little variation between the topsoil and subsoil resulting in undetectable features.

3.3 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 1.0 m. Readings are logged at intervals of 0.25m along each traverse. Marked guide ropes are used to ensure high positional accuracy during the survey.

3.4 Data processing

The data collected in each 20m x 20m grid is transferred from the data-logger to a personal computer where it is compiled and processed using TerraSurveyor v.3.0.33.10 software. Additional analysis of the data is carried out using MagPick v3.25.

The numeric data are converted to a greyscale plot where data values are represented by modulation of the intensity of a greyscale 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. X-Y trace plots of the collected data are also used to aid interpretation.

The Bartington Grad 601-2 captures raw data in the range of +/- 3000 nT. When raw data is presented in greyscale format all but the extreme high or low readings are rendered in the central range of the greyscale and therefore not visible against the background. The data is minimally processed by clipping as archaeological features tend to produce readings within the +/-15nt range.

Corrections may also be made to the data to compensate for instrument drift and other data collection inconsistencies. These corrections may include:

- de-striping using *zero mean traverse* which sets the background mean of each traverse within each grid to zero, removing striping effects and edge discontinuities;
- de-staggering in order to correct for slight differences in the speed of walking on forward and reverse traverses;
- de-spiking to remove high or low readings caused by stray pieces of iron, fences, etc. in order to reduce background magnetic noise;

- the application of a high pass filter to remove low frequency, large scale spatial detail for example a slowly changing geological background;

- the application of a low pass filter to remove high frequency, small scale spatial detail in order to smooth data or to enhance larger weak anomalies; and

- interpolation to produce a smoothed grayscale plot with more but smaller pixels in order to aid clarity.

3.5 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.

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*.

3.6 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 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.

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.
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 Disturbance	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 has been conducted across the footprint of the proposed development (Figure 05). The results are presented as a minimally processed greyscale plot (raw data clipped to +/- 15nT; Figure 06), a processed greyscale plot (raw data clipped to +/- 15nT, de-striped and smoothed; Figure 07) and an interpretative plan (Figure 08). Specific anomalies have been given numerical labels which appear in the text below, as well as on the interpretative plan (Figure 08).

4.1 Probable Archaeology

Two well-defined sub-rectangular low-moderate positive polarity ditch-type anomalies with associated parallel areas of increased negative response [1] [2] have been identified at the northern edge of the survey area. They appear to represent two small conjoined enclosures, the northern sides of which are partially masked by ferrous disturbance from current field boundary fences, gates, an adjacent metal-roofed shed and a portable stock feeder in the field. The lines of the ditched southern boundaries of each appear to continue towards the northeastern and western sides of the present-day field boundary though again, these are partially masked by ferrous disturbance from present-day ferrous boundary structures. Each of the enclosures [1] and [2] contain low-moderate positive polarity cut features: a broadly parallel-sided sub-rectangular cut feature [3] in [1], and a cut feature, most likely a pit [4], in [2]. Together the anomalies [1] – [4] appear to represent the remains of two contemporary settlement enclosures from an unknown archaeological period, but which predate the historic mapping available for the survey area.

A straight linear low-moderate positive trend which turns into a more clearly defined curvilinear low-moderate positive polarity ditch-type anomaly with associated parallel areas of increased negative response [5], runs east-northeast west-southwest from the junction of [1] and [2] before turning to the north-northwest. The line of the north-northwest south-southeast aligned portion continues after a break as an ‘L’ shaped low-moderate negative ditch type anomaly. This group of anomalies appear to represent the remains of a large sub-rectangular field boundary ditch, possibly an enclosure truncated by the present-day field boundary to the northwest, and possibly with an entrance or opening along its southwestern side.

A further ‘L’ shaped feature comprised of a low to moderate negative trend and ditch type anomaly with associated parallel areas of increased positive response [6] has been identified adjacent to the southern corner of [5]. It appears to continue along the same east-northeast

west-southwest alignment as the southeastern side of anomaly [5] and runs off towards the edge of the survey area and the present-day field boundary to the southwest. Again, anomaly [6] appears to represent the remains of a ditched field boundary, and together with anomaly [5], probably forms part of a ditched rectilinear field system associated with the settlement enclosures [1] and [2] to the north.

4.2 Ridge and Furrow

A number of parallel broadly spaced east-northeast west-southwest aligned straight linear anomalies have been identified within the survey area. They most likely represent the traces of ridge and furrow cultivation. Their date is uncertain, however they do not respect the probable settlement [1] [2] and field system [5] [6] enclosures and therefore are not contemporary with them. They are however broadly parallel with the present-day southeastern field boundary and may therefore be the result of recent agricultural activity within the survey area.

4.3 Uncertain Origin

A number of north-northwest south-southeast aligned weak linear trends of uncertain origin have been identified within the survey area. They may be related to modern agricultural activity or they may represent land drains.

4.4 Ferrous / Magnetic Disturbance

High magnitude ferrous responses close to field boundaries are due to adjacent modern post and wire metal fences and gates. Ferrous disturbance along the northern edge of the survey area is also due to an adjacent metal-roofed shed and a portable stock feeder located in the field.

Smaller-scale ferrous anomalies consisting of consists of a single high magnitude positive anomaly with an associated negative response ("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 interpretative plot.

5 DATA APPRAISAL AND CONFIDENCE ASSESSMENT

English Heritage guidelines (English Heritage, 2008, Table 4) state that the average magnetic response over sandstone and mudstone solid geology is generally poor, and also generally poor on glacial till drift geologies. Despite this, this magnetometer survey has yielded evidence of probable settlement enclosures and field systems, ridge and furrow agriculture and anomalies of uncertain origin. As a consequence, the technique is likely to have detected any major archaeological features if present.

6 CONCLUSIONS AND RECOMMENDATIONS

The geophysical survey has identified evidence for *Probable Archaeology* in the form of two conjoined sub-rectangular ditched settlement enclosures in the north of the survey area with an attached rectilinear ditched field system to their southwest. All of these features predate the available historic mapping for the survey area. Traces of *Ridge and Furrow* agriculture have also been identified, they are not contemporary with the early enclosures and it is also possible that they are associated with modern agricultural activity. A number of weak linear trends have been assigned to the *Uncertain* category and may be modern agricultural features or land drains. Given the identification of probable archaeological remains, it is recommended that a further programme of archaeological evaluation (trial trenching or targeted excavation) is implemented to verify the existence of the probable archaeological anomalies and determine their character, function and date.

