10 Ornithology

10.1 Introduction

10.1.1 This chapter considers the potential impacts of the Consented Development on birds at the Site and surrounding Study Area, during construction and operation, with decommissioning impacts having been scoped out (see further details under section 'Impacts scoped out). The assessment is based upon comprehensive baseline data, comprising specifically targeted ornithological surveys of potentially important and legally protected bird species identified during desk study and consultation feedback. It draws on pre-existing information, where appropriate, from other studies, survey data sources and NatureScot (previously Scottish Natural Heritage) guidance. The scope of the ornithological assessment excludes potential impacts on habitats, flora and other fauna, which are considered separately in Chapter 11: Ecology.

10.1.2 Alba Ecology Ltd. led on all aspects of the ornithological fieldwork and assessment in association with the Beaw Field Wind Farm. Alba Ecology is Scottish-based multi-disciplinary ecological consultancy that has worked in the north of Scotland, and Shetland specifically, for many years. Alba's staff have led on and contributed to all aspects of Ecological Impact Assessment on many large-scale Scottish wind farm development projects, including the management of Ecological Clerks of Work teams, principal ornithological/ecological surveyors and advisors on planning applications, expert witness advice at Public Local Inquiry and production of Environmental Statements, Habitat Regulations Assessments and Habitat Management Plans.

10.1.3 The ornithological surveyors used in the Study Area between 2010 and 2012 and in 2015 were Claire Bailly, Chris Bingham, Mark Chapman, Cameron Cosgrove, Peter Cosgrove, Robert Curtis, Kevin Cuthbert, Martha Devine, Euan Ferguson, David Hunt, Katie Lloyd, Ross Macgregor, Robert Potter, Neil Robertson, Malcolm Smith, Chris Townend, and Ryan Wilson-Parr.

10.1.4 Following submission of the original EIA, SNH (as it was then known) lodged a holding objection pending further information which was provided in an FEI submission dated June 2016 (see Appendix 1.2). The further information satisfied SNH so that the objection was subsequently lifted.

10.1.5 A first red throated diver survey in May 2022 has been carried out by Alba Ecology. A confidential survey report has been produced to accompany this EIAR. Also in May 2022, an update survey of the baseline habitats at the Site was undertaken and an updated Habitat and NVC Survey Report is included at Appendix 11.7.

10.1.6 The surveyors have extensive ornithological field experience of upland areas, and attended regular training events led by experts, covering areas such as breeding bird survey techniques, estimating distances and heights, recording data concisely and accurately, navigation techniques and health and safety. Surveyors were trained to carry out bird surveys in a systematic manner, following recognised standardised survey methods. Those surveyors working near Schedule 1 birds in the breeding season held relevant NatureScot Schedule 1 Bird Licenses.

10.1.7 Full details of ornithological survey methodologies and data collected can be found in Appendix 10.1: Birds Technical Report as per guidance[1].

10.1.8 The assessment involved the following key stages:

- Reference to relevant legislation, policy and guidance;
- Identification of likely zone of influence of the Consented Development;
- Identification of potentially important ornithological receptors likely to be affected (baseline conditions) by the Consented Development;
- Evaluation of important ornithological receptors and features likely to be affected by the Consented Development;
- Identification of likely impacts and magnitude of the Consented Development works on important ornithological receptors; and
- Assessment of the likely significant effects of the Consented Development, including any mitigation and enhancement measures and definition of any residual significant effects.

10.1.9 The May 2022 red throated diver survey provided initial results that suggest that diver activity at the Site is very similar to that recorded during the original survey effort. The habitat and NVC update survey has found that there have been no fundamental changes to the habitats and communities within the Study Area. Therefore the baseline situation remains unchanged and, as a result, the findings of the original assessment, which are reproduced below, remain valid.

10.1.10 The term 'receptor' is used throughout the Environmental Impact Assessment (EIA) process and is defined as the element in the environment affected by a development (e.g. a bird in the case of ornithology). The term 'impact' is also used commonly throughout the EIA process and is defined as a change experienced by a receptor (this can be positive, neutral or adverse). The term 'effect' is defined as the consequences for the receptor of an impact. The use of the word 'effect' rather than 'impact' at the end of species and designated site accounts is based on the wording of the EIA Regulations which require determination of '*likely significant effects*'.

10.2 Methodology

Study Area Definitions

10.2.1 The following geographic area definitions are used in this chapter and associated technical appendices (Table 10.1). The Ornithology Study Area is illustrated in Figure 10.1.

Table 10.1: Geographic area definitions

Term	***Definition***
The Site	This refers to all the land within the Application Boundary for the Beaw Field Wind Farm and is located within the southern half of Yell. The Site is located approximately 4km northeast of Ulsta, 1km northwest of Burravoe and 1km south of Gossabrough.
development footprint	This refers to the footprint of the Consented Development infrastructure

	within the Site. It includes the turbines, access tracks, substation, temporary construction compound, borrow pits and all work areas.
turbine area	This refers to the area within the rotor sweep plus a 500m buffer.
Study Area	The Study Area equates to all the land within the Application Boundary, plus an appropriate buffer e.g. ca. 500m for breeding birds. The Study Area was the same for all bird species, except that searches for certain Schedule 1 bird nests went beyond this. As regards surveying for nests of Schedule 1 birds, the search area varied depending upon NatureScot guidance for individual species, but usually went out to 2km from the Site, with one notable exception. It was agreed with NatureScot to search greater distances across southern Yell for breeding red-throated divers *Gavia stellata*.

Impacts assessed

10.2.2 The main elements of the Consented Development which have the potential to impact on ornithological receptors both during construction and operation are described in Chapter 3: Project Description of and include:

- A maximum of 17 wind turbine generators, each with a maximum tip height of up to 145m with a total generating capacity greater than 50MW;
- Turbine foundations and transformers;
- Access tracks;
- Hardstanding and cleared areas for wind turbine construction and maintenance;
- Underground electrical and communication cabling;
- Substation and control building;
- Compound during construction;
- Permanent Met mast;
- Telecommunications tower
- Four borrow pits for aggregates; and
- Watercourse crossings.

10.2.3 The following potential impacts have been assessed in full in relation to the construction of the Consented Development:

- Direct loss of foraging habitat and/or breeding habitat for birds;
- Indirect loss of foraging habitat and/or breeding habitat for birds, through displacement; and
- Disturbance to birds due to track and turbine base construction as well as turbine erection, heavy machinery, noise and human activity on the Site.

10.2.4 The following potential impacts have been assessed in full in relation to the operation of the Consented Development:

- Direct loss of foraging or breeding habitat due to displacement or avoidance;

- Indirect loss of foraging or breeding habitat due to displacement or avoidance;
- Impacts on commuting routes due to ‘barrier effects’, i.e. turbines blocking a preferred flight route/corridor;
- Death or injury of birds through collision with turbine blades (‘collision risk’); and
- Cumulative impacts of the Consented Development in the context of other nearby wind farms (operational and consented).

Impacts scoped out

10.2.5 Impacts on birds arising from the process of decommissioning have been scoped out of this assessment. An assessment of the ornithological impacts of decommissioning the Consented Development has not been undertaken as part of the EIA because: (i) the future baseline conditions (environmental and other developments) cannot be predicted accurately at this stage; (ii) the proposals for decommissioning are not known at this stage, and (iii) the best practice guidance on decommissioning methods will likely change during the life-time of the Consented Development and so cannot be predicted at this stage. Nevertheless, the Applicant commits to an additional consultation one year in advance of the year of decommissioning and to implement best practice decommissioning methods at the time of decommissioning. General decommissioning intentions are considered within Chapter 3: Project Description.

10.2.6 The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 as amended (hereafter known as the ‘EIA Regulations’) require all *likely significant effects* (beneficial and adverse) to be considered. This is usually taken to mean site specific related effects, although this is not as straightforward as it first appears to be. For example, the benefits to birds within the Study Area stemming from the contribution made by the wind farm towards countering climate change through renewable energy generation cannot yet be quantified at a local scale. Nevertheless, it is clear that a wind farm of this size will make a beneficial contribution to meeting national CO_2 emission targets as well as reducing actual CO_2 emissions, helping to combat climate change, a significant threat to birds globally. Locally on Yell, species such as golden plover have been specifically identified as vulnerable to climate change[2].

10.2.7 Uncertainties regarding climate change predictions mean that it is not possible at present to carry out a quantitative assessment of the beneficial impacts of wind farms to birds. Therefore, these have been scoped out of further consideration within this chapter.

10.3 Legislative framework

Policy context

10.3.1 Relevant national planning policy guidelines, international commitments, legislation and planning policies relevant to the protection, conservation and enhancement of nature conservation interests associated with the development are outlined in Chapter 4: Planning and Energy Policy.

10.3.2 The approach used to assess the significance of potential effects of the Consented Development upon ornithological receptors is set in the context of:

- The Wildlife and Countryside Act 1981 (as amended);

- European Commission (EC) (2011) European Biodiversity Strategy;
- EC Directive 2009/147/EC on the conservation of wild birds (codified version). The so-called ‘Birds Directive’;
- EC Directive 1992/43/EEC on the conservation of natural habitats and of wild fauna and flora. The so-called ‘Habitats Directive’;
- The Conservation (Natural Habitats) Regulations 1994. The so-called ‘Habitats Regulations’;
- The Conservation of Habitats and Species Regulations 2010;
- The Nature Conservation (Scotland) Act 2004 (as amended);
- Scottish Government (2010) Scottish Planning Policy;
- Scottish Government. (2011). Planning Circular 3 2011: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011.
- Guidelines for Ecological Impact Assessment in the United Kingdom, (IEEM, 2006)[3];
- Guidelines for Ecological Impact Assessment in the UK and Ireland, second edition (CIEEM, 2016)[4];
- Guidelines for Ecological Evaluation and Impact Assessment[5];
- Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities[1];
- Assessing Significance of Impacts from Onshore Windfarms on Birds Outwith Designated Areas[6];
- Monitoring the Impact of Onshore Wind Farms on Birds[7];
- Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms[8];
- Use of Avoidance Rates in the NatureScot Wind Farm Collision Risk Model[9];
- Regional Population Estimates of Selected Scottish Breeding Birds[10];
- Assessing the Cumulative Impact of Onshore Wind Energy Developments[11];
- Avoidance Rates for Wintering Species of Geese in Scotland at Onshore Wind Farms[12]; and
- Natural Heritage Zones Bird Population Estimates. SWBSG Commissioned Report: 1504[13].

10.3.3 It is recognised that the term ‘*Favourable Conservation Status*’ (FCS) as articulated within the EC Habitats Directive is not used in the EC Birds Directive, but NatureScot advises on its use and context in relation to birds. Conservation status is considered favourable where:

- Population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitat;
- The natural range of the species is not being reduced, nor is it likely to be reduced in the foreseeable future; and
- There is (and will continue to be) a sufficiently large habitat area to maintain its populations on a long-term basis.

10.3.4 Whilst considering a range of potential outcomes that could arise from the Consented Development, the assessment reports the effects that are considered *likely* to be significant on the basis of evidence, standard guidance and professional judgement. It is these likely

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significant effects that the Applicant is obliged to report, and that the decision maker is obliged to consider.

Potentially important receptors

10.3.5 Whilst all bird species observed were recorded during ornithological surveys, NatureScot wind farm guidance[1] identifies three important overarching bird species lists, which describe protected species and species of conservation importance to consider during the wind farm assessment:

- Annex I of the EC Birds Directive;
- Schedule 1 of the UK Wildlife and Countryside Act 1981 (as amended); and
- UK Red-listed Birds of Conservation Concern.

10.3.6 In addition, special consideration should also be given to species identified locally as of conservation concern, and for any other species for which the Site hosts a particular concentration.

Designated sites

10.3.7 At the time of the original EIA there was one site subject to two designations with ornithological features within 10km of the Site (Figure 10.2); this site is simultaneously a Special Protection Area (SPA) and a Site of Special Scientific Interest (SSSI). Special Protection Areas (SPAs) are protected as important European sites for birds (so called 'Natura 2000 sites'), as set out in the Conservation of Habitats and Species Regulations 2010. Sites of Special Scientific Interest (SSSIs) are protected under the Nature Conservation (Scotland) Act 2004 as important national sites for birds (when listed as a qualifying feature).

10.3.8 Since completion of the original EIA, the Bluemull and Colgrave Sounds SPA and East Mainland Coast SPA have been designated. Bluemull and Colgrave Sounds is designated for it's red throated diver population and is located approximately 6.7 km to the north of the closest WTG. East Mainland Coast is designated for great northern diver, Slavonian grebe, common eifder, long-tailed duck, red-breasted merganser and red-throated diver. It is located 4.45 km from the closest WTG. Both were designated after the Consented Development gained consent

10.3.9

Planning policy

10.3.10 Draft National Planning Framework 4 is under preparation and will include all aspects of national planning policy as per the provisions of the Planning (Scotland) Act 2019. Draft NPF4 requires that development proposals for renewable energy developments must take into account effects on the natural heritage, including birds.

10.3.11 Scottish Planning Policy (Scottish Government, 2014) sets out the Scottish Government's national planning policies for the protection of biodiversity through the planning system. This seeks to ensure projects provide biodiversity benefits where possible, not simply to avoid significant negative effects. These policies are incorporated into development plans and are a material consideration in the determination of development proposals. Further details can be found in Chapter 4: Planning and Energy Policy.

10.3.12 The UK Biodiversity Action Plan (BAP) was the UK Government's 2004 response to the Convention on Biological Diversity, to which the UK was a signatory. Action plans for the most threatened species and habitats (called 'UK BAP species and habitats')[14] were set out to aid recovery. Following the publication of the Convention on Biological Diversity's '*Strategic Plan for Biodiversity 2011–2020*' (Convention on Biological Diversity, 2010), its commitment to 20 '*Aichi targets*', agreed at Nagoya, Japan in October 2010, and the launch of the European Biodiversity Strategy in May 2011[15] the UK Government has changed its strategic thinking. The implications of this in Scotland (where 'environment' is a devolved matter) are not yet clear, since most current planning policy and NatureScot guidance requires consideration of, and makes explicit reference to, UK BAP species and habitats.

10.3.13 The Shetland Local Development Plan contains policies and objectives to conserve and enhance the habitats and species that contribute to the unique character and heritage of Shetland. It has links to Supplementary Guidance on Local Nature Conservation Sites in Shetland and draft Supplementary Guidance on Natural Heritage. This guidance is provided to aid planning applicants and their agents when considering development in relation to their biodiversity responsibilities.

Scoping opinion

10.3.14 Details of the scoping chronology are given in Chapter 5: Design Evolution and Alternatives. Table 10.2 summarises the ornithological responses received from statutory and non-statutory consultees in relation to the Consented Development.

Table 10.2: Summary of scoping ornithological responses and key consultation responses

Consultee	*Summary of response in relation to ornithology*	*Date of response*
Shetland Islands Council (SIC)	SIC satisfied that desk study process is thorough. The Applicant should also take into account of local information and knowledge imparted during the public consultation period.	07/05/15
Royal Society for the Protection of Birds (RSPB)	RSPB has concerns about proposal due to: • Proximity to Otterswick and Graveland Special Protection Area (SPA). • Presence of a number of important bird species in the Study Area.	27/04/15
NatureScot (previously Scottish Natural Heritage)	NatureScot's advice is that development raises one main issue: • Impact on the adjacent Otterswick and Graveland SPA. In addition to main issue, other natural heritage interests are likely to be affected by the Consented Development. NatureScot confirm that ornithological surveys carried out in 2011-2012 are sufficiently recent to use in EIA and welcome decision to conducted further surveys in 2015 to support previous survey results. Need to consider flight height categories in relation to 145m to tip. Welcome inclusion of a Habitat Management Plan.	08/05/15
NatureScot	Meeting to agree ornithological survey methods. Important points to note include: • NatureScot prefer to see 1km viewsheds, due to detectability issues highlighted for smaller birds by Viking Wind Farm ES (Viking Energy Partnership, 2009). • Additional survey effort needed in 2nd year focussed on SPA diver flightlines, particularly in light of several pairs failing in 1st year (where no or few nest flightlines were recorded). • Measures to stabilise/protect diver lochans could be beneficial to both SPA and SSSI, however it could not be seen as mitigation of any predicted wind farm impacts on divers from the designated site.	28/02/12

Establishing baseline conditions

10.3.15 The ornithological baseline conditions were established in two phases. The first was a desk study of historical ornithological information sources. The second was targeted field surveys of potentially important and/or legally protected ornithological receptors based on the desk study of likely bird species present on Yell. All the field surveys were undertaken using recognised standardised survey methods[1,16,17] , during appropriate times of year and under suitable weather conditions for the species concerned. Occasionally these standard methodologies were amended in light of NatureScot guidance and advice to make them more relevant to surveys on Yell.

