To	Alexander Ford (MS), Robert Main (MS), David O'Sullivan (MS).
Cc.	Roger May (MS), Finlay Bennet (MS), Victoria Appleyard (JNCC), Erica Knott (SNH).
From	Karen Hall (JNCC), Catriona Gall (SNH).
Date	18 December 2012
Subject	**MORL Offshore Windfarm – Preliminary advice from JNCC & SNH**

This memo provides JNCC and SNH advice from our review of the MORL Environmental Statement (ES). While we have some concerns about the complexity of the ES structure, we welcome the thorough approach that has been taken by the applicant, including pre-application consultation on a draft ES.

This memo provides our advice on key natural heritage interests and impacts to consider in respect of the proposed MORL windfarm development, as identified below. We do not identify any further information required from the applicant in respect of seascape, landscape and visual impact assessment (SLVIA). In respect of marine mammals, fish, benthic ecology and coastal processes, we are in current discussion with Marine Scotland regarding the consenting process, the cumulative impacts of MORL together with Beatrice, and the conditions that might be required for mitigating and / or monitoring the impacts of these proposals.

The main outstanding issue is therefore impact assessment and Habitats Regulations Appraisal for key seabird species from a number of Special Protection Areas within foraging distance. We are in current discussion with Marine Scotland and MORL over this, and with both MORL and Beatrice regarding cumulative impacts. The situation remains complicated due to each developer adopting different approaches to the impact assessment / HRA for these bird species in their submitted ES, so that providing our advice on cumulative impacts is more problematic.

1. KEY NATURAL HERITAGE INTERESTS AND IMPACTS TO CONSIDER

The following natural heritage interests and impacts (a) – (d) are those which are key for consideration of MORL by itself and together with the adjacent Beatrice windfarm proposal.

a) Qualifying Interests of Special Protection Areas (SPAs)

Habitats Regulations Appraisal (HRA) of operational windfarm impacts on key seabird species during the breeding season, as the windfarm is located within foraging range of a number of SPA breeding seabird colonies. Please see section 2 on ornithology.

b) Qualifying Interests of Special Areas of Conservation (SACs)

HRA of windfarm construction impacts on harbour seals as a qualifying interest of the Dornoch Firth & Morrich More SAC and on bottlenose dolphin as a qualifying interest of the Moray Firth SAC. Please see the further discussion under section 3 on marine mammals and our HRA advice for marine mammal interests presented in Appendix A.

HRA of windfarm construction impacts on freshwater fish and associated species – Atlantic salmon, freshwater pearl mussel and sea lamprey – which are qualifying interests of riverine SACs in the area. Please refer to our HRA advice on these species presented in Appendix B.

c) European Protected Species

Consideration of EPS licensing requirements for cetacean species. Please see the discussion under section 3 on marine mammals.

d) Marine Fish

Impacts of windfarm construction, particularly underwater noise impacts, on cod and herring. Please refer to the discussion under section 4 on fish interests.

d) Seascape, Landscape and Visual Impacts

Please see the summary of our key advice provided in section 5.

2. ORNITHOLOGY

Summary of key advice

We confirm that Appendix A (Population Viability Analysis outputs for SPA species) of Appendix 4.5 A (Ornithology) of the MORL ES addresses the key seabird species we were expecting: great black-backed gull, herring gull, kittiwake, gannet, guillemot, razorbill and puffin – as requested in our note to the Moray Firth Offshore Wind Developers' Group (MFOWDG), dated 26 August 2011. MORL are also addressing fulmar, which we consider helpful.

We provided headline points on ornithology to MORL for discussion at the meeting held on Friday 7 December 2012. At this meeting we agreed to outline the information we are expecting regarding the presentation of, and outputs from, MORL's population modelling. We further discussed these matters at a teleconference held on Friday 14 December between Marine Scotland, MORL and ourselves. Discussion over the impact assessments (including HRA) for bird species is ongoing, so we are continuing to liaise with Marine Scotland both for MORL alone, and in respect of the cumulative impacts of MORL and Beatrice together.

3. MARINE MAMMALS

Summary of key advice

As discussed at the meeting held on Thursday 6 December, JNCC and SNH are satisfied with the assessment approach undertaken by MORL: the interim Population Consequences of Disturbance (PCoD) framework outlined in Appendix 7.3B of the ES, with key areas of scientific uncertainty (and their significance) highlighted in Table 4.7 in Appendix 7.3A.

