10. ECOLOGY AND NATURE CONSERVATION

Executive Summary

This chapter provides an assessment of the potential impacts on ecology and nature conservation resulting from the proposed development. The assessment has been prepared with reference to the Guidelines for Ecological Impact Assessment in the United Kingdom published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2016).

Ramboll Environment and Health UK Limited (Ramboll) completed a full suite of ecology surveys in the summer of 2013, with an update survey undertaken in January 2018 to confirm that conditions on site remain unchanged.

The 2013 surveys identified peatland habitats on site which have been degraded and modified through afforestation and grazing. Ground Water Dependent Terrestrial Ecosystems (GWDTE) are also present. However, the proposed development has been designed to avoid peatland habitats and GWDTE, where possible, thereby minimising impact through turbine location and access track route selection.

The Construction Environmental Management Plan (CEMP) sets out proposed measures to minimise disturbance to ecological features throughout the construction period and is provided as Appendix 5.1: CEMP.

The Habitat Management Plan (HMP) sets out proposed measures for habitat restoration and creation and is provided as Appendix 10.6. Proposed measures include the restoration of 27.7 ha of peatland habitat and the creation of 3.5 ha of native broadleaved woodland.

Following the implementation of the proposed mitigation measures detailed in this chapter, the residual effects on ecological features are considered to be **not significant**, and are therefore **not significant** in accordance with the EIA Regulations.

10.1 Introduction

10.1.1 This chapter considers the potential effects on ecology and nature conservation resulting from impacts associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the ecological baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects, on ecological features;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the significance of residual effects remaining following the implementation of mitigation.

10.1.2 The assessment has been carried out by Ramboll in accordance with the CIEEM Ecological Impact Assessment (EcIA) guidelines (CIEEM, 2016). All surveys were completed by Ramboll with the exception of fish surveys, which were undertaken by Waterside Ecology.

10.1.3 Effects on ornithological features are addressed separately in Chapter 9: Ornithology.

10.1.4 This chapter is supported by:

- Appendix 10.1: Survey Methodology and Detailed Results;
- Appendix 10.2: Bat Survey Analysis;
- Appendix 10.3: Freshwater Invertebrate Results;
- Appendix 10.4: Fish Habitat Survey Report;
- Appendix 10.5: Badger Protection Plan; and
- Appendix 10.6: Habitat Management Plan (HMP).

10.1.5 Figures 10.1 – 10.13 are referenced in the text, where relevant. Figure 10.9: Badger Sett is confidential and should not be shared with members of the public.

10.2 Scope of Assessment

Project Interactions

10.2.1 The proposed development has an increase in turbine height and rotor diameter in comparison to the Tangy III ES (2014). However, the footprint of the proposed development remains unchanged from that presented and assessed in the Tangy III ES (2014). As a result, potential impacts upon the majority of ecological features previously recorded in the ecological study area are likely to remain unchanged. A walkover survey was undertaken to assess the current conditions of the site and ground-truth previous survey results with the previous Tangy III ES (2014). The data from those surveys completed in support of the Tangy III application have been used alongside new data collected during the ground truthing update walkover to assess the potential impacts on ecological features.

Ecological Study Area

10.2.2 The ecological study area for this assessment includes the site boundary, as shown on Figure 10.1: Designated Sites, and appropriate buffer distances beyond the site boundary, e.g. up and downstream on watercourses, as shown on Figure 10.12: Fish Survey.

10.2.3 The ecological study area also includes a desk study area, which gathered information from within the site boundary and included a 10 km buffer around the site boundary.

Scoping and Consultation

10.2.4 Full details on the consultation responses can be reviewed in Appendix 7.1: Consultation Register. Table 10.1: Consultation Responses summarises relevant scoping and consultation responses specific to ecology and nature conservation.

Table 10.1: Consultation Responses

Consultee and Date	Summary of Response	Comment/Action Taken
Argyll and Bute Council (ABC) 05/07/2017	The scale and layout of the proposed development should be designed so as to minimise the impact on key environmental features and sites designated for their ecological qualities.	The layout of the proposed development has been designed to avoid habitats with the highest ecological value, where possible, as described in Section 10.6: Mitigation by Design.
Scottish Natural Heritage (SNH) 26/06/2017 SNH (continued)	There was a high level of pipistrelle registers and this would indicate that standard buffering, together with a period of post-construction survey to ascertain the need for a curtailment regime, is likely to be necessary.	Standard buffering is detailed in Section 10.6.15 and 10.6.16, respectively. Although no significant effects are predicted on bats, a dedicated search for bat carcasses would be carried out on a monthly basis within a 50 m radius of each turbine, as discussed in Appendix 10.6: Habitat Management Plan. Searches would be undertaken by the applicant following the standard Scottish and Southern Energy (SSE) protocol.
	As badgers could be affected by the proposed development, there should be the provision of a more specific badger protection plan before determining any application.	A badger protection plan is provided in Appendix 10.5: Badger Protection Plan.
	Measures to protect Tangy Loch Special Site of Scientific Interest (SSSI) must include further site investigation on peat slide risk and implementation of pollution prevention measures detailed in a site-specific CEMP.	Further assessment of peat stability and protection measures are detailed in Chapter 11: Geology, Soils and Peat and Appendix 11.1: Peat Stability Risk Assessment. Mitigation includes a detailed intrusive ground investigation prior to construction, following tree removal and the inclusion of construction practices to avoid peat slide.
Scottish Environment Protection Agency (SEPA) 26/05/2017	GWDTE are protected under the Water Framework Directive and therefore the layout and design of the proposed development must avoid impact on such areas. The following information must be included in the submission:	The layout of the proposed development does not avoid impacts on all GWDTE areas, therefore this chapter provides further assessment of the likely effects on GWDTE.

Table 10.1: Consultation Responses		
Consultee and Date	**Summary of Response**	**Comment/Action Taken**
	a) A map demonstrating that all GWDTE are outwith a 100 m radius of all excavations shallower than 1 m and outwith 250 m of all excavations deeper than 1 m and proposed groundwater abstractions. If micrositing is to be considered as a mitigation measure, the distance of survey needs to be extended by the proposed maximum extent of micrositing. The survey needs to extend beyond the site boundary where the distances require it. b) If the minimum buffers above cannot be achieved, a detailed site specific qualitative and/or quantitative risk assessment will be required. We are likely to seek conditions securing appropriate mitigation for all GWDTE affected.	The GWDTE present in the ecological study area are shown on Figure 10.4: GWDTE, with appropriate 100 m and 250 m buffers around new cut access tracks and turbines, respectively. Not all GWDTE are outwith these buffers. However, many of those within the buffers are considered to have developed as a result of activities to construct Tangy I and II. The suggested buffers were not achieved for all GWDTE areas, therefore this chapter provides further assessment of the likely effects on GWDTE, with mitigation described in Section 10.6, and residual effects described in Section 10.7.
Royal Society for the Protection of Birds (RSPB) 26/05/2017 RSPB (continued)	The ES should include details of proposals for mitigation/enhancement in relation to important habitats and species on this site. These should consider measures to enhance woodland biodiversity through increased provision of native tree species/open space. Compensatory planting should be seen as an opportunity to deliver priority biodiversity habitats and achieve aims within the Argyll and Bute Woodland and Forestry Strategy. We would welcome the restoration of suitable areas of bog/peat and increased planting of native tree species in suitable areas within and surrounding the proposed development for biodiversity gain. Ideally, any off- or on-site compensatory planting required should be included as part of the ES so the impacts can be assessed. A detailed Habitat Management Plan (HMP) should be submitted with any application containing detailed ecological justification for any proposals.	Mitigation is described in Section 10.6. Further detail on habitat management is provided in Appendix 10.6: Habitat Management Plan and Ch 16, Table 16.6 Land use - forestry Compensatory planting for the removal of coniferous plantation is detailed in Chapter 16: Land Use, Socio-economics and Recreation. Appendix 10.6: Habitat Management Plan, proposes measures for broadleaved woodland creation and peatland restoration. Further details on compensatory planting can be found in Chapter 16: Land Use, Socio-economics and Recreation.
Marine Scotland 26/05/2017	The Developer should carry out up to date fish population surveys for the presence and abundance of fish species within and downstream of the proposed development.	Although the fish surveys were undertaken in 2013, the habitat is considered to remain unchanged since these were completed. Brown trout *Salmo trutta* were the only species recorded within the proposed development. As the unchanged habitats are likely to support a similar

Table 10.1: Consultation Responses		
Consultee and Date	**Summary of Response**	**Comment/Action Taken**
		population recorded during the previous surveys, the previously developed mitigation is considered to remain valid and the surveys have not been updated.

Effects to be Assessed

10.2.5 This chapter considers effects on:

- designated sites;
- habitats, particularly sensitive habitats such as peatlands and wetlands, from habitat loss and fragmentation;
- groundwater dependent terrestrial ecosystems; and
- protected faunal species, such as badger *Meles meles*, otter *Lutra lutra*, pine marten *Martes martes*, bat species and water vole *Arvicola amphibius*.

