BSG | ecology

Upper Ogmore Wind Farm

Technical Appendix 6.3: Ecology and Ornithology Survey Reports

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Client	RES Ltd
Project	Upper Ogmore Wind Farm, Technical Appendix 6.3: Ecology and Ornithology Survey Reports
Version	FINAL
Project number	P17-059 Technical Appendix 6.3 - Ecology and Ornithology Survey Reports.docx

	Name	**Position**	**Date**
Originated	Gareth Lang	Senior Ecologist	12 October 2018
Reviewed	Owain Gabb	Partner	15 October 2018
Approved for issue to client	Owain Gabb	Partner	15 October 2018
Issued to client	Gareth Lang	Senior Ecologist	15 October 2018
Updated	Gareth Lang	Senior Ecologist	03 September 2020

Contents

1 Introduction

1.1 BSG Ecology was commissioned by RES Ltd in early 2014 to complete ornithological survey work inform and support an application to build and operate a wind farm at Upper Ogmore (the 'Site'), in the County of Bridgend, South Wales. BSG Ecology were subsequently commissioned in 2016 to carry out further ecological survey work in support of the application, and an updated Phase 1 survey and autumn season bat survey work were commissioned in 2018.

1.2 The Site has an (approximate) central Ordnance Survey Grid Reference of SS918935. The village of Nant-y-moel, one of a number of residential settlements that are present along Ogmore Vale, lies in the valley to the east of the Site. The village of Pontycymer is located in the Cwm Garw valley to the west of the Site.

1.3 The Site and developable area (defined by a gradient of < 15%) are shown on Figures 6.1 – 6.11. At the time of commission, the proposed development was at an early design stage and included the installation of seventeen turbines extending along the ridge running south of the current Site boundary. The scheme has since reduced to seven turbines in response to ground instability issues (as a result of historical mining) and visual impact.

Site description

1.4 The Site is an area of upland moorland located at the head of the Garw and Ogmore Valleys. The majority of the site is a mosaic of acid and marshy grassland, with the former occurring in the better drained areas.

1.5 Small areas of wet modified bog and marshy grassland are present in the north-eastern part of the site, and acid dry dwarf shrub heath occurs locally where grazing pressure is reduced. Enclosed semi-improved and improved pasture fields are present in the eastern part of the site.

1.6 Several small flushes are present beyond the eastern and western sides of the developable area (defined by <15% slope) where the ground slopes steeply down and groundwater emerges. These areas are frequently punctuated by rock escarpments. Below the natural exposures there are large scree slopes present amongst a mosaic of acid dry dwarf shrub heath and unimproved acid grassland.

1.7 A transmission mast and associated buildings are present in the central part of the site within a fenced compound. The area is accessed via a concreted road leading from the A4107 to the north.

1.8 A larch *Larix decidua* dominated plantation is present immediately beyond the site boundary to the east, much of which has been felled. Plantations are also present to the north and west of the site boundary.

1.9 The proposed Development includes seven turbines and associated infrastructure. The maximum height of the turbines is 149.9 m. These will all be positioned on the flatter ground within the developable area.

1.10 The proposed access route will follow the existing NRW Forestry track between the southern extent of the operational Pen-y-Cymoedd Wind Farm at Ordnance Survey Grid Reference (OSGR) SS 90599 98517 to the Bwlch forestry access point at the A4107 at OSGR SS 91697 95718. (a distance of approximately 3.6 km). Localised widening of the forestry track will be required to allow passage of abnormal indivisible loads.

Evidence of Technical Competence and Experience

1.1 Niall Lusby BSc MCIEEM. Niall completed the initial Phase 1 survey of the Site, and undertook the Phase 2 botanical survey work. Niall has been a professional ecologist for ten years and has

specialised in botanical survey but also has extensive experienced of protected species and habitat survey. He has undertaken botanical survey for a range of upland and lowland sites in Wales.

1.2 Caroline O'Rourke ACIEEM. Caroline undertook the updated Phase 1 Survey work at the Site. Caroline is a keen botanist and holds a Level 4 Field Identification Skills Certificate (FISC) from the Botanical Society of Britain and Ireland. She has experience in National Vegetation Classification (NVC) survey in lowland neutral grassland and assessment of habitats against regional nature conservation site criteria in south and mid-Wales.

1.3 Gareth Lang BSc MSc ACIEEM. Gareth Completed the winter season bird survey work in 2014, and the breeding season and winter season bird survey work in 2015-2016. He also completed the ecological appraisal of the access route and assisted with the bat, great crested newt, and water vole survey work. Gareth has over 10 years of ornithological experience. Gareth's role at BSG Ecology includes the management and interpretation of ornithological data from various medium and large-scale development projects, most of which are in Wales. He has a sound knowledge of survey techniques required for various development proposals and habitat types, and has a good understanding of application of relevant wildlife legislation. Gareth has extensive experience of vantage point survey over a range of habitats in Wales, from upland moorland to coastal bays and estuaries. In addition to his role at BSG, Gareth has conducted breeding bird surveys for the BTO covering multiple squares in a variety of habitats over the last 7 years, and has held a BTO ringing licence since 2010.

1.4 Stuart Thomas BSc. Stuart, along with Micky Maher (below), carried out the 2014 breeding bird survey work. Stuart has been working as an ornithological and ecological consultant since 2003. During this time he has carried out bird survey work on over eighty onshore renewable energy projects. He undertakes the majority of his work within Wales, and has an excellent working knowledge of the species that occur there and standard survey methods, including VPs, standard breeding bird survey methods as well as species specific survey method. In addition to windfarm work he has surveyed for large scale infrastructure projects such as power stations, ports and The National Grid. Prior to becoming a consultant, Stuart managed several Nature Reserves including the seabird colonies of The Farne Islands National Nature Reserve (NNR), The Isle of Noss NNR on The Shetland Islands and the Ayres NNR on the Isle of Man.

1.5 Micky Maher BSc. Micky has extensive ornithological survey experience dating back to 1991. He has been a freelance ecologist since 2007, during which time he has undertaken upland bird surveys for a wide range of consultancies and renewable energy companies. Prior to becoming a freelance ecologist, Micky managed several Nature Reserves including the seabird colonies of The Farne Islands National Nature Reserve (NNR), The Isle of Noss NNR on The Shetland Islands and The Aride Island nature reserve in the Seychelles. Micky is a qualified European Seabirds at Sea (ESAS) observer and trainer for the Joint Nature Conservation Committee (JNCC), a member of the British Birds Rarities Committee (BBRC) and has been the county bird recorder for The Shetland Bird Club (2002-2007).

1.6 Mark Hipkin was the lead surveyor for the merlin survey work. Mark is a ranger for the National Trust, and is the current County Bird Recorder for West Glamorgan and Director of the Neath Port Talbot biodiversity action group. Mark worked as a freelance ornithological consultant between 2011 and 2015 inclusive, during which time he completed survey and monitoring studies for a variety of proposed and operational windfarms in Wales; including studies into raptor displacement effects of a windfarm in Wales over a period of 5 years. He has extensive experience of targeted merlin and honey buzzard survey in particular.

1.7 Matthew Hobbs MSc MCIEEM assisted with part of the merlin survey work. Matthew is competent and experienced in carrying out a wide range of bird surveys including Vantage Point (VP), and most breeding bird survey methods. Matthew has a particular interest in research and has published and presented a number of papers on cetaceans, seabirds and bats.

1.8 Rachel Taylor BSc ACIEEM. Rachel assisted with bat and great crested newt surveys on the Site. Rachel's role at BSG Ecology includes planning and undertaking ecological surveys and monitoring exercises, interpreting data and compiling reports, particularly with regard to heritage projects (such as maintenance and restoration of castles and other buildings) and wind farm proposals.

1.9 Hannah Meinertzhagen BSc MSc GradCIEEM. Hannah assisted with great crested newt and water vole surveys on the Site. Hannah has a broad range of ecological survey experience including a variety of protected species work (bats, birds, water voles, great crested newt) and habitat surveys. Whilst at university, she gained a distinction for her MSc research project titled 'Habitat characteristics of Dartford warbler territories'.

1.10 Owain Gabb MSc CEnv MCIEEM undertook the technical review of this report. Owain is a specialist ornithologist and experienced all round ecologist. He has particular experience working with onshore renewable energy, the nuclear and construction sectors, and has managed nationally significant infrastructure projects. Owain undertook the review of this report, and also planned and helped co-ordinate the survey work based on an initial site visit and appraisal. Owain has a strong background in field ornithology and has undertaken survey work in many different areas of the UK. This has resulted in a good understanding of the practicalities and limitations of various survey methods, and how they can be adapted to answer specific development-related questions. Owain is also an experienced BTO ringer, holding an A licence and training endorsement.

1.11 A summary of each BSG staff member's experience and competence as a professional ecologist is provided at http://www.bsg-ecology.com/index.php/people/.

2 Desk Study

Methods

2.1 The presence of statutory designated sites of nature conservation interest in relation to the site was established using the Magic website (http://magic.defra.gov.uk/). This was initially accessed ahead of work completed in 2014, with further checks to ensure information remained consistent[1].

2.2 The South East Wales Biodiversity Records Centre (SEWBReC) was asked to provide records of non-statutory designated sites and records of protected/notable species and habitats within 2 km of the site boundary. For low and medium-risk species of bats records were requested within 5 km of the site, and statutory designated sites (designated for bats) and high-risk bats within 10 km. The data request was first made on 06 January 2015 and updated on 21 March 2016. An additional data request was made on 02 December 2016 for protected species, statutory and non-statutory site data within 2 km of the proposed access route along the NRW Forestry Track. Detailed information from SEWBReC can be provided on request.

2.3 The 2010 Llynfi Afan Renewable Energy Park (REP) Environmental Statement (RPS 2010) was interrogated for ornithological information relevant to the site and surrounding area. The Llynfi Afan REP Pre-Construction Ornithological Survey Report 2015 (Natural Power 2016) was also reviewed[2].

2.4 Local status and abundance data for birds within the County and Wales were obtained from the Glamorgan bird report (Glamorgan Bird Club, 2017) and Welsh Bird Report (The Welsh Ornithological Society, 2014) respectively.

2.5 Relevant results from desk study data are summarised within each survey report.

[1] Completed regularly in 2016, 2017 and 2018
[2] In addition to publicly available baseline survey data. The report was provided by Gamesa.

3 Phase 1 Habitat Survey of the Site

Aims of Study

3.1 The aim of the 2014 study was to identify and map the habitats present within the study area and to assess the potential for the survey area to support protected or otherwise notable species. The aim of the 2018 survey was to review site conditions and determine any changes to the previously established baseline.

Methods

Field Survey

Phase 1 Habitat Survey

3.2 The Phase 1 habitat survey was carried out in accordance with standard methods (JNCC, 2010), initially on 24 July 2014 and 02-04 September 2014 by Niall Lusby MCIEEM, and updated on 21 May 2018 by Caroline O'Rourke ACIEEM on finalisation of the scheme design. The surveys involved walking the study area and mapping the habitats present using standard codes. The surveys were extended to take account of any evidence of protected or otherwise notable species, or habitats that had the potential to support them.

3.3 In accordance with the Bat Conservation Trust (BCT) Guidelines (BCT, 2016) an initial site appraisal was also carried out to assess whether the site is likely to be low, medium or high risk for bats taking into account the quality of the roosting and foraging habitat present within the survey area.

3.4 During the 2014 survey, where wetter areas were identified that might lie on peat, a peat probe was used to establish the approximate peat depth to aid in the classification of habitat type. The results are indicative only and should not be considered to be equivalent to a full peat survey. The results of a peat survey undertaken by Ramboll Environ in 2017 have been incorporated into the 2018 habitat classifications.

Limitations to Methods

3.5 No significant limitations to the survey were noted.

Results

Designated sites

Statutory

3.6 There are four statutory sites of nature conservation interest within 5 km of the Site. These are: Mynydd Ty-isaf Site of Special Scientific Interest (SSSI), Cwm Cyffog SSSI, Blaenrhondda Road Cutting SSSI, and Cwm Du Woodlands SSSI. The nearest internationally important site is the Blackmill Woodlands Special Area of Conservation (SAC) and SSSI located approximately 7.2 km south of the Site, and the nearest Special Protection Area (SPA) is the Severn Estuary SPA, located approximately 34 km south-east of the Site.

Non-Statutory

3.7 There are eight local authority designated Sites of Importance for Nature Conservation (SINCs) within 2 km of the Site: four in Bridgend County Borough (BCB) and four in Rhondda Cynon Taf (RCT). There are also an additional five sites that meet SINC criteria in Neath Port Talbot (NPT); however, NPT SINC descriptions are not currently published (SEWBReC currently only hold qualifying habitat lists for each SINC).

Habitats

3.8 The results of the survey are illustrated on Figure 6.6. Target note descriptions are presented in Appendix 1, and photographs are provided at the end of this section.

3.9 The 2018 update confirmed that baseline conditions are broadly similar to those recorded in 2014 with the following minor changes due to natural vegetation session, agricultural/forestry operations and more detailed peat depth and vegetation data resulting from the peat depth and National Vegetation Classification (NVC) surveys (see Section 5).

- Forestry adjacent to site boundary at TN19 and TN20 has been felled and now supports regenerating acid/marshy grassland mosaic.
- Improved grassland north of TN19 has been ploughed and re-seeded with perennial rye-grass *Lolium perenne*. This area now conforms to the arable habitat classification.
- Minor changes in the extent of modified wet bog and unimproved acid grassland following review of the peat depth and NVC surveys i.e. areas of purple moor-grass *Molinia caerula* dominated vegetation on peat >0.5m are classified as modified wet bog.
- A small area of acid/marshy grassland mosaic west of TN14 has been subject to intensive grazing and some agricultural improvement. This area now conforms to the semi improved acid grassland habitat classification.

3.10 Blanket bog and inland rock exposure and scree slopes are listed as Priority Habitats under Section 7 of the Environment (Wales) Act, 2016.

Unimproved acid grassland

3.11 This habitat type dominates the freer draining areas of the site such as the steep slopes that occur just outside of the developable area. The freer draining area extends over the shoulder of the slopes onto the outside edge of the plateaux that forms the developable area. With dominant common bent *Agrostis capillaris* and sweet vernal grass *Anthoxanthum odoratum* with occasional purple moor grass *Molinia caerulea* and heath bedstraw *Gallium saxatile*, frequent common heather *Calluna vulgaris*, bilberry *Myrtillus vaccinium*, matt grass *Nardus stricta*, green ribbed sedge *Carex binervis*, common haircap *Polytrichum communi var communi*, springy turf moss *Rhytidiadelphus squarrosus*, *dicranum* spp., heath wood rush *Luzula multiflora*, heath rush *Juncus squarrosus* and tormentil *Potentilla reptans* also occur. Soft rush *Juncus effusus* is present very occasionally.

Marshy grassland

3.12 Marshy grassland is present across much of the flatter areas within the Site and occasionally on steeper ground (Photograph 1).

3.13 With a very similar composition to the unimproved acid grassland described above but with a greater abundance of purple moor grass, with frequent matt grass, common bent, bilberry, common haircap, heath woodrush, heath rush, common heather, heath bedstraw. Sphagnum moss occurs occasionally along with sweet vernal, tormentil, soft rush and carnation sedge *Carex panicea*.

3.14 In a few places soft rush *Juncus effusus* becomes dominant and this has also been mapped as marshy grassland.

Acid grassland / marshy grassland mosaic

3.15 The majority of the study area is dominated by acid grassland and marshy grassland which frequently grades between the two habitat types with a continuum of both types present as a complicated mosaic (Photograph 2). Given the high degree of variability and the complicated mosaic present on the Site, the majority of these habitats have been mapped as acid grassland / marshy grassland mosaic.

Improved Acid grassland

3.16 A number of enclosed fields are present in the north-eastern part of the Site (TN16, Photograph 3), the flatter areas of these fields, all support improved acid grassland. The extent of these areas is defined by the ability of a tractor to access the land, with all accessible areas, demonstrating evidence of having been cultivated and reseeded in the past, apart from a few areas which have very wet ground conditions.

Semi-improved acid grassland

3.17 High grazing pressure has caused changes in the species composition and the sward structure of the common land in some parts of the Site. In these areas sweet vernal dominates with common bent and frequent purple moor grass, abundant sheep's fescue and springy turf moss (Photograph 3). Tormentil, heath bedstraw, marsh thistle, smooth meadow grass *Poa pratensis*, wavy hair grass, matt grass, white clover *Trifolium repens*, creeping buttercup *Ranunculus repens*, cuckoo flower *Cardamine pratensis* and foxglove *Digitalis purpurea all* occur occasionally in these areas. Soft rush dominates where localised wetter ground conditions occur (where ground water emerges).

Wet modified bog

3.18 Two large areas of degraded blanket bog are present in the north of the site (TN 24 and TN25) with peat depths in excess of two metres recorded during the 2014 survey. Elsewhere within the Site the vegetation community shifts to be more suggestive of this habitat. Under Phase 1 guidance on habitat classification, peat depth is an important factor in differentiating marshy grassland from wet modified bog. The results of the 2017 peat depth survey have therefore been incorporated into the classification of habitats at the Site and used as a guide to broadly estimate the extent of both habitat types.

3.19 The plant communities in these areas are similar to that of the marshy grassland but with a higher proportion of deer grass *Scirpus cespitosus* in the sward. Typically comprising a species mix of purple moor grass dominating, with frequent deer grass, common cotton grass *Eriophorum angustifolium* and common haircap *Polytrichum commune var commune*. Common heather *Calluna vulgaris* is also present very occasionally along with wavy hair grass *Deschampsia flexuosa*, heath milkwort *Polygala serpyllifolia* and hares-tail cotton grass *Eriophorum vaginatum*.

Dry dwarf shrub heath

3.20 Where the gradient of the surrounding slopes increases to the extent that grazing pressure is reduced, or where cliff faces completely preclude grazing, dry dwarf shrub heath occurs (TN18, 36 and 37, Photograph 4). In this habitat common heather typically dominates though in places bilberry *Vaccinium myrtillus* dominates, bell heather *Erica cinerea* is present occasionally along with small saplings and stunted semi-mature rowan *Sorbus aucuparia*.

Flushes

3.21 Several small flushes were identified around the edges of the Site (TN21, 23, 27 and 35), where the ground slopes steeply down and groundwater emerges, most of these are outside of the developable area (Photograph 5). The flushes are typically dominated by purple moor grass and soft rush with abundant sphagnum Sp., frequent common haircap, star sedge, tufted hair grass *Deschampsia cespitosa*, and occasional lady fern *Athyrium filix-femina*, opposite leaved golden saxifrage *Chrysosplenium oppositifolium*, lesser skullcap *Scutellaria galericulata*, marsh violet *Viola palustre*, hares-tail cotton grass, heath rush *Juncus squarrosus*, tormentil *Potential erecta*, cross-leaved heath *Erica tetralix*, bilberry and common heather occur on the on drier areas of some of the flushes.

Rock exposure and screes

3.22 The slopes present just outside the developable area are frequently punctuated by rock escarpments. In places these exposures have been quarried (TN3, 11, 18, 29, 36, and 37) and

attain more significant proportions. Below the natural exposures there are large scree slopes present amongst acid dry dwarf shrub heath and unimproved acid grassland mosaic.

Arable

3.23 This habitat type is present on a small area of plateau north-east of TN20. The area had been recently ploughed and re-seeded with perennial rye-grass at the time of the 2018 survey.

Plantation Woodland

3.24 A larch *Larix decidua* dominated plantation is present immediately beyond the site to the east, much of which has been felled (Photograph 6). Sitka spruce *Picea sitchensis* plantations are also present to the north (Photograph 7) and west (Photograph 8) of the site.

Species

3.25 During the 2014 survey common lizard Lacerta vivipara was observed twice and most of the habitat present within the survey area is suitable for this species. The species was also observed twice during the 2018 survey (north of TN20 and east of TN12).

3.26 Field signs of water vole *Arvicola amphibious* are present in the area of wet modified bog in the north-east of the survey area.

3.27 Two ponds (P1 and P2) and one section of flooded track (P3) are present within the survey area, these ponds were assessed as being moderate to poor for use by great crested newt *Triturus cristatus* (Photographs 9-11). Full details of the HSI assessment are provided in Section 9. The 2018 survey confirmed that all three features were still present and as previously described.

3.28 A small amount of Japanese knotweed *Fallopia japonica* rhizome has been fly tipped on the south side of the A4107 (approximate OSGR SS 92768 95226).

3.29 The Werfa mast compound (TN12, Photograph 12) has some limited potential to support roosting bats as do several natural cliff faces / rock escarpments and the sides of large subsidence fissures. Overall, the site appraisal for bats confirmed the site risk-level as being low, based on the exposed, upland setting and the limited diversity and scale of the foraging and roosting habitats present for bats to exploit.

3.30 No other protected or notable species were recorded during the survey, and no evidence or suitable habitats were found to be present during the survey. Given that conditions recorded during the 2018 survey are largely consistent with the previously established baseline, the potential of the site to support protected or notable species is considered to be unchanged.

Photographs

Photograph 1: Areas of marshy grassland are present in the north-east of the Site.	**Photograph 2:** View south along the centre of the Site showing the homogenous *Molinia* dominated acid grassland.
	

Photograph 3: View of improved and semi-improved grassland in the eastern part of the Site	**Photograph 4:** Areas of dwarf heath emerge where grazing pressure is reduced.
	

Photograph 5: One of the streams that emerge from the slopes surrounding the Site.	**Photograph 6:** View of the plantation towards Nant-y-moel, east of the Site.
	

Photograph 7: View north over grazed acid grassland to a block of plantation beyond the northern Site boundary	**Photograph 8:** Looking south from the north-western *arm* of the Site towards Blaengarw and an extensive block of plantation.
	

Photograph 9: Pond P1 at TN7	**Photograph 10:** Pond P2 at TN8
	

Photograph 11: Flooded track (P3) at TN9	**Photograph 12:** The Werfa mast compound in the centre of the Site.
	

4 Ecological Appraisal of the Access Route

Background

4.1 The NRW Forestry track was surveyed by RPS in 2008 (RPS, 2008) and 2010 (RPS, 2010a) to support the Llynfi Afan Renewable Energy Park (REP) scheme. The route was not included in the final Llynfi Afan REP scheme design, and so no improvement works were made to the existing track.

4.2 The condition of the NRW Forestry track, and its suitability to allow passage of AILs varies along its length. A number of potential 'pinch points' (at which widening works would be necessary) were identified by RES Ltd and provided to BSG Ecology on 06 October 2016.

Aims of study

4.3 The aims of the study are as follows:

- To undertake an ecological appraisal and desk study for improvements to the forestry track at Bwlch, to identify and map the habitats present, providing details of any features of ecological interest, and assess the likely presence of protected and notable species.
- To recommend further targeted survey if required.

Methods

Field Survey

Ecological Appraisal

4.4 A field survey of the NRW Forestry track was carried out by Gareth Lang ACIEEM. The survey method was based on the Phase 1 habitat survey method (JNCC, 2010) and was undertaken on 07 October 2016. An update to the Phase 1 habitat survey of the NRW Forestry track was carried out by Caroline O'Rourke ACIEEM on 04 June 2020. The results of the Phase 1 survey are presented on Figure 6.7.

4.5 The survey involved walking the NRW Forestry track from the point of entry at the A4107 to the southern extent of the Pen-y-Cymoedd wind farm site, mapping the principal habitat types and compiling detailed 'Target Notes' (TNs) of key features. Habitat areas were identified and mapped onto a site plan in the field. The TNs include habitat features and the predominant vascular plant species present.

4.6 The Phase 1 habitat survey method was extended to include observations on the presence of protected or notable species, or habitats suitable for such species. Relevant observations are recorded as incidental information as part of the TNs.

4.7 At the time of the 2016 survey, a final design for the access track had not been determined. Areas likely to require improvement works were provided by RES on 06 October 2016. However, the extent of required works at each location was not defined. Therefore, the Phase 1 survey was not limited to localised pinch-points, but covered the length of the NRW Forestry track from the point of entry at the A4107 to the southern extent of the Pen-y-Cymoedd wind farm site. The 2020 updated survey recorded any changes in habitat extent or condition since the 2016 baseline.

Limitations to Methods

4.8 The survey of the proposed NRW Forestry track was undertaken during autumn; and some plant species may not have been evident during the survey. The timing of survey is not considered to be a constraint to characterising the broad habitat types in accordance with the Phase 1 habitat survey method that was used.

4.9 The habitats adjacent to the forestry track were surveyed as far as possible. However, dense, mature plantation in some areas limited visibility and were not surveyed extensively. There is a small chance that features such as badger setts or raptor nests could be present that were not recorded as a result.

Results

Designated sites

Statutory

4.10 There is one statutory sites of nature conservation interest within 2 km of the NRW Forestry track. This is the Mynydd Ty-isaf Site of Special Scientific Interest (SSSI). An additional statutory site, Blaenrhondda Road Cutting SSSI, is located within 3 km of the NRW Forestry track.

4.11 The Mynydd Ty-isaf SSSI is notified for its crags, scree slopes and ffridd habitats. The higher crags are known to provide nesting sites for a Schedule 1 raptor. The Blaenrhondda Road Cutting SSSI is notified for its geological interest, including sandstones, shale and coal seams.

Non-Statutory

4.12 There are three local authority designated Sites of Importance for Nature Conservation (SINCs) within 2 km of the NRW Forestry track in Bridgend, and three sites that meet the SINC criteria within 2 km of the track in Neath Port Talbot. These sites form a mosaic of woodlands, upland marshy grasslands and ffridd habitats throughout the local landscape.

4.13 In addition there are seven watercourses within 250 m of the NRW Forestry track that are included within the NPT Watercourses SINC.

Habitats

4.14 The results of the ecological appraisal survey are illustrated in Figure 6.7, and should be cross-referenced with the Target Note descriptions below. Photographs are also provided at the end of this section.

Access from A4107 (TN1-8)

4.15 The NRW Forestry track at the point of access from the A4107 is approximately 5 m wide (TN1). The junction is bounded to the east by a close-grazed, acid-grassland verge containing annual meadow-grass *Poa annua*, common bent *Agrostis capillaris*, crested dog's-tail *Cynosurus cristatus*, soft rush *Juncus effusus*, greater plantain *Plantago major*, creeping buttercup *Ranunculus repens*, white clover *Trifolium repens*, and creeping thistle *Cirsium arvense* (Photograph 1). The verge bounding the west of the junction is rank, with taller soft rush and common nettle *Urtica dioica* recorded (Photograph 2). Sitka spruce plantation, approximately 12 m in height, bounds the grassy verges to the north.

4.16 To the west of the track, the remaining plantation block is small, approximately 0.1 ha, and gives way to an area of clearfell that has developed into a mosaic of marshy grassland and wet heath (TN2, Photograph 3). Species present in this area include purple moor-grass *Molinia caerulea*, soft rush, heath rush *Juncus squarrosus*, common bent, common heather *Calluna vulgaris*, bilberry *Vaccinium myrtillus*, common haircap moss *Polytrichum commune*, male fern *Dryopteris filix-mas*, hard fern *Blechnum spicant*, rosebay willowherb *Chamerion angustifolium*, and marsh thistle *Cirsium palustre*. Between this habitat and the track is a strip of disturbed ground and a close-grazed grass verge dominated by common bent, creeping bent *Agrostis stolonifera* and Yorkshire fog *Holcus lanatus* (Photograph 4). A small flush is present near the track at TN3, and a stream further north at TN4 (Photograph 5), culverted beneath the track. The stream was dry at the track during the survey, with flowing water becoming evident approximately 50 m downstream of the track to the west. Bankside vegetation is dominated by purple moor-grass, common heather, and common haircap moss, with abundant bramble *Rubus fruticosus* and gorse *Ulex europaeus* scrub,

planted alder (in tubes, c. 1 – 1.5 m in height). Herb Robert *Geranium robertianum*, great willowherb *Epilobium hirsutum*, and colt's-foot *Tussilago farfara*, are also frequent here.

4.17 Mature sitka spruce plantation is present to the west of the clearfell at TN5, and regenerating sitka spruce (c. 1 – 2 m in height), grey willow *Salix cinerea* scrub and planted alder (in sapling tubes), become more dominant to the north of the stream, with a young pre-thicket plantation present at TN6 (Photograph 6). East of the track at TN7 is spruce plantation with a cleared area containing a borrow pit with bare earth bank (Photograph 7). The mature plantation gives way to pre-thicket stage spruce plantation at TN8. The track verge in this area is a marshy grassland / wet heath mosaic, including sweet vernal-grass *Anthoxanthum odoratum*, mat-grass *Nardus stricta*, purple moor-grass, common bent, soft rush, common heather, and heath rush *Juncus squarrosus* (Photograph 8).

4.18 A number of culverts are present below the track. These were all dry at the time of survey.

Central Section (TN9-13)

4.19 The track verge at TN9 is annual meadow grass dominated semi-improved grassland that varies between 1 and 2 m in width (Photograph 9). Himalayan balsam *Impatiens glandulifera* forms frequent stands on the verge to the east of the track (TN10, Photograph 10), and is also occasionally present to the west. Mature sitka spruce plantation is present beyond the track verge to the west, and a continuation of the clearfell at TN8 to the east. A borrow pit is present immediately east of the track at TN11, and is primarily bare ground with frequent smaller herbs including wavy bittercress *Cardamine flexuosa* and broad-leaved willowherb *Epilobium montanum.* Common heather, purple moor-grass and scattered willow scrub encroaches onto this area (Photograph 11). At TN12 the track narrows to approximately 3 m, with 2 m wide verges either side onto spruce plantation (Photograph 12). The verges contain occasional stumps of felled trees, with annual meadow-grass dominated semi-improved grassland including frequent colt's-foot, common fleabane *Pulicaria dysenterica*, creeping cinqfoil *Potentilla reptans*, silverweed cinquefoil *Argentina anserina*, white clover *Trifolium repens*, red clover *Trifolium pratense*, creeping buttercup *Ranunculus repens*, bristly oxtongue *Helminthotheca echioides*, bilberry, and ferns (including male fern, scaly male fern *Dryopteris affinis*, lady fern *Athyrium filix-femina* and hard fern) found along the forestry edge.

4.20 A number of shallow and dry ditches are present alongside the track with occasional culverts, and a small pond (approximately 3 m x 5 m) fringed by purple moor-grass is present at TN13 (Photograph 13). No aquatic vegetation was noted, and the pond water appeared reddish in colour, indicating an acidic influence.

Embankment 1 (TN14-20)

4.21 At TN14 (Photograph 14) and TN15 (Photograph 15) are areas of grey willow and bramble scrub with some tall ruderal vegetation dominated by rosebay willow-herb, behind a verge containing annual meadow grass, tufted hair grass, purple moor-grass, creeping buttercup, silverweed cinquefoil and soft rush. These areas of scrub are separated by a track extending from the NRW Forestry track to the west. On the east side of the track at TN16 (Photograph 16) is an area of willow scrub with some 5 m high sitka spruce, occasional rowan *Sorbus aucuparia*, silver birch *Betula pendula*, bracken *Pteridium aquilinum* and rosebay willowherb. A stand of Japanese knotweed *Fallopia japonica* is present at TN17 (Photograph 17).

4.22 A small stream (approximately 50 cm wide and 10 cm deep) approaches to within 5 m of the track (Photograph 18) and runs north-east into purple moor-grass dominated marshy grassland, at which point the channel is ill-defined and obscured by vegetation tussocks. The stream forks near TN17 and passes west through a culvert beneath the track and out at the base of a sparsely vegetated bank dominated by weedy species such as colt's-foot and ragwort (Photograph 19). The stream continues west through willow scrub at TN15 and marshy grassland.

4.23 The proposed access route takes the eastern, minor track at the fork at TN18 (Photograph 20). This section of track is approximately 2 m wide, and bounded by a mosaic of bare ground, establishing dwarf heath, purple moor-grass, and occasional thicket stage sitka spruce and willow

scrub. A colony of stag's-horn clubmoss *Lycopodium clavatum*, a Section 7 species, was also noted to the south-west of the track at TN18. At TN19 the track narrows to approximately 1.5 m in width, and passes through an area of marshy grassland dominated by purple moor-grass and creeping bent with occasional common heather, and common haircap moss (Photograph 21). The grassland gives way to an area of willow scrub at TN20 and is bounded to the north and south by stands of mature sitka spruce.

Embankment 2 (TN21-22)

4.24 Sitka spruce stands either side of the track converge at TN21, resulting in a narrow ride of approximately 4 m between trees (Photograph 22). The track then emerges at the northern extent of the plantation stand with verge of purple moor-grass dominated grassland with frequent tall ruderal and scrub, including rosebay willowherb, ragwort, grey willow, bramble, blackthorn *Prunus spinosa* and European gorse (Photograph 23). The route re-joins the main track at TN22, and is approximately 3 m wide.

