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**Coch Willan Hydro-Electric Scheme,  
Penrhyn, Gwynedd.  
November 2015  
V 3.0**



aeon archaeology



Archaeological Assessment  
Project Code: A0017.1  
Report no. 0015

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# **Coch Willan Hydro-Electric Scheme, Penrhyn, Gwynedd. November 2015**

Report no. 0015 v1.0

Archaeological Assessment

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Project Code: A0017.1

Date: 23/11/2015

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## 1.0 NON-TECHNICAL SUMMARY

Aeon Archaeology was commissioned by Carter Jonas LLP to undertake an archaeological assessment of the proposed construction of a new micro hydro-electric scheme. The proposed hydro-electric scheme is to be located on the western bank of the Afon Ogwen, approximately 500.0m east of the farm of Pen Lan, Penrhyn, Gwynedd.

The assessment ascertained that the proposed development will impact physically upon four sites of archaeological significance (weir feature 1, sluice gate feature 2, mill race feature 3, and unnamed road feature 9). The proposed scheme will have a low beneficial impact upon the weir, a high adverse impact upon the sluice gate and mill race, and a low adverse impact upon the renamed road. Site specific recommendations have been given to minimise/negate these impacts.

In addition, the archaeological assessment ascertained that there was a medium-high potential for unknown buried archaeological remains within the northernmost 250.0m of the hydro pipeline. As such recommendations have been made for a watching brief during groundworks in this area. The report also ascertained that the southernmost 250.0m of the hydro pipeline is devoid of any potential for preserved remains due to the construction of the A55 expressway.

The potential of the large enclosed grazing field to the west of the turbine house, to produce unknown buried archaeological remains is considered to be very high. This field occupies a flat plateau of land overlooking the Afon Ogwen and lies within 110.0m of a possible prehistoric settlement (PRN: 29434); 350.0m of the early Neolithic timber building, prehistoric pits, prehistoric burnt mounds, and Iron Age/Roman settlement at Parc Bryn Cegin, and approximately 550.0m from the prehistoric Henge Monument and Cursus Scheduled Ancient Monument (CN153). The close proximity of such a large quantity of nationally important well preserved buried archaeological remains coupled with the suitability of the flat plateau of land for early habitation makes this site of particularly high potential. As such Aeon Archaeology has advised the client to avoid any disturbance of this area and after detailed design changes, a cable route has been proposed that avoids this area and follows the farmers trackway northeast, after which it will be buried within the verge of the unnamed minor road.

## 2.0 INTRODUCTION, AIMS AND PROJECT DESIGN

Aeon Archaeology was commissioned by Carter Jonas LLP to undertake an archaeological assessment of the proposed construction of a new micro hydro-electric scheme. The proposed scheme is to be located on the western bank of the Afon Ogwen, approximately 500.0m east of the farm of Pen Lan, Penrhyn, Gwynedd. The scheme is to include an intake weir located on the Afon Ogwen (NGR **SH 60122 69963**) and a c.500.0m long buried pipe to a turbine house located in a field to the west of the river (NGR **SH 60127 70223**). The pipe will be made from 1500mm (external diameter) HDPE black plastic which will be laid into the base of the historic mill race once it has been emptied of silt and debris. In addition excavations for the installation of a screen box and fish bypass will take place at the southern end of the mill race and immediately adjacent to the weir. The mill race will then be in-filled with soil and the pipe will enter and be laid in the base of the existing modern culvert beneath the A55. Once it emerges on the northern side of the culvert the pipe will be trenched through the edge of the historic mill race and be buried through the field to the new turbine house.

A new cable will then run northwest within the farm trackway. It will then be trenched northward along the unnamed road and into a field to the west where it will be joined to an existing power line (NGR **SH 59875 70247**) (figure 1).

In addition to the proposed hydro-electric scheme the works will also include repair to the western bank and side of the weir as part of a wider flood-prevention scheme. This will involve diverting the water away from the left hand bank via excavation and installation of a galvanised steel drop plank frame into the river bed in a dry region on the river channel on the eastern side. When the frame is installed, boulder/gravel deposits will be removed to provide a new channel through the frame to accommodate flow during moderate river conditions. This will drop the water level above the weir, reducing diversion works required to dry the area at the eastern bank in need of repair. On completion, drop planks will be inserted in the frame restoring the original river level above the weir. The weir will be repaired using existing stones that have fallen from it.

During the construction a lay down compound for material storage will be used in the enclosed field beneath the A55 expressway and plant machinery will access the site via the existing trackways.

The archaeological assessment was carried out as part of a full planning application (**ref: C13/1039/16/LL**).

This archaeological assessment is for the proposed development area, which includes the water intake point, the hydro pipe route, the turbine house, the water outflow, the power cable route, and a 40.0m wide assessment corridor centred on the proposed pipeline route.

As part of the archaeological assessment a 1.0km search area centred on the proposed route was utilised for a search of the Gwynedd Historic Environment Record (HER). This provided a background historical narrative of the area and included source material from the Gwynedd Archives and Record Office. Information on Scheduled Ancient Monuments and Listed Buildings was obtained from Cadw.

The following report conforms to the guidelines specified in *Standard and Guidance for Archaeological Desk-based Assessment* (Institute of Field Archaeologists, 1994, rev. 2007).

The archaeological desk-based assessment considered the following:

- (i) The history of the site;
- (ii) The significance of any remains in their context both regionally and nationally;

- (iii) The potential impact of the proposed development on known sites of archaeological importance including their setting.

The archaeological desk-based assessment was undertaken in four stages:

- (i) Archival research
- (ii) Field visit/site walkover of all accessible areas
- (iii) Written report
- (iv) Project archive

### **3.0 METHODS AND TECHNIQUES**

#### **3.1 Archival research**

The archaeological assessment involved the study of the following records:

- The regional Historic Environment Record (Gwynedd Archaeological Trust, Craig Beuno, Garth Road, Bangor, LL57 2RT) was examined for information concerning the study area. This included an examination of the core HER, and secondary information held within the record which included unpublished reports, the 1:2500 County Series Ordnance Survey maps, and the National Archaeological Record index cards and aerial photography.
- The National Monuments Record (NMR RCAHMW, National Monuments Record of Wales, Plas Crug, Aberystwyth, SY23 1NJ) was checked for sites additional to the HER.
- Information about Listed Buildings and Scheduled Ancient Monuments from Cadw were examined in the regional HER. The Register of Outstanding and Special Historic Landscapes and the Register of Parks and Gardens was checked, and also the location of World Heritage Sites.
- Secondary sources were examined, including the Inventories of the Royal Commission on Ancient and Historical Monuments for Wales, and works held within the regional libraries.
- Evidence from aerial photographs was collated. Vertical and oblique collections held by the NMR, Natural Resources Wales (NRW) and the Welsh Government were examined.
- Results from previous archaeological work within the area was also reviewed.

#### **3.2 Site walkover**

The site walkover was carried out on 25<sup>th</sup> June 2013 by Richard Cooke BA MA MCIfA, archaeological contractor and consultant at Aeon Archaeology. The weather conditions were ideal for the field search being both bright and clear. All archaeological sites and view points were photographed using a digital SLR (Canon 550D) set to maximum resolution (72 dpi).

A follow up site walkover was carried out on 18<sup>th</sup> September 2014 by Richard Cooke BA MA MCIfA as part of an update to the existing archaeological assessment report.

#### **3.3 Assessment report**

All features identified from the archival research and site walkover were assessed and allocated to categories of international, national, regional/county, local and none/unknown importance as listed in section 6.0. These are intended to place the archaeological feature within a geographical context of importance and thus help inform the most suitable level of mitigatory response. The criteria used for allocating features to categories of importance are based on existing statutory designations and, for non-designated assets, the Secretary of State's non-statutory criteria for Scheduling Ancient Monuments; these are set out in Planning Policy Wales and Welsh Office Circular 60/96.

### 3.4 Project archive

A full archive including plans, photographs and written material was prepared. All plans, photographs and written descriptions were labelled and cross-referenced using Aeon Archaeology pro-formas. A draft copy of the report was sent to the client and upon written approval from them paper and digital copies of the report will be sent to the regional HER (x1) (Gwynedd Archaeological Trust, Craig Beuno, Garth Road, Bangor, LL57 2RT), the Gwynedd Archaeological Planning Service (GAPS) (x1), and the Royal Commission on the Ancient and Historic Monuments in Wales (RCAHMW) (x1). Copies of all notes, plans, and photographs from the assessment are stored at Aeon Archaeology under the project code **A0017.1** with the originals being lodged in a suitable repository to be agreed with the archaeological curator.

Any artefacts arising from future phases of fieldwork will be lodged with the Gwynedd Museum and Art Gallery, Bangor, Gwynedd.

## 4.0 ARCHAEOLOGICAL AND TOPOGRAPHICAL BACKGROUND

### 4.1 Topographic Description

The proposed hydro-electric scheme will be located on the western bank of the Afon Ogwen, approximately 500.0m east of the farm of Pen Lan, Penrhyn, Gwynedd. The scheme is to include an intake weir located on the Afon Ogwen (NGR **SH 60122 69963**) and a c.500.0m long buried pipe to a turbine house located in a field to the west of the Afon Ogwen (NGR **SH 60127 70223**). A buried cable will then be trenched northwest within the farm trackway and unnamed road to an existing power line at NGR **SH 59875 70247**. The site lies within the historic community of Llandygai within the unitary authority of Gwynedd.

The water intake will consist of the opening up of the existing overflow channel at approximately 40.0m OD. After which the pipe will pass through an existing storm overflow culvert which runs through a large embankment for the A55 expressway for approximately 250.0m. The culvert emerges on the northern side of the A55 and the proposed scheme will pass through a reasonably flat enclosed grazing field for approximately 250.0m to a new turbine house at approximately 37.0m OD before emptying back into the Afon Ogwen. The new power cable will utilise the penstock trench as far south as the current farm trackway, where it will then be trenched within the track to the unnamed road and continue northward within the road verge.

The bedrock geology is of the Nant Ffrancon Subgroup. A sedimentary siltstone bedrock that formed approximately 449 to 485 million years ago in the Ordovician Period when the local environment was dominated by shallow seas (British Geological Survey).

### 4.2 Statutory and non-statutory designations

#### 4.2.1 Non-designated monument points from the Gwynedd Historic Environment Record (figure 1)

The Gwynedd Historic Environment Record (HER) maintains a register of non-designated archaeological sites represented as single point data or as polygons. These are identified through their Primary Reference Number (PRN). These include sites which are of archaeological/historical interest, artefact find spots, documentary evidence, and locations of past events such as archaeological projects.

There are 30 non-designated monuments within 1.0km of the proposed pipeline route (see appendix I).

The proposed scheme lies within 100.0m of the following:

- (i) Approximately 4.0m northwest of the projected line of the *Segontium-Canovium Roman road* (PRN: 17567);
- (ii) Approximately 54.0m southeast of the *Roman coin findspot- Llandegai* (PRN: 6890);
- (i) Approximately 100.0m southwest of the possible prehistoric *settlement north of Pen Lan* (PRN: 29434).

In addition there are 2 new monument sites within 1.0km of the proposed scheme, these are monument points that have been identified during past fieldwork but are not fully recorded

within the Gwynedd HER. No new monument sites lie within the 40.0m wide assessment corridor centred on the pipeline and cable route or within 100.0m.

#### **4.2.2 Listed Buildings (figure 2)**

The Secretary of State for Culture, Media and Sport holds a List of Buildings of Special Architectural or Historic Interest, considered to be of national importance. Compiled under the Planning (Listed Buildings and Conservation Areas) Act 1990, the List includes structures from boundary walls and telephone boxes to cathedrals. Listing gives statutory protection and restrictions apply. Consent may be required for works to, or that affect the setting of, a Listed Building and the Local Planning Authority conservation officer should be consulted if in doubt.

There are 55 Listed Buildings within 1.0km of the proposed pipeline route (see appendix I) but none lie within the 40.0m assessment zone centred on the pipe.

The pipe route lies within 500.0m of the following:

- (i) Approximately 117.0m north of the grade II Listed Building of *Felin Cochwillan* (LB: 3669).

#### **4.2.3 Scheduled Ancient Monuments (figure 3)**

Scheduled monuments are those considered to be monuments of national importance. The Ancient Monuments and Archaeological Areas Act 1979 supports a formal system of Scheduled Monument Consent (SMC) for any work to a designated monument. Any works within a Scheduled area will require SMC; this includes non-invasive techniques such as geophysics or field-walking.

There is one Scheduled Ancient Monument within 1.0km of the proposed pipeline and cable route (see appendix I) but none lie within 500.0m of the proposed development.

#### **4.2.4 National Monuments Record (figure 3)**

The Royal Commission on the Ancient and Historic Monuments in Wales (RCAHMW) maintains the National Monuments Record (NMR) for Wales. This is a register of non-designated archaeological sites represented as single point data or as polygons. These are identified through their National Primary Reference Number (NPRN) and include sites which are of archaeological/historical interest, artefact find spots, documentary evidence, and locations of past events such as archaeological projects that are not statutorily protected.

There are 20 non-designated monument points within 1.0km of the pipeline and cable route (see appendix I) but none lie within the 40.0m assessment zone centred on the pipe.

The pipe route lies within 100.0m of the following:

- (i) Approximately 77.0m southwest of the prehistoric *Penlan Settlement* (NPRN: 403369).

#### **4.2.5 Events (figure 4)**

There has not been any past project work undertaken by Aeon Archaeology or any other archaeological contractor within the immediate vicinity of the proposed micro hydro-electric

scheme. In the wider landscape however, approximately 340.0m to the northwest of the site, a geophysical survey was undertaken by Stratascan in 2005 and a strip, map and sample excavation was undertaken by the Gwynedd Archaeological Trust also in 2005 (GAT report 764. 2008). This fulfilled an archaeological planning condition as part of the development of the Parc Bryn Cegin site at Llandygai. The excavations there revealed features dating from the Early Neolithic to the medieval period overlaid by eighteenth and nineteenth-century field boundaries. The most significant discovery was the remains of an Early Neolithic rectangular timber building as well as several clusters of Mid to Late Neolithic pits. In addition sixteen burnt mounds were found, some very well preserved, dating from the Neolithic and Bronze Age, as well as the remains of a Mid Iron Age ring-groove roundhouse and a Late Iron Age/Romano-British settlement.

