

Croesor Hydroelectric Project

Planning Application Supporting Document
Incorporating Design and Access

Renewables First – Company

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Document Control

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1 Introduction

Location

1.1 The proposed development lies within Snowdonia National Park which itself lies with the unitary county of Gwynedd. The proposed HEP scheme is to be located on the Afon Croesor just to the southwest of the settlement of Croesor. The penstock runs northeast to southwest for approximately 1.7km. Location and site plans accompany this document as part of the planning application.

Site Description

1.2 The intake of the proposal will be located at OS grid reference SH 62545 44192 and the outfall will be located at OS grid reference SH 61890 43545.

1.3 An intake structure would be constructed taking water through a buried penstock pipe to the turbine house / outfall location. The penstock runs across open fields generally covered by grass pasture and/or bracken, stone walls separating the fields and a stone track. Generally the ground across the penstock route is rocky and fairly steep in sections, flattening out at the intake. There are sections which will require deeper trench digging where the ground surface undulates to ensure the penstock maintains a fall. The path will generally follow the natural contours of the valley. A buried 11kV line will run parallel to the penstock from a pole mounted transformer at the turbine house to the nearest available pole on the existing HV line.

Background to the Site

1.4 The whole of the scheme is on land known as the Brondanw Estate. The Estate is owned by the charitable trust - Clough Williams-Ellis Foundation. The aim of the Trust is to protect the property and ensure its conservation.

Pre-application Discussions

1.5 Pre-application advice was received from Natural Resources Wales (NRW) in December 2013. Much of this advice was focused on consents to be obtained from NRW, however, it did suggest that a Flood Consequences Assessment (FCA) would likely be required as part of a planning application and that an ecology survey should be undertaken.

1.6 Planning pre-application discussions began in earnest in 2013 and have continued up until submission.

1.7 Based on ecological and tree concerns – the penstock route was changed to minimise the potential impact.

Public Consultation

1.8 The applicant has endeavoured to keep the local community informed about the project during its development. On 22nd January 2015, a Public Drop In session was held at the Brondanw Plas & Gardens Caffi. Invitations were sent by Balfours of Shrewsbury on behalf of the Estate. The event was open from 1pm – 6:30pm and a number of members from Renewables First Design & Planning Team and Balfours representing the

Estate. The format consisted of 6x A1 Posters, an example intake screen and penstock pipe with staff on hand to take members of the public through the project and answer any questions.

1.9 Feedback forms were handed out to formally secure feedback. 33 people were recorded attending, the majority from Croesor village or surrounding area with 19 feedback forms being completed. 4 respondents raised concerns over potential impact on the amenity value of the various pools along the river due to reduced flows. Any scheme abstracting water would need to be approved by NRW which would regulate against over abstraction. Generally the feedback was neutral / positive.

2 Project Description

Site Enabling Works and Works Sequence

- 2.1 The method of construction in relation to works adjacent to the watercourse will be further defined and controlled via the flood defence consent process which is in that case issued by Natural Resources Wales.
- 2.2 Access to the intake site will follow the existing access track, and it will require the construction of a minor access route extension to the inlet location. This track will be 3m wide, and with either be unsurfaced, or locally as required will be reinforced with imported stone underlain with geotextile.
- 2.3 The intake and powerhouse site will be made secure and at each location an area which will constitute the adjacent works compound will be made up. This will not involve altering bank levels as these could impact on flood levels. A compound area will be covered with geotextile and a layer of hardcore to provide a base. This will be removed after construction to leave a minimal access track suitable for, for example, an off road vehicle.

Intake Structure

- 2.4 Work to form the excavation for the intake will occur. This will involve removal of up to 60m³ of material. Such material will be placed elsewhere on the owner's land to the satisfaction of Natural Resource Wales or removed from site.

Penstock Route

- 2.5 Excavation work to form the Penstock trench will take place. Excavation will be undertaken typically by a 5 tonne excavator via a track described in section 2.2. The penstock trench will involve excavation of up to 1800 m³ of material (approximately 1.5 m³/m of pipe route). Dug material will be replaced and used as backfill where suitable to minimise visual impact after construction (see drawing CROES_11 and 12). Where dug material is unsuitable for use as backfill remaining spoil will be placed elsewhere on the owner's land to the satisfaction of Natural Resource Wales or removed from site as necessary. Where the penstock passes in close proximity to trees, specific precautions will be taken to ensure minimal damage to tree root extents (see Appendix E Tree Survey for further details).

Turbine House

- 2.6 Work to form the excavation for the turbine house will occur. This will involve removal of up to 80m³ of material. The outfall culvert will use as dug material to backfill up to required level where the material is deemed suitable. Spoil will be placed elsewhere on the owner's land to the satisfaction of Natural Resource Wales or removed from site.