10.2.6 The chapter assesses cumulative effects as arising from the addition of the proposed development to other similar developments which are the subject of a valid planning application. Operational, under construction and consented (not yet constructed) developments are considered as part of the baseline.

Effects Scoped Out of Assessment

Habitats

10.2.7 Habitats of less than local value are scoped out from further consideration in this assessment on the basis that effects on these habitats would not be considered significant in terms of the EIA regulations given their low ecological value. This includes improved and neutral grassland habitats, bracken *Pteridium aquilinum* and scrub habitat.

Invertebrates

Surveys of this species group are considered unnecessary as the EcIA adopts a precautionary approach and includes appropriate mitigation, where required, to avoid significant effects.

Amphibians

10.2.8 The densities of amphibian populations within the proposed development are considered to be low due to the limited availability of suitable habitat. Where suitable habitat is present, amphibians have been assumed to be present even where no field records exist. Measures to control transfer of chytridiomycosis, an infectious disease of amphibians caused by the chytrid ***Batrachochytrium dendrobatidis*****, are considered unnecessary and are scoped out of further assessment.**

Disease Transfer

10.2.9 No common juniper *Juniperus communis* was recorded in the ecological study area, therefore biosecurity measures for the control of *Phytophthora austrocedrae*, a fungus-like organism which infects the plant via the roots and causes foliage to decline and eventually die, is considered unnecessary and **disease transfer impacts are scoped out of further assessment**.

10.3 Methodology

Overview

10.3.1 This section describes the methodology used to assess the significance of potential effects upon the ecological features on or near the site. The methodology is based on CIEEM (2016) 'Guidelines for Ecological Impact Assessment in the United Kingdom'.

10.3.2 Whilst considering a range of potential outcomes that could arise from implementation of the proposed development, the assessment reports the impacts and subsequent effects considered to be likely. It is these likely effects that the applicant is obliged to report, and that Scottish Ministers are obliged to consider (Schedule 4 of the EIA Regulations). The underlying approach comprises:

- identification of the ecological features to be assessed and determination of baseline conditions;
- evaluation of the ecological features identified;
- identifying and characterising activities likely to cause significant effects as a result of the proposed development;
- evaluating the ecological significance of the predicted likely effects on the feature at an appropriate geographical scale;
- where significant effects are likely, define mitigation, including prevention, reduction and compensation for any significant adverse effects; and
- assessing the ecological significance of likely residual effects (after mitigation has been taken into account).

Method of Baseline Characterisation

Desk Surveys

10.3.3 A desk study to collect existing baseline data about the site and the surrounding area, such as the location of designated sites or other natural features of potential ecological importance, was undertaken, drawing upon the following data sources:

- SNH Sitelink[1]; and
- MAGIC website[2].

10.3.4 The Argyll and Bute Biodiversity Action Plan (BAP) (ABC 2010-2015)[3] was consulted for the likely presence of key protected species. Supplementary information on the site and its surroundings was obtained from aerial images available from Google™ Earth Pro. The Environmental Statements (ES) for the existing Tangy I and Tangy II Wind Farms, and the Tangy III ES (2014) were also consulted.

Field Survey Techniques

10.3.5 Full details of field survey methodology are provided in Appendix 10.1: Survey Methodology and Detailed Results.

10.3.6 The following surveys were undertaken as part of the proposed Tangy III development:

- Extended Phase 1 habitat survey and National Vegetation Classification (NVC) survey in April and June 2013;
- Great crested newt *Triturus cristatus* presence-absence surveys between May and July 2013;

[1] URL: https://gateway.snh.gov.uk/sitelink/
[2] URL: http://magic.defra.gov.uk/
[3] This plan has not yet been updated.

- Bat activity surveys between April and October 2013;
- Protected species surveys for Otter, Water Vole, Pine Marten and Wildcat between April and June 2013;
- Red squirrel survey from April to June 2013;
- Badger survey completed from April to June 2013;
- Reptile survey from April to June 2013;
- Aquatic invertebrate survey and freshwater pearl mussel *Margaritifera margaritifera* survey completed in October 2013; and
- Electrofishing survey in August 2013.

10.3.7 An extended Phase 1 habitat survey was undertaken in January 2018 to update the previous Tangy III survey results for the proposed development.

Effects Evaluation Methodology

Criteria for Assessing Importance of Ecological Features

10.3.8 Habitats and species (i.e. ecological features) identified within the ecological study area have been assigned ecological values using the standard CIEEM scale that classifies ecological features within a defined geographic context (CIEEM, 2016). The classification uses recognised and published criteria where the habitats and ecological study area are assessed in relation to their size, diversity, naturalness, rarity, fragility, typical-ness, connectivity with surroundings, intrinsic value, recorded history and potential value (Ratcliffe, 1977 and Wray et al, 2010). Table 10.2: Geographic Importance provides details of the frame of reference used in this assessment.

Table 10.2: Geographic Importance

Geographic Importance	Examples
International	Internationally designated sites including Special Areas of Conservation (SAC), Ramsar sites, Biogenetic Reserves, World Heritage sites, Biosphere Reserve, candidate SACs and potential Ramsar sites; discrete areas which meet the published selection criteria for international designation but which are not themselves designated as such; or a viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas which are essential to maintain the viability of a larger whole. Resident or regularly occurring populations of species which may be considered at an International level, such as European Protected Species (EPS), the loss of which would adversely affect the conservation status or distribution of the species at an international level; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
National	Nationally designated sites SSSI, National Nature Reserves (NNR), Marine Nature Reserves; discrete areas which meet the published selection criteria for national designation (e.g. SSSI selection guidelines) but which are not designated as such; or areas of a key habitat type identified in the UK Post-2010 Biodiversity Framework (UK Government, 2012). Resident or regularly occurring populations of species which may be considered at the national level, such as species listed in Schedules 5 and 8 of the Wildlife and Countryside Act (1981), the loss of which would adversely affect the conservation status or distribution of the species across Britain or Scotland; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
Regional	Areas of a habitat type identified in the Regional BAP; viable areas of habitat identified as being of Regional value in the appropriate Natural

Table 10.2: Geographic Importance	
Geographic Importance	**Examples**
	Area Profile (or equivalent); or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Resident or regularly occurring populations of species which may be considered at an international level, or at the national level, the loss of which would adversely affect the conservation status or distribution of the species across the region; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.
County	Designated sites at the local authority level in Scotland including statutory Local Nature Reserves (LNR) and non-statutory Local Nature Conservation Sites; or discrete areas which meet the published selection criteria for designation but which are not designated as such. Resident or regularly occurring populations of species which may be considered at the local authority level, the loss of which would adversely affect the conservation status or distribution of the species across the local authority area.
Local	Features of local value include areas of habitat or populations/communities of species considered to appreciably enrich the habitat resource within the immediate surrounding area, for example, species-rich hedgerows. Resident or regularly occurring populations of species which may be considered at an international level, or at the national level, the loss of which would adversely affect the conservation status or distribution of the species across the immediate surrounding area; or where the population forms a critical part of a wider population; or the species is at a critical phase of its life cycle.

10.3.9 A wide range of sources can be used to assign importance to ecological features, including legislation and policy. In the case of designated nature conservation sites, their importance reflects the geographic context of the designation. For example, sites designated as SACs are recognised as being of importance at an international level. Ecological features not included in legislation and policy may also be assigned importance due to, for example, local rarity or decline, or provision of a functional role for other ecological features. Professional judgement is used to assign such importance.

Criteria for Assessing Ecological Impacts

10.3.10 The potential impacts on designated sites, habitats and species have been considered in relation to the proposed development. The impacts have been assessed without consideration of any specific mitigation measures that might be employed. The assessment of likely ecological impacts has been made in relation to the baseline conditions of the ecological study area. The likely impacts of development activities upon ecological features have been characterised according to several variables detailed in Table 10.3.

Table 10.3: Impact Characterisation	
Parameter	**Description**
Direction	Impacts are either adverse (negative) or beneficial (positive).
Magnitude	This is defined as high, moderate, low or negligible, with these being classified using the following criteria:

Table 10.3: Impact Characterisation	
Parameter	**Description**
	High: Total/near total loss of a population due to mortality or displacement or major reduction in the status or productivity[4] of a population due to mortality or displacement or disturbance. Total/near total loss of a habitat. Medium: Partial reduction in the status or productivity of a population due to mortality or displacement or disturbance. Partial loss of a habitat. Low: Small but discernible reduction in the status or productivity of a population due to mortality or displacement or disturbance. Small proportion of habitat lost. Negligible: Very slight reduction in the status or productivity of a population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the 'no change' situation. Slight loss of habitat that is barely discernible from the habitat resource as a whole.
Extent	The area over which the impact occurs.
Duration	The time for which the impact is expected to last prior to recovery of the ecological feature or replacement of the feature by similar resource (in terms of quality and/or quantity). This is expressed as a short-term, medium-term, or long-term effect relative to the ecological feature that is impacted.
Reversibility	Irreversible impacts: permanent changes from which recovery is not possible within a reasonable time scale or for which there is no reasonable chance of action being taken to reverse it. Reversible impact: temporary changes in which spontaneous recovery is possible or for which effective mitigation (avoidance/cancellation/reduction of effect) or compensation (offset/recompense/offer benefit) is possible.
Frequency and timing	The number of times an activity occurs will influence the resulting effect (if appropriate, described as low to high and quantified, where possible). The timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons e.g. the badger breeding season.

