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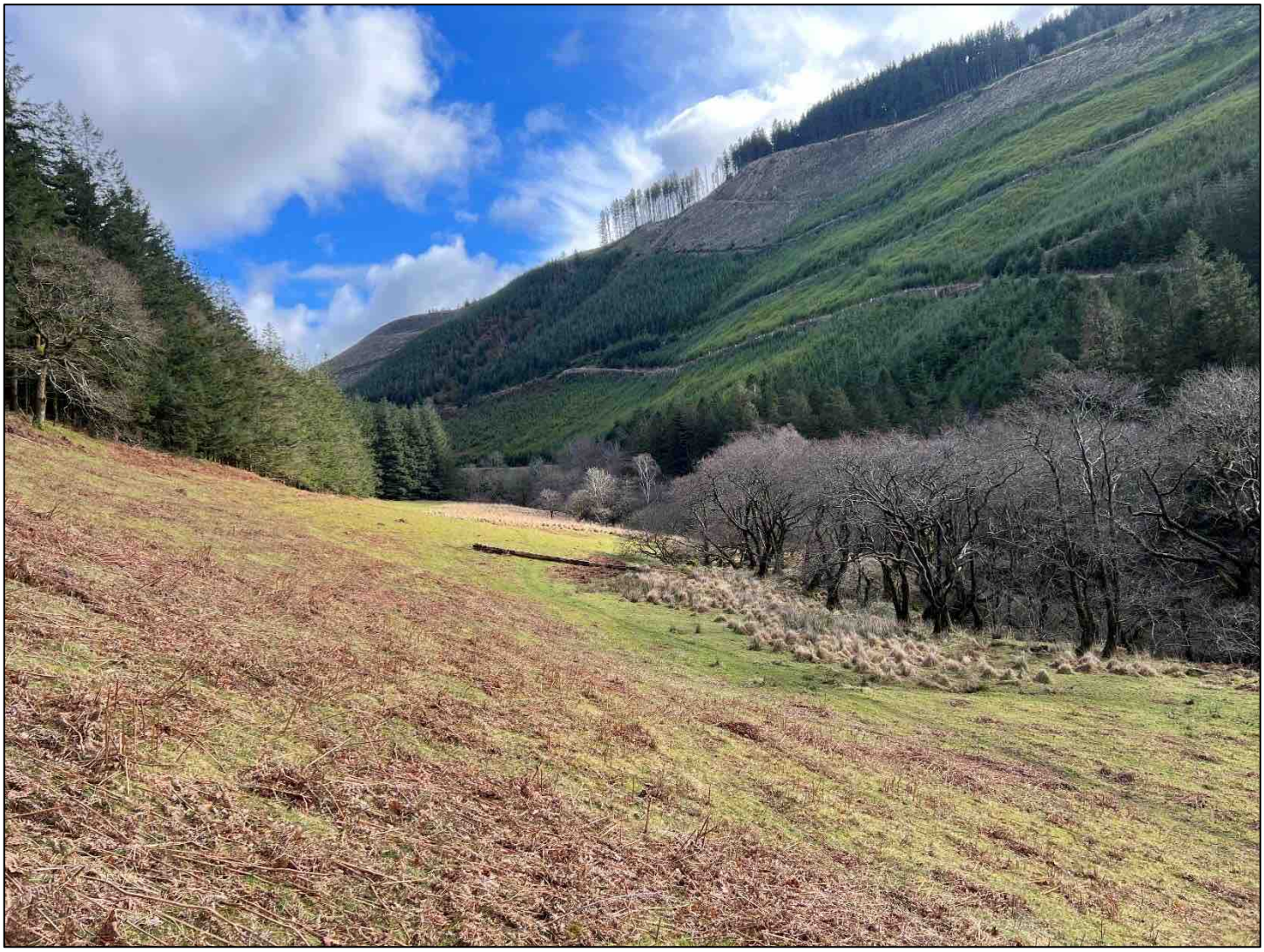

ECOLOGICAL IMPACT ASSESSMENT

TY MAWR

Arbor Vitae Environment Ltd, Lower Betton Farm, Cross Houses, Shrewsbury, Shropshire, SY5 6JD

Project name: **Ty Mawr, Mallwyd, Machynlleth, SY20 9HS**

Grid Reference: SH89361143

Date: 31/03/2023

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Reviewed by: William Prestwood BSc Director

Requested by: Greenearth Hydro Limited

Contents

1 INTRODUCTION

1.1 BACKGROUND TO DEVELOPMENT

Planning permission will be sought for the development of a 34kW Hydro Power Scheme along Nant Llyn Coch Hwyad at Ty Mawr farm, Mallwyd.

Arbor Vitae were commissioned by Greenearth Hydro Limited to undertake a Ecological Impact Assessment in order to assess the impact of the development on habitats and protected species.

1.2 SCOPE OF SURVEY

The survey is primarily designed to:

- Identify and record habitats and important ecological features on site;
- Evaluate the potential of the proposed development site to provide opportunities for protected species;
- Determine any likely impact which the development and landscape proposals may have on these.
- Identify opportunities for the enhancement of habitats and biodiversity features on site.

1.3 KEY PRINCIPLES

All ecological surveys conducted by Arbor Vitae Environment Ltd are underpinned by the following key principles, as outlined by CIEEM (2018):

Avoidance - Seek options that avoid harm to ecological features (for example, by locating on an alternative site).

Mitigation - Adverse effects should be avoided or minimized through mitigation measures, either through the design of the project or subsequent measures that can be guaranteed – for example, through a condition or planning obligation.

Compensation - Where there are significant residual adverse ecological effects despite the mitigation proposed, these should be offset by appropriate compensatory measures.

Enhancements - Seek to provide net benefits for biodiversity over and above requirements for avoidance, mitigation or compensation.

2 SITE DESCRIPTION

2.1 LOCATION, LANDSCAPE, AND BACKGROUND

The site to be developed is located at Ty Mawr, near Mallwyd, Machynlleth. The landscape surrounding the site is characterised by agricultural grassland, deciduous woodland and wet grassland. Large areas of conifer plantations dominate surrounding hillsides.

The proposal will include the development of a 34kW Hydro Power Scheme along Nant Llyn Coch Hwyad. The development will include placing both over ground and below ground penstock pipes, construction of a power house and routing of all generated electricity to the nearby farm yard.

3 SURVEY METHODOLOGY

3.1 DESK STUDY

An initial desk study was composed to gain background information regarding any protected species or designations within the area. The main sources of information were MagicMap and Biodiversity Information Service (paid search).

3.2 SITE SURVEY

A site visit was made on 07/03/2023. The survey was carried out in accordance with CIEEM (2017) best practice guidelines. The objective of the survey was to find and record any signs of use by protected species and to note the habitat features present.

An assessment of the available habitats both on and adjacent to the site led to consideration of the potential of the site for the following protected species:

- Badger
- Bats
- Breeding birds
- Hazel dormice
- Otter

The survey methodology was tailored to evaluate the area for these species in the following ways:

Badger

An area within 50 metres of the site was closely searched for the following signs of badger activity:

- Setts,
- Tracks and footprints,
- Latrines,
- Snuffle holes.

Bats

The site was assessed in terms of its suitability to support bat species. Hedgerow habitat and nearby potential habitat were assessed and recorded and potential impacts from the proposals considered.

Breeding birds

The site was assessed in terms of its suitability to support breeding bird populations. Hedgerow habitat and nearby potential habitat were assessed and recorded.

Hazel dormice

The site was assessed in terms of habitat suitability and connectivity to another suitable habitat. The following features were noted:

- Proximity to existing distribution,
- Presence of hazel,
- Gnawed hazel nuts,
- Presence of honeysuckle or other suitable nest building materials.

Otter

Any water courses within the area and appropriate terrestrial land were searched for the following field signs:

- Spraint,
- Footprints,
- Feeding remains.

3.3 PERSONNEL

The survey was carried out by William Prestwood BSc: Director, Phillipa Stirling MSc ACIEEM: Ecologist Natural Resources Wales bat licence number: S091037-1 and GCN licence number: S089109-1 and Molly Isherwood BSc: Assistant Ecologist.

3.4 CONSTRAINTS

The time of year that the survey was commissioned is not optimal for botanical/vegetation surveys. However, this has had no significant impact upon the findings and/or mitigation and compensation measures.

