

CHAPTER 11 – ECOLOGY

Introduction

- 11.1 This chapter describes the findings of the ecological assessment for the proposed Mynydd y Gwynt Wind Farm. The assessment was designed to identify valued ecological receptors (i.e. species and habitats) associated with the study area that may be significantly affected by the development of the wind farm and to determine what the potential effects of the development on these receptors would be.
- 11.2 Ecological baseline conditions were assessed through a combination of desk study and original field survey. Ecological studies have been undertaken at Mynydd y Gwynt from 2004 until the production of this report (2014). Full scale studies were initially undertaken between March 2004 and October 2005 (vegetation, mammals including bats and birds); during 2008 to 2011 these studies have been updated as follows:
- vegetation – update and expansion of National Vegetation Classification (“NVC”) survey and reclassification according to Turner (2006), 2010;
 - peat – structured peat surveys of the infrastructure footprint, 2010 and 2011;
 - bird - Vantage Point surveys - November 2009 to November 2010;
 - bird - Brown and Shepherd Breeding Wader surveys, April to June 2010 and April to June 2008;
 - bird - Winter Bird Surveys, December 2010 to February 2011;
 - mammal - Water Vole, Otter and Badger surveys, October and November 2009, Water Vole and Otter re-surveys March 2014;
 - mammal - Bats - transect surveys during Spring, Summer and Autumn 2010 - focussing on the predicted infrastructure layout, plus ANABAT surveys of Mine Adits;
 - reptiles - carrying out refugia surveys around all proposed turbine locations and locations along proposed Access roadways, 2010;
 - fish - Bullhead - search of suitable habitat in River Wye and tributaries within the Study Area, 2010; and
 - desk study - updated data from Powys Biological Information Service (“BIS”) on Priority species including 2km buffer around the site.
- 11.3 Species and habitats are described and evaluated in terms of recognised criteria (see **Paragraphs 11.14 – 11.17**).
- 11.4 A Habitat Management Plan (“HMP”) has been produced.
- 11.5 Potential impacts of the main phases of the development (being construction, operation and decommissioning) have been reviewed, with particular attention paid to species and habitats of high vulnerability to the proposed development. Recommendations regarding species and habitats have been incorporated into project design, operation and maintenance where possible. Mitigation proposals (including future management) and

residual impacts are detailed as relevant and the significance of post-mitigation impacts is described.

11.6 The key issues of the assessment are considered to be:

- direct effects of the wind farm construction on ecological receptors (e.g. habitat loss and/or loss of plant or animal species);
- indirect effects of the wind farm construction on ecological receptors (e.g. the effects of altered hydrological regimes on wetland habitats);
- direct and indirect effects of the wind farm operation on ecological receptors (e.g. disturbance of habitats and/or species);
- direct and indirect effects of the wind farm decommissioning on ecological receptors;
- mitigation to avoid/reduce these effects; and
- opportunities for habitat management and enhancement.

Assessment Guidelines

11.7 The assessment has been informed by guidance related to the development of wind farms. This ranged from general guidance provided by the Environment Agency (“EA”) on the scope of assessments and potential significant effects (EA, 2002) to detailed guidance relating to specific species or groups of species. References to consulted guidance are provided below:

- Countryside Council for Wales (“CCW”), (2010). Assessing the Impact of Windfarms on Peatlands in Wales. CCW Bangor;
- Scottish Natural Heritage (“SNH”), (2005). Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities;
- Langston, R.H.W. & Pullan, J.D., (2003). Wind Farms and Birds: An Analysis of the Effects of Wind Farms on Birds, and Guidance on Environmental Assessment Criteria and Site Selection Issues. For the Council of Europe Directorate of Culture and of Cultural and Natural Heritage by RSPB and Birdlife International;
- EA, (2002). Scoping Guidelines for the Environmental Impact Assessment of Projects;
- SNH, (2001). Guidelines in the Environmental Impacts of Wind Farms and Small Scale Hydroelectric Schemes;
- English Nature, RSPB, WWF-UK and BWEA, (2001). Wind Farm Development and Nature Conservation;
- BWEA, (1994). Best Practice Guidelines for Wind Energy Development;
- Natural England, (2012). Bats and onshore wind turbines: Interim guidance. Natural England Technical Information Note TIN051, second edition.

Assessment Method

- 11.8 The ecological assessment has followed the guidance on assessment methodologies in relation to wind farms and specific groups of species detailed above. The guidelines of the Institute of Ecology and Environmental Management (“IEEM”) on impact assessment were also used to guide this assessment. These guidelines set out the principal factors which should be considered within an ecological assessment. The IEEM guidelines are generic and as acknowledged in the documentation need to be adapted to suit particular projects and sites.
- 11.9 The IEEM guidelines were produced in 2006 (IEEM, 2006), and supersede an earlier set of draft guidelines produced in 2002 (IEEM, 2002). Both these sets of guidelines have been used to inform this assessment. However, it was felt that the earlier guidelines provide more explicit criteria and a more methodical approach for the evaluation of impact significance. They have therefore been employed for this purpose. Whilst both sets of guidelines provide a robust basis for the assessment of ecological impacts, they do not have any legal standing. In addition, they are not a substitute for professional judgement and interpretation, particularly where ecological value and/or the magnitude of effect for a proposed development are not clear (IEEM, 2006).
- 11.10 Following best practice for Environmental Impact Assessment (“EIA”), an iterative approach has been adopted. Potential impacts were identified at an early stage and where feasible, alternatives, which removed or reduced the impacts, were identified and incorporated in the project design. Such an approach leads to inherent design mitigation and where such measures have taken place, they are listed in the Optimisation section of this Chapter in order to demonstrate the sensitive design of the proposals.
- 11.11 This assessment is based on identifying the potential sensitive receptors within a study area, predicting the potential impacts that may occur from construction, operation and decommissioning of the project and then determining if these may lead to a significant effect on the sensitive receptors themselves or on the systems on which they rely.
- 11.12 Baseline ecological information for the site was collected through desk study and original field survey. The results of initial scoping and consultation focused attention on those ecological groups and habitats most likely to be affected by the development. These included blanket bog, upland fen, wintering and breeding birds, Otter (*Lutra lutra*), Water Vole (*Arvicola amphibius*) and bats. Individual survey methodologies for these groups and habitats are outlined under the relevant sections below.
- 11.13 Throughout the survey process, particular attention was paid to (a) protected animal and bird species, (b) habitats for which relevant legislation exists and (c) Biodiversity Action Plan (“BAP”) species and habitats. Legislation designed to protect habitats and species and therefore relevant to the ecological assessment procedure is outlined in **Appendix 11.1**.

Assessment of Significance

- 11.14 The ecological value of a habitat or species can be expressed in terms of its geographical significance. The IEEM guidelines state that a habitat or species may be considered ecologically valuable at one of the following levels: international, national, regional, county/metropolitan, district/borough or parish/neighbourhood. These categories are defined, with examples, in **Appendix 11.2**.

- 11.15 Impacts can be either adverse or beneficial. Adverse effects are those that will negatively affect an ecological receptor, for example through reduction in its area or population, or impairing its functioning. Beneficial effects are those which result in an improvement or increase in the ecological receptor, for example increased productivity of populations, or greater habitat area. Effects can also be permanent or temporary, and vary in the probability that they will occur, with different effects potentially persisting for different time periods.
- 11.16 The descriptions in **Table 11.1** were used to categorise impacts on species and habitats. Thus, if the predicted change is likely to cause a permanent adverse effect on the integrity of an ecological receptor (that is, species or habitat), this impact would be described as 'major negative'. The judgement on the severity of impacts was based on a combination of the following: knowledge of the requirements of the species or habitat in question and an evaluation of the impact itself. In describing the latter, reference was made to the following factors: confidence in predictions, extent of impact, magnitude of impact, duration of impact, reversibility of impact and timing and frequency of impact.
- 11.17 In this report, impact significance was determined through a combination of the ecological value of the species and/or habitat (**Appendix 11.2**) and the impact description from **Table 11.1**. The matrix in **Table 11.2** was used for this purpose. The matrix displays the significance criteria. As an example, a sustainable (i.e. ecologically viable) area of County BAP habitat would be valued at 'County/metropolitan' level of value (**Appendix 11.2**). If a substantial proportion of this were to be removed for turbine bases and access tracks, this would mean the effect was of a large extent. The effect would also be irreversible (at least for the foreseeable future). A high degree of confidence could be placed in this prediction. Taken together, these factors would result in the effect being classed as 'major negative' (**Table 11.2**). The combination of 'County/metropolitan' level of value and 'major negative' effect would give a significance value of 'major – moderate' (**Table 11.2**). In cases such as this, where the significance falls within a range (i.e. between 'major' and 'moderate'), a decision is made as to which is the correct value. This decision is based on the factors listed in **Paragraph 11.16** and particularly on 'professional judgement'. In this assessment, any effect that is of at least 'major' significance at a 'County/metropolitan' level is considered as significant in the overall context of the development and in terms of the EIA Regulations. An effect may be either negatively or positively significant.

Table 11.1: Determining Impact on an Ecological Receptor	
Impact description	Criteria
Major negative	The change is likely to cause a permanent adverse effect on the integrity of an ecological receptor
Negative	The change adversely affects the valued ecological receptor, but there will probably be no permanent effect on its integrity
Neutral	No effect

Table 11.1: Determining Impact on an Ecological Receptor	
Impact description	Criteria
Positive	The change is likely to benefit the receptor in terms of its conservation status, but not so far as to achieve favourable conservation status
Major positive	The change is likely to restore an ecological receptor to favourable conservation status, or to create a feature of recognisable value

Table 11.2: Determining Significance of Ecological Impacts						
	International	National	Regional	County/ metropolitan	District/ borough	Parish/ neighbor hood
Major negative	Critical	Critical	Critical- moderate	Major- moderate	Moderate- minor	Minor- moderate
Negative	Major-minor	Major-minor	Major – minor	Moderate – minor	Moderate – minor	Minor
Neutral	No impact					
Positive	Major – minor	Major – minor	Major – minor	Moderate – minor	Moderate – minor	Minor
Major positive	Critical	Critical	Critical – moderate	Major – moderate	Moderate – minor	Minor - moderate

Survey Methods

11.18 Unless stated elsewhere the Study Area for all surveys was the red line application area as presented in **Figure 2.1**. The surveys have been carried out over a period from 2004 to 2014, and most have been repeated. While some of the data may be older than two years, the fact that there is a series of data covering a six year period, which shows little variation, indicates that there is no reason to suggest that the survey data does not provide an accurate depiction of the ecology of the site. This view is supported by NRW’s response to the S42 consultation (**Appendix 48 of Consultation report lines 128 to 159**) which does not indicate any concerns about the data. The only issue raised about the

surveys related to the provision of more data about the methodologies used and the mapping of NVC communities, both of which have been addressed.

Phase I Habitat Survey

- 11.19 An 'extended' Phase I habitat survey was carried out in early Autumn 2004, covering the area of the application site as well as a section to the west of the application area. This followed the Nature Conservancy Council (now National Resources Wales ("NRW")) guidelines (NCC, 1990). In addition, it included a general evaluation of the site in terms of its invertebrates and incidental observations of mammals.
- 11.20 Phase I categories were mapped on a base map, using lettered codes (see **Figure 11.1**). Habitats and plant species of more interest were target-noted ("TN") and these are described in **Paragraphs 11.121 – 11.147**. Where applicable, the BAP categories are suggested. A full vascular plant species list is presented in **Appendix 11.3**. Species nomenclature follows that in Stace (1991).
- 11.21 Including the area to the west of the application area 918.88ha was surveyed in total; this report relates to the Study Area (583.93ha.) shown as the area within the red line in **Figure 11.1**.
- 11.22 Although the Phase 1 survey is now dated, the broad habitats recorded are unlikely to have changed significantly within the intervening period. The NVC survey was updated and expanded in 2010 to cover the whole of the Study Area. Given that NVC provides more precise habitat information than the Phase 1 survey, it is considered that it should not be necessary to update the 2004 Phase 1 survey.

National Vegetation Classification

- 11.23 The NVC survey was originally undertaken in 2005; this survey was updated and expanded in the summer of 2010. Following on from the Section 42 Consultation submission and comments made by NRW, and following liaison with NRW habitat specialists, particular areas of blanket bog and associated habitat were remapped in 2013.
- 11.24 During summer 2005 the proposed site was classified in terms of the NVC. NVC is an in-depth vegetation survey technique that provides information on vegetation communities. The methodology for NVC survey followed that outlined in Rodwell (1991 et seq.). In summary, this required recording 2 x 2m quadrats in stands of homogeneous vegetation. In discussion with CCW (now NRW), it was decided that a NVC survey would not take place in areas of improved, poor semi-improved and semi-improved acid grassland. Sampling would therefore focus on the more ecologically valuable vegetation communities. Thus, mapping was undertaken within areas of dry dwarf shrub heath, wet dwarf shrub heath, blanket bog, acid flush and marshy grassland communities. The NVC map of the Study Area is reproduced in **Figure 11.2**.
- 11.25 The number of quadrats recorded from each vegetation community varied, depending on the confidence of the surveyor in correctly classifying a community and in assessing how typical the community was. The cover abundance of each taxon of flora (that is, species) was recorded for each quadrat using the Domin scale. Additional notes were taken in order to aid sub-community classification. Quadrat location was recorded using a Geographical Positioning System ("GPS").

- 11.26 In order to update the NVC, including a small previously un-surveyed area close to the proposed site compound, and to incorporate classification following Turner (2006), further NVC surveys were carried out during 2010 and 2013.

Peat Depth

- 11.27 Peat survey work focussing on the wind farm infrastructure footprint was carried out in 2010. Peat depth readings were based upon the most current design at that time and focused on turbine and track locations. Peat depth measurements were carried out at 50m intervals.
- 11.28 Where new tracks have been proposed, a measure was taken in the centre of the track. For new and extended tracks, measures were recorded at 5m and 30m either side of the track. In all, 1642 peat depth measurements were taken in 2010, plus a further 450 in 2011 and 34 in 2013. Extra points were taken in 2011 as a result of scheme design amendments. Readings were taken up to 150cm depth, to the nearest 1cm using a steel probe. Data was entered onto a 'MobileMapper'.
- 11.29 Using this peat depth data, together with earlier previously collected targeted depth measurements carried out between 2004 and 2009, a peat depth map has been produced (**Figure 11.3**).

Peat Depth Map Contour Creation Methodology

- 11.30 Within ESRI ArcGIS software a point shapefile was created, points were generated along internal tracks and across infrastructure construction sites at an interval between 20 and 100 metres. Each point was attributed with its correct Ordnance Survey 12 figure National Grid coordinates and allocated a unique number. The shape file and attribute table were exported from ArcGIS and uploaded to a Mobile Mapper GPS. This would enable the field surveyor to take peat depth measurements at the correct position and to add the recorded depth to the attribute table for each point.
- 11.31 On completion of the survey the depth data shapefile was downloaded to ArcGIS software for cleaning prior to contour creation. Once cleaned the data was then used to create a raster of the depths covering the surveyed area using ArcToolbox. From this depth raster contours were interpolated using ArcGIS Spatial Analyst to create the final peat depth contours used.
- 11.32 The peat depth map presents peat depths according to depth classes. Should infrastructure design evolve outside of the areas covered, then further readings will be taken to cover any new areas.
- 11.33 Peat depth is indicative of certain habitat types, namely, bogs and fens. These are found over deep peat, typically being greater than 0.5m in depth. Upland habitats are often in a degraded form and can be difficult to categorise in terms of vegetation classification. In such cases, peat depth can provide an indication of the resultant likely habitat if restoration is implemented. Also, as peat depth is indicative of these, generally sensitive, habitat types it is a relatively simple procedure to use peat depth as a means by which potential impacts may be targeted towards less sensitive areas, i.e. on shallow peat. Peat also contains a significant amount of soil carbon and so acts as a carbon sink. Destruction of peat will lead to mineralisation and subsequent release of previously locked up carbon dioxide (CO₂) into the atmosphere, which contributes to global warming.

Bird Surveys and Methods

Vantage Point Birds Survey

- 11.34 Vantage Point (“VP”) surveys, following SNH (2005) guidance, were carried out during 2009–2010. Birds of prey and waders were targeted and any Birds of Conservation Concern (“BoCC”) that were seen were also noted. Two VP surveys were required in order to observe the whole site; one in the north of the site at SN 823 863, and the other in the south of the site at SN 839 842. Ideally, VPs should be placed off-site. However, this was not possible for the Southern VP due to the landform of the area. The surrounding hills were either too far away or had their view obscured by Y Foel. Viewshed from the VPs are presented in **Figure 11.4**. Observations for these follow up surveys spanned one calendar year from November 2009 to November 2010 inclusive.
- 11.35 In total, 108 hours of observation were made from each VP. During the spring migration period (late March to mid May) the autumn migration period (early September to early November) and the breeding season (mid March to mid July) at least 36 hours of survey were undertaken from each VP. This was augmented by 18 hours from each VP during the winter period (December to February). Numbers, details of flight height and direction of birds were recorded. Flight height was recorded in metres, however, it should be recognised that estimation of flight height is somewhat subjective and difficult.
- 11.36 In subsequent analysis, flight height data was categorised into three classes as follows:
- Low = below turbine blade height (less than 30m);
 - Medium = within turbine blade height (30 to 130m); and
 - High = above turbine blade height (over 130m).
- 11.37 Previous migratory surveys were carried out during 2004-05. These surveys were carried out in accordance with recommendations made at that time by CCW (now NRW). During these original surveys, five counts were made during the spring migration period (late March – mid May), and ten counts during the autumn migration period (early September to early November). Counts were carried out within three hours of dawn.
- 11.38 Maps showing VP results are presented in **Figure 11.5a through to Figure 11.5d**.

Breeding Birds Survey

- 11.39 Breeding bird surveys were carried out in 2005 and repeated in 2008 and 2010.
- 11.40 The Brown and Shepherd (1993) methodology was adopted for the breeding bird survey. This states that the surveys should be carried out between 08.30 and 18.00. The site is notionally divided into 500m x 500m quadrats, and each area visited for a constant amount of time. The observer should cover the survey area so that he/she passes within 100m of all points of the site.
- 11.41 All birds were recorded, using standard British Trust for Ornithology (“BTO”) symbols on a relevant scale map. The behaviour of individual birds was also recorded, where appropriate. Birds are said to be breeding if they are observed displaying or singing, adults are repeatedly alarm calling, nests, eggs or young are located, distraction displays are seen and/or territorial disputes are seen.

- 11.42 For breeding birds, this methodology requires a minimum of two visits to a site, the first visit during the period early April to mid-May, with the second visit between mid May to late June.
- 11.43 Particular emphasis was put on recording birds of prey, waders (principally Snipe (*Gallinago gallinago*), Lapwing (*Vanellus vanellus*), Curlew (*Numenius arquata*)) and Red Grouse (*Lagopus lagopus scoticus*). The whole area of the site was walked and birds using the site or flying over were recorded, and their locations noted. A full non-breeding birds list for the Study Area is included at **Appendix 11.4**.
- 11.44 For the 2008 and 2009 surveys, SNH guidance (2005) on targeting species, has been followed. The guidance recommends targeting species of conservation concern, these are defined as:
- Annex 1 species of the EC Birds directive;
 - Red listed BoCC; and
 - Schedule 1 species of the Wildlife and Countryside Act 1982.
- 11.45 In addition BAP species and all raptors and waders were also targeted.
- 11.46 Territory centers are identified on the Breeding Bird map (**Figure 11.6**). These were determined as follows. Following all survey visits, information was transferred to species maps. This resulted in clusters of species registrations. Territory centers are points that fall roughly at the centre of these clusters. However, this is only an approximation and is given as an aid for descriptive purposes and clarification of the spatial relationship between clusters. Although it may well correspond to actual territory centers, it is not intended as a literal identification of such on the ground.
- 11.47 Maps presenting VP results for the 'breeding season' (March to August) are presented in **Figure 11.5a** for Red Kite (*Milvus milvus*) and **Figure 11.5c** for Target Species other than Red Kite.
- 11.48 The Red Kite Trust was consulted with regard to records for breeding Red Kite within 2km of the Study Area; they reported no records for the area.

Other Bird Surveys: Ring Ouzel and Black Grouse

- 11.49 Targeted Ring Ouzel (*Turdus torquatus*) and Black Grouse (*Tetrao tetrix*) surveys were also carried out, following methods recommended by the RSPB (Gilbert *et al*, 1998). The Etheridge and Baines (1995) methodology for Black Grouse was followed; this suggests one visit from the end of March - mid May, one hour before and one hour after sunrise in previously noted suitable habitat. The Ring Ouzel survey method requires three visits, two between mid-April and mid-May and one mid-May to June. A tape recording was played of a Ring Ouzel within 500m of any suitable rocky habitat. This was also carried out to the north-east, outside of the application area within the Pumlumon (Plynlimon) SSSI.

Non-breeding Birds

- 11.50 Winter bird surveys were carried out during the winter of 2010 – 2011. The approach followed the Brown and Shepherd (1993) methodology, as detailed above; monthly visits were made during December, January and February.

- 11.51 Non-breeding birds have also been targeted during VP surveys (methodology above).
- 11.52 In addition, previous surveys were undertaken during 2004-05, consisting of nine visits made to the Study Area to record non-breeding birds. These took place outside the breeding season, that is, July to March, with one visit per month. The Brown and Shepherd (1993) methodology was again used for these surveys.
- 11.53 Maps presenting VP results for the non-breeding season (September to February) are presented in **Figure 11.5b** for Red Kite and **Figure 11.5d** for Target Species other than Red Kite. A map showing the Brown and Shepherd Winter Bird survey findings is presented in **Figure 11.5e**.

Bird Collision Risk Assessment Methods

- 11.54 This section summarises the application of the SNH Collision Risk Model (“CRM”), set out and developed by Band *et al.* (2007).
- 11.55 The model is designed to estimate the number of bird collisions over the course of the survey period, usually one year, and involves a three-stage calculation process. The first stage seeks to assess how many birds will fly through the rotors of the wind farm; this is based on actual field observations of birds using the site, and relies on accurate mapping of flight lines and heights. The second stage assesses the probability of birds actually colliding with the rotors, using data on turbine and bird dimensions, along with a variety of other parameters.
- 11.56 The first two stages assume that birds will be unable to take action to avoid the rotors or turbines. Of course, in the great majority of cases individual birds will be capable of taking avoiding action. To account for this, SNH has published guidance on Avoidance Rates, using a combination of direct observations and assumptions based on existing knowledge of bird behaviour and flight capabilities. The third stage of the assessment involves the application of these avoidance rates to the previously calculated total, and provides a more realistic figure for potential collision. Detailed workings for these calculations can be found in **Appendix 11.5**. The assessment was carried out for both the V90 and the V105 turbine models.
- 11.57 The VP and other bird surveys found clear evidence that two Species of Conservation Concern were using the site regularly, and exhibiting flight lines within range of the rotors. These species are Golden Plover (*Pluvialis apricaria*) and Red Kite (*Milvus milvus*).
- 11.58 All other species observed were not recorded in sufficient numbers to be considered here, as their use of the site is not regular enough to be suitable for Collision Risk Modelling.

Constraints and Limitations

- 11.59 The CRM has been devised by SNH and is recommended for use on wind farm EIAs. However, the method is still very much in development and subject to frequent analysis and peer review, most particularly in the application of avoidance rates (a factor which is poorly understood and lacking in empirical evidence). The methods used in this document are consistent with the most up to date version of the CRM, as provided by SNH.

Golden Plover

- 11.60 There are two distinct methods for the stage one calculation, each designed around variations in bird flight behaviour. In the case of this species, the appropriate method is for birds utilising the wind farm airspace. The use of this method is arguable, but although direct observations most often recorded Golden Plover flying purposefully over the site, most likely between feeding and roosting sites, there was no predominant flight direction that birds were using. In addition, on occasion they were also seen circling over the site as well as feeding on the site on one occasion.
- 11.61 The full stage one calculation can be found at **Appendix 11.5**. The calculation relies on accurate data relating to observations of time spent by birds in the wind farm area. The 'bird occupancy' is derived from the observed number of birds and the period of time over which they were observed. The raw data was assessed in order to determine the number of birds flying within the 'risk window' (area to be occupied by wind turbines and rotors). Observers had plotted flight lines on maps, which could be compared to the proposed locations of the 27 turbines. To allow for potential observer error, any Golden Plover flight line within 200m of the site boundary was included in the calculation, along with any observations of the species within the risk window. The VP survey represents a small portion of the time that birds could be active over the site. Therefore the results were scaled up to provide an estimate of bird occupancy over the whole period that Golden Plover could be active on site, considered to be from September to March, and based on average daylight hours.

Red Kite

- 11.62 The same method for the stage one calculation was used for Red Kite. Although many of the observations of Red Kite were for birds moving purposefully over the site, some of the observations were for feeding/scavenging birds. Therefore, of the two methods, this is the more appropriate for Red Kite.
- 11.63 The full stage one calculation can be found at **Appendix 11.5**. Flight lines and heights were plotted and analysed as for Golden Plover. The results were scaled up to provide an estimate of bird occupancy over the whole year based on average daylight hours.

Mammal Surveys

Otter Survey Method

- 11.64 The survey methodology broadly followed that detailed by Chanin (2003) and has been adapted to cover all the watercourses lying within the Study Area. Linear water features throughout the site were surveyed for signs of Otter presence and activity. The principal waterways in the locality are the River Wye to the west of the site, and the River Bidno to the east of the site bordering the Hafren forest. All of the streams on-site drain into the River Wye. Streams draining the site include the hillside streams, into which flow a number of smaller streams and drainage ditches. Otter patrol and mark all watercourses within an area to establish 'ribbon' territories, for foraging and to exclude rivals.
- 11.65 The Otter surveys were carried out in 2004 repeated during October and November 2009 and repeated again in March 2014.

Water Vole Survey Method

- 11.66 Survey work for Water Vole was based on searching along and adjacent to on-site watercourses, following the methodology of Strachan and Moorhouse (2006). In particular, areas of marshy grassland dominated by Soft Rush (*Juncus effusus*) and Purple Moor-grass (*Molinia caerulea*) adjacent to watercourses, were searched. Survey concentrated on searching for field signs, principally droppings, feeding remains (for example, piles of pith from Soft Rush) and burrows.
- 11.67 Habitat type and where relevant, quality were recorded, and positions of features established using a GPS. The type of field sign/s was recorded (i.e. burrows, feeding piles, droppings) as was the extent of individual Water Vole colonies. During other surveys Water Vole presence was considered and any incidental finding recorded.
- 11.68 The Study Area for the Water Vole survey was all watercourses running within and adjacent to the red line application area (see **Figure 2.1**). Additional records were made where these fell outside the application area, and in particular, where these were associated with the River Wye. Water Vole surveys were carried out in 2004, repeated during October 2009 and repeated again in March 2014.

Brown Hare Survey Method

- 11.69 Brown Hare (*Lepus europaeus*) were recorded through incidental records, in conjunction with other fieldwork. Locations were noted.

Badger Survey Method

- 11.70 The whole of the Study Area was surveyed for signs of Badger (*Meles meles*) activity, including active Badger setts and latrines. This took place during September and October 2005.
- 11.71 The Badger surveys were repeated during October and November 2009.

Bat Survey Method

Bats 2010 Surveys

- 11.72 During 2010, transect surveys were carried out which focused on the infrastructure layout. Surveys were carried out in spring (April – June), summer (July and August) and autumn (September and October). Following Bat Conservation Trust guidelines, the site was divided into three transect walks. Each transect aimed to cover as much ground as possible within the three hour recommended survey window. During each survey period, transects were surveyed at both dusk and dawn. Transect routes aimed to encompass the proposed turbine locations as well as linear or other habitat features likely to be used by bats. In addition, a number of different habitat types (considered likely to be good and bad) were sampled to provide some (site) specific information on bat species' habitat preferences. Transects were walked in tandem, with each surveyor listening for bat calls on a Batbox Duet frequency division bat detector and one recording with a single Anabat datalogger. The raised Anabat was set to record at all times at its maximum working sensitivity (6.75 - 7). When walking along linear features potentially used by bats, surveyors were staggered, in order to ascertain the direction in which bats were moving. Where bats could be observed (generally around dusk and dawn) flight direction, height and behaviour were noted.

- 11.73 All recorded bat calls were analysed off site, although some species or genus level separation was possible by ear during the survey. Recorded calls were analysed using Analook software to achieve species level identification, where possible (Thorne and Thorne, 2010).
- 11.74 Following on from mine adit surveys carried out in 2006, during 2010, the mine adits located in Nant Iago at SN 82782 85086 (Adit 1, 382m) and SN 82715 86198 (Adit 2, 435m), were each surveyed for roosting bats. Both of these adits contained standing water indicating high potential humidity levels (required by hibernating bats). The two mine adits were monitored using automated Anabats to continuously record bat species present. Anabats were positioned in such a way as to limit external recordings of bats commuting or foraging along the nearby stream line. Each survey aimed to encompass a period of around 5-7 days. Surveys were carried out in spring, summer and autumn. Autumn and spring surveys aimed to identify swarming and hibernation activity, and summer surveys aimed to record occasional roosting bats, such as lone males seeking cooler roosts (Thorne and Thorne 2010).

