

## **Afon Alice Hydro Scheme**

### **Ecology Report**

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## 1. SUMMARY

- A micro hydro scheme is proposed for the Afon Alice, close to Pennal, Meirionnydd. Consultation had taken place with Snowdonia National Park Authority (SNPA) and recommendations were made to carry out, as a minimum, an extended Phase I vegetation survey of the site, as well as protected species surveys. These latter were to cover otter, badger, amphibians and reptiles and breeding birds. Protected species surveys were also to cover bats, if any mature or semi-mature trees were affected. In order to pre-empt any requirement for a lower plants survey, a bryophyte survey was carried out on the day. In addition, an appraisal of the site for sensitive lichen species was carried out (i.e. not a full survey but an assessment of the site's potential to support sensitive lichens).
- Extended Phase 1 vegetation survey concentrated primarily on the penstock route and the proposed locations of infrastructure (intakes, powerhouse) (since these were the areas that were most likely to be directly impacted). Woodland areas on both sides of the Afon Alice were also categorised in terms of their Phase I categories. Phase I habitat survey revealed that all vegetation communities likely to be impacted were widespread upland communities of mid and north Wales. In terms of sensitivity, the route and infrastructure avoids the majority of vegetation/habitats of value. The only exception to this is the presence of some flushing (acid flush) approximately 250m to the south-east of the powerhouse location, along the cable route. The cable route may have a minor impact on this area of flushing, though this is considered unlikely, provided appropriate mitigation is implemented.
- Survey and assessment for protected species did not reveal any otter holts or resting places (including close to the intake and outfall points), and it is considered that the proposed works will have a negligible impact on this species. There was no evidence of active badger setts along any of the proposed penstock route or close to any proposed infrastructure. A small number of trees were considered suitable as bat roosts. However, these were all either further downstream from the powerhouse location or at a sufficient distance from the proposed infrastructure so as not to be impacted by the scheme. The woodland is not considered suitable for dormouse. In addition, water vole are not considered to be present.
- The breeding bird assemblage of the proposed route and infrastructure areas was also taken into consideration during the survey. This was assessed to be entirely typical for the locality and unlikely to support any species protected under Schedule 1 of the Wildlife and Countryside Act.
- A bryophyte survey was carried out which focused particularly on humidity-demanding species, representative of the Section 7

(Environment (Wales) Act 2016) oceanic ravine community. The site was also assessed for the presence of 'old forest' lichens and any indicators of important areas for riparian lichens. The lower plants assemblage was found to be poor, with few species of the Section 7 community, a single 'old forest' lichen and no potential for significant riparian lichens.

- The overall conclusion of the ecology surveys was that the proposed penstock route, intake points and powerhouse will have little ecological impact, and certainly not a significant impact on any protected species or important ecological receptor. The only exception is the area of flushing described above and mitigation is suggested to take account of this.
- Formal mitigation and protection measures are outlined for the potential presence of bat roosts. No measures are stipulated for otter, dormouse or water vole, as it is considered that these species are not present (apart from otter which is likely to be sporadically present along this watercourse).

## **2. INTRODUCTION**

### **2.1. Background and Survey Objectives**

A hydro scheme is proposed on the Afon Alice, Pennal, Meirionnydd.

Chris F. Brown MCIEEM surveyed the site to establish if there were any ecological constraints or likely impacts on, or of, the proposed development.

The survey consisted of the following elements:

- A habitat survey of the route and infrastructure areas to a Phase 1 level;
- A site survey that identified the potential for protected species on the proposed route and infrastructure locations;
- A bryophyte survey of the proposed penstock route and associated with the stream itself (to ascertain the presence and sensitivity of humidity-demanding species);
- A desk study comprising recorded ecological interests within 2km of the proposed development. Information relating to the location of key sites and species of nature conservation interest within the search area was obtained from cofnod (north Wales environmental information service).
- This report, which details the results of the above together with species protection measures and suggestions for ecological enhancement.

## **2.2. Site Description**

The proposed penstock route is close to the Afon Alice, which forms a narrow upland stream, with forested banks for much of its length. Photo 1 (Appendix 3) shows intake 1 location. The area immediately adjacent to intake 1 (Photo 2, Appendix 3) largely consists of acid grassland vegetation, grading to low scrub and plantation forestry just downstream.

