

Pengarnddu Service Reservoir

Ecological Impact Assessment Report

V2

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Executive Summary

Mott Macdonald Bentley (MMB) has been commissioned by Welsh Water as part of the Capital Delivery Alliance to undertake the design and construction of an additional service reservoir to increase the capacity of the site.

A baseline ecological survey of the site was undertaken by Arcadis Consulting (UK) Limited in 2019, with further reptile surveys conducted by MMB in May 2020.

This report presents the findings of the surveys undertaken, summarises the existing ecological baseline conditions for the site and identifies key ecological constraints. The information within this Ecological Impacts Assessment Report can be used to inform planning.

The ecology baseline surveys identified the habitats within the proposed development site and the immediate surrounding area, as well as their potential to support protected species. The further surveys carried out by MMB recorded the presence of a small reptile population within the current boundary of the Welsh Water site, with no reptiles being observed within the common land area (part of Blaenmorlais SINC) which is the proposed location for the new service reservoir. Breeding birds and invertebrates are known to utilise the suitable vegetation/habitats on site.

Key actions during construction will include supervised clearance to avoid killing or injuring reptiles and nesting birds. As well as the reinstatement and management of land post construction to improve the ecological value of the Site.

On completion of the new service reservoir the land within Welsh Water's ownership will be managed to enhance the site for reptiles, amphibians, terrestrial invertebrates and ground nesting birds. This will be achieved by re-instating the areas affected by the works with an appropriate species-rich upland grassland mix. Further to this a larger area of the Blaenmorlais SINC will be protected from overgrazing moving forward. This will be achieved by incorporating an area of the SINC into the Welsh Water site compound, where the grassland can be allowed to grow and provide suitable structure for reptiles, terrestrial invertebrates and ground nesting birds.

Two brash piles will be created in the north of the site as an enhancement measure for reptiles and nesting birds. In addition, two hibernacula suitable for reptiles and amphibians will be created in the south site.

The results of this survey effort will be valid for 18 months with the need for further surveys to be undertaken if an assessment is required after this point.

Note: if the scope of works change, further surveys may be required, and the ecological impacts will need to be reassessed.

1 Introduction

Ecological Impact Assessment (EcIA) is a process of identifying, quantifying and evaluating potential effects of development-related or other proposed actions on habitats, species and ecosystems.

1.1 Background and Purpose of the Report

Arcadis and MMB were commissioned by Welsh Water (WW) to undertake a desk study, Extended Phase 1 Habitat Survey and other Phase 2 ecological surveys to inform plans for a proposed development at Pengarnddu Service Reservoir, NGR: SO07592 08923, hereafter referred to as 'the Site'.

This Ecological Impact Assessment (EcIA) report is designed to inform a planning application. The report details ecological baseline conditions, identifies ecological constraints, informs detailed design, assesses ecological impacts and provides recommendations for avoidance and mitigation measures.

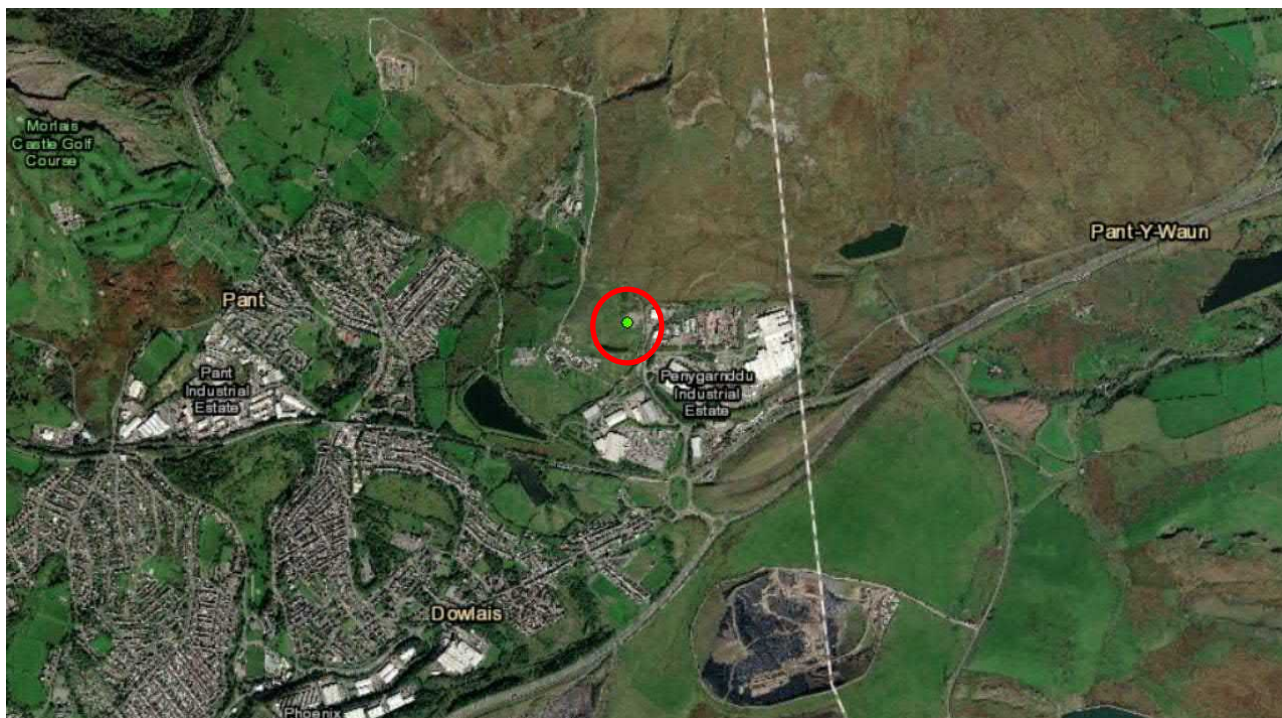
This report is the result of survey work undertaken between May 2019 and May 2020.

No warranty is given as to the possibility of future changes in the condition of the Site. This report is produced solely for the benefit of Welsh Water and no liability is accepted for any reliance placed on it by any other party. This report is prepared for the proposed uses stated in the report and should not be used in a different context.

1.2 Site Description

The Site (Figure 1) is an existing service reservoir and area of common land which has recently been acquired by Welsh Water. The Site is situated approximately 3.5km north east from the centre of Merthyr Tydfil and approximately 3.7km north west of Rhymney. The Site is located to the east of an area of common land (Blaenmorlais SINC) and to the west of an industrial estate. To the north of the Site is moorland, with further common land, a traveling community and an industrial estate being found to the south. It is situated at NGR: SO07592 08923 within the county borough of Merthyr Tydfil.

Figure 1: Site Location (Green marker)



Source: ESRI 2019. ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute.

1.3 Scope

The proposed service reservoir will be built to the west of the existing service reservoir. The proposed development will temporarily include a larger area of the common land further to the west (see Figure 2), the area will be used for material storage, site cabins and plant. Once the construction has been completed this area of land will be returned as common land and the habitat reinstated.

Figure 2: Proposed development with temporary construction area included (Red line), finalised boundary (Black line) and existing boundary (Light Blue line).



1.4 Consultation

A pre-application meeting was held on 27th February 2020 and formal pre-application advice was received from Merthyr Tydfil County Borough Council (MTCBC) on the 6th March 2020 (see Appendix E for the general response and comments from the county ecologist).

An Environmental Impacts Assessment (EIA) screening opinion was sought from MTCBC. A response was received on the 11th March 2020 informing MMB that an EIA was not required for the scheme (see Appendix E for the response).

1.5 Legal Context and Policy Framework

The legal context for ecological survey is provided by a framework of international and domestic legislation which aims to protect specific sites, habitats and species. A full list of relevant legislation is provided in Appendix A.

1.5.1 Biodiversity and Ecosystem Resilience

Welsh Water has an obligation under Section 6 of the Environment (Wales) Act 2016 that requires all public bodies to seek to maintain and enhance biodiversity so far as is consistent with the proper exercise of their functions and in so doing promote the resilience of ecosystems.

Also relevant is the Wellbeing of Future Generations (Wales) Act 2015, which requires Public Bodies listed in the Act to embed sustainable development principles, aiming at achieving the seven well-being goals, including to maintain and enhance a biodiverse natural environment. Whilst Welsh Water is not a Public Body under the Well-being Act, it is aiming to contribute to Wales achieving the well-being goals and has embedded well-being objectives in its '2050 vision'¹. To maintain and enhance biodiversity as part of its function will support Welsh Water's contribution to the Well-being goals, and the company's '2050 vision'.

1.5.2 Protected Sites

Statutory protected sites include:

- **European Sites (Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites)** protected under the Conservation of Habitats and Species Regulations 2017 (as amended) and the International Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention);
- **National Sites (Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR))** protected under the Wildlife and Countryside Act 1981 (as amended); and
- **Local Sites (Local Nature Reserves (LNRs))**, protected under the National Parks and Access to the Countryside Act 1949 (as amended).

These sites are protected by the relevant legislation regardless of whether planning permission is required. Where planning consent is required, they will also be protected by Planning Policy.

Non-statutory sites including Country Parks, Local Wildlife Sites (LWS), Sites of Importance for Nature Conservation (SINC) and Ancient Woodlands are protected by Planning Policy, which will apply to schemes which require planning consent.

1.5.3 Protected Species

Statutory protected species include:

- **European Protected Species (EPS)** protected under the Conservation of Habitats and Species Regulations 2017 (as amended); and
- **Nationally Protected Species**, protected under the Wildlife and Countryside Act 1981 (as amended) (WCA); Protection of Badgers Act 1992; Countryside and Rights of Way Act 2000 (CROW); and Salmon and Freshwater Fisheries Act 1975.

These legislations protect different species to varying degrees, and in most cases their habitats also, regardless of whether planning permission is required. In addition, these species are also afforded protection through Planning Policy, which requires that they are a 'material consideration' of any planning application.

Species and habitats of conservation concern which receive non-statutory protection include:

- **Section 7 species and habitats listed in the Environment (Wales) Act 2016 (the Environment Act)** (applies to Wales only); and **Section 41 species and habitats listed in the Natural Environment and Rural Communities (NERC) Act 2006 (the NERC Act)**. These species and habitats are also known as '*Species and Habitats of Principal Importance for the Conservation of Biodiversity in Wales and England*'; and

¹ Welsh Water 2050 Vision (March 2018) <https://www.dwrcymru.com/en/Company-Information/Business-Planning/Welsh-Water-2050.aspx>

- **Locally Protected Species** which may be identified within County Local Biodiversity Action Plans (LBAP), the Royal Society for the Protection of Birds (RSPB) 'Birds of Conservation Concern' or Red Data books for example.

1.5.4 Invasive Non-Native Species

Invasive Non-Native species (INNS) listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) may also occur within or adjacent to where schemes are to be delivered. It is illegal to plant or otherwise cause to grow in the wild any plant listed in Schedule 9 or to release or allow to escape into the wild any animal which is listed in Schedule 9.

The Invasive Alien Species (Enforcement and Permitting) Order 2019 strengthens the legislation in relation to widely spread species of European Union concern; requiring effective management measures to be put in place to minimise their impacts. It is an offence to import, keep, breed / grow, transport, sell, use, allow to reproduce, or release into the environment the species listed in Schedule 2 of this Order.

1.5.5 National Planning Policy

At national level, Planning Policy Wales² Chapter 6 (Distinctiveness and Natural Places) requires Local Authorities, when formulating development plan strategies, policies and development proposals to consider the need to:

- Support the conservation of biodiversity, in particular the conservation of wildlife and habitats;
- ensure action in Wales contributes to meeting international responsibilities and obligations for biodiversity and habitats;
- Ensure statutorily and non-statutorily designated sites are properly protected and managed;
- Safeguard protected and priority species and existing biodiversity assets from impacts which directly affect their nature conservation interests and compromise the resilience of ecological networks and the components which underpin them, such as water and soil, including peat; and
- Secure enhancement of and improvements to ecosystem resilience by improving diversity, condition, extent and connectivity of ecological networks.

Planning Policy Wales is supplemented by Technical Advice Note (TAN) 5³ (Nature Conservation and Planning) which provides further advice and detail about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. The TAN brings together advice on sources of legislation relevant to various nature conservation topics which may be encountered by local planning authorities.

1.5.6 Local planning policies

At a local level, planning policies are set out within Merthyr Tydfil County Borough Council Replacement Local Development Plan (Adopted January 2020).

The existing Welsh Water site is located within a Policy EnW5: 'landscape protection' area with the proposed extension including the new service reservoir being situated within a Policy EnW3: 'Regionally important geological sites, sites of importance for nature conservation, local nature reserves and priority habitats and species' area. As the proposed development is located within Blaenmorlais SINC, Policy EnW1: 'Nature Conservation and Ecosystem Resilience' is also relevant to the scheme. Such developments which are deemed to have an adverse impact on these sites will only be permitted where it can be demonstrated that:

- The need for the development clearly outweighs the conservation value of the site;
- Adverse impact on nature conservation features or geological features can be avoided;
- Appropriate and proportionate mitigation and compensation measures can be provided; and
- The development maintains and where possible enhances biodiversity and geodiversity interests.

² Planning Policy Wales Edition 10 (December 2018) Welsh Government

³ Technical Advice Note 5 Nature Conservation and Planning (September 2009) Welsh Government

The following Supplementary Planning Guidance (SPG) documents are also relevant to the scheme:

- SPG 4 – Sustainable Design (July 2013); and
- SPG 5 – Nature and Development (May 2015)

1.5.7 Welsh Water Plans and Policies

Welsh Water have translated their legal obligations into several internal policies, strategies and reports including;

- Welsh Water 2050 (March 2018) Strategic Response 14: Supporting Ecosystems and Biodiversity which states; *“We will look for ways to help nature, enhance biodiversity and promote ecosystem resilience while we carry out our water and sewerage activities”*.
- Making Time for Nature (2017): Welsh Water’s Plan for Maintaining and Enhancing Biodiversity under Section 6 of the Environment (Wales) Act 2016.
- Doing the right thing for nature (December 2019) Welsh Water’s statutory report on the Biodiversity Duty under Section 6 of the Environment (Wales) Act 2016.

Developers must ensure that they comply with the above legislation and policy by fully assessing the potential impacts on protected and priority species and habitats from the proposed development. Where planning permission is required, this assessment must be finalised prior to and included with the submission of the planning application. The Planning Authority can then ensure that the necessary protected species and habitats information has been provided to inform an assessment and that proposals are in full accordance with relevant legislation and planning policy.

2 Methodology

2.1 Zone of Influence

The study area for ecological receptors is defined by the distance over which impacts are likely to occur. The current guidance on ecological assessments (Chartered Institute of Ecology and Environmental Management (CIEEM), 2018) recommends that all ecological features that occur within a 'Zone of Influence' (Zol) for a proposed development are investigated.

The Zol includes:

- Areas directly within the land take for the proposed development and access;
- Areas which will be temporarily affected during construction;
- Areas likely to be impacted by hydrological disruption; and
- Areas where there is a risk of pollution and noise disturbance during construction and/or operation.

The Zol is variable depending on the nature of the construction activities and the ecological receptors affected.

For this assessment the following zones have been defined (**Error! Reference source not found.**).

Table 1 Zone of Influence used for this assessment

Ecological features	Zone of Influence
Designated Sites	2km buffer around Site boundary
Internationally Designated Sites for bats	10km buffer around the Site boundary
Protected species records	2km from Site boundary
Protected species evidence	Within the Site boundary, plus a 50m buffer

2.2 Desk Study

A desk study was undertaken in accordance with current guidelines for Preliminary Ecological Appraisal (CIEEM, 2018) to determine the presence of any designated nature conservation sites and protected or notable species within the Zol of the Site.

The Multi-Agency Geographic Information for the Countryside (MAGIC) website⁴ was reviewed for information on national and internationally designated sites of nature conservation importance within 2km and 10km respectively of the proposed works.

The search included Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar sites, Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs).

In addition, ecological records were obtained from Aderyn on 07/02/2020. The records include protected and priority species⁵ up to 2km from the proposed works and include details of local designations such as Sites of Importance for Nature Conservation (SINCs) and Wildlife Trust Reserves. The Merthyr Tydfil County Borough Council Proposals Map was also reviewed for local site designations.

⁴ www.magic.gov.uk

⁵ EU and UK legally protected species under the Conservation of Habitats and Species Regulations 2017 and Wildlife and Countryside Act 1981 (as amended); and species present on the Species of Principal Importance in Wales list in response to Section 7 of the Environment (Wales) Act 2016 (known as Section 7 species).

2.3 Field Surveys

The following surveys were undertaken by Arcadis and MMB between May 2019 and May 2020.

In all cases the surveys were undertaken by suitably qualified and experienced Arcadis / MMB ecologists.

2.4 Extended Phase 1 Habitat Survey – Arcadis

The extended Phase 1 habitat survey was undertaken during May 2019. This comprised a walkover survey to map Phase 1 habitats present within the proposed development site following the standard survey methodology (JNCC 2010 Handbook for Phase 1 Habitat survey). Dominant plant species were noted, as were any uncommon species or species indicative of particular habitat types, but there was no attempt to compile exhaustive species lists. Botanical names follow Stace for higher plants (Stace, 2010). The habitats were assessed for their potential to support protected/ notable species of plants and/ or animals and observation was made of any incidental signs of protected/ notable species. The outputs of the surveys include a Phase 1 habitat plan and a set of Target Notes (TNs) which are illustrated on the Phase 1 map in Appendix C. The full Arcadis report can be found in Appendix D.

2.5 National Vegetation Classification – Arcadis

The survey was carried out in accordance with the NVC Users Handbook (Rodwell, 2006). The aim of the NVC survey was to ascertain whether the acid grassland communities within the proposed development boundary met the Criteria for the Selection of Sites of Importance for Nature Conservation in the County Boroughs of Blaenau Gwent, Caerphilly, Merthyr Tydfil and Rhondda Cynon Taff (the 'Mid-Valleys Area'). There was no intention to provide a complete audit of NVC communities within the proposed development boundary. The results of the Phase 1 habitat survey were used to identify homogenous stands of acid grassland to be surveyed.

These stands of vegetation were sampled using a standard 2m x 2m square quadrat.

The plant species rooted within each quadrat were recorded. The percentage cover of each plant species as an aerial projection within the quadrat was recorded using the Domin logarithmic scale, as defined in Table 2 below:

Table 2 - Domin values

Percentage Cover	Domin Value
91-100%	10
76-90%	9
51-75%	8
34-50%	7
26-33%	6
11-25%	5
4-10%	4
<4% (many individuals)	3
<4% (several individuals)	2
<4% (few individuals)	1

The NVC survey was undertaken by an experienced botanist, Sarah Simons, on 21 May 2019. The quadrat results were compared against the habitat keys and floristic tables in the relevant NVC handbooks (Volumes 2 and 3) to confirm the identification of the vegetation communities present (Rodwell (ed.) 1991 and Rodwell, (ed) 1992). In total 10 No. 2m x 2m quadrats were sampled.

Further details can be found in the Arcadis Baseline Ecology report in Appendix D.

2.6 Breeding bird surveys – Arcadis

Breeding bird surveys followed the Breeding Bird Survey (BBS) methodology from the British Trust of Ornithology (Gilbert et al. 1998). Transect bird surveys were undertaken between May and June 2019 by Ornithologist, Libby Brooks, to identify the presence and distribution of breeding birds (i.e. nesting and

foraging) on Site. The surveys were undertaken 45 minutes after dawn and took place across a variety of weather conditions to obtain a representative picture of bird numbers and activity. It was not possible to survey in April due to the timing of commission.

During the survey, a predetermined transect route was walked particularly focusing on areas of interest to breeding birds (i.e. common land and scrub). All bird species including species of local/or national nature conservation importance were recorded and mapped using standard BTO species and behaviour codes (Gilbert et al., 1998). The behaviour codes were used to indicate whether the individuals were likely to be breeding within the survey area. Clear evidence of breeding was determined by types of activity or signs, such as males singing and alarm calls. The approximate grid reference in which birds were recorded was also noted. Species of nature conservation importance recorded included:

- species that receive, protection under Schedule 1 of the Wildlife and Countryside Act 1981(as amended);
- species listed under Section 7 of the Environment (Wales) Act 2016; and
- birds that are on the Red or Amber lists of Birds of Conservation Concern (BoCC) in the UK (Eaton, et al. 2015).

An inventory of all other species was also produced for each survey visit.

2.7 Terrestrial Invertebrate habitat assessment – Arcadis

The proposed development site was assessed by experienced terrestrial invertebrate surveyor, Rich Prew, to highlight features of particular interest to priority invertebrate species and ascertain whether targeted terrestrial invertebrate surveys should be recommended. This included a walkover of the Site undertaken in June 2019 where features and habitat types suitable for priority invertebrate species were noted.