#### **4.2.6 Historic Landscape Character Areas (HLCAs) (figure 5)**

Cadw, Natural Resources Wales (formerly the Countryside Council for Wales), and the International Council of Monuments and Sites (ICOMOS UK) compiled the two volume Register of Landscapes of Historic Interest in Wales. This includes 58 landscapes of outstanding or special historic interest, which are considered to be the best examples of different types of historic landscapes in Wales. The Register provides information to decision makers and landscape managers, to help ensure that the historic character of the landscape is sustained, and that where change is contemplated, it is well-informed.

The proposed development site lies within the following Historic Landscape Area (HLA):

- (i) The *Dyffryn Ogwen Landscape of Outstanding Historic Interest* (HLW(Gw)10).

Historic Landscape Characterisation takes a closer look at the historic landscape by showing the processes that have shaped the landscape over centuries of human activity, contributing to its present character. Detailed characterisation studies have been compiled by the four Welsh Archaeological Trusts for all 58 areas on the Register. They are used by local government and developers to help assess the impact of development proposals on the historic landscape.

The proposed development area lies within the following Historic Landscape Character Areas (HLCAs):

- (i) The *Improved Fields Above Pentir* Historic Landscape Character area (HLCA: 54).

#### **4.2.6 Historic Parks and Gardens**

Cadw holds a Register of Historic Parks and Gardens of Special Historic Interest. These Registered landscapes are graded I, II\* or II, and include private gardens, public parks and other green spaces. They are valued for their design, diversity and historical importance. Inclusion on the Register brings no additional statutory controls, but there is a presumption in favour of conservation of the designated site. Local authorities are required to consult Cadw on applications affecting sites Registered as grade I or II\* and the Garden History Society on sites of all grades.

There is 1 Registered Historic Park and Garden within 1.0km of the pipeline and cable route (see appendix I) but none lie within the 40.0m assessment zone centred on the pipe or within 500.0m of the proposed scheme.

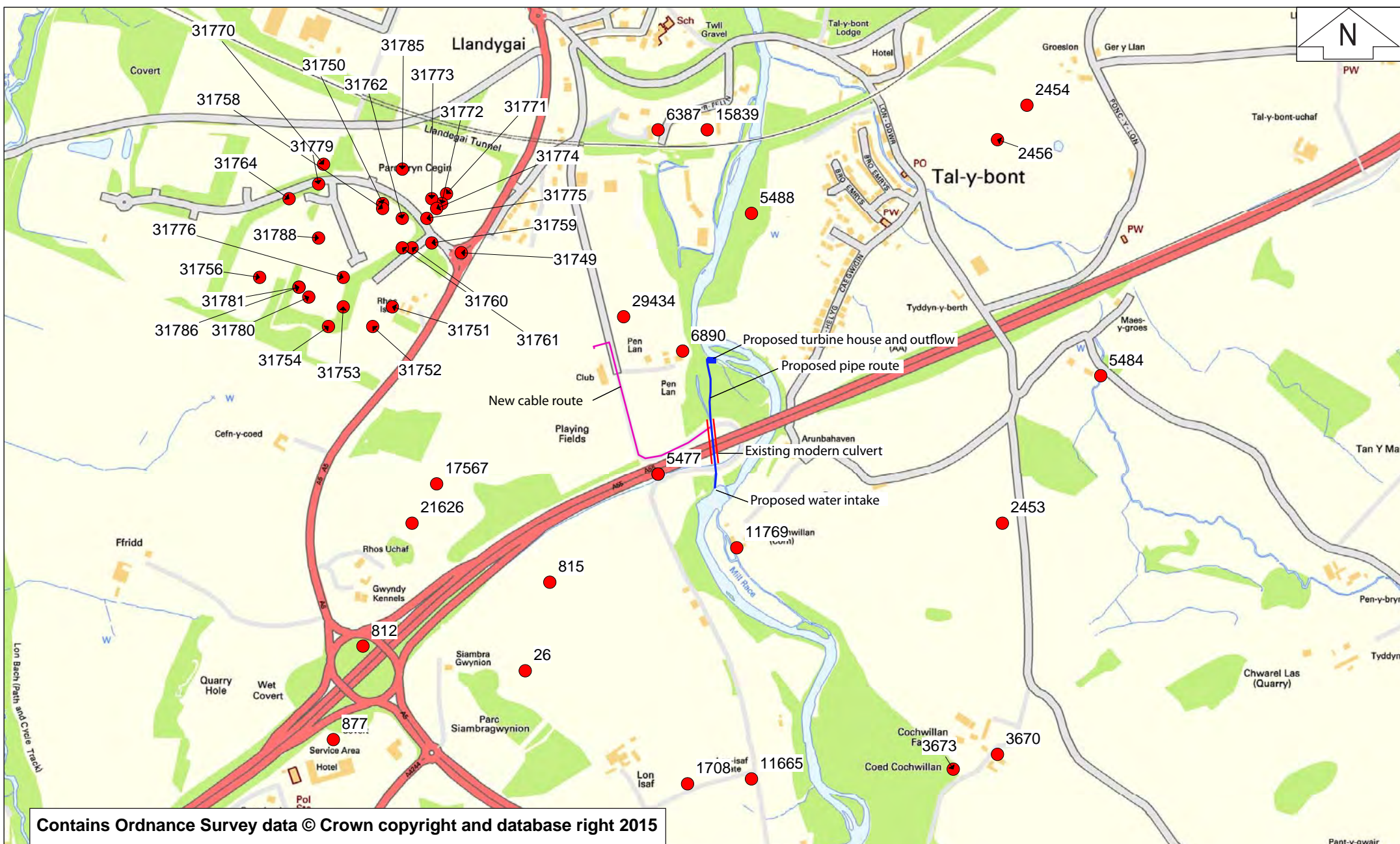
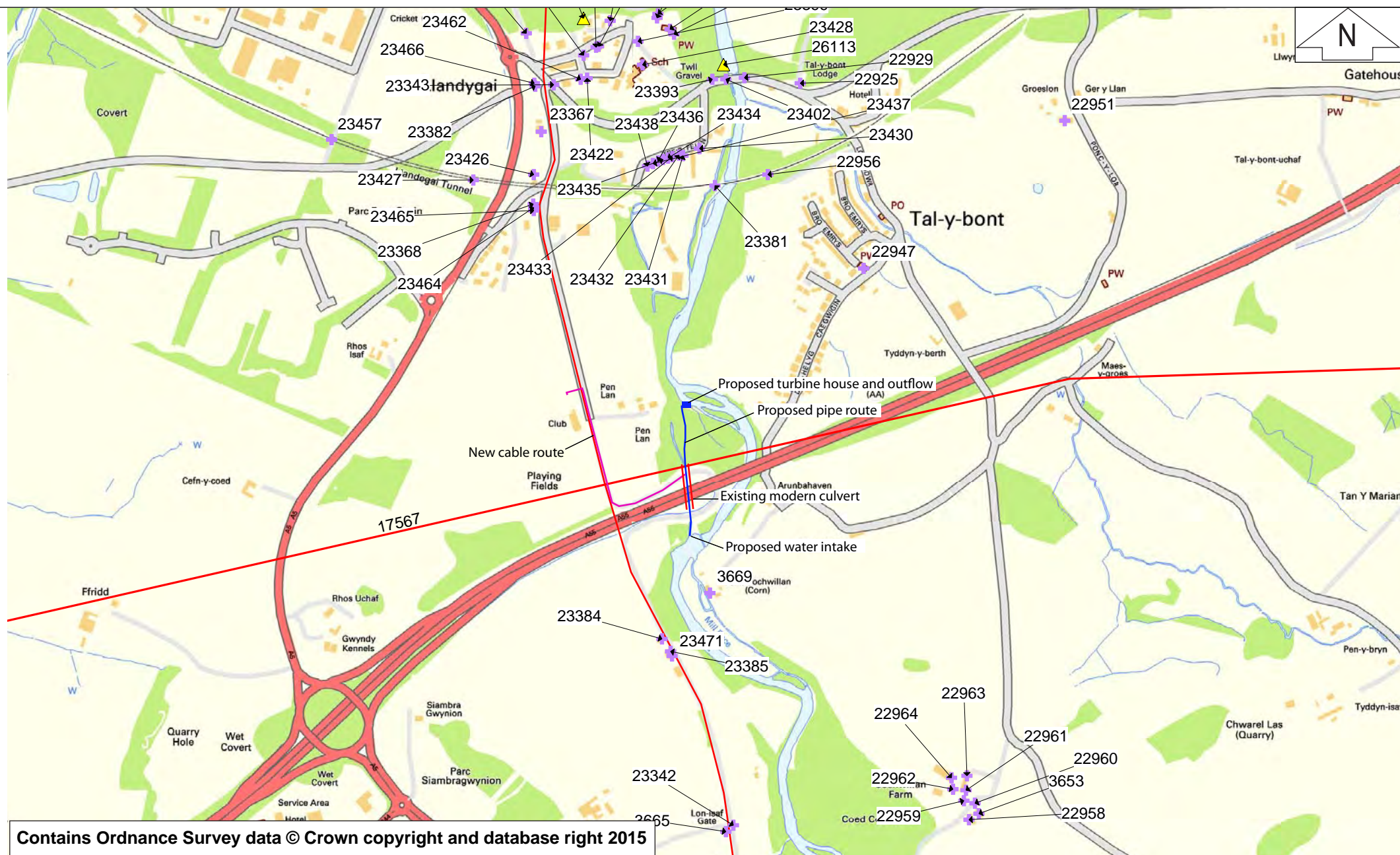


Figure 1: Location of Monument points from the Gwynedd Historic Environment Record (HER). Scale 1:10,000 at A4. (Numbers refer to HER Primary Reference Number (PRN), see report appendix I)

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Figure 2: Location of new Monument points from the Gwynedd HER (yellow triangles), Listed Buildings (purple crosses), and projected routes of Roman roads (red lines). Scale 1:10,000 at A4. (Numbers refer to reference numbers, see report appendix I)