7 SOURCES CONSULTED

British Geological Survey, 2020, *Geology of Britain viewer*, website http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps [accessed 30/03/2020]

Chartered Institute for Field Archaeologists, 2014, *Standard and Guidance for Archaeological Geophysical Survey*

English Heritage, 1991, *Management of Archaeological Projects*

English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*

English Heritage, 2015, *Management of Research Projects in the Historic Environment (MoRPHE)*

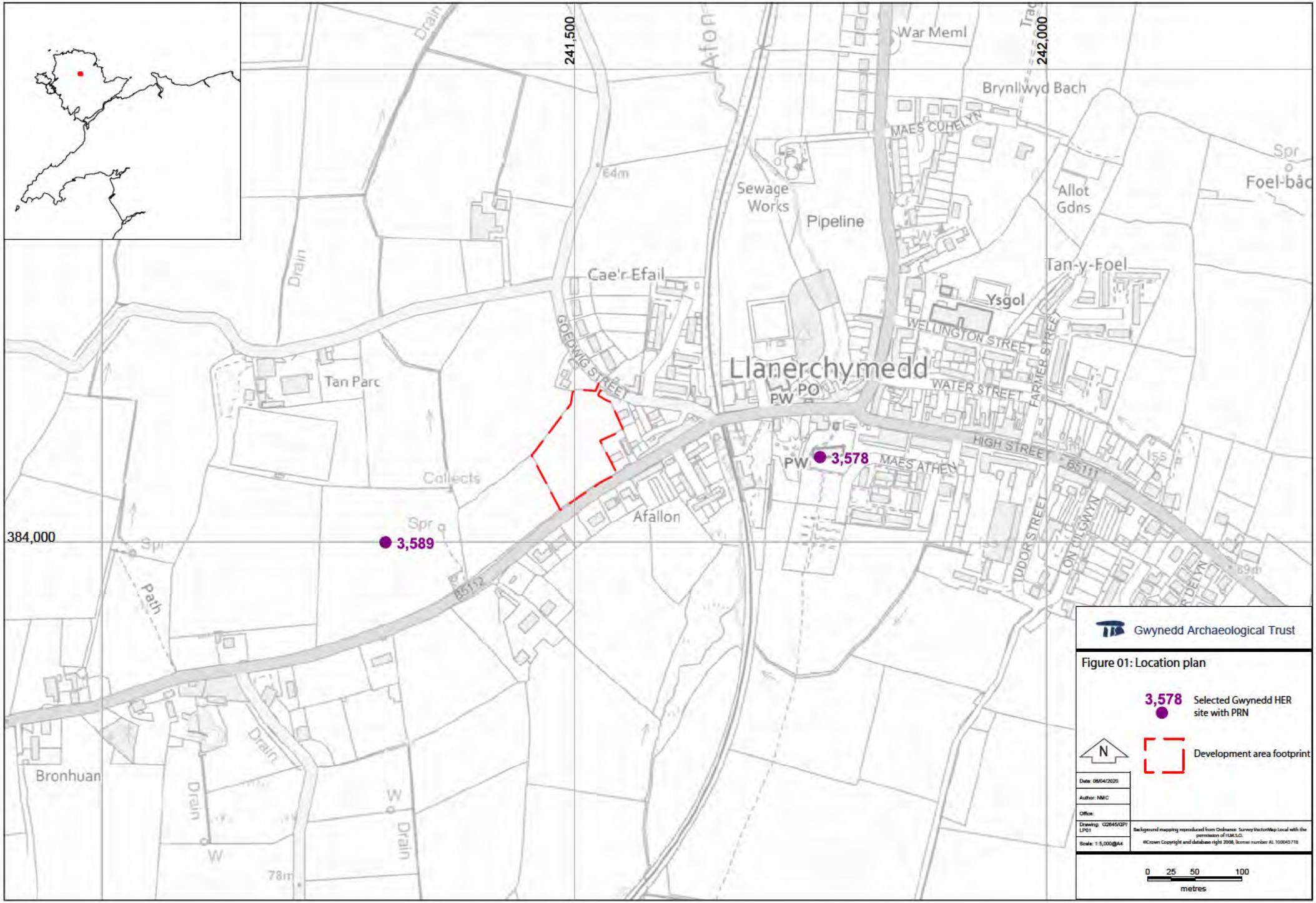
European Archaeological Council, 2015, *Guidelines for the use of Geophysics in Archaeology: Questions to Ask and Points to Consider*

Royal Commission on Ancient and Historic Monuments of Wales 2015 *Guidelines for digital archives*

Soilscapes, 2020, *Cranfield Soil and A grifood Institute Soilscapes viewer*, website http://www.landis.org.uk/soilscapes/ [accessed 30/03/2020]

The Welsh Archaeological Trusts, 2018, *Guidance for the Submission of Data to the Welsh Historic Environment Records (HERs)* (Version 1.1)

FIGURES


241,500
242,000
384,000
Drain
Afon
War Meml
Brynllwyd Bach
MAES CUHELYN
Sewage Works
Pipeline
64m
Allot Gdns
Spr
Foel-bâc
Tan-y-Foel
Ysgol
Cae'r Efail
GOEDWIG STREET
WELLINGTON STREET
FARMER STREET
Llanerchymedd
PO
PW
WATER STREET
HIGH STREET
3,578
MAES ATHEN
B5111
Tan Parc
Collects
Afallon
3,589
Spr
Path
Bronhuan
Drain
W
78m
LUDOR STREET
69m
Gwynedd Archaeological Trust
Figure 01: Location plan
3,578
Selected Gwynedd HER site with PRN
N
Development area footprint
Date: 09/04/2020
Author: NMC
Office:
Drawing: G2645/GP/LP01
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©Crown Copyright and database right 2008, license number AL 100043718
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metres