2.8 Habitat Suitability Index (HSI) Assessment of Waterbodies – Arcadis

In accordance with best practice guidance (Amphibian and Reptile Groups of the United Kingdom, 2010. Advice Note 5: Great Crested Newt Habitat Suitability Index), waterbodies that were located up to 250m from the proposed development, as identified from Ordnance Survey mapping, were surveyed in conjunction with the extended Phase 1 habitat survey in June 2019 to determine their suitability for breeding great crested newts (*Triturus cristatus*). The survey was carried out by an accredited agent newt surveyor (Kailey O'Brien accredited agent licence number 79593:OTH:SA:2018).

At each of these waterbodies, a Habitat Suitability Index (HSI) assessment was undertaken. The HSI scoring system scores a waterbody against ten habitat suitability indices including, for example, water quality, the likely presence/ absence of fish and aquatic plant cover. From these ten suitability indices, a geometric mean is calculated which gives an overall numerical index ranging from between zero and one. A score of near zero indicates sub-optimal habitat whilst a score near one represents optimal habitat for use by breeding great crested newts. However, the HSI is not a substitute for undertaking newt surveys; if a waterbody is awarded a high HSI score this does not guarantee that great crested newts will be present, only that they are more likely to be present in this waterbody than in a waterbody with a sub-optimal score. As such, HSI scores alone cannot be used to rule ponds in or out from further survey. The HSI results can be found in Appendix E. A total of 3 waterbodies were assessed in this way (ponds labelled P1 – P3 on the Phase 1 Habitat Map - Appendix C).

2.9 Environmental DNA (eDNA) Survey – Arcadis

Great crested newts release their DNA into ponds via their saliva, skin cells and urine where it will remain for several weeks. Environmental DNA (eDNA) surveys are undertaken by obtaining water samples from the waterbody (in accordance with guidance published by Biggs et. al., 2014 which are analysed in a laboratory to identify the presence/absence of GCN DNA which will determine if GCN have used the pond.

Three possible results will be presented by the testing:

- Positive – GCN eDNA has been detected in the pond;
- Negative – GCN eDNA has not been detected within the pond; or

- Inconclusive results – GCN eDNA has not been detected but the sample may have been degraded (e.g. not stored correctly and/or at the correct temperature before testing) or the test inhibited (e.g. by an unexpected chemical identified within the sample).

Environmental DNA (eDNA) surveys were undertaken on 12th June 2019 by Kailey O'Brien assisted by Libby Brooks to confirm the presence/absence of GCN within waterbodies (P1, P2 and P3). The samples were analysed by Nature Metrics (see Appendix E).

2.10 Reptile surveys – MMB

A total of 35 artificial refugia, comprising of bitumen roofing felt (~50x60cm) were placed within selected areas of suitable habitat within the Site and in the proposed working area at a spacing of approximately 1 every 10m. Areas identified as possessing suitable habitat to support reptiles included the northern end of the current Welsh Water site, the southern bank next to the existing service reservoir and the western edge of the site boundary within the area of common land (sub-optimal habitat due to overgrazing, but SINCDesignated). The artificial refugia were set out 29th April 2020 to allow two weeks for the refugia to bed in.

A total of seven surveys were undertaken between 12th May 2020 and 29th May 2020. All the survey visits were undertaken in May which is the optimum survey period for reptiles. All surveys were undertaken during suitable weather conditions for basking reptiles (generally when the air temperature was between 10-20°C and there was no heavy rain - see Table 3 for weather conditions). During each visit, a visual survey of the area and artificial refugia was carried out with any naturally basking reptiles noted before the artificial refugia was surveyed for any reptiles sheltering underneath.

Table 3: Weather conditions during survey effort

Visit	Date	Weather
1	12/05/2020	14C, 40% Cloud cover, dry
2	15/05/2020	15C, 30% Cloud cover, dry
3	18/05/2020	14C, 60% Cloud cover, dry
4	20/05/2020	15C, 30% cloud cover, dry
5	22/05/2020	15C, 20% cloud cover, dry
6	26/05/2020	14C, 0% cloud cover, dry
7	29/05/2020	17C, 10% cloud cover, dry

The presence/likely absence surveys were undertaken by MMB Ecology Lead Elliott Hughes.

2.11 Limitations

Biological records obtained from third parties and presented in the desk study do not represent a full and complete species list for the area. They are mostly given by individuals on an ad hoc basis, often meaning there are areas of deficiency in the data.

The findings presented in this report represent those at the time of survey and reporting, and data collected from available sources. Ecological surveys can be limited by factors affecting the presence of plants and animals, such as the time of year, migration patterns and behaviour. The absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. However, the likely presence of protected and/or other notable species could be adequately determined from the surveys carried out and further surveys were recommended where any uncertainty on presence or absence remained.

3 Assessment Methodology

The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the United Kingdom (CIEEM, 2018) form the basis of this impact assessment. These guidelines set out a process of identifying the value of ecological receptors and then characterising the impacts that are predicted. They go on to discuss the impacts on the integrity or conservation status of the receptor, the proposed mitigation and residual impacts.

The CIEEM guidelines recommend that the value of ecological receptors or features is determined based on a geographic frame of reference. For this assessment the following geographic frame of reference is used:

- International;
- National;
- Regional;
- County;
- Local (i.e. within circa 5 km); and
- Less than Local / within the context of the site.

In accordance with CIEEM guidelines, when describing impacts reference is made to the following:

- Magnitude – i.e. the size of an impact in quantitative terms where possible;
- Extent – i.e. the area over which an impact occurs;
- Duration – i.e. the time for which an impact is expected to last;
- Reversibility – i.e. a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it. A temporary impact is one from which a spontaneous recovery is possible;
- Timing and frequency – i.e. whether impacts occur during critical life stages or seasons and how often impacts occur; and,
- Direct and Indirect – i.e. direct ecological impacts are changes that are directly attributable to a defined action, e.g. the physical loss of habitat occupied by a species during the construction process. Indirect ecological impacts are attributable to an action, but which affect ecological resources through impacts on an intermediary ecosystem, process or receptor.

In accordance with the CIEEM guidelines, a significant impact, in ecological terms, is defined as ‘an impact (whether negative or positive) on the integrity⁶ of a defined site or ecosystem and/or the conservation status⁷ of habitats or species within a given geographical area, including cumulative and in combination impacts.’

It is important to note, however, that in accordance with the CIEEM guidelines, the actual determination of whether an impact is ecologically significant is made irrespective of the value of the receptor in question.

⁶ Integrity is the coherence of ecological structure and function, across a site's whole area that enables it to sustain a habitat, complex of habitats and/or the levels of populations of species.

⁷ Conservation status for habitats is determined by the sum of the influences acting on the habitat and its typical species that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area. Conservation status for species is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area.

4 Baseline Ecological Conditions

The ecological baseline surveys identified the following conditions.

4.1 Designated Sites

4.1.1 Statutory Designated sites

There is a single statutory nationally designated site within 2.0km of the proposed developments, as listed in Table 4 below. There are no internationally designated sites located within 10.0km of the Site.

Table 4: Statutory designated sites

Site Name	Designation	Description	Distance
Cwm Taf Fechan Woodlands	Site of Special Scientific Interest	Mixed deciduous woodlands cover steep slopes and spoil from quarries with one of the few Glamorgan stations for <i>Gymnocarpium robertianum</i> . There are interesting plant communities in flushes around tufa springs and luxuriant growths of bryophytes in the splash zone of the river.	1.8km north west

4.1.2 Non-Statutory Designated Sites

There are nine non-statutory designated sites within 2.0km of the proposed development, as listed in Table 5 below.

Table 5: Non-statutory designated sites

Site Name	Designation	Description	Distance
Blaenmorlais	Site of Importance for Nature Conservation (SINC)	A large area supporting a mosaic of upland habitats at the western edge of Merthyr Common. Mainly acid grasslands with acidic flushes, grass-heaths, dry heathlands, marshy grasslands, bracken (<i>Pteridium aquilinum</i>) slopes and smaller areas of wet heathland and scrub.	Located within the Site boundary.
Merthyr Common North	SINC	Very extensive area of upland common land supporting a mosaic of both wet and dry moorland habitats. These include extensive areas of unimproved acid grassland, marshy grassland, dry heathland and grass-heath, together with areas of wet heath, acid flush, bracken stands, scree and exposed gritstone bedrock. Breeding populations of skylark (<i>Alauda arvensis</i>), meadow pipit (<i>Anthus pratensis</i>) and snipe (<i>Gallinago gallinago</i>) are present, and numerous other bird species of interest have been recorded. Other species of interest include grayling butterfly (<i>Hipparchia semele</i>) and a range of localised moths.	Located along the northern boundary of the Site.
Pan March and Traed y Milwyr, Llechryd	SINC	Not detailed in the Review of sites of importance for nature conservation (June 2018) but aeriels suggest similar habitat as Merthyr common north. The two sites border each other.	0.7km to the north east of the Site.
Brynau	SINC	Semi-upland site comprising a complex mosaic of mainly acidic habitats associated with disused quarries and spoil tips. Species of interest include	1.4km to the west of the Site

the regionally scarce royal fern (*Osmunda regalis*) and climbing corydalis (*Ceratocarpus claviculata*), along with numerous localised plant species. The ponds of the site support good populations of common amphibian species and great crested newt has also been recorded.

Morlais Hill	SINC	Complex semi-upland area of limestone-influenced habitats partly derived from old limestone quarries (Morlais Quarries) and screes associated with the former Morlais Castle. Part of the site is currently in use as a golf course. Supports several nationally scarce and regionally rare and scarce plant species. Grayling butterfly occurs in the quarries and small pearl-bordered fritillary butterfly (<i>Boloria selene</i>) has been recorded in the past	1.4km to the west of the Site
Tyle Haidd	SINC	Valley slopes above the Afon Taf Fechan on limestone geology with screes and a disused quarry (Tyle Haidd). Supports unimproved, species-rich, semi-upland calcareous grassland of high biodiversity value, along with calcareous ledge and crevice communities, calcareous scrub woodland, bracken stands and small areas of acid grassland. Supports several nationally scarce and regionally rare and scarce plant species.	1.6km to the north west of the Site
Cwm Taf Fechan	SINC	A long linear site based on the valley of the Afon Taf Fechan and containing the Cwm Taf Fechan Woodlands SSSI. The SINC covers a more extensive area of adjacent habitats supplementary to those of the SSSI. Much of the woodland is ancient semi-natural ash (<i>Fraxinus excelsior</i>), with some oak (<i>Quercus spp</i>) locally. Supports several nationally scarce and regionally rare and scarce plant species. Birds of interest on the river include kingfisher (<i>Alcedo atthis</i>) and dipper (<i>Cinclus cinclus</i>). Many rare and scarce invertebrate species have been recorded from the SSSI, including small pearl-bordered (<i>Boloria selene</i>) and silver-washed fritillary (<i>Argynnis paphia</i>) butterflies.	1.7km to the north west of the Site
Cefn Gelligaer, West of Deri	SINC	An area of acid grassland with at least seven indicator species	1.9km to the south east of the Site
Tair Carreg Moor, North West of Fochriw	SINC	Primary designated for the resident populations of sea/ river/ brook lamprey (<i>Lampetra Sp.</i>) and other protected fish species such as twaite shad (<i>Alosa fallax</i>) and Atlantic salmon (<i>Salmo salar</i>). The site is also a probable breeding area for otters and has valuable semi-natural wetland, grassland and woodland habitats as part of the wider stream corridor.	1.9km to the south east of the Site

There is a single area of ancient semi-natural woodland within 2.0km of the Site. This single area has four regions which are found 1.9km to the west of the development site.

The Site is situated in the South Wales Valley Important Invertebrate Area (IIA). IIAs are areas listed by Buglife as 'nationally or internationally significant places for the conservation of invertebrates and the habitats upon which they rely'. There is as of yet no detail to the species or habitats that are the reason for

this selection, but it may be due to the brownfield sites resulting from historical mining land use in the south Wales area which are known to be of high conservation value for invertebrates.

The Site also lies within a special landscape and archeologically sensitive area.

4.2 Habitats

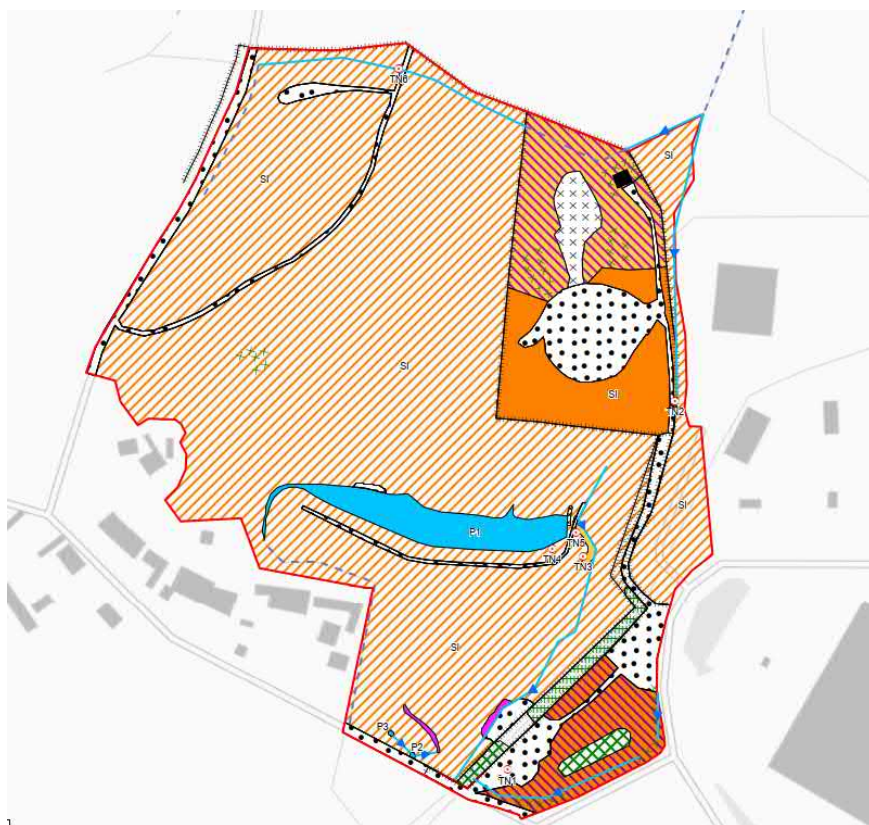
4.2.1 Survey Area Overview

The area outside of the Welsh Water compound is predominantly heavily horse-grazed semi-improved acid grassland with two small areas of species-poor acid flush, one small area of dry dwarf shrub heath and areas of disturbed/ bare ground. There are three ponds located outside of the compound (see Photo 1 in Appendix B). The area within the compound is semi-improved neutral grassland, wet dwarf shrub heath with scattered scrub, ephemeral/ short perennial and areas of disturbed/ bare ground. A hedgerow/ treeline is present toward the south-east of the Site with an area of marshy grassland, bare ground and scrub on the roadside verge, which has recently been used as a site compound. The identified habitats are presented on the Phase 1 habitat map (Appendix C).

4.2.2 Habitats located within the proposed site boundary

The proposed site boundary/working area plan can be found in Appendix C, a snapshot of the Phase 1 map showing the application boundary and ownership boundary can be found in Figure 3 below.

Figure 3: Red Line - Survey boundary, Red Dashed Line - Application Boundary (inc. Temporary site compound), Blue Line – Ownership/Development Boundary



4.2.2.1 Semi-improved acid grassland

The majority of the proposed development area comprises semi-improved acid grassland with Sheep's Fescue (*Festuca ovina*), Mat-grass (*Nardus stricta*), Sweet Vernal-grass (*Anthoxanthum odoratum*) Sheep's Sorrel (*Rumex acetosella*) and Creeping bent (*Agrostis stolonifera*) and occasional Tormentil (*Potentilla*

erecta), Heath Bedstraw (*Galium saxatile*) and Heath Wood-rush (*Luzula multiflora*). A number of moss species were also identified including *Rhytidiadelphus squarrosus* and *Polytrichum* species. The grassland was closely grazed by horses and rabbits and included nutrient-rich patches dominated by nettles (*Urtica dioica*) and dock species (*Rumex* sp.), several areas of fly-tipping, and disturbed ground from off-roading activities (see Photos 2 and 3 in Appendix B).

4.2.2.2 Scattered scrub

Areas scattered scrub were identified within the site compound. Species identified within the scrub were Hawthorn (*Crataegus monogyna*), Willow (*Salix* sp.), Rowen (*Sorbus aucuparia*) and Gorse (*Ulex europaeus*).

4.2.2.3 Semi-improved neutral grassland

Approximately half of the habitat within the Welsh Water compound (around the reservoir and south of the reservoir) was assessed as semi-improved neutral grassland comprising of Cock's-foot (*Dactylis glomerata*), Yorkshire-fog (*Holcus lanatus*), Daisy (*Bellis perennis*), Hop Trefoil (*Trifolium campestre*), Ribwort Plantain (*Plantago lanceolata*) and Dandelion (*Taraxacum agg.*). Discrete patches comprised of Sweet Vernal-grass with some Mouse-ear-hawkweed (*Pilosella officinarum*) and Canadian fleabane (*Conyza canadensis*) occurred on the reservoir slopes. The area directly adjacent to the reservoir appeared to be seeded grassland.

4.2.2.4 Wet dwarf shrub heath

The northern half of the compound comprised wet dwarf shrub heath dominated by Heather and Purple Moorgrass (*Molinia caerulea*) tussocks. Other species here included Tormentil, Heath Wood-rush, Heath Bedstraw, Sheep's Fescue, Common Milkwort (*Polygala vulgaris*) and Sheep's Sorrel (*Rumex acetosella*). A number of moss species were also identified including *Polytrichum* species and *Rhytidiadelphus squarrosus*.

A bank located to the north-east of the wet dwarf shrub heath (west of the building) was assessed as more species-rich in comparison to the rest of the habitat with greater heather cover.

4.2.2.5 Bare ground

Bare ground was recorded within the compound. A track leads from the Site access gate, north to a building and the reservoir is capped with gravel chippings. East of the track (along the Site boundary) one stand of Japanese Knotweed (*Fallopia japonica*) (TN2) was noted during the 2019 surveys. No evidence of this was found by MMB during the 2020 surveys, therefore it is likely that the Japanese Knotweed was spray and removed by Welsh Water's maintenance team.

4.2.2.6 Ephemeral/ short perennial

A small area of disturbed, re-seeded ephemeral ground was identified north of the reservoir. Species identified within this area included Mouse-ear-hawkweed (*Pilosella officinarum*), Dock species (*Rumex* sp.) and Spear Thistle (*Cirsium vulgare*).

4.3 Protected / Priority Plant Species

Records of thirty protected/priority plant species within 2km of the Site were returned by the desk study. These species included records for Bluebell (*Hyacinthoides non-scripta*), Eyebright (*Euphrasia micrantha*) and Upright Brome (*Bromopsis erecta*). Of the 30 protected/priority plant species returned by the desk study, Bluebell is awarded full protection under the Wildlife and Countryside Act 1981, as amended, four species are listed on the UK Red Data Book (RDB1, UK) listing based on IUCN guidelines (Cheffings and Farrell 2005), three are listed on the Welsh Red Data Book (RDB1, Wales) listing based on IUCN guidelines (Dines 2008) and 24 species are listed as locally important species to SEWBRc.

The closest record of Bluebell is 900 metres north of the Site. The closest record of any protected or priority plant species is of Floating Bur-reed (*Sparganium angustifolium*) 90 metres south of the Site boundary, listed as a locally important species to SEWBRc.

4.4 Invertebrates

The desk study returned records of 12 priority species within 2km of the Site: knot grass (*Acronicta rumicis*), small heath (*Coenonympha pamphilus*), small square-spot (*Diarsia rubi*), small phoenix (*Ecliptopera silaceata*), dingy skipper (*Erynnis tages*), autumnal rustic (*Eugnorisma glareosa*), brindled beauty (*Lycia hirtaria*), white ermine (*Spilosoma lubricipeda*), buff ermine (*Spilosoma lutea*), anomalous (*Stilbia anomala*), cinnabar (*Tyria jacobaeae*) and dark-barred twin-spot carpet (*Xanthorhoe ferrugate*). All 12 priority species are listed on Section 7 of the Environment (Wales) Act 2016. The desk study also returned a record of Buff-tailed bumblebee (*Bombus terrestris*) 1.2km east of the Site. Buff-tailed bumblebee is listed on the Merthyr Tydfil Local Biodiversity Action Plan (Merthyr Tydfil County Borough Council, 2014. Action for Wildlife in Merthyr Tydfil).

The Pengarnddu reservoir site as a whole contains a topographically diverse landscape situated on a south facing slope containing a mosaic of habitats with diverse vegetation structure in places. The diversity of vegetation structure and plant species within the Site, especially within the Welsh Water compound, around the stream running from the reservoir and within the marshy grassland road verge provides multiple niches for specialist invertebrates to inhabit. Species associated with upland heathland are likely to be found within the north of the Site whereas the south of the Site is more suited to wetland invertebrate assemblages.