The distance between the mature sitka spruce coupes either side of the track at this point is approximately 20 m and includes acid-grassland verges containing frequent annual meadow-grass, tufted hair-grass *Deschampsia cespitosa* and purple moor-grass. Multiple dry culverts pass under the track in this area.

Pen-y-Cymoedd Muster Point (TN23-27)

4.25 The plantation of the eastern side of the track opens out into a small area of re-generating thicket stage wood at TN23 and clearfell at TN24 colonised by a purple moor-grass and heathland mosaic (Photograph 24). Areas of tall ruderal vegetation including rosebay willowherb and common knapweed *Centaurea nigra* bound the track, with some piles of brash from recent felling evident. The plantation continues to the west of the track, bounded by a c. 3 m wide purple moor-grass dominated verge.

4.26 A pond measuring approximately 8 m x 7 m is present at TN25, set in an area of marshy grassland at the plantation edge (Photograph 25). The pond appears to have an acidic influence, with no submerged aquatic vegetation visible. Small beds of lesser pond sedge *Carex acutiformis* are present and soft rush and purple moor-grass encroach the pond margins. A number of dry culverts are present beneath the track in this area.

4.27 A quarry is present at TN26 enclosed by a stock-proof fence and tall ruderal vegetation (Photograph 26). To the north of the quarry, at TN27 (Photograph 27), is an area of semi-mature sitka spruce and willow scrub surrounded by marshy grassland dominated by purple moor-grass, with tufted hair-grass, crested dog's-tail *Cynosurus cristatus* and soft rush. To the west of the track, the plantation gives way to an area of marshy grassland dominated by purple moor-grass with occasional sitka spruce trees (Photograph 28). A scrape is present at TN28 (Photograph 29) which was dry at the time of survey. The scrape margins include deergrass *Muhlenbergia rigens*, common cottongrass *Eriophorum angustifolium*, common heather and occasional hawkweed *Hieracium caespitosum*.

4.28 The track joins a fork at the Pen-y-Cymoedd muster point at the northern extent of the area surveyed (Photograph 30). The junction is approximately 40 m wide at its widest point. The proposed access route continues north along the eastern fork into the Pen-y-Cymoedd wind farm.

Species

Birds

4.29 Records of 37 species of bird were provided within a 2 km search radius. These included records of common crossbill *Loxia curvirostra* (3 records), golden plover *Pluvialis apricaria* (4 records), goshawk *Accipiter gentilis* (5 records), hen harrier *Circus cyaneus* (6 records), kestrel *Falco tinnunculus* (2 records), merlin *Falco columbarius* (3 records), nightjar *Caprimulgus europaeus* (1 record), peregrine falcon *Falco peregrinus* (15 records), red kite *Milvus milvus* (9 records), and ring ouzel *Turdus torquatus* (51 records).

4.30 The records of common crossbill are all more than 1 km from the NRW Forestry track. The one record for which a grid reference with greater than 1 km resolution was provided is located approximately 1.9 km west of the track at Blaengwynfi. One record of goshawk provided by the search is dated within last 10 years, and relates to an active nest at Nant-y-Moel, approximately 1.6 km south-east of the NRW Forestry track. Earlier records are of single birds noted in the Mynydd Blaenafan area, within 1 km of the NRW Forestry track. The record of nightjar is greater than 10 years old.

4.31 One record of hen harrier is dated within the last 10 years, and is of a single bird near Werfa Mast, 500 m south of the NRW Forestry track. Kestrel was recorded on two occasions within the last 10 years, within 1 km of the NRW Forestry track, and merlin on one occasion, hunting at Mynydd Llangeinwyr, 2 km south of the track. Eight records of red kite are dated within the last 10 years; one record at Mynydd Blaenafan, within 1 km west of the NRW Forestry track, and the remainder around Werfa Masts, 1 km south of the track. Three records of peregrine were given within the last 10 years, all of which were winter period sightings; one at Craig Walter, 2 km south-west of the NRW Forestry track and three at Graig Fawr, approximately 600 m east of the track. Two winter period golden plover records were provided within the last 10 years, both at the Werfa Mast. Of the 51 records of ring ouzel provided by SEWBReC only one record is dated within the last 10 years, and located at Craig Walter.

4.32 Thirty-nine species were recorded during breeding bird surveys of the NRW Forestry track in 2008 (RPS, 2008). Of these, nine were considered to be breeding within 50 m of the track. These were: cuckoo *Cuculus canorus*, skylark, tree pipit *Anthus trivialis*, dunnock *Prunella modularis*, stonechat *Saxicola rubicola*, song thrush *Turdus philomelos*, common crossbill, bullfinch *Pyrrhula pyrrhula* and reed bunting *Emberiza schoeniclus*.

4.33 Relatively few birds were noted during the 2016 survey, and were limited to common species typical of plantation edge habitats such as raven *Corvus corax*, goldcrest *Regulus regulus*, great tit *Parus major*, coal tit *Periparus ater*, and wren *Troglodytes troglodytes*. The capacity of the grassland adjacent to the track to support species such as short-eared owl, hen harrier and golden plover is limited, owing to its enclosed nature. However, areas of clearfell at TNs 6, 8 and 24 may provide suitable breeding habitat for nightjar, and ground nesting passerines such as skylark *Alauda arvensis* and meadow pipit *Anthus pratensis*.

4.34 There is the potential for Schedule 1 species, such as red kite, goshawk and crossbill, to breed within the plantation surrounding the NRW Forestry track. No raptor nests were observed during the survey. However, the survey was outside of the breeding bird season, and therefore the breeding bird community was not established.

Reptiles and Amphibians

4.35 The SEWBReC data search returned three records of common lizard *Zootoca vivipara*, the nearest of which, dated June 2013, is located approximately 1.3 km west of the NRW Forestry track. No records for any other species of reptile were provided by the data search.

4.36 The dwarf shrub heath, grassland and bare ground mosaics bounding the track over much of its length provide suitable habitat for common reptiles such as common lizard and grass snake *Natrix natrix*. Adder may also be present in areas of heathland and re-colonised clearfell.

4.37 Common toad *Bufo bufo* was the only amphibian species for which SEWBReC provided data (11 records in the last 10 years).

4.38 The ponds at TN13 and TN25 may provide breeding habitat for common amphibians, including common toad and common frog *Rana temporaria*. Both ponds are small (3 m x 5 m and 8 m x 7 m respectively), appear to have an acidic influence and little aquatic vegetation.

4.39 Survey work completed by BSG Ecology (Section 9) on three ponds on the Upper Ogmore Wind Farm site, approximately 1.4 km south west of the access track, during 2016 resulted in a small population of palmate newt *Lissotriton helveticus* but no evidence of great crested newt *Triturus cristatus*. Additionally, great crested newt was not found during survey of ponds on the adjacent

Llynfi Afan REP site in 2005 and 2010 (RPS, 2010b), and no local records for great crested newt were provided by the data search. A Phase 1 habitat survey of the track for the Llynfi Afan REP scheme in 2010 (RPS 2010a) did not record the ponds, suggesting that they are reasonably new. The ponds are also isolated and do not appear to form part of a network of ponds in the landscape. Given this, the ponds are considered to be suboptimal for great crested newt.

Bats

4.40 The SEWBReC data search returned one record for each of common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, and an unidentified bat within the last 10 years.

4.41 The records of common pipistrelle, soprano pipistrelle, and unidentified bat are from May 2011, and approximately 1.25 km east of the access track. The bats were noted to be active around the residential area of Blaencwm.

4.42 The habitats adjacent to the access track may provide a foraging resource for bats. Common and soprano pipistrelle are known to exploit plantation edge and areas of clearfell as a foraging resource (Kirkpatrick *et al*., 2017) and are likely to be found foraging and commuting along the forestry track.

4.43 The coniferous plantation may offer some very limited potential for roosting bats (such as under lifted bark), but any use is likely to be ephemeral. There are no buildings present that may provide bat roost potential within 1 km of the NRW Forestry track, and the nearest semi-natural broadleaved woodland (which may provide more extensive bat roost opportunities) is found within the Blaencwm valley, approximately 600 m to the east.

Other Mammals

4.44 The SEWBReC data search provided one record of Eurasian otter *Lutra lutra* (field signs of) from 2002, approximately 2 km east of the access track at Blaencwm. No records of water vole *Arvicola amphibius* were returned by the data search. However, evidence of water vole (droppings and feeding stations) were found in an area of wet flush during survey work by BSG Ecology (2016b) at the Upper Ogmore Wind Farm site in 2014 and 2016, approximately 500 m south-east of the NRW Forestry track.

4.45 The streams at TN4 and TN16 were checked for signs of otter and water vole during the survey. There are no potential holt opportunities for otter along the streams. The low water levels present within the narrow stream channels are likely to limit foraging opportunities for otters. It is considered unlikely that otter would use any of the streams adjacent to the track on more than an occasional basis.

4.46 No field signs were observed during the surveys that suggest the presence of water vole. No burrows or associated latrines, footprints or grazing lawns were observed along any of the watercourses.

4.47 No signs of badger (such as latrines, hairs or footprints) were found during the Phase 1 survey. A number of dry culverts are present below the track. However, no evidence of their use by badger was noted.

Invasive Species

4.48 Data form the SEWBReC data search included 2 records of himalayan balsam, and 2 records of Japanese knotweed within 500 m of the NRW Forestry track.

4.49 Stands of himalayan balsam were identified at TN10, with nearby scattered plants indicating local dispersal. A stand of Japanese knotweed was also recorded at TN17.

4.50 Small stands of *Rhododendron ponticum* were recorded during the 2020 survey at TNs 18 and 24 which have colonised since 2016.

Photographs

Photograph 1. View south-east from the Bwlch Forestry track to the A4107	**Photograph 2**. View west along the A4107
	

Photograph 3. Marshy grassland and sitka spruce plantation to the west of the track at TN2	**Photograph 4**. Disturbed ground alongside the track at TN2
	

Photograph 5. View west along the stream channel at TN4. Pre-thicket stage plantation and alder sapling tubes are present to the north of the channel.	**Photograph 6**. Area of pre-thicket plantation at TN6
	

Photograph 7. Borrow pit at TN7	**Photograph 8**. View north-west along the track between TN8 and TN9
	

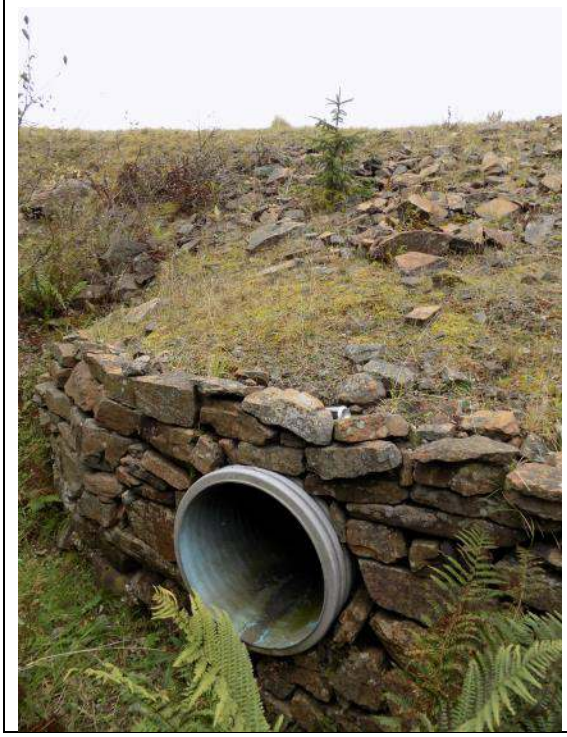
Photograph 9. Acid grassland track verge at TN9	**Photograph 10**. Stand of Himalayan balsam at TN10
	

Photograph 11. A borrow pit surrounded by a mosaic of bare ground and heath species	**Photograph 12**. Narrowing of the track at TN12 as it passes through plantation
	

Photograph 13. Small pond (P4) at TN13	**Photograph 14**. Area of willow-dominated scrub at TN14
	

Photograph 15. View north to the area of scrub at TN15. A track branches off from the Access Route to the west	**Photograph 16**. Tall ruderal vegetation and scrub to the east of the track at TN16
	

Photograph 17. A stand of Japanese knotweed at TN17	**Photograph 18**. A stream emerging from the plantation and scrub at TN16
	

Photograph 19. The stream culvert emerging from the western side of the track. The stream continues west through scrub at TN15	**Photograph 20**. The Access Route takes the minor track heading north at TN18
	

Photograph 21. View north along the narrowed track at TN19. Willow scrub at TN20 is visible	**Photograph 22**. The track passes through plantation at TN21
	

Photograph 23. View south where the Access Route joins the main forestry track at TN22	**Photograph 24**. View over marshy grassland, clearfell and spruce thicket to the east of the track at TN23 and TN24
	

Photograph 25. A pond (P5) adjacent to the track at TN25	**Photograph 26**. View east over the quarry at TN26
	

Photograph 27. View south along the eastern verge of the track from the Pen-y-Cymoedd muster point	**Photograph 28**. View of the marshy grassland to the west of the track at TN28
	

Photograph 29. The dry scrape within an area of marshy grassland at TN28	**Photograph 30**. View of the Pen-y-Cymoedd track continuing north from the muster point
	

5 Phase 2 Botanical Survey

Background

5.1 The presence of some areas of higher quality habitat, including several areas of deep peat (in excess of two metres in an area of marshy grassland and degraded blanket bog, in the north-east of the site), were identified during the Phase 1 survey at Upper Ogmore in 2014 (Section 2). Loss of peatland is a particular concern in Wales. Guidance produced by Natural Resources Wales (Jones, 2010) establishes three principles with regard to renewables projects that have the potential to affect peat resources:

1) that peat should be avoided wherever possible;
2) that impacts on peat will require detailed assessment as part of an Environmental Impact Assessment (EIA), including assessment of the whole peatland resource within an application site; and,
3) that compensation for loss or degradation of peat should demonstrate equivalence by taking the form of peat restoration elsewhere within a development site, or as close to it as possible.

5.2 This botanical survey was undertaken to provide additional ecological information on the higher quality habitats.

Scope of Botanical Survey

5.3 Botanical survey work focused on the area of marshy grassland and degraded blanket bog in the north-east of the Site in order to provide information that can be used to assess impacts on these habitats should they be affected by the proposed development.

5.4 This report presents the methods and baseline results of this botanical survey. The areas in which detailed botanical survey was undertaken is shown in Figure 6.8. Photographs of the habitats surveyed are presented at the end of this section.

Aims of study

5.5 The aims of this study are as follows:

- To identify and describe the vegetation present within the areas of higher quality habitat identified during the Phase 1 Survey of the Site, with reference to the National Vegetation Classification (NVC) system of Rodwell et al. (1991);
- To record the species of plants present within the area surveyed.

Methods

Field survey

5.6 The botanical survey of the Site was undertaken on 8 and 9 July 2016 by Niall Lusby MCIEEM, a Senior Ecologist at BSG Ecology.

5.7 The area surveyed within the Site was initially walked by the surveyor to identify and map “Areas” defined by homogenous stands of vegetation with the aid of aerial photographs.

5.8 In order to collect quantitative botanical data, quadrats (measuring 2 m x 2 m for grassland) were then marked out in each Area that had been identified.

5.9 Five quadrats from each Area were then taken where possible. Five is the minimum recommended number of quadrats to allow a robust calculation of inter-stand frequency classes which is an important step in determining the NVC community present. However, while five is the

recommended minimum number of quadrats, it wasn't possible to achieve this for all vegetation communities due to the limited extent of some habitats[3]. All plant species present within quadrats were recorded, along with estimates of their cover values. Cover values were recorded using the Domin scale of Rodwell et al. (1991), provided in Appendix 2.

5.10 Quadrat locations were recorded using a handheld GPS receiver.

Data analysis

5.11 Quadrat data were tabulated using Microsoft Excel and sorted into a floristic table where species are arranged by decreasing inter-quadrat frequency (as used in Rodwell *et al*, 1992). Data analysis involved three methods (where five quadrats in each area were taken):

- The vegetation community identification keys in Rodwell *et al* (1992) were used to identify plant communities, based on the data in the floristic table.
- The floristic tables were compared (by inspection) with those of Rodwell *et al*. (1992).
- The data were entered into MAVIS (Modular Analysis of Vegetation Information System) software (CEH, 2016). Quadrats for each homogenous stand of vegetation were subject to a combined group analysis to determine similarity with published NVC datasets.

5.12 A written summary of each of the homogeneous stands of vegetation was also produced.

5.13 For those habitats in which only a single quadrat was taken, the communities were identified using the keys in Rodwell *et al* (1992) only and were not analysed further by the MAVIS software[4].

Limitations to methods

5.14 The survey was undertaken within the main botanical survey season for grassland and bog habitats (May to June) so it is considered that the species list recorded for each quadrat is likely to contain most of the species present. It is possible that early, late or species not in flower could have been missed but this is not considered likely to have significantly affected the results.

Results and Interpretation

5.15 Figure 6.8 illustrates the Areas that were surveyed and the locations of quadrat sample points.

5.16 Table 1 below summarises the NVC communities present in each Area. This is followed by a more detailed description of each of the communities. The full results, consisting of species lists per quadrat are provided in the format of frequency tables in Appendix 3. Quadrat locations are shown in Figure 6.8.

Table 1: Summary of NVC communities present within each survey area

Area	Best fit NVC community	Notes
1	M19 (*Calluna vulgaris* – *Eriophorum vaginatum* blanket mire) / M20 (*Eriophorum vaginatum* blanket and raised mire) transition	An area of degraded blanket or saddle mire which is enclosed by fencing and heavily sheep grazed. No drainage has been undertaken but some natural gullying has occurred, with a localised increase in soft rush *Juncus effusus* in the bases of the gullies. Peat depths of over 2 m were recorded in this area during the Phase 1 Survey (BSG, 2014).

[3] In addition, only a single quadrat was taken for an area of semi-improved grassland; the resulting species list has been provided for contextual information only.

[4] The MAVIS software analysis is based on interstand frequencies (i.e. the number of quadrats in which each species is present), and therefore cannot run on single quadrat data.

Area	Best fit NVC community	Notes
2	M6 (*Carex echinata-Sphagnum recurvum/auriculatum* mire) / M23 *Juncus effusus/acutiflorus-Galium palustre*	Gully area below the area described above. Upslope bank (and corresponding habitat) is at least 1 m higher than the down slope bank and habitat. Banks on either side support occasional exposures of bare peat. The base of the gully is dominated by soft rush and purple moor-grass *Molinia caerulea,* with deer grass *Trichophorum cespitosum* and hare's tail cottongrass *Eriophorum vaginatum* much less frequent that the habitats on either side.
3	U6 *Juncus squarrosus-Festuca ovina* grassland	Downslope from Area 1 and separated by the gully described / covered by Area 2. The ground level is at least 1 m lower than the above gully location and with a much shorter sward with a greater proportion of purple moor-grass. Still over deep peat (recorded during the Phase 1 Survey (BSG, 2014)).
4	Single quadrat so no MAVIS analysis possible.	A small bog pool of swamp dominated by common cottongrass *Eriophorum angustifolium* and pill sedge *Carex pilulifera*. Very small area so treated as one large quadrat.
5	M25 *Molinea caerulea-Potentilla erecta* mire / degraded M15d *Scirpus cespitosus-Erica tetralix* community	An area of grassland dominated by purple moor-grass in an elevated position several metres above the blanket mire on much shallower peat. Localised patches of hare's tail cottongrass, soft rush and deer grass. The area is lightly sheep grazed with large tussocks of purple moor-grass with bare peat covered in grass litter beneath.
6	S9 *Carex rostrata* swamp	A flush leads into the area of purple moor-grass from collection points formed by road drainage. These areas have a localised abundance of bottle sedge *Carex rostrata* and bare peat with marsh violet *Viola palustris*.
7	U5a *Nardus stricta-Galium saxatile* grassland, species-poor sub-community	Drier acid grassland on the steep slopes above the small stream that drains the above area. Steep ground has prevented significant agricultural improvement and it still retains some natural character.
8a	Single quadrat so no MAVIS analysis possible.	An area of homogenous semi-improved pasture. A species list from a single quadrat has been provided for contextual information on the setting of Area 8 (below).
8	U5a *Nardus stricta-Galium saxatile* grassland, species-poor sub-community	An area of marshy grassland within a semi-improved pasture. The marshy grassland is dominated by purple moor-grass and soft rush.

Vegetation Community Descriptions

Area 1 - M19/M20 degraded blanket bog

5.17 The ten highest matching coefficients (obtained by analysis using MAVIS) for the group of five quadrats from the degraded blanket bog area as described by the Phase 1 survey were for five NVC communities:

- M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire (34.04%), M19a Erica tetralix sub-community (39.64%), M19b *Empetrum nigrum* ssp. *nigrum* sub-community (33.71%);
- U2b *Deschampsia flexuosa* grassland (38.68%);
- M17 *Scirpus cespitosus-Eriophorum vaginatum* blanket mire (35.66%), M17c (36.81%) *Juncus squarrosus-Rhytidiadelphus loreus sub-community*;
- M20 *Eriophorum vaginatum* blanket and raised mire (37.38%), M20a species-poor sub-community (35.97%), M15d *Scirpus cespitosus-Erica tetralix* wet heath, *Vaccinium myrtillus* sub-community (35.23%);
- U5a *Nardus stricta - Galium saxatile* grassland (34.31%).

5.18 The M19a sub-community had the highest matching coefficient, of 39.64%, which is considered a very poor score.

5.19 Using the vegetation community identification keys in Rodwell *et al* (1992) it was determined that the best community match was M19 but with several of the constant species missing. The lack of ericoid shrubs is potentially due to historic burning (within the last 20 years) and overgrazing leading to local extinction of these species. Cottongrass *Eriophorum* species often reach dominance in such situations as their rhizomes enable quick recover post fire and their tussock growth form protects the growth points from grazing. The community could be keyed out as a M20 but for the presence of purple moor-grass as a constant species.

5.20 The habitat appears to be a transition between the M19 and M20 communities based on the vegetative tables. The poor fit to either community could be a result of burning followed by heavy grazing pressure and/or as a result of the public road which crosses this habitat with associated drainage intercepting down slope flows and causing drying of the underling peat.

Area 2 - M6 mire /M23 rush-pasture in erosion gully

5.21 The next area sampled was recorded as marshy grassland in the Phase 1 survey and occurred along the base of an erosion feature between two patches of blanket bog.

5.22 The ten highest matching coefficients for the group of five quadrats from the marshy grassland were for five NVC communities:

- M6 *Carex echinata-Sphagnum recurvum/auriculatum* mire (38.66%), M6c *Juncus effusus* sub-community (45.56%);
- U5 *Nardus stricta-Galium saxatile* grassland (40.61%), U5a species-poor sub-community (41.85%), U5d *Calluna vulgaris-Danthonia decumbens* sub-community (41.70%); U5b *Agrostis canina-Polytrichum commune* sub-community (38.86%);
- U20b *Pteridium aquilinum-Galium saxatile* community, *Vaccinium myrtillus-Dicranum scoparium* sub-community (39.18%), U2b *Deschampsia flexuosa* grassland, *Vaccinium myrtillus* sub-community (38.33%);
- U4e *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Vaccinium myrtillus-Deschampsia flexuosa* sub-community (38.88%);
- M15d *Scirpus cespitosus-Erica tetralix* wet heath, *Vaccinium myrtillus* sub-community (38.46%).

5.23 The M6c sub-community had the highest coefficient of 45.56% which is considered to be a very poor score.

5.24 Using the vegetation community identification keys in Rodwell *et al* (1992), this community keys out as M23 *Juncus effusus* / *acutiflorus-Galium palustre* rush pasture and the floristic table for this community does not provide a good fit due to the presence of two cottongrass species. It is possible that the gully this habitat occurs in was brought about by erosion following historic fire and the resulting disturbance has resulted in a localised abundance of soft rush.

5.25 None of the frequency tables for either habitat provided a strong fit.

5.26 Based on the above results, his vegetation is considered transitional between M6 mire and M23 rush pasture.

Area 3 - U6 grassland dominated by purple moor-grass on deep peat

5.27 The ten highest matching coefficients for the group of five quadrats from the area dominated by purple moor-grass on deep peat were for six NVC communities:

- U6 *Juncus squarrosus-Festuca ovina* grassland (47.87%); U6b *Carex nigra-Calypogeia trichomanis* sub-community (44.52%).

- U5 *Nardus stricta-Galium saxatile* grassland (46.15%); U5b Agrostis canina-Polytrichum commune sub-community (46.70%); U5d Calluna vulgaris-Danthonia decumbens sub-community (46.20%);
- U4e *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Vaccinium myrtillus-Deschampsia flexuosa* sub-community (46.18%);
- M15d *Scirpus cespitosus-Erica tetralix* wet heath, *Vaccinium myrtillus* sub-community (44.81%);
- U20b *Pteridium aquilinum-Galium saxatile* community, *Vaccinium myrtillus-Dicranum scoparium* sub-community (44.71%);
- U2b *Deschampsia flexuosa* grassland, *Vaccinium myrtillus* sub-community (42.55%);

5.28 47.87% is a very poor fit with U6 *Juncus squarrosus-Festuca ovina* grassland.

5.29 The vegetation community identification keys in Rodwell *et al* (1992), supports the MAVIS analysis which is further supported by the constancy tables.

Area 4 – M3 bog pool

5.30 Due to the small size of this habitat feature it was not possible to sample more than one quadrat. For this reason it was only possible to attempt to classify this community was through the use of the vegetation community identification keys in Rodwell *et al* (1995), and not using MAVIS or by comparison of frequency tables. Use of the key suggests that the bog pool is M3 *Eriophorum angustifolium* bog pool community with *Eriophorum angustifolium* being a constant where other vascular species and bog mosses (*Sphgnum* species) play a relatively minor role. The community description describes the habitat as being typically found as small stands on barer exposures of acid raw peat soils in depressions, erosion channels or shallow peat cuttings.

Area 5 – M25 mire

5.31 The ten highest matching coefficients for the group of five quadrats from the vegetation dominated by purple moor-grass on deep peat were for six NVC communities with M15 and its sub-communities providing the highest match (in particular M15d *Scirpus cespitosus-Erica tetralix Vaccinium myrtillus* sub-community) but the scores indicate a very poor fit.

- M15d *Scirpus cespitosus-Erica tetralix Vaccinium myrtillus* sub-community (33.39%), M15c *Cladonia* spp. sub-community (32.19%);
- W4c *Betula pubescens-Molinia caerulea* woodland, *Sphagnum* spp. sub-community (33.29);
- M6 *Carex echinata-Sphagnum recurvum/auriculatum* mire (30.80%); M6a *Carex echinata* sub-community (31.97%);
- H4 *Ulex gallii-Agrostis curtisii* heath (31.86%);
- U5d *Nardus stricta-Galium saxatile* grassland, *Calluna vulgaris-Danthonia decumbens* sub-community (31.65%);
- U2b *Deschampsia flexuosa* grassland, *Vaccinium myrtillus* sub-community (31.25%).

5.32 Use of the vegetation community identification keys in Rodwell *et al* (1992) suggest that the community here is a good fit with M25 *Molinea caerulea-Potentilla erecta* mire. This is due to the dominance of purple moor-grass and the relative paucity of other species particularly as constants within the quadrat data. The presence of deer grass as one of the more frequently occurring species and the MAVIS results suggest that this area could be a M15d *Scirpus cespitosus-Erica tetralix* community that has become degraded with a consequent increase in the frequency and cover of purple moor-grass.

Area 6 - S9 flush on deep peat

5.33 The ten highest matching coefficients for the group of five quadrats from the flush area on deep peat were for eight NVC communities:

- S12d *Typha latifolia* swamp, *Carex rostrata* sub-community (38.22%)
- S9 *Carex rostrata* swamp (37.42%), S9a *Carex rostrata* sub-community (31.96%);
- M25c *Molinia caerulea-Potentilla erecta* mire, *Angelica sylvestris* sub-community (34.36%);
- M4 *Carex rostrata-Sphagnum recurvum* mire (33.72%);
- S10b *Equisetum fluviatile* swamp, *Carex rostrata* sub-community (32.55%);
- M5 *Carex rostrata-Sphagnum squarrosum* mire (32.34%);
- M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture (30.15%), M23b *Juncus effusus* sub-community (30.52%);
- U2 *Deschampsia flexuosa* grassland (47.83%);
- U5d *Nardus stricta-Galium saxatile* grassland, *Calluna vulgaris-Danthonia decumbens* sub-community (47.78%), M27c *Filipendula ulmaria-Angelica sylvestris* mire, *Juncus effusus-Holcus lanatus* sub-community (30.02%).

5.34 The highest matching coefficient for S12d at 38% is considered a very poor score. Having analysed the quadrat data using the vegetation community identification keys in Rodwell *et al* (1992) and compared frequency tables, this habitat is considered to correspond most closely to S9 *Carex rostrata* swamp due to the main component of the vegetation being bottle sedge *Carex rostrata*. The habitat is described as being dominated by bottle sedge which typically forms a characteristic open sward which matches the flush community encountered.

Area 7 - U5a unimproved acid grassland

5.35 The ten highest matching coefficients for the group of five quadrats from the unimproved acid grassland area on the steeper ground above the small stream were for five NVC communities:

- U5 *Nardus stricta-Galium saxatile* grassland (49.92%), U5a species-poor sub-community (54.68%), U5b *Agrostis canina-Polytrichum commune* sub-community (50.40%);
- U16c *Luzula sylvatica-Vaccinium myrtillus* tall-herb community, species-poor sub-community (49.54%);
- U4e *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Vaccinium myrtillus-Deschampsia flexuosa* sub-community (48.27%);
- U20b *Pteridium aquilinum-Galium saxatile* community, *Vaccinium myrtillus-Dicranum scoparium* sub-community (48%), U20 *Pteridium aquilinum-Galium saxatile* community (45.41%);
- U2b *Deschampsia flexuosa* grassland, *Vaccinium myrtillus* sub-community (46.03%).

5.36 The highest coefficient is for a *Nardus stricta-Galium saxatile* grassland with a coefficient of 54.68% which is considered to be a poor score. The use of the key also supports a U5a community which is typical of the upland setting of the site. The poor fit could be attributable to this community representing a transition between an area of semi-improved grassland and unimproved grassland on the steeper slopes.

Area 8 - U5a marshy grassland in flush

5.37 The ten highest matching coefficients for the group of five quadrats from the flush area in the semi-improved field were for six NVC communities:

- U5 *Nardus stricta-Galium saxatile* grassland (37.63%); U5a species-poor sub-community (41.22%), U5d *Calluna vulgaris-Danthonia decumbens* sub-community (38.62%),

- U20 *Pteridium aquilinum-Galium saxatile* community (37.27%); U20b Vac*cinium myrtillus-Dicranum scoparium* sub-community (39.87%), U20a *Anthoxanthum odoratum* sub-community (38.02%),
- U2b *Deschampsia flexuosa* grassland, *Vaccinium myrtillus* sub-community (39.06%);
- U16c *Luzula sylvatica-Vaccinium myrtillus* tall-herb community, species-poor sub-community (37.41%).
- H8e *Calluna vulgaris-Ulex gallii* heath, *Vaccinium myrtillus* sub-community (36.63%);
- M6c *Deschampsia flexuosa* grassland, *Vaccinium myrtillus* sub-community (36.46%).

5.38 The highest coefficients were for the U5 *Nardus stricta-Galium saxatile* grassland but at 41.22% this is considered a very poor score. Use of the key in Rodwell supported this result. The poor fit could be attributable to this flush community reverting to marshy grassland following agricultural improvement such as ploughing and reseeding and the heavily grazing pressure on the surrounding habitats. A species list obtained for a single quadrat within the surrounding semi-improved grassland (Area 8a) has been provided in Appendix 3 for contextual information.

Photographs

Area 1: View west over the M19 / M20 degraded blanket bog	**Area 2:** M6 / M23 marshy grassland within an erosion gully
	

Area 3: U6 grassland over deep peat	**Area 4:** Bog pool
	

Area 5: M25 / M15d grassland dominated by purple moor-grass on deep peat	**Area 6:** S9 flushes within grassland dominated by purple moor-grass.
	

Area 7: U5a Dry acid grassland on the steep slopes above a small stream	**Area 8:** Marshy grassland within a semi-improved pasture
	

6 Ornithological Survey 2014-2015

Aims of Study

6.1 Wind farms present three main potential risks to birds (Scottish Natural Heritage, 2014[5]). These are:

- Direct habitat loss through construction of wind farm infrastructure;
- Displacement (sometimes referred to as indirect habitat loss) if birds avoid the wind farm and its surrounding area due to turbine construction and operation. Displacement may also include barrier effects in which birds are deterred from using normal flight routes to feeding or roosting grounds;
- Death through collision or interaction with turbine blades and other infrastructure.