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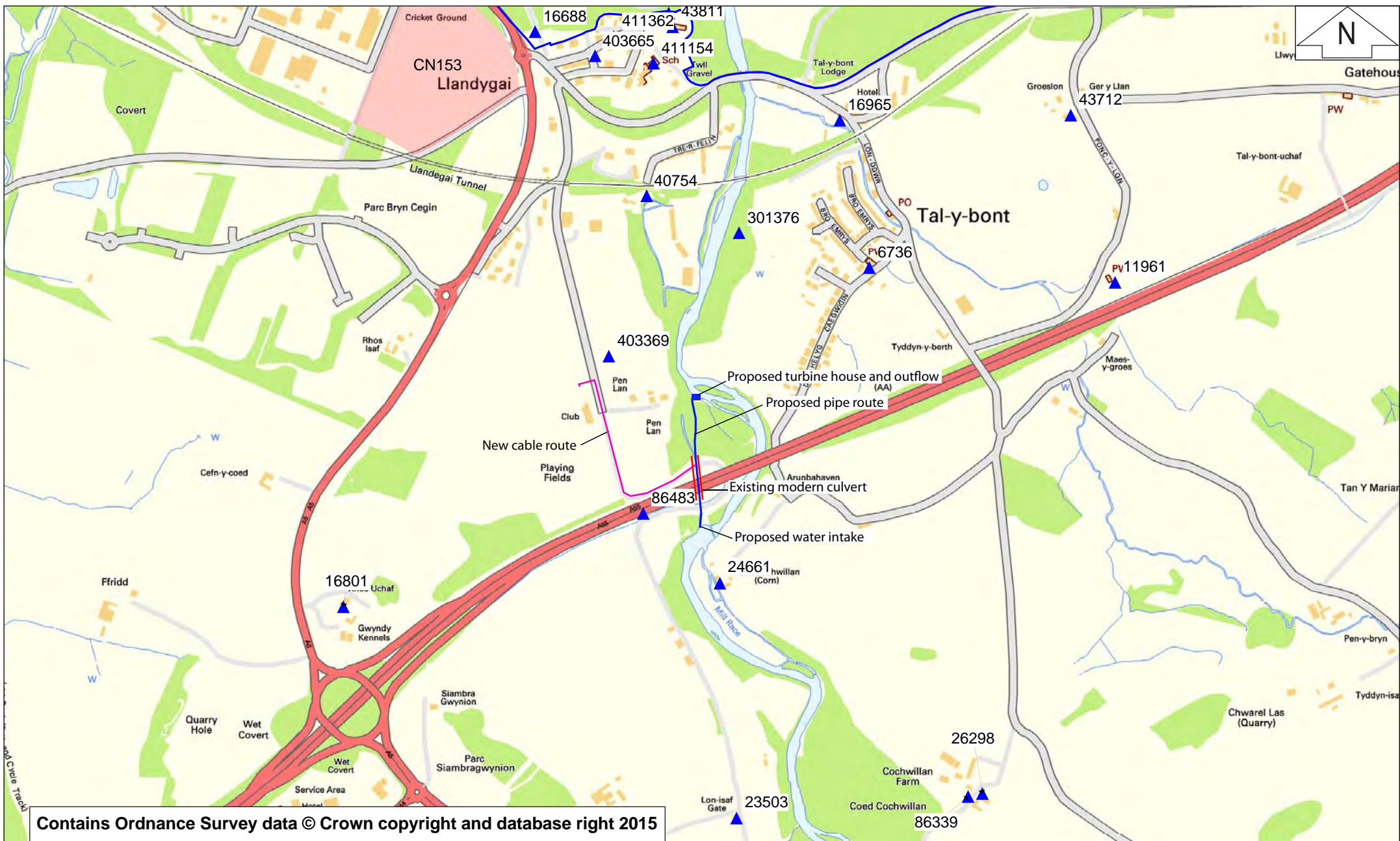
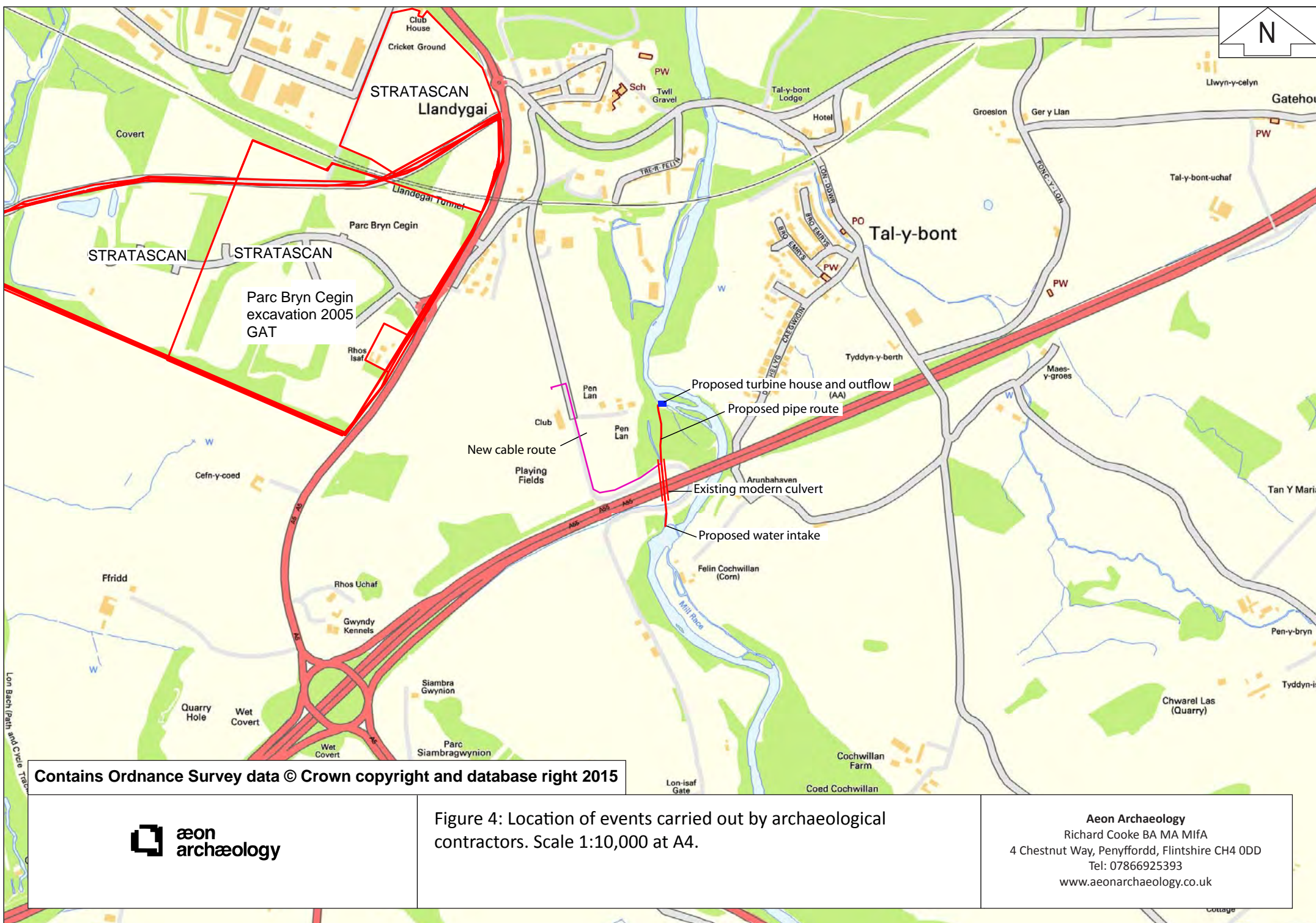
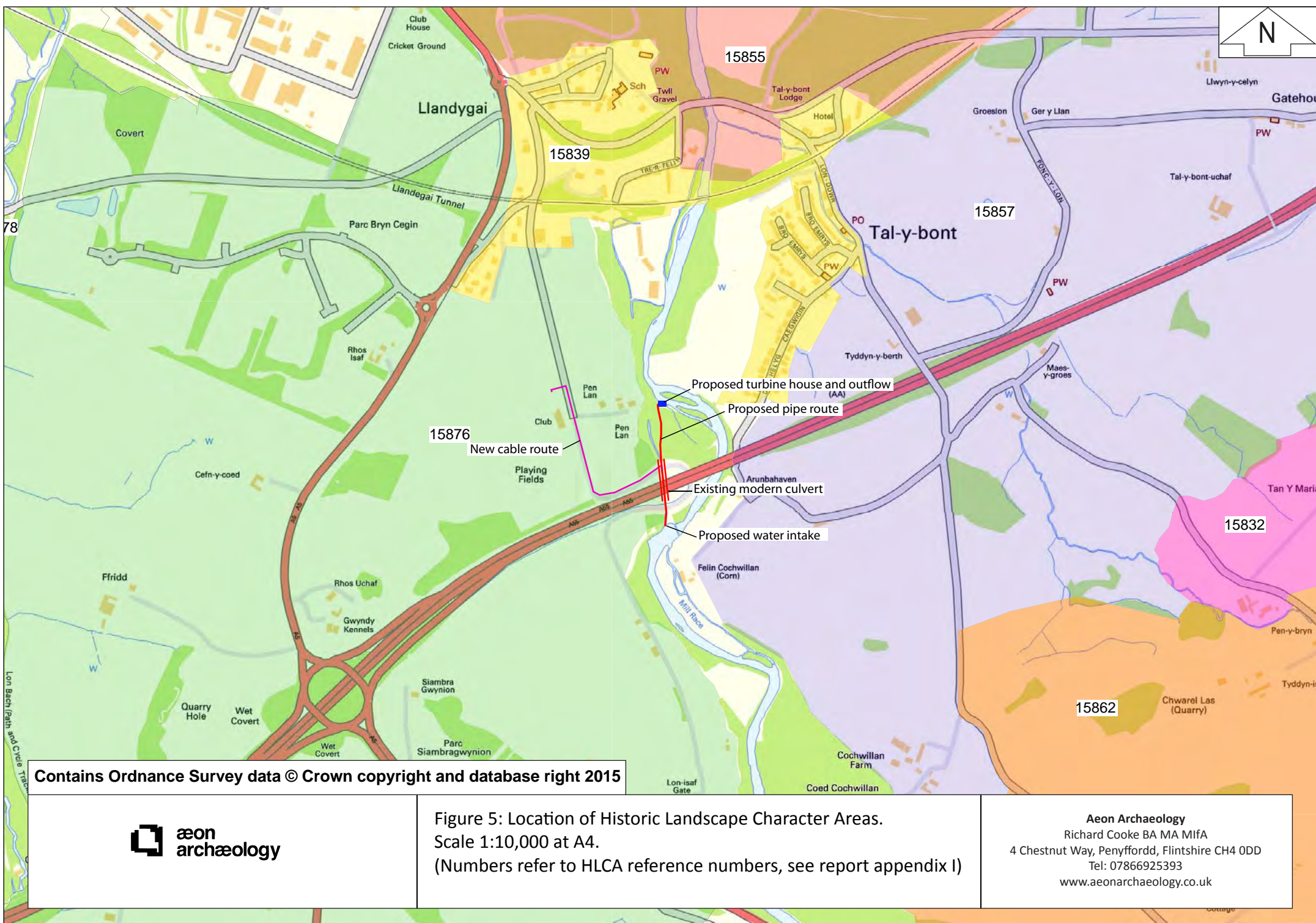


Figure 3: Location of Scheduled Ancient Monuments (shaded red) and monuments points as listed on the National Monument Record (blue triangles). Scale 1:10,000 at A4.  
(Numbers refer to reference numbers, see report appendix I)

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## 5.0 THE HISTORICAL CONTEXT

The following sections describe the known archaeological record within the general area of the proposed development. Sites are identified by their Primary Reference Number (PRN) which is the number by which they are identified in the Gwynedd Historic Environment Record (HER), or by their Scheduled Ancient Monument reference, Listed Building reference and/or their National Primary Reference Number (NPRN) if applicable. The intention of this section is to provide a historic and archaeological context to the site. This aids in establishing the relative importance of an archaeological feature within its landscape, as well as assessing the potential for unknown buried archaeological remains on the proposed development site.

The beginning and end of certain periods is a contentious issue. In the Gwynedd Historic Environment Record (HER) the following dates are used. This is a standard convention across all of the Welsh HERs.

**Table 1. Historic periods**

Palaeolithic (prehistoric)	500,000 BC – 10,001 BC
Mesolithic (prehistoric)	10,000 BC – 4,001 BC
Neolithic (prehistoric)	4,000 BC – 2,351 BC
Bronze Age (prehistoric)	2,350 BC – 801 BC
Iron Age (prehistoric)	800 BC – 47 AD
Romano-British	48 AD – 409 AD
Post-Roman (Early Medieval)	410 AD – 1065 AD
Medieval	1066 AD – 1539 AD
Post-Medieval	1540 AD – 1900 AD
Modern	1901 AD – 2050 AD

### 5.1 Prehistoric and Roman Period

The site lies within the Dyffryn Ogwen Landscape of Outstanding Historic Interest (HLW(Gw)10) so designated for its contrasting evidence of prehistoric and later land use, superimposed by the extensive and visually dramatic remains of the recent and continuing industrial exploitation of slate.

The prehistoric period is particularly well represented within this part of North Wales with a possible prehistoric settlement (PRN: 29434) having been identified through cropmarks approximately 207.0m to the northwest of the proposed hydro discharge point. Furthermore, a bronze age burnt mound (PRN: 815) has been found at Rhos Uchaf and approximately 393.0m to the southwest. In the wider landscape in the area around Llandegai the prehistoric period is particularly well represented with a henge monument and cursus (Scheduled Ancient Monument CN153) having been discovered under the existing industrial estate during excavations by C. Houlder in 1966-7. This revealed a sanctuary of two large henge monuments, the largest measuring 90.0m in diameter and constructed over an earlier Neolithic house. Between the two henges was the western end of a cursus which ran along the gravel ridge towards the Ogwen valley for approximately 130.0m.

Later excavations at Parc Bryn Cegin and approximately 570.0m northwest of the proposed hydro site in 2005, revealed features dating from the Early Neolithic to the medieval period overlaid by eighteenth and nineteenth-century field boundaries. The most significant discovery was the remains of an Early Neolithic rectangular timber building as well as several clusters of Mid to Late Neolithic pits. In addition sixteen burnt mounds were found, some very well preserved, dating from the Neolithic and Bronze Age, as well as the remains of a

Mid Iron Age ring-groove roundhouse and a Late Iron Age/Romano-British settlement. Associated finds included a Roman seal box and evidence for glass bead making. A large cache of glass beads dating to the Roman period was probably related to the settlement despite being found some distance from it (GAT report 764. 2008).

The Roman period is also fairly well represented with the projected line of the Segontium-Canovium Roman road (PRN: 17567) located approximately 4.0m to the southeast. Furthermore, approximately 165.0m to the west lies the proposed line of the Caer Llugwy-Bangor Roman road (PRN: 17819) as theorised by Waddelove (1999, 77-101). The road is proposed to run from Caer Llugwy to a hypothetical camp at Penrhyn, Bangor following amongst other things, the line of the old coach road, the turnpike through Nant y Benglog and Lord Penrhyn's along the west side of the Nant Ffrancon. Neither of these routes have been proven within proximity of the proposed development area and further work is required to confirm their existence.

Approximately 707.0m to the northeast of the site an apparent right-angle in the field west of St. Cross Church is believed to have been the site of a Roman fortlet (PRN 2456), although this area has since been landscaped and thus destroyed. In very close proximity to the proposed development site a Roman coin (PRN: 6890) was found approximately 54.0m to the northwest of the site.

## 5.2 Early Medieval, Medieval and Post-Medieval Periods

Evidence of the early medieval period is located approximately 1.06km to the northeast where cropmarks show at least two small square barrows with slightly rounded corners, one with a central grave pit, the other, larger barrow with two central pits (PRN: 24776) (Driver, T. 2006). In close proximity to this site and approximately 1.16km northeast of the development site an extended inhumation cemetery was identified during the 1966/67 excavations at Llandygai, overlying the cursus and approximately c.50.0m from the western terminal. Over sixty graves were recorded within the areas excavated, lying within the cursus and extending beyond the ditches to the north and south. A particularly significant feature of this group was a single grave lying within a rectangular mortuary enclosure on the south side. The graves were identified during surface cleaning of the cursus area and covered a total excavation area of c.380m. A characteristic dark fill identified the features and their interpretation as graves was dependant on their elongated shape (the dimensions were consistent with known extended inhumations), a generally west-east alignment and the evidence from excavation or partial excavation of eighteen examples (GAT report 697).

By the 12<sup>th</sup> and 13<sup>th</sup> centuries the kingdom of Gwynedd was divided into administrative *commotes*, administered through a network of local centres governed by a royal court or *Llys*. The township of a commote associated with a *llys* was known as the *maerdref*, in which the Prince's agent would reside. The component parts of a *llys* included the royal hall and other buildings associated with the residence, as well as the royal demesne worked by bond tenants, and the settlements of these tenants which constituted small hamlets. The *llys* and royal lands became the property of the English King upon the conclusion of the conquest of Wales.