For harbour seal and bottlenose dolphin this PCoD framework allows for long-term population modelling to be undertaken. This demonstrates that while there will be short and medium-term effects on each population, the populations are sustainable over the long-term. Please see Appendix A for our advice on Habitats Regulations Appraisal (HRA) for these two species.

MORL have committed to further studies to help address the conservative assumptions used within the interim PCoD assessment framework. For example, their met mast study aims to validate noise estimates of piling activities and further define species responses to this noise (looking at harbour porpoise and harbour seal). They will also be reviewing other work (such as the Wash study of tagged harbour seals) that may help refine the assumptions and predictions made within the ES. We welcome this commitment from MORL and will continue to discuss these matters as studies progress.

As also discussed at the meeting on Thursday 6 December, MORL recognise that licensing of the project will be required to cover risk of disturbance to European Protected Species (EPS). JNCC and SNH note that all cetacean species have EPS status, so consideration needs to be given to all these species recorded within the Moray Firth, not just those listed in Appendix 7.3H. We note that further discussion is needed between Marine Scotland and ourselves with regard to an EPS licensing framework for marine developments, including renewables.

4. FISH OF CONSERVATION CONCERN

Summary of key advice on marine fish species

Underwater noise impacts during construction are the key consideration for marine fish species. Cod and herring are the key species of concern; we agree with the ES that the (pre-mitigation) underwater noise impacts of pile-driving the MORL turbine foundations are of moderate-major significance for cod and moderate for herring. We note that the piling requirements for the offshore platforms should be included alongside those for the turbines in any overall assessment of noise impacts during construction.

As we discussed at the meeting on Thursday 6 December, while MORL provide a spatial zone of impact for a 'worst case' piling scenario, this is not then discussed or explored in respect of the temporal aspects. We need a better understanding of construction programming for the 'most likely' (or realistic) development scenario that is being considered by MORL. To inform discussions over potential construction impacts, it would be helpful for the applicant to provide an analysis of available data on seasonal weather patterns and oceanographic conditions expected at the MORL windfarm site. It would then be helpful to know how the applicant is accounting for these aspects in their construction programming.

As also discussed at the meeting, we would welcome further consideration of possible mitigation options (in addition to soft-start piling) that could help reduce or manage underwater noise impacts to cod and herring in particular. We are in current discussion with Marine Scotland to agree the required conditions for consenting.

In the ES, proposed mitigation of electric magnetic fields is the burial of cables to 1m in soft sediments (comprising the majority of the cable route), and placement of 0.25m depth of rock armouring in those locations where cable burial is not possible. The ES correctly notes the considerable degree of uncertainty regarding the impacts of EMF. Nevertheless, on the basis of existing knowledge, we consider this to be sufficient mitigation for any EMF effects from the MORL proposal on marine fish. As noted above, we are in current discussion with MS to agree the required conditions for consenting.

Summary of key advice on diadromous fish species

The ES recognises the principle areas that could lead to adverse impacts on Atlantic salmon, sea trout, sea lamprey and European eel. The ES also recognises the uncertainties regarding the behaviour of these diadromous fish species in the marine environment, and their potential interaction with construction / operation / decommissioning of the proposed windfarm.

The effect of noise on Atlantic salmon and sea trout is assessed to be negative, of minor-moderate significance and probable. For sea / river lamprey the effect is estimated to be small, and for European eel, the effect is thought to be between medium and small. For these species, we consider that noise disturbance to individuals will not result in population level effects. We are in current discussion with MS to agree the required conditions for consenting.

Please see the previous section for discussion of EMF that may arise from cabling. On the basis of existing knowledge, we consider that the mitigation (cable burial / rock armouring) proposed in the ES will be sufficient to avoid any significant EMF effects on diadromous fish species. As noted above, we are in current discussion with MS to agree the required conditions for consenting.

Please see Appendix B for JNCC and SNH's advice on HRA in respect of the qualifying interests of riverine SACs.