4 SURVEY RESULTS

4.1 DESK STUDY

The desk study found that within 1km of the site there were the following designations:

Name	Designation	Distance from site
Llanbrynmair Moors	SSSI	1.4km
Waun Figen	LWS	1.8km
Various Unnamed Ancient Semi Natural Woodland	Ancient Semi Natural Woodland	0-2km
Restored Ancient Woodland Site	Restored Ancient Woodland Site	0.2-0.3km
Plantation on Ancient Woodland Site	Plantation on Ancient Woodland Site	0.03km-2km
Ancient Woodland Site of Unknown Category	Ancient Woodland Site of Unknown Category	0.1km- 1.8km
Woodland	NRW Priority Area (Woodland-PAWS)	0.1km-1.5km
Lowland Wetland	NRW Priority Area (Lowland Wetland)	0-2km
The search included Ramsar, SSSI, SAC, SPA, LWS, NNR and LNR. [1]		

Results from the desk study revealed that within a 2km radius of the proposed development site the following protected species have been recorded:

Species	Distance	Protection
Mammals		
Western European Hedgehog	0.8km	Wildlife and Countryside Act 1981, 2010 Priority Species.

[1] **SSSI**: Site of Special Scientific Interest, **SAC**: Special Area of Conservation, **SPA**: Special Protection Area, **LWS:** Local Wildlife Site **NNR:** National Nature Reserve, **LNR**: Local Nature Reserve.

Brown Hare	1km	Wildlife and Countryside Act 1981.
Polecat	0.9km-2km	Wildlife and Countryside Act 1981.
American Mink	2km	Animal Welfare Act 2006
Eurasian Badger	1.8km	Protection of Badgers Act 1992, Wildlife and Countryside Act 1981.
Eurasian Otter	0.5km-2km	European Protected Species, Wildlife and Countryside Act 1981.
Hazel Dormouse	1.5km	European Protected Species, Wildlife and Countryside Act 1981.
Common Pipistrelle Brown Long-eared bat Lesser Horseshoe Myotis Soprano pipistrelle	0.1km-1.5km	European Protected Species, Wildlife and Countryside Act 1981.
Birds		
Barn Owl Buzzard Crossbill Kestrel Red Kite Treecreeper Whooper Swan	0.02km-2km	Wildlife and Countryside Act 1981.
Fish		
European Eel Atlantic Salmon Brown/Sea Trout	0.06-0.5km	Natural Environment and Rural Communities Act 2006

4.2 HABITATS ON SITE

All habitats are classified using JNCC's Phase 1 Habitat Survey Handbook (JNCC, 2010).

Semi-natural broad-leaved woodland

The area surveyed is part of a larger remnant semi-natural woodland on an ancient woodland site. Most trees are mature or late-mature with some approaching ancient or

veteran status. The woodland lies on a steep, south-facing slope in the lower reaches of a broad valley drained by a tributary of the Afon Tafolog.

The vegetation community most closely fits that of W11 *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland (Sessile oak-Downy birch-Wood sorrel woodland) although the presence of a significant proportion of ash trees is unusual in this community.

The wood is unfenced and evidently heavily grazed by sheep. Some of the trees are multi-stemmed and probably arise from past coppicing. No other recent management is evident. A short length of old and derelict hedgerow runs up the slope within the woodland at one point, possibly marking a past ownership boundary.

The woodland canopy is complete over most of the site, although some gaps in the canopy are present, particularly along the foot of the slope. Sessile oak is the dominant tree although ash makes up 30% of the canopy in parts and reflects the nature of the soils which, despite the steep slope, are moist. No other tree species are present. The majority of trees are mature or late-mature although there are some groups of early mature trees which must reflect a period when grazing was absent, allowing a phase of natural regeneration.

The under-storey and shrub layer is largely absent except for occasional and scattered hazel with occasional hawthorn. There is no regeneration of woody species due to the grazing pressure.

The ground flora is dominated over large areas by tufted hair grass with a high coverage of bryophytes (up to 25-30%). Other species evident at the time of survey included common violet, wood sorrel, foxglove, creeping soft grass, hard fern, broad buckler fern, barren strawberry and wood speedwell. Common polypody is common as an epiphyte on trees. There is clearly a very rich bryophyte and lichen assemblage.

Whilst the structure of the woodland is impoverished due to the effects of grazing, other features add to its diversity. These include lying dead wood habitats and small rock outcrops.

Marshy grassland

Parts of the lower gentle slopes above the stream are dominated by a marshy grassland habitat which picks out the seepage zone of a spring line. The vegetation dominating the site is a M25 *Molinia caerulea- Potentilla erecta* mire, typical of peaty mineral soils of

western Britain. This habitat type is listed as Priority Habitat under NERC s.41 2006 in Wales.

Tussocks of *Molinia caerulea* (purple moor grass) dominate the entire area although a relatively rich assemblage of other species occur in low numbers. These include soft rush, jointed rush, marsh thistle, tufted hair grass, tormentil, lesser celandine, large bird's-foot trefoil cross-leaved heath, bilberry and several species of *Sphagnum* mosses.

Acid grassland

Much of the route of the underground pipe lies within acid grassland. This is permanent grassland and is relatively unimproved although remains species-poor. Common bent (*Agrostis capillaris)* is frequent along with sheep's fescue (*Festuca ovina).* Herbaceous species include heath bedstraw, tormentil, barren strawberry, sheep's sorrel. The vegetation community most closely fits the U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland type (Sheep's sorrel-Common bent-Heath bedstraw grassland).

Small patches of soft rush pick out seepages on sloping areas. Other species in these small damper spots include purple moor grass, tufted hair grass and marsh thistle.

Bracken occurs in variable quantities through ranging from scarce to dominate, probably reflecting soil depths and along with past management practices. The denser bracken patches in this field appear to have been cut and this is probably done annually to reduce its vigour.

Improved grassland

Several fields to the north of the river will contain underground power cables. These parcels of land provide typical agriculturally improved grassland with very limited species diversity. Species recorded within the fields include: perennial ryegrass, Yorkshire fog, cock's foot, white clover, chickweed and broad-leaved dock. This vegetation is classified as the *Lolium perenne-Cynosurus cristatus* grassland community (MG6 Perennial rye-grass-Crested dog's-tail grassland).

Running water

The tributary of the River Tafolog which will be utilised for the scheme is a fast-flowing section of water with a smooth basin, carved through rock. There are a series of stepped pools above the proposed intake weir and the edges of the watercourse are lined with mature and developing woodland. There are a range of aggregate sizes present in the watercourse, from small pebbles to large boulders.

4.3 ADJACENT HABITATS

Alder woodland

A small area of alder-dominated woodland lies at the foot of the slope adjacent to the stream where the damp conditions are fed by a spring line on the bank above. The area is dominated by common alder with occasional downy birch and grey willow. The woodland most closely resembles the *Betula pubescens-Molinia caerulea, Juncus effusus* sub-community woodland type (W4b Downy birch-Purple moor grass, soft rush sub-community woodland).

As above, the shrub layer is more or less absent due to grazing pressure and there is very little regeneration.

The ground flora is dominated variously by purple moor grass, tufted hair grass and soft rush.

Coniferous woodland

Conifer plantations can be seen on the northern and southern slopes of the valley in which the River Tafolog runs. Some areas on the southern slope have recently been clear felled and re-planted.

4.4 PROTECTED SPECIES

Badgers

No field signs were found within the search area. No evidence of setts, snuffle holes or latrines were identified. The closest record of badger is 1.8km from the site.

Bats

Numerous trees in and around the site have the potential to provide rooting habitats for bats. However, none of the trees that will be removed provide suitable roosting habitats as they have no aged or potential roosting features.

The riparian corridor along the river tributary provides continuous wooded cover through the landscape. This habitat feature provides good quality commuting and foraging opportunities for bat species.

A number of bats have been recorded within 2km of the site, the closest being a Common Pipistrelle at 34m from the site.

Breeding birds

The varied habitats present on site provides several opportunities for nesting birds, particularly within woodland areas along the river.

Open grassland areas are routinely grazed and offer limited options for ground nesting birds. Dense bracken areas may provide opportunities for breeding birds who favour this habitat type.

Great crested newt

There are two ponds present to the south of the proposed work. The ponds lie on the far side of the river and also within 'marginal' territory for GCN as per the Habitat Suitability Index. The fast flowing and variable river corridor present a significant barrier to terrestrial dispersal and therefore, no further survey work was carried out with regard to GCN.