10.3.11 The assessment only describes those characteristics relevant to understanding the ecological impact and determining the significance of the effect.

Risk Analysis for Bat Species

10.3.12 Risk analysis of bat species found to be present in the ecological study area determined the level of risk to both individuals and populations, following technical advice published by Natural England (2014).

10.3.13 Low, medium and high risk categories were used to classify the degree of risk to, and therefore the sensitivity of, individual bats from wind turbines based on information on their flight patterns, foraging strategies and echolocation calls collected during the bat surveys. Similarly, the classifications of low, medium and high were used to classify the risk to bat populations based on relative population size for each species, and therefore their likely sensitivity.

[4] Status is defined as the conservation status of the species and indicates whether the species is likely to become extinct in the near future. Productivity is defined as the rate of population growth.

10.3.14 Tables 10.4: Individuals of Bat Species Likely to be at Risk from Wind Turbines and 10.5: Populations Likely to be Threatened Due to Risk from Wind Turbines show the risk to bats from wind turbines on an individual level and on a population level as published by Natural England (2014).

Table 10.4: Individuals of Bat Species Likely to be at Risk from Wind Turbines		
Low Risk	**Medium Risk**	**High Risk**
Myotis sp.	Common pipistrelle *Pipistrellus pipistrellus*	Noctule *Nyctalus noctule*
Long-eared bats *Plecotus sp.*	Soprano pipistrelle *P. pygmaeus*	Leisler's *N. leisleri*
Horseshoe bats *Rhinolophus sp*.	Serotine *Eptesicus serotinus*	Nathusius pipistrelle *Pipistrellus nathusii*
	Barbastelle *Barbastella barbastellus*	

Table 10.5: Populations Likely to be Threatened Due to Risk from Wind Turbines		
Low Risk	**Medium Risk**	**High Risk**
Myotis sp.	Serotine	Noctule
Long-eared bats	Barbastelle	Leisler's
Horseshoe bats		Nathusius pipistrelle
Common pipistrelle		
Soprano pipistrelle		

Effects Significance

10.3.15 Significant effects are assessed with reference to the geographical importance of the ecological feature. However, the scale of significance of an effect may not be the same as the geographic context in which the feature is considered important. For example, an effect on a species which is on a national list of species of principal importance for biodiversity may not have a significant effect on its national population.

10.3.16 For the purposes of EcIA, apart from in exceptional circumstances, a significant effect is only considered to be possible where the feature in question is considered to be of regional, national or international importance. That is not to say that impacts from the proposed development could not result in effects on features of county or local importance[5], simply that those effects are not considered significant under EIA Regulations.

10.3.17 The potential for significant effects, in the absence of mitigation, has been determined with reference to the geographic conservation importance and the criteria in Table 10.2. By referring to the criteria in Table 10.3, the assessment seeks to characterise the magnitude of the effects in space and time. Except in exceptional circumstances, effects characterised as negligible or low magnitude would typically be short term and reversible. Therefore, even if the feature is of regional, national or international conservation importance, a negligible or low magnitude effects is not likely to be significant. Moderate and high magnitude effects, are likely to be medium to long term, and possibly irreversible. Where the feature is of regional, national and international

[5] It is noted that the CIEEM (2016) Guidelines for Ecological Impact Assessment allow for effects to be categorised as 'significant' at any geographic scale e.g. from local to international, however in the context of the EIA Regulations, an effect on features of local and county conservation importance, are, in general, not considered significant under the EIA regulations.

conservation importance, moderate and high magnitude effects are, in general, likely to be significant.

10.3.18 Mitigation and/or compensation is proposed for all effects considered significant under the EIA Regulations. Where appropriate, as a good practice measure, additional controls and/or compensation may be proposed for effects on features of county or local importance, or where required in relation to protected species where legislation may require actions to protect populations or individuals.

10.3.19 Residual effects are characterised as either adverse (negative) or beneficial (positive) and either **significant** or **not significant**, taking account of mitigation and/or compensation proposals.

Assessing Cumulative Effects

10.3.20 Cumulative effects can result from individually insignificant but collectively significant effects taking place over a period of time or concentrated in a location. Cumulative effects are particularly important in EcIA as many ecological features are already exposed to background levels of threat or pressure and may be close to critical thresholds where further impacts could cause irreversible decline and significant effects. Further impacts can also make habitats and species more vulnerable or sensitive to change.

10.3.21 Developments included in the cumulative impact assessment are the following types of future development where environmental information is available:

- proposals for which consent has been applied that are awaiting determination in any regulatory process (not necessarily limited to planning permission);
- projects which have been granted consent (not limited to planning permissions) but which have not yet been started;
- proposals which have been refused permission but which are subject to appeal and the appeal is undetermined; or
- to the extent that their details are in the public domain, proposed projects that will be implemented by a public body but for which no consent is needed from a competent authority.

Limitations of Assessment

10.3.22 It should be noted that the availability and quality of the data obtained during desk studies is reliant on third party responses. This varies from region to region and for different species groups. Furthermore, the comprehensiveness of data often depends on the level of coverage, the expertise and experience of the recorder and the submission of records to the local recorder.

10.3.23 The habitat and faunal surveys provide a snapshot of ecological conditions and do not record plants or animals that may be present in the ecological study area at different times of the year. The absence of a particular species cannot definitely be confirmed by a lack of field signs and only concludes that an indication of its presence was not located during the survey effort. However, surveys in 2013 were undertaken during optimal periods for identifying flowering plants or locating faunal species' field signs and there are not considered to be any limitations on the data derived. The update survey in 2018 was undertaken in January, outwith the optimal period for surveying habitats and water vole. However, as no signs of water vole were recorded in 2013 and the habitats were considered to have minimal importance for this species and were found not to have changed in the 2018 surveys, this is not considered to be a limitation to the data derived.

10.3.24 The protected species survey area, particularly for badger, was restricted as areas of the forest were inaccessible due to the forest density. However, all forest edges were surveyed for mammal paths, which were followed where present. As such, the survey results are considered to be robust and sufficient for the purpose of preparing this assessment.

10.4 Baseline Conditions

Current Baseline

Designations

10.4.1 Ornithological designations are considered in Chapter 9: Ornithology. There are no statutory ecological designations present in the ecological study area. The following sites are located within 10 km of the nearest proposed turbine as shown on Figure 10.1: Designated Sites.

10.4.2 Tangy Loch SSSI boundary is located less than 100 m to the south east of the closest turbine (although the loch itself is approximately 500 m to the south east of the nearest turbine) and is an important oligotrophic loch supporting slender naiad *Najas flexilis*, a nationally rare aquatic plant.

10.4.3 Machrihanish Dunes SSSI is located over 2 km from the nearest turbine to the south-west of the proposed development and is important for its sand dunes. Due to its distance from the proposed development and the main A83 road acting as a barrier, this site is not considered further in this assessment.

10.4.4 Woodland listed on the semi-natural woodland inventory (SNWI) is a non-statutory designated site and is located in the north of the ecological study area, as shown on Figure 10.1: Designated Sites. However, this area of woodland is no longer semi-natural and has been replaced by coniferous plantation. No areas of ancient woodland occur in the ecological study area.

Field Surveys

10.4.5 Detailed results of field surveys are provided in Appendix 10.1: Survey Methodology and Detailed Results. A summary of the ecological features recorded in the ecological study area is provided in this section.

Phase 1 Habitat Survey

10.4.6 The Phase 1 Habitat Map is shown on Figure 10.2: Phase 1 Habitat Survey. The habitats in the ecological study area are dominated by coniferous plantation, marshy grassland, improved grassland and wet modified bog. Two areas in the east comprise recently felled forest. The forest fire breaks consist of areas of wet and dry heath as well as marshy grassland and wet modified bog.

NVC Surveys

10.4.7 Figure 10.3: NVC Survey shows the NVC habitats present in the ecological study area. Table 10.6: GWDTE provides information on the area and sensitivity of each habitat that is groundwater dependent, with their locations shown on Figure 10.4: GWDTE. The NVC habitats that are not considered to be GWDTE are detailed in Appendix 10.1: Survey Methodology and Detailed Results.