5. SEASCAPE, LANDSCAPE & VISUAL IMPACTS

Summary of key advice for MORL

We provide the following advice on seascape, landscape and visual impacts for the proposed MORL windfarm development (the eastern development area):

- The principal change arising due to MORL will be its visibility from the Caithness coast. There will be no intrinsic character change to the Caithness landscape. MORL's distance from the shore, the activities and focus of receptors along the coast / within the coastal hinterland, and intermittent windows of visibility (needed to clearly see the development) mean that it will not dominate the Caithness coastal and landscape character.
- Sea views from the Caithness and Sutherland coasts will change from an open, 'unpopulated' sea, with incidental marine traffic. In good weather, with clear visibility, MORL (at distances of 35+km) will read as a distant, linear feature on the horizon. Overall, MORL will form a 'seascape' element associated with the distant, outer marine environment rather than inshore waters; it is not likely to be perceived as a coastal feature. Nor will it dominate the coast.
- In a core area extending from north of Wick to Dunbeath, MORL will create a prominent 'landmark' on the open sea skyline, changing sea views. Impacts on the coastal character will be moderate.
- There will be a significant change in night time character of seas and skies within the core area.
- Within this core area there will be locally major impacts on specific viewpoints, scenic panoramas and places (especially elevated clifftop castles and landmarks). These form Caithness's coastal scenic resource. There will be locally major impacts on Dunbeath Castle Historic Garden and Designed Landscape.
- There will be no impacts on nationally designated landscapes. There will be negligible impacts on Duncansby Head Special Landscape Area (SLA) and locally moderate change to Berriedale Coast section of Flow Country and Berriedale Coast SLA.
- MORL will form a significant feature on the horizon in seaward views from the A9 between Berriedale and Latheron, for 14.5km; the A99 between Latheron and Thrumster, for 20km. It will have a locally major impact on views from the A9 at the Ord of Caithness and on keyhole views from road to sea at Ousedale; as well as on travellers eastwards on the A882.
- There will be negligible impacts on the Aberdeenshire and Moray coasts as MORL lies 40+km. Visibility would be limited to periods of exceptional / excellent weather and light conditions.

Summary of key advice on cumulative SLVI of MORL and Beatrice together:

We provide the following advice on the cumulative seascape, landscape and visual impacts of MORL (the eastern development area) and Beatrice together:

- Beatrice is the windfarm proposal which significantly develops the sea skyline, and MORL only marginally increases the influence and prominence of windfarm development on the horizon.
- MORL is consistently seen behind Beatrice and the two windfarms will appear to be a single development.
- As it is further offshore, MORL is constantly more 'recessive' in the view, with its image, scale and form consistent with Beatrice standing to the 'forefront'.

Comments on the baseline assessment presented in the ES

- The coastal character assessment methodology follows relevant guidance resulting in a comprehensive, clear and well-presented description and appreciation of the baseline landscape and coastal character of the East Coast and Moray Coast study area.
- The visual baseline and assessment is also well-considered and illustrated in the ES.

6. HYDRODYNAMIC PROCESSES & COASTAL GEOMORPHOLOGY

Summary of key advice

We note the difficulty on providing advice on sediment concentration modelling and the assessment of scour effects, when the applicant retains a broad design (Rochdale) envelope. In particular the 'worst case' scenario of using all gravity bases across the windfarm is problematic, as discussed under section 7 below on benthic ecology. We recommend that the applicant further discusses this issue with Marine Scotland in the first instance.

We would welcome greater clarity on the likely distribution of sediments released as a result of scour effects, and the applicant's particle tracking modelling could be used to help inform discussion. We advise that consideration of scour effects (and any supporting modelling) is best undertaken at the point a 'most likely' development scenario can be detailed, proposing a realistic number / distribution of gravity bases and jacket structures across the windfarm site. We are in current discussion with Marine Scotland over consenting issues and how to deal with uncertainty in the impact assessment process, introduced by applicants' use of design (Rochdale) envelopes.

Table 9.2-2 in chapter 9 (Physical Environment) of ES Volume 4 (Transmission Infrastructure) indicates that the installation approach for the cable landfall has not yet been confirmed, and it may be either horizontal directional drilling (HDD) or open cut trenching. We note that the Export Cable Feasibility Study (Appendix 2.1A, ES Volume 8) provides advice that:

> Open cut trenching across these is unlikely to be technically feasible. The clear beach expanse and low height differential would be conducive to a short direct HDD (200m) breaking out onto the beach intertidal area.

As MORL refines their project proposal, JNCC and SNH seek continued consultation over the proposed location and installation approach for this cable landfall. We are in discussion with Marine Scotland to agree the required conditions for consenting.