10.3.16 The Study Area was predominantly upland, open and sloping in character, with the highest point being 210m Above Ordnance Datum (AOD). The current principal land use of the Site is crofting grazing for sheep. The majority (64%) of the Study Area was made up of wet and dry modified bog habitats (Chapter 11: Ecology), much of it heavily degraded through sheep grazing and peat cutting.

Desk study

10.3.17 The desk study was conducted using the NatureScot's SiteLink website[12,18]. Records of avian receptors within a 2km radius of the centre of the Site were identified. There were several historical ornithological records within the desk Study Area, but very few records from within the Site itself. All designated sites with ornithological qualifying features within a 10km radius of the Site on Yell were identified.

Flight activity surveys

10.3.18 Care was taken to ensure that fight activity survey methods and the level and type of survey effort was consistent with NatureScot guidance available at the time surveys commenced[1], i.e. Vantage Point (VP) watches viewing to a maximum of 1km, viewsheds covering the entire site plus a 500m buffer and adjacent SPA areas, during the breeding and non-breeding season, for target species[a] were conducted between October 2010 and September 2012. It should be noted that the 1km viewshed distance was specifically recommended by NatureScot locally in initial discussions for two main reasons: (i) due to detectability issues over longer distances highlighted for waders by the Viking Wind Farm ES[19], and (ii) so that potential errors in plotting diver flightlines are reduced, allowing confidence in diver flight corridors to be accurately mapped.

10.3.19 Enough VPs must be selected to enable most of the airspace above the turbine area to be seen, including a 500m survey buffer[1]. During initial discussions, NatureScot recommended that nine additional hours surveying should be undertaken at each VP during the breeding season to increase the sample size of flights collected. Thus, the standard minimum of 36 hours per VP was increased to a minimum of 45 hours per VP for the two breeding seasons. Full details are presented in Appendix 10.1: Birds Technical Report.

10.3.20 VP watches are designed to record larger birds using the turbine area; they include the collection of data of the flight paths of these birds, including height from the ground, duration of sighting, and activities of the birds. Birds recorded by this method include raptors, skuas, gulls, wildfowl and waders. Methods are outlined by Madders (unpublished; given as appendix in Whitfield, 2002[20], Whitfield and Bullman, 2004[21], and NatureScot (previously SNH), 2010[9]), and ultimately result in an analysis of collision risk (Band *et al.* 2005) and mapping of flight-line distribution.

[a]Species potentially present given their geographical range and the habitats present on site that have been identified by previous studies/SNH guidance as likely, through their behaviour, to potentially be affected by wind farm developments.

10.3.21 This method involves selecting VP locations to view over the Site. Given the landform across the Site (and 1km viewshed recommendation), some VP locations were unavoidably placed within the turbine area (Figure 10.3).

Breeding raptor surveys

10.3.22 SNH provides clear guidance in relation to raptor sensitivities and survey effort[1]. Surveys beyond the Site were undertaken to determine the location of breeding raptors listed on Annex I of the EC Birds Directive or Schedule 1 of the UK Wildlife and Countryside Act 1981 (as amended). Priority was given to detecting breeding species most likely to occur given the desk study, habitats present and within NatureScot recommended survey distances. The only regularly occurring and potentially nesting raptor on Yell was merlin, so the NatureScot recommended 2km search distance was used as the basis for nest searches. Breeding raptor surveys were conducted in 2011, 2012 and 2015. Merlin survey methods followed best practice guidance (e.g. Hardey *et al.* 2013[17]).

Moorland breeding bird surveys

10.3.23 The modified Brown and Shepherd (1993)[22] Moorland Breeding Bird Survey is the standard survey technique for moorland/upland open habitat breeding birds[16]. The Brown and Shepherd methodology is based on a constant search method involving spending 25 minutes in each 500m × 500m quadrant, within the Site. This equates to spending 100 minutes for every square kilometre. Each quadrant was walked to ensure that all parts were approached to within 100m. At regular intervals, the surveyor paused, scanned the area for species and listened out for calls and songs. All registrations were marked on a 1: 25,000 scale map using British Trust for Ornithology symbols with a note of the species activity recorded on a survey form. These surveys were undertaken at least three-four times each breeding season in 2011, 2012 and 2015. The main habitat in the Site was defined as moorland/open habitat and so this survey methodology was used. Full details are presented in Appendix 10.1: Birds Technical Report.

Breeding diver surveys

10.3.24 The standard NatureScot survey guidance for red-throated diver was amended so that concerns relating to adjacent SPA divers could be addressed. The NatureScot guidance[1] at the time the survey work began recommended surveying all water bodies within a survey buffer of 1km around the edge of the Site, in addition to the area contained within the Site, plus all potential parts of any designated sites for divers. Diver nest surveys on Yell were initially conducted in 2011 on waterbodies out to a distance of 8km from the Consented Development (which roughly equated a distance up to Mid Yell and so covered all of the Otterswick and Graveland SPA). All potential diver waterbodies in this area were surveyed at least twice during the nesting season. If breeding divers were present, observers returned later in the season to record flightlines to and from nests and if possible determine breeding success.

10.3.25 Most breeding red-throated divers in Shetland fly to the nearest area of coast to feed and their behaviour suggests non-SPA birds in the north of the buffer zone would not come near the Beaw Field Wind Farm in the south. Having considered this, NatureScot said they "*agree that it looks unlikely from the topography and the known behaviour of red-throated divers that birds from the north of the buffer zone would fly over Beaw Field. The surveys that you will be doing on the SPA birds should allow us to say with more certainty whether this is the case - if the divers from the northern part of the Otterswick section of the SPA fly consistently away from the* *windfarm site then we can safely assume that those to the north of the SPA will do so too and so do not need to be surveyed*"[23]. Consequently, subsequent waterbody surveys for red-throated divers were targeted in 2012 within the Otterswick and Graveland SPA (north of the Site), as well as all potentially suitable non-SPA waterbodies east, west and south of the Site. As with the first year, the waterbodies were visited at least twice during the breeding season if nothing was present. However, if occupied, waterbodies were visited on multiple occasions during the breeding season to determine nest location, flightlines and breeding success.

10.3.26 Dedicated nest watches to assess typical foraging flight-line directions to and from each active nest (as per NatureScot guidance) were undertaken in 2011, 2012 and 2015.

Winter walkover surveys

10.3.27 During the non-breeding period (October 2011 to March 2012; October 2012 to March 2013), surveyors undertook three walkover bird surveys that mirrored moorland breeding bird surveys. Full details are presented in Appendix 10.1: Birds Technical Report.

Evaluation criteria

10.3.28 This section defines the criteria that were used to evaluate the significance of predicted likely effects on important ornithological receptors due to the construction and operation of the Consented Development.

Evaluating conservation importance and sensitivity

10.3.29 The ornithological receptors identified in the baseline studies were evaluated following best practice guidelines (e.g. IEEM, 2006[3]; NatureScot, 2006[6]). The site's ornithological receptors determine its nature conservation interest or value. Guidance on Ecological Impact Assessment sets out categories of ornithological or nature conservation value that relate to a geographical framework (e.g. international, through to local) together with criteria and examples of how to place a site (defined by its ornithological attributes) into these categories. It is generally straightforward to evaluate sites or bird populations designated for their international or national importance (as criteria for defining these exist), but for sites or populations of regional or local value, criteria may not be easily defined. Where possible, the potential value of an ornithological receptor in the Site was determined within a defined geographical context using categories outlined in Table 10.3.

Table 10.3: Summary of Geographic population importance criteria used

Term	*Definition*
International	>1% of European Community (EC) population.
National	>1% of United Kingdom (UK) or Scottish population.
Regional	>1% of Shetland Natural Heritage Zone (NHZ) population.
Local	Within local area.

10.3.30 According to NatureScot (previously SNH)(2006)[6], the top three geographical tiers (international, national and regional) are the most important within the context of the EIA. This means that if there is an effect at this population level, it is considered '*significant*' in terms of the EIA regulations. For breeding bird species, NatureScot uses Natural Heritage Zones (NHZ) as the appropriate regional biogeographical unit of assessment. Twenty one zones covering Scotland have been drawn to reflect biogeographical differences between zones, with a high level of coherence within each zone. According to NatureScot (previously SNH)(2006)[6] "*the question as to whether there is an impact on a* [bird] *species regionally therefore may be translated into the question as to whether there is an impact within the relevant NHZ. Where a windfarm site is close to the boundary of an NHZ, it may be worth considering possible impacts on the adjacent NHZ as well*". The proposed Beaw Field Wind Farm is within the Shetland NHZ and not close to any adjoining NHZ boundaries.

10.3.31 Very recently, the Scottish Wind Farm Bird Steering Group (with the British Trust for Ornithology) published a systematic review of NHZ bird populations across Scotland[13], including Shetland. The Viking Wind Farm ES also examined existing data sources and estimated relevant Shetland bird populations (Viking Energy Partnership, 2009), so that potential wind farm effects could be assessed in light of the Shetland population estimates. The regional population metrics reported in this ES are mostly derived from Wilson *et al.* (2015)[13] and those used in the Viking Wind Farm ES and have been updated where more up to date population data are available.

10.3.32 The importance attached to a species can also be determined to an extent according to legislative status. Some receptors are subject to a general level of legal protection through the UK Wildlife and Countryside Act 1981 (as amended), Nature Conservation (Scotland) Act 2004 and others under the EC Birds Directive. Another factor when assessing potential impacts is the sensitivity of the ornithological receptor under consideration (e.g. high, medium or low), which can vary in space and time. Different receptors respond differently to stimuli, making some particularly sensitive to development activities and others less so. Professional judgement is used when assigning a sensitivity value to an ornithological receptor and this is recorded in a clear and transparent way. It should be noted that to avoid confusion, legal protection requirements need to be considered separately from conservation value (IEEM, 2006[3]).

10.3.33 By way of example, sensitivity is determined according to species behaviour, using broad criteria set out in Table 10.4. Behavioural sensitivity can differ between species and between individuals of the same species. Therefore, sensitivity is likely to vary with both the nature and context of the disturbance activity as well as the experience and even personality of the individual bird. Sensitivity also depends on the activity the species is undertaking. For example, a species is likely to be less tolerant of disturbance close to its nest during the breeding season than at other times of year. Thus, sensitivity changes with both space and time.

Table 10.4: Summary of sensitivity criteria used

Term	*Definition*
High	Species occupying remote areas away from human activities and exhibiting strong and long-lasting reactions to disturbance events.

Medium	Species that appear to be warily tolerant of human activities and exhibiting short-term reactions to disturbance events.
Low	Species occupying areas subject to frequent human activity and exhibiting mild and brief reaction to disturbance events.

Evaluating magnitude

10.3.34 Effects on ornithological receptors may be beneficial, neutral or adverse. The characteristics and significance of an effect involve several factors such as the scale (e.g. number of individuals killed or displaced by an activity, or hectares (ha) of habitat lost), extent (the area over which an impact occurs), duration (the time over which an impact occurs), reversibility (whether an impact is temporary or permanent) and its timing or frequency.

10.3.35 A reversible (temporary) effect is one from which spontaneous recovery is possible or for which effective mitigation is possible and a commitment to undertake this mitigation has been made. An irreversible (permanent) effect is one from which recovery is not possible within a reasonable timescale, or for which there is no reasonable chance of action being taken to reverse it.

10.3.36 The duration of a predicted impact can be important, with three time frames used in the assessment: short term (two years or less), medium term (two-five years) and long term (life of the wind farm). The timing of an impact can also have a large influence on its effect. Finally, a level of confidence (whether the predicted impact is certain, probable, possible or unlikely) is attached to predicted effect.

10.3.37 Magnitude refers to the ‘size’ or ‘amount’ of a predicted impact (i.e. change). Changes on ornithological receptors are therefore judged in terms of their magnitude in space and time. There are many different ways in which these can be defined and it is important that whatever method is used clear definitions are provided[3]. Professional judgement is used to synthesise the many attributes of magnitude (such as the effect’s timing, scale, frequency, duration and reversibility) on species of conservation importance and these are reported.

10.3.38 In this assessment there are considered to be four levels of magnitude of change (Table 10.5) and it is assumed these are adverse, unless otherwise stated.

Table 10.5: Summary of magnitude criteria used

Term	***Definition***
Major (high)	Total/near total loss of a population due to mortality or displacement. Total/near total loss of breeding productivity in a population due to disturbance. Guide: >50% of population affected.
Moderate (medium)	Moderate reduction in the status or productivity of a population due to mortality or displacement or disturbance. Guide: 10-49% of population affected.
Minor (low)	Small but discernible reduction in the status or productivity of a population due to mortality or displacement or disturbance. Guide: 1-9% of population affected.

None (negligible)	Very slight reduction in the status or productivity of a population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the ‘no change’ situation. Guide: < 1% population affected.

10.4 Baseline

Designated sites

10.4.1 The desk study identified one site (with two designations) where birds were a qualifying feature within a 10km radius of the Site on Yell (Table 10.6 and Figure 10.2).

Table 10.6: Designated sites with birds as a qualifying feature within 10km of Site on Yell

Designated site	***Designation type***	***Qualifying feature***	***Area & direction***
Otterswick & Graveland	SPA & SSSI	Red-throated diver - 26 pairs (during 1992-99), 3% of the British population.	2,241 ha, immediately north of the Site.

Ornithological receptors

10.4.2 The conservation/legal importance of potentially important ornithological receptors was determined using criteria set out in Table 10.7. The importance of a species from a legal perspective in this listing does not equate to the importance of the Site. The conservation importance of the birds using the Site is evaluated by considering the number of individuals of species present in the context of geographical populations. A site can hold a protected species of importance, but the population present may not be regionally, nationally or internationally important. Thus, the occurrence of a legally protected species listed in Table 10.7 does not mean the Site is important for that species. It should be noted that all bird species, not just those listed below, are protected under the UK Wildlife and Countryside Act, 1981 (as amended).

Table 10.7: Conservation Listing of Potentially Important Ornithological Receptors

Species	***Conservation listing of target species***
Greylag goose	S1 (northwest Scotland only)
Red-throated diver	S1, AI
Golden plover	AI
Dunlin	AI (*schinzii*)
Lapwing	Red L
Ringed plover	Red L
Curlew	Red L
Oystercatcher	
Snipe	
Arctic skua	Red L
Great skua	
Merlin	AI, S1, Red L

Key: A1 = EC Birds Directive Annex I species, S1 = UK Wildlife and Countryside Act Schedule 1 species, Red L = UK Birds of Conservation Concern Red List species[24].

10.4.3 Geographical population estimates for potentially important bird species within the Study Area are provided in Table 10.8.

10.4.4

Table 10.8: Geographical population estimates for potentially important Study Area bird species (breeding pairs unless stated)

Species	*Scotland*	*UK/GB (National)*	*Europe (International)*
Greylag goose	20,000 post breeding birds	46,000	120,000-190,000
Red-throated diver	935-1,500	1,000-1,600	32,000-92,000
Golden plover	15,000	38,000-59,000	460,000-740,000
Dunlin	8,000-10,000	8,600-10,600	300,000-570,000
Lapwing	71,500-105,600	130,000	1,700,000-2,800,000
Ringed plover	4,900-6,700	5,300	120,000-220,00
Curlew	58,800	66,000	220,000-360,000
Oystercatcher	84,000-116,500	110,000	300,000-450,000
Snipe	34,000-40,000	76,000	930,000-1,900,000
Arctic skua	2,100	2,100	40,000-140,000
Great skua	9,650	9,600	16,000
Merlin	800	1,100-1,200	31,000-49,000
Population reference	*Forrester and Andrews, 2007*[25]	*Musgrove et al. 2013*[26]	*Birdlife International, 2004*[27]

10.4.5 The behavioural sensitivity of the potentially important ornithological receptors (Table 10.7) is described using criteria set out in Table 10.9. Two potentially occurring important species were judged to have high behavioural sensitivity, six to have moderate behavioural sensitivity and four to have low behavioural sensitivity. When available, the assumed distance thresholds and hence sensitivity for disturbance in Table 10.9 was predominantly based on expert opinion examined by Ruddock and Whitfield (2007)[28], Gilbert *et al.* (1998) and field experience. The assessment of behavioural sensitivity is primarily based on disturbance to breeding birds at the nest, not general disturbance of birds undertaking other activities.