Concrete Works

- 2.7 Once the turbine footprint has been excavated foundations and sump retaining walls will be cast using reinforced concrete. Approximately 46.5m³ of concrete will be used

in the structure, to be brought to site and placed by a concrete pump to minimise environmental risks and shorten placing time as much as practicable. Upon completion of foundations and sump retaining walls the site will be backfilled up to the required level. The floor platform will be cast using appropriate shuttering techniques to construct the floor over the sump. Since the eastern wall of the turbine house will be partially set into the bank a tanking arrangement will be constructed to prevent ingress of water. The final steel penstock section will be cast into a reinforced concrete thrust block at the south easterly corner of the turbine house.

Generator and Switchgear Housing

2.8 After the reinforced concrete structure has been constructed, a block and wood clad powerhouse structure will be constructed which will house the generation and control equipment. The turbine house incorporates an overhead steel gantry to facilitate installation and maintenance of the generator and turbine equipment.

Turbine installation

2.9 Subsequent to the construction of the concrete sections and completion of the powerhouse the turbine will be installed. The turbine will be delivered directly to the turbine house. Due to the relatively small size of the turbine it will be delivered on the back of a small goods vehicle and taken to the powerhouse door with a tele handler or excavator. The turbine will be installed using the overhead gantry. The turbine installation phase is foreseen to be relatively short, due to the overall dimensions of the turbine. The penstock manifold will be installed incorporating suitable flange connections and shut off valves. The turbine will be connected to the controlling elements (level sensors, pressure gauges, automated spear jets and controller unit).

Roadways, paths and access

2.10 The village of Croesor has access from an unnamed road off the A4085 which is less than 5km from the A487 a main road in the local area.

2.11 Access to the intake will be along an existing track through the Parc complex off the unnamed road heading north east towards Croesor village. This track requires extending by less than 150m to reach the intake location which is likely to take the form of temporary trackway. A temporary track may need to be laid adjacent to the penstock route in any soft spots to allow the excavator to traverse, however it is expected that most of the route will not require any works as the installation will be carried out in dry weather and the works can occur with minimal need to traverse the route. The turbine house location will require access via temporary trackway along the penstock route.

2.12 There is an undesignated footpath that may be impacted due to access required through the Parc complex.

3 Design and Access Statement

Amount

3.1 The proposed hydroelectric turbine will have a maximum generating capacity of 175kW, which would be sufficient to meet the annual electricity needs of approximately 228 Welsh homes¹. This equates to a carbon emission saving of 427² tonnes CO₂e. The scheme will comprise of:

- Minor enabling works to establish site compound at turbine house and intake locations
- Installation of temporary works consisting of small sand bags and piping to flume the river water around the works site, plus associated small scale pumping arrangements to dry the site out.
- Installation of Intake Structure
- Earthworks and installation of pipe work for the length of the penstock route (excavation, landscaping and returning material to original location, any excess could be removed offsite)
- Construction of a Turbine House and installation of Turbine and generator
- Removal of the compound
- Reinstatement of landscape and planting scheme

3.2 Construction of the scheme will take place over a period of approximately 3 months.

Layout

3.3 The intake of the development will be located:

- Approximately 240m southwest of Weirglodd Bach
- Approximately 240m southeast of Cae Glas
- Approximately 260m northwest of Tan-y-Bryn

3.4 The outfall of the development will be located:

- Approximately 440m west of Beudy-newydd
- Approximately 60m northeast of Gelli

¹ Based on a Welsh average household electricity consumption of 3,787kWh taken from the Sub-National electricity consumption data, DECC (2013).

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65999/7357-subnat-elec-cons-stats-2011-factsheet.pdf

² Based on UK electricity carbon emission factor of 0.49426 kg CO₂e per kWh

<http://www.ukconversionfactorscarbonsmart.co.uk/>

- Approximately 470m east of Creua

Scale

3.5 The overall planning area will measure 0.98ha; this includes the intake location, temporary access track for length of the penstock route, the penstock itself, the turbine house, temporary compound, turbine house access track and the grid connection. The turbine will be housed entirely within the confines of the turbine house and the installed capacity of the hydro-electric scheme will be 175kW. The turbine house housing the turbine, generator and electrical infrastructure will measure 6.25m by 7m.

Appearance

3.6 Wherever possible the scheme will be designed to be in keeping with its surroundings and the generator housing in particular will be of similar appearance to local buildings.

Use

3.7 The site will be used as a hydro-electric generating station with the Pelton wheel turbine and associated infrastructure in place for the duration of the project lifetime, approximately 30 years for the mechanical and electrical aspects. There are examples in the area of hydro-electric infrastructure lasting 50 – 100 years.