There are no historical records of GCN within 2km of the site and so, no further investigation was carried out with regard to GCN.

Hazel dormice

The desk study found one dormouse record at 1.5km from the site to be developed. This observation was recorded in 2020.

The woodland parcels present on site do not currently provide suitable woodland habitat for hazel dormice. The shrub and understorey layer within the woodland has been entirely limited by grazing pressure and although hazel exists, it is in low numbers and largely in poor condition.

Nesting and feeding opportunities are sub-optimal and no hazelnuts with characteristic hazel dormouse markings were found during the survey.

Otter

The river corridor provides ample opportunity for otter to feed, commute and rest. Eurasian otter has been recorded within 1km of the site. Close inspection of the river at two main areas (intake weir & outfall headwall) did not reveal any evidence of habitual use by this species.

Terrestrial grassland habitat surrounding the watercourse provides limited opportunities for otter but wooded areas along the river provide good cover for otter.

5 POTENTIAL ECOLOGICAL IMPACT

5.1 HABITAT ASSESSMENT

Semi-natural broad-leaved woodland

A separate Arboricultural Impact Assessment has concluded that: "The arboricultural impact is relatively low, and can be mitigated with the tree works detailed in the Tree Works Schedule, the protective barriers as shown on the Tree Protection Plan and the arboricultural supervision as set out in the Arboricultural Method Statement and by mitigation and re-instatement measures (Fencing and restocking woodland area) as mentioned in 4.6".

The current ecological status of the woodland is largely owing to the varied lichen and bryophyte assemblage present. The woodland's ground flora is sparse and the shrub layer virtually non-existent due to grazing pressure. The installation of the over ground penstock pipe is unlikely to have any impact upon ecologically important features, provided all recommendations provided within Mynydd Timber Services Ltd report dated 5th March 2023.

Marshy grassland

Alternative routes have been considered for the underground penstock but due to levels on site, the only viable option is to install the pipe through the wet grassland. Mitigation will be required to ensure that impacts are temporary and all vegetation is re-instated upon completion. A working method statement can be found in Section 6.1.

Acid grassland

Approximately 500m of the buried penstock will cross through acid grassland and a small stone access track will be installed to provide alternative access.

The buried penstock will result in temporary ground disturbance created by trench excavation. This will be temporary as all ground levels will be re-instated upon completion of pipeline installation. The grassland is relatively species-poor and the pipeline avoids any floristically diverse areas.

It is important that any areas of bare earth which result from the work are **not** re-seeded with an improved grassland seed mix. The areas should be allowed to regenerate naturally *or* an acid grassland mixture should be used.

Material storage areas will be situated on areas of acid grassland, as will small built structures such as the powerhouse.

Improved grassland

A small electric cable will be buried underground through the improved grassland parcels. This installation is likely to use a mole drain technique or similar, causing minimal ground disturbance and temporary habitat loss.

Running water

An intake weir will be constructed within the tributary at the eastern edge of the project development area. The weir is a concrete structure which spans the width of the watercourse, diverting 50% of the flow. The other 50% of the water is allowed to continue downstream as per the 'Hands-Off Flow' approach in combination with proportional abstraction. This is achieved by using a rectangular notched weir, set lower than the crest which feeds the turbine.

In order to construct the weir, a temporary dam structure will be built upstream with all water diverted through a pipe around the western edge of the weir site. Pollution Prevention Measures will be required.

Water re-entering the tributary will be through a concrete headwall and apron, angled downstream and built into the bank. Construction of this feature will be isolated from the watercourse using sandbags to ensure a dry working area and reduce the risk of pollution.

There will be steel girder bridges over the tributary and the River Tafolog to carry electrical cables.

Migratory species such as eel and fish have been accommodated within the design of the weir through the inclusion of: eel substrate through the weir, a rocky ramp to aid movement of animals and a plunge pool for fish passage.

Alder woodland

The proposed buried penstock and overall scheme will have no impact upon the existing wet woodland along the south east boundary of the site. This is confirmed within the arboricultural report: "3.4.11. The penstock will be buried again from peg 300 to the intake weir. The buried penstock is routed far enough to the north of the riparian woodland to avoid impacting the RPA's of these trees, as indicated by Alder (T48), the largest and closest of these trees".

5.2 PROTECTED SPECIES ASSESSMENT

Badger

There is no evidence to suggest that badgers are active on or adjacent to the site, including all woodland areas surveyed. The proposed work is unlikely to have any impact upon badger.

Bats

All trees planned for removal from the site provide 'negligible' potential as a bat roost and therefore the proposals will have no impact upon existing or potential roosting sites.

The proposals will not result in any artificial lighting during the construction or operational phases of the project. There will be no disruption to mature woodland/riparian corridors on site and therefore no impact upon potential foraging and commuting habitat.

Breeding birds

The installation of the pipeline is unlikely to have an impact upon breeding birds. Precautionary measures will be adopted during works on site.

Hazel dormouse

The habitats to be directly impacted by the proposals do not provide suitable habitat for hazel dormice and it is unlikely that this species is present on site. No evidence was found within the woodland to suggest that hazel dormice are present.

Furthermore, the proposals will not have any detrimental impact upon the woodland's canopy/arboreal areas. Ground disturbance will be minimal and restricted to the placement of an over ground penstock, fixed in place by steel piles.

The construction and operational phases of the project will have no impact upon dormice. Recommended mitigation and enhancement for the project will result in an improvement in woodland quality on site and enhanced opportunities for hazel dormice in the region.

Otter

The areas of the watercourse which will be directly impacted did not reveal any evidence of habitual use by otter for feeding, resting or breeding. This is not to say that the stretch of watercourse is not in use by at least patrolling otter and appropriate mitigation is required.

Works to install structures into the watercourse corridor will be temporary. The structures do not pose a direct threat to otter and this species will be able to continue using the habitats on site.

6 AVOIDANCE, MITIGATION AND ENHANCEMENT

6.1 HABITAT MITIGATION

Semi-natural broad-leaved woodland

The penstock pipe has been laid over ground through the woodland area so as to reduce impacts upon the root protection area of the existing trees. Works which will directly impact the RPA will be supervised by an arboriculturist. The over ground pipe will be secured through the woodland section by solid steel stakes driven into the ground

Mitigation for all tree loss and temporary alteration to woodland habitat will be achieved through the exclusion of livestock from the woodland (where the penstock pipe crosses it) and supplementary under planting. The arboricultural report provides the following species recommendation: oak, rowan, birch, hawthorn and holly. In addition to this, hazel and honeysuckle will also be included in a planting plan for the site.

Marshy grassland

Works through this habitat type will follow a strict Working Method Statement as follows:

Construction ground protection mats will be used for all work within the wet grassland habitat to alleviate pressure from tracked machinery.

During the preparation of the penstock and cable trenches, turf, top soil and subsoil will be removed and stored separately to ensure that when back filling, they are replaced in the correct order to minimise disruption and ensure a quick recovery.

In addition to the above condition, works in the *Molinia mire* habitat are subject to the following measures:

- All trenching works through this habitat will be completed within 48 hours to; improve the likelihood of successful reinstatement of vegetation and therefore aid recovery of this area, and to reduce the amount of time that ground level protection is in place.
- The top 0.5m of vegetation will be retained in a damp condition whilst it is displaced. The vegetation will be stored within a PVC sheet and watered at least twice in the 48 hour period.

Acid grassland

During the preparation of the penstock and cable trenches, turf, top soil and subsoil will be removed and stored separately to ensure that when back filling, they are replaced in the correct order to minimise disruption and ensure a quick recovery.

It is important that, any areas of bare earth which result from the work are **not** re-seeded with an improved grassland seed mix. The areas should be allowed to regenerate naturally *or* an acid grassland mixture should be used.

Improved grassland

During the preparation of the penstock and cable trenches, turf, top soil and subsoil will be removed and stored separately to ensure that when back filling, they are replaced in the correct order to minimise disruption and ensure a quick recovery.

The construction methods outlined above should limit the creation of any areas of bare soil post construction, but if any do exist, and if these areas are situated within improved grassland, they will be re-seeded.

Running water

A Construction Environmental Management Plan will be adopted during all works to the watercourse on site. This will include Pollution Prevention Measures, as follows:

All works will adhere to the Pollution Prevention Guidance set out in GPP 1: A General guide to preventing pollution and GPP 5: Works and maintenance in or near water.