Table 10.9: Behavioural sensitivity of potentially important Study Area species

Species	*Nature of sensitivity*	*Sensitivity level*
Red-throated diver	Birds potentially vulnerable to collision with turbines when making flights between the nesting waterbody and sea. Breeding birds are sensitive to human activity, visual disturbance and sudden noise events over large	High

Table 10.9: Behavioural sensitivity of potentially important Study Area species

Species	*Nature of sensitivity*	*Sensitivity level*
	distances (up to 500m). However, evidence from the Shetland Viking Wind Farm studies indicates that some individuals (perhaps habituated) appear to tolerate moderate levels of disturbance in some situations. The size of waterbodies also has an impact; breeding birds are more easily disturbed and fly from small nesting lochans (where they presumably feel more vulnerable) than large lochs, where they have the ability to swim away, without taking flight.	
Merlin	Breeding birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and hunting. Breeding merlin are particularly sensitive to human activity, visual disturbance and sudden noise events over large distances (up to 500m). However, some individual merlins appear to tolerate moderate levels of disturbance in some situations. For example, some merlins appear to be able to nest relatively close to public roads, where regular disturbance occurs.	High
Greylag goose	Birds potentially vulnerable to collision with turbines when making flights, although detailed studies suggest this is not a significant cause of goose mortality. During the breeding season, greylag geese tend to walk with goslings or fly low over the ground making the adults less vulnerable to collision risk than would otherwise be the case. Greylag geese migrating along a traditional flight corridor are potentially vulnerable to collision risk. However, in spring, many of the UK's greylag geese migrate towards northwest Scotland (thereby avoiding Shetland) before flying on to Iceland and Greenland. In the autumn, migrating greylag geese arrive in the UK on a broad front and are not so concentrated in northwest Scotland when arriving, with some flocks crossing Shetland. Breeding greylag geese respond immediately (and loudly) to the presence of humans (and sheep) when near nests or groups of goslings and often at moderate distances (~250m). However, adults usually stay with and successfully protect goslings with young when disturbed, making them less vulnerable to predation.	Moderate
Golden plover & Dunlin	Birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and commuting between breeding and feeding areas. Species' behaviour of flying low and having relatively small territories (tiny in the case of dunlin) makes them less vulnerable to collision than high flying waders with large territories. Breeding birds are sensitive to human activity, visual disturbance and sudden noise events over moderate distances (~250m).	Moderate
Curlew	Birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and commuting between breeding and feeding areas. Large size, big territories and species' behaviour of generally flying at low, medium and high heights makes them vulnerable to collision. Breeding birds are usually considered sensitive to human activity, visual disturbance and sudden noise events over moderate distances (~250m). However, in Shetland curlews often nest and feed close to or on in-bye fields, which are regularly used by crofters.	Moderate

Table 10.9: Behavioural sensitivity of potentially important Study Area species

Species	***Nature of sensitivity***	***Sensitivity level***
Arctic skua	Birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and commuting between breeding and feeding areas. However, species' behaviour of flying low and having relatively small nesting territories (often within discrete colonies) makes them less vulnerable to collision than would otherwise be the case. Nevertheless, adults hunt low over moorland habitats, covering large areas. Care should be taken around nesting skuas, especially not to flush young skuas which are vulnerable to predation by neighbouring adult skuas.	Moderate
Great skua	Birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and commuting between breeding and feeding areas. The species' behaviour of flying high over nesting territories (often within discrete colonies) makes them more vulnerable to collision than would otherwise be the case. Great skuas show individual variation in feeding behaviour and major differences in behaviour as breeders, failed breeders and immatures, so that individual exposure to disturbance and collision risk is likely to vary considerably between individuals (Furness, 2015[29]). Care should be taken around nesting skuas, especially not to flush young skuas which are vulnerable to predation by neighbouring adult skuas.	Moderate
Ringed plover	Birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and commuting between breeding and feeding areas. However, species' behaviour of flying low and having relatively small territories makes them less vulnerable to collision than high flying waders with large territories. This species regularly selects to nest on man-made habitats, such as road verges and quarries and so is not considered particularly susceptible or sensitive to human disturbance.	Low
Lapwing & Oystercatcher	Birds potentially vulnerable to collision with turbines when displaying, mobbing avian intruders and commuting between breeding and feeding areas. Species' behaviour of generally flying low and having relatively small territories makes them less vulnerable to collision than high flying waders with large territories. These two species typically nest within or close to in-bye fields and so are used to the daily presence of crofters and sheep.	Low
Snipe	Birds potentially vulnerable to collision with turbines when displaying. Having relatively small territories makes them less vulnerable to collision than high flying waders with large territories. Snipe have a low sensitivity to human disturbance, with visual activity and noise events only causing disturbance very close to nests (e.g. <10m).	Low

10.4.6 In total 77 bird species were recorded by Alba Ecology in the Study Area during targeted ornithological surveys in 2011, 2012 and 2015 (Table 10.10).

Table 10.10: Bird Species Recorded during Targeted Surveys 2010-2012 and in 2015

Species	
Arctic skua *Stercorarius parasiticus*	Hooded crow *Corvus cornix*
Arctic tern *Sterna paradisaea*	Jack snipe *Lymnocryptes minimus*
Blackbird *Turdus merula*	Kestrel *Falco tinnunculus*
Brent goose *Branta bernicla*	Lapwing *Vanellus vanellus*
Black-headed gull *Larus ridibundus*	Lesser black-backed gull *Larus fuscus*
Buzzard *Buteo buteo*	Linnet *Carduelis cannabina*
Carrion crow *Corvus corone*	Long-billed dowitcher *Limnodromus scolopaceus*
Chaffinch *Fringilla coelebs*	Mallard *Anas platyrhynchos*
Common gull *Larus canus*	Meadow pipit *Anthus pratensis*
Cormorant *Phalacrocorax carbo*	Merlin *Falco columbarius*
Curlew *Numenius arquata*	Mealy redpoll *Carduelis flammea*
Dunlin *Calidris alpine*	Oystercatcher *Haematopus ostralegus*
Fieldfare *Turdus pilaris*	Pallid harrier *Circus macrourus*
Fulmar *Fulmarus glacialis*	Peregrine *Falco peregrinus*
Golden plover *Pluvialis apricaria*	Pied/white wagtail *Motacilla alba*
Goosander *Mergus merganser*	Pink-footed goose *Anser brachyrhynchus*
Greylag goose *Anser anser*	Pintail *Anas acuta*
Goldeneye *Bucephala clangula*	Purple sandpiper *Calidris maritima*
Glaucous gull *Larus hyperboreus*	Raven *Corvus corax*
Great black-backed gull *Larus marinus*	Robin *Erithacus rubecula*
Great-northern diver *Gavia immer*	Redwing *Turdus iliacus*
Great skua *Stercorarius skua*	Red grouse *Lagopus lagopus*
Grey heron *Ardea cinerea*	Red-breasted merganser *Mergus serrator*
Hen harrier *Circus cyaneus*	Redshank *Tringa totanus*
Herring gull *Larus argentatus*	Red-throated diver *Gavia stellata*

Redpoll spp. *Carduelis flammea/cabaret*
Reed bunting *Emberiza schoeniclus*
Rock pipit *Anthus petrosus*
Rock dove *Columba livia*
Rough-legged buzzard *Buteo lagopus*
Raven *Corvus corax*
Ringed plover *Charadrius hiaticula*
Ruff *Philomachus pugnax*
Short-eared owl *Asio flammeus*
Siskin *Carduelis spinus*
Skylark *Alauda arvensis*
Snipe *Gallinago gallinago*
Snow bunting *Plectrophenax nivalis*
Song thrush *Turdus philomelos*
Sparrowhawk *Accipiter nisus*
Starling *Sturnus vulgaris*
Swallow *Hirundo rustica*
Teal *Anas crecca*
Turnstone *Arenaria interpres*
Twite *Carduelis flavirostris*
Waxwing *Bombycilla garrulus*
Wheatear *Oenanthe oenanthe*
Whimbrel *Numenius phaeopus*
Whooper swan *Cygnus cygnus*
Wigeon *Anas penelope*
Woodcock *Scolopax rusticola*
Wren *Troglodytes troglodytes*

10.4.7 The following species accounts are those target species recorded during surveys that have been identified by previous studies/SNH guidance as potentially likely to be affected by wind farm developments. NatureScot guidance[9] makes it clear that bird species on Annex I of the EC Birds Directive, Schedule 1 of the UK Wildlife and Countryside Act 1981 (as amended) and UK Red-listed Birds of Conservation Concern should be the focus of the subsequent assessment. Other more common species, not on these three lists, should be ignored during assessment and effort focussed on those potentially important ornithological receptors instead.

10.4.8 SNH's 2009c '*Environmental Statements and Annexes of Environmentally Sensitive Bird Information*', provides detailed guidance on how to present sensitive EIAR information in a way that does not compromise or threaten the sensitive species under consideration from disturbance/wildlife crime. All non-sensitive information is provided within this chapter. However, Schedule 1 nest site locations (and flightlines to and from nests) are considered sensitive information and are presented in Appendix 10.2: Confidential Information, which is provided to appropriate stakeholders.

Greylag goose

10.4.9 Shetland NHZ population estimate: 700-1,000 pairs (increasing at a rate of ca. 17-20% per annum recently)[30]. Likely to be in *Favourable Conservation Status*. Greylag geese are present in Shetland all year round, with some birds breeding and others wintering in the Study Area. In 2011 a single pair of greylag geese nested within the Study Area, near the development footprint, close to Turbine 4. In 2012 three pairs of greylag geese were recorded nesting within the Study Area, but none within the development footprint. In 2015 a single pair of greylag geese nested in the Study Area, within the development footprint between Turbine 3 and Turbine 5 on Atli's Hill (Figure 10.4). Greylag geese were the only target breeding species regularly present in the development footprint throughout the year (Figures 10.5; 10.6; 10.7; 10.8).

10.4.10 Greylag goose is not listed under any of NatureScot's three important ornithological receptor criteria (Table 10.7), but being present throughout the year within the Site it is considered further within this assessment following recent specific NatureScot guidance for grey geese at onshore wind farms[12]. The one breeding pair of greylag geese represents 0.1-0.14% of the Shetland NHZ population within the development footprint.

Red-throated diver

10.4.11 Shetland NHZ population estimate: 407 pairs[13]. Likely to be in *Favourable Conservation Status*. Red-throated divers are usually present on their breeding grounds in Shetland between April and August, after which time they move to the sea for the winter[31,19] . Occasionally late breeding pairs have been recorded feeding chicks on lochans throughout September (Mark Chapman, *pers comm.*). Yell is an important area for breeding red-throated divers and from the outset, following discussions with NatureScot, it was recognised that this bird species was likely to be the most important and of greatest concern to NatureScot in relation to the Consented Development.

10.4.12 Freshwater bodies (mainly lochans) on Yell are used for red-throated diver nesting and chick-rearing. Some breeding adults also use a nearby 'satellite' loch for loafing, washing and resting in between bouts of foraging at sea.

10.4.13 Red-throated divers were recorded breeding within and adjacent to the development footprint during ornithological surveys in 2011, 2012 and 2015. In summer 2011 two pairs of red-throated divers nested within the development footprint (one pair failed and one pair was successful). In 2012 one pair of red-throated divers nested unsuccessfully within the development footprint in the loch they used successfully in 2011. In summer 2015 one pair of red-throated divers nested within the development footprint, in the same waterbody used successfully in 2011 and unsuccessfully in 2012 (Appendix 10.2: Confidential Information). The unsuccessful breeding loch used in 2011 is no longer suitable for breeding divers as a consequence of peat erosion. The one regular breeding pair of red-throated divers represents 0.25% of the Shetland NHZ population within the development footprint.

10.4.14 A first breeding survey for red throated divers was carried out in May 2022. It recorded very similar results to those previously recorded in 2011-2012. This is likely to be due to the predictability of divers in relation to the physical characteristics of the waterbodies they require for breeding and the fact that these waterbodies have not fundamentally changed since 2011-2012. A second survey is due to be carried out in July 2022 to confirm breeding activity.

10.4.15 Several pairs of breeding red-throated divers were recorded elsewhere in the Study Area during the original surveys and the final design layout was specifically made to avoid impacts on breeding red-throated divers in the adjacent Otterswick and Graveland SPA (and SSSI), as well as wider countryside breeding red-throated divers (Appendix 10.2: Confidential Information). All breeding red-throated divers flew to coastal waters to feed, usually flying to and from the nearest coastal area and dedicated diver nest watches recorded these flightlines, which were then used to help inform the final design layout by avoiding any regularly used diver flight corridors (Confidential Figures). Non-breeding birds also used the Study Area. Typically they flew around southern Yell in an apparently random manner (i.e. not flying along shortest distance corridors between the sea and a loch) and were not recorded in the same area of airspace again.

Golden plover

10.4.16 Shetland NHZ population estimate: 5,665 pairs[13]. Likely to be in *Favourable Conservation Status.* Golden plover are mostly present on their breeding grounds in Shetland between March and August, after which time they move to the coast and in-bye croftland[31,19]. In Shetland golden plovers principally nest on blanket bog and moorland, and locally on serpentine heath on Unst and Fetlar. Although they often feed on areas of improved grassland, they do not breed in this habitat[31]. Golden plover were recorded breeding within the Study Area during ornithological surveys in 2011, 2012 and 2015.

10.4.17 In summer 2011 seventeen pairs of golden plover were recorded breeding in the Study Area of which four-five pairs nested within the turbine area and one pair nested close to the main west-east access track (Figure 10.9). In summer 2012 twelve pairs were recorded breeding in the Study Area of which five-six pairs nested within the turbine area and one pair nested close to the main west-east access track by borrow pit 2 (Figure 10.10). In summer 2015 fourteen pairs were recorded breeding in the Study Area of which four-five pairs nested within the turbine area and one pair nested close to the main west-east access track (Figure 10.11). These four-five pairs represent ca. 0.09% of the Shetland NHZ population within the turbine area.

Dunlin

10.4.18 Shetland NHZ population estimate: 2,054 pairs[13]. Likely to be in *Favourable Conservation Status.* Dunlin are mostly present on their breeding grounds in Shetland between May and July, after which time they move to the coast[19,31]. Dunlin were recorded breeding within the Study Area during ornithological surveys in 2011, 2012 and 2015.

10.4.19 In summer 2011 eight pairs of dunlin were recorded breeding in the Study Area of which two pairs nested within the turbine area (Figure 10.12). In summer 2012 ten pairs were recorded breeding in the Study Area of which three pairs nested within the turbine area (Figure 10.13). In summer 2015 fifteen pairs were recorded breeding in the Study Area of which five pairs nested within the turbine area (Figure 10.14). Theses two-five pairs represent between 0.10-0.24% of the Shetland NHZ population within the turbine area.

Lapwing

10.4.20 Shetland NHZ population estimate: 1,740 pairs. Likely to be in *Favourable Conservation Status.* Lapwings are mostly present on their breeding grounds in Shetland between April and August, after which time they move to agricultural fields and the coast. Lapwing were recorded breeding within the Study Area during ornithological surveys in 2011, 2012 and 2015 and failed or non-breeding birds were present in the improved grassland fields in Aris Dale.

10.4.21 In summer 2011 three pairs of lapwing were recorded breeding in the Study Area of which one pair nested within the turbine area (Figure 10.15). In summer 2012 four pairs were recorded breeding in the Study Area of which two pairs nested within the turbine area (Figure 10.16). In summer 2015 two pairs were recorded breeding in the Study Area of which one pair nested within the turbine area (Figure 10.17). These one-two pairs represent between ca. 0.06-0.11% of the Shetland NHZ population within the turbine area.

Ringed plover

10.4.22 Shetland NHZ population estimate: 800-1,000 pairs. Likely to be in *Favourable Conservation Status*. However, the latest Birds of Conservation Concern 4[32] has elevated ringed plover nationally to the Red List. Ringed plovers are mostly present on their breeding grounds in Shetland between March and August, after which time they move to the coast.

10.4.23 In summer 2011 three pairs (Figure 10.18) and in summer 2012 two pairs (Figure 10.19) of ringed plovers were recorded breeding in the Study Area. One of these pairs in 2011 nested within the turbine area. Two pairs in 2011 and 2012 held territories in the same locations in consecutive years (Hill of Arisdale and between the Beaw Field Water Treatment Works and Burn of Evrawater). In summer 2015 one pair of ringed plovers were recorded breeding in the Study Area but not within the turbine area (Figure 10.20).

10.4.24 Although outwith the turbine area, the pair that nested between the Beaw Field Water Treatment Works and Burn of Evrawater in 2011 and 2012 were close to the main west-east access track. This single pair represents between 0.1-0.125% of the Shetland NHZ population within the development footprint.

