# *5 Ecology and Nature Conservation*

## 5.1 Introduction

5.1.1 This chapter describes the non-avian ecology and nature conservation baseline conditions and impact assessment for the Proposed Development. The chapter details the methods used to establish the ecological interest within the site and surrounding area and the process used to determine the nature conservation importance of the populations present. It then sets out the likely significant effects on Valued Ecological Receptors (VERs) during construction, operation and decommissioning and assesses the significance of potential effects on habitats and populations at an appropriate biogeographical scale. Means to mitigate any significant effects are proposed and a summary of residual effects is provided in Table 5.10. An assessment of effects on avian ecology is considered in Chapter 6: Ornithology.

5.1.2 One of the key outcomes of a Sharing Good Practice conference organised by Scottish Natural Heritage (SNH) and the Royal Society for the Protection of Birds (RSPB) was the need for ecological impact assessment chapters to be structured in a clear and transparent manner, preferably by species[1]. In response to this feedback, this chapter adopts a format in which *Baseline Description*, *Assessment of Potential Effects, Mitigation* and *Assessment of Significance* are considered separately for each species or functional group.

5.1.3 This chapter includes the following sections:

- Assessment Approach – this section summarises the main issues scoped in or out of this assessment, preliminary ecological appraisal methods (including stakeholder consultation and desk study), baseline survey methods and assessment methodology;
- Information gaps – this section highlights any information gaps or key data limitations;
- Receptor Assessments – this section includes a description of baseline non-avian ecology at the site, followed by assessment of likely significant effects (including cumulative effects) and proposed mitigation arranged per species or receptor.
- Habitat Management Plan (HMP) – this section also includes proposed monitoring methods;
- Summary of Residual Effects – an assessment of the significance of the effects of the Proposed Development after mitigation has been implemented
- Statement of Significance
- References

[1] SNH, RSPB. 09/09/2008. *Sharing Good Practice: Assessing the impacts of wind farm developments on birds.*

**5.2 Assessment Approach**

5.2.1 The assessment approach was designed with reference to various relevant legislation, policy and guidance, and involved a number of stages. Following best practice, a preliminary ecological appraisal was completed to scope in the main issues, and scope out issues which did not require further consideration in order to complete an impact assessment (Benatt 2012). Targeted novel baseline surveys were then undertaken where necessary to provide a baseline to inform this assessment. Finally an ecological impact assessment was completed. This approach and the methods employed are described in the following sections:

- Legislation;
- Summary of Main Issues;
- Preliminary Ecological Appraisal;
- Baseline Survey Methodology; and
- Impact Assessment Methodology.

Legislation

5.2.2 The following legislation, policy and guidance documents have been considered in assessing the ecological effects on non-avian ecology:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna (*Habitats Directive*);
- The Conservation (Natural Habitats, &c.) Regulations 1994;
- Wildlife and Countryside Act 1981 (as amended);
- Nature conservation (Scotland) Act 2004;
- The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007;
- Wildlife and Natural Environment (Scotland) Act 2011;
- The Protection of Badgers Act 1992;
- Highland Biodiversity Action Plan 2010-2013;
- Electricity Works (EIA) (Scotland) Regulations 2000;
- Guidance on the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000;
- Guidance on the Electricity Works (Environmental Impact Assessment) (Scotland) Amendment Regulations 2008;
- Scottish Executive Planning Advice Note 58: Environmental Impact Assessment[2];
- Scottish Government Planning Advice Note 1/2013: Environmental Impact Assessment;
- Scottish Planning Policy 2010;

[2] Superseded by Planning Advice Note 1/2013 after project had commenced.

- Scottish Executive National Planning Policy Guideline 6 (revised 2000): Renewable Energy Development;
- Scottish Planning Policy 6: Renewable Energy;
- Guidelines for Ecological Impact Assessment in the United Kingdom (Institute of Ecology and Environmental Management [IEEM] 2006);
- Guidelines for Preliminary Ecological Appraisal (Benatt 2012);
- Bats and onshore wind turbines: Interim guidance (second edition) (Natural England 2012) (adopted by SNH);
- Bat Mitigation Guidelines (Mitchel-Jones 2004);
- Bat Conservation Trust Bat Surveys Good Practice Guidelines (Bat Conservation Trust [BCT] 2012);
- Bat Conservation Trust Bat Surveys Good Practice Guidelines, 2nd Edition. Surveying for onshore wind farms (BCT 2011); and
- Handbook of Biodiversity Methods (Hill *et al.* 2005).

Summary of Main Issues

5.2.3 A preliminary ecological appraisal was undertaken, in accordance with best practice guidelines (Benatt 2012), in order to identify ecological sensitivities requiring more detailed targeted baseline survey work. This involved an initial site visit undertaken in August 2012, desk study and detailed stakeholder consultation. The outcome of this scoped in the following specific issues which were required to be addressed so as to inform this assessment:

- Protected mammals (particularly otters associated with Caithness & Sutherland Peatlands Special Area of Conservation [SAC], but also including other species such as badger, red squirrel, wildcat and pine marten, but not including bats);
- Habitats (particularly peatland habitats associated with the adjacent Caithness & Sutherland Peatlands SAC and Cnoc an Alaskie Site of Special Scientific Interest [SSSIs]);
- Freshwater Pearl Mussel (particularly populations associated with River Naver SAC); and
- Fisheries (particularly Atlantic salmon populations associated with River Naver SAC).

5.2.4 The following issues were scoped out during this process:

- Bats (full details for scoping out bats are provided in the Receptor Assessment section (5.4).

Preliminary Ecological Appraisal

5.2.5 A preliminary ecological appraisal was completed following best practice guidelines (Benatt 2012), and involved the following elements:

- Site visit;
- Desk study; and
- Stakeholder consultation.

5.2.6 A walkover visit was undertaken between 27$^{th}$ and 29$^{th}$ August 2012. The survey aimed to provide an overview of the site, to determine surveys that will be required to inform an ecological

assessment and to identify any obvious ecological sensitivities. The walkover visit involved the surveyor walking over the site and surrounding area, focusing particular attention on areas of possible concern. Areas of ecologically sensitive habitat, or with the potential to support species of conservation concern were noted, as were any species of particular conservation concern observed during the visit. Discussions were also held with Pieter Bakker (Altnaharra Estate) to identify known ecological sensitivities and any access constraints.

5.2.7 Data requests for information were made with Highland Biological Recording Group (HBRG), Scottish Badgers (SB), Saving Scotland's Red Squirrels (SSRS), North Highland Bat Network (NHBN), Amphibian and Reptile Conservation Trust (ARC), Butterfly Conservation (BC) and British Dragonfly Society (BDS). Responses are summarised in Table 5.1 below, and relevant data are included in the baseline accounts found elsewhere in this Chapter.

**Table 5.1 Data Search Summary**

| Data Provider | Result |
|---|---|
| HBRG | Data was provided and is considered in the relevant baseline descriptions. |
| SB | No relevant data held for this area. |
| SSRS | No relevant data held for this area. |
| NHBN | No relevant data held for this area. |
| ARC | No relevant data held for this area. |
| BC | Data was provided and is considered in the relevant baseline descriptions. |
| BDS | No relevant data held for this area. |

5.2.8 A detailed consultation document was issued to Scottish Natural Heritage (SNH) and Scottish Environmental Protection Agency (SEPA) on 20th September 2012. Both organisations were invited to comment on work completed to date and the proposed approach for progressing the site. An open dialogue was maintained throughout the project, ensuring that any sensitivities identified during novel survey work were discussed. In addition, a more general chapter was included in the formal Scoping report, and relevant responses were received from Highland Council and Scottish Government Energy Consents and Deployment Unit (ECDU). Table 5.2 provides a summary of consultation responses and action taken to address these.

**Table 5.2. Stakeholder Consultation Summary**

| Consultee | Date | Summary | Specific Actions |
|---|---|---|---|
| SEPA | 25/09/2012 | Confirmed that support approach to ecology – particularly Phase 1 Habitat Survey and National Vegetation Classification (NVC) Survey of potential Ground Water Dependent Terrestrial Ecosystems (GWDTEs), in accordance with current SEPA guidance (2012). | None required. |
| | 26/11/2012 | Formal scoping response. Relevant advice additional to that previously provided is summarised below. | |

| Consultee | Date | Summary | Specific Actions |
|---|---|---|---|
| | | Confirmed generally satisfied with approach.<br><br>Advised to reconsider roads, tracks or trenches within 100m of GWDTEs.<br><br>Advised to reconsider borrow pits or foundations within 250m of GWDTEs.<br><br>Where avoidance of GWDTEs is not possible, details of how effects will be minimised and mitigated should be provided. In particular this should address drainage, pollution and waste management. | <br><br>Considered within iterative design process.<br><br>Considered within iterative design process.<br><br>Mitigation outlined in this chapter, and Chapter 9: Other Issues. |
| SNH | 04/10/2012 | Welcomed approach to surveys on site.<br><br>Confirmed that relevant designated sites had been identified.<br><br>Confirmed that survey approach and methods were acceptable, and very thorough.<br><br>Confirmed that understood reasoning for not undertaking bat surveys, but were awaiting advice from an advisor. | None required. |
| | 12/10/2012 | Confirmed that support approach to ecology.<br><br>SEPA confirmed they agree there is a reasonable case for not undertaking bat surveys. | None required. |
| | 13/12/2012 | Formal scoping response. Relevant advice additional to that previously provided is summarised below.<br><br>Advised that site boundary used in Scoping Report included small areas of Caithness & Sutherland Peatlands SAC and Cnoc an Alaskie SSSI.<br><br>Advised that salmonid and eel surveys should be undertaken.<br><br>Advised that freshwater pearl mussel survey should be undertaken. | <br><br><br><br>Ensured that no development is within designated sites.<br><br>Undertook fisheries survey and assessment.<br><br>Undertook freshwater pearl mussel survey and assessment. |
| | 21/02/2013 | Confirmed that SNH had not requested additional surveys included in EDCU response (plant survey, reptile and amphibian survey, and terrestrial and aquatic invertebrate survey – see below).<br><br>Confirmed that SNH are satisfied with approach already being taken, and that additional surveys are not necessary. | None required. |
| Highland | 07/01/2013 | Advised that must consider likely effects on nature conservation interests of all designated sites in | None required: all advice is incorporated |

| Consultee | Date | Summary | Specific Actions |
|---|---|---|---|
| Council | | vicinity of Proposed Development.<br><br>Advised that must identify rare or threatened habitats and those protected under European or UK legislation, or identified in national or local Biodiversity Action Plans.<br><br>Advised that ES must provide details of mitigation proposals to avoid effects or reduce them to a level that is not significant. Habitat enhancement and mitigation measures should be detailed in biodiversity context. | within the ecological impact assessment approach. |
| ECDU | 01/02/2013 | Advised that must consider likely effects on nature conservation interests of all designated sites in vicinity of Proposed Development.<br><br>Advised that must identify rare or threatened habitats and those protected under European or UK legislation, or identified in national or local Biodiversity Action Plans.<br><br>Must provide a comprehensive account of habitats present on the Proposed Development site.<br><br>Advised that ES must provide details of mitigation proposals to avoid effects or reduce them to a level that is not significant. Habitat enhancement and mitigation measures should be detailed in biodiversity context.<br><br>Advised must provide sufficient information to make it clear how the Habitats Regulations tests will be met, as described in June 2000 Scottish Government guidance.<br><br>Must address whether or not the Proposed Development could assist or impede delivery of elements of relevant Biodiversity Action Plans.<br><br>Particular attention should be given to effects on priority habitats listed in Annex I of the Habitats Directive.<br><br>Particular attention should be given to effects on deep peat and intact hydrological units of mire vegetation.<br><br>Turbines and infrastructure must be located in light of vegetation work to minimise effects on vegetation communities and peat habitats.<br><br>Measures to avoid pH effects on peatland from use of cement/concrete must be set out. | Incorporated in ecological impact assessment approach.<br><br>Incorporated in ecological impact assessment approach.<br><br>Completed Phase 1 and NVC Habitat Surveys.<br><br>Incorporated in ecological impact assessment approach.<br><br>Incorporated in ecological impact assessment approach.<br><br>Incorporated in ecological impact assessment approach.<br><br>Incorporated in ecological impact assessment approach.<br><br>Incorporated in ecological impact assessment approach.<br><br>Considered within iterative design process.<br><br>Mitigation outlined in this chapter, and Chapter 9: Other Issues. |

| Consultee | Date | Summary | Specific Actions |
|---|---|---|---|
| | | SNH and Royal Society for the Protection of Birds (RSPB) may wish to see a Habitat Management Plan for the wind farm site and any areas managed in mitigation of compensation measures. | Habitat Management Plan is outlined in this chapter. |
| | | A commitment to maintain and/or enhance biodiversity in the overall area is expected. | Demonstrated in this chapter and Habitat Management Plan. |
| | | Monitoring of specific effects and the outcome of any Habitat Management Plan should be set out. | Demonstrated in this chapter and Habitat Management Plan. |
| | | Must consider legally protected animals and plants. | Incorporated in ecological impact assessment approach. |
| | | Advised that a plant survey (including fungi) should be undertaken. | Based on NVC Survey results, a plant survey was not considered necessary at this site. This approach was agreed with SNH. |
| | | Advised that mammal surveys should be undertaken. | Completed protected mammal survey. |
| | | Advised that reptile and amphibian surveys should be undertaken. | A preapplication reptile survey was not considered necessary for this site. This was agreed with SNH. Preconstruction surveys and mitigation for reptiles is outlined in this chapter. Surveys for amphibians were not considered necessary, as agreed with SNH. |
| | | Advised that fisheries and other freshwater ecology surveys should be undertaken. | Completed fisheries and freshwater pearl mussel surveys. Other freshwater ecology surveys were not considered necessary for this site, as agreed with SNH. |
| | | Advised that terrestrial and aquatic invertebrate surveys should be undertaken. | Completed freshwater pearl mussel surveys. Other terrestrial and aquatic invertebrate surveys were not considered necessary at |

| Consultee | Date | Summary | Specific Actions |
|---|---|---|---|
| | | | this site, as habitats present are not known for supporting outstanding populations of these groups. Furthermore, designated sites in the vicinity are not notified for invertebrates other than freshwater pearl mussels. This was agreed with SNH. |
| | 15/03/2013 | Confirmed that additional surveys included in Scoping Response are not required (plant survey, reptile and amphibian survey, and terrestrial and aquatic invertebrate survey – see above). | None required. |

Baseline Survey Methodology

5.2.9 Full details of survey methods and results can be found in the Technical Appendices within Volume 2 of the ES. A summary of methods employed are provided in Table 5.3 below, which also indicates the associated Technical Appendix where further information can be found. Note that surveys were conducted over a much larger area than the application boundary, as the original area considered for development (core survey area) has since been reduced as part of the iterative design process. Figure 5.1 indicates the core survey area in relation to the final application site boundary.