The nearest surviving remains of the medieval period to the proposed development site includes the grade II Listed Building (PRN: 3670) of Cochwillan - 'The dark red enclosure' - called this because of the purple shade of the Penrhyn slate, which reddens the soil. It lies approximately 790.0m to the southeast and there are many historical associations tied up with the house. For successive centuries have the virtues of the occupants of Cochwillan been the theme of bardic song. The only portion of the house remaining is the dining room - which appears to have formed the north side of a quadrangle (Barnwell, E.L. & Evans, J.E. 1866).

Further remains from the medieval period were found during the archaeological excavations in 2005 at Parc Bryn Cegin, where a single medieval corn-drier was discovered (GAT report 764. 2008).

In 1765 Richard Pennant inherited part of the Penrhyn estate, and in 1781 he gained control of the remainder. Slowly Pennant took direct control over the running of the slate quarries and land, aided by his quarry manager William Williams (appointed 1761) and agent Benjamin Wyatt (appointed 1785). Pennant had employed Benjamin's brother, Samuel, to rebuild the house at Penrhyn, and also to construct a new villa at Lime Grove, where Benjamin was to live. Samuel was impressed with slate as a building medium, and the influential Wyatt family were responsible for a number of the early contracts for roofing slates, and more importantly for raising overall awareness of the advantages of slate.

In 1790 Benjamin Wyatt designed new harbour facilities to deal with an increased output of slates. New stone quays with a small stone pier and a warehouse for storage were constructed. The name of the port was changed from Abercegin to Port Penrhyn, to reflect its new status as a slate port controlled by the Pennant family. Usage of the port was also increased by the establishment of a flint grinding mill (Penlan mill) in c.1795 that imported flints from Suffolk and Ireland, usually in the form of ship's ballast. These flints were then mixed with local cherts from a quarry at Llanllechid and ground to form a temper, which was then exported and used in the making of ceramics. The development of these industries was largely the influence of Samuel Worthington, encouraged by Pennant (GAT report 943).

John Evans' wrote of Penlan mill in 1812 that *'in the vicinity of Penrhyn, on the stream of the Ogwen, is a curious mill, to grind petrosilex, or chert, quartz, and flints, for the use of porcelain and delph ware potteries. The machinery is well contrived, and consists of two overshot wheels about twenty feet in diameter, having trundles on the beams, sixteen do. Which, working within the mill, impart power to another large horizontal trundle-wheel, lifting several upright levers, that again operate on others, two floors above. Circular vessels are paved at the bottom with gritstone, on each of these is a centre with several elbows, between which are placed large flat stones, moved rapidly round by the communicating motion.*

*The chert and flints are previously roasted in kilns nearly similar to those used for the calcination of lime. The materials so prepared are put into the molindary vessles, with a portion of water, and ground into an impalpable powder.*

*The mass in a fluid state is let out into divers reservoirs, where, after undergoing various decantations, is carried to a drying stove, and then packed in casks, and shipped to different parts of the Kingdom.'* (Evans, J. 1812.)

Penlan mill (PRN: 6387; NPRN: 40754) lies approximately 440.0m north of the proposed development area, and was fed by the sluice and mill race which it is proposed are utilised as the intake for the hydro-electric scheme.

The proposed micro hydro-electric scheme location is first depicted on the Penrhyn estate map for Penylann of 1768 (figure 6). The hydro route lies partly within a field labelled as *llain arw* meaning *rough plot* and partly within *llain Uchaf* meaning *upper plot*. The new cable route passes through a field labelled as *gallt cae* meaning *hill field*.

The site is again depicted on the Llandygai parish tithe map of 1841 (figure 7). The proposed development site is depicted as being rather different to how it exists today, as the A55 expressway had not been constructed. The majority of the proposed hydro scheme location lies within what is depicted as a single large field (field 86), lying between the Afon Ogwen to the east and Telford's A5 road to the west. This is indicative of the land tenanted by the

nearby farm of Pen Lan as opposed to realistically depicting the layout of enclosed fields. The water intake and most southerly part of the scheme is shown as lying within a thin belt of woodland.

**Table 2. Tithe apportionment of 1841.**

Field Number	Field Name	Landowner	Occupier	A/R/P
86	Penylan	The Hon. Edward Gordon Douglas Pennant	Griffith Thomas	24/1/38

The accompanying tithe apportionment (table 2) for the parish tithe map names field 86 as *Penylan* which shows that the whole of that area was tenanted and farmed by that property. The apportionment names the tenant as Griffith Thomas who is recorded on the Wales census of 1840 as being a farmer of 55 years of age. The census also shows that he was living with his wife Catherine Thomas (50 years) and his son Griffith Thomas (20 years), as well as eleven farm labourers (6 male and 5 female) at the time of the census.

The landowner was the Hon. Edward Gordon Douglas Pennant, 1<sup>st</sup> Baron Penrhyn. Born Edward Gordon Douglas, he was the younger son of the Hon. John Douglas and his wife Lady Frances. James Douglas, 14th Earl of Morton, was his paternal grandfather and George Sholto Douglas, 17th Earl of Morton, his elder brother. He inherited the Penrhyn estate through his wife's father, George Hay Dawkins-Pennant, and changed his name to Douglas-Pennant by Royal license in 1841. He was the owner of Penrhyn Quarry near Bethesda, which under his ownership developed into one of the two largest slate quarries in the world. He was also involved in politics and sat as Member of Parliament for Caernarvonshire between 1841 and 1866. He also held the honorary post of Lord Lieutenant of Caernarvonshire. In 1866 he was raised to the peerage as 1<sup>st</sup> Baron Penrhyn, of Llandegai in the County of Carnarvon.

Lord Penrhyn married, firstly, Juliana Isabella Mary, daughter of George Hay Dawkins Pennant, in 1833. They had two sons and three daughters. After her death in 1842 he married, secondly, Maria Louisa, daughter of Henry FitzRoy, 5th Duke of Grafton, in 1846. They had eight daughters. He died in 1886, aged 85, and was succeeded in the barony by his eldest son, George (Dodd, 1968).

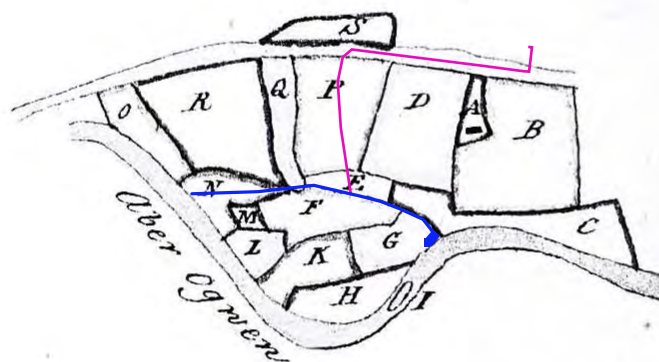
The proposed hydro scheme location is depicted in detail on the first, second and third edition county series 25" Ordnance Survey maps of 1889, 1900, and 1914 respectively (figures 8, 9, and 10). All three editions depict the weir across the Afon Ogwen, which still exists today, and is the location of the proposed water intake for the hydro scheme. Also depicted is a mill race which leaves the river on the western bank immediately upstream of the weir, and is almost certainly the open cut channel in existence today, which is to be utilised to carry water to the turbine house. The mill race is shown as running north and the majority of it was almost certainly replaced with the existing modern culvert during the construction of the A55 expressway. All three Ordnance Survey maps show the mill race continuing northward in the location of what is now the overflow channel north of the A55 road, and then it abruptly stops being depicted as it becomes a culvert for approximately 225.0m. After which the mill race is shown again as an open cut channel which continued north to feed the water wheels at the Penlan mill flint mill (PRN: 6387; NPRN: 40754).

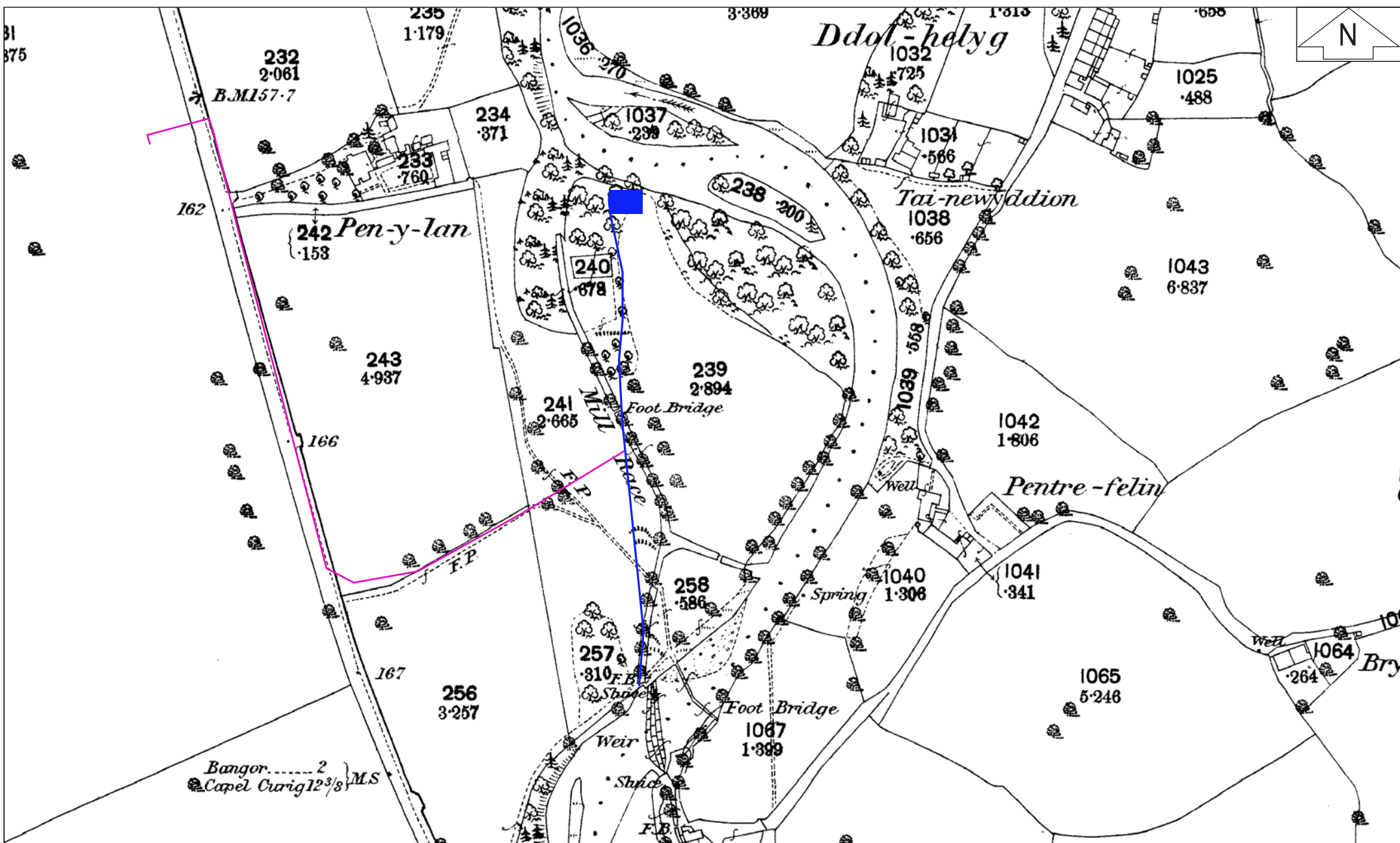
The second and third edition Ordnance Survey maps (figures 9 and 10) depict a small building in the field north of the A55 expressway. This building was most probably a sheepfold or agricultural outbuilding, the remains of which can still be seen today (section 6.0, feature 5).