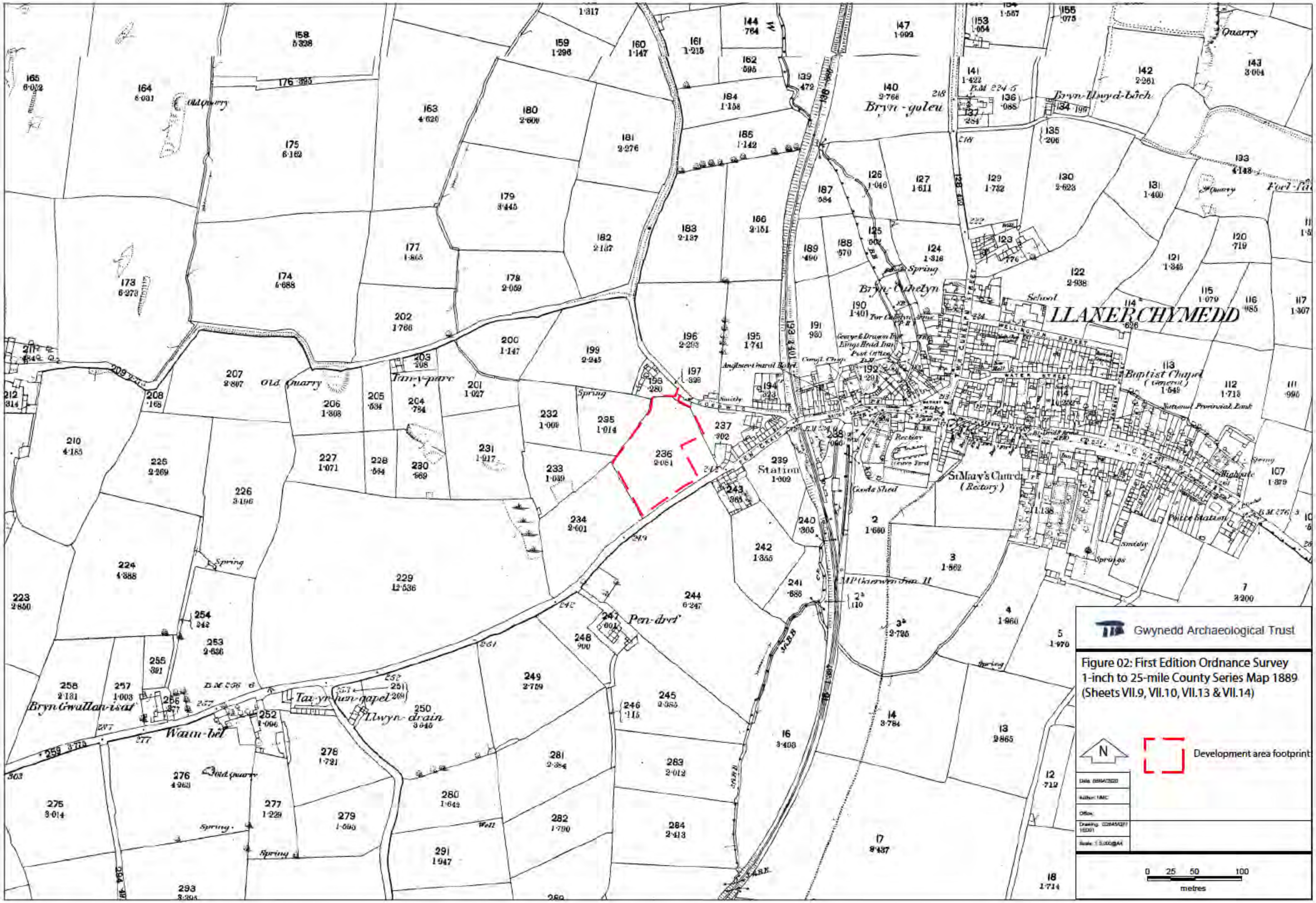


Figure 02: First Edition Ordnance Survey 1-inch to 25-mile County Series Map 1889 (Sheets VII.9, VII.10, VII.13 & VII.14)