**Table 5.3. Baseline Survey Methodology**

| Survey | Technical Appendix with Detailed Methodology | Summary of Methodology |
|---|---|---|
| Phase 1 Habitat Survey | TA5.1 | A Phase 1 Habitat survey was conducted within the core survey area indicated in Figure 5.1. Standard methodology was used to identify habitat areas of ecological importance (JNCC 2010). The survey was conducted between 1st and 4th March 2013 and on 30th July, 6th August and 7th August 2013 under suitable weather conditions. Field maps were then used in conjunction with detailed aerial photography to produce the final Phase 1 habitat map. |
| National Vegetation Classification (NVC) Survey | TA5.1 | As the Phase 1 Habitat survey identified that the majority of the site consisted of modified bog, a full NVC survey was completed in the core survey area (Figure 5.1) in order to identify any areas of good quality peatland habitats which may be included under Annex I of the Habitats Directive which may also be associated with the adjacent Caithness & Sutherland Peatlands SAC and Cnoc an Alaskie SSSI. This survey also ensured that any potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs) were identified in accordance with guidance (SEPA 2012). The NVC survey was completed under suitable weather conditions between 3rd and 7th June 2013 and on 30th July, 6th |

| **Survey** | **Technical Appendix with Detailed Methodology** | **Summary of Methodology** |
|---|---|---|
| | | August and 7th August 2013 following standard methodology (Rodwell 2006). |
| Protected Mammal Survey | TA5.1 | A survey to determine the presence of protected mammals was conducted within the core survey area indicated in Figure 5.1 between 1st and 4th March 2013. This survey targeted otter, water vole, badger, red squirrel, pine marten and Scottish wildcat, although signs or observations of other species were also to be recorded. The survey was completed by an experienced mammal ecologist, and followed standard methodologies (Chanin 2003a; Chanin 2003b; Strachan *et al.* 2011; SNH 2001). Reference was made to appropriate field guides (Chanin 2003a; Strachan *et al.* 2011; Roper 2010; Bang & Dahlstrøm 2006). A camera trap was also employed to aid detection of cryptic species such as wildcat and pine marten. As the core survey area itself offered poor habitat for these species, the trap was located in the best habitat nearby in order to detect their presence in the wider area. The location of the camera trap is shown in Figure 5.1.<br><br>Furthermore, any field signs or observations of protected species were to be recorded during other ecology and ornithology survey routines completed between August 2012 and August 2013. |
| Freshwater Pearl Mussel Survey | TA5.1 | A survey to determine the presence of freshwater pearl mussels was undertaken by appropriately experienced and licensed ecologists between 7th and 10th May 2013, following standard methodology (SNH guidance accessed 2013[3]). Surveys assessed habitat suitability of the watercourses which may be influenced by the development including: River Vagastie (which forms part of the River Naver Special Area of Conservation [SAC], for which freshwater pearl mussels are a feature), Allt na h-Aire, Allt Bealach an Fhuarain and Allt a' Chraisg. Surveys to determine presence were undertaken in suitable habitat. Surveys included the development area as well as100m upstream and 500m downstream, and are shown in Figure 5.2. |
| Fisheries Survey | TA5.2 | Area delineated multi-run depletion electric fishing surveys were completed at sites on the Allt na h-Aire (2nd August 2012), Vagastie (15th to 30th August 2012) and River Tirry (13th September 2007 to 27th August 2012) (locations shown in Technical Appendix TA5.2). Surveys were carried out by experienced and qualified local fisheries staff following Scottish Fisheries Coordination Centre (SFCC) protocols (SFCC 2007).<br><br>These surveys provide information on the presence and abundance of Atlantic salmon, brown/sea trout and eels. Detailed habitat surveys were also performed for each site. Alternative sources of information were used to assess the presence of lamprey species and arctic charr, including previous |

[3] Scottish Natural Heritage. Freshwater Pearl Mussel Survey Protocol for use in site specific projects. http://www.snh.gov.uk/docs/A372955.pdf Accessed March and August 2013.

| Survey | Technical Appendix with Detailed Methodology | Summary of Methodology |
|---|---|---|
| | | SNH and SEPA surveys together with anecdotal evidence. |

Impact Assessment Methodology

5.2.10 The approach taken to the assessment of ecological effects follows the guidance produced by the Institute of Ecology and Environmental Management (IEEM 2006). These guidelines set out the process for assessment through the following stages:

- Identification of Valued Ecological Receptors (VERs) (the ecological components of highest value present at a site);
- Determining the nature conservation value (sensitivity) of the VERs present within the zone of influence that may be affected by the development;
- Identifying the likely significant effects based on the nature of the construction, operation and decommissioning of the Proposed Development;
- Determining the magnitude of the effects including consideration of the sensitivity of the receptor and the duration and reversibility of the effect;
- Determining the significance of the effects based on the interaction between the effect magnitude/duration, and the nature conservation value and the likelihood of the effect occurring;
- Identifying mitigation measures required to address significant adverse effects;
- Determining the residual effect significance after the effects of mitigation have been considered, including a description of any legal and policy consequences; and
- Identification of any monitoring requirements.

5.2.11 The assessment process involves identifying VERs. These ecological receptors and their conservation concern, or 'Sensitivity', are determined by the criteria defined in Table 5.4. It should be noted that these criteria are intended as a guide and are not definitive. Attributing a value to a receptor is generally straightforward in the case of designated sites, as the designations themselves are normally indicative of a value level. For example a site designated as a Special Area of Conservation under the Habitats Directive is implicitly of European (i.e. international) importance – and so classified as of 'Very high' sensitivity. Professional judgement is important when attributing a value level to a particular species or individual habitat. In these cases, reference has also been made to national guidelines for the selection of Sites of Special Scientific Interest (SSSI) in order to determine which level of significance should be applied (Nature Conservancy Council, 1989). Social and economic factors are also considered when valuing receptors, if appropriate.

**Table 5.4. Approach to Identifying Sensitivity for Ecological Receptors.**

| Sensitivity Level | Examples |
|---|---|
| Very high | An internationally designated site, candidate site, or an area meeting the criteria for an international designation (e.g. Special Area of Conservation [SAC]). |

| **Sensitivity Level** | **Examples** |
|---|---|
| | Large areas of priority habitat listed under Annex I of the Habitats Directive, and smaller areas of such a habitat that are essential to maintain the viability of that ecological resource.<br><br>A regularly occurring, nationally significant population of any internationally important species, listed under Annex II or Annex IV of the Habitats Directive. |
| High | A nationally designated site, or area meeting criteria for national level designations (e.g. Site of Special Scientific Interest [SSSI]).<br><br>Significant extents of a priority habitat identified in the UKBAP / Scottish Biodiversity List, or smaller areas which are essential to maintain the viability of that ecological resource.<br><br>A regularly occurring, regionally significant population of any nationally important species listed as a UK BAP / Scottish Biodiversity List priority species and Species listed under Schedule 1 or Schedule 5 of the Wildlife and Countryside Act or Annex II or Annex IV of the Habitats Directive. |
| Medium | Viable areas of key semi-natural habitat identified in the UKBAP.<br><br>A regularly occurring, locally significant population of any nationally important species listed as a UK BAP / Scottish Biodiversity List priority species and Species listed under Schedule 5 of the Wildlife and Countryside Act or Annex II or Annex IV of the Habitats Directive.<br><br>Sites which exceed the local authority-level designations but fall short of SSSI selection guidelines, including areas of semi-natural woodland exceeding 0.25ha. |
| Low | Areas of semi-natural ancient woodland smaller than 0.25ha.<br><br>Sites of Importance for Nature Conservation or equivalent sites selected on local authority criteria.<br><br>Local Nature Reserves.<br><br>Other species of conservation concern, including species listed under the Local BAP (LBAP).<br><br>Areas of habitat or species considered to appreciably enrich the ecological resource within the local context e.g. species-rich flushes or hedgerows. |
| Negligible | All other species and habitats that are widespread and common and which are not present in locally, regionally or nationally important numbers or habitats which are considered to be of poor ecological value (e.g. commercial forestry). |

5.2.12 Effects on VERs are judged in terms of magnitude and duration, or 'reversibility' (Regini 2000).

5.2.13 Magnitude is determined on a quantitative basis where possible. This may relate to the area of habitat lost to the development footprint in the case of a habitat receptor, or predicted loss of

individuals in the case of a population of a particular species of animal. Magnitude is assessed using the five categories detailed in Table 5.5.

**Table 5.5 Criteria for Describing Magnitude (adapted from Percival 2007)**

| **Magnitude** | **Description** |
|---|---|
| Severe | Total loss or very major alteration to key elements/features of the baseline (pre-development) conditions such that the post development character / composition / attributes would be fundamentally changed and may be lost from the site altogether.<br><br>Guide: <20% of population/habitat remains |
| Major | Major loss or major alteration to key elements / features of the baseline conditions such that the post development character / composition/attributes would be fundamentally changed.<br><br>Guide: 20-80% of population/habitat lost |
| Moderate | Loss or alteration to one or more key elements / features of the baseline conditions such that post development character / composition / attributes would be partially changed.<br><br>Guide: 5-20% of population/habitat lost |
| Minor | Minor shift away from baseline conditions. Change arising from the loss / alteration would be discernible but the underlying character/composition/attributes would be similar to pre-development circumstances/patterns.<br><br>Guide: 1-5% of population/habitat lost |
| Negligible | Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation.<br><br>Guide: < 1% population/habitat lost |

5.2.14 In the case of designated sites, spatial magnitude is assessed in respect of the area within the designated site boundary. For non-designated sites, spatial magnitude is assessed in respect of an appropriate scale depending on the value of the receptor.

5.2.15 Reversibility is defined by considering the duration of the effect. This is the time for which the effect is expected to last before recovery – i.e. return to pre-construction baseline conditions (see Table 5.6).

**Table 5.6 Criteria for Describing Reversibility of Effects**

| **Reversibility** | **Definition** |
|---|---|
| Irreversible | Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period (e.g. the replacement of mature trees by young trees which need >25 years to reach maturity, or restoration of ground after removal of a development. Such exceptions can be termed very long-term effects). |
| Reversible | Effects that recover over the lifetime of the development, either naturally or as a result of mitigation or compensation. Duration of reversible effects can be categorised as below:<br><br>Long-term (15 - 25 years)<br><br>Medium-term (5 – 15 years)<br><br>Short-term (up to 5 years) |

5.2.16 Knowledge of how rapidly the population or performance of a species is likely to recover following loss or disturbance (e.g. by individuals being recruited from other populations elsewhere) is used to assess reversibility, where such information is available.

5.2.17 Magnitude, reversibility and sensitivity are then considered alongside proposed mitigation, and the consequence of the effect determined. The nature of any effect on a VER is assessed as negative or positive based upon IEEM guidelines. While a negative change is one that is likely to cause an adverse effect on the integrity of a VER, a positive will result in a beneficial change. The concept of 'integrity' in this context refers to sustained coherence of ecological structure and function of a VER, and includes consideration of both temporal and spatial factors.

5.2.18 The combined assessment of the magnitude of the effect and the sensitivity of ecological receptors have been used to determine whether or not an effect is significant with respect to the EIA Regulations. Table 5.7 shows how these criteria are considered to determine the overall level of significance of an effect. Effects with significance levels of moderate, high and very high are considered to be significant in terms of EIA Regulations.

**Table 5.7 Significance Level of Ecological Effects**

| | Sensitivity of VER | | | | |
|---|---|---|---|---|---|
| **Magnitude of effect** | **Very High** | **High** | **Medium** | **Low** | **Negligible** |
| **Severe** | **Very High** | **Very High** | **High** | **Medium** | **Low** |
| **High** | **Very High** | **Very High** | **Medium** | **Low** | **Very Low** |
| **Moderate** | **Very High** | **High** | **Low** | **Very Low** | **Very Low** |
| **Minor** | **Medium** | **Low** | **Low** | **Very Low** | **Very Low** |
| **Negligible** | **Low** | **Very Low** | **Very Low** | **Very Low** | **Very Low** |

**Red = SIGNIFICANT in terms of EIA Regulations**
**Green = NOT SIGNIFICANT in terms of EIA Regulations**

Cumulative Impact Assessment Methodology

5.2.19 Cumulative effects would not be detected when considering the Proposed Development in isolation, but become significant in combination with other effects. The context in which cumulative effects are considered depends upon the ecology of the species or habitat in question.

5.2.20 The need to consider cumulative effects is a requirement of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000. Specific guidance has also been provided for assessment of cumulative effects of onshore wind farms on bird populations (SNH 2012), but not for other ecological receptors. However, much of the guidance for birds can be more widely applied to other ecological receptors. Projects to be incorporated in such an assessment must include those in the past (existing), present (consented), and foreseeable future (application stage). Therefore, a cumulative impact assessment must investigate the effects of the development:

- on its own;
- cumulatively with relevant existing and consented developments; and
- cumulatively with relevant existing and consented developments as well as those at the application stage.

5.2.21 In order to undertake a cumulative impact assessment it is necessary to define:

- the VERs where the Proposed Development may result in significant cumulative effects; and
- the relevant developments for which cumulative effects must be considered.

5.2.22 Upon defining these, a cumulative impact assessment is undertaken by summing the effects identified for each receptor by each project EIA.

5.2.23 The purpose of the cumulative impact assessment is to determine whether effects are likely to affect the Favourable Conservation Status of an ecological interest feature. Where the species or habitat is associated with an SAC or other designated site effects are assessed in context with this population or area. Where species are not associated with an SAC effects are assessed in a *regional* context. The appropriate regional bio-geographic unit has been identified as the Natural Heritage Zone (NHZ) by SNH. NHZ classifications represent areas with a high level of bio-geographic coherence, and are unrelated to administrative boundaries. At this stage, little data for the majority of ecological receptors is available at NHZ level. The constraints of available data

therefore make assessment at NHZ level difficult. Creag Riabhach lies within the Peatlands of Caithness and Sutherland NHZ, and regional effects are assessed within this area as far as is practicable.

5.2.24 As different projects often employ differing baseline and impact assessment methodologies, data often cannot be directly compared, and so quantitative assessment of cumulative effects is often not possible. Furthermore, as there is no compulsion for developers to share commercial data with other companies, it is often impossible to acquire a full dataset. Therefore a comprehensive and quantitative cumulative impact assessment is rarely possible. However, every effort has been made to provide a qualitative assessment that is as robust as the available data allows.

*Identifying Relevant Valued Ecological Receptors*

5.2.25 As different VERs vary in their ecology, behaviour and conservation status it is first necessary to define which species should be considered as this will determine the developments relevant to the cumulative impact assessment.

5.2.26 SNH guidance recognises that cumulative impact assessments can be expensive and time consuming, and it is therefore necessary to focus on likely significant effects which could affect the planning decision (SNH 2012; Masden *et al.* 2010). It is also important that any potential cumulative effects on Natura sites are considered so as to inform a Habitats Regulations Appraisal. As it is not practical to undertake a comprehensive cumulative impact assessment for all VERs, this assessment focuses on receptors identified as of 'High Sensitivity' which also have either a measurable effect predicted or those receptors for which a moderate significant negative effect or higher is predicted.

*Identifying Relevant Developments*

5.2.27 Upon determining the relevant VERs on which the Project may result in significant cumulative effects, a list of developments which should be considered can be identified.

5.2.28 The context in which cumulative impact assessments are considered depends on the ecology of the species or habitat. For example different species have different territory sizes or ranges, or habitat requirements.

5.2.29 Therefore, developments relevant to the cumulative impact assessment for one VER may differ from those appropriate for consideration for others.

**5.3 Information Gaps**

5.3.1 Information regarding the distribution and abundance of lamprey ammocoetes within the study area is limited. However, any significant effects on lampreys are considered highly unlikely with recommended mitigation in place.

**5.4 Receptor Assessments**

5.4.1 A summary of identified non-avian Valued Ecological Receptors (VERS) is provided in Table 5.8 below.

**Table 5.8 Summary of identified non-avian receptors.**

| Sensitivity | VER |
|---|---|
| VERY HIGH | Habitats; M2 and M3 bog pools, M15 wet heath, M17 blanket bog, H10 heath, H17 heath (Caithness & Sutherland Peatland SAC, Cnoc an Alaskie SSSI and Druim nam Bad SSSI support similar habitats)<br><br>Freshwater peal mussel (including features of River Naver SAC)<br><br>Atlantic salmon (including features of River Naver SAC)<br><br>Otters (including features of Caithness & Sutherland Peatlands SAC) |
| HIGH | Alpine ant spider *Micaria alpine* (included in 'Other Invertebrates' subsection)<br><br>Wildcat |
| MEDIUM | Brown/sea trout<br><br>Eels<br><br>Lamprey Species<br><br>Arctic charr<br><br>Reptiles<br><br>Pine marten<br><br>Water vole<br><br>Red squirrel<br><br>Bats |
| LOW | Upland Birchwood and scrub (no NVC code) (planted woodland)<br><br>Other invertebrates<br><br>Badger |
| NEGLIGIBLE | M6 mire<br><br>U4 grassland |

5.4.2 Receptors of negligible conservation importance are not considered further in this assessment as they were not recorded in important numbers or areas. These receptors are generally common and widespread species or habitats.

5.4.3 The results of field surveys and historical data searches are summarised below. Results from all relevant surveys are compiled to produce a baseline description for each particular receptor detected or reported. These are then discussed as species groups or individual receptor accounts as appropriate. Potential construction and operational effects are also considered for each receptor.

5.4.4 Mitigation is then discussed where appropriate. However, it should be considered that the principal mitigation measure adopted to minimise the ecological effects of the development has been the use of an iterative design process. Use has been made of ecological constraints plans and ecological issues have been taken into account throughout the design process. This means that most mitigation measures are embedded within the overall design, allowing the opportunity to microsite turbines away from sensitive habitats or species. This section presents specific measures adopted through the different phases of the development. An Ecological Clerk of Works (ECoW) will be appointed to oversee mitigation measures, and ensure best practise during the construction and decommissioning phases.