Access

3.8 The site is in a rural location with access likely to come from the A487 and then the A4085 to the Estate via the unnamed road to Croesor village. The turbine itself as well as the general building materials will be delivered by small HGVs or other suitable vehicles. Delivery vehicles and construction plant will be required during the preparation and construction process. However these vehicles are likely to be similar in nature and scale to the agricultural vehicles that are utilised in the local area already and the narrow nature of the road to Croesor is known and has been taken into account. Construction will take place over a number of months but will be planned carefully and considerately as part of a Construction Method Statement that will be produced upon planning approval in order to minimise disruption.

3.9 For the turbine house access is along the temporary access way which will follow the penstock route. There will be a small area for parking and a temporary construction compound.

3.10 To enable the access from the highway to the Intake location – an existing track will be utilised and extended to the final location.

3.11 For the penstock route temporary track way will be utilised in order to allow the excavator and the pipe laying equipment to operate without damaging the ground where the ground is found to be soft.

4 Planning Statement

Extant Planning Policy

Eryri Local Development Plan

4.1 The Eryri Local Development Plan was adopted by the authority in 2011 and in the foreword states that 'climate change and the implications for people, plants and animals and our response to this threat pose a real challenge to the 'Special Qualities' of Eryri'.

4.2 The following policies are relevant to this proposal:

Development Policy 1: General Development Principles (1)

To conserve and enhance the 'Special Qualities' and purposes of the National Park development will only be permitted where all the following apply:

- i. The nature, location and siting, height, form and scale of the development is compatible with the capacity and character of the site and locality within which it is located.*
- ii. A development within the domestic curtilage of a dwelling will not detract from the character and form of the existing dwelling or its setting in the landscape.*
- iii. The development is not unduly prominent in the landscape and will not significantly harm the amenity of neighbouring property.*
- iv. The development reflects a good sustainable design standard, uses materials that are sympathetic to or enhance their surroundings and conforms with Development Policy 6: Sustainable Design and Materials.*
- v. The development will not have an unacceptable adverse impact on the characteristic biodiversity of Snowdonia, particularly habitats and species protected under national and European legislation.*
- vi. The development does not result in the loss of landscape features, including woodland, healthy trees, hedgerows, dry stone walls or damage any important open space or public view.*
- vii. An appropriate access meeting highway standards exists or can be provided without harm to the character of the locality or neighbouring amenity.*
- viii. Adequate provision of car parking and on-site turning areas are provided where necessary which are appropriate to the scale of the proposed development. Car parking surfaces should be permeable where appropriate to the development.*
- ix. The traffic implications of the development do not result in volumes or types of traffic which will create highway or safety problems on the local road network, or significantly harm the landscape or amenity of local people.*
- x. Appropriate services and infrastructure can be provided without compromising the quality and character of the landscape and cultural heritage.*

- xi. The development will not have an unacceptable adverse impact, through increased resource use, discharges or emissions, on public health, surface and ground water (quality, quantity or ecology), air quality, soil and the best and most versatile agricultural land.*
- xii. The development is compatible with, and does not cause significant harm, to the environment, neighbouring residential amenity or the amenity of the Park by way of noise, dust, vibration, odour, light pollution, hazardous materials or waste production.*
- xiii. The development will not have an unacceptable adverse impact on the quiet enjoyment of the area by the public.*
- xiv. The development will not have an unacceptable adverse impact on public rights of way, other recreational routes or open country.*
- xv. Land stability can be achieved without causing unacceptable environmental or landscape impact.*
- xvi. The risks of, and consequences of flooding can be managed on and off site to an acceptable level in line with national planning policy.*

Development Policy 3: Energy (3)

All planning applications should be accompanied by an energy statement as part of the Design and Access Statement and should take into account the Supplementary Planning Guidance for Sustainable Design.

Wherever possible, developments should be sited and orientated to take advantage of solar gain and shelter.

Wherever possible all new buildings, including extensions, should consider the potential for maximising renewable energy technologies

Microgeneration and small-scale community renewable energy plant will be supported especially where they make a contribution to improving the quality of life in smaller communities.

Strategic Policy E: Minerals Safeguarding Policy (E)

To ensure that aggregate mineral resources are safeguarded an area has been identified as Mineral Safeguarding Area (MSA) and shown on the Proposals Map.

In the MSA planning permission will only be granted for non-mineral development if it can be demonstrated that the proposed development does not permanently sterilise, or restrict, the possible future working of the identified mineral resource. However, where it is considered that the proposed development is of overriding importance consideration will be given to the principle of pre-extraction of the minerals.

*Because the MSA includes areas within, and close to European designated nature conservation sites proposals for both mineral and non-mineral development in the MSA must conform to other policies in this plan and Strategic Policy D in particular.
[...]*

Strategic Policy Ff: Historic Environment (Ff)

The historic landscape, heritage assets and cultural heritage of Snowdonia National Park will be conserved and enhanced, due to their contribution to the character and ‘Special Qualities’ of the National Park. Particular protection will be given to the following archaeological, architectural, historic or cultural assets and where appropriate, their settings.