10.4.8 Much of the existing Tangy I and II Wind Farm is covered in a carpet of rushes (*Juncus sp*.). While these species are present due to their ability to colonise disturbed land, habitats dominated by rushes tend to be classified as GWDTE. In the ecological study area, the *Juncus* dominated M23 is classified as a highly GWDTE by SEPA. However, the M23 habitat in the ecological study area is largely a species poor wet grassland as a result of grazing pressures and is considered to be of low importance. Much of, the M23 rush pasture adjacent to the existing Tangy I and II Wind Farms has formed as a direct result of the disturbance of habitats caused by construction.

10.4.9 No habitats of greater than local value have been identified on site. There are examples of peatland habitats, such as M15, M16 and M19, that may be considered to have greater ecological value but the examples in the ecological study area are degraded and modified by afforestation and grazing. The examples of GWDTE in the ecological study area have been similarly altered or, as described previously, are only present as a result of previous developments.

Table 10.6: GWDTE						
Habitat Code	**Name**	**Area (ha)**	**Details**	**Groundwater Dependency**	**Sensitivity**	**Importance**
M15	*Scirpus cespitosa-Erica tetralix* wet heath	12.42	More than half of the fire breaks in the coniferous plantation, as well as parts of the open area south-west of the plantation, contain M15 wet heath.	Moderate	Moderate	Local
M15/ M25/ W2	*Scirpus cespitosa-Erica tetralix* wet heath/ *Molinia caerulea-Potentilla erecta* mire/ *Salix cinerea-Betula pubescens-Phragmites australis* woodland	0.12	A small section of the fire break towards the northern part of the ecological study area contains a mix of M15/M25 heath/mire, and W2 woodland.	Moderate	Moderate	Local
M15/ W23/ MG10	*Scirpus cespitosa-Erica tetralix* wet heath/ *Ulex europaus-Rubus fructicosus* scrub/ *Holcus lanatus-Juncus effusus* rush-pasture	0.14	Immediately to the north-west of the M15/M25/W2 mixture, the habitat changes to a M15 wet heath, W23 scrub and MG10 rush pasture mosaic.	Moderate	Moderate	Local
M16	*Erica tetralix-Sphagnum compactum* wet heath	1.08	An area of M16 wet heath is located in the north-eastern part of the existing wind farm.	High	High	Local
M16a	*Erica tetralix-Sphagnum compactum* wet heath, typical sub-community	4.56	A few large areas of M16a wet heath are located on the northern section of the existing wind farm.	High	High	Local
M16d	*Erica tetralix-Sphagnum compactum* wet heath*, Juncus squarrosus-Dicranum scoparium* sub-community	5.91	Large parts of the field located on the western edge of the existing wind farm consist of M16d wet heath.	High	High	Local
M23	*Juncus effusus/acutiflorus-*	68.2	The largest NVC community in the ecological study	High	Moderate	Local

Table 10.6: GWDTE						
Habitat Code	**Name**	**Area (ha)**	**Details**	**Groundwater Dependency**	**Sensitivity**	**Importance**
	Galium palustre rush-pasture		area is M23 rush pasture, which is present in several fire breaks as well as in fields and adjacent to infrastructure on the existing wind farm.			
M23/ M25	*Juncus effusus/acutiflorus-Galium palustre rush-pasture/ Molinia caerulea-Potentilla erecta* mire	0.24	A small section of a fire break in the east of the ecological study area contains a mosaic of M23 rush pasture and M25 mire.	High	Moderate	Local
M23/ M15	*Juncus effusus/acutiflorus-Galium palustre* rush-pasture/ *Scirpus cespitosa-Erica tetralix* wet heath	0.42	A section of a fire break in the coniferous plantation contains M23 rush pasture and M15 wet heath.	High	Moderate	Local
M25	*Molinia caerulea-Potentilla erecta* mire	11.83	Large parts of the ecological study area, including many fire breaks in the west of the coniferous plantation and fields on the existing wind farm, contain M25 mire.	Moderate	Moderate	Local
M5/ W23/ MG1	*Carex rostrata-Sphagnum squarrosum* mire/ *Ulex europaus-Rubus fructicosus* scrub/ *Arrhenatherum elatius* grassland	0.11	A small area in the north contains a mosaic of M5 mire, W23 scrub and MG1 grassland.	High	High	Local
M6	*Carex echinata-Sphagnum recurvum/auriculatum* mire	0.07	A fire break near the east of the ecological study area contains M6 mire.	High	High	Local
M6c	*Carex echinata-Sphagnum recurvum/auriculatum* mire, *Juncus effusus* sub-community	0.17	A small section of a fire break towards the northern part of the coniferous	High	High	Local

Table 10.6: GWDTE						
Habitat Code	**Name**	**Area (ha)**	**Details**	**Groundwater Dependency**	**Sensitivity**	**Importance**
			plantation contains M6c.			
MG10	*Holcus lanatus-Juncus effusus* rush-pasture	9.27	Large parts in the north-west of the ecological study area, including several fire breaks, contain MG10 rush pasture.	Moderate	Low	Local
MG9	*Holcus lanatus-Deschampsia cespitosa* grassland	0.83	A few sections along the Allt nan Creamh contain MG9 grassland.	Moderate	Low	Local
MG9/ MG10	*Holcus lanatus-Deschampsia cespitosa* grassland/ *Holcus lanatus-Juncus effusus* rush-pasture	1.46	Two fire breaks in the east of the ecological study area contain a mosaic of MG9 grassland and MG10 rush-pasture.	Moderate	Low	Local
U4/ M15	*Festuca ovina-Agrostis capillaris-Galium saxatile* grassland/ *Scirpus cespitosa-Erica tetralix* wet heath	0.57	A fire break in the west of the coniferous plantation consists of a mosaic of U4 grassland and M15 wet heath.	Moderate	Moderate	Local

Protected Species

10.4.10 Protected species surveys recorded the following[6]:

- Three otter spraints on the Allt nan Creamh, as shown on Figure 10.8: Otter and Pine Marten Survey;
- Two outlier badger setts, one with three active entrances, the other with a single inactive entrance approximately 50 m to the south of the active sett, as shown on confidential Figure 10.9: Badger Sett.
- Four bat species comprising common pipistrelle, soprano pipistrelle, Leisler's bat and Daubenton's bat. Overall bat activity within the site boundary was low, with the highest abundance recorded outwith the site boundary along the broadleaved woodland to the south and by Tangy Loch. Only two passes of Leisler's bat were recorded (one probable and one confirmed), with the remaining activity dominated by common species at low and medium risk of effects from wind farms at a population level. Full details of the results of the bat surveys are provided in Appendix 10.2: Bat Survey Analysis;
- Possible pine marten scat in the coniferous plantation to the south of the Allt nan Creamh, as shown on Figure 10.8: Otter and Pine Marten Survey;

[6] All records are from 2013 except for the potential pine marten scat identified in 2018.

- Four sightings of common lizard *Zootoca vivipara*, three within the coniferous plantation in the centre of the proposed development and one in the open habitat around the existing wind turbines in the south of the proposed development, as shown on Figure 10.13: Reptile Survey;
- Palmate newt *Lissotriton helvetica* in pond 3, as shown on Figure 10.5: GCN;
- Brown trout in Tangy Burn. Full details of the results of fish surveys are provided in Appendix 10.4: Fish Habitat Survey Report; and
- Freshwater invertebrate assemblage showing good water quality at all six sites. Full details of the results from freshwater invertebrate surveys are provided in Appendix 10.3: Freshwater Invertebrate Results.

Future Baseline

10.4.11 The future baseline of the ecological study area is unlikely to be different from the current baseline. The coniferous plantation is likely to be harvested by clear fell methods before the trees reach maturity at 40-70 years. Without the proposed development, the forest would be felled within approximately the next decade. These areas are then typically restocked for another rotation of the process to begin.

10.4.12 The peatland and grassland habitats are considered unlikely to change significantly in the absence of the proposed development as the open habitats of the existing Tangy I and II Wind Farms would continue to be impacted and shaped by afforestation and grazing. The majority of habitats are already modified by surrounding coniferous plantation and farming practices, which are expected to continue. Therefore, the distribution of species present within the ecological study area is unlikely to change significantly in the future. Temporary to long term displacement of forest species is likely as coniferous plantations are clear felled and replanted and species recolonise the previously displaced area.