Bats Pre 2010 Surveys

- 11.75 Prior to 2010, baseline survey of bat activity within the application area was carried out from June to September 2005. Further surveys were carried out by car in June and July 2006. A daytime visit was made to mine sites to assess the potential of each mining feature to be used by bats. Further details are presented below.
- 11.76 A daytime survey of various disused mining structures within the application boundary was undertaken in June 2005 to assess the potential of these structures to accommodate bats and to identify the focus of more detailed survey effort. The daytime survey was also used to identify particular areas within the site that were most likely to support bat activity and that should form the focus of evening field surveys.
- 11.77 Remote monitoring of one mine adit was undertaken in August 2005 to survey for potential swarming activity. An ANABAT logging bat detector system was used (a frequency division bat detector linked to a data logger), placed within the mine adit and pointing towards an adjoining shaft entrance.
- 11.78 Evening surveys were conducted in order to monitor bat activity and to identify bat foraging habitats and possible commuting routes through the application area. Due to the large scale of the application area, it was decided that the evening surveys should follow a simplified 'car survey' methodology (originally devised by The Mammals Trust UK and The Bat Conservation Trust). The methodology involves driving along tracks/roads at a steady speed (<15mph), starting shortly after sunset whilst using a broadband bat detector to monitor bat activity. During periodic stops to observe for any more distant bats both frequency division (Duet) and time expansion (Tranquillity) bat detectors were used to ensure full coverage of all the frequencies used by resident UK bat species. A note was made of any other contacts (visual) made with bats between sample points. A high-powered lamp was used periodically to scan the horizon and woodland edges to observe activity too far away to pick-up with bat detectors. The two car surveys were undertaken in June and July 2006.

Reptiles and Amphibians Survey Method

- 11.79 During 2010 a reptile survey was carried out by undertaking refugia searches. Methodology followed that as detailed in the Herpetofauna Workers Manual (JNCC 1998). Consequently, refugia were located at each of the proposed turbine locations together with targeted track locations; refugia were inspected on five occasions during the survey period. A full survey protocol is provided in **Appendix 11.6**.
- 11.80 Prior to the 2010 surveys, a targeted search was made for reptiles in the summer/autumn 2008, looking for potential basking sites and refugia (refuges under rocks, sheltered banks, etc).
- 11.81 Incidental observations of reptiles and amphibians were also made throughout the survey period.

Bullhead Survey Method

- 11.82 During October 2010, targeted searches were made of all suitable habitat in the River Wye, and tributaries within the impact area, for Bullhead (*Cottus gobio*). Survey methodology followed the protocol as detailed in **Appendix 11.7**. Within the pre-selected localities surveyors, supplied with lift nets, walked lengths of watercourses. The river/stream bed was carefully inspected for the presence/absence of Bullhead. This included the lifting of, and searching below, stones on the river/stream bed.
- 11.83 The methodology employed is an amalgam of 'Bankside Counts' method and 'Lift Netting' method, as described in Sutherland (1997). It is acknowledged that it is not as efficient as electro fishing in that it will not result in the capture of as large a sample of the overall fish population. However, the survey is only required to determine presence / absence. Furthermore, benthic species such as Bullhead may not rise to the surface following electro fishing. This method has the advantage that Bullhead habitat is targeted and systematically searched. Therefore, this approach, which has previously been used by ADAS on the ecological impact assessment of the proposed Heysham to M6 Link, which resulted in positive captures of Bullhead, was considered to be the most suitable.

Lay-by Ecological Walkover Survey

- 11.84 An ecological walkover survey has been undertaken in June 2012 on sections of the road along which there will be delivery of wind farm components to the Mynydd y Gwynt Wind Farm, where the enlargement or creation of new lay-by areas may need to take place. During the survey, emphasis was placed on searching for evidence of and potential of habitats and features supporting protected or notable species. The full description of the walkover survey methodology is provided in **Appendix 11.8**.

Consultations and Data Gathering

- 11.85 Consultations with statutory and non-statutory consultees included NRW, the Royal Society for the Protection of Birds (“RSPB”) and local interest groups and recorders. Details of consultations are listed in **Table 11.3**.

Table 11.3: Comments from Statutory and Non statutory Consultees		
Consultee	Comments	
Natural Resources Wales (“NRW”) (formerly Countryside Council for Wales (“CCW”))	<p>Consultation with CCW took place from the project’s inception in 2005, and the scope of the fieldwork was based on guidance supplied by CCW.</p> <p>Discussion took place with Andrew Law on several occasions during the survey period. Discussion centred on the details of survey methodologies for bird surveys and the scope of Phase II vegetation survey of the site.</p> <p>CCW wrote a letter on 11th August 2005 commenting in detail on the scoping report (consultation responses are provided in the Consultation Report, this included the following:</p> <p>EIA should provide information to allow assessment of the effect on the Afon Gwy (River Wye), a Special Area of Conservation (“SAC”).</p> <p>The Local Authority biodiversity officer should be consulted regarding regional and local biodiversity issues.</p> <p>Details of survey methodologies for bird surveys and the scope of Phase II vegetation survey should be discussed with CCW.</p> <p>Stipulation that construction material should not originate or be disposed of in the mines SSSIs.</p> <p>Recommendation that the EIA should include:</p>	
	<ul style="list-style-type: none"> potential impacts on the River Wye and mitigation; 	<ul style="list-style-type: none"> changes to run-off regime and mitigation;
	<ul style="list-style-type: none"> physical changes to site drainage and mitigation; 	<ul style="list-style-type: none"> impact on rush-dominated flushes and degraded bogs, blanket bog and wet heath associated with blanket bog or acid grassland;
	<ul style="list-style-type: none"> detailed survey of site hydrology including peat depth mapping exercise; 	<ul style="list-style-type: none"> impacts on geological mine SSSIs if affected;
	<ul style="list-style-type: none"> origin of construction material and disposal of removed 	<ul style="list-style-type: none"> areas of species-rich acidic grassland mapped to same

Table 11.3: Comments from Statutory and Non statutory Consultees		
Consultee	Comments	
	material;	level of detail as mire, bogs and heaths;
	<ul style="list-style-type: none"> acid grassland with suppressed cover of ericoids should be mapped; 	<ul style="list-style-type: none"> wider habitats should be mapped if they provide important contextual information to help assess effect of fragmentation;
	<ul style="list-style-type: none"> how improvements to degraded bog habitats and enhancement of blanket peat/wet heath/acid grassland would be achieved; 	<ul style="list-style-type: none"> how layout and construction timing would be implemented to avoid breeding periods;
	<ul style="list-style-type: none"> detailed survey for bats and otters; 	<ul style="list-style-type: none"> Include autumn bat survey for swarming activity;
	<ul style="list-style-type: none"> roost survey of shafts or assessment of the value of mines as roost sites; 	<ul style="list-style-type: none"> bat surveys should follow transect or likely foraging areas;
	<ul style="list-style-type: none"> concentrate badger survey on lower ground where there are to be access improvements to A44; 	<ul style="list-style-type: none"> assess impact of potential contamination, disturbance and loss of feeding sites on otters;
	<ul style="list-style-type: none"> inclusion of Red Kites and possible Red Grouse in surveys; 	<ul style="list-style-type: none"> inclusion of Tir Gofal agreement, CCW Rivers Team Data, Phase 1 information, Plynlimon SSSI files, RSPB survey data and PBIS;
	<ul style="list-style-type: none"> Brown and Shepherd methodology/draft SNH guidance should be followed for breeding bird survey; 	<ul style="list-style-type: none"> dusk survey for Snipe;
	<ul style="list-style-type: none"> Include monitoring and surveillance during and post construction for Red Kite collision and other impacts on species and habitats. 	

Table 11.3: Comments from Statutory and Non statutory Consultees	
Consultee	Comments
	Further comments were provided by NRW following the Section 42 consultation. These included requirement for further detail and clarification on methodology, mapping and further information on mitigation measures.
Powys County Council	Meeting with Powys County Council to discuss proposal and Transport route on 14 th September 2009, attendees Gwilym Davies (Planning), Dale Boyington (Highways), Nina Bufton (Rights of Way), Paul Bufton (Environmental Health), CCW: Carol Fielding
Powys Biological Information Service ("BIS")	Powys BIS were contacted (2005) in order to obtain information on Local Priority Species, Species of Local Conservation Concern and county wildlife sites that had been recorded within 3km of the centre of the site. Repeat data search conducted September 2011 within 2km radius of the perimeter of the planning application boundary
Royal Society for the Protection of Birds ("RSPB") (James Byrne, 2010, Stephen Bladwell, Andy Young in 2008, Mike Webb and Patrick Lindley pre 2005)	RSPB was consulted regarding methodological approaches for the bird surveys, and to ascertain whether there were any known locations for important bird species in the vicinity of the Study Area. In particular, consultation took place regarding Hen Harrier and Black Grouse. RSPB held no records of either species from the Study Area or its immediate vicinity. RSPB provided advice on bird survey methodology and scope. The RSPB were consulted in 2011 to obtain records of birds of Prey. They hold no records and directed enquiries to BTO.
RSPB Reserve Ynysir	For an estimation of breeding birds especially curlews, in Montgomeryshire and Wales from their surveying experience.
County bird recorders, Pete Jennings (Radnorshire), Russell Jones (Powys), Brayton Holt (Montgomeryshire)	For an estimation of breeding birds especially curlews, in Montgomeryshire and Wales from their surveying experience.

Table 11.3: Comments from Statutory and Non statutory Consultees	
Consultee	Comments
)	
Peter Lack (2011) Jane Kelsor (British Trust for Ornithology ("BTO") rep.)	Data request submitted in August 2011 for Bird of Prey records within 2km of the Study Area boundary. Peter Lack of BTO replied that very little data was available. Indicative results showed a lack of useful data for the Study Area and surrounds.
Ecology Matters (Mick Green)	For an estimation of breeding birds especially curlews, in Montgomeryshire and Wales from their surveying experience.
Red Kite Trust. Tony Cross	Consulted for Red Kite Records August 2011. No records available for the search area.
Steve Roberts. Local Honey Buzzard Expert.	Attempted to obtain records on Honey Buzzard from Steve Roberts in August and September 2011. Unsuccessful in making any contact and could not obtain any records for this species.
Centre for Ecology and Hydrology ("CEH")	Aquatic Fauna search August 2011. CEH directed ADAS to ENSIS for Biological records collected on the River Wye.
ENSIS Ltd	ENSIS were contacted in October 2011 for aquatic fauna records that are collected on the River Wye as part of the UK Acid Waters Monitoring Network ("UKAWMN").
Environment Agency ("EA") (now part of NRW)	Aquatic Fauna search August 2011. Invertebrate, salmon and trout records provided for a variety of locations on the River Wye and its tributaries.

Data Gathering Results

- 11.86 Conservation designations within the vicinity of the application area have been identified and biological information obtained from Powys BIS. In addition, a review of national and local BAPs (Powys Local Biodiversity Action Plan, 2008) was carried out to ascertain relevance to the Study Area.

Conservation Designations in the Vicinity of the Study Area

- 11.87 There are three SSSIs and one Special Area of Conservation ("SAC") within 3km of the application area, one of which is in the application area and two of which are adjacent (data source NRW). Location of the SSSIs and SAC are shown on **Figure 5.2**. In addition a Special Protection Area ("SPA") is located 3.4km to the south-west. SSSIs are statutory

sites that are of national importance for nature conservation and the SAC and SPA are of European-wide importance.

Plynlimon (Pumlumon) SSSI

- 11.88 Plynlimon SSSI covers a large area adjacent to the north east of the site. The Plynlimon SSSI extends from Plynlimon Fawr (753m) in the south to Foel Fadian (564m) in the north. It consists of blanket bog communities, dwarf-shrub heath and acid grassland. A number of uncommon plants occur here such as Starry Saxifrage (*Saxifraga stellaris*).
- 11.89 The upland bird assemblage of Plynlimon forms one of the qualifying features for its designation. This bird assemblage includes Red Kite, Peregrine (*Falco peregrinus*), Merlin (*Falco columbarius*), Hen Harrier (*Circus cyaneus*), Short-eared Owl (*Asio flammeus*), Kestrel (*Falco tinnunculus*), Buzzard (*Buteo buteo*), Ring Ouzel, Golden Plover, Red Grouse, Common Sandpiper (*Actitis hypoleucos*), Wheatear (*Oenanthe oenanthe*), Whinchat (*Saxicola rubetra*) and Teal (*Anas crecca*). Not all of these birds breed here.
- 11.90 The Plynlimon citation was compiled around 30 years ago, since then many of the breeding birds forming part of the assemblage have disappeared or suffered large declines. A recent study found that Golden Plover, Ring Ouzel, Curlew, Black-headed Gull and Teal no longer breed on Plynlimon (Crump & Green, 2011). Whinchat and Wheatear have also been subject to large declines.
- 11.91 In the production of this report particular consideration has been given to those bird species, which are features of the Plynlimon SSSI. Species were assessed through targeted single species surveys and/or through VP watches and through Brown and Shepherd survey.

Mwyngloddfa Nantiago SSSI

- 11.92 Mwyngloddfa Nantiago SSSI is an old mine shaft located just within the application area in the north of the site, at around SN 827 863, west of the existing track. It is a site of geological interest containing minerals of special note.

Afon Gwy (River Wye) SSSI/SAC

- 11.93 The Afon Gwy (River Wye) is a SSSI and a SAC. SACs are designated for features (i.e., species and habitats) of European-wide importance (other than for birds) and are listed under Annex I of the Council Directive 92/43/EEC (1992) on the conservation of natural habitats and of wild fauna and flora ("EC Habitats Directive").
- 11.94 The headwaters of the River Wye rise on Plynlimon and run in a largely south easterly direction in a valley to the west of the Mynydd y Gwynt proposal. Small streams and springs from the south and west slopes in the proposed application area drain into the river here. The River Wye and several of its tributaries represent a large ecosystem which acts as an important wildlife corridor, an essential migration route and a key breeding area for many nationally and internationally important species. The River Wye is a SAC for the majority of its length. Given the status of the river Wye and its proximity to Mynydd y Gwynt it is important that measures are taken to avoid impact on the watercourse.
- 11.95 **Table 11.4** lists the SAC features of the Afon Gwy (River Wye) SAC. These are differentiated into those that are a primary reason for SAC selection (i.e. are

commensurate with the very best examples of this habitat or species in the UK) and those that are present as a qualifying feature, but not a primary reason for SAC selection.

Table 11.4: SAC Features of Afon Gwy (River Wye) SAC	
Feature	Primary or Secondary Qualifying Feature
Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation	Primary
Transition mires and quaking bogs	Secondary
White-clawed (or Atlantic stream) Crayfish <i>Austropotamobius pallipes</i>	Primary
Sea Lamprey <i>Petromyzon marinus</i>	Primary
Brook Lamprey <i>Lampetra planeri</i>	Primary
River Lamprey <i>Lampetra fluviatilis</i>	Primary
Twaite Shad <i>Alosa fallax</i>	Primary
Atlantic Salmon <i>Salmo salar</i>	Primary
Bullhead <i>Cottus gobio</i>	Primary
Otter <i>Lutra</i>	Primary
Allis Shad <i>Alosa</i>	Secondary

11.96 A description of each of the SAC qualify features is given in **Appendix 11.9**.

Summary Afon Gwy (River Wye) SAC Features

11.97 The River Wye is clearly of high conservation importance for a large number of SAC features. Several of these are associated with the lower stretches (e.g. the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, Sea Lamprey and Twaite Shad), whilst other features such as White-clawed Crayfish are also found well downstream at the confluence of some of the main tributaries. These are all therefore found at a considerable distance from the Mynydd y Gwynt proposal.

- 11.98 However, other features, such as Bullhead, Atlantic Salmon and Otter are all found more widely throughout the Wye. For example, Otter have territories within the Study Area, and Salmon have been found (in very low numbers) at a nearby aquatic sampling station.

Elenydd - Mallaen SPA/SAC/SSSI/NNR

- 11.99 The Elenydd – Mallaen SPA is situated on the southern portion of the Cambrian Mountains. Part of the SPA is designated as a SAC, SSSI and a National Nature Reserve (“NNR”).
- 11.100 The Elenydd - Mallaen SPA qualifies for designation under Article 4.1 of the Directive (79/409/EEC) as it supports internationally or nationally important breeding populations of 3 Annex I species:
- 0.5% of the GB breeding population (5 year mean, 1987 – 1991) of Merlin;
 - 9.3% of the GB breeding population (count as at 1997) of Red Kite; and
 - 1% of GB breeding population of Peregrine Falcon.¹
- 11.101 Nationally Red Kite numbers have increased since designation of the SPA in 1996, when the SPA accounted for 9.3% of the GB breeding population. At the time of designation the population of breeding pairs within the SPA was 34, putting the GB population at around 377 breeding pairs. This correlates reasonably well with published population estimates set out in Table 1 of issue 26 of the Newsletter of the Welsh Kite Trust. Recent population estimates put the Welsh population at 1200 pairs and the GB population at greater than 1700 pairs. At the same time, the Designated Sites Bird Monitoring Project (Vanstone et al, 2013) identified the breeding population within the SPA in 2011 at 18 pairs while the population within 3km of the boundary is recorded at 67 pairs. The data therefore indicate that the population of Red Kite is increasing significantly (around 9% per annum) while the population of Red Kite within the SPA has fallen to a point where the area barely qualifies for SPA status.
- 11.102 Although the Elenydd is particularly outstanding for its breeding bird interest, it is also important for its hill land vegetation, with a wide variety of uncommon plants, and also nutrient-poor upland lakes. This includes the following Annex I habitats, for which a proportion of the SPA area is designated as a SAC: blanket bog, calaminarian grasslands, dry heaths, Floating Water Plantain (*Luronium natans*) and Oligotrophic to mesotrophic standing waters.

County Wildlife Sites

- 11.103 There are no sites designated at a County level (County Wildlife Sites) in the vicinity (3km) of the application area.

¹ Note: Peregrine Falcon is not cited on the SPA Standard Data Form. However, it was included in the 2001 Review, and is cited as a ‘Feature’ in the Elenydd – Mallaen Management Plan. As such it is a legal requirement to treat it as an SPA ‘Feature’.

Glastir/Tir Gofal Agri-environment Schemes

11.104 Since 1 January 2014 land within the site boundary has been managed under the Welsh Government Glastir agri-environment scheme; prior to that date it was managed under the predecessor scheme, Tir Gofal. Although neither Glastir nor Tir Gofal are planning designations affording statutory protection to land, the areas in question are receiving Government financial support to achieve specific environmental objectives. The main objectives of these agreements related to ecology and for Glastir specifically are:

- combating climate change;
- improving water management; and
- maintaining and enhancing biodiversity.

11.105 As the proposed application was under Tir Gofal and is currently under a Glastir agreement, the appropriate Project Officers will be consulted prior to any construction. However, the potential impacts on habitats under the Tir Gofal scheme have been assessed in this Chapter and mitigation measures proposed where applicable.

Powys Biological Information Service Data

11.106 The Powys BIS search was undertaken in September 2011. Powys BIS provided a Geographical Information Systems (“GIS”) plot of a 2km radius buffered around the Study Area. The locations of any known Priority Species, Species of Conservation Concern and Locally Important Species were plotted within this 2km radius.

11.107 Priority Species are defined as:

- Species of Conservation Concern are defined as Global Red List, British Red Data Book, Nationally Rare and Scarce, Welsh Red Birds and Welsh Vascular Plant Red Data List, species with European and UK Legal Protection, Section 42 [NERC] Species and UK BAP Priority Species.
- Locally Important Species are defined as Local BAP Species not identified as Priority or Species of Conservation Concern and locally important species as identified by experts.

11.108 The data search results are presented in a table in **Appendix 11.10**. The search includes post 1970 records, BIS hold bat records that have been collected as part of this study; these are presented within the report and are therefore not included within the table.

11.109 The data search revealed several Priority Species within a 2km radius of the site: Red Kite; Merlin - 1km to the north of the proposed site;

- Black Grouse;
- Curlew;
- Lapwing;
- Barn Owl (*Tyto alba*);

- Viviparous Lizard (*Lacerta vivipara*);
- Polecat (*Mustela putorius*);
- Red Squirrel (*Sciurus vulgaris*);
- Pine Marten (*Martes martes*);
- Water Vole;
- Small Pearl-bordered Fritillary (*Boloria selene*) west of the River Wye (Small Pearl-bordered fritillary recorded from within the Study Area during ADAS surveys);
- Small Heath (*Coenonympha pamphilus*);
- Stag’s-horn Clubmoss (*Lycopodium clavatum*); and
- Wood Bitter-vetch (*Vicia orobus*) - south of the A44.

11.110 Two Priority Species records fall within the planning application boundary: Brown Hare (*Lepus europaeus*) and Otter (*Lutra lutra*). These have both been recorded during subsequent surveys as part of this application. The search also highlighted four Species of Conservation Concern. These were Ivy-Leaved Bellflower (*Wahlenbergia hederedea*) - west of the River Wye however there are no records post 1977 for this species, Corn Mint (*Mentha arvensis*), Hawkweed (*Hieracium aggregatum*) and Arctic Eyebright (*Euphrasia arctica ssp borealis*).

11.111 Records of Locally Important species within the search area included:

- White Sedge (*Carex canescens*) - west of the River Wye; and
- Common Spotted-orchid (*Dactylorhiza fuchsii*).

Birds of Prey Data Search

11.112 A search of the Bird Track website revealed records for birds of prey. The search was conducted for the SN88 10km grid square in October 2011. The results are presented in **Table 11.5**.

Table 11.5: Bird Track Birds of Prey Data		
Species	Year	Comment
Barn Owl (<i>Tyto alba</i>)	2011	Location withheld
Hen Harrier (<i>Circus cyaneus</i>)	2005	Location withheld
Kestrel (<i>Falco tinnunculus</i>)	2008	River Wye

Osprey (<i>Pandion haliaetus</i>)	2005	Location withheld
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Aquatic Fauna

Environment Agency

- 11.113 The EA (now part of NRW) provided Salmon and Trout records for the River Wye, 1975 – 2009. These are presented in **Appendix 11.11**. The data shows that Salmon are rare, though occasionally present at the adjacent sampling station just to the west of the Study Area at SN 824 854, with low numbers recorded in 2005-6 and 2008. At Pont Rhydgaled where the River Wye crosses the A44 and the study site entrance is located, Salmon numbers over the years have been variable. However, since 2006 Salmon counts have been good, the latest 2009 data rated the fishery here as overall A for Salmon, on an A to F scale.
- 11.114 Brown Trout are present at the adjacent sampling station at SN 824 854. Peak years for Trout were 2003, 2006 and 2008, with a maximum count of 100⁺ Trout; the fishery here has not been graded as the methodology of survey is not suitable for this purpose.
- 11.115 During the Bullhead survey, undertaken as part of this wind farm application, Brown Trout were occasionally found in the streams within the Study Area.
- 11.116 At Pont Cefn-brwyn (SN 82996 83892), 1.5km upstream from Pont Rhydgaled, the Trout fishery was rated as A in 2003. This rating, however, appears to have been an anomaly, as, of 67 Trout fisheries rated (over the years), 64 of these received D to F ratings.
- 11.117 Other fish species were also recorded. These were mostly Minnows (*Phoxinus phoxinus*) and some Sticklebacks (*Gasterosteus aculeatus*); however, there were also several records for Bullhead. Bullhead were recorded at Pont Rhydgaled in 2006, 2km downstream on the River Wye in 2008 and 5km upstream of Pont Rhydgaled on the river Tarrenig in 2009. There was also a single record for Stone Loach (*Noemacheilus barbatulus*) from Nanty SN 85802 81769 (2km downstream) in 2007.
- 11.118 The EA also provided freshwater invertebrate records dating back to January 1990. These records are for the River Wye at Pont Rhydgaled. A species list is included in **Appendix 11.12**.

ENSIS

- 11.119 ENSIS (the consultancy arm of the Environmental Change Research Centre (“ECRC”) at University College London (“UCL”)), conduct a monitoring programme as part of the UK Acid Waters Monitoring Network funded by a consortium and led by the Department for Environment, Food and Rural Affairs (“Defra”). This study was established in 1988 to monitor the chemical and ecological importance of acid deposition in areas in the UK believed to be sensitive to acidification. Sampling has been undertaken since the programme began on the River Wye at SN 824 854 (the adjacent sampling station). This is approximately 400m west of the western side of the planning application boundary. ENSIS were also able to provide records of aquatic invertebrates recorded at the site from 1991 to 2009: these are listed in **Table 11.6**.

Table 11.6: ENSIS Aquatic Invertebrate records			
Latin Name	English Name	Latin Name	English Name
<i>Amphinemura sulcicollis</i>	Stonefly	<i>CULICIDAE</i>	Mosquito
<i>Brachyptera risi</i>	Stonefly	<i>Baetis sp.</i>	Mayfly
<i>Chloropepla tripunctata</i>	Stonefly	<i>LEPTOPHLEBIIDAE</i>	Mayfly
<i>Diura bicaudata</i>	Stonefly	<i>Siphonurus lacustris</i>	Mayfly
<i>Isoperla grammical</i>	Stonefly	<i>Siphonoperla torrentium</i>	Mayfly
<i>Leuctra hippopus</i>	Stonefly	<i>CHIRONIMIDAE</i>	Non-biting midges
<i>Leuctra inermis</i>	Stonefly	<i>Dicranota sp.</i>	True flies
<i>Leuctra nigra</i>	Stonefly	<i>Niphargus aquilex</i>	Crustacean
<i>Leuctra sp.</i>	Stonefly	<i>Oreodytes sanmarkii</i>	Diving beetle
<i>LIMONIIDAE</i>	Crane fly	<i>SIMULIIDAE</i>	Blackfly
<i>PEDICIIDAE</i>	Crane fly	<i>EMPIDIDAE</i>	Dagger fly
<i>Tipula sp.</i>	Crane fly	<i>OLIGOCHARTA</i>	Worms
<i>Drusus annulatus</i>	Caddis fly	<i>Halesus radiatus</i>	Caddis fly
<i>Plectrocnemia conspersa</i>	Caddis fly	<i>POLYCENTROPODIDAE</i>	Caddis fly
<i>Polycentropus flavomaculatus</i>	Caddis fly	<i>Rhyacophila dorsalis</i>	Caddis fly
<i>Tinodes waeneri</i>	Caddis fly	<i>Potamophylax sp.</i>	Caddis fly

- 11.120 The data shows that the River Wye here (close to its headwaters) supports a diverse range of aquatic invertebrates. ENSIS also recorded Diatom (*microscopic algae*); those species recorded in 2009 are presented in **Appendix 11.13**.

Description of Baseline Conditions

Phase I Habitats and Communities

- 11.121 Phase I categories, are listed in **Table 11.7** below and shown on **Figure 11.1**. **Table 11.7** presents habitats in decreasing order of abundance.

Table 11.7: Phase 1 Habitats Identified in the Study Area		
Habitat type	Area in hectares	Percentage %
Wet modified bog mire (WB)	133.12	22.80
Unimproved acid grassland (AG)	90.69	15.53
Marsh/marshy grassland (MG)	71.43	12.23
Improved and poor semi-improved grassland (1 + SI)	66.74	11.43
Semi-improved acid grassland (SAG)	50.00	8.56
Blanket bog mire (BB)	41.73	7.15
Wet dwarf shrub heath (WH)	38.42	6.58
Wet heath/acid grassland mosaic (WAG)	26.20	4.49
Acid flush (AF)	21.64	3.71
Area not surveyed	14.31	2.45
Acid dry dwarf shrub heath (ADH)	10.00	1.71
Coniferous plantation (CP)	6.04	1.03

Table 11.7: Phase 1 Habitats Identified in the Study Area		
Habitat type	Area in hectares	Percentage %
Dry heath/acid grassland mosaic (DGM)	3.45	0.59
Continuous bracken (CB)	3.16	0.54
Scattered bracken (SB)	2.58	0.44
Dry modified mire (DB)	1.28	0.22
Semi-improved neutral grassland (SNG)	1.20	0.21
Broad-leaved plantation & hedges (PBW)	1.21	0.21
Standing water (SWO + SWM)	0.75	0.13
Total	583.93	100

11.122 These Phase I categories are described more fully below.

Improved and Poor Semi-improved Grassland

11.123 There are a few areas of improved fields. These are at the south end of the site near the road, south – south-east of the young broad-leaved plantation and in a few other areas it is interspersed with acid grassland. Perennial Rye-grass (*Lolium perenne*), a good indicator of agricultural improvement, is frequent to abundant, with frequent White Clover (*Trifolium repens*). The improved fields are heavily grazed, resulting in low structural diversity. Most of the improved fields are poor semi-improved, with a slightly greater diversity of herbs and grasses. In many of these fields however, Spear and/or Marsh Thistle (*Cirsium vulgare* / *C. palustre*) have become widespread. These are indicative of overgrazing.

Semi-improved Acid Grassland

11.124 Large areas of poor quality semi-improved acid grassland are found near Y Drum. Most of this is outside of the application area with a small strip within the site. The main areas of semi-improved acid grassland within the site are at Bryn Daith and nearby, as well as at the north-west corner of Y Foel. These have been subjected to some agricultural improvement, but still retain some species of more unimproved acid grassland.

Unimproved Acid Grassland

- 11.125 Many of the slopes south and west of Y Foel, are unimproved acid grassland. Acid grassland has formed on areas of very shallow peat, in base-poor and infertile situations. Much of the acid grassland on the site is typified by the high cover values of the following species; Mat-grass (*Nardus stricta*), Sheep's-fescue (*Festuca ovina*), Common Bent (*Agrostis capillaris*), Heath-grass (*Danthonia decumbens*) and Green-ribbed Sedge *Carex binervis*. A few areas of acid grassland, such as to the west of Esgair y Maesnant, are dominated by Heath Rush (*Juncus squarrosus*). The spread of both Mat-grass and Heath Rush is favoured by conditions of heavy grazing (Rodwell, 1992).
- 11.126 Acidiphilous herbs are prominent in the vegetation, and include Heath Bedstraw (*Galium saxatile*), Tormentil (*Potentilla erecta*), and Common and Sheep's Sorrel (*Rumex acetosa/acetosella*). Other herbs include Heath Milkwort (*Polygala serpyllifolia*), Heath Speedwell (*Veronica officinalis*) and more locally, Mountain Pansy (*Viola lutea*) (see Target Note 5 in **Appendix 11.14**). Prominent mosses of the acid grassland on the site are *Rhytidiadelphus squarrosus*, *Hylocomium splendens* and *Pleurozium schreberi*. Bilberry (*Vaccinium myrtillus*) is also frequent on the damper areas. The unimproved acid grassland is species-poor and typical of the Welsh uplands (exceptions are Target Note 5 where Mountain Pansy was recorded, and Target Note 7, areas of U4e. These areas however will not be directly affected by the construction).