5.4.5 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas.

5.4.6 Potential cumulative effects are also considered.

5.4.7 Full details of survey results can be found in the relevant technical appendices (see Table 5.3), where they are presented for each discrete survey routine.

Designated Sites

5.4.8 Consultation and a search of available digital datasets indicates that there are no statutory designations of European importance (e.g. Special Areas of Conservation [SACs]) or national importance (e.g. Sites of Special Scientific Interest [SSSI]) within the application site boundary. Table 5.9 provides details of statutory designations of European importance within 20km and biological SSSIs within 5km of the Proposed Development site, and these are shown in Figures 5.3 and 5.4. Full citations for statutory designated sites can be requested from Caledonian Conservation Ltd or can be obtained at http://www.snh.org.uk/snhi/.

**Table 5.9 Designated Sites (also shown in Figures 5.3 and 5.4)**

| Designation | Site name | Distance (km) | Comments |
|---|---|---|---|
| Special Area of Conservation (SAC) | Caithness & Sutherland Peatlands | Adjacent | Internationally important habitats listed under Annex I of the Habitats Directive, including:<br>▪ Blanket bogs<br>▪ Depressions on peat substrates of the *Rhynchosporion*<br>▪ Natural dystrophic lakes and ponds<br>▪ North Atlantic wet heaths with *Erica tetralix*<br>▪ Oligotrphic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojunctea*<br>▪ *Saxifraga hirculus*<br>▪ Transition mires and quaking bogs<br>It is possible that changes to hydrology and pollution during construction or runoff from roads may have effects on habitats within the SAC.<br>It is possible that the Proposed Development site may include similar habitats to those in the SAC.<br>Internationally important population of otters (listed under Annex II of the Habitats Directive).<br>It is possible that otters associated with this SAC may forage or live within the Proposed Development site. |

| Designation | Site name | Distance (km) | Comments |
|---|---|---|---|
| SAC | River Naver | Adjacent | Internationally important populations of species listed under Annex II of the Habitats Directive:<br>▪ Atlantic salmon<br>▪ Freshwater pearl mussel<br>It is possible that salmon may use watercourses within the Proposed Development site to breed, and so the development may have an effect on this species.<br>It is possible that construction activities may result in pollution of watercourses which feed in to River Naver which may have effects on Atlantic salmon or freshwater pearl mussels. |
| Site of Special Scientific Interest (SSSI) | Cnoc an Alaskie | Adjacent | Nationally important blanket bog habitats.<br>It is possible that changes to hydrology and pollution during construction or runoff from roads may have effects on habitats within the SSSI.<br>It is possible that the Proposed Development site may include similar habitats to those in the SSSI.<br>The rare Red Data Book alpine ant-spider (*Micaria alpina*) is also known from Cnoc an Alaskie SSSI, although the record was erroneously assigned to Torridon Forest SSSI. However, at the time of writing the alpine ant-spider has not been added to the Cnoc an Alaskie citation. |
| SSSI | Ben Klibreck | 120m E | Nationally important habitats including: |

| Designation | Site name | Distance (km) | Comments |
|---|---|---|---|
| | | | ▪ Blanket bogs<br>▪ Upland birch woodland<br>▪ Alpine heaths<br>▪ Oligotrophic lochs<br><br>There is no pathway for effect as identified in this assessment. |
| SAC | Altnaharra | 2.18km N | Internationally important transition mires and quaking bogs (habitat listed under Annex I of the Habitats Directive).<br><br>There is no pathway for effect as identified in this assessment. |
| SSSI | Bad na Gallaig | 3.4km NE | Nationally important blanket bog habitats.<br><br>There is no pathway for effect on the habitat features as identified in this assessment. |
| SSSI | Loch Meadie Peatlands | 3.82km N | Nationally important blanket bog habitats.<br><br>There is no pathway for effect on the habitat features as identified in this assessment. |
| SSSI | Druim Nan Bad | 3.97km WNW | Nationally important blanket bog habitats.<br><br>There is no pathway for effect on the habitat features as identified in this assessment. |
| SAC | River Oykel | 16.5km W | Internationally important populations of species listed under Annex II of the Habitats Directive:<br><br>▪ Atlantic salmon<br>▪ Freshwater pearl mussel<br><br>There is no pathway for effect as identified in this assessment. |

5.4.9 Potential effects on these sites are considered alongside the relevant species or habitat receptors below.

Habitats

*Baseline*

5.4.10 A Phase 1 habitat survey identified the majority of the core survey area as modified bog with a margin of wet heath and acid grassland (see Figures 5.5 Phase 1 North and 5.6 Phase 1 South). Although degraded and of generally poor quality, the presence of bog and wet heath, which fall under Annex I of the Habitats Directive, indicated the necessity for a more detailed survey of the composition of habitats in order to inform a robust assessment. Therefore, an NVC survey was carried out for the entire core survey area, of which the final application site boundary is a portion (see Figures 5.7 NVC North and 5.8 NVC South). Only habitat that occurs within the application site boundary (Figure 5.8) will be considered here although an additional area has been set aside, north of the site, for purposes of compensation for the Habitat Management Plan (Figures 5.7 and 5.10). Full details of the Phase1 and NVC surveys can be found in Technical Appendix 5.1.

5.4.11 The majority of the site and core survey area consists of a large scale mosaic of blanket bog (mostly NVC type M17 with some M25) and wet heath (NVC type M15). Both are listed as internationally important Annex I Habitats under the Habitats Directive and are considered to be of **very high sensitivity**. Smaller areas of H17 montane heath, H10 dry heath, MG 10 grassland and M2 and M3 bog pools are also listed under Annex I and are also considered to be of **very high sensitivity.**

5.4.12 As well as being an Annex I habitat M15 wet heath is considered to be **Moderately Ground Water Dependent** (SEPA 2012). Annex I habitats M17 bog and M2 and M3 bog pools are considered of **Low Ground Water Dependency** (SEPA 2012)**.**

5.4.13 A forestry exclosure falls partially within the application site boundary, as marked on the OS maps. However, this exclosure contains only small pockets of woodland, consisting mainly of birch and willow stands with a species-poor understory, unclassified in the NVC (Averis *et al* 2004). The majority of trees within this exclosure occur near the bottom of the slopes, near the Vagastie River, and are off site (Figure 5.8) (see Photos A5.1.13 and A5.1.14 in Technical Appendix 5.1). The section of exclosure falling within the site consists of habitats found across the rest of the site, namely M15 wet heath and M25 mire with occasional H10 dry heath and willow and birch scrub. The heath and mire elements (M25, M25, H10) are detailed above and, as the tiny areas of scrub within the application site boundary are of no designation, this area is considered to be of **low sensitivity.**

*Potential Construction Effects*

5.4.14 There are four ways in which habitat receptors may be affected during the construction phase:

- Direct loss – this is the most obvious ecological effect, where areas occupied by a particular habitat are reduced in order to accommodate development infrastructure. Turbine bases, crane pads, access tracks, control buildings and other elements of the development all have a footprint that results in direct habitat loss at those locations. These losses are permanent in the context of this assessment;

- Disturbance – the effects of disturbance are variable in their extent, depending on the nature of the disturbance and sensitivity of the habitat receptor. Some disturbance types (for example, creation of temporary hard standing areas at the contractor's compound) result in medium- to long-term disturbance with extended recovery periods. In other cases (for example, installation of cables at the sides of access tracks) disturbance is short-term, and certain habitat types are able to recover quickly;

- Nutrient enrichment – organic enrichment of habitats is unlikely in the context of wind farm construction, but mineral enrichment can be an issue in some circumstances. Localised mineral enrichment can result where vegetation is being used to treat water run-off from excavations or roads with high silt content. This is an undesirable effect on sensitive habitat receptors such as peatlands. Often limited direct habitat loss through creation of lagoons as pollution control measures is necessary to prevent mineral enrichment over a wider area. Concrete used for turbine bases in particular can cause localised enrichment and using best practice such as BN EN 206-1 and relevant guidance will mitigate against this, e.g. using an inert coating substance on bases (Stunell 2010), and

- Indirect effects – these primarily relate to changes in hydrology of wetlands in the context of a wind farm development. For example, if an access track bisects an area of bog, this can result in one half drying out. Pollution may also result in the event of spillage.

5.4.15 Potential effects on the VERs identified are discussed below.

5.4.16 A total area of 12.1 ha of Annex I M17 and M25 bog and M15 wet heath will be lost permanently in construction (Figures 5.7 and 5.8). This constitutes 3.4% of the total area of the site boundary (356ha) and <0.01% of the 400,000ha of available habitat occurring within the NHZ. As the 400,000ha figure quoted above represents only the bog habitat within the NHZ this is a precautionary figure, the proportion of habitat lost is likely to be far less. Therefore magnitude of any negative effect through direct loss and is considered to be of **negligible magnitude** and **irreversible**. As such the **significance level of the effect will be low.** Furthermore the Habitat Management Plan, containing approximately 425ha of bog and wet heath, will improve the quality of the peatland habitats to the north of the site by blocking drains which will have an overall **positive effect of minor magnitude**, and so of a **medium level of significance**. Therefore a **significant positive effect is predicted**.

5.4.17 A further 0.7ha of M15, M17 and M25 will be temporarily lost, which is less than 0.2% of the site area and less than 0.01% of habitat available in the NHZ. This habitat will be reinstated after construction is completed. Therefore magnitude of any negative effect through temporary loss is considered to be of **negligible** magnitude and **reversible in the medium-term.** Improvements to these habitats north of the application site boundary through the Habitat Management Plan will have an overall **positive effect** of **minor magnitude** and so of a **medium significance level.** Therefore a **significant positive effect is predicted.**

5.4.18 M15 is also regarded as being a **Highly Ground Water Dependant Terrestrial Ecosystem** and M17 a **Moderately Ground Water Dependant Terrestrial Ecosystem** (Figures 5.7 and 5.8). As such factors other than direct habitat loss need to be considered such as nutrient enrichment, potential pollution and indirect, hydrological effects. In order to avoid such potential effects, it is essential that all construction activities are planned with due regard to all relevant Pollution Prevention Guidelines – particularly *PPG 5: Works in, Near or Liable to Affect Watercourses* and *PPG 2 Above Ground Oil Storage Tanks*. All surface water drainage will be designed to meet with current Sustainable Urban Drainage Systems (SUDS) best practice and with reference to *Sustainable Drainage Systems, maximising the potential for people and wildlife* (Graham *et a.l* 2012), to ensure maximum biodiversity benefits. Full details of mitigation to avoid effects on the environment during construction environment can be found in Chapter 9: Other Issues.

5.4.19 Construction activities will avoid M2/M3 bog pools through the site design and micrositing and so **no negative effect is predicted** on this habitat. Furthermore the Habitat Management Plan includes the blocking of drains to improve bog habitat and increasing potential for bog pools, particularly for the M2 pools which are most effectively conserved through protection from drainage (Averis et al 2004). This will result in a **positive effect of minor magnitude.** Therefore a **significant positive effect is predicted.** M2 and M3 bog pools are also regarded as having a **low dependence on groundwater** (SEPA 2012) and any effects, other than direct habitat loss, detailed in above will therefore need to be considered (Figure 5.8).

5.4.20 Montane heath, of **very high sensitivity** constitutes 0.15ha of the application site, on two tiny knolls (Figure 5.8) and infrastructure will be micro-sited to avoid this. Therefore **no effect is**

**predicted** on montane heath. Additionally larger areas of the same habitat (approximately 1 hectare with H17 also occurring with other habitats in a mosaic) occur within the Habitat Management Plan area (Figure 5.10).

5.4.21 As the Habitat Management Plan will improve peatland habitats onsite, directly adjacent to Caithness and Sutherland Peatlands SAC, this will increase the continuous area of high quality bog. As a result, these habitats will be more sustainable (as a larger unit), and the area available to support species associated with the SAC will also be increased, improving the integrity of these populations.

5.4.22 The forestry exclosure can be considered best as degraded bog, particularly as only a tiny area of woodland actually occurs within the site. Therefore the magnitude of any negative effect through direct loss to woodland is considered to be of **negligible magnitude,** which will be **reversible in the long-term.** Therefore the level of significance is considered to be **very low**.

*Potential Operation Effects*

5.4.23 Although there will be a small increased risk in runoff and pollution during operation, any effect will be mitigated by following appropriate guidance and best practice in designing the site. Further details of pollution mitigation can be found in Chapter 9: Other Issues. With mitigation, any effect is considered to be of **negligible magnitude, reversible in the short-term** and of a **low level of significance.** Therefore, **no significant effect is predicted**.

*Decommissioning Effects*

5.4.24 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.25 In a wider context, the main habitats found on site are common and widespread in the north of Scotland. Most of the ubiquitous wet heaths of the north and west of Scotland consist of M15 vegetation (Averis et al. 2004) and M17 and other bog communities make up 400,000ha of the Peatlands of Caithness and Sutherland NHZ. Furthermore M3 bog pool communities are widespread throughout blanket bog (Averis *et al.* 2004). Far better examples of higher quality habitat are found within the extensive Caithness and Sutherland Peatlands SAC. As such, any loss of habitat caused by this development would represent less than 0.01% of the areas available within the NHZ, as the 400,000ha figure quoted above represents only the bog habitat within the NHZ this is a precautionary figure, the proportion of habitat lost is likely to be far less. Furthermore, the Habitat Management Plan will improve the quality of peatland habitats within the Habitat Management Plan area (Figures 5.7 and 5.10), which at 440.66ha in size is larger than the application site boundary (which measures 356.37ha). Therefore, although there will be a **negligible** (and **not significant**) loss of habitats, there will be a **minor** (and so **significant**) **positive effect** on the quality in a wider area (benefiting such habitats as bog, bog pool and wet heath). As such, a cumulative impact assessment is not considered necessary, as no significant effects have been identified and the benefits of the Habitat Management Plan will outweigh any minor effects.

Freshwater pearl mussel

*Baseline*

5.4.26 As freshwater pearl mussels (*Margaritefera margaritefera*) are listed under Annex II and Annex IV of the Habitats Directive, Schedule 5 of the Wildlife and Countryside Act and are a feature of River Naver SAC, they are considered to be of **very high sensitivity**.

5.4.27 Optimal freshwater pearl mussel habitat was found to be confined to a small area of the River Vagastie, over 600m from the borrow pit and over 5km from the nearest turbine location (Target Notes 1, 2 and 3 in Figure 5.9). River Vagastie habitat was found to be sub-optimal upstream and

nearer to the site – features included large series of bedrock substrates, outcrops and gorges together with slow moving flows, meandering channels & silty sediments (Target notes 4-14 in Figure 5.9). Habitat on the Allt na h-Aire, Allt Bealach an Fhuarain and Allt a' Chraisg was found to be sub-optimal – features included bedrock, boulders, unstable banks and a lack of gravels.

5.4.28 However, no freshwater pearl mussels were found during detailed surveys of the limited suitable habitat on the River Vagastie. Therefore, **no effect is predicted** for this species, or on the River Naver SAC.

5.4.29 Although no freshwater pearl mussel individuals were located during detailed surveys, the development does have the potential to cause a number of effects on the wider freshwater aquatic environment. It is prudent to highlight these effects as the freshwater pearl mussels are internationally protected and may colonise suitable habitat (Target Notes 1, 2 and 3 in Figure 5.9) in the future. Therefore, these effects are considered below.