7. BENTHIC ECOLOGY

Summary of key advice

At the meeting held on 6 December 2012, we discussed the difficulties in presenting a 'worst case scenario' using gravity bases as the proposed foundation type for all turbines. It is unclear from the ES, and from discussion with the applicant, whether this 'worst case scenario' has been, or can be, fully assessed. We recommend that the applicant further discusses this issue with Marine Scotland in the first instance – particularly with regard to anticipated dredging work and sediment discharge (with associated licensing requirements) and the decommissioning of gravity bases.

JNCC and SNH would note that the sediment concentration modelling for the 'worst case' using all gravity bases, has been done on the assumption that all dredged material would be removed from the windfarm to a licensed disposal site. On this basis, we would not be concerned that the resultant levels of sediment dispersal would have any significant effects on benthic ecology. The modelled sediment release from the windfarm is well within levels that may naturally occur (such as during storm events). We note, however, that it is not confirmed whether all dredged material can actually be removed from the site (which Marine Scotland and the applicant need to further discuss). If not, then we could be concerned about the possible levels of sediment dispersal, and require this to be modelled (i.e. using the assumption that dredged material is to be released on-site).

We welcome the sandeel survey that has been carried out by MORL following recommendations from Marine Scotland Science (MSS). This indicates low densities across the eastern development area and we are satisfied that the MORL windfarm proposal would not result in significant impacts to sandeels. MSS will be able to advise whether post-construction monitoring of sandeel could be helpful in this area.

Benthic survey work for MORL has identified Annex I habitat within the export cable route: *Sabellaria spinulosa* reef and stony and rocky reefs. As discussed at pre-application, and presented in the submitted ES, the applicant proposes micro-siting the export cable around the Sabellaria reef (which is patchily distributed) and using installation aids to prevent damage. No mitigation is currently proposed regarding the areas of stony and rocky reef, as the ES notes that impacts would be limited, compared to the wider distribution of this habitat type within the survey area.

JNCC and SNH seek further discussion over proposed micro-siting and installation methods for the export cable, as the applicant refines their project proposal. We are in current discussion with Marine Scotland to agree the required conditions for consenting.

The ES states the intention to use good practice to reduce / avoid the possibility of introducing non-native species into the Moray Firth from the range of activities associated with the proposed windfarm development. We would welcome further discussion of this aspect in order to inform our recommendations for consent conditions.

APPENDIX A

MARINE MAMMALS
JNCC & SNH ADVICE for HABITATS REGULATIONS APPRAISAL

Introduction

Habitats Regulations Appraisal is the process which applies to any plan or project with the potential to affect the qualifying interests of a Natura site. As set out in our scoping response, we advise that the marine mammal interests of the following Special Areas of Conservation (SACs) will need to be addressed under HRA for the MORL offshore windfarm proposal:

- **Dornoch Firth & Morrich More SAC** - designated for its population of harbour seals (*Phoca vitulina*) and for coastal and marine habitats including sand dune habitats, intertidal mudflats and sandflats; subtidal sandbanks and reefs.
- **Moray Firth SAC** - designated for bottlenose dolphin (*Tursiops truncatus*) and for subtidal sandbank habitat.

JNCC & SNH advice for Habitats Regulations Appraisal

We provide the following advice to Marine Scotland for informing HRA in respect of the marine mammal interests of each of these SACs:

1. Is the proposal connected with or necessary for SAC conservation management?

The proposal is not directly connected with or necessary for the conservation management of either the Dornoch Firth & Morrich More SAC or the Moray Firth SAC.

2. Is the proposal likely to have a significant effect on the qualifying interests of the SACs either alone or in combination with other plans or projects?

- **Harbour seals** of the Dornoch Firth SAC.

  The seals are not confined to this SAC itself and will range more widely within the Firth and beyond. Construction (and other) noise arising from the proposal is modelled to extend beyond the windfarm footprint and may overlap with seal use of the surrounding environment (see Technical Appendix 7.3F of the MORL ES – Noise propagation and SAFESIMM model outputs for marine mammal risk assessment). Boat movements, cable-laying and other construction activity may give rise to disturbance. There may also be impacts to the prey species of seals – either from the placement of infrastructure or due to noise.

  We therefore advise the possibility of **likely significant effect** from the MORL windfarm proposal on the harbour seals of the Dornoch Firth SAC, so impacts (including cumulative) will need to be considered in appropriate assessment (see step 3 below).

- **Bottlenose dolphins** of the Moray Firth SAC.