Development will not be permitted that will adversely affect in any way the following Heritage Assets, or where appropriate their settings and significant views:

- i. Conservation Areas*
- ii. World Heritage Sites*
- iii. Scheduled Monuments and other sites of archaeological importance*
- iv. Historic landscapes, parks and gardens*
- v. Listed Buildings*
- vi. Traditional Buildings*

Development Policy 6: Sustainable Design and Materials (6)

In order to promote sustainable development within the National Park all forms of new built development will attain at least the national sustainable building requirements.

With regard to National Park setting and the Authority’s commitment to social inclusion, development proposals will be required to take into consideration the following:

- i. Inclusive design*
- ii. Landscape protection and enhancement*
- iii. Biodiversity protection and enhancement*
- iv. The historic environment*
- v. Environmental sustainability*
- vi. Cultural identity*
- vii. An Integrated energy statement*

Within the National Park natural Welsh mineral slate roofing or an approved equivalent material with the same colour, texture and weathering characteristics will be required on new buildings and extensions.

As an exception to the use of mineral slate roofing, alternative appropriately coloured and textured natural materials and appropriately designed and located renewable energy proposals will be considered.

Proposal should also accord with Development Policy 3: Energy.

Material Considerations

Planning Policy Wales

4.3 It is evident from the Planning Policy Wales document that the Welsh Government is committed to sustainable development with important contributions from renewable energy generation. Paragraph 4.4.3 explains that *planning policies, decisions and proposals should:*

- *Support the need to tackle the causes of climate change by moving towards a low carbon economy. This includes facilitating development that reduces emissions of greenhouse gases in a sustainable manner, provides for renewable and low carbon energy sources at all scales and facilitates low and zero carbon developments.*

4.4 Paragraph 4.5.2 of PPW states that:

The Welsh Government has set out to achieve annual carbon reduction equivalent emissions reductions of 3 per cent per year from 2011 in areas of devolved competence, which include land use planning. We are also committed to achieving at least a 40% reduction in all greenhouse gas emissions in Wales by 2020 against a 1990 baseline. This will assist in making a significant contribution to the UK Carbon Budgets. The Climate Change Strategy for Wales and associated Delivery Plans on Emission Reduction and Adaptation set out how we intend to limit greenhouse gas emissions and adjust to changes in our climate. This includes a specific action to ensure that land use and spatial planning promote sustainable development and enable a move towards a low carbon economy which takes account of future climate impacts. Key areas that underpin actions in each sector are as follows:

- *Supporting behaviour change*
- *Research and good practice*
- *Innovation and skills*
- *Buildings*
- *Energy Generation*
- *Food*

4.5 Paragraph 12.8.9 states that:

Local planning authorities should facilitate the development of all forms of renewable and low carbon energy to move towards a low carbon economy (see 4.4.3) to help to tackle the causes of climate change (see 4.7.3). Specifically, they should make positive provision by:

- *considering the contribution that their area can make towards developing and facilitating renewable and low carbon energy, and ensuring that development plan policies enable this contribution to be delivered;*
- *ensuring that development management decisions are consistent with national and international climate change obligations, including contributions to renewable energy targets and aspirations;*
- *recognising the environmental, economic and social opportunities that the use of renewable energy resources can make to planning for sustainability (see Chapter 4); and*
- *ensuring that all new publicly financed or supported buildings set exemplary standards for energy conservation and renewable energy production*

Planning Guidance

Supplementary Planning Guidance: Renewable and Low Carbon Energy

4.6 Appendix 2 of the Supplementary Planning Guidance document summarises the findings of the Snowdonia Renewable Energy Capacity Assessment. It identifies small-scale hydropower as having the potential to produce 6.1GWh of electricity from an installed capacity of 1.9MW. The hydro section of the main report points out that this estimate is based on low-head sites and is therefore an underestimate of the total capacity of small-scale hydro, nevertheless, this proposal will make a significant contribution to the generating capacity of hydro projects within the National Park.

4.7 The Hydro and Micro Hydro section of the document outlines the following headings that should be addressed in any application for a hydroelectric scheme.