*Potential Construction Effects*

5.4.30 There is a potential for suitable habitats to be disturbed, damaged or lost as a result of vehicle movements, construction, siltation and pollution of water courses. As no freshwater pearl mussels were found, it is unlikely that construction activities may lead to the direct loss or damage of individuals or occupied habitat. In order to avoid loss of potentially suitable freshwater pearl mussel habitat, it is essential that all construction activities are planned with due regard to all relevant Pollution Prevention Guidelines – particularly *PPG 5: Works in, Near or Liable to Affect Watercourses* and *PPG 2 Above Ground Oil Storage Tanks*. Full details of mitigation to avoid effects on the aquatic environment can be found in Chapter 9: Other Issues. Given the distance to the nearest area of suitable freshwater pearl mussel habitat and the mitigation in place, **no effect is predicted.**

5.4.31 Construction works may physically damage substrate, alter the substrate or channel shape, which may potentially cause the loss of suitable freshwater pearl mussel habitat. However, construction activities will be confined to relatively small areas a considerable distance (over 5km) from potential suitable habitat for this species. Therefore, **no direct effect is predicted.**

*Potential Operation Effects*

5.4.32 There is no pathway for effect during the operational phase as identified in this assessment.

*Decommissioning Effects*

5.4.33 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.34 As no effects are predicted on freshwater pearl mussels, **no cumulative effects are predicted.**

Other Invertebrates

*Baseline*

5.4.35 The site was not found to offer habitats known to support important communities of invertebrates of conservation concern (e.g. deadwood, ancient woodland, fens or open mosaic habitats on previously developed land [ie brownfield]) (SNH 2002; Gibson 1998; Bodsworth *et al.* 2005). However, the rare Red Data Book listed alpine ant spider (*Micaria alpina*) is known from the adjacent Cnoc an Alaskie SSSI, although it is not one of the notified features (Milner 1988; Bratton 1991). The alpine ant spider is normally found at elevations above 750m, although was found near

Loch an Fheòir in Cnoc an Alaskie SSSI at the remarkably low level of around 220m elevation (Milner 1988). The spider has been associated with *Vaccinium myrtillus* bilberry heath, *Nardus/Racomitrium* grassland and a hummock of *Racomitrium* in a *Sphagnum* bog (Harvey *et al.* 2002). This implies that the species is associated with more mountainous habitats and climates. Therefore, it is interesting to note that the NVC survey found examples of habitat types normally associated with higher elevations than are present in the core survey area, which suggests an unusual microclimate which may also support the alpine ant spider. However, the habitats within the application boundary itself are largely degraded and do not offer examples of the montane habitats found by the NVC survey north of the site. Therefore, although the core survey area may support this species, it is unlikely that it is present within the application boundary itself. As the alpine ant spider is listed as Rare (RDB3 – occurring in 15 or fewer 10km squares in the UK) in the Red Data Book, it is considered to be of **high sensitivity.**

5.4.36 Other invertebrate populations are considered to be of **low sensitivity.**

*Potential Construction Effects*

5.4.37 The development will have a relatively small landtake, and will be microsited to avoid effects on the best areas of habitat, and so it is considered highly unlikely to have any measurable negative effect on populations or communities of invertebrates. Therefore, any negative effect will be of **negligible magnitude**, and of **long-term duration**, and of **very low significance**. However, measures will be taken to restore the bog habitats to the north of the application site boundary as part of the Habitat Management Plan (see Figure 5.10). This will help create additional habitat for species such as the alpine ant spider, and help maintain and enhance the montane habitats found at unusually low elevations to the north of the application boundary. The development will therefore have a **significant positive effect of medium magnitude over the long-term** on invertebrates associated with these special habitats, and will offset any negligible negative effects caused by construction.

5.4.38 As noted in the freshwater pearl mussel assessment, there is a potential for construction activities to have a negative effect on aquatic habitats. However, with mitigation in place as described in the freshwater pearl mussel assessment and Chapter 9: Other Issues, **no effect is predicted**.

5.4.39 Therefore, **no significant negative effects** are predicted for terrestrial or freshwater invertebrates.

*Potential Operation Effects*

5.4.40 There is no pathway for effect during the operational phase as identified in this assessment.

*Decommissioning Effects*

5.4.41 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.42 As no negative effects are predicted on invertebrate populations, **no cumulative effects are predicted.**

Fisheries

*Baseline*

5.4.43 The study area for the Creag Riabhach Wind Farm baseline fish population assessment included watercourses that originate from, flow through or are directly adjacent to the Proposed

Development area. The confluence of such waters with Loch Naver was taken to be the limit of the assessment. Full details of the study area can be found in Technical Appendix TA5.2.

5.4.44 The Allt na h-Aire Burn originates at the north end of the Proposed Development site and flows north east before joining the lower reaches of the River Mudale. The Vagastie originates from the south west of the Proposed Development site before flowing north along the east edge of the site and draining into Loch Naver. A number of its tributaries drain the Proposed Development area.

5.4.45 The River Tirry arises 10km south of Altnaharra and travels approximately 20km south before flowing into Loch Shin. Although it does not naturally form part of the Naver Catchment, the Tirry receives a significant amount of water from the River Vagastie as part of a water transfer scheme. During the 1950's a structure was built across the upper Vagastie catchment to divert water into the neighbouring Shin catchment as part of the Loch Shin hydropower scheme.

5.4.46 A summary baseline description of the key fish species of interest recorded within the study area is presented below. Full details can be found in Volume 2 Technical Appendix TA5.2.

*Atlantic Salmon*

5.4.47 A natural obstruction to the passage of salmon (*Salmo salar)* is located on the Allt na h-Aire Burn approximately 750m above its confluence with the River Mudale. The area below the obstruction was found to provide an important spawning and nursery area, supporting 'moderate' densities of salmon fry and 'excellent' densities of salmon parr. The results of historical surveys indicate that spawning success and fry survival below the falls are heavily influenced by river level and subsequent accessibility for adult salmon. The presence of 2+ year old salmon parr suggest that the site may be important for recruitment of slow growing multi-sea-winter salmon and in particularly the vulnerable 'spring' component of the Naver salmon population. The area above the falls is artificially supported by the introduction of hatchery bred salmon.

5.4.48 A 'catchwater' ( a structure diverting run off from one river system for use elsewhere) on the upper River Vagastie acts as a physical barrier to the upstream and downstream migration of salmon. It also significantly reduces downstream flows and changes flood flow characteristics. The lower reaches of the Vagastie were found to support 'excellent' densities of both salmon fry and parr, indicating its importance as a spawning and nursery area for salmon. Densities were found to decrease with distance travelled upstream, with fry 'absent' below the catchwater and parr densities falling to 'good'. The results of historical surveys indicate an absence of entire year classes of salmon over successive years, suggesting that this reach of the river is particularly affected by changes in environmental conditions. This is most likely due to low flows resulting from the catchwater. Both salmon fry and parr were found to be absent above the catchwater.

5.4.49 The dam at Loch Shin (NC 574 694) is believed to act as a barrier to both the upstream migration of adult salmon and the downstream migration of salmon smolts. This has had a significant effect on salmon populations in the River Tirry. They are now supported by hatchery introductions and smolt relocations. The lower reaches of the Tirry below the influence of the Vagastie were found to support 'poor' densities of salmon fry and 'very poor' densities of salmon parr. As this area has not been stocked for some time, the densities are likely to be indicative of natural levels. The area above the influence of the Vagastie was found to support 'moderate' densities of salmon fry and 'very poor' densities of salmon parr. These levels are likely to be artificially increased through the introduction of hatchery bred fry upstream of the site. The River Naver SAC has internationally important populations of species of salmon, listed under Annexes and V of the Habitats Directive, and the multi-sea-winter component of the Atlantic salmon population is included in the UK BAP Priority Species List. They are therefore considered to be of **very high sensitivity**.

*Brown Trout/Sea Trout*

5.4.50 Trout (*Salmo trutta*) were found to be naturally distributed both above and below falls on the Allt na h-Aire Burn. Those present above the falls are likely to form part of a glacial relic population of particular conservation value. Those below the falls are likely to be from both sea and brown trout

origin. 'Poor' densities of trout fry and 'moderate densities of parr were recorded below the falls in 2012. The poor densities of fry are thought to relate to the particularly dry conditions recorded during the 2011 spawning season. A proportion of the trout parr are likely to drop down into Loch Naver. 'Good' densities of trout were recorded above the falls in 2012, with trout parr being absent. Overall, densities of juvenile trout were found to be highly variable from year to year.

5.4.51 The lower reaches of the River Vagastie provide an important spawning and nursery area for juvenile trout supporting 'moderate' densities of trout fry. However, spawning is limited in the mid to upper reaches with fry being 'absent' directly below the catchwater. This is believed to be as a result of abstraction and morphological pressures relating the catchwater. Fry densities increased once again above the catchwater, although only achieving a 'very poor' classification. Trout parr were found to be 'absent' at the lowest site on the Vagastie, with 'poor' densities in the middle reaches and 'excellent' densities directly below the catchwater. Densities fell slightly above the catchwater, although still achieving a 'good' classification.

5.4.52 The lower reaches of the Tirry, below the influence of the Vagastie, were found to support 'excellent' densities of trout fry when it was last surveyed in 2007, with trout parr found to be 'absent'. Above the influence of the Vagastie, trout fry were found to be present in 'excellent' densities, with parr present in 'good' densities. Overall, densities of juvenile trout in the Tirry were found to be highly variable from year to year. Trout are a Scottish Biodiversity List species although they are not a qualifying species for the River Naver SAC. Therefore they are considered to be of **medium sensitivity**

*European Eel*

5.4.53 The European eel (*Anguilla anguilla*) were distributed above and below the falls on the Allt na h-Aire Burn, the majority being juvenile (elvers) present in relatively low densities. Eels were found to be present at all sites below the catchwater on the River Vagastie, but absent above it. This indicates that the structure may create a barrier to the upstream passage of eels. No eels were recorded on the Tirry, suggesting that they are not able to access the river. The European eel is listed as 'critically endangered' on the International Union for Conservation of Nature (IUCN) Red List although they are not a qualifying species for the River Naver SAC. They are also listed under the Scottish Biodiversity List. Therefore they are considered to be of **medium sensitivity**

*Lamprey Species*

5.4.54 Information regarding the distribution and abundance of lamprey ammocoetes within the study area is limited. However, the presence of juvenile lamprey (*Lampetra spp)* in the lower reaches of the River Vagastie has been confirmed, with a number of these positively identified as brook lamprey. The same is true for the River Mudale in close proximity to the mouth of the Allt na h-Aire Burn.

5.4.55 The falls on the Allt na h-Aire Burn and the catchwater on the River Vagastie are likely to act as barriers to the distribution of lamprey, with the presence and/or abundance of lamprey species likely to decrease with distance travelled upstream on the Vagastie. The same is likely to be true for the Tirry catchment, for which no records of lamprey were found. The three UK lamprey species are listed in Annex II of the EU Habitats Directive, Appendix III of the Bern Convention and are included on the Scottish Biodiversity List, although they are not a qualifying species for the River Naver SAC. Therefore the presence of lamprey species are considered to be of **medium sensitivity.**

*Arctic Charr*

5.4.56 There are no records of arctic charr (*Salvelinus alpinus*) having been captured during electric fishing surveys on the River Tirry, Vagastie, Allt n h-Aire Burn or any other sites across the Naver catchment. Similarly, there are no reports of arctic charr spawning activity in the rivers flowing into or out of the major lochs. Arctic charr were recorded as being present in Loch Naver by SEPA during a Water Framework Directive (WFD) Survey in July 2010 (Alistair Duguid SEPA, per comms). Arctic charr are on the Scottish Biodiversity List although they are not a qualifying species for the River Naver SAC. They are therefore considered to be of **medium sensitivity.**

*Potential Construction Effects*

5.4.57 There are a number of ways by which the Proposed Development has the potential to effect fish populations. These are common to all fish species to a greater or lesser extent and are described in further detail below.

5.4.58 Pollution, in relation to the water environment, means the direct or indirect introduction, as a result of human activity, of substances or heat into the water environment, or any part of it, which may give rise to any harm (SEPA 2013). Point source pollution (e.g. fixed discharge points) and diffuse pollution (e.g. fuel or concrete spills and sediment releases) may occur as a result of construction works on the Proposed Development site.

5.4.59 Any such event has the potential for significant negative effects on fish populations. To reduce the likelihood and effect of any such event, any activity liable to cause pollution must be authorised by SEPA via The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). This allows for the proportionate regulation based on the risk that an activity poses to the water environment. SEPA has also produced guidelines for the prevention of pollution which will be followed, particularly through the construction and decommissioning phases. Surface water runoff will be discharged in such a way as to minimise the risk of pollution to the water environment. Therefore with compliance with appropriate regulations the effect of potential pollution on fisheries is considered to be **of negligible magnitude, reversible in the short-term** and of **low significance** for salmon and **very low** for all other species**.** Therefore **no significant effect is predicted.**

5.4.60 Abstraction means the doing of anything whereby any water is removed or diverted by mechanical means, pipe or any engineering structure or works from any part of the water environment, whether temporarily or permanently, including anything whereby the water is so removed or diverted for the purpose of being transferred to another part of the water environment (SEPA, 2013). The abstraction of water for the construction process has the potential to deplete flows in watercourses that originate from or flow through the Proposed Development site, with a subsequent negative effect on fish populations.

5.4.61 To reduce the likelihood and effect of any such event, those abstractions ≥10m$^3$ per day will require CAR authorisation based on the risk that an activity poses to the water environment. Sensitive periods for key receptor species (such as spawning and low flow periods) will be avoided. Abstraction points will also comply with The Salmon (Fish Passes and Screens) (Scotland) Regulation 1994 which states that screens, at the point of water abstraction, should serve to prevent the entry and injury of salmon. Other species of fish will also be considered in the same manner. Therefore with compliance with the appropriate regulations the potential effect of abstractions on fisheries is considered to be **of negligible magnitude, reversible in the short-term** and of **low significance** for salmon and **very low** for all other species**.** Therefore **no significant effect is predicted.**

5.4.62 Peat disturbance through activities such as the excavation of turbine foundations, borrow pits and the construction of roads can have indirect effects on water quality and quantity. Peat deposits can affect the acidity of water, to which salmonid species are particularly sensitive. Peat slides can also have a direct effect on fish populations through entry and blockage of watercourses. In order to prevent this, a detailed survey of peat deposits present within the site has been undertaken to assess the risk of peat slide during construction. Areas of deep peat and areas where it is not possible to implement appropriate mitigation measures have been avoided. Natural peat drainage channels will be preserved throughout the site of the development. Excavated material will not be stockpiled on areas of unstable peat and concentrated water flows onto peat slopes will be avoided. Wherever possible construction on the proposed site will avoid water bodies with a 50 metre buffer zone being established. Therefore with appropriate mitigation measures in place and with the avoidance of areas where such measures are impossible to implement the impact of peat disturbance on fisheries would be **of negligible magnitude, reversible in the short-term** and of **low significance** for salmon**, very low** for all other species**.** Therefore **no significant effect is predicted.**

5.4.63 Road building and accompanying culverting and drainage has the potential to significantly change the nature of water runoff. Increased runoff can lead to rapid rises in river levels under wet conditions and reduced river levels under dry conditions. The concentration of flows can lead to erosion and increases in sediment transportation and deposition. All of these changes have the potential to negatively effect fish populations. The effects of road building will be mitigated by maintaining natural peat drains where possible and through the installation of appropriate siltation controls. Therefore with the appropriate mitigation measures outlined above in place the impact of road building on fisheries would be **of negligible magnitude, reversible in the short-term** and of **low significance** for salmon and **very low** for all other species**.** Therefore **no significant effect is predicted.**

5.4.64 Poorly designed river crossings can be a significant barrier to fish passage. Some of the main problems that can result in barriers to migration include perched inverts creating a drop from the structure, undersized crossings that are too small for fish to pass through and may also increase the speed water flowing through the structure, excessively wide crossings which create flows that are too shallow for fish to swim through and a lack of resting places and pools.

5.4.65 Four stream crossings have been proposed across the Proposed Development. Three of these cross in the upper reaches of steep tributaries of the Vagastie where salmon are extremely unlikely to be present given their gradient and size. The fourth will cross in the upper reaches of the main River Vagastie below the catchwater. It is proposed that a 'single span' structure is used in this location. This will span the width of the channel and not affect the bed or banks of the river (if the abutments are set back). Therefore the three crossings of the tributaries of the Vagastie and the crossing of the upper reaches of the river itself are predicted to have **no effect** on fisheries.

5.4.66 Construction activities within close proximity to watercourses have the potential to cause disturbance to fish. This may range from human activity close to water bodies to vibrations from machinery. Different species of fish have differing noise threshold levels. The effect of noise on fish depends on the received noise level. It is widely accepted that there are five general levels of response:

5.4.67 Detection – the noise levels that the fish species can detect under normal conditions;

5.4.68 Avoidance – The level at which the fish exhibit active avoidance such as swimming away;

5.4.69 Temporary hearing damage – the level which causes temporary but reversible changes to hearing sensitivity;

5.4.70 Permanent hearing damage - the level which causes permanent changes to hearing sensitivity;

5.4.71 Physical damage – the noise or pressure level that would result in extensive physical damage to the fish's auditory system or other organs or tissue.