4.5 Protected / Priority Fish

One record of brown trout (*Salmo trutta*) was identified approximately 1.8km north-west of the Site. This species is listed under Section 7 of the Environment (Wales) Act. There are three permanent waterbodies within the survey area, which are all relatively shallow, polluted and sub-optimal for supporting fish.

The ponds will not be impacted by the development.

4.6 Amphibians

The desk study returned no records of great crested newts (GCN) within 2km of the Site. Records of common toad (*Bufo bufo*), common frog (*Rana temporaria*) and palmate newt (*Lissotriton helveticus*) were identified within 2km of the Site. The closest of which was a common toad record approximately 500m east of the Site. There are three permanent waterbodies to the south of the proposed working area, all three ponds (P1, P2 and P3) have the potential to support amphibians. There were a number of dry ditches located to the north, west and south of the survey area.

The HSI assessment determined that one waterbody (P1) had 'good' suitability for supporting GCN and two (P2 and P3) had 'below average' suitability for supporting GCN. A summary of the HSI assessment is included in Table 4 below with full results included in Appendix E. The eDNA survey confirmed that three ponds (P1, P2 and P3) were not utilised by GCN in the weeks prior to sampling. Results of the eDNA surveys are included in Table 6 below.

Table 6: Summary of HSI and eDNA results

Waterbody Number	HIS Score	Pond suitability	eDNA result
P1	0.74	Good	Negative
P2	0.57	Below average	Negative
P3	0.57	Below average	Negative

No amphibians were observed during HSI assessments, the eDNA surveys or the subsequent reptile surveys.

4.7 Reptiles

The desk study returned records of common lizard (*Zootoca vivipara*) within 2km of the Site. The closest record was approximately 1.8km north-west of the Site. Common lizard is listed under Section 7 of the Environment (Wales) Act 2016. The Site has the potential to support reptile populations, the wet dwarf shrub heath located to the north of the compound provides suitable foraging and basking opportunities for reptiles, whilst the bare ground and surrounding area of the capped reservoir provides suitable basking spots. The

treeline/hedgerow throughout the south-east of Site would provide suitable hibernating opportunities for reptiles.

The field survey results collected during the May 2020 surveys can be seen below within Table 7.

Table 7: Reptile survey data

Site Visit	Date	Condition s	Adder		Grass Snake		Slow Worm		Common Lizard	
			Female	Male	Female	Male	Female	Male	Female	Male
1	12/05 /2020	14C, 40% Cloud cover, dry	0	0	0	0	0	0	0	1
2	15/05 /2020	15C, 30% Cloud cover, dry	0	0	0	0	0	0	1	0
3	18/05 /2020	14C, 60% Cloud cover, dry	0	0	0	0	0	0	1	1
4	20/05 /2020	15C, 30% cloud cover, dry	0	0	0	0	1	0	0	0
5	22/05 /2020	15C, 20% cloud cover, dry	0	0	0	0	0	0	1	0
6	26/05 /2020	14C, 0% cloud cover, dry	0	0	0	0	0	0	0	0
7	29/05 /2020	17C, 10% cloud cover, dry	0	0	0	0	0	0	0	0
Peak Count			N/A		N/A		1		2	
Populatio n Class			N/A		N/A		Low		Low	

Figure 4: Common Lizard found on Site



4.8 Birds

The desk study returned records of nine species afforded full protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) within 2km of the site. These included redwing (*Turdus iliacus*), peregrine (*Falco peregrinus*) and red kite (*Milvus milvus*). The closest record is of whooper swan (*Cygnus*

cygnus) 350 metres west of the Site. Twelve species listed on the Red List of the Birds of Conservation Concern (BoCC) (Eaton et al. 2015) have been recorded within 2km of the Site including skylark (*Alauda arvensis*), song thrush (*Turdus philomelos*) and house sparrow (*Passer domesticus*). The closest record is of linnet (*Linaria cannabina*) 80 metres south of the Site. Twenty-five species listed on the Amber List of the BoCC (Eaton et al. 2015), have been recorded within the 2km of the Site including black-headed gull (*Chroicocephalus ridibundus*), house martin (*Delichon urbicum*) and kestrel (*Falco tinnunculus*). The closest record is of mallard (*Anas platyrhynchos*) 90 metres south of the Site. The results of the breeding bird surveys are described below. Seven species protected under Section 7 of the Environment (Wales) Act 2016 were identified on Site. Of these seven species, four were considered likely to be breeding within the Site due to suitability of the habitat on Site. The additional three species were considered likely to be breeding outside of the Site and to be using the Site as a foraging resource. Table 8 shows the peak count for each of these species, their potential breeding status within the Site, and their conservation status. Nine other notable species (i.e. Birds of Conservation Concern in the UK and/or Wales) were recorded during the breeding bird transect surveys. Of these nine species, four were considered likely to be breeding within the Site and the other five were considered to be likely to be breeding elsewhere and to be using the Site as a foraging resource. Table 9 shows the peak count for each of these species, their potential breeding status within the Site, and their conservation status.

Eighteen other bird species typical of upland and scrub habitat were also recorded during the breeding bird surveys. The results of the breeding bird surveys identified that the hedgerows and scrub on the east and south eastern boundary of the Site offer the most valuable foraging and nesting habitats for the majority of species on Site. The semi-improved acid grassland had high to moderate potential to support ground nesting bird species such as meadow pipit (two observations) and skylark (three observations). The area is largely overgrazed and highly disturbed (horses and vehicles) with more favourable habitat to the north of the Site (Merthyr Common SINC); however, territorial behaviour was observed. The waterbodies in the survey area offer suitable foraging habitat for a variety of gull and waterfowl. Whilst no overwintering bird surveys were undertaken, the site is considered likely to provide high value foraging and roosting habitat for overwintering bird species. This is confirmed likely due to records of overwintering and wintering passage birds noted in the desk study (within 2km) including wigeon (*Anas penelope*) and teal (*Anas crecca*).

Table 8: Peak count of Section 7 birds

		Conservation Status							Peak count per survey (May to June 2019)				
Species recorded	Latin	UK Red	UK Amber	Wales Red	Wales Amber	Sch. 1	Section 7	LBAP	15 th May	16 th May	6 th June	19 th June	Breeding Status
Herring gull	<i>Larus argentatus</i>	✓		✓			✓		1		2	1	U
Song Thrush	<i>Turdus philomelos</i>	✓					✓		1		1		P
Lapwing	<i>Vanellis vanellus</i>	✓		✓			✓		1				P
Starling	<i>Sturnus vulgaris</i>	✓		✓			✓		8	6	25	14	U
Linnet	<i>Carduelis cannabina</i>	✓		✓			✓			2	1	2	P
Curlew	<i>Numenius arquata</i>	✓		✓			✓			1			U
Bullfinch	<i>Pyrrhula pyrrhula</i>						✓				2	2	P

Table 9: Peak count of notable bird species

Species recorded	Latin	Conservation Status							Peak count per survey (May to June 2019)				
		UK Red	UK Amber	Wales Red	Wales Amber	Sch. 1	Section 7	LBAP	15 th May	16 th May	6 th June	19 th June	Breeding Status
Skylark	<i>Alauda arvensis</i>	✓					✓		1	2	1		P
Mistle Thrush	<i>Turdus viscivorus</i>	✓					✓		1		1	2	P
Mallard	<i>Anas platyrhynchos</i>	✓					✓		1	2		2	U
Willow warbler	<i>Phylloscopus trochilus</i>		✓	✓			✓		8	1	2		P
Dunnock	<i>Prunella modularis</i>		✓				✓				1	1	P
Swallow	<i>Hirundo rustica</i>				✓		✓			3	2	4	U
Swift	<i>Apus apus</i>				✓		✓					4	U
Cuckoo	<i>Cuculus canorus</i>			✓			✓			1			U
Lesser black-backed gull	<i>Larus fuscus</i>		✓		✓		✓				2		U

4.9 Bats

The desk study returned records of six bat species within 2km of the Site. Lesser horseshoe (*Rhinolophus hipposideros*), unidentified pipistrelle species (*Pipistrellus sp.*), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), unidentified myotis species (*Myotis sp.*) and brown long-eared (*Plecotus auritus*). The nearest record is located approximately 1.9km north-west of Site and all records within the desk study data were of foraging bats.

The grassland and waterbodies within and adjacent to the Site provide good bat foraging habitat, although the Site is very open and more likely to be used by bat species which fly in open spaces, such as the noctule (*Nyctalus noctula*) bat (see Figure 5 below). Connecting habitat (bat commuting routes) from the Site to the wider landscape is limited as there is only one short hedgerow present to the south of the Site compound.

Figure 5: Taken from inside the site compound looking west towards the horse grazed pasture



Three single storey, metal clad buildings (an electrical kiosk and a storage containers) located within the Site compound were assessed as having negligible potential for roosting bats as they appeared to be tightly sealed and not accessible to bats (see Figures 6-8).

Figure 6: Kiosk



Figure 7: Storage container



Figure 8: Storage container



4.10 Hazel dormouse

No records of dormice (*Muscardinus avellanarius*) were identified within 2km of the Site and the Site is not well connected to woodland blocks suitable for this species so it is considered unlikely this species is present within the proposed development area.

4.11 Otter and water vole

No records of otter (*Lutra lutra*) or water vole (*Arvicola amphibius*) were identified within 2km of the Site. It is possible that otters travel through the area to forage in the waterbodies but there is little cover for a holt or resting Site within the proposed development area. The area is highly disturbed by off-roading and people attending to the horses. It is considered unlikely that water vole would be present within the proposed development area due to poor habitat suitability.

4.12 Badger

No records of badger (*Meles meles*) were identified within 2km of the Site and the nutrient-poor substrate of the acid grassland is unlikely to provide a good foraging resource for badger. No areas suitable for badger setts were noted during any of the surveys.

4.13 Other Mammals or Conservation Concern

The wet dwarf shrub to the north of the existing service reservoir and the semi-improved grassland provide potential foraging habitat for hedgehogs (*Erinaceus europaeus*). Hedgehogs are listed under Section 7 of the Environment (Wales) Act 2016. During the extended Phase 1 survey evidence of hedgehog was identified (hedgehog scat) within the Site, outside of the compound.

4.14 Evaluation of Ecological Receptors

Table below evaluates all the ecological resources present, or potentially present, within the study area and its immediate surroundings.

Table 10: Evaluation of ecological receptors

Ecological Feature	Ecological Value	Justification
Designated sites⁸		
Blaenmorlais (SINC) (within the working area)	County (Area within the proposed working area is of local ecological value due to over grazing)	Blaenmorlais SINC and is located on the western boundary of the existing Welsh Water site which would mean the proposed development will be taking place within the SINC. Blaenmorlais SINC is a large area supporting a mosaic of upland habitats at the western edge of Merthyr Common. Mainly acid grasslands with acidic flushes, grass-heaths, dry heathlands, marshy grasslands, bracken slopes and smaller areas of wet heathland and scrub. The site also contains small disused quarries (Garth Quarries) and acid screes. A section of the Nant Morlais within the site has steep valley sides with rocky outcrops. A large pond in the south of the site supports a regionally rare plant, and several uncommon dragonflies. To the north the site contains an area of limestone spoil tips supporting unimproved upland calcareous grassland, as well as some limestone outcrops and scree.

⁸ Other designated sites identified in Section 4.1 are not listed here as they are of significant distance away from site and no pathways are identified for effects from the proposed works.

		The area within the proposed working area is semi-improved acid grassland, moving towards improved grassland due to overgrazing by horses. It is likely that this area of the site would no longer qualify as a SINC if it was reassessed. The grassland in the proposed working area is unlikely to support any species of note in its current condition. <i>The “Guidelines for the Selection of Wildlife Sites in South Wales” states:</i> <i>The following Acid Grassland should be considered for selection:</i> • <i>all examples of unimproved acid grassland</i> • <i>all examples of semi-improved acid grassland which retain a relatively high diversity of indicator species</i> It is considered that the acid grassland on Site does not meet this criteria.
Merthyr Common North (SINC) (112m North of the Site)	County	Designated by MTCBC for important upland habitats, 112m north of the proposed development. Likely to support ground nesting birds and a good population of reptiles and invertebrates.
Habitats		
Semi-improved acid grassland (upland)	Local	An abundant habitat in the local area which has been heavily overgrazed by horses. This area is also regularly used as a fly-tipping site.
Semi-improved neutral grassland	Local	Area of grassland that is regularly mown by Welsh Water but is not fertilised or regularly sprayed.

Scrub	Local	Widespread habitat. May support small numbers of nesting birds
Ephemeral / short perennial	Less than local	Minimal ecological value
Bare ground	Less than local	Minimal ecological value
Species		
Badger	Less than local	No signs of badger were identified within the Site and the nutrient poor substrate of the acid grassland is unlikely to provide a good foraging resource for badger. No areas suitable for badger setts were noted during the Phase 1 habitat survey.
Bats	Local	No suitable roosting locations within the proposed site. The habitat does provide suitable habitat for foraging bats. The connectivity of the Site to the wider landscape is limited. Therefore, the Site is likely to be used by high flying species such as Noctule. The traveling community to the south west of the Site may offer more favourable foraging opportunities for species such as common pipistrelle (<i>Pipistrellus pipistrellus</i>) which are able to forage effectively within urban habitats.
Reptile	Local	The surveys identified low reptile population to the north of the existing service reservoir. The proposed area for the development is heavily grazed and so provides less than ideal habitat for reptiles, no reptiles were found in this area during the surveys.
Otter	Less than local	No records of otter (<i>Lutra lutra</i>) were identified within 2km of the Site. It is possible that otters travel through the area to forage in the

		waterbodies but there is little cover for a holt or resting site within the proposed development area.
Bird	Local	The proposed site could possess suitable habitat for foraging birds. However due to the high levels of disturbance in the area for the proposed development (Blaenmorlais SINC) there is a low chance of ground nesting birds.
Amphibian	Local	The three permanent waterbodies within the survey boundary, have the potential to support amphibians. There were a number of dry ditches located to the north, west and south of the Site. These waterbodies are to remain undisturbed during the development, but the surrounding area will experience disturbance. No amphibians were incidentally recorded during the further reptile surveys.
Terrestrial Invertebrates	Local	Suitable niches for invertebrates are available within the current Welsh water site but due to the levels of disturbance these are limited within the area proposed for development.
Hedgehogs	Local	The Site provides suitable foraging habitat for hedgehogs (<i>Erinaceus europaeus</i>).
Invasive non-native species	N/A	The Extended Phase 1 habitat survey identified Japanese Knotweed within the Site boundary. Japanese Knotweed was located within the Site compound along the eastern boundary of Site (TN2). No evidence of Japanese Knotweed could be found during the May 2020 surveys.

5 Description of the Proposed Development

The construction of the service reservoir will be in line with the plans laid out in drawing B10237-123532-ZZ-XX-DR-ZA-PN0069 (Appendix C). The new service reservoir will include a 61.00 x 50.00 x 4.52m two cell semi precast rectangular service reservoir with supporting structures. The new service reservoir will be connected into pre-existing inlet main and other utilities which are located within the current Welsh Water site.

The scheme has aimed to minimise ecological effects through design by considering the potential locations for the new service reservoir and selecting an area of land which is considered to have poor ecological value. The reinstatement on the completion of the construction phase has been designed to enhance the ecological value of the area thus making it a more species rich area to encourage ecological success.

5.1 Proposed Works

The project is aiming to construct a secondary service reservoir in the land to the west of the current service reservoir to allow for greater storage of water to support the growing population in the area.

The works are proposed to incorporate an area of common land which is to be acquired by Welsh Water and incorporated into the existing site boundary. The project would also require the temporary use of further common land to the west of the new proposed site boundary during construction. This land would be utilised to contain the site compound, for the storage of materials and providing a suitable buffer between the construction and members of the public to ensure the safety of all those involved.

The project is forecasted to being construction onsite in April 2021 and the work will continue for approximately 20 months with the estimated completion date being the December 2022.

The Site construction will be contained within the proposed site outline within Appendix C. This will include machinery and materials accessing the Site along current access tracks which enter the Site from the east. The work will commence with earth movement to prepare the Site for construction, followed by the construction of the service reservoir using preformed sections. The Site would then be connected to the current operational site and reinstatement undertake to return the habitat quality of the land around the development.

6 Assessment of Effects and Mitigation Measures

The habitat quality in the area of the proposed development is considered to be poor with similar or better-quality habitat available in the local vicinity. The impact on known species present in the area is considered to be limited.

Areas of habitats to be impacted:

- Habitat permanently lost to the new service reservoir and access track extension 0.38ha
- Existing grassland retained, or grassland reinstated to match existing where disturbed during construction and proposed re-seeding: 0.33ha
- Existing shrubs/scrub to be retained and protected: 0.28ha
- Existing shrubs/scrub to be removed and reinstated with grass/wildflower mix: 0.04ha

The need for the development outweighs the conservation value of the Blaenmorlais SINC in its current condition (see 4.14). The location of the proposed service reservoir minimises the ecological impact of the scheme with the waterbodies and wet dwarf shrub habitats being retained. The proposed management of the habitats within the new Welsh Water boundary will enhance the ecological value of the Site by allowing the grassland to flower. The grassland will also provide additional habitat for ground nesting birds, reptiles and terrestrial invertebrates.

6.1 Construction

A large area of habitat will be made unsuitable to support flora and fauna during the construction of the proposed service reservoir (~20 months). This will reduce the ecological value of the Site from being of local value to negligible value in the short-term. However, the habitats present on Site are abundant in the local area and it is considered that nesting birds, invertebrates and reptiles will move to the surrounding habitats (such as Merthyr Common North SINC) during the construction period.

Vegetation clearance within habitats suitable to support reptiles will be undertaken under ecological supervision to avoid committing offences under the Wildlife and Countryside Act 1981 (amended). Habitat manipulation techniques will be used to encourage any reptiles which may be present to move to retained habitat to the north.

Where possible clearance of vegetation will be undertaken outside the breeding bird season (mid-February-September), if this is not possible clearance will be undertaken under ecological supervision to ensure that no nesting birds are present. If active nests are discovered all work will cease and a suitable working buffer will be employed to avoid disturbance. Regular checks will be undertaken by site operatives to ensure no breeding bird nests are at risk from disturbance during construction.

The works will follow best practice pollution prevention measures to ensure that the offsite waterbodies and other adjacent habitats are not impacted by the works.

Environmental audits will be undertaken throughout the construction phase of the project to ensure no environmental and ecological risks are being managed in line with best practice and the CMP.

6.2 Post-construction

The works will aim to improve the habitat quality of the retained Blaenmorlais SINC grassland within the proposed new compound area. This will be implemented by improving the grassland management, excluding grazing animals and re-seeding areas of grassland that will be temporarily lost during development (see the Landscaping Plan in Appendix C).

6.3 Operation

Owing to the nature of the proposed development there is limited risk of environmental impact from the development once it is in operation. The Site has the potential risk of noise pollution and disturbance from increased human activity. But these risks are unlikely to be greater than those risks already present from the

current Welsh Water site and as such will have limited effects on the overall environmental impact of the Site.

7 Enhancement and Monitoring

The areas of land which have been topsoil stripped during construction will be reinstated with an appropriate species-rich grassland mix. The proposed site fencing will exclude grazing animals and will be mown once/twice a year in line with habitat in the north of the existing site. Managed in this way the grassland will provide suitable habitat for ground nesting birds, reptiles, amphibians and invertebrates, as well as improving the quality of the acid grassland within Blaenmorlais SINC.

Two brash piles will be created on the northern edge of the Site using material from the vegetation clearance. The brash piles will provide suitable habitat for reptiles and nesting birds.

Two hibernacula will be created on the southern edge of the Site using concrete, soil and vegetation. The hibernacula will follow the design in the Great Crested Newt Mitigation Guidelines (Page 42)⁹ and provide suitable habitat for amphibians and reptiles.

The Site will undergo an ecological site walkover in the first summer following completion of the works. The purpose of the walkover will be to check that the re-instated habitat has established and is being correctly managed.

⁹ http://mokrady.wbs.cz/literatura_ke_stazeni/great_crested_newt_mitigation_guidelines.pdf

8 Conclusions

MMB were commissioned by Welsh Water to evaluate the ecological receptors likely to be present at the proposed development of a new service reservoir at Pengarnddu service reservoir. They were also tasked with assessing the impacts of construction and future operation of the proposed development at Pengarnddu Service Reservoir. This is to ensure compliance with legislation and policy applicable to the Site.

The EclA considered effects on designated sites, habitats and species located in the vicinity of the proposed development and the potential effects it could have at a wider landscape level. Potential effects include the loss of species-poor acid grassland habitat, the temporary loss of foraging habitat for species such as bats, and the temporary displacement of breeding birds and reptiles from areas within the construction site during construction. These effects have been considered and deemed to possess limited risk to the overall environmental and ecological quality of the area at a county level. It has been assessed that the availability of other suitable habitat located in the immediate vicinity of the Site and the planned mitigation and enhancement will result in the development having an overall positive effect on the local area. The mobility of the species at risk will also allow them to quickly return and repopulate the Site upon completion of the Site whilst benefiting from the reduced levels of disturbance from horse grazing and vehicles within the new Welsh Water site boundary.