Acid Dry Dwarf Shrub Heath

- 11.127 This mainly comprises Western Gorse (*Ulex gallii*) juxtaposed with acid grassland. It occurs on the south-west facing slopes below Y Foel. There are also small areas of Heather (*Calluna vulgaris*) below Tir Gwyn (see heath/acid grassland mosaic).

Wet Modified Bog

- 11.128 The wet modified bog tends to be species-poor, dominated by Purple Moor-grass (*Molinia caerulea*) with little Sphagna, and occasionally with bare peat patches. The peat here is normally over 0.5m and Hare's-tail Cottongrass is frequent throughout most of this category. Few other species occur here, though Tormentil is frequent. The wet modified bog covers a large area and is found on the majority of Tir Gwyn, approximately 50% of Waun Goch, some of the eastern section and south of Y Foel. In all cases, wet modified bog is juxtaposed with blanket bog and wet heath.

Dry Modified Bog

- 11.129 There are three small areas of partially dry degraded bog in the application area. One of these is in the north of the site, whilst the other two are patches in the south. The dry modified bog is species-poor, dominated by Heather or Hare's-tail Cottongrass with Sphagnum notably absent.
- 11.130 Heath Rush is also a much more prominent feature of the more modified bog. The transition to the more degraded blanket bog has largely been effected through heavy and prolonged grazing. Modification of the blanket bog vegetation would have been exacerbated by any historical burning and/or the effects of moorland drainage grips.

Blanket Bog

- 11.131 This is the dominant habitat type on the flat summits of the site. It has formed in areas of deep peat on flat and gently sloping surfaces. The blanket bog on the proposed site varies

in quality from the much less modified, more heathy areas on Y Foel to bog that has been substantially modified from its original condition.

- 11.132 The more unmodified bog supports a combination of higher ericoid cover (particularly Heather and Crowberry (*Empetrum nigrum*)), high Sphagnum cover (particularly *Sphagnum papillosum* and *S. fallax*) and very high cover of Hare's-tail Cottongrass. Bog Asphodel (*Narthecium ossifragum*) is frequent. The more unmodified bog is found mainly on Y Foel especially to the north and south west, scattered patches on Tir gwyn, the east section and the central area of Esgair y Maesnant. Other species associated with the blanket bog vegetation on the site include Deergrass (*Trichophorum cespitosum*), Cross-leaved Heath (*Erica tetralix*), Round-leaved Sundew (*Drosera rotundifolia*), Cranberry (*Vaccinium oxycoccus*) and, in more open areas, Common Cottongrass (*Eriophorum angustifolium*). Bog Asphodel is particularly frequent on this site. The blanket bog habitat category is intimately associated with the wet heath and acid flush categories described below.

Wet Dwarf Shrub Heath

- 11.133 These areas grade into the blanket bog communities in most cases and, when heavily grazed, to Purple Moor-grass-dominated degraded bog. The peat is shallower here (typically < 0.3m) with little *Sphagnum papillosum* or Hare's-tail Cottongrass. These two species increase in transition to blanket bog. Cross-leaved Heath, Deergrass and Purple Moor-grass are the dominants. In the drier stands, heath rush was particularly abundant.

Marshy Grassland / Acid Flush

- 11.134 These two habitat categories are very similar on the proposed site, and, for this reason, are discussed together. They both occur mainly on hillside flushes throughout the site although in some places marshy grassland is on wet, level ground. Both the marshy grassland and the acid flush are largely dominated by either Soft Rush (*Juncus effusus*) or Sharp-flowered Rush (*Juncus acutiflorus*). The marshy grassland has varying amounts of Yorkshire-fog (*Holcus lanatus*). It is a generally species-poor habitat on the site, and supports few herbs. These include Common Sorrel, Meadow Buttercup (*Ranunculus acris*), Creeping Buttercup (*Ranunculus repens*), Greater Bird's-foot-trefoil (*Lotus pedunculatus*), Heath Bedstraw and mosses such as *Pleurozium schreberi*. The conservation value of these grasslands is not particularly high.
- 11.135 The acid flushes on this site differ mainly in the extensive carpet of Sphagna and *Polytrichum commune* rather than the more mesotrophic mosses, again a species-poor habitat as a result of rush domination. Marsh Violet (*Viola palustris*) is a characteristic herb.

Basic Flush

- 11.136 This comprises a very small transitional area situated outside the application area, near Esgair y Maen. Basic flushes typically support a carpet of pleurocarpous brown mosses, often without *Sphagnum*, overlain by a small sedge layer or a mixed herb layer.

Valley Mire

- 11.137 This comprises small transitional areas situated outside the application area, north and north-east of the hill Esgair y Maen. The valley mires around this area are similar to acid flushes except the valley mires are more complex and tend to develop on the lower slopes and floor of a small valley whereas a flush is a single feature. The species composition is very similar to the acid flushes.

Wet Heath / Acid Grassland Mosaic

- 11.138 This mainly occurs in the south-east of the application area on Tir Gwyn as well as just below Tir Gwyn. It comprises a mixture of acid grassland and wet or dry heath, Purple Moor-grass being a dominant species. On the south facing slope below Tir Gwyn there are interspersed patches of heather with shorter acid grassland (Sheep's-fescue and Common Bent), rather than the Moor-grass.

Dry Heath / Acid Grassland Mosaic

- 11.139 This is a mixture of dry heath (mainly bilberry) and acid grassland. There is only a very small amount of this (in small patches), the wet grassland mosaic being more abundant.

Young and Mature Conifer Plantation

- 11.140 Most of this comprises small blocks of conifer plantation down in the valley. Very little else grows here due to the lack of light, space and poor soils. On the lower slopes, south and south-west of Y Foel, there are young conifer plantations mixed with bracken and gorse (forming semi-scrub habitat).

Broad-leaved Plantation

- 11.141 The broad-leaved plantation is mainly located around Grid Reference SN 83308537. It is a young broad-leaf plantation over Purple Moor-grass. Small Pearl-bordered Fritillary have been recorded here, in number. South of the application site, adjacent to the River Wye, is a small corner of semi-natural broad-leaved trees such as willow (*Salix sp.*), alder (*Alnus*) and Downy Birch (*Betula pubescens*). This patch represents potential breeding habitat for Otter.

Continuous and Scattered Bracken

- 11.142 As the habitat name implies, these areas are dominated by Bracken (*Pteridium aquilinum*). In the Study Area, there are a few slopes with relatively small areas of Bracken. These are mainly to the south and east of the application area. This can be dominant (continuous Bracken) or sparser (scattered Bracken). Bracken forms an integral component of 'ffridd', a characteristic Welsh habitat that supports bird species such as Cuckoo (*Cuculus canorus*) and Whinchat (*Saxicola rubetra*).

Standing Water

- 11.143 There are a few small ponds within the Study Area, they are mostly associated with the track layout, lying adjacent to these. The largest pond is situated south of the young broad-leaved plantation (SN 8315 8525). Another pond of note is the small bog-pond situated within the bog on Waun Goch (see Target Note 8 in **Appendix 11.14**).

Not Surveyed

11.144 An area to the north and west of the site situated to the west of the existing main access track has not been surveyed; the area includes an old mine complex. Although this area lies within the red line of the Study Area it is situated well away from any proposed turbines, associated tracks and infrastructure. The area within the red line boundary to the south of the A44 has also not been surveyed as there are no works proposed here apart from along the road.

National Vegetation Classification

11.145 **Table 11.8** lists the NVC communities which were established for the Study Area, they are shown in extent (decreasing) order. The location of the NVC communities is provided in **Figure 11.2**.

Table 11.8: NVC and 'Turner' Vegetation Communities Recorded		
(Extent order)		
NVC Community	Sum Hectares	% of Study Area*
M25/a/b/(sp)/(ev)(sp): <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire, <i>Erica tetralix</i> sub-community, <i>Anthoxanthum odoratum</i> sub-community	124.00	22.75%
MG6: <i>Lolium perenne</i> – <i>Cynosurus cristatus</i> grassland	78.28	14.36%
U4,a,b,d,e: <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland, Typical sub-community, <i>Holcus lanatus</i> sub-community, <i>Deschampsia flexuosa</i> sub-community	61.76	11.33%
M25/a/b/c/(sp)/(ev)/M15/a/b/(sw): <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire various sub-communities in mosaic with <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath typical sub-community and 'swampy' variant	46.50	8.53%
M15,a,b,d: <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath, <i>Carex panicea</i> sub-community, Typical sub-community, <i>Vaccinium myrtillus</i> sub-community	30.27	5.55%
U5/U4b: <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland in mosaic with <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland <i>Holcus Trifolium</i> subcommunity	16.34	3.00%
M23,a,b: <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush-pasture, <i>Juncus acutiflorus</i> sub-community, <i>Juncus effusus</i> sub-community	16.26	2.98%

Table 11.8: NVC and 'Turner' Vegetation Communities Recorded		
(Extent order)		
NVC Community	Sum Hectares	% of Study Area*
Trees – primarily coniferous shelter-belts and small plantations	12.42	2.28%
U5,a,b,c,d,e: <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland, Species-poor sub-community, <i>Polytrichum commune</i> sub-community, <i>Carex panicea</i> – <i>Viola riviniana</i> sub-community, <i>Calluna vulgaris</i> – <i>Danthonia decumbens</i> sub-community, <i>Racomitrium lanuginosum</i> sub-community	11.66	2.14%
M6a,b,c,d: <i>Carex echinata</i> – <i>Sphagnum fallax/denticulatum</i> mire <i>Carex echinata</i> sub-community, <i>Carex nigra</i> – <i>Nardus stricta</i> sub-community, <i>Juncus effusus</i> sub-community, <i>Juncus acutiflorus</i> sub-community	10.58	1.94%
U4b/MG6: Intermediate acid/ neutral grassland	10.53	1.93%
M17/a/b/c/(sr/sc): <i>Trichophorum cespitosum</i> – <i>Eriophorum vaginatum</i> blanket mire, <i>Drosera rotundifolia</i> - <i>Sphagnum</i> spp. sub-community, <i>Cladonia</i> spp. – <i>Sphagnum</i> spp. sub-community, <i>Juncus squarrosus</i> – <i>Rhytidiadelphus loreus</i> sub-community	10.12	1.86%
M15b/d/U6d <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath in mosaic with <i>Juncus squarrosus</i> – <i>Festuca ovina</i> grassland	7.37	1.35%
Bare ground, mainly area that will be used for site compound and batching plant	7.34	1.35%
M15b/M19a <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath in mosaic with <i>Calluna vulgaris</i> – <i>Eriophorum vaginatum</i> blanket mire, <i>Erica tetralix</i> sub-community	7.22	1.32%
M25/a/(ev)/M17a/c: <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire in mosaic with <i>Trichophorum cespitosum</i> – <i>Eriophorum vaginatum</i> blanket mire	7.07	1.30%
M17c/M20b: <i>Trichophorum cespitosum</i> – <i>Eriophorum vaginatum</i> blanket mire <i>Juncus squarrosus</i> – <i>Rhytidiadelphus loreus</i> sub-community / <i>Eriophorum vaginatum</i> blanket & raised mire <i>Calluna vulgaris</i> – <i>Cladonia</i> spp. Sub-community mosaic	6.86	1.26%

Table 11.8: NVC and 'Turner' Vegetation Communities Recorded		
(Extent order)		
NVC Community	Sum Hectares	% of Study Area*
MG6/U5: Intermediate between <i>Lolium perenne</i> – <i>Cynosurus cristatus</i> mesotrophic grassland and <i>Nardus stricta</i> – <i>Galium saxatile</i> acid grassland	6.64	1.22%
H18a: <i>Vaccinium myrtillus</i> – <i>Deschampsia flexuosa</i> heath – <i>Hylocomnium splendens</i> – <i>Rhytidadelphus loreus</i> sub-community	6.02	1.10%
M19a: <i>Calluna vulgaris</i> – <i>Eriophorum vaginatum</i> blanket mire, <i>Erica tetralix</i> sub-community	5.60	1.03%
M17a/c/M15b: <i>Trichophorum cespitosum</i> – <i>Eriophorum vaginatum</i> blanket mire mosaic with <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath	5.77	1.06%
M19a/M15b <i>Calluna vulgaris</i> – <i>Eriophorum vaginatum</i> blanket mire, <i>Erica tetralix</i> sub-community in mosaic with <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath	5.13	0.94%
M25/M23/a: <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire / <i>Juncus effusus/acutiflorus</i>	4.46	0.82%
U4a/b/M25/b: <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Galium saxatile</i> grassland, in mosaic with <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire	3.85	0.71%
M25b/H8a/Young conif.: <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire <i>Erica tetralix</i> sub-community / <i>Calluna vulgaris</i> – <i>Ulex gallii</i> heath species-poor sub-community / young conifer mosaic	3.84	0.70%
M25/a/U5/b/d: <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire in mosaic with <i>Nardus stricta</i> – <i>Galium saxatile</i> acid grassland	3.39	0.62%
H8,a,c: <i>Calluna vulgaris</i> – <i>Ulex gallii</i> heath, species-poor sub-community, <i>Sanguisorba minor</i> sub-community.	3.05	0.56%
M17c/M2: <i>Trichophorum cespitosum</i> – <i>Eriophorum vaginatum</i> blanket mire <i>Juncus squarrosus</i> – <i>Rhytidadelphus loreus</i> sub-community / <i>Sphagnum cuspidatum</i> / <i>fallax</i> bog pool community mosaic	3.03	0.56%

Table 11.8: NVC and 'Turner' Vegetation Communities Recorded (Extent order)		
NVC Community	Sum Hectares	% of Study Area*
N19a,b,c: Nodum 19 <i>Vaccinium oxycoccos</i> – <i>Sphagnum fallax</i> nodum,	2.24	0.41%
MG10: <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush-pasture	2.03	0.37%
N19c/M20 <i>Vaccinium oxycoccos</i> – <i>Sphagnum fallax</i> nodum in mosaic with <i>Eriophorum vaginatum</i> blanket & raised mire	2.00	0.37%
M15b/M23b <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath mosaic in mosaic with <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush-pasture	1.82	0.33%
N19b/M25a: <i>Vaccinium oxycoccos</i> – <i>Sphagnum fallax</i> nodum in mosaic with <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire	1.75	0.32%
U4/MG10: <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland mosaic with <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush-pasture	1.54	0.28%
N19b/M15d <i>Vaccinium oxycoccos</i> – <i>Sphagnum fallax</i> nodum in mosaic with <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath	1.46	0.27%
H12c/M25b Intermediate between <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath and <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire	1.38	0.25%
Water – standing water – ponds	1.07	0.20%
M23b/M6/c: Mosaic of <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush-pasture and <i>Carex echinata</i> – <i>Sphagnum fallax/denticulatum</i> mire	1.04	0.19%
M1/M15(sw): <i>Sphagnum denticulatum</i> bog pool community / <i>Trichophorum cespitosum</i> – <i>Erica tetralix</i> wet heath 'swampy' variant mosaic	1.00	0.18%
M17a/N19a mosaic	0.80	0.15%

Table 11.8: NVC and 'Turner' Vegetation Communities Recorded		
(Extent order)		
NVC Community	Sum Hectares	% of Study Area*
M25a/M6c mosaic	0.79	0.14%
MG6/U1 mosaic	0.69	0.13%
M15b/M23b/U5 mosaic	0.65	0.12%
M25a/U4a/U4e mosaic	0.60	0.11%
M25/M21 mosaic	0.57	0.10%
U5b/U19 mosaic	0.55	0.10%
U4/U5 mosaic	0.54	0.10%
CW: coniferous woodland	0.52	0.10%
M15/U4b mosaic	0.45	0.08%
U4/M23 mosaic	0.44	0.08%
M21/M25 mosaic	0.42	0.08%
M4: <i>Carex rostrata</i> – <i>Sphagnum fallax</i> mire community	0.39	0.07%
U2: <i>Deschampsia flexuosa</i> grassland	0.37	0.07%
H21: <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> – <i>Sphagnum capillifolium</i> heath	0.36	0.07%
M17a/M2/M3/N19a/U6a – complex mosaic of mire habitat	0.35	0.06%
U4/U19 mosaic	0.32	0.06%

Table 11.8: NVC and 'Turner' Vegetation Communities Recorded (Extent order)		
NVC Community	Sum Hectares	% of Study Area*
H12/a: <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath, <i>Calluna vulgaris</i> sub-community	0.30	0.06%
M6c/M25 mosaic	0.30	0.05%
M25a/M25b/M15b mosaic	0.27	0.05%
M15a/M19a mosaic	0.24	0.04%
M6d/M4: <i>Carex echinata</i> – <i>Sphagnum fallax/denticulatum</i> mire <i>Juncus acutiflorus</i> sub-community / <i>Eriophorum angustifolium</i> bog pool community mosaic	0.23	0.04%
M20: <i>Eriophorum vaginatum</i> blanket & raised mire	0.22	0.04%
M6/M21 mosaic	0.21	0.04%
M21/M6c mosaic	0.21	0.04%
U6d: <i>Juncus squarrosus</i> – <i>Festuca ovina</i> grassland <i>Agrostis capillaris</i> – <i>Luzula multiflora</i> sub-community	0.20	0.04%
M18b mosaic	0.20	0.04%
M6d/M17 mosaic	0.19	0.04%
M6c(ev)/M15b mosaic	0.19	0.03%
Bare/M23b: <i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush- pasture <i>Juncus effuses</i> sub-community / bare ground mosaic	0.18	0.03%
M19/M20 mosaic	0.17	0.03%

Table 11.8: NVC and 'Turner' Vegetation Communities Recorded		
(Extent order)		
NVC Community	Sum Hectares	% of Study Area*
H21/U5 mosaic	0.16	0.03%
U1: <i>Festuca ovina</i> – <i>Agrostis capillaris</i> – <i>Rumex acetosella</i> grassland	0.12	0.02%
M2b: <i>Sphagnum cuspidatum</i> - <i>Sphagnum recurvum</i> bog pools, <i>Sphagnum recurvum</i> subcommunity.	0.10	0.02%
M6/M19a mosaic	0.08	0.02%
M3: <i>Eriophorum angustifolium</i> bog pool community	0.06	0.01%
M35: <i>Ranunculus omiophyllus</i> – <i>Montia fontana</i> rill	0.02	0.00%
Total	545.15	100%
Note: Where possible, in order to simplify the table, mosaics have been separated (assuming a 50:50 proportion) and sub-communities included in individual community descriptions.		

11.146 Descriptions of these communities are set out in more detail in **Appendix 11.15**.

Bryophytes

11.147 The majority of bryophyte records were made during the course of the NVC survey. The majority of these were common species, associated with the main Study Area habitats. These included *Calliergonella cuspidatum* and *Rhytidiadelphus squarrosus* (associated with marshy grassland), a range of *Sphagna* (*fallax*, *capillifolium*, *papillosum*, *palustre* and *tenellum*), *Plagiothecium undulatum*, *Polytrichum commune*, *Aulacomnium palustre* and *Ptilidium ciliare* associated with valley mire, acid flushes and wet dwarf shrub heath and *Pleurozium schreberi* and *Hylocomium splendens* associated with dry heath.

Peat Depth

11.148 Peat depth is highly associated with vegetation type. Thus, blanket mire, fen and acid flush communities (degraded included) are found in areas of deeper peat (30cm +), wet heath communities are found on shallow peat at around 10-30cm and acid grassland on very shallow peat or other soil type (< 10cm) (see the **Figure 11.3** for peat depth). There

appeared to be no correlation between peat depth and the degree to which bog communities had been modified.

- 11.149 Information from the original peat depth surveys, and results from the 2010 targeted peat depth survey was combined to produce a peat depth contour map (**Figure 11.3**). Peat depths are illustrated in a number of Depth Classes. These are:
- <0.31m
 - 0.31 – 0.49m
 - 0.50 – 1.00m
 - >1.00m.
- 11.150 Peat depth under the majority of the infrastructure layout is below 0.3m and, on the west of the site, approximately correlated with less sensitive habitats such as semi-improved grassland (NVC MG6) and acid grassland (NVC U4/U5).
- 11.151 The east of the application area is primarily composed of a complex mosaic of mire habitats and, in these locations, peat depth is variable. Outside of a small number of scattered localities, the main locations of maximum peat depth of >1m is attained on the plateaux of Waun Goch, Tir Gwyn, and in the middle of the site around SN 837 849. The vegetation in the deep peat areas of Waun Goch is NVC M6/M25, while in the other two areas, it is primarily NVC M17/M19. 'Absolute' constraints exist in all of these areas.
- 11.152 Historically, the peatlands within the Study Area have been subject to many years of peat cutting (for fuel) and several hundred years ago the peatland would undoubtedly have been more extensive supporting a greater depth of peat. Indeed, the present owners of Mynydd y Gwynt were cutting peat up until the 1950s. Where areas of deeper peat are present (over 1m depth), these mostly form islands rising out of the bog. They represent areas where the peat has not been cut/was cut to a lesser extent and they typically have a near vertical edge exposing a bare peat surface. These peat islands are particularly sensitive to disturbance.
- 11.153 Waun Goch / Esgair y Maesnant has been largely subject to historical peat cutting. Today, islands of peat rising above the adjacent land are present, with the largest area of such situated around SN 8337 8632, covering around 1ha and supporting M17a blanket mire vegetation. There are also many small 'islands' of peat. These are drying and eroding and tend to be covered by M15 wet heath or M25 mire.
- 11.154 Like Waun Goch, Tir Gwyn has been subject to extensive historical peat cutting. Islands of peat remain; most of these have been classified as M17. The edges of these have been classified as the M17b sub-community due to abundant *Racomitrium lanuginosum* together with several *Cladonia* species. M17b is said to be uncommon in Wales, however its development here may be due to the edge drying effect, in contrast to the wetter M17c towards the centre of the peat island. M17c was largely classified due to the presence of frequent to abundant Heath Rush and Bilberry.
- 11.155 The entire infrastructure footprint has been subject to peat depth survey and a comprehensive body of data exists.

Summary of Vegetation and Peat Depth Findings

- 11.156 The vegetation within the Study Area predominantly comprises semi-natural plant communities, but with around thirty percent of the total Phase 1 surveyed area made up of improved, poor semi-improved or semi-improved acid grasslands. Around fifty percent of the Phase 1 surveyed area comprises mire communities and marshy grasslands, of which wet modified bog (dominated by Purple Moor-grass) is the largest category, covering around 253ha. Areas of blanket bog (29ha), wet dwarf shrub heath (48ha), valley mire (12ha) and marshy grassland/ acid flush (103ha), border, or are transitional to, the modified bog. The largest remaining habitat category is unimproved acid grassland (148ha), which, is mainly situated on hill slopes. There are also small areas of bracken, woodland plantation, dry heath and standing water.
- 11.157 Historically, a large portion of the application area appears to have been subjected to many years of heavy grazing. Indicative of this are the frequent occurrence of heath rush, a plant adapted to grazing, in wet ground, and the lack of ericoids in the mire communities. Over at least the last ten years grazing levels have reduced in the Study Area, the site being subject to a Tir Gofal agreement, and since 1 January 2014 its successor scheme, Glastir.

Constraints Map

- 11.158 A constraints map (see **Figure 11.7**) has been produced; this map is based upon the value of vegetation communities, the sensitivity of these communities to wind farm development and peat depth. The peat and vegetation constraints used to produce this map are presented in **Table 11.9 and Table 11.10** below. Here, for example, a combination of high 'sensitivity' habitat and peat depth of >1m equates to an 'absolute constraint'.

Table 11.9: Criteria for Ecology Constraints				
Combined Peat & Vegetation Constraint		Peat Constraint		Vegetation Constraint*
Absolute	=	Peat Depth <i>1m and over</i>	+	High
High	=	Peat Depth <i>1m and over</i>	+	Medium
High	=	Peat Depth <i>1m and over</i>	+	Low
High	=	Peat Depth - > 0.5 < 1m	+	High
High	=	Peat Depth - > 0.5 < 1m	+	Medium
High	=	Peat Depth - > 0.3 < 0.5	+	High
High	=	Peat Depth - < 0.3m	+	High
High		No peat depth data collected	+	High
Medium	=	Peat Depth - > 0.5 < 1m	+	Low
Medium	=	Peat Depth - > 0.3 < 0.5	+	Medium
Medium	=	Peat Depth - > 0.3 < 0.5	+	Low
Medium	=	Peat Depth - < 0.3m	+	Medium
Medium		No peat depth data collected	+	Medium
Low	=	Peat Depth - < 0.3m	+	Low
Low		No peat depth data collected	+	Low
* see table below for explanation of Vegetation Constraints				

Table 11.10: Vegetation Constraints	
Vegetation Constraints	Description (NVC community, including Turner clarifications)
High*	M1, M2, M3, M4, M6, M15 (Swampy variant), M17, M18, M19/ Nodum 19 complex, M20, M21, M25 (<i>Eriophorum vaginatum</i> variant) , M35, W – all waterbodies
Medium	H8, H12, H18, H21, M15, M16, M23, M25c, U6a, U19
Low	MG all, U – all except those listed above, M25 (sp), M25a/ M25b, Coniferous woodland
<p>* Note a few polygons of H21 and U19 have also been classified as high constraint, due to characteristics of the vegetation communities present including the sloping rocky incised nature of the terrain.</p>	

- 11.159 Earlier versions of the Constraints map included areas where Curlew bred. However, as Curlew have not been recorded breeding on site since 2008 these areas are no longer included.
- 11.160 Peat probing was carried out at 50m centres. Therefore, it is possible for polygon boundaries of 'high sensitivity' habitats to fall between these points. As a result, some small polygons of high 'sensitivity' and good quality habitat exist which are not shown as areas of 'absolute constraint' on the Constraints Map (**Figure 11.7**). However, these habitats should be avoided. These are listed in **Table 11.11** below.

Table 11.11: Small Areas of High Quality Sensitive Habitat	
Location	Habitat / Description
Around SN 8280 8640 and SN 8290 8640	Two polygons of M17c mire
Around SN 8400 8590 and SN 8405 8590	Polygon of M17c mire. Polygon of M20 mire
SN 8425 8560	Polygon of M17c mire
Around SN 8460 8550	Three Polygons of M17c mire

SN 8470 8435	Polygon of M17b/c mire
SN 8485 8405	Polygon of M17c mire

Fauna

Ornithological

Non-breeding Birds

11.161 Dates at which Winter Bird surveys along with other survey specific details are given in **Appendix 11.16**. Maps showing VP results for the non-breeding season (September to February) are presented in **Figure 11.5b** for Red Kite and **Figure 11.5d** for Target Species other than Red Kite. A map showing the Brown and Shepherd Winter Bird survey findings is presented in **Figure 11.5e**.

11.162 During the non-breeding bird surveys that were carried out during the winter of 2010–2011 a total of seven Species of Conservation Concern (SNH 2005) or birds of prey were recorded. Species recorded were:

- Red Grouse;
- Red Kite;
- Buzzard;
- Sparrowhawk;
- Golden Plover;
- Short-eared Owl; and
- Crossbill.

11.163 These are detailed in **Table 11.12**.

Table 11.12: Targeted Non-breeding Birds Recorded During Winter Bird Surveys 2010–2011			
Species	No. of bird sightings	Months Recorded	Comments
Red Grouse	4	Jan., Feb.	3 sightings on Y Foel, and 1 sighting on Tir Gwyn. Droppings also recorded on Waun Goch. Resident species. Principally occurs on summit area of Y Foel and Waun Goch.

Table 11.12: Targeted Non-breeding Birds Recorded During Winter Bird Surveys 2010–2011			
Species	No. of bird sightings	Months Recorded	Comments
Red Kite	2	Feb.	1 sighting over upper slopes of Fawnog y Bont and 1 sighting over west of Esgair y Maesnant. Hunts regularly over whole site
Buzzard	4	Jan., Feb., Mar.	1 sighting over west flank of Y Foel, 1 sighting over upper slopes of Fawnog y Bont and 2 sightings 500m off south west boundary of site. Hunts regularly over whole site.
Sparrowhawk	1	Feb.	1 sighting on lower slopes of Fawnog y Bont. Probably regular winter visitor to site in low numbers on lower ground
Golden Plover	12 (+ 2 fox kills)	Mar.	Flock over Esgair y Maesnant to Waun Goch. Also seen more regularly during VP surveying in the Tir Gwyn, Y Foel area to south of site, see VP survey in Paragraphs 11.191 – 11.207 . Recorded birds are probably part of a larger flock of birds that are known to frequent high ground in the surrounding vicinity throughout the winter period. Study Area thought to represent part of regular wintering ground, birds appear to feed here on an occasional basis, generally feeding in the vicinity but not on site.
Short-eared Owl	1	Jan	Flushed on Waun Goch Scarce, but probably regular, winter visitor. Study Area thought to represent part of wider wintering ground.
Crossbill	20	Jan., Feb., Mar.	All records are of birds on the periphery of Hafren Forest. Common resident species in Hafren Forest.

11.164 The previous 2004-05 non-breeding bird surveys found 50 species of bird within the Study Area, which are listed in **Appendix 11.4**.