Travelling east, the penstock route from intake 1 runs through low forestry plantation and at the edge of a forestry track (Photo 3, Appendix 3), to join the main intake, intake 2 (Photo 4, Appendix 3). Intake 2 is more wooded than intake 1, with young birch and willow (Photo 5, Appendix 3). The penstock route leaves this broadleaved wooded area within 50m of Intake 2 where it enters into conifer plantation and then, approximately 300m from Intake 2, it follows a forestry track through low growth plantation forestry (Photo 6, Appendix 3). It runs through this forestry for approximately 600m before entering bracken-dominated acid grassland. It passes through this bracken for approximately 150m, before arriving at the proposed powerhouse location (Photo 7, Appendix 3). The proposal is for the penstock from Intake 2 to the power house to be over-grounded throughout. The powerhouse location is in damp acid grassland. The cable route from the powerhouse largely runs through semi-improved acid grassland. After approximately 250m, the cable route passes over a more flushed area, consisting of sharp-flowered rush *Juncus acutiflorus* and various sedge species. After crossing this flushed area, the cable route continues to run through semi-improved acid grassland.

## **2.3. Proposed Works**

The project involves the construction of two new intake weirs across the full width of the watercourses, a building to house the turbine and generator (power house), a feed pipe to link the two intakes (buried for its entire length), a forebay tank near Intake 2 to combine the water from both intakes and a pipe (penstock) over ground for its entire length from the forebay tank to the power house. A cable route will run from the power house for approximately 640m before connecting to an existing electricity pole.

A screen will be used on the intake weirs and the screen size (2mm) has been stipulated by the Environment Agency to eliminate the risk of fish being drawn into the penstock. Where the water is discharged back into the watercourse, the tailrace pipe will be above the water level preventing fish from entering the turbine even during flood levels.

The trench depth required for the feed pipe, between Intake 1 and Intake 2, will be a minimum of 700mm to provide at least 500mm of cover over the pipe. The trench width will be approximately 350mm wide. The working width required for the pipe installation, including the temporary pile of spoil, will be about 3,500mm.

## **2.4. Correspondence with consultees**

Greenearth hydro, working on behalf of the developer, approached SNPA to discuss any concerns they may have with the proposal in relation to ecology. SNPA requested that protected species were assessed, specifically citing otter, reptiles and amphibians and, where relevant, bats. SNPA also requested that an extended Phase 1 vegetation survey should be conducted.

## **3. METHODOLOGY**

### **3.1. Vegetation Survey and Assessment**

A vegetation survey and assessment was carried out to a Phase 1 habitat survey level, in line with guidance from SNPA. The penstock route (including the power house and intake weir sections), was surveyed in terms of its vegetation communities, and these were categorized according to Phase I habitat categories. The woodland close to the stream was also surveyed in terms of its vegetation communities. Brief species lists were compiled for these areas. Habitat survey was based on the procedures in JNCC (2010).

The site was surveyed on 15<sup>th</sup> September 2018. The weather was generally bright, with some overcast periods and short periods of rain. There was a slight north westerly (F. 2/3) breeze. Chris F. Brown, a qualified ecologist, ornithologist and bryologist, carried out the survey. He has carried out many similar surveys previously and is highly familiar with their aims and requirements.

### **3.2. Protected Species Surveys**

Surveys for protected species were undertaken on the same date as the vegetation survey. The presence or potential presence of protected species was noted on a survey field map.

#### **3.1.1. Otter**

A standard otter *Lutra lutra* survey was undertaken, following the methodology detailed by Chanin (2003). The stream was searched for signs of otter at suitable locations and in particular at the intake locations and at the power house. Otter signs include spraints (faeces), tracks, paths, food remains and shelters (holts and couches). This last (i.e. the presence of holts and/or couches) is a particularly important survey requirement, in that breeding sites and resting places are specifically mentioned in the European legislation covering this species. They are also highlighted by Natural Resources Wales (NRW) and SNPA as an important survey requirement.