  The dolphins are not confined to this SAC and will range more widely within the Firth and beyond. Construction (and other) noise arising from the proposal is modelled to extend beyond the windfarm footprint and may overlap with dolphin use of the surrounding environment (see Technical Appendix 7.3F of the MORL ES – Noise propagation and SAFESIMM model outputs for marine mammal risk assessment). Boat movements, cable-laying and other construction activity may give rise to disturbance. There may also be impacts to the prey species of dolphin – either from the placement of infrastructure or due to noise.

  We therefore advise the possibility of **likely significant effect** from the MORL windfarm proposal on the bottlenose dolphins of the Moray Firth SAC, so impacts (including cumulative) will need to be considered in appropriate assessment (see step 3 below).

3. Can it be ascertained that the proposal will not adversely affect the integrity of the SAC, either alone or in combination with other plans or projects?

This step is termed **appropriate assessment**, and it is to be undertaken by Marine Scotland, based on information in the Environmental Statement (ES) submitted for MORL, with advice from ourselves. Marine Scotland are currently considering how the consenting process can take account of the design envelopes requested by windfarm applicants. So while JNCC and SNH are able to provide our overall advice on HRA, including appropriate assessment, we are still in discussion with Marine Scotland over the conditions required for consenting – to mitigate construction impacts to these marine mammal interests (see discussion below).

Appropriate assessment considers the implications of the proposed MORL windfarm for the (relevant) conservation objectives relating to the harbour seals of the Dornoch Firth SAC and the bottlenose dolphins of the Moray Firth SAC. Please refer to http://www.snh.org.uk/snhi/ for a full list of these conservation objectives as we only discuss the relevant ones below.

- **Harbour seals** of the Dornoch Firth SAC.

  The relevant conservation objective to consider is the maintenance of the harbour seal population as a viable component of the Dornoch Firth SAC. This encompasses any significant disturbance to individuals while they are outwith the SAC, such as underwater noise impacts arising from windfarm construction.

  As presented in Appendices 7.3A & B, MORL have developed an assessment framework for harbour seals which considers whether any noise (and other) impacts to individuals would result in population level effects. JNCC and SNH are satisfied with this approach as the best possible under current scientific knowledge – it sets out a process for considering the outcomes of noise disturbance and behavioural displacement as a reduction in the individual fitness of animals and then models the consequences of this for the population, using reproductive success as the key parameter that is affected. Key areas of scientific uncertainty are highlighted, including their significance to the assessment framework.

  As presented in the ES, the framework predicts that noise and other impacts from windfarm construction will reduce the breeding success of the harbour seal population for the duration of construction. While this results in population-level effects over the short and medium-term (a construction phase of up to 6 years for MORL and Beatrice together), the population is expected to recover in the long-term once windfarm construction is complete. This modelling is for a 'worst case' that considers the construction impacts of both windfarms together on harbour seals, and alongside continuing seal mortality due to licensed shooting.

  Therefore JNCC and SNH are satisfied that there will be no adverse impacts on SAC site integrity over the long-term, and that the short and medium-term effects on the harbour seal population can be reduced through construction programming at the MORL and Beatrice sites. We are in current discussion with Marine Scotland, as the competent authority, to agree the required conditions for consenting.

- **Bottlenose dolphins** of the Moray Firth SAC.

  The relevant conservation objective to consider is the maintenance of the bottlenose dolphin population as a viable component of the Moray Firth SAC. This encompasses any significant disturbance to individuals while they are outwith the SAC, such as underwater noise impacts arising from windfarm construction.

  MORL have modelled a worst case for potential noise impacts to bottlenose dolphin during construction and then modelled whether such impacts would result in any population level effects (see Technical Appendix 7.3A). As before, JNCC and SNH are satisfied with this approach as the best possible under current scientific knowledge. We are satisfied that there is expected to be no long-term effects on the bottlenose dolphin population of the Moray Firth SAC arising from the proposed MORL windfarm by itself, or from this site together with Beatrice, and as such no adverse impact to SAC site integrity over the long-term.

It is also unlikely that there will be any significant effects to the bottlenose dolphin population during construction. Although, the zones of impact from the noisiest construction activities (associated with pile-driving the turbine foundations) could slightly extend into areas used by bottlenose dolphin transiting along the coast in the Moray Firth (modelling a 'worst case' for piling at MORL and Beatrice windfarm sites together), such effects can be reduced through construction programming at each of the windfarms.