The following specific measures will be implemented throughout the duration of the construction phase:

Storage and waste products

- If any hazardous liquids such as oils and fuels need to be stored on site, they will be stored within bunded storage drums and containers.
- A waste hierarchy will be adopted on site which consists of five principles: Reduce, reuse, recycle, recover and dispose of.
- All hazardous waste will be stored, handled and disposed of separately to normal waste. The site manager should keep a record of waste disposal to ensure it is being properly managed.
- All arisings from the site, both vegetative and construction related, will be cleared on a daily basis and disposed of through correct methods. The site manager should keep a record of waste disposal to ensure it is being properly managed.

Spills & leaks

- Spill kits will be stored within the site compound during and post construction and all spills will be cleaned up accordingly and if necessary reported.
- All chemical substances and hazardous materials will be stored in accordance with EA guidelines with all diesel fuel and other lubricants being stored in appropriate containers and within double bunded storage areas.
- Any washing of concreting vehicles will be done well away from any watercourses and/or drainage systems. Preferably this will not be carried out on site at all but at an approved yard.
- Any re-fuelling and re-lubrication will only be completed in an approved area in which a spill kit is available.
- Small well sealed containers (jerry cans) will be used to refuel plant by hand, when it needs to be done near the construction sites, and these will not be left unattended overnight but removed to a shipping container and stored on bunded trays.

General

- A temporary bypass of the watercourse will be used around the construction site in order to reduce the risk of run-off and pollution of the tributary.
- Work will be carried out from the bank, rather than in the river, wherever possible.
- Silt fence material, a suitably sized dewatering bag and pump will be available on site at all times, and staff trained in their use, if any event should arise where any watercourses are at risk of runoff containing silt.
- Concrete mixing areas will be at least 10 metres away from the watercourse or any surface drain.
- No paint will be required in the construction of the intake weir. A small quantity may be required for the power house. This will be painted by hand to reduce risks of contamination associated with spraying. Small, well-sealed containers will be used for paints and solvents and they will not be left unattended overnight, but stored in a secure area.
- A small quantity of sealants may be required in the construction works. Low solvent or water-based products will be used where possible and stored securely overnight.

Alder woodland

The riparian woodland along the tributary will not be directly or indirectly impacted by the project. The following construction-phase conditions apply:

- No machinery of any kind will be operated or stored within the vicinity of the alder woodland.
- No materials will be stored within the vicinity of the woodland edge.

6.2 PROTECTED SPECIES MITIGATION

Badger

The proposals will have no impact upon badger, their setts or foraging areas. Specific mitigation will not be required in this instance.

Bats

The proposals will have no impact upon existing or potential roosting sites, nor will it affect prime commuting/foraging habitat on site. In order to remove any residual risk to bat species during the construction phase, the following condition applies:

- No artificial external lighting will be used to extend the working hours. All works will strictly be carried out during the day time.

Breeding birds

As per Greenearth Hydro's Construction Environmental Management Plan:

"All construction areas will be checked for nests by a qualified ecologist immediately before any work commences if the work is to be carried out in the nesting season (mid-February to August inclusive). Any active ground nests that are found will be clearly marked (e.g. with a coloured cane) and left undisturbed until the young have fledged, with a buffer zone of at least 30 metres established around each nest in which no activities will be undertaken".

Hazel dormice

The proposed development will have no direct impact upon woodland which provides suitable habitat opportunities for hazel dormice. Mitigation and enhancement for the site will result in an improvement to the quality of the woodland on site, eventually providing a suitable habitat for the species.

Otter

A pre-commencement check will be carried out on site, specifically searching areas of the tributary to be directly impacted by the project.

No artificial external lighting will be used to extend the working hours. All works will strictly be carried out during the day time.

General Avoidance Measures

The following measures should be implemented to decrease the likelihood of killing/injuring small animals:

- If piles of rubble, logs, bricks, other loose materials or other potential refuges are to be disturbed, this should be done by hand and carried out during the active season (March to October) when the weather is warm to allow animals to disperse naturally.
- The grassland areas should be kept short prior to and during construction to avoid creating attractive habitats for wildlife.
- All building materials, rubble, bricks and soil must be stored on raised platform (e.g. wooden pallets) to prevent their use as refuges by wildlife.
- Where possible, trenches should be opened and closed in the same day to prevent any wildlife becoming trapped. If it is necessary to leave a trench open overnight then it should be provided with a means of escape in the form of a shallow ramp.
- Any open pipework should be capped overnight. All open trenches and pipework should be inspected at the start of each working day to ensure no animal is trapped.
- Any common reptiles or amphibians discovered should be allowed to naturally disperse. Advice should be sought from an appropriately qualified and experienced ecologist if large numbers of common reptiles or amphibians are present.

6.3 ECOLOGICAL ENHANCEMENT

Mitigation for the loss of some trees on site will include fencing the section of woodland through which the over ground penstock passes in order to prevent grazing and allow regeneration of the shrub and ground layer in the woodland.

In addition to this, and in order to provide a Net Biodiversity Benefit, exclusion of livestock and supplementary under planting of the rest of the woodland parcel will be carried out. Under planting will include: oak, rowan, birch, hawthorn, hazel, holly and honeysuckle.

Trees will be planted at 3m x 3m density using 80/100cm bare root plants. All plants will be fitted with appropriate tree guard and support stake. Tree planting will take place between November and March when plants are dormant and ground moisture levels are high.

Guards and canes to be removed from the trees from year 8-10, provided the plants are established and not at risk from browsing pressure.

7 SUMMARY

Planning permission will be sought for the development of a Hydro Power Scheme near Ty Mawr farm, Mallwyd. Arbor Vitae were commissioned by Greenearth Hydro Limited to undertake a Ecological Impact Assessment in order to assess the impact of the development on habitats and protected species. The proposal will include the development of a 34kW Hydro Power Scheme along Nant Llyn Coch Hwyad. The development will include placing both over ground and below ground pipes through several different habitats.

A key summary of the findings are:

- The proposed project crosses through several different habitat types, including: Acid grassland, oak woodland, marshy grassland, running water and improved grassland.
- The majority of water and electricity pipes will be buried below ground in order to achieve appropriate levels to feed water into the turbine system. The water pipe will be kept above ground through the woodland section in order to avoid damage to this habitat type.
- Small built structures and access tracks will be installed into acid and improved grassland habitats with no long-term negative impact expected on the overall ecological value of the site.
- The proposal will have no impact upon badger as there is no evidence to suggest that badger are active on or adjacent to the site, including all woodland areas surveyed. No specific mitigation will be required.
- The proposals will have no impact upon existing or potential bat roosting sites as all trees planned for removal from the site provide 'negligible' potential as a bat roost. The proposals will not result in any artificial lighting during the construction or operational phases of the project. There will be no disruption to mature woodland/riparian corridors on site and therefore no impact upon potential foraging and commuting habitat.
- The installation of the pipeline is unlikely to have an impact upon breeding birds. Precautionary measures will be adopted during works on site as outlined in Greenearth Hydro's Construction Environmental Management Plan.
- The habitats to be directly impacted by the proposals do not provide suitable habitat for hazel dormice and it is unlikely that this species is present on site. The construction and operational phases of the project will have no impact upon dormice. Recommended mitigation and enhancement for the project will result in an improvement in woodland quality on site.

- A pre-commencement check will be carried out on site, specifically searching areas of the tributary to be directly impacted by the project for any recent sign of otter. No artificial external lighting will be used to extend the working hours. All works will strictly be carried out during the day time. Works to install structures into the watercourse corridor will be temporary.
- Tree protection measures will be adopted on site in full, as per the Arboricultural Impact Assessment document produced in line with the project. Mitigation for the loss of a small number of trees will include the fencing and re-stocking of part of the woodland which the penstock will cross through.
- Work to bury the penstock through *Molinia mire* habitat will follow a strict working method statement, to minimise overall disturbance and any potential long-term impact upon the vegetative community present.
- Acid grassland will be temporarily disturbed by the installation of a buried penstock. A working method statement will ensure that vegetation is returned to its correct location upon completion and any necessary re-seeding will be done with an appropriate seed mixture.
- Pollution Prevention Measures will be adopted on site to ensure that the watercourse is not adversely impacted as a result of the project.
- Proportional abstraction will be adopted, taking 50% of the overall flow for use in the scheme.
- Migratory species such as eel and fish have been accommodated within the design of the weir through the inclusion of: eel substrate through the weir, a rocky ramp to aid movement of animals and a plunge pool for fish passage.
- In order to provide ecological enhancement on site, mitigation for the loss of some trees on site will include fencing the section of woodland which the over ground penstock passes through. In addition to this and in order to provide a Net Biodiversity Benefit, exclusion of livestock and supplementary under planting of the rest of the woodland parcel will be carried out.