- 11.165 Birds of prey recorded over the nine visits included Buzzard (*Buteo buteo*) on almost every visit, a single Kestrel on many occasions, Hen Harrier, a single Goshawk (*Accipiter gentilis*) seen over the small plantation west of Bryn Daith, one Sparrowhawk, a single Peregrine Falcon and a few Red Kite. Buzzard, were largely seen hovering over Y Foel and nearby areas, a Kestrel was often seen over Bryn Daith area, a Hen Harrier flying south of proposed Turbine 14 in June 2005. The Peregrine Falcon was seen chasing two Jays (*Garrulus glandarius*) (at location SN 850835) in October during a vegetation survey. In 2005 a Short-eared Owl was recorded in March at dusk, hunting north-west of Tir Gwyn and then just east of Y Foel.
- 11.166 On most of the 2004/05 visits at least one Snipe was flushed from wet grassland and bog areas. The favoured Snipe areas were SN 8357 8586 and the south end of Waun Goch. Two were seen flying together here in October. A circling flock of about 35 Golden Plover were seen east – south-east of Y Foel at dusk in March 2006.
- 11.167 Red Grouse were recorded on many bird and non-bird surveys. One near Y Foel in September 2005, one seen on two occasions south-west of Y Foel in the Heather area, two west of proposed Turbine 10, four recorded in the south-east corner of Waun Goch in winter 2005, four recorded from the track near Y Foel in the Heather in September 2005, and one on the north edge of Waun Goch during the 2008 survey. Two Red Grouse were recorded on Tir Gwyn and a pair on Y Foel during November 2009.
- 11.168 Other species recorded from the site during the non-breeding bird surveys are also noteworthy. These included:
- three Crossbill (*Loxia curvirostra*) calling from the track near an old barn (just outside of the application area) on the 25th February 2005, possibly breeding early;
 - Fieldfare (*Turdus pilaris*) were seen in small flocks and individually on the short acid grassland. Around 100 flew out of a small broadleaf patch over the acid grassland (at SN 8412 8355) in February 2005;
 - Starling (*Sturnus vulgaris*) were recorded in small flocks on acid grassland throughout the survey;
 - Stonechat (*Saxicola torquata*) and Reed Bunting were both seen a couple of times in the lower wetter areas; and
 - eight Linnet (*Carduelis cannabina*) and a Stonechat were recorded south-east of Turbine 23 in a sheltered gorse area.
- 11.169 Teal (*Anas crecca*) were recorded on many occasions (30+ in October 2004), in the large pond at SN 832 853. Teal were also reported by the owner to use the small pond north-east of Esgair y Maesnant. A Grey Heron (*Ardea cinerea*) and Grey Wagtail (*Motacilla cinerea*) were seen on a couple of occasions feeding and flying by the river.

Breeding Birds

- 11.170 Dates at which Breeding Bird surveys took place along with other survey specific details are given in **Appendix 11.16**. The breeding bird Brown and Shepherd survey map is presented in **Figure 11.6**. Maps illustrating VP results for the 'breeding season' (March to

August) can be found in **Figure 11.5a** for Red Kite and **Figure 11.5c** for Target Species other than Red Kite.

11.171 Breeding Bird Surveys carried out in 2010 found a total of seven Species of Conservation Concern (SNH, 2005), plus (the pre-recorded supplementary species) Buzzard and Snipe. Species recorded were:

- Red Grouse;
- Red Kite;
- Hen Harrier;
- Buzzard;
- Snipe;
- Cuckoo;
- Skylark;
- Willow Warbler; and
- Bullfinch.

11.172 These species are detailed in **Table 11.13**.

Table 11.13: Target Species Recorded During Breeding Bird Survey 2010		
Species	Estimated Breeding Status	Comments
Red Grouse	1 – 2 pairs	Recorded on Y Foel.
Red Kite	Not Breeding on site	Whole site frequently and regularly used as hunting territory and passage but not breeding on site.
Hen Harrier	Not Breeding on site	Several records over a number of years, mostly males or juveniles.
Kestrel	1 Pair	Breeding just outside Study Area, in isolated conifer block at SN 8250 8580. Three young fledged in 2010.
Buzzard	Not Breeding on site	Whole site frequently and regularly used as hunting territory but not known to breed on site.

Snipe	2 – 3 pairs	Recorded on the south of Waun Goch and Y Foel / Tir Gwyn plateau. Was found in similar locations on earlier surveys
Cuckoo	Min. 1 territory holding male	One record of a singing male on forest edge north of Esgair y Maesnant.
Skylark	Min. 22 pairs	Widespread over higher ground.
Willow Warbler	Min. 4 pairs	Common in suitable habitat on lower ground.
Bullfinch	Min. 1 pair	Limited numbers on site due to lack of suitable habitat.

11.173 **Figure 11.6** details the on site distribution of species assessed as breeding during the 2010 Breeding Bird Survey. Breeding Bird Brown and Shepherd surveys were also carried out in 2008 and 2005.

Curlew

11.174 'Singing' and calling Curlew were recorded during both the 2005 breeding birds surveys in the west of Esgair y Maesnant/Waun Goch (SN 831 861) on three different occasions, and further south at around SN 836 850 on two separate occasions. Based on the 2005 surveys, two to three pairs of Curlew were thought to be breeding in the Study Area, in the locations identified above. The two breeding bird surveys carried out in May and June 2008 saw little evidence around the original breeding site for Curlews on Waun Goch, although one Curlew was recorded flying over and landing on Bryn Daith (SN 829 858) during both visits. The habitat on Bryn Daith is short rather improved grassland and thus most unlikely to provide suitable Curlew breeding habitat.

11.175 On Tir Gwyn however, centred around SN 843 841, on both the 2008 visits, a Curlew was seen circling the area and landing nearby on several occasions. As it was alarm calling, landing and circling, it is probable that a female was sitting on a nest close by. Therefore it is likely that one pair bred in that area in 2008. The location of both the 2005 and the 2008 survey sightings are provided in the **Figure 11.6**.

11.176 No Curlew were present during the 2010 breeding bird surveys. In addition to the breeding bird surveys, VP surveys were also carried out during the breeding season in 2010 and again no Curlew were heard or seen. The bird surveys carried out as part of this development proposal have documented a decline in Curlews at Mynydd y Gwynt from at least two pairs in 2005 to no birds in 2010. Anecdotal evidence from the land owners suggests a drastic decline in Curlew at Mynydd y Gwynt from being 'numerous' in the 1950s to not breeding today.

Snipe

- 11.177 Snipe are breeding at the south end of Waun Goch (around SN 833 858), having been recorded here in 2010, 2008 and 2005; in 2005 targeted Snipe survey recorded Snipe drumming at this location. Snipe are also likely to be breeding around Y Foel (SN 839 842), having been recorded here in 2010 and 2005.
- 11.178 Snipe were recorded around SN 837 849 in 2005, but have not been subsequently seen at this location.

Red Grouse

- 11.179 One to two pairs of Red Grouse are breeding on Y Foel/Tir Gwyn, having been recorded during the 2010 surveys. Breeding grouse were also present in this area during both the 2008 and 2005 surveys. Y Foel/Tir Gwyn represents a large block of mire habitat with extensive areas of heather cover and thus provides suitable Red Grouse habitat.
- 11.180 Red Grouse are resident at this locality and were observed within the area during most of the monthly VP surveys.

Kestrel

- 11.181 In 2010, a pair of Kestrel bred just outside Study Area, in an isolated conifer block adjacent to the track at around SN 8250 8580. Three young were fledged.

Other Breeding Birds

- 11.182 Between 20 and 25 pairs of Skylark (*Alauda arvensis*) and similar numbers of Meadow Pipit (*Anthus pratensis*) are estimated to be breeding in the application area. These are widely dispersed throughout the Study Area and all were recorded within the degraded bog and acid grassland habitats.
- 11.183 Stonechat are breeding in the young broad-leaf plantation (SN 834 855). Lesser Redpoll (*Carduelis carbaret*), were seen calling and flying in four different locations: near the large pond around SN 833 853; in Hafren forest; and a small plantation east of the site. It is highly likely that this species bred in some of these locations. Willow Warbler (*Phylloscopus trochilus*) were heard singing at the edge of the small plantation near SN 833 853, in the young planted broadleaf scrub and east of the site in another scrubby patch bordering the Hafren. A pair of Reed Bunting, are thought to have bred south of SN 833 853 near the stream.
- 11.184 In 2005, pairs of Crossbill were recorded on both visits in the Hafren forest and near the farm house at SN 840 828, (both locations are just outside of the application area). It is likely that both these pairs were breeding.
- 11.185 Red Kite hunt throughout the site but do not breed within it.
- 11.186 In August 2011 a female/juvenile Hen Harrier was seen on the approach to Fawnog y Bont area (lower eastern corner of site). In 2008 an immature Hen Harrier was seen around the north eastern arm of the site around SN 842 858. In 2005, male Hen Harriers were seen during two separate breeding bird surveys, at SN 8500 8350 and at SN 8420 8485. Hen Harrier do not breed within the Study area.

- 11.187 In April 2010 a Merlin was seen on Waun Goch sparring with a Kestrel and hunting a Meadow Pipit. In 2005, a male Merlin was recorded on the eastern arm around SN 8433 8395. These Merlin probably breed on Plynlimon which is a known Merlin breeding ground.
- 11.188 Cuckoo, Song Thrush, and Siskin have been recorded singing from the edges of the coniferous plantations of the Hafren forest, which border the site on its eastern and northern aspects. These birds are likely to be breeding here.
- 11.189 On the southern side of Y Foel, a single male Golden Plover in breeding plumage was recorded in late March 2005.

Other Bird Surveys: Ring Ouzel and Black Grouse

- 11.190 No records were made of either of these two species. While Ring Ouzel have been known to breed on Plynlimon, which is to the north west of the site, the Study Area does not provide good Ring Ouzel breeding habitat lacking crags, boulders, gulleys and scree beds (Cramp, 2009). Disturbance is also recognised as an issue for Ring Ouzel and parts of the site with its rally car complex are prone to periods of high disturbance. There is anecdotal evidence for the presence of Black Grouse around SN 827 838 (a few hundred metres west of the Study Area) at some point before 1995 (Manod Estate owner, pers. comm., 2005). At this time, an area of forestry had been cleared allowing a sizeable area of young Heather to grow in a sheltered location. Targeted Black Grouse surveys undertaken did not record any of these birds.

Vantage Point Survey

- 11.191 Maps showing VP results are presented in **Figure 11.5a** through to **Figure 11.5d**. Survey dates and timings are provided in **Appendix 11.16**.
- 11.192 A total of seven Species of Conservation Concern (SNH 2005), plus Buzzard, were recorded from the targeted species during the November 2009 to November 2010 VP surveys. Species recorded were:
- Red Kite;
 - Buzzard;
 - Peregrine Falcon;
 - Merlin;
 - Hen Harrier;
 - Kestrel;
 - Red Grouse; and
 - Golden Plover.

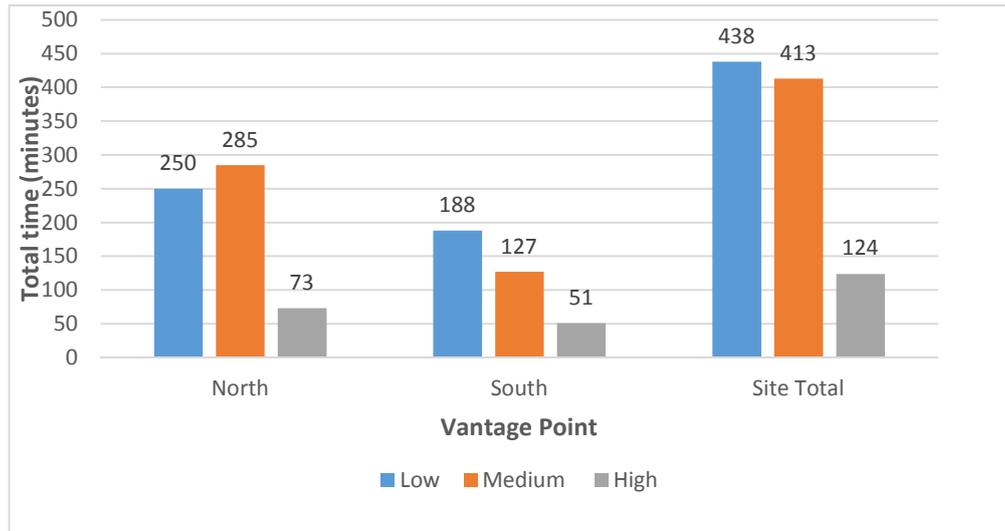
11.193 **Table 11.14** details the above species and times recorded at various height categories from each VP. Height classes are:

- Low = below turbine blade height;
- Medium = within turbine blade height; and
- High = above turbine blade height.

11.194 **Graph 11.1** details the total sighting time for all height categories at each VP for all species.

Table 11.14: Species Recorded from Each Vantage Point and Times Observed (minutes)				
		North Vantage Point	South Vantage Point	Total Species Time*
	Low	32.2	16.2	48.4
Red Kite	Medium	109.0	14.8	123.8
	High	16.2	2.3	18.5
	Low	131.9	20.0	151.9
Buzzard	Medium	149.7	34.0	183.7
	High	52.1	-	52.1
	Low	2.0	-	2.0
Peregrine Falcon	Medium	-	-	-
	High	-	-	-
	Low	0.8	-	0.8
Merlin	Medium	-	-	-

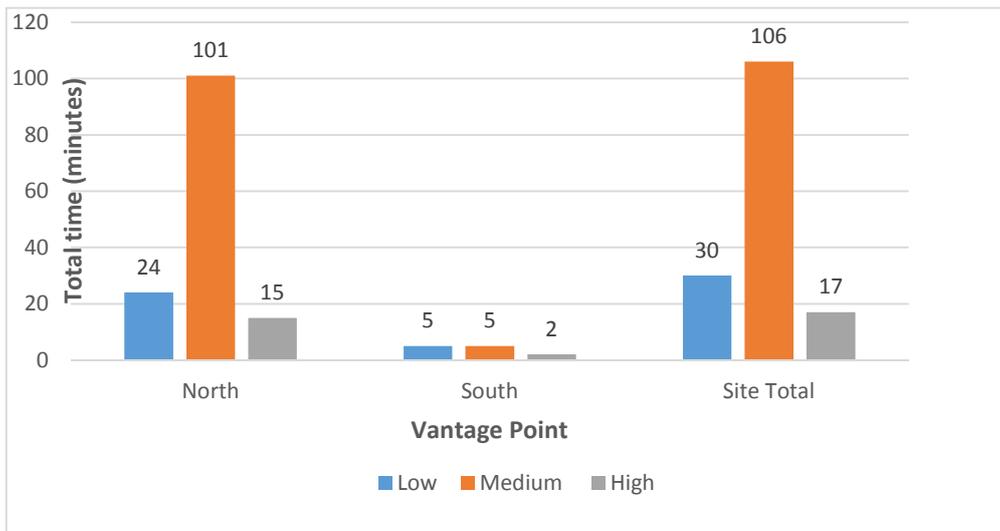
Table 11.14: Species Recorded from Each Vantage Point and Times Observed (minutes)				
		North Vantage Point	South Vantage Point	Total Species Time*
	High	-	-	-
	Low	1.5	-	1.5
Hen Harrier	Medium	-	-	-
	High	-	-	-
	Low	51.3	7.5	58.8
Kestrel	Medium	7.1	11.5	18.6
	High	0.7	-	0.7
	Low	-	4.4	4.4
Red Grouse	Medium	-	-	-
	High	-	-	-
	Low	1.7	134.4	136.1
Golden Plover	Medium	3.4	64.1	67.5
	High	1.3	47.6	48.9
* note time observed is for a single bird, e.g. a flock of 40 birds observed for 1 minute would result in a species time of 40 minutes				



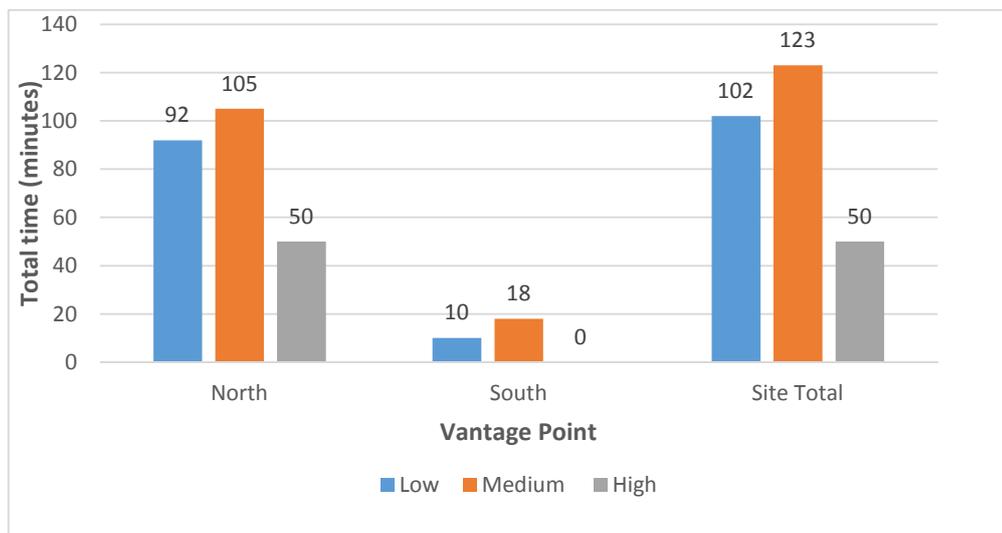
Graph 11.1: All Species - Total Sighting Time (minutes) in Various Height Categories

- 11.195 Combined recorded sighting time, for all species, from both VPs equalled 16.2 hours. The North VP recorded 10.1 hours of sightings (62% of total sighting time) and the South VP recorded 6.1 hours of sightings (38% of total sighting time).
- 11.196 The two most frequently recorded species were Buzzard and Red Kite which were recorded for 6.5 hours (39% of total sighting time) and 3.2 hours (20% of total sighting time) respectively. Golden Plover comprised a modest number of sightings (9) of at times large numbers of individuals. Golden Plover were recorded for 4.2 hours (26% of all sighting time). Please note that sighting time is a function of both the time observed and the number of birds seen. Thus, the time observed is multiplied by the number of birds. Golden Plover are usually recorded in flocks and so although flocks were seen for relatively brief periods the sighting time is relatively high. These three species combined, accounted for 85% of total sighting time.
- 11.197 Most Golden Plover records relate to the South VP and the months of November and December, though a call was also heard in September 2010. At the South VP, birds were observed on 6 occasions, sometimes feeding and sometimes apparently passing over; flock size ranged between 6 and 40 birds. Birds were observed for between five seconds and nine minutes. At the North VP Golden Plover were observed three times in November 2009 flying over, travelling in a westerly direction, with observations lasting for brief periods (5 to 15 seconds). A bird was also heard but not seen in January 2010. The data suggests that Golden Plover migrate over the site in autumn/early winter and at that time the southern part of the site around Tir Gwyn is used as a temporary feeding ground.
- 11.198 Most sightings of Red Grouse were situated around the South VP centred on Y Foel and grouse were observed during nearly every month of 2010 in this area. All Red Grouse sightings were in the Low height category. Away from the southern part of the Study Area, four Red Grouse were seen in November 2010 from the North VP (outside and to the west of the Study Area) from around SN 823 862. Red Grouse were also heard, though not seen, from this locality in September 2010. Red Grouse droppings were also observed at various points away from Y Foel including the north-eastern arm, at around SN 845 855.

- 11.199 Kestrel were observed during VP surveys for a total of around 68 minutes, most of this time was from the north VP (around 59 minutes), and 19 minutes from the south VP. They were mostly hunting/ hovering, though on two occasions they were noted as sparring once with a Merlin and once with a Buzzard. A great majority of the recorded time at the north VP was in the Low height class, whereas in the south most observed time of Kestrel was in the Medium height class. So despite substantially greater observation time from the north only 7 minutes of this was from the Medium height class, while in the south just under 12 minutes at this height was noted.
- 11.200 During VP surveys Merlin were recorded on two occasions, a Hen Harrier once and a Peregrine Falcon once. All sightings of these birds of prey were from the north and from within the Low height category. A single Sparrowhawk was recorded from the south VP for just 4 seconds, Low height.
- 11.201 Very brief sightings of flocks of Starlings were recorded on one visit in November 2009, from the north VP all at low height. Other birds recorded for brief periods were Snipe, Woodcock, Fieldfare and Wheatear. Cuckoos were heard calling twice from the south VP. Skylarks and Meadow pipits were observed during VP surveys on a number of occasions, they are very common at Mynydd y Gwynt but are too small to be reliably recorded during the VP surveys.
- 11.202 Overall flight patterns at the North VP appeared to be loosely seasonally correlated. During the winter period, birds were largely restricted to the north – south aligned Wye Valley and birds seemed to be using the valley as a commuting route. During summer months, sightings were still weighted to the valley, but greater frequency of sightings was recorded over Esgair y Maesnant.
- 11.203 Sightings at the South VP did not appear to be seasonally correlated, and birds were recorded in approximately equal measure over the Wye Valley and the summit plateau of Y Foel. As with the North VP, flight paths in the valley tended to follow the valley alignment. However, on Y Foel no directional preference could be ascertained and flight paths appeared to encompass 360° and the whole plateau.
- 11.204 The majority of sightings were made within the Low (45%) and Medium (42.3%) height classes; the High height class accounting for 12.7% of records. From the perspective of this study the Medium height category is the most critical as it relates to the zone of potential bird strike. The category is large, from 30 to 130m, and the method of analysis was such that if a bird was recorded at a borderline height (30 or 130m), then as a precautionary principle that time was assigned to the Medium category.
- 11.205 **Graph 11.2** and **Graph 11.3** detail the total observation time for Red Kite and Buzzard respectively during the breeding period (mid March to mid July). **Table 11.15** summarises observations for these species. Individual breeding period sightings for other species were too limited for any meaningful analysis.



Graph 11.2: Red Kite - Total Sighting Time (minutes) in Various Height Categories for Breeding Period



Graph 11.3: Buzzard - Total Sighting Time (minutes) in Various Height Categories for Breeding Period

Table 11.15: Red Kite and Buzzard - Summary of Breeding Period Sightings			
	North VP	South VP	Site Total
Red Kite			
Total breeding period sighting time (hours)	2.3	0.2	2.5
Total sighting time in Medium height class (hours)	1.7	<0.1	1.8
Buzzard			
Total breeding period sighting time (hours)	4.1	0.5	4.6
Total sighting time in Medium height class (hours)	1.7	0.3	2.0

11.206 A high proportion of Red Kite sightings were made in the 'Medium' height class during the breeding period. Buzzard were proportionately most often recorded in the Medium category, closely followed by the Low category. Sightings of Red Kite and Buzzard during the breeding period were heavily weighted to the North VP.

11.207 There were also three separate sightings of Red Kite during the 2004-2005 surveys. It would appear that Red Kite activity levels over the Study Area have increased between 2004 and 2011; this is consistent with the apparent increasing populations of Red Kite in Mid Wales.

Mammals

Bats

11.208 Full results for the Bat surveys are detailed in Thorne and Thorne (2010) and Crompton (2005) (**Appendix 11.17**). With the exception of the mine adits, numbers of bats recorded were very low, with records limited to a few brief passes.

11.209 The 2010 transect surveys revealed similar results to findings from 2005/06 (see **Figure 11.8b**). The same three species of bat: Daubenton, Common Pipistrelle and Soprano Pipistrelle, were again recorded in low numbers. In 2010 a small Natterers swarm/roost was found at one mine Adit and a possible Natterers swarm/roost at another adit.

Previously in 2005 swarming Daubentons were observed at a third mine adit (see **Figure 11.8a**).

- 11.210 Bat distribution was centred largely around the central area of the site and was associated with the Wye valley tributaries and sheltered forest edge locations. Observations of dawn commuting appeared to confirm this. Foraging was associated with damp and diverse habitat, often in association with the shelter provided by forest edge, stream lines and raised ground. In 2010, no bats were recorded in the south part of the site.
- 11.211 Almost all repetitive foraging activity was noted in association with the shelter provided by Hafren Forest (conifer plantation), and/or the valley sides of the small streams (Nant y Gwrdy and Afon Bidno). However, on any particular day, the use of these areas tended to vary in relation to the prevailing wind direction.
- 11.212 Three key foraging areas were identified as follows (see **Figure 11.8a**):
- Bat Key Area 1 - the forest edge in the north, adjacent to a large tract of apparent Purple Moor-grass-dominated vegetation i.e. mire and wet heath (SN 844 858);
 - Bat Key Area 2 - a small pool at the head of the stream in Afon Bidno surrounded by flush and mire vegetation (SN 839 857); and
 - Bat Key Area 3 - the pond near the head of the stream in Nant y Gwrdy, surrounded by some young wet woodland (SN 832 853).
- 11.213 Apart from at these foraging sites, there were only a very few bat encounters, and these were over the large tract of Purple Moor-grass-dominated vegetation in the north. Similar vegetation (in abundance and often with associated conifer edge) in the south appeared to be unused.
- 11.214 Flight height was noted on several occasions generally when bats were repeatedly foraging in sheltered habitat. Most of the height observations relate to Pipistrelle bats, however Daubenton activity around one pool could be classified as at Low height. Bats foraging along conifer/moorland edge interface and between tree cover were noted foraging at between 4 and 5m height (e.g. around SN 840 860). This height rarely exceeded the height of the associated trees (at 5m) and flight heights dropped slightly as bats moved out over the moorland (at 4m).
- 11.215 Bats were rarely encountered over open country; where they were, flight heights were low e.g. a Common Pipistrelle was recorded commuting and foraging over open moorland at SN 83387 86499 at 2-3m height.
- 11.216 Daytime survey of mining structures revealed three mine adits, many other mine features had been in-filled or built over with tracks and turning/service areas. There are also a number of mine shafts but these are fenced off and dangerous to access. In 2010, two adits were surveyed (Adit 1 SN 82782 85086 and Adit 2 SN 82715 86198); one other adit was surveyed in 2005 (Adit 3 SN 8289 8503). Survey used Anabat recorders, left static in-situ for periods of five to ten days. The recording devices were placed flush with each adit entrance.

- 11.217 At all three adits, Common and Soprano pipistrelles were recorded during most recording sessions. The highly attenuated calls of the pipistrelles suggests that the bats were using the surrounds rather than the adits themselves.
- 11.218 Adits 1 and 2 were surveyed in spring, summer and autumn; during the autumn surveys, as well as both species of Pipistrelle a small number of unambiguous and clear Natterer's (*Myotis nattereri*) calls were recorded at both adits. These were rare in Adit 1 but frequent in Adit 2. The timings of these recordings strongly suggests that Natterer's Bat is likely to roost and/or swarm within at least one adit (Adit 2), although probably at both.
- 11.219 However, only a few recordings were made in clustered batches and activity levels appeared to be low. In addition, the size of the adits would indicate small numbers of bats.
- 11.220 During 2005, Adit 3 which is situated less than 150m from Adit 1 and noted above was surveyed for ten days during late August and early September.
- 11.221 Many Pipistrelle recordings were made, these were always short (i.e. less than 2 seconds duration). Longer contacts (up to 14 seconds) were made with Daubenton's Bats; with these occurring around midnight, several hours after sunset, suggesting 'swarming' or other social behaviour.
- 11.222 From the daytime survey, the features with the highest potential to be used by bats were those areas providing shelter and sources of food (insect prey) i.e. areas of woodland, water bodies and watercourses on the site. Specifically, the woodland edge of Hafren Forest, the small ponds towards the northern end of the site, the rivers and streams and the small areas of woodland throughout the site formed the focus of the evening car transect surveys which followed the methodology devised by The Mammals Trust UK and The Bat Conservation Trust. Car transect surveys were carried out in 2006 and these had very similar results to those from the 2010 transect surveys: moderate bat activity over the pond on Nant y Gwrdd (SN 83160 85249), over the small reservoir/pond on the Afon Bidno (SN 83935 85693) and along the edge of Hafren Forest. Species noted were Common and Soprano Pipistrelles (foraging/commuting behaviour). There was limited activity along the smaller watercourses and no bat activity was noted over the more exposed grassland areas.
- 11.223 In the southern section of the site, bat activity was only recorded around lower lying areas. These included either side of the Dyffryn Gwy (near the application area boundary) and limited bat activity was noted mainly around the small areas of woodland alongside the tracks, with a few contacts close to the streams running down from Y Foel. Species noted were Common and Soprano Pipistrelles (largely foraging behaviour) and a small number of *Myotis* bats close to the woodland areas and the Dyffryn Gwy (contacts were too short to identify to species). There was no activity along other parts of the southern transect.
- 11.224 Turbines have been sited away from habitat features where possible. Turbine 27 is proposed to be erected by an existing narrow flow line and a new settlement pond will be constructed close by to contain run-off. The bat survey did not find any bat activity in this area.
- 11.225 Apart from the above, the closest turbine to a stream is Turbine 25 which is situated just over 70m from a small stream to the north-west. The closest turbine to woodland, tree-line or hedgerow is Turbine 8 which lies around 87m to the south-west of neighbouring coniferous plantation woodland. Turbine 9 is planned to be constructed within an existing

small coniferous plantation/ shelterbelt: this woodland will be harvested prior to the construction of the turbine. Further information on distance of turbines to watercourses and other bat habitat is provided in **Appendix 11.18**.

Otter

- 11.226 During the 2009 Otter surveys, spraints were found along the River Wye and the Nant lago. Otter spraints were also found at a number of places along the Nant y Gwrdy, including around the emergence of the stream at SN 83597 85432. Two spraints were also found on the Nant Cwm-y-foel at SN 83247 84368, just to the west of a pond. The location of spraints are shown on **Figure 11.9** and those from the 2009 survey listed in **Table 11.16** below.
- 11.227 During the 2014 surveys, spraints were recorded in three locations along the Afon Bidno, in three locations along the River Wye and in a single location on the Nant Cwm-y-foel (west of the pond). The majority of the spraints recorded were single and were also not fresh. The only locations that more than one spraint were found were at SN 84098 85241 (on the Afon Bidno, old spraints), SN 83643 83440 (on the Wye to the east of Llidart coch) and at SN 84369 84843 (Afon Bidno, further south than the other spraints recorded). The location of spraints from 2014 are shown on **Figure 11.9** and listed in **Table 11.16**.