Curlew

10.4.25 Shetland NHZ population estimate: 4,227 pairs[13] . Likely to be in *Favourable Conservation Status*. However, the latest Birds of Conservation Concern 4[32] has elevated curlew nationally to the Red List. Curlews are mostly present on their breeding grounds in Shetland between mid-March and August, after which time they move to the coast and in-bye croftland.

10.4.26 In summer 2011 five pairs of curlew were recorded breeding in the Study Area of which two pairs nested within the turbine area (Figure 10.21). In summer 2012 six pairs were recorded breeding in the Study Area of which one pair nested within the turbine area (Figure 10.22). In summer 2015 six pairs of were recorded breeding in the Study Area of which two-three pairs nested within the turbine area (Figure 10.23). These ca. two pairs represent 0.05% of the Shetland NHZ population within the turbine area.

Oystercatcher

10.4.27 Shetland NHZ population estimate: 3,350 pairs. Likely to be in *Favourable Conservation Status*. Oystercatchers are mostly present on their breeding grounds in Shetland between March and August, after which time they move to the coast and in-bye fields.

10.4.28 In summer 2011 thirteen pairs of oystercatchers were recorded breeding in the Study Area of which two pairs nested within the turbine area (Figure 10.24). In summer 2012 sixteen pairs were recorded breeding in the Study Area of which five pairs nested within the turbine area (Figure 10.25). In summer 2015 overall breeding numbers were substantially reduced with seven pairs recorded breeding in the Study Area of which only one pair nested within the turbine area (Figure 10.26). These one-five pairs represent between 0.03-0.15% of the Shetland NHZ population within the turbine area.

10.4.29 SNH's guidance on assessing wind farm impacts recommends that efforts should be directed towards those species on three important bird species lists: Annex 1, Schedule 1 and the Red-List[1]. Oystercatcher is a widespread and common species and is not listed under any of these criteria (Table 10.7) and so is not considered further within this assessment.

Snipe

10.4.30 Shetland NHZ population estimate: 3,450 pairs. Likely to be in *Favourable Conservation Status.* Snipe are mostly present on their breeding grounds in Shetland between April and at least August. Snipe were recorded breeding within the Study Area during ornithological surveys in 2011, 2012 and 2015.

10.4.31 In summer 2011 eleven pairs of snipe were recorded breeding in the Study Area of which three pairs were within the turbine area (Figure 10.27). In summer 2012 nine pairs were recorded breeding in the Study Area of which three pairs were within the turbine area (Figure 10.28). In summer 2015 twelve pairs were recorded breeding in the Study Area of which five pairs nested within the turbine area (Figure 10.29). These three-five pairs represent between 0.09-0.15% of the Shetland NHZ population within the turbine area.

10.4.32 SNH's guidance on assessing wind farm impacts recommends that efforts should be directed towards those species on three overarching bird species lists: Annex 1, Schedule 1 and the

Red-List[1] (. Snipe is a widespread and common species and is not listed under this any of these criteria (Table 10.7) and so is not considered further within this assessment.

Arctic skua

10.4.33 Shetland NHZ population estimate: 516-1,120 pairs[13]. Likely to be in *Unfavourable Conservation Status*. Arctic skuas are usually present on breeding territories in Shetland between May and August, after which they migrate to coastal Africa[19,31].

10.4.34 In summer 2011 three pairs of Arctic skuas were recorded breeding in the Study Area, with two nests within the turbine area, on east shore of Horse Water (Figure 10.30). In summer 2012 three pairs were recorded breeding in the Study Area of which one pair nested within the turbine area (Figure 10.31). In summer 2015 two pairs of were recorded breeding in the Study Area of which one pair nested within the turbine area (Figure 10.32). Arctic skuas ranged far and wide hunting across the Study Area in both 2011 and 2012, with most flightlines <20m in height. These one-two pairs represent 0.09-0.39% of the Shetland NHZ population within the turbine area.

Great skua

10.4.35 Shetland NHZ population estimate: 6,874-10,377 pairs[13]. Likely to be in *Favourable Conservation Status*. Great skuas are usually present on breeding territories in Shetland between April and September, after which they migrate to coastal areas[19,31]. It is difficult to estimate accurately the number of breeding great skua pairs using standard survey methods because non-breeding birds can be present throughout the breeding period and react similarly (aggressively) as territorial pairs.

10.4.36 In summer 2011 seven apparently occupied great skua territories were recorded in the Study Area, of which one pair were within the turbine area (Figure 10.33). In summer 2012 seven apparently occupied great skua territories were recorded in the Study Area, of which two pairs were within the turbine area (Figure 10.34). In summer 2015 eight apparently occupied great skua territories were recorded in the Study Area, of which two pairs were within the turbine area (Figure 10.35). These one-two pairs represent between 0.01-0.03% of the Shetland NHZ population within the turbine area.

10.4.37 Two non-breeding birds were also regularly present within the Study Area throughout the breeding season in consecutive years. There were a very large number of great skua flightlines recorded during VP watches in 2011 (Figure 10.36) and 2012 (Figure 10.37).

10.4.38 Great skua is a localised Scottish breeding species but is common in Shetland. It is not listed under any of NatureScot's three important ornithological receptor criteria (Table 10.7), but is considered further within this assessment following recent specific NatureScot guidance for great skua at onshore wind farms (Furness, 2015) and local concentrations in the Study Area.

Merlin

10.4.39 Shetland NHZ population estimate: 25 occupied territories, 24 pairs bred during 2015 Shetland wide merlin survey with 90% coverage of previously known sites (Mark Chapman, *pers comm.*). The Wilson *et al.,* (2015) population estimate is 30 pairs. Likely to be in *Favourable Conservation Status*. However, the latest Birds of Conservation Concern 4[32] has elevated merlin nationally to the Red List. Merlins are usually present on breeding territories in Shetland between early April and September[31], after which they migrate to winter in lowland and coastal areas.

10.4.40 No pairs of merlins were located nesting within the Study Area in 2011 and 2012 breeding seasons. However, one successfully fledged merlin nest (with 4 young) was found ca. 4km north of the Study Area during red-throated diver nest surveys (Appendix 10.2: Confidential Information) In summer 2015 one pair of merlins bred successfully in the Study Area (Appendix 10.2: Confidential Information). This represents 0-4% of the Shetland NHZ population within the Study Area.

Other bird species

10.4.41 A range of other common breeding species were recorded during surveys across the Site e.g. meadow pipit, skylark, wheatear and starling. No pairs of whimbrel were recorded nesting in the Study Area. A handful of flight records of single whimbrel on passage were recorded. A single great-black-backed gull pair nested in the middle of the Site. There was a small common gull colony of 21 nests within the Study Area in the southeast around Loch of Kettlester. None of these are likely to have particular importance in relation to the Consented Development and are not considered further.

10.4.42 A single peregrine was recorded once during breeding season surveys (in May 2011) and a scattering of single peregrines, usually flying <20m in height, were recorded during winter season surveys (one in Oct-Dec 2010, one in Jan 2011, one in March 2011, one in September 2011 and one in November 2011). There were insufficient records in any one season to undertaken CRA on (migrant/wintering) peregrines and the species is not considered further.

10.4.43 Other records of note include non-breeding records of common buzzard (one in November 2011 and one in May 2012), rough-legged buzzard (one in November 2010 and one in April 2011), pallid harrier (one in September 2011), long-billed dowitcher (one in September 2015) and great northern diver (one in October 2010).

10.5 Assessment of impacts

Designated sites

10.5.1 This section describes the potential impacts on ornithological features of designated sites that could arise from the construction and operation of the Consented Development. Only one designated site (with ornithological features) lies within 10km of the Site on Yell. The designated site is the Otterswick and Graveland SPA (and SSSI), with the following features of interest:

- Red-throated diver - 26 pairs (during 1992-99), 3% of the British population.

10.5.2 The Consented Development does not lie within the Otterswick and Graveland SPA (and SSSI) boundary, but lies adjacent and to the south of it (Figure 10.2). No land-take or habitat loss will occur within the Otterswick and Graveland SPA (and SSSI). Chapter 3: Project Description describes how and where construction work will take place. Consequently, no significant impacts resulting from land-take on the Otterswick and Graveland SPA (and SSSI) bird habitats are predicted.

10.5.3 No disturbance to breeding red-throated divers within the Otterswick and Graveland SPA (and SSSI) will take place (Appendix 10.2: Confidential Information). The nearest regularly used red-throated diver nesting lochan within the adjacent SPA is well over 1km away. Consequently, no significant impacts resulting from disturbance to breeding red-throated divers within the Otterswick and Graveland SPA (and SSSI) are predicted. Red-throated divers show high nest site fidelity in Shetland, usually returning to breed at the same lochan year after year (Pearce-Higgins, 1992[33]), providing a high degree of confidence in terms of likely nesting lochans used.

10.5.4 Detailed observations of nesting diver flightlines from the Otterswick and Graveland SPA were conducted in 2011, 2012 and 2015 and the results show very clear flight patterns (Confidential Figures). Most breeding red-throated diver nest flights took place between the nesting SPA lochan and the nearest area of sea coast. The main exception to this was a north to south flight corridor along Aris Dale in 2011 and 2012, where some breeding red-throated divers left the SPA lochans and flew south. In light of these data, and to avoid any potential collision risk or barrier effects on SPA breeding red-throated divers the whole western part of the Site was dropped from consideration for turbines. This precautionary approach to avoiding risk to SPA divers was in accordance with initial NatureScot feedback on the main ornithological sensitivities within the Study Area.

10.5.5 Furness (2015)[29] reviewed the evidence base for increasing the precautionary red-throated diver CRA avoidance rate and found no instances of red-throated divers being killed at North American wind farms and only one instance of a diver casualty out of over 11,150 birds killed at European wind farms. Thus, Furness (2015)[29] reported that there is strong-evidence for macro-avoidance of wind farms by red-throated diver and recommended an increase in the avoidance rates used to calculate CRA at Scottish wind farms: NatureScot has accepted this.

10.5.6 Based on the SPA nesting diver flightlines recorded during studies in 2011, 2012 and 2015 (Confidential Figures), the turbine area was specifically selected to avoid any regularly used flight corridor. As a result, no collision mortality to breeding red-throated divers within the Otterswick and Graveland SPA (and SSSI) will likely take place (Appendix 10.2: Confidential Information). Consequently, no significant impacts resulting from collision morality to breeding red-throated divers within the Otterswick and Graveland SPA (and SSSI) are predicted. No 'barrier effect' with turbines blocking diver flight corridors between the sea and SPA breeding lochans will take place, as all known SPA diver flight corridors have been specifically avoided.

10.5.7 This section summarises the results of this assessment, but the detailed work and figures that inform this assessment are provided in Appendix 10.2: Confidential Information.

Table 10.10: Summary of potential impacts on Otterswick and Graveland SPA red-throated diver feature

SPA conservation objective	*Potential impact*
"*To avoid deterioration of the qualifying habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained*"; and "*To ensure for the qualifying species that the following are maintained in the long term*":	
Population of the species as a viable component of the site	None, no change to red-throated diver population as a viable component of the designated site

Distribution of the species within site	None, the existing distribution of red-throated diver within SPA will remain
Distribution and extent of habitats supporting species	None, the distribution and extent of SPA red-throated diver habitats will remain
Structure, function and supporting processes of habitats supporting the species	None, the structure, function and supporting processes of SPA red-throated diver habitats will remain
No significant disturbance of the species	None, no significant disturbance of red-throated divers

10.5.8 Having considered the potential impacts of Consented Development on the qualifying species of the Otterswick and Graveland SPA and based on evidence collected, it can be concluded that there will be no likely significant effects on the red-throated diver qualifying feature or designated site integrity. Therefore, there is no need for an Appropriate Assessment (a Habitats Regulations Assessment). However, this EIAR chapter provides enough information for the competent authority to undertake an Appropriate Assessment should this be deemed necessary.

10.5.9 As the Bluemull and Colgrave Sounds SPA and East Mainland Coast SPA have both been designated since the Consented Development gained consent and no changes are planned to WTG numbers, locations or dimensions, no detailed assessment of impacts on those deignations has been carried out.

Wider countryside species

Red-throated diver

10.5.10 Red-throated diver is an Annex 1 and Schedule 1 species and therefore of high conservation importance (Table 10.7). The behavioural sensitivity of the species is considered high (Table 10.9). The national and international population estimates of this species are known (Table 10.8)[34]. The Shetland NHZ population estimate is 407 pairs and without evidence to the contrary the species is likely to be in *Favourable Conservation Status* within Shetland.

Land-take impacts

10.5.11 Red-throated diver could potentially be susceptible to land-take and habitat loss from construction activities. During three years of monitoring red-throated divers nested within the Study Area.

10.5.12 Further details are provided within Appendix 10.2: Confidential Information and associated figures.

Construction/operational disturbance

10.5.13 Red-throated diver could potentially be susceptible to construction/operational disturbance. During three years of monitoring red-throated diver nested within the Study Area.

10.5.14 Further details are provided within Appendix 10.2: Confidential Information and associated figures.

Collision impacts

10.5.15 Red-throated divers fly at low, medium and high heights which could bring them into risk of collision with turbines. The VP data from 2011 and 2012 showed levels of flight activity were sufficient for CRA. The following metrics are from Appendix 10.3: Collision Risk Assessment, using a 99% avoidance (after Furness, 2015) rate:

- Max risk summer 2011: = 0.208, i.e. one bird every 4.8 years.
- Min risk summer 2011: = 0.123, i.e. one bird every 8.1 years.
- Max risk summer 2012: = 0.104, i.e. one bird every 9.6 years.
- Mini risk summer 2012: = 0.062, i.e. one bird every 16.2 years.

10.5.16 With red-throated divers being mainly present on the Site in the summer season, considering the birds mainly flap, taking the recently advised conservative avoidance rate of 99%[29] results in CRA predictions of between 0.208 collisions per year and summer season in worst-case (i.e. one bird every 4.8 years) and 0.062 collisions per year and summer season in best-case (i.e. one bird every 16.2 years) (Appendix 10.3 Collision Risk Assessment).

10.5.17 Taking the mean of these four metrics (using 99% avoidance rate) suggests a mortality figure of that one bird will be killed by turbines approximately every eight years, i.e. the predicated *likely* mortality figure is considered to be ca. three non-breeding red-throated divers during the life-time of the Beaw Field Wind Farm. Given these considerations, collision impacts using 99% avoidance rate would be likely to have a negligible, permanent adverse impact on red-throated diver and no significant effects are predicted.

10.5.18 Furness (2015)[29] reported that the precautionary 99% avoidance rate should be used until the generality of the results can be established, but that it would be consistent with evidence from Orkney and overseas to also adopt a 99.5% avoidance rate. Using the 99.5% avoidance rate results in CRA predictions of between 0.104 collisions per year and summer season in worst-case (i.e. one bird every 9.6 years) and 0.031 collisions per year and summer season in best-case (i.e. one bird every 32.3 years) (Appendix 10.3 Collision Risk Assessment).

Summary of impacts on red-throated diver

10.5.19 It is considered that the magnitude of the impacts on red-throated diver due to the wind farm construction and operational activities is likely to impact on no breeding birds and only a small number of non-breeding red-throated divers. The only adverse impacts are likely to relate to predicted CRA losses of three non-breeding red-throated divers during the life time of the Beaw Field Wind Farm. However, it is possible to estimate a theoretical worse-case impact magnitude with some crude assumptions about the Shetland red-throated diver population.

10.5.20 Using the Shetland NHZ metric of 407 pairs (all of which will remain unaffected), plus an assumed number of non-breeding individuals, it is possible to predict the impact of the Consented Development. The exact number of non-breeding birds in Shetland is unknown, but these birds are relatively common and widespread on Yell and across Shetland. Detailed diver studies for the Viking Wind Farm ES[19] in 2005 and 2006 estimated that approximately 35% (39/111 birds) and 34% (49/145 birds), respectively were non-breeding. This suggests that slightly over one third of the population on the breeding grounds are non-breeding individuals. This proportion of non-breeders is similar to the 38% estimated from the results of the 1994 national survey[35]. Taking the Shetland NHZ breeding red-throated diver population as 407 pairs and assuming a third of birds on the Shetland breeding ground are non-breeding, provides an estimate of 271 non-breeding individuals in the population. Based on observations of breeding red-throated divers in the Study Area (which were highly predictable in terms of their flight line corridors and use of airspace across the Site), it is a component of these 271 non-breeding individuals which were recorded flying across the Study Area and turbine area in an apparently random manner during VP watches and it is this (non-breeding) part of the Shetland diver population that is likely to face most collision risk.