6.2 The survey work undertaken at Upper Ogmore between April 2014 and March 2015 has therefore aimed to establish:

- Whether bird species of high conservation interest use the Site or immediately surrounding areas, the nature and frequency of this use, and the habitat type(s) favoured; and,
- Whether there is regular use of the airspace above the Site by 'target species.' SNH defines these target species as:
  - Those protected under Schedule 1 of the Wildlife & Countryside Act 1981 (as amended);
  - Those listed on Annex 1 of the Council Directive 79/409/EEC on the Conservation of Wild Birds;
  - Regularly occurring migratory species which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the proposed wind farm; and
  - Species that occur at a Site in nationally or regionally important numbers.

6.3 In addition to species that (unequivocally) fall into these categories, kestrel *Falco tinnunculus*, was also considered a target species at Upper Ogmore. This was based on widespread concerns about the conservation status of the species in Wales.

Methods

Vantage Point Survey

Breeding Season (April – September 2014 inclusive)

6.4 SNH guidance is that vantage-points (VPs) should be chosen parsimoniously in order to achieve maximum visibility from the minimum number of survey locations. An arc of up to 180 degrees extending to 2km from the observer can be effectively surveyed from each VP (subject to topography and any other constraints to effective survey).

6.5 SNH guidance further states that a minimum of 36 hours of survey effort should be completed at each VP during the breeding season, and that the timing of VP watches should be varied to ensure that all times of day are appropriately covered.

6.6 A preliminary site visit was completed by Owain Gabb on 10 April 2014 to identify potential VP locations. Two VP locations were chosen for survey: VP1, approximately 300 m south-east of the

[5] In the absence of equivalent guidance from Natural Resources Wales or other Welsh nature conservation stakeholders, SNH guidance tends to be applied in Wales (with reference to describing potential effects of wind farms on birds and in deriving appropriate baseline survey programs).

transmission masts in the northern part of the Site (at approximate Ordnance Survey Grid Reference (OSGR) SS91284 94604); and VP2, on the track approximately 150 m to the north-east of the transmission masts (approximate OSGR SS91739 94769).

6.7 Both VP locations were located in the northern part of the Site allowing access to both locations along existing tracks linked to the A4107. The 2 km viewing arcs from the selected VP locations covered the indicative turbine locations of the updated, 8 turbine scheme.

6.8 Thirty-six hours of survey was completed at both VPs between April and September 2014 inclusive, resulting in a total of 72 hours of survey work. During each VP watch, standard information was collected with regard to weather, including wind speed and direction, temperature, cloud cover and precipitation. Weather was reassessed at regular intervals during each watch to ensure that changes / consistency in weather conditions were both noted.

6.9 Target species flights were timed, and height recorded in bands of 0-30m, 30-60m, 60-90m, 90-120m, 120-150m and in excess of 150m above ground level. In general, 0-30m is considered to be below collision risk height, and over 120m above collision risk height. The purpose of using multiple height bands is to encourage considered height estimation, and to collect detailed information on flight characteristics. Flight lines were drawn onto an Ordnance Survey map as accurately as possible, using terrain and geographical features for spatial reference.

6.10 In addition, as per SNH (2014) guidance, a summary of all (non-target) avian activity was made at five minute intervals (or less frequently if no bird activity was apparent) during each VP watch. This enabled characterisation of the breeding bird community of the Site, and was complementary to walkover survey methods.

6.11 VP survey dates, durations and times can be found in Tables 1-3 in Appendix 4. Table 1a provides dates and times of VP watches, Table 2a weather information during watches (and number of target species flights recorded) and Table 3a detailed data on target species flight parameters that can be used in collision risk analysis.

6.12 In combination, these tables demonstrate that survey dates and times were varied appropriately to ensure that representative coverage of different parts of the day was achieved from each VP, and that a range of representative weather conditions were sampled.

6.13 Survey work was as evenly spaced as weather allowed. Periods of high wind, low visibility and heavy rain were avoided, as these conditions compromise the survey method, and often also result in supressed bird activity.

Winter Season (October 2015 - March 2016 inclusive)

6.14 The VP locations used during the breeding season surveys were reused for the winter work. Methods were consistent with SNH guidance (2014) as outlined above.

6.15 Thirty-six hours of survey was completed at both VPs between October 2015 and March 2016 inclusive, resulting in a total of 72 hours of survey work. VP survey dates, durations and times during the 2014/15 winter season can be found in Tables 1-3 in Appendix 4. Table 1b provides dates and times of VP watches, Table 2b weather information during watches (and number of target species flights recorded) and Tables 3b detailed data on target species flight parameters that can be used in collision risk analysis.

6.16 The weather conditions during the winter work were representative of the period. Survey work was as evenly spaced as weather allowed. However, the altitude of the Site in relation to the surrounding landscape and local weather stations meant that conditions were not always reflective of weather forecasts. This lead to the cancellation of some VP watches. The time missed as a result of poor weather was re-scheduled to ensure that the required number of hours at each VP was achieved.

Honey Buzzard Survey

6.17 There are records of honey buzzard *Pernis apivorus* nest sites within the Neath Valley (approximately 10 km north-west of the Site); however, the specific locations of these are confidential and not described in published literature. Honey buzzard survey was recommended by consultees to inform the nearby Llynfi Afan (REP) application.

6.18 There is no suitable breeding or foraging habitat for honey buzzard on the Site. However, there are areas of plantation adjacent to the Site boundary, these are: east of the Site at Nant-y-Moel; west of the Site, north of Blaengarw; and north of the Site at Mynydd Blaenafan.

6.19 The plantation in the Nant-y-Moel valley, adjacent to the eastern Site boundary, has been largely clear-felled, but does retain some mature stands adjacent to the A4061 and surrounding Nant-y-Moel village. These areas may to be too disturbed and limited in size to support breeding honey buzzard. Although suboptimal, the habitat structure remains suitable for this species.

6.20 The woodland to the west of the Site, north and west of Blaengarw, is extensive and includes mature stands, although areas nearest the Site boundary are relatively young and have not been subject to thinning. The mature mixed plantation areas may have a structure suitable to support honey buzzard, but these areas are greater than 1 km distant from, and 150 m lower in altitude than the nearest indicative turbine location. The land between the Site and this woodland is occupied by open moorland habitat on steep slopes with areas of exposed rock and scree.

6.21 The plantation block bounding the Site to the north at Mynydd Blaenafan is thicket stage Sitka spruce *Picea sitchensis* monoculture with a dense structure. Clear-fell areas bound the A4107, north of the Llynfi Afan REP site, with more mature stands present further north and west around Blaengwynfi. These mature areas are greater than 1.5 km distant from the nearest turbine location, and very little of the mature habitat is visible from the Site (due to the landscape at Mynydd Blaenafan). Honey buzzard surveys to inform the Llynfi Afan REP in 2008 (RPS 2010), and post-consent surveys for the same scheme undertaken by Natural Power in 2015, focused on these mature areas north of Blaengwynfi.

6.22 An additional twelve hours of survey was conducted from each of two additional VP locations overlooking the areas of plantation at Nant-y-Moel to the east of the Site and Blaengarw to the west. No additional survey effort was undertaken on the area of plantation immediately north of the Site due to the suboptimal structure for honey buzzard. The more suitable habitat north of Blaengwynfi was not surveyed due to the distance from the Site, and to avoid repetition of survey effort to inform the Llynfi Afan REP.

6.23 The two additional VP locations were at OSGR SS 90367 94460 and SS 92123 94924. These have been labelled VP3 and VP4 respectively on Figure 6.2. Watches from these locations were completed during the period when breeding honey buzzards are likely to be displaying (late May/early June) and foraging beyond woodland cover (in late July/early August). In addition to the views of woodland habitat, the locations of the additional VPs also allowed for observation of scree slopes, steep-sided streams and felled plantation for merlin *Falco columbarius* activity.

Moorland Wader Survey (April – June 2014 inclusive)

6.24 Moorland bird populations were surveyed using a walkover technique based on the Brown & Shepherd (1993) method, as recommended in SNH (2014) guidance. A constant search effort was employed, with surveyors spending 20-25 minutes in each 500 m x 500 m quadrat and all accessible parts of the developable area being approached to within approximately 100 m. The land slopes away from the relatively flatter developable area with a high gradient and is generally inaccessible. Land beyond the perimeter of the developable area (within the Site boundary) was surveyed from local vantage points or accessed to a limited extent where it was safe to do so.

6.25 Frequent stops were made at local vantage-points in order to listen for singing and calling birds and to scan areas in front of the observer. All birds were recorded using standard British Trust for Ornithology species and behaviour codes.

6.26 Three visits were completed between April and June inclusive. The dates of each visit are listed in **Table 1** below. SNH (2014) guidance now recommends that four visits (three visits were suggested under previous iterations of the guidance) should be completed over the breeding season, based on recommendations set out in Calladine et al. (2009). However, a fourth walkover survey visit was not considered necessary due to the nature of the Site (heavily grazed and locally cut and burnt) and its geographical location (beyond the current breeding range of upland waders and grouse).

6.27 For species that are not readily detectable by standard walkover methods, such as common snipe *Gallinago gallinago*, survey effort was supplemented by early morning and evening VP watches. Snipe often display and call at these times if present.

Table 1. Dates and times of moorland wader walkover survey

Visit	Date	Time	Weather conditions
1	24 April 2014	09:40-17:10	Wind – E 1-2; Cloud – 8/8, mist delayed start
2	21 May 2014	08:30-16:00	Wind – E 1-2; Cloud – 3/8, dry
3	20 June 2014	08:00-15:45	Wind – E 2-3; Cloud – 3/8, dry

Winter Walkover Survey (October 2014 – March 2015 inclusive)

6.28 Winter walkovers were completed to gain further insight into the distribution of birds and the habitats they use during the winter period, and aimed to provide information to assess potential displacement effects within an Ornithological Impact Assessment (OIA). The walkovers did not aim to replicate breeding season work (i.e. get within 100 m of all areas), but sought to answer questions raised by the VP work, such as to determine the size and location of golden plover day roosts or whether particular areas were being used by feeding snipe. Flocks of passerines ('perching birds' such as starling *Sturnus vulgaris*) were also noted.

6.29 The walkovers were conducted on a monthly basis between October 2014 and March 2015 inclusive, resulting in a total of 6 days of survey work. The dates of each visit are listed in **Table 2** below. During each visit, the surveyors walked a fixed transect route, making frequent stops to scan all parts of the developable area. The land slopes away from the relatively flatter developable area with a high gradient and is generally inaccessible. Therefore, land beyond the perimeter of the developable area (within the Site boundary) was surveyed from local vantage-points or accessed to a limited extent where it was safe to do so.

Table 2. Dates and times of winter walkover survey.

Visit	Date	Time	Weather conditions
1	10 October 2014	08:50-16:01	Wind - SW 4; Cloud – 6/8, Temperature – 13°C
2	05 November 2014	08:15-15:15	Wind - NW 1; Cloud – 3/8, Temperature – 6°C
3	16 December 2014	09:10-15:30	Wind - W 2; Cloud – 8/8, Temperature – 4°C
4	06 January 2015	09:30-16:00	Wind - W 3; Cloud – 8/8, Temperature – 3°C
5	17 February 2015	07:45-13:45	Wind - W 3; Cloud – 0/8, Temperature – 3°C
6	05 March 2015	07:10-13:30	Wind - W 3; Cloud – 8/8, Temperature – 4°C, mist to start.

Incidental Records

6.30 Birds recorded outside timed VP survey work, such as during walks to and from VPs and breaks in survey, were noted on field maps. For target species, flights were mapped and their durations recorded.

6.31 Although it is not possible to use this data for collision risk analysis[6], it can be of use in understanding the nature of use of a site by target species.

Results and Interpretation

Desk Study Data

6.32 Data obtained from the SEWBReC included breeding season records of peregrine falcon *Falco peregrinus* (5 records), red kite *Milvus milvus* (6 records), honey buzzard *Pernis apivorus* (1 record), northern goshawk *Accipiter gentilis* (2 records), barn owl *Tyto alba* (2 records), osprey *Pandion haliaetus* (1 record), European nightjar *Caprimulgus europaeus* (9 records), ring ouzel *Turdus torquatus* (1 record) and common crossbill *Loxia curvirostra* (2 records) within 2 km of the Site since 2004.

6.33 Three of the five records of peregrine are adjacent to the Site boundary: two on the eastern slope towards Nant-y-moel (one of which is of two birds perched on a crag), and one near Blaengarw to the west. The remaining two records are greater than 1.5 km to the north-west, and west of the Site respectively.

6.34 All records of red kite are approximately 2 km from the Site boundary; four south of the Site towards Bryncethyn, and two west of the Site towards Nantyffyllon.

6.35 The record of honey buzzard is from an area of plantation, more than 2 km west of the Site, west of Blaengarw, from August 2006.

6.36 The nearest record of goshawk is approximately 800 m north-west of the Site at Blaengwynfi, and the nearest barn owl record is approximately 1 km west of the Site at Pontycymer. The record of osprey is from an area of plantation approximately 2 km west of the Site towards Caerau during April 2006.

6.37 The record of ring ouzel is from within 1 km of the Site[7] during June 2004. Ring ouzel is primarily associated with crags and scree slopes, and is a scarce summer visitor in East Glamorgan (Glamorgan Bird Club, 2014).

6.38 The records of nightjar are approximately 1.5 km east of the Site in an area of plantation, east of Ogmore Vale. One record of crossbill is also from this location, with the second record approximately 1.6 km west of the Site, west of Blaengarw.

6.39 Winter season records (including early and late passage periods) from SEWBReC within the last 10 years include peregrine falcon (1 record), red kite (5 records), northern goshawk (2 records), merlin (1 record), hen harrier (1 record), golden plover (4 records), common crossbill (6 records) and ring ouzel (11 records).

6.40 One record of golden plover and two records of ring ouzel are from within the Site boundary. The golden plover record is of 48 birds in the southern part of the Site, recorded in February 2005. The nearest off-Site record of golden plover was approximately 700 m south of the Site (5 birds during December 2006). Two records of ring ouzel were recorded near the Werfa mast compound, both during October 2005 (2 and 5 birds respectively). The nearest off-Site record is approximately 100

[6] Collision risk analysis is calculated by extrapolating likely flight activity over a site based on encounter rates and flight durations during timed watches. on the use of consistent view-sheds makes the process more straightforward. As incidental records are not typically made from VP locations and are outside timed, structured survey, it is not possible to use the data statistically.

[7] The record location was provided with a 1 km resolution.

m north of the north-western part of the Site, and is of 2 birds recorded during October 2005. Further records of this species (8 records) are confined to the valleys either side of the Site.

6.41 The record of peregrine is from greater than 2 km to the west of the Site, west of Blaengarw, during March 2007.

6.42 All five records of winter season red kite are beyond 2 km south of the Site, around Llangeinor.

6.43 The nearest record of goshawk is from moorland approximately 800 m south of the Site from December 2006. The record of hen harrier is also from this location on the same date. A second record of goshawk is located approximately 2 km west of the Site, west of Pontycymer. The record of merlin is also located at Pontycymer, approximately 1.5 km west of the Site.

6.44 Two crossbill records are south of the Site, the nearest of which is on moorland approximately 800 m beyond the southern Site boundary. The remaining four records are more than 2 km west of the Site in areas of plantation woodland west of Pontycymer and Blaengarw.

Lynfi Afan REP Data

Breeding Season Work 2005, 2006, 2008 and 2009

6.45 The Llynfi Afan REP site is immediately adjacent to the northern boundary of the Site at Mynydd y Geli. Ornithological survey work including VP survey and walkover breeding bird surveys were completed to inform the Environmental Statement (ES) for the Llynfi Afan REP between April 2005 to April 2006 and between June 2008 and May 2009.

6.46 Six VP locations were used for the vantage point work: VPs 1 and 2 at Coetgae Isaf (SS881961), VP 3 at Werfa (SS908948), VPs 4 and 5 at Llyndwr Fawr (SS889945) and VP 6 at Foel Gwillym Hywel (SS884932). The viewshed from VPs 5 and 6 overlooked part of the north western arm of the Upper Ogmore Site.

6.47 In excess of 60 hours of vantage point observations were obtained from each of VPs 1, 2, 3, 4 and 6 during the breeding season work[8], and 18 hours from VP 5[9].

6.48 In addition to general vantage point survey, targeted surveys for honey buzzard were completed in 2008. The method included use of three additional VP locations which were surveyed between 15 May and 01 June 2008 and between 01 July and 31 August 2008. The respective locations of the honey buzzard VPs were at OSGR locations SS885984, SS890984 and SS886963.

6.49 Survey work also included two walkover visits based on the Brown and Shepherd (1993) survey method during each of May to June 2005 and June to July 2008, and nest and roost site surveys within a 500 m perimeter of the Llynfi Afan site for barn owl (in April and June 2005) and long-eared owl (in May and June 2005). Targeted survey was also completed in 2005 and 2008 for nightjar.

6.50 The breeding season VP work in 2005 and 2008 resulted in a total of eight species of raptor being recorded, including: red kite (5 flights) hen harrier (1 flight), goshawk (17 flights), merlin (4 flights) and peregrine (19 flights),

6.51 Nightjar surveys resulted in two male and one female nightjar being recorded to the west of the Mynydd y Geli land holding (approximately 2.5 km west of the Site) in 2005. No observations of the species were noted in 2008.

6.52 Results from the targeted survey for peregrine suggest that 1 pair bred within the area surveyed in 2005, and up to 2 pairs bred in 2008.

[8] Split over the periods of April 2005 to April 2006 and May 2008 to May 2009.

[9] Surveyed in 2008 only.

6.53 No evidence of honey buzzard, long-eared owl or breeding waders were found during the 2005 or the 2008 survey work.

Winter Season (October 2005 – March 2006 and October 2008 – March 2009 inclusive)

6.54 Between 31 and 42 hours of observations were obtained from each of VPs 1-6 between October 2008 and March 2009 inclusive. It is unclear what level of survey was completed during the 2005/06 winter season work.

6.55 Target species recorded during the winter work included:

- Red kite. Recorded over the survey area in October 2005, February and March 2006, October and December 2008 and February and March 2009.
- Hen harrier. Seen during watches in March 2006, October and December 2008.
- Merlin. Recorded in September, October and December 2008 and January and February 2009;
- Golden plover. Between one and four golden plover were recorded within the Llynfi Afan site between January and March 2006, a flock of 55 were seen over the Llynfi Afan site in February 2005, between one and five birds October and November 2008, a flock of 22 in December 2008, nine in January 2009, and between one and five in February 2009.

Breeding Season Survey Results (2014)

VP Survey

6.56 The results of the honey buzzard VP surveys are combined with VP survey results in this section.

6.57 Target species recorded during VP survey work at Upper Ogmore in the 2014 breeding season were red kite, peregrine falcon, merlin, and kestrel. Flight details are summarised in this section.

Red Kite

6.58 Red kite was the most frequently recorded species with 14 flights mapped during survey across 8 of the twenty-four 3-hour watches at VPs 1 and 2, and 5 of the eight 3-hour watches at VPs 3 and 4. Two flights were recorded during each watch on the 25 April, 17 July and 16 August 2014, and one flight on each of the 23 May, 31 May, 26 June, 28 July, 29 July, 9 August and 22 August 2014. Flights on the 25 April and 17 July 2014 each involved three birds, while flights on the 28 July, 16 August and 22 August 2014 involved two birds. All other recorded flights were of single birds. No flights by red kite were recorded during survey in September 2014.

6.59 Of a total of 1530 seconds (25 minutes 30 seconds) of flight activity recorded, kites spent 1020 seconds (17 minutes) below and 510 seconds (8 minutes 30 seconds) at theoretical collision risk height. Flights were distributed over the observed area, with an apparent concentration of activity over the sloping ground immediately east of the transmission masts[10].

6.60 Red kite are a rare breeder in East Glamorgan (Glamorgan Bird Club, 2015), although the Welsh population is expanding (Welsh Ornithological Society, 2014) with records increasing throughout the southernmost counties.

6.61 Red kite flight lines recorded within 250 m of the turbine bases at collision risk height are shown on Figure 6.9a. Records of flying birds noted during walkover surveys are shown on Figure 6.10.

Peregrine

6.62 Peregrine was recorded on 28 July 2014. The bird flew south-east towards Cwm Nant-y-moel for 60 seconds below theoretical collision risk height. Given the single sighting during the VP work, it is

[10] No carcass was identified, and no other obvious ecological reason was found. This apparent pattern of activity was not found in subsequent work.

unlikely that peregrine bred on Site in 2014. Peregrine are a locally common resident breeder in East Glamorgan (Glamorgan Bird Club, 2015), with a population of more than 300 pairs in Wales (Welsh Ornithological Society, 2014).

6.63 Peregrine flight lines recorded within 250 m of the turbine bases at collision risk height are shown on Figure 6.9c. Records of flying birds noted during walkover surveys are shown on Figure 6.10.

Kestrel

6.64 Two flights of kestrel were recorded during VP survey; one on 23 May and one on 24 September 2014. Kestrel spent a total of 150 seconds (1 minute 30 seconds) at collision risk height and 15 seconds below collision risk height.

6.65 The low level of activity recorded for this species does not indicate breeding on Site. However, the areas of moorland on, and surrounding, the Site offer foraging opportunities for this species. Kestrel is a common resident breeder in East Glamorgan. However, reports of breeding were limited to a single pair in 2013 (Glamorgan Bird Club, 2015).

6.66 Kestrel flight lines recorded within 250 m of the turbine bases at collision risk height are shown on Figure 6.9b. Records of flying birds noted during walkover surveys are shown on Figure 6.10.

Merlin

6.67 Merlin flights were recorded during watches at VP4 on two dates: 6 June and 17 July 2014. Both recorded flights were entirely below theoretical collision risk height for a total of 90 seconds. Merlin were not recorded from any other VP location.

6.68 Merlin are a scarce breeding resident in East Glamorgan, and scarce throughout Wales (The Welsh Ornithological Society, 2014). No breeding was reported in East Glamorgan for 2013, with only two single bird sightings during the breeding season (Glamorgan Bird Club, 2015).

6.69 Merlin flight lines recorded within 250 m of the turbine bases at collision risk height are shown on Figure 6.9c. Records of flying birds noted during walkover surveys are shown on Figure 6.10.

Honey Buzzard

6.70 Honey buzzard was not recorded during the 2014 VP survey work.

Secondary Species

6.71 Secondary species noted during the breeding season VP watches included buzzard *Buteo buteo* and raven *Corvus corax* which were both recorded on twenty-eight VP survey watches. Sparrowhawk *Accipiter nisus* was also noted during four watches.

6.72 Skylark *Alauda arvensis* and meadow pipit *Anthus pratensis* breed within the site, and were recorded on VP surveys throughout the period. Other passerines were recorded less frequently reflecting the fact that these species either do not breed on the Site or occur at low density.

Moorland Wader Walkover Survey

6.73 Moorland wader surveys were conducted on 24 April, 21 May and 20 June 2014. The weather conditions were appropriate (as defined by the method) during all survey days.

6.74 Waders recorded at Upper Ogmore between April and June 2014 included golden plover *Pluvialis apricaria* and common snipe. All wader registrations recorded from Upper Ogmore in 2014 are shown on Figure 6.10.

6.75 Three golden plover were noted during survey on 24 April 2014: the first was identified as a non-breeding adult or second year bird at approximately 100 m south west of the transmitter mast and

the second, identified as an adult male, approximately 1.5 km further south[11]. A third bird was later noted flying south near the southern part of the developable area.

6.76 The timing of these records, and lack of subsequent sightings of this species, suggest that these birds were on passage. The Site is beyond the current breeding range of this species (Glamorgan Bird Club, 2015). No evidence of breeding was recorded on the Site during the 2014 work.

6.77 A common snipe was noted calling in the north-western part of the Site during a survey on 20 June 2014. No further registrations of this species were made during moorland wader survey or VP survey in 2014. Snipe are an occasional summer visitor at suitable breeding sites in East Glamorgan (Glamorgan Bird Club, 2015).

6.78 The moorland bird survey work did not establish any evidence that wader territories were present within the Site boundary.

6.79 Incidental records of other target species recorded during the moorland wader survey are also shown on Figure 6.10. Red kite were observed during all moorland wader survey visits in 2014. Peregrine falcon was recorded during survey visits in April and June; merlin in May and June; and kestrel in May.

6.80 Breeding passerines recorded during the moorland wader survey are presented in Table 3 overleaf.

Table 3. Breeding passerines within and adjacent to the Site boundary

Species	BTO Species Code	Number of territories	Section 42 species[12]	Red (R) or Amber (A) listed species[13]
Blackbird *Turdus merula*	B.	3		
Blue Tit *Parus caeruleus*	BT	2		
Chaffinch *Fringilla coelebs*	CH	11		
Chiffchaff *Phylloscopus collybita*	CC	3		
Common Cuckoo *Cuculus canorus*	CK	1	✓	R
Dunnock *Prunella modularis*	D.	2	✓	A
Goldcrest *Regulus regulus*	GC	2		
Great Tit *Parus major*	GT	1		
Lesser Redpoll *Acanthis cabaret*	LR	3	✓	R

[11] The plumage of breeding golden plover is similar between sexes, and this makes sexing difficult in the field. However, breeding males do have more extensive black than females making identification to sex possible with good views. First and second calendar year birds cannot be reliably sexed and, without exceptional views, resemble non-breeding adult birds. Therefore, unless a bird is confirmed to be breeding, it should be recorded as a non-breeding adult or an immature bird.

[12] The Natural Environment and Rural Communities Act 2006 (NERC 2006) required the Welsh Assembly Government (WAG), based on advice from the Countryside Council for Wales (now NRW), to identify species and habitats of principal importance for the conservation of biodiversity in Wales. Section 42 of The NERC Act requires the WAG to take steps to "further the conservation" of these species/habitats.

[13] Seven quantitative criteria are used to assess the population status of each bird species and to categorise it on the red, amber or green list of conservation concern (species that are red-listed are of greatest conservation concern whereas those that are green-listed are not considered to be of particular conservation priority or (in a few cases) have insufficient data to be robustly categorised). Criteria considered are: global conservation status; evidence of recent decline; evidence of historical decline; an unfavourable European conservation status; rarity (in terms of breeding numbers); restricted (localised) distribution; and whether a species is considered to be of international conservation importance (featuring in the list of birds in Annex 1 of the Birds Directive 1979). When considering whether a species is added to the red or the amber list, factors such as the extent of decline and range contraction are considered.

Species	BTO Species Code	Number of territories	Section 42 species[12]	Red (R) or Amber (A) listed species[13]
Long-tailed Tit *Aegithalos caudatus*	LT	1		
Meadow Pipit *Anthus pratensis*	MP	106		A
Pied Wagtail *Motacilla alba*	PW	3		
Robin *Erithacus rubecula*	R.	1		
Skylark *Alauda arvensis*	S.	138	✓	R
Song Thrush *Turdus philomelos*	ST	9	✓	R
Stonechat *Saxicola torquata*	SC	1		
Wheatear *Oenanthe oenanthe*	W.	19		A
Willow Warbler *Phylloscopus trochilus*	WW	7		A
Wren *Troglodytes troglodytes*	WR	12		

6.81 Nineteen species were noted breeding on or immediately adjacent to the Site. Of these, five are Section 42 species: common cuckoo *Cuculus canorus,* lesser redpoll *Acanthis cabaret,* skylark, dunnock *Prunella modularis* and song thrush *Turdus philomelos*. These also red-listed species of conservation concern in Wales [RSPB, 2009] (with the exception of dunnock, which is an amber-listed species). An additional three species are amber-listed: meadow pipit, wheatear *Oenanthe oenanthe* and willow warbler *Phylloscopus trochilus*.

6.82 No passerine species listed under Schedule 1 Part 1 of the Wildlife & Countryside Act 1981 (as amended)[14] were recorded.

6.83 Skylark and meadow pipit were the most abundant breeding passerines on the Site. The moorland habitats that occur over much of the Site comprise typical breeding habitat for these species. All other passerine species were recorded holding territories in or near habitat features including plantation edge, field boundaries and along watercourses.

6.84 Indicative central territory locations are shown on Figures 6.11a and 6.11b.

6.85 Other species recorded during walkover survey that were not observed holding a territory on the Site were buzzard *Buteo buteo*, carrion crow *Corvus corone corone*, coal tit *Parus ater*, garden warbler *Sylvia borin*, herring gull *Larus argentatus*, house martin *Delichon urbica*, jackdaw *Corvus monedula*, magpie *Pica pica*, mistle thrush *Turdus viscivorus*, raven *Corvus corax*, reed bunting *Emberiza schoeniclus*, swallow *Hirundo rustica*, tree pipit *Anthus trivialis* and wood pigeon *Columba palumbus*.

Winter Season Survey Results (2014/15)

VP survey

6.86 Target species recorded during VP survey work at Upper Ogmore in the 2014/15 winter season were red kite, kestrel *Falco tinnunculus*, merlin *Falco columbarius*, hen harrier, short-eared owl, and golden plover. Flight details are summarised in this section.

Red Kite

[14] Schedule 1 birds receive full protection under the Wildlife and Countryside Act 1981 (as amended), In addition to the protection from killing or taking that all birds, their nests and eggs have under the Act, Schedule 1 birds and their young must not be disturbed at the nest.

6.87 A total of 19 flights of red kite were recorded during the winter 2014/15 surveys, 11 of which were recorded during survey from VP1 on 28 October 2014. The total flight time recorded was 2625 seconds (43 minutes, 45 seconds), 1900 seconds (31 minutes, 40 seconds) of which was spent at collision risk height.

6.88 The flights recorded on 28 October were all of single birds. A low bank of thick fog was present in the valleys during the watch, and this may have pushed kite up to the ridge at the developable area to forage. Other species that were noted infrequently through the 2014/15 surveys, including hen harrier, merlin, kestrel and golden plover, were also recorded during this watch.

6.89 Red kite were also noted on 22 October (3 flights), 25 November (1 flight), 12 February 2015 (1 flight), 06 March (2 flights) and 19 March (1 flight). Flights were generally made by single birds, except for one flight recorded on 06 March which involved two birds flying above collision risk height over the western Site boundary.

6.90 Kite activity at collision risk height was most frequently recorded over the steeper slopes away from the ridge defining the developable area.

6.91 Red kite flight lines recorded within 250 m of the turbine bases at collision risk height during the winter season are shown on Figure 6.9a.

Kestrel

6.92 Kestrel flights were recorded during six of the twelve survey days. A total of 1515 seconds (25 minutes, 15 seconds) of flight time was recorded, 835 seconds (13 minutes, 55 seconds) of which was at collision risk height.

6.93 Five of the total ten observations of this species were recorded during survey on 18 November 2014, all of which were of a single bird foraging over sloping ground towards the Nant-y-moel valley, east of the developable area.

6.94 Kestrel were also recorded on 28 October 2014 (1 flight), 10 December (1 flight), 26 January 2015 (1 flight), 12 December (1 flight), and 06 March (1 flight).

6.95 Kestrel flight lines recorded within 250 m of the turbine bases at collision risk height are shown on Figure 6.9b.

Merlin

6.96 Merlin was recorded on two occasions: 28 October 2014 and 18 November 2014. The flight recorded on 28 October was at collision risk height for 45 seconds. The bird was observed flying west over the Site, approximately 700 m south of VP1. The second flight, recorded on 18 November, was entirely below collision risk height, and was observed for 60 seconds.

6.97 Merlin flight lines recorded within 250 m of the turbine bases at collision risk height are shown on Figure 6.9c.

Hen Harrier

6.98 Four flights of hen harrier were recorded, all during a watch from VP1 on 28 October 2014. All flights were made by a female or immature bird, which was presumed to be the same individual. The total observed flight time was 195 seconds (3 minutes, 15 seconds). The flights were generally low, quartering flights over the Site, with higher flights occurring as the bird moved over the valley towards Blaengarw, to the south-west of VP1. Hen harrier were not recorded on any other visit during the winter 2014/15 surveys.

6.99 Hen harrier are a scarce winter visitor and passage migrant in East Glamorgan, and scarce throughout Wales (The Welsh Ornithological Society, 2014). Seven sightings were reported in East Glamorgan for 2014, all during mid-winter (Glamorgan Bird Club, 2015).

Short-eared Owl

6.100 Short-eared owl was recorded during a watch at VP1 on 12 February 2015. Two flights were noted, both approximately 700 m south west of VP1, entirely below collision risk height. No further observations of this species were made during the 2014/15 survey work.

6.101 Short-eared owl are an uncommon winter visitor and passage migrant in East Glamorgan (Glamorgan Bird Club, 2015), present in small numbers in all counties in Wales (The Welsh Ornithological Society, 2014).