Table 11.16: Otter Survey Results - 2009			
Grid Ref	Description	Date	Location
SN 82579 85914	Otter spraint	02/11/2009	
SN 83247 84368	2 Otter spraints	29/10/2009	Molinia clump in stream
SN 83028 85071	Otter spraint	29/10/2009	
SN 82711 85119	Otter spraint	29/10/2009	On rock
SN 82562 85324	Otter spraint	29/10/2009	On rock
SN 83597 85432	Otter spraint	30/10/2009	On rock
SN 83127 85190	Otter spraint	30/10/2009	

SN 84098 85241	Single Otter spraint	25/03/2014	On flat rock in Afon Bidno
SN 84489 84799	3 Otter spraints	25/03/2014	On boulder in Afon Bidno
SN 883871 83329	Otter spraint (old)	24/03/2014	
SN 83643 83440	Otter spraint (fresh and older)	24/03/2014	Stone
SN 884424 84832	Otter spraint (fresh and older)	25/03/2014	Stone
SN84369 84843	Several Otter spraints (not fresh)	25/03/2014	Stone
SN83017 84156	Otter spraint (not fresh)	31/03/2014	Regular sprainting point on large stone in centre of stream – varying ages
SN82507 846991	Otter spraint (not fresh)	24/03/2014	Stone

11.228 During the Bullhead survey in 2010, a further single spraint was found on the Afon Bidno at SN 84012 85317.

11.229 Six Otter spraints were found on the south end of the River Wye (outside the application area) in October 2005. The surroundings of the river in this part (unlike the rest) have overhanging willow and scrub with root hollows and other potential areas for breeding Otter. The spraints were found on rocks in three different places separated by about 40m and 120m. It is likely that this area is an important section of at least one Otter's territory. On the eastern edge of the site, there was also one small single spraint found on Nant y Crug and two small spraints on River Bidno, one in the rushes where the flush joined the stream. In May 2005, a spraint and large pile of frog bones was found at the edge of the small pool on Waun Goch. Despite having been checked on many subsequent occasions

no further spraints have been found by this pool. These findings indicate that Otters feed (on frogs, small mammals and aquatic species) and travel at least occasionally to the north eastern end of the application area.

11.230 The results from the re-survey in March 2014 indicate that usage of the Afon Bidno and the Wye 250m north of Pont Rhydgaled are the most frequently used sections of river within the application area. Use of the Nant Cwm-y-foel appears to be light and occasional. In 2014, no records of spraints were made from the Nant y Gwrdy.

Water Vole

11.231 The Water Vole surveys were carried out in autumn 2009 on the 29th and 30th of October and the 2nd November. The surveys were carried out in warm dry weather towards the end of a long dry spell of weather. The surveys were undertaken by Steven Shepherd and Emily Jackson.

11.232 Re-surveys for Water Vole were carried out in spring 2014 on 24th, 25th and 31st March. The weather on these occasions was also dry and relatively mild.

11.233 During 2009, Water Vole presence was confirmed from a number of locations. Activity was greatest around the Nant y Gwrdy to the east and north of the pond. Latrines and burrows were also found in a number of places along the Nant Cwm-y-foel around SN 83171 84630. Water Vole was found to be present along the River Wye at SN 83665 83403. The location of Water Vole, as assumed by the presence of latrines and burrows, is shown on **Figure 11.9** and details of survey findings are presented in **Table 11.17**.

11.234 During 2014, Water Vole presence was also confirmed from a number of locations. As in 2009, these were associated with the Nant Cwm-y-foel and with the Nant y Gwrdy (though on this occasion, to the south west of the pond). A number of additional sites were also located adjacent to the River Wye, though a number of these were outwith the application boundary (to the west). Locations of Water Vole records are shown in **Figure 11.9** and details of survey findings presented in **Table 11.17**.

Table 11.17: Water Vole Survey Results			
Grid Ref	Description	Date	Location
SN 83663 83428	2 Water Vole latrines	29/10/2009	North bank of River Wye
SN 83665 83403	3 Water Vole latrines	02/11/2009	South bank of River Wye
SN 82979 83946	3 Water Vole latrines & burrows	29/10/2009	Nant Cwm y foel. Droppings on tyre in stream, within tall Molinia and Soft rush habitat

SN 83146 84460	2 Water Vole latrines & burrows	29/10/2009	Nant Cwm y foel. Latrine on Molinia clump in stream
SN 83196 84490	3 Water Vole latrines & burrows	29/10/2009	Nant Cwm y foel. Large Molinia tussock some soft rush, close to fork in stream
SN 83171 84630	1 Water Vole latrine	29/10/2009	Nant Cwm y foel
SN 83123 84745	3 Water Vole latrines	29/10/2009	Nant Cwm y foel
SN 83581 85427	20 + Water Vole latrines & burrows	30/10/2009	Close to Nant y Gwrddy pond from this location to pond, many large latrines, and burrows
SN 83206 85317	2 Water Vole latrines	30/10/2009	Close to Nant y Gwrddy pond
SN 83240 85415	3 Water Vole latrines	30/10/2009	Close to Nant y Gwrddy pond. Clearing in tall Juncus, a few more latrines up to fence line
SN 83182 85242	Water Vole remains (lower jaws including teeth)	25/03/2014	To south-west of Nant y Gwrddy pond
SN 83045 83621	Feeding signs, several latrines	24/03/2014	River Wye, near Pont Cefn-brwyn
SN 84075 83046	Feeding signs, several latrines	25/03/2014	East of River Wye, north of Pont Rhydgaled
SN 82977 84009	Feeding signs, several latrines	31/03/2014	Nant Cwm-y-foel
SN 83083 84343	Feeding signs, several latrines	31/03/2014	Nant Cwm-y-foel, near pond
SN 83184 84743	Feeding signs, several latrines	31/03/2014	Nant Cwm-y-foel
SN 83265 84851	Feeding signs, several latrines	31/03/2014	Nant Cwm-y-foel

SN 82665 85928	Feeding signs, several latrines	24/03/2014	Small tributary of River Wye, north side of Bryn Daith
SN 82474 85922	Feeding signs, several latrines	24/03/2014	West side of River Wye, west of small plantation
SN 82458 85574	Feeding signs, several latrines, burrows	24/03/2014	West side of River Wye, south of small plantation
SN 83068 85119	Feeding signs, several latrines, burrows	24/03/2014	To south west of Nant y Gwrddy pond
SN 82505 84827	Feeding signs, several latrines, burrows	24/03/2014	West side of River Wye, west side of Y Drum

- 11.235 The three streams within the footprint found to host Water Vole are connected by a 2.5km stretch of the River Wye. The streams are each less than 1km apart but are separated from each other by dry grassland hill habitat.
- 11.236 The streams are, at least in part, spate streams, tending to be relatively fast flowing and as such, would not represent typical Water Vole habitat. However, the peaty nature of the soils allows burrows to be readily excavated and the streams are bordered by wide swathes of Soft rush and Purple Moor-grass habitat. Such habitat probably helps in facilitating predator (American Mink *Mustela vison*) avoidance (Strachan and Moorhouse, 2006). Particular concentrations of latrines, feeding signs and burrows were noted in M6c flush habitat. This is where Soft Rush provides relatively open habitat, in combination with a soft ground layer of bog-moss (sphagnum). Water Vole signs were recorded in similar habitat alongside the River Wye itself (as well as tributaries) in 2014. It was noted that in areas where Purple Moor-grass becomes more dominant, Water Vole signs became fewer and often non-existent.
- 11.237 The nature of the habitat and the fact that Water Vole was not recorded in 2005, (albeit some potential burrows noted) suggests that the streams may be part of a single Water Vole meta-population, based around the River Wye. The habitat in the tributaries is probably sub-optimal but nevertheless important for Water Vole, functioning as a refuge from predators and as an over flow area when populations expand.
- 11.238 During 2005, no definitive signs of Water Vole were recorded within the site. However, on the pond along the Nant y Gwrddy to the north of the site some probable old burrows were found around one bank edge. These were assessed as possibly used by Water Vole, but no active signs were found at the time of the survey (Sep-Oct 2005). Droppings from Field Vole (*Microtus agrestis*) were located in marshy grassland throughout the site.

Brown Hare

- 11.239 There were very few records for Brown Hare; one was noted in 2008 from around SN 834 857 and two were noted during the 2004-2005 surveys. While targeted Brown Hare surveys have not been carried out, incidental records were made during the course of other field survey. Between 2004 and 2011, considerable ecological survey effort has taken place in the Study Area. The altitude of the site, the high levels of precipitation and the lack of any crop cover suggest that the Study Area provides poor habitat for Brown Hare.

Badger

- 11.240 Three Badger setts were found within the wind farm footprint and near environs. Only one of these setts was obviously active in 2009; this sett, south of Waun Goch, comprised two holes and five large latrines; the sett is situated on a gravel slope above a stream. The sett is located approximately 120m from an existing access track that is due to be upgraded. Signs of Badger feeding 'scuffings' on grassland, indicative of Badger feeding (for invertebrates including soil-dwelling grubs of beetles and moths), were found extensively over areas to the east of this sett.
- 11.241 A second sett was found to the north west of Bryn Daith, sited on a large shale heap (just outside of the application area). Although there were potential tracks around, no definitive signs of activity were observed around the six holes. In the grasslands to the east of this sett there were widespread signs of Badger feeding.
- 11.242 A third sett is situated in a small mixed woodland south of Y Drum (just outside of the application area). The sett comprised three holes and during 2004-05, the sett was active with fresh badger hair present. At that time badger feeding signs were found in a number of locations on acid grassland, especially on the south and east slopes of Y Foel. These signs were not observed in 2009.

Other Mammals

- 11.243 In 2009 Weasel (*Mustela nivalis*) droppings were found in the entrance to a den on the steep slopes above the Nant y Crug at SN 84636 83328. Weasel droppings were found in a similar location in 2004-05.
- 11.244 Rabbit (*Oryctolagus cuniculus*), Red Fox (*Vulpes vulpes*) and Field Vole were recorded on the site on at least one occasion. Common Mole (*Talpa europaea*) signs were recorded. The site is also likely to support a range of other small mammals such as Wood Mouse *Apodemus sylvaticus*, Common and Pygmy Shrew (*Sorex araneus* and *S. minutus*). In winter 2010, a Short-eared Owl was recorded on Waun Goch, and in 2005 one was recorded close to Tir Gwyn; this indicates the presence of small mammals.
- 11.245 There have been extensive surveys for Pine Marten in the Rheidol and only one scat has conclusively been proved on DNA evidence to be Pine Marten. Populations are therefore likely to be very, very low. Surveys have been carried out at Nant y Moch; however, no evidence of Pine Marten was found despite extensive searches and DNA testing of all scats found. All proved to be fox.
- 11.246 It is doubtful that any Pine Martens present in Wales are in fact the original stock rather than introduced animals. DNA evidence from scats and one dead animal are all of the same haplotype as the Scottish animals, and not the same as historical Welsh individuals

(as taken from specimens in the museum in Cardiff). It is possible that the Welsh Pine Marten is extinct and that there have been occasional unauthorised introductions from Scotland.

- 11.247 Even if animals were present in the Hafren Forest, they would largely be using the forest areas, for which there is no impact from the scheme. The total land take and construction disturbance associated with the scheme will not result in significant impacts on the conservation status of Pine Marten, even if present in the locality. Given the extremely limited impact on their habitat and that the evidence indicates that the Pine Martens could be introduced Scottish animals; they are not considered to be a Valued Ecological Receptor and do not merit further study.

Reptiles and Amphibians

- 11.248 The 2010 targeted reptile search resulted in a very low number of records, with just one single reptile being recorded. A Common Lizard (*Lacerta vivipara*) was documented at SN 83726 85266, close to the existing track.
- 11.249 Other incidental records from the targeted reptile survey included Common Frogs (*Rana temporaria*) close to the existing track and pool at SN 83969 85711, and at SN 83079 85985. A Common Toad (*Bufo bufo*) was also recorded at SN 83058 86224.
- 11.250 Over the years a few records for Common Lizard (*Lacerta vivipara*) have been made, always during the summer/autumn. These were mainly on areas of degraded peat bog. Two Palmate Newt (*Triturus helveticus*) have been recorded near streams. Despite no individual being recorded, the marshy grassland and damper areas in the lower reaches of the site could also potentially support Grass Snake (*Natrix natrix*).

Bullhead

- 11.251 Bullhead predominately occur in cool, oxygen-rich, stony streams, and in such streams they typically occur within riffles that are associated with a firm gravel and sand substrate. This species is listed as a SAC feature on the River Wye. Bullhead is a distinctive species in that they have very limited home ranges and therefore, genetically discrete populations can exist within small sections of rivers (Tomlinson and Perrow, 2003). Despite intensive search of suitable habitat, no records were made of Bullhead.
- 11.252 Information provided by the EA confirmed that Bullhead are present on the River Wye and Tarrenig, south of the A44, with records from Pont Rhydgaled (2006), 2km downstream from Pont Rhydgaled on the River Wye (2008) and 5km upstream of Pont Rhydgaled on the River Tarrenig (2009).
- 11.253 Incidental records were made, during Bullhead survey, of Brown Trout (*Salmo trutta*) which were recorded just outside of the Study Area, on the River Wye at SN 82527 84742, SN 82568 84369, SN 82918 83692 and SN 83141 83675. A further record of Brown Trout was made on the Afon Bidno at SN 84210 84996.

Butterflies - Small Pearl-bordered Fritillary

- 11.254 Small Pearl-bordered Fritillary (*Clossiana selene*) has been recorded in the application area around SN 833 854; here the ground is wet and supports a young broad-leaved 'plantation', where Purple Moor-grass is in places dominant. A few individuals were seen in 2010, and in 2005 on the 22nd June, at least 100 of these butterflies were observed. The

very slowly developing woodland in this area has created a localised warm micro-climate, which in places supports abundant Marsh Violet (*Viola palustris*). The proposed wind farm would be unlikely to affect the Small Pearl-bordered Fritillaries at this location, as there are no turbines or tracks proposed over this habitat. A loop of existing track surrounding the Fritillary habitat is due to be upgraded, however these tracks are a minimum of 100m from the Small Pearl-bordered Fritillary habitat and providing that, as is intended suitable pollution control measures are instigated, no effect on the butterflies is anticipated. In time, further development of the trees could impact negatively on the population here, and the habitat has probably deteriorated between 2005 and 2010 in terms of what it offers to Small Pearl-bordered Fritillary.

Lay-by Ecology Walkover Survey

- 11.255 The full results of the lay-by ecology walkover survey are provided in **Appendix 11.8**. The majority of the habitats found on the proposed lay-bys are semi-improved neutral grassland or species poor neutral grassland and have low ecological value. Hedges lined some of the proposed lay-by areas.
- 11.256 Although none were seen during the survey widespread reptiles such as Common Lizard and Slow-worm (*Anguis fragilis*) could potentially be present on several of the proposed lay-bys sites. Hedges and areas of scattered scrub also provide suitable habitat for nesting birds. The potential for other Protected or Notable Species was considered unlikely.

Ecological Evaluation of the Study Area

- 11.257 **Tables 11.18, 11.19 and 11.20** provide the ecological evaluation of designated sites near the Study Area and the habitats and species within the Study Area.

Legislative Requirements

- 11.258 The EC Habitats Directive lists habitats of European-wide importance under Annex 1. Sustainable areas of such habitats are eligible for designation as SACs. **Table 11.18** details the SACs in the immediate surroundings (and other statutory designations).
- 11.259 The EC Habitats Directive (1994) makes it an offence to deliberately kill, capture or disturb a European Protected Species or to damage or destroy the breeding site or resting place of such an animal.
- 11.260 Birds of European-wide importance are listed under Annex 1 of the Birds Directive (1992). Sustainable areas of habitats supporting these species are eligible for designation as Special Protection Areas.
- 11.261 Certain habitats are also designated under the Wildlife and Countryside Act (“WCA”) 1981 (as amended). Designated sites such as SSSIs are detailed in **Table 11.18**.
- 11.262 A number of species that were recorded in the Study Area are subject to legislative requirements. These species are listed in **Table 11.20**, together with the relevant legislation.
- 11.263 All birds are protected under the WCA. This prevents killing or injuring any bird or damaging or destroying nests and eggs. Certain species are also listed under Schedule 1 of the WCA, which prevents disturbance of the species or its nest and/or eggs at any time.

There are certain birds excluded from the general stipulations under the WCA. These are quarry species, as well as pest species such as Woodpigeon and Carrion Crow.

- 11.264 The WCA also provides protection for certain mammal, reptile and amphibian species, listed under Schedule 5. This prevents killing or injuring and disturbance or damage to the species' breeding/roosting/hibernation location.
- 11.265 All plants are protected from unauthorised uprooting (that is, without the landowner's permission) under Schedule 13 of the WCA.
- 11.266 Certain habitats and species are listed under Section 42 of the Natural Environment and Rural Communities ("NERC") Act Wales (2006). Section 42 provides statutory underpinning to the UK Biodiversity Action Plan ("BAP"). Thus, all habitats and species listed under the UK BAP are also Section 42 species. The NERC Act 2006 states that *"every public authority must in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity"*, known as the Biodiversity Duty. Biodiversity here relates to those habitats and species listed under Section 42 of the Act.

Other Evaluation Criteria

- 11.267 A number of the species and habitats recorded in the Study Area are listed under the BAP, either at a national level or at a local level or both (UK Steering Group Report, 1995). In addition, some of the bird species are listed by RSPB Wales as birds of conservation concern ("BoCC") (Eaton *et al.*, 2009). These species are detailed in **Table 11.20** below.
- 11.268 Priority LBAP species are listed. Local Species of Conservation Concern for Powys are not listed.
- 11.269 **Table 11.18** summarises the value of the designated sites on or adjacent to the Site. **Tables 11.19** and **11.20** summarise the value of the habitats and species recorded on site. In **Table 11.20**, the ecological value is based on the value of the species in the context of the site.

Table 11.18: Ecological Value of Designated Sites			
Site	Level of ecological value	Distance from application boundary	Ecological value justification
Afon Gwy (River Wye) SAC/SSSI	International and national	Outside the application area, less than 100m from the boundary. There are also tributaries of the River Wye close to some of the new tracks.	Statutory Designation under the Conservation of Habitats and Species Regulations (2010) and National Designation under the WCA 1981.
Elenydd - Mallaen SPA/SAC/SSI/NNR	International and national	Outside the application area, 3.4km at nearest point.	Statutory Designation under the Conservation of Habitats and Species Regulations (2010) and National Designation under the

Table 11.18: Ecological Value of Designated Sites

Site	Level of ecological value	Distance from application boundary	Ecological value justification
			WCA 1981.
Plynlimon SSSI	National	Outside application area, bordering north west of the Study Area.	National Designation under the WCA 1981.
Mwyngloddfa Nantiago SSSI	National	Within application area, west of the existing lower track	National Designation under the WCA 1981.

Table 11.19: Ecological Value of Habitats

Habitat*	Level of ecological value	Hectares within Phase 1 Survey area	Ecological value justification
Improved and poor semi-improved grassland	Parish	66.74	Widespread and common habitat
Semi-improved acid & neutral grassland	Parish	51.20	Widespread and common, nearly all, over 97% is semi-improved acid grassland
Unimproved acid grassland	Parish/District (more species-rich examples – District)	90.69	Mat-grass, Sheep's-fescue and Common bent dominated overall. Also Mountain pansy and wetter mossy areas. Bilberry abundant on damper areas.
Wet modified bog	County	133.12	Species-poor but due to size and position in ecological framework, potentially important with appropriate management. Deep peat.
Dry modified bog	District	1.28	Generally a more valuable habitat than Wet modified bog, however a relatively small area, on deep peat.

Table 11.19: Ecological Value of Habitats			
Habitat*	Level of ecological value	Hectares within Phase 1 Survey area	Ecological value justification
Blanket bog	Regional	41.73	Annex 1, Habitats Directive, UKBAP, on deep peat.
Upland heath – acid dry dwarf shrub heath and wet dwarf shrub heath (Includes wet heath, <i>Ulex gallii</i> heath, and <i>Vaccinium myrtillus</i> heath) (ADH + WH)	County	48.42	Annex 1, Habitats Directive, Section 74 habitat (UKBAP, LBAP). The wet heath is of variable quality, some is species-poor and the habitat grades in blanket bog (including modified). Widespread problem of too much Purple Moor-grass in this habitat. Important for diversity of habitat and position in ecological framework. The dry heath is in the main species-poor, not structurally diverse, bilberry-dominated upland heath. Important for diversity of habitat and position in ecological framework.
Marshy grassland and acid flush	District	92.07	Mainly species-poor examples, however those around SN 83372 85443 are Marsh Violet (<i>Viola palustris</i>) rich and support a population of Small Pearl-bordered Fritillary. The marshy grassland here forms a mosaic with young broad-leaved plantation.
Wet heath/acid grassland mosaic and dry heath/acid grassland mosaic (WGM + DGM)	District	26.20	Mosaics including the regionally important habitats described above. Important for diversity of habitat and position in ecological framework. Mostly species-poor/not structurally diverse examples.
Young and mature conifer plantation	Parish	6.04	Low grade habitat
Broad-leaved plantation	District	0.67	Medium grade habitat. Those around SN 83372 85443 comprise a mosaic with Marshy Grassland and support a population of Small Pearl-bordered Fritillary. The young broad-leaved trees are sheltering the open areas between allowing warm micro-climates to develop, which are essential for these butterflies.

Table 11.19: Ecological Value of Habitats			
Habitat*	Level of ecological value	Hectares within Phase 1 Survey area	Ecological value justification
Continuous and scattered bracken	Parish	5.74	Generally on species-poor grassland and of low ecological value.
Oligotrophic and mesotrophic Standing Water	District / Parish	0.75	Mainly nutrient- poor pools of standing water, and adjacent to tracks. The pond at SN 8315 8525 has been found to support Water Vole.
Rivers and streams	International/ District		LBAP, UKBAP, the River Wye is a SAC
* Basic flush, valley mire, bare ground and spoil are outside the application area and therefore not assessed further.			

Table 11.20: Ecological Value of Faunal Receptors			
Species/ group	Level of ecological value	Description*	Ecological value justification
Water Vole	Regional	Present and active on three tributaries of the River Wye and on the River Wye itself. Water Voles on site probably form part of a meta-population, based around River Wye, occupying not optimal, but important, habitat along tributaries, expanding along these small streams when populations high.	UKBAP, LBAP. Schedule 5 WCA and Section 74. Dramatic decline in status.
Otter	County	Regular use of the Study Area, likely to be occasionally present on the on-site watercourses, as Otters following prey and patrol streams; likely frequent use of south section of the River Wye and the Afon Bidno. No signs of Otter resting places, such as holts or couches seen and use of site appears to be modest. This justifies the County value. .	UKBAP, LBAP. European Protected Species, Schedule 5 WCA and Section 74

Table 11.20: Ecological Value of Faunal Receptors			
Species/ group	Level of ecological value	Description*	Ecological value justification
Brown Hare	District	Very scarce in the Study Area. Although a UK BAP species, populations on site are unexceptional and similar to many other areas of Powys.	UKBAP, LBAP
Badger	Parish	Common. One active sett within the site foot print. Two setts just outside of the footprint, one of which is probably active and the other inactive. Plenty of evidence of Badger feeding on site. Common species throughout Powys.	Badgers Act 1991, Protection of Badgers Act 1992.
Bats	District	Considering the size of the Study Area bat activity is very low. Middle section of site most important for bats, incorporating the River Wye valley tributary the Nant y Gwrddy. Two mine adits support small numbers of Natterer's Bat at Adit 2 (SN 82715 86198) and possibly swarming Daubenton's at Adit 3 (SN 8289 8503). Both of these adits are on the western edge of the Study Area, some 400m from the nearest proposed turbine.	UKBAP, LBAP, protected by the EC Habitats Directive, Schedule 5 WCA, and Section 74.
Reptiles	Parish	Common lizard seen occasionally in wet habitats. Targeted reptile survey, found very low numbers. Common throughout Wales in similar habitats.	All reptiles are protected by the WCA
Red Kite	District	Frequent, not breeding in Study Area itself, but commuting along the River Wye valley and in summer while still predominantly commuting also foraging over Esgair y Maesnant. Most activity over the northern part of the site.	EU Birds Directive Annex 1, LBAP, Schedule 1 WCA,
Merlin	Parish	Rare, not breeding in Study Area itself, occasionally hunting over.	EU Birds Directive Annex 1, Schedule 1 WCA,
Kestrel	District	Frequent, breeding in conifer belt just outside Study Area, at SN 8250 8580. Brief hunting forays over the Study	Red List, Section 42 species

Table 11.20: Ecological Value of Faunal Receptors			
Species/ group	Level of ecological value	Description*	Ecological value justification
		Area, mostly the northern part.	
Peregrine	Parish	Rare, not breeding in Study Area itself, very occasional hunting over.	EU Birds Directive Annex 1, Schedule 1 WCA,
Hen Harrier	District	Rare, not breeding in Study Area itself, hunting over.	EU Birds Directive Annex 1, Schedule 1 WCA, Red list, Section 42 species
Goshawk	Parish	Rare, only one record flying overhead, probably breeding in Hafren Forest.	Schedule 1 WCA
Short-eared Owl	Parish	Rare, not breeding in Study Area, occasional winter visitor.	EU Birds Directive Annex 1, Red List
Red Grouse	District	Resident year round and breeding in low numbers around Y Foel.	Red list, Section 42 species
Golden Plover	District	Occasional autumn passage migrant and winter feeder.	EU Birds Directive Annex 1, Red list, Section 42 species
Curlew	NA	No longer breeding within Study Area.	Red list, LBAP, Section 42 species
Snipe	District	Occasional throughout wet areas, breeding.	Amber list
Skylark	District	Common breeding	Section 42 species
Song Thrush	Parish	Rare, probably not breeding in Study Area.	Section 42 species.
Fieldfare	Parish	Not breeding in Study Area, occasional winter flocks.	Schedule 1 WCA
Redwing	Parish	Occasional as above	Schedule 1 WCA

Table 11.20: Ecological Value of Faunal Receptors			
Species/ group	Level of ecological value	Description*	Ecological value justification
Starling	Parish	Common, not breeding in Study Area itself, occasionally flying over and feeding.	Red list, Section 42 species
Linnet	District	Occasional, not breeding.	Red list, Section 42 species
Reed Bunting	District	Rare, breeding	Section 42 species.
Willow Warbler	District	At least 4 pairs breeding, in woodland northern areas	Red list
Bullfinch	District	1 pair breeding Nant y Gwrdd 'woods'	Red list
Common Crossbill	Parish	One pair probable breeding at the edge of Study Area.	Schedule 1 WCA
* 'rare' indicates that the species is found in very small numbers on the site, 'scarce' or 'occasional' indicates that the species is found in slightly greater numbers 'common' indicates that the species is found in high numbers			

11.270 The above values have been used in the assessment of the effects in later sections of this Chapter. The assessment focuses on whether the habitat/species is sufficiently valuable for an impact to be significant in terms of biodiversity.

Overall Evaluation

Habitats

11.271 The presence of a large area of blanket bog (albeit degraded over much of the area) is integral to the overall ecological evaluation. The importance of blanket bog is recognised both in its inclusion as an Annex 1 habitat under the Habitats Directive and as a priority habitat in the UK BAP. The UK BAP is underlined by legislation in the NERC Act (Section 42).

11.272 The total area of blanket bog in Wales (both semi-natural and modified) is c. 56,200ha (Jones *et. al*, 2003). The total of this habitat for Powys is 18,800ha. The Phase 1 Study Area supports more than 134.4ha of modified bog and 41.73ha of unmodified blanket bog. Most of the bog on the site is modified as a result of historical management including extensive cutting of peat for fuel. Although the absolute area of bog is large, it forms a

small (less than 1%) of the reported Powys resource, and most of it is modified. Given this context bog habitats at Mynydd y Gwynt have been valued at between Regional value (blanket bog) and District value (dry modified bog). It should also be considered that bog habitats have an integral role in supporting a number of the species detailed in **Table 11.20** (particularly Snipe and Red Grouse).