5.4.72 Fish are particularly sensitive to disturbance during spawning periods and to construction activities likely to cause physical damage such as impact piling. These can be avoided through the introduction of a 50m buffer zone around all water causes and the timing of any activities likely to cause significant noise outwith the spawning period of sensitive periods. Construction methods can also be adapted to reduce noise levels. Therefore with a 50m buffer in place, construction activities close to water would be predicted to have **no effect.**

5.4.73 The potential construction effects of the Proposed Development on the key species of interest are considered in further detail below:

Atlantic Salmon

5.4.74 Salmon were found to be absent from the River Vagastie above the catchwater. Effectively 100% of the flow above the catchwater is diverted into the Tirry system under normal summer levels. Any change in water quality or quantity above the catchwater is therefore unlikely to have a significant effect on Naver salmon populations for which the Naver SAC is designated. The effects of changes in water quality or sedimentation under high flow conditions (when levels spill over the structure) are likely to be minimal due to the dilution effect. Therefore, any negative effect will be of **negligible magnitude**, **of long-term effect** and of a **low significance** level. Therefore, **no significant effect** is predicted.

5.4.75 The area directly below the catchwater is heavily affected with a 75% depletion of flow at 1.7km below the structure (SEPA 2008). Salmon fry were found to be absent at the survey site within this reach with the absence of years classes of fish over successive years. This suggests that spawning success and fry survival are heavily influenced by environmental conditions. Any changes in quality or quantity of flows associated with the Proposed Development would therefore have the potential to effect salmon populations in this reach of the river. This is particularly true with regards to road building and potential changes to runoff patterns as water is at a premium. However, the likelihood and potential effects of such an event will be significantly reduced by the mitigation proposed. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, **long-term** and of a **low significance** level. Therefore **no significant negative effect** is predicted.

5.4.76 Populations of juvenile salmon are much healthier in the mid to lower reaches of the river. This is despite of the continued influence of the catchwater and estimated 25% depletion of flows remaining at the confluence of the river with Loch Naver. A number of minor tributaries drain the Proposed Development area and enter the Vagastie within this area. The Proposed Development is unlikely to have any effect on water quality or quantity in these tributaries given the proposed mitigation. In addition to this, the influence of these burns on flows in the main river is very small compared to that of Feith Bad an Loch (NC 538 289) approximately 9 km from the loch and Allt Loch na Glas-choille (NC 567 335) approximately 2 km from the loch. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, long-term and of a **low significance** level. Therefore no significant negative effect is predicted.

5.4.77 The falls on the Allt na h-Aire Burn were found to be inaccessible to salmon, with the area above the falls being supported by hatchery bred fish. Any change in water quality or quantity has the potential to have a negative effect on both the hatchery bred populations above the falls and wild populations below the falls. Given the proposed mitigation and distance of the construction works from the burn, any negative effects are unlikely. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, **long-term** and of a **low significance** level. Therefore **no significant negative effect** is predicted.

5.4.78 With water diverted from the headwaters of the Vagastie to the River Tirry, any change in water quality or quantity as a result of the Proposed Development has the potential to have a negative effect on salmon populations. However, the likelihood and potential effects of such an event will be significantly reduced by the mitigation proposed, the distance from the development and the nature of the slow flowing catchwater. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, **long-term** and of a **low significance** level. Therefore **no significant negative effect** is predicted.

*Brown Trout/Sea Trout*

5.4.79 As with salmon, three key aspects of habitat quality sustain a trout population: water quantity (flow), chemical quality (water quality) and physical habitat quality (Giles *et al*, 2004). Any change in water quality or quantity resulting from the Proposed Development has the potential to have a significant effect on salmon populations in or adjoining to the proposed site.

5.4.80 Trout were found to be present above the catchwater on the River Vagastie. Any changes in quality or quantity of flows associated with the Proposed Development would therefore have the potential to effect trout populations in this reach of the river. However, the likelihood of such an event is significantly reduced by the mitigation proposed. The same is true for the area directly below the structure where trout fry were found to be absent, with the proposed mitigation once again

significantly reducing the likelihood of any negative effect. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, **long-term** and of a **very low significance** level. Therefore **no significant negative effect** is predicted.

5.4.81 Trout were found to be present both above and below the falls on the Allt na h-Aire Burn. Any change in water quality or quantity has the potential to have a negative effect on both of these populations, however, given the proposed mitigation and distance of construction works from the burn any negative effects are unlikely. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, **long-term** and of a **very low significance** level. Therefore **no significant negative** effect is predicted.

5.4.82 With water diverted from the headwaters of the Vagastie to the River Tirry, any change in water quality or quantity as a result of the Proposed Development has the potential to have a negative effect on trout populations. However, the likelihood and potential effects of such an event will be significantly reduced by the mitigation proposed, the distance from the Proposed Development and the nature of the slow flowing catchwater. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, **long-term** and of a **very low significance** level. Therefore **no significant negative effect** is predicted.

*European Eel*

5.4.83 Eels were found to be absent from the River Vagastie above the catchwater. With 100% of the flow in this reach diverted into the Tirry under normal conditions, any change in water quality or quantity above the catchwater is unlikely to have a significant effect on Naver eels populations. Eels were found to be distributed throughout the Vagastie below the catchwater. As for both salmon and trout, the most sensitive area for eels is likely to be that directly below the structure. Given the proposed mitigation any negative effects are unlikely. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, **long-term** and of a **very low significance** level. Therefore **no significant negative** effect is predicted.

5.4.84 Eels were found to be present both above and below the falls on the Allt na h-Aire Burn. Any change in water quality or quantity has the potential to have a negative effect on both of these populations; however, given the proposed mitigation and distance of construction works from the burn any negative effects are unlikely. No eels were recorded in the River Tirry, suggesting that they are either absent or present in very low numbers. Once again any negative effects are unlikely. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, **long-term** and of a **very low significance** level. Therefore **no significant negative effect** is predicted.

*Lamprey Species*

5.4.85 The presence of juvenile *Lampetra spp* in the lower reaches of the River Vagastie and in the River Mudale below the Altnaharra Burn has been confirmed, with a number of these positively identified as brook lamprey. It is assumed that the falls on the Allt na h-Aire Burn and the catchwater on the River Vagastie act as barriers to the distribution of lamprey, with the presence and/or abundance of lamprey species decreasing with distance travelled upstream given a reduction in suitable juvenile habitat. As for salmon, trout and eels the most sensitive area for lamprey is likely to be that directly below the catchwater on the River Vagastie. However, given the proposed mitigation any negative effects resulting from the construction phase are unlikely. No records of lamprey were found for the Tirry catchment. Following implementation of mitigation measures previously outlined, any potential effect would be of **negligible magnitude**, **long-term** and of a **very low significance** level. Therefore **no significant negative** effect is predicted.

*Arctic Charr*

5.4.86 There are no records of arctic charr having been captured during electric fishing surveys on the River Vagastie, Allt na h-Aire Burn or the Tirry. The nearest recorded population to the site of the Proposed Development is that in Loch Naver. Given its distance from the site and the proposed

mitigation, any significant effect resulting from the construction works is unlikely. Therefore it is predicted that there will be **no effect.**

*Potential Operation Effects*

5.4.87 Potential operation effects of the Proposed Development primarily relate to maintenance of drainage schemes, siltation controls, roads and other structures. The potential effects on the different fish species present in the fisheries study area (see Technical Appendix 5.2 for full details of fisheries surveys) and the proposed mitigation relate to effects on the quality and quantity of water together with disturbance. These are the same as those covered under construction effect section, with the proposed mitigation making any significant effect on any of the key species unlikely. Therefore with mitigation procedures in place to deal with run off, potential pollution and disturbance discussed above any potential effect would be of **negligible magnitude**, **reversible in the short-term** and of a **low significance level** for salmon and **very low significance level** for other species. Therefore no **significant negative effect is predicted**.

5.4.88 There is also the potential for the behaviour of fish populations to be effected by the noise and vibration associated with turbine movement. However, given the 50m buffer zone around all water courses this is unlikely. The same is true for effects relating to the transit of high voltage cables. These will be insulated and/or buried to reduce the effects of electromagnetic fields, with the potential considered to be of negligible magnitude and so not significant. Therefore no effect is predicted.

*Decommissioning Effects*

5.4.89 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.90 The WFD River Basin Management Plan (RBMP) identified the River Vagastie as a designated Heavily Modified Water body (HMWB). This is as a result of abstraction and morphological pressures resulting from the production of renewable electricity.

5.4.91 During the 1950's a structure was built across the upper Vagastie catchment to divert water into the neighbouring Shin catchment as part of the Loch Shin hydro-power scheme. This consists of a concrete dam and canal system or 'catchwater' impounding the Allt Bealach an Fhuarain, Allt Meadhonach and Allt a' Chuil and exporting flow to the River Tirry (which in turn flows into Loch Shin).

5.4.92 Through this designation SEPA as the competent authority, recognise that the SSE catchwater has an effect on the River Vagastie such as to deviate the river hydro-morphology from that of the natural system. However it is extremely unlikely that the development will exacerbate the effects of the SSE catchwater. Therefore **no cumulative effect is predicted.**

Reptiles

*Baseline*

5.4.93 The core survey area offers excellent reptile habitat, and both adders (*Vipera berus*) and common lizards (*Zootoca vivipara*) are known to occur to the north of the Proposed Development (detected during incidental observations during bird surveys, and known to Altnaharra Estate – Pieter Bakker pers. comm.). However, the Proposed Development itself does not offer optimal habitats, and lacks the habitat structure that these species require to thrive. Adders and common lizards are both protected from intentional or reckless killing or injury under the Wildlife and Countryside Act, and are also Scottish Biodiversity List species. They are therefore considered to be of **medium sensitivity.**

*Potential Construction Effects*

5.4.94 The Proposed Development will have a relatively small landtake of sub-optimal reptile habitat, and will be microsited to avoid effects on the best areas, and so it is considered highly unlikely to have any measurable negative effect on populations or communities of reptiles. Therefore, any negative effect will be of **negligible magnitude**, and of **long-term duration**, and of a **very low significance level**. Increased noise, increased ground vibrations, vehicle traffic may result in disturbance to reptiles if they are present within the application site boundary during construction activities.

5.4.95 Increased vehicle traffic during the construction phase may also present an increased risk of mortality to reptiles. It is also possible that reptiles may be directly killed or injured by construction activities and there is a risk that reptiles may become trapped in trenches which may result in mortality.

5.4.96 Preconstruction surveys should be undertaken of suitable habitat within the development footprint to identify presence of reptiles. Where populations of reptiles are found to be present specific mitigation measures will be considered to avoid injury or mortality, including reptile exclusion fencing. Should any hibernacula be identified, these will be marked and development should be microsited to avoid destruction of these features and injury to the occupying reptiles. It is also recommended that excavations are either covered up overnight and/or ramps provided in trenches to avoid reptiles becoming trapped during the construction phase. A suitably experienced and qualified Ecological Clerk of Works will be appointed to oversee construction activities.

5.4.97 Therefore, there is a possibility of disturbance and increased mortality risk to reptiles during construction. It is highly unlikely that there would be any noticeable effect on the local population. Furthermore, the population would certainly be able to recover in the unlikely event of any mortality through natural recruitment. The proposed mitigation also minimises any risk of injury or mortality to individual reptiles. Therefore, any predicted negative effect would be of **negligible magnitude** and reversible in the **short-term**, and so of a **very low significance level.** Therefore **no significant negative effect is predicted.**

5.4.98 However, measures will be taken to restore the bog habitats to the north of the application boundary as part of the Habitat Management Plan (see Figure 5.10). This will restore habitat structure off site creating new reptile habitat, and help maintain and enhance the habitats found to the north of the application boundary. It should also be noted that despite the short-term negative effects, the works will create a mosaic of vegetation structure and heights that is essential for reptile populations to thrive. Vegetation structure is of utmost importance for reptiles, especially the availability of basking places, and ecotones where vegetation height changes (Edgar *et al.* 2010). Therefore, it can be reported that the construction works will ultimately have significant positive benefits for reptiles if present in the area.

5.4.99 The development will therefore have a positive effect of minor magnitude over the long-term on reptiles.

*Potential Operation Effects*

5.4.100 There will be a small level of traffic associated with maintenance during the operational phase. However, although reptiles are likely to use the roads and hardstanding to bask, this will be restricted to dawn and dusk, or during periods of cool overcast weather. It is therefore unlikely that maintenance traffic will coincide with basking reptiles with any frequency. Should reptiles be found to be present, maintenance staff will be made aware of their presence, and to check for them while driving onsite. A low speed limit will also be enforced which will reduce the likelihood of mortality through collision with vehicles. In the unlikely event that individuals are lost, these would be easily replaced through natural recruitment. Therefore, any negative effect will be **of negligible magnitude**, **reversible in the short-term** and of a **very low level of significance.** Therefore, **no significant effect is predicted.**

5.4.101 Furthermore, this effect would be offset by the positive effects of the Habitat Management Plan.

*Decommissioning Effects*

5.4.102 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.103 As no measurable negative effect is predicted, **no cumulative effects are predicted.**

Otter

*Baseline*

5.4.104 The North Highlands otter (*Lutra lutra*) population is thought to be at or near carrying capacity and is stable (Strachan 2007; Chanin 2013). They are also a qualifying feature of the adjacent Caithness and Sutherland Peatlands SAC, for which the otter population is considered to be in favourable condition (Strachan 2007). In addition otters are listed under Annex IV and of the Habitats Directive and Schedule 5 of the Wildlife and Countryside Act. They are therefore considered to be of **very high sensitivity.**

5.4.105 Although otter is common and widespread in the wider area, no otter holts or evidence of otter were recorded within 200m of the footprint of the core survey area. However, otter spraints and footprints were found in the wider area, with the nearest signs being located 300m from the proposed borrow pit and 400m from the nearest turbine location (see Figure 5.11).

5.4.106 Habitat along Allt na h-Aire, in the north of the core survey area, and Allt Bealach an Fhuarain, which ran along the south western edge of the core survey area, was assessed as being suitable for foraging but was sub-optimal for establishing holts.

5.4.107 The River Vagastie located on the other side of the A836 single track road was more suitable for otter holts with many overhanging trees. However, estate staff reported that otter was rarely seen on this stretch of water. Little of this watercourse is within 200m of the Proposed Development footprint, although signs of otters were found beyond this buffer (see Figure 5.11).

5.4.108 Estate staff reported otter were regularly seen on the River Mudale some 2.5km north of the Proposed Development.

5.4.109 A single otter record was provided within 500m of the Proposed Development site by HBRG – however this was only accurate to 1km.

5.4.110 It is possible that otters may use water courses in the wider area, and may also forage or commute over the Proposed Development site.

*Potential Construction Effects*

5.4.111 Although no evidence of otters or holts (for which the habitat was found to be sub-optimal) was found within the application site boundary, they will almost certainly move through the site on occasion while foraging or commuting on. However, this is likely to be infrequent as the site does not offer good foraging habitat for this species.

5.4.112 Increased noise, increased ground vibrations and vehicle traffic may result in disturbance to otters, if they forage in this area during construction activities.

5.4.113 Increased vehicle traffic during the construction phase may also present an increased risk of mortality to otters.

5.4.114 There is also a risk that otters may become trapped in trenches required during construction activities which may result in mortality.

5.4.115 Therefore, there is a small possibility of disturbance and increased mortality risk during construction. It is highly unlikely that there would be any noticeable effect on the local population. Furthermore, the population would certainly be able to recover in the unlikely event of any mortality through natural recruitment.

5.4.116 As there is a risk of an effect on the local otter population through mortality, mitigation is required to reduce this to an acceptable level. Preconstruction surveys should be undertaken to ascertain current local status and use of the development footprint. Should any holts or couches be identified, and disturbance considered likely, an application for a European Protected Species licence will be made. If a license is required, implementation of an otter management plan may be necessary. Where there is a potential risk of fatality through collision with construction traffic, specific mitigation measures will be considered including otter fencing and wildlife reflectors. It is also recommended that excavations are either covered up overnight and/or ramps provided in trenches to avoid otter, or other mammals, becoming trapped during the construction phase. A suitably experienced and qualified Ecological Clerk of Works will be appointed to oversee construction activities.