We advise that potential disturbance to bottlenose dolphin from other construction activities – and in particular the installation of export cable routes – can also be managed via construction programming for MORL and for Beatrice. We are in current discussion with Marine Scotland, as the competent authority, to agree the required conditions for consenting. These will be needed for bottlenose dolphin both as an SAC qualifying interest, and in respect of their status as a European Protected Species.

APPENDIX B

FRESHWATER FISH of CONSERVATION CONCERN
JNCC & SNH ADVICE for HABITATS REGULATIONS APPRAISAL

Introduction

Habitats Regulations Appraisal is the process which applies to any plan or project with the potential to affect the qualifying interests of a Natura site. As set out in our scoping response, we advise that the freshwater fish interests of the following Special Areas of Conservation (SACs) will need to be addressed under HRA for the MORL offshore windfarm proposal:

- **Berriedale & Langwell Waters SAC** - designated for Atlantic salmon (*Salmo salar*).
- **River Evelix SAC** - designated for freshwater pearl mussel (*Margaritifera margaritifera*).
- **River Moriston SAC** - designated for Atlantic salmon and for freshwater pearl mussel.
- **River Oykel SAC** - designated for Atlantic salmon and for freshwater pearl mussel.
- **River Spey SAC** - designated for Atlantic salmon, sea lamprey (*Petromyzon marinus*), freshwater pearl mussel and otter (*Lutra lutra*).
- **River Thurso SAC** - designated for Atlantic salmon.

We have considered other SACs and included only those that we consider relevant i.e. where there may be connectivity between the windfarm proposal and the SAC.

JNCC & SNH advice for Habitats Regulations Appraisal

We provide the following advice to Marine Scotland for informing HRA in respect of the freshwater fish interests of each of the above riverine SACs:

1. Is the proposal connected with or necessary for SAC conservation management?

The proposal is not directly connected with or necessary for the conservation management of any of the above riverine SACs.

2. Is the proposal likely to have a significant effect on the qualifying interests of the SACs either alone or in combination with other plans or projects?

- **Atlantic salmon**

We have listed a wide range of SACs due to the current uncertainty about the migratory movements of Atlantic salmon – they are recorded in the Moray Firth, but we do not know which SAC watercourses adult fish or post smolts are going to, or coming from.

We advise **likely significant effect** from the MORL windfarm proposal on Atlantic salmon due to the possibility that they could be disturbed by construction noise and / or possible effects of electro-magnetic fields (EMF) arising from installed cables. We are satisfied that operational noise would not result in likely significant effects to salmon.

Impacts (including cumulative) will therefore need to be considered in appropriate assessment (see step 3 below).

- **Freshwater Pearl Mussel**

Atlantic salmon (and other salmonids) are integral to the life cycle of freshwater pearl mussel (FWPM), therefore any impacts to Atlantic salmon that prevent them from returning to their natal rivers may have a resulting effect on FWPM populations.

We therefore advise **likely significant effect** from the MORL windfarm proposal on FWPM, so potential indirect impacts to this species will need to be considered in appropriate assessment.

- **Sea Lamprey**

  Sea lamprey is a qualifying interest of the River Spey SAC where is is virtually at the northern limit of its range in Britain. We note that there is little available information on the movements of sea lamprey in general, and within the Moray Firth in particular.

  We advise **likely significant effect** from the MORL windfarm proposal on sea lamprey due to the possibility that they could be disturbed by construction noise and / or possible effects of electro-magnetic fields (EMF) arising from installed cables. We are satisfied that operational noise would not result in likely significant effects to this species.

  Impacts (including cumulative) will therefore need to be considered in appropriate assessment.

3. Can it be ascertained that the proposal will not adversely affect the integrity of the SAC, either alone or in combination with other plans or projects?

This step is termed **appropriate assessment**, and it is to be undertaken by Marine Scotland, based on information in the ES submitted for MORL, with advice from ourselves, as presented below. It considers the implications of the proposal for the (relevant) conservation objectives relating to the SAC qualifying species of concern. Please refer to http://www.snh.org.uk/snhi/ for a full list of these conservation objectives as we only discuss the relevant ones below.

- **Atlantic salmon**

  The relevant conservation objective to consider is whether or not the proposed MORL windfarm would result in any impacts on the viability of Atlantic salmon populations supported by the SACs listed above. While there may be some level of noise disturbance to individuals during construction we confirm that this will not result in population level effects. We are satisfied that operational noise would not result in likely significant effects to salmon.