The ecological and environmental quality of the Site will be monitored throughout the development's progression by ecologists and other environmental professionals to ensure the Site is maintained at the utmost environmental standards.

No warranty is given as to the possibility of future changes in the condition of the Site. This report is produced solely for the benefit of Welsh Water and no liability is accepted for any reliance placed on it by any other party. This report is prepared for the proposed uses stated in the report and should not be used in a different context.

Note: if the scope of works change, further surveys may be required and the ecological impacts will need to be reassessed.

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10 Appendices

- A Summary of Relevant Legislation
- B Photographs
- C Phase 1 Map and Site Plan
- D Baseline Ecology Report (including target notes)
- E Records of Consultation

Appendix A – Summary of Relevant Legislation

A framework of international, European, national and local legislation and planning policy guidance exists to protect and conserve wildlife and habitats. This is described in the following sections.

10.1.1 Statutory Designated Sites

A network of nationally Designated sites has been established through the Designation of Sites of Species Scientific Interest (SSSI) under the Wildlife and Countryside Act 1981 (as amended). The protection afforded by the Act means it is an offence to carry out or permit to be carried out any operation listed within the notification without the consent of the Statutory Nature Conservation Organisation¹⁰ (Natural Resources Wales).

The protection afforded to SSSIs is used to underpin the Designation of areas at a European Level. European Sites comprise:

- Special Areas of Conservation (SAC) Designated under the Conservation of Habitats and Species Regulations 2017 (known as the Habitats Regulations);
- Special Protection Areas (SPA) Designated under the Wildlife and Countryside Act.

Wetlands of International Importance (Ramsar Sites) declared under the Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 are normally also notified as SSSIs but are only considered European Sites as a matter of UK and Local Government Policy.

The Habitats Regulations transpose the requirements of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) in to law within England and Wales, while the Wildlife and Countryside Act transposes Directive 79/409/EEC on the Conservation of Wild Birds (the Birds Directive) in the law within England and Wales. Equivalent legislation exists to transpose these directives in the law within Scotland and Northern Ireland.

The Habitats Regulations require that consideration is given to the implications of plans and projects (developments) on European Sites are considered. Specifically Regulation 63(1) states:

“A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which –

(a) is likely to have a significant effect on a European site or European marine site (either alone or in combination with other plans or projects), and

(b) is not directly connected with or necessary to the management of that site,

must make an appropriate assessment of the implications for that site in view of that site’s conservation objectives.”.

The formal consideration of effects on European Sites is therefore undertaken by the determining authority such as the Local Planning Authority.

¹⁰ Section 28 of the Wildlife and Countryside Act 1981 (as substituted by Schedule 9 of the Countryside and Rights of Way Act 2000).

Local Nature Reserves can be given protection against damaging operations through powers within the National Parks and Access to the Countryside Act 1949 (as amended). However, this protection is usually conveyed through inclusion of protection within local planning policy relating to these sites and other non-statutory sites such as Sites of Importance for Nature Conservation.

10.1.2 European Protected Species

The Habitats Regulations convey special protection to a number of species which are listed in schedule 2 of the Regulations and are referred to as European Protected Species (EPS):

- All UK resident bat species;
- All whale and dolphin species;
- Large blue butterfly (*Maculinea arion*);
- Common dormouse (*Muscardinus avellanarius*);
- Pool frog (*Rana lessonae*);
- Sand lizard (*Lacerta agilis*);
- Fisher's estuarine moth (*Gortyna borelii lunata*);
- great crested newt (*Triturus cristatus*)
- common otter (*Lutra lutra*)
- wild cat (*Felis silvestris*);
- Lesser Whirlpool Ram's-horn Snail (*Anisus vorticulus*)
- Smooth snake (*Coronella austriaca*);
- Sturgeon (*Acipenser sturio*);
- Natterjack toad (*Bufo calamita*); and
- All marine turtles.

Regulation 43 makes it an offence to:

- a) Deliberately capture, injure or kill any wild animal of a EPS;
- b) Deliberately disturb wild animals of such a species;
- c) Deliberately takes or destroys the eggs of such a species;
- d) Damages or destroys a breeding site or resting place of such an animal.

Disturbance in the context of the offences above is disturbance which is likely to impair the ability of the animals to survive, to breed or reproduce, to nurture their young, to hibernate, to migrate; or to affect significantly the local distribution of the species.

Licences can be granted by the relevant SNCO for developments (sometime referred to as EPS Licences or Derogation Licences) providing the purposes of the licence is for "preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment".

10.1.3 UK Protected Species

10.1.3.1 Wildlife and Countryside Act 1981

The Wildlife and Countryside Act 1981 provide protect to both EPSs and other species including wild birds, water voles and reptiles.

All wild birds, their nests and eggs are protected with some rare species afforded extra protection from disturbance during the breeding season (these species are listed in Schedule 1 of the Act). It is illegal to take any wild bird or damage or destroy the nests and eggs of breeding birds. There are certain exceptions to this in respect of wildfowl, game birds and certain species that may cause damage.

In England and Wales water voles are listed on Schedule 5 of the Wildlife and Countryside Act 1981, receiving full protection since 2008. The Wildlife and Countryside Act 1981 together with amending legislation, lists the following offences:

- Intentionally killing, injuring or taking a water vole by any method;
- Intentionally or recklessly damaging or destroying a water vole place of shelter or protection;
- Intentionally or recklessly damaging disturbing a water vole whilst it is occupying such a structure or place it uses for shelter or protection;
- Intentionally or recklessly obstructing access to a water vole's place of shelter or protection;
- Selling, offering for sale, or possessing or transporting for the purposes of sale, any live or dead water vole, or any part or derivative, or advertising any of these for buying or selling.

All native reptile species in the UK are subject to partial protection from intentional or reckless killing or injury only.

The Act also includes provisions for the control of invasive non-native species (INNS). Under these provisions it is an offence to:

- release or allow to escape into the wild any animal which is not ordinarily resident or a regular visitor to Great Britain, or is included in Schedule 9 of the Act;
- plant or otherwise cause to grow in the wild any plant which is included in Schedule 9 of the Act.

People undertaking works in proximity to invasive non-native plant species should take all reasonable steps and exercise all due diligence to avoid committing an offence.

10.1.3.2 The Protection of Badgers Act 1992

Badger (*Meles meles*) and their setts are protected under the Protection of Badgers Act 1992 which makes it an offence to kill, injure or take a badger, or interfere with a sett.

10.1.3.3 Hedgerow Regulations 1997

The Hedgerow Regulations 1997 set out a framework for the protection of hedgerows against removal where they are deemed to be important either due to their age, ecological or archaeological features. Approval is required from the Local Planning Authority prior to the removal of Important Hedgerows.

10.1.3.4 National Park and Access to the Countryside Act 1949 (as amended)

Local Nature Reserves can be given protection against damaging operations through powers within the National Parks and Access to the Countryside Act 1949. However, this protection is usually conveyed

through inclusion of protection within local planning policy relating to these sites and other non-statutory sites such as Sites of Importance for Nature Conservation.

Appendix B – Photographs

Photo 1: Pond 1 to the South of the Proposed Development



Photo 2: Species-poor Acid Grassland / Blaenmorlais SINC



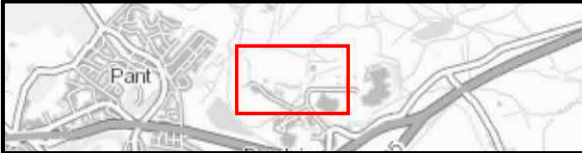
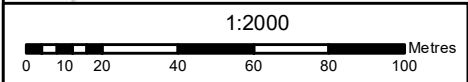
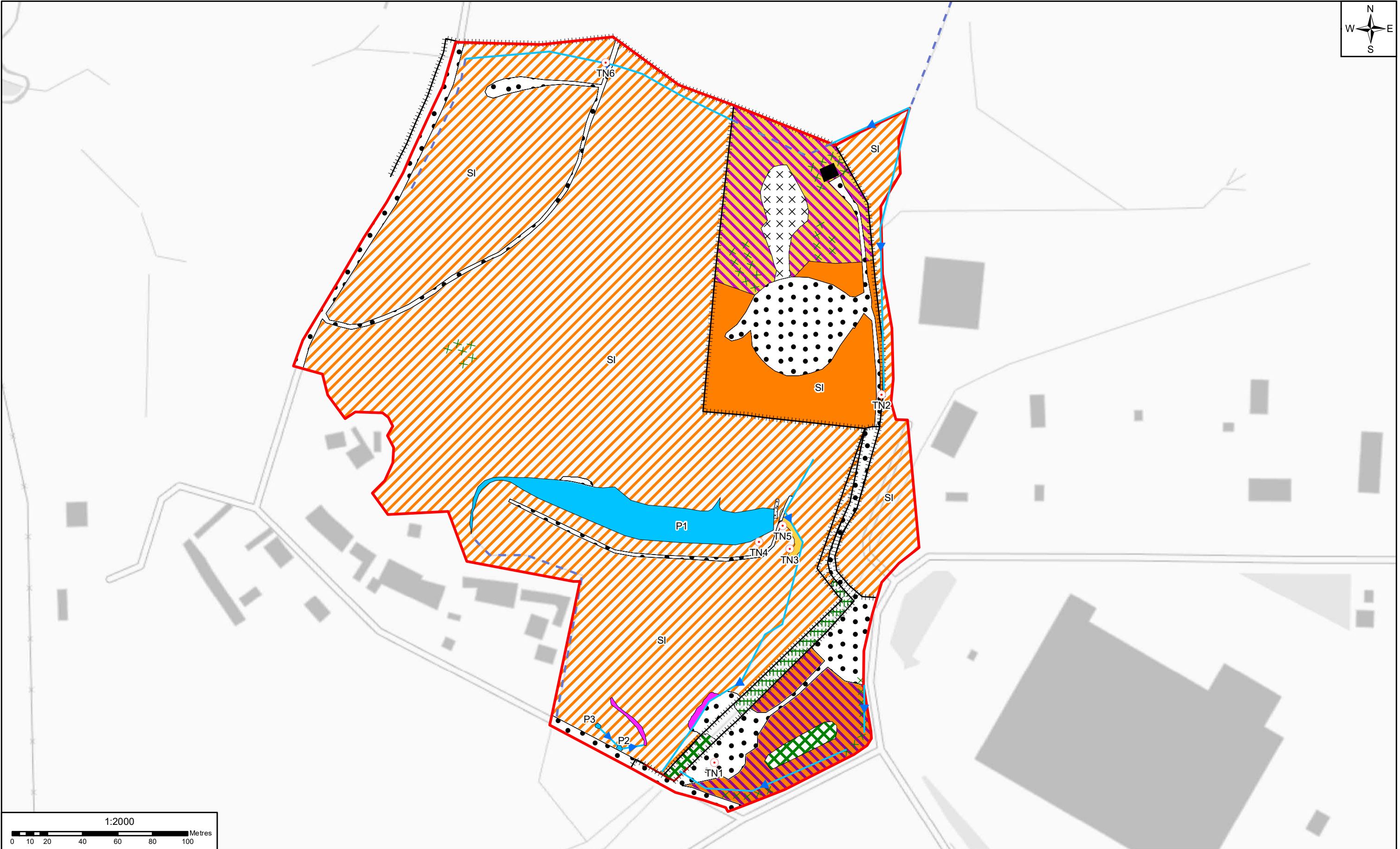
Photo 3: Overgrazed Species-poor Acid Grassland / Blaenmorlais SINC and existing Site boundary



Appendix C – Phase 1 Habitat Map, Site Plan and Landscape Plan

Phase 1 Target Notes

Number	Description
TN1	Indian balsam within bare ground (<i>outside application boundary</i>)
TN2	Japanese Knotweed along eastern boundary
TN3	Rocky stream and heathland area, suitable for reptiles (<i>outside application boundary</i>)
TN4	Reptile basking habitat – piles of rocks (<i>outside application boundary</i>)
TN5	Invertebrate habitat – exposed mud bank suitable for burrowing invertebrates (<i>outside application boundary</i>)
TN6	Ditch heavily polluted with oil and rubbish (<i>outside application boundary</i>)



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01	29/11/19	Initial Issue	YG	KO	SS - D
REV	Date	Description	Drawn	Check	Approv

LEGEND			
Site Boundary	Acid Flush	Marshy Grassland	
Target Note	Bare Ground		
Dry Ditch	Dense Scrub		
Fence	Dry Dwarf Shrub Heath		
Running Water	Wet Dwarf Shrub Heath		
Scattered Scrub	Standing Water		
Wall	Neutral Grassland - Semi-Improved		
Ephemeral/ Short Perennial	Acid Grassland - Semi-Improved		
	Hedge with trees - species-poor		

Client

Site
Pengamddu

Client
Dŵr Cymru Cyl
Penyryn Road
Nelson
Treharris
Mid Glamorgan
CF46 6LY

Suitability Description: PRELIMINARY/CONFIDENTIAL			
Designed	K.O'Brien	Date 29NOV19	Signed
Drawn	Y.Giri	Date 29NOV19	Signed
Checked	K.O'Brien	Date 29NOV19	Signed
Approved	S. Saunders -Davies	Date 29NOV19	Signed
Scale:	1:2000	Datum:	AOD
Original Size:	A3	Grid:	OS
Suitability Code:	S2	Project Number:	10032821

PROJECT:
Pengamddu

TITLE:
Pengamddu
Phase 1 Survey Plan

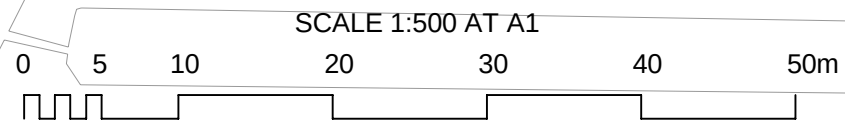
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Drawing Number:
B10237-118878-ZZ-XX-DR-NA-EI0057

Issue
01



PLAN
1 : 500



NOTES:

1. SITE ADDRESS:
PENGARNDDU SRV. MERTHYR TYDFIL. CF48 2TA.
2. DO NOT SCALE FROM THIS DRAWING.
3. SOW PROPOSED GRASS AND WILDFLOWERR MIX AT 3-4 GRAMS PER SQUARE METRE, INCLUDES 80% MEADOW GRASS, 20% WILDFLOWERS - PERCENTAGES BY SEEDWEIGHT AS FOLLOWS:
BETONY STACHYS OFFICINALIS 1.2% OF MIX
BIRDSFOOT TREFOIL LOTUS CORNICULATUS 0.8% OF MIX
BLACK KNAPWEED CENTUREA NIGRA 1.4% OF MIX
COMMON CATSEAR HYPOCHAENS RADICATA 0.2% OF MIX
COMMON SORREL RUMEX ACETOSA 0.8% OF MIX
CRESTED DOGSTAIL CYNOSURUS CRSTATUS 16% OF MIX
FRAGRANT AGRIMONY AGRIMONA PROCERA 2% OF MIX
GREATER BIRDSFOOT TREFOIL LOTUS ULIGNOSUS 0.8% OF MIX
HIGHLAND BENT AGROSTIS CASTELLANA 8% OF MIX
LADY'S BEDSTRAW GALIUM VERUM 2% OF MIX
MEADOW BUTTERCUP RANUCULUS ACNIS 2% OF MIX
OXEYE DAISY LEUCANTHEMUM VULGARE 1% OF MIX
RAGGED ROBIN LYCHNIS FLOS-CUCULI 0.8% OF MIX
RED FESCUE FESTUCA RUBRA SSP. PRUINOSA 16% OF MIX
SHEEP'S SORREL RUMEX ACETOSELLA 0.4% OF MIX
SHEEP'S FESCUE FESTUCA OVINA 32% OF MIX
SLENDER ST. JOHN'S WORT HYPERCUM PULCHRUM 0.6% OF MIX
SNEEZEWORT ACHILLEA PTARMICA 0.8% OF MIX
SWEET VERNAL GRASS ANTHOXANTHUM ODORATUM 4% OF MIX
TUFTED VETCH VICIA CRACCA 2% OF MIX
WAVY HAIRGRASS DESCHAMPSIA FLEXUOSA 4% OF MIX
FOXGLOVE DIGITALIS PURPUREA 0.8% OF MIX
YARROW ACHILLA MILLEFOLIUM 1.6% OF MIX
YELLOW RATTLE RHINANTHUS MINOR 0.8% OF MIX

LEGEND:

- PROPOSED 1.8M TALL WELDMESH FENCING
- APPLICATION BOUNDARY
- EXISTING SITE BOUNDARY
- EXISTING GRASSLAND RETAINED, OR GRASSLAND REINSTATED TO MATCH EXISTING WHERE DISTURBED DURING CONSTRUCTION
- EXISTING SHRUBS/SCRUB TO BE RETAINED AND PROTECTED
- EXISTING SHRUBS/SCRUB TO BE REMOVED AND REINSTATED WITH GRASS AND WILDFLOWER MIX (SEE NOTE 3)
- PROPOSED GRASS AND WILDFLOWER MIX (SEE NOTE 3)
- EXISTING STRUCTURES AND ACCESS ROAD
- EXISTING WATERBODY
- PROPOSED BRASH PILE FOR REPTILES
- PROPOSED HIBERNACULA FOR GREAT CRESTED NEWTS

P02	11.09.20	BSW	UPDATED FOLLOWING PUBLIC CONSULTATION	EH	MT	14.09.20
P01	25.06.20	TSM	FOR INFORMATION	SC	MT	25.06.20
Rev.	Date.	BIM.	Description.	Chk.	App.	Iss Date.



Project Name: PENGARNDDU SERVICE RESERVOIR					
Drawing Title: LANDSCAPING AND PLANTING GENERAL ARRANGEMENT					
Suitability: FOR INFORMATION					Suitability Code: S2
Originator: TM	Designer: MP	Date: 25.06.20			
Internal Project Number: IS44	Scale: 1:500 @ A1	Rev: P02			
Drawing Number: B10237-123532-XX-XX-DR-LA-DI9003					MMB MORT MACDONALD MERTHYR

Dwr Cymru Cyl gives this information as to the position of its underground apparatus by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New Roads and Streetworks Act 1991 and of the Company's right to be compensated for any damage to its apparatus.

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Appendix D – Baseline Ecology Report

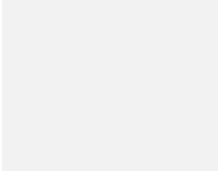
PENGARNDDU SRV

Baseline Ecological Survey Report

NOVEMBER 2019



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Pengarnddu SRV – Baseline Ecological Survey Report

Baseline Ecological Survey Report

Author Elisabeth Brooks / Kailey O'Brien

Checker Laura Cawley

Approver Sarah Simons

Report No B10237-118878-ZZ-XX-RP-NA-EI0059

Date NOVEMBER 2019

VERSION CONTROL

Version	Date	Author	Changes
DRAFT	November 2019	Elisabeth Brooks / Kailey O'Brien	

This report dated 29 November 2019 has been prepared for Dwr Cymru Welsh Water (the "Client") in accordance with the terms and conditions of appointment dated 01 April 2019(the "Appointment") between the Client and Arcadis UK Ltd. ("Arcadis") for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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B10237-118878-ZZ-XX-DR-NA-EI0057 Phase 1 Survey Plan

B10237-118878-ZZ-XX-DR-NA-EI0058 NVC Quadrat Locations

APPENDICES

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Legislation and Policy

APPENDIX B

Local Record Centre Data

APPENDIX C

Phase 1 Target Notes

Plant Lists for main Phase 1 habitat types –
outside Welsh Water Compound

Plant Lists for main Phase 1 habitat types –
inside Welsh Water Compound

APPENDIX D

Habitat Suitability Index Assessment and
eDNA results

APPENDIX E

Photographs

APPENDIX F

National Vegetation Classification tables

APPENDIX G

Invertebrate Habitat Assessment – Desk Study
Results

APPENDIX H

Breeding Bird Results

1 Introduction

Arcadis Consulting (UK) Limited, was instructed by Dŵr Cymru Welsh Water as part of the Capital Delivery Alliance to undertake baseline ecological surveys of Pengarnddu Service Reservoir, Merthyr Tydfil as part of a proposal to extend the Welsh Water compound and install a new service level reservoir (hereafter referred to as the proposed development).

This report presents the findings of the surveys undertaken, summarises the existing ecological baseline conditions for the site and identifies key ecological constraints. The design of the proposed development is subject to ongoing optioneering, therefore an ecological impact assessment and mitigation design could not be undertaken at this time. The survey information can be used to inform the optioneering and detailed design of the proposed development within the site and assess whether any additional ecological surveys and/or mitigation and enhancement measures may be required once the design has been finalised.

1.1 Site Location/ Description

The proposed development site is located within the county borough of Merthyr Tydfil. The nearest main road is the A465 which is 350m to the south of the site. The main access is from a minor road to the east of the site. The site is surrounded by industrial warehouses to the east and arable and common land to the north and east. See Drawing B10237-118878-ZZ-ZZ-DR-CA-CI0045 for a plan of the proposed development site.