1. *Landscape and Visual*

- *Landscape and visual impacts including an assessment of impact on LANDMAP*
- *Cumulative impacts, consideration of other existing and proposed nearby hydro developments/abstractors on the water course.*

2. *Ecology*

- *Impacts on riverine habitats, protected species and fisheries*
- *Impacts of protected areas such as SSSIs, and internationally designated sites SACs, SPAs and Ramsar sites and NERC Act Section 425 and Biodiversity Action Plan habitats and species.*

3. *Impact on Amenity*

- *Impacts on public rights of way*
- *Impacts on recreational uses of the watercourse, especially at minimum flow*
- *Impacts on “scenic qualities” of waterfalls*

- *Impact of mechanical noise of nearby receptors*
- *Cumulative impact of noise*
- 4. *Impact on Heritage*
 - *Visual impact upon Listed Buildings, Conservation Areas and Sites of National Historic Importance such as National Trust Properties; Scheduled Ancient Monuments*
 - *Impact on Non Scheduled Archaeological Sites*
 - *Impact on Registered Parks and Gardens*
 - *Impact on Registered Historic Landscapes*
- 5. *Hydrology*
 - *Impact on water quantity and quality of the watercourse and the wider catchment*
 - *Impact on soil drainage of the penstock*
- 6. *Operational and Ancillary Development within the Site*
 - *Access tracks*
 - *Ancillary buildings such as turbine houses transformer buildings*
 - *Hard standing areas and temporary working areas. (Construction Method Statements are crucial in this respect)*
- 7. *Connection to the electricity network*
 - *A plan indicating the proposed grid connection, which will also be assessed by the above criteria.*

4.8 The Planning and Implementation Workbook for the Installation of a Micro Hydro Electricity Generation Facility (prepared for Gwynedd Economic Partnership) echoes the points made above. These topics have been assessed as part of the proposal and can be found in this supporting statement or the documents that accompany the application.

The Development with Respect to the Development Plan & Material Considerations

Contribution to Sustainable Development

4.9 The development of hydroelectric power schemes is supported by the PPW and by government targets for the mitigation and reduction of greenhouse gas emissions.

4.10 The proposed scheme provides a source of renewable energy generation at a local level with a low impact on the surrounding area. This complies with policies 1, 3 and 6 of the Eryri Local Development Plan.

Minerals

4.11 Policy E of the Local Development Plan ensures protection for areas identified for Mineral Safeguarding. The policy states that '*planning permission will only be granted for non-mineral development if it can be demonstrated that the proposed development does*

not permanently sterilise, or restrict, the possible future working of the identified mineral resource.'

4.12 The proposed scheme location falls within a Mineral Safeguarding Area for Ordovician Igneous Rock. The construction of the intake, penstock, turbine housing and associated works will not sterilise or restrict the mineral resource.

Historic Environment

4.13 The site is not within or close to any Conservation Areas or World Heritage Sites. The Aberglaslyn Landscape of Outstanding Historic Interest is located approximately 500m from the turbine location and will not be affected by the proposal. The closest listed building, Grade II Beudy Newydd, is approximately 50m from the penstock and will be unaffected by the proposal. The closest scheduled ancient monument, Unenclosed Hut Circle Settlement East of Garth-y-Foel, is approximately 130m from the penstock and will also not be impacted by the proposal.

4.14 The proposed penstock will run through Parc Grade II* Registered Park and Garden. As the penstock will be routed underground the impact to the setting of the Park and Garden during operation will be non-existent. The setting will be impacted during the construction phase but this will be a temporary disturbance that will be eliminated once the penstock has been completed.

5 Landscape & Visual

5.1 A review of the LANDMAP has been undertaken which recommended that the landscape should be maintained as currently and supported the management of the Estate. Due to the much localised potential impact the LANDMAP assessments have not been reviewed any further and the focus will be on the localised impact and potential mitigation.

Description of the scheme and its Landscape and Visual aspects

- 5.2 The scheme composes of 3 elements: Intake structure, penstock and turbine house / outfall location. In addition there is the grid connection required to connect the generator inside the turbine house to the nearest existing pylon.
- 5.3 The Intake structure will be in river and is at a location that is some 470m from the nearest road and screened by topography and vegetation. It would only be visible if a viewer were to walk up to the location. A mock up has been produced to show how the weir structure would look in the existing view. It is likely that the concrete structure would be clad with stone or local materials in order to blend in more with its surroundings.
- 5.4 The Penstock is effectively a pipe that will run outside of the river from the intake to the turbine house. This is a tried and tested technique which is often buried underground. The project intention is to bury the majority of the pipe in open ground in order to minimise visual impact. This will depend on the rock and ground conditions encountered at the point of construction. However the preference would be to full bury the pipe and re-position the existing turf on top. There may be sections have cannot be buried completely so would be turfed over to hide the pipeline. There are a number of existing schemes within Snowdonia which have successfully minimised the visual impact of the penstock route. Where re-turfed/re-seeded there may be a 1 – 2 year period whilst the vegetation matures to blend into its surroundings.
- 5.5 The turbine house will consist of a building measuring 6.25m x 7m x 3.6m to the apex of the roof will be made from local materials. The structure will be approximately 550m from the A4085 and similar distance from the unclassified road north east towards Croesor village. A mock up has been produced to show how the structure would look in the existing view. Longer range views would not be possible due to screening from vegetation.
- 5.6 The grid connection will require a new length of cable from the Turbine House to the nearest suitable pylon. Currently the project is in discussion with the DNO Grid Operator regarding a underground connection of less than 600 metres in order to minimise visual impact
- 5.7 Overall the visibility of the different elements of the scheme will be much localised and in some cases unnoticeable to passers-by.