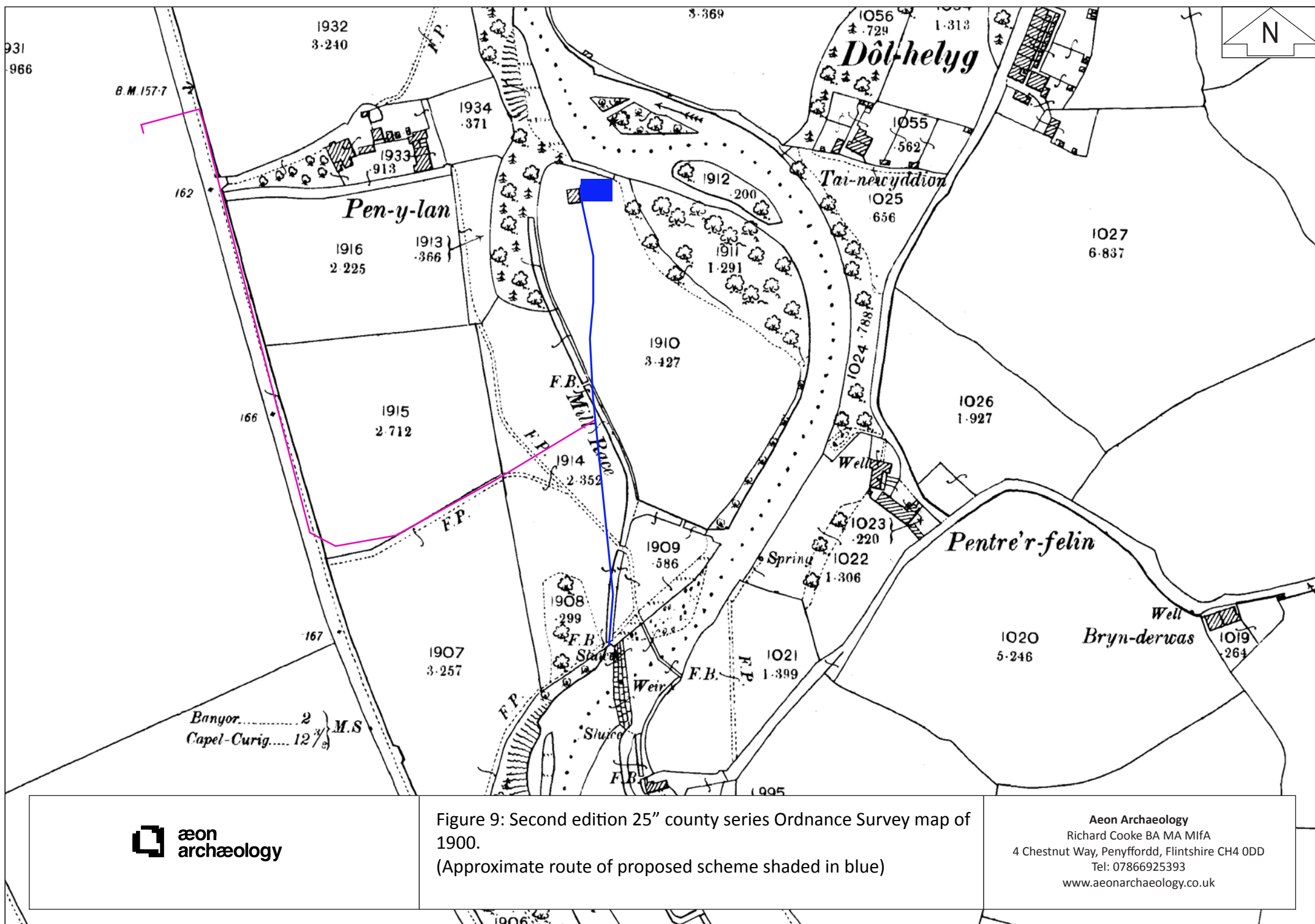
### **5.3 Aerial Photographs**

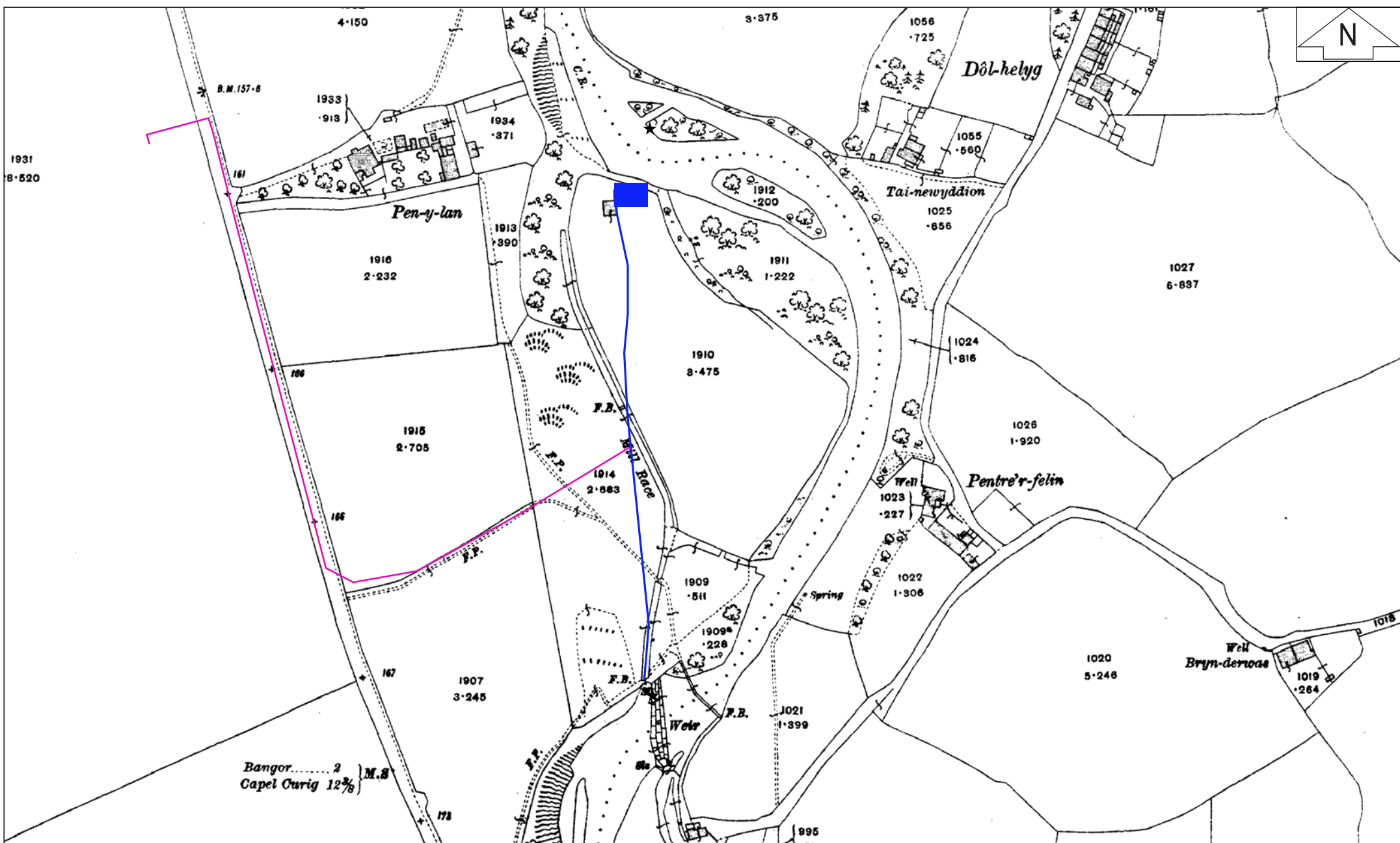
Aerial photographs taken by the RAF of the proposed development area in 1947 and 1948 were inspected for sites additional to the HER. In addition modern Ordnance Survey coverage from 1999 to 2009 was inspected. No additional sites were observed from the aerial photographs as being within the proposed development area.

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## 6.0 ASSESSMENT OF HISTORICAL ASSETS

### 6.1 Definitions

Definitions of importance, impact, and significance of effect as used in the gazetteer (section 6.2) are listed below. Definitions of assessment and mitigation techniques as used in the gazetteer are listed in appendix II.

#### 1. Definition of Categories of importance

The following categories were used to define the importance of the archaeological resource.

Significance	Description
International (Very High)	Archaeological sites or monuments of international importance, including World Heritage Sites. Structures and buildings inscribed as of universal importance as World Heritage Sites. Other buildings or structures of recognised international importance.
National (High)	Ancient monuments scheduled under the Ancient Monuments and Archaeological Areas Act 1979, or archaeological sites and remains of comparable quality, assessed with reference to the Secretary of State's non-statutory criteria. Listed Buildings. Undesignated structures of national importance.
Regional/ County (Medium)	Conservation Areas Archaeological sites and remains which, while not of national importance, score well against most of the Secretary of State's criteria.
Local (Low)	Archaeological sites that score less well against the Secretary of State's criteria. Historic buildings on a 'local list'.
Negligible/None	Areas in which investigative techniques have produced no or only minimal evidence for archaeological remains, or where previous large-scale disturbance or removal of deposits can be demonstrated.
Unknown	Archaeological sites whose importance cannot be determined with the information currently at hand. This can include sites where the extent of buried remains is unknown.

## 2. Definition of Impact

The direct impact of the proposed development on each site was estimated. The impact is defined as follows:

<b>Magnitude</b>	<b>Direct Impacts</b>	<b>Indirect Impacts</b>
High Adverse	Complete removal of an archaeological site. Complete destruction of a designated building or structure.	Radical transformation of the setting of an archaeological monument. A fundamental change in the setting of a building.
Medium Adverse	Removal of a major part of an archaeological site and loss of research potential.  Extensive alteration (but not demolition) of a historic building or feature, resulting in an appreciable adverse change.	Partial transformation of the setting of an archaeological site (e.g. the introduction of significant noise or vibration levels to an archaeological monument leading to changes to amenity use, accessibility or appreciation of an archaeological site). Partial adverse transformation of the setting of a designated building.
Low Adverse	Removal of an archaeological site where a minor part of its total area is removed but the site retains a significant future research potential. Change to a historic building or feature resulting in a small change in the resource and its historical context and setting.	Minor change to the setting of an archaeological monument or historic building.
Negligible/ Neutral	No impact from changes in use, amenity or access. No change in the ability to understand and appreciate the resource and its historical context and setting.	No perceptible change in the setting of a building or feature.
Low Beneficial	Land use change resulting in improved conditions for the protection of archaeological remains or understanding/ appreciation of a historic building or place	Decrease in visual or noise intrusion on the setting of a building, archaeological site or monument. Improvement of the wider landscape setting of a building, archaeological site or monument.
Medium Beneficial	Land use change resulting in improved conditions for the protection of archaeological remains, or understanding/ appreciation of a historic building or place, including through interpretation measures (heritage trails, etc). Removal of harmful alterations to better reveal the significance of a building or structure, with no loss of significant fabric.	Significant reduction or removal of visual or noise intrusion on the setting of a building, archaeological site or monument; and Improvement of the wider landscape setting of a building, archaeological site or monument Improvement of the cultural heritage amenity, access or use of a building, archaeological site or monument.
High Beneficial	Arrest of physical damage or decay to a building or structure;	Exceptional enhancement of a building or archaeological site, its cultural heritage amenity and access or use

### 3. The significance of effect

The significance of effect is derived from the importance of the resource and the magnitude of the impact upon it.

**Very large** - A serious impact on a site of international or national importance with little or no scope for mitigation. These effects represent key factors in the decision making process.

**Large** - Lesser impacts on sites of national importance and serious impacts on sites of regional importance, with some scope for mitigation. These factors should be seen as being very important considerations in the decision making process.

**Moderate** - Moderate or minor impacts on sites of regional importance and minor to major impacts on sites of local or minor importance. A range of mitigatory measures should be available.

**Slight** - Negligible impacts on sites of regional, local or minor importance and minor and moderate impacts on minor or damaged sites. A range of basic mitigatory measures should be available.

**Neutral** - No perceptible effect or change to sites of all categories.

The significance of effect will be determined using the table below, a basic matrix combining archaeological value and magnitude of impact.

#### Determination of Significance of Effect

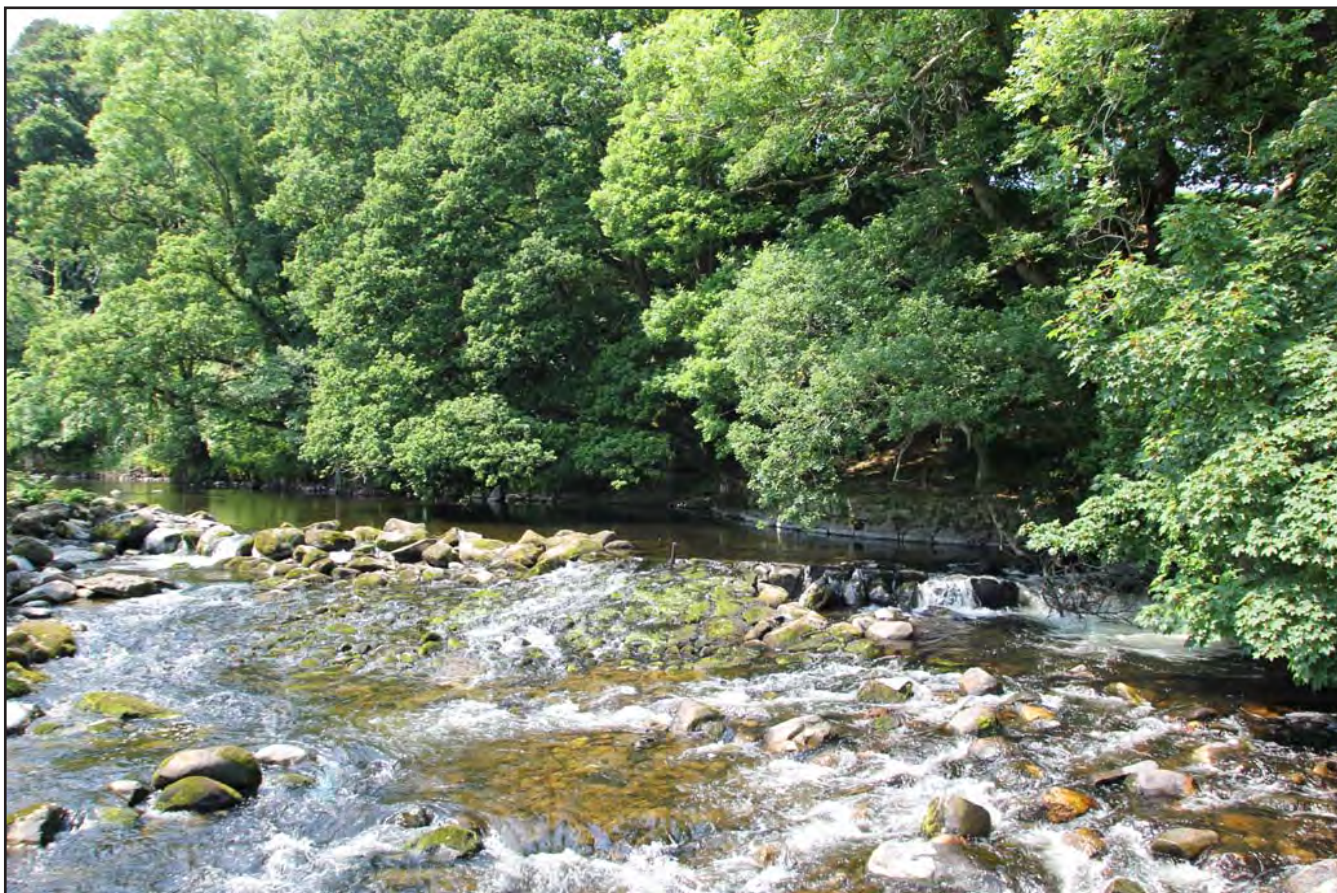
Archaeological Value	<b>International</b>	Neutral	Moderate or Large	Large or Very Large	Very Large
	<b>National</b>	Neutral	Moderate or Slight	Moderate or Large	Large or Very Large
	<b>Regional</b>	Neutral	Slight	Moderate	Moderate or Large
	<b>Local</b>	Neutral	Neutral or Slight	Slight	Moderate or Slight
	<b>Negligible</b>	Neutral	Neutral or Slight	Neutral or Slight	Slight
		<b>None</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
		<b>Magnitude of impact</b>			

## **7.0 SITE GAZETTEER – PHYSICAL IMPACTS**

The field walkover discovered 10 sites of archaeological and historic interest within the 40.0m wide assessment corridor, as listed below.