5.4.117 Following implementation of mitigation measures outlined above, any potential effect would be of **negligible magnitude**, **reversible in the short- to medium-term**, and of a **low significance** level. Therefore **no significant negative effect is predicted.**

*Potential Operation Effects*

5.4.118 There will be a small level of traffic associated with maintenance during the operational phase. This may potentially result in disturbance to otters, discouraging them from foraging in the area during maintenance activities. However, otters are generally crepuscular and nocturnal in their habits (with the exception of coastal populations), and so their activity is unlikely to coincide with maintenance works (Kruuk 1995; Chanin, 2013). Therefore, disturbance to otters is unlikely during the operational phase. A low speed limit will also be enforced which will reduce the likelihood of mortality through collision with vehicles. In the unlikely event that individuals are lost, these would be easily replaced through natural recruitment. Therefore, any negative effect will be **of negligible magnitude**, **reversible in the short-term** and of a **low level of significance.** Therefore, **no significant effect is predicted.**

*Decommissioning Effects*

5.4.119 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.120 Any development that is constructed concurrently in the North Highlands may result in disturbance to otters during the construction phase. There may also be a cumulative increased risk of mortality through collision with construction traffic and, depending on construction methods, also through becoming trapped in trenches. However, these effects will be temporary and highly localised – affecting only a very small development footprint. Standard mitigation measures further reduce the minimal increased mortality risk to a negligible level over the baseline rates. Therefore, **no significant cumulative effect is predicted.**

5.4.121 Any development that is operational concurrently may result in a cumulative disturbance effect on otters during maintenance activities, or other increased human activities. However, wind

farm maintenance activities are likely to be brief and infrequent. Therefore, any maintenance activity is likely to result in a negligible increase to baseline disturbance levels. Therefore, **no significant cumulative effect is predicted.**

Pine marten

*Baseline*

5.4.122 Although the Highlands are the stronghold for UK pine marten (*Martes martes*) populations, this species is currently expanding its range (Croose *et al.* 2013; Scott 2011; Balharry *et al.* 1996; JNCC 2007). Pine martens are listed under Annex IV of the Habitats Directive and Schedule 5 of the Wildlife and Countryside Act, but are unlikely to be regularly present onsite. Therefore pine martens are considered to be of **medium sensitivity.**

5.4.123 Estate staff report seeing pine martens regularly in the wider area. However, no pine martin scats or potential pine martin dens were recorded within the core survey area. In addition, a baited camera trap positioned in the coniferous woodland just outside Altnaharra did not record any pine martens (see Figure 5.1). However, the stunted mixed plantation located on the south eastern boundary of the application site boundary was considered to represent good potential foraging habitat for this species. However, the majority of the core survey area (and application site boundary) does not offer suitable pine marten habitat. Furthermore, it is estimated that between 86ha and 166ha of woodland is required to support an individual pine marten while a minimum of 250ha of woodland is required to support a pair (Balharry *et al.* 1996). Studies have also shown that male pine marten territories in fragmented upland coniferous woodland can be very large (23.63km$^2$), and even female territories can be large in this environment (8.83km$^2$) (Caryl 2008). The core survey area does not offer a significant extent of woodland, and so it is considered highly unlikely that pine martens would be present within the application site boundary, or that this habitat is important to any peripheral territories.

5.4.124 There are no records of pine martens relevant to the Proposed Development site, although they are known from the wider area historically (based on HBRG data).

*Potential Construction Effects*

5.4.125 No evidence of pine martens was found within the core survey area. Furthermore the core survey area does not offer habitat of a sufficient extent to support resident pine martens, and there is very little suitable foraging habitat. It is possible that pine martens from periphery territories may occasionally forage within the stunted woodland to the south east of the Proposed Development, although this is likely to be rare.

5.4.126 Increased noise, increased ground vibrations and vehicle traffic may result in disturbance to pine martens, if they forage in this area during construction activities.

5.4.127 Increased vehicle traffic during the construction phase may also present an increased risk of mortality to pine martens.

5.4.128 There is also a risk that pine martens may become trapped in trenches required during construction activities which may result in mortality.

5.4.129 Therefore, there is a very small possibility of disturbance and increased mortality risk during construction. It is highly unlikely that there would be any noticeable effect on the local population. Furthermore, the population would certainly be able to recover in the unlikely event of any mortality through natural recruitment.

5.4.130 However, given the limited foraging habitat and unsuitability of the site for resident pine martens, the risk of any effect is considered to be highly unlikely and so negligible before mitigation.

5.4.131 Although any effect on pine marten is considered highly unlikely, mitigation is recommended as a precaution. Preconstruction surveys should be undertaken to ascertain current local status and

use of the development footprint. Should any dens be identified, and disturbance considered likely, an application for a European Protected Species licence will be made. If a license is required, implementation of an pine marten management plan may be necessary. Where there is a potential risk of fatality through collision with construction traffic, specific mitigation measures will be considered including wildlife reflectors. It is also recommended that excavations are either covered up overnight and/or ramps provided in trenches to avoid pine martens, or other mammals, becoming trapped during the construction phase. A suitably experienced and qualified Ecological Clerk of Works should be appointed to oversee construction activities.

5.4.132 Following implementation of mitigation measures outlined above, any potential effect would be of **negligible magnitude**, **reversible in the short- to medium-term**, and of a **very low significance** level. Therefore **no significant negative effect is predicted.**

*Potential Operation Effects*

5.4.133 There will be a small level of traffic associated with maintenance during the operational phase. This may potentially result in disturbance to pine martens, discouraging them from foraging in the area during maintenance activities. However, pine martens are generally crepuscular and nocturnal in their habits, and so their activity is unlikely to coincide with maintenance works (Caryl 2008). Therefore, disturbance to pine martens is unlikely during the operational phase. A low speed limit will also be enforced which will reduce the likelihood of mortality through collision with vehicles. In the unlikely event that individuals are lost, these would be easily replaced through natural recruitment. Therefore, any negative effect will be **of negligible magnitude**, **reversible in the short-term** and of a **very low level of significance.** Therefore, **no significant effect is predicted.**

*Decommissioning Effects*

5.4.134 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.135 As no measurable negative effect is predicted, **no cumulative effects are predicted.**

Badger

*Baseline*

5.4.136 Badgers (*Meles meles*) are protected under the Protection of Badgers Act 1992, however they are now a common and widespread species in Scotland and the UK as a whole. Badgers are also widespread in the Highlands, although rocky habitats in this region limit distribution locally (Scott 2011). Badgers are therefore considered to be of **low sensitivity**.

5.4.137 Although badgers are common and widespread in the wider area, no badger setts or evidence of badgers were recorded within 200m of the footprint of the core survey area. Furthermore, the habitat throughout much of the site does not offer 'diggable' substrates for the establishment of setts, which is essential for badgers (Roper 2010).

5.4.138 Estate staff reported that badgers have been observed in the wider area.

5.4.139 Neither SB nor HBRG held any data for the relevant area. While it is unlikely that badgers are present on the exposed, rocky peatland areas that comprise the site, they may be present in the wider area.

*Potential Construction Effects*

5.4.140 Although no evidence of badgers or setts (for which the habitat was found to be sub-optimal) was found within the application site boundary, they may on occasion forage on site However, this is likely to be infrequent as the site does not offer good foraging habitat for this species.

5.4.141 Increased noise, increased ground vibrations and vehicle traffic may result in disturbance to badgers, if they forage in this area during construction activities.

5.4.142 Increased vehicle traffic during the construction phase may also present an increased risk of mortality to badgers.

5.4.143 There is also a risk that badgers may become trapped in trenches required during construction activities which may result in mortality.

5.4.144 Therefore, there is a small possibility of disturbance and increased mortality risk during construction. It is highly unlikely that there would be any noticeable effect on the local population. Furthermore, the population would certainly be able to recover in the unlikely event of any mortality through natural recruitment.

5.4.145 Although any effect on badgers is considered highly unlikely, mitigation is recommended as a precaution. Preconstruction surveys should be undertaken to ascertain current local status and use of the Proposed Development footprint. Should any setts be identified, and disturbance considered likely, an application will be made to SNH for a licence. If a license is required, implementation of a badger management plan may be necessary. Where there is a potential risk of fatality through collision with construction traffic, specific mitigation measures will be considered including badger fencing and wildlife reflectors. It is also recommended that excavations are either covered up overnight and/or ramps provided in trenches to avoid badgers, or other mammals, becoming trapped during the construction phase. A suitably experienced and qualified Ecological Clerk of Works will be appointed to oversee construction activities.

5.4.146 Following implementation of mitigation measures outlined above, any potential effect would be of **negligible magnitude**, **reversible in the short- to medium-term**, and of a **very low significance** level. Therefore **no significant negative effect is predicted.**

*Potential Operation Effects*

5.4.147 There will be a small level of traffic associated with maintenance during the operational phase. This may potentially result in disturbance to badgers, discouraging them from foraging in the area during maintenance activities. However, badgers are nocturnal in their habits and so their activity is unlikely to coincide with maintenance works (Roper 2010). Therefore, disturbance to badgers is unlikely during the operational phase. A low speed limit will also be enforced which will reduce the likelihood of mortality through collision with vehicles. In the unlikely event that individuals are lost, these would be easily replaced through natural recruitment. Therefore, any negative effect will be of **negligible magnitude**, **reversible in the short-term** and of a **very low level of significance.** Therefore, **no significant effect is predicted.**

*Decommissioning Effects*

5.4.148 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.149 As no measurable negative effect is predicted, **no cumulative effects are predicted.**

Wildcat

*Baseline*

5.4.150 Scottish wildcats have suffered a dramatic decline and are on the brink of extinction, largely as a result of inbreeding with domestic cats and habitat fragmentation (Davis and Gray 2010). Scottish wildcats are known from the wider area historically, although the core survey area is not within any of the 'hotspots' identified by Davis and Gray (2010) (Scott 2011; JNCC 2007). Scottish wildcats are protected under Annex IV of the Habitats Directive and Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). They are therefore considered to be of **high sensitivity.**

5.4.151 No wildcat dens or signs were found within the core survey area. Furthermore, wildcats prefer good cover for hunting and shelter, which is not offered by the degraded bog habitat within the application boundary (Davis and Gray 2010). Therefore, habitat is sub-optimal for wildcat.

5.4.152 Estate staff reported that no wildcat had been seen in the vicinity of the core survey area in recent years.

5.4.153 There are no records of wildcat relevant to the Proposed Development site, although they are known from the wider area historically (based on HBRG data).

5.4.154 It is possible that wildcat may be present in the wider area, and may on occasion venture onto the site while hunting or commuting.

*Potential Construction Effects*

5.4.155 Although the habitat onsite is largely sub-optimal for wildcat, and no evidence was found for this species within the application site boundary, they may occasionally hunt or commute through the site. However, this is likely to be extremely infrequent as the site does not offer good habitat for this species, and any local population, if present, will exist at a very low density.

5.4.156 Increased noise, increased ground vibrations and vehicle traffic may result in disturbance to wildcat, if they hunt in this area during construction activities.

5.4.157 Increased vehicle traffic during the construction phase may also present an increased risk of mortality to wildcat, however as the habitat onsite is sub-optimal and this species is largely nocturnal and present at a very low density (if at all) this is considered highly unlikely.

5.4.158 There is also a risk that wildcats may become trapped in trenches required during construction activities which may result in mortality.

5.4.159 Therefore, there is a very small possibility of disturbance and increased mortality risk during construction. It is highly unlikely that there would be any noticeable effect on the local population. Furthermore, the population would certainly be able to recover in the unlikely event of any mortality through natural recruitment.

5.4.160 Although any effect on wildcat is considered highly unlikely, mitigation is recommended as a precaution. Preconstruction surveys should be undertaken to ascertain current local status and use of the development footprint. Should any dens be identified, and disturbance considered likely, an application for a European Protected Species licence will be made. If a license is required, implementation of an wildcat management plan may be necessary. Where there is a potential risk of fatality through collision with construction traffic, specific mitigation measures will be considered including fencing and wildlife reflectors. It is also recommended that excavations are either covered up overnight and/or ramps provided in trenches to avoid wildcats, or other mammals, becoming trapped during the construction phase. A suitably experienced and qualified Ecological Clerk of Works will be appointed to oversee construction activities.

5.4.161 Following implementation of mitigation measures outlined above, any potential effect would be of **negligible magnitude**, **reversible in the short- to medium-term**, and of a **very low significance** level. Therefore **no significant negative effect is predicted.**

*Potential Operation Effects*

5.4.162 There will be a small level of traffic associated with maintenance during the operational phase. This may potentially result in disturbance to wildcats, discouraging them from hunting in the area during maintenance activities if present at all. However, wildcats are generally nocturnal in their habits, and so their activity is unlikely to coincide with maintenance works (Davis and Gray 2010). Therefore, disturbance to wildcats is unlikely during the operational phase. A low speed limit will also be enforced which will reduce the likelihood of mortality through collision with vehicles. Furthermore, if wildcat are present the density will be extremely low, and so the likelihood of an individual being present onsite at the same time as maintenance staff is negligible. Therefore, any negative effect will be **of negligible magnitude**, **reversible in the short-term** and of a **very low level of significance.** Therefore, **no significant effect is predicted.**

5.4.163 In addition, measures will be taken to restore the bog habitats onsite and to the north of the application boundary as part of the Habitat Management Plan (see Figure 5.10). This will restore habitat structure onsite creating greater cover, and help maintain and enhance the habitats found to the north of the application boundary. This will therefore increase the habitat suitability for wildcats in the future. The development will therefore have a **positive effect of low magnitude over the long-term** on wildcats if present.

*Decommissioning Effects*

5.4.164 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.165 As no measurable negative effect is predicted, **no cumulative effects are predicted.**

Water vole

*Baseline*

5.4.166 Water voles (*Arvicola terrestris*) are known from the wider area and are listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), although the site was not found to support the species, and offers only limited suitable habitat (Scott 2011). They are therefore considered to be of **medium** sensitivity.

5.4.167 No evidence of water voles was found within the core survey area and no records were provided relevant to the Proposed Development site, although they are known from the wider area (based on HBRG data).

5.4.168 However, a water vole colony was found at Loch Ben Harrald, over 3.3km from the Proposed Development (see Figure 5.11).

5.4.169 The water courses within the core survey area were considered unsuitable for water vole due to the gradient and/or the rocky substrate. Most of the water courses also appeared too shallow to support water voles. Some of the peat pools, however, represented good habitat for water voles.

5.4.170 Studies have found the average dispersal distance for water voles to be between 1.8km and 3.5km, although they have been found to disperse up to 8km (Aars *et al.* 2001; Telfer *et al.* 2003; Lambin *et al.* 2011). However, water voles have been found to travel up to a maximum of 23.9km to find suitable new habitat and to encounter potential mates (Lambin *et al.* 2011). Therefore, there

is a possibility that they may travel over the site while dispersing or establish new colonies here in the future.

*Potential Construction Effects*

5.4.171 Although no evidence of water voles was found within the application site boundary, they may colonise areas of suitable habitat in the future.

5.4.172 Increased noise, increased ground vibrations and vehicle traffic may result in disturbance to water voles, if they have colonised the area before construction activities begin.

5.4.173 Increased vehicle traffic during the construction phase may also present an increased risk of mortality to water voles.

5.4.174 There is also a risk water voles may become trapped in trenches required during construction activities which may result in mortality.

5.4.175 Therefore, there is a small possibility of disturbance and increased mortality risk during construction. It is highly unlikely that there would be any noticeable effect on the local population. Furthermore, the population would certainly be able to recover in the unlikely event of any mortality through natural recruitment.

5.4.176 Preconstruction surveys should be undertaken to ascertain whether water voles have colonised habitat within 50m of the development footprint. Should any colonies be identified, and disturbance considered likely, an application will be made to SNH for a licence. If a license is required, implementation of a water vole management plan may be necessary. Where there is a potential risk of fatality through collision with construction traffic, specific mitigation measures will be considered including water vole fencing. It is also recommended that excavations are either covered up overnight and/or ramps provided in trenches to avoid water voles, or other mammals, becoming trapped during the construction phase. A suitably experienced and qualified Ecological Clerk of Works will be appointed to oversee construction activities.