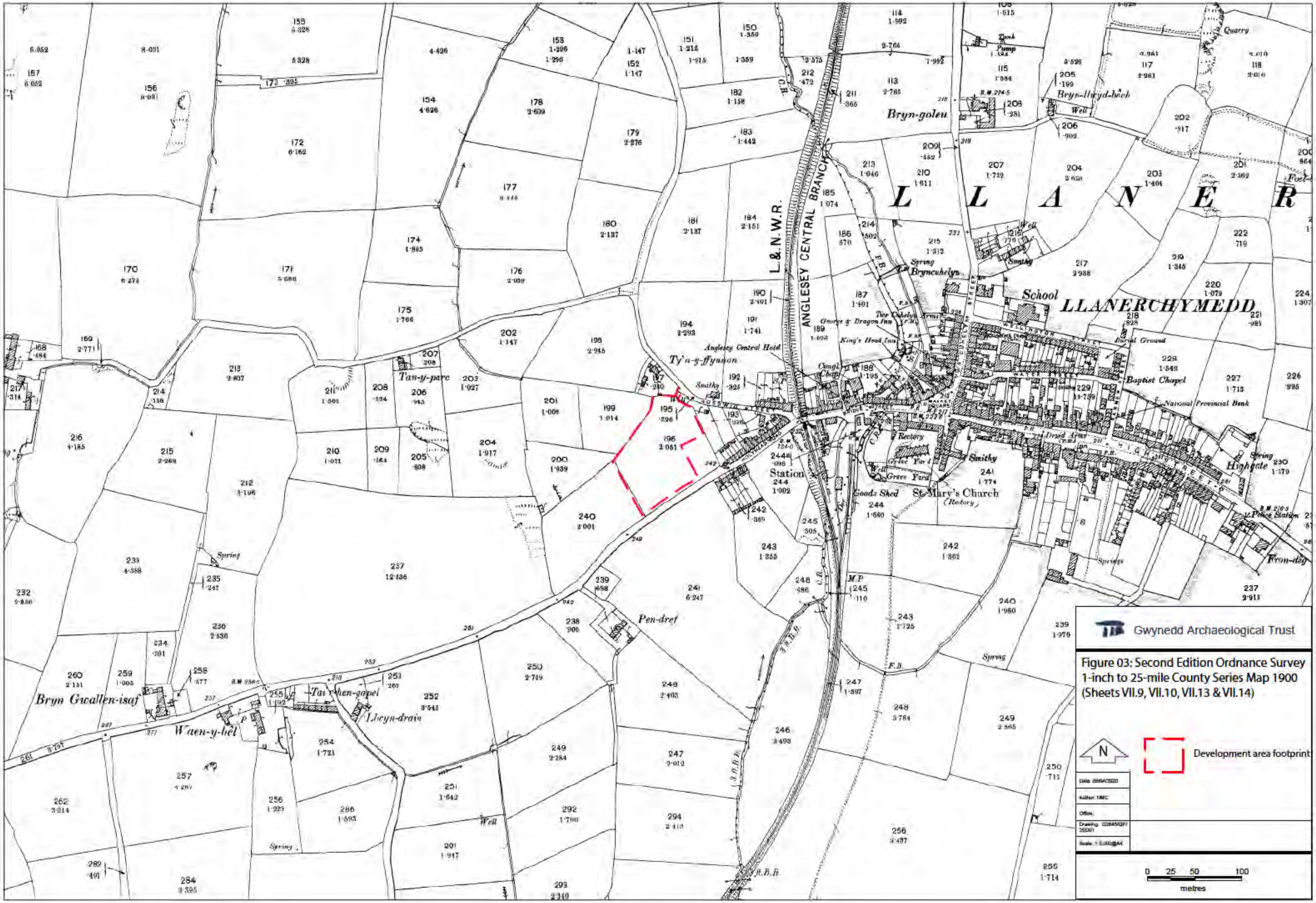
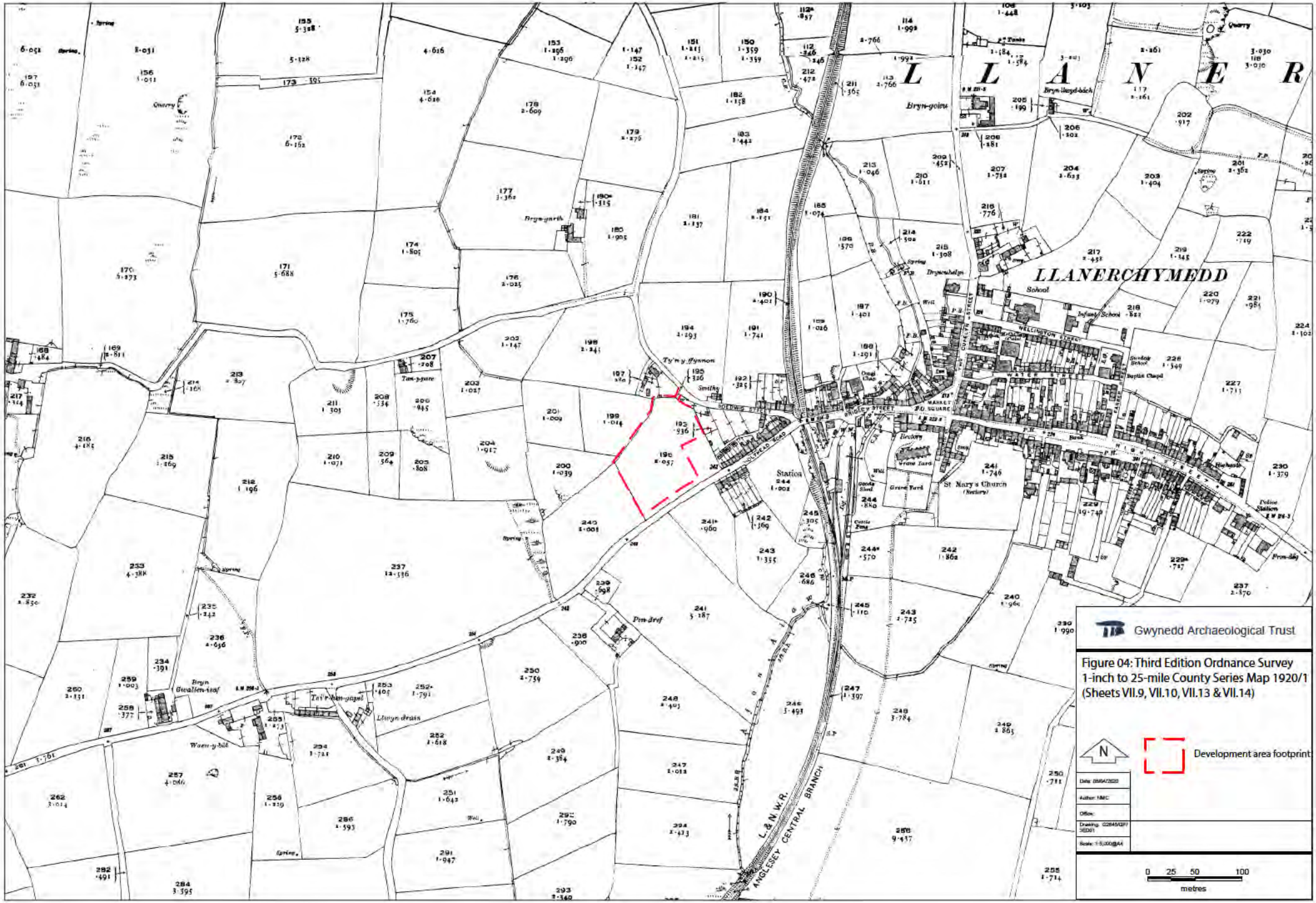
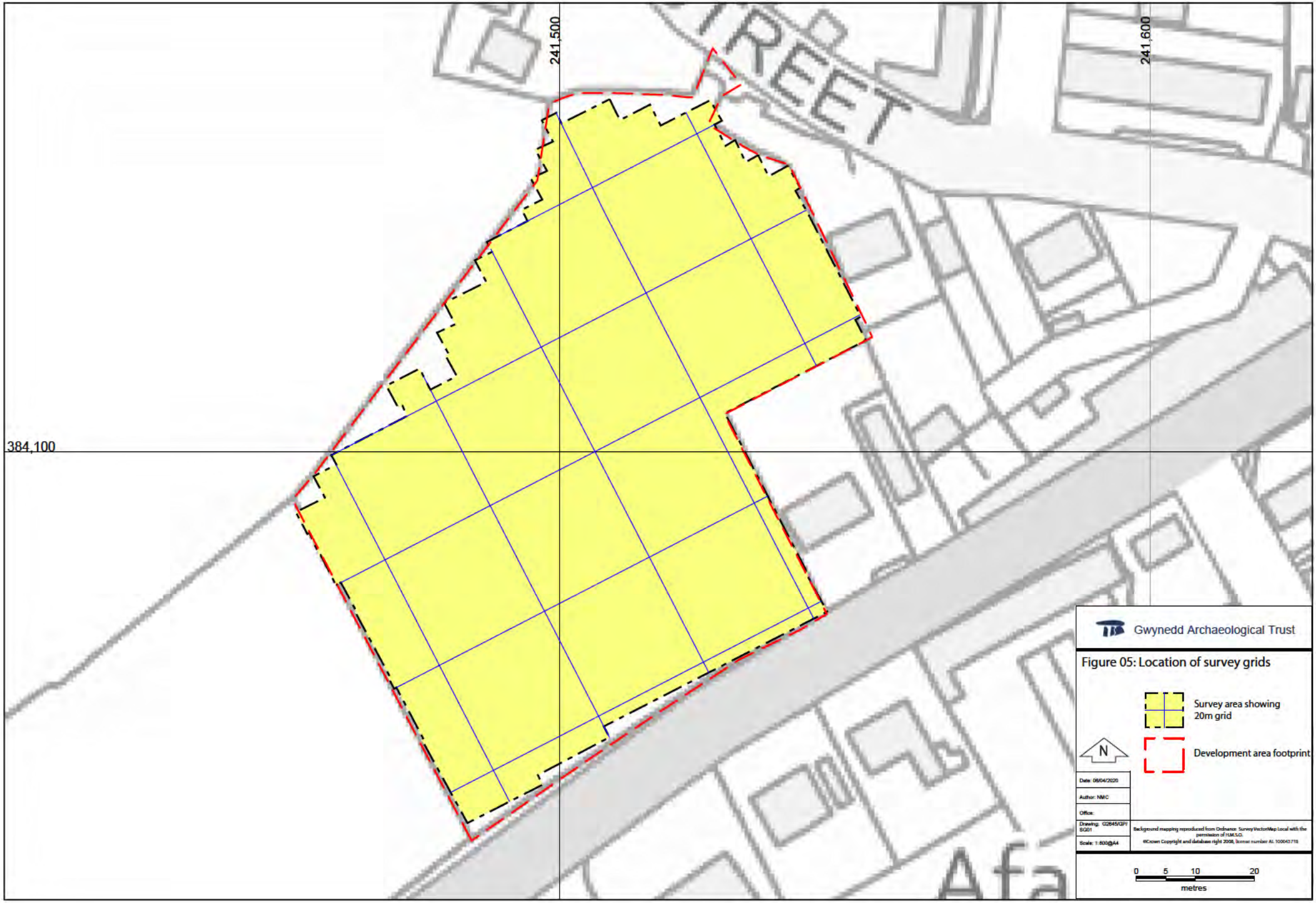