In accordance with Planning Policy Wales and Welsh Office Circular 60/96 each heritage asset has been assigned a level of importance ranked from International through to National, Regional/County, Local, and None. If it is not possible to assess the importance of the site from the visible remains, then it is ranked Unknown with the suspected importance level placed in brackets if possible. Identified sites were also assigned a level of impact ranked from High through to Medium, and Low. Levels of impact can be considered as both adverse or beneficial, and can be direct (physically impacting upon a site) or indirect (indirectly physically impacting upon a site). The significance of effect is determined from the importance level of the resource and the magnitude of the impact upon it. Where it is expected that a site will be impacted upon by the proposed works then mitigation/assessment recommendations are provided. All archaeological/historical sites identified are depicted on figure 11 along with the location/orientation of photographs.

<b>1. Weir</b>	
<b>PRN:</b> 37933	
<b>Figure:</b> 11	<b>Plate:</b> 1
<b>NGR:</b> SH 60119 69971 – SH 60133 69939	<b>Period:</b> Post-Medieval
<p><b>Description</b></p> <p>A weir constructed from large rounded boulders and slate spans the length of the Afon Ogwen at this point. The weir is depicted on the first, second and third edition Ordnance Survey maps of 1889, 1900, and 1914 respectively (figures 8, 9 and 10) and was constructed in order to feed water into the mill race for the flint mill at Penlan (PRN: 6387; NPRN: 40754), situated to the north.</p> <p>The weir is post-medieval in date and most probably contemporary with the mill c.1795 and is considered to be of regional importance through its association and group value as part of the wider mill complex. The proposed micro hydro-electric scheme and flood prevention works will result in the repair of the eroded western side of the weir using existing boulders washed out of the weir. In addition some concrete will be used for the hands off flow at the north end of the weir and for anchoring boulders within the fish pass. As such it is expected that the proposed scheme will have a low beneficial physical impact upon the feature through its stabilisation thus ensuring its long-term survival. Therefore no further assessment or mitigatory measures are recommended.</p>	
<b>Category of importance:</b> Regional	
<b>Level of impact:</b> Low beneficial physical	
<b>Significance of effect:</b> Slight beneficial	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> None	



**Plate 01:** Weir (feature 1), from the east.

<b>2. Sluice gate</b>	
<b>PRN:</b> 37934	
<b>Figure:</b> 11	<b>Plate:</b> 2 and 3
<b>NGR:</b> SH 60115 69972	<b>Period:</b> Post-Medieval
<p><b>Description</b></p> <p>A timber sluice gate is located immediately upstream of the weir (feature 1) on the western bank of the Afon Ogwen at this point. The timber frame survives in relatively good condition but the wood panelling has been removed and replaced with a concrete barrier which sits in front of the sluice to prevent water ingress into the channel. The sluice was originally operated via a rack and pinion mechanism, parts of which still survive.</p> <p>The sluice gate is depicted on the first, second and third edition Ordnance Survey maps of 1889, 1900, and 1914 respectively (figures 8, 9 and 10) and is almost certainly contemporary with the weir and Penlan flint mill, having been constructed c.1795. Its function was to regulate the feed of water into the mill race which ran north to feed the flint mill at Penlan (PRN: 6387; NPRN: 40754). In conjunction with the weir and the remaining parts of the mill race, the sluice gate represents an important element of the early Penrhyn landscape and as such is considered to be of regional importance through its group value.</p> <p>The sluice will require removal as part of the proposed works to open up the overflow channel and as such the expected impact will be high adverse physical. It is recommended that the sluice gate be avoided and thus preserved in-situ, or if that is not possible, then a detailed record should be taken of the sluice gate prior to removal (July 2013).</p> <p>Upon revisiting the site in September 2014 it was found that the sluice gate and winding mechanism had been removed as part of emergency flood risk management works and replaced with a steel flood barrier (plate 2). As such no further assessment or mitigatory works are required.</p>	
<b>Category of importance:</b> Regional	
<b>Level of impact:</b> High adverse direct physical	
<b>Significance of effect:</b> Moderate adverse	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> None – removed as part of emergency flood risk management.	



**Plate 02:** Sluice gate (feature 2), from the north. Scale 1.0m. (July 2013)



**Plate 03:** Sluice gate (feature 2) removed, from the north. Scale 1.0m. (September 2014)

<b>3. Mill race</b>	
<b>PRN:</b> 37935	
<b>Figure:</b> 11	<b>Plate:</b> 4 and 5
<b>NGR:</b> SH 60115 69972 – SH 60078 70200	<b>Period:</b> Post-Medieval
<p><b>Description</b></p> <p>An open-cut channel runs from the sluice gate (feature 2) northwards for approximately 25.0m before it runs into a modern culvert, which was added during the construction of the A55 expressway. The culvert continues north for approximately 112.0m where it then empties back out into an open-cut channel on the north side of the A55. This channel then continues north for approximately 94.0m before running into a culvert. It continues for approximately 225.0m before becoming an open cut channel again and continues north for approximately 218.0m where it originally fed the water wheels at the Penlan flint mill (PRN: 6387; NPRN: 40754). The mill race is first depicted on the first, second and third edition Ordnance Survey maps of 1889, 1900, and 1914 respectively (figures 8, 9 and 10). The mill race is almost certainly contemporary with the flint mill construction c.1795 and as such is of regional importance through its group value (July 2013).</p> <p>Upon revisiting the site in September 2014 it was found that as part of the flood risk management works the mill race had been partly filled in and breached within its section south of the A55. This was undertaken to enable plant machinery access to the western bank of the Afon Ogwen and to reduce flood water entering the modern culvert.</p> <p>The proposed scheme will involve the excavation of silt and debris from within the base of the leat so that the intake pipe can be laid onto the base of the historic leat. The current proposals are then for the leat to be backfilled in its entirety. Moreover, it is proposed that a screen box with trench for fish bypass will be installed within the southernmost part of the leat. This will involve the removal of the cobble built leat walls at this point.</p> <p>The overall impact of the proposed scheme is expected to be high adverse direct physical resulting in a moderate or large significance of effect. It is recommended therefore that a watching brief be maintained during the removal of silt and debris from the leat base so that any currently hidden structure is recorded, and during the breaching of the leat walls for the installation of the screen box.</p> <p>The proposed scheme will also involve the breaching of the northern section of the mill race by the penstock route. It is recommended that the cobbled walls of the leat at this point be reinstated upon completion of works. To the immediate east of the leat at this point is a slate Penrhyn style fence which will also require breaching. This feature should also be reinstated.</p>	
<b>Category of importance:</b> Regional	
<b>Level of impact:</b> High adverse direct physical	
<b>Significance of effect:</b> Moderate or large adverse	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> Watching brief during removal of silt and debris and during excavation for screen box and fish bypass; reinstatement of cobbled leat	

bypass; reinstatement of cobbled leat walls and Penrhyn slate fence upon completion of works within northern section.



**Plate 03:** Mill race and modern culvert (feature 3), from the southeast. Scale 1.0m.



**Plate 05:** Mill race (feature 3) partly filled in, from the east. Scale 1.0m. (September 2014)

4. Possible structure	
PRN: 37936	
Figure: 11	Plate: 6
NGR: SH 60112 70159	Period: Unknown
<b>Description</b> A collection of stones well embedded within the grazing field appear to form the possible remains of a linear wall. The possible wall measures approximately 0.4m in width and 0.1m in height, and runs for approximately 2.0m from east to west before appearing to turn and head south for a short distance.  It is not clear what these remains represent but they could be the lower course of a stone structure. The possible wall lies slightly to the east of the proposed pipe trench and as such it is not expected that the scheme will impact upon it directly. However, due to the uncertainty of the feature's identity and the possibility that remains could extend into the development area, it is recommended that a watching brief be maintained during groundworks in this area.	
<b>Category of importance:</b> Unknown	
<b>Level of impact:</b> Unknown	
<b>Significance of effect:</b> Unknown	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> Avoidance and watching brief during groundworks in proximity to the feature.	



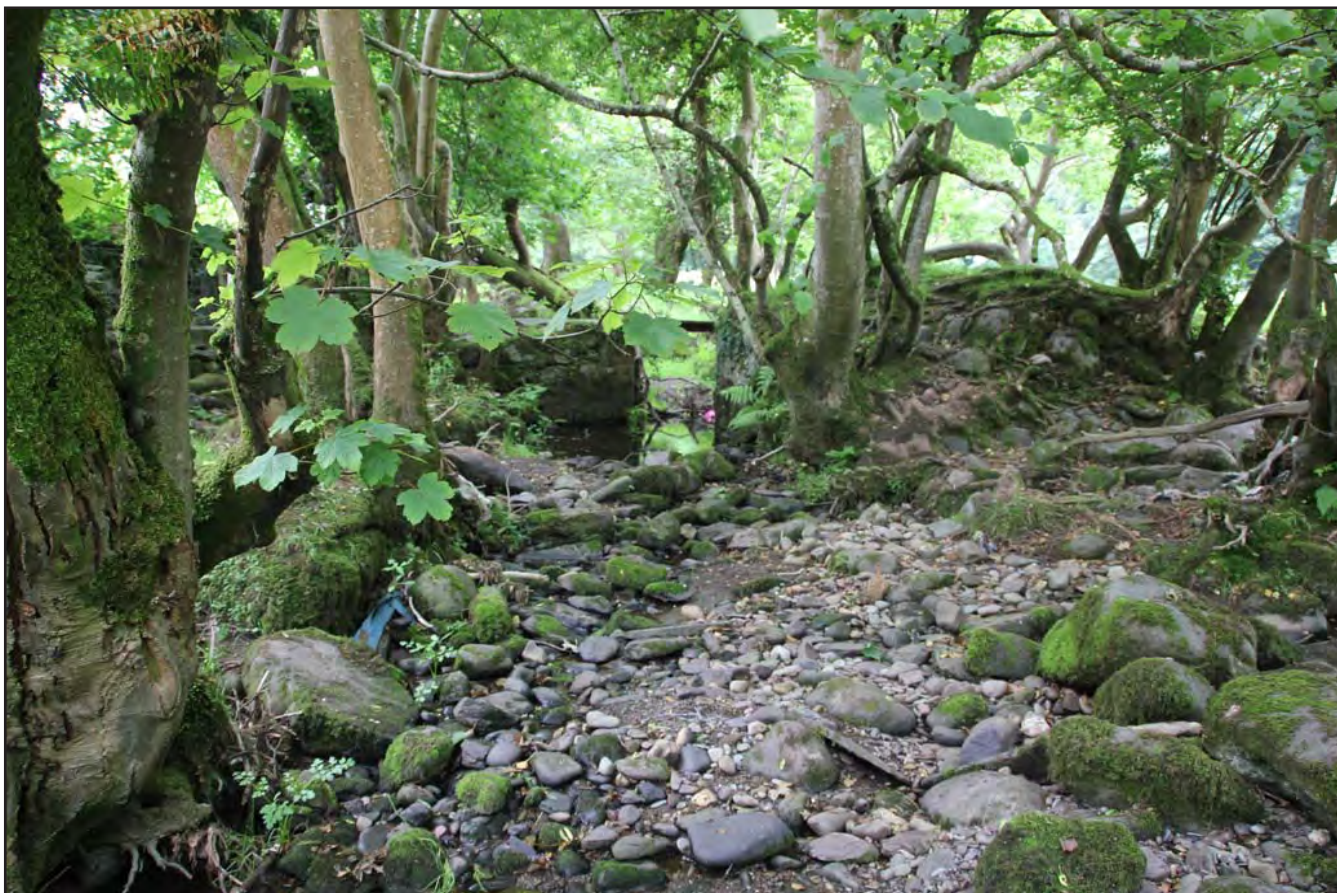
**Plate 06:** Possible wall (feature 4), from the west. Scale 1.0m.