5.4.177 Following implementation of mitigation measures outlined above, any potential effect would be of **negligible magnitude**, **reversible in the short- to medium-term**, and of a **very low significance** level. Therefore **no significant negative effect is predicted.**

5.4.178 There is a potential for suitable habitats to be disturbed, damaged or lost as a result of vehicle movements, construction, siltation and pollution of water courses. As no water voles were found, it is unlikely that construction activities may lead to the direct loss or damage of individuals or occupied habitat. In order to avoid loss of potentially suitable water vole habitat it is essential that all construction activities are planned with due regard to all relevant Pollution Prevention Guidelines – particularly *PPG 5: Works in, Near or Liable to Affect Watercourses* and *PPG 2 Above Ground Oil Storage Tanks*. Full details of mitigation to avoid effects on the aquatic environment can be found in Chapter 9: Other Issues. Given water voles were not found to be present onsite and the mitigation in place, **no effect is predicted.**

5.4.179 Construction works may physically damage substrate, alter the substrate or channel shape, which may potentially cause the loss of suitable water vole habitat. However, construction activities will be confined to relatively small areas and avoid suitable habitat for this species. Therefore, **no direct effect is predicted.**

*Potential Operation Effects*

5.4.180 There will be a small level of traffic associated with maintenance during the operational phase. Water vole habitat is generally limited to 20m around a watercourse, with the majority of water vole activity concentrated within a 2-5m from the bank (Strachan *et al.* 2011). Therefore, potential water vole habitat is unlikely to be greatly affected. Therefore, disturbance to water voles is considered to be highly unlikely during the operational phase. A low speed limit will also be enforced which will reduce the likelihood of mortality through collision with vehicles. In the unlikely

event that individuals are lost, these would be easily replaced through natural recruitment. Therefore, any negative effect will be **of negligible magnitude**, **reversible in the short-term** and of a **very low level of significance.** Therefore, **no significant effect is predicted.**

*Decommissioning Effects*

5.4.181 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.182 As no measurable negative effect is predicted, **no cumulative effects are predicted.**

Red squirrel

5.4.183 There are no records of red squirrels relevant to the Proposed Development site (based on SSRS data which is accessed via NBN Gateway), and there are no priority woodlands in the wider area (Poulsam *et al.* 2005). However, red squirrels have been recorded in the wider area historically (Scott 2011). Red squirrels are listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). They are therefore considered to be of **medium sensitivity**.

5.4.184 There is no suitable habitat for red squirrels within the core survey area. The small area of stunted woodland within the east of the application site boundary is unsuitable for this species as trees are short and sparsely scattered with a fully open canopy (SNH 1997). Therefore, **no effects on red squirrels are predicted**.

Bats

*Baseline*

5.4.185 It is usual best practice to conduct bat activity transects and set up a series of remote bat detectors at proposed wind farms to record bats that are utilising the site so that Planning Authorities are fully informed as to the likely significant effects of the proposals and to influence the siting of turbines (Bat Conservation Trust [BCT] 2007; BCT 2011; BCT 2012; Mitchell-Jones and McLeish 2004; Natural England 2012; Wray et al. 2010).

5.4.186 However, in this case it was decided and agreed with SNH that bat activity surveys will not provide any further information regarding the use of the Proposed Development site by foraging and roosting bats that is not already known. Therefore undertaking surveys would be disproportionate as it would not help inform a significantly more robust assessment than can already be undertaken.

5.4.187 Although 18 species of bat are found in the UK, numbers and species diversity decrease with increasing latitude. Nine species are known to occur in south Scotland which decreases further to just five species in the north of Scotland (Corbet and Harris 1991; Mitchell-Jones 2004; Mitchell-Jones et al. 1999; Morris 1993; Ransome 1990; Richardson 2000), including common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*P. pygmaeus*), Daubenton's (*Myotis daubentonii*), Natterer's (*M. nattereri*) and brown long-eared (*Plecotus auritus*). However, Natterer's bat does not occur as far north as the Proposed Development (Alexander Macdonald, SNH, pers. comm.).

5.4.188 All of the four species known to be present in the Lairg area are considered to be of medium or low risk for collision with wind turbines (BCT 2011; BCT 2012; Wray *et al*. 2010).

5.4.189 Habitat within the Proposed Development site predominantly comprises open wet heath with a number of lochans, water courses and ditches running through the site. This type of open, exposed, windswept, habitat is known to offer poor foraging and commuting opportunities for bats of all four of the species known to occur locally (Altringham 1998; Cowan 2006; Ransome 1990; Vaughan 1997; Walsh and Harris1996a; Walsh and Harris 1996b).

5.4.190 The stunted, sparsely scattered open canopy plantation located on the eastern boundary of the site offers limited shelter for commuting bats, and remains exposed to wind. Furthermore, due to the lack of roosting opportunities nearby, the number of bats using the forest edge to forage and commute is likely to be low (Altringham 1998; Cowan 2006; Ransome 1990; Vaughan 1997; Walsh and Harris 1996a; Walsh and Harris 1996b).

5.4.191 Both the open wet heath habitat and conifer plantations are unlikely to attract brown long-eared bats which are known to favour broadleaved woodland foraging habitats (Altringham 1998; Ransome 1990).

5.4.192 In addition roosting opportunities within and adjacent to the site are considered to be very poor (Altringham 1998; Cowan 2006; Mitchell-Jones and McLeish 2004; Ransome 1990).

5.4.193 Discussions with bat ecologists who have been conducting bats surveys at proposed wind farms nearby have confirmed that the area is not favoured by foraging bats with just a handful of bats recorded in a whole season of surveys (Stuart Spray pers.comm; Duverge pers. comm.).

5.4.194 The results of any bat activity surveys that could be conducted at the Proposed Development would confirm that the site represents poor foraging and commuting habitat for bats. If any species were recorded at all, these would include small numbers of common pipistrelle bats and one or two soprano pipistrelle and Daubenton's bats.

5.4.195 Professional experience and expertise indicates that activity levels will be extremely low due to the unsuitability of the habitat, bat activity surveys were not considered to be necessary for this site (BCT 2007; BCT 2011; BCT 2012; Natural England 2012; Mitchell-Jones and McLeish 2004; Wray *et al.* 2010).

5.4.196 All bat species are listed under Annex IV of the Habitats Directive and Schedule 5 of the Wildlife and Countryside Act. However, it is highly unlikely that the application site boundary or wider core survey area supports any bat roosts, and offers extremely poor foraging habitat. Therefore, any bat activity will be extremely low, if there is any at all. As such, bats are considered to be of **medium sensitivity.**

*Potential Construction Effects*

5.4.197 As there is no suitable roosting or foraging habitat within the application site boundary or wider core survey area, no effects on bats are predicted during construction activities.

*Potential Operation Effects*

5.4.198 Bats are susceptible to mortality through collision and barotrauma caused by wind turbines (Natural England 2012; BCT 2012; Baerwald *et al.* 2008). However, as any species of bat is highly unlikely to fly over the application site while foraging or commuting, any risk of an effect is very low, and lost individuals would be replaced easily through natural recruitment. Therefore, any effect is considered to be of **negligible magnitude**, **reversible in the short- to medium-term**, and of a **very low significance level**. Therefore **no significant effect is predicted.**

*Decommissioning Effects*

5.4.199 Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning.

*Potential Cumulative Effects*

5.4.200 As no measurable negative effect is predicted, **no cumulative effects are predicted.**

**5.5 Habitat Management Plan**

5.5.1 A Habitat Management Plan (HMP) will involve offsite compensation aimed at enhancing peatland habitats to the north of the application site boundary, within Altnaharra Estate. These habitats have become degraded as a result of human management, including extensive drainage of the bog. The drainage ditches are also unusually wide and deep, presenting a hazard for wildlife, including reptiles and small mammals which could fall in and become trapped. The plan will be developed in collaboration with Altnaharra Estate, the Highland Council Biodiversity Officer , SNH, RSPB and any other relevant organisations. The HMP would include blocking of the extensive drainage ditch network, restoring the water table and enhancing peatland habitats. In addition fences will be marked to avoid bird collisions. Other management options will also be considered in order to maximise the biodiversity potential of this area.

5.5.2 The potential area for habitat management is approximately 440ha, including the some of the borrow pit area which will also be available for habitat management after construction has been completed (see Figure 5.10). The Habitat Management Area is therefore larger than the application site boundary of 356.37ha. This Habitat Management Plan is an opportunity to restore habitat to be closer to the high quality peatlands surrounding the site, and provide additional areas for birds associated with SPAs to use for breeding and foraging in the future.

5.5.3 A Deer Management Plan has also been developed, and is provided in Technical Appendix 5.3.

5.5.4 Post consent monitoring will be carried out. Data will provide information which may contribute to a better understanding of the effects of future wind farms on ecological receptors. Preconstruction surveys will establish an up-to-date baseline prior to construction, and post-construction monitoring will be undertaken during the years 1, 2, 3, 4, 5, 10 and 15 of the operational phase, allowing comparison with bird monitoring results. A decision will then be taken based upon the results to date as to whether there is a requirement for monitoring to continue beyond year 15. A dedicated monitoring programme for fish will also be undertaken (further details of which are provided in Technical Appendix A5.2).

**5.6 Summary of Residual Effects**

5.6.1 Table 5.10 details the predicted effects after mitigation has been considered. As decommissioning activities are of a similar type and intensity as construction activities, the assessment considers that potential effects of decommissioning will be of a similar nature to the potential effects of construction. In the case of this development, mitigation measures during construction would also apply to the decommissioning phase and so are not repeated. This is likely to be precautionary as in practice many of the decommissioning effects are likely to be of a smaller scale than the construction effects.

**5.7 Summary**

Introduction

5.7.1 Wind farms can have an effect on habitats and other non-avian ecology as a result of construction activities, operation of the wind farm and decommissioning activities. A desk study and field surveys were conducted between August 2012 and August 2013 so as to inform an assessment of potential effects on these habitats and species.

Assessment Approach

5.7.2 The assessment approach was designed with reference to various relevant legislation, policy and guidance, and involved a number of stages. Following best practice, a preliminary ecological appraisal was completed to scope in the main issues, and scope out issues which did not require further consideration in order to complete an impact assessment. Targeted novel baseline surveys were then undertaken where necessary to provide a baseline to inform this assessment. Finally an ecological impact assessment was completed, considering cumulative effects where appropriate.

5.7.3 Stakeholder consultation was also undertaken with Scottish Environmental Protection Agency (SEPA), Scottish Natural Heritage (SNH), Highland Council and Energy Consents and Deployment Unit, in order to identify potential sensitivities and to address these during the baseline surveys and assessment.

5.7.4 Novel baseline surveys included a Phase 1 Habitat Survey, National Vegetation Classification (NVC) Survey, Protected Mammal Survey, Freshwater Pearl Mussel Survey and a Fisheries Survey

Information Gaps

5.7.5 Information regarding the distribution and abundance of lamprey young within the study area is limited. However, any significant effects on lampreys are considered highly unlikely with recommended mitigation in place.

Receptor Assessments

5.7.6 Blanket bog and wet heath habitat are qualifying features of the adjacent Caithness and Sutherland Special Area of Conservation (SAC) and are listed under Annex I of the Habitats Directive. A very small area of these habitats will permanently be lost to construction (<0.01%of the habitat available in the region) and a smaller area temporarily lost. Improvements to these habitats, both on site and in the Habitat Management Plan area will more than compensate for any loss. Therefore a significant positive effect is predicted.

5.7.7 Bog pool habitats, also qualifying features of the adjacent Caithness and Sutherland Special Area of Conservation (SAC) and listed under Annex I of the Habitats Directive will be avoided during construction. With improvements to these habitats, both on site and in the Habitat Management Plan a significant positive effect is predicted.

5.7.8 Dry heath and montane heath habitats, listed under Annex I of the Habitats Directive will be avoided during construction. With improvements to these habitats, both on site and in the Habitat Management Plan a significant positive effect is predicted. Blanket bog and wet heath habitats are also classified as Groundwater Dependent Terrestrial Ecosystems (GWDTEs). Other constructional and operational effects, such as nutrient enrichment, pollution and indirect hydrological effects will be avoided by adhering to all relevant guidance, regulation and best practice (detailed in Volume 1 Chapter 9: Other Issues: Soil and Water of the ES).

5.7.9 Freshwater pearl mussels are qualifying features of the adjacent River Naver SAC, and are listed under Annex II and Annex IV of the Habitats Directive and Schedule 5 of the Wildlife and Countryside Act. Optimal freshwater pearl mussel habitat was found to be confined to a small area of the River Vagastie, over 600m from the borrow pit and over 5km from the nearest turbine location and no freshwater pearl mussels were found in the limited suitable habitat. The distance of the site boundary from suitable habitat means potential disturbance, substrate damage or the alteration of water channels will be avoided. Any other potential construction or operational effects, such as pollution and indirect hydrological effects will be avoided by adhering to all relevant guidance, regulation and best practice (detailed in Volume 1 Chapter 9: Other Issues: Soil and Water of the ES). Therefore no effect is predicted.

5.7.10 The site was not found to offer habitats known to support important communities of invertebrates of conservation concern. However, the rare Red Data Book listed alpine ant spider (*Micaria alpina*) is known from the adjacent Cnoc an Alaskie SSSI, although it is not one of the notified features. Suitable habitat can be found in the core survey area although not within the site application site boundary itself. Improvements in the Habitat Management Plan area will therefore result in a significant positive effect for this species if present.

5.7.11 Atlantic salmon occur in the wider fisheries study area, although not within the application site boundary. Atlantic salmon are qualifying features of the adjacent River Naver SAC, and are listed under Annex II of the Habitats Directive. Brown trout and lamprey are listed on the Scottish Biodiversity List, European eel are listed on the International Union for Conservation of Nature (UICN) Red List. None of these species are qualifying features of the adjacent River Naver SAC.

All occur in the river Vagastie although only trout in the higher reaches, within the application site boundary. Any activities with the potential to cause pollution or any removal or diversion of large amounts of water from catchments arising from the application site (abstraction) must be authorised by SEPA. Other potential effects such as the acidification of water, changes to drainage through road building or culverting will require appropriate mitigation. With mitigation measures in place no significant effect is predicted. Arctic Charr were not found in the fisheries study area and no effect is predicted.

5.7.12 Adders and common lizards are both protected from intentional or reckless killing or injury under the Wildlife and Countryside Act, and are also Scottish Biodiversity List species. The core survey area offers excellent reptile habitat, and both adders and common lizards are known to occur to the north of the Proposed Development. However, the Proposed Development itself does not offer optimal habitats. The Proposed Development will have a small landtake of sub optimal habitat and will be microsited to avoid the best habitat. The risk of increased mortality during construction and operation will be mitigated through following best practice and guidance and would be offset through improvements to habitat through the Habitat Management Plan. Therefore no significant effect is predicted.

5.7.13 Otter are qualifying features of the adjacent Caithness and Sutherland Peatlands SAC and are listed under Annex II of the Habitats Directive and Schedule 5 of the Wildlife and Countryside Act. Water vole are listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) although not a qualifying feature of the Caithness and Sutherland Peatlands SAC. No evidence of either species was found within 200m of the core survey area. Both species are known historically from the wider area, a water vole colony was also found approximately 3km from the Application Site Boundary and otter spraints and footprints found 300m from the proposed borrow pit and 400m from the nearest turbine location. It is possible that both species may travel through the site with a risk of increased mortality. Therefore preconstruction surveys will be undertaken and management plans implemented if necessary. With this mitigation in place no significant effect is predicted. Construction activities will be confined to relatively small areas and will avoid suitable habitat, which was found unoccupied, therefore no direct effect on habitat is predicted. During the operational phase of the proposed wind farm, given the habits of these species and with a low speed limit reducing the risk of mortality through collision with traffic, no significant effect is predicted.

5.7.14 No evidence was found within the core survey area of pine marten or wildcat, listed under Annex IV of the Habitats Directive and Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), or red squirrel (Schedule 5 Wildlife and Countryside Act 1981 (as amended)) or badger (protected under the Protection of Badgers Act 1992). No suitable habitat was found for these species within the Application Site Boundary. As a precautionary measure to avoid potential disturbance or mortality risk during construction, operation and decommissioning mitigation measures will be implemented including pre construction surveys and, where necessary, species management plans. Therefore no significant effect is predicted. There is no suitable habitat for red squirrel at the site or within the core survey area so no effect is predicted.