2 Planning Policy and Legislation

The legislation and policy relevant to the proposed Development are summarised in Appendix A.

3 Methodology

3.1 Overview

This section outlines the methodology for the desk study, Extended Phase 1 habitat and protected species walkover survey, NVC survey, and surveys for great crested newts and breeding birds.

3.2 Desk Study

A desk study was undertaken in order to identify any existing ecological information relating to the proposed development site and its surroundings. The following sources of information were consulted.

- The Multi-Agency Geographical Information System (MAGIC) website (Ref 1) was used to search for statutory designated sites of nature conservation value within 2km of the site. The search buffer was extended to 10km for Special Areas of Conservation (SAC) sites designated for bats.
- The South East Wales Biodiversity Records Centre (SEWBRc) data was collected in May 2019 via Aderyn: Biodiversity Information & Reporting Database for the Welsh Water Capital Delivery Alliance (Ref 2) to check whether they held any records of protected species or species of conservation concern within 2km of the proposed development site. This included a request for data for priority habitats and species as listed under Section 7 of the Environment (Wales) Act 2016 (Ref 3). A summary of the results of this search is presented in Appendix B.
- The Forestry Commission's Ancient Woodland Inventory Map (Ref 4) was reviewed in June 2019 in order to identify any areas of ancient semi-natural woodland, restored ancient woodland and/ or plantation on an ancient woodland site within 2km of the proposed development site.
- The Council Ecologist was contacted June 2019 with a request for information on Tree Preservation Orders (TPOs) within 100m, and Local Nature Conservation Sites within 2km of the proposed development site.

3.3 Field Survey

In all cases the surveys were undertaken by suitably experienced and, where specified, licenced Arcadis ecologists.

3.3.1 Extended Phase 1 Habitat Survey

The extended Phase 1 habitat survey was undertaken during May 2019. This comprised a walkover survey to map Phase 1 habitats present within the proposed development site following the standard survey methodology (Ref 5). Dominant plant species were noted, as were any uncommon species or species indicative of particular habitat types, but there was no attempt to compile exhaustive species lists. Botanical names follow Stace (Ref 6) for higher plants.

The habitats were assessed for their potential to support protected/ notable species of plants and/ or animals and observation was made of any incidental signs of protected/ notable species. The outputs of the surveys include a Phase 1 habitat plan and a set of Target Notes (TNs) which are illustrated on Drawing 10032821-ARC-XX-XX-DR-EC-0001-01 and Appendix C.

3.3.2 National Vegetation Classification

The survey was carried out in accordance with the NVC Users Handbook (Ref 7)). The aim of the NVC survey was to ascertain whether the acid grassland communities within the proposed development boundary met the Criteria for the Selection of Sites of Importance for Nature Conservation in the County Boroughs of Blaenau Gwent, Caerphilly, Merthyr Tydfil and Rhondda Cynon Taff (the 'Mid-Valleys Area') (Ref 8). There was no intention to provide a complete audit of NVC communities within the proposed development boundary. The results of the Phase 1 habitat survey were used to identify homogenous stands of acid grassland to be surveyed.

These stands of vegetation were sampled using a standard 2m x 2m square quadrat. The following stands of vegetation were chosen to be surveyed:

- Stand A – Horse-grazed acid grassland outside of the Welsh Water compound; and
- Stand B – Semi-improved acid grassland inside the Welsh Water compound.

The location of the homogenous stands and quadrat locations is presented in Drawing B10237-118878-ZZ-XX-DR-NA-EI0058.

The plant species rooted within each quadrat were recorded. The percentage cover of each plant species as an aerial projection within the quadrat was recorded using the Domin logarithmic scale, as defined in Table 1 below:

Table 1 - Domin values

Percentage Cover	Domin Value
91-100%	10
76-90%	9
51-75%	8
34-50%	7
26-33%	6
11-25%	5
4-10%	4
<4% (many individuals)	3
<4% (several individuals)	2
<4% (few individuals)	1

The NVC survey was undertaken by an experienced botanist, Sarah Simons, on 21 May 2019. The quadrat results were compared against the habitat keys and floristic tables in the relevant NVC handbooks (Volumes 2 and 3) to confirm the identification of the vegetation communities present (Ref 9 and Ref 10). In total 10 No. 2m x 2m quadrats were sampled.

3.3.3 Protected Species Survey

3.3.4 Terrestrial invertebrate habitat assessment

The proposed development site was assessed by experienced terrestrial invertebrate surveyor, Rich Prew, to highlight features of particular interest to priority invertebrate species and ascertain whether targeted terrestrial invertebrate surveys should be recommended. This included a walkover of the site undertaken in June 2019 where features and habitat types suitable for priority invertebrate species were noted.

3.3.5 Habitat Suitability Index (HSI) Assessment of Waterbodies

In accordance with best practice guidance (Ref 11), waterbodies that were located up to 250m from the proposed development, as identified from Ordnance Survey mapping, were surveyed in conjunction with the extended Phase 1 habitat survey in June 2019 to determine their suitability for breeding great crested newts (*Triturus cristatus*). The survey was carried out by an accredited agent newt surveyor (Kailey O'Brien accredited agent licence number 79593:OTH:SA:2018).

At each of these waterbodies, a Habitat Suitability Index (HSI) assessment was undertaken. The HSI scoring system scores a waterbody against ten habitat suitability indices including, for example, water quality, the likely presence/ absence of fish and aquatic plant cover. From these ten suitability indices, a geometric mean is calculated which gives an overall numerical index ranging from between zero and one. A score of near zero indicates sub-optimal habitat whilst a score near one represents optimal habitat for use by breeding great crested newts.

However, the HSI is not a substitute for undertaking newt surveys; if a waterbody is awarded a high HSI score this does not guarantee that great crested newts will be present, only that they are more likely to be present in this waterbody than in a waterbody with a sub-optimal score. As such, HSI scores alone cannot be used to rule ponds in or out from further survey. The HSI results can be found in Appendix D.

A total of 3 waterbodies were assessed in this way (ponds labelled P1 – P3 on Drawing B10237-118878-ZZ-XX-DR-NA-EI0057).

3.3.6 Environmental DNA (eDNA) survey

GCN release their DNA into ponds via their saliva, skin cells and urine where it will remain for several weeks. Environmental DNA (eDNA) surveys are undertaken by obtaining water samples from the waterbody (in accordance with guidance published by Biggs *et. al.*, 2014 (Ref 12)) which are analysed in a laboratory to identify the presence/absence of GCN DNA which will determine if GCN have used the pond.

Three possible results will be presented by the testing:

- Positive – GCN eDNA has been detected in the pond;
- Negative – GCN eDNA has not been detected within the pond; or
- Inconclusive results – GCN eDNA has not been detected but the sample may have been degraded (e.g. not stored correctly and/or at the correct temperature before testing) or the test inhibited (e.g. by an unexpected chemical identified within the sample).

Environmental DNA (eDNA) surveys were undertaken on 12th June 2019 by Kailey O'Brien assisted by Libby Brooks to confirm the presence/absence of GCN within waterbodies (P1, P2 and P3). The samples were analysed by Nature Metrics.

3.3.7 Breeding bird surveys

Breeding bird surveys followed the Breeding Bird Survey (BBS) methodology from the British Trust of Ornithology (Ref 13). Transect bird surveys were undertaken between May and June 2019 by Ornithologist, Libby Brooks, to identify the presence and distribution of breeding birds (i.e. nesting and foraging) on site. The surveys were undertaken 45 minutes after dawn and took place across a variety of weather conditions to obtain a representative picture of bird numbers and activity. It was not possible to survey in April due to the timing of commission.

During the survey, a predetermined transect route was walked particularly focusing on areas of interest to breeding birds (i.e. common land and scrub). All bird species including species of local/or national nature conservation importance were recorded and mapped using standard BTO species and behaviour codes (Ref 13). The behaviour codes were used to indicate whether the individuals were likely to be breeding within the survey area. Clear evidence of breeding was determined by types of activity or signs, such as males singing and alarm calls. The approximate grid reference in which birds were recorded was also noted. Species of nature conservation importance recorded included:

- species that receive, protection under Schedule 1 of the Wildlife and Countryside Act 1981(as amended) (Ref 14) ;
- species listed under Section 7 of the Environment (Wales) Act 2016 (Ref 3); and
- birds that are on the Red or Amber lists of Birds of Conservation Concern (BoCC) in the UK (Ref 15).

An inventory of all other species was also produced for each survey visit.

4 Baseline Ecological Conditions

4.1 Designated Sites

4.1.1 Statutory Designated Sites

There is one statutory designated site within 2km of the proposed development site, as listed in Table 2 below.

Table 2: Statutory Designated Sites

Site Name	Reasons for Designation	Location in relation to the proposed development
Cwm Taf Fechan Woodlands Site of Special Scientific Interest (SSSI)	Mixed deciduous woodlands, with one of the few Glamorgan stations for limestone fern <i>Gymnoscarpium robertianum</i> . There are interesting plant communities in flushes around tufa springs and luxuriant growths of bryophytes in the splash zone of the river.	1.9km to the west of the site.

There are no TPOs inside or within 100m of the site boundaries.

4.1.2 Non-Statutory Designated Sites

There are six non-statutory designated sites within 2km of the proposed development, as listed in Table 3 below.

Table 3: Non-Statutory Designated Sites

Site Name	Reasons for Designation	Location in relation to the proposed development
Blaenmorlais (Site of Importance for Nature Conservation (SINC))	A large area supporting a mosaic of upland habitats at the western edge of Merthyr Common. Mainly acid grasslands with acidic flushes, grass-heaths, dry heathlands, marshy grasslands, bracken (<i>Pteridium aquilinum</i>) slopes and smaller areas of wet heathland and scrub.	Located within the site boundary covering the southern and eastern boundary.
Merthyr Common North (SINC)	Very extensive area of upland common land supporting a mosaic of both wet and dry moorland habitats. These include extensive areas of unimproved acid grassland, marshy grassland, dry heathland and grass-heath, together with areas of wet heath, acid flush, bracken stands, scree and exposed gritstone bedrock. Breeding populations of skylark (<i>Alauda arvensis</i>), meadow pipit (<i>Anthus pratensis</i>) and snipe (<i>Gallinago gallinago</i>) are present, and numerous other bird species of interest have been recorded. Other species of interest include grayling butterfly (<i>Hipparchia semele</i>) and a range of localised moths.	Located along the north-eastern boundary of the site.
Bryniau (SINC)	Semi-upland site comprising a complex mosaic of mainly acidic habitats associated with disused quarries and spoil tips	Located approximately 1.4km to the west of the site.

Site Name	Reasons for Designation	Location in relation to the proposed development
	Species of interest include the regionally scarce royal fern (<i>Osmunda regalis</i>) and climbing corydalis (<i>Ceratocarpus claviculata</i>), along with numerous localised plant species. The ponds of the site support good populations of common amphibian species and great crested newt has also been recorded.	
Morlais Hill (SINC)	Complex semi-upland area of limestone-influenced habitats partly derived from old limestone quarries (Morlais Quarries) and screes associated with the former Morlais Castle. Part of the site is currently in use as a golf course. Supports several nationally scarce and regionally rare and scarce plant species. Grayling butterfly occurs in the quarries and small pearl-bordered fritillary butterfly (<i>Boloria selene</i>) has been recorded in the past	Located approximately 1.4km to the west of the site.
Tyle Haidd (SINC)	Valley slopes above the Afon Taf Fechan on limestone geology with screes and a disused quarry (Tyle Haidd). Supports unimproved, species-rich, semi-upland calcareous grassland of high biodiversity value, along with calcareous ledge and crevice communities, calcareous scrub woodland, bracken stands and small areas of acid grassland. Supports several nationally scarce and regionally rare and scarce plant species.	Located approximately 1.6km to the north-west of the site.
Cwm Taf Fechan (SINC)	A long linear site based on the valley of the Afon Taf Fechan and containing the Cwm Taf Fechan Woodlands SSSI. The SINC covers a more extensive area of adjacent habitats supplementary to those of the SSSI. Much of the woodland is ancient semi-natural ash (<i>Fraxinus excelsior</i>), with some oak (<i>Quercus spp</i>) locally. Supports several nationally scarce and regionally rare and scarce plant species. Birds of interest on the river include kingfisher (<i>Alcedo atthis</i>) and dipper (<i>Cinclus cinclus</i>). Many rare and scarce invertebrate species have been recorded from the SSSI, including small pearl-bordered (<i>Boloria selene</i>) and silver-washed fritillary (<i>Argynnis paphia</i>) butterflies.	Located approximately 1.7km to the north-west of the site.

There are four areas of ancient semi-natural woodland within 2km from site. The closest area of ancient woodland is 1.9km to the west of the site.

The site is situated in the South Wales Valley Important Invertebrate Area (IIA). IIAs are areas listed by Buglife as 'nationally or internationally significant places for the conservation of invertebrates and the habitats upon which they rely'. There is as of yet no detail to the species or habitats that are the reason for this selection, but it may be due to the brownfield sites resulting from historical mining land use in the south Wales area which are known to be of high conservation value for invertebrates.

4.2 Phase 1 Habitats

4.2.1 Overview

The area outside of the Welsh Water compound is predominantly horse-grazed semi-improved acid grassland with two small areas of species-poor acid flush, one small area of dry dwarf shrub heath and areas of disturbed/ bare ground. There are three ponds located outside of the compound. The area within the compound is semi-improved grassland, wet dwarf shrub heath with scattered scrub, ephemeral/ short perennial and areas of disturbed/ bare ground. See Photo 1 in section 4.4.8 to see the different habitats outside and within the Welsh Water Compound. A hedgerow/ treeline is present toward the south-east of site with an area of marshy grassland, bare ground and scrub on the roadside verge, which has recently been used as a site compound.

The identified habitats are presented on Drawing B10237-118878-ZZ-XX-DR-NA-EI0057 and target notes and plant species lists are included in Appendix C.

4.2.2 Outside of Welsh Water compound

Semi-improved acid grassland

The majority of the proposed development area comprises semi-improved acid grassland with Sheep's Fescue (*Festuca ovina*), Mat-grass (*Nardus stricta*), Sweet Vernal-grass (*Anthoxanthum odoratum*) Sheep's Sorrel (*Rumex acetosella*) and Creeping bent (*Agrostis stolonifera*) and occasional Tormentil (*Potentilla erecta*), Heath Bedstraw (*Galium saxatile*) and Heath Wood-rush (*Luzula multiflora*). A number of moss species were also identified including *Rhytidiadelphus squarrosus* and *Polytrichum* species. The grassland was closely grazed by horses and rabbits and included nutrient-rich patches dominated by nettles (*Urtica dioica*) and dock species (*Rumex* sp.), several areas of fly-tipping, and disturbed ground from off-roading activities. Photos 1 and 2 in Appendix E show this area and a more detailed plant list can be found in Appendix F.

Acid flush

Two areas of species-poor acid flush were located towards the south-east of the site, one area associated with a running stream and one surrounding a pond (P2). These were dominated by grasses similar to the surrounding grassland but with higher rush cover (Soft-rush (*Juncus effusus*)), bare ground open water and some bryophyte cover.

Dry dwarf shrub heath

A small area of dry dwarf shrub heath was identified adjacent to a small running stream (TN3). Species included Heather (*Calluna vulgaris*), Sweet Vernal-grass, Cuckooflower (*Cardamine pratensis*), and mouse-ear-hawkweed (*Pilosella officinarum*) in large patches. Yellow-rattle (*Rhinanthus minor*) was also identified in this area. This area included exposed rock piles and scattered cover suitable for reptile basking (TN4). See photos 3 and 4 in Appendix F.

Marshy grassland

The road verge outside of the main acid grassland field comprised marshy grassland with hard rush (*Juncus inflexus*) and soft rush (*Juncus effusus*) throughout and hairy sedge (*Carex hirta*) locally abundant. Species included Cock's-foot (*Dactylis glomerata*), Yorkshire-fog (*Holcus lanatus*), Sweet Vernal-grass, Tufted hair-grass (*Deschampsia cespitosa*), Common Vetch (*Vicia sativa*), Red Clover (*Trifolium pratense*), Smooth Tare (*Vicia tetrasperma*), Ribwort Plantain (*Plantago lanceolata*), Common Cinquefoil (*Potentilla simplex*), Meadow Buttercup (*Ranunculus acris*) and Creeping Buttercup (*Ranunculus repens*). Photos 5 and 6 in Appendix F show this area and a more detailed species list can be found in Appendix C.

The area of marshy grassland had areas of recently disturbed bare ground and scattered scrub occurred throughout, as detailed below.

Dense/ continuous scrub/ scattered scrub

Areas of dense and scattered scrub were identified within the marshy grassland. Species identified within the scrub were Hawthorn (*Crataegus monogyna*), Willow (*Salix sp.*), Bramble (*Rubus fruticosus agg.*) and Gorse (*Ulex europaeus*).

Hedgerow/ treeline

A hedgerow/treeline divides the site in the south-east corner and continues along the access track up to the Welsh Water compound boundary. Species recorded included Hawthorn, Hazel (*Corylus avellana*), Beech (*Fagus sylvatica*), Corsican Pine (*Pinus nigra subsp. laricio*), Field Maple (*Acer campestre*), Willow, Elder (*Sambucus nigra*), Alder (*Alnus glutinosa*), Oak (*Quercus sp.*), Blackthorn (*Prunus spinosa*) and Rowan (*Sorbus aucuparia*).

Standing water

Three areas of standing water were identified (P1, P2 and P3). One large waterbody (P1) is located in the centre of site which is used as drinking water and has heavily poached edges and two smaller waterbodies (P2 and P3) were located adjacent to a road leading up to a residential property. These were likely to be ephemeral and were associated with drains but did contain some aquatic vegetation. Pond photographs can be found within Appendix E.

Running water

Two flowing watercourses were identified within the site boundary, a ditch along the northern boundary (TN6) of the site and a stream to the south of the site. A small area of dry dwarf shrub heath was identified adjacent to a small running stream. Species associated with the stream included Common Water-crowfoot, Water Horsetail (*Equisetum fluviatile*) and Cuckooflower in small patches. The stream edges included steep cliffs of partially vegetated bare ground suitable for a range of invertebrates (TN5). A plant species list can be found in Appendix C.

Bare ground

An area of bare ground was identified in the south-east corner of the site, which appeared to be left from previous construction activities. Regrowth of Indian (Himalayan) balsam (*Impatiens glandulifera*) (TN1) was evident throughout.

4.2.3 Inside Welsh Water compound

Semi-improved neutral grassland

Approximately half of the habitat within the Welsh Water compound (around the reservoir and south of the reservoir) was assessed as semi-improved neutral grassland comprising of Cock's-foot (*Dactylis glomerata*), Yorkshire-fog (*Holcus lanatus*), Daisy (*Bellis perennis*), Hop Trefoil (*Trifolium campestre*), Ribwort Plantain (*Plantago lanceolata*) and Dandelion (*Taraxacum agg.*). Discrete patches comprised of Sweet Vernal-grass with some Mouse-ear-hawkweed (*Pilosella officinarum*) and Canadian fleabane (*Conyza canadensis*) occurred on the reservoir slopes. The area directly adjacent to the reservoir appeared to be seeded grassland. Photos 7 and 8 in Appendix F show this area and a plant species list for this area can be found in Appendix C.

Wet dwarf shrub heath

The northern half of the compound comprised wet dwarf shrub heath dominated by Heather and Purple Moor-grass (*Molinia caerulea*) tussocks. Other species here included Tormentil, Heath Wood-rush, Heath Bedstraw, Sheep's Fescue, Common Milkwort (*Polygala vulgaris*) and Sheep's Sorrel (*Rumex acetosella*). A number of moss species were also identified including *Polytrichum* species and *Rhytidiadelphus squarrosus*. Photos 9 and 10 in Appendix F show this area and a plant species list can be found in Appendix C.

A bank located to the north-east of the wet dwarf shrub heath (west of the building) was assessed as more species-rich in comparison to the rest of the habitat with greater heather cover.

Bare ground

Bare ground was recorded within the compound. A track leads from the site access gate, north to a building and the reservoir is capped with gravel chippings. East of the track (along the site boundary) was one stand of Japanese Knotweed (*Fallopia japonica*) (TN2).

Ephemeral/ short perennial

A small area of disturbed, re-seeded ephemeral ground was identified north of the reservoir. Species identified within this area included Mouse-ear-hawkweed (*Pilosella officinarum*), Dock species (*Rumex* sp.) and Spear Thistle (*Cirsium vulgare*).

Scattered scrub

Scattered scrub is located throughout the wet dwarf shrub heath. Species recorded included Hawthorn, Willow and Rowan.

4.3 NVC Habitats

The results of the NVC survey are summarised below, with photographs of the vegetation presented in Appendix E. The two NVC communities surveyed are broadly illustrated on Drawing B10237-118878-ZZ-XX-DR-NA-EI0058 and the detailed NVC floristic tables are presented in Appendix F.