Golden Plover

6.102 Nine flights of golden plover were recorded over five survey days. Four flights were recorded on 26 January 2015, two flights on 12 February 2015, and one flight on each of the 28 October 2014, 19 January 2015 and 26 February 2015. The largest flock size was 43 on 12 February 2015. All other flights comprised flocks of between 1 and 14 birds.

6.103 Golden plover were recorded in flight for a total of 720 seconds (12 minutes), of which 415 seconds (6 minutes, 55 seconds) was spent at collision risk height. Flights were generally recorded at the centre of the Site where the land slopes away to the south-east from the Wefa mast compound.

6.104 The level of golden plover activity recorded on the Site suggests that this species use the Site in low numbers throughout the winter.

6.105 Golden plover are a locally common winter visitor and passage migrant in East Glamorgan (Glamorgan Bird Club, 2015). However, submitted sightings generally originate from the Kenfig area, with few upland records.

6.106 Golden plover flight lines recorded within 250 m of the turbine bases at collision risk height are shown on Figure 6.9c.

Secondary Species

6.107 Secondary species noted during winter season VP watches included buzzard, raven, carrion crow, herring gull, wood pigeon, grey heron, skylark, meadow pipit, starling, redwing *Turdus iliacus*, pied wagtail, linnet, goldfinch and chaffinch.

6.108 Buzzard were noted on all watches in October and November 2014, with a maximum of 5 flights recorded on 18 November. Sightings were less frequent further into the season, with two flights noted in January 2015, and four in March. Raven and carrion crow were recorded on the majority of VP days. Numbers of raven were higher than during breeding bird surveys, with more than five flights recorded on seven of the 24 watches. The greatest number of flights by raven was recorded on 19 January 2015, when 47 flights were noted flying south over the western part of the Site throughout the watch, with a maximum count of 16 birds. Carrion crow were generally recorded feeding in the semi-improved, grazed fields in the eastern part of the Site, with counts of up to 37 birds noted on 22 October 2014. Carrion crow was generally noted in lower numbers between December 2014 and March 2015, with total watch counts not exceeding 10 birds.

6.109 Herring gull were noted infrequently, with a total of five flights recorded throughout the survey season.

6.110 A grey heron was recorded on 19 March 2015 heading south towards a pond located approximately 350 m south of VP1. The bird remained at the pond for the duration of the watch.

6.111 A flock of 200 wood pigeon were noted flying south along the eastern Site boundary on the 22 October 2014, 25 redwing were noted during a watch on 18 November 2014, and a flock of 29 starling were recorded on 28 October 2014. Other passerines were recorded infrequently and in low numbers during the winter work.

Winter Walkover Survey

6.112 Waders recorded during the winter walkover surveys between October 2014 and March 2015 inclusive were golden plover, snipe *Gallinago gallinago* and jack snipe *Lymnocryptes minimus*. Other target species were red kite, kestrel, and merlin.

6.113 All registrations recorded during walkover survey are shown on Figure 6.10.

Golden Plover

6.114 Golden plover were recorded during walkover surveys on 16 December 2014 and 06 January 2015.

6.115 On 16 December, a flock of five birds were recorded taking off from ground in the north-eastern arm of the Site and flying south-west over the Site, reaching a height of approximately 90 meters. A flock of four birds were later flushed from the ground by the surveyor at the southern tip of the Site. The birds were quickly lost to view in low flight over a ridge.

6.116 A single bird was noted on the ridge at the southern tip of the Site on 06 January. The bird was took off from the ground and headed west to Pontycymer at approximately 40 m in height.

Snipe

6.117 Snipe were recorded in low number on all survey dates with the exception of the 16 December 2014. Registrations of snipe are distributed through the survey area, with a broad association with marshier areas. A total of 18 birds were recorded during the 2014/15 winter season work.

6.118 Snipe are a common winter visitor and passage migrant in East Glamorgan (Glamorgan Bird Club, 2015).

Jack Snipe

6.119 Jack snipe was recorded during survey on 06 January 2015. The bird was flushed by the surveyor at close range in the north western part of the Site.

6.120 Jack snipe are a locally common winter visitor and passage migrant in East Glamorgan (Glamorgan Bird Club, 2015).

Other Target Species

6.121 Red kite were noted on all walkover survey visits between October 2014 and March 2015 inclusive. A total of 11 flights were recorded for this species throughout the area surveyed. Merlin were recorded on one occasion, during a survey on 05 November 2014, flying low in direct flight over the grazed fields in the eastern part of the Site. Five flights of kestrel were recorded during the winter walkover surveys. One bird was noted flying at a height of approximately 100 m with a sparrowhawk during survey on 10 October 2014.

7 Ornithological Survey 2015-2016

Synopsis of Bird Survey Work between April 2014 and March 2015 Inclusive

7.1 The approach to ornithological survey in 2014 was informed by: a preliminary appraisal of the habitats present based on aerial photographs, maps and an initial Site visit; a review of the position of the Site in relation to statutory sites of nature conservation interest and a review of species data from the local records centre.

7.2 The 2014 breeding season work consisted of vantage-point survey, targeted survey for honey buzzard, and a walkover moorland wader survey. In winter 2014/15 work included vantage-point survey and walkover wintering wader survey.

7.3 Vantage-point survey work undertaken at Upper Ogmore between April 2014 and March 2015 inclusive resulted in relatively infrequent use of the airspace above the site by red kite *Milvus milvus*, hen harrier *Circus cyaneus*, peregrine falcon *Falco peregrinus*, kestrel *Falco tinnunculus*, merlin *Falco columbarius*, short-eared owl *Asio flammeus* and golden plover *Pluvialis apricaria* being recorded.

7.4 No honey buzzard *Pernis apivorus* were recorded during the targeted survey work. In addition, desk study data indicated that no evidence of honey buzzard had been found during targeted survey completed by RPS in 2005 and 2008 to support the adjacent Llynfi Afan REP.

7.5 The results from the 2014 surveys at Upper Ogmore, taken with the published results from the baseline Llynfi Afan REP surveys, did not indicate a need to continue survey for honey buzzard in 2015. In addition, Natural Power were commissioned by Gamesa Energy UK to complete updated honey buzzard surveys in 2015 for the Llynfi Afan REP, and an agreement was obtained from Gamesa to allow the use data obtained from the commissioned work to support an impact assessment at Upper Ogmore.

7.6 Targeted wader walkover surveys of the Site completed during the breeding season 2014 did not suggest breeding of waders on the Site or the immediate surrounding area. The breeding bird community of the site was dominated by skylark *Alauda arvensis* and meadow pipit *Anthus pratensis*, and reflective of the homogenous moorland present on the Site. Wheatear *Oenanthe oenanthe* and stonechat *Saxicola rubicola* territories were generally associated with landscape features, such as infrequent rocky outcrops and the Werfa mast compound; while other common species were confined to stream valleys and plantation edge beyond the Site boundary. Golden plover were recorded in low numbers during the 2014/15 winter period work.

7.7 Given the impoverished wader and passerine communities present on the Site it was not considered necessary to complete a second year of survey to inform an impact assessment.

Aims of Study

7.8 Wind farms present three main potential risks to birds (Scottish Natural Heritage, 2014[15]). These are:

- Direct habitat loss through construction of wind farm infrastructure;
- Displacement (sometimes referred to as indirect habitat loss) if birds avoid the wind farm and its surrounding area due to turbine construction and operation. Displacement may also include barrier effects in which birds are deterred from using normal flight routes to feeding or roosting grounds;
- Death through collision or interaction with turbine blades and other infrastructure.

[15] In the absence of equivalent guidance from Natural Resources Wales or other Welsh nature conservation stakeholders, SNH guidance tends to be applied in Wales (with reference to describing potential effects of wind farms on birds and in deriving appropriate baseline survey programs).

7.9 The survey work undertaken at Upper Ogmore between April 2015 and March 2016 has therefore aimed to establish:

- Whether bird species of high conservation interest use the Site or immediately surrounding areas, the nature and frequency of this use, and the habitat type(s) favoured; and,
- Whether there is regular use of the airspace above the Site by 'target species.' SNH defines these target species as:
  - Those protected under Schedule 1 of the Wildlife & Countryside Act 1981 (as amended);
  - Those listed on Annex 1 of the Council Directive 79/409/EEC on the Conservation of Wild Birds;
  - Regularly occurring migratory species which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the proposed wind farm; and
  - Species that occur at a Site in nationally or regionally important numbers.

7.10 In addition to species that (unequivocally) fall into these categories, kestrel *Falco tinnunculus*, was also considered a target species at Upper Ogmore. This was based on widespread concerns about the conservation status of the species in Wales.

Methods

Vantage Point Survey

Breeding Season 2015 (April – September 2015 inclusive)

7.11 SNH guidance is that vantage-points (VPs) should be chosen parsimoniously in order to achieve maximum visibility from the minimum number of survey locations. An arc of up to 180 degrees extending to 2km from the observer can be effectively surveyed from each VP (subject to topography and any other constraints to effective survey).

7.12 SNH guidance further states that a minimum of 36 hours of survey effort should be completed at each VP during the breeding season, and that the timing of VP watches should be varied to ensure that all times of day are appropriately covered.

7.13 The Upper Ogmore Windfarm scheme was reduced to eight turbines within the current Site boundary in early 2015. This led to an adjustment of VP locations ahead of the second year of survey to provide maximum coverage of the 500 m buffer area around the revised layout. The VP locations used in 2015-2016 are shown on Figure 6.1. The location of VP 1 was moved to the western corner of the Werfa mast compound, approximately 140 m north-west relative to the location used for the 2014/15 work, at approximate Ordnance Survey Grid Reference (OSGR) SS91324 94732. The Werfa Mast compound provided screening of the surveyor to avoid influencing bird behaviour. VP 2 was moved approximately 50 m east to a track at a slightly lower elevation (approximate OSGR SS91722 94759), and allowed the hillside backdrop to screen the surveyor.

7.14 Both VP locations were accessed along existing tracks linked to the A4107. The 2 km viewing arcs from the selected VP locations covered the indicative turbine locations of the updated, 8 turbine scheme.

7.15 Thirty-six hours of survey was completed at both VPs between April and September 2014 inclusive, resulting in a total of 72 hours of survey work. During each VP watch, standard information was collected with regard to weather, including wind speed and direction, temperature, cloud cover and precipitation. Weather was reassessed at regular intervals during each watch to ensure that changes / consistency in weather conditions were both noted.

7.16 Target species flights were timed, and height recorded in bands of 0-30m, 30-60m, 60-90m, 90-120m, 120-150m and in excess of 150m above ground level. In general, 0-30m is considered to be

below collision risk height, and over 120m above collision risk height. The purpose of using multiple height bands is to encourage considered height estimation, and to collect detailed information on flight characteristics. Flight lines were drawn onto an Ordnance Survey map as accurately as possible, using terrain and geographical features for spatial reference.

7.17 In addition, as per SNH (2014) guidance, a summary of all (non-target) avian activity was made at five minute intervals (or less frequently if no bird activity was apparent) during each VP watch. This enabled characterisation of the breeding bird community of the Site, and was complementary to walkover survey methods.

7.18 VP survey dates, durations and times can be found in Tables 1-3 in Appendix 5. Table 1a provides dates and times of VP watches, Table 2a weather information during watches (and number of target species flights recorded) and Table 3a detailed data on target species flight parameters that can be used in collision risk analysis.

7.19 In combination, these tables demonstrate that survey dates and times were varied appropriately to ensure that representative coverage of different parts of the day was achieved from each VP, and that a range of representative weather conditions were sampled.

7.20 Survey work was as evenly spaced as weather allowed. Periods of high wind, low visibility and heavy rain were avoided, as these conditions compromise the survey method, and often also result in supressed bird activity.

Winter Season (October 2015 - March 2016 inclusive)

7.21 The VP locations used during the breeding season surveys were reused for the winter work. Methods were consistent with SNH guidance (2014) as outlined above.

7.22 Thirty-six hours of survey was completed at both VPs between October 2015 and March 2016 inclusive, resulting in a total of 72 hours of survey work. VP survey dates, durations and times during the 2015/16 winter season can be found in Tables 1-3 in Appendix 5. Table 1b provides dates and times of VP watches, Table 2b weather information during watches (and number of target species flights recorded) and Tables 3b detailed data on target species flight parameters that can be used in collision risk analysis.

7.23 The weather conditions during the winter work were representative of the period. Survey work was as evenly spaced as weather allowed. However, the altitude of the Site in relation to the surrounding landscape and local weather stations meant that conditions were not always reflective of weather forecasts. This lead to the cancellation of some VP watches. Persistent poor conditions (including heavy rain and high winds interspersed with periods of dense fog) during December[16] resulted in the abandonment of all surveys attempted in that month. However, the time missed as a result of poor weather was re-scheduled to ensure that the required number of hours at each VP was achieved.

Merlin Survey (April 2016 – June 2016 inclusive)

7.24 Targeted merlin survey was completed during the 2015 breeding bird season following observations of merlin on the Site during May, June and July 2014. Surveys followed standard methods presented in Hardey *et al* (2009) and Gilbert et al (1998) that were adapted to reflect the habitats present on the Site.

7.25 It was considered very unlikely that merlin could breed within the developable area on the Site. The majority of merlin nests identified in a study by Rebecca (2011) were located on the ground[17] (48% of nests found in Wales). Despite this, conifer plantation was the principle habitat for 45% of nest sites in Wales, with 36% of identified sites being associated with dry heath. There are no trees within the developable area, and less intensively grazed, dry heath habitats occur predominantly on

[16] Met Office data suggests that December 2015 was the wettest month overall since records began in 1910.

[17] Rebecca suggests that the high proportion of ground nesting merlin may reflect a long-established habit following widespread deforestation.

the steep slopes that demarcate the Site boundary. Given this, it is reasonable to assume that merlin, if present in the locality, would breed offsite. In addition, breeding bird walkover surveys of the Site and a 500 m perimeter of it completed between April and June 2014 did not result in records of breeding merlin. Survey work therefore focused on scanning suitable habitat beyond the developable area from local vantage points.

7.26 The survey work included a combination of short VP watches with walks in between to cover all suitable nesting habitat for the species within the Site and a 500 m perimeter around it (as recommended in Gilbert et al, 1998). Surveys were completed by two surveyors on four days during April-June 2015. Six VP locations were selected for visual coverage of rocky slopes and plantation edges within the area surveyed. The VP locations are presented in Figure 6.1. The VP locations were recced during the first visit on 24 April 2014 with experienced raptor surveyor Mark Hipkin. VPs 2, 3 and 4 were not surveyed on subsequent visits since it was felt that the areas observed from these locations were less likely to support breeding merlin. Approximately 2 hours was spent at each of VPs 1, 5 and 6 during visits on 14 May, 28 May and 11 June 2016. The survey times and weather conditions for each visit are presented in **Table 1**.

Table 1. Dates and times of merlin survey

Visit	Date	Time	Weather conditions
1	22/04/2015	08:00-16:00	Wind W 3, Cloud 6/8, No rain
2	14/05/2015	08:00-15:40	Wind E 1, Cloud 3/8, No rain
3	28/05/2015	08:15-15:30	Wind NW 2-3, Cloud 6/8, No rain
4	11/06/2015	07:50-15:00	Wind ENE 2-3, Cloud 7/8, No rain

Incidental Records

7.27 Birds recorded outside timed VP survey work, such as during walks to and from VPs and breaks in survey, were noted on field maps. For target species, flights were mapped and their durations recorded.

7.28 Although it is not possible to use this data for collision risk analysis[18], it can be of use in understanding the nature of use of a site by target species.

Desk Study Data

7.29 See Section 6 for a review of species records.

Additional Llynfi Afan REP Data

Breeding Season Work (April to July 2015 inclusive)

7.30 A combination of vantage point survey, breeding bird walkover survey and targeted breeding raptor surveys were completed at Llynfi Afan between April and July 2015 inclusive to update the baseline data ahead of construction.

Vantage Point Survey

7.31 Five of the six vantage point locations used during 2005-2010 were revisited for the 2015 surveys. Forty-eight hours of observation was obtained from each of VP locations 2, 5 and 6, and 54 hours from VPs 3 and 4 between April and July 2015 inclusive.

[18] Collision risk analysis is calculated by extrapolating likely flight activity over a site based on encounter rates and flight durations during timed watches. on the use of consistent view-sheds makes the process more straightforward. As incidental records are not typically made from VP locations and are outside timed, structured survey, it is not possible to use the data statistically.

7.32 The surveys resulted in records of red kite (57 flights), peregrine (13 flights), kestrel (9 flights) and merlin (1 flight). In addition, hobby *Falco subbuteo* and lapwing *Vanellus vanellus* were recorded outside of the timed watches on one occasion each.

7.33 Secondary species of note recorded during the work include three observations of ring ouzel. The locations of these records are not provided in the report.

Breeding Bird Walkover Survey

7.34 Breeding bird survey was completed on the Llynfi Afan REP site following an adapted Brown and Shepherd method. Four visits were completed between April and July 2015.

7.35 The surveys resulted in an assemblage of species typical of upland moorland and plantation edge being recorded. Meadow pipit and skylark were the most frequently recorded species within the moorland areas, with stonechat and wheatear also being frequently noted. Chaffinch *Fringilla coelebs* were the most abundant species within areas of plantation edge. Of note was one record of tree pipit *Anthus trivialis* near Blaencaerau, approximately 2.5 km west of the Upper Ogmore Site, and two records of snipe *Gallinago gallinag* near Darren y Bannau, approximately 2.3 km west south-west of the Upper Ogmore Site (both species were assessed as probable breeding).

Breeding Raptor Walkover Survey

7.36 Walkover surveys of areas of suitable breeding habitat for goshawk, red kite and merlin within 1 km of the Llynfi Afan REP site were completed over 8 dates in April and June 2015.

7.37 The surveys resulted in the identification of one active peregrine nest (confirmed to have fledged young in 2015) at Graig Fawr, approximately 1 km north of the Upper Ogmore Site, one active goshawk nest at Mynydd Ynyscorrwg, approximately 3.5 km north-west of the Upper Ogmore Site, and one possible red kite nest site at Foel Gwilym Hywel, approximately 3 km south-west of the Upper Ogmore Site (although occupancy in 2015 was not confirmed).

Honey Buzzard Survey

7.38 Targeted surveys for honey buzzard from 4 additional VP locations were completed over ten dates between 25 May and 30 July 2015. The respective locations of the honey buzzard VPs were at OSGR locations SS849991, SS870996, SS894986, SS835953.

7.39 No honey buzzard territories were identified during the survey work. A single bird was noted during survey on 05 July[19], but was not seen again during the remainder of the work. It was suggested in the report that the bird was likely to have been a foraging bird from a known nest site at Pelenna, approximately 9 km west of the Upper Ogmore Site.

Breeding Season 2015 Survey Results

VP Survey (April to September 2015 inclusive)

7.40 Target species recorded during VP survey work at Upper Ogmore in the 2015 breeding season were red kite, kestrel, hen harrier, peregrine falcon, merlin, and hobby. Flight details are summarised in this section.

Red Kite

7.41 Red kite flights were noted on eight of the 24 VP watches. A total of 23 flights were recorded, including flights of two birds on 13 May, 25 June, and 31 July 2015. Nine flights were recorded on 13 May 2015, and included a flight made by four birds observed in display over the south-eastern corner of the Site. Kite were also heard calling (presumed in flight) from the Nant-y-moel valley, east of VP 2 on 31 July, 24 August, and 28 August, and also to the north-west of VP 1 on the 24

[19] The location of the bird is not provided in the report

August. Flight activity observed over the woodland near Nant-y-moel (and other potential breeding habitat for kite within 1 km of the Site) during VP survey and targeted raptor work in 2014 and 2015 did not suggest local breeding.

7.42 A total of 3645 seconds (60 minutes, 45 seconds) of flight time was recorded, of which 1920 seconds (32 minutes) was spent at collision risk height.

7.43 The level of activity observed during the 2015 breeding season was greater than that recorded during the 2014 season (during which 14 flights were noted, with a total flight time of 25 minutes and 30 seconds). In 2014 a large proportion of the flights were over the sloping ground immediately east of the Wefa masts, but this was not observed in 2015. Kite were recorded throughout the Site during the 2015 work, with the exception of the far western extent of the Site[20].

7.44 Red kite flight lines recorded within 250 m of the turbine bases at collision risk height during the breeding season 2015 are shown on Figure 6.9a.

Kestrel

7.45 Kestrel was the most commonly recorded target species during the survey work, and were noted on 14 of the 24 3-hour VP watches. A total of 41 flights by this species were recorded during the survey work, totalling 4605 seconds (76 minutes and 45 seconds). Of the total flight time recorded, 2760 seconds (46 minutes) was spent at collision risk height.

7.46 Flights by this species appear to be concentrated over areas of less intensively grazed grassland, with avoidance of the enclosed acid grassland fields in the eastern part of the Site. Highest activity was observed over areas of rougher vegetation on sloping ground, and this is reflective of the presumed higher density of prey items, such as field vole, in these areas.

7.47 The level of activity recorded for kestrel, and frequent observation of two birds in flight, suggests local breeding. However, breeding opportunities on the Site are limited to structures within the Werfa mast compound and associated pylons. These structures were scanned during VP watches throughout the 2015 survey work, but no nests were observed. There are no trees, rock shelfs, or other structures not visible from the VP locations within the Site.

7.48 In addition, the low activity of this species during the 2014 breeding season work (two flights with a total flight time of 1 minute and 30 seconds) does not suggest that the Site is used frequently between years.

7.49 Kestrel flight lines recorded within 250 m of the turbine bases at collision risk height during the breeding season 2015 are shown on Figure 6.9b.

Hen Harrier

7.50 Hen harrier were recorded during two VP watches. One bird was recorded quartering at low level on 28 August 2015 near the centre of the Site, at the top of the Cwm Nant-y-Moel valley. The flight was observed for approximately 75 seconds before the bird was lost from view within a stream valley. Two flights of hen harrier were recorded on 29 September 2015. Both birds were again observed in low level flight over the ridge at the centre of the Site, south of the Werfa mast compound. The birds were recorded in flight for approximately 240 seconds and 90 seconds respectively. All hen harrier recorded during the VP work were ringtail birds (female or juvenile).

7.51 Hen harrier were not recorded during the 2014 breeding season work, but were noted on one date in October 2014. The timing of the 2015 records suggests that these birds were on passage, and did not breed on the Site.

[20] Flights below collision risk height near the western Site boundary may not have been detected from the VP location as the land begins to slope away behind a ridge approximately 500 m to the west of VP 1.

7.52 Hen harrier flight lines recorded within 250 m of the turbine bases at collision risk height during the breeding season 2015 are shown on Figure 6.9c.

Peregrine Falcon

7.53 Five flights of peregrine falcon were recorded during the 2015 VP work; one flight was recorded on each of 31 July and 24 August 2015, and three flights on 09 September 2015. The bird recorded on 31 July 2015 passed over VP2 from Mynydd Ty-isaf, heading south-west over the Site. The flight was observed for approximately 120 seconds and was entirely above collision risk height. On 09 September 2015 a bird was recorded taking a similar flight path, but included approximately 135 seconds at collision risk height.

7.54 The flight recorded on 24 August 2015, and two of the three flights recorded on 09 September 2015 were recorded over the Mynydd Ty-isaf valley and were entirely beyond the Site boundary. The two flights recorded on 09 September 2015 were of separate birds flying up from the crags at Mynydd Ty-isaf concurrently: one bird flew east out of view, and the other returned to the crags in rapid descent.

7.55 Peregrine was recorded on one date during the 2014 breeding season work. However, the location of the sightings in 2015 suggests that peregrine are likely to have bred on the cliff at Mynydd Ty-isaf, approximately 1 km north of the Site. Breeding was confirmed at this location in 2015 by Natural Power (2016), having recorded two fledged young at the nest. In addition, the most recent Mynydd Ty-isaf SSSI notification (dated 1986) states that the *higher crags within the SSSI provide nesting sites for a Schedule 1 raptor* suggesting that peregrine have used the eyrie (albeit with unknown frequency) for more than 20 years.

7.56 Peregrine flight lines recorded within 250 m of the turbine bases at collision risk height during the breeding season 2015 are shown on Figure 6.9c.

Merlin

7.57 Merlin was recorded on three dates: 31 July, 28 August and 09 September 2015. All recorded activity was entirely below collision risk height, and totalled 1 minute and 45 seconds of flight time. Flights noted on 31 July and 09 September were short, with birds noted appearing briefly over field boundaries in the north-eastern part of the Site. A male bird recorded on 28 August was noted in pursuit of a meadow pipit alongside the track at the centre of the Site. The bird failed to catch its prey, and continued south before being lost from view in a stream valley.

7.58 The level of activity and timing of the records of merlin during the 2015 work is consistent with that recorded during the 2014 breeding season.

7.59 Merlin flight lines recorded within 250 m of the turbine bases at collision risk height during the breeding season 2015 are shown on Figure 6.9c.

Hobby

7.60 Hobby was recorded flying east over the central part of the Site during a watch on 31 July 2015. The bird was observed to make a (failed) attempt at catching a meadow pipit as it passed through. The flight was timed at 45 seconds, entirely below collision risk height.

7.61 Hobby was not recorded during the 2014 breeding season work.

Secondary Species

7.62 Secondary species noted during the 2015 breeding season VP watches included buzzard *Buteo buteo*, raven *Corvus corax*, carrion crow *Corvus corone*, jackdaw *Corvus monedula*, grey heron *Ardea cinerea*, lesser black-backed gull *Larus fuscus*, herring gull *Larus argentatus*, cuckoo *Cuculus canorus*, swift *Apus apus*, swallow *Hirundo rustica*, house martin *Delichon urbicum*,

wheatear, skylark, meadow pipit, pied wagtail *Motacilla alba*, blackbird *Turdus merula*, lesser redpoll *Acanthis cabaret*, chaffinch, goldfinch *Carduelis carduelis*, and linnet *Carduelis cannabina*.

7.63 Raven and carrion crow were noted on 18 of the 24 survey visits, with maximum counts of 24 (raven) and 26 (carrion crow) respectively. Buzzard was also recorded frequently during the work. The species was noted on 15 of the 24 watches, with up to 4 birds recorded together.

7.64 Gulls were recorded flying over the site on an occasional basis between May and July; herring gull was noted on five dates and lesser black-backed gull on two dates. Grey heron was recorded flying east of the Site on one date in June.

7.65 Cuckoo was recorded on two dates in May and June. The bird was heard calling from the Nant-y-moel valley, beyond the eastern Site boundary on both occasions.

7.66 Hirundines were recorded regularly between May and August. Swallow were noted in small groups on 13 of the 24 watches, and up to 20 swift were counted during a watch in July. House martin were recorded on two dates, with a maximum count of 20 birds recorded on 28 August.

7.67 Meadow pipit were recorded on all survey dates between mid-May and the end of August. Skylark were also frequently recorded during this period. Goldfinch, linnet and chaffinch were recorded passing over the Site infrequently. Lesser redpoll was noted over-flying on one date in May, and wheatear was recorded on the track leading to Werfa masts on one occasion in July.

Merlin Survey (April to June 2015 inclusive)

7.68 The targeted merlin survey work completed between April and June 2015 resulted in one flight of merlin being recorded. The flight was made by a female bird to the north of the Site, heading north over Graig Fawr on 22 April 2015.

Other target species

7.69 Red kite were recorded during visits on 15 May, 28 May and 11 June. A total of 12 flights were noted throughout the area surveyed, 10 of which were recorded during survey on 15 May. Red kite were the only target raptor species noted within the Site boundary during the merlin survey work.

7.70 A male hen harrier was recorded flying north over Graig Fawr during survey on 11 June 2015. The bird continued north and appeared to drop to ground in excess of 3 km further north near Blaenrhondda.

7.71 Five flights of peregrine were recorded over three dates: 22 April (1 flight), 15 May (2 flights), and 11 June 2015 (2 flights). The pair of birds noted on 22 April were detected flying up from the cliffs at Graig Fach to attack the merlin recorded on the same date. The merlin dropped in height and flew east, whilst the peregrine continued north. The birds then flew east and out of view. A bird was also noted flying up from this area to attack the hen harrier recorded on 11 June. Two peregrine were also noted flying east over plantation at Mynydd Blaenafan on the same date.

7.72 Four flights of kestrel were recorded during the work: one on 15 May, two on 28 May and one on 11 June 2015. All flights were recorded to the north of the Site over Graig Fawr.

7.73 Goshawk was recorded over the plantation at Mynydd Blaenafan on 11 June 2015, approximately 1.2 km north of the Site. Two birds were noted (a female and 1st year bird) flying up from the trees in pursuit of a flock of racing pigeon. The juvenile returned to the plantation (following the unsuccessful attack) and the adult continued west towards Blaengwynfi.

Incidental breeding season records

7.74 A pair of ring ouzel were recorded on a crag at the eastern Site boundary, overlooking the hairpin of Bwlch-Y-Clawdd road, during a water vole survey on 08 June 2016. The behaviour of the birds

suggested a nest in this location. Ring ouzel were not recorded during the breeding season work in 2014 or 2015.

Winter Season Survey Results (2015/16)

VP survey

7.75 Target species recorded during VP survey work at Upper Ogmore in the 2015/16 winter season were red kite, kestrel hen harrier, goshawk, and golden plover. Flight details are summarised in this section.

Red Kite

7.76 A total of 30 flights of red kite were recorded during the winter 2015/16 surveys. The total flight time recorded was 58 minutes; 29 minutes and 45 seconds of which was spent at collision risk height. Red kite were noted on all surveyed months during the 2015/16 winter period[21], with records made on 12 October 2015 (5 flights), 19 October (8 flights), 20 November (2 flights), 28 January 2016 (3 flights), 10 February (2 flights), 16 February (2 flights), 24 February (4 flights), and 21 March (4 flights).

7.77 The recorded activity was approximately 35% greater during the winter of 2015/16 than recorded during the winter of 2014/15. A total of 19 flights, totalling 43 minutes and 45 seconds was recorded during the 2014/15 work.

7.78 Flights were generally made by single birds. Three birds were noted in flight together on 19 October and two birds were recorded together on 24 February and 21 March 2016. Kite activity typically involved soaring flights over moorland areas, with fewer flights noted over the grazed pasture in the eastern part of the Site. One bird was observed to land in this area (perhaps to feed on worms) during a watch on 28 January 2016.

7.79 Red kite flight lines recorded within 250 m of the turbine bases at collision risk height during the winter period 2015/16 are shown on Figure 6.9a.

Kestrel

7.80 Kestrel was recorded on two dates: 12 October 2015 (1 flight) and 19 October (2 flights). A total of 7 minutes and 30 seconds of flight time was recorded, with 3 minutes spent at collision risk height.

7.81 Flights were made over the ridge through the centre of the Site, and beyond the Site boundary to the South.

7.82 Flight activity was lower than during the 2014/15 winter period, with ten flights totalling 13 minutes and 55 seconds duration recorded between October 2014 and March 2015 inclusive. However, half of the total recorded activity (5 flights) was noted during a three hour watch on 18 November 2014.

7.83 Kestrel flight lines recorded within 250 m of the turbine bases at collision risk height during the winter period 2015/16 are shown on Figure 6.9b.

Hen Harrier

7.84 Four flights of hen harrier were recorded (all female or juvenile birds), one on each of 12 October 2015, 20 November, 28 January 2016 and 21 March. The total observed flight time was 6 minutes and 45 seconds. The flights were generally low, quartering flights over the Site, with one bird recorded rising to collision risk height for 1 minute and 30 seconds as it flew south from the Site on 12 October.

[21] Except December 2015, which was not surveyed.

7.85 Hen harrier was recorded on one date in late October during the 2014/15 winter period. No spring passage period observations were made in 2015.

7.86 Hen harrier flight lines recorded within 250 m of the turbine bases at collision risk height during the winter period 2015/16 are shown on Figure 6.9c.

Goshawk

7.87 Goshawk was recorded on 16 February 2016. The bird was first noted over the Nant-y-moel valley being mobbed by several carrion crow. It then flew north-west, over VP 2 toward the plantation at Mynydd Blaenafan, north of the Site boundary. The flight was timed at 1 minute; 45 seconds of which was spent at collision risk height. No further observations of this species were made during the 2015/16 or 2014/15 VP survey work.

7.88 Goshawk flight lines recorded within 250 m of the turbine bases at collision risk height during the winter period 2015/16 are shown on Figure 6.9c.

Golden Plover

7.89 Four flights of golden plover were recorded over three survey days. These were: 12 October 2015 (2 flights), 25 November (1 flight), and 25 February 2016 (1 flight). Golden plover were also heard calling to the north-east of VP 1 on 12 October 2015, and on the slope to the Nant-y-moel valley, immediately south of the Site on 21 March 2016, but no flight was observed on either occasion. Flocks were small, with a maximum count of 7 birds present on 25 November 2015 and 24 February 2016. The two flights recorded on 12 October 2015 were made by one bird.