Mitigation

5.8 The main mitigation of landscape and visual impact has come in the form of the schemes design and small scale nature. This scheme has been designed sympathetically to its locality and in line with Snowdonia National Park Authority guidelines. The final finish of the structures will be agreed with the Planning Authority.

6 Cultural Heritage

- 6.1 A desk based assessment of records held by National Monuments Records for Wales, Welsh Archaeological Trusts' Historic Environment Records, CADW Listed Buildings & Scheduled Ancient Monuments, the Royal Commission on the Ancient and Historical Monuments of Wales was undertaken. Based on this assessment the scheme has been designed to avoid any known existing features in particular along the Penstock route.
- 6.2 The nearest Grade II* listed building to the proposal is the L-shaped Agricultural Range at Parc, approximately 120m east of the penstock. The nearest Grade II listed building is Beudy Newydd, approximately 50m southeast of the penstock. There are no Grade I listed buildings within the vicinity of the proposal. Neither of the listed buildings discussed above, or any of the other nearby Grade II and II* buildings, will be impacted by the proposal during its operational phase. However, there will be a temporary disturbance to the setting of the buildings during the construction phase.
- 6.3 The closest scheduled ancient monument is the Unenclosed Hut Circle Settlement East of Garth-y-Foel, located amongst trees and approximately 120m northwest of the penstock and on the opposite side of the bank from the penstock. The setting of the monument will not be affected.
- 6.4 Over half of the penstock will pass through Parc, Llanfrothen Grade II* Registered Park and Garden. The primary reason for designation of this asset is *'the rare survival of exceptional stone-built garden terraces probably of seventeenth-century date, associated with a group of interesting buildings and historical features set within a contemporary small walled park which includes a gatehouse and viewpoint'*. The penstock will not pass through or close to the garden terraces and will only have a visual impact on the park during construction, after which point there will be no effect to the setting.
- 6.5 The grid connection is likely to be installed in the penstock trench with a short 30m underground offshoot to a nearby existing overhead. Being underground and immediate backfill will ensure no impact on the heritage assets or their settings.

7 Ecology

7.1 A number of ecological surveys were carried out by Dr Rhod Gritten during November 2014 and May 2015 examining the vegetation (including bryophytes), otters, water voles, badgers and birds of the affected reach of the river and the vegetation, birds, bats, water voles and badgers of the penstock route. The full report is attached to the application, however a summary of the conclusions are presented below.

Penstock

7.2 The penstock route passes through mostly improved pastures under which it will be buried. Intervening ground, though often wooded, is infested with Bracken of varying degrees of density. No Schedule 8 or Section 42 species were noted during these surveys. However, broadleaved (Oak) woodland is a priority Section 42 habitat and pipe burial will have to be undertaken with a great deal of sensitivity through this habitat. The penstock route was amended a number of times to reduce impact on trees. The revised route was confirmed by the ecologist to not change the conclusions of the Ecology report but please note the route depicted in the ecology report is not the most up to date route, please refer to plan drawings.

Grid

7.3 The cable will be laid in the penstock trench and will create no additional ecological impact, especially as the route is through improved pastures for the majority of its length.

The River

7.4 There will be no impact of the construction of the penstock route on the vegetation of the Croesor valley but it is open to speculation whether a run-of-river HEP scheme such as the one proposed on a river of such open aspect will have a deleterious impact on riverine/in-stream bryophytes. Only a carefully thought out long-term monitoring programme will be able to ascertain this with any degree of certainty. Such a scheme as the one proposed for the Afon Croesor would be an ideal scheme to monitor since the river is accessible along its entire length and the bryophyte assemblage is reasonably rich. This would require the establishment of a number of permanent quadrats as soon as possible after the scheme has been constructed and is generating electricity. The quadrats would need to be checked every five years for 10-15 years post-construction.

Badgers

7.5 There were three setts of varying size and status recorded during the survey. The non-natal badger sett 26 metres from the proposed penstock route is a sufficient distance from it for light wheeled vehicles to be able to be used without causing any damage to the setts. Before works start, it is recommended that these setts are clearly marked and isolated with suitable tape and contractors advised about the need to exercise care in the vicinity.

Otters

7.6 Abstraction during the generation periods of this scheme will not affect otters since it will not impede their passage up or down river. Since there are no holts at the discharge point or the intake site, otters will not be directly affected during the construction phase of the proposal. However, it is recommended that appropriate Reasonable Avoidance Measures are adopted during the construction period.