Birds

- 11.273 Red Kite were observed 31 times in the north and 25 times in the south during the VP surveys. Despite these comparable figures the total and Medium height observation times was far greater in the North (157 and 109 minutes) than in the South (33 and 15 minutes). This shows that Red Kite were more active in the north and that most of this activity was within the Medium height category. Red Kite are not breeding within the Study Area.
- 11.274 Red Kite populations have greatly increased over the past 20 years and in 2011 the Welsh population was estimated at 1000 pairs (Welsh Red Kite Trust, 2011). Recent population estimates put the Welsh population at 1200 pairs. The Mid Wales population increase has been undoubtedly aided by daily feeding at the relatively near centres: Nant yr Arian, Ponterwyd and Gigrin Farm, Rhayader.
- 11.275 Kestrel were observed 10 times in the north and 5 times in the south during VP surveys. The total and Medium height observation times was in the 59 and 7 minutes in the north and 19 and 12 minutes in the south. Kestrels breed just to the north west of the Study Area so it is not surprising that they were observed far more in the North. Why Kestrel spend more time in the Medium height category in the south is not entirely clear.
- 11.276 Populations of Kestrel are thought to be undergoing a slow decline in Wales (Green, 2002), the breeding range has contracted by 6% with losses occurring in Central Wales; the UK population declined by 32% 1995-2010 (Balmer *et al.*, 2013). The numbers recorded from the Study Area may be considered as typical of similar habitat throughout Powys.
- 11.277 Golden Plover utilise and pass over the site during late autumn, and are mostly associated with southern areas. Golden Plover were recorded feeding and flying over the Study Area on nine occasions. The total and Medium height observation times was in the North (6 and 3 minutes) and in the South (246 and 64 minutes). The species does not breed in the Study Area. Small flocks of Golden Plover are a regular occurrence in many upland areas of Wales in the autumn and winter. At a UK level winter distribution of Golden Plover have increased by 19% since 1984, though there is some evidence of decreases in western Britain (Balmer *et al.* 2013).
- 11.278 Other birds listed in **Table 11.20** that were recorded either flying over the Study Area, or hunting/feeding within it, but not breeding, were Goshawk, Peregrine, Merlin, Hen Harrier, Short-eared Owl, Starling and Fieldfare. Numbers of Merlin, Hen Harrier, Short-eared Owl, Peregrine and Fieldfare were low, and records occasional. Starling observations were occasional and brief, but flock size was large.
- 11.279 Peregrine, Merlin and Hen Harrier have all shown population increases in the last few years. In particular, Peregrine populations are buoyant. Peregrine have seen a UK breeding distribution increase of 184% in the last 40 years and a wintering distribution increase of 105% in the last 30 years. Hen Harrier have seen a UK breeding distribution increase of 29% and wintering distribution increase of 24%. Merlin have seen a UK

breeding distribution increase of 11% and wintering distribution increase of 46%, although Ewing *et al.* (2011) report large declines from upland areas of Wales. Numbers of breeding Hen Harrier and Merlin have been increasing in Wales (RSPB, pers. comm., 2008), with a large percentage of breeding pairs in Denbighshire (the Berwyns) to the north of the Study Area.

- 11.280 Red Grouse were recorded in low numbers on many occasions in the Study Area. The UK breeding population of Red Grouse has decreased by 22% although the wintering population is reported as up by 12%; significant losses in both seasons are reported for Wales (Balmer *et al.* 2013). The total Welsh Red Grouse population is estimated at no more than 5,000 birds (Green, 2002). Of these, Powys supports relatively high numbers, associated with the moorland habitat. The site supports a small resident breeding population of Red Grouse.
- 11.281 The Study Area supports two to three pairs of Snipe (based on the number of birds heard 'drumming'/'chipping' and birds flushed from suitable habitat). The UK breeding population of Snipe has decreased by 31% although the wintering population is reported as up by 16% (Balmer *et al.* 2013). Green (2002) states that the total Welsh population of breeding Snipe is between 300 and 500 pairs. He gives a figure for Montgomeryshire of 21 pairs. In this context the breeding Snipe on site represent a significant proportion of this total. The frequency of Snipe in winter was much higher, due to winter in-migration, as in many similar locations in Wales.
- 11.282 Bird Atlas 2007-11 (Balmer *et al.*) reports the loss of breeding Curlew in parts of western Britain over the last 40 years as a key finding. The total Welsh population of Curlew is estimated at 1100 pairs (RSPB pers. comm., 2008), with a figure for Montgomeryshire of 15 pairs (Green, 2002). The LBAP for Powys gives a higher figure of 50 – 70 pairs (Powys County Council's Biodiversity, 2008). Two to three pairs were thought to be breeding in the Study Area in 2005, a single pair in 2008 and none thereafter. Any pairs of Curlew breeding in Montgomeryshire would be regarded as significant. Anecdotal evidence suggests similar declines in Curlew throughout mid Wales.
- 11.283 One of the species listed in **Table 11.20**, Skylark, is common, both in the Study Area and in upland Wales generally.
- 11.284 Song Thrush are only loosely associated with the Study Area, they do not breed there and were only recorded from the edges of the coniferous plantation (on the periphery).
- 11.285 Other passerines, listed in **Table 11.20** are Linnet, Reed Bunting, Willow Warbler, Bullfinch and Common Crossbill. These were, with the exception of Linnet, all breeding in low numbers in the Study Area. Accurate figures for total populations of these species are neither available for Wales nor Powys. However, based on Welsh Breeding Birds Survey data, Reed Bunting and Willow Warbler populations continue to decline, whereas Linnet and Crossbill are increasing.
- 11.286 Despite the lack of accurate national or county figures for these passerines (perching birds), the numbers breeding in the Study Area cannot be regarded as a significant proportion of the Powys population. This assumption is based on the low numbers present in the Study Area, and the availability of suitable similar habitat in many areas of the county.

Mammals

- 11.287 The Study Area can probably be regarded as significant for both Water Vole and Otter. The site appears to comprise part of a meta-population for Water Vole comprising the Nant y Gwrdy, the Nant Cwm-y-foel and an unnamed tributary north of here and stretches of the River Wye linking the three (as well as further south adjacent to the River Wye). As such, the Water Vole areas are predominantly situated to the west of the infrastructure of turbines, new tracks etc.
- 11.288 Water Vole have been found in Rush dominated habitat lying adjacent to water courses. Such habitat is widespread throughout the Study Area and within Upland Wales in general. The distribution of Water Vole here and within the wider countryside is therefore unlikely to be limited by habitat availability.
- 11.289 The development may lead to relatively small areas of Water Vole habitat being lost, through the construction and enlargement of tracks. Areas of potential impact are around the proposed construction compound and the new track leading to it and the widening of the track to the east of the Nant y Gwrdy, see **Figure 11.9**. No areas of confirmed Water Vole habitat will be lost as a result of the development.
- 11.290 Development will lead to noise close to Water Vole habitat. However, Water Vole are tolerant of anthropogenic disturbance and are often found in well used man made areas such as canals, where disturbance by man can be high. In this context the increased noise levels will probably not significantly disturb and impact Water Vole. The absolute amounts of Water Vole habitat likely to be lost are small compared with that available. Care needs to be taken to ensure that silt and debris are not allowed to enter these watercourses; provided that these measures are undertaken, then Water Vole should not be significantly adversely affected.
- 11.291 Otter have been found to use the Study Area, being present at times on most of the area's watercourses. Otter have even been shown to visit the bog pool on Waun Goch which is at least 500m from the nearest watercourse. The site is therefore well used by Otter. That said, the on-site small streams and pools probably do not represent as good habitat for Otter as the larger watercourse, the River Wye, of which all the site watercourses are tributaries.
- 11.292 The watercourses on site will form components of Otter territories and as such will be patrolled by Otter; they will also be used as foraging sites with Otter visiting when prey are most abundant.
- 11.293 It is very difficult to estimate how many Otter are using the Study Area, but it is suggested that the site is likely to accommodate at least one male and one female/family unit. As Otter signs have been found in many different parts of the site, on different streams, this perhaps indicates that there may be several Otter active within the Study Area. On the River Wye just outside the southern site boundary suitable breeding habitat is present and here a high frequency of spraints has been recorded.
- 11.294 Direct land take of Otter habitat by the development will in all likelihood be small, as the development avoids watercourses where practical. Otter feed on fish, amphibians and even small mammals and birds, and they require clean water to thrive. The greatest potential threat from the development to Otter will take place during the construction stage, where, if care is not taken, siltation of watercourses from washed away peat and soil could

occur. There is also potential for other toxic substances such as oil, diesel and chemicals to enter and pollute watercourses.

- 11.295 Providing that, as is of course intended, measures are put in place to ensure that such pollution events do not occur, then the impact on Otter should not be significant as is discussed in more detail in the impact assessment sections.
- 11.296 Badger forage over parts of the site; two Badger setts have been recorded just to the west of the site boundary. A third sett is present to the north of the site about 120m from a track that is due to be upgraded. This sett, consisting of two holes can best be classified as a Subsidiary Sett (Clark 1998), which, at the time of survey was currently occupied, showing numerous signs of habitation.
- 11.297 The number of setts found on and around the study site increased from one to three, between the 2005 and 2009 surveys. Even considering that one of these setts may have been abandoned, it does indicate that badgers may be increasing within the Study Area and indeed this would fit in with current badger population trends.
- 11.298 As things stand, Badgers should not be unduly disturbed by the development; however given the relatively close proximity of the on-site sett to a track and the expanding nature of badger populations it would be prudent to survey the infrastructure footprint for Badger, shortly before any construction is due to begin.
- 11.299 Much of the site is far from being an ideal habitat for bats, with few sheltered habitats available. This lack of shelter limits the abundance of insect prey. The bat activity encountered was moderate at best, even when survey conditions were ideal. High altitude locations are less likely to be visited by bats except for peak insect emergence and to utilise underground caves and mines for autumn swarming.
- 11.300 The high level of activity of Daubenton's Bats around a shaft entrance during late August and early September suggests 'autumnal swarming' behaviour. Swarming of bats at this time of year is thought to be a mating event, with bats travelling large distances to reach important swarming sites (Parsons *et al*, 2003). The influx of bats from several different and distant locations is thought to be important in maintaining genetic diversity in bat populations (Green, 2003).
- 11.301 From the data collected from the car transect surveys, it is likely that the Daubenton's Bat travelling to and from this swarming site used the relative shelter of the Dyffryn Gwy as a commuting route, rather than trying to negotiate a route over the more exposed and featureless upland grassland. The importance of this particular swarming site to other species of bat is unknown although two species of Pipistrelle were also recorded at this site.
- 11.302 Similarly, with regard to the 2010 records of likely roosting and/or swarming of Natterer's Bat, in the mine adits, these individuals are also likely to use the shelter of the River Wye and other related linear features as a commuting route rather than travel across more upland terrain.
- 11.303 Visual observations of commuting bats were limited. However, on the occasions that observations were made, flight height was low and rarely exceeded the height of associated trees, at approximately 5m. Over open ground, flight heights were typically

lower at approximately 4m and well below the sweep heights of turbine blade (between 35 and 125m above ground).

- 11.304 The fact that the most common species recorded in the proposed site are Pipistrelles is significant in terms of the evaluation of impacts. Certain bat species are thought to be more susceptible to turbine collisions than others. Research has shown that due to their tendency to fly at greater heights and hunt over greater distances in a 'hawking' manner, bats such as Noctule, Leisler's (*Nyctalus leisleri*) and Serotine (*Eptesicus serotinus*) are most likely to come into contact with turbine blades as a result (Mitchell-Jones and Carlin, 2009). In general, pipistrelle species (apart from Nathusiusus Pipistrelle (*Pipistrellus nathusii*) which was not recorded from the proposed site) are not thought to fly at these heights.
- 11.305 In summary, the bats appear to be commuting across the application site at low level by using the rivers and streams that run from the uplands down the Wye Valley, and foraging over water bodies and small woodland areas along the way.

Reptiles

- 11.306 Three potential reptile 'hotspots', which consisted of sheltered areas with Heather patches and rocks, were identified on the site. However, none of these areas are situated in the infrastructure footprint. Outside of these areas, available habitat is likely to be sub-optimal for reptiles and consequently numbers are likely to be relatively low. Indeed, this notion was supported by targeted reptile survey. Therefore, direct land take of reptile habitat by the development is likely to be insignificant.

Overall Evaluation Summary

- 11.307 The following factors contribute to the overall site evaluation:
- large area of blanket bog (including modified) and wet heath; and,
 - the presence of a number of species protected by legislation (e.g. Otter, Water Vole, bats).
- 11.308 Taken together, these factors make the overall proposed site of County importance for its biodiversity (see **Appendix 11.2** for discussion of ecological evaluation criteria).

Design Optimisation

- 11.309 Ecological constraints and sensitivities were taken on board during the design of the wind farm. The constraints map in **Figure 11.7** was used to guide the layout of the wind farm. The main constraints considered are also summarised in **Chapter 5** on Site Design. New tracks and existing tracks to be widened have been designed to avoid deep peat and less modified habitat. There have been many iterations of the design and at each stage efforts have been made to lessen the impact of the design upon valued habitats and species.
- 11.310 Construction and placement of wind turbines has avoided wherever possible on-site watercourses. Where the original tracks cross a stream or river there are currently culverts in place. Where these tracks need widening and the associated culverts lengthening, methods such as over pumping will be used to prevent sedimentation.

Description of Construction Period Effects

- 11.311 The assessment of effects is based against how the site would develop in the absence of the scheme. The site would probably not change considerably in the absence of the scheme, however there are some scenarios in which negative change (re: the site ecology) could occur. New tracks could for example be constructed for the rally complex, which could have an impact on the hydrology of the site e.g. peat drying, habitat degradation and possible disturbance to breeding waders, if built close to breeding locations.
- 11.312 Agri-environmental schemes such as Glastir have a finite life, which will expire part way through the life of the wind farm, so there would be potential for agriculture to intensify, primarily through increased stocking levels.
- 11.313 It is during the construction period when most of the potential ecological effects would be experienced. During this phase of the project's life cycle, the habitat loss would occur and the short-term level of disturbance would be the most intense. The principal direct effects that would be experienced are anticipated to be the direct loss of habitat through land-take for infrastructure construction (i.e. turbine bases, crane hardstands and access tracks).
- 11.314 Indirect effects include:
- changes to existing hydrological patterns that could lead to detrimental changes in wetland flora and fauna as a result of increased drainage and/or de-watering, potential for further peat desiccation;
 - increase pollution risk associated with accidental spillage of fuels and oils, and increases in silt-laden run-off, peat soils and fugitive dust emissions, potentially affecting the Afon Gwy (River Wye) SAC and Water Vole and Otter;
 - effects on birds, particularly breeding waders due to change of habitats as described above; and
 - disturbance to species such as breeding waders, through construction disturbance and habitat loss.

Designated Sites

- 11.315 No construction is planned to take place within the Mwyngloddfa Nantiago SSSI or within the Pumlumon (Plynlimon) SSSI. The nearest construction is scheduled to be over 100m east of the Mwyngloddfa Nantiago SSSI and over 250m from the Plynlimon SSSI. Thus no impacts resulting from construction activities are predicted on these SSSIs.

Potential Impacts on the Afon Gwy (River Wye) SAC Features

- 11.316 There is the potential for some impact from indirect effects during the construction phase from hydrological connections between the development site and the River Wye. The great majority of proposed wind farm infrastructure is positioned at least 150m from the nearest watercourse directly or indirectly connecting with the River Wye. However, there are a small number of upgraded crossings proposed for watercourses that are contiguous with the main river.

- 11.317 A screening assessment has been prepared to provide the Competent Authority with sufficient information to determine whether, following mitigation, the proposed development is likely to have a significant effect on the conservation objectives of the Afon Gwy (River Wye) SAC. The full assessment is provided in **Appendix 11.19**.
- 11.318 The potential effects would be associated with increasing sedimentation which could lead to erosion of certain banks, damage to spawning grounds and heavier sediment loads, which in turn may lead to increased turbidity. In addition, pollution from accidental spillages could flow into the River Wye from the small streams on site and affect water quality and potentially poison species in the river. If these effects were to occur, the significance of the effect on the Afon Gwy (River Wye) SSSI/SAC would be major adverse. However, the potential for these effects to occur should be greatly reduced through a number of measures.
- 11.319 **Chapters 2, 5 and 6** of the Environmental Statement (“ES”) provide overall construction proposals for the development. Further detail is provided in the Construction Environmental Management Plan (“CEMP”) in **Appendix 6.1**. Sedimentation and soil erosion would be managed through the Surface Water Management Plan (“SWMP”) in **Appendix 14.3**. Measures employed at the construction site to prevent the release of suspended sediments would include:
- Cut-off ditches and/or geotextile silt-fences will be installed at suitable locations around excavations or exposed ground and stockpiles or watercourses to prevent the uncontrolled release of sediments from the site.
 - The gradient of the ditches will be as flat as possible to avoid high velocities and erosion during storm events. The existing ditches dug into the underlying shales have a ‘rough’ cross-section and this reduces velocity and promotes the deposition of suspended solids.
 - The drainage channels beside site tracks will be constructed in discrete sections and not interconnected to outfall into any existing watercourses. The purpose of the drainage ditches will be to provide temporary storage of run-off from the tracks to allow the fall-out of any suspended solids while the collected water soaks away naturally. The size of the channels required will be designed according to the areas being drained and augmented as necessary to suit local conditions.
 - Site access points will be regularly cleaned to prevent build up of dust and mud.
 - Earth movement will be controlled to reduce the risk of construction silt being mobilised by site run-off.
 - Properly contained wheel wash facilities will be used where required, to isolate sediment rich run-off.
 - Removal of silt from site run-off through a suitably designed surface water drainage system incorporating settlement facilities before discharge of clean water to a nearby surface watercourse. The watercourses to receive discharge are to be identified and agreed with the EA. Discharge will generally be by gravity to avoid disturbance of settled silts in the cut-off trenches; and restoration of disturbed areas and reseeded (with native local species of known provenance) of redundant tracks where required to encourage vegetation regeneration and minimise erosion.

- Consent, detailing volumes and rates of discharge, may need to be agreed with the EA prior to the commencement of works.
- 11.320 No water from foundation excavations will be discharged directly into any watercourse.
- 11.321 More specific details of the mitigation provided to protect the hydrology of the site are given in **Chapter 14** of the ES. Provided these are followed, there should be no adverse sediment loading caused by the construction. As a minimum, construction activities around watercourses will adhere to general good practice management measures, as described in **Chapter 14**, seeking to maintain water quality and flow on the site. In particular, chemicals, oils and hazardous materials will be stored securely away from watercourses and the EA Pollution Prevention Guidelines will be followed. All temporary exposed pipelines adjacent to watercourses will be capped at the end of each working day, and trenches will be ramped for easy exit by Otter. With reference to the watercourse crossings, the CEMP will control activities on access track construction to ensure any earthworks and hardcore placements do not generate turbid water and affect the water quality status (see **Chapter 14, Appendix 14.3** and **Appendix 6.1** for further detail on hydrological mitigation).
- 11.322 A speed limit of 19mph for all construction traffic will be strictly adhered to, particularly during hours of darkness.
- 11.323 A pre-construction survey will be carried out for Otter. If upgraded crossings are found to lie near areas of Otter lie-up or new holts, it may be necessary to apply for a NRW European Protected Species (“EPS”) Licence to Disturb. This would also apply in the case of other construction works such as culvert replacement/strengthening) where works occur within 30m of a known Otter resting place. The mitigation measures described above will form the basis of such an application, and will be detailed in a Species Protection Plan for the site.
- 11.324 Given the distance from the watercourses of the majority of the proposed infrastructure and the precautions taken to avoid impacts, it is considered unlikely that the construction will cause any significant impacts on the SAC.
- 11.325 Cumulative impacts were also considered. There is one wind farm within the upper reaches of the Wye catchment; Bryn Titli. This is an operational wind farm although an extension has been proposed. Discussions with the RWE Project Manager on 28th July 2014 indicated that a layout has not been finalised and no timetable for the development has been announced. It is therefore not possible to make any meaningful assessment as it is not clear if the extension will proceed. From the consultation responses from NRW, it is clear that potential effects on watercourses are much more likely to occur during the construction period of the project and not during the operational period. However, with appropriate controls and mitigation, the potential effects can be completely avoided. There are therefore no in-combination effects associated with other wind farms within, or close to the 10km Study Area.

Potential Impacts on the Elenydd - Mallaen SPA and SAC Features

- 11.326 As bird surveys identified use of the site by Red Kite, Merlin and Peregrine Falcon, a screening assessment has been prepared to provide the Competent Authority with sufficient information to determine whether, following mitigation, the proposed

development is likely to have a significant effect on the conservation objectives of the Elenydd Mallaen SPA and SAC. The full assessment is provided in **Appendix 11.19**.

- 11.327 In general, the degree of geographical separation between the Mynydd y Gwynt development site and the Elenydd - Mallaen SPA and SAC, indicates that there is no potential, in isolation, for the development to impact on SPA/SAC site 'Features'. Following guidance, a number of site criteria have been assessed. It is considered the development will result in no impacts on SPA/SAC 'coherence', 'habitats', 'environmental quality', 'community structure' or 'resilience'. There is a potential for impacts on 'reproductive populations' of the SPA Annex I species: Merlin, Red Kite and Peregrine Falcon during the operational phase due to turbine blade strike. However, this is considered to be 'extremely unlikely' to be significant for Merlin and Peregrine Falcon as the numbers using the development site are very low. Numbers of Red Kite outside the SPA are increasing while numbers within the SPA are declining which indicates it is probable that the Red Kites recorded on the development site are not likely to originate from the SPA but from the more hospitable roost and breeding sites in the valleys around Llangurig and other locations outside the SPA. Given a low pre-mitigation anticipated bird strike, the dramatically reduced importance of the SPA to the species and the probability that the birds recorded on-site do not originate from the SPA, there is no effect caused by this proposal (see **Appendix 11.19**).
- 11.328 Therefore the study concluded that no impacts are anticipated on the SAC, and subject to mitigation measures, impacts on the SPA should not be significant.
- 11.329 Cumulative impacts were also considered with regard to proposed wind farms within 10km of Mynydd y Gwynt. There is only one proposed scheme within 10km of Mynydd y Gwynt which is Nant y Moch. While there are other wind farms within that radius, they are operational and are considered as part of the baseline. Plans to develop Nant y Moch are moribund; consequently, there are no other proposals within 10km of Mynydd y Gwynt that could cause in-combination effects. Recent monitoring has indicated that the Elenydd - Mallaen SPA does not support a significant breeding population of Red Kite; more birds nest and breed in the valleys around the SPA. Therefore, the birds associated with Mynydd y Gwynt are likely to come from nest sites in the valleys adjacent to the site and near to Llangurig. In the light of this data it can be concluded that there is unlikely to be movement of Red Kite between the SPA and Mynydd y Gwynt, so the presence of the two wind farms will not present a barrier to movement of the species.

Habitats

- 11.330 Physical land take would entail the direct removal of habitat for turbines and associated structures: hard standings adjacent to turbines, access tracks, site compound and substation. The replacement meteorological mast would be located in the place of the previous mast and is not anticipated to lead to additional land-take. There will also be ancillary areas where habitats will be damaged or destroyed but where some vegetation will nevertheless be able to persist or re-grow. For instance, land adjacent to track ways will be subject to ditching for the laying of cables and will be traversed and compacted by heavy machinery during construction activities. Hardstanding next to turbines will remain *in situ* through the lifetime of the development but with the edges blended into contours with soil material and allowed to vegetate.
- 11.331 **Tables 11.21 and 11.22** present the loss of different types of habitat within the application area. Habitats which would not be directly affected have not been included in the tables.

The tables display impacts in terms of direct permanent and temporary loss of habitat as a result of the development using realistic assumptions when available or worst-case assumptions, as follows:

- The site compound and batching plant would account for 1.66ha. This will be a temporary landtake. Since the Phase 1 Habitat survey was carried out in 2004, the area of the proposed site compound and batching plant has been converted to bare ground for use in the rally activities and therefore would not result in loss of habitat (in table as previously disturbed land).
- The substation will result in a permanent landtake of 0.20ha and an additional 10% of temporary landtake. As above, this area has now been converted to bare ground.
- The settlement pond near to Turbine 27 will result in a permanent landtake of approximately 0.084ha.
- Each new turbine will account for a circular base with diameter of 17.6m and 1.45m deep (with the bottom of the excavation typically between 2.5m and 3m below existing ground level) but the area of disturbance and the crane hard-standing would be 20m by 40m (as presented in **Chapter 6**). In addition there will be an area of 50m by 15m for the blade lay-down area. Blades will be lain on bogmats on top of the habitat by crane. Therefore there is no expected loss of habitat.
- On-site tracks will be typically 5m wide, however in calculating figures for the assessment a worst case width of 7m has been assumed, with an additional 2.5m either side of temporary habitat which will be taken or directly damaged by tracks on level ground, and 8.5m either side on steep ground, so as to account for edge impacts from cabling, ditching and damage inflicted by construction machinery.
- To construct the new tracks, the top layer of soils will have to be removed (depending on the underlying material). The top and sub-soils will be stored adjacent to the tracks for use in restoration. Wherever possible, soils would be stored on improved or semi-improved habitats to avoid damaging sensitive habitats.

11.332 The values given in **Tables 11.21** and **11.22** are based upon assumptions so they will not always be completely accurate; however, they do provide an indication of the kind of direct habitat loss that can be expected. Those habitats of County level of importance or higher have been shaded in **Table 11.21**.

11.333 **Tables 11.21** and **11.22** are based on the Phase 1 Habitat survey apart from the habitat of the location of the substation, site compound and batching plant, which as mentioned above, has changed in the intervening period to bare ground.

Table 11.21: Permanent Loss of Habitat in the Study Area due to Construction of the Development				
Habitat Type	Total hectares directly impacted by construction of the development	% Of habitat type lost within Phase 1 Study Area	Total habitat type within Phase 1 Study Area (ha)	Representation of habitat type within Phase 1 Study Area (%)
Acid dry dwarf shrub heath	0.03	0.30	10.00	1.71
Acid flush	0.07	0.32	21.64	3.71
Blanket bog mire	0.08	0.19	41.73	7.15
Coniferous plantation*	0.17	2.81	6.04	1.03
Improved & Poor semi-improved grassland	0.94	1.41	66.74	11.43
Marsh/marshy grassland	1.88	2.63	71.43	12.23
Oligotrophic standing water	0.01	1.33	0.75	0.13
Broad leaved plantation and hedges	0.002	0.17	1.21	0.21
Semi-improved acid grassland	0.42	0.84	50.00	8.56
Semi-improved neutral grassland	0.02	1.67	1.20	0.21
Unimproved acid grassland	1.35	1.49	90.69	15.53

Wet dwarf shrub heath	0.99	2.58	38.42	6.58
Wet heath/acid grassland mosaic	0.50	1.91	26.20	4.49
Wet modified bog mire	2.92	2.19	133.12	22.80
Previously disturbed land	0.20	-	-	-
Total	9.58	n/a	n/a	n/a

* An additional ~1.38ha of conifer plantation will be harvested around Turbine 9, and this land outside of the development footprint will revert back to its previous habitat.

Table 11.22: Temporary Loss of Habitat in the Study Area due to Construction of the Development				
Habitat Type	Total hectares directly impacted by construction of the development	% Of habitat type lost within Phase 1 Study Area	Total habitat type within Phase 1 Study Area (ha)	Representation of habitat type within Phase 1 Study Area (%)
Acid dry dwarf shrub heath	0.13	1.3	10.00	1.71
Acid flush	0.19	0.88	21.64	3.71
Blanket bog mire	0.24	0.58	41.73	7.15
Coniferous plantation	0.15	2.48	6.04	1.03
Improved & Poor semi-improved	1.17	1.75	66.74	11.43

Table 11.22: Temporary Loss of Habitat in the Study Area due to Construction of the Development

Habitat Type	Total hectares directly impacted by construction of the development	% Of habitat type lost within Phase 1 Study Area	Total habitat type within Phase 1 Study Area (ha)	Representation of habitat type within Phase 1 Study Area (%)
grassland				
Marsh/marshy grassland	2.05	2.87	71.43	12.23
Oligotrophic standing water	0.04	5.33	0.75	0.13
Broad leaved plantation and hedges	0.005	0.41	1.21	0.21
Semi-improved acid grassland	0.65	1.30	50.00	8.56
Semi-improved neutral grassland	0.03	2.50	1.20	0.21
Unimproved acid grassland	1.03	1.14	90.69	15.53
Wet dwarf shrub heath	1.11	2.89	38.42	6.58
Wet heath/acid grassland mosaic	0.62	2.37	26.20	4.49
Wet modified bog mire	2.52	1.89	133.12	22.80
Previously disturbed land	1.71	-	-	-

Table 11.22: Temporary Loss of Habitat in the Study Area due to Construction of the Development				
Habitat Type	Total hectares directly impacted by construction of the development	% Of habitat type lost within Phase 1 Study Area	Total habitat type within Phase 1 Study Area (ha)	Representation of habitat type within Phase 1 Study Area (%)
Total	11.65	n/a	n/a	n/a

- 11.334 Approximately 0.08ha of unmodified blanket bog will be permanently and 0.24ha temporarily impacted on by the construction, which is respectively 0.19% and 0.58% of the total blanket bog on site. Despite the value of this habitat, the loss of blanket bog at Mynydd y Gwynt is predicted to be modest and primarily associated with track creation and widening. Without mitigation the impact of direct effects on the Study Area blanket bog is assessed as Moderate; with mitigation in place through the HMP the impact is assessed as Minor. However, the indirect impacts on adjacent areas of bog through drying and chemical changes could be greater.
- 11.335 Approximately 2.92ha of wet modified bog will be permanently and 2.52ha temporarily impacted on by the construction, which is respectively 2.19% and 1.89% of the total wet modified bog on site. The impact of this is assessed as Moderate; mitigation through the HMP should improve the quality of some areas of wet modified bog and thus will reduce the overall impact upon this habitat. Nevertheless given the relatively large area of habitat lost the post mitigation impact on wet modified bog will still be classed as Minor.
- 11.336 Approximately 0.03ha of acid dry dwarf shrub heath will be permanently and 0.13ha temporarily impacted by the construction. This represents respectively 0.30% and 1.3% of this habitat type on site. The significance of this effect is Minor adverse.
- 11.337 The area of wet dwarf shrub heath which will be impacted is 0.99ha of permanent and 1.11ha of temporary loss. In the Study Area, wet heath is frequently in mosaic with acid grassland. The loss of this wet heath/acid grassland mosaic impacted is 0.50ha permanent and 0.62ha temporary loss. Wet heath in the Study Area tends to grade into blanket bog or degraded bog. Furthermore, Heath Rush and Purple Moor-grass are prominent constituents of the wet heaths in some areas. Heath Rush can indicate a history of heavy grazing and dense Purple Moor-grass can lead to reduced diversity due to the shading effects of its leaf litter. Much of the wet heath at Mynydd y Gwynt is partially degraded, resulting in less ecological value than good condition wet heath habitats. In this context the impact is assessed to be Moderate adverse. Mitigation through the HMP should improve the quality of some areas of wet heath and thus is predicted to reduce the overall impact upon this habitat to Minor.
- 11.338 The total upland heath resource in Wales is estimated at around 80,000ha (Jones *et al*, 2003). Upland Vegetation Survey also suggests that approximately 12,000ha of upland heath exist within Powys (17.5% of the Welsh resource), comprising 8,800ha of acidic dry heath, 360ha of wet heath, and 2,870ha of grassland/heath mosaic (Jones *et al*, 2003).