7.90 Golden plover were recorded in flight for a total of 4 minutes and 25 seconds, of which 1 minute and 30 seconds was spent at collision risk height. Flights were generally made from the centre of the Site, south of the Wefa mast compound. The flock of 7 birds recorded on 24 February appeared to take flight from this area, and the bird noted on 12 October was also recorded on the ground here.

7.91 Up to 43 birds were recorded during the 2014/15 winter period surveys, with a reported total of nine flights equating to 12 minutes of flight time. The lower observed activity during the 2015/16 work may be reflective of the wetter, milder conditions experienced during the 2015/16 winter period..

7.92 Golden plover flight lines within 250 m of the turbine bases at collision risk height are shown on Figure 6.9c.

Secondary Species

7.93 Secondary species noted during winter season VP watches included buzzard, raven, carrion crow, magpie *Pica pica*, great black-backed gull *Larus marinus*, starling *Sturnus vulgaris*, stock dove *Columba oenas*, fieldfare *Turdus pilaris*, redwing *Turdus iliacus*, mistle thrush *Turdus viscivorus*, skylark, meadow pipit, pied wagtail, chaffinch, goldfinch, and linnet.

7.94 Buzzard were noted on all watches in February and March 2016, with flights also recorded on 19 October 2015, 20 November, and 28 January 2016. A maximum of 5 flights was recorded on 21 March. All flights were of single birds, except for a flight noted on 10 February which involved two birds. Raven and carrion crow were recorded during all VP watches. Maximum counts of 5 raven (recorded on 20 November) and 20 carrion crow (recorded on 10 February) were noted during the work.

7.95 A great black-backed gull was recorded on one date during the winter 2015/16 work. A flock of 50 starling was recorded flying east over the northern Site boundary during a watch on 12 November. Mixed flocks of up to 50 redwing and fieldfare were noted in November 2015, with a smaller flock of 6 fieldfare also recorded on 28 January, and single birds noted on 19 October and 24 February.

7.96 Skylark were recorded in small flocks of up to 8 birds between 28 January and 31 March. Up to 35 meadow pipit were noted in October 2015, and only 2 birds were noted between 20 November 2015 and 04 March 2016. Other passerines were recorded infrequently and in low numbers during the winter 2015/16 work.

Incidental Records

7.97 A merlin was recorded flying north-west over the A4107 at the entrance to the Site outside of timed survey on 25 November 2015. No further observations of merlin were made during the 2015/16 winter survey work.

8 Ornithological Survey 2020

Introduction

8.1 SNH (2017) guidance recommends that ornithological survey data used to inform impact assessment of onshore wind farms should be no more than 5 years old, and that two years of data should be obtained within this period. Ornithological survey work at the site commenced in April 2014 and, therefore, the first year of breeding bird survey was updated prior to submission of the Upper Ogmore Wind Farm Environmental Statement.

Aims of Study

8.2 The survey work undertaken at Upper Ogmore between April and August 2020 has aimed to update the year 1 breeding season survey work reported in Section 7 of this document.

Methods

Vantage Point Survey

8.3 As described in Section 7 of this document, the Upper Ogmore Windfarm scheme was reduced to eight turbines within the current Site boundary in early 2015. This led to an adjustment of VP locations ahead of the second year of survey to provide maximum coverage of the 500 m buffer area around the revised layout. The VP locations used in 2015-2016 were also used for the 2020 survey work, and are shown on Figure 6.1..

8.4 Both VP locations were accessed along existing tracks linked to the A4107. The 2 km viewing arcs from the selected VP locations covered the indicative turbine locations of the updated, 7 turbine scheme.

8.5 Thirty-six hours of survey was completed at both VPs between April and August 2020 inclusive, resulting in a total of 72 hours of survey work. During each VP watch, standard information was collected with regard to weather, including wind speed and direction, temperature, cloud cover and precipitation. Weather was reassessed at regular intervals during each watch to ensure that changes / consistency in weather conditions were both noted.

8.6 Target species flights were timed, and height recorded in bands of 0-30m, 30-60m, 60-90m, 90-120m, 120-150m and in excess of 150m above ground level. In general, 0-30m is considered to be below collision risk height, and over 120m above collision risk height. The purpose of using multiple height bands is to encourage considered height estimation, and to collect detailed information on flight characteristics. Flight lines were drawn onto an Ordnance Survey map as accurately as possible, using terrain and geographical features for spatial reference.

8.7 In addition, as per SNH (2017) guidance, a summary of all (non-target) avian activity was made at five minute intervals (or less frequently if no bird activity was apparent) during each VP watch. This enabled characterisation of the breeding bird community of the Site, and was complementary to walkover survey methods.

8.8 VP survey dates, durations and times can be found in Tables 1-3 in Appendix 6. Table 1 provides dates and times of VP watches, Table 2 weather information during watches (and number of target species flights recorded) and Table 3 detailed data on target species flight parameters that can be used in collision risk analysis.

8.9 In combination, these tables demonstrate that survey dates and times were varied appropriately to ensure that representative coverage of different parts of the day was achieved from each VP, and that a range of representative weather conditions were sampled.

8.10 Survey work was as evenly spaced as weather allowed. Periods of high wind, low visibility and heavy rain were avoided, as these conditions compromise the survey method, and often also result in supressed bird activity.

Moorland Wader Survey (April – July 2020 inclusive)

8.11 Moorland bird populations were surveyed using a walkover technique based on the Brown & Shepherd (1993) method, as recommended in SNH (2017) guidance. A constant search effort was employed, with surveyors spending 20-25 minutes in each 500 m x 500 m quadrat and all accessible parts of the developable area being approached to within approximately 100 m. The land slopes away from the relatively flatter developable area with a high gradient and is generally inaccessible. Land beyond the perimeter of the developable area (within the Site boundary) was surveyed from local vantage points or accessed to a limited extent where it was safe to do so.

8.12 Frequent stops were made at local vantage-points in order to listen for singing and calling birds and to scan areas in front of the observer. All birds were recorded using standard British Trust for Ornithology species and behaviour codes.

8.13 Four visits were completed between April and July inclusive. The dates of each visit are listed in **Table 1** below.

Table 1. Dates and times of moorland wader walkover survey

Visit	Date	Time	Weather conditions
1	26 April 2020	09:00-15:00	Temp: 11-17°C; Wind: 1-2 bf; Cloud: 4/8; dry
2	14 May 2020	08:40-13:00	Temp: 6-11°C; Wind: 1-4 bf; Cloud: 1/8; dry
3	14 June 2020	08:20-12:20	Temp: 13-15°C; Wind: 1-2 bf; Cloud: 5/8; dry
4	13 July 2020	08:30-12:00	Temp: 15°C; Wind: 1-2 bf; Cloud: 8/8; showers

Breeding Raptor Survey (*April – July 2020 inclusive*)

8.14 The approach to the raptor survey was based on methods provided in Hardey et al. (2013) and SNH (2017) guidance, which recommends that surveys for red kite, kestrel and merlin are completed within 2 km of a proposed wind farm. The approach was also informed by study of aerial photographs.

8.15 Survey to confirm occupancy of territories by red kite, kestrel and merlin included a combination of short watches from local vantage points and walking a route through areas of suitable breeding habitat on three visits between May and July 2020 inclusive. A search for evidence of breeding raptors and short watches from VPs covering an area of up to 2 km of the site was also undertaken during the moorland wader survey visit on 26 April 2020[22]. An area extending to all open common land within 2 km of indicative turbine locations was covered by the survey.

8.16 The survey times and weather conditions for each visit are presented in **Table 1**.

Table 1. Dates and times of merlin survey

Visit	Date	Time	Weather conditions
1	26 April 2020	09:00-15:00	Temp: 11-17°C; Wind: 1-2 bf; Cloud: 4/8; dry
2	17 May 2020	08:20-15:00	Temp: 5-12°C; Wind: 3 bf; Cloud: 8/8; dry

[22] Surveys were combined in response to emerging government guidelines on travel restrictions during the Covid-19 pandemic.

Visit	Date	Time	Weather conditions
3	24 June 2020	09:00-16:00	Temp: 29°C; Wind: 3 bf; Cloud: 0/8; dry
4	14 July 2020	09:00-16:00	Temp: 15°C; Wind: 1-2 bf; Cloud: 8/8; dry

Merlin Survey (June and July 2020)

8.17 An additional two days of survey targeting breeding merlin were undertaken in response to observations of merlin during Vantage Point survey work in early June 2020. The merlin survey work included watches from two VP locations selected for visual coverage of rocky slopes and plantation edges immediately to the south-west of the site.

8.18 Approximately 3 hours was spent at each of the VP locations during visits on 04 June and 15 July 2020. The survey times and weather conditions for each visit are presented in **Table 1**.

Table 1. Dates and times of merlin survey

Visit	Date	Time	Weather conditions
3	04 June 2020	10:15-17:00	Temp: 12°C; Wind: 4 bf; Cloud: 8/8; dry
4	14 July 2020	10:10-16:30	Temp: 15°C; Wind: 5 bf; Cloud: 8/8; dry

Incidental Records

8.19 Birds recorded outside timed VP survey work, such as during walks to and from VPs and breaks in survey, were noted on field maps. For target species, flights were mapped and their durations recorded.

8.20 Although it is not possible to use this data for collision risk analysis[23], it can be of use in understanding the nature of use of a site by target species.

Results

Desk Study Data

8.21 See Section 6 for a review of species records, and Section 7 for a review of the Llynfi Afan REP data.

Breeding Season 2015 Survey Results

VP Survey (April to August 2020 inclusive)

8.22 Target species recorded during VP survey work at Upper Ogmore in the 2020 breeding season were red kite, kestrel, goshawk, peregrine falcon, merlin, hobby, and golden plover. Flight details are summarised in this section.

Red Kite

8.23 Red kite flights were noted on eighteen of the 24 VP watches. A total of 53 flights were recorded, including flights of two birds on 16 April and 06 May. Six flights were recorded on 06 May and five on 16 April 2020. One of the flights recorded on 16 April was made by two birds soaring over the valley in the south-eastern part of the Site for a total duration of 50 minutes.

[23] Collision risk analysis is calculated by extrapolating likely flight activity over a site based on encounter rates and flight durations during timed watches. on the use of consistent view-sheds makes the process more straightforward. As incidental records are not typically made from VP locations and are outside timed, structured survey, it is not possible to use the data statistically.

8.24 Flight activity observed over areas of woodland adjacent to the site during VP survey and targeted raptor work in 2020 did not suggest local breeding.

8.25 A total of two hours and twenty-eight minutes of flight time was recorded, of which one hour, twelve minutes and thirty seconds was spent at collision risk height.

8.26 The level of activity observed during the 2020 breeding season was greater than that recorded during the 2014 and 2015 breeding seasons (during which 14 and 23 flights were noted respectively). Kite were recorded throughout the Site during the 2015 and 2020 work, albeit a high proportion of the flights recorded in 2020 were associated with the slopes beyond the site boundary. Only nine of the fifty-three flights passed within 250 m of turbine locations at collision risk height.

8.27 Red kite flight lines recorded within 250 m of the turbine bases at collision risk height during the breeding season 2020 are shown on Figure 6.9d.

Kestrel

8.28 Eight flights of kestrel were recorded during the 2020 VP survey work. This is lower than the activity recorded uring 2015 in which 41 flights by this species were recorded. Of the nine flights, two were at collision risk height for a total flight time of 2 minutes and 45 seconds.

8.29 Kestrel were most frequently recorded beyond the northern boundary of the site, and over the sloping ground immediately south of the site.

8.30 The observation of birds throughout the breeding season, and frequent flights by two birds recorded in 2015 indicated local breeding. However, breeding opportunities on the Site are limited to structures within the Werfa mast compound and associated pylons. These structures were scanned during VP watches throughout the 2020 breeding season survey work, but no nests were observed. Despite likely local breeding, the low-level of activity recorded in 2020 does not indicate that the site is used frequently by kestrel.

8.31 Kestrel flight lines recorded within 250 m of the turbine bases at collision risk height during the breeding season 2020 are shown on Figure 6.9d.

Peregrine Falcon

8.32 Peregrine was recorded flying east over the central part of the Site during a watch on 22 April 2020. The flight was timed at 45 seconds, entirely below collision risk height.

8.33 Five flights of peregrine falcon were recorded during the 2015 VP work; all were associated with the area around Mynydd Ty-Isaf, approximately 1 km north of the site.

Merlin

8.34 Three flights by merlin were recorded during the 2020 VP work. Two flights were recorded on 16 April 2020. One bird was identified as a female in low flight over the eastern part of the site; the second was a high and distant flight of a bird in pursuit of a meadow pipit to the east of the site. A third flight was recorded during a watch on 03 June 2020 and involved a male bird commuting across the western part of the site.

8.35 Merlin spent a total of 60 seconds at collision risk height over two flights. The thirds flight was entirely below collision risk height.

8.36 The level of activity and timing of the records of merlin during the 2015 work is consistent with that recorded during the 2020 breeding season.

8.37 Merlin flight lines recorded within 250 m of the turbine bases at collision risk height during the breeding season 2020 are shown on Figure 6.9d.

Hobby

8.38 Hobby was recorded commuting over the Site during a watch on 06 May 2020. The flight was timed at 45 seconds, entirely below collision risk height.

8.39 A single flight had also been recorded during the 2015 survey work.

Goshawk

8.40 Two goshawk flights were recorded in 2020: both on 16 April 2020. Both flights were made by birds flying from the plantation to the north of the site towards Nant y Moel to the east. One bird was identified as a female, the other was unsexed. No further observations of goshawk were made on subsequent watches.

8.41 Goshawk was not recorded during the 2015 breeding season VP work.

8.42 Goshawk flight lines recorded within 250 m of the turbine bases at collision risk height during the breeding season 2020 are shown on Figure 6.9d.

Golden Plover

8.43 One golden plover flight (involving one bird) was recorded during a watch on 15 May 2020. The bird made a short flight (45 seconds) over the common land in the south-eastern part of the site.

8.44 Golden Plover was not recorded during the 2015 breeding season VP work.

Secondary Species

8.45 Secondary species noted during the 2015 breeding season VP watches included buzzard *Buteo buteo*, sparrowhawk *Accipiter nisus,* raven *Corvus corax*, carrion crow *Corvus corone*, rook *Corvus frugilegus*, jackdaw *Corvus monedula*, lesser black-backed gull *Larus fuscus*, and herring gull *Larus argentatus*.

8.46 Carrion crow were noted on 12 of the 24 survey visits, with a maximum counts of 49 carrion crow noted on 11 June 2020. Raven were recorded on nine dates, with a maximum of 10 birds recorded on 04 August 2020. Buzzard was also recorded frequently during the work. The species was noted on 11 of the 24 watches, with up to 5 birds recorded together.

8.47 Gulls were recorded flying over the site on an occasional basis between April and June; herring gull was noted on six dates and lesser black-backed gull on nine dates.

Moorland Wader Survey (April to July 2020 inclusive)

8.48 The moorland wader survey work in 2020 did not establish any evidence that wader territories were present within the Site boundary.

8.49 Incidental records of other target species recorded during the moorland wader survey are shown on Figure 6.10. Red kite were observed during three of four survey visits in 2020.

8.50 Meadow pipit and skylark were the most frequently encountered species during walkover survey work. Other species recorded during the surveys included buzzard (overflying the site on all visits), cuckoo *Cuculus canorus* (heard calling from the plantation at Nant y Moel on 26 April and 14 May 2020), raven, carrion crow, wheatear *Oenanthe oenanthe*, stonechat *Saxicola rubicola*, pied wagtail *Motacilla alba*, swallow *Hirundo rustica*, linnet *Linaria cannabina*, and reed bunting *Emberiza schoeniclus*.

Breeding Raptor Survey (April to July 2020 inclusive)

8.51 One flight by two kestrel was recorded during a breeding raptor survey on 14 July 2020. The birds flew north-east over the site from the sloping ground immediately south of the site towards Blaengarw.

8.52 Red kite and buzzard were recorded overflying the site and surrounding area on all survey visits.

8.53 No evidence of breeding peregrine was observed at the historical breeding site within the Mynydd Ty-isaf SSSI during checks on 26 April, 17 May, 24 June and 14 July 2020.

8.54 An incidental record of golden plover was made during a survey on 24 April 2020. The bird was loafing in the south-western part of the site.

Merlin Survey (April to June 2015 inclusive)

8.55 The targeted merlin survey work completed in June and July 2020 did not record any merlin activity.

8.56 A juvenile kestrel was recorded hunting beyond the western boundary of the site during a watch on 15 July 2020. Red kite were noted flying over the western part of the site on 04 June.

9 Bats Survey

Aims of study

9.1 The aims of bat survey work were to identify:

- The species of bat using the Site over the survey period.
- Areas of the Site subject to particular use by bat species.
- The likelihood of roosts occurring in proximity to the Site.
- Baseline information to inform an assessment of potential impacts on bats.

Methods

Guidance on the risks of wind farms to bat populations

9.2 Guidance on the risks posed to bats from onshore wind farms has been produced by Scottish Natural Heritage (SNH) *et al*. (2019) which supersedes guidance relating to wind farms published by the Bat Conservation Trust (BCT) (Hundt, 2012[24]) and by NE (2012). Initial survey work at Upper Ogmore (in 2016 and 2018) was completed in accordance with the BCT guidance, with updated survey work completed in 2019 following the survey protocols recommended by the SNH guidance.

Field survey

Site appraisal survey

9.3 The site appraisal was completed with reference to guidance documents produced by Natural England (NE) (2012) and the Bat Conservation Trust (BCT) (Hundt, 2012; Collins, 2016).

9.4 The quality of the habitats available for bats on the Site was assessed during an initial site appraisal. The likely on-site assemblage of bats, based on the results of previous surveys, desk study and the known habitat preferences of UK bats was also taken into account. The main elements that determine habitat quality for most bats are likely to be the presence of potential roosting and foraging habitat, and how well these habitats are connected to those in the surrounding landscape. The BCT guidance is the same as NE guidance in terms of its assessment of the level of risk associated with bat populations and uses the same classifications of high, medium and low risk for both species and survey sites.

9.5 A site appraisal was carried out in April 2014, as part of a Phase 1 survey of the Site. This confirmed the site risk-level for bats as being low, due to the exposed, upland setting and the limited diversity and scale of the foraging and roosting habitats present for bats to exploit. For a site that is assessed as 'low risk' the guidance recommends that surveys are carried out during each season of the active period for bats (in spring, summer and autumn).

9.6 The BCT guidance also recommends that a daytime inspection of structures and trees suitable for roosting bats be carried out within 200 m of the developable area (turbine envelope) and that further surveys should be carried out if evidence of 'significant' roosts of medium and/or high-risk species is found within this survey area. The guidance also suggests that further survey should be carried out if the desk-study identifies roosts that could be affected by the development.

9.7 The site appraisal survey identified that the buildings at the Werfa mast compound have low potential to support roosting bats, and that there are a number of natural cliff faces/ rock escarpments as well as subsidence fissures that could support roosting bats but are unlikely to do

[24] The 2012 edition of the guidance covers onshore wind farms in Chapter 10 (now superseded by SNH *et al.* (2019). The remainder of the guidance has also superseded by the third edition (Collins, J. (ed.), 2016).

so (see Photographs 1 and 2 at the end of this section). Although, the buildings at the Werfa mast compound will not be affected by the development of the wind farm, an inspection survey was recommended as well as a single emergence survey. BCT guidance (Collins 2016) recommends that one dusk emergence and/or dawn re-entry survey should be carried out between May and September for a structure identified as having low potential to support roosting bats.

Building inspection and emergence survey

9.8 The building inspection of the structures was completed by Matthew Hobbs MCIEEM on 10 August 2016. The inspection involved a search of all external elevations (the structures consisted of derelict walls) for evidence of bats such as droppings, feeding remains, staining and scratch marks. Internal access to the south building was not possible due to the presence of potential Asbestos Containing Materials (ACMs). The survey was undertaken from ground level using an endoscope and torch to inspect cracks / crevices and cavities in the walls of the derelict buildings. Most crevices could be inspected in this way with some out of reach in the higher parts of some walls. Close focussing binoculars and high-powered torches were used to visually search higher elevations. Any roosting opportunities were recorded onto standardised field survey sheets.

9.9 Bats may use a number of roosting opportunities within walls, for example, cracks and crevices within stonework where they are difficult to see. The absence of evidence (such as droppings) does not necessarily mean that roosting bats are not present as bats may not be roosting in the accessible or visible parts of a wall, and they do not always leave visible signs (particularly if the roosts have been recently established, support small numbers of bats or are temporary in nature). The absence of roosting bats in a structure can be very difficult to prove for this reason. As a result an assessment of the buildings' potential to accommodate roosting bats was also made in the absence of any clear evidence of bats being present.

9.10 The dusk emergence survey was completed on 10 August 2018 by Matthew Hobbs MCIEEM and Rachel Taylor ACIEEM. The survey commenced approximately fifteen minutes before sunset and continued until approximately two hours after sunset. During the survey, two surveyors were positioned to observe the exterior walls of the building.

9.11 Surveyors used two different bat detectors on each survey to supplement visual observations: a Batbox Duet detector for listening to bat calls from the combined heterodyne/frequency division output and an Anabat frequency division detector for recording calls for subsequent identification.

9.12 An updated external inspection of the building was subsequently completed on 22 October 2019 by James Garside following the methods used during the 2016 inspection work.

Walked transect survey

9.13 During walked transect surveys (carried out in spring, summer and autumn respectively), two surveyors followed a predetermined transect route through the site, recording all bat echolocation calls using Anabat (SD1 and 2), Bat box duet, and Echo Meter (EM3) bat detectors, and noting any bat activity heard or seen on standardised recording forms. Surveys were carried out only when weather conditions were suitable for bats to be active, avoiding temperatures below 8 °C, heavy rain and high wind speeds (above 25 mph). Each transect took between 2-3 hours to complete. The timing of the surveys covered the peak bat emergence period (from sunset to one hour after sunset) and the period of most intense foraging activity (up to two hours after sunset).

9.14 The start point and direction of travel along each transect route was altered between successive surveys to ensure that different parts of the Site were surveyed at different times of the night. This approach aimed to reduce potential bias in sampling.

Automated bat detector surveys

<u>2015- 2018</u>

9.15 The method for automated detector survey at the site in 2015, 2016 and 2018 was based on Bat Conservation Trust (BCT) guidelines (Hundt, 2012). The guidance recommended that a

representative sample of turbine locations is surveyed. For open homogeneous moorland it is suggested that a quarter of the turbine locations are sampled and that potentially some additional (control) locations are surveyed next to habitat features away from turbines. At Upper Ogmore, none of the turbine locations are close to any higher quality habitat features for bats, such as woodland, watercourses, or hedgerows. As such the use of paired detectors was not appropriate.

9.16 The site was categorised as 'low risk' for bats given the exposed, upland setting and the limited diversity and scale of the foraging and roosting habitats present for bats to exploit. Four detectors were deployed for a period of five nights during early October 2015 (in 'autumn') and redeployed for an additional five nights in June ('spring') and August ('summer') 2016. An updated autumn period survey was completed in September 2018 (due to ageing data for this period). The update survey comprised automated detector deployment over a period of 10 nights[25]. The selected automated detector locations were representative of indicative turbine locations, but were also chosen to provide some security from damage by the public and livestock (as the survey area is partly located on common land). Therefore, detector locations coincide with existing structures to mask their presence, as follows:

- Detector 1 (D1) located on the security fence of the Werfa mast compound;
- Detector 2 (D2) located on a wooden electricity pylon; and
- Detectors 3 (D3) and 4 (D4) located on stock fence posts.

9.17 The detector locations used during the 2015, 2016 and 2018 survey work are presented on Figure 6.3a.

9.18 Song Meter (SM2) bat detectors with external microphones were deployed at each location. The SM2 detectors were configured to record above the level of ambient noise, such as from wind or rain using an adaptive trigger set to 6 dB, and were set to define a bat pass as a call note of >2 ms which is separated from another by more than one second. Each bat detector was housed in a waterproof Peli-case. An external microphone was connected via a cable to the detector unit, and attached to a pole at approximately 3-4 m above ground level.

9.19 For each night sampled, detectors were set to record from half an hour before sunset to half an hour after sunrise, the period during which bats are usually active away from their roosts. The duration of recording per night varied throughout the survey period according to day/night length. A minimum of 23 nights (max 25 nights) was recorded at each detector location over the survey period (see *Limitations to methods* below).

9.20 The methods used for analysis of the data are presented in Appendix 7.

2019

9.21 Automated detector surveys were further updated in 2019 to follow the newly emerged multi-agency guidance on assessing impacts of wind farms on bats, 'Bats and onshore wind turbines: survey, assessment and mitigation' (SNH *et al*., 2019). The guidance recommends that all proposed turbine locations are sampled for a period of 10 nights per season. Automated detectors were, therefore, set to sample at all seven proposed turbine locations during spring, summer and autumn 2019.

9.22 Each automated detector was assigned a name based on the proposed turbine number sampled by that detector. Detectors were therefore labelled D1 to D7 (representative of proposed turbines T1 to T7). The locations of detectors used during the 2019 work are illustrated on Figure 6.3b[26].

9.23 Song Meter (SM4) bat detectors with external microphones were deployed at each location. The SM4 detectors were configured to record above the level of ambient noise, such as from wind or

[25] Ten nights were sampled in 2018 in line with (then) forthcoming SNH guidance for bat survey at wind farms, published in 2019.
[26] Note that the locations of D1 to D4 used during the 2015, 2016 and 2018 survey work differ to the locations of D1 to D4 used during the 2019 work.

rain using an adaptive trigger set to 6 dB, and were set to define a bat pass as a call note of >2 ms which is separated from another by more than one second. An external microphone was connected via a cable to the detector unit, and attached to a pole at approximately 2.5 m above ground level.

9.24 For each night sampled, detectors were set to record from half an hour before sunset to half an hour after sunrise. The duration of recording per night varied throughout the survey period according to day/night length. A total of 30 nights was recorded at each detector location over the survey period.

9.25 The methods used for analysis of the data are presented in Appendix 7. The detector deployment and collection dates are presented in Appendix 8.

Limitations to methods

9.26 Automated detectors were originally deployed in May 2016 to sample the spring period; however no bat passes were recorded on any of the detectors. As the detectors were established to be functioning correctly it was concluded that conditions on site had been too cold for bats to be active and detectors were redeployed in June. The results from May have not been used for analysis.

9.27 In the summer, only 3 nights of data was collected from detector 1, despite two deployments at this location. Given the levels of activity recorded throughout the rest of the site during this period were very low, it is unlikely that this will have affected the overall results and analysis uses actual deployment periods.

Results

Desk study

9.28 The review of bat records provided by SEWBReC indicated that brown long-eared bat *Plecotus auritus*, common pipistrelle, soprano pipistrelle, Nathusius's pipistrelle *Pipistrellus nathusii*, lesser horseshoe bat *Rhinolophus hipposideros*, Leisler's bat *Nyctalus leisleri*, Noctule *Nyctalus noctula*, Daubenton's bat *Myotis daubentonii*, and Natterer's bat *Myotis nattereri* have been recorded within 10 km of the site.

9.29 The closest bat record for the Site was for common pipistrelle 1.2 km to the south east in the bottom of the valley (Nant-y-moel). This is also the closest bat roost record to the Site.

9.30 There were 37 bat roosts recorded within 5 km of the site, all of which were located in buildings at the bottom of various valleys within the search area.

9.31 The extended 10 km search for noctule, Leisler's bat and Nathusius' pipistrelle returned 79 records. These included:

- 61 records of noctule, the closest being 3 km to the south of the Site;
- Five records of Leisler's bat, the closest being 10 km to the south east of the Site; and,
- Nine records of Nathusius' pipistrelle, the closest being 10 km to the south east of the Site.
- Four records of bats in the genus *Nyctalus*[27] (unidentified to species level), all beyond 9 km south-east of the site.

9.32 The review of the Llynfi Afan Renewable Energy Park Environmental Statement and Appendices revealed that four species of bat were recorded in low numbers during the transect and static detector surveys in April, May and June 2012 (common and soprano pipistrelle, *Myotis* sp. and noctule). Bat records were generally grouped around landscape features (woodland edge, waterbodies, lower valleys, etc.). No bat roosts were identified.

[27] Includes Leisler's bat and noctule.

Building inspection and emergence survey

9.33 There two buildings on the Site that form part of an electrical substation compound, both of which have some potential for roosting bats. Both buildings are simple single storey structures with solid brick walls and flat roofs. The northern building had gaps around the soffits and cracks formed due to missing mortar between bricks. The southern building was intact.

9.34 The northern building was considered to have low potential for roosting bats so a single emergence survey was carried out. The southern building had no potential for roosting bats and therefore no further survey was required.

9.35 The emergence survey was conducted on 10 August 2016. The survey started at 20:30 and continued until 22:00. Conditions were suitable for bats (temperature 14-12 ^{o}C; low wind; no rain).

9.36 No bats were recorded during the emergence survey.

9.37 The updated inspection survey in 2019 indicated that the condition of the buildings had not changed. No evidence to suggest regular use of the building by bats was indicated by the automated detector work[28]. Therefore, it was considered that further emergence survey work would be unlikely to provide any further useful information to support an impact assessment.

Walked transect survey

9.38 Details of transect surveys are included in Appendix 8, with maps showing walked transect routes as well as the number of passes and species recorded during each transect survey included in Figure 2.

9.39 In total, two common pipistrelle bat passes (B) were recorded during walked transect surveys in 2015/16. Both passes were recorded on 6 October 2015 at 19:58 and 19:59 respectively, near to the electricity sub-station in the middle of the Site.

Static bat detector survey

<u>2015- 2018</u>

9.40 Static bat detectors recorded for a total of 100 nights, equating to 1061.5 hours of survey time[29]. Appendix 8 gives details of static detector deployment dates and locations with the latter illustrated in Figure 6.3a. Table 1 gives details of the number of passes and relative activity relative activity (referred to as 'activity' in the text below) recorded during automated detector surveys (unidentified bat species have not been included in any further analysis).

9.41 A total of 2,726 bat passes (B) from a minimum of five species of bat were recorded. Figure 6.3 and Table 2 illustrates the proportion of activity (bat passes per hour; B/h[30]) recorded for different species at each automated survey location. Data for which there were less than 0.1 B/h in Table 2 (e.g. *Myotis* sp.) have been included as 'other bat species'.

[28] Detector D1 was located on the Werfa Mast perimeter fence during the 2016 and 2018 survey work, and detector D3 was located adjacent to the fence (within 50 m of the buildings) during the 2019 work.
[29] This duration includes the autumn 2015, spring 2016, summer 2016 and autumn 2018 deployments.
[30] See Appendix 6 for an explanation of bat data analysis methods.

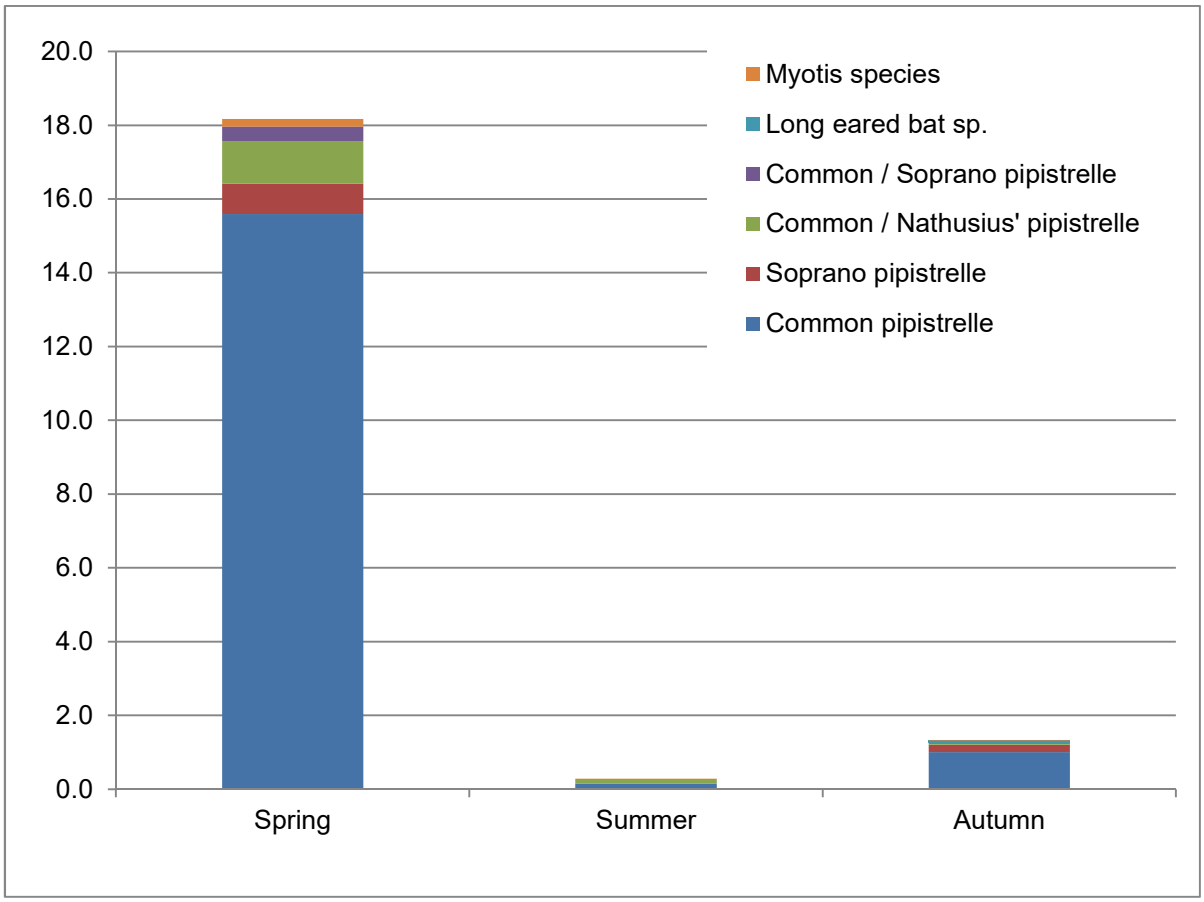
Table 1: Total number of bat passes (B) and bat passes per hour (B/h) for each bat species recorded during static surveys in 2015/2016 and 2018.