#### **3.1.2. Bats**

The potential for bats was assessed through the identification of suitable habitat and roost structures. This included assessing any large trees close to the pipeline route, intake points and powerhouse location. Guidance was

taken from the Bat Conservation Trust guidelines (Collins, 2016). In particular, large trees with split limbs, dense epicormic growth, covering of ivy and/or woodpecker and other holes were noted. Potential signs of bat use were also noted, including droppings, feeding remains, urine splats, bat carcasses, grease staining and polishing suggestive of bat entry.

### **3.1.3. Dormouse**

The potential for dormouse *Muscardinus avellanarius* was assessed through habitat appraisal. This included reviewing the site for the following features, considered favourable for dormice (Natural England/Forestry Commission interim guidance, 2007):

- Woods that are connected to other areas of suitable woodland;
- Wide range of broadleaved species and ages present, in patches, scattered throughout, or around the edge;
- Shrub layer present, especially with hazel, honeysuckle or bramble;
- Species-rich scrub on woodland margins, ride sides or in patches;
- Canopy connections across tracks or thick, wide hedgerow connections to other nearby suitable habitat;
- Conifer/broadleaved mixtures or conifer plantations colonised by native broadleaves; and
- Fruiting hazel or sweet chestnut – ideally as managed coppice.

### **3.1.4. Badger**

Badger *Meles meles* survey was undertaken through looking for signs such as setts, foraging signs, dung pits or tracks. Active setts in particular were searched for, as these may constrain the location of any development (i.e. no development within 30m of an active sett).

### **3.1.5. Birds**

An assessment of the site for breeding birds was conducted whilst walking the route of the penstock. Particular attention was paid to species associated with the intake areas, the powerhouse and the Afon Alice and surrounding woodland.

## **3.3. Lower Plants Survey and Assessment**

Suitable micro-habitats were searched in detail for mosses and liverworts. These included steep damp rock faces, rock niches, woodland flushes and tree bases, trunks and branches. Drier areas of rock faces were also

examined, as was the floor of the woodland and rocks/boulders within the stream itself. All species from the proposed site were identified. Wherever possible, material was identified on site using x10 and x20 hand lenses. In cases where identification was not possible with a hand lens, a sample of material was obtained and packaged, for microscopic identification later. The survey also encompassed 'old forest' lichen species i.e. lichens associated with long-established woodland conditions. This included a search for species typical of more humid woodland conditions e.g. species of *Sticta*, *Lobaria virens*, etc.

A number of lower plant species (in particular some of the bryophytes) are dependent on high levels of humidity. They are therefore principally associated with areas of fast-flowing water, often exacerbated by topographical features such as waterfalls, incised ravines and gorges. The importance of these ravine communities of bryophytes is underlined by their inclusion as an assemblage under Section 7 of the Environment (Wales) Act 2016 (i.e. of principal importance for conservation of biological diversity in Wales). The Section 7 'oceanic ravine community' list of species is reproduced in Appendix 2.

## **4. RESULTS**

### **4.1. Desk Study**

Only a small number of species records (69) were returned from cofnod. Very few of these were less than 1km distant from the proposal. Lesser horseshoe (bat) was recorded from 730m distance (south-west of the proposal). This species favours networks of hedgerows and walls, and roosts in old buildings. The site is therefore inimical to lesser horseshoe. Other bat records were associated with old buildings approximately 1.7km distant. Otter and dormouse were both recorded from locations approximately 1.2km distant. Few bird species records were evident. The closest was for redstart *Phoenicurus phoenicurus*, 944m from the centre point of the proposal. Red kite *Milvus milvus* was recorded 1.3km from the proposal. All other records were over 1km from the proposal. There was no ecological connection between the species that were recorded and the proposed hydro scheme.

No statutory designated sites lie within 2km of the site.

### **4.2. Vegetation Survey and Assessment**

#### **4.2.1. Vegetation Descriptions**

In terms of vegetation communities, the penstock route can be divided into five basic types:

- acid grassland;
- semi-improved grassland;
- bracken;



- marshy grassland;
- plantation woodland;

These habitats are broken down further below, into their respective Phase I survey categories. A plan showing the location of these communities at the site is provided in Appendix 1.