Water Voles

7.7 A careful search was made of the riparian zone of the affected reach of the river where accessible, in particular around the intake weir and the Turbine House/outflow, and in the small flushes besides the penstock route. No signs of water voles were noted anywhere within the survey area. Water voles will not be affected by the proposed HEP scheme.

Bats

7.8 It has been suggested that no trees will need to be felled to construct this scheme but a separate tree survey will be undertaken which will be able to confirm this. Bats are unlikely to be affected by the proposal.

Birds

7.9 Birds will not be affected by the proposed. However a further survey is recommended if construction works are likely to be started within the breeding season, particularly of the wetland area just below the intake weir.

Trees

7.10 Based on informal feedback from Snowdonia National Park Authority, a Tree Survey compliant with BS 5837: 2012 was undertaken by Access2Trees during July 2015.

7.11 The results of the survey are attached as Appendix E and details the proposed mitigation measures that will be undertaken by the project.

7.12 The exact penstock route was amended a number of times to reduce the impact on trees.

7.13 There is a 40 metre section identified in the tree survey as requiring to be overground to avoid potential Root Protection Areas. The project will assess this with a qualified arboriculturalist onsite prior to excavation to confirm whether this section can be buried or not. The project would like to maintain a buried pipeline for aesthetic reasons but if advised to definitely leave this section above ground, it will comply with specialist and local authority advice.

7.14 The project requires a number of trees to be removed and whilst this is a considerable number of mainly mature trees, when viewed in the context of the whole site and wider area it remains a very low percentage of overall trees and will not have a negative effect on the areas appearance. Add to this the replacing agreement that the clients are keen to uptake that every tree removed of a B or C category is replaced on a two for one basis. The scheme is suitable for this area in arboricultural terms.

Overall

7.15 The Ecology and Tree Surveys show that this project can be constructed and operated with minimal impact on ecology, wildlife, flora and fauna. Tree removal will be in line with good woodland management replacing old trees with young trees to ensure a long term woodland area.