Species	B	B/h
Nathusius' pipistrelle	1	<0.1
Common / Nathusius' pipistrelle	203	0.2
Common pipistrelle	2819	2.8
Common / Soprano pipistrelle	67	0.1
Soprano pipistrelle	218	0.2
Myotis species	41	0.1
Long eared bat sp.	32	<0.1
Total	**3381**	**3.3**

9.42 The highest activity rate was recorded for common pipistrelle, followed by soprano pipistrelle (2.8 and 0.2 B/h respectively). 99 % of all the recorded passes were identified as pipistrelle bat species[31]. Low numbers of passes were recorded for all other species (<=0.1 B/h).

9.43 The highest overall activity was recorded in spring (18.2 B/h), with lower activity during the autumn 2018 (1.3 B/h), summer 2016 (0.3 B/h) and autumn 2015 (<0.1 B/h) periods. This is illustrated in Graph 1 below. Patterns of activity for individual species are discussed in the following section.

Graph 1: Monthly variation in bat activity (B/h) in 2015/16/18



[31] There were 181 passes which fell within the call parameters for both common and Nathusius' pipistrelle and 58 passes which fell within the call parameters for soprano and common pipistrelle.

9.44 The data presented in Table 4 show the activity of each species at the different locations sampled. This information is also illustrated as scaled pie charts in Figure 6.3. The number of bat passes recorded for each location can be found in Appendix 8.

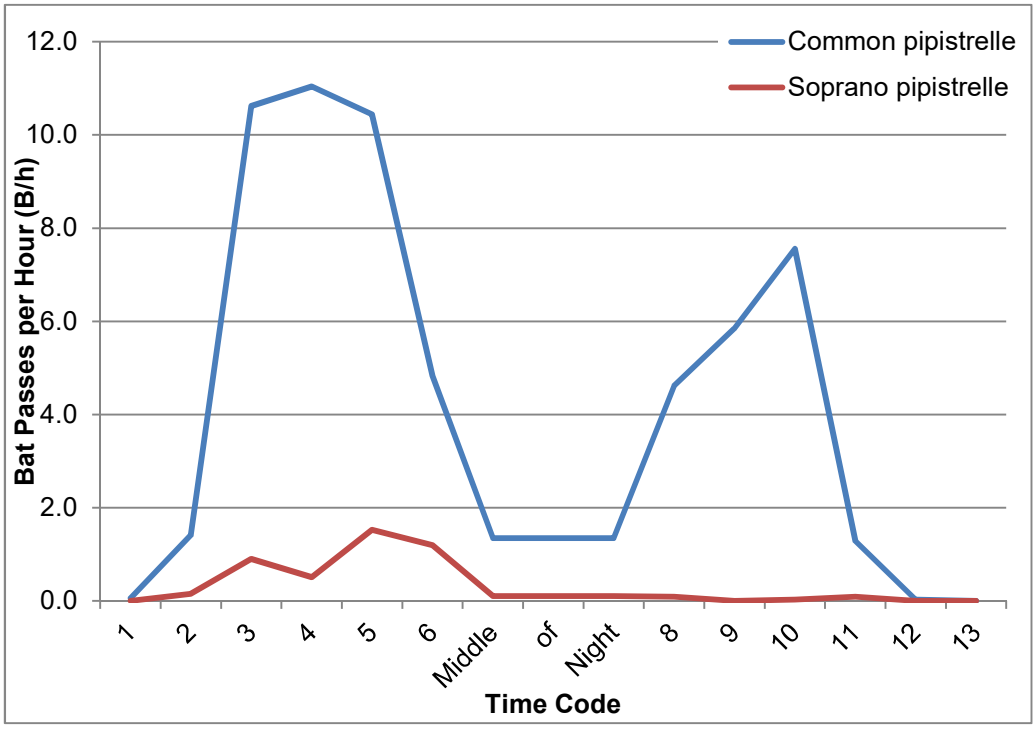
Table 2: Activity (B/h) of bat species at each detector location in 2015/16/18.

Species	D1	D2	D3	D4	Grand Total
Nathusius' pipistrelle	0.0	0.0	<0.1	0.0	**<0.1**
Common pipistrelle	6.7	0.1	2.0	1.9	**2.7**
Soprano pipistrelle	0.4	<0.1	0.3	0.2	**0.2**
Common / Nathusius' pipistrelle	0.3	0.0	0.4	0.1	**0.2**
Common / Soprano pipistrelle	0.1	0.0	0.1	<0.1	**0.1**
Long eared bat sp.	<0.1	<0.1	0.1	<0.1	**0.0**
Myotis species	<0.1	<0.1	0.1	<0.1	**0.0**
Total	**7.4**	**0.1**	**2.9**	**2.2**	**3.2**

9.45 The highest levels of activity (7.4 B/h; 67% of total activity) were recorded at D1 followed by D3 (2.9 B/h; 21% of activity), D4 (2.2 B/h; 12 % of all activity), and D2 (0.1 B/h).

9.46 Graph 2 shows the activity of common and soprano pipistrelle bats throughout the night, other bat species were not recorded often enough for any pattern to be discernible. The highest levels of bat activity were recorded between 41 minutes and 100 minutes after sunset and again between 120 minutes and 61 minutes before sunrise. Differences in activity for individual bat species throughout the night are discussed below.

Graph 2: Activity (B/h) of common and soprano pipistrelle throughout the night during 2015/16/18, explanation of time code are given in Appendix 7.



2019

9.47 Static bat detectors recorded for a total of 210 nights, equating to 2107 hours of survey time. Appendix 8 gives details of static detector deployment dates and locations with the latter illustrated

in Figure 6.3b. Table 3 gives details of the number of passes and relative activity relative activity (referred to as 'activity' in the text below) recorded during automated detector surveys (unidentified bat species have not been included in any further analysis).

9.48 A total of 1075 bat passes (B) from a minimum of seven species of bat were recorded. Figure 6.3b and Table 4 illustrates the proportion of activity (B/h) recorded for different species at each automated survey location. Data for which there were less than 0.1 B/h in Table 6 (e.g. *Myotis* sp.) have been included as 'other bat species'.

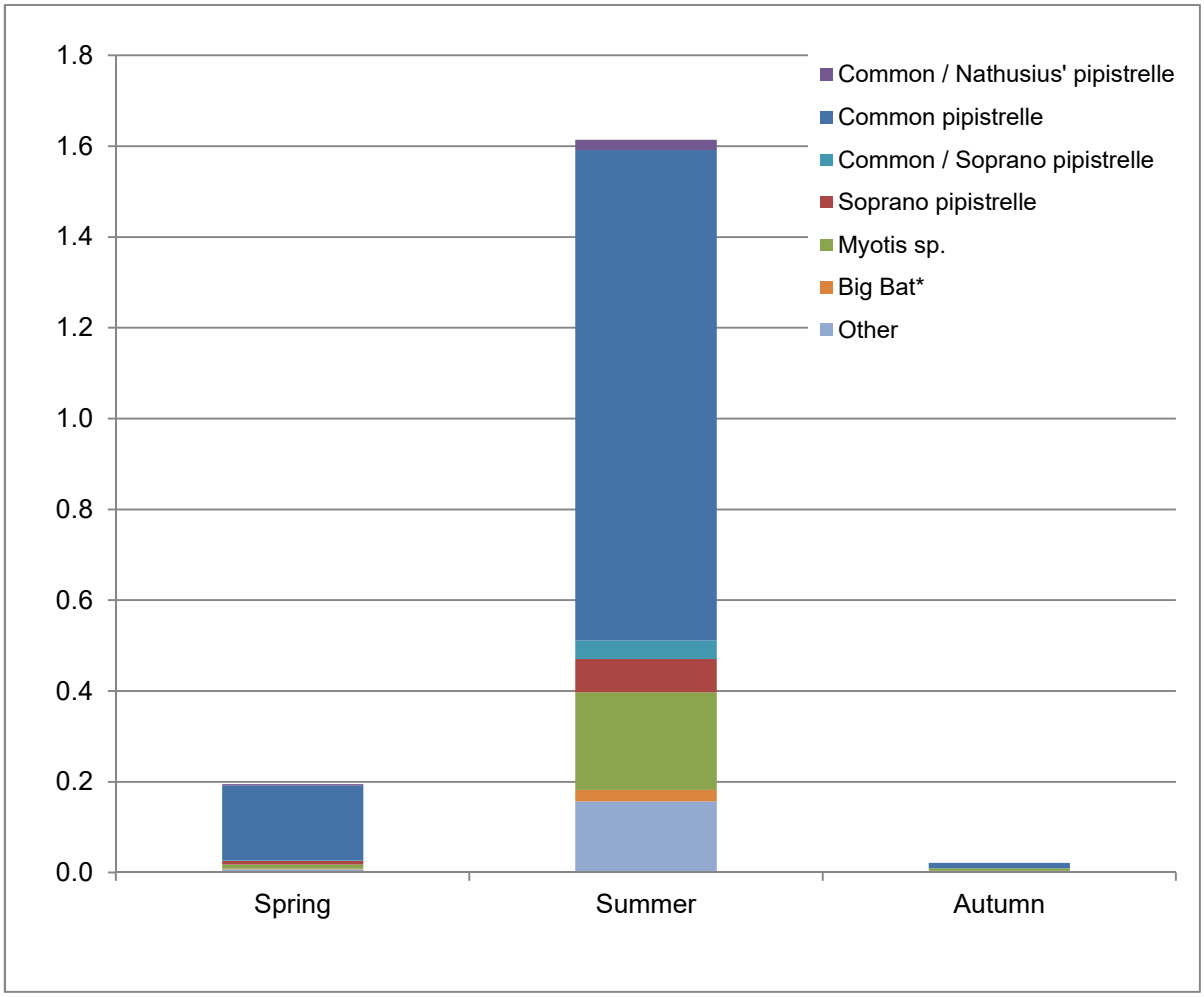
Table 3: Total number of bat passes (B) and bats passes per hour (B/h) for each bat species recorded during static surveys in 2019.

Species	**B**	**B/h**
Common / Nathusius' pipistrelle	15	**<0.1**
Common pipistrelle	736	**0.3**
Common / Soprano pipistrelle	25	**<0.1**
Soprano pipistrelle	47	**<0.1**
Long eared bat sp.	49	**<0.1**
Myotis sp.	136	**0.1**
Myotis sp. / Serotine	1	**<0.1**
Serotine	3	**<0.1**
Leisler's bat	2	**<0.1**
Noctule	11	**<0.1**
Unidentified bat species	50	**<0.1**
Total	**1075**	**0.5**

9.49 The highest activity rate was recorded for common pipistrelle (B=736; 0.3 B/h). *Myotis* sp. bats were recorded at a rate of 0.1 B/h. Low numbers of passes were recorded for all other species (<0.1 B/h).

9.50 The highest overall activity was recorded in summer (B=947; 1.6 B/h), with lower activity during the spring (B=107; 0.2 B/h), and autumn (B=21; <0.1 B/h) periods. This is illustrated in Graph 3 below. Patterns of activity for individual species are discussed in the following section.

Graph 3: Monthly variation in bat activity (B/h) during 2019



*Big Bat refers to Noctule, Leisler's bat and serotine.

9.51 The data presented in Table 4 show the activity of each species at the different locations sampled. This information is also illustrated as scaled pie charts in Figure 6.3. The number of bat passes recorded for each location can be found in Appendix 8.

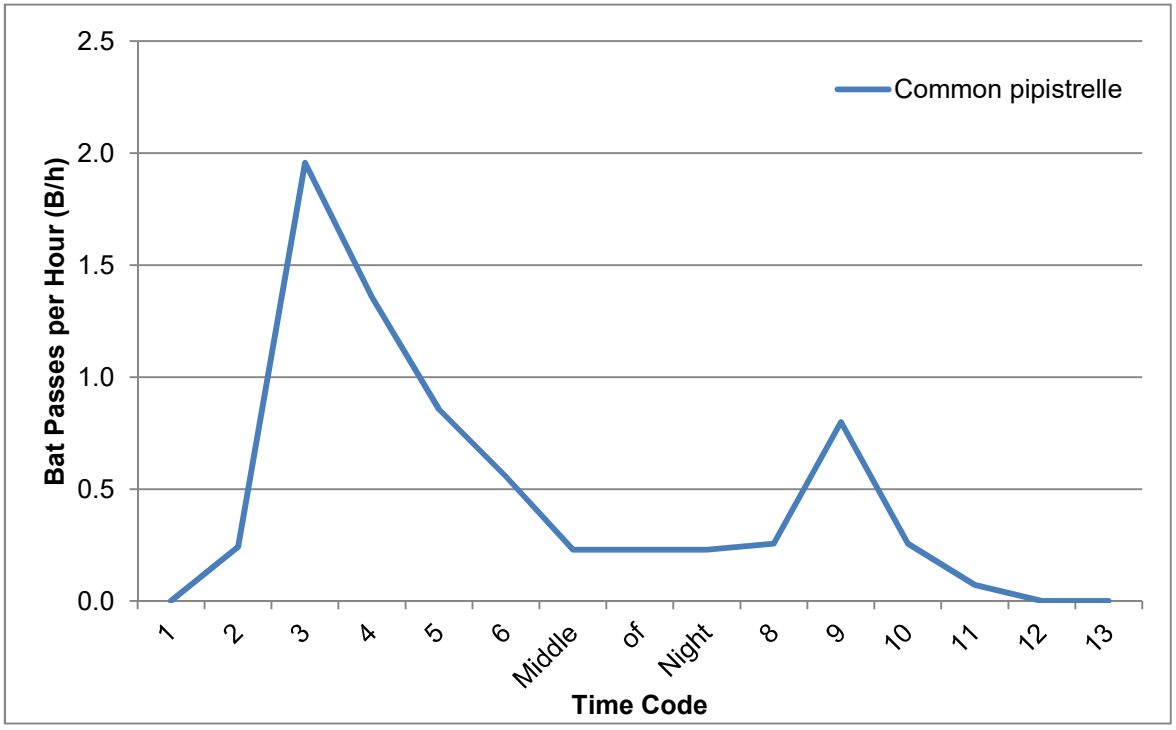
Table 4: Activity (B/h) of bat species at each detector location during 2019.

Species	D1	D2	D3	D4	D5	D6	D7	Total
Common / Nathusius' pipistrelle	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Common pipistrelle	0.1	0.1	0.5	0.9	0.4	0.3	0.1	**0.3**
Common / Soprano pipistrelle	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Soprano pipistrelle	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Long eared bat sp.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Myotis sp.	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	**0.1**
Myotis sp. / Serotine	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Serotine	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Leisler's bat	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Noctule	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Unidentified bat species	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	**<0.1**
Total	**0.2**	**0.2**	**0.8**	**1.3**	**0.5**	**0.5**	**0.1**	**0.5**

9.52 The highest levels of activity (1.3 B/h) were recorded at D4 followed by D3 (0.8 B/h). The lowest activity was recorded at D7 (0.1 B/h).

9.53 Graph 4 shows the activity of common pipistrelle bats throughout the night, other bat species were not recorded often enough for any pattern to be discernible. The highest levels of bat activity were recorded between 41 minutes and 100 minutes after sunset and again between 120 minutes and 61 minutes before sunrise. Differences in activity for individual bat species throughout the night are discussed below.

Graph 4: Activity (B/h) of common pipistrelle throughout the night, explanation of time code are given in Appendix 7.



Species accounts

Nathusius' pipistrelle

2015- 2018

9.54 There was one Nathusius' pipistrelle bat call recorded during the survey period, on 9 June 2016 at 03:59.

9.55 There were 196 passes recorded during the 2015, 2016 and 2018 survey work that could have been either Nathusius' pipistrelle or common pipistrelle but could not be determined to species level due to overlapping call parameters. These were recorded in spring and summer 2016 and autumn 2018 (165 passes in spring 2016, 16 passes in summer 2016, 15 passes in autumn 2018, 2 passes in spring 2019, and 13 passes in summer 2019), and occurred most frequently at the beginning and end of the night (the same pattern as common pipistrelle, and therefore most likely to be this species).

2019

9.56 No confirmed passes of this species was recorded during the 2019 survey work.

9.57 There were 15 passes during the 2019 survey work that could have been either Nathusius' pipistrelle or common pipistrelle. The majority of passes (13) were recorded during the summer period. None were recorded during the autumn.

Common pipistrelle

2015- 2018

9.58 Common pipistrelles were recorded in spring and summer 2016 and autumn 2018, and at all detector locations during the survey period. Bat activity was highest in spring (20.8 B/h), followed by autumn (1.0 B/h)32, with summer having lowest level of activity (0.2 B/h).

9.59 The highest activity was recorded from 41 minutes and 100 minutes after sunset (10.6-11.0 B/h), this reduced during the middle of the night (1.4 B/h). There was a secondary peak in activity between 120 minutes and 61 minutes before sunrise (4.6-7.6 B/h). No bat passes were recorded later than 39 minutes before sunrise, and only two passes (both at detector D4 on 26 September 2018) were recorded earlier than 40 minutes after sunset, suggesting that the presence of a local roost is unlikely.

9.60 There were 67 bat passes that could have been either common pipistrelle or soprano pipistrelle, based on overlapping call parameters. The majority of passes were recorded during the middle of the night, and patterns in activity matched those for both common and soprano pipistrelle species

2019

9.61 Common pipistrelles were recorded during all sample periods, and at all detector locations during 2019. Bat activity was highest in summer (1.1 B/h), followed by spring (0.2 B/h), with autumn having lowest level of activity (<0.1 B/h).

9.62 The highest activity was recorded from 41 minutes to 60 minutes after sunset (2 B/h), this reduced during the middle of the night (0.2 B/h). There was a secondary peak in activity between 100 minutes and 81 minutes before sunrise (0.8 B/h). No bat passes were recorded later than 40 minutes before sunrise, and only two passes (both at detector D3 on 02 August 2019) were recorded earlier than 30 minutes after sunset (25 minutes and 27 minutes after sunset respectively).

[32] No passes by this species was recorded during the autumn 2015 sampling period

9.63 There were 25 bat passes that could have been either common pipistrelle or soprano pipistrelle, based on overlapping call parameters. The majority of passes (16) were recorded during the middle of the night, with no passes recorded earlier than 40 minutes after sunset or later than 80 minutes before sunrise.

Soprano pipistrelle

2015- 2018

9.64 Soprano pipistrelles were recorded at D1, D3 and D4 during spring 2016 and autumn 2018. Passes by this species were only recorded at D2 during autumn 2018. The highest level of overall activity was recorded at D1 (0.4 B/h) followed by D3 (0.3 B/h) then D4 (0.2 B/h). These results are shown in Figure 6.3.

9.65 The highest activity was recorded from 81-120 mins after sunset (1.5-1.2 B/h), activity then dropped to 0.1 B/h and remained low for the rest of the night period.

2019

9.66 Soprano pipistrelles were recorded infrequently at all detector locations during 2019. The majority of passes were recorded at detector D4 (23 passes of a total 47 recorded across the Site). No passes by this species were recorded during the autumn period; 43 were recorded during the summer, and 4 passes recorded during spring.

9.67 The highest activity was recorded from 41-100 mins after sunset (0.1 B/h). Activity was less than 0.1 B/h at all other times. No bats were recorded earlier than 48 minutes after sunset or 54 minutes before sunrise.

Myotis species

2015- 2018

9.68 Low numbers of *Myotis* sp. bat passes were recorded in spring (B=27) and summer (B=1) 2016, and in Autumn (B=9) 2018. The highest number of bat passes was recorded at D3 (B=25). Bat passes were most frequently recorded in the middle of the night (B=21).

2019

9.69 *Myotis* sp. passes were recorded most frequently in the period between 2 hours after sunset and 2 hours before sunrise (B=128 of a total 136 passes; 0.1 B/h), and most frequently during the summer period (B=126; 0.2 B/h).

Long-eared bat sp.

2015- 2018

9.70 One long-eared bat *Plecotus* sp. pass was recorded at D3 at 03:44 on 11 October 2015, and 31 passes recorded during the autumn 2018 sampling period. Passes were recorded at all detector locations in autumn 2018, with most passes at detector D3 (B=14). No activity by this species was recorded during the spring and summer sampling periods.

2019

9.71 Long-eared bats were recorded infrequently during 2019. The majority of activity (B=43 of a total 49 passes; 0.1 B/h) were recorded during the summer period.

Big bats

2015- 2018

9.72 No big bats (noctule, Leisler's bat or serotine) were recorded during survey work during 2015-2018.

2019

9.73 Noctule, Leisler's bat and serotine were recorded over the Site infrequently during the 2019 surveys. For noctule, a total of 11 passes (<0.1 B/h) were recorded, all during the summer period. Passes were recorded at all detectors except D1. Two passes of Leisler's bat were recorded during the survey: one on 02 June (at D2) and one on 01 August 2019 (at D6). Three passes were recorded for serotine (two on 01 August and one on 27 July 2019), all at detector location D4.

Weather Conditions

9.74 Weather conditions (including rainfall, wind speed and temperature) were recorded during the 2019 survey work using a Davis Vantage Vue portable weather station. The weather station was located adjacent to detector D5, and set at 2 m above ground level.

9.75 Table 7 shows the maximum and minimum figures for rainfall, wind speed and temperature when bats were recorded, and also over the survey period (including when no bats were recorded).

9.76 No bat passes were recorded above wind speeds of 12.9 m/s (Max 20.9 m/s) and no bat passes were recorded at temperatures below 4.1 °C (Min 1.6 °C).

Table 7: Minimum and maximum weather variables

		Rain	Wind Speed	Temperature
Spring	Maximum values	0.3	20.9	16.5
	Maximum values that bats were recorded	0.0	12.9	15.9
	Mean values	0.0	6.8	10.9
	Minimum values that bats were recorded	0.0	0.0	8.4
	Minimum values	0.0	0.0	5.7
Summer	Maximum values	0.2	7.2	18.1
	Maximum values that bats were recorded	0.2	7.2	17.7
	Mean values	0.0	3.4	13.6
	Minimum values that bats were recorded	0.0	0.4	10.6
	Minimum values	0.0	0.4	10.6
Autumn	Maximum values	7.1	13.0	13.1
	Maximum values that bats were recorded	5.84	11.6	13
	Mean values	0.5	5.5	6.4
	Minimum values that bats were recorded	0.0	0.9	4.1
	Minimum values	0.0	0.4	1.6
Total	**Maximum values**	7.1	20.9	18.1
	Maximum values that bats were recorded	5.84	12.9	17.7
	Mean values	0.2	5.3	9.6
	Minimum values that bats were recorded	0.0	0.0	4.1
	Minimum values	0.0	0.0	1.6

9.77 Correlation coefficients (Pearson's) were run to assess the importance of the relationship between bat activity and individual weather variables. Although some correlation was observed, these were statistically very weak. Table 8 gives the R values for the correlations, with a brief description of what these mean.

Table 8: Correlation coefficient of weather variables (+1 = 100% positive correlation, -1 = 100% negative correlation)

Weather variable	Rain	Wind Speed	Temperature
R value	-0.072	-0.162	0.319
Correlation	7 % negative correlation	16 % negative correlation	31 % positive correlation
Description	Fewer bat passes with increased rainfall	Fewer bat passes with increased wind speed	More bat passes with higher temperatures

Photographs

Photograph 1: south building	Photograph 2: north building
	

10 Great Crested Newt Survey

Aims of study

10.1 The aim of the survey was to identify whether great crested newt *Triturus cristatus* are present in the ponds within the Site (see Section 3) and adjacent to the NRW Forestry Track (see Section 4) using industry standard survey methods.

10.2 The results would inform the need for mitigation and licensing during construction of the wind farm (on the assumption it is consented).

Methods

10.3 Three ponds (P1 - P3) were identified within the Site during the Phase 1 survey visit in 2014 (see Section 3 and Figure 6.4). Two additional ponds (P4 and P5) were located adjacent to the existing NRW Forestry track during an ecological appraisal of the proposed access route in 2016 (see Section 4 and Figure 6.4). A Habitat Suitability Assessment (HSI) was carried out on each of the on-Site ponds during the Phase 1 survey, and the forestry track ponds during the ecological appraisal of the proposed access route following ARG UK (2010) guidance. The methods used to survey each of these ponds for the presence of great crested newt in 2016 are provided below.

On-Site Ponds P1 – P3

10.4 All great crested newt surveys in 2016 were led by a licensed surveyor (Gareth Lang ACIEEM, Niall Lusby MCIEEM and Rachel Taylor ACIEEM) and conducted in accordance with guidance provided by Natural England (2001).

10.5 Four visits were made to each of the on-Site ponds between mid-March and mid-June 2016 (two visits were made between mid-April to mid-May 2016 in line with guidance) in order to determine the presence/absence of great crested newt. During each visit three different survey methods were utilised. These were: bottle trapping, torching and egg searching (egg strips were used to provide egg laying substrate which facilitated the egg search). The methods are provided below. The ponds were assessed again by Gareth Lang on 26 April 2020 and 17 May 2020 and found to be dry on both occasions as a result of a long period of dry weather. Subsequent checks of the ponds on 24 June (following a period of rainfall) confirmed that the ponds still retain water. However, no further survey of the ponds were completed as it was considered unlikely that great crested newt (if present locally) would have used the ponds due to unsuitable breeding conditions in 2020.

Bottle trapping

10.6 A total of 30 bottle traps were deployed at approximately 2 m intervals around the pond margins during the early evening. Ponds P1 and P2 had 15 bottle traps each and the Flooded Track (P3) had 10. Fourteen bottle traps were deployed in Pond P2 on the last visit (19 May 2016) because one of the bottle traps had been damaged and was unsuitable for use. The traps were checked for the presence of newts and removed from the ponds early the following morning. Any animals found were identified, counted and released.

10.7 Bottle traps were deployed at the ponds during evening visits on 14 April 2016, 18 April 2016, 05 May 2016 and 19 May 2016. The traps were then checked during the following morning of each visit.

Torch survey

10.8 A search for great crested newt was made after sunset by shining a high power (1 million candlepower) torch (Clulite) into the water at each pond. The perimeter of each pond was slowly walked once, and all newts seen were identified to species level, sexed and recorded. It is not

always possible to differentiate between smooth and palmate newts (particularly females) due to the often limited views of individual newts seen during the torch survey.

10.9 Torch surveys were carried out at the ponds during evening visits on 14 April 2016, 18 April 2016, 05 May 2016 and 19 May 2016.

Egg search

10.10 The submerged vegetation in the ponds was searched for the presence of great crested newt eggs. Eggs are usually found folded in the leaves of plants such as water mint *Mentha aquatica*, but can also be found in dead leaves and overhanging grasses.

10.11 Due to the limited availability of suitable aquatic vegetation for great crested newt to lay their eggs on, egg strips were made (using black plastic bags cut into strips and attached to bamboo canes using tape) and deployed in all three ponds (Ponds P1 and P2 had three egg strips each and the Flooded Track (P3) had four). These were placed in the ponds where they provided an artificial substrate for great crested newt to lay their eggs on. Egg strips were deployed during the first visit (14 April 2016) and collected (because no eggs were found during each subsequent check) on the last visit (20 May 2016).

10.12 Egg searching of vegetation and egg strips was carried out at the ponds during the mornings of 15 April 2016, 19 April 2016, 06 May 2016 and 20 May 2016.

Access Route Ponds P4 and P5

10.13 The ponds adjacent to the NRW Forestry track (P4 and P5) were surveyed on 27 April 2017 using an eDNA sample technique in accordance with the published methods (Williams, 2013) presented in DEFRA's Technical Advice Note WC1067 (Biggs *et al* 2014). eDNA survey was considered the most appropriate survey method due to the likelihood of the ponds returning a negative result. This initial conclusion was based on the isolation of the ponds from other ponds networks in the local area, and the absence of great crested newt from the site (inferred following survey of the on-site ponds). The ponds were assessed again during an updated Phase 1 survey of the Access Track by Caroline O'Rourke on 04 June 2020. However, P5 was found to hold very little standing water (< 10 cm) and considered unlikely to support great crested newt.

eDNA survey

10.14 eDNA sample collection at ponds P4 and P5 was taken by Rachel Taylor ACIEEM on 27 April 2017 and again at pond P4 by Gareth Lang on 24 June 2020. The surveys were conducted in accordance DEFRA's Technical Advice Note WC1067.

10.15 Twenty sub-samples were taken from each of ponds P4 and P5 in 2016 and P4 in 2020, with sampling points spaced as evenly as possible around the accessible pond margins. The resultant whole-sample for each pond was then used to fill six sample tubes, each containing 35 mL of ethanol to preserve the eDNA sample. The samples were stored in a cooled box prior to return for analysis.

10.16 The analyses reports for the 2017 and 2020 surveys were issued by SureScreen Scientifics on 04 May 2017 and 09 July 2020 respectively (provided in Appendix 9).

10.17 Water samples were collected within the specified survey window for eDNA analysis, and in accordance with the published methods (Williams 2013). Two ponds were sampled. These were labelled Pond 1 and Pond 2 in the report and relate to ponds P4 and P5 respectively.

Results

Desk Study

10.18 No records of great crested newt within 2 km of the Site were returned by SEWBReC. The closest 1 x 1 km Grid Square in which great crested newt records have been recorded is approximately 8.8 km to the south-east of the Site, in Penygraig. The closest waterbody (excluding the three ponds on Site) was approximately 1 km from the three survey ponds. No surveys were required due to the distance of this pond from the Site.

Field Survey

10.19 The results of the HSI assessment in 2016 indicated that all three on-Site ponds surveyed are average in terms of their potential for great crested newt (see Table 1 for the HSI baseline data). The assessment of the forestry track ponds indicate that both have below average potential to support great crested newt. All on-site ponds (Photographs 6 – 8) and one of the forestry track ponds (Photograph 9) were found to be dry during an update assessment visit in 2020. The results below relate to the 2016 assessment only.

Table 1. HSI Baseline data[33]

HSI Factor	Pond P1	Pond P2	Flooded Track P3	Pond P4	Pond P5
Geographic location	B (0.5)	B (0.5)	B (0.5)	B (0.5)	B (0.5)
Pond area	113 m^2 (0.2)	113 m^2 (0.2)	150 m^2 (0.3)	15 m^2 (0.1)	56 m^2 (0.1)
Permanence	Rarely dries (1)	Rarely dries (1)	Sometimes dries (0.5)	Sometimes dries (0.5)	Sometimes dries (0.5)
Water quality	Moderate (0.67)	Moderate (0.67)	Moderate (0.67)	Moderate (0.67)	Moderate (0.67)
Shade	0% (1)	0% (1)	0% (1)	40% (1)	30% (1)
Fowl	0 (1)	0 (1)	0 (1)	0 (1)	0 (1)
Fish	0 (1)	0 (1)	0 (1)	0 (1)	0 (1)
Pond count	2 (0.55)	2 (0.55)	2 (0.55)	1 (0.45)	1 (0.45)
Terrestrial	Good (1)	Good (1)	Good (1)	Good (1)	Good (1)
Macrophytes	30% (0.6)	30% (0.6)	10% (0.4)	10% (0.4)	10% (0.4)
Score	0.68 Average	0.68 Average	0.64 Average	0.56 Below average	0.56 Below average

On Site Ponds P1 – P3

10.20 GCN surveys were conducted under licence between 14 April and 20 May 2016 by principal ecologist Matthew Hobbs, ecologist Gareth Lang and ecologist Hannah Meinertzhagen. On each visit, weather conditions, including air temperature, were recorded. **Table 2** gives details of the surveys.