Area A (Quadrats A1 to A5)

The horse-grazed acid grassland fields had an average of 12 species recorded in the five quadrats. The community matched the U4 *Festuca ovina*-*Agrostis capillaris*-*Galium saxatile* grassland which is typical of grazed pasture in the uplands of South Wales. This type of grassland typically occurs as a grass mixture dominated by Sheep's Fescue, Common Bent (*Agrostis capillaris*) and Sweet Vernal-grass close-cropped into a tight, fine-textured turf. It appeared to be species-poor due to close-grazing and nutrient enrichment but does meet the criteria for SINC selection having the following nine species present out of a minimum of 7 required for consideration: Sheep's Fescue, Heath Bedstraw, Heath Wood-rush, Mat Grass (*Nardus stricta*), Mouse-ear-hawkweed, Heath Milkwort (*Polygala serpyllifolia*), Sheep's sorrel, Heather and Heath Rush (*Juncus squarrosus*). This type of acid grassland has the potential to support a rich fungal diversity which would not have been evident to surveyors at the time of survey.

Area B (Quadrats B1 to B5)

The tussocky grassland within the Welsh Water compound most closely aligned with the M25 *Molinia caerulea* – *Potentilla erecta* mire community due to the overwhelming dominance of large *Molinia* tussocks. There were few other species in several of the quadrats with a large proportion of bare ground and leaf litter being recorded. Soft Rush, Tormentil and Heath Wood-rush were seen most commonly. Due to the species-poor nature of the grassland this area does not meet the criteria for SINC selection having only five species of the required eight for an area of 0.2ha or 12 for 0.5ha. The heather covered embankment had a higher species-diversity than the lower grounds of the *Molinia* tussocks. Species recorded in the Phase 1 habitat survey have been included in the assessment of SINC criteria.

4.4 Species and Species Groups

4.4.1 Plants

4.4.1.1 Protected / Priority Plant Species

Records of thirty protected/priority plant species within 2km of the site were returned by the desk study. These species included records for Bluebell (*Hyacinthoides non-scripta*), Eyebright (*Euphrasia micrantha*) and Upright Brome (*Bromopsis erecta*). Of the 30 protected/priority plant species returned by the desk study, Bluebell is awarded full protection under the Wildlife and Countryside Act 1981, as amended (Ref 14), four species are listed on the UK Red Data Book (RDB1, UK) listing based on IUCN guidelines (Ref 16), three are listed on the Welsh Red Data Book (RDB1, Wales) listing based on IUCN guidelines (Ref 17) and 24 species are listed as locally important species to SEWBRc.

The closest record of Bluebell is 900 metres north of the site. The closest record of any protected or priority plant species is of Floating Bur-reed (*Sparganium angustifolium*) 90 metres south of the site, listed as a locally important species to SEWBRcC.

4.4.1.2 Non-native Invasive Plant Species

The desk study returned records of Sea-buckthorn (*Hippophae rhamnoides*) within 2km of the site. Sea-buckthorn is listed as an Invasive Non-Native Species (INNS). The closest record is 600 metres south of the site.

The Extended Phase 1 habitat survey identified Japanese Knotweed and Indian (Himalayan) balsam within the site boundary. Japanese Knotweed was located within the site compound along the eastern boundary of site (TN2). Indian balsam was located in the south-eastern corner of site within bare ground (from previous works) and hedgerow (TN1).

Japanese Knotweed and Indian balsam are listed on Schedule 9 of the Wildlife and Countryside Act 1981, as amended (Ref 14). Section 14 of the Act makes it an offence to plant or otherwise cause these plants to grow in the wild. Measures should be put in place to ensure that any proposed development does not disturb any areas that support Japanese Knotweed or Indian Balsam or cause it to spread.

4.4.2 Terrestrial Invertebrates

The desk study returned records of 12 priority species within 2km of the site: knot grass (*Acronicta rumicis*), small heath (*Coenonympha pamphilus*), small square-spot (*Diarsia rubi*), small phoenix (*Ecliptopera silaceata*), dingy skipper (*Erynnis tages*), autumnal rustic (*Eugnorisma glareosa*), brindled beauty (*Lycia hirtaria*), white ermine (*Spilosoma lubricipeda*), buff ermine (*Spilosoma lutea*), anomalous (*Stilbia anomala*), cinnabar (*Tyria jacobaeae*) and dark-barred twin-spot carpet (*Xanthorhoe ferrugate*). All 12 priority species are listed on Section 7 of the Environment (Wales) Act 2016 (Ref 3).

The desk study also returned a record of Buff-tailed bumblebee (*Bombus terrestris*) 1.2km east of the site. Buff-tailed bumblebee is listed on the Merthyr Tydfil Local Biodiversity Action Plan (Ref 18).

The Pengarnddu reservoir site as a whole contains a topographically diverse landscape situated on a south facing slope containing a mosaic of habitats with diverse vegetation structure in places. The diversity of vegetation structure and plant species within the site, especially within the Welsh Water compound, around the stream running from the reservoir and within the marshy grassland road verge provides multiple niches for specialist invertebrates to inhabit. Species associated with upland heathland are likely to be found within the north of the site whereas the south of the site is more suited to wetland invertebrate assemblages. The site is suitable to support various priority species on particular habitats as shown in Appendix G.

4.4.3 Protected / Priority Aquatic Invertebrates

The desk study returned no records of aquatic invertebrates within 2km of the site. The waterbodies on site have the potential to support widespread aquatic invertebrates.

4.4.4 Protected / Priority Fish

One record of brown trout (*Salmo trutta*) was identified approximately 1.8km north-west of the site. This species is listed under Section 7 of the Environment (Wales) Act (Ref 3).

There are three permanent waterbodies within the site, which are all relatively shallow and less suitable to support fish.

4.4.5 Amphibians

The desk study returned no records of great crested newts (GCN) within 2km of the site. Records of common toad (*Bufo bufo*), common frog (*Rana temporaria*) and palmate newt (*Lissotriton helveticus*) were identified within 2km of the site. The closest of which was a common toad record approximately 500m east of the site.

There are three permanent waterbodies within the site boundary, all three ponds (P1, P2 and P3) have the potential to support amphibians. There were a number of dry ditches located to the north, west and south of the site.

HSI and eDNA survey results

The HSI assessment determined that one waterbody (P1) had 'good' suitability for supporting GCN and two (P2 and P3) had 'below average' suitability for supporting GCN. A summary of the HSI assessment is included in Table 4 below with full results included in Appendix E. Photographs are included in Appendix E.

The eDNA survey confirmed that three ponds (P1, P2 and P3) were not utilised by GCN in the weeks prior to sampling. Results of the eDNA surveys are included in Table 4 below.

Table 4: Summary of HSI and eDNA results

Waterbody Number	HSI score	Pond suitability	eDNA result
P1	0.74	Good	Negative
P2	0.57	Below average	Negative
P3	0.57	Below average	Negative

No amphibians were observed during HSI assessments or the eDNA surveys.

4.4.6 Reptiles

The desk study returned records of common lizard (*Zootoca vivipara*) within 2km of the site. The closest record was approximately 1.8km north-west of the site. Common lizard is listed under Section 7 of the Environment (Wales) Act 2016 (Ref 3).

The site has the potential to support reptile populations, the wet dwarf shrub heath located to the north of the compound provides suitable foraging and basking opportunities for reptiles, whilst the bare ground and surrounding area of the capped reservoir provides suitable basking spots. The treeline/hedgerow throughout the south-east of site would provide suitable hibernating opportunities for reptiles.

4.4.7 Birds

The desk study returned records of nine species afforded full protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (Ref 14) within 2km of the site. These included redwing (*Turdus iliacus*), peregrine (*Falco peregrinus*) and red kite (*Milvus milvus*). The closest record is of whooper swan (*Cygnus cygnus*) 350 metres west of the site.

Twelve species listed on the Red List of the Birds of Conservation Concern (BoCC) (Ref 15) have been recorded within 2km of the site including skylark (*Alauda arvensis*), song thrush (*Turdus philomelos*) and house sparrow (*Passer domesticus*). The closest record is of linnet (*Linaria cannabina*) 80 metres south of the site.

Twenty-five species listed on the Amber List of the BoCC (Ref 15), have been recorded within the 2km of the site including black-headed gull (*Chroicocephalus ridibundus*), house martin (*Delichon urbicum*) and kestrel (*Falco tinnunculus*). The closest record is of mallard (*Anas platyrhynchos*) 90 metres south of the site.

The results of the breeding bird surveys are described below, with detailed results tables provided in Appendix H.

Seven species protected under Section 7 of the Environment (Wales) Act 2016 (Ref 3) were identified on site. Of these seven species, four were considered likely to be breeding within the site due to suitability of the habitat on site. The additional three species were considered likely to be breeding outside of the site and to be using the site as a foraging resource. Table 5 shows the peak count for each of these species, their potential breeding status within the site, and their conservation status.

Nine other notable species (i.e. Birds of Conservation Concern in the UK and/or Wales) were recorded during the breeding bird transect surveys. Of these nine species, four were considered likely to be breeding within the site and the other five were considered to be likely to be breeding elsewhere and to be using the site as a foraging resource. Table 6 shows the peak count for each of these species, their potential breeding status within the site, and their conservation status.

Eighteen other bird species typical of upland and scrub habitat were also recorded during the breeding bird surveys. A full list of the other bird species recorded is presented in Appendix H.

The results of the breeding bird surveys identified that the hedgerows and scrub on the east and south eastern boundary of the site offer the most valuable foraging and nesting habitats for the majority of species on site.

The semi improved acid grassland had high to moderate potential to support ground nesting bird species such as meadow pipit (two observations) and skylark (three observations). The area is largely overgrazed and highly disturbed (horses and vehicles) with more favourable habitat to the north of the site (Merthyr Common SINC); however, territorial behaviour was observed. The reservoir in the centre of the site and surrounding small ponds/ditches offer suitable foraging habitat for a variety of gull and waterfowl. Whilst no overwintering bird surveys were undertaken, the reservoir is considered likely to provide high value foraging and roosting habitat for overwintering bird species. This is confirmed likely due to records of overwintering and wintering passage birds noted in the desk study (within 2km) including wigeon (*Anas penelope*) and teal (*Anas crecca*).

Conservation Status						Peak count per survey (May to June 2019)							
Species recorded	Latin	UK Red	UK Amber	Wales Red	Wales Amber	Sch. 1	Section 7	LBAP	15th May	16th May	6th June	19th June	Breeding Status
Herring gull	<i>Larus argentatus</i>	√		√			√		1		2	1	U
Song Thrush	<i>Turdus philomelos</i>	√					√		1		1		P
Lapwing	<i>Vanellus vanellus</i>	√		√			√		1				P
Starling	<i>Sturnus vulgaris</i>			√			√		8	6	25	14	U
Linnet	<i>Carduelis cannabina</i>	√		√			√			2	1	2	P
Curlew	<i>Numenius arquata</i>	√		√			√			1			U
Bullfinch	<i>Pyrrhula pyrrhula</i>						√				2	2	P

Table 6: Peak count of notable bird species

Conservation Status						Peak count per survey (May to June 2019)							
Species recorded	Latin	UK Red	UK Amber	Wales Red	Wales Amber	Sch. 1	Section 7	LBAP	15th May	16th May	6th June	19th June	Breeding Status
Skylark	<i>Alauda arvensis</i>	√							2	2	1		P
Mistle Thrush	<i>Turdus viscivorus</i>	√							2		1	2	P
Mallard	<i>Anas platyrhynchos</i>	√							2	2		2	U
Willow warbler	<i>Phylloscopus trochilus</i>		√	√					2	1	2		P
Dunnock	<i>Prunella modularis</i>		√						2		1	1	P
Swallow	<i>Hirundo rustica</i>				√				2	3	2	4	U
Swift	<i>Apus apus</i>				√				4			4	U
Cuckoo	<i>Cuculus canorus</i>			√						1			U
Lesser black-backed gull	<i>Larus fuscus</i>		√		√						2		U

4.4.8 Bats

The desk study returned records of six bat species within 2km of the site. Lesser horseshoe (*Rhinolophus hipposideros*), unidentified pipistrelle species (*Pipistrellus* sp.), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), unidentified myotis species (*Myotis* sp.) and brown long-eared (*Plecotus auritus*). The nearest record is located approximately 2km north-west of site and all records within the desk study data were of foraging bats.

The grassland and waterbodies within and adjacent to the site provide good bat foraging habitat, although the site is very open and more likely to be used by bat species which fly in open spaces, such as the noctule (*Nyctalus noctula*) bat. Connecting habitat (bat commuting routes) from the site to the wider landscape is limited as there is only one short hedgerow present to the south of the site compound, See Photograph 1 below. The residential gardens to the south of the site may offer more favourable foraging opportunities for species such as common pipistrelle (*Pipistrellus pipistrellus*) which are able to forage effectively within urban habitats.



Photograph 1 Taken from inside the side compound looking west towards the horse grazed pasture

Three single storey, metal clad buildings (an electrical kiosk and a storage containers) located within the site compound were assessed as having no bat potential as they appeared to be tightly sealed and not accessible to bats (see Photographs 2-4).



Photo 2 Kiosk



Photo 3 Storage container



Photo 4 Storage container

Bats are protected under the Conservation of Habitats and Species Regulations 2017 (Ref 19).

4.4.9 Hazel dormouse

No records of dormice (*Muscardinus avellanarius*) were identified within 2km of the site and the site is not well-connected to woodland blocks suitable for this species so it is considered unlikely this species is present within the proposed development area.

4.4.10 Otter and water vole

No records of otter (*Lutra lutra*) or water vole (*Arvicola amphibius*) were identified within 2km of the site. It is possible that otters travel through the area to forage in the waterbodies but there is little cover for a holt or resting site within the proposed development area. The area is highly disturbed by off-roading and people attending to the horses, with an active stable nearby. It is considered unlikely that water vole would be present within the proposed development area due to poor habitat suitability.

4.4.11 Badger

No records of badger (*Meles meles*) were identified within 2km of the site and the nutrient-poor substrate of the acid grassland is unlikely to provide a good foraging resource for badger. No areas suitable for badger setts were noted during the Phase 1 habitat survey.

4.4.12 Other mammals of conservation concern

The site provides suitable foraging habitat for hedgehogs (*Erinaceus europaeus*) with the treeline/hedgerow providing suitable nesting and hibernating opportunities. Hedgehogs are listed under Section 7 of the Environment (Wales) Act 2016 (Ref 3).

During the extended Phase 1 survey evidence of hedgehog was identified (hedgehog scat) within the site, outside of the compound.

5 Conclusions

The proposed development site lies partly within the Blaenmorlais SINC, and the acid grassland outside of the Welsh Water compound qualifies under the SINC selection criteria for the area. The proposed development will therefore need to ensure that loss of acid grassland and associated habitats including dwarf heath is minimised through design and mitigated to equal or greater value. This could be achieved by fencing off areas of retained grassland from horse-grazing and introducing a more ecologically sensitive management regime to enhance the species-diversity and structural-diversity of the grassland. This type of mitigation would need to be secured in the long-term by a habitat management plan. An alternative or additional method of compensating loss of grassland habitat would be to provide a green roof on the proposed reservoir, if achievable within design constraints. Both options should specifically target habitat creation and management for terrestrial invertebrates and reptiles

The construction phase of the proposed development should aim to avoid the stream corridor and dry-dwarf heath area which is of particular note due to localised botanical interest and likely value to terrestrial invertebrates and reptiles.

The marshy grassland to the east of the proposed development, which may be used as a site compound is also of value and should be retained, protected and / or restored post-construction. The mature hedgerow / tree line at the site should also be retained where possible and replanted or translocated where breaches are needed for access.

Japanese knotweed and Himalayan balsam have both been recorded within the proposed development boundary. An Invasive Species Management Plan will therefore be required which sets out mitigation to prevent spreading these species in to the wild.

The following protected and/ or priority species or groups will need to be included in an ecological impact assessment for the scheme with specific mitigation requirements outlined to reduce the impact of the scheme through timing, etc.

- Otters
- Bats (foraging only)
- Breeding birds
- Overwintering birds
- Reptiles
- Terrestrial invertebrates

6 References

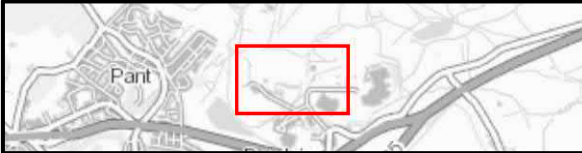
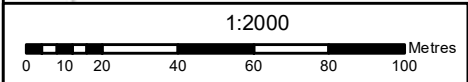
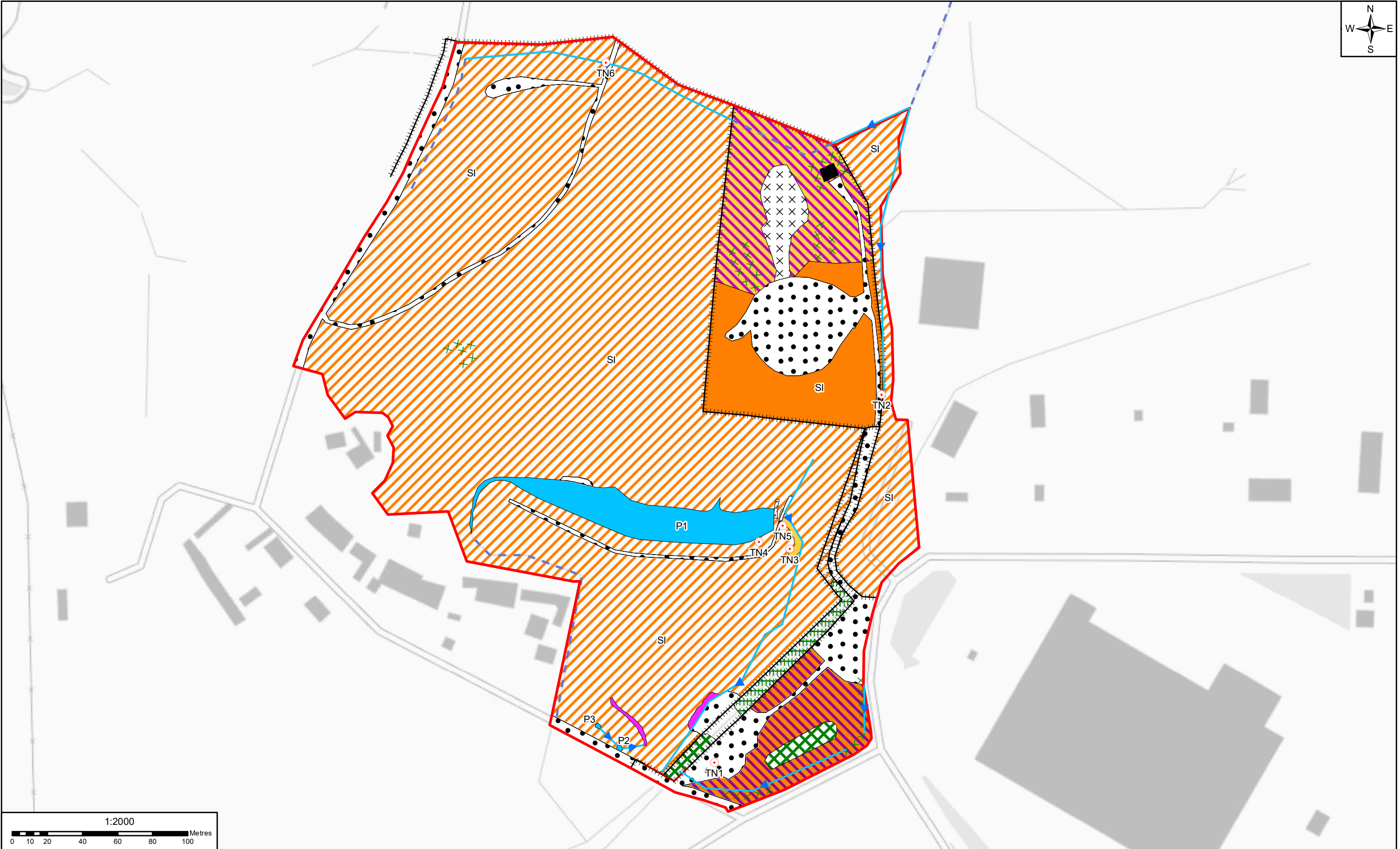
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Drawings

B10237-118878-ZZ-ZZ-DR-CA-CI0045 Site Location Plan

B10237-118878-ZZ-XX-DR-NA-EI0057 Phase 1 Survey Plan

B10237-118878-ZZ-XX-DR-NA-EI0058 NVC Quadrat Locations



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01	29/11/19	Initial Issue	YG	KO	SS - D
REV	Date	Description	Drawn	Check	Approv

LEGEND			
Site Boundary	Acid Flush	Marshy Grassland	
Target Note	Bare Ground		
Dry Ditch	Dense Scrub		
Fence	Dry Dwarf Shrub Heath		
Running Water	Wet Dwarf Shrub Heath		
Scattered Scrub	Standing Water		
Wall	Neutral Grassland - Semi-Improved		
Ephemeral/ Short Perennial	Acid Grassland - Semi-Improved		
	Hedge with trees - species-poor		

Client

Dŵr Cymru Welsh Water

Site

Pengamddu

Client

Dŵr Cymru Cyl
Penyryn Road
Nelson
Treharris
Mid Glamorgan
CF46 6LY

Suitability Description:			
PRELIMINARY/CONFIDENTIAL			
Designed	K.O'Brien	Date 29NOV19	Signed
Drawn	Y.Giri	Date 29NOV19	Signed
Checked	K.O'Brien	Date 29NOV19	Signed
Approved	S. Saunders - Davies	Date 29NOV19	Signed
Scale:	1:2000	Datum:	AOD
Original Size:	A3	Grid:	OS
Suitability Code:	S2	Project Number:	10032821

PROJECT:	Pengamddu
TITLE:	Pengamddu Phase 1 Survey Plan

ARCADIS Design & Consultancy for natural and built assets

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Drawing Number: B10237-118878-ZZ-XX-DR-NA-EI0057

Issue 01



- Legend
- Site Boundary
 - Welsh Water Compound Boundary
 - NVC Quadrat

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Ordnance Survey 0100031673



01	S2	13/11/2019	Initial Issue	YG	JN	SS
Rev	Status	Rev. Date	Purpose of revision	Drawn	Chk'd	Appr'd

Client



Designer



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Project
DG5 Scheme – Pengamddu

Drawing Title
NVC Quadrat Locations

Status	S2	Revision	01
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Scale	1:2,000	Date	14-Nov-19
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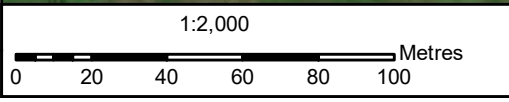
Drawn By
Yogesh Giri

Checked By
Janine Norman

Approved By
Sarah Simons

PINS No.