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FIGURE 1 LOCATION

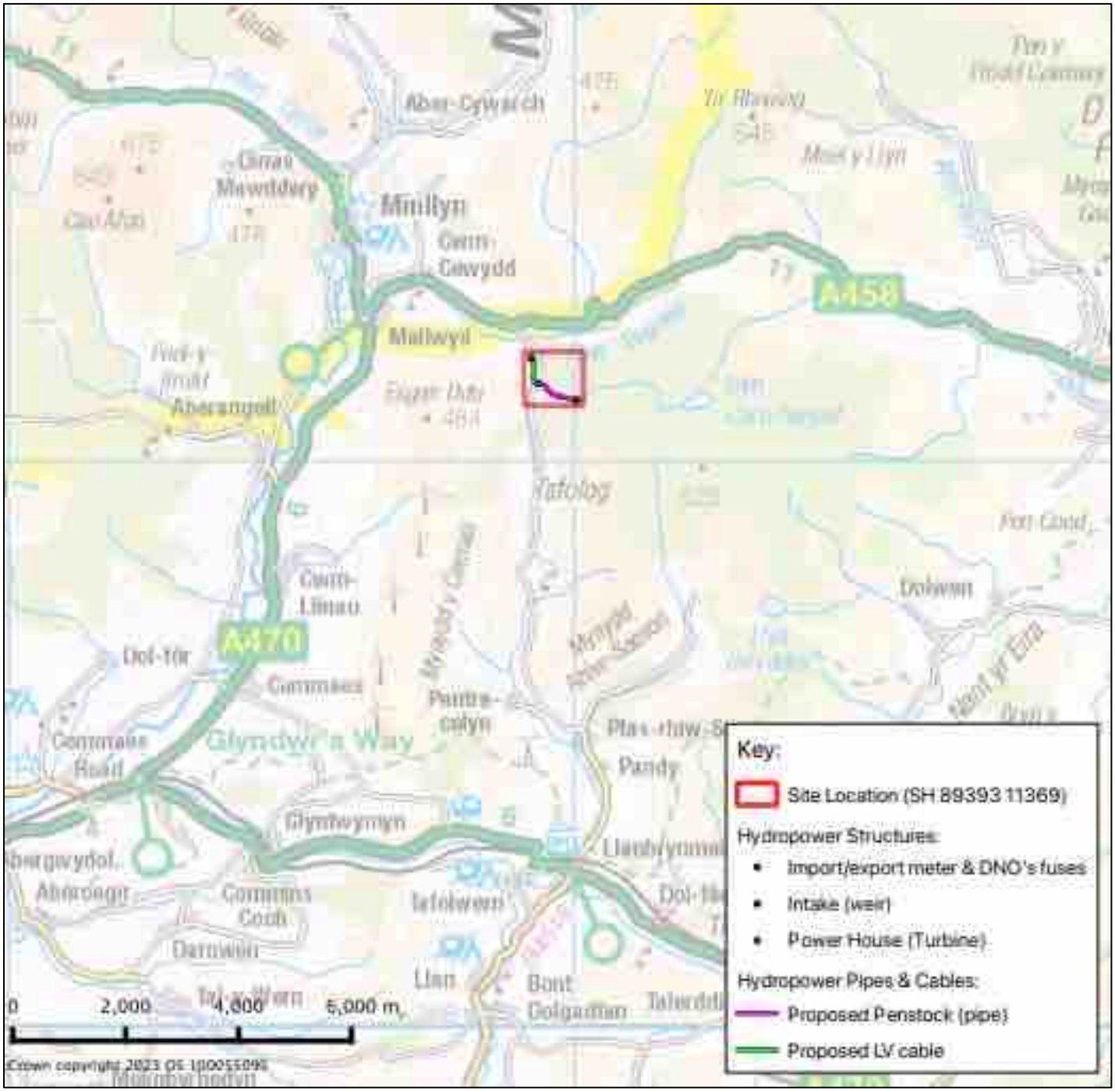


FIGURE 2 AERIAL PHOTOGRAPH

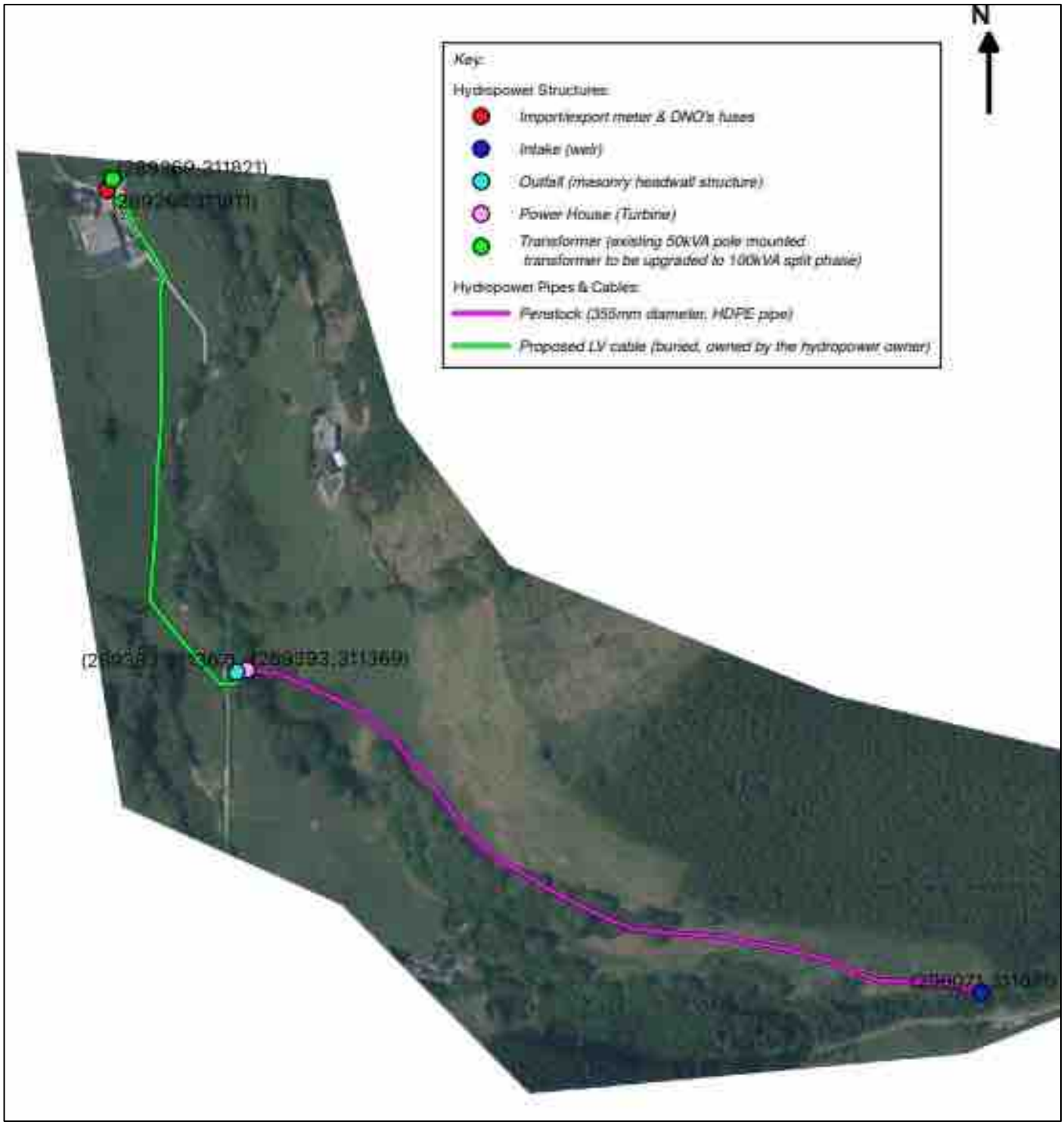
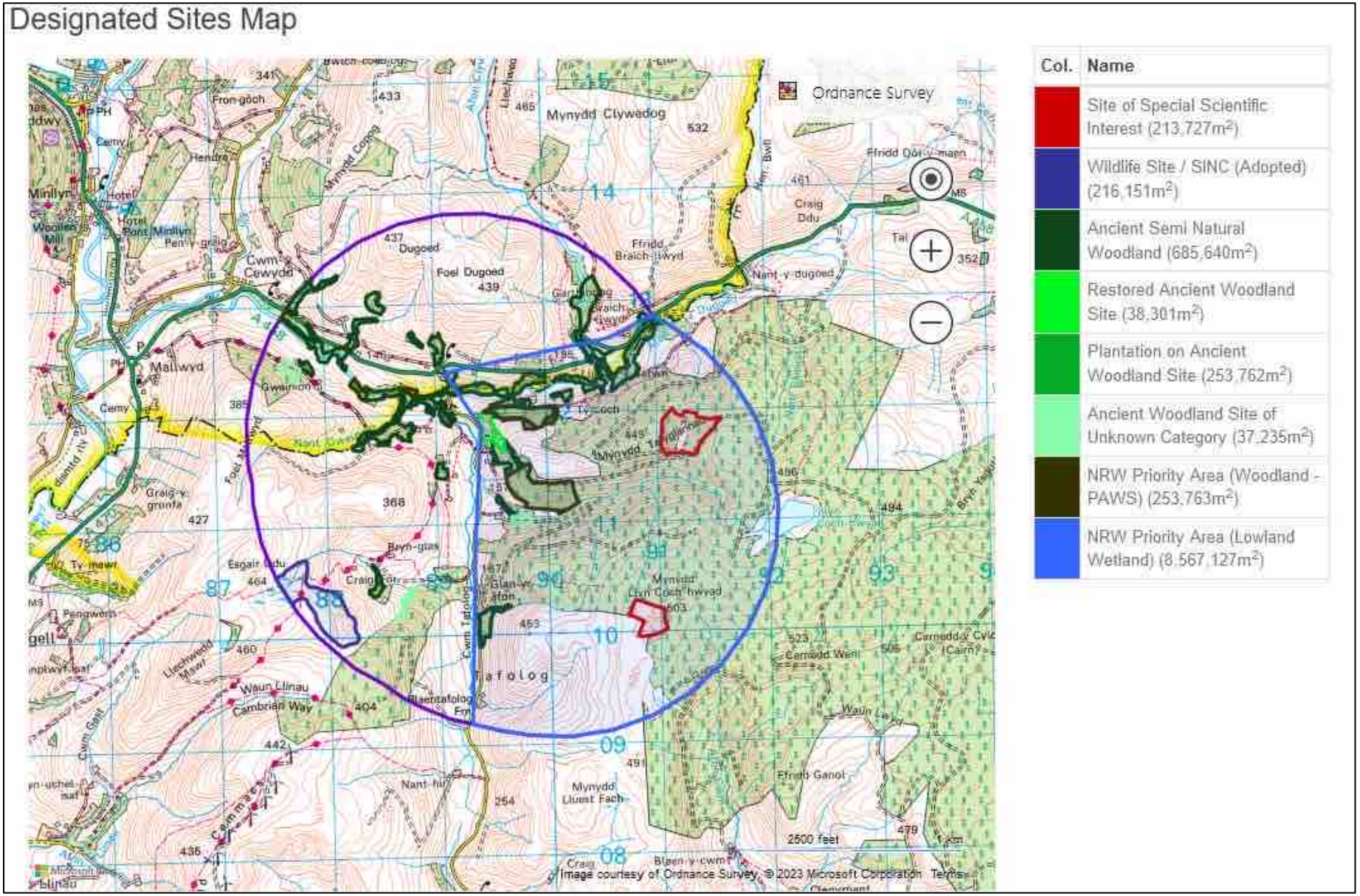


FIGURE 3 DESIGNATED SITES MAP

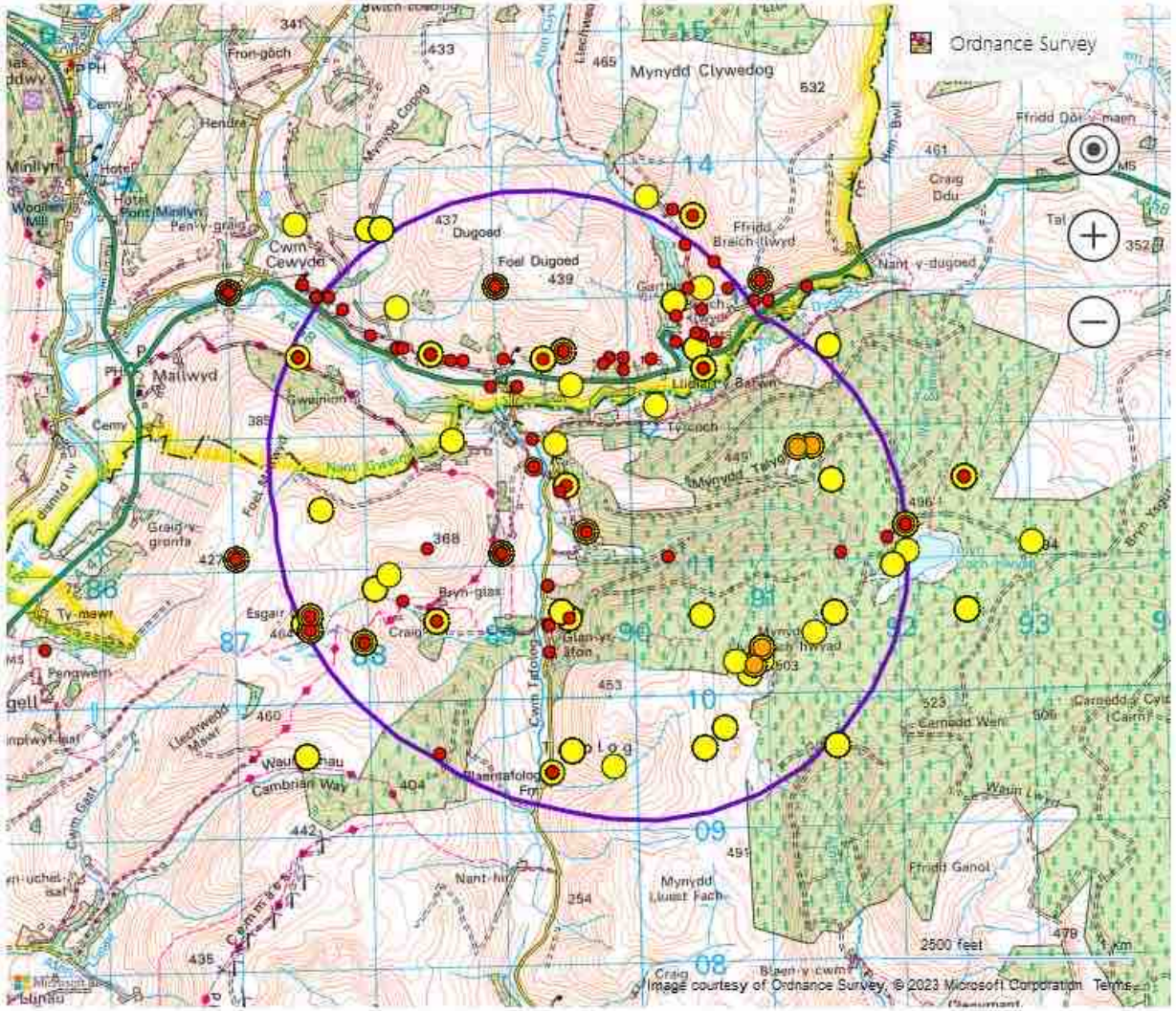


Col.	Name
	Site of Special Scientific Interest (213,727m²)
	Wildlife Site / SINC (Adopted) (216,151m²)
	Ancient Semi Natural Woodland (685,640m²)
	Restored Ancient Woodland Site (38,301m²)
	Plantation on Ancient Woodland Site (253,762m²)
	Ancient Woodland Site of Unknown Category (37,235m²)
	NRW Priority Area (Woodland - PAWS) (253,763m²)
	NRW Priority Area (Lowland Wetland) (8,567,127m²)

FIGURE 4 SPECIES MAP

Species Map

Species records are mapped below. Records are mapped as centred points (centre of grid reference polygon).