10.5.21 The theoretical death of three non-breeding red-throated divers as a result of collision would result in a reduction in the Shetland NHZ non-breeding population of 1.1% (assuming a worse-case scenario of all these collisions occurring in one year, rather than separately throughout the 25 years of operation). Thus, the number of predicted red-throated diver turbine collisions is tiny annually (undetectable in population monitoring) within a population with Favourable Conservation Status (FCS) and a surplus of non-breeding individuals. So therefore, under this scenario, the magnitude of adverse impacts of land-take, disturbance and collision risk on red-throated diver would still be negligible, with no significant effects predicted.

10.5.22 Although red-throated diver is a species of high conservation importance, the likely effects are judged to be not significant in the context of the EIA Regulations, i.e. there will be no detectable regional population level impacts and so the Shetland NHZ will not be adversely affected. Furthermore, the Outline Habitat Management Plan aims to protect and restore six red-throated diver lochans in southern Yell, which is likely to directly benefit the overall red-throated diver population. Therefore, if Beaw Field Wind Farm is built, the available information indicates, using the three tests[6], that FCS will not be affected because:

- Red-throated diver is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of red-throated diver in the Shetland NHZ will not be reduced by the proposed wind farm, nor will it become likely to be reduced in the foreseeable future; and

- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the red-throated diver population on a long-term basis should the proposed wind farm be built.

Greylag goose

10.5.23 Greylag goose is not listed on any of the three important NatureScot bird lists and is of relatively low conservation importance. The behavioural sensitivity of the species is considered to be moderate (Table 10.9). The national and international population estimates of this species are known (Table 10.8). The Shetland NHZ population estimate is 700-1,000 pairs and increasing at a rate of ca. 17-20% per annum recently (Harvey *et al.* 2012[30] pairs). Without evidence to the contrary the species is likely to be in *Favourable Conservation Status* within Shetland.

Land-take impacts

10.5.24 Greylag geese could potentially be susceptible to land-take and habitat loss from construction activities. 0-1 pair of greylag geese nested within the turbine area annually. Pairs nested within the turbine area in 2011 and 2015, but not 2012 when three pairs nested in the wider Study Area only (Figure 10.4). Both nesting pairs were within 300m of the development footprint. This suggests that up to one pair of greylag geese per year are likely to be close to construction activity and, potentially, their territories susceptible to land-take impacts. However, greylag geese appear not to be very habitat specific in terms of their nest sites and nest locations always vary between years. Thus, the location of nests recorded in 2011, 2012 and 2015 is not likely to be an indication of nest location in future years.

10.5.25 Nevertheless, based on the location of nests in 2011 and 2015, up to one nest could be affected direct habitat loss associated with land-take. Therefore, the likely magnitude of any permanent adverse direct land-take impacts on one pair of greylag geese or indirect impacts through habitat modification would be negligible, with no significant effects predicted.

Construction/operational disturbance

10.5.26 Greylag geese are judged to have moderate sensitivity to disturbance (Table 10.9) and therefore, in theory, construction works could potentially displace some birds from suitable nesting areas, possibly resulting in reduced site productivity. For the purposes of this assessment it is assumed that greylag geese nesting within 300m of construction work sites might experience some disturbance from construction activities. This is likely to be a cautious assumption given the wide availability of potentially suitable nesting sites. Assuming a worse case (not *likely*) scenario, the loss of one nesting pair over two years is likely to have a negligible, temporary (mid-March and July) adverse impact on breeding greylag geese and no significant effects are predicted.

10.5.27 Greylag geese could potentially be susceptible to disturbance (in breeding and feeding areas) from operational activities near nest and foraging sites during the breeding season and also winter season. However, as outlined above for construction disturbance, at worse a single nesting pair might be adversely affected. The main area used by greylag geese for foraging (in both breeding season and winter) is the reseeded improved pasture in Aris Dale (Figures 10.5; 10.6; 10.7; 10.8), well away from any planned operational development activity. Consequently operational disturbance is likely to be confined to the turbine area, well away from preferred foraging sites. Assuming a worse case (not *likely*) scenario, the loss of one nesting pair is likely to have a negligible, permanent adverse impact on breeding greylag geese and no significant effects are predicted.

Collision Impacts

10.5.28 Greylag geese were recorded flying at low, medium and high heights which could bring them into risk of collision with turbines (Figures 10.5; 10.6; 10.7; 10.8). The VP data from summer and winter 2011 and 2012 show levels of flight activity that are sufficient for CRA. The following metrics are from Appendix 10.3: Collision Risk Assessment, using 99.8% avoidance rate:

- Max risk winter 2010-summer 2011: 0.010 + 0.084 = 0.094, i.e. one bird every 10.6 years.
- Min risk winter 2010-summer 2011: 0.006 + 0.047 = 0.053, i.e. one bird every 18.9 years.
- Max risk winter 2011-summer 2012: 0.031 + 0.026 = 0.057, i.e. one bird every 17.5 years.
- Min risk winter 2011-summer 2012: 0.017 + 0.015 = 0.032, i.e. one bird every 31.3 years.

10.5.29 With greylag geese in the turbine area throughout the year (but mainly summer), considering the birds flap, taking the precautionary 99.8% avoidance factor and assuming no evasive behaviour, the collision risk per year results in between 0.094 collisions per year in worst-case (one bird every 10.6 years) and 0.032 collisions per year best-case (one bird every 31.3 years). Taking the mean of these four metrics suggests that one bird will be killed by turbines every 17.0 years, i.e. approximately one greylag goose mortality during the life time of the Consented Development. Full details of the CRA are provided in Appendix 10.3: Collision Risk Assessment. Given these considerations, collision impacts would be likely to have a negligible, permanent adverse impact on greylag geese and no significant effects are predicted.

Summary of Impacts on Greylag Goose

10.5.30 It is considered that the magnitude of the impacts on greylag goose due to the wind farm construction and operational activities is likely to impact on one breeding pair (either through land-take or disturbance), with CRA losses of one bird during the life time of the Beaw Field Wind Farm. However, if the one pair identified were adversely affected (and there is no evidence to suggest this would occur), it is possible to estimate a theoretical worse-case impact magnitude. Using the Shetland NHZ metric of 700-1,000 pairs (increasing at a rate of ca. 17-20% per annum) the theoretical loss of one breeding pair (assuming they do not move elsewhere; an unlikely assumption as potentially suitable breeding habitat is not limiting) as a result of land-take would result in a reduction in the Shetland NHZ population of 0.1-0.14% at its current population size. The very low numbers of greylag geese predicted to be killed by turbine collisions is considered to be trivial against a background of a rapidly expanding population. So therefore, under this worse-case (not *likely*) scenario, the magnitude of adverse impacts of land-take, disturbance and collision risk on greylag goose would still be negligible, with no significant effects predicted.

10.5.31 Greylag goose is a species of low conservation importance and the likely effects are judged to be not significant in the context of the EIA Regulations, i.e. there will be no detectable regional population level impacts and so the Shetland NHZ will not be adversely affected. Therefore, if Beaw Field Wind Farm is built, the available information indicates, using the three tests (SNH, 2006), that FCS will not be affected because:

- Greylag goose is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of greylag goose in the Shetland NHZ will not be reduced by the proposed wind farm, nor will it become likely to be reduced in the foreseeable future;
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the greylag goose population on a long-term basis should the proposed wind farm be built.

Golden plover

10.5.32 Golden plover is an Annex 1 species and therefore of high conservation importance (Table 10.7). The behavioural sensitivity of the species is considered moderate (Table 10.9). The national and international population estimates of this species are known (Table 10.8). The Shetland NHZ population estimate is 1,450 pairs and without evidence to the contrary the species is likely to be in *Favourable Conservation Status* within Shetland.

Land-take Impacts

10.5.33 Golden plover could potentially be susceptible to land-take and habitat loss from construction activities. On average five pairs of golden plover nested within the turbine area annually. Whilst most pairs were located in the same general areas (based on notional territory centres) in successive years, not all were with at least one pair in a new location annually. Three of the notional territory centres/nests of four-five pairs in 2011 in the turbine area were within ca. 300m of the development footprint, with an additional pair within 100-200m of the main west-east access track, just south of borrow pit 2 (Figure 10.9). In 2012 one notional territory centre and one nest in the turbine area were within ca. 300m of the development footprint, with an additional pair within 100-200m of the main west-east access track, underneath proposed borrow pit 2 (Figure 10.10). In 2015 three notional territory centres in the turbine area were within ca. 300m of the development footprint (Figure 10.11).

10.5.34 This suggests that perhaps two-three pairs of breeding golden plover are likely to be close to construction activity and, potentially, their territories susceptible to land-take impacts. However, the exact positions of most golden plover nests were not located and the majority of locations marked on figures refer to notional territory centres based on recordings of territorial birds from repeat walk-over surveys. As golden plovers have relatively small territories, the notional centres of territories are therefore likely to be within the actual territories, providing a level of confidence in terms of identifying where golden plover may be potentially susceptible to land-take impacts.

10.5.35 Recent evidence from properly designed Before-After Control-Impact (BACI) studies have shown little or no impacts of operational wind farm infrastructure on golden plover distribution and numbers (e.g. Fielding and Haworth, 2010[36]; Douglas *et al.* 2011[37]; Pearce-Higgins *et al.* 2012[2]; Fielding and Haworth, 2012[38]), so it could be argued that no significant impacts are likely. Earlier work suggesting wind farm impacts on golden plover (e.g. Pearce-Higgins *et al.* 2009[39]) is considered methodologically flawed and the results were not repeated in the later properly designed BACI work.

10.5.36 Construction, in particular the access tracks, could result in modest, localised hydrological change in the adjacent peatland habitats. However much of this is already severely damaged from over-grazing and peat cutting. Golden plover do not appear to be particularly sensitive to localised changes in the water table, or even moderate peat erosion. Indeed, breeding golden plover use many types of moorland habitat including dry, even degraded areas and show a preference for short vegetation (Whittingham *et al.* 2000[40]; Pearce-Higgins and Grant, 2006[41]). Therefore, the likely magnitude of any permanent adverse direct land-take impacts or indirect impacts through habitat modification would be on up to two-three pairs of golden plover and so would be negligible, with **no significant effects** predicted.

Construction/Operational Disturbance

10.5.37 Golden plovers are judged to have moderate sensitivity to disturbance (Table 10.9) and therefore, in theory, construction works could potentially displace some birds from suitable nesting areas, possibly resulting in reduced site productivity. For the purposes of this assessment it is assumed that golden plovers nesting within 300m of construction work sites might experience some disturbance from construction activities. This is likely to be a cautious assumption. Given assumptions described previously about territory centres, it is likely some pairs may be temporarily disturbed by construction activities if they took place during the breeding season. Therefore, were it to occur, the potential disturbance of two-three golden plover pairs during the 24 months of construction of the Consented Development would be likely to have a negligible, temporary (mid March and July) adverse impact on breeding golden plover and no significant effects are predicted.

10.5.38 Golden plover could potentially be susceptible to disturbance (in breeding and feeding areas) from operational activities near nest and foraging sites during the breeding season. However, as discussed, properly designed BACI studies have shown little or no significant impacts of operational wind farms on golden plover distribution and numbers. Furthermore, the main non-blanket bog feeding area for Study Area golden plovers appears to be the reseeded grassland in Aris Dale, well away from proposed operational activities (Figures 10.9 and 10.10). Therefore, operational impacts would be likely to have a negligible, permanent adverse impact on golden plover and no significant effects predicted.

Collision Impacts

10.5.39 Golden plover were recorded flying at low, medium and high heights which could bring them into risk of collision with turbines. The VP data from summer and winter 2011 and 2012 show levels of flight activity that was sufficient for CRA (Figures 10.9; 10.10; 10.11). The following metrics are from Appendix 10.3: Collision Risk Assessment, using 98% avoidance rate:

- Max risk winter 2010-summer 2011: 0.104 + 0.189 = 0.293, i.e. one bird every 3.4 years.
- Min risk winter 2010-summer 2011: 0.060 + 0.108 = 0.168, i.e. one bird every 6.0 years.
- Max risk winter 2011-summer 2012: 0.213 + 0.244 = 0.457, i.e. one bird every 2.2 years.
- Min risk winter 2011-summer 2012: 0.122 + 0.139 = 0.261, i.e. one bird every 3.8 years

10.5.40 With golden plover in the turbine area throughout the year (but mainly summer), considering the birds mainly flap, taking the precautionary 98% avoidance factor and assuming no evasive behaviour, the collision risk per year results in between 0.457 collisions per year in worst-case (one bird every 2.2 years) and 0.168 collisions per year best-case (one bird every 6.0 years). Taking the mean of these four metrics suggests that one bird will be killed by turbines every ca.

3.4 years, i.e. approximately seven golden plover mortalities during the life time of the Consented Development. Given these considerations, collision impacts would be likely to have a negligible, permanent adverse impact on golden plover and no significant effects are predicted. As discussed above, recent BACI studies show little or no significant impacts of operational wind farms on golden plover distribution and numbers. Given these considerations, collision impacts would be likely to have a negligible, permanent adverse impact on golden plover and no significant effects are predicted.

Summary of Impacts on Golden Plover

10.5.41 It is considered that the magnitude of the impacts on golden plover due to the wind farm construction and operational activities is likely to impact on two-three pairs (either through disturbance or collision risk). However, if the two-three pairs identified were adversely affected (and there is no evidence to suggest this would occur), it is possible to estimate a theoretical worse-case impact magnitude. Using the Shetland NHZ metric of 1,450 pairs, the theoretical loss of up to two-three pairs of golden plover (assuming they do not move elsewhere; an unlikely assumption given some pairs use different territories annually strongly suggesting potentially suitable breeding habitat is not limiting) as a result of land-take/disturbance would result in a reduction in the Shetland NHZ population of 0.14-0.21%. Therefore, under this worse-case (not *likely*) scenario, the magnitude of adverse impacts of land-take/disturbance on golden plover would still be negligible, with no significant effects predicted.

10.5.42 Although golden plover is a species of high conservation importance, the likely effects are judged to be not significant in the context of the EIA Regulations, i.e. there will be no detectable regional population level impacts and so the Shetland NHZ will not be adversely affected. Furthermore, the Habitat Management Plan which aims to stop further deterioration and restore blanket bog habitats across the Site is likely to directly benefit golden plovers. Therefore, if Beaw Field Wind Farm is built, the available information indicates, using the three tests[6] outlined in Section 9.53, that FCS will not be affected because:

- Golden plover is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of golden plover in the Shetland NHZ will not be reduced by the proposed wind farm, nor will it become likely to be reduced in the foreseeable future; and
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the golden plover population on a long-term basis should the proposed wind farm be built.

Dunlin

10.5.43 Dunlin (sub-species *schinzii,* which breeds in Shetland) is an Annex 1 species and therefore of high conservation importance (Table 10.7). The behavioural sensitivity of the species is considered moderate (Table 10.9). The national and international population estimates of this species are known (Table 10.8). The Shetland NHZ population estimate is 1,700 pairs and without evidence to the contrary the species is likely to be in *Favourable Conservation Status* within Shetland.

Land-take impacts

10.5.44 Dunlin could potentially be susceptible to land-take and habitat loss from construction activities. Of the eight pairs of dunlin that nested in the Study Area in 2011, two pairs were close to the development footprint (100-200m away) (Figure 10.12). Of the nine pairs that nested in the Study Area in 2012 two pairs nested within the turbine area and were relatively close to the development footprint (100-200m away from territory centres) (Figure 10.13). In 2015, fifteen pairs nested within the Study Area and five pairs nested within the turbine area, with only one pair (by Turbine 2) close to wind farm infrastructure (<100m away from the access track and turbine) (Figure 10.14).

10.5.45 Dunlin have very small territories (typically ~0.3km^2) and are particularly sedentary during the breeding season, rarely moving more than 200-300m from the nest (O'Connell *et al.* 1996). Based on notional territory centres, one-two pairs in 2011 and 2012 and three pairs in 2015 will be close enough to the development footprint to potentially lose territory habitat to land-take; other pairs are likely to be far enough away to avoid being affected by land-take. This assumes the notional territory centres plotted were accurate (Figures 10.12; 10.13; 10.14). However, exact positions of dunlin nests within the turbine area were not located, except once in 2011. The locations marked on the EIAR figures refer to notional territory centres based on recordings of territorial birds from repeat walk-over surveys. As stated, dunlin have very small territories, so the notional centres of territories are therefore likely to be within the actual territories, providing a high level of confidence in terms of identifying where dunlin may be susceptible land-take impacts.