LLANERCHYMEDD
L L A N E R
Gwynedd Archaeological Trust
Development area footprint
N
0 25 50 100
metres
L.&.N.W.R.
ANGLESEY CENTRAL BRANCH
Station
St. Mary's Church
School
Baptist Chapel
National Provincial Bank
Rectory
Smithy
Bryn-goleu
Bryncuhelyn
Ty'n-y-ffynnon
Tan-y-parc
Pen-dref
Bryn Gwallen-isaf
Waen-y-bel
Llwyn-drain
Highgate
Fron-deg
Police Station
Anglesey Central Hotel
George & Dragon Inn
King's Head Inn
Druid Arms
Burial Ground
Goods Shed
Grave Yard
Quarry
Spring
Well

Figure 03: Second Edition Ordnance Survey 1-inch to 25-mile County Series Map 1900 (Sheets VII.9, VII.10, VII.13 & VII.14)


LLANERCHYMEDD
Station
St Mary's Church
Gwynedd Archaeological Trust
Figure 04: Third Edition Ordnance Survey 1-inch to 25-mile County Series Map 1920/1 (Sheets VII.9, VII.10, VII.13 & VII.14)
N
Development area footprint
0 25 50 100
metres


241,500
241,600
384,100
Gwynedd Archaeological Trust
Figure 05: Location of survey grids
Survey area showing 20m grid
Development area footprint
N
Date: 09/04/2020
Author: NMC
Office:
Drawing: G2645/GPI SQ01
Scale: 1:800@A4
Background mapping reproduced from Ordnance SurveyVectorMap Local with the permission of H.M.S.O.
©Crown Copyright and database right 2008, license number AL 100043718
0 5 10 20
metres


241,500
241,600
384,100
Gwynedd Archaeological Trust
Figure 06: Geophysical survey greyscale plot (minimally processed, raw data clipped to +/- 15nT)
15 nT
0 nT
-15 nT
N
Date: 06/04/2020
Author: NMC
Office:
Drawing: G2645/GPV MP01
Scale: 1:800@A4
Background mapping reproduced from Ordnance Survey VectorMap Local with the permission of H.M.S.O.
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0 5 10 20
metres


241,500
241,600
384,100
Gwynedd Archaeological Trust
Figure 07: Geophysical survey processed greyscale plot (raw data clipped to +/- 15nT, de-striped and smoothed)
15 nT
0 nT
-15 nT
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Office:
Drawing: G2545/GPY ZM101
Scale: 1:600@A4
Background mapping reproduced from Ordnance Survey VectorMap Local with the permission of H.M.S.O.
©Crown Copyright and database right 2008, license number AL 100043718
0 5 10 20
metres


241,500
241,600
384,100
1
2
3
4
5
6
Gwynedd Archaeological Trust
Figure 08: Geophysical survey interpretative plan
Probable Archaeology (discrete / trend / increased response)
Ridge and Furrow
Uncertain (trend)
Ferrous / Magnetic Disturbance
N
Date: 06/04/2020
Author: NMC
Office:
Drawing: G2645/GPI IP01
Scale: 1:800@A4
0 5 10 20
metres

APPENDIX I

Gwynedd Archaeological Trust Written Scheme of Investigation

TY'N FFYNNON LLANERCHYMEDD, YNYS MÔN (G2645)

WRITTEN SCHEME OF INVESTIGATION FOR ARCHAEOLOGICAL EVALUATION (GEOPHYSICAL SURVEY)

Prepared for Mr and Mrs Thomas

February 2020

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

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

TY'N FFYNNON LLANERCHYMEDD, YNYS MÔN (G2645)

WRITTEN SCHEME OF INVESTIGATION FOR ARCHAEOLOGICAL EVALUATION (GEOPHYSICAL SURVEY)

Prepared for *Mr and Mrs Thomas*, February 2020

CONTENTS

1 INTRODUCTION

Gwynedd Archaeological Trust has been commissioned by Mr and Mrs. Thomas to undertake an archaeological evaluation (geophysical survey) in advance of a proposed residential development on land at Ty'n Ffynnon, Llanerchymedd, Ynys Môn (NGR SH41508408; postcode: LL71 7AD; Figure 01). The development area measures 0.7ha and will include 16 dwellings located within a field of improved open pasture at the western end of Llanerchymedd. The evaluation will be undertaken from February 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);
- *Standard and Guidance for Historic Environment Desk-Based Assessment* (Chartered Institute for Archaeologists, 2014); and
- *Standard and Guidance for Archaeological Geophysical Survey* (Chartered Institute for Archaeologists, 2014.

Based on the results of the geophysical survey, further pre-determination archaeological works may be recommended, which could include targeted trial trenching. Any such works will be defined in future written schemes of investigation.