Icon	Name
	Pri. Species
	Cons. Concern
	Loc. Important

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FIGURE 5 HABITAT MAP

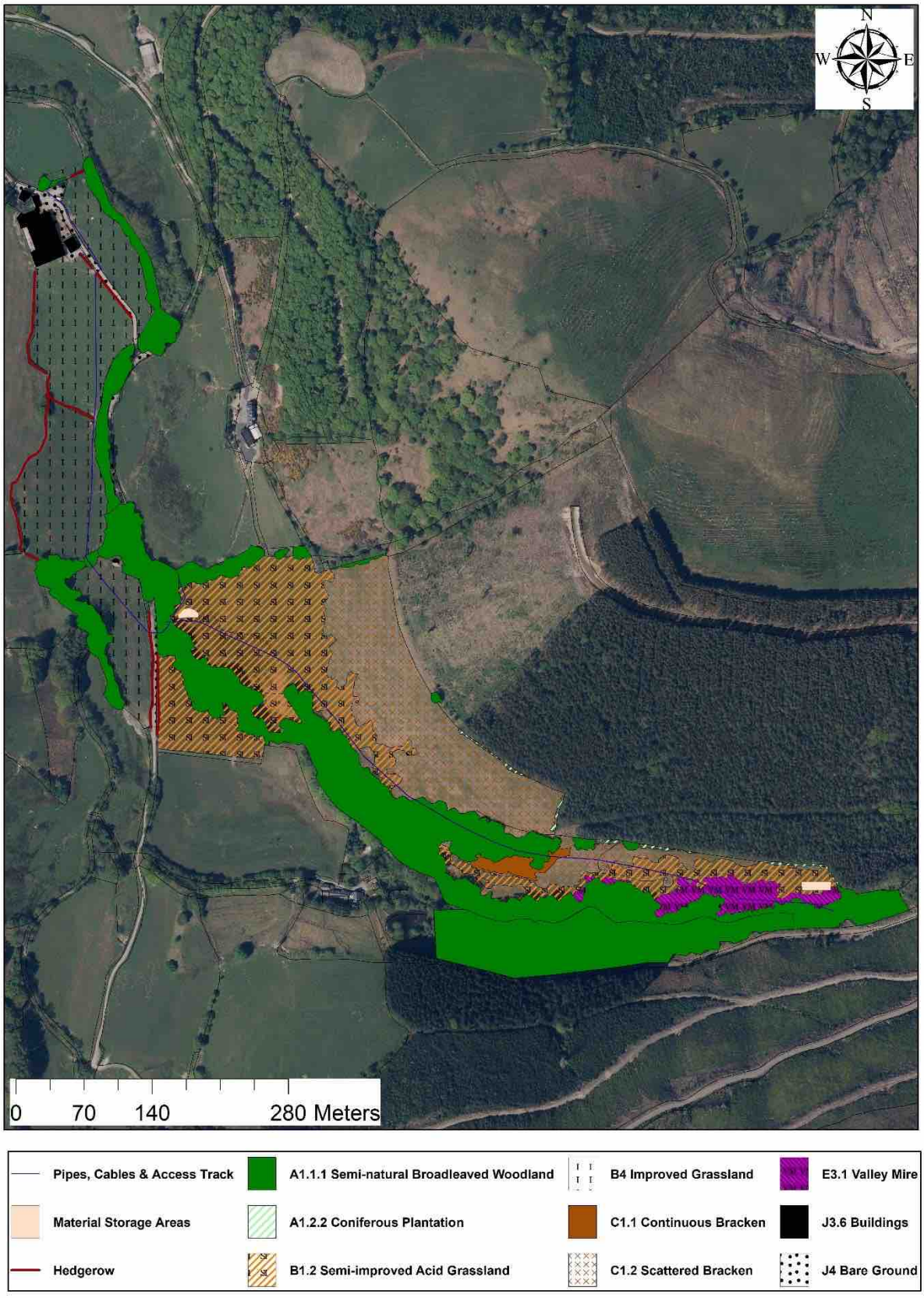

FIGURE 6 HABITAT MAP 1 of 2

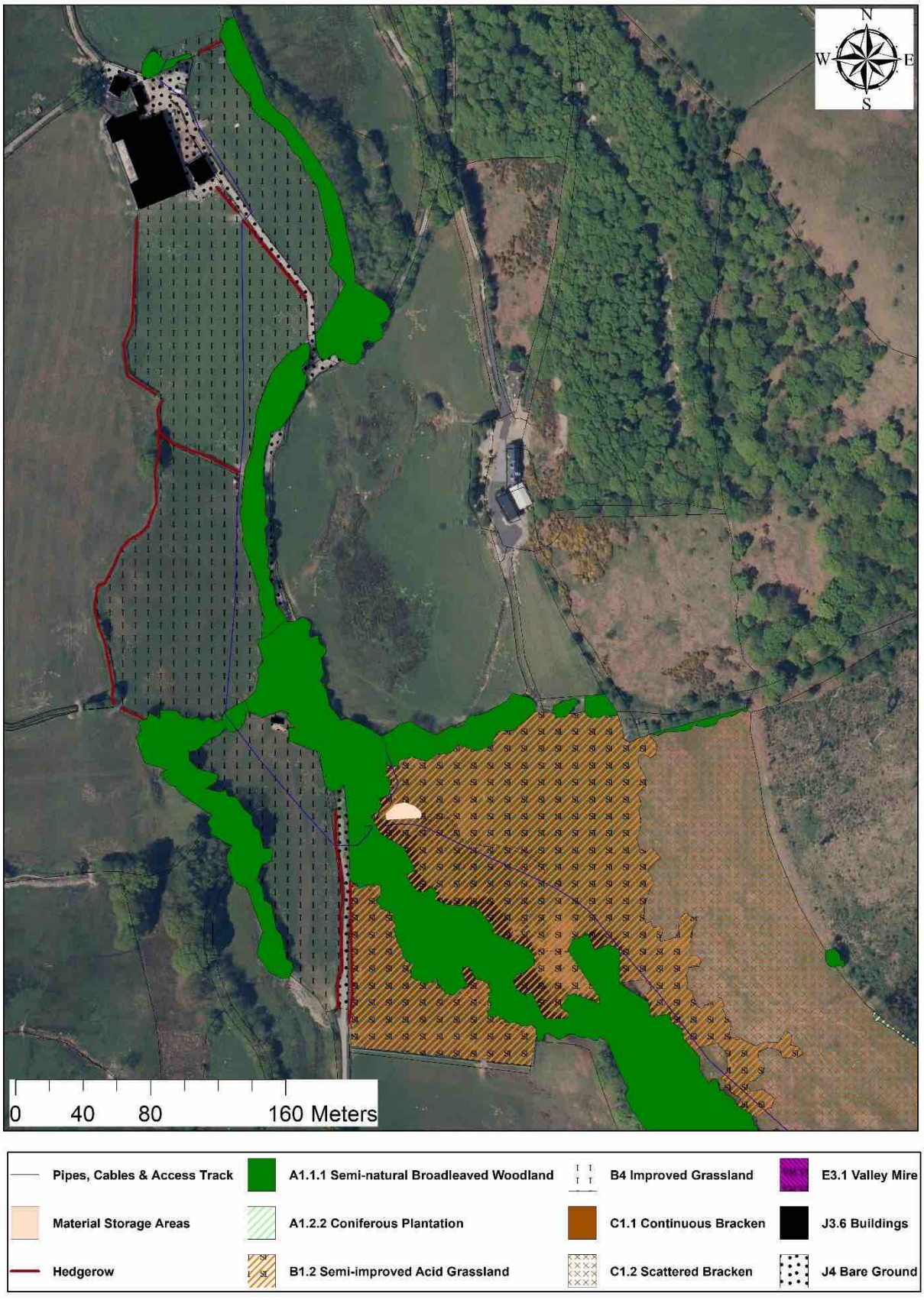

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FIGURE 7 HABITAT MAP 2 of 2

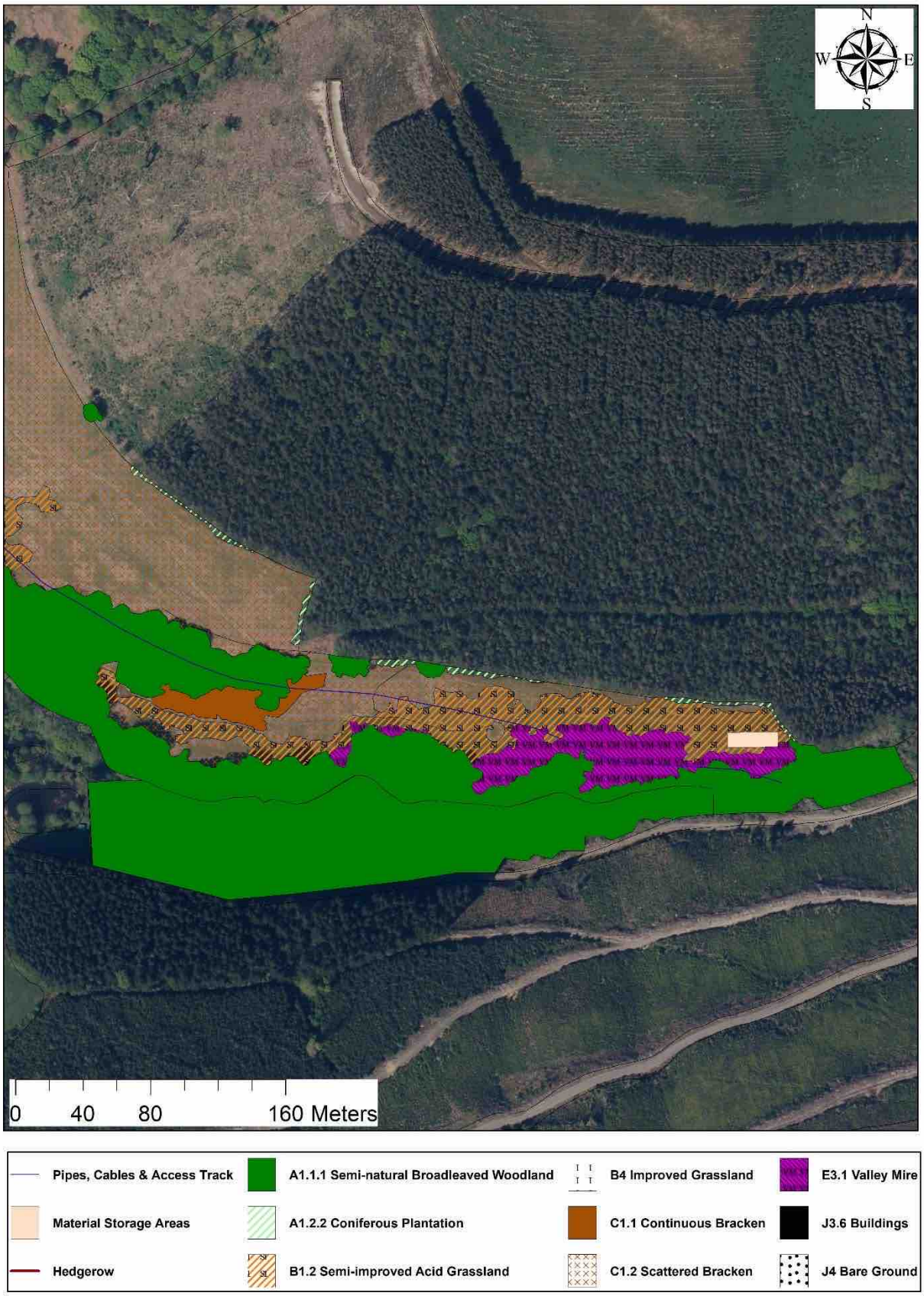

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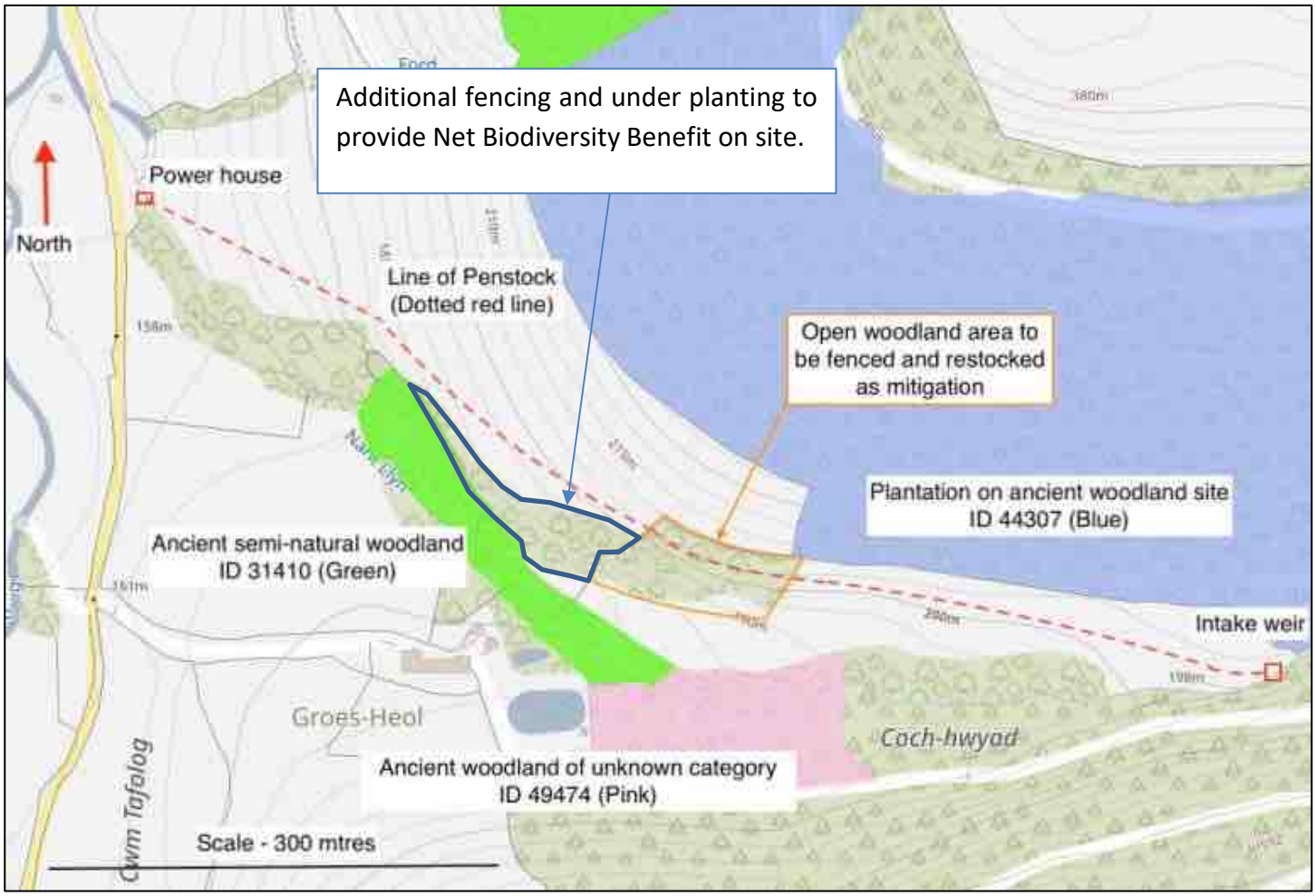
FIGURE 8 MITIGATION AND ENHANCEMENT AREA



Plan adapted from the Executive Summary of Mynydd Timber Services Ltd Arboricultural Report and additional fencing added for enhancement purposes.

APPENDIX 1 PHOTOGRAPHS

	
Location of intake weir.	Ash tree to be removed.
	
Ash tree to be removed showing no aged features.	Molina mire habitat with pegs showing route of pipeline.
	
Alder woodland adjacent to the stream.	Coniferous woodland on valley slopes. Alder woodland and molina mire habitats adjacent to stream.

	
Oak/ ash woodland on south-facing slope.	Route of overground pipe through oak/ash woodland.
	
Acid grassland with scattered bracken.	Remains of a hazel hedgerow.
	
Acid grassland.	Existing track through oak/ash woodland.

	
Outfall headwall.	Proposed power house location.
	
Proposed route of cable adjacent to agricultural and residential buildings to the import/export meter.	Improved grassland.