10.5.46 Dunlin nest locations vary annually and indeed the number of pairs also fluctuates widely, with 8-15 pairs in the Study Area between 2011 and 2015. As a consequence, there are no fixed, regular dunlin sensitivities as regards land-take. Nevertheless, based on data collected over three field seasons, between one-three pairs would likely be potentially susceptible to land-take impacts. The potential loss of one-three dunlin pairs to land-take would likely have a negligible adverse impact on dunlin, with no significant effects predicted.

Construction/Operational Disturbance

10.5.47 As discussed above, between one-three dunlin territories close to the development footprint and so could be susceptible to construction/operational disturbance activities near a nest (assuming the territory was not lost to land-take). As dunlin have very small territories and are particularly sedentary during the breeding season, rarely moving more than 200-300m from the nest[42], this suggests that one-three pairs of breeding dunlin (the same ones as those potentially affected by land-take) may be potentially be affected by construction/operational disturbance. Pre-construction and construction breeding season monitoring would need to carefully search for and monitor any dunlin nest within the development footprint area. Therefore, the potential disturbance of one-three dunlin pairs during construction and operation would likely have a negligible adverse impact on dunlin, with no significant effects predicted.

Collision Impacts

10.5.48 Dunlin usually fly low, close to the ground during the breeding season (although do go higher during display flights). The VP data from 2011 and 2012 shows low levels of flight activity with the airspace occupied by turbines, most of which was below turbine height (<20m) (Figure 10.12 and 10.13). There are a number of explanations for this: (i) dunlin do not fly very much within their very small breeding territories, (ii) when they do, most dunlin flights are characteristically low and close to the ground, and (iii) their small size and cryptic colouration, causes low detectability during VP watches. It is likely that all three explanations provide a reason for why so few flights were recorded. However, it is worth noting that whilst they may fly low and sometimes go undetected when on territory, at such height dunlin are not at risk of collision. Consequently, collision impacts on dunlin would likely be negligible and no significant effects are predicted.

Summary of Impacts on Dunlin

10.5.49 It is considered that the magnitude of the impacts on dunlin due to the wind farm construction and operational activities is likely to be negligible, with one-three pairs potentially adversely affected. It is possible to estimate a theoretical worse-case impact magnitude. Using the Shetland NHZ metric of 1,700 pairs, the theoretical loss of one-three pairs of dunlin (and assuming they do not move elsewhere) as a result of either land-take (habitat loss) or disturbance would result in a reduction in the Shetland NHZ population of 0.06-0.18%, so therefore, under this worse-case (not *likely*) scenario, the magnitude of adverse impacts of land-take and disturbance on dunlin would be negligible, with no significant effects predicted.

10.5.50 Although dunlin is a species of high conservation importance, the likely impacts are judged to be not significant in the context of the EIA Regulations, i.e. there will be no detectable regional population level impacts and so the Shetland NHZ will not be adversely affected. Therefore, if Beaw Field Wind Farm is built, the available information indicates, using the three NatureScot tests[6], that FCS will not be affected because:

- Dunlin is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of dunlin in the Shetland NHZ will not be reduced by the proposed wind farm, nor will it become likely to be reduced in the foreseeable future; and
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the dunlin population on a long-term basis should the proposed wind farm be built.

Lapwing

10.5.51 Lapwing is a Red-List species and therefore of high conservation importance (Table 10.7). The behavioural sensitivity of the species is considered low (Table 10.9). The national and international population estimates of this species are known (Table 10.8). The Shetland NHZ population estimate is 1,740 pairs and without evidence to the contrary the species is likely to be in *Favourable Conservation Status* within Shetland.

Land-take impacts

10.5.52 Lapwing could potentially be susceptible to land-take and habitat loss from construction activities. One of the three pairs of lapwing in the Study Area in 2011 was relatively close to the development footprint, being ca. 250m away from Turbine 4 within the turbine area (Figure 10.15). Of the four pairs that nested in the Study Area in 2012 two pairs nested within the turbine area and relatively close to the development footprint (100-200m away from territory centres) (Figure 10.16). In 2015, a single pair nested within the turbine area, ca. 400m away from the nearest wind farm infrastructure (Turbine 17) (Figure 10.17).

10.5.53 The notional territory centre of two lapwing pairs within the turbine area in 2012 suggests that these pairs may be close to construction activity and, potentially, their territory susceptible to land-take impacts. However, in 2011 and 2015, none of the breeding pairs were close enough to the development footprint to be susceptible to land-take impacts. As lapwings tend to nest in agricultural fields (improved pasture in Yell), the birds are used to annual management changes within their territories and so are adaptable in terms of moving nesting locations and territory centres if necessary. Thus, the 100m-200m distances from the 2012 territory centres to the development footprint are not considered likely to result in land-take impacts on nesting lapwings. Therefore, the magnitude of any permanent direct land-take impact on lapwings would be likely be negligible, s predicted.

Construction/operational disturbance

10.5.54 The distances from lapwing territory centres to the development footprint in 2011 and 2015 indicate that construction/operational disturbance is highly unlikely (Figures 10.15 and 10.17). The notional territory centre of two lapwing pairs within the turbine area in 2012 suggests that these pairs may be close to construction activity and, potentially, their territories susceptible to construction/operational disturbance impacts (Figure 10.16). However, this species sensitivity is considered low and lapwings regularly nest within modified and managed agricultural habitats, often close to regular daily human activity. Given the distances (100-200m away from territory centres), it is considered unlikely that construction/operational disturbance would occur.

10.5.55 Pre-construction and construction breeding season monitoring would carefully search for any nests within the development footprint area. Assuming this is carried out and disturbance and damage to any nest is avoided, the magnitude of temporary (during construction) adverse impacts of disturbance on breeding lapwings would likely be negligible and no significant effects are predicted.

Collision impacts

10.5.56 Lapwings usually fly relatively low, close to the ground during the breeding season (although they do go higher during display flights). The VP data from 2011 and 2012 shows low levels of flight activity with the airspace occupied by turbines, most of which was below turbine height (<20m) and so CRA is unnecessary (Figures 10.15 and 10.16). Consequently, collision impacts on lapwings would likely be negligible and no significant effects are predicted.

Summary of impacts on lapwing

10.5.57 It is considered that the magnitude of the impacts on lapwing due to the wind farm construction and operational activities is likely to be negligible, with no pairs potentially adversely affected. However, if one or two pairs identified in 2012 were adversely affected (and there is no evidence to suggest this would occur), it is possible to estimate a theoretical worse-case impact magnitude. Using the Shetland NHZ metric of 1,740 pairs, the theoretical loss of one-two pairs of lapwing (and assuming they do not move elsewhere) as a result of either land-take (habitat loss) or disturbance would result in a reduction in the Shetland NHZ population of 0.06-0.12%, so therefore, under this worse-case (not *likely*) scenario, the magnitude of adverse impacts of land-take on lapwing would still be negligible, with **no significant effects** predicted.

10.5.58 Although lapwing is a species of high conservation importance, the likely impacts are judged to be **not significant** in the context of the EIA Regulations, i.e. there will be no detectable regional population level impacts and so the Shetland NHZ will not be adversely affected.

Therefore, if Beaw Field Wind Farm is built, the available information indicates, using the three NatureScot tests[6], that FCS will not be affected because:

- Lapwing is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of lapwing in the Shetland NHZ will not be reduced by the proposed wind farm, nor will it become likely to be reduced in the foreseeable future; and
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the lapwing population on a long-term basis should the proposed wind farm be built.

Ringed plover

10.5.59 Ringed plover is a Red-List species and therefore of high conservation importance (Table 10.7). The behavioural sensitivity of the species is considered low (Table 10.9). The national and international population estimates of this species are known (Table 10.8). The Shetland NHZ population estimate is 800-1,000 pairs and without evidence to the contrary the species is likely to be in *Favourable Conservation Status* within Shetland.

Land-take Impacts

10.5.60 Ringed plover could potentially be susceptible to land-take and habitat loss from construction activities. The three pairs of ringed plover that nested in the Study Area in 2011 and two pairs nested within the Study Area in 2012 (Figures 10.18 and 10.19). Two of these nests were located in the same areas in successive years. In 2011 a single pair nested within the turbine area, to the west of Turbine 14 and Turbine 16 (Figure 10.18). In 2015 a single pair nested at the eastern edge of the Study Area, close to the Burn of Horsewater (Figure 10.20).

10.5.61 The notional territory centre of one pair in 2011 and 2012, between the Beaw Field Water Treatment Works and Burn of Evrawater, lay relatively close to the main west-east access track. This suggests that one pair of breeding ringed plover may be relatively close to construction activity and, potentially, their territory susceptible to land-take impacts. The notional territory centre of the single pair within the turbine area in 2011 is ca. 200m from the nearest access track and turbine, suggesting that habitats within this territory are unlikely to be susceptible to land-take impacts (Figure 10.18). However, this is based on the assumption that the potentially affected ringed plover pairs return to these territories, both of which were unoccupied in 2015. As ringed plovers have relatively small territories, the notional centres of territories marked on the figures are therefore likely to be within the actual territories, providing a level of confidence in terms of identifying where ringed plovers may be potentially susceptible to land-take impacts.

10.5.62 Construction, in particular the main west-east access track, could result in the loss of some breeding habitat for the pair between the Beaw Field Water Treatment Works and Burn of Evrawater, but most habitat will remain unchanged. The 2011 territory within the turbine area, to the west of Turbine 14 and Turbine 16 may also be affected but its centre appeared to be at least 200m away from planned land-take. Ringed plovers are adaptable and readily use semi-natural habitats such as heaths and man-made/modified habitats for breeding. For example, Pennington *et al.* (2004)[31] reported that during 1984 BTO breeding bird surveys in Shetland, 41 ringed plover nests were found on roadside hard shoulders, eleven on airstrips, eight on industrial sites, seven in quarries and one on a football pitch. Consequently, the evidence from breeding ringed plovers in Shetland indicates that the species nests within highly modified habitats, often close to regular human activity. Therefore, the magnitude of any permanent direct land-take impact on one-two pairs of ringed plovers would be likely be negligible, with no significant effects predicted.

Construction/operational disturbance

10.5.63 To our knowledge there have been no published studies into the impact of wind farm construction and operation on ringed plovers. As one-two pairs were present close to the development footprint in 2011 and 2012, but not 2015 (Figures 10.18; 10.19; 10.20), potential construction/operational disturbance would only likely affect these one-two pairs. However, this species sensitivity is considered low and ringed plovers regularly nest within highly modified habitats, often close to regular human activity. With many pairs in Shetland selecting artificial nest sites e.g. roadside hard-shoulders, there is no evidence that construction and operational disturbance, specifically of the main west-east access track between the Beaw Field Water Treatment Works and Burn of Evrawater would adversely impact on this nesting pair. Pre-construction and construction breeding season monitoring would carefully search for any nest within this area. Assuming this is carried out and disturbance and damage to any nest is avoided, the magnitude of temporary (during construction) adverse impacts of disturbance on breeding ringed plovers would likely be negligible and **no significant effects** are predicted. As ringed plovers select nest sites on roadside hard shoulders, no operational disturbance from the main west-east access track is considered likely.

Collision impacts

10.5.64 Ringed plovers usually fly low, close to the ground. Indeed, when adult birds accompany chicks, they prefer to walk rather than fly. The VP data from 2011 and 2012 shows very low levels of flight activity (Figures 10.18 and 10.19), none in airspace occupied by turbines and so CRA is unnecessary. Consequently, collision impacts on ringed plovers would likely be negligible and no significant effects are predicted.

Summary of impacts on ringed plover

10.5.65 It is considered that the magnitude of the impacts on ringed plover due to the wind farm construction and operational activities is likely to be negligible, with no pairs potentially affected. However, if the Beaw Field Water Treatment Works and Burn of Evrawater pair identified in 2011 and 2012 were adversely affected (and there is no evidence to suggest this would occur), it is possible to estimate a theoretical worse-case impact magnitude. Using the Shetland NHZ metric of 800-1,000 pairs, the theoretical loss of one pair of ringed plover (and assuming they do not move elsewhere) as a result of land-take would result in a reduction in the Shetland NHZ population of 0.1-0.125%, so therefore, under this worse-case (not *likely*) scenario, the magnitude of adverse impacts of land-take on ringed plover would still be negligible, with no significant effects predicted.

10.5.66 Although ringed plover is a species of high conservation importance, the likely impacts are judged to be not significant in the context of the EIA Regulations, i.e. there will be no detectable regional population level impacts and so the Shetland NHZ will not be adversely affected. Therefore, if Beaw Field Wind Farm is built, the available information indicates, using the three NatureScot tests[6], that FCS will not be affected because:

- Ringed plover is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of ringed plover in the Shetland NHZ will not be reduced by the proposed wind farm, nor will it become likely to be reduced in the foreseeable future;
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the ringed plover population on a long-term basis should the proposed wind farm be built.

Curlew

10.5.67 Curlew is a Red-List species and therefore of high conservation importance (Table 10.7). The behavioural sensitivity of the species is considered high (Table 10.9). The national and international population estimates of this species are known (Table 10.8). The Shetland NHZ population estimate is 2,300 pairs and without evidence to the contrary the species is likely to be in *Favourable Conservation Status* within Shetland.

Land-take impacts

10.5.68 Of the one–two pairs of curlew that nested within the turbine area annually, one pair were usually close enough to the development footprint to potentially lose habitat to land-take (Figures 10.21; 10.22;10.23). However, detailed research into impacts of wind farms on curlew suggests adverse effects are likely to be caused by construction and operational disturbance (displacement) and not land-take per say. Only relatively small areas of habitat within large curlew territories are likely to be lost to land-take so impacts would be likely be negligible, with no significant effects predicted.

Construction/operational disturbance

10.5.69 Curlew could potentially be susceptible to construction/operational disturbance related activities. One-two pairs of curlew nested within the turbine area annually in different locations (based on assumed territory centres) in successive years. Published research on curlew suggests that this species may be particularly susceptible to disturbance during wind farm construction and operation[2], although it is not clear why this may be the case. There was evidence of significant effects on curlew densities during construction and throughout operation during post-construction monitoring. Pearce-Higgins *et al.* (2012)[2] results suggest that curlew populations in the vicinity of wind farms may decline by about 40% as a result of disturbance from construction work (defined as within 620m around turbines).

10.5.70 This suggests that perhaps two pairs of breeding curlew annually are likely to be within the zone of impact (defined as <620m around turbines) to construction activity and disturbance impacts. However, the exact position of curlew nests were not located and the locations marked on Figures 10.21-10.23 refer to notional territory centres based on multiple recordings of territorial birds from repeat walk-over surveys. Curlews have relatively large territories and often fly off blanket bog areas to feed on reseeded in-bye fields. Nevertheless, notional territory centres lie within well-used central parts of breeding territories and so can be used to determine territories potentially impacted by wind farm construction and operation. Pearce-Higgins *et al.* (2012)[2] reported 40% reduction suggests that at least one of the two pairs within 620m of turbines will likely fail and be lost for the life-time of the Consented Development. The potential loss of one curlew pair to land-take would likely have a negligible adverse impact on curlew, with no significant effects predicted.

Collision impacts

10.5.71 Curlews were recorded flying at low, medium and high heights which could bring them into risk of collision with turbines. The VP data from summer and winter 2011 and 2012 show levels of flight activity that was sufficient for CRA (Figures 10.21 and 10.22). The following metrics are from Appendix 10.3: Collision Risk Assessment, using a 98% avoidance rate:

- Max risk winter 2010-summer 2011: 0.072 + 0.055 = 0.127, i.e. one bird every 7.9 years.
- Min risk winter 2010-summer 2011: 0.039 + 0.030 = 0.069, i.e. one bird every 14.5 years.
- Max risk winter 2011-summer 2012: 0.037 + 0.310 = 0.347, i.e. one bird every 2.9 years.
- Min risk winter 2011-summer 2012: 0.020 + 0.168 = 0.188, i.e. one bird every 5.3 years

10.5.72 With curlew in the turbine area mainly present in the summer breeding season and to a much lesser extent in the winter, considering the birds mainly flap and rarely glide, taking the precautionary 98% avoidance factor and assuming no evasive behaviour, the collision risk per year results in between 0.347 collisions per year in worst-case (one bird every 2.9 years) and 0.069 collisions per year in best-case (one bird every 14.5 years) (Appendix 10.3: Collision Risk Assessment).

10.5.73 Taking the mean of these four metrics suggests that one bird will be killed by turbines every ca. 5.5 years, i.e. approximately four-five curlew mortalities during the life time of the Consented Development. Based on this scenario, the predicated likely mortality figure is considered to be ca. five curlews during the life-time of the Consented Development. Given these considerations, collision impacts would be likely to have a negligible, permanent adverse impact on curlew and no significant effects are predicted.