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 evaluation 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. GAPS have stated the geophysical survey should be supported by sufficient desk-based research to aid interpretation of any archaeological evidence encountered.

The GAPS Archaeologist will need to be informed of the project timetable and of the subsequent progress and findings. The curator contact details are: 01248370926.

1.2 Historic Environment Record

In line with the GAT 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). In line with this guidance, all submitted reporting will need to include the equivalent of a non-technical summary in Welsh and English at the front of the report combined with short bilingual summaries of the principal Historic Assets recorded during the event. These requirements are mandatory. The GAT HER enquiry number is 1228 and the event primary reference number is 45799.

The GAT HER will also be responsible for supplying Primary Reference Numbers (PRN) for new assets identified and recorded.

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

A brief examination of the regional Historic Environment Record demonstrates that the evaluation area is part of a wider historic landscape associated with Llanerchymedd as well as within a general area of known archaeological activity, with two sites located within close proximity:

- The site of a Bronze Age earthwork associated with burial activity (Primary Reference Number (PRN) 3589) is located at NGR SH41308400, c.181m to the southwest; and
- St. Mary's Church (PRN 3578) is located at NGR SH4176084090, c.219m to the east, which includes possible early medieval structural activity within a later church, including a doorway between the nave and tower with a roughly round arch and square abaci.

In terms of post-medieval land use and development, an examination of the Ordnance Survey First to Third Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheet of the area (Sheets VII.9, VII.10, VII.13 & VII.14; 1889, 1900 and 1920/21 respectively; cf. Figures 02 to 04) shows the development area within an enclosed field of open pasture that generally matches the current boundaries. The plot is located at the western end of Llanerchymedd, within the main settlement area. This layout has not fundamentally changed, beyond additional settlement along the local road network, including two plots within the former southeastern corner of the plot.

3 METHODOLOGY

3.1 Geophysical Survey

3.1.1 Summary

The geophysical survey will be undertaken by GAT staff and will incorporate the area defined as the red highlighted plot in Figure 01 and 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.

3.1.2 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.

3.1.3 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.

3.1.4 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.

3.1.5 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)

3.2 Assessment (Desktop Study)

The geophysical survey will be supported by sufficient desk-based research to aid interpretation of any archaeological evidence encountered. A desk-based assessment is defined as “a programme of study of the historic environment within a specified area or site on land, the inter-tidal zone or underwater that addresses agreed research and/or conservation objectives. It consists of an analysis of existing written, graphic, photographic and electronic information in order to identify the likely heritage assets, their interests and significance and the character of the study area, including appropriate consideration of the settings of heritage….Significance is to be judged in a local, regional, national or international context as appropriate” (CIfA 2014, 4).

The desk-based assessment will involve a study of the following resources:

1. The regional Historic Environment Register ((HER) Gwynedd Archaeological Trust, Craig Beuno, Ffordd y Garth, Bangor, Gwynedd LL57 2RT) will be examined for information concerning the study area, defined as the red highlighted plot in Figure 01 and the immediate environs. This will include an examination of the core HER, the 1:2500 County Series Ordnance Survey maps and any secondary information held within the HER. All identified features will be mapped, described and added to a gazetteer of sites and the relative importance of any sites defined;
2. The National Monuments Record of Wales (Royal Commission on the Ancient and Historical Monuments of Wales, Plas Crug, Aberystwyth SY23 1NJ) will be checked for sites additional to the HER;
3. Aerial photographs from the National Monuments Record of Wales (Royal Commission on the Ancient and Historical Monuments of Wales, National Monuments Record of Wales, Plas Crug, Aberystwyth SY23 1NJ) will be examined for potential features;
4. On-line catalogue search of the National Library of Wales (Penglais Rd, Aberystwyth SY23 3BU);
5. Archive data, including primary and secondary sources, historic maps and estate maps will be examined at the regional archives (Archifau Ynys Môn / Anglesey Archives, Bryn Cefni Industrial Estate Road, Llangefni LL77 7JA). The examination of the archive data will include the local tithe map and schedule;

6. If available, Light Detection and Ranging (LiDAR) data will be examined from the Lle Geo-Portal at http://lle.gov.wales/home for information on potential surface features using digital terrain modelling and digital surface modelling;

3.3 Data processing and 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;
7. Results;
8. Conclusions and recommendations;
9. Acknowledgements;
10. Bibliography;
    a. Primary sources;
    b. Secondary sources;
11. Figures; inc.:
    - location plan;
    - historic mapping;
    - location plan with identified features;
    - 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);
    Back cover.

Illustrations will include plans of the location of the study area and archaeological sites. 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 March 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 evaluation will be completed by a team of Project Archaeologists who will have responsibility for completing and compiling the survey data, interpreting the results, preparing the subsequent report and archive. The project manager will be responsible for reviewing and approving the report prior to submission.

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. Ordnance Survey First Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets VII.9, VII.10, VII.13 & VII.14; 1889.
5. Ordnance Survey Second Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets VII.9, VII.10, VII.13 & VII.14; 1900.
6. Ordnance Survey Third Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets VII.9, VII.10, VII.13 & VII.14; 1920/21.
7. Royal Commission on Ancient and Historic Monuments of Wales 2015 *Guidelines for digital archives*
8. Standard and Guidance for Archaeological Geophysical Survey (Chartered Institute for Archaeologists, 2014).
9. Standard and Guidance for Historic Environment Desk-Based Assessment (Chartered Institute for Archaeologists, 2014).

FIGURE 01

Reproduction of WM Design and Architecture Limited Drawing No. A-00-01, denoting development area (outlined red) targeted for evaluation.

G:N

1 Site OS Plan 1:1250

This drawing is to be read in conjunction with the written specification provided by WMDesign.
Structural Engineers drawings details and calculations shall take precedence over the Architectural drawings.
If in doubt ASK

Construction Risks	Maintenance/cleaning Risks	Demolition/adaptation Risks

In addition to the hazard/risks normally associated with the types of work detailed on this drawing take note of the above. It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

Safety Health and Environmental Information Box

Rev	Description	Initials	Date

DESIGN AND ARCHITECTURE LIMITED
CIAT
Pier House St. Georges Road Menai Bridge Anglesey LL59 5EY
t: 01248 717230 e: office@wmdesign.co.uk w: www.wmdesign.co.uk

Proposed Residential Development

Site adj, Tyn Y Ffynon

Llanerchymedd

Site OS Plan

J & H Thomas

project	drawing status	date	
SH1804	**Preliminary**	**04/12/2019**	
originator	scale @ A3	number	rev
Adrian Williamson	**1:1250**	**A-00-01**	

FIGURE 02

Reproduction of Ordnance Survey First Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets VII.9, VII.10, VII.13 & VII.14; 1889. Scale 1:5000 @A4.