Watercourses and Streams - Aquatic Systems

- 11.339 Construction and placement of wind turbines has avoided on-site watercourses wherever possible. There are currently culverts where the original tracks cross a stream or river. In instances where these culverts need lengthening, silt traps would be applied to prevent sedimentation.
- 11.340 No new water crossings will be required. Eleven mapped water crossings currently appear under existing wind farm tracks, including almost 30 existing culverts of varying sizes which will be investigated and renewed as required. Five of the new or upgraded proposed tracks are planned to cross / run close to streams:
- The track between Turbines 4 and 5 will run close to the head of a tributary leading into the Nant Iago.
 - The track to Turbine 27 appears to run close to (though may not actually traverse) the headwaters of a tributary of the River Wye. However, although Turbine 27 appears to be very close to the mapped watercourse, on-site inspections indicate that the mapping is incorrect and the watercourse runs 40m to the south through areas of wet boggy ground (see **Chapter 14** for more information).
 - The track running north and east from Turbine 22 will cross the head of the Nant y Crug utilising an old track. This is an important location, as, to the south, the stream drains through an acid flush and to the north, lies an Oligotrophic pool and blanket bog.
 - The existing track from Turbine 7 running east to Turbines 8 and 10 crosses over a small dam across the Afon Bidno, the track will need to be realigned and widened.
 - The track running east to Turbine 14 clips the head of a stream linking into the Afon Bidno though again this is an existing track that will need widening.
- 11.341 In addition the main access road through Mynydd y Gwynt crosses tributaries of the River Wye and also runs close to watercourses in places. The main access road is existing but will need widening and realigning in places.
- 11.342 The construction of settling ponds and pollution control measures will be particularly critical in these areas.
- 11.343 All the river and stream dwelling conservation priority species have the potential to be adversely affected by the development if large amounts of suspended solids in the form of mud and silt are carried off site. This could adversely affect these organisms by covering and clogging their spawning grounds and reducing the clarity, quality, and oxygen content of the waters. Brown Trout, Salmon, Twaite Shad and all three species of Lamprey require 'clean' gravel for spawning (Carstairs, 2000). Pollution in the form of oil, petrol and other chemicals could introduce toxic elements into the watercourses potentially affecting these and other species. Waste material created during construction including hardcore and cement could potentially enter watercourses and eventually find their way down stream; these may contribute to siltation deposition, change the chemical and pH status of the watercourses and lead to physical and aesthetic pollution.

- 11.344 Any such effects are likely to be much more pronounced closer to the development; therefore those species inhabiting waters closer to the development are at greater risk. Potential impacts on aquatic systems are most likely to occur during the construction phase, as at this time there is a heightened possibility of substances entering watercourses. As mentioned in **Paragraph 11.319** there will be adequate measures in place within the SWMP and CEMP to reduce the risk of sedimentation and pollution. Once construction is completed, the risks should diminish, though until bare soils and peat are vegetated and stabilised there will still be a danger of these materials being washed into aquatic systems.
- 11.345 All aquatic life is vulnerable to pollution, be it particulates of silt or petrochemicals, and the effects of an incident in any one area can be carried many kilometres downstream. It is also important to realise that areas remote from watercourses will eventually drain into streams. Such areas may be buffered by dry land, but there is still risk, particularly after heavy rain events, for pollutants to find their way into watercourses. This is discussed in more detail in **Paragraphs 14.68 – 14.82 of Chapter 14**. With the proposed protection measures in place, the potential significance of effect would be minor adverse on the watercourses within the Study Area and No Impact on the Afon Gwy (River Wye) SAC.

Indirect Construction Period Effects on Habitats

Alteration in the Hydrology of Surrounding Habitats

- 11.346 The construction of both access tracks and the turbines themselves may have negative hydrological impacts on surrounding areas of good quality habitat due to:
- drainage;
 - compaction from the weight of the construction vehicles and deposited materials; and
 - increase in impermeable surfaces.
- 11.347 This could possibly result in a minor increase in the volume of surface run-off and a reduction in time for water to reach the river. Hydrological impacts are notoriously difficult to predict. However, a small percentage of the good quality habitat of the Study Area is dependent on soligenous water flow (in particular, areas of valley mire and acid flush). Therefore, changes to either the flow regime or the base content of the water itself are likely to have indirect impacts on the mire habitats of the Study Area.
- 11.348 Potential hydrological impacts are addressed in **Chapter 14** and mitigation measures incorporated into the project design are described and include:
- use of sustainable drainage systems during the creation of or upgrading of tracks, including drainage ditches, and culverts designed for the purpose of managing surface water run-off, maintaining surface water quality, reducing erosion and minimising sediment transport and sedimentation;
 - periodic inspection and cleaning of blockages caused during the construction phase;
 - limiting vehicle movements to defined access tracks and hard standing in order to minimise compaction of the soils and changes to run-off rates and volumes; and

- designing new access roads so as to avoid the creation of river crossings where possible.
- 11.349 The drainage ditches are proposed beside site tracks to provide sustainable drainage by providing temporary storage of run-off from the tracks to allow the fall-out of any suspended solids while the collected water soaks away naturally. They will be constructed in discrete sections and not interconnected to outfall into any existing watercourses. The size of the channels required will be designed according to the areas being drained and augmented as necessary to suit local conditions.
- 11.350 Mire habitats (blanket bogs, valley mires and acid flushes) are susceptible to changes in hydrology. These habitats are usually founded upon peat, and peat needs to be constantly wet in order to maintain its integrity. Valley mires and flushes are fed by percolating, moving water and blanket bogs are fed directly by rain. The foundations of structures constructed within peat cannot usually be allowed to be constantly wet and construction features may lead to peat drying where these meet the built structures. As blanket bogs are only fed by rain and are not refreshed with ground water from outside they are particularly vulnerable to drying. The significance of changes in the hydrology depends on the affected habitat. The significance would be moderate-minor if it is a temporary effect on degraded bog, wet heath or acid flush habitats, while the impact significance would be critical if it is a permanent effect on good quality blanket bog habitat. However, with the protection measures, as described above and in **Chapter 14**, put in place and considering that the wind farm has been designed to avoid blanket bog where possible, the risk of altering the hydrology of these areas is small.

Alteration in the pH of Surrounding Habitats

- 11.351 Materials from construction (alkaline dust, particulates, etc.) may drift on to surrounding habitat. Cement is alkaline in character and base rich chemicals may with time leach from the turbine bases into adjacent habitat. This is most likely to happen and produce adverse effects where structures are placed within wet acidic habitats. If groundwater is encountered in the excavation for the turbine bases, the excavation will be lined with an impermeable membrane to prevent seepage of cementitious material into the sub-soil. Vegetation in the Study Area is mostly acidic in character, and those habitats most likely to be affected by any increases in pH are the blanket bog and valley mire communities; there is also the potential for adverse effects on the dry heaths and acid grasslands. However, any leaching effects are likely to be minor and would only affect a small area.
- 11.352 Cement and other alkaline building materials will be used for the construction of turbine bases and may be used for other structures such as culverts. It is again the wet acidic habitats that are most at risk from chemical changes, particularly blanket bogs as they are particularly acid in character. The areas most at risk from this process are the same as those outlined above: again, blanket bog which has a naturally low pH, would be particularly vulnerable to alkaline dust which could cause pH values to rise, and consequently affect vegetation composition.
- 11.353 Alkaline dust, if not effectively controlled, could potentially spread over a wide area and adversely affect much of the application site. Unmitigated, the severity of the effect would depend on the volume of alkaline material entering the habitats and the area of habitat affected. It is not possible to predict these factors at this stage, but based on the importance of the blanket bog and valley mire habitats (**Table 11.19**) the significance of effect could, as a worse case scenario, were clouds of cementitious material released, be at

least moderate. However, the EA advice on dust suppression and the prevention of dust creation will be followed and as a result this impact should be avoided.

- 11.354 With the measures outlined above and in **Chapter 14** in place, the risk of the impact regarding alteration of hydrology and pH is assessed as being of Minor significance.

Effects on Peat

- 11.355 Construction-related activities such as foundation excavation and track building can cause disturbance in surrounding peat soils, which can potentially lead to failure of peat deposits. The layout including turbines and tracks has been designed wherever possible to avoid peat deposits (see **Figure 11.3**). However, it is possible that in localised areas some small new sections of track may traverse through peat that is up to 1m depth, or existing tracks that already cut through peat may need to be widened.
- 11.356 Given the nature of blanket bogs (deep peat), there is a potential for failure of the peat soils locally due to any loading of the peat. However, the track will be micro-sited in the detailed design stage to avoid impacts on blanket bog. Given that the site design avoids deep peat where possible and that further micro-siting will take place, the magnitude of the effect of a peat failure here is considered to be negative and of Minor significance. In addition, the measures described in **Paragraphs 11.319 - 321** and **Chapter 14** would be employed to reduce sedimentation and soil erosion.

Fauna

Birds

- 11.357 Much of the Study Area supports wetland habitat which is the favoured habitat of breeding waders Curlew and Snipe. For this reason, development within wetlands could have a potential displacement effect on breeding waders. Construction noise could also lead to the displacement of waders.
- 11.358 During early surveys Snipe and Curlew were recorded in the Waun Goch area; this influenced the design of the wind farm, as plans to site turbines in the very wet parts of this area were discounted. In particular, Curlew were seen around the western side of Waun Goch/Esgair y Maesnant.
- 11.359 Anecdotal evidence from the land owner, suggests that immediately post WWII both Curlew and Lapwing were common throughout the site, Curlew being present on many areas of boggy ground. Since then a gradual, year on year decline in the numbers of these waders appears to have occurred. The decline has now reached the point where breeding Lapwing disappeared many years ago and breeding Curlew have not been recorded since 2008. Stocking levels at Mynydd y Gwynt have declined since a high around 30 years ago and today the site still accommodates large areas of semi-natural wet vegetation. This indicates that Curlew decline is probably not simply related to habitat availability. Apparently Waun Goch was consistently the last refuge for Curlew and that within this large area nest location varied in any particular year.
- 11.360 However during 2008 (the last year they were recorded) Curlew were primarily recorded around Y Foel/Tir Gwyn (where there is again a sizable area of wetland) with just a single sighting from west of Waun Goch.

- 11.361 Curlew are a Conservation Priority species (on the red list for Wales), having experienced a major contraction in range in recent decades (Thorpe, R.I. and Young, A., 2002). It is predicted that there are only 1,100 pairs of curlew breeding in Wales (RSPB, pers. comm., 2008). This species is also listed in the Powys LBAP, and only low numbers breed in the county. Snipe are on the amber list, they are not considered to be a Conservation Priority Species, however given the large area of good Snipe habitat present they can be treated as a species of local importance.
- 11.362 Based on the apparent relative abundance of Curlew within the recent past, together with the assumption that the on-site habitat has not greatly changed within the recent past, it would seem that habitat availability is not a limiting factor for breeding Curlew at the site.
- 11.363 Curlew are not currently an issue at the site, having been absent from the site for a number of years. There is of course the possibility that Curlew will return to the Study Area in the future. Given the nature of the site and its history, it is very unlikely that Curlew numbers are limited by habitat availability. Provided that their historical stronghold, Waun Goch, is left free of development then the wind farm would probably not be a barrier to Curlew re-colonising the site.
- 11.364 A Curlew survey will be carried out in the breeding season, prior to on-site development work beginning. If breeding Curlew are present, NRW will be consulted and work will not commence in the relevant areas until an approach has been agreed with NRW.
- 11.365 The site probably supports between two to three pairs of Snipe (based on the number of birds heard 'drumming'/'chipping' and birds flushed from suitable habitat in 2005). Green (2002) states that the total Welsh population of breeding Snipe is between 300 and 500 pairs. He gives a figure for Montgomeryshire of 21 pairs. Given that 2 to 3 pairs were breeding on the proposed site, this represents 10 to 15% of the total Montgomeryshire pairs.
- 11.366 Snipe feed and nest in boggy ground (Hale, 1980). Snipe may be temporarily disturbed by works, however, there is plenty of adjacent alternative boggy habitat at the site for Snipe to relocate. On-site development work should commence in wetland areas before the breeding season begins. Providing that this occurs, a Minor adverse effect on Snipe is predicted.

Bats

Destruction and Disturbance of Habitats and Commuting Corridors

- 11.367 The development should not lead to any loss or disruption to the watercourses. There will be a permanent loss of 0.01ha and temporary loss of 0.06ha of standing water due to the widening of existing tracks and the loss of Oligotrophic pond habitat. Three ponds/pools will be affected, two to the east of Turbine 6 and one to the east of Turbine 7 (dam over Afon Bidno). These pools have been created as a by-product of existing track development and the widened tracks may inadvertently create replacement pools. Only very small areas of coniferous plantation will be lost (maximum 1.74ha) and therefore should pose little threat to the bats commuting across the site using the rivers and streams or small woodland areas.
- 11.368 For these reasons, the impact is thought to be Negligible.

Destruction or Disturbance of Roosts

- 11.369 This potential impact relates to both the direct loss of potential roost sites, e.g. from removal of trees or buildings. The potential roost sites identified included the mining structures and wooded areas. The mining structures and the wooded areas, which are potential roost sites, would not be affected by the development.

Summary of Effects on Bats

- 11.370 Based upon the survey work carried out, together with knowledge of the site, the effect of the construction on bats is likely to be Negligible.

Water Vole

- 11.371 The development may lead to small areas of Water Vole habitat being lost, through the construction and enlargement of tracks. Areas of greatest potential impact are to the south of the proposed construction compound and the new track leading to it and the widening of the track to the east of the Nant y Gwrdd.
- 11.372 The absolute amounts of habitat likely to be lost are very small compared with that available. Care needs to be taken to ensure that silt and debris are not allowed to enter these watercourses; provided that these measures are undertaken then the effect on Water Voles is predicted to be Minor adverse.

Otter

- 11.373 Direct land take of Otter habitat will be small, as the development mainly avoids watercourses where Otters are found. Within the design process, one turbine was removed due to being in the vicinity of an area where an Otter spraint was found. Otters are clearly active within the Study Area (at least intermittently), though there are no holts and no couches have been identified.
- 11.374 Otters feed on fish, amphibians and even small mammals and birds, and they require clean water to thrive (Harris and Yalden, 2008). The greatest potential threat from the development to Otter may occur during the construction stage, where, if care is not taken, siltation of watercourses from washed away peat and soil could occur. There is also potential for other toxic substances such as oil, diesel and chemicals to enter and pollute watercourses. Otter patrol sections of watercourse, moving mainly at night, there is potential for the passage of Otter to be blocked, were watercourses are to be blocked. Specific measures would be employed to reduce the potential for polluting substances to enter watercourses and this is discussed in more detail in **Chapter 14**.
- 11.375 The noise during the construction period may disturb any Otter that could potentially be resting within their territories during the day. Otter may react to this disturbance by retreating to quieter areas of their territory.
- 11.376 Without mitigation the construction period impacts on Otters would be Moderate adverse.

Construction/extension of Proposed Lay-bys

- 11.377 The construction and/or extension of the five proposed lay-bys would result in some loss of semi-natural habitat such as semi-improved and unimproved neutral grassland but the habitat loss overall is considered to be negligible.

- 11.378 For protected species the most widespread potential impacts are to breeding birds and widespread reptiles.
- 11.379 The works could also affect nesting birds during clearance of areas of scattered scrub and if any hedge removal or trimming is required. Without appropriate mitigation this could lead to damage or destruction of nests and disturbance to breeding birds. Depending on the amount of works required to the hedges, the potential effect on breeding birds is predicted to be Moderate-minor adverse.
- 11.380 The proposed works would lead to a small loss of reptile habitat lead to the loss of this habitat and potentially harm of any individual animals which may be present. The habitats present on the sites are not unique to these locations and the small area that would be lost will be insignificant in comparison with the availability of similar habitat in the surrounding area. The potential effect on reptiles is predicted to be Minor adverse.

Mitigation of Construction Period Effects

Ecological Clerk of Works

- 11.381 An Environmental/Ecological Clerk of Works (“ECOW”) will be appointed to advise the Applicant and their contractors during the construction period to ensure that potential effects on key ecological receptors are avoided or reduced and that the mitigation measures identified below are implemented successfully. In addition, the ECOW will ensure legal obligations with regard to species protection are adhered to. The ECOW’s remit is outlined more fully in the draft CEMP at **Appendix 6.1** and the Species Protection Plan at **Appendix 11.20**.

Habitats and Habitat Management Plan

- 11.382 The wind turbines, substation and access tracks have been sited with the aid of an Ecological Constraints Map so as to totally avoid all Absolute Constraint areas and to avoid where possible High Constraint areas. Extensive discussion with the developer and engineer have taken place as to turbine location and access tracks, and as a result a number of theoretical wind turbine locations have been moved from areas of blanket bog and deep peat, to areas of improved and poor semi-improved grassland (see **Chapter 5** on Site Design).
- 11.383 Bog/mire habitat is of particular importance in the context of this development. Mires form on peat, which is susceptible to drying, and are conservation priority habitats: they also support breeding and foraging waders. This assessment has highlighted a potential minor adverse effect on blanket bog through land take, though construction work will generally attempt to avoid areas where peat depth is greater than 0.5m through micro-siting. A peat depth plan has been used to inform the siting of infrastructure with the aim of avoiding deep peat, wherever possible. Where access tracks have to cross mire or blanket bog habitat, they will be designed to impede drainage.
- 11.384 Existing track widths on-site vary from 2m to 6m. Where required existing tracks will be widened to at least 5m width. In most cases, this will involve widening existing tracks by up to 2m on either side. However in areas of sensitive habitat, tracks will be widened

appropriately i.e. towards the least sensitive side. Prior to construction, an ecological surveyor will mark with surveying posts which side of the track to widen in areas of ecological concern, to avoid higher value habitats.

- 11.385 Similarly, material stockpiled for reinstatement would not be stored on areas of better quality habitat.

Habitat Management Plan

- 11.386 Although every effort has been made to avoid important habitats, some areas of semi-natural vegetation will be lost and damaged through the development. These habitats would be compensated for by introducing measures, through a management plan, to revert some areas of degraded habitat and ensure the medium term positive management of key areas of existing habitat. A HMP has been produced and is provided in **Appendix 11.21**.

- 11.387 The plan focuses upon:

- Ensuring the survival of the peat islands (remnant areas that have avoided peat cutting) on Esgair y Maesnant. These areas are subject to erosion and very sensitive to grazing.
- To control Purple-moor-grass on Esgair y Maesnant and in so doing enhance habitat quality for breeding waders. The peat islands mentioned above are juxtaposed with degraded wet bog and wet heaths where invasion/dominance by Purple Moor-grass is a substantial problem. Grazing by cattle is a proposed approach to help break down and remove the Purple Moor-grass. In addition localised mechanical removal of dense areas of Purple Moor-grass is proposed.
- Ensuring the continued medium term positive management of the wet open young woodland and pond around Nant y Gwrdd. This is a key area for Water Vole and Small Pearl-bordered Fritillary and is also used occasionally by Otter. Although the trees are a valuable part of the habitat here, management is needed to ensure that the area is not further over-shaded by trees and Purple Moor-grass.
- To see an overall maintenance of habitat quality, Mynydd y Gwynt has been subject to agri-environment agreements for the last 20 years, and continues to be so. The agreement has allowed many previously heavily grazed habitats to at least partially recover. The plan aims to as a minimum maintain this improvement.

- 11.388 The management plan includes measures to revert areas of degraded bog and wet heath mosaic to better quality bog and wet heath habitats with a higher cover of bog species, ericoids such as heather and a higher water table, hence improving these habitats.

- 11.389 Such management may involve measures including reduced stocking levels, blocking/not managing any drainage ditches currently open, and the spreading of cut heather and ericoid branches (containing seeding material) on suitable areas. A change in stock type from sheep to cattle could help open up the sward and reduce the amount of Purple Moor-

grass (the dominant species on the degraded bog and acid grassland areas at Mynydd y Gwynt).

- 11.390 Care will need to be taken however, to decide the number of grazing animals on these habitats. Such measures could improve the biodiversity of some of the non-impacted areas. **Table 11.23** shows the Glastir Livestock Units (“LSU”) for key areas at Mynydd y Gwynt, while **Table 11.24** provides the LSU for different types of livestock. The rates in **Table 11.24** should generally be seen as maximum figures.

Table 11.23: Livestock Units and Glastir Stocking Rates								
	Stocking Rates (LSU/ha)							
Field Number	Jan - Mar		Apr - Jun		Jul - Sept		Oct - Dec	
	Max	Min	Max	Min	Max	Min	Max	Min
SN8485 3156 (Eastern Arm)	0.04	0	0.15	0.04	0.15	0.04	0.04	0
Sheep Numbers	16 sheep	0	56 sheep	16 sheep	56 sheep	16 sheep	16 sheep	0
SN8386 5025 (Esgair y Maesnant)	0.01	0	0.1	0.05	0.1	0.05	0.01	0
Sheep Numbers	4 sheep	0	45 sheep	23 sheep	45 sheep	23 sheep	4 sheep	0
SN8484 5802 (Tir Gwyn)	0.02	0	0.16	0.08	0.08	0.06	0.02	0
Sheep Numbers	15	0	85	43	63	32	15	0

	sheep		sheep	sheep	sheep	sheep	sheep	
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Table 11.24: Livestock LSU	
Livestock	LSU
1 suckler beef cow	1
1 breeding ewe/ram > 1 yr old	0.15
1 dairy cow	1
1 beef cattle 6 – 24 months	0.6
1 horse	1

Watercourses and Streams - Aquatic Systems

11.391 The measures contained within the CEMP and the SWMP would ensure the protection of aquatic systems. This is discussed in more detail in **Chapter 14, Appendix 14.3 and Appendix 6.1.**

Peat

11.392 Turbine 16 runs to the west of a peat body, any micro-siting of this turbine will be to the west away from the peat body.

Fauna

11.393 A draft Species Protection Plan has been produced this can be found in **Appendix 11.20.** The plan focuses on Otter, Water Vole and Badger.

Birds

- 11.394 In order to avoid disturbance to breeding Snipe and to other breeding birds, construction work in semi-natural habitats would ideally be started (in those semi-natural areas) outside the breeding season of March to August inclusive. Where this is impossible, then the affected areas should be checked to ensure that no breeding birds are present shortly before work commences.
- 11.395 Where works are scheduled to commence within 400m of 'mature' woodland (including conifer plantation) within the period February to August, a survey of the woodland edge should be undertaken to ensure that Red Kite have not begun nesting in these areas (Holden *et al*, 2002).
- 11.396 A pre-construction breeding bird survey is proposed. Over a number of years, waders may change their breeding location. This was observed during surveys undertaken here where in 2008, Curlew bred in the boggy area near to Tir Gwyn as opposed to Waun Goch in 2005. A minimum of two breeding wader surveys will be carried out, primarily targeting wetland areas in the breeding season prior to construction. The survey would identify the most current breeding sites, with a view to avoiding these during construction.

Bats

- 11.397 In accordance with guidance from Natural England (2012), the turbines would be micro-sited to ensure a distance of at least 50m from the edge of the rotor swept area to habitat features associated with foraging, e.g. Hafren Forest edge and other woodland. The guidance states that studies suggest most bat activity occurs at close proximity to habitat features and declines with distance to the feature.

Water Vole

- 11.398 Prior to construction beginning, a full Water Vole survey will be undertaken, focussing primarily upon areas where construction could possibly have an impact. In these focus areas, the survey will use Water Vole rafts as these features are readily used by Water Vole as latrine sites and thus provide more accurate survey and detection potential. Any areas found to accommodate Water Vole close to construction will be marked and protected with an appropriate buffer zone prior to construction commencing.
- 11.399 Water Vole within and around Nant y Gwrdd are considered within the HMP. Once the development has been ascertained, any additional proposal with regard to Water Vole suggested by NRW can be integrated into the HMP.

Otter

- 11.400 In order to limit potential disturbance to Otter, no works will take place between 10pm and 6am. A pre-construction survey will be carried out for Otter. If upgraded crossings are found to lie near areas of Otter lie-up or new holts, it may be necessary to apply for a NRW EPS Licence to Disturb.
- 11.401 Care would be taken to avoid siltation and chemicals associated with construction from entering watercourses (see **Paragraph 11.319** and **Chapter 14**).
- 11.402 Where watercourses are to be crossed, measures will be put in place to ensure that the passage of Otters is not blocked.

- 11.403 Providing that the mitigation outlined above (together with measures to ensure that pollution events do not occur are put in place), then the impact on Otter, through disturbance, should be Minor adverse. This is based upon the County value of Otter within the Study Area.

Other Species

- 11.404 A site infrastructure walk over would be undertaken, immediately prior to construction to record any species of significance, including Badger, Otter, Water Vole and wading birds. If protected species are present along or adjacent to directly impacted areas, appropriate mitigation measures will be taken in liaison with NRW.

Mitigation of Impacts of Proposed Lay-bys

- 11.405 To avoid disturbing breeding birds any cutting of trees, hedges and scrub would be carried out during the period September through to February. During this period birds will not be breeding and so will not be disturbed. If this is not possible operationally, then it is advised that a suitably qualified ecologist undertakes checks for nesting birds in advance of felling.
- 11.406 To safe-guard reptiles and to mitigate against any potential impacts on reptiles, the following measures would be carried out at the proposed lay-bys which had potential for reptiles, when the reptiles are active during the months of April to September inclusive. That is, before they choose a hibernation site which may be located within the area to be developed.
- A suitably qualified ecologist should search proposed lay-by POI 41 before the following procedures are carried out.
 - The grassland vegetation should be carefully reduced to ground level including any grassland vegetation for 3m at either end of the lay-by.
 - All refuges such as logs, pieces of metal, etc. should be carefully removed from the site by hand.
 - If any reptiles are encountered during the clearance of the grassland and / or during the development they should be left alone and all work should be stopped until they have moved off the site.
- 11.407 If any of the works at the lay-bys involve removal of sections of a hedgerow then it will be necessary to exclude reptiles from the working areas with reptile fencing and further advice should be sort.

Residual Construction Period Effects

- 11.408 Mitigation detailed above and in the HMP should reduce the significance of the predicted construction effects to Minor or Negligible.
- 11.409 The aquatic systems and the species that use them would not be vulnerable to direct effects, but to indirect effects of pollution caused by sedimentation and spillage. The potential effects would be minimised through the implementation of the SWMP and CEMP during construction. With these protection and mitigation measures in place, there is still a Minor adverse risk of sedimentation/run off into aquatic systems.

- 11.410 The mitigation measures would reduce the potential for disturbance and displacement of breeding birds, disturbance to Otter and Water Vole and loss of habitats. However there are still predicted to be Minor adverse impacts.
- 11.411 The mitigation measures proposed to safeguard reptiles and breeding birds during the works to the proposed lay-bys is predicted to reduce the significance of impacts to Negligible.

Description of Operational and Long-term Effects

- 11.412 During the operation of the wind farm, the principal effects would be:
- disturbance from vehicles used by staff to conduct visual checks on the turbines;
 - short-term habitat loss in exceptional circumstance when major components need to be replaced due to failure;
 - possible bird strike;
 - possible bat strike; and
 - displacement of Snipe.

Designated Sites

- 11.413 No significant operational effects are predicted on designated sites (see also **Appendix 11.19**). Some of the birds from the Pumlumon (Plynlimon) SSSI may forage over the site and these impacts are considered under the impacts on fauna.

Habitats

- 11.414 Except in the unlikely event of a failure of a major turbine component, such as a blade, all maintenance and visual checks would be carried out from the existing tracks. Where major components need to be replaced, any habitat disturbance would take place on habitat disturbed during the construction of the wind farm. Therefore no additional effects over and above those predicted for the construction period would be caused if a large component needed to be replaced.
- 11.415 Access within the Study Area is presently mainly good, as a network of tracks already exist, however the development will inevitably lead to an extension of this network. The development will lead to the construction of approximately 6.9km of new tracks and the upgrading of 9.5km of existing tracks within the application site. These tracks will probably make parts of the site more accessible to farm traffic, which could facilitate agricultural improvement by allowing the land manager to more easily bring stock, agrochemicals, manure and machinery into these areas. There is a slight possibility for example, of agricultural improvement in areas like Tir Gwyn where there will now be extra new tracks.
- 11.416 A counter argument to this could be made that new tracks could also mean that farm vehicles stay on road for farm operations and that there is reduced habitat disturbance arising.

- 11.417 While the improvement of semi-natural habitats would be contrary to the Environmental Impact Assessment (Uncultivated Land and Semi-natural Areas) Regulations 2001, it remains a debatable risk that improvement could be carried out piecemeal and gradually.
- 11.418 At present, most of Mynydd y Gwynt is in Glastir which does not allow intensification of semi-natural habitats. However Glastir is a 5 year scheme and if not renewed would expire at the end of 2018. Given improved access, agricultural improvement could convert semi-natural habitats into more improved agricultural habitats in time, which could potentially have negative effects on biodiversity. However, there is a great deal of uncertainty whether agricultural improvement would actually be undertaken; it is a potential risk. Effective mitigation of this agricultural improvement issue will be tackled through the HMP, reducing this impact to Negligible.