[33] Bracketed numbers indicate Suitability Indices as defined in ARG UK (2010)

Table 2. Details of GCN surveys

Visit number	Date	Survey methods used[34]	Weather conditions[35]
1	14th April 2016	BT, TL, ES	7˚C, dry, wind: 0
2	18th April 2016	BT, TL, ES	9˚C, dry, wind: 1
3	5th May 2016	BT, TL, ES	10˚C, dry, wind: 0
4	19th May 2016	BT, TL, ES	7˚C, dry, wind: 4

10.21 The survey results are summarised in Table 3 below. No GCN were found in any of the ponds surveyed during the four required presence/absence surveys, and so additional population estimate surveys were not required (Natural England, 2001). Palmate newts were recorded in the Flooded Track (P3), with a peak count of 5 male newts on 05 May 2016. Small newts (either smooth or palmate) which could not be identified under torch light were present in all ponds, with a peak count of 9 individuals in Pond P2 on 05 May 2016. Common frog spawn and tadpoles were also present in all three ponds.

Table 3. Summary of GCN survey results

Pond	Visit	Torchlight	Bottle trap	Egg search
P1	1	0	0	0
	2	1 small newt	0	0
	3	2 small newt	0	0
	4	0	2 palmate	0
P2	1	0	0	0
	2	1 small newt	0	0
	3	9 small newt	0	0
	4	0	0	0
P3 (Flooded Track)	1	0	0	0
	2	1 small newt	0	0
	3	5 palmate	5 palmate	0
	4	9 small newt	0	0

Limitations

10.22 Surveys of the on-site ponds were undertaken within the recommended survey period and in suitable weather conditions. Only 14 bottle traps (rather than 15) were deployed at Pond P2 on the final visit (19 May 2016), however, it is unlikely this had any bearing on the results.

[34] BT = bottle trap, TL = torchlight, ES = egg search

[35] 1 = calm, 2 = moves smoke, 3 = moves leaves and twigs, 4 = loose paper raised, 5 = small trees sway, 6 = large branches move.

Access Route Ponds P4 and P5

10.23 The eDNA test returned a negative result with regard to great crested newts for both ponds sampled in 2017 and for the pond (P4) resampled in 2020. All samples passed tests for sample integrity, degradation, and inhibition as carried out by the laboratory. The full eDNA results are set out in Appendix 9.

Photographs

Photograph 1: On-Site pond P1 (2016).	**Photograph 2:** On-Site pond P2 (2016).
	

Photograph 3: On-Site pond P3 (flooded track) (2016)	**Photograph 4**. Pond P4 adjacent to NRW Forestry track (2017)
	

Photograph 5. Pond P5 adjacent to NRW Forestry track (2017)	**Photograph 6**. On-Site pond P1 was dry through April and May 2020.
	

Photograph 7. On-Site pond P2 was dry through April and May 2020.	**Photograph 8:** Track at P3 previously flooded but dry in 2020
	

Photograph 9. Pond P4 adjacent to NRW Forestry track (2020)	**Photograph 10**. Pond P5 adjacent to NRW Forestry track considered too shallow for eDNA sampling in 2020.
	

11 Water Vole Survey

Aims of study

11.1 The aims of the water vole survey were to:

- Assess whether watercourses within the Survey Area had the potential to support water vole *Arvicola amphibius*.
- Establish the likely presence/absence of water vole, and if present, their distribution throughout the Survey Area.

Methods

Field survey

11.2 The water vole survey in 2016 was conducted by Senior Ecologist Gareth Lang ACIEEM and Ecologist Hannah Meinertzhagen GradCIEEM. The survey included two visits to cover potentially suitable habitat for water vole within the Survey Area, as recommended within the Water Vole Mitigation Handbook (Dean *et al*., 2016). The six tributaries and the wet flush identified in 2014 were surveyed for water vole. The first visit was conducted during the first half of the breeding season (defined in Dean *et al*. (2016) as mid-April – end of June) and the subsequent visit was conducted during the second half of the breeding season (defined as July to September inclusive).

11.3 An update survey visit was competed in May 2020 by Gareth Lang. The dates and times of the visits, surveyors and weather conditions during survey are provided in Table 1 (below). For all survey visits, all accessible watercourses and waterbodies were inspected for field signs of water vole, such as latrines (piles of two or more faecal pellets), feeding stations, grazed lawns, burrows (wider than high, diameter 4-8 cm), runs and footprints.

11.4 In addition, an assessment was made of whether individual watercourses have potential to support water vole. The Water Vole Mitigation Handbook describes favourable water vole habitat as having dry areas above water level for nesting, herbaceous vegetation to provide food and cover, and water as a means of escape from predators.

Table 1. Dates and times of water vole survey visits.

Visit Number	Date	Time	Surveyor[36]	Weather
1a	08 June 2016	12:00-16:45	GL	Sunny, warm, and calm.
1b	09 June 2016	10:00-12:20	HM	Sunny, warm, and calm.
2	03 August 2016	12:00-16:30	GL+HM	Overcast, cool, occasional light rain
3	17 May 2020	12:00-16:00	GL	Sunny, warm, and breezy.

Results

Desk Study

11.5 The data request from SEWBReC and an on-line search of the NBN Gateway did not provide any records of water vole within 2 km of the Site boundary.

[36] GL: Gareth Lang. HM: Hannah Meinertzhagen.

Field Survey

Habitat Suitability for Water Vole

11.6 Scottish Natural Heritage (www.snh.org.uk)[37] describes good quality upland water vole habitat as "comprising sedge-rich areas, including grasses, rushes and heather adjacent to slow flowing, shallow burns with moderately steep banks and penetrable (often peaty) substrate."

11.7 The watercourses surveyed were mostly narrow and quite steep in places. The bank substrate is predominately peat with occasional clay and rock. Water depth varied but was shallow throughout (did not exceed 40 cm). Parts of the watercourses were dry on the first visit and filled with fast flowing water on the second visit. All watercourses are lined with dense grasses and rushes, leading to heavy shading in some places. There are also occasional underground sections of all surveyed watercourses. There is no indication that the watercourses are managed in any way (Photographs 1 – 4 at the end of this section show the character of the watercourses).

11.8 The wet flush, where field signs of water vole were found, did not have an obvious flow of water during the survey visits, but was wet and boggy throughout. The water depth in this area did not exceed 20 cm. The vegetation cover is extensive and dominated by mosses, grasses and rushes on a peat substrate, leaving very few areas of open water. There are no shrubs or trees but some tall rushes are present which may provide localised shading. There is no indication that the wet flush is managed in any way.

11.9 The watercourses and wet flush within the survey area have features that are suitable for water vole (grasses, rushes, moderately steep penetrable peat banks, with shallow slow flowing water in places) and features that are less desirable (clay and rock banks, and fast flowing water in some places following heavy rain).

Evidence of Water Vole

11.10 Field signs of water vole were found during the surveys of the wet flush. Five latrines and one feeding station were found on 09 June 2016 (Photograph 5) and four latrines were found in the same area on 03 August 2016 (Photograph 6).

11.11 No field signs that clearly establish the presence of water vole were observed along the watercourses. Some burrows that had dimensions suitable for use by water vole and/or bank vole *Myodes glareolus* and rats were noted (Photographs 7, 8 and 9), but did not exhibit signs of current use and were not associated with latrines, feeding stations, footprints or grazed lawns. Table 2 (below) provides a summary of the field signs found at each water body/course during the water vole survey.

11.12 No evidence of recent use of burrows, or any feeding signs or droppings, were recorded during the visit in May 2020.

Table 2. Summary of field signs found during the water vole survey.

Watercourse/body	Burrow	Latrine	Feeding Station
Watercourse 1	2	0	0
Watercourse 2	0	0	0
Watercourse 3	2	0	0
Watercourse 4	0	0	0
Watercourse 5	0	0	0

[37] Scottish Natural Heritage (http://www.snh.org.uk/publications/on-line/wildlife/voles/management.asp# upland)

Watercourse/body	Burrow	Latrine	Feeding Station
Watercourse 6	0	0	0
Pond 1	0	0	0
Pond 2	0	0	0
Pond 3	0	0	0
Wet flush	0	9	1

Limitations of Study

11.13 Many sections of the watercourses were deep narrow channels which were often concealed from above by vegetation (grasses and rushes) and were occasionally subterranean for short lengths. This impeded the view of some parts of the watercourses. This limitation is not likely to be significant as the majority of the watercourses were accessible and visible.

Photographs

Photographs 1 and 2: Bankside vegetation comprised mainly grasses and rushes

Photographs 2 and 3: Water flows quickly through the streams following periods of rainfall

Photograph 5: A latrine (left) and a feeding station (right) found in the wet flush on visit 1 (09 June 2016).

Photograph 6: A latrine found in the same wet flush on visit 2 (03 August 2016).

Photographs 7and 8: Potential water vole burrows found at watercourse 1 on 08 June 2016

Photograph 9: Potential water vole burrows found at watercourse 3 on 08 June 2016

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Appendix 1: Phase 1 Target Notes

Appendix 2: Phase 2 Botanical Survey Domin Scale

A quantitative measure of abundance of every species was recorded using the Domin scale (Rodwell 1991, 1992) as shown below.

Cover	Domin Score
91 – 100%	10
76 – 90%	9
51 -75%	8
34 -50%	7
26 -33%	6
11 -24%	5
4 – 10%	4
<4% (with many individuals)	3
<4% (with several individuals)	2
<4% (with few individuals)	1

Appendix 3: Phase 2 Botanical Survey Frequency Tables

Area 1 M19 (*Calluna vulgaris* – Eriophorum vaginatum blanket mire) / M20 (*Eriophorum vaginatum* blanket and raised mire) transition		**Quadrats**					**Frequency**
Plant Species		**1**	**2**	**3**	**4**	**5**	
Purple moor-grass	*Molinia caerula*	7	7	5	6	6	v
Wavy hair-grass	*Deschampsia flexuosa*	5	5	4	4	0	v
Hare's-tail cottongrass	*Eriophorum vaginatum*	4	5	6	4	6	v
Common cottongrass	*Eriophorum angustifolium*	4	4	5	6	6	v
Springy turf moss	*Rhytidiadeplhus squarrosus*	2	2	4	4	2	v
Lustrous bog-moss	*Sphagnum subnitens*	5	4	6	7	6	v
Neat feather moss	*Pseudoscleropodium purum*	1	2	0	2	3	iv
Bilberry	*Vaccinium myrtillus*	3	3	3	0	0	iii
Fork mosses	*Dicranum* spp.	2	2	0	0	2	iii
Heath rush	*Juncus squarrosus*	4	4	0	0	0	ii
Common haircap	*Polytrichum commune* var. *commune*	2	4	0	0	0	ii
Heath milkwort	*Polygala serpyllifolia*	0	0	0	0	1	i
Sedges	*Carex sp.*	0	0	0	0	2	i

Area 2 M6 (*Carex echinata-Sphagnum recurvum/auriculatum* mire) / M23 *Juncus effusus / acutiflorus-Galium palustre*)		**Quadrats**					**Frequency**
Plant Species		**6**	**7**	**8**	**9**	**10**	
Purple moor-grass	*Molinia caerulea*	7	7	8	7	7	v
Soft rush	*Juncus effusus*	8	5	6	7	5	v
Sheep's-fescue	*Festuca ovina*	3	4	3	4	0	iv
Common haircap	*Polytrichum commune* var. *commune*	0	1	1	2	2	iv
Springy turf moss	*Rhytidiadelphhus squarrosus*	2	3	3	3	0	iv
Sweet vernal grass	*Anthoxanthum odoratum*	0	4	3	4	0	iii
Heath bedstraw	*Galium saxatile*	0	1	4	0	0	iii
Lemon scented fern	*Oreopteris limbosperma*	2	0	2	2	0	iii
Fork mosses	*Dicranum spp.*	0	0	0	3	3	iii
Weak feather moss	*Rhytidiadelphus loreus*	3	0	3	0	0	iii
Lustrous bog-moss	*Sphagnum subnitens*	4	3	5	0	6	iii
Wavy hair grass	*Deschampsia flexuosa*	0	0	0	2	0	i
Matt grass	*Nardus stricta*	0	0	0	1	0	i
Common heather	*Calluna vulgaris*	1	0	0	0	0	i
Bilberry	*Vaccinium myrtillus*	0	0	0	1	0	i
Heath rush	*Juncus squarrosus*	0	0	0	2	0	i
Pill sedge	*Carex pilulifera*	0	1	0	0	0	i
Hard fern	*Blechnum spicant*	0	0	0	2	0	i
Liverworts		3	0	0	0	0	i
Common hair cap	*Polytrichum commune*	0	1	0	0	0	i

Area 3 U6 (*Juncus squarrosus-Festuca ovina* grassland)		**Quadrats**					**Frequency**
Plant Species		**11**	**12**	**13**	**14**	**15**	
Purple moor-grass	*Molinia caerulea*	7	7	8	7	7	v
Sweet vernal grass	*Anthoxanthum odoratum*	8	5	6	7	5	v
Deer grass	*Trichophorum cespitosum*	3	4	3	4	0	v
Springy turf moss	*Rhytidiadelphus squarrosus*	0	1	1	2	2	v
Wavy hair grass	*Deschampsia flexuosa*	2	3	3	3	0	iv
Sheep's-fescue	*Festuca ovina*	0	4	3	4	0	iv
Heath rush	*Juncus squarrosus*	0	1	4	0	0	iv
Common haircap	*Polytrichum commune* var. *commune*	2	0	2	2	0	iv
Neat feather moss	*Pseudoscleropodium purum*	0	0	0	3	3	iii
Matt grass	*Ardus stricta*	3	0	3	0	0	ii
Bilberry	*Vaccinium myrtillus*	4	3	5	0	6	ii
Heath bedstraw	*Galium saxatile*	0	0	0	2	0	ii
Field wood rush	*Luzula camperstris*	0	0	0	1	0	ii
Heath wood rush	*Luzula multiflora*	1	0	0	0	0	ii
Common heather	*Calluna vulgaris*	0	0	0	1	0	i
Tormentil	*Potentilla erecta*	0	0	0	2	0	i
Hare's tail cottongrass	*Eriophorum vaginatum*	0	1	0	0	0	i
Tawny sedge	*Carex hostinana*	0	0	0	2	0	i
Fork mosses	*Dicranum* spp.	3	0	0	0	0	i
Lustrous bog-moss	*Sphagnum subnitens*	0	1	0	0	0	i

Area 4 Bog pool		**Quadrats**
Plant Species		**16**
Common toad rush	*Juncus bufonius*	4
Common cottongrass	*Eriophorum angustifolium*	6
Deer grass	*Trichophorum cespitosum*	4
Star sedge	*Carex echinata*	3
Carnation sedge	*Carex panicea*	5
Lustrous bog-moss	*Sphagnum subnitens*	4

Area 5 M25 (*Molinea caerulea-Potentilla erecta* mire) / degraded M15d (*Scirpus cespitosus-Erica tetralix* community)		**Quadrats**					**Frequency**
Plant Species		**17**	**18**	**19**	**20**	**21**	
Purple moor-grass	*Molinia caerulea*	8	9	9	9	8	v
Deer grass	*Trichophorum cespitosum*	4	0	2	2	0	iii
Neat feather moss	*Pseudoscleropodium purum*	3	0	0	1	1	iii
Wavy hair grass	*Deschampsia flexuosa*	4	0	0	5	0	ii
Sheep's-fescue	*Festuca ovina*	0	0	0	4	1	ii
Sweet vernal grass	*Anthoxanthum odoratum*	0	0	0	2	0	ii
Bilberry	*Vaccinium myrtillus*	0	0	0	1	0	ii
Heath bedstraw	*Galium saxatile*	0	0	0	0	1	ii
Marsh willowherb	*Epilobium palustre*	0	0	0	0	3	ii
Marsh thistle	*Cirsium palustre*	0	0	0	0	1	ii

Area 5 M25 (*Molinea caerulea-Potentilla erecta* mire) / degraded M15d (*Scirpus cespitosus-Erica tetralix* community)		**Quadrats**					**Frequency**
Plant Species		**17**	**18**	**19**	**20**	**21**	
Soft rush	*Juncus effusus*	0	0	0	0	3	ii
Hare's tail cottongrass	*Eriophorum vaginatm*	2	0	0	0	0	ii
Bottle sedge	*Carex rostrata*	0	3	0	0	3	ii
Common haircap	*Polytrichum commune* var. *commune*	3	0	0	3	0	ii
Fork mosses	*Dicranum* spp.	2	1	0	0	0	ii
Tawny sedge	*Carex hostinana*	0	0	0	0	1	i
Common yellow sedge	*Carex viridula*	0	0	0	0	1	i
Pill sedge	*Carex pilulifera*	0	0	0	3	0	i
Springy turf moss	*Rhytidiadelphus squarrosus*	2	0	0	0	0	i
Liverworts		2	0	0	0	0	i

Area 6 S9 (*Carex rostrata* swamp)		**Quadrats**					**Frequency**
Plant Species		**22**	**23**	**24**	**25**	**26**	
Purple moor-grass	*Molinia caerulea*	5	4	5	4	5	v
Soft rush	*Juncus effusus*	4	3	5	4	5	v
Bottle sedge	*Carex rostrata*	5	7	7	7	6	v
Marsh violet	*Viola palustris*	3	4	4	0		iv
Water starwort species	*Callitriche sp.*	0	1	1	1	3	iv
Marsh willowherb	*Epilobium palustre*	2	3	2	0	0	iii
Cuckoo flower	*Cardamine pratensis*	3	3	0	0	0	iii
Marsh bedstraw	*Galium palustre*	0	0	1	0	0	i
Common toad rush	*Juncus bufonius*	0	0	0	1	0	i
Lustrous bog-moss	*Sphagnum subnitens*	0	0	1	0	0	i

Area 7 U5a (*Nardus stricta-Galium saxatile* grassland, species-poor sub-community)		**Quadrats**					**Frequency**
Plant Species		**27**	**28**	**29**	**30**	**31**	
Purple moor-grass	*Molinea caerulea*	8	7	7	7	7	v
Wavy hair grass	*Deschampsia flexuosa*	4	5	4	4	1	v
Sheeps fescue	*Festuca ovina*	4	5	4	4	4	v
Sweet vernal grass	*Anthoxanthum odoratum*	4	5	5	5	5	v
Heath bedstraw	*Galium saxatile*	1	4	4	4	4	v
Heath wood rush	*Luzula multiflora*	1	2	1	2	0	v
Springy turf moss	*Rhytidiadelphus squarrosus*	4	4	4	4	4	v
Bilberry	*vaccinium myrtillus*	1	0	0	2	1	iii
Heath milkwort	*Polygala serpyllifolia*	1	1	0	0	1	iii
Tormentil	*Potentilla erecta*	2	0	0	1	0	ii
Matt grass	*Nardus stricta*	0	0	0	1	0	i
Annual meadow grass	*Poa annua*	0	0	1	0	0	i
Soft rush	*Juncus effusus*	0	0	2	0	0	i
Common yellow sedge	*Carex viridula*	0	0	0	0	4	i
Fork mosses	*Dicranum* spp.	0	0	1	0	0	i

Area 8a Semi-improved grassland		**Quadrats**
Plant Species		**32**
Pernnial rye-grass	*Lolium perenne*	4
Sweet vernal grass	*Anthoxanthum odoratum*	4
Rough meadow grass	*Poa trivialis*	9
Marsh thistle	*Cirsium palustre*	4
White clover	*Trifolium repens*	5
Procumberent pearlwort	*Sagina procumbens*	3
Common mouseear	*Cerastium fontanum*	3
Field wood rush	*Luzula camperstris*	3
Segdes	*Carex* spp.	2
Springy turf moss	*Rhytididelplhus squarrosus*	3

Area 8 U5a (Nardus stricta-Galium saxatile grassland, species-poor sub-community) within an area of semi-improved grassland		**Quadrats**					**Frequency**
Plant Species		**33**	**34**	**35**	**36**	**37**	
Purple moor-grass	*Molinia caerulea*	8	8	9	7	7	v
Sweet vernal	*Anthoxanthum odoratum*	5	5	5	5	4	v
Springy turf moss	*Rhytidiadelhus squarrosus*	5	5	4	4	4	v
Sheep's-fescue	*Festuca ovina*	4	4	4	0	0	iii
Heath bedstraw	*Galium saxatile*	0	2	3	4	0	iii
Soft rush	*Juncus effusus*	0	0	2	2	8	ii
Wavy hair grass	*Deschampsia flexuosa*	5	2	0	0	0	ii
Common haircap	*Polytrichum commune* var. *commune*	1	1	0	0	0	ii
Lemon scented fern	*Oreopteris limbosperma*	0	0	0	0	1	i
Bilberry	*Vaccinium myrtillus*	0	2	0	0	0	i

Appendix 4: Ornithological Survey 2014-2015 Detailed VP Data

Table 1a – Breeding season 2014 VP Dates and times

	VP Number			
Date	**1**	**2**	**3**	**4**
23/04/2014	13:30-16:30	17:30-20:30		
25/04/2014	16:30-19:30	12:30-15:30		
23/05/2014	16:00-19:00	12:00-15:00		
31/05/2014	18:00-21:00	04:50-07:50		
06/06/2014			13:00-16:00	08:45-11:45
19/06/2014	12:00-15:00	16:00-19:00		
25/06/2014	15:00-18:00			
26/06/2014		10:00-13:00		
05/07/2014	06:00-09:00		10:00-13:00	
17/07/2014		13:00-16:00		09:00-12:00
20/07/2014	14:00-17:00		10:00-13:00	
28/07/2014		12:00-15:00		
29/07/2014				10:00-13:00
09/08/2014	15:00-18:00		10:00-13:00	
16/08/2014		14:00-17:00		10:00-13:00
22/08/2014	07:00-10:00	11:00-14:00		
19/09/2014	15:00-18:00	11:00-14:00		
24/09/2014	06:35-09:35	11:00-14:00		
TOTAL	**36**	**36**	**12**	**12**

Table 1b – Winter season 2014/15 VP Dates and times

	VP Number	
Date	**1**	**2**
22/10/2014	11:30-14:30	15:15-18:15
28/10/2014	11:00-14:00	06:30-09:30
18/11/2014	09:45-12:45	13:30-16:30
25/11/2015	07:45-10:45	11:30-14:30
10/12/2014	07:45-10:45	11:30-14:30
19/12/2014	13:45-16:45	10:00-13:00
19/01/2015	11:30-14:30	07:45-10:45
26/01/2015	10:20-13:20	14:05-17:05
12/02/2015	07:15-10:15	11:00-14:00
26/02/2015	15:15-18:15	11:30-14:30
06/03/2015	10:25-13:25	06:40-09:40
19/03/2015	15:45-18:45	12:00-15:00
TOTAL	**36**	**36**

Table 2a. Breeding season 2014 VP weather data

Date	VP	Time	Wind	Rain	Cloud cover	Temp °C	KT flights	PE flights	ML flights	K flights	Notes
23/04/2014	1	13:30-16:30	E 1-2	Nil	4/8	10					No target species recorded
23/04/2014	2	17:30-20:30	E 1-2	Nil	7/8	9					No target species recorded
25/04/2014	1	16:30-19:30	E 1-2	Nil	5/8	8					No target species recorded
25/04/2014	2	12:30-15:30	E 2	Nil	4/8	12	2 (4)				
23/05/2014	1	16:00-19:00	W 2-3	Nil	2/8	10				1	
23/05/2014	2	12:00-15:00	W 3	Nil	8/8	12	1				
31/05/2014	2	04:50-07:50	W 2	Nil	8/8	9					No target species recorded
31/05/2014	1	18:00-21:00	SW 2	Nil	8/8	15	1				
06/06/2014	3	13:00-16:00	0	Nil	3/8	21					No target species recorded
06/06/2014	4	08:45-11:45	0	Nil	2/8	20			1		
19/06/2014	2	16:00-19:00	NE 3	Nil	2/8	21					No target species recorded
19/06/2014	1	12:00-15:00	0	Nil	2/8	21					No target species recorded
25/06/2014	1	15:00-18:00	SE 2-3	Nil	8/8	12					No target species recorded
26/06/2014	2	10:00-13:00	SE 2-4	Nil	6/8	14	1				
05/07/2014	1	06:00-09:00	SW 3-4	Nil	6/8	14					No target species recorded
05/07/2014	3	10:00-13:00	SW 3-4	Nil	2/8	16	1				
17/07/2014	2	13:00-16:00	E 3	Nil	3/8	17	1				
17/07/2014	4	09:00-12:00	E 3	Nil	2/8	18	1 (3)		1		
20/07/2014	1	14:00-17:00	E 3	Nil	6/8	17					No target species recorded
20/07/2014	3	10:00-13:00	E 2	Nil	4/8	16					No target species recorded
28/07/2014	2	12:00-15:00	NE 2	Nil	6/8	16	1 (2)	1			
29/07/2014	4	10:00-13:00	E 3-4	Nil	2/8	17	1				
09/08/2014	1	15:00-18:00	E 3-4	Nil	4/8	14					No target species recorded
09/08/2014	3	10:00-13:00	E 3-4	Nil	4/8	14	1				
16/08/2014	2	14:00-17:00	E 4-5	Nil	7/8	16	1 (2)				
16/08/2014	4	10:00-13:00	E 4-5	Nil	7/8	15	1				

Date	VP	Time	Wind	Rain	Cloud cover	Temp °C	KT flights	PE flights	ML flights	K flights	Notes
22/08/2014	1	07:00-10:00	W 5	Nil	6/8	15					No target species recorded
22/08/2014	2	11:00-14:00	W 4-5	Nil	4/8	14	1 (2)				
19/09/2014	2	11:00-14:00	NE 0-1	Mist	8/8	13					No target species recorded
19/09/2014	1	15:00-18:00	NE 1-2	NIL	8/8	15					No target species recorded
24/09/2014	1	06:35-09:35	NW 1-3	NIL	8/8	13					No target species recorded
24/09/2014	2	11:00-14:00	NW 2-3	LIGHT	8/8	15				1	

Table 2b. Winter season 2014/15 VP weather data

Date	VP	Time	Wind	Rain	Cloud cover	Temp °C	KT flights	HH Flights	ML flights	K flights	SE Flights	GP Flights	Notes
22/10/2014	1	11:30-14:30	SW 4	NIL	8/8	10	3						
22/10/2014	2	15:15-18:15	SW 3-4	LIGHT	8/8	8							No target recorded
28/10/2014	1	11:00-14:00	S 2	NIL	7/8	12	12	4	1	1		1 (7)	
28/10/2014	2	06:30-09:30	S 1-2	NIL	8/8	8							No target recorded
18/11/2014	1	09:45-12:45	NE 3	NIL	8/8	7				1			
18/11/2014	2	13:30-16:30	NE 2-3	NIL	5/8	7			1	4			
25/11/2015	1	07:45-10:45	NE 2	NIL	6/8	3	1						
25/11/2015	2	11:30-14:30	NE 2-3	NIL	8/8	3							No target recorded
10/12/2014	1	07:45-10:45	W 4	NIL	4/8	3				1			
10/12/2014	2	11:30-14:30	W 4	NIL	2/8	4							No target recorded
19/12/2014	1	13:45-16:45	W 4	NIL	1/8	4							No target recorded
19/12/2014	2	10:00-13:00	W4	LIGHT	5/8	3							No target recorded
19/01/2015	1	11:30-14:30	WNW 1	NIL	0/8	0							No target recorded
19/01/2015	2	07:45-10:45	N 1	NIL	0/8	-3						1	
26/01/2015	1	10:20-13:20	WNW 3	NIL	7/8	4				1		4 (14, 12, 5, 7)	
26/01/2015	2	14:05-17:05	NW 3	NIL	7/8	4							No target recorded
12/02/2015	1	07:15-10:15	E 0-1	NIL	8/8	2					2		
12/02/2015	2	11:00-14:00	E 1	NIL	8/8	2	1			1		2 (43, 43)	
26/02/2015	2	11:30-14:30	W 4-5	NIL	8/8	4						1 (13)	
26/02/2015	1	15:15-18:15	SW 4-5	NIL	7/8	5							No target recorded
06/03/2015	2	06:40-09:40	SW 2-3	NIL	8/8	3							No target recorded
06/03/2015	1	10:25-13:25	SW 2-3	NIL	6/8	4	2			1			
19/03/2015	2	12:00-15:00	NE 1	NIL	1/8	10	1					1	No target recorded
19/03/2015	1	15:45-18:45	N 1	NIL	1/8	10							No target recorded

Table 3a – Breeding bird season 2014 detailed flight data

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
KT1	Red Kite	3		360		2	25/04/2014
KT2	Red Kite	1	15	45		2	25/04/2014
K.1	Kestrel	1	15	75		1	23/05/2014
KT3	Red Kite	1	30			2	23/05/2014
KT4	Red Kite	1	45	15		1	31/05/2014
ML1	Merlin	1	60			4	06/06/2014
KT5	Red Kite	1	75	30		2	26/06/2014
KT6	Red Kite	1	60			3	05/07/2014
KT7	Red Kite	1	120			2	17/07/2014
KT8	Red Kite	3	45			4	17/07/2014
ML2	Merlin	1	30			4	17/07/2014
PE1	Peregrine Falcon	1	60			2	28/07/2014
KT9	Red Kite	2	180			2	28/07/2014
KT10	Red Kite	1	120	15		4	29/07/2014
KT11	Red Kite	1	90	15		3	09/08/2014
KT12	Red Kite	2	75			2	16/08/2014
KT13	Red Kite	1	90			4	16/08/2014
KT14	Red Kite	2	75	30		2	22/08/2014
K.2	Kestrel	1		75		2	24/09/2014

Table 3b – Winter season 2015/16 detailed flight data

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
KT1	Red Kite	1	30	150		1	22/10/2014
KT2	Red Kite	1	60	45		1	22/10/2014
KT3	Red Kite	1	30	190	155	1	22/10/2014
K.1	Kestrel	1	30			1	28/10/2014
HH1	Hen Harrier	1	30			1	28/10/2014
KT4	Red Kite	1	15	60		1	28/10/2014
KT5	Red Kite	1	150			1	28/10/2014
KT6	Red Kite	1		465		1	28/10/2014
KT7	Red Kite	1	60	15		1	28/10/2014
HH2	Hen Harrier	1		15		1	28/10/2014
HH3	Hen Harrier	1	30			1	28/10/2014
KT8	Red Kite	1		45		1	28/10/2014
GP1	Golden Plover	7	15			1	28/10/2014
KT9	Red Kite	1	15	195		1	28/10/2014
KT10	Red Kite	1		210		1	28/10/2014
KT11	Red Kite	1		45		1	28/10/2014
HH4	Hen Harrier	1	75	45		1	28/10/2014
KT12	Red Kite	1	15	30		1	28/10/2014
KT13	Red Kite	1		195		1	28/10/2014
KT14	Red Kite	1		60		1	28/10/2014
ML1	Merlin	1		45		1	28/10/2014
K.2	Kestrel	1	225	195		1	18/11/2014
ML2	Merlin	1	60			2	18/11/2014
K.3	Kestrel	1	45			2	18/11/2014
K.4	Kestrel	1	20	325		2	18/11/2014
K.5	Kestrel	1	75			2	18/11/2014
K.6	Kestrel	1	15			2	18/11/2014
KT15	Red Kite	1	60	15		1	25/11/2014
K.7	Kestrel	1	60	15		1	10/12/2014
GP2	Golden Plover	1	15			2	19/01/2015
GP3	Golden Plover	14	15	45	30	1	26/01/2015
K.8	Kestrel	1	60	30		1	26/01/2015
GP4	Golden Plover	12	60	70	20	1	26/01/2015
GP5	Golden Plover	5		15	15	1	26/01/2015
GP6	Golden Plover	7		195		1	26/01/2015
SE1	Short-eared Owl	1	30			1	12/02/2015
SE2	Short-eared Owl	1	60			1	12/02/2015
GP7	Golden Plover	43	105			2	12/02/2015

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
GP8	Golden Plover	43	15	60		2	12/02/2015
KT16	Red Kite	1	45	15		2	12/02/2015
K.9	Kestrel	1	45	165		2	12/02/2015
GP9	Golden Plover	13	15	30		2	26/02/2015
KT17	Red Kite	2			45	1	06/03/2015
K.10	Kestrel	1	30	105	75	1	06/03/2015
KT18	Red Kite	1		135		1	06/03/2015
KT19	Red Kite	1	45	30		2	19/03/2015