Ecological Importance

10.4.13 The ecological features identified as being sensitive to the proposed development and that have been 'scoped-in' to the assessment are given in Table 10.7: Importance of Ecological Features, together with the justification for their inclusion:

Table 10.7: Importance of Ecological Features

Ecological Feature	Importance	Justification
Tangy Loch SSSI	National	This is a statutory designated site for the presence of slender naiad, a plant protected under the EC Habitats Directive (EU, 1994) and the Wildlife and Countryside Act (UK Government, 1981). The proposed development has a potential hydrological connection to the SSSI.
Habitats (M5/W23/MG1, M6, M6c, M15, M15/M25/W2, M15/W23/MG10, M16, M16a, M16d, M19, M20, M23, M23/M25, M23/M15, M25, MG10, MG9, MG9/MG10, U4/M15 and U4)	Local	These habitats are considered to be groundwater dependent and could be affected by the proposed development. Some of the examples identified on site are likely to have developed as a result of previous works to construct Tangy I and II. GWDTE are sensitive to changes in hydrology and hydrogeology and are a priority under the EU Water Framework Directive (EU, 2000). The examples of these habitat types within the ecological study area are of

Table 10.7: Importance of Ecological Features		
Ecological Feature	**Importance**	**Justification**
		varying condition and subject to modification but do include areas of increased diversity.
Bat Species	County	Bats are a EPS under the EC Habitats Directive (EU, 1994). Bat activity is low across the ecological study area and is dominated by common species that are at a low risk of adverse effects on their populations, although at a medium risk of adverse effects on individuals. However, Leisler's bat is a notable species due to its rarity in Scotland, although only two records (one probable and one confirmed) were recorded across the entire survey period in the ecological study area during surveys in 2013.
Otter	Local	Otters are a EPS under the EC Habitats Directive (EU, 1994). Otter activity was recorded along the Allt na Creamh. Although no protected resting or dwelling places were recorded in the ecological study area, the species could be disturbed by the proposed development.
Badger	Local	Badgers and their setts are protected under the Protection of Badgers Act (UK Government, 1992). Signs of badger activity were low. A single active sett occurs approximately 75 m from the proposed development and disturbance of this sett is possible.
Pine marten	Local	Pine marten are protected under Schedule 5 of the Wildlife and Countryside Act (UK Government, 1981). A possible, single scat was recorded in the coniferous plantation of the ecological study area, although No protected dens were recorded.
Fish species (brown trout)	Local	Brown trout are a priority species in the UK Post-2010 Biodiversity Framework (UK Government, 2012). Spawning brown trout were recorded in the ecological study area, with limited spawning habitat present in Tangy Burn. Any further damage to this habitat as a result of the proposed development could be detrimental to local brown trout populations.
Reptiles (common lizard)	Local	All reptiles are protected under the Wildlife and Countryside Act (UK Government, 1981) from intentional killing or injury. Four common lizard sightings were recorded in the ecological study area and injury or death of common lizard could occur as part of the proposed development.

10.5 Effects Evaluation

10.5.1 This section considers the potential impacts and associated effect significance of the decommissioning of the existing Tangy I and II Wind Farms and all associated infrastructure not considered for re-use on the proposed development (Tangy IV), as well as the installation and operation of the Tangy IV wind turbines, their access tracks and other associated infrastructure, as described in Chapter 5: Description of Development.

Construction Impacts

Habitats

10.5.2 Construction activities have the potential to result in adverse impacts that directly degrade or destroy terrestrial habitat as a result of, for example, excavation, compaction, or modification (e.g. vegetation removal, covering). Alternatively, there could be indirect impacts as a result of, for example, dewatering, or from the accidental release of fuels, lubricants or other chemicals. Construction could cause changes in drainage patterns resulting in the degradation of existing habitats, particularly GWDTE. Some aquatic habitats could be adversely affected indirectly as a result of accidental releases of silt, fuel, lubricants or chemicals, such as Tangy Loch SSSI. Some activities could cause permanent degradation or destruction, for example where turbine foundations are constructed or permanent new access tracks are formed, but in most cases, adverse effects would be temporary.

10.5.3 In particular, pollution or siltation impacts from activities around turbine 5 and borrow pit E have the potential to have an adverse impact upon Tangy Loch SSSI and the slender naiad plants occurring there.

10.5.4 Table 10.8: Areas of Habitats Affected by Proposed Development shows the habitat area lost directly to and indirectly affected by turbines, tracks and other infrastructure, and the percentage of the total area those habitats comprise. The habitats with the highest percentage of potential direct loss are U4, M19 and M15. The habitats with the highest percentage of potential indirect loss are M6, U4/M15 mosaic and M15.

Table 10.8: Area of Habitats Affected by Proposed Development

		Direct Effect – Habitat Loss		Indirect Effect – Habitat Modification[7]	
Habitat Code	**Habitat Size in Ecological Study Area (ha)**	**Area Lost (ha)**	**Percentage Loss (%)**	**Area Modified (ha)**	**Percentage Modified (ha)**
H12	9.57	0.05	0.52	0.13	1.36
M6	0.07	0.005	7.14	0.01	14.29
M15	12.42	1.13	9.10	0.65	5.23
M16a	4.56	0.008	0.18	0.09	1.97
M19	13.17	1.28	9.72	0.37	2.81
M20	25.03	0.23	0.92	0.35	1.40
M23	68.20	2.52	3.70	1.60	2.35
M23/M15	0.42	0.01	2.38	0.02	4.76

[7] A 10 m buffer around the areas of direct habitat loss has been used to calculate the indirect habitat modification as this is considered to represent the likely area indirectly affected by the proposed development.

Table 10.8: Area of Habitats Affected by Proposed Development					
		Direct Effect – Habitat Loss		Indirect Effect – Habitat Modification[7]	
Habitat Code	**Habitat Size in Ecological Study Area (ha)**	**Area Lost (ha)**	**Percentage Loss (%)**	**Area Modified (ha)**	**Percentage Modified (ha)**
M25	11.83	0.27	2.28	0.21	1.78
MG7	45.27	3.33	7.36	1.17	2.59
MG10	9.27	0.02	0.22	0.04	0.43
U4	12.71	2.12	16.68	0.42	3.31
U4/M15	0.57	0.02	3.51	0.06	10.53
Totals	**214.17**	**9.81**	**4.58**	**4.33**	**2.02**

10.5.5 The only habitats that have a direct loss of greater than 5% are U4, M19, M15, MG7 and M6, with a potential loss of 2.12 ha, 1.28 ha, 1.13 ha, 3.33 ha and 0.005 ha, respectively. The only habitats that have an indirect modification of greater than 5% are M6, U4/M15 mosaic and M15, with a potential modification of 0.01 ha, 0.06 ha and 0.65 ha, respectively. M6 is a highly GWDTE with a high sensitivity rating and M15 and the U4/M15 mosaic are moderately GWDTE with moderate sensitivity ratings. U4, MG7 and M19 are not GWDTE.

10.5.6 The pre-mitigation assessment has identified a combination of permanent and temporary (reversible) adverse impacts on the habitats of the ecological study area. The impacts from accidental pollution events could be both direct, on for example the habitats themselves, and indirect on the species utilising those habitats. The pre-mitigation assessment concludes that these impacts could lead to an adverse effect at the local level in terms of habitat loss and/or modification, which is considered to be **not significant** under the EIA Regulations. Effects on Tangy Loch SSSI could be **significant** at the national level, which is significant under the EIA Regulations. Mitigation is specified to address potential effects on the Tangy Loch SSSI in Section 10.6.

Bat Species

10.5.7 As no bat roosts would be disturbed or destroyed as a result of construction activities, no impacts are predicted. Construction has the potential to result in a short term, low magnitude impact upon bats which forage infrequently in the forest, however that would **not result in a significant effect**.

Otter

10.5.8 Construction activities in the vicinity of the watercourses in the north to the north-west of the proposed development have the potential to disturb otters as a result of noise, vibration or light as otter are known to be present from spraints recorded along the Allt nan Creamh. This would be a localised, short term, low magnitude impact on this species. As a result, the effect of construction of the proposed development on otter is considered to be **not significant**.

Badger

10.5.9 Two outlier setts were recorded but only one was active at the time of the 2018 survey. The existing coniferous plantation in proximity to the sett would be felled to facilitate the wind farm construction and would likely result in disturbance of the sett. The change in habitat type with the felling of the forest and replanting to a key-hole design may also impact badger, potentially beneficially in the longer term. No other activity was recorded within the woodland.

10.5.10 Construction activities would likely have a localised, short term, low magnitude disturbance impact on this species. Neither sett would be destroyed. As a result, the effect of construction of the proposed development on badger is considered to be **not significant**.

Pine Marten

10.5.11 Construction of the proposed development would result in the permanent loss of forest habitat suitable for use by pine marten. However, only one potential pine marten scat was found on site. That notwithstanding, this is considered to be a low magnitude impact in the context of the available habitat resource remaining in the ecological study area and in the surrounding area. Construction activity would also likely have a localised, low magnitude disturbance impact on this species, potentially present at a low level in the ecological study area, with no records in 2013 and a single scat recorded in the 2018 survey. As a result, the effect of construction on pine marten is considered to be **not significant**.

Fish

10.5.12 Construction impacts have the potential to result in the degradation or destruction of aquatic habitats inhabited by fish, either directly by excavation or compaction, or indirectly by pollution from the accidental release of fuels, lubricants or other chemicals as well as changes in drainage patterns and silt released into aquatic habitats. The degradation of aquatic habitats could kill fish directly or change the chemical composition of the habitat. Pollution or sediments from construction runoff could also enter watercourses in the ecological study area and impact fish species in the larger watercourses that drain them, particularly Tangy Burn where brown trout were recorded. The pre-mitigation assessment concludes that this could lead to an adverse effect on fish species at the local level but this effect is considered to be **not significant** under the EIA Regulations as it is a local level feature.