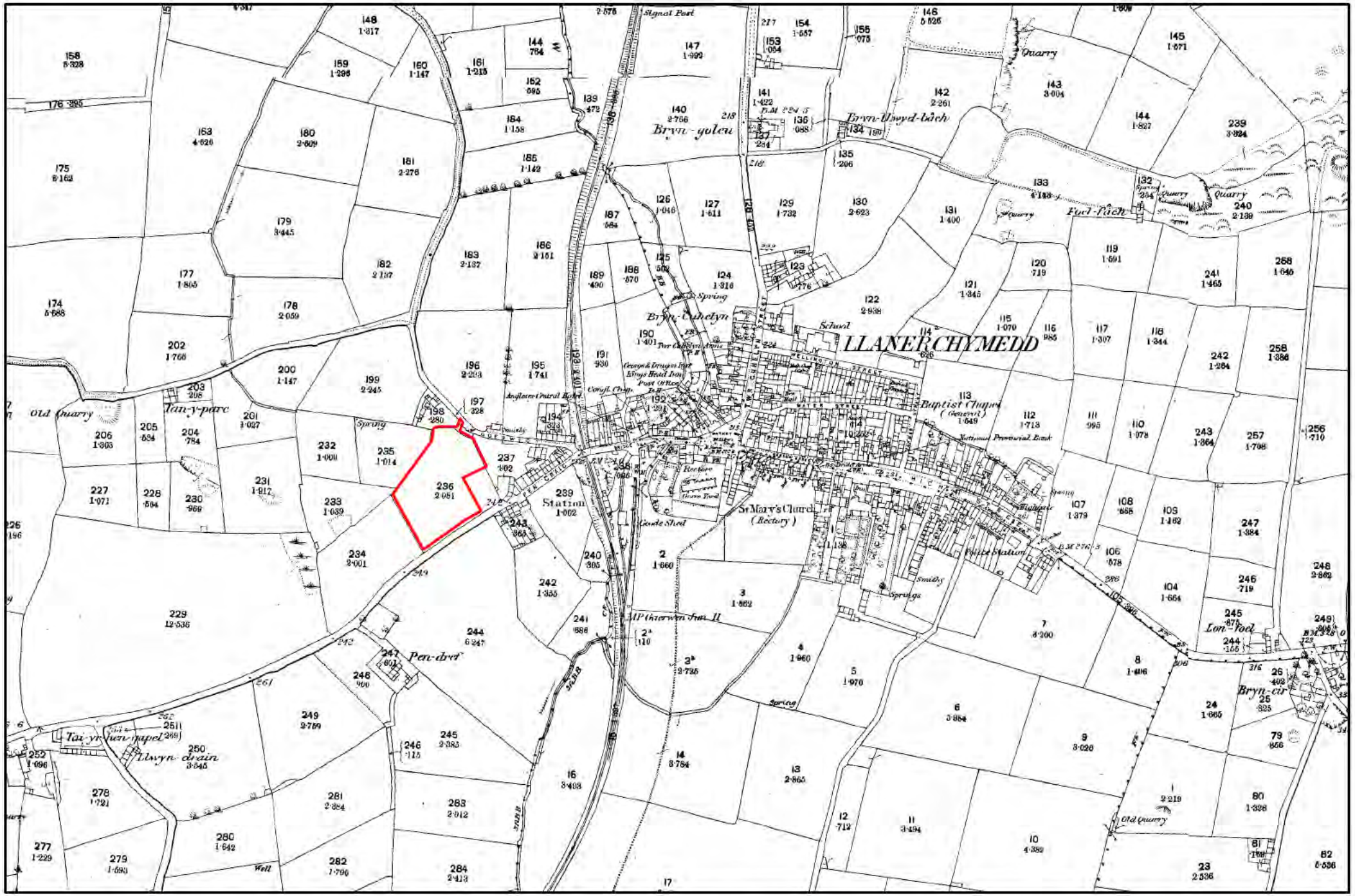

FIGURE 02 Reproduction of Ordnance Survey First Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets VII.9, VII.10, VII.13 & VII.14; 1889. Scale 1:5000 @A4.

FIGURE 03

Reproduction of Ordnance Survey Second Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets VII.9, VII.10, VII.13 & VII.14; 1900. Scale 1:5000 @A4.