Summary of impacts on curlew

10.5.74 It is considered that the magnitude of the impacts on curlew due to the wind farm construction and operational activities is likely to be negligible, with one pair potentially affected. Using the Shetland NHZ metric of 2,300 pairs, the theoretical loss of one pair of curlews (and assuming they do not move elsewhere) as a result of disturbance/displacement would result in a reduction in the Shetland NHZ population of 0.04%, so therefore, under this *likely* scenario, the magnitude of adverse impacts of land-take on curlew would still be negligible, with no significant effects predicted.

10.5.75 Although curlew is a species of high conservation importance, the likely impacts are judged to be not significant in the context of the EIA Regulations, i.e. there will be no detectable regional population level impacts and so the Shetland NHZ will not be adversely affected. Therefore, if Beaw Field Wind Farm is built, the available information indicates, using the three NatureScot tests[6], that FCS will not be affected because:

- Curlew is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;

- The natural range of curlew in the Shetland NHZ will not be reduced by the proposed wind farm, nor will it become likely to be reduced in the foreseeable future; and
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the curlew population on a long-term basis should the proposed wind farm be built.

Arctic skua

10.5.76 Arctic skua is a Red-List species and therefore of high conservation importance (Table 10.7). The behavioural sensitivity of the species is considered moderate (Table 10.9). The national and international population estimates of this species are known (Table 10.8). The Shetland NHZ population estimate is 1,128 pairs (declining) without evidence to the contrary the species is likely to be in *Unfavourable Conservation Status* within Shetland.

Land-take impacts

10.5.77 Arctic skua could potentially be susceptible to land-take and habitat loss from construction activities on its moorland breeding sites. On average, two-three pairs of Arctic skua nested within the Study Area, with one-two pairs nesting within the turbine area. Arctic skuas nested close to Loch of Kettlester, Evra Water, Loch of Hamnavoe and at a small one-two pair colony on the east side of Horse Water. Only one of these breeding locations, Evra Water, is close to the development footprint, being adjacent to the main west-east access track. Given these considerations, one pair of Arctic skuas (i.e. those at Evra Water in two out of three years) is likely to be susceptible to land-take impacts. As nest sites were recorded (rather than notional territory centres), these provide a very high degree of confidence in identifying where land-take impacts would likely occur. The likely magnitude of any permanent land-take impacts would be on one pair of Arctic skuas and so would be negligible, with no significant effects predicted.

10.5.78

Construction/operational disturbance

10.5.79 Arctic skua could potentially be susceptible to construction/operational disturbance related activities at Evra Water, where one pair nested in 2012 and 2015 but not 2011 (Figures 10.30; 10.31; 10.32). However, other nesting locations were well away from the development footprint and so are unlikely to be affected. The Evra Water pair has already been considered as vulnerable to likely land-take impacts and so would only be affected by disturbance if they continued to nest at that location. If land-take losses caused the Evra Water Arctic skua pair to abandon their territory, then no construction/operation disturbance would occur (as the pair would already be absent). No additional disturbance is considered likely and so the likely magnitude of any permanent land-take impacts would be on zero-one pair of Arctic skuas and so would be negligible, with no significant effects predicted.

Collision impacts

10.5.80 There is little direct evidence on the impact of wind turbines on Arctic skuas. A study of European wind farm bird mortality data by Dürr (2014) found no casualties of any skua species, but few wind farms are believed to have been erected close to nesting Arctic skuas. Arctic skuas exhibit unusual behaviour, hunting large areas of land and sea for prey. Many of the VP flightlines recorded were relatively low and below turbine height (Figures 10.30 and 10.31). However, there were sufficient flightlines from the turbine area in 2011 and 2012 during summer months for CRA to be undertaken. The following metrics are from Appendix 10.3: Collision Risk Assessment, using a 98% avoidance rate:

- Max risk summer 2011: = 0.144, i.e. one bird every 6.9 years.
- Min risk summer 2011: = 0.074, i.e. one bird every 13.5 years.
- Max risk summer 2012: = 0.086, i.e. one bird every 11.6 years.
- Mini risk summer 2012: = 0.044, i.e. one bird every 22.7 years.

10.5.81 With Arctic skuas only being present on the Site for a short period during the summer season, considering the birds mainly flap and rarely glide, taking the conservative avoidance rate of 98%, results in CRA predictions of between 0.144 collisions per year and summer season in worst-case (i.e. one bird every 6.9 years) and 0.044 collisions per year and summer season in best-case (i.e. one bird every 22.7 years) (Appendix 10.3 Collision Risk Assessment).

10.5.82 Taking the mean of these four metrics suggests that one bird will be killed by turbines every ca. 11.5 years, i.e. approximately two Arctic skua mortalities are predicted during the life time of the Consented Development. Based on this scenario, the predicated *likely* mortality figure is considered to be ca. two Arctic skuas during the life-time of the Consented Development. Given these considerations, collision impacts would be likely to have a negligible, permanent adverse impact on Arctic skua and no significant effects are predicted.

Summary of impacts on Arctic Skua

10.5.83 It is considered that the magnitude of the impacts on Arctic skua due to the wind farm construction and operational activities is likely to be negligible, with one pair potentially affected by disturbance/displacement and ca. two individuals killed by collision mortality during the life-time of the wind farm. However, it is possible to estimate a theoretical worse-case impact magnitude. Using the Shetland NHZ metric of 1,128 pairs, the theoretical loss of one-two pairs of Arctic skuas (and assuming they do not move elsewhere) as a result of land-take/disturbance and collision risk would result in a reduction in the Shetland NHZ population of 0.09-0.18%, so therefore, under this worse-case (not *likely*) scenario, the magnitude of the adverse impacts on Arctic skua would still be negligible, with no significant effects predicted.

10.5.84 Although Arctic skua is a declining species of high conservation importance, the likely impacts are judged to be **not significant** in the context of the EIA Regulations, i.e. there will be no detectable regional population level impacts and so the Shetland NHZ will not be adversely affected. Therefore, if Beaw Field Wind Farm is built, the available information indicates, using the three NatureScot tests[6], that FCS will not be affected because:

- Arctic skua is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of Arctic skua in the Shetland NHZ will not be reduced by the proposed wind farm, nor will it become likely to be reduced in the foreseeable future;
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the Arctic skua population on a long-term basis should the proposed wind farm be built.

Great skua

10.5.85 Despite not being listed under any of NatureScot'athree important ornithological receptor criteria (Table 10.7), NatureScot does provide guidance for assessing the impact of onshore wind farms on great skua (Furness, 2015) and they are present within the Study Area. The behavioural sensitivity of the species is considered moderate (Table 10.9). The national and international population estimates of this species are known (Table 10.8). The Shetland NHZ population estimate is 6,974 pairs and without evidence to the contrary the species is likely to be in *Favourable Conservation Status* within Shetland.

Land-take impacts

10.5.86 Great skua could potentially be susceptible to land-take and habitat loss from construction activities on its moorland breeding sites. On average, seven-eight pairs of great skua held territory within the Study Area annually, with one-two pairs within the turbine area. Whilst most pairs were located in the same general areas (based on notional territory centres) in successive years e.g. Hill of Arisdale and Canis Dale, not all were, with some pairs in a new locations annually. One of the notional territory centres in the turbine area in 2011 was within ca. 300m of the development footprint (Figure 10.33).

10.5.87 In 2012 two notional territory centres in the turbine area were within ca. 100-150m of the development footprint (Figure 10.34). In 2015 one notional territory centres in the turbine area was within ca. 100m of the development footprint and another >300m away (Figure 10.35). This suggests that up to two pairs of great skuas are likely to be susceptible to land-take impacts. The notional centres of territories marked on the figures are believed to be close to actual nest locations, based on the behaviour of adult birds diving at surveyors, providing a high level of confidence in terms of identifying where great skuas may be potentially susceptible to land-take impacts. Therefore, the likely magnitude of any permanent land-take impacts would be on up to two pairs of great skua and so would be negligible, with no significant effects predicted.

Construction/operational disturbance

10.5.88 Great skua could potentially be susceptible to construction/operational disturbance related activities. The one-two pairs of great skuas present annually within the turbine area were often relatively close to turbine locations and potential infrastructure. Given the species' moderate sensitivity to disturbance, it is considered likely that construction and operational disturbance would affect the one-two pairs nesting within the turbine area (assuming they were not already lost to land-take). Furness (2015)[29] reported on the response of breeding great skuas on Foula, Shetland to three wind turbines in 2012-2013, "*most of the time bonxies* (great skuas) *appear to be well aware of where the turbines are and fly on a course that will avoid them. In poor visibility they fly steadily, close to the ground, apparently using it as a guide*". No great skua carcasses have been found to date during their short period of operation (they were damaged by severe winds and were removed). The avoidance of areas with turbines suggests that the birds will be displaced from the turbine area and will not use this part of the Site. Therefore, the likely magnitude of any disturbance impacts would be on up to two pairs of great skua and so would be negligible, with no significant effects predicted.

Collision Impacts

10.5.89 Furness (2015)[29] reviewed the evidence base for increasing the precautionary great skua CRA avoidance rate and found no instances of great skuas being killed at three Orkney wind farm sites where the species is present or indeed at other wind farms in Scotland. Furthermore, a study of European wind farm bird mortality data by Dürr (2014)[43] found no casualties of any skua species. Thus, Furness (2015) reported that there is strong evidence for macro-avoidance of wind farms by great skua and recommended an increase in the avoidance rates used to calculate CRA at Scottish wind farms, which NatureScot have accepted. The following metrics are from Appendix 10.3: Collision Risk Assessment, using a 99% avoidance rate:

- Max risk summer 2011: = 1.093, i.e. one bird every 0.9 years.
- Min risk summer 2011: = 0.573, i.e. one bird every 1.8 years.
- Max risk summer 2012: = 0.614, i.e. one bird every 1.6 years.
- Mini risk summer 2012: = 0.322, i.e. one bird every 3.1 years.

10.5.90 With great skuas only being present on the Site during the summer season, considering the birds mainly flap and rarely glide, taking the conservative avoidance rate of 99%, results in CRA predictions of between 1.093 collisions per year and summer season in worst case (i.e. one bird every 0.9 years) and 0.322 collisions per year and summer season in best case (i.e. one bird every 3.1 years) (Appendix 10.3 Collision Risk Assessment).

10.5.91 Taking the mean of these four metrics suggests that one bird will be killed by turbines every ca. 1.5 years, i.e. approximately sixteen great skua mortalities during the life time of the Consented Development. Based on this scenario, the predicated *likely* mortality figure is considered to be ca. sixteen great skuas during the life-time of the Consented Development. Given these considerations, collision impacts would be likely to have a negligible, permanent adverse impact on great skua and no significant effects are predicted.

10.5.92 It is worth noting that Furness (2015) also reported that there was evidence to use a greater avoidance rate (99.5%), which is also provided in Appendix 10.3 Collision Risk Assessment. If such an avoidance rate were used, considerably lower collision mortality would be predicted. The following metrics are from Appendix 10.3: Collision Risk Assessment, using a 99.5% avoidance rate:

- Max risk summer 2011: = 0.547, i.e. one bird every 1.8 years.
- Min risk summer 2011: = 0.286, i.e. one bird every 3.5 years.
- Max risk summer 2012: = 0.307, i.e. one bird every 3.3 years.
- Mini risk summer 2012: = 0.161, i.e. one bird every 6.3 years

10.5.93 Taking the mean of these four (99.5% avoidance) metrics suggests that one bird will be killed by turbines every ca. 3.1 years, i.e. approximately eight great skua mortalities predicted during the life time of the Consented Development.

Summary of impacts on great skua

10.5.94 It is considered that the magnitude of the impacts on great skua due to the wind farm construction and operational activities is likely to be negligible, with up to two pairs potentially affected through displacement and avoidance of the turbine area and no significant effects predicted. However, there were very high levels of great skua flight activity recorded across the Study Area, including the turbine area and consequently relatively high levels of collision mortality (compared to other bird species) are predicted.

10.5.95 The mean predicted collision metrics suggest that 0.65 birds will die per year on the Site but does not take into account the macro-avoidance of turbines by great skuas. During annual VP watches and walkover surveys it was estimated that up to two pairs - four individual breeding adults and two non-breeders (which were often present on the ridge between Atli's Hill and Mossy Hill) were present, i.e. 6 adults, plus any associated juveniles. It was these individuals that were recorded regularly flying in the turbine area airspace. The biologically realistic or likely scenario would be to assume that the relatively high CRA metric suggests the great skuas present within the turbine area (6 adults, plus any associated juveniles) would be killed (this assumes they were not displaced) during the lifetime of the Beaw Field Wind Farm.

10.5.96 Using these predicted impacts, it is possible to estimate a theoretical likely impact magnitude. Using the Shetland NHZ metric of 6,874 pairs, the theoretical loss of two pairs of great skua as a result of land-take/disturbance or collision risk would result in a reduction in the Shetland NHZ breeding population of 0.03%, so therefore, under this likely scenario, the magnitude of adverse impacts of land-take, disturbance and collision risk on great skua would still be negligible, with no significant effects predicted.

10.5.97 Although great skua is a species of high conservation importance, the likely impacts are judged to be not significant in the context of the EIA Regulations, i.e. there will be no detectable regional population level impacts and so the Shetland NHZ will not be adversely affected. Therefore, if Beaw Field Wind Farm is built, the available information indicates, using the three NatureScot tests (SNH, 2006), that FCS will not be affected because:

- Great skua is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of great skua in the Shetland NHZ will not be reduced by the proposed wind farm, nor will it become likely to be reduced in the foreseeable future; and
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the great skua population on a long-term basis should the proposed wind farm be built.

Merlin

10.5.98 Merlin is an Annex 1, Schedule 1 and Red-List species and therefore of high conservation importance (Table 10.7). The behavioural sensitivity of the species is considered high (Table 10.9). The national and international population estimates of this species are known (Table 10.8). The Shetland NHZ population estimate is 25 pairs and without evidence to the contrary the species is likely to be in *Favourable Conservation Status* within Shetland.

Land-take impacts

10.5.99 Merlin could potentially be susceptible to land-take and habitat loss from construction activities. During three years of monitoring merlins have only nested once within the Study Area (in 2015).

10.5.100 Further details are provided within Appendix 10.2: Confidential Information and associated figures.

Construction/operational disturbance

10.5.101 Merlin could potentially be susceptible to construction/operational disturbance. During three years of monitoring merlins have only nested once within the Study Area (in 2015).

10.5.102 Further details are provided within Appendix 10.2: Confidential Information and associated figures.

Collision impacts

10.5.103 Merlins usually fly low, close to the ground. However, when hunting they can chase prey species such as meadow pipit and skylark high into the air potentially bringing them into risk of collision with turbines. The VP data from 2011 and 2012 shows low levels of flight activity, insufficient for CRA. Consequently, collision impacts on merlins would likely be negligible and no significant effects are predicted.

Summary of impacts on merlin

10.5.104 Further details are provided within Appendix 10.2: Confidential Information and associated figures.

10.5.105 Merlin is a species of high conservation importance and in the absence of mitigation, assuming one pair returns to the same Study Area nest site to breed and does not move elsewhere the likely effects are judged to be significant in the context of the EIA Regulations, i.e. there will be a detectable regional population level impact and so the Shetland NHZ would be adversely affected. Conversely, if the pair failed to return to the Study Area to breed or moved elsewhere, the likely effects are judged to be non-significant in the context of the EIA Regulations, i.e. there will be no detectable regional population level impact and so the Shetland NHZ would not be adversely affected.

10.5.106 Therefore, if merlins return to breed within the study area, using the three NatureScot tests[6], that FCS will be affected because of failure on the second of the three tests:

- Merlin is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of merlin in the Shetland NHZ will be reduced on Yell (where there are thought to be only two known pairs) by the proposed wind farm; and
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the merlin population on a long-term basis should the proposed wind farm be built.

10.5.107 The above significant effects prediction is based on the following highly precautionary, worse-case assumptions: (i) merlins regularly attempt to breed within the Study Area and only at the location used in 2015, (ii) if disturbed the merlins would fail to move and breed elsewhere and so would in effect be lost from the Shetland NHZ population, and (iii) no mitigation work takes place.