Reptiles

10.5.13 Construction activities could result in the direct disturbance or injury/accidental death of individual reptiles. Construction activities could also have the potential to degrade or destroy reptile habitat either directly as a result of, for example, excavation, compaction, or modification (e.g. vegetation removal, covering) or indirectly as a result, for example, of dewatering, or from the accidental release of fuels, lubricants or other chemicals. Some activities could cause permanent degradation or destruction, for example where turbine foundations are constructed or permanent new access tracks are formed, but in most cases, impacts would be temporary and the effects are considered to be **not significant**.

Operational Impacts

Habitats

10.5.14 Operational impacts on habitats are considered possible through accidental spillage of fuels, chemicals and lubricants during maintenance works that have the potential to enter terrestrial and aquatic habitats, leading to habitat loss or degradation. In the absence of mitigation, this could be an adverse effect on habitats at the local level but this effect is considered to be **not significant** under the EIA Regulations. Effects on Tangy Loch SSSI could be **significant** at the national level, which is significant under the EIA Regulations.

Bat Species

10.5.15 The main operational impact on bat species is direct collision with wind turbines leading to bat fatalities. Bat mortality can also result from internal haemorrhage due to indirect barotrauma (Baerwald *et al.*, 2008).

10.5.16 The current low level of activity by any bat species in the ecological study area indicates that effects associated with either direct collision and indirect barotrauma are unlikely as only two passes of Leisler's bat, a species at high risk from the effects of wind farms on its population, were recorded, with the remaining low level of activity dominated by species at medium or low risk from the effects of wind farms at a population level. Therefore, based on the low total bat activity, the increased likelihood of a bat fatality associated with increased swept area is not considered to represent a significant effect.

10.5.17 Indirect impacts of wind turbines on bats also include disturbance and displacement from foraging, commuting or migrating areas. As bat activity is considered to be low in the ecological study area, the effects are predicted to be **not significant**.

Otter

10.5.18 Fuel and chemical spills from service vehicles and plant have the potential to enter watercourses and adversely impact otters by degrading the aquatic habitat and either directly killing fish species or indirectly killing their invertebrate prey and changing the chemical composition of the watercourses. This could be an adverse effect on otter at the local level but this effect is considered to be **not significant** under the EIA Regulations as it is a local level feature.

Badger

10.5.19 No adverse operational impacts on badger are predicted. It is possible that the removal of coniferous plantation in the ecological study area may create new foraging areas for badger and result in a beneficial effect on this species, although this effect is considered to be **not significant** due to the low magnitude of the impact and the low badger activity recorded in the ecological study area.

Pine Marten

10.5.20 No adverse operational impacts or effects on pine marten are predicted as no further habitat suitable for use by this species would be lost, with all wind farm activities occurring from access tracks and infrastructure established during construction.

Fish

10.5.21 Fuel and chemical spills from service vehicles and plant have the potential to enter watercourses and adversely impact fish species by degrading the aquatic habitat, and either directly killing fish species or killing their invertebrate prey and changing the chemical composition of the watercourses. In the absence of mitigation, these could lead to adverse effects at the local level but these effects are considered to be **not significant** under the EIA Regulations as they involve a local level feature.

Reptiles

10.5.22 No operational impacts on reptiles are predicted as no further habitat suitable for use by this species group would be lost, with all wind farm activities occurring from access tracks and infrastructure established during construction.

Decommissioning Impacts

10.5.23 The proposed development would involve both the decommissioning of the existing Tangy I and II Wind Farms in the southern part of the ecological study area as well as the decommissioning of the proposed development at the end of its lifetime. Decommissioning impacts would involve personnel and machinery accessing locations across the ecological study area to dismantle and remove infrastructure, including turbines, hardstanding and site buildings, as detailed in Chapter 5: Description of the Proposed Development. The existing wind turbines and towers would be removed to ground level, with the concrete foundations left in-situ and broken down to

approximately 1 m below ground level. The existing electrical cables would be left in-situ to minimise habitat disturbance. It is possible that the existing substation would also be retained. Approximately 2.2 km of access tracks would be removed and the habitat reinstated. These impacts would be short-term, intermittent and temporary and last weeks or months at any given location. Existing access tracks would be used to access the infrastructure to be decommissioned. As a result, no effects on habitats are predicted, with habitats allowed to recover and regenerate following the removal of infrastructure.

10.5.24 There may be a temporary and short term disturbance impact on protected species in the ecological study area but as this will be restricted to the access tracks and other infrastructure, the effect of this is considered to be **not significant**.

10.6 Mitigation

Mitigation by Design

10.6.1 The layout of the proposed development has, where possible, been designed to avoid those habitats of highest ecological value and highest sensitivity to effects. In the area of the existing Tangy I and II Wind Farms, existing infrastructure would be reused for tracks for the proposed development. New turbines have been placed outwith areas of high groundwater dependence, where possible, with the majority placed within the coniferous plantation to the north of the existing Tangy I and II Wind Farms. It should be noted that where turbines are placed in areas of GWDTE, the habitat is considered to be of low importance, with rushes dominating more because of disturbance and surface water than the groundwater dependence of the habitat.

10.6.2 M6 *Carex echinata-Sphagnum recurvum/auriculatum* mire, which is a highly GWDTE and considered highly sensitive, would be avoided as much as possible along the forest firebreak towards the eastern part of the ecological study area in order to reduce the direct habitat loss of 0.005 ha (7.14%) and the indirect modification of 0.01 ha (14.29%) expected without mitigation. As described in Chapter 4: Site Selection, the design evolution has taken into account areas of deep peat that would typically support this type of habitat, and the turbine locations and access track routes have been selected to avoid areas of deep peat, where possible. Where peat depth is >1 m, track construction would be of a floating design rather than a cut design, in order to minimise the disturbance to peat. Measures already taken into account during design include track micro-alignment to avoid deep peat and, where required, features would be incorporated into the track, such as hydrological culverts to minimise the potential effects on the hydrological characteristics of the M6 mire habitat. Further details of hydrological mitigation to reduce the significance of potential adverse effects on the hydrology are described in Chapter 12: Surface Water.

10.6.3 Infrastructure and turbine locations within the current coniferous plantation to the north of the site have been chosen to avoid the areas of deepest peat where the main areas of remnant peatland occur.

Mitigation during Construction

Tangy Loch SSSI

10.6.4 Peat slide risks on Tangy Loch SSSI and the required mitigation measures are discussed in Appendix 11.1: Peat Stability Risk Assessment. A detailed intrusive ground investigation following tree removal and prior to construction will inform relevant good practice measures to reduce peat slide risks. Such mitigation measures will be included in the CEMP.

Protected Species

10.6.5 A protected species survey, following best practice guidance, would be completed within eight months prior to the start of construction, particularly focusing on badger, otter and pine marten,

which may be present to be present, but including surveys for e.g. water voles. This would identify any protected species within the proposed development area not recorded during previous surveys, such as water vole. Depending on the time of survey and the start of construction works, a suitably qualified ecologist would be appointed to survey areas where reptiles may be found. Any reptiles discovered during the survey would be moved to suitable areas outwith the construction area. If the work is undertaken outwith the active months for reptiles, the ecologist would search for suitable hibernation sites for relocation. All such work would be undertaken in accordance with approved method statements.

10.6.6 Prior to work in the area of the known active badger sett (which is expected to comprise forestry clearance due to the volume of windthrow in this area), the measures described in Appendix 10.5: Badger Protection Plan would be followed to allow forestry clearance within 20 m of the active sett. A further survey of the single entrance sett prior to construction would determine if it is active, in which case the same protection measures would be applied. If found inactive, no protection measures would be required for this sett.

CEMP

10.6.7 An outline CEMP is included as Appendix 5.1: Construction Environmental Management Plan. The CEMP would be further developed post-consent and pre-construction to include protection and mitigation measures, as well as monitoring programmes, for all predicted and potential environmental impacts identified.

10.6.8 The CEMP would include measures to control levels of disturbance during the construction period, including set-back distances for construction works from badger setts, measures to avoid impacts on mature broadleaved woodland along the access track with the potential to support roosting bats, measures to protect Tangy Loch SSSI and wider measures relating to operational hours and construction site management.

10.6.9 All watercourses and ponds within the site boundary would have appropriate buffers, as agreed with SEPA. Exclusion zones within which construction activities would not occur, with the exception of works such as tracks crossing over watercourses, would be established and demarcated during the construction phase, where necessary. At all watercourse locations, appropriate pollution response spill kits and silt mitigation measures would be installed as described within the CEMP, in line with current good practice guidance

Mitigation during Operation

Watercourse and Aquatic Habitat Pollution Prevention Measures

10.6.10 The risk of pollution from surface runoff to watercourses and aquatic habitats, such as Tangy Loch SSSI, would be prevented by ensuring that runoff control measures, such as interceptor drains and silt traps to assist in maintaining water quality, are in place. Additionally, interceptor drains would be used to control the flow of any runoff from operation activities.