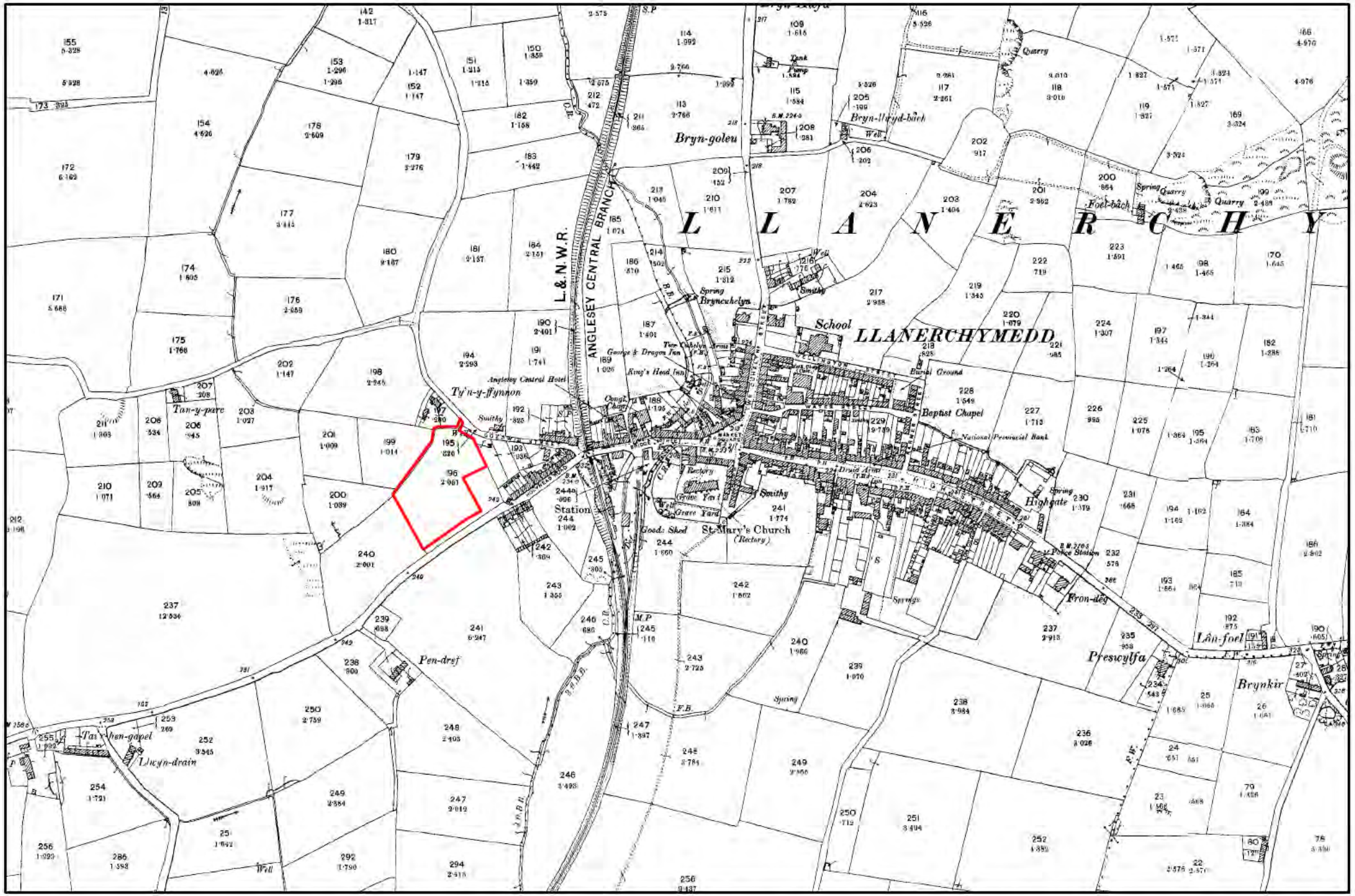

FIGURE 03 Reproduction of Ordnance Survey Second Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets VII.9, VII.10, VII.13 & VII.14; 1900. Scale 1:5000 @A4.

FIGURE 04

Reproduction of Ordnance Survey Third Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets VII.9, VII.10, VII.13 & VII.14; 1920/21. Scale 1:5000 @A4.

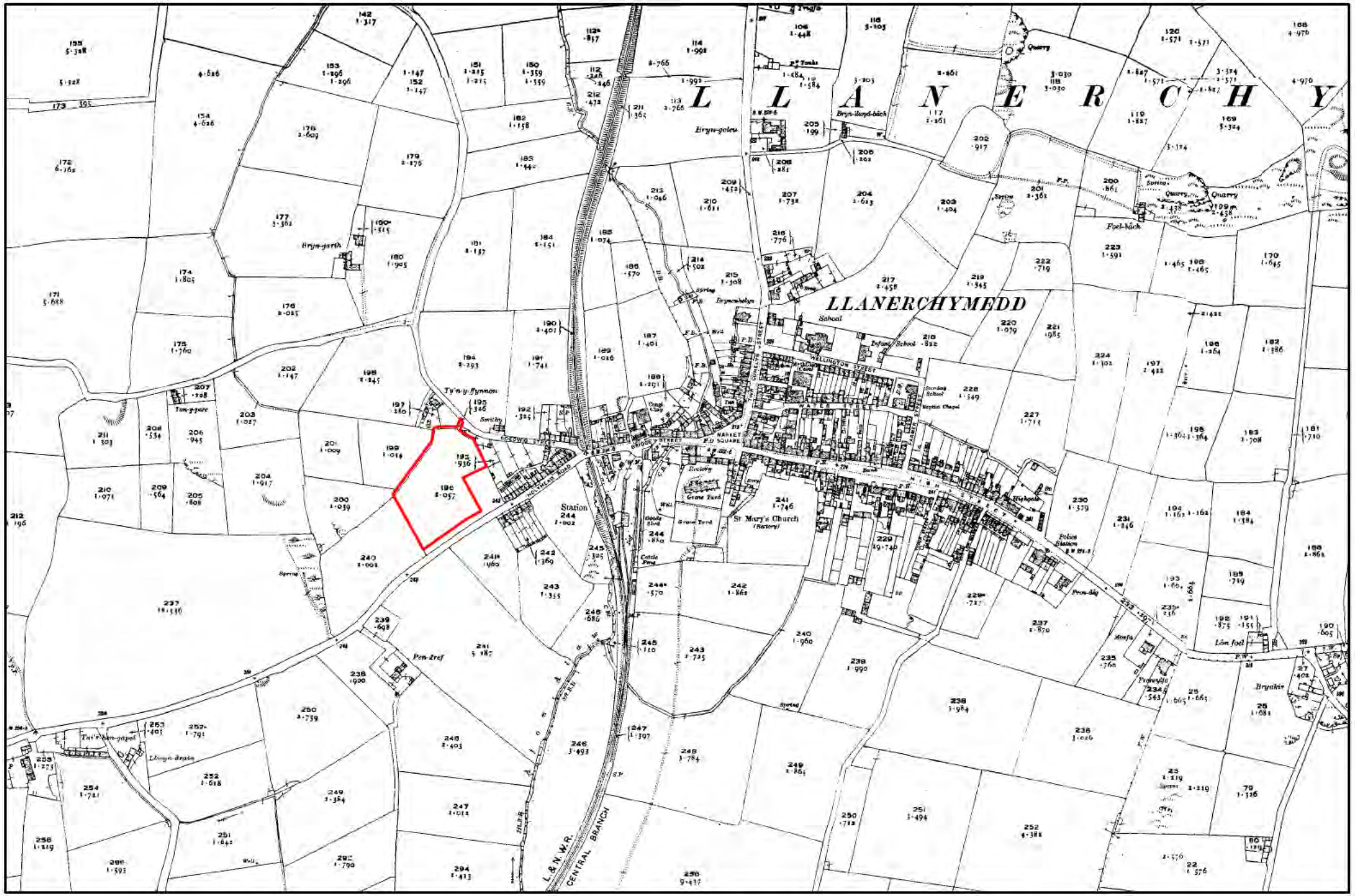

FIGURE 04 Reproduction of Ordnance Survey Third Edition Ordnance Survey 1-inch to 25-mile County Series Map Sheets VII.9, VII.10, VII.13 & VII.14; 1920/21. Scale 1:5000 @A4.

Gwynedd Archaeological Trust
Ymddiriedolaeth Archaeolegol Gwynedd

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