Watercourses and Streams - Aquatic Systems

- 11.419 Many of the potential impacts on the ground and water environment discussed in the construction activities are common to the operational phase of the wind farm. The protection measures which are to take place during construction would continue to be utilised throughout the operational lifespan of the development. It should be noted that the layout of the turbines and wind farm infrastructure have been designed so as to minimise many operational impacts.
- 11.420 In light of the proposed protection measures, no additional mitigation measures are proposed.

Fauna

Birds

- 11.421 Perhaps the primary effects that the wind farm may have on birds, once operational, will be through potential bird strike. A number of studies (Winkelman, 1992, Musters *et al*, 1996, Still *et al*, 1995) have shown that, in general, operational wind turbines have negligible effects on bird populations. Where turbines are present in much greater numbers than proposed here, and inappropriately sited on migration and/or important breeding sites, more serious effects can arise (Orloff and Flannery, 1992, SEO/Birdlife, 1995). The proposed site at Mynydd y Gwynt is not on a recognised migration route.

Collision Risk Assessment Results

Golden Plover

- 11.422 The full Collision Risk Assessment ("CRA") calculation can be found in **Appendix 11.5**. **Table 11.25** details the results of the CRA for both the V90 and the V105 turbines.
- 11.423 As discussed in the methods section, an avoidance rate must be applied to the result in order to gain an accurate figure for bird collisions. The accepted avoidance rate for Golden Plover is 98%.

Table 11.25: Golden Plover Collision Risk		
	V90	V105
Number of birds passing through rotors per year	1265.53	1721.38
Probability of bird being hit (adjusted for turbine down time)	5.48%	5.34%
Predicted number of collisions per year assuming no avoidance	69.3	91.96
Predicted number of collisions per year assuming 98% avoidance rate	1.39	1.84

Red Kite

- 11.424 The full calculation can be found at **Appendix 11.5. Table 11.26** details the results of the CRA for both the V90 and the V105 turbines.
- 11.425 As previously discussed, an avoidance rate must be applied to the result in order to gain an accurate figure for bird collisions. The accepted avoidance rate for Red Kite is 98%.

Table 11.26: Red Kite Collision Risk		
	V90	V105
Number of birds passing through rotors per year	620.59	1039.06
Probability of bird being hit (adjusted for turbine down time)	8.56%	8.62%
Predicted number of collisions per year assuming no avoidance	53.12	89.52

Predicted number of collisions per year assuming 98% avoidance rate	1.06	1.79
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Collision Risk Assessment Conclusions

- 11.426 The observations show that Golden Plover are present during the autumn and winter months, primarily November and December. Most observations appear to be birds passing over the site in transit to roosting/feeding grounds, though birds do at times also feed directly on the site.
- 11.427 The observations show that Red Kite utilise the site through much of the year. The peak month for Red Kite activity was found to be May, with most activity associated around the north of the Study Area. Activity levels were also high in April, with most of the activity at this time associated with the southern part of the site. Activity over the site from December through February was very low.
- 11.428 Collision risk assessment work has been carried out for two species, Golden Plover and Red Kite. Golden Plover are a high Conservation priority species; they are on the Welsh Red list having suffered a population decline of 83% - 1982 to 2007 (Johnstone, Thorpe & Noble, 2010). However, the decline is primarily manifested through the breeding population. Winter numbers of Golden Plover are higher (particularly in Wales) than the breeding population, with the British winter population estimated at 180,000 birds (Cramp, 2009). The wintering population for Wales is estimated at between 15,000 and 20,000 birds, though is subject to fluctuations from year to year. The Golden Plover at Mynydd y Gwynt are present during late autumn as passage migrants, feeding on site on their way to their wintering grounds. The CRA predicts a collision risk of less than two Golden Plover every year. Taking this modest level into account, along with the potential disturbance that the operation of the wind farm could have on these birds, it is predicted that the development will have a Minor effect upon Golden Plover.
- 11.429 Observation has shown that Red Kite use the site through much of the year. The peak month for Red Kite activity was found to be May, with most activity at that time associated around the north of the Study Area. Activity levels were also high in April, with most of the activity then associated with the southern part of the Study Area. Activity over the site from December through February was very low.
- 11.430 Red Kite is a high Conservation Priority species; they are also a conservation success story. Numbers of Red Kite in Wales have increased from 100 pairs in the mid 1990s, to 350 to 400 pairs by 2003 and recent population estimates put the Welsh population at 1200 pairs and the GB population at greater than 1700 pairs. Red Kite are today on the Welsh Amber list (previously red-listed).
- 11.431 The predicted collision risk of less than one pair per annum would be 0.08% of the Welsh population and would be considered a negligible impact. A basic assessment of the population growth using figures from Table 1 of issue 26 of the Newsletter of the Welsh Kite Trust indicates that the rate of increase is declining (13% in the first few years after 2000 and 8.8% between 2009 and 2011). This may be indicative that the population is limited by the food supply as has been reported in other areas of the UK such as the Chilterns where the range of the species is expanding, but breeding productivity in the core area is declining. If this is the case, the loss of less than one pair per annum would

not affect the potential of the population to maintain current numbers and there would be a negligible effect. However, mitigation measures (see **Paragraphs 11.445– 11.447 below**) will be put in place to reduce the chances of strike. With these mitigation measures in place, it is assessed that the impact on Red Kite, through bird strike and disturbance, will be Minor adverse.

Breeding Birds

- 11.432 Pearce-Higgins *et al* (2009) found that a number of breeding birds display turbine avoidance, with such birds being negatively correlated with wind farms. The only breeding bird found at Mynydd y Gwynt from this turbine avoidance list is Snipe. As such, it is predicted that disturbance will lead to a negative impact of Moderate significance for Snipe. Snipe are not considered to be a Conservation Priority species and thus this impact is not deemed to be significant.

Bats

- 11.433 Four concerns regarding bat conservation and wind turbines have been identified by the United Nations Environment Programme (“UNEP”) EuroBats (resolution 4.7, Sofia Meeting 2003). These are:
- i) increased collision risk for bats in flight;
 - ii) destruction and disturbance of habitats and commuting corridors;
 - iii) destruction or disturbance of roosts; and
 - iv) emission of ultrasound noise.
- 11.434 The destruction of habitats, commuting corridors and roosts has been discussed in the Construction Effects section and collision risk and emission of ultrasound is discussed below as these effects could occur during the operation of the turbines.

Bats: Collision Risk

- 11.435 As wind farm technology has progressed, individual turbines have increased markedly in size and generating capacity. A study looking at 33 wind farms in North America found that bat mortality increased exponentially around some of the taller turbines (Barclay MR *et al*, 2007). The study found a pronounced relationship between turbines with hubs of 65m or higher and bat mortality. The effect was not present for all tall turbines and there was no relationship between rotor blade dimensions and bat mortality. The mortalities consistently took place during late summer and autumn. This has led the authors to suggest that bats migrate at lower heights than birds and that tall turbines situated on migration routes lead to bat fatalities with rotor blades potentially extending up into their autumn migration routes.
- 11.436 While the hypothesis fits the facts, there is unfortunately a knowledge gap with regard to bat migration. Radar studies are not yet able to distinguish between birds and bats, so while it is known that some bats or birds migrate as low as 100m altitude, it is not known definitively that these flying creatures are bats rather than birds. Bat migration is certainly considerably more pronounced in North America and continental Europe than in the UK. However, little is known about the migratory behaviour of British bats (Betts S, 2006). Eurobats, which is a United Nations group administering the 1991 Agreement on the

Conservation of Bats in Europe, has called for research into bat migration as a priority (Eurobats, 2006).

- 11.437 On balance of probabilities, given that there is scant evidence for UK bat migration, migrating bats are unlikely to be affected by the development.
- 11.438 Bats were found to be commuting across the site using the watercourses and small woodland areas and therefore some collision risk does exist. Natural England’s Technical Information Note (2012) provides interim guidance on bats and wind farms and gives potential collision risk based on bat species behaviour. The collision risk of species recorded on site is provided in **Table 11.27** below.

Table 11.27: Natural England’s Interim Guidance: Risk of Collision of Bat Species			
Species	Relative population size and status	Risk of collision	Population threat
Daubenton’s Bat	Common	Low	Low
Common Pipistrelle	Common	Medium	Low
Soprano Pipistrelle	Common	Medium	Low
<i>Myotis</i> bats	N/A	Low	Low

11.439 Based on Appendix 2 of Natural England’s guidance, the species of bats recorded during the surveys are at medium or low risk of colliding with turbines. Daubenton’s Bats generally fly up to 15m while Common and Soprano Pipistrelle fly between 5 and 25m. The maximum height that species of *Myotis* bats generally fly at is in the range of 10 to 20m, depending on the species. The turbines would be up to 80m to hub height and the blades would have a maximum swept diameter of between 90m and 105m. The V90 blades would cover an area of 35m above the ground up to 125m. Therefore, the blades would be over the height at which the bats recorded on site generally fly and this reduces the likelihood of collision. Therefore, there is unlikely to be any impact. However, acting on the side of caution would rate the risk of collision as Minor adverse. A V105 turbine has a minimum tip height of 20m above ground. Daubenton’s and *Myotis* bats generally fly below this height. Although Common and Soprano Pipistrelle can fly between 5 and 25m, the survey data recorded flight heights limited to the height of sheltering features; away from such features flight height decreased markedly and levelled off at 2 – 3m (**Appendix 11.17 Section 4.2 in the November 2010 Bat Survey**). Turbine positions allow at least 50m clearance from blade tip to the Hafren forest, so flight heights would drop to well below 20m away from the forest edge, therefore the collision risk remains at Minor adverse.

Bats: Emission of Ultrasound Noise

- 11.440 The Eurobat report on wind farms and bats identifies, but does not provide details on, the potential problem of ultrasound from wind turbines in relation to bat activity. The concern is probably associated with the potential production of sounds which could lead to bats becoming confused as they use echolocation to navigate and find prey. Research into this potential phenomenon is at an early stage, and therefore it is not possible to make confident predictions regarding impacts.

Otter

- 11.441 No additional direct effects are predicted on this species, although there may be some level of disturbance caused by maintenance operations. However, experience from other development sites including nuclear power stations, indicates that Otters become accustomed to a level of disturbance and will continue to use their territory provided the majority of the habitat is left intact, especially as they are able to breed all year round. No additional effect is predicted.

Water Vole

- 11.442 No additional direct effects are predicted on this species. Water Vole are often present on man made water bodies, which are subject to considerable levels of activity and in this context, are unlikely to be disturbed by maintenance operations.

Mitigation of Operational and Long-term Effects

Habitats

- 11.443 To mitigate against the risk of increased site access leading to agricultural improvement in more accessible areas, a HMP has been drawn up with the landowner and submitted for consultation to NRW and other stakeholders. The implementation of this HMP could entirely counter this negative impact and has the potential to improve the biodiversity of non-impacted areas. With a management plan providing a cap on stock numbers and placing limitations on activities that the landowner cannot undertake, such agricultural improvement is less probable. More details of the scope of the proposed HMPs are provided in the section Habitat Management Plan in **Paragraph 11.386** et seq.

Fauna

Birds General

- 11.444 The HMP will include a requirement that no works will take place on habitat areas of the site during the bird breeding season.

Birds Red Kite

- 11.445 High Red Kite activity levels at Mynydd y Gwynt correlate with the lambing season. The lambing season and the period thereafter provides a resource which is of great value to a species that relies to a large part on scavenging. Afterbirth, lamb and ewe fatalities and docked (removed) tails all act as a food resource for Red Kites and are attractive to these birds.

- 11.446 At other times of year, the spreading of manure and the cutting of grass (as hay or silage) also attracts Kites, probably through the associated invertebrates in manure and the small mammals etc which are flushed when grass is cut.
- 11.447 To mitigate against potential collision risk, it would be prudent to avoid making the area under and around turbines attractive to Red Kite. In order not to provide these food resources for Red Kite, the HMP will require that the following activities will not be undertaken within 150m of turbines:
- lambing;
 - stocking with young lambs that have not yet lost their tails;
 - spreading of manures; and
 - cutting for hay or silage.

Bats

- 11.448 Turbines would be micro-sited to ensure a distance of at least 50m from the edge of the rotor swept area to the habitat features. The guidance by Natural England (2012) states that studies suggest most bat activity occurs at close proximity to habitat features and declines with distance to the features. The appropriate distance between the blade tip and the top of the habitat features would reduce the risk of collision.

Residual Operational Period Effects

- 11.449 Post mitigation Minor negative residual effects will remain for Golden Plover, Red Kite and bats. A Moderate negative residual effect will remain for Snipe. None of these effects are considered to be significant.

Description of Decommissioning Period Effects

- 11.450 Decommissioning is likely to take place approximately 25 years after commissioning. The reinstatement and regeneration of disturbed land around turbine bases will be dealt with in a decommissioning method statement, which will be submitted to, and agreed with, Powys County Council prior to commencing site works. The turbine and meteorological mast bases would be left in the ground but would be backfilled with subsoil and top soiled over with sufficient depth to allow future use of the affected area. This area should preferably be filled with soil/peat material from the same habitat type, and the Phase 1 map will be used to this effect. Where compatible vegetated turf exists, this will be used as a top layer.

Changes to Hydrological Regime

- 11.451 Should the site return to natural vegetation, the run-off regime for the entire site would change over time as areas naturally re-vegetate. An increase in rainfall interception and reduction in less permeable areas will lead to a potential decrease in stream flow which, during periods of heavy rainfall, would reduce any potential for downstream sedimentation and flooding. This would provide a Minor positive effect.
- 11.452 It is not expected that the decommissioning works will have a significant effect on peat stability or soil erosion issues, as the greatest changes to the hydrological regime are expected to take place during the construction period.

Suspended Sediment

- 11.453 Sediments may be mobilised during the cutting and backfilling of redundant turbine bases, stockpiles, plant and wheel washing, dusts and mud from access roads. If suspended sediments reach watercourses following a rainfall event it can have a temporary, adverse impact on the local watercourses through processes such as surface runoff and subsurface runoff and will depend on the volume of sediment. However, as with the construction period, protection measures would be put in place to reduce the risk of sedimentation and with these in place the significance of effect would be minor.

Chemical and Hydrocarbon Pollution

- 11.454 Demolition machinery and vehicles used to remove waste materials from the site will use fuels and oils. Risk exists for the pollution of a watercourse through fuel and oil spills or leakages. As with the construction period, protection measures, as outlined in **Chapter 14**, would be put in place to reduce the risk of pollution.
- 11.455 There is potential for crushed concrete and concrete dust from the removal of turbine bases to enter watercourses either via windborne dust or spillage of materials whilst in transit resulting in a Minor adverse effect.
- 11.456 Where existing tracks that are no longer of use in connection with the wind farm or current rally tracks, have been constructed on peat, then the track material will be removed down to the depth of the peat and in-filled with peat. On other semi-natural habitats, the top layer of obsolete track-ways will be removed to a level of 10cm to 20cm below that of the adjacent land unless it is anticipated to lead to adverse hydrological impacts. Where compatible vegetated turf exists, this will be used as a top layer.
- 11.457 Provided the decommissioning takes place within the footprint of the construction period land-take, no additional effect is predicted over that already identified for construction.

Mitigation of Decommissioning Period Effects

- 11.458 In light of the proposed protection measures, which will broadly mirror the measures required for the CEMP and SWMP (see **Paragraph 11.319** et seq.), no additional mitigation measures are proposed.

Residual Decommissioning Period Effects

- 11.459 There would be no significant decommissioning period residual effects.

Residual Effects and their Significance

- 11.460 Residual effects are summarised in **Table 11.28** below.

Table 11.28: Residual Effects				
Receptor	Nature of effect	Geographic extent of effect	Time period	Residual significance (post mitigation)

Table 11.28: Residual Effects				
Receptor	Nature of effect	Geographic extent of effect	Time period	Residual significance (post mitigation)
Designated sites	Pollution/ Sedimentation – impact on the Afon Gwy (River Wye) SAC	NA	NA	Minor adverse
Component habitats	Loss of blanket bog, wet modified bog and dry and wet heath	Local	Permanent	Minor adverse
Component habitats	Indirect effect of alteration of hydrology, pH.	Local	Long-term/ permanent	Minor adverse
Aquatic systems and hydrology	Pollution/ sedimentation	Local	Short-term	Minor adverse
Agricultural improvement	Semi-improved habitats improved due to easier access.	Local	Permanent	Negligible
Peat resource	Direct loss of peat, peat stability and localised drying	Local	Permanent	Minor adverse
Golden Plover	Collision risk, Disturbance	Local	Long-term	Minor adverse
Red Kite	Collision risk, Disturbance	Local	Long-term	Minor adverse
Snipe	Breeding disturbance, displacement due to disturbance	Local	Long-term	Moderate-minor adverse
Bats	Disturbance & Collision risk	Local	Temporary & Long-term	Minor adverse

Table 11.28: Residual Effects				
Receptor	Nature of effect	Geographic extent of effect	Time period	Residual significance (post mitigation)
Water Vole	Pollution	Local	Temporary	Minor adverse
Otter	Pollution & Disturbance	Local	Temporary & Permanent	Minor adverse
Reptile	Potential for harm during construction of proposed lay-bys	Local	Temporary	Negligible

11.461 Provided that the mitigation measures stipulated are adhered to, the construction of a 27 turbine wind farm at Mynydd y Gwynt is likely to produce an overall Minor adverse impact in terms of ecological impacts. Such an impact cannot be regarded as significant. Appropriate site design and layout has meant that the majority of ecological interests have been avoided or negative impacts reduced to Minor significance. The implementation of a management plan to revert some of the degraded habitat into better quality habitats would also provide compensation for the removal of some relatively modest areas of ecological value.

Monitoring

11.462 A monitoring programme will be agreed and carried out to ensure the mitigation as described in this report is adhered to and working properly so that the residual effects are of the same level as predicted. Monitoring proposals are included within the HMP. In particular, monitoring and surveillance during and post construction would be carried out for Red Kite as suggested by NRW.

Conclusion

11.463 Following consultation, extensive ecological surveys took place in the Study Area of the proposed Mynydd y Gwynt Wind Farm. These focused particularly on mammals, breeding and wintering birds, vascular plants and mire (bog) habitats. Detailed Phase I and NVC habitat and vegetation surveys were carried out. In addition, and in consultation with NRW and RSPB, standard survey methods were employed for bird and other species surveys.

11.464 A number of species protected by legislation were found to use the application area. These included bird species listed under Schedule 1 of the Wildlife and Countryside Act, species and habitats listed under Section 42 of the NERC Act in Wales and habitats listed under Annex 1 of the European Habitats Directive. Several species were also listed as Local and/or National Biodiversity Action Plan species. Of principal importance in the overall ecological evaluation is:

- wet heath and mire habitats lost and the effect this may have on the adjacent bog habitats through alteration of the water table;
 - populations of Water Vole and Otter;
 - the breeding wader populations Snipe and until 2008 Curlew;
 - occasional wintering Golden Plover; and
 - the River Wye SAC with its associated species such as Otter, which is subject to a separate Habitats Regulations Assessment (“HRA”).
- 11.465 Survey results and desk study suggested that the site is of a County level of ecological value (largely based on populations of Water Vole and Otter, historical Curlew, and large areas of semi-natural habitat, including peatlands. The project design and further mitigation has focused on avoiding areas of more ecological value. A constraints map is provided for this purpose. Turbines have not been sited on areas of Absolute and High Constraint, other associated infrastructure has not been sited on Absolute Constraint and have avoided High Constraint areas where practical. Provided the mitigation stipulated is adhered to, the construction and operation of the wind farm is likely to result in a Minor level of negative ecological impact. The findings of this assessment depend upon the implementation of the mitigation and monitoring measures outlined in the HMP.
- 11.466 Residual impacts are Negligible or Minor except for possible Moderate-Minor displacement effects that the turbines may have on breeding waders (Snipe), although it is hard to quantify using the standard guidelines as this site is unusual in that the existing status already has regular rallying activities which may be as or more disturbing than future construction vehicles and ongoing maintenance vehicles during the operational phase. Minor residual impacts include collision risk to Red Kite and Golden Plover, the temporary disturbance to Otter, the loss of mire and heath habitat and potential indirect effects such as drying of peat, change of pH and peat failure.

References

Bainbridge Ian P., and Bullman Rhys, (2009). *The distribution of breeding birds around upland wind farms*. Journal of Applied Ecology, 2009. doi: 10.1111/j.1365-2664.2009.01715.x

Balmer D, Gillings S, Caffrey B, Swann B, Downie I & Fuller R., (2013). *Bird Atlas 2007-11 The breeding and wintering birds of Britain and Ireland*. BTO.

Barclay, M. R., Baerwald, E. F. & Gruver, J. C. (2007). Variation in bat and bird fatalities at wind energy facilities: assessing the effects of rotor size and tower height. Canadian Journal of Zoology. 85, 381-387.

Betts S. (2006). ‘Are British bats at risk from wind farms’, British Wildlife, 17, 5. British Wildlife Publishing.

Brown, A. F. and Shepherd, K. B. (1993). A method for censusing upland breeding waders. Bird Study 40, 189-195.

BWEA, (1994). Best Practice Guidelines for Wind Energy Development.

- Carstairs, M. (2000). The Ecology and Conservation of Allis and Twaite Shad in British Wildlife, 11, 3. British Wildlife Publishing.
- CCW, (2006). CCW Website. Retrieved from: <http://www.ccw.gov.uk/>.
- CCW (2010). Assessing the Impact of Windfarms on Peatlands in Wales. CCW Bangor.
- Chanin, P. (2003). Monitoring the Otter. English Nature.
- Clark, M. (1998). Badgers. Whittet Books.
- Corbet, B. & Harris, S. (1991). The Handbook of British Mammals. Blackwell Science Ltd.
- Cramp, S. (2009). Birds of the Western Palearctic 2.0.2 Oxford University Press. DVD Version.
- Crump, H. and Green, M., (2012). Changes in breeding bird abundances in the Plynlimon SSSI 1984 – 2011. University of Aberystwyth.
- Crompton R, (2005). Baseline Bat Activity Survey Sweetlamb. Wildwood Ecology.
- Eaton M A, Brown A F, Noble D G, Musgrove A J, Hearn R, Aebischer N J, Gibbons D W, Evans A and Gregory R D, (2009). *Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man*. British Birds 102, pp296–341 English Nature, RSPB, WWF-UK and BWEA, (2001). Wind Farm Development and Nature Conservation.
- Environment Agency. (2002). Environmental Impact Assessment (EIA). Scoping guidelines for the Environmental Impact Assessment of projects.
- Eurobats, (2006). Wind Turbines and Bat Populations. Record Annex 9. 5th Session of the Meeting of Parties. Ljubljana, Slovenia, 4 – 6 September 2006. Resolution 5.6. Retrieved from: <http://www.bats.org.uk/helpline/documents/EurobatsResolution5.6windturbines.pdf>
- [Ewing S, Rebecca G, Heavisides A, Court I, Lindley P, Ruddock M, Cohen S. & Eaton M., \(2011\). Breeding Status of Merlins *Falco columbarius* in the UK in 2008. Bird Study 58: 379-389.](#)
- Gent, A. H., & Gibson, S.D., eds. (1988). *Herpetofauna workers' manual*. Peterborough, JNCC.
- Green, J. (2002). Birds in Wales 1992 – 2000. The Welsh Ornithological Society, Cardigan.
- Green, N. (2003). Autumn swarming at caves. In: The Bat Conservation Trust National Bat Conference 2003 – speakers abstracts, 29th-31st August 2003, York. London: Bat Conservation Trust, pp. 9-10.
- Hale, W. G. (1980). Waders. Collins.
- Hancock, M. Baines, D. Gibbons, D. Etheridge, B. & Shepherd, M., (1999). Status of male black grouse (*Tetrao tetrix*) in Britain 1995-96. *Bird Study*, 46, 1-15.

- Harris S. and Yalden D.W., (2008). Mammals of the British Isles: Handbook, 4th Edition. The Mammal Society, Southampton.
- CIEEM, (2006). Guidelines for Ecological Impact Assessment in the United Kingdom, Winchester. Chartered Institute of Ecology and Environmental Management (IEEM)
- IEEM (2002) Draft Guidelines for Ecological Impact Assessment in the United Kingdom, Winchester. Institute of Ecology and Environmental Management
- The Wildlife and Countryside Act 1981. London: HMSO.
- Protection of Badgers Act 1992. London: HMSO.
- Holden, P & Cleeves T, (2002). RSPB Handbook of British Birds. Helm, C; London.
- Jones, P.S., Stevnes, D.P., Blackstock, T.H., Burrows, C.R. & Howe, E.A., (2003). Priority habitats of Wales: a technical guide. CCW, Bangor.
- Langston, R.H.W. & Pullan, J.D., (2003). Wind Farms and Birds: An Analysis of the Effects of Wind Farms on Birds, and Guidance on Environmental Assessment Criteria and Site Selection Issues. For the Council of Europe Directorate of Culture and of Cultural and Natural Heritage by RSPB and Birdlife International.
- Mitchell-Jones T and Carlin C (2009) Bats and onshore wind turbines: Interim guidance. Technical Information Note 051. Natural England, Sheffield.
- Musters, C.J.M., Noordervliet, M.A.W. and Ter Keurs, W. J., (1996). Bird casualties caused by a wind energy project in an estuary. *Bird Study* 43: 124 – 126.
- Natural England, (2012). Bats and onshore wind turbines: Interim guidance. Natural England Technical Information Note TIN051. Second Edition.
- Nature Conservancy Council (1990). Handbook for Phase I habitat survey. NCC, Peterborough.
- Orloff, S. & A. Flannery. (1992). Wind turbine effects on avian activity, habitat use, and mortality in Altamont Pass and Solano County WRAs. Prepared by BioSystems Analysis, Inc. (Tiberon, CA) for California Energy Commission.
- Parsons, K.N., Jones, G., Davidson-Watts, I. and Greenaway, F. (2003). Swarming of bats at underground sites in Britain – implications for conservation. *Biological Conservation*, 111, 63 –70.
- Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P., and Bullman, R., (2009). The distribution of breeding birds around upland wind farms. *Journal of Applied Ecology*. Vol. 46, Issue 6. 1323-1331.
- Percival, S.M., (2003). Birds and Wind farms in Ireland: A Review of Potential Issues and Impact Assessment. Ecology Consulting.
- Powys County Council's Biodiversity Website, (2008). Local Biodiversity Action Plan. Retrieved from: <http://www.ukbap.org.uk/lbap.aspx?id=443>

- Powys County Council's Biodiversity Web Site (2008). A Local Biodiversity Action plan For Powys. Retrieved from: <http://biodiversity.powys.org.uk/en/>
- Rodwell, J.S. (1991). British Plant Communities Volume 2. Mires and heaths. Cambridge University Press.
- Rodwell, J.S. (1992). British Plant Communities Volume 3. Grasslands and montane communities. Cambridge University Press.
- RSPB, (2003). The State of Birds in Wales. Retrieved from: http://www.rspb.org.uk/Images/sobwales_tcm9-133191.pdf
- RSPB, (2011). RSPB Website. Retrieved from <http://www.rspb.org.uk/wildlife/birdguide/name/r/redkite/population.aspx>
- Scottish Natural Heritage and the British Wind Energy Association, (2000). Methodology for Assessing the Affects of Wind Farms on Ornithological Interest. Draft Document.
- Scottish National Heritage, (2001). Guidelines on the Environmental Impacts of Wind Farms and Small Scale Hydroelectric Schemes.
- Scottish National Heritage, (2005). Survey Methods for use in Assessing the Impacts of Onshore Wind farms on Bird Communities.
- SEO/BirdLife (1995). Effects of wind turbine power plants on the avifauna in the Campo de Gibraltar region. Summary of final report commissioned by the Environmental Agency of the Regional Government of Andalusia (unpublished).
- Stace, C.A. (1997). Field Flora of the British Isles. Cambridge University Press.
- Still, D., Little, B. and Lawrence, S. (1995). The effect of wind turbines on the bird population at Blyth Harbour ETSU Report. 34pp.
- Strachan, R & Moorhouse, T. (2006) Water Vole Conservation Handbook. WCRU. Oxford.
- Sutherland, W. J. (1997). Ecological Census Techniques.
- Temple, R., Clark, C & Harris, S. (2000). The National Hare survey. Unpublished preliminary report from the University of Bristol.
- Thorne, R.G. and Thorne A. K. (2010) Bat activity survey at Sweet Lamb proposed windfarm site near Llangurig Powys. Report to ADAS. Thorpe, R.I. and Young, A. (2002). The population status of birds in Wales: an analysis of conservation concern, 2002 – 2007. Welsh Birds Vol. 3, No. 4: 289-302.
- Tomlinson, M.L. and Perrow, M.R. (2003). Ecology of the Bullhead. Conserving Natura 2000 Rivers. Ecology series No. 4 English Nature Peterborough.
- Turner, A. (2006). Guidelines to NVC Community Definitions for the M17/M18/M21/M2/Nodum 19 Complex in Wales. CCW Internal Report.
- UK Biodiversity Steering Group, (1995). Biodiversity; The UK Steering Group Report. Volume 2, et seq. HMSO, London.

Vanstone, A., Lamacraft, D. and Challis, A., (2013). Designated Sites Bird Monitoring Project. A report on bird features on SSSI in Wales. CCW/RSPB Strategic Grant Partnership 2010 – 2013: No. 13347.

Welsh Kite Trust, (2011). Newsletter of the Welsh Kite Trust. Issue 26, Autumn 2011. Winkelman, J.E. (1985). Impact of medium-sized wind turbines on birds: a survey of flight behaviour, victims and disturbance. *Neth.J.Agric.Sci.* 33:75-78.

Winkelman, J.E. (1992). The impact of the Sep Wind Park near Oosterbierum, The Netherlands, on birds, 1: collision risks. RIN Report No. 92/2.

Woodroffe, G. (2007). *The Otter*. The Mammal Society.