Mitigation during Decommissioning

Habitat Reinstatement - Decommissioned Areas

10.6.11 Areas of wind farm infrastructure such as turbines and tracks to be removed as part of the decommissioning of the existing Tangy I and II Wind Farms would be reinstated. Where tracks would not be upgraded to be used in the proposed development, they would be reinstated to allow recolonisation of natural habitats. It is likely that recolonisation would include M23 rush pasture and M23/M25 mire habitats as they are the habitats found around the sections of track to be removed. More details on the proposed approach to decommissioning and reinstatement are set out in Appendix 5.1: Construction Environmental Management Plan.

Good Practice Measures

Habitat Restoration

10.6.12 Active restoration of the peatland habitats in the ecological study area would be carried out in line with Appendix 10.6: Habitat Management Plan. Active restoration is defined here as the process of actively encouraging the regeneration of degraded peatland habitats. A total of 27.7 ha of peatland would be restored in deforested areas.

10.6.13 M15 *Scirpus cespitosus-Erica tetralix* wet heath, which is located throughout most of the firebreaks in the coniferous plantation and parts of the open area adjacent to the south-west part of the plantation, as well as M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire, which is located over large areas of the fire breaks in the middle of the site and areas on the northern part of the existing wind farm, are both likely to regenerate. It is assumed that the modified peatland under the forest was once classifiable as M15 and M19 and that these habitats are likely to regenerate following tree removal. However, it is likely that before reaching such plant communities, there would be periods of rush and grass dominance as typically seen on previous deforested sites.

Forestry Replanting

10.6.14 A total of 270.5 ha of coniferous plantation is required to be felled. Replanting would be to a keyhole design and would be predominantly Sitka spruce *Picea sitchensis*, selecting a slow growing provenance. This second rotation would be felled at 10 m in tree height. An area of approximately 3.50 ha of native broadleaf woodland planting is proposed to increase the biodiversity value of the site, see Appendix 10.6: Habitat Management Plan.

Bats

10.6.15 Forestry replanting would use a minimum buffer of 50 m from the turbine blade tip (the edge of the rotor swept area) to the nearest part of any habitat feature, to avoid creating an edge habitat near the turbines that would be attractive to bats, as specified in Natural England (2014) guidance. For this assessment, this guidance has been used to calculate the buffer distance required using the largest potential turbine specification, with a blade length of 65 m and a hub height of 85 m, and a tree height of 10 m, which equates to a buffer of approximately 87 m from the turbine blade tips.

10.6.16 Compensatory planting outwith the site would also be required to account for areas designed to accommodate the proposed wind farm infrastructure (including the bat buffers) where replanting is prevented. Further details on compensatory planting can be found in Chapter 16: Land-Use, Socioeconomics and Recreation.

Habitat Management Plan

10.6.17 Appendix 10.6: Habitat Management Plan provides details of the proposed restoration of 27.7 ha of peatland habitat and the creation of 3.50 ha of native broadleaved woodland.

10.7 Residual Effects

Construction - Habitats

10.7.1 Implementation of the proposed CEMP would avoid likely significant adverse effects from pollution events on Tangy Loch SSSI, with no residual effects predicted.

10.7.2 Following completion of construction of the proposed development (including reinstatement work), residual adverse effects are anticipated for the short to medium term (approximately five to ten years), until habitats have re-established. Permanent habitat loss would occur in peatlands (2.98 ha), coniferous plantation (11.44 ha) and GWDTE (3.98 ha) due to the excavation of turbine bases, other infrastructure and access tracks. This effect is considered to be of low magnitude due to the small footprint involved. As a result, no significant residual effects are predicted.

10.7.3 Approximately 27.7 ha of peatlands would be restored following deforestation as part of the compensation for forest removal. Forest replanting (on and off-site), including the creation of 3.53 ha of broadleaved woodland, would further meet compensatory planting obligations and provide a local beneficial effect. As a result, no significant residual effects are predicted.

10.7.4 While habitat types present in the ecological study area are considered to be GWDTE as a result of their habitat classification, they are noted to be predominantly of low conservation value, with rushes dominating because of high levels of existing habitat modification. The GWDTE are considered to be predominantly surface water dependent are not in contact with potential sources of groundwater. Nevertheless, the proposed track construction includes proposed measures to maintain hydrologic connectivity, where required, to minimise effects on GWDTE. As a result, no significant residual effects are predicted for GWDTE.

10.7.5 Overall, with the completion of the mitigation and good practice measures detailed in this chapter, whereby the most ecologically valuable and sensitive habitats have been avoided and measures to reduce impacts on all other habitats of higher value and sensitivity have been employed, the effects on habitats are considered to be **not significant**.

Construction – Protected Species

10.7.6 Overall, with the completion of the mitigation and good practice measures detailed in this chapter such as pre-construction protected species survey, the effects on protected species are considered to be **not significant**.

Construction - Fish

10.7.7 Following implementation of mitigation, such as the implementation of pollution prevention measures proposed in the CEMP, no residual effects are predicted on aquatic habitats or fish.

Operation - Habitats

10.7.8 Good practice pollution prevention measures would avoid likely adverse effects from pollution events in terrestrial and aquatic habitats. No residual effects on Tangy Loch SSSI or habitats have been identified (**not significant**). The proposed broadleaved woodland creation and peatland restoration would enhance the ecological study area by increasing the biodiversity value and providing suitable habitat for bat species, birds, mammals and reptiles. This could potentially result in a significant residual beneficial effect.

Operation – Protected Species

10.7.9 No residual effects on protected species have been identified for the operational phase of the proposed development (**not significant**).

Operation – Fish

10.7.10 No residual effects on fish have been identified for the operational phase of the proposed development (**not significant**).

Decommissioning

10.7.11 There would be no significant decommissioning effects pre-mitigation and, consequently, no residual decommissioning effects would occur.

Cumulative Effects

10.7.12 This section considers the potential for cumulative effects on habitats and species from those proposed, applied and consented schemes closest to the site by first describing the known conditions on each of those sites and then summarising the cumulative effect with the proposed development.

Beinn an Tuirc

10.7.13 Located approximately 2.5 km to the east of the proposed development, Beinn an Tuirc wind farm (Phase 3) contains similar habitats to the ecological study area. Potential effects considered are loss of GWDTE, pollution of habitats from run-off and spillages and tree felling of coniferous plantation. Most of the potential effects are not considered to have a cumulative effect with other committed developments in the area following mitigation. The HMP would have potential positive effects on peatland habitats. It is likely that some loss of GWDTE would occur despite the mitigation measures and, combined with the losses from the proposed development, would amount to a combined low percentage of GWDTE habitat loss.

Auchadaduie

10.7.14 Located approximately 5 km north of the proposed development, Auchadaduie wind farm is at the consented stage. Small areas of marshy grassland, semi-improved acid grassland, watercourses and broadleaved plantation were recorded on the site. Otter signs were found along Barr Water, but no bat activity was recorded and the site was considered unsuitable for foraging/roosting habitat. Mitigation included a 50 m buffer from the blade tips of the turbines to the forest edge and pre-construction surveys. No significant effects were predicted.

10.7.15 The proposed development in this assessment would lead to the temporary disturbance of otter and no significant effects on bats. The design also includes a 50 m buffer from the blade tips to planted forestry and pre-construction surveys for protected species, including otter. As a result, no cumulative effects are predicted.

Blary Hill

10.7.16 Located approximately 5 km north-east of the proposed development, Blary Hill wind farm is at the consented stage and the site comprises mostly coniferous plantation. Surveys recorded blanket bog, wet heath, bat species, otter, Atlantic salmon, brown trout and reptiles that may be affected by the wind farm. However, careful siting of the proposed development and its associated infrastructure would avoid significant effects on these ecological features. As a result, cumulative effects with the proposed development in this assessment are not predicted.

Deucheran Hill

10.7.17 Located approximately 14 km north-east of the proposed development, Deucheran Hill wind farm (operational) contains habitats that are similar to the ecological study area. Effects on habitats were considered to be negligible after adoption of ecologically sensitive construction methods for turbine base and track construction. As a result, no cumulative effects are predicted.

Summary of Cumulative Effects

10.7.18 Following SNH's strategic locational guidance (SNH, 2009) the proposed development falls within Zone 2 of medium natural heritage sensitivity that comprises 55 % of Scotland's land area. The main cumulative effects are considered to be a small loss of peatland habitats, some of which might be considered to be GWDTE. However, as a result of the felling of areas of coniferous plantation, an area (27.7 ha) of degraded peatland is proposed for restoration. The restoration of this peatland could result in an overall beneficial cumulative effect on habitats.

10.7.19 Taking into account the relative low cumulative effects of the surrounding proposed wind farm developments with the proposed development, no significant cumulative effects are considered to occur.