10.5.108 The EIA Regs require all "*likely significant effects*", not precautionary/worse case effects to be used to assess Consented developments. Based on this approach to effects determination, the evidence collected suggests that merlins do have alternative nest site locations on Yell (they only nested once within the Study Area in 2015). There is no evidence to suggest that the 2015 nest site is the only one available on Yell. Consequently, the likely effects are assessed as follows, using the three NatureScot tests[6] FCS will be not be affected because:

- Merlin is likely to maintain itself on a long-term basis as a viable component of its habitat in the Shetland NHZ;
- The natural range of merlin in the Shetland NHZ will not be reduced on Yell by the proposed wind farm;
- There will be (and will continue to be) a sufficiently large habitat area in the Shetland NHZ to maintain the merlin population on a long-term basis should the proposed wind farm be built.

10.6 Cumulative impacts

10.6.1 The above sections have considered the implications of the Beaw Field Wind Farm in isolation from other wind farm developments in Shetland. Currently there is no agreed method for determining cumulative impacts on ornithological receptors. NatureScot guidance[1] on cumulative impacts of wind farms on birds recommends a five-stage process to aid the ornithological assessment:

- Define the species to be considered;
- Consider the limits or 'search area' of the cumulative impact study;
- Decide the methods to be employed;
- Review the findings of existing studies; and
- Draw conclusions of cumulative impacts within the Study Area.

10.6.2 This cumulative impact guidance was updated in March 2012[10]. The key principle of NatureScot's updated cumulative impact assessment guidance is to focus on significant impacts and in particular those that are likely to influence the outcome of the consenting process. Thus, the species that should be considered are those for which a likely potentially significant effect has been predicted.

10.6.3 The NatureScot guidance suggests an additive impacts approach, where sums of predicted impacts from different developments are made. However, NatureScot recognises that the difficulty of this approach is that it can lead to errors being compounded, such as assuming predicted CRA impacts in EIAR are likely impacts (or indeed using impacts assessed and reported in an EIAR using old/out of date CRA avoidance rates). As the recent work on upland bird species demonstrates, few predicted construction and operational wind farm impacts on a range of upland species are supported by post-construction monitoring across multiple sites. Whilst more work on this subject is necessary, Pearce-Higgins *et al,* (2012)[2] demonstrate that there is little evidence for consistent post-construction declines in any potentially important ornithological receptors relevant to Beaw Field Wind Farm, except curlew (note it excluded raptors and so made no reference to merlin), but suggested that temporary wind farm construction impacts have greater impacts upon upland birds than wind farm operational impacts.

10.6.4 SNH's prime concern is to maintain the conservation status of a relevant species' population size, population trend and its natural range within Scotland, i.e. whether or not the impact of the development proposal raises issues of national interest (using the concept of FCS) and that of the relevant NHZ – Shetland in this case. Thus, the search limits for cumulative assessment should accord with wind farm developments in Shetland within the planning system (where ornithological data are publicly available).

10.6.5 Table 10.11 provides a list of all wind farm sites within the Shetland NHZ. No significant residual effects are predicted on the important ornithological receptors present at Beaw Field Wind Farm (Table 10.12). The only regularly occurring important ornithological receptor within the Site on which cumulative impacts could possibly occur is merlin, with a minor, permanent adverse effect due to loss of one irregularly used territory (a precautionary worse-case scenario, not likely scenario).

Table 10.11: Other Shetland wind farms considered in cumulative impact assessment

Wind farm	***Planning status***	***Location***	***No. of turbines***
Viking Wind Farm	Approved	Southwest, on Shetland Mainland	103
Garth Wind Farm	Approved	North, near Cullivoe on Yell	5
Gremista Wind Turbine	Approved	Southwest, near Lerwick on Shetland Mainland	3
Burradale Wind Farm (Phase 1 & 2)	Built, operational	Southwest, near Lerwick on Shetland Mainland	5
Energy Isles	Awaiting Decision	North, Northern Yell north of Gossa Water	17

10.6.6 The main species potentially significantly impacted by the Viking Wind Farm was considered to be breeding whimbrel (which are not present on the Beaw Field Wind Farm site). However, at Appeal in the Court of Session in 2014, Lord Brodie delivered the Opinion of The Inner House of the Court of Session that the Viking Wind Farm consent was competent, that Scottish ministers acted lawfully in issuing the decision letter and there was no breach of the EU Birds Directive because ministers had considered impacts (and residual effects) on birds, whimbrel in particular, properly (www.vikingenergy.co.uk/court-victory-for-viking-wind-farm). As a result, it has been determined that the Viking Wind Farm will not have any significant residual effects on important bird species in Shetland. It should be noted that the Viking CRA work used some old (now out of date) CRA avoidance rates. For example, it is likely that if the data were reanalysed with the current red-throated diver avoidance rate of 99% that lower, still negligible amounts diver collision mortality would be predicted for the Viking Wind Farm. <u>A further assessment was carried out to support the Section 36 application process to increase blade tip heights at Viking from 145m to 155m. It assessed cumulative effects with the Consented Development and found that the increased tip heights would not increase effects by any more than a negligible amount and so there would continue to be no significant cumulative effects.</u>

10.6.7 Garth Wind Farm ES predicted one red-throated diver collision every 10-11 years (North Yell Development Council, 2009). However, this CRA metric was based on an old CRA avoidance rate of 95%. It is likely that if the data were reanalysed with the current red-throated diver avoidance rate of 99% that lower, still negligible amounts diver collision mortality would be predicted (likely to be none within the life-time of the wind farm given 99% avoidance rate). The CRA for great skua was predicted to be 0.8 birds per year, or approximately four deaths due to collision risk every 5 years[44]. However, this metric was also based on an old CRA avoidance rate of 95%. It is likely that if the data were reanalysed with the current great skua avoidance rate of 99% that lower, negligible amounts great skua collision mortality would be predicted. All other bird species present were predicted to have no or trivial losses. No significant effects were predicted on ornithological receptors associated with the Garth Wind Farm in North Yell, so following NatureScot guidance, no significant cumulative impacts are likely.

10.6.8 The Gremista ES[45] reports on negligible, non-significant effects for all potentially important ornithological receptors. It should be noted that the Gremista CRA work used old (now out of date) avoidance rates. For example, it is likely that if the data were reanalysed with the current red-throated diver avoidance rate of 99% that lower, still negligible amounts diver collision mortality would be predicted. No significant effects were predicted on ornithological receptors associated with the Gremista Wind Farm, so following NatureScot guidance, no significant cumulative impacts are likely.

10.6.9 The Burravoe Wind Farm was commissioned in 2000 and 2003 and the application is no longer publicly available and so of little use to cumulative impact considerations. Presumably no significant effects were predicted on ornithological receptors associated with Burravoe Wind Farm, so following NatureScot guidance, no significant cumulative impacts are likely.

10.6.10 The EIA for the Energy Isles Wind Farm considered cumulative effects with the Consented Development. Due to there being negligible predicted impacts resulting form the Consented Development in solus and given the separation distance, it concluded that these two developments are unlikely to impact on the same population of any particular species.

10.6.11 Based on information that is publicly available, no significant impacts on important ornithological receptors are predicted for the above four Shetland wind farms. Consequently, Favourable Conservation Status for all relevant species will be maintained and so **no significant effects** are predicted in association with Beaw Field Wind Farm. Clarification of the robustness of the original cumulative assessment was provided in the FEI submission (Appendix 1.2).

10.7 Mitigation and enhancement measures

10.7.1 A usefulf hierarchy of mitigation for potential impacts is to:

- Avoid negative ecological impacts, especially those that could be significant to important receptors;
- Reduce negative impacts that could be avoided; and
- Compensate for any remaining significant impacts.

10.7.2 Mitigation to avoid adverse impacts was incorporated during the design phase, for example by excluding turbines from the entire western part of the Site (Chapter 3: Project Description). No significant effects on designated sites or any wider countryside bird species are predicted (but see comments on precautionary, worse-case, not likely effects on merlin) and so no specific mitigation is required to offset predicted likely significant effects. This assumes best practice measures relating to the overall design of the planned works and that the method statements prepared for construction are implemented fully. Such measures will be detailed in the Construction Environment Management Plan (CEMP) and Breeding Birds Protection Plan (BBPP), which the contractor will be required to implement.

10.7.3 Detailed best practice measures will be included in the CEMP and BBPP, based on the information contained in this EIAR and taking into account any additional requirements as part of consent conditions and findings of pre-construction ornithological surveys. A suitably qualified and experienced Ecological Clerk of Works (ECoW) will provide input into the CEMP and BBPP prior to the start of construction. Monitoring the implementation of mitigation as outlined in this EIAR and compliance in line with the requirements in the CEMP and BBPP will be important components of the ECoW's remit during construction. A breeding bird protection plan is a plan designed to ensure breeding birds and their nests are not disturbed, damaged or destroyed during construction. The BBPP will be prepared prior to construction, with input from NatureScot and will follow their best practice guidance (currently outlined in their on-line guidance 'Dealing with construction and breeding birds').

10.7.4 It should be noted that Scottish Planning Policy[46] requires development projects to avoid significant impacts and effects and, where possible, to mitigate non-significant impacts and seek to achieve biodiversity benefits, which can be delivered for example through habitat enhancements for bird species. These mitigation measures and biodiversity enhancements are outlined in Appendix 10.4: Outline Habitat Management Plan.

Red-throated divers

10.7.5 The Outline Habitat Management Plan (OHMP) provides details of red-throated diver lochan enhancement measures. The main aim of OHMP diver work is to create conditions on former lochans on Yell conducive to the enhancement of habitat and restoration of breeding red-throated divers. Over recent decades many diver breeding lochans have been lost due to overgrazing and erosion of surrounding peat in Shetland[19]. The overgrazing and erosion is caused when the action of sheep (through trampling and grazing) opens up one or more gaps or gullies through which the lochan water drains out. The result is that several formerly suitable red-throated diver lochans on Yell have either dried out or become too shallow to be used by nesting divers in recent years.

10.7.6 Six potentially suitable candidate lochans in southern Yell have been identified for restoration work. Landowner liaison has taken place and long-term agreements (for the life-time of the Beaw Field Wind Farm) secured for the planned conservation work. If and when consent is granted for the Beaw Field Wind Farm, planned OHMP work on these lochans will begin as soon as is practicable, i.e. before wind farm construction commences. When restored, each of the lochans will quickly provide suitable water levels for nesting by red-throated divers.

10.7.7 Given the large number of non-breeding red-throated divers within the Shetland population and the restoration lochan locations (in areas heavily used by breeding and non-breeding red-throated divers) it is anticipated that most, perhaps all, of the six lochans will be regularly used for breeding.

Merlin

10.7.8 The OHMP provides details of merlin nesting habitat enhancement measures. Another aim of OHMP work is to improve nest habitat quality at two traditional but abandoned merlin territories within the Study Area, away from construction and operational activities. This measure is based on the tenet that the current state of the merlin nesting habitat, in particular deep heather, at all known southern Yell territories is poor due to high grazing pressure and this has contributed to low territory occupancy rates in the recent past and present. During ornithological surveys (2011-2015) two active merlin territories were identified in southern Yell but neither was regularly occupied throughout the study period (i.e. there were years when these territories were not used). Two additional unoccupied, former territories were also identified on east facing slopes of West Hill in Aris Dale and Stouraclev in Canis Dale.

10.7.9 It is intended that merlin nesting habitat quality will be improved by erecting fences (creating an exclosure) around areas of potential suitable nesting habitat to exclude livestock (i.e. sheep) in former, currently unoccupied territories in southern Yell. The increase in merlin nesting habitat quality that is expected to follow from exclosure fences is predicted to increase merlin occupancy rates in at least one of the two treated territories. This would potentially offset non-significant adverse effects from the Consented Development on one pair of merlin that has irregularly nested within the Study Area. By providing two areas of long-rank heather, within former merlin territories it is predicted that merlins will find the habitat conditions suitable for a long time (i.e. life-time of the Beaw Field Wind Farm). The occasional/intermittent use of existing territories in southern Yell strongly suggests optimal conditions for nesting are not currently available. Therefore, by providing optimal conditions in Southern Yell merlins are likely to utilise them.

10.7.10 The two sites were selected for merlin habitat restoration exclosures because both have a combination of (current) poor habitat condition and historically low occupancy rates and importantly are away from proposed wind turbine locations. Both restoration sites held at least some stands of remnant heather and so have the potential to be improved (i.e. from short heather currently present to deep and dense heather in the future) and, in the judgement of the ornithologist, were sites intrinsically attractive to nesting merlin in terms of their slope, aspect and position in the landscape. As these sites were historical merlin territories, they clearly hold features intrinsically attractive to merlins.

10.7.11 Aris Dale holds suitable merlin passerine prey and hunting merlins have occasionally been seen here during ornithological surveys. There is an opportunity to expand and enhance native broadleaved cover along the Burn of Arisdale. Given historical clearance of all native woodland on Yell, there is little woodland cover anywhere outside gardens. Woodland expansion would benefit a range of songbird species, which should increase in number/density.

10.7.12 The aim of this additional enhancement work will be plant native broadleaved trees along ca. 1km of the banks of the Burn of Aridale, centred around the existing small group of planted broadleaves at Arisdale croft. An increase in song bird densities, which would occur with broadleaved expansion in this area, would likely improve prey densities for merlins in the area immediately below the West Hill merlin nesting exclosure (Appendix 10.4: Outline Habitat Management Plan).

Peatland restoration

10.7.13 Peatland restoration will take place primarily through reductions in grazing pressure over the entire Application Boundary area, ca. 1,158ha. The maximum number of sheep allowed in the area at present is 1,800 units (sheep), the actual current figure grazing is ca. 1,200 sheep and, through the mechanism of the Beaw Field Wind Farm, sheep numbers will be reduced down to a maximum of 600 (Appendix 10.4: Outline Habitat Management Plan). The evidence from adjacent land at West Yell suggests that a large scale reduction in grazing pressure should result in bare peat surfaces and hags naturally revegetating with little or no other interventionist management across large areas of the Site, most of it away from the turbine area. This general habitat improvement for blanket bog habitats is likely to benefit a range of breeding upland bird species.

10.8 Residual effects

10.8.1 Table 10.12 summaries the residual effects of the Consented Development. No significant residual effects are predicted.

Table 10.12: Summary of Residual Effects

Project phase	***Receptor***	***Importance of Site bird population***	***Magnitude of change (Pre-mitigation)***	***Additional mitigation***	***Magnitude of change (post-mitigation)***	***Nature of change***			
						Positive/ negative	***Permanent/ temporary***	***Reversible/ irreversible***	***Residual significance***
Construction & operation	Otterswick & Graveland SPA/SSSI	None	None	None	None	None	None	None	Not significant
Construction & operation	Red-throated diver	Local	Negligible	Restoration of diver lochans	Negligible	Positive	Permanent	Irreversible	Not significant
Construction & operation	Greylag goose	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant
Construction & operation	Golden plover	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant
Construction & operation	Dunlin	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant
Construction & operation	Lapwing	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant
Construction & operation	Oystercatcher	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant

Table 10.12: Summary of Residual Effects

Project phase	*Receptor*	*Importance of Site bird population*	*Magnitude of change (Pre-mitigation)*	*Additional mitigation*	*Magnitude of change (post-mitigation)*	*Nature of change*			
						Positive/ negative	*Permanent/ temporary*	*Reversible/ irreversible*	*Residual significance*
Construction & operation	Ringer plover	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant
Construction & operation	Curlew	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant
Construction & operation	Snipe	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant
Construction & operation	Arctic skua	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant
Construction & operation	Great skua	Local	Negligible	None	Negligible	Negligible	Permanent	Irreversible	Not significant
Construction & operation	Merlin	Local/Region al	Negligible	Restoration of suitable nesting habitat within former merlin territories	Negligible	Positive	Permanent	Irreversible	Not significant

10.9 Monitoring

10.9.1 Monitoring of a range of ornithological receptors needs to take place prior to construction, during construction and during operation. As a general principle, NatureScot'spost-consent and post-construction monitoring guidance[7] will be followed and agreed with SIC. An independent and fully qualified ECoW will be employed during construction of the Consented Development.

10.9.2 Pre-construction surveys will be carried out and used to inform and adjust the construction programme to avoid disturbance to Schedule 1 and Annex 1 breeding birds (offences under the Wildlife and Countryside Act 1981 (as amended by the Nature Conservation (Scotland) Act 2004)). This survey will form the basis of a detailed BBPP to ensure that construction activities do not result in disturbance of important avian receptors present. Suitable disturbance free buffer zones will be identified around any Schedule 1 breeding birds if found to be present.

10.9.3 Monitoring associated with the planned mitigation and enhancement works will be required and is summarised in Appendix 10.4 Outline Habitat Management Plan.

10.10 Summary and conclusions

10.10.1 No significant adverse residual effects are predicted for any of the ornithological receptors in the Study Area. This assessment does not predict any residual effects considered significant.

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