#### Acid grassland

The acid grassland at the site comprised relatively impoverished examples, entirely typical and characteristic of heavily grazed conditions in the Welsh uplands. The main area of unimproved acid grassland was around intake 1. This supported the grasses common bent *Agrostis capillaris*, purple moor-grass *Molinia caerulea* and tufted hair-grass *Deschampsia cespitosa*. A representative photo of this acid grassland is provided as photo 2 (Appendix 3). Other species, typical of steep acid banks, included foxglove *Digitalis purpurea*, male-fern *Dryopteris filix-mas* and the mosses *Polytrichum commune* and *Pogonatum urnigerum*. A photo showing this steep acid bank vegetation is provided as photo 8 (Appendix 3). A small quantity of cross-leaved heath *Erica tetralix* was present. A very small quantity of ivy-leaved bellflower *Wahlenbergia hederacea* was also present close to intake 1. Damp acid grassland of a similar species composition was found at the proposed powerhouse location (photo 7, Appendix 3).

#### Semi-improved grassland

Semi-improved acid grassland is found along the majority of the cable route. Whilst this grassland can vary in terms of its species richness, the example at the site is species-poor. It supported some species indicative of agricultural improvement (in particular perennial rye-grass *Lolium perenne*). Common bent was common in this grassland.

#### Marshy grassland

The cable route crosses an area of flushed marshy grassland approximately 250m from the powerhouse location. This area is relatively species-rich, particularly downslope from the cable route. Sharp-flowered rush is the dominant rush species. The main grass species is purple moor-grass. Associated species include star sedge *Carex echinata*, smooth-stalked sedge *C. laevigata*, greater bird's-foot-trefoil *Lotus pedunculatus*, tormentil *Potentilla erecta*, selfheal *Prunella vulgaris* and meadowsweet *Filipendula ulmaria*. Lesser skullcap *Scutellaria minor* and bitter vetch *Lathyrus linifolius* were sparsely represented. The point at which the cable route crosses this 'flush' is narrow and the habitat feature widens considerably downslope.

#### Bracken

Bracken *Pteridium aquilinum* is found in the area between the powerhouse and heading upstream, as far as the forestry plantation. The example at the site is species-poor and supports few associated species.

## Plantation woodland

The majority of the penstock route lies in forestry plantation, either along forestry tracks or running through the plantation itself. This is largely very poor quality habitat, of little ecological value. The forestry itself supports few associated species. The forestry tracks have a few more associated species, some indicative of the damp substrate, such as soft rush *Juncus effusus* and great willowherb *Epilobium hirsutum*. Other species are indicative of drier, often shaley substrates. These include heather *Calluna vulgaris*, bell heather *Erica cinerea* and particularly gorse *Ulex europaeus*. Very occasionally, single plants of sheep's-bit *Jasione montana* and heath speedwell *Veronica serpyllifolia* were present. A small area of wet semi-natural broadleaved woodland was also present, near intake 2. This comprised young downy birch *Betula pubescens* and goat willow *Salix caprea* (photo 5, Appendix 3). The penstock runs through this for the first 25m downstream and then follows the plantation forestry track. A few larger broadleaved trees (particularly ash *Fraxinus excelsior* and alder *Alnus glutinosa*) were present in the area near the powerhouse location.

No other vegetation communities were present.

### **4.2.2. Flora**

All plant species recorded were widespread and typical of the habitats they were found in. No vascular (i.e. higher) plant species were found that are protected.

### **4.3. Lower Plants Survey and Assessment**

All bryophytes recorded were common and widespread species. The commonest species within the woodland areas were *Rhytidiadelphus loreus*, *Thuidium tamariscinum* and *Mnium hornum*. The rocks in the watercourse supported typical species for the area and setting. Dominating these rocks were *Hyocomium armoricum* (close to intake 2), *Racomitrium aciculare* and *Nardia compressa*. This last was found close to the water level and submerged in the river itself. It is a good indicator of acidic (base-poor) conditions. Other typical waterside species were *Marsupella emarginata*, *Pellia epiphylla* and *Rhizomnium punctatum*. Only one species was recorded that is listed under the Section 7 community. This is *Hyocomium armoricum* and falls under criterion 4. The site therefore clearly fails to qualify as one supporting the Section 7 oceanic ravine community. A single 'old forest' lichen was recorded. This is *Sticta limbata* which was found in quantity on an old ash approximately 25m from the powerhouse location. This tree will not be affected by the powerhouse construction. A photo showing the tree is provided as photo 9 (Appendix 3).