<b>5. Shelter</b>	
<b>PRN:</b> 37937	
<b>Figure:</b> 11	<b>Plate:</b> 7
<b>NGR:</b> SH 60105 70204	<b>Period:</b> Post-Medieval
<p><b>Description</b></p> <p>A 1.5m high revetment wall made up of large and medium sized sub-rounded cobbles and bonded by mortar runs from south to north at this point. A mound of rubble strewn around the eastern side of the wall appears to mark the limits of what was a stone built structure that would have measured approximately 4.0m square. The structure is shown on the second and third edition Ordnance Survey maps of 1900 and 1914 (figures 9 and 10) respectively but is not shown on the first edition map of 1889 (figure 8), and thus it can be surmised that it was constructed sometime between 1889 and 1900. The structure is almost certainly a stone-built agricultural building or shelter.</p> <p>The remains of the structure lie to the west of the proposed penstock route and as such will not be impacted upon by the scheme.</p>	
<b>Category of importance:</b> Local	
<b>Level of impact:</b> None	
<b>Significance of effect:</b> Neutral	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> None	



**Plate 07:** Sheepfold (feature 5), from the southeast. Scale 1.0m.

<b>6. Felin Cochwillan mill race</b>	
<b>PRN:</b> 11769	
<b>Figure:</b> 11	<b>Plate:</b> 8
<b>NGR:</b> SH 60124 69928 – SH 60349 69672	<b>Period:</b> Post-Medieval
<p><b>Description</b></p> <p>The tailrace channel for the mill wheel at Felin Cochwillan runs from southeast to northwest and feeds back into the Afon Ogwen at the eastern side of the weir (feature 1). The mill race consists of an open cut channel approximately 3.0m in width, as well as the remains of a brick built sluice gate housing and overflow channel. The mill race is first depicted on the first, second and third edition Ordnance Survey maps of 1889, 1900, and 1914 respectively (figures 8, 9 and 10).</p> <p>This feature lies outside of the proposed development area and as such will not be impacted upon by the proposed works.</p>	
<b>Category of importance:</b> Local	
<b>Level of impact:</b> None	
<b>Significance of effect:</b> Neutral	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> Avoidance	



**Plate 08:** Felin Cochwillan mill race (feature 6), from the south.

<b>7. Slate field boundary</b>	
<b>PRN:</b> 59701	
<b>Figure:</b> 11	<b>Plate:</b> 9
<b>NGR:</b> SH 60054 70150	<b>Period:</b> Post-Medieval
<p><b>Description</b></p> <p>A slate field boundary built in the Penrhyn style runs from north to south and marks the eastern boundary of a large grazing field. This style of fencing is of a local tradition and is considered to be of local importance. The boundary is first depicted on the Penrhyn Estate map of 1768 (figure 6).</p> <p>The boundary will not be impacted upon by the works and as such no further assessment or mitigatory measures are proposed.</p>	
<b>Category of importance:</b> Local	
<b>Level of impact:</b> None	
<b>Significance of effect:</b> Neutral	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> None	



**Plate 09:** Field boundary (feature 7), from the northwest. Scale 1.0m.

<b>8. Stone field boundary</b>	
<b>PRN:</b> 59702	
<b>Figure:</b> 11	<b>Plate:</b> 10
<b>NGR:</b> SH 59921 70200	<b>Period:</b> Post-Medieval
<p><b>Description</b>  A single-skin dry-stone field wall constructed from medium sized sub-rounded stone cobbles runs from north to south and marks the western limit of the large enclosed grazing field. The boundary has been reinforced with a modern wooden post and wire fence. The boundary is first depicted on the Penrhyn Estate map of 1768 (figure 6) and is considered to be of local importance.</p> <p>The boundary will not be impacted upon by the works and as such no further assessment or mitigatory measures are proposed.</p>	
<b>Category of importance:</b> Local	
<b>Level of impact:</b> None	
<b>Significance of effect:</b> Neutral	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> None	



**Plate 10:** Field boundary wall (feature 8), from the east. Scale 1.0m.

<b>9. Unnamed road</b>	
<b>PRN:</b> 59703	
<b>Figure:</b> 11	<b>Plate:</b> 11
<b>NGR:</b> SH 59911 70219	<b>Period:</b> Post-Medieval
<p><b>Description</b></p> <p>An unnamed single track road runs from north to south connecting Llandegai village with Bangor Rugby Club and continuing beneath the A55 expressway. The road is first depicted on the Penrhyn Estate map of 1765 (figure 6) and originally connected the village with Tregarth in the south.</p> <p>The boundary will require breaching by the proposed cable route and as such should be reinstated upon the completion of works.</p>	
<b>Category of importance:</b> Local	
<b>Level of impact:</b> Low adverse direct physical	
<b>Significance of effect:</b> Neutral or slight adverse	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> Reinstatement	



**Plate 11:** Unnamed road (feature 9), from the north. Scale 1.0m.

<b>10. Hedgerow</b>	
<b>PRN:</b> 59704	
<b>Figure:</b> 11	<b>Plate:</b> 12
<b>NGR:</b> SH 59894 70253	<b>Period:</b> Post-Medieval
<p><b>Description</b></p> <p>A hedgerow measuring 5.0m in height runs from north to south and marks the eastern limit of an enclosed grazing field. The boundary is first depicted on the Llandygai Parish tithe map of 1841 (figure 7) and although the actual age of the hedge is unknown, under The Hedgerow Regulations 1997 a hedgerow is considered “important” if it is greater than 30 years old and is recorded in a document held at the relevant date at a Record Office as an integral part of a field system pre-dating the Enclosure Acts.</p> <p>The boundary will not be impacted upon by the works and as such no further assessment or mitigatory measures are proposed.</p>	
<b>Category of importance:</b> Local	
<b>Level of impact:</b> None	
<b>Significance of effect:</b> Neutral	
<b>Recommendations for further assessment:</b> None	
<b>Recommendations for further mitigatory measures:</b> None	



**Plate 12:** Hedgerow (feature 10), from the southeast. Scale 1.0m.

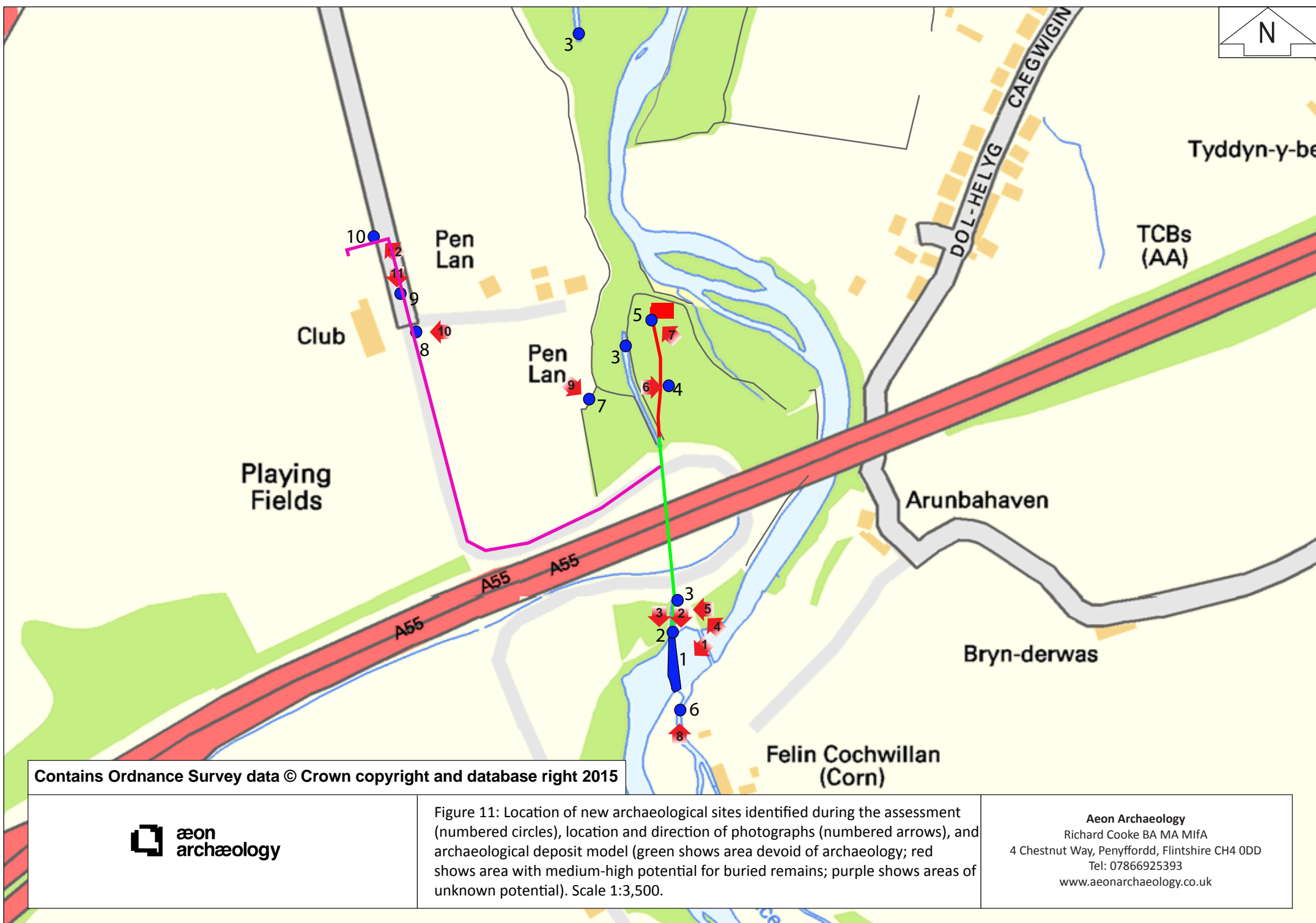


Table 2: Summary of archaeological features. <span style="float: right;">GREEN = no action required; RED= Action required</span>						
Number	Name	Importance	Impact	Significance of effect	Further Assessment	Mitigation Recommendations
<b>PHYSICAL DIRECT AND INDIRECT IMPACTS</b>						
1	Weir	Regional	Low beneficial direct physical	Slight beneficial	None	None
2	Sluice gate	Regional	High adverse direct physical	Moderate adverse	None	None – removed as part of emergency flood risk management.
3	Mill race	Regional	High adverse direct physical	Moderate or large adverse	None	Watching brief during removal of silt and debris; watching brief during excavation for screen box and fish bypass in southern section; reinstatement of cobbled leat walls and slate fence upon completion in northern section.
4	Possible structure	Unknown	Unknown	Unknown	None	Avoidance and watching brief in proximity.
5	Shelter	Local	None	Neutral	None	None
6	Felin Cochwillan mill race	Local	None	Neutral	None	Avoidance
7	Slate field boundary	Local	None	Neutral	None	None
8	Stone field boundary	Local	None	Neutral	None	None
9	Unnamed road	Local	Low adverse direct physical	Neutral or slight adverse	None	Reinstatement
10	Hedgerow	Local	None	Neutral	None	None

## 8.0 IMPACT AND RECOMMENDATIONS

### 8.1 Direct physical impact

#### *Construction phase*

The proposed development scheme is expected to have a *low beneficial direct physical* impact upon the weir (feature 1) which is considered to be of regional importance, thus resulting in an overall *slight beneficial* significance of effect.

In addition the proposed development scheme is expected to have a *low adverse direct physical* impact upon one site of *local* importance (features 9) resulting in a *neutral or slight adverse* significance of effect; and a *high adverse direct physical* impact upon two features (2 and 3) of *regional* importance resulting in a *moderate or large* significance of effect. One of these features (sluice gate feature 2) has since been removed as part of flood risk management works and as such no further mitigatory measures are proposed for this feature.

#### *Completion phase*

The proposed development scheme is not expected to have any direct physical impact upon any known sites of archaeological and historical significance upon completion.

### 8.2 Indirect physical and non-physical (visual) impact

#### *Construction phase*

The proposed development scheme is not expected to have any indirect physical or non-physical impacts upon any known sites of archaeological and historical significance during the construction phase.

#### *Completion phase*

The proposed development scheme is not expected to have any indirect physical or non-physical impacts upon any known sites of archaeological and historical significance upon completion.

### 8.3 Historic Landscapes

The proposed development site currently lies within the *Improved Fields Above Pentir* Historic Landscape Character area (HLCA: 54). Due to the proposal to bury the hydro penstock it is not expected that there will be a loss or alteration to any of the historic landscape character areas.

### 8.4 Site Specific Recommendations

It has been recommended that a watching brief be maintained during the removal of silt and debris from the base of the leat and during the excavation of groundworks associated with the screen box and fish bypass. It has also been recommended that upon the completion of works that the cobbled walls of the leat and slate fence within the section north of the A55 be reinstated.

Further recommendations have been made for a watching brief in proximity of the possible structure (feature 4) and for the reinstatement of the unnamed road (feature 9) upon the completion of works.

## 8.5 General recommendations

The overall potential of the site to produce unknown buried archaeological remains is currently considered to be medium-high for the northernmost 250.0m of the intake pipeline and considered none for the southern 250.0m of the pipeline (figure 11). This is due to the close proximity of a large amount of prehistoric and Roman archaeological remains in conjunction with the relatively undisturbed flat terrain of the northern grazing field. The southern part of the scheme is considered to be devoid of any buried remains due to the high disturbance caused through the construction of the A55 expressway. It is therefore recommended that a watching brief is maintained during the excavation of the pipe trench in the field north of the A55.

The original hydro scheme design had the new cable route passing through a large enclosed grazing field to the west of the turbine house location. The potential of this field to produce unknown buried archaeological remains was considered to be very high. The field occupies a flat plateau of land overlooking the Afon Ogwen and lies within 110.0m of a possible prehistoric settlement (PRN: 29434); 350.0m of the early Neolithic timber building, prehistoric pits, prehistoric burnt mounds, and Iron Age/Roman settlement at Parc Bryn Cegin, and approximately 550.0m from the prehistoric Henge Monument and Cursus Scheduled Ancient Monument (CN153). The close proximity of such a large quantity of nationally important well preserved buried archaeological remains coupled with the suitability of the flat plateau of land for early habitation makes the site of particularly high potential. It was therefore recommended that an alternative cable route be found. As such the proposed cable connection will now run southward from the turbine house and within the penstock trench as far as the existing farm trackway. The cable will then be trenched within the track heading northwest to the unnamed road, where it will continue within a trench within the road verge.

The potential for the preservation of buried archaeological remains beneath the farm track and road is currently unknown. There is known prehistoric archaeological remains within the vicinity of the site and these may have survived the construction of both the track and road, however this is reliant on the nature and vulnerability of the remains in question, as well as the depth of soil overburden and methods utilised during the track and road build. It is therefore proposed that an archaeological watching brief be maintained during trenching within the farm trackway and unnamed road. If it becomes clear from the outset that there is very little potential for the preservation of remains then the watching brief should be suspended.

The site specific and general mitigatory measures should be secured via a relevant archaeological condition.

## 9.0 SOURCES

### *OS Maps*

1<sup>st</sup> edition 25 inch Ordnance Survey Map of 1889, Sheet XIII.1.

2<sup>nd</sup> edition 25 inch Ordnance Survey Map of 1900, Sheet XIII.2.

3<sup>rd</sup> edition 25 inch Ordnance Survey Map of 1914, Sheet XIII.3

OS 1:10 000 Series sheet SH 56 NE, SH 56 SE, SH 56 SW, SH 56 NW, SH 57 NE, SH 57 SE, SH 57 SW, SH 57 NW, SH 66 NE, SH 66 SE, SH 66 SW, SH 66 NW, SH 67 NE, SH 67 SE, SH 67 SW, and SH 67 NW.