5.7.15 As there is no suitable roosting or foraging habitat within the application site boundary or wider core survey area, no effects on bats are predicted during construction activities. It is very unlikely that bats will overfly the site during the operation and no significant operational effect is predicted

Habitat Management Plan

5.7.16 A Habitat Management Plan (HMP) involving offsite compensation aimed at enhancing peatland habitats to the north of the application site boundary, within Altnaharra Estate is proposed. These habitats have become degraded as a result of human management, including extensive drainage of the bog. The potential area for habitat management is 440.66ha and is therefore larger than the application site boundary of 356.37ha. This Habitat Management Plan is an opportunity to restore habitat to be closer to the high quality peatlands surrounding the site, and provide additional areas for species associated with nearby SACs and SSSIs in the future. The Habitat Management Plan is predicted to have positive effects on habitats, invertebrates, reptiles and mammals.

5.7.17 Post consent monitoring will be carried out and Preconstruction surveys will establish an up-to-date baseline prior to construction.

Summary of Residual Effects

5.7.18 No significant negative effects are predicted on habitats or other non-avian ecology as a result of the Proposed Development. The Habitat Management Plan is predicted to result in positive effects for a number of habitats and species of conservation concern.

**Table 5.10 Summary of residual effects.**

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| ***CONSTRUCTION (AND DECOMMISSIONING) EFFECTS*** | | | | | | | | |
| M17 blanket bog | Very High | Direct loss of blanket bog habitat | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. Restoration through the Habitat Management Plan more than compensates for habitat loss. |
| M17 blanket bog | Very High | Temporary loss of blanket bog habitat | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. Restoration through the Habitat Management Plan more than compensates for temporary habitat loss. |
| M2 bog pools | Very High | Direct loss of blanket bog habitat (none predicted) | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. Restoration through the Habitat Management Plan more than compensates for habitat loss |
| M3 bog pools | Very High | Direct loss of blanket bog habitat (none predicted) | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. Restoration through the Habitat Management Plan more than compensates for habitat loss |
| M25 Molinia mire | Very High | Direct loss of blanket bog habitat | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. Restoration through the Habitat Management Plan more |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | than compensates for habitat loss |
| M15 wet heath | Very High | Direct loss of wet heath habitat | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. Restoration through the Habitat Management Plan more than compensates for habitat loss |
| H10 dry heath | Very High | Direct loss of dry heath habitat | None | No effect predicted | | | | Not significant. High certainty. |
| H17 montane heath | Very High | Direct loss of montane heath habitat | Avoidance | No effect | | | | Not significant. High. Two miniscule (boulder size) habitats in known locations |
| Birch/willow scrub | Low | Direct loss of scrub | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Not significant. High. Planted scrub in an area of bog and wet heath, the wider, more natural habitat will be improved through the Habitat Management Plan. |
| Freshwater pearl Mussels | Very High | Vehicle movements, construction, siltation and pollution | Use of best practice and guidance | No effect predicted | | | | Not significant. High certainty, no freshwater pearl mussels found in study area, suitable habitat to be protected using best practice/guidance |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| Alpine ant spider | High | Direct habitat loss | Restoration of habitat in Habitat Management Plan | Minor | Long-term | Positive | Low | Not significant. High certainty. No suitable habitat in the Application site Boundary. Habitat Management Plan area contains suitable habitat |
| Other Invertebrates | Low | Direct habitat loss | Restoration of habitat in Habitat Management Plan | Minor | Long-term | Positive | Very Low | Not significant. High certainty. Habitat Management Plan improve habitats for invertebrates |
| Atlantic salmon | Very High | Pollution, abstraction, acidification, runoff | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty. |
| | | Blocking of rivers, disturbance | Appropriate bridge design, observation of buffer | No effect predicted | | | | Not significant. High certainty. |
| Brown/sea trout | Medium | Pollution, abstraction, acidification, runoff | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Very low | Not significant. High certainty. |
| | | Blocking of rivers, disturbance | Appropriate bridge design, observation of buffer | No effect predicted | | | | Not significant. High certainty. |
| European eel | Medium | Pollution, abstraction, acidification, | Compliance with legislation, guidance and best | Negligible | Reversible in short-term | Negative | Very low | Not significant. High certainty. |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| | | runoff | practice | | | | | |
| | | Blocking of rivers, disturbance | Appropriate bridge design, observation of buffer | No effect predicted | | | | Not signigficant. High certainty. |
| Lamprey species | Medium | Pollution, abstraction, acidification, runoff | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Very low | Not significant. High certainty. |
| | | Blocking of rivers, disturbance | Appropriate bridge design, observation of buffer | No effect predicted | | | | Not significant. High certainty. |
| Arctic charr | Medium | Pollution, abstraction, acidification, runoff. disturbance | | No effect predicted | | | | Not significant. High certainty, no arctic charr in area. |
| Reptiles | Medium | Disturbance, increased mortality through construction/traffic. Entrapment in trenches | Micrositing, covering of trenches/providing escapes, ECoW presence during construction, habitat restoration | minor | Long-term | Positive | Low | Not significant. High certainity. |
| Otter | Very High | Disturbance, increased mortality through | Pre construction surveys, Otter Management Plan if otters present | Negligible | Reversible in Short – Medium-term | Negative | Low | Not significant. High certainty. No otters seen within 200m of core survey area. |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| | | construction/traffic. Entrapment in trenches | involving ECoW presence during construction, covering of trenches/providing escapes, | | | | | Management plan required if pre construction surveys prove otter presence |
| Pine Marten | Medium | Disturbance, increased mortality through construction/traffic. Entrapment in trenches | Pre construction surveys, Management Plan if pine marten present involving ECoW presence during construction, covering of trenches/providing escapes | Negligible | Reversible in Short-Medium-term | Negative | Very Low | Not significant. High certainty. No pine marten seen within 200m of core survey area. Management plan required if pre construction surveys prove pine marten presence . |
| Badger | Low | Disturbance, increased mortality through construction/traffic. Entrapment in trenches | Pre construction surveys, Management Plan if pine marten present involving ECoW presence during construction, covering of trenches/providing escapes | Negligible | Reversible in Short-Medium-term | Negative | Very Low | Not significant. High certainty. No badgers seen within 200m of core survey area. Management plan required if pre construction surveys prove badger presence. |
| Wildcat | High | Disturbance, increased mortality through construction/tr | Habitat Management Plan improving habitat for wild cat | Minor | Long-term | Positive | Low | Not significant. High certainty, wildcat extremely unlikely to be on site at the same time as operations. |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| | | affic. | | | | | | |
| Water vole | High | Disturbance, increased mortality through construction/traffic. Entrapment in trenches, habitat loss | Pre construction surveys, Management Plan if pine marten present involving ECoW presence during construction, covering of trenches/providing escapes | Negligible | Reversible in the Short – Medium-term | Negative | Very low | Not significant. High certainty, no water voles found in core survey area footprint, limited potential habitat around pools only, which will be avoided, water courses unsuitable |
| | | Pollution, damage or alteration of water courses | Following pollution prevention guidelines | No effect predicted | | | | Not significant. High certainty. No water vole found in the core survey area footprint. |
| Red squirrel | Medium | Habitat loss, disturbance | | No effect predicted | | | | Not significant. High certainty, none found in core survey area, no priority woodland in wider area. |
| *Bats* | *Medium* | Loss of roosting/ foraging habitat, increased mortality | | No effect predicted | | | | Not significant. High certainty, no foraging/roosting potential, unsuitable habitat. |
| ***OPERATIONAL EFFECTS*** | | | | | | | | |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| M17 blanket bog | Very High | Run off and pollution, increased mortality through construction/traffic | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty. Detailed in Chapter 9; Other Issues |
| M2 bog pools | Very High | Run off and pollution | Following guidance and best practice | Negligible | Reversible in Short-term | Negative | Low | Not significant. High certainty. Detailed in Chapter 9; Other Issues |
| M3 bog pools | Very High | Run off and pollution | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty. Detailed in Chapter 9; Other Issues |
| M25 Molinia mire | Very High | Run off and pollution | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty. Detailed in Chapter 9; Other Issues |
| M15 wet heath | Very High | Run off and pollution | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty. Detailed in Chapter 9; Other Issues |
| H10 dry heath | Very High | Run off and pollution | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty. Detailed in Chapter 9; Other Issues |
| H17 montane heath | Very High | Run off and pollution | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty. Detailed in Chapter 9; Other Issues |
| Birch/Willow scrub | Low | Run off and pollution | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Very low | Not significant. High certainy. Detailed in Chapter 9; Other Issues |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| Freshwater pearl mussels | Very High | | | No effect pathways during operations | | | | Not significant. High certainty |
| Alpine ant spider | High | | | No effect pathways during operations | | | | Not significant. High certainty |
| Other invertebrates | Low | | | No effect pathways during operations | | | | Not significant. High certainty |
| Atlantic salmon | Very High | Run off and pollution | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainy |
| | | Disturbance | | No effect predicted | | | | Not significant. High certainty |
| Brown/sea trout | Medium | Run off and pollution | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Very Low | Not significant. High certainty |
| | | Disturbance | | No effect predicted | | | | Not significant. High certainty |
| European eel | Medium | Run off and pollution | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Very Low | Not significant. High certainty |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| | | Disturbance | No effect predicted | No effect predicted | | | | Not significant. High certainty |
| Lamprey species | Medium | Run off and pollution | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Very Low | Not significant. High certainty. |
| | | Disturbance | | No effect predicted | | | | Not significant. High certainty |
| Arctic charr | Medium | Run off, pollution, disturbance | | No effect predicted | | | | Not significant. High certainty |
| Reptiles | Medium | Increase in traffic | Speed limit, checks on site and informing operatives | Negligible | Reversible in short-term | Negative | Very Low | Not significant. High certainty |
| Otter | Very High | Increase in traffic | Speed limit, checks on site and informing operatives | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty, otter being crepuscular in nature are unlikely to be affected particularly with a low speed limit |
| Pine marten | Medium | Increased mortality due to increased traffic, disturbance | Speed limit, checks on site and informing operatives | Negligible | Reversible in short-term | Negative | Very Low | Not significant. High certainty, pine marten being crepuscular in nature are unlikely to be affected particularly with a low speed limit |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| Wildcat | High | Increased mortality due to increased traffic, disturbance | Speed limit, checks on site and informing operatives. Restoration of bog habitat | Minor | Irreversible | Positive | Low | Not significant. High certainty, wildcat numbers are such that increases in mortality extremely unlikely, improvements in habitat structure will increase potential foraging. |
| Water vole | High | Increased mortality due to increased traffic, disturbance | Low speed limit | Negligible | Reversible in short-term | Negative | Very Low | Not significant. High certainty, water vole stay within 20m of water, usually 2-5m disturbance extremely unlikely. |
| Red squirrel | Medium | Increased mortality due to increased traffic, disturbance | | No effect predicted | | | | Not significant. High certainty |
| Bats | Medium | Collision, barotrauma | | negligible | Reversible in short-term | Negative | Very Low | Not significant. High certainty, no suitable foraging or roosting habitat. |
| ***CUMULATIVE EFFECTS*** | | | | | | | | |
| M17 blanket bog | Very High | Direct loss of blanket bog habitat | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. No Cumulative Impact Assessment necessary |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| M2 bog pools | Very High | Direct loss of blanket bog habitat (none predicted) | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. No Cumulative Impact Assessment necessary |
| M3 bog pools | Very High | Direct loss of blanket bog habitat (none predicted) | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. No Cumulative Impact Assessment necessary |
| M25 Molinia mire | Very High | Direct loss of blanket bog habitat | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. No Cumulative Impact Assessment necessary |
| M15 wet heath | Very High | Direct loss of wet heath habitat | Habitat restoration through drain blockage | Minor | Long-term | Positive | Medium | Significant. High certainty. No Cumulative Impact Assessment necessary |
| H10 dry heath | Very High | Run off and pollution | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty. No Cumulative Impact Assessment necessary |
| H17 montane heath | Very High | Run off and pollution | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Low | Not significant. High certainty. No Cumulative Impact Assessment necessary |
| Birch/Willow scrub | Low | Run off and pollution | Following guidance and best practice | Negligible | Reversible in short-term | Negative | Very low | Not significant. High certainty. No Cumulative Impact Assessment necessary |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| Freshwater pearl Mussels | Very High | Run off and pollution | | No cumulative effect predicted | | | | Not significant. High certainty. |
| Alpine ant spider | High | Direct loss of habitat | | No cumulative effect predicted | | | | High |
| Other Invertebrates | Low | Direct loss of habitat | | No cumulative effect predicted | | | | High |
| Atlantic salmon | Very High | Run off and pollution | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Low | High certainty. No Cumulative Impact Assessment Necessary |
| | | Disturbance | | No cumulative effect predicted | | | | High |
| Brown/sea trout | Medium | Run off and pollution | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Low | High certainty. No Cumulative Impact Assessment Necessary |
| | | Disturbance | | No cumulative effect predicted | | | | High |
| European eel | Medium | Run off and pollution | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Low | High certainty. No Cumulative Impact Assessment Necessary |

| VER | Sensitivity | Potential Effect (before mitigation) | Mitigation | Magnitude (after mitigation) | Reversibility (after mitigation) | Nature (after mitigation) | Significance Level (after mitigation) | Level of Certainty/ Comments and Significance (in terms of EIA regulations) |
|---|---|---|---|---|---|---|---|---|
| | | Disturbance | | No cumulative effect predicted | | | | High |
| Lamprey species | Medium | Run off and pollution | Compliance with legislation, guidance and best practice | Negligible | Reversible in short-term | Negative | Low | High certainty. No Cumulative Impact Assessment Necessary |
| Arctic charr | Medium | Pollution, disturbance, changes to water flow | | No cumulative effect predicted | | | | High. |
| Reptiles | Medium | Direct loss of habitat, disturbance | | No cumulative effect predicted | | | | High. |
| Otter | Very High | Direct loss of habitat, disturbance | | No cumulative effect predicted | | | | High |
| Pine Marten | Medium | Direct loss of habitat, disturbance | | No cumulative effect predicted | | | | High |
| Wildcat | High | Direct loss of habitat, disturbance | | No cumulative effect predicted | | | | High |
| Water vole | High | Direct loss of habitat, disturbance | | No cumulative effect predicted | | | | High |

| **VER** | **Sensitivity** | **Potential Effect (before mitigation)** | **Mitigation** | **Magnitude (after mitigation)** | **Reversibility (after mitigation)** | **Nature (after mitigation)** | **Significance Level (after mitigation)** | **Level of Certainty/ Comments and Significance (in terms of EIA regulations)** |
|---|---|---|---|---|---|---|---|---|
| Red squirrel | Medium | Direct loss of habitat, disturbance | | No cumulative effect predicted | | | | High |
| Bats | Medium | Direct loss of habitat, disturbance | | No cumulative effect predicted | | | | High |
| ***DECOMMISSIONING EFFECTS*** | | | | | | | | |
| Potential decommissioning effects are considered to be of the same nature as construction effects, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas. Relevant mitigation described under Construction Effects will also be applied during Decommissioning. | | | | | | | | |

**5.8 Statement of Significance**

5.8.1 An assessment has been made of the likely effects of the proposed Creag Riabhach Wind Farm during the construction, operation and decommissioning stages. It is concluded that, provided best practice is followed to avoid disturbance to protected species, pollution, run off, sedimentation and other potential environmental effects during construction there will be no likely significant effects on any avian valued ecological receptor. Mitigation is recommended to minimise potential effects on VERs identified. After mitigation is considered, the effect on VERs is assessed as not significant.

5.8.2 The Habitat Management Plan will involve the restoration of peatland habitats in an area larger than the application site boundary. This will have a positive effect on habitats and including those associated with Caithness and Sutherland Peatlands SPA. By increasing the available area of high quality and internationally important habitats in the vicinity of this SPA, this will help maintain the integrity of these peatlands in the long-term. Furthermore, enhancement of the bog habitats will maximise the biodiversity potential of the Habitat Management Plan area, and improve habitat structure which will benefit many groups including mammals, reptiles, amphibians, invertebrates and plants.

5.8.3 Climate change is widely accepted as the cause of some adverse ecological events and predictions indicate that declines will occur in many habitat types and ecological taxa. It is also important in the decision making process to consider the positive contribution that the development will have in tackling the issue of climate change.

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