## **4.4. Protected Species Surveys**

### **4.4.1. Otter**

No signs of otter were recorded. Otter undoubtedly use the Afon Alice from time to time, but this section does not appear to be regularly used, as no spraints were found. It is likely that the water is largely inimical to fish species (too base-poor). Otter are much more likely to use the lower stretches of the stream (closer to larger watercourses, more potential prey).

### **4.4.2. Bats**

No buildings lay close to the proposed pipeline or infrastructure locations and therefore there was no potential for such structures to support bat roosts. A small number of trees were considered to have features potentially suitable for roosting bats. These were all at a sufficient distance from the penstock route and proposed infrastructure locations so that they will not be affected by the construction of the pipeline.

### **4.4.3. Dormouse**

The woodland was wholly unsuitable for supporting dormouse. There was a lack of food plants for this species (food plant species such as honeysuckle were sparse) and there was a general lack of broadleaved trees.

### **4.4.4. Badger**

No badger setts were found on the proposed route. No evidence of badgers was found within the woodland. Much of the penstock route appeared too damp for badger setts. A small number of holes were present at the powerhouse location, but these were rabbit burrows and not badger.

### **4.4.5. Birds**

Few birds were recorded on the site. A number of species are likely to be associated with the young growth forestry areas. These are likely to include tree pipit *Anthus trivialis* and warblers such as willow warbler *Phylloscopus trochilus* and garden warbler *Sylvia borin*. Cuckoo *Cuculus canorus* is also likely to breed in the vicinity, using meadow pipit *Anthus pratensis* as a host.

## **5. CONCLUSIONS AND RECOMMENDATIONS**

### **5.1. Evaluation**

This section provides an evaluation of the potential impact of the proposed development on habitats and species identified within the report above.

### **5.2. Possible Impacts of Proposed Works on Vegetation**

Almost the entire infrastructure (proposed intake points, power house and penstock route, cable route) are anticipated as having a negligible impact on

their respective surrounding habitats. The only exception to this is where the cable route passes over the flushed marshy grassland area approximately 250m south-east of the powerhouse location. There is some potential for the cable route to have indirect impacts on the vegetation here. However, this is considered unlikely if appropriate mitigation is adhered to. The flushed area is narrow at the point at which the cable route crosses and indirect impacts could be avoided by either feeding the route over the flushed area or providing a small culvert in this location. The removal of small trees for the Intake 2 construction is of no consequence as these are of no ecological significance.

### **5.3. Possible Impacts of Proposed works on Lower Plant Species**

There will be negligible impact from the proposed works on lower plant species. No individual species of conservation significance were recorded and the site also clearly fails to meet the criteria for the Section 7 oceanic ravine community. The tree supporting the old forest lichen *Sticta limbata* will not be impacted by the works.

### **5.4. Possible Impacts of Proposed works on Protected Species**

#### **5.4.1. Bats**

There will be no impact from the scheme on bats, as all suitable bat roost trees are at a sufficient distance from the proposed route and infrastructure so as not to be impacted. However, general mitigation and protection measures are outlined for this group.

#### **5.4.2. Dormouse**

There will be negligible impact from the scheme on dormouse as there is no suitable habitat for this species.

#### **5.4.3. Badger**

No signs of badger were recorded and no active setts will be impacted by the proposal. There will therefore be no impacts on this species and no mitigation or species protection measures are considered necessary.

#### **5.4.4. Otter**

No signs of otter were recorded, and usage of the Afon Alice is likely to be low. No impacts are predicted for this species and no mitigation or species protection measures are considered necessary.

#### **5.4.5. Birds**

No impacts are predicted from the scheme on birds, subject to the mitigation and species protection measures outlined below.

## **5.5. Mitigation and Species Protection Measures**

No mitigation measures are considered necessary for lower plants, dormouse, badger and otter.

### **5.5.1. Vegetation**

Mitigation measures for vegetation are outlined above i.e. routing of the cable route over or culverted through the flushed marshy grassland 250m south-east of the powerhouse location. No other mitigation measures for vegetation are considered necessary, as the penstock route and other infrastructure will avoid all vegetation of ecological value (the penstock route largely runs through poor quality habitat).