### *Aerial Photographs*

#### *RAF Aerial Photographs*

CPE/UK/1996. Frames 1303, 1304, 2305, and 2306 taken 13<sup>th</sup> April 1947

541/178. Frames 3189, 3190 and 4210 taken 8<sup>th</sup> October 1948

541/38. Frame 4028 taken 21<sup>st</sup> May 1948

#### *OS Aerial Photographs*

Google Maps: 1999-2009

### *Primary Sources*

1840s census of Wales

Tithe Map and Apportionment of the Parish of Llandygai IR29/48 DEGWM 3

UB 26 and 27. *Plan of Penrhyn Estate, Bangor*

UB 38. *Plan of Penrhyn Estate, Bangor*

UB 235. *Map of Penrhyn Demesne*. 1847

UB 2943 and 2944. *Survey of Penrhyn land in the principality of Wales*. 1768

UB MS64. *Diary of Ellen Griffith of Penlan, Llandygai*

### *Secondary sources*

Barnwell, E.L. & Evans, J.E. 1866. *Archaeologia Cambrensis*.

Brown D. H., 2007. *Archaeological Archives: A guide to best practice in creation, compilation, transfer and curation*. Archaeological Archives Forum

British Geological Survey website. [www.bgs.ac.uk](http://www.bgs.ac.uk).

Caernarfon Record Office

Driver, T. 2006. *Archaeology in Wales*

Dodd, A.H. 1968. *A History of Caernarvonshire*

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English Heritage, 2006. *Management of Research Projects in the Historic Environment (MORPHE)*

English Heritage, 2011. *The Settings of Heritage Assets*

Evans, J. 1812. *The Beauties of England and Wales – North Wales.*

Gwynedd Archaeological Trust report 697. *Unit 1 Llandygai Industrial Estate*, 2007.

Gwynedd Archaeological Trust report 943. *Land near Pentwmpath: Llandygai, Gwynedd.* 2011.

Gwynedd Historic Environment Record (HER)

NMR Site Record Cards

The Institute for Archaeologists, 1994 (revised 2009) *Standard and Guidance for Archaeological Desk-Based Assessment*

The Institute for Archaeologists, 2008. *Standard and Guidance for the Creation, Compilation, Transfer and Deposition of Archaeological Archives*

## APPENDIX I: ARCHAEOLOGICAL SITES WITHIN 1.0KM OF THE PROPOSED DEVELOPMENT AREA

Undesignated monument points within 1km of the proposed development area as listed on the Gwynedd HER

PRN	Name	Type	Period
26	Earthwork Enclosure, Siambra-gwynion	Enclosure	Unknown
812	Track or Roadway, Llandegai	Trackway	Unknown
815	Burnt Mound, Rhos Uchaf	Burnt mound	Unknown
877	Prehist. Industrial Site - Poss, Wet Covert Ll'gai	Occupation site	Prehistoric
1708	Tollbooth, Lon Isaf	Tollbooth	Post-Medieval
2314	Henge Monument & Cursus, Site of, Llandygai	Henge	Prehistoric
2317	Bronze Tool (Palstave) - Findspot, Llandegai	Findspot	Bronze Age
2319	Llandegai Church	Church	Medieval
2453	Roman Fortlet, Tal-y-bont, Bryn-derwas	Fort	Roman
2454	Roman Fortlet, Tal-y-bont	Fortlet	Roman
2456	Roman Fortlet, Tal-y-bont	Fortlet	Unknown
3670	Cochwillan (House), Llandygai	House	Medieval
3673	Pebble Macehead, Llandygai	Findspot	Prehistoric
4469	Penrhyn Castle Gardens	Garden	Post-Medieval
5477	Trackways Above Llanfairfechan	Trackway	Unknown
5484	Lead & Bronze Finds - Findspot Maes y Groes, Tal	Findspot	Unknown
5488	Coins - Findspot, Tal-y-bont	Findspot	Post-Medieval
5847	Travellers Routes & Llys Helig, Traeth Llafan	Routeway	Unknown
6387	Penlan Flint Mill, Llandegai	Flint mill	Unknown
6626	Platform Huts, Penrhyn Park	Hut platform	Medieval
6627	Ridge & Furrow, Penrhyn Park	Ridge and furrow	Medieval
6890	Roman Coin - Findspot, Llandegai	Findspot	Roman
6958	Llandegai Parish Church	Church	Medieval
11394	Penrhyn Castle Grand Lodge	Building	Post-Medieval
11665	Lon-isaf Gate and Building E.;former Toll Cottage	Toll house	Post-Medieval
11769	Cochwillan Mill	Corn mill	Post-Medieval

15839	Llandygai and Tal y Bont - Landscape	Landscape	Multi-Period
17567	Part of Roman Road, Segontium - Canovium	Road	Roman
21626	Iron Ore Mine, Llandygai	Ironstone mine	Post-Medieval
29434	Settlement, Possible, N of Pen Lan	Settlement	Prehistoric

**New undesignated monument points within 1km of the proposed development area as listed on the Gwynedd HER**

<b>PRN</b>	<b>Name</b>	<b>Type</b>	<b>Period</b>
26113	Sluice & Weir SE of St Tegrai's Church	Sluice & Weir	Unknown
26114	Buildings W of Drws Melin Lodge	Buildings	Unknown

**Listed Buildings within 1km of the proposed development area.**

<b>ListEntry</b>	<b>Name</b>	<b>Grade</b>	<b>Eastings</b>	<b>Northings</b>
3653	Cochwillan	I	260695	369416
3657	Church of St Tegai	II*	260076	370987
3661	Grand Lodge and forecourt walling	II*	259788	370979
3665	Lon-Isaf Gate	II*	260188	369380
3669	Felin Cochwillan	II	260156	369858
22925	Tal-y-bont Lodge	II	260337	370879
22929	Pont Tal-y-bont (partly in Llandygai community)	II	260225	370890
22947	Capel Bethlehem	II	260464	370508
22951	Eglwys St Cross	II	260867	370804
22956	Railway Viaduct (partly in Llandygai community)	II	260272	370696
22958	Outbuildings at Cochwillan	II	260675	369404
22959	Bwthyn Cochwillan	II	260665	369442
22960	Pigsties at Bwthyn Cochwillan	II	260687	369437
22961	Slate Fencing at Bwthyn Cochwillan	II	260669	369463
22962	Fferm Cochwillan	II	260643	369465
22963	Cowhouses/Cart Shelter at Fferm Cochwillan	II	260671	369492
22964	Pigsties/Pig Kitchen at Fferm Cochwillan	II	260640	369488
23342	Weigh House at Lon-Isaf Gate	II	260203	369393
23343	Slate Direction Indicators	II	259843	370876
23366	Wyatt Memorial at the Church of St Tegai	II*	260084	370977
23367	Ficardy	II	259818	370782
23368	No.1 Tan-y-Bryn	II	259802	370637
23381	Railway Viaduct (partly in Llanllechid community)	II	260166	370674
23382	Bodeilian	II	259806	370873
23384		II	260060	369766
23385		II	260077	369741
23393	Horse Drinking Trough and Fountain	II	260161	370887
23399	Gate piers, gates, walls and railings to churchyard	II	260012	370963

23402	Pont Tal-y-bont (partly in Llanllechid community)	II	260188	370887
23421		II	259903	370935
23422	Arfon Cottage	II	259910	370889
23423		II	259928	370951
23424	The Anchorage	II	259956	371004
23426	Tan y Graig	II	259803	370696
23427	Air shaft to Llandygai Tunnel	II	259682	370685
23428	Ysgol Llandygai & School House	II	260021	370916
23429	Neuadd Talgai	II	260050	371010
23430	Former Sawmill Manager's House	II	260135	370748
23431	No.1 Tre-felin Cottages	II	260102	370734
23432	No.2 Tre-felin Cottages	II	260094	370735
23433	No.3 Tre-felin Cottages	II	260081	370732
23434	No.4 Tre-felin Cottages	II	260072	370729
23435	No.5 Tre-felin Cottages	II	260062	370726
23436	No.6 Tre-felin Cottages	II	260052	370723
23437	No.7 Tre-felin Cottages	II	260042	370718
23438	No.8 Tre-felin Cottages	II	260031	370713
23457	Portal at west end of Llandygai Tunnel	II	259398	370766
23459	Walling and Depots on east side of former turnpike road (old A 5)	II	260231	369233
23461	Rose Cottage	II	259933	370953
23462		II	259897	370887
23463	The Old School House	II	260052	371018
23464	No.2 Tan-y-Bryn	II	259803	370630
23465	No.3 Tan-y-Bryn	II	259803	370624
23466	Lyric Cottage	II	259804	370879
23471		II	260080	369732

**Scheduled Ancient Monuments within 1km of the proposed development area**

<b>SAM no.</b>	<b>Name</b>	<b>Period</b>	<b>NGR</b>
CN153	Henge Monument and Cursus	Prehistoric	SH595709

**Registered Parks and Gardens within 1km of the proposed development area**

<b>Ref no.</b>	<b>Name</b>	<b>NGR</b>	<b>Grade</b>
GD40	Penrhyn Castle	SH6029071991	II*

**Undesignated monument points within 1km of the proposed development area as listed on the NMR**

<b>NPRN</b>	<b>Name</b>	<b>Type</b>	<b>Period</b>
6736	Bethlehem welsh independent chapel, cae gwigyn, tal-y-bont	Chapel	Post medieval
11961	Mission room	Chapel	Post medieval
16688	Penrhyn castle grand lodge	Lodge	Post medieval?
16801	Rhos uchaf, llandegai	Dwelling	Post medieval?
16965	Ty mawr	House	Post medieval?
23503	Lon-isaf tollgate and building e.;former toll cottage	Toll house	Post medieval?
24661	Cochwillan mill;felin cochwillan	Corn mill	Post medieval
26298	Cochwillan	House	Post medieval?
40754	Penlan flint mill	Flint mill	Post medieval
43712	St cross' church	Church	Medieval
43811	St tegai's church, llandegai	Church	Medieval;post medieval
86339	Cochwillan, talybont	Farm garden	Medieval?
86483	Talybont allotment, bangor	Nursery garden	Post medieval
301376	Tre'r felin cottages nos 1-8, llandygai; trefelin; tre-felin	Terrace	Post medieval
403369	Pen lan, llandygai	Settlement	Prehistoric
403665	No. 7 llandygai village, bangor	Cottage	Post medieval
406346	Penrhyn park	Deserted rural settlement	Medieval;post medieval
411153	The old school house, llandygai	School	Post medieval
411154	Ysgol llandygai and school house, llandygai	School	Post medieval
411362	Llandegai; llandygai model village	Village	Post medieval;19th century

**Historic Landscape Character Areas (HLCAs) within 1km of the proposed development area**

<b>Hlca</b>	<b>Prn</b>	<b>Name</b>
13	15839	Llandygai and tal y bont
29	15855	Penrhyn demesne
31	15857	Lowland coastal area around wig
38	15862	Fieldscape around llanllechid
40	15863	Sling
54	15876	Improved fields above pentir

## APPENDIX 2: DEFINITIONS OF FURTHER ASSESSMENT AND MITIGATORY MEASURES

### 1. Definition of field evaluation techniques

Field evaluation is sometimes necessary when the importance of an identified archaeological feature cannot be ascertained via an archaeological desk based assessment alone. There are several different techniques but the three most common are geophysical survey, trial trenching, and supervised metal detector survey:

#### *Geophysical survey*

This technique is a non-intrusive form of archaeological field evaluation. It utilises a magnetometer which detects differences within the earth's magnetic field caused by the presence of iron in the soil. This iron often takes the form of magnetised iron oxides in the topsoil which have been re-deposited into lower archaeological features through cutting and backfill. A magnetometer can also detect iron artefacts within the soil and the presence of burnt stone material such as on hearths, kilns, and burnt mounds.

#### *Trial trenching*

Where a site is suspected to contain more subtle archaeological features such as pits, a geophysical survey may not be appropriate due to its lack of sensitivity in detecting these features. Indeed, trial trenching can also be utilised when anomalies have been identified during the geophysical survey and clarification is required in order to identify them. Trial trenches usually measure 20m by 2m although can vary in size if targeting geophysical anomalies. Trenches are excavated using a mechanical tracked excavator and supervised by an archaeologist. The topsoil and subsoil are removed onto buried features or if absent, on to the natural glacial substrata. Any archaeological remains found are usually evaluated and recorded prior to backfilling of the trench, so that further site specific mitigatory recommendations can be made.

#### *Supervised Metal Detector Survey*

Some types of underlying substrata and bedrock can mask the results of investigation techniques such as geophysical survey. In such instances an archaeologically supervised metal detector survey can be undertaken. This involves the supervision of metal detectorists by a suitably qualified archaeologist and the spatial mapping of artefacts as they are discovered. This technique can give a geographical spread of metal finds and thus be indicative of 'hotspot' areas which may require further investigation by trial trenching for example.

### 2. Definition of Mitigatory Recommendations

None:

No further action is required.

Detailed recording:

A photographic and concise descriptive record is required, along with a digital survey.

Basic recording:

A photographic and basic descriptive record is required.

Watching brief:

Monitoring is required by a suitably qualified archaeologist during the proposed development. An archaeological watching brief is divided into four categories according to the IFA, 2001.

*Institute for Archaeologists 2001 Standard and Guidance for an archaeological watching brief:*

- comprehensive (present during all ground disturbance)
- intensive (present during sensitive ground disturbance)
- intermittent (viewing the trenches after machining)
- partial (as and when seems appropriate).

**Avoidance:**

These features should be avoided by the proposed development and any ancillary works including the establishment of compound and material lay-down areas. It may be necessary to surround the feature with a barrier and/or signage to avoid accidental damage.

**Reinstatement:**

These features should be reinstated to their original location and condition. Supervision by an archaeologist is required.