Drawing number
B10237-118878-ZZ-XX-DR-NA-EI0058



Appendix A

Legislation and Policy

Ecological constraint	Rationale
European Designated sites (Special Areas of Conservation, Special Protection Areas and Ramsar Sites)	Under the Conservation of Habitats and Species Regulations 2017, an assessment is required where a plan or project may give rise to significant effects upon 'European Sites' including SACs, SPAs, and Ramsar sites. The process of assessing the implications of development on European Sites is known as Habitats Regulations Assessment (HRA). The initial stage of the HRA is Screening. This process initially identifies the likely impacts upon a European Site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts may be significant. Natural Resources Wales must be consulted in relation to the outcome of Screening. Unless the likelihood of a significant effect can be ruled out on the basis of objective information, then an Appropriate Assessment must be undertaken (this is the next stage of the HRA).
Nationally Designated Sites (Sites of Special Scientific Interest)	It is a legal requirement to apply for 'assent' from Natural Resources Wales for any works which could potentially damage the flora, fauna or features for which a SSSI is designated (under the Wildlife and Countryside Act (1981) (as amended)).
Invasive Plants (Rhododendron, Giant Hogweed, Japanese Knotweed, certain species of Cotoneaster, Variegated Yellow Archangel, Canadian Waterweed, Japanese Rose, Monbretia, New Zealand Pigmyweed, Virginia Creeper, Water-fern etc.)	It is an offence under Section 14 of Wildlife and Countryside Act 1981 (as amended) to cause plants listed in Schedule 9 of this act to grow in the wild. Material contaminated with these species is classified as controlled waste under the Environmental Protection Act 1990 and should therefore be disposed of in an appropriately licensed landfill site.
European protected species (great crested newts, natterjack toad, sand lizard, smooth snake, bats, dormice, otters)	It is an offence under the Conservation of Habitats and Species Regulations 2017 to deliberately kill or injure a European protected species, to destroy breeding/ resting sites, or to deliberately disturb these species and affect their ability to survive, rear young, breed or hibernate.
Nationally protected species- those listed in Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) (Allis shade, twaite shad, great crested newt, natterjack toad, bats, dormice, otter)	It is an offence under the Wildlife and Countryside Act 1981 (as amended) to intentionally or recklessly disturb a species listed on Schedule 5 whilst it is in a place of shelter, or to obstruct access to a place of shelter.
Reptiles	It is an offence under the Wildlife and Countryside Act 1981 (as amended) to kill or injure common species of reptiles.

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Nationally protected bird species- those listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (barn owl, peregrine falcon, red kite, kingfisher, firecrest etc.)

All nesting birds are protected whilst nesting as identified below. However, for those listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) it is also an offence to intentionally or recklessly disturb these birds at, on or near an active nest.

Nesting birds

It is an offence under the Wildlife and Countryside Act 1981 (as amended) to damage or destroy a bird's nest whilst it is in use, and to kill or injure a bird or destroy an egg.

Badgers

It is an offence under the Protection of Badgers Act (1992) to damage or destroy a badger sett; obstruct any entrance of a badger sett; and disturb a badger whilst it is occupying a badger sett.

Appendix B

Local Record Centre Data

Common Name	Latin Name	Legislation
Plants		
Small Water-pepper	<i>Persicaria minor</i>	RDB1 (UK) - VU
Dwarf Thistle	<i>Cirsium acaule</i>	LI(SEWBRcC)
Hoary Plantain	<i>Plantago media</i>	LI(SEWBRcC)
Bee Orchid	<i>Ophrys apifera</i>	LI(SEWBRcC)
Purple Willow	<i>Salix purpurea</i>	LI(SEWBRcC)
Crowberry agg.	<i>Empetrum nigrum</i>	LI(SEWBRcC)
Pink Water-Speedwell	<i>Veronica catenata</i>	LI(SEWBRcC)
Rigid Hornwort	<i>Ceratophyllum demersum</i>	RDB1 (Wales) - LC
Eyebright	<i>Euphrasia micrantha</i>	RDB1 (Wales) - LC
Variegated Horsetail	<i>Equisetum variegatum</i>	RDB1 (Wales) - LC
Knotted Pearlwort	<i>Sagina nodosa</i>	LI(SEWBRcC)
Ivy-leaved Duckweed	<i>Lemna trisulca</i>	RDB1 (Wales) - LC
Soft-leaved Sedge	<i>Carex montana</i>	RDB1 (UK) - VU
Mossy Saxifrage	<i>Saxifraga hypnoides</i>	RDB1 (Wales) - LC
Few-flowered Spike-rush	<i>Eleocharis quinqueflora</i>	LI(SEWBRcC)
Limestone Bedstraw	<i>Galium sternerii</i>	LI(SEWBRcC)
Common Rock-rose	<i>Helianthemum nummularium</i>	RDB1 (Wales) - LC
Betony	<i>Stachys officinalis</i>	LI(SEWBRcC)
Common Milkwort	<i>Polygala vulgaris</i>	RDB1 (Wales) - NT
Limestone Fern	<i>Gymnocarpium robertianum</i>	LI(SEWBRcC)
Invasive plants		
Sea-buckthorn	<i>Hippophae rhamnoides</i>	RDB2 (UK) - S, INNS
Bryophytes		
Yellow Starry Feather-moss	<i>Campylium stellatum</i>	RDB1 (Wales) - LC

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Common Name	Latin Name	Legislation
Roof Plait-moss	<i>Hypnum cupressiforme</i> var. <i>lacunosum</i>	RDB1 (Wales) - LC
Common Feather-moss	<i>Kindbergia praelonga</i>	RDB1 (Wales) - LC
Dense Fringe-moss	<i>Racomitrium ericoides</i>	RDB1 (Wales) - LC
Slender Bristle-moss	<i>Orthotrichum tenellum</i>	RDB1 (Wales) - LC
Slender Ditrichum	<i>Ditrichum gracile</i>	RDB1 (Wales) - LC
Ciliated Fringewort	<i>Ptilidium ciliare</i>	RDB1 (Wales) - LC, LI(VC41, LR)
Frizzled Crisp-moss	<i>Tortella tortuosa</i>	RDB1 (Wales) - LC
Lindberg"s Plait-moss	<i>Calliergonella lindbergii</i>	RDB1 (Wales) - LC
Marsh Forklet-moss	<i>Dichodontium palustre</i>	RDB1 (Wales) - LC
Yellow Feather-moss	<i>Homalothecium lutescens</i>	RDB1 (Wales) - LC
Claw Brook-moss	<i>Hygrohypnum ochraceum</i>	RDB1 (Wales) - LC
Ringless Hook-moss	<i>Sarmentypnum exannulatum</i>	RDB1 (Wales) - LC
Mougeot"s Yoke-moss	<i>Amphidium mougeotii</i>	RDB1 (Wales) - LC
Verdigris Tufa-moss	<i>Gymnostomum aeruginosum</i>	RDB1 (Wales) - LC
Curled Hook-moss	<i>Palustriella commutata</i>	RDB1 (Wales) – LC, LI(VC41, LR)
Intermediate Hook-moss	<i>Scorpidium cossonii</i>	RDB1 (Wales) - LC, LI(VC41, LR)
Shining Flapwort	<i>Solenostoma paroicum</i>	RDB1 (Wales) - LC
Common Apple-moss	<i>Bartramia pomiformis</i>	RDB1 (Wales) - LC
Alpine Haircap	<i>Polytrichastrum alpinum</i>	RDB1 (Wales) - LC
Delicate Germanderwort	<i>Riccardia multifida</i>	RDB1 (Wales) - LC
Narrow Mushroom-headed Liverwort	<i>Preissia quadrata</i>	RDB1 (Wales) - VU, RDB1 (UK) - DD, LI(SEWBRcC)
Green Mountain Fringe-moss	<i>Racomitrium fasciculare</i>	RDB2 (UK) – S, LI(SEWBRcC)
Pale Thread-moss	<i>Bryum pallens</i>	RDB1 (Wales) - LC, LI(VC41, LR)
Thick-nerved Apple-moss	<i>Philonotis calcarea</i>	RDB1 (Wales) - LC, LI(VC41, LR)
Tall Thyme-moss	<i>Plagiomnium elatum</i>	LI(SEWBRcC)
Transparent Fork-moss	<i>Dichodontium pellucidum</i>	RDB1 (Wales) - LC
Awl-leaved Screw-moss	<i>Tortula subulata</i>	RDB1 (Wales) - LC, LI(VC41, LR)

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Common Name	Latin Name	Legislation
Weissia controversa var. crispata	<i>Weissia controversa var. crispata</i>	RDB2 (UK) - S, LI(SEWBrEC)
Andreaea rothii subsp. falcata	<i>Andreaea rothii subsp. falcata</i>	LI(SEWBrEC)
Fungi		
Heath Waxcap	<i>Gliophorus laetus</i>	RDB1 (Wales) - VU, RDB2 (UK) - S
Invertebrates		
Knot Grass	<i>Acronicta rumicis</i>	S7
Small Heath	<i>Coenonympha pamphilus</i>	S7, RDB1 (UK) - NT, LBAP (GWY, VOG)
Small Square-spot	<i>Diarsia rubi</i>	S7
Small Phoenix	<i>Ecliptopera silaceata</i>	S7
Dingy Skipper	<i>Erynnis tages</i>	S7, RDB1 (UK) - VU, LI(SEWBrEC)
Autumnal Rustic	<i>Eugnorisma glareosa</i>	S7
Brindled Beauty	<i>Lycia hirtaria</i>	S7
White Ermine	<i>Spilosoma lubricipeda</i>	S7
Buff Ermine	<i>Spilosoma lutea</i>	S7
Anomalous	<i>Stilbia anomala</i>	S7
Cinnabar	<i>Tyria jacobaeae</i>	S7
Dark-barred Twin-spot Carpet	<i>Xanthorhoe ferrugata</i>	S7
Buff-Tailed Bumblebee	<i>Bombus terrestris</i>	LBAP (MTR)
Golden-ringed Dragonfly	<i>Cordulegaster boltonii</i>	LI(SEWBrEC)
Dingy Skipper	<i>Erynnis tages tages</i>	LI(SEWBrEC)
Black-tailed Skimmer	<i>Orthetrum cancellatum</i>	LI(SEWBrEC)
Black Darter	<i>Sympetrum danae</i>	LI(SEWBrEC)
Fish		
Brown/Sea Trout	<i>Salmo trutta</i>	S7, LBAP (MTR, RCT)
Amphibians		
Palmate Newt	<i>Lissotriton helveticus</i>	WCA5
Common Toad	<i>Bufo bufo</i>	WCA5, S7

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Common Name	Latin Name	Legislation
Common Frog	<i>Rana temporaria</i>	HDir, WCA5
Birds		
Skylark	<i>Alauda arvensis</i>	BDir22, S7, WBAm(RSPB), UKBR(RSPB)
Kingfisher	<i>Alcedo atthis</i>	BDir1, WCA1.1, WBAm(RSPB), UKBAm(RSPB)
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	BDir22, S7, WBR(RSPB), UKBAm(RSPB)
Hen Harrier	<i>Circus cyaneus</i>	BDir1, S7, WBR(RSPB)
Whooper Swan	<i>Cygnus cygnus</i>	BDir1, WCA1.1, UKBAm(RSPB)
Reed Bunting	<i>Emberiza schoeniclus</i>	S7, WBAm(RSPB), UKBAm(RSPB)
Merlin	<i>Falco columbarius</i>	BDir1, WCA1.1, WBAm(RSPB), UKBR(RSPB)
Peregrine	<i>Falco peregrinus</i>	BDir1, WCA1.1
Kestrel	<i>Falco tinnunculus</i>	S7, WBR(RSPB), UKBAm(RSPB)
Red Grouse	<i>Lagopus lagopus</i>	BDir21, S7, WBR(RSPB), UKBAm(RSPB)
Herring Gull	<i>Larus argentatus</i>	BDir22, S7, WBR(RSPB), UKBR(RSPB)
Linnet	<i>Linaria cannabina</i>	S7, WBR(RSPB), UKBR(RSPB)
Red Kite	<i>Milvus milvus</i>	BDir1, WCA1.1, WCA9, WBAm(RSPB)
Curlew	<i>Numenius arquata</i>	BDir22, S7, WBR(RSPB), UKBR(RSPB)
House Sparrow	<i>Passer domesticus</i>	S7, WBAm(RSPB), UKBR(RSPB)
Marsh Tit	<i>Poecile palustris</i>	S7, WBR(RSPB), UKBR(RSPB)
Dunnock	<i>Prunella modularis</i>	S7, UKBAm(RSPB)
Bullfinch	<i>Pyrrhula pyrrhula</i>	S7, WBR(RSPB), UKBAm(RSPB)
Starling	<i>Sturnus vulgaris</i>	BDir22, S7, WBR(RSPB), UKBR(RSPB)
Redwing	<i>Turdus iliacus</i>	BDir22, WCA1.1, WBAm(RSPB), UKBR(RSPB)
Song Thrush	<i>Turdus philomelos</i>	BDir22, S7, WBAm(RSPB), UKBR(RSPB)
Barn Owl	<i>Tyto alba</i>	WCA1.1, WCA9, WBAm(RSPB)
Lapwing	<i>Vanellus vanellus</i>	BDir22, S7, WBR(RSPB), UKBR(RSPB)
Common Sandpiper	<i>Actitis hypoleucos</i>	WBAm(RSPB), UKBAm(RSPB)
Teal	<i>Anas crecca</i>	BDir21, WBAm(RSPB), UKBAm(RSPB)

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Common Name	Latin Name	Legislation
Wigeon	<i>Anas penelope</i>	BDir21, WBAm(RSPB), UKBAm(RSPB)
Mallard	<i>Anas platyrhynchos</i>	BDir21, WBAm(RSPB), UKBAm(RSPB)
Meadow Pipit	<i>Anthus pratensis</i>	WBAm(RSPB), UKBAm(RSPB)
Swift	<i>Apus apus</i>	WBAm(RSPB), UKBAm(RSPB)
Tufted Duck	<i>Aythya fuligula</i>	BDir21, WBAm(RSPB)
Dipper	<i>Cinclus cinclus</i>	LBAP (MTR, RCT,), WBAm(RSPB), UKBAm(RSPB)
Mute Swan	<i>Cygnus olor</i>	BDir22, WBAm(RSPB), UKBAm(RSPB)
House Martin	<i>Delichon urbicum</i>	LBAP (BRG, CON, POW, RCT, VOG), WBAm(RSPB), UKBAm(RSPB)
Snipe	<i>Gallinago gallinago</i>	BDir21, WBAm(RSPB), UKBAm(RSPB)
Swallow	<i>Hirundo rustica</i>	WBAm(RSPB)
Lesser Black-backed Gull	<i>Larus fuscus</i>	BDir22, WBAm(RSPB), UKBAm(RSPB)
Great Black-backed Gull	<i>Larus marinus</i>	BDir22, WBR(RSPB), UKBAm(RSPB)
Wheatear	<i>Oenanthe oenanthe</i>	WBAm(RSPB)
Coal Tit	<i>Parus ater</i>	WBAm(RSPB)
Cormorant	<i>Phalacrocorax carbo</i>	WBAm(RSPB)
Redstart	<i>Phoenicurus phoenicurus</i>	WBAm(RSPB), UKBAm(RSPB)
Willow Warbler	<i>Phylloscopus trochilus</i>	WBR(RSPB), UKBAm(RSPB)
Whitethroat	<i>Sylvia communis</i>	WBAm(RSPB)
Iceland Gull	<i>Larus glaucoideus</i>	UKBAm(RSPB)
Glaucous Gull	<i>Larus hyperboreus</i>	UKBAm(RSPB)
Yellow-legged Gull	<i>Larus michahellis</i>	UKBAm(RSPB)
Grey Wagtail	<i>Motacilla cinerea</i>	UKBR(RSPB)
Reptiles		
Common Lizard	<i>Zootoca vivipara</i>	WCA5, S7
Mammals		
Myotis Bat Species	<i>Myotis</i>	EPS, HDir, WCA5, S7
Pipistrellus Bat Species	<i>Pipistrellus</i>	EPS, WCA5

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Common Name	Latin Name	Legislation
Common Pipistrelle	<i>Pipistrellus pipistrellus</i>	EPS, HDir, WCA5, S7, RDB2 (UK)
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	EPS, HDir, WCA5, S7, RDB2 (UK)
Brown Long-eared Bat	<i>Plecotus auritus</i>	EPS, HDir, WCA5, S7, RDB2 (UK)
Lesser Horseshoe Bat	<i>Rhinolophus hipposideros</i>	EPS, HDir, WCA5, S7, RDB2 (UK)

Appendix C

Phase 1 Target Notes

Phase 1 Target Notes	
Number	Description
Target Note 1	Indian balsam (<i>Impatiens glandulifera</i>) within bare ground
Target Note 2	Japanese Knotweed along eastern site boundary
Target Note 3	Rocky stream and heathland area, suitable for reptiles – full plant list below
Target Note 4	Reptile basking habitat – piles of rocks
Target Note 5	Invertebrate habitat - exposed mud bank suitable for burrowing invertebrates
Target Note 6	Ditch heavily polluted with oil and rubbish. Species included Cuckooflower (<i>Cardamine pratensis</i>), Water crowfoot sp. (<i>Ranunculus aquatilis</i>), Marsh Thistle (<i>Cirsium palustre</i>), Marsh stitchwort (<i>Stellaria palustris</i>), floating sweet grass (<i>Glyceria fluitans</i>), lesser spearwort (<i>Ranunculus flammula</i>) and moss sp. (<i>Polytrichum</i>).