Appendix 5: Ornithological Survey 2015-2016 Detailed VP Data

Table 1a – Breeding season 2015 VP Dates and times

Date	VP Number	
	1	2
16/04/2015	16:15-19:15	12:45-15:45
29/04/2015	10:30-13:30	06:45-09:45
13/05/2015	10:45-13:45	14:30-17:30
28/05/2015	16:30-19:30	
29/05/2015		12:00-15:00
04/06/2015	09:00-12:00	05:15-08:15
25/06/2015	15:00-18:00	18:45-21:45
23/07/2015	18:45-21:45	15:00-18:00
31/07/2015	05:45-08:45	09:30-12:30
24/08/2015	13:30-16:30	09:45-12:45
28/08/2015	10:45-13:45	07:00-10:00
09/09/2015	10:30-13:30	14:15-17:15
29/09/2015	12:30-15:30	16:15-19:15
TOTAL	**36**	**36**

Table 1b – Winter period 2015/16 VP Dates and times

Date	VP Number	
	1	2
12/10/2015	07:15-10:15	11:00-14:00
19/10/2015	12:15-15:15	15:45-18:45
12/11/2015		08:00-09:30
20/11/2015	10:30-13:30	07:45-09:45
25/11/2015	13:30-16:30	09:45-12:45
07/01/2016	13:15-16:15	09:45-12:45
15/01/2016	13:00-16:00	09:00-12:00
28/01/2016	07:30-10:30	11:15-14:15
10/02/2016	10:15-13:15	14:00-17:00
16/02/2016	11:15-14:15	07:30-10:30
24/02/2016	07:00-10:00	10:45-13:45
04/03/2015	10:45-13:45	
21/03/2016	13:15-16:15	09:30-12:30
31/03/2016		17:00-20:00
TOTAL	**36**	**36.5**

Table 2a. Breeding season 2015 VP weather data

Date	VP	Time	Wind	Rain	Cloud cover	Temp °C	KT flights	PE flights	HH flights	ML flights	K flights	HY Flights
16/04/2015	1	16:15-19:15	E 1-2	NIL	5/8	15						
16/04/2015	2	12:45-15:45	NNE 2	NIL	1/8	16	1					
29/04/2015	1	10:30-13:30	SW 3	NIL	6/8	5	1					
29/04/2015	2	06:45-09:45	SW 2	SLEET	8/8	3						
13/05/2015	1	10:45-13:45	E 1-2	NIL	3/8	14	6 (10)					
13/05/2015	2	14:30-17:30	NE 1-2	NIL	3/8	16	3 (4)					
28/05/2015	1	16:30-19:30	W 3	NIL	4/8	13					2	
29/05/2015	2	12:00-15:00	W 2-3	NIL	6/8	10					1	
04/06/2015	1	09:00-12:00	SE 2	NIL	0/8	10	3				1	
04/06/2015	2	05:15-08:15	0	NIL	0/8	4						
25/06/2015	1	15:00-18:00	SE 1	NIL	8/8	17	4 (6)				4 (5)	
25/06/2015	2	18:45-21:45	SE 2	NIL	3/8	16					1	
23/07/2015	1	18:45-21:45	SW 2	NIL	7/8	15					4 (6)	
23/07/2015	2	15:00-18:00	SW 2	NIL	7/8	17						
31/07/2015	1	05:45-08:45	SE 1	NIL	1/8	5					1	1
31/07/2015	2	09:30-12:30	E 1-2	NIL	1/8	10	6 (10)	1		1	7	
24/08/2015	1	13:30-16:30	NW 2	NIL	8/8	14					3	
24/08/2015	2	09:45-12:45	NNW 1	LIGHT	8/8	13		1				
28/08/2015	1	10:45-13:45	SW 3	LIGHT	7/8	14						
28/08/2015	2	07:00-10:00	SW 2	LIGHT	8/8	13			1	1	2	
09/09/2015	1	10:30-13:30	NE 1	NIL	1/8	16	2				1	
09/09/2015	2	14:15-17:15	NE 3	NIL	8/8	15		3		1	1	
29/09/2015	1	12:30-15:30	NE 1	NIL	2/8	16					6 (7)	
29/09/2015	2	16:15-19:15	N 2	NIL	2/8	14			2		7	

Table 2b. Winter period 2015/16 VP weather data

Date	VP	Time	Wind	Rain	Cloud cover	Temp °C	KT flights	HH flights	K. flights	GI flights	GP Flights
12/10/2015	1	07:15-10:15	N 1	NIL	0/8	6		1			1
12/10/2015	2	11:00-14:00	N 2	0	0/8	8	5		1		2
19/10/2015	1	12:15-15:15	0	NIL	8/8	15	8 (10)		2		
19/10/2015	2	15:45-18:45	N 1-2	0	4/8	14					
12/11/2015	2	08:00-09:30	S 2-3	0	1/8	8					
20/11/2015	2	07:45-09:45	W 2-3	NIL	8/8	13	1				
20/11/2015	1	10:30-13:30	W 2-3	NIL	7/8	4	1	1			
25/11/2015	2	09:45-12:45	NW 3-6	LIGHT	8/8	7					
25/11/2015	1	13:30-16:30	NW 4-5	LIGHT	7/8	8					1 (7)
07/01/2016	2	09:45-12:45	WNW 5-6	NIL	8/8	5					
07/01/2016	1	13:15-16:15	W 6	NIL	5/8	3					
15/01/2016	2	09:00-12:00	NW 3-6	SNOW	8/8	-1					
15/01/2016	1	13:00-16:00	WNW 3	NIL	6/8	1					
28/01/2016	1	07:30-10:30	SW 3-4	NIL	3/8	2	2				
28/01/2016	2	11:15-14:15	S 3	LIGHT	8/8	3	1	1			
10/02/2016	1	10:15-13:15	W 3	SLEET	6/8	4	2				
10/02/2016	2	14:00-17:00	W 2-3	NIL	5/8	4					
16/02/2016	2	07:30-10:30	E 2-3	NIL	0/8	-1				1	
16/02/2016	1	11:15-14:15	E 3-4	NIL	7/8	4	2				
24/02/2016	1	07:00-10:00	NE 0-1	0	0/8	-2					1 (7)
24/02/2016	2	10:45-13:45	NE 1-2	NIL	0/8	4	4 (5)				
04/03/2016	1	10:45-13:45	W 3-4	SNOW	7/8	2					
21/03/2016	2	09:30-12:30	NW 2-3	NIL	1/8	8					1
21/03/2016	1	13:15-16:15	W 2-3	0	7/8	8	4	1			
31/03/2016	2	17:00-20:00	W 2	NIL	2/8	7					

Table 3a – Breeding bird season 2015 detailed flight data

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
KT1	Red Kite	1	120	15		2	16/04/2015
KT2	Red Kite	1	15			1	29/04/2015
KT3	Red Kite	1		150		1	13/05/2015
KT4	Red Kite	1	45	30		1	13/05/2015
KT5	Red Kite	1	15	60		1	13/05/2015
KT6	Red Kite	1	15	165		1	13/05/2015
KT7	Red Kite	4	180	75		1	13/05/2015
KT8	Red Kite	1	75			1	13/05/2015
KT9	Red Kite	1		75		1	13/05/2015
KT10	Red Kite	1	15	45	90	2	13/05/2015
KT11	Red Kite	1	120			2	13/05/2015
KT12	Red Kite	2			195	2	13/05/2015
K.1	Kestrel	1	15	15		1	28/05/2015
K.2	Kestrel	1	15			1	28/05/2015
K.3	Kestrel	1		15		2	29/05/2015
KT13	Red Kite	1		45		1	04/06/2015
K.2	Kestrel	1	15			1	04/06/2015
KT14	Red Kite	1		300		1	04/06/2015
KT15	Red Kite	1			105	1	04/06/2015
K.5	Kestrel	1	30	90		1	25/06/2015
KT16	Red Kite	1	15	90		1	25/06/2015
K.6	Kestrel	1	135	105		1	25/06/2015
KT17	Red Kite	2	60	75		1	25/06/2015
KT18	Red Kite	2		105	45	1	25/06/2015
KT19	Red Kite	1	15	30		1	25/06/2015
K.7	Kestrel	2	30	15		1	25/06/2015
K.8	Kestrel	1	15	15		1	25/06/2015
K.9	Kestrel	1	15	315	90	2	25/06/2015
K.10	Kestrel	2	15	150		1	23/07/2015
K.11	Kestrel	1	45			1	23/07/2015
K.12	Kestrel	2	120	105		1	23/07/2015
K.13	Kestrel	1	15	15		1	23/07/2015
HY1	Hobby	1	45			1	31/07/2015
K.14	Kestrel	1	120			1	31/07/2015
K.15	Kestrel	1	90	45		2	31/07/2015
K.16	Kestrel	1	15	90		2	31/07/2015
K.17	Kestrel	1	15	60		2	31/07/2015
K.18	Kestrel	1	15			2	31/07/2015

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
KT20	Red Kite	2	45	195		2	31/07/2015
KT21	Red Kite	2	135	75		2	31/07/2015
K.19	Kestrel	1	60	30		2	31/07/2015
K.20	Kestrel	1	60	255		2	31/07/2015
KT22	Red Kite	2	45	225		2	31/07/2015
KT23	Red Kite	1	30			2	31/07/2015
KT24	Red Kite	1	60			2	31/07/2015
KT25	Red Kite	2	135	75		2	31/07/2015
PE1	Peregrine	1			120	2	31/07/2015
ML1	Merlin	1	15			2	31/07/2015
K.21	Kestrel	1	15	30		2	31/07/2015
PE2	Peregrine	1		45		2	24/08/2015
K.22	Kestrel	1	30			1	24/08/2015
K.23	Kestrel	1		240		1	24/08/2015
K.24	Kestrel	1	135	30		1	24/08/2015
ML2	Merlin	1	75			2	28/08/2015
K.25	Kestrel	1	30			2	28/08/2015
K.26	Kestrel	1	15			2	28/08/2015
HH1	Hen Harrier	1	75			2	28/08/2015
KT26	Red Kite	1		60		1	09/09/2015
KT27	Red Kite	1	30	15		1	09/09/2015
K.27	Kestrel	1	210	75		1	09/09/2015
PE3	Peregrine	1	15	15	15	2	09/09/2015
PE4	Peregrine	1		15		2	09/09/2015
K.28	Kestrel	1		105		2	09/09/2015
PE5	Peregrine	1	15	135	90	2	09/09/2015
ML3	Merlin	1	15			2	09/09/2015
K.29	Kestrel	1	15	60		1	29/09/2015
K.30	Kestrel	1	45	60		1	29/09/2015
K.31	Kestrel	1	15			1	29/09/2015
K.32	Kestrel	2	15	105		1	29/09/2015
K.33	Kestrel	1	15	15		1	29/09/2015
K.34	Kestrel	1	90			1	29/09/2015
K.35	Kestrel	1	210	15		2	29/09/2015
K.36	Kestrel	1	15			2	29/09/2015
K.37	Kestrel	1	30	120		2	29/09/2015
K.38	Kestrel	1		120		2	29/09/2015
HH2	Hen Harrier	1	240			2	29/09/2015
K.39	Kestrel	1		240		2	29/09/2015

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
HH3	Hen Harrier	1	90			2	29/09/2015
K.40	Kestrel	1	15			2	29/09/2015
K.41	Kestrel	1	15	225		2	29/09/2015

Table 3b – Winter period 2015/16 detailed flight data for Red Kite

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
HH1	Hen Harrier	1	90	90		1	12/10/2015
GP1	Golden Plover	1				1	12/10/2015
GP2	Golden Plover	1		60		2	12/10/2015
KT1	Red Kite	1		30		2	12/10/2015
KT2	Red Kite	1	75	30		2	12/10/2015
K.1	Kestrel	1	120	75		2	12/10/2015
GP3	Golden Plover	1	15	15		2	12/10/2015
KT3	Red Kite	1		90		2	12/10/2015
KT4	Red Kite	1	60	165		2	12/10/2015
KT5	Red Kite	1	60			2	12/10/2015
KT6	Red Kite	2	120	135	105	1	19/10/2015
KT7	Red Kite	2			120	1	19/10/2015
KT8	Red Kite	1	75	60		1	19/10/2015
K.2	Kestrel	1	120	60		1	19/10/2015
K.3	Kestrel	1		45	30	1	19/10/2015
KT9	Red Kite	1		90	15	1	19/10/2015
KT10	Red Kite	1	15	30	45	1	19/10/2015
KT11	Red Kite	1	15	15		1	19/10/2015
KT12	Red Kite	1	30	120		1	19/10/2015
KT13	Red Kite	1		30		1	19/10/2015
KT14	Red Kite	1		30		2	20/11/2015
HH2	Hen Harrier	1	15			1	20/11/2015
KT15	Red Kite	1	105	90		1	20/11/2015
GP4	Golden Plover	7	15			1	25/11/2015
KT16	Red Kite	1	15	15		1	28/01/2016
KT17	Red Kite	1		180	15	1	28/01/2016
HH3	Hen Harrier	1	75			2	28/01/2016
KT18	Red Kite	1	30	45		2	28/01/2016
KT19	Red Kite	1	15	15		1	10/02/2016
KT20	Red Kite	1	75			1	10/02/2016
GI1	Goshawk	1	15	45		2	16/02/2016
KT21	Red Kite	1	75	75		1	16/02/2016
KT22	Red Kite	1	30			1	16/02/2016
GP5	Golden Plover	7	15	15	120	1	24/02/2016
KT23	Red Kite	2		60		2	24/02/2016
KT24	Red Kite	1	75	180	15	2	24/02/2016
KT25	Red Kite	1	45	15		2	24/02/2016
KT26	Red Kite	1	15			2	24/02/2016

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
GP6	Golden Plover					2	21/03/2016
KT27	Red Kite	1	15	30	15	1	21/03/2016
KT28	Red Kite	1	60			1	21/03/2016
KT29	Red Kite	1	30	195	255	1	21/03/2016
KT30	Red Kite	1		60	75	1	21/03/2016
HH4	Hen Harrier	1	135			1	21/03/2016

Appendix 6: Ornithological Survey 2020 Detailed VP Data

Table 1 – Breeding season 2020 VP Dates and times

Date	VP Number	
	1	2
03/04/2020	06:30-09:30	10:10-13:10
16/04/2020	07:30-10:30	11:10-14:10
22/04/2020	12:00-15:00	08:15-11:15
06/05/2020	08:40-11:40	12:20-15:20
15/05/2020	08:45-11:45	12:15-15:15
01/06/2020	08:30-11:30	12:00-15:00
11/06/2020	13:00-14:30	09:30-12:30
17/06/2020	10:30-13:30	07:00-10:00
24/06/2020	13:40-14:50	
25/06/2020	06:30-09:30	10:00-13:00
07/07/2020	10:00-13:00	13:30-15:00
14/07/2020		13:30-15:00
28/07/2020	10:45-13:45	14:15-17:15
04/08/2020	09:50-12:50	06:20-09:20
TOTAL	**36**	**36**

Table 2. Breeding season 2020 VP weather data

Date	VP	Time	Wind	Rain	Cloud cover	Temp °C	KT flights	PE flights	HH flights	ML flights	K flights	HY Flights	GP Flights
03/04/2020	1	06:30-09:30	W 2-3	Nil	7 -8/ 8	5-6							
03/04/2020	2	10:10-13:10	W 2-3	Nil	7/8	5							
16/04/2020	1	07:30-10:30	NE 3-4	Nil	2/8	5-8	5 (6)						
16/04/2020	2	11:10-14:10	E 4 - SE 6	Nil	5/8	12	3 (4)	2	2				
22/04/2020	1	12:00-15:00	E 5-6	Nil	1/8	17	2					1	
22/04/2020	2	08:15-11:15	E 5-6	Nil	1/8	10-14	3			1			
06/05/2020	1	08:40-11:40	E 4-5	Nil	0/8	8-10	6 (9)			1			
06/05/2020	2	12:20-15:20	ESE 5-6	Nil	0/8	11-15	3			2	1		
15/05/2020	1	08:45-11:45	1-2 N	Nil	2/8	12-13	6						
15/05/2020	2	12:15-15:15	NW 0-2	Nil	3/8	15	6						1
01/06/2020	1	08:30-11:30	NE5	Nil	0/8	13-16	2		1				
01/06/2020	2	12:00-15:00	NNE 4	Nil	0/8	16-20	3						
11/06/2020	1	13:00-14:30	N 4	Nil	8/8	10							
11/06/2020	2	09:30-12:30	N 4-5	Nil	8/8	10							
17/06/2020	1	10:30-13:30	SW3	Rain + Thunder	8/8	14	1						
17/06/2020	2	07:00-10:00	ESE 1 - S 3	Nil	3 - 8/8	13-14	2						
24/06/2020	1	13:40-14:50	E 3	Nil	0/8	29							
25/06/2020	1	06:30-09:30	E4	Nil	0/8	18-22	1						
25/06/2020	2	10:00-13:00	SE4-5 - SE6	Nil	0/8	25-28	3			1			
07/07/2020	1	10:00-13:00	S3-4	Nil	8/8	12	1			1			

Date	VP	Time	Wind	Rain	Cloud cover	Temp °C	KT flights	PE flights	HH flights	ML flights	K flights	HY Flights	GP Flights
07/07/2020	2	13:30-15:00	SW 4	Drizzle from 14:45 - survey stopped at 15:00 due to low cloud	8/8	13	4						
14/07/2020	2	13:30-15:00	W 2-3	Nil	6/8	16							
28/07/2020	1	10:45-13:45	SW 3-4	Nil	8/8	16	2			1			
28/07/2020	2	14:15-17:15	W4	Nil	6/8	15							
04/08/2020	1	09:50-12:50	S2	Nil	8/8	11				1			
04/08/2020	2	06:20-09:20	SW 1	Nil	8/8	11							

Table 3 – Breeding bird season 2020 detailed flight data

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
KT1	Red Kite	1	45	0	0	1	16/04/2020
KT2	Red Kite	1	195	45	0	1	16/04/2020
KT3	Red Kite	1	120	0	0	1	16/04/2020
KT4	Red Kite	1	105	0	0	1	16/04/2020
KT5	Red Kite	2	30	2970	0	1	16/04/2020
GI1	Goshawk	1	0	105	60	2	16/04/2020
KT6	Red Kite	1	240	0	0	2	16/04/2020
ML1	Merlin	1	45	0	0	2	16/04/2020
KT7	Red Kite	2	0	240	0	2	16/04/2020
KT8	Red Kite	1	60	0	0	2	16/04/2020
ML2	Merlin	1	0	30	30	2	16/04/2020
GI2	Goshawk	1	15	0	0	2	16/04/2020
KT9	Red Kite	1	30	0	0	1	22/04/2020
PE1	Peregrine	1	45	0	0	1	22/04/2020
KT10	Red Kite	1	75	0	0	1	22/04/2020
K.1	Kestrel	1	240	0	0	2	22/04/2020
KT11	Red Kite	1	150	0	0	2	22/04/2020
KT12	Red Kite	1	0	60	0	2	22/04/2020
KT13	Red Kite	1	45	0	0	2	22/04/2020
KT14	Red Kite	1	30	0	0	1	06/05/2020
KT15	Red Kite	1	45	0	0	1	06/05/2020
KT16	Red Kite	1	75	0	0	1	06/05/2020
K.2	Kestrel	1	90	0	0	1	06/05/2020
KT17	Red Kite	2	45	0	0	1	06/05/2020
KT18	Red Kite	2	240	0	0	1	06/05/2020
KT19	Red Kite	2	60	0	0	1	06/05/2020
KT20	Red Kite	1	90	0	0	2	06/05/2020
K.3	Kestrel	1	7440	0	0	2	06/05/2020
K.4	Kestrel	1	60	0	0	2	06/05/2020
KT21	Red Kite	1	90	0	0	2	06/05/2020
KT22	Red Kite	1	45	0	0	2	06/05/2020
HY1	Hobby	1	45	0	0	2	06/05/2020
KT23	Red Kite	1	60	0	0	1	15/05/2020
KT24	Red Kite	1	30	90	0	1	15/05/2020
KT25	Red Kite	1	105	0	0	1	15/05/2020
KT26	Red Kite	1	195	0	0	1	15/05/2020
KT27	Red Kite	1	0	60	0	1	15/05/2020
KT28	Red Kite	1	120	0	0	1	15/05/2020

Flight No	Species	Count	Flight Time (s)			VP	Date
			0-30m	30-120m	120m +		
KT29	Red Kite	1	15	15	0	2	15/05/2020
KT30	Red Kite	1	30	195	0	2	15/05/2020
KT31	Red Kite	1	15	210	330	2	15/05/2020
KT32	Red Kite	1	120	0	0	2	15/05/2020
KT33	Red Kite	1	45	0	0	2	15/05/2020
KT34	Red Kite	1	135	75	0	2	15/05/2020
GP1	Golden Plover	1	45	0	0	2	15/05/2020
KT35	Red Kite	1	45	0	0	1	01/06/2020
KT36	Red Kite	1	75	0	0	1	01/06/2020
ML3	Merlin	1	45	30	0	1	01/06/2020
KT37	Red Kite	1	105	45	0	2	01/06/2020
KT38	Red Kite	1	30	90	45	2	01/06/2020
KT39	Red Kite	1	60	0	0	2	01/06/2020
KT40	Red Kite	1	30	0	0	1	17/06/2020
KT41	Red Kite	1	150	0	0	2	17/06/2020
KT42	Red Kite	1	30	60	0	2	17/06/2020
KT43	Red Kite	1	60	0	0	1	25/06/2020
KT44	Red Kite	1	165	135	0	2	25/06/2020
KT45	Red Kite	1	420	0	0	2	25/06/2020
K.5	Kestrel	1	30	0	0	2	25/06/2020
KT46	Red Kite	1	45	15	0	2	25/06/2020
K.6	Kestrel	1	30	45	0	1	07/07/2020
KT47	Red Kite	1	15	0	0	1	07/07/2020
KT48	Red Kite	1	30	0	0	2	07/07/2020
KT49	Red Kite	1	60	0	0	2	07/07/2020
KT50	Red Kite	1	60	0	0	2	07/07/2020
KT51	Red Kite	1	45	0	0	2	07/07/2020
KT52	Red Kite	1	15	45	0	1	28/07/2020
K.7	Kestrel	1	90	120	0	1	28/07/2020
KT53	Red Kite	1	30	0	0	1	28/07/2020
K.8	Kestrel	1	30	0	0	1	04/08/2020

Appendix 7: Bat call identification and call analysis

Bat Call Identification

12.1 Recorded bat calls were converted using Wildlife Acoustics Kaleidoscope Pro Software. The software uses predefined classifiers to label bat calls to species[38]. These calls were then analysed by an experienced surveyor using Analook software to confirm the species labelled. Where possible, the bat was identified to species level. Species of the genus *Myotis* were grouped together as overlapping call parameters make species identification problematic (Hundt, 2012). Similarly, grey long-eared and brown long-eared bat have almost identical call parameters and are therefore labelled as long-eared bat sp. It is likely given the distribution and abundance of grey long-eared bat in the UK that the call recorded was from brown long-eared bat.

12.2 For pipistrelle species the following criteria, based on measurements of peak frequency, were used to classify calls:

- Common pipistrelle ≥42 and <49 kHz
- Soprano pipistrelle ≥51 kHz
- Nathusius' pipistrelle <39 kHz
- Common pipistrelle / Soprano pipistrelle ≥49 and <51 kHz
- Common pipistrelle / Nathusius' pipistrelle ≥39 and <42 kHz

12.3 Bat calls which could not be ascribed to any of these categories were not used in the analysis.

Calculation of relative activity

12.4 The SM4 detectors were configured to record above the level of ambient noise, such as from wind or rain, and set to define a bat pass (B) as a call note of >2 ms separated from another by more than one second.

12.5 AnalookW software was used for all analysis of bat calls. The software enables analysis of the relative activity (referred to as 'activity' in the text below) of different species of bats by counting the number of bat passes (B) recorded within a unit of time – hour (h) was used. As the bats per hour equation uses the exact amount of time each detector was recording for the calculation, the result is a comparable unit, even though individual detectors recorded for varying lengths of time. More than one pass of the same species was counted within a sound file if multiple bats were recorded calling simultaneously. During analysis of sound files, it was possible to estimate the minimum number of bats recorded on individual sound files but not whether consecutive sound files had recorded, for example, a number of individual bats passing as they commute to a feeding habitat or one bat calling repeatedly as it flies around the detector cannot be distinguished. Although relative abundance cannot therefore be estimated from this analysis, the number of bat passes does provide an indication of the importance of features/habitats to bats by assigning a level of bat activity that is associated with that feature, regardless of the type of activity.

Analysis by sunset-sunrise times

12.6 As part of the analysis of nocturnal patterns of behaviour for bats the data were split into discrete time periods relating to their proximity to sunset or sunrise. The time categories (time codes: TC) were as follows:

- TC 0 = before sunset
- TC 1 = 0-20 min after sunset

[38]For more information on how Wildlife Acoustics Kaleidoscope Pro Software classifies bat calls please see: https://www.wildlifeacoustics.com/products/kaleidoscope-software-ultrasonic

- TC 2 = 20-40 min after sunset
- TC 3 = 40-60 min after sunset
- TC 4 = 60-80 min after sunset
- TC 5 = 80-100 min after sunset
- TC 6 = 100-120 min after sunset
- TC 7 = Middle of night (varies across seasons)
- TC 8 = 120-100 min before sunrise
- TC 9 = 100-80 min before sunrise
- TC 10 = 80-60 min before sunrise
- TC 11 = 60-40 min before sunrise
- TC 12 = 40-20 min before sunrise
- TC 13 = 20-0 min before sunrise

For each of these categories B/h was calculated to allow a comparison between the activity level recorded in different time periods, and a correction factor was applied to TC7 data to allow for variation in night length throughout the survey season.

Appendix 8: Bat detector locations and deployment dates, and transect survey details.

Table 1: Bat detector locations and deployment dates in 2015, 2016 and 2018

Location	Grid ref	Autumn (2015)	Spring (2016)	Summer (2016)	Autumn (2018)
D1	SS9109094594	06-10/10/2015	08-12/06/2016	03-03/08/2016 and 08-09/08/2016	21-30/09/2018
D2	SS9134194732	06-10/10/2015	22-26/06/2016	03-07/08/2016	21-30/09/2018
D3	SS9204994776	06-10/10/2015	08-12/06/2016	03-07/08/2016	21-30/09/2018
D4	SS9265894131	06-10/10/2015	08-12/06/2016	03-07/08/2016	21-30/09/2018

Table 2: Details of walked bat transects in 2015 and 2016.

Survey date	Surveyors*	Sunset	Time	Weather
07/10/2015	RT, GL	18:41	START: 18:20 FINISH: 21:10	START: Wind F2, 8/8 cloud, no rain, 12˚C FINISH: Wind F2, 8/8 cloud, light drizzle, 11.5˚C
02/06/2016	GL, HM	21:23	START: 21:12 FINISH: 23:50	START: Wind F1, 1/8 high cloud, no rain, 12˚C FINISH: Wind F2-3, 1/8 high cloud, no rain, 9˚C
08/08/2016	GL, RT	20:51	START: 20:35 FINISH: 23:29	START: Wind F2, 0/8 , no rain, 13˚C FINISH: Wind F2, 0/8 , no rain, 11˚C

*Gareth Lang = GL; Rachel Taylor = RT; Hannah Meinertzhagen = HM

Table 3: Bat detector locations and deployment dates in 2019

Location	Grid ref	Spring (2019)	Summer (2019)	Autumn (2019)
D1	SS 90410 94835	23/05 – 01/06/2019	24/07 – 02/08/2019	22-31/10/2019
D2	SS 91016 94973	23/05 – 01/06/2019	24/07 – 02/08/2019	22-31/10/2019
D3	SS 91399 94690	23/05 – 01/06/2019	24/07 – 02/08/2019	22-31/10/2019
D4	SS 92055 94791	23/05 – 01/06/2019	24/07 – 02/08/2019	22-31/10/2019
D5	SS 92238 94574	23/05 – 01/06/2019	24/07 – 02/08/2019	22-31/10/2019
D6	SS 92471 94361	23/05 – 01/06/2019	24/07 – 02/08/2019	22-31/10/2019
D7	SS 91179 94662	23/05 – 01/06/2019	24/07 – 02/08/2019	22-31/10/2019

Appendix 9: Great Crested Newt eDNA Technical Report

(overleaf)

SureScreen Scientifics

Folio No:	E0440
Report No:	1
Order No:	LANG
Client:	BSG ECOLOGY LTD
Contact:	Gareth Lang
Contact Details:	g.lang@bsg-ecology.com
Date:	04/05/2017

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS

Date sample received at Laboratory: 28/04/2017
Date Reported: 04/05/2017
Matters Affecting Results: None

RESULTS

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
31821	Upper Ogmore, Pond 1	SS 912 969	Pass	Pass	Pass	Negative	0
31822	Upper Ogmore, Pond 2	SS 908 980	Pass	Pass	Pass	Negative	0

SUMMARY

When Great Crested Newts (GCN); Triturus cristatus inhabit a pond, they deposit traces of their DNA in the water as evidence of their presence. By sampling the water, we can analyse these small environmental DNA (eDNA) traces to confirm GCN habitation, or establish GCN absence.

The water samples detailed below were submitted for eDNA analysis to the protocol stated in DEFRA WC1067 (Latest Amendments). Details on the sample submission form were used as the unique sample identity.

RESULTS INTERPRETATION

Lab Sample No.- When a kit is made it is given a unique sample number. When the pond samples have been taken and the kit has been received back in to the laboratory, this sample number is tracked throughout the laboratory.

Site Name- Information on the pond.

O/S Reference – Location/co-ordinates of pond.

SIC- Sample Integrity Check. Refers to quality of packaging, absence of tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to results errors. Inspection upon receipt of sample at the laboratory. To check if the Sample is of adequate integrity when received. Pass or Fail.

DC- Degradation Check. Analysis of the spiked DNA marker to see if there has been degradation of the kit since made in the laboratory to sampling to analysis. Pass or Fail.

IC- Inhibition Check- PCR inhibitors can cause false results. Inhibitors are analysed to check the quality of the result. Every effort is made to clean the sample pre-analysis however some inhibitors cannot be extracted. An unacceptable inhibition check will cause an indeterminate sample and must be sampled again.

Result- NEGATIVE means that GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as no evidence of GCN presence. POSITIVE means that GCN eDNA was found at or above the threshold level and the presence of GCN at this location at the time of sampling or in the recent past is confirmed. Positive or Negative.

Positive Replicates- To generate the results all of the tubes from each pond are combined to produce one eDNA extract. Then twelve separate analyses are undertaken. If one or more of these analyses are positive the pond is declared positive for the presence of GCN. It may be assumed that small fractions of positive analyses suggest low level presence but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive.

METHODOLOGY

The laboratory testing adheres to strict guidelines laid down in WC1067 Analytical and Methodological Development for Improved Surveillance of The Great Crested Newt, Version 1.1

The analysis is conducted in two phases. The sample first goes through an extraction process where all six tubes are pooled together to acquire as much eDNA as possible. The pooled sample is then tested via real time PCR (also called q-PCR). This process amplifies select part of DNA allowing it to be detected and measured in ‘real time’ as the analytical process develops. qPCR combines PCR amplification and detection into a single step. This eliminates the need to detect products using gel electrophoresis. With qPCR, fluorescent dyes specific to the target sequence are used to label PCR products during thermal cycling. The accumulation of fluorescent signals during the exponential phase of the reaction is measured for fast and objective data analysis. The point at which amplification begins (the Ct value) is an indicator of the quality of the sample. True positive controls, negatives and blanks as well as spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared so they act as additional quality control measures.

The primers used in this process are specific to a part of mitochondrial DNA only found in GCN ensuring no DNA from other species present in the water is amplified. The unique sequence appropriate for GCN analysis is quoted in DEFRA WC 1067 and means there should be no detection of closely related species. We have tested our system exhaustively to ensure this is the case in our laboratory. We can offer eDNA analysis for most other species including other newts.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. Kits are manufactured by SureScreen

Scientifics to strict quality procedures in a separate building and with separate staff, adopting best practice from WC1067 and WC1067 Appendix 5. Kits contain a ‘spiked’ DNA marker used as a quality control tracer (SureScreen patent pending) to ensure any DNA contained in the sampled water has not deteriorated in transit. Stages of the DNA analysis are also conducted in different buildings at our premises for added

SureScreen Scientifics Ltd also participate in Natural England’s proficiency testing scheme and we also carry out inter-laboratory checks on accuracy of results as part of our quality procedures.

Reported by: Sam Humphrey **Approved by:** Harry Neal

End Of Report

SureScreen Scientifics

Folio No: E8162
Report No: 1
Purchase Order: P20-069
Client: BSG ECOLOGY LTD
Contact: Gareth Lang

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 30/06/2020
Date Reported: 09/07/2020
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
4469	Ogmore P1	SS 9123 9692	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Sarah Evans **Approved by:** Chris Troth

METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of GCN eDNA** [Positive/Negative/Inconclusive]
Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative GCN presence.
Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.