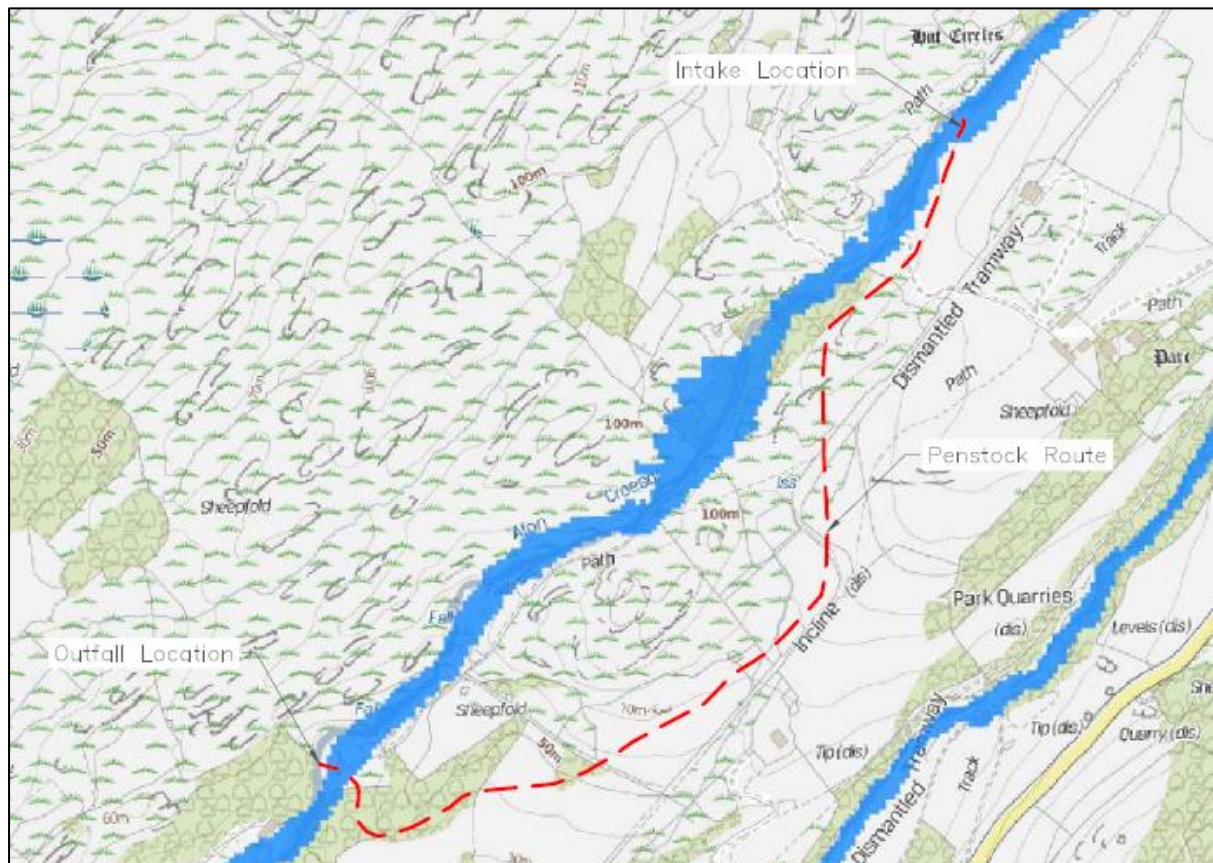
8 Noise

- 8.1 Any turbine and generator are bespoke pieces of equipment so the precise amount of noise they make varies from site to site. However the noise associated with the system is all generated in the powerhouse itself, and the design has been carried out to ensure that a nuisance is not heard outside. The noise level expected within the powerhouse will be 85dB (A). The building has been designed with a dense concrete block and timber cladding construction which will be heavy enough to suppress noise, and penetrations through the building have been designed to hold noise within; for instance the ventilation arrangements and water outfall pipe. For this reason we do not expect the plant to be intrusive when stood adjacent to it and for the level at the nearest receptor road to be below 30dB (A).
- 8.2 It is necessary that the nearest noise sensitive receptor to the site would receive no nuisance and this is taken in this case to be a level associated with the development of 30dB(A) which is equivalent to a rural background level. The river flow itself will create a certain level of background noise.
- 8.3 The nearest property is residential and approximately 60m from the proposed turbine house. This is sufficient distance in combination with building attenuation for no audible sound to be heard in any circumstances.
- 8.4 The powerhouse construction will be heavy so that a 60dB (A) attenuation can be expected and this noise source is therefore not discussed further.
- 8.5 The outfall from the turbine house has been designed so that there is not a direct air channel from turbine to outside of turbine house. This means any noise has to travel through water flowing down the outflow.
- 8.6 No additional absorption of sound is assumed, although in practice there may be some from vegetation and topography.
- 8.7 It is hence concluded that the system will not cause a noise nuisance.

9 Flood Consequences Assessment and Hydrology

9.1 Figure 9:1 below shows that the locations of the intake and outfall are located in Flood Zone C2. A Flood Consequences Assessment accompanies this planning application and a summary of the results are included below.

Figure 9:1 NRW Flood Map



- 9.2 Flooding at the site from the Afon Croesor following the proposed development will not be altered as the proposed structures are off-line to the watercourse to the extent that the water level is calculated to rise in all floods, and therefore will not impede flood flows.
- 9.3 The proposed powerhouse floor level is situated at an elevation of 25.3 mAOD which is above the adjacent river levels during flooding. Therefore it is outside of Flood Zone B.
- 9.4 The turbine enclosure comprises the only proposed above ground structure and has a footprint of 6.25m x 7m internally. As this structure is above the 1:100 predicted flood flow level then it does not constitute a loss in flood plain storage.
- 9.5 In addressing the Sequential Test, the powerhouse has been located as far and as high as practicable from the edge of the watercourse and is therefore at the least possible risk from damage caused by flood waters.

- 9.6 The intake structure has not been assessed quantitatively in detail due to its small size and function, and the small volume of water which is impounds. No critical control equipment will be sited here, and access will not be necessary in elevated flows.
- 9.7 It is proposed to put into operation a Flood Management Plan that will be included in the Operation and Maintenance Manual for the hydro power system. The Flood Management Plan will be used to ascertain when there is considered to be a flood risk to the equipment and operators and propose safe measures for shutting down the equipment if necessary to prevent harm and minimise damage. In this case it is likely to be focussed on appropriate access to the intake.
- 9.8 The Flood Management Plan will include the following:
- Key flood risk indicators.
 - Safe shut down procedures.
 - Instructions on whether it is safe to access the powerhouse.
 - Safe access routes / evacuation procedures.
 - Emergency contacts.
- 9.9 Appropriate flood mitigation measures and management procedures have been proposed to alleviate the flood risk.
- 9.10 No significant changes are proposed to the flow in the main river and there is no net loss of flood plain storage, it can therefore be demonstrated that there is no increase in flood risk to the site or elsewhere.
- 9.11 The risk of flooding to the proposed development is considered acceptable and the development should be allowed to proceed.

10 Conclusion

- 10.1 The proposal for a 175kW hydroelectric scheme at Croesor is compliant with both local and national planning policy.
- 10.2 Reports have been completed that show there will be no significant impacts to ecology, noise, flood risk.
- 10.3 The scheme would generate electricity to supply approximately 228 Welsh homes saving 427 tonnes of carbon emissions per annum.
- 10.4 All documents referenced in this report have been submitted as part of the planning application.
- 10.5 In conclusion this project should be granted planning permission.