10.8 Post Construction Monitoring

10.8.1 Although no significant effects are predicted on bats, a dedicated search for bat carcasses would be carried out on a monthly basis within a 50 m radius of each turbine, as detailed in Appendix 10.6:

Habitat Management Plan. Searches would be undertaken by the applicant following the standard SSE protocol.

10.9 Summary of Assessment Conclusions

10.9.1 Table 10.9: Assessment Summary shows the summary of potential effects of the proposed development, with mitigation measures and the predicted residual effects.

Table 10.9: Assessment Summary					
Ecological Feature	**Potential Impact**	**Pre-Mitigation Effect Significance**	**Mitigation/Good Practice Measures Proposed**	**Implementation**	**Residual Effect Significance**
Construction					
Habitats, including GWDTE	Habitat loss or modification/degradation	Adverse but not significant	Avoidance of sensitive habitats, micrositing, reduction of impacts on GWDTE	Design and CEMP	Not significant
Aquatic habitats, Tangy Loch SSSI and fish	Accidental pollution or siltation of water bodies and habitats	Adverse on aquatic habitats and fish but not significant Significant adverse effect on Tangy Loch SSSI	Exclusion zones around watercourses agreed with SEPA and pollution and siltation prevention measures	CEMP	Not significant
Bat species	Loss of foraging habitat	Adverse but not significant	N/A	N/A	Not Significant
Otter	Disturbance	Not significant	Pre-construction protected species survey, exclusion zones around watercourses agreed with SEPA and pollution and siltation prevention measures	CEMP	Not significant
Badger	Disturbance	Not significant	Pre-construction protected species survey and badger protection plan to minimise disturbance to setts	ECoW present on site during construction/felling works around badger setts	Not significant
Pine marten	Habitat loss and disturbance	Not significant	Pre-construction protected species survey	ECoW	Not significant
Reptiles	Disturbance and accidental killing/injury of reptiles	Not significant	Pre-construction survey and ECoW present to translocate any reptiles	ECoW present on site during construction in suitable reptile habitats	Not significant
Operation					

Table 10.9: Assessment Summary					
Ecological Feature	**Potential Impact**	**Pre-Mitigation Effect Significance**	**Mitigation/Good Practice Measures Proposed**	**Implementation**	**Residual Effect Significance**
Habitats	Habitat restoration and creation	Significant beneficial effect	Restoration of 27.7 ha of peatland habitat and the creation of 3.53 ha of native broadleaved woodland	HMP	Significant beneficial effect
Aquatic habitats, Tangy Loch SSSI, otter and fish	Pollution or siltation of water bodies and habitats	Adverse but not significant for habitats, otter and fish Significant adverse effect for Tangy Loch SSSI	Pollution and siltation prevention measures	Spill kits stored on site (e.g. in central store in ops building) and carried in site vehicles when undertaking maintenance works	Not significant
Bat species	Mortality from collision or barotrauma and disturbance or displacement	Not significant	Maintenance of an 87m buffer between forestry replanting and turbines. Compensatory planting would also include areas of increased biodiversity with the planting of broadleaved species. Compensatory planting could provide new foraging and commuting areas	HMP	Not significant, potential for beneficial effect from compensatory planting
Badger	New foraging areas produced from removal of coniferous plantation	Beneficial but not significant	N/A	N/A	Beneficial but not significant
Pine marten	None predicted	N/A	N/A	N/A	N/A
Reptiles	None predicted	N/A	N/A	N/A	N/A
Decommissioning					

Table 10.9: Assessment Summary					
Ecological Feature	**Potential Impact**	**Pre-Mitigation Effect Significance**	**Mitigation/Good Practice Measures Proposed**	**Implementation**	**Residual Effect Significance**
Habitats	Habitat reinstatement	Not significant	Regeneration of habitats following removal of wind farm infrastructure and access tracks	CEMP	Not significant

10.10 References

ABC (2010-2015), *The Argyll and Bute Local BAP* https://www.argyll-bute.gov.uk/sites/default/files/planning-and-environment/AandB%20BAP%20Draft.pdf [2014]

ABC (2011), *Woodland and Forestry Strategy* https://www.argyll-bute.gov.uk/sites/default/files/planning-and-environment/woodland%20and%20forestry%20strategy%20april%202011.pdf [09/02/2018]

Chanin, P. (2003), *Monitoring the Otter Lutra lutra*, Conserving Natura 2000 Rivers Monitoring Series No 10, Peterborough: English Nature.

CIEEM (2016), *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal*. Winchester: Chartered Institute for Ecology and Environmental Management.

Cryan, P.M. (2008), *Mating Behaviour as a Possible Cause of Bat Fatalities at Wind Turbines*. Journal of Wildlife Management, 72: 845-849.

Baerwald, E.F., D'Amours, G.H., Klug, B.J. and Barclay R.M.R. (2008), *Barotrauma is a Significant Cause of Bat Fatalities at Wind Turbines*. Current Biology 18:695-696.

English Nature (2001), *Great Crested Newt Mitigation Guidelines*. ISBN 1 85716 568 3.

EU (2000), *Water Framework Directive* http://jncc.defra.gov.uk/page-1375 [2014]

EU (1994), *Habitats Regulations* http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/legal-framework/habitats-directive/euro/ [2014]

Forestry Commission (2011), *Forests and Water UK Forestry Standard Guidelines*, 5th Edition.

Gurnell, J. *et al* (2001), *Practical Techniques for Surveying and Monitoring Squirrels*. Edinburgh: Forestry Commission.

Hastie, M.R. and Cooksley, S.L. (2003), *Monitoring the Freshwater Pearl Mussel, Margaritifera margaritifera*. Conserving Natura 2000 Rivers Monitoring Series No. 2. Peterborough: English Nature.

Hundt, L. (2012), *Bat Surveys: Good Practice Guidelines, 2nd edition*. Bat Conservation Trust. ISBN-13: 9781872745985.

JNCC (2010), *Handbook for Phase 1 Habitat Survey – a technique for environmental audit*. Peterborough: JNCC.

MAGIC website http://www.natureonthemap.naturalengland.org.uk/MagicMap.aspx [2014]

Natural England (2014), *Natural England Technical Information Note TIN051*. Bats and onshore wind turbines.

Oldham R.S., Keeble J., Swan M.J.S. and Jeffcote M. (2000), *Evaluating the Suitability of Habitat for the Great Crested Newt (Triturus cristatus)*. Herpetological Journal, Vol 10, pp. 143-155.

Ratcliffe, D. (1977), *A Nature Conservation Review*. Cambridge: Cambridge University Press.

Rodwell, J.S. and Patterson, G.S. (1994), *Creating New Native Woodlands*, Forestry Commission Bulletin 112, London: Her Majesty's Stationary Office.

Rodwell, J.S. (2006), *National Vegetation Classification: User's Handbook*. Peterborough: JNCC.

Scottish Government (2017), *Planning Advice Note 1/2013* http://www.gov.scot/Publications/2013/08/6471 [30/01/2018]

Scottish Government (2014), *Scottish Planning Policy* http://www.gov.scot/Topics/Built-Environment/planning/Policy [30/01/2018]

Scottish Government (2011), *Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations* http://www.legislation.gov.uk/ssi/2011/139/made [30/01/2018]

SEPA (2009), *Engineering in the Water Environment Good Practice Guide: Riparian Vegetation Management*. Second edition. WAT-SG-44.

SEPA (2006), *Guidelines for Water Pollution Prevention from Civil Engineering Contracts* https://www.sepa.org.uk/media/152220/wat_sg_31.pdf [2014]

SEPA (2001), *Sampling of Freshwater Benthic Invertebrates*. Method number NWM/ECOL/002.

SFCC (2007), *Scottish Fisheries Co-ordination Centre Electrofishing Team Leader Training Manual*. Inverness College.

SNH (2009), *Strategic Locational Guidance for Onshore Wind Farms in Respect of The Natural Heritage*. Policy Statement No. 02/02 http://www.snh.org.uk/pdfs/polstat/ar-ps01.pdf [2014]

SNH SiteLink http://gateway.snh.gov.uk/sitelink/ [2014]

SNIFFER (2009), *WFD95: A Functional Wetland Typology for Scotland - Field Survey Manual*. Version 1. ISBN: 978 1 906934 22 4.

Strachan, R. (2012), *Water Vole Conservation Handbook*, Third Edition. Wildlife Conservation Research Unit.

UK Government (2017) *The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations* http://www.legislation.gov.uk/ssi/2017/101/regulation/1/made [05/02/2018]

UK Government (2012) *UK Post-2010 Biodiversity Framework* http://jncc.defra.gov.uk/page-6189 [05/02/2018]

UK Government (1992), *Protection of Badgers Act* http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/legal-framework/badger-protection/ [2014]

UK Government (1981), *Wildlife and Countryside Act* https://www.legislation.gov.uk/ukpga/1981/69 [2014]

Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. (2010), *Valuing Bats in Ecological Impact Assessment*. In Practice. December 2010 pp23-25. Winchester: CIEEM.