Plant Lists for main Phase 1 habitat types – outside Welsh Water Compound

Species Name	Latin Name
Marshy grassland verge	
Common Vetch	<i>Vicia sativa</i>
Bugle	<i>Ajuga reptans</i>
Meadow Buttercup	<i>Ranunculus acris</i>
Creeping Buttercup	<i>Ranunculus repens</i>
Yorkshire Fog	<i>Holcus lanatus</i>
Compact Rush	<i>Juncus conglomeratus</i>
Horsetail species	<i>Equisetum</i> sp.
Cuckooflower	<i>Cardamine pratensis</i>
Sedge species	<i>Carex</i> sp.
Hop Trefoil	<i>Trifolium campestre</i>
Marsh Thistle	<i>Cirsium palustre</i>
Cowslip	<i>Primula veris</i>
Cinquefoil	<i>Potentilla</i>

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Species Name	Latin Name
Common Sorrel	<i>Rumex acetosa</i>
Smooth Tare	<i>Vicia tetrasperma</i>
Creeping Thistle	<i>Cirsium arvense</i>
Canadian Fleabane	<i>Conyza canadensis</i>
Hogweed	<i>Heracleum sphondylium</i>
Male Fern	<i>Dryopteris filix-mas</i>
Cock's-foot	<i>Dactylis glomerata</i>
Pendulous Sedge	<i>Carex pendula</i>
Red Clover	<i>Trifolium pratense</i>
White Clover	<i>Trifolium repens</i>
Daisy	<i>Bellis perennis</i>
Ribwort Plantain	<i>Plantago lanceolata</i>
Rough Meadow-grass	<i>Poa trivialis</i>
Black Knapweed	<i>Centaurea nigra</i>
Dock species	<i>Rumex</i> sp.
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>
Colt's-foot	<i>Tussilago farfara</i>
Tufted hair-grass	<i>Deschampsia cespitosa</i>
Soft-rush	<i>Juncus effusus</i>
Glacous Sedge	<i>Carex flacca</i>
Heath Speedwell	<i>Veronica officinalis</i>
Herb-robert	<i>Geranium robertianum</i>
Cow Parsley	<i>Anthriscus sylvestris</i>
Germander Speedwell	<i>Veronica chamaedrys</i>
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>
Crane's-bill species	<i>Geranium</i> sp.
Hard rush	<i>Juncus inflexus</i>

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Species Name	Latin Name
Greater willowherb	<i>Epilobium hirsutum</i>
Yarrow	<i>Achillea millefolium</i>
Soft Brome	<i>Bromus hordeaceus</i>
Curled Dock	<i>Rumex crispus</i>
Dandelion	<i>Taraxacum agg.</i>
Creeping Bent	<i>Agrostis stolonifera</i>
Broad-leaved Dock	<i>Rumex obtusifolius</i>
Silverweed	<i>Potentilla anserina</i>
Rosebay Willowherb	<i>Chamerion angustifolium</i>
Marsh Marigold	<i>Caltha palustris</i>
Scattered Scrub	
Gorse	<i>Ulex europaeus</i>
Hawthorn	<i>Crataegus monogyna</i>
Willow species	<i>Salix sp.</i>
Bramble	<i>Rubus fruticosus agg.</i>
Hedgerow	
Hawthorn	<i>Crataegus monogyna</i>
Hazel	<i>Corylus avellana</i>
Beech	<i>Fagus sylvatica</i>
Dog rose	<i>Rosa canina</i>
Corsican Pine	<i>Pinus nigra subsp. laricio</i>
Field Maple	<i>Acer campestre</i>
Willow species	<i>Salix sp.</i>
Elder	<i>Sambucus nigra</i>
Alder	<i>Alnus glutinosa</i>
Oak	<i>Quercus sp.</i>
Blackthorn	<i>Prunus spinosa</i>

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Species Name	Latin Name
Rowan	<i>Sorbus aucuparia</i>
Stream and heathland area (Target note 3)	
Brooklime	<i>Veronica beccabunga</i>
Willow species	<i>Salix</i> sp.
Bog Stitchwort	<i>Stellaria alsine</i>
Male fern	<i>Dryopteris filix-mas</i>
Broad-leaved dock	<i>Rumex obtusifolius</i>
Ragwort	<i>Senecio jacobaea</i>
Gorse	<i>Ulex europaeus</i>
Heather	<i>Calluna vulgaris</i>
Bramble	<i>Rubus fruticosus</i> agg.
Nettle	<i>Urtica dioica</i>
Colt's-foot	<i>Tussilago farfara</i>
Milkwort	<i>Polygala vulgaris</i>
Rosebay Willowherb	<i>Chamerion angustifolium</i>
Tormentil	<i>Potentilla erecta</i>
Creeping Buttercup	<i>Ranunculus repens</i>
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>
Soft Rush	<i>Juncus effusus</i>
Ribwort Plantain	<i>Plantago lanceolata</i>
Daisy	<i>Bellis perennis</i>
Marsh Thistle	<i>Cirsium palustre</i>
Cuckoo flower	<i>Cardamine pratensis</i>
Mouse-ear hawkweed	<i>Pilosella officinarum</i>
Water horsetail	<i>Equisetum fluviatile</i>
Round-leaved water crowfoot	<i>Ranunculus omiophyllus</i>

Plant Lists for main Phase 1 habitat types – inside Welsh Water Compound

Species Name	Latin Name
Species-rich semi-improved grassland around existing reservoir – appears to be seeded and uniform in structure	
Ribwort Plantain	<i>Plantago lanceolata</i>
Tormentil	<i>Potentilla erecta</i>
Common Bird's-foot-trefoil	<i>Lotus corniculatus</i>
Mouse-ear-hawkweed	<i>Pilosella officinarum</i>
Red Clover	<i>Trifolium pratense</i>
Common Vetch	<i>Vicia sativa</i>
Yarrow	<i>Achillea millefolium</i>
Cock's-foot	<i>Dactylis glomerata</i>
Rough hawkbit	<i>Leontodon hispidus</i>
Yorkshire fog	<i>Holcus lanatus</i>
Common sorrel	<i>Rumex acetosa</i>
Red fescue	<i>Festuca rubra</i>
Field Wood-rush	<i>Luzula campestris</i>
Hop trefoil	<i>Trifolium campestre</i>
Rosebay willowherb - on bank	<i>Chamerion angustifolium</i>
Male fern - on bank	<i>Dryopteris filix-mas</i>
Dandelion	<i>Taraxacum agg.</i>
Hogweed - on bank	<i>Heracleum sphondylium</i>
Wild strawberry	<i>Fragaria vesca</i>
Marsh thistle	<i>Cirsium palustre</i>
Field horsetail	<i>Equisetum arvense</i>
Creeping buttercup	<i>Ranunculus repens</i>
Spear Thistle	<i>Cirsium vulgare</i>
White clover	<i>Trifolium repens</i>

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Species Name	Latin Name
Rough Hawk's-beard	<i>Crepis biennis</i>
Common ragwort	<i>Senecio jacobaea</i>
Common Lady's mantle	<i>Alchemilla filicaulis subsp. vestita</i>
Pillwort	<i>Pilularia globulifera</i>
Mat Grass	<i>Nardus stricta</i>
Cuckooflower	<i>Cardamine pratensis</i>
Daisy	<i>Bellis perennis</i>
Common Milkwort (near scrub)	<i>Polygala vulgaris</i>
Dense and scattered scrub	
Hawthorn	<i>Crataegus monogyna</i>
Willow	<i>Salix sp.</i>
Rowan	<i>Sorbus aucuparia</i>
Bank with heather	
Marsh Thistle	<i>Cirsium palustre</i>
Heather	<i>Calluna vulgaris</i>
Tormentil	<i>Potentilla erecta</i>
Heath speedwell	<i>Veronica officinalis</i>
Dandelion	<i>Taraxacum agg.</i>
Horsetail	<i>Equisetum sp.</i>
Common Vetch	<i>Vicia sativa</i>
Common ragwort	<i>Senecio jacobaea</i>
Mouse-ear-hawkweed	<i>Pilosella officinarum</i>
Meadowsweet	<i>Filipendula ulmaria</i>
Ribwort Plantain	<i>Plantago lanceolata</i>
Wild strawberry	<i>Fragaria vesca</i>
Cuckooflower	<i>Cardamine pratensis</i>
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>
Rough Meadow-grass	<i>Poa trivialis</i>

Species Name	Latin Name
Sheep's fescue	<i>Festuca ovina</i>
Heath-Wood rush	<i>Luzula multiflora</i>
Moss species	<i>Rhytidiadelphus</i>
Bilberry	<i>Vaccinium myrtillus</i>
Yorkshire fog	<i>Holcus lanatus</i>
Moss species	<i>Calliergonella</i>
Red clover	<i>Trifolium pratense</i>
Cock's-foot	<i>Dactylis glomerata</i>
Wet dwarf shrub heath - signs of previous burning	
Purple moor-grass	<i>Molinia caerulea</i>
Marsh willowherb	<i>Epilobium palustre</i>
Heather	<i>Calluna vulgaris</i>
Tormentil	<i>Potentilla erecta</i>
Common Milkwort	<i>Polygala vulgaris</i>
Cuckooflower	<i>Cardamine pratensis</i>
Glaucous sedge	<i>Carex flacca</i>
Marsh Thistle	<i>Cirsium palustre</i>
Horsetail	<i>Equisetum sp.</i>
Hogweed	<i>Heracleum sphondylium</i>
Dock	<i>Rumex sp.</i>
Spear thistle	<i>Cirsium vulgare</i>
Common Bird's-foot-trefoil	<i>Lotus corniculatus</i>
Willow sapling	<i>Salix sp.</i>

Appendix D

Habitat Suitability Index Assessment and eDNA results

	Pond Number	Geographic Location	Area (m2)	Permanence	Water Quality	Shade	Waterfowl	Fish	Pond count	Terrestrial Habitat	Macrophytes	HSI score	Pond suitability	eDNA result
Description	P1	B		Never	Good	0%	Minor	Minor	8	Good	5%	0.74	Good	Negative
SI score		0.5	0.8	0.9	1	1	0.67	0.67	0.9	1	0.35			
Description	P2	B		Someti mes	Moderate	0%	Minor	Absent	6	Good	90%	0.57	Below Average	Negative
SI Score		0.5	0.05	0.5	0.67	1	0.67	1	0.77	1	0.9			
Description	P3	B	*	*	*	*	*	*	*	*	*	0.57	Below Average	Negative
SI Score		0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			

* = Field Data Missing



Report: 19302-ARC-KO-1

Order number: ARC-19002-KO

Great Crested Newt eDNA Results

Company: Arcadis (UK) Ltd
Contact: Kailey O'Brien
Project code | Task code: DCWW Pengarnddu SRV - 10032821
Date of Report: 25 June 2019
Number of samples: 3

Thank you for sending your samples for analysis by NatureMetrics. Your samples have been processed in accordance with the protocol set out in Appendix 5 of Biggs et al. (2014).

DNA was precipitated via centrifugation at 14,000 x g and then extracted using Qiagen Blood and Tissue extraction kits.

qPCR amplification was carried out in 12 replicates per sample, using the primers and probe described by Biggs et al. (2014), in the presence of both positive and negative controls.

Results indicate GCN absence in 'P1', 'P2', and 'P3'. All controls performed as expected and so the results are conclusive.

Results are based on the samples as supplied by the client to the laboratory. Incorrect sampling methodology may affect the results. Note that a negative result does not preclude the presence of Great Crested Newts at a level below the limits of detection.

Sample	Pond ID	Arrived	Inhibition	Degradation	Score	GCN status
1895	'P1'	21-Jun	No	No	0	Negative
1893	'P2'	21-Jun	No	No	0	Negative
1894	'P3'	21-Jun	No	No	0	Negative



Appendix E

Photographs

Photo 1 :



Photo 2:



Photo 3 :



Photo 4 :



Photo 5:



Photo 6:



Photo 7:



Photo 8:



Photo 9:



Photo 10:



Appendix F

National Vegetation Classification tables

Area A - Outside Compound Quadrats - Semi- improved acid grassland

Species Name	Latin Name	A1	A2	A3	A4	A5	Frequency
Tormentil	<i>Potentilla erecta</i>	2	3				II (2-3)
Moss species	<i>Rhytidiadelphus squarrosus</i>	6	5	4	5		IV (4-6)
Hop trefoil	<i>Trifolium campestre</i>	1	2	3		2	IV (1-3)
Heath Wood-rush	<i>Luzula multiflora</i>	3					I (3)
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>	8		9	7		III (7-9)
Heath bedstraw	<i>Galium saxatile</i>	3					I (3)
Yorkshire fog	<i>Holcus lanatus</i>	3			2		II (2-3)
Dandelion	<i>Taraxacum agg.</i>	1	1			1	III (1)
Sheeps fescue	<i>Festuca ovina</i>	8	8	8	7		IV (7-8)
Sheeps sorrel	<i>Rumex acetosella</i>	3					I (3)
Red clover	<i>Trifolium pratense</i>	3	4	4	4	5	V (3-5)
Mat-grass	<i>Nardus stricta</i>	4					I (4)
Marsh thistle	<i>Cirsium palustre</i>	1				3	II (1-3)
Creeping buttercup	<i>Ranunculus repens</i>		5				I (5)
Daisy	<i>Bellis perennis</i>		1	2			II (1-2)
Field wood-rush	<i>Luzula campestris</i>		3	5			II (3-5)
Ragwort	<i>Senecio jacobaea</i>		1	2			II (1-2)
Silverweed	<i>Potentilla anserina</i>		1				I (1)
Bare ground			4	4	4		III (4)
Annual meadow-grass	<i>Poa annua</i>		2	2		3	III (2-3)
Creeping bent	<i>Agrostis stolonifera</i>		4		8	9	III (4-9)
Moss species	<i>Polytrichum juniperum</i>		1				I (1)
Common Yellow-sedge	<i>Carex demissa</i>		2				I (2)
Moss species	<i>Pesudoscleropodium purum</i>		2				I (2)
Heath speedwell	<i>Veronica officinalis</i>			3		1	II (1-3)
Rough hawkbit	<i>Leontodon hispidus</i>			1	1	1	III (1)

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Species Name	Latin Name	A1	A2	A3	A4	A5	Frequency
Selfheal	<i>Prunella vulgaris</i>			1		1	II (1)
Greater plantain	<i>Plantago major</i>					2	I (2)
Marsh Stitchwort	<i>Stellaria palustris</i>					4	I (4)
Mouse-ear-hawkweed	<i>Pilosella officinarum</i>					1	I (1)

Area B - Inside Compound Quadrats - Wet dwarf shrub heath

Species Name	Latin Name	B1	B2	B3	B4	B5	Frequency
Purple moor-grass	<i>Molinia caerulea</i>	10	8	8	8	8	V (8-10)
Moss species	<i>Rhytidiadelphus squarrosus</i>	1				5	II (1-5)
Bare ground		4	5	4			III (4-5)
Soft rush	<i>Juncus effusus</i>	1					I (1)
Leaf litter		4	5	5	4		IV (4-5)
Heather	<i>Calluna vulgaris</i>		1	4	1		III (1-4)
Marsh willowherb	<i>Epilobium palustre</i>		2	1		1	III (1-2)
Heath Wood-rush	<i>Luzula multiflora</i>		3	3		4	III (3-4)
Tormentil	<i>Potentilla erecta</i>		2	4	1	3	IV (1-4)
Moss species	<i>Polytrichum</i> sp.		2	3		1	III (1-3)
Moss species	<i>Calliergonella cuspidatum</i>		2			3	II (2-3)
Sow thistle	<i>Sonchus arvensis</i>		1				I (1)
Rush?	<i>Juncus</i> sp.		1	1	1	1	IIII (1)
Heath bedstraw	<i>Galium saxatile</i>			1			I (1)
Sheeps fescue	<i>Festuca ovina</i>			2		7	II (2-7)
Sheeps sorrel	<i>Rumex acetosella</i>			1		3	II (1-3)
Common Club-rush	<i>Schoenoplectus lacustris</i>			2			I (2)
Gorse	<i>Ulex europaeus</i>				1		I (1)
Moss species	<i>Brachythecium rutabutum</i>				2		I (2)
Moss species	<i>Eurinchium praelongum</i>				2		I (2)
Cuckooflower	<i>Cardamine pratensis</i>					2	I (2)
Horsetail	<i>Equisetum</i> sp.					3	I (3)
Marsh Thistle	<i>Cirsium palustre</i>					2	I (2)
Ribwort plantain	<i>Plantago lanceolata</i>					3	I (3)
Common sedge	<i>Carex nigra</i>					3	I (3)
Dandelion	<i>Taraxacum</i> agg.					1	I (1)
Sweet Vernal-grass	<i>Anthoxanthum odoratum</i>					4	I (4)

Appendix G

Invertebrate Habitat Assessment – Desk Study Results

Priority invertebrate species

Species	Common name	Family	Conservation status	Habitat	Associations
<i>Erynnis tages</i>	Dingy Skipper	Hesperiidae	Section 7 Priority Species; VU	Tall sward & scrub	<i>Hippocrepis comosa</i> , <i>Lotus corniculatus</i> , <i>Lotus pedunculatus</i>
<i>Coenonympha pamphilus</i>	Small Heath	Nymphalidae	Section 7 Priority Species; NT;	Short sward & bare ground	Poaceae
<i>Acronicta rumicis</i>	Knot Grass	Noctuidae	Section 7 Priority Species - research only		
<i>Diarsia rubi</i>	Small Square-spot	Noctuidae	Section 7 Priority Species - research only	Tall sward & scrub	Asteraceae
<i>Ecliptopera silaceata</i>	Small Phoenix	Geometridae	Section 7 Priority Species - research only	Tall sward & scrub	Epilobium
<i>Eugnorisma glareosa</i>	Autumnal Rustic	Noctuidae	Section 7 Priority Species - research only	Tall sward & scrub	Asteraceae
<i>Spilosoma lubricipeda</i>	White Ermine	Erebidae	Section 7 Priority Species - research only	Tall sward & scrub	Asteraceae
<i>Spilosoma lutea</i>	Buff Ermine	Erebidae	Section 7 Priority Species - research only		Asteraceae
<i>Stilbia anomala</i>	Anomalous	Noctuidae	Section 7 Priority Species - research only		
<i>Tyria jacobaeae</i>	Cinnabar	Erebidae	Section 7 Priority Species - research only	Tall sward & scrub	<i>Senecio jacobaea</i>
<i>Xanthorhoe ferrugata</i>	Dark-barred Twin-spot Carpet	Geometridae	Section 7 Priority Species - research only	Tall sward & scrub	Asteraceae

Appendix H

Breeding Bird Results

Species recorded	Latin name	Conservation Status							Peak count per survey (May to June 2019)				Breeding Status
		UK Red	UK Amber	Wales Red	Wales Amber	Sch. 1	Section 7	LBAP	15th May	16th May	6th June	19th June	
Herring gull	<i>Larus argentatus</i>	√		√			√		1		2	1	U
Skylark	<i>Alauda arvensis</i>	√							2	2	1		P
Blackbird	<i>Turdus merula</i>								2	1	2	1	P
Mistle Thrush	<i>Turdus viscivorus</i>	√							2		1	2	P
Mallard	<i>Anas platyrhynchos</i>	√							2	2		2	U
Whitethroat	<i>Sylvia communis</i>								2		1		P
Wren	<i>Troglodytes troglodytes</i>								1	1	1	1	P
Robin	<i>Eithacus rubecula</i>								1		1	2	P
Willow warbler	<i>Phylloscopus trochilus</i>		√	√					2	1	2		P
Song Thrush	<i>Turdus philomelos</i>	√					√		1		1		P
Goldfinch	<i>Carduelis carduelis</i>								10	2		2	P
Dunnock	<i>Prunella modularis</i>		√						2		1	1	P
Blackcap	<i>Syvlia atricapilla</i>								1	1	1		P
Lapwing	<i>Vanellus vanellus</i>	√		√			√		1				P
Starling	<i>Sturnus vulgaris</i>			√			√		8	6	25	14	U
Meadow Pippit	<i>Anthus pratensis</i>								1		1		P
Pied Wagtail	<i>Motacilla alba</i>								2	1	1	4	U
Swallow	<i>Hirundo rustica</i>				√				2	3	2	4	U
Swift	<i>Apus apus</i>				√				4			4	U
Carrian Crow	<i>Corvus corone</i>								5	5	2	2	U
Jackdaw	<i>Corvus monedula</i>								1		1		U
Magpie	<i>Pica pica</i>								1	1		2	U
Grey Heron	<i>Ardea cinerea</i>								1	1			U
Linnet	<i>Carduelis cannabina</i>	√		√			√			2	1	2	P
Curlew	<i>Numenius arquata</i>	√		√			√			1			U
Cuckoo	<i>Cuculus canorus</i>			√						1			U

Pengarnddu SRV – Baseline Ecological Survey Report

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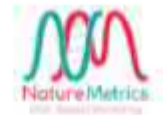
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A decorative graphic consisting of three orange lines: one horizontal line spanning the width of the page, and two diagonal lines intersecting it from the bottom left towards the top right.

Appendix E – Records of Consultation and eDNA results

eDNA Survey Results



Report: 19302-ARC-KO-1

Order number: ARC-19002-KO

Great Crested Newt eDNA Results

Company: Arcadis (UK) Ltd
Contact: Kalle O'Brien
Project code|Task code: DCWW Pengarnddu SRV - 10032821
Date of Report: 25 June 2019
Number of samples: 3

Thank you for sending your samples for analysis by NatureMetrics. Your samples have been processed in accordance with the protocol set out in Appendix 5 of Biggs et al. (2014).

DNA was precipitated via centrifugation at 14,000 x g and then extracted using Qiagen Blood and Tissue extraction kits.

qPCR amplification was carried out in 12 replicates per sample, using the primers and probe described by Biggs et al. (2014), in the presence of both positive and negative controls.

Results indicate GCN absence in 'P1', 'P2', and 'P3'. All controls performed as expected and so the results are conclusive.

Results are based on the samples as supplied by the client to the laboratory. Incorrect sampling methodology may affect the results. Note that a negative result does not preclude the presence of Great Crested Newts at a level below the limits of detection.

Sample	Pond ID	Arrived	Inhibition	Degradation	Score	GCN status
1895	P1	21-Jun	No	No	0	Negative
1893	P2	21-Jun	No	No	0	Negative
1894	P3	21-Jun	No	No	0	Negative