### **5.5.2. Bats**

Although it is not anticipated that any large trees with potential bat roosts are likely to be felled (based on the information and route provided), the developer should notify the ecologist prior to the works commencing if it is likely that any large trees will be impacted. An initial roost assessment (in line with the BCT Guidelines) can then be carried out on the impacted tree, and from this, decisions can be made with regard to emergence surveys and further assessment. In general, felling should take place in the winter when roosts are least likely to be present. It is possible however that hibernation roosts may be present at this time of year, and the ecologist should be notified of any large trees that could potentially be felled.

### **5.5.3. Birds**

A number of species of bird may be breeding close to the penstock route, intake points or power house area. It is recommended that a pre-construction survey take place for any active nests that may be disturbed by construction. This would take the form of a check immediately ahead of the works for the presence of nesting or nest-building birds. If found, then they should be left undisturbed with at least 5m of cover around the nest, until the young have fledged and the nest is no longer in use.

## **5.6. Recommendations and Ecological Enhancement Measures**

The lack of predicted impacts from the scheme means that few mitigation and species protection measures are considered necessary (as above). No other ecological enhancement measures are considered necessary.

## **6. REFERENCES**

**Chanin (2003).** Ecology of the European otter *Lutra lutra*. Conserving Natura 2000 Rivers Ecology Series No 10. English Nature. Peterborough, UK.

**Collins, J. (ed.) (2016)** Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

**Rodwell (1991).** Rodwell, J.S. *et seq.*, (1992). British Plant Communities Vols 1-5. Cambridge University Press: Cambridge.

Appendix 1: NVC map of site (see next page)

Key:

AG Acid grassland

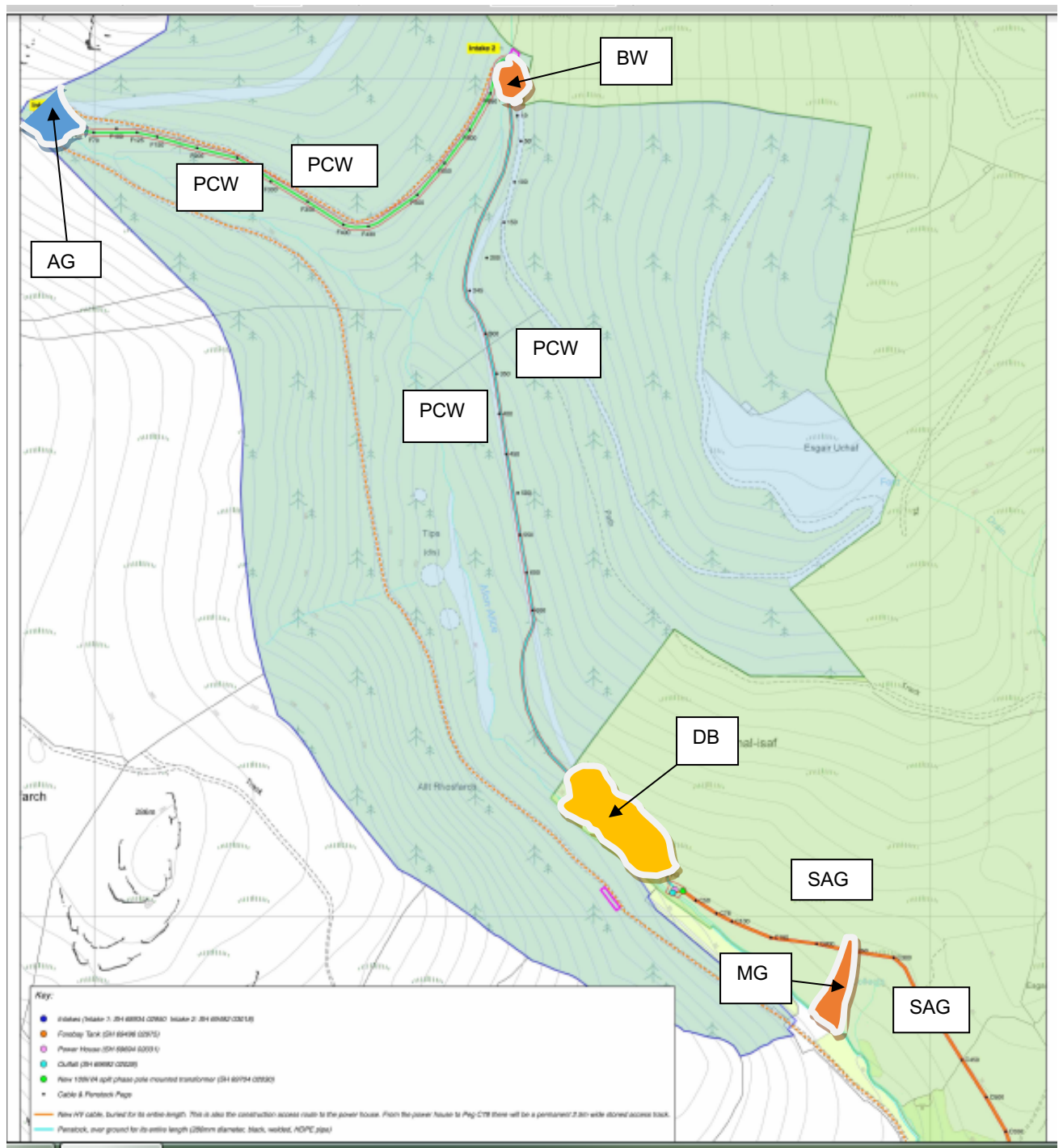
SAG Semi-improved acid grassland

MG Marshy grassland

DB Dense bracken

PCW Plantation coniferous woodland

BW Semi-natural broadleaved woodland





## Appendix 2: Section 42 Oceanic Ravine Bryophytes.

Bryophytes included under Section 42 of the Natural Environment and Rural Communities (NERC) Act 2006 have recently been revised and now include 52 species plus an assemblage named 'Oceanic Ravine Bryophytes'.

Important sites for the latter are identified by the following indicator species:

1. Presence of any one of the following species: *Aphanolejeunea microscopica*, *Campylopus setifolius*, *Daltonia splachnoides*, *Drepanolejeunea hamatifolia*, *Hageniella micans*, *Harpalejeunea molleri*, *Leptoscyphus cuneifolius*, *Metzgeria leptoneura*, *Paraleptodontium recurvifolium*, *Plagiochila exigua*, *Plagiochila heterophylla*, *Radula voluta* or *Sematophyllum demissum*; OR
2. Presence of three or more of the following species: *Adelanthus decipiens*, *Andreaea megistospora*, *Dicranum scottianum*, *Fissidens polyphyllus*, *Jubula hutchinsiae*, *Lepidozia cupressina*, *Lepidozia pearsonii* or *Radula aquilegia*; OR
3. Presence of five or more of the following species: *Anastrepta orcadensis*, *Colura calyptrifolia*, *Douinia ovata*, *Heterocladium wulfsbergii*, *Hygrobrella laxifolia*, *Hygrohypnum eugyrium*, *Isothecium holtii*, *Marchesia mackaii*, *Plagiochila bifaria*, *Plagiochila punctata*, *Platyhypnidium lusitanicum*, *Porella pinnata*, *Rhabdoweisia crenulata* or *Sphenolobopsis pearsonii*; OR
4. Presence of eight or more of the following species: *Bazzania trilobata*, *Fissidens bryoides* var. *caespitans*, *Hyocomium armoricum*, *Lejeunea lamacerina*, *Lejeunea patens*, *Lophocolea fragrans*, *Plagiochila spinulosa*, *Saccogyna viticulosa*, *Scapania gracilis*, *Solenostoma paroicum* or *Sphagnum quinquefarium*.

### Appendix 3: Photographs



Photo 1: Intake 1 location



Photo 2: Penstock route from Intake point 1 showing acid grassland (some bracken) and running into low plantation forestry





Photo 3: Forestry track (penstock route) from intake



Photo 4: Intake 2





Photo 5: Birch and willow woodland close to intake 2



Photo 6: Forestry track (bramble, some heather, soft rush)





Photo 7: Power house location (damp acid grassland)



Photo 8: Acid grassland vegetation on steep bank next to watercourse





Photo 9: Old ash supporting the lichen *Sticta limbata*