  The applicant proposes to adopt soft-start piling methods to help mitigate any noise disturbance and to bury cables to reduce EMF. We are satisfied that this mitigation will further reduce impacts to individuals, and avoid population level effects, therefore we advise that the MORL windfarm will not result in any impact to the site integrity of the SACs listed above. We are in current discussion with Marine Scotland, as the competent authority, to agree the required conditions for consenting.

  Due to uncertainty over the impact assessment and information to support HRA in the Beatrice ES, we cannot provide confirmed advice on cumulative impacts at this time.

- **Freshwater Pearl Mussel**

  As there is not impact to the viability of the Atlantic salmon populations of SACs listed above, and no significant effects on other salmonid species (such as sea trout – see our advice in section 4 of this memo) there will be no indirect effects on freshwater pearl mussel (FWPM) populations in the Rivers Evelix, Moriston, Oykel and Spey SACs. We advise that the MORL windfarm will not result in any impact to the site integrity of the SACs listed above.

- **Sea Lamprey**

  The relevant conservation objective to consider is whether or not the proposed MORL windfarm would result in any impacts on the viability of the sea lamprey population of the River Spey SAC. While there may be some level of noise disturbance to individuals during construction we confirm that this will not result in population level effects. We are satisfied that operational noise would not result in likely significant effects to sea lamprey.

  The applicant proposes to adopt soft-start piling methods to help mitigate any noise disturbance and to bury cables to reduce EMF. We are satisfied that this mitigation will further reduce impacts to individuals, and avoid population level effects, therefore we advise that the MORL windfarm will not result in any impact to the site integrity of the River Spey SAC.

  Due to uncertainty over the impact assessment and information to support HRA in the Beatrice ES, we cannot provide confirmed advice on cumulative impacts at this time.

JNCC
Joint Nature Conservation Committee

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

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CNS REN OSWF MORL

For the attention of: Robert Main

8 July 2013

MORAY OFFSHORE RENEWABLES LTD

TELFORD, STEVENSON and MACCOLL: OFFSHORE WINDFARM PROPOSALS

JNCC & SNH ADVICE ON APPLICATION

Background

Thank you for your consultation on the application submitted for the MORL offshore windfarm proposals, made under the Electricity Act 1989, the Marine (Scotland) Act 2010, the Marine and Coastal Access Act 2009 and supporting regulations. The proposals are located in the Round 3, Zone 1 - Eastern Development Area (EDA) in the Moray Firth about 22km from the Caithness coastline.
The site boundary is given in Figure 1.1-2 of the Environmental Statement (ES) (Volume 6a).

Within the marine environment, JNCC is the statutory nature conservation adviser for development proposals from 12 nautical miles offshore out to the edge of the continental shelf. SNH is the statutory adviser for proposals within 12 nautical miles of the coast. We have been liaising closely to provide joint advice on the MORL Round 3 zone, and the Beatrice site lying adjacent. We set out the principles of our joint working on offshore wind proposals in our memo of understanding, dated 8 February 2010.

Use of Design Envelopes

For MORL Eastern Development Area (EDA), within the identified site boundary, the applications for each of the 3 windfarms is made for a design envelope with an 'upper' and 'lower' limit of turbine number and density as follows:

- Number in site 1 – 63 to 139 turbines
- Number in site 2 – 63 to 100 turbines
- Number in site 3 – 63 – 100 turbines

The order of the site construction of the three windfarms, this will be determined post further site analysis. If the 3.6 MW turbine is selected it will only be built out in site 1. The range of turbine sizes is from 3.6MW to 8MW, with a range in blade tip height from 164m to 204m.

The final windfarm design, to be confirmed post-consent, will fall within these limits. The ancillary infrastructure for the windfarm proposal includes 1 offshore meteorological (met) masts, and up to six offshore substation platforms.

The applicant proposes that assessment for each natural heritage interest is based on the scenario (or option) that is considered a 'realistic worst case' for that interest.

HEADLINE ADVICE

i) Impacts to key SPA seabird species

Environmental Impact Assessment (EIA) and Habitats Regulations Appraisal (HRA) have shown that SPA seabird species are the key natural heritage interest which will constrain development of the MORL and Beatrice offshore windfarm proposals in combination. Impacts to birds, including collision risk and displacement, will occur over the operational lifespan of the windfarm, and not only during construction. Please see Appendix (iii) for our full advice to inform HRA, however, the headline issues are these:

- **Collision risk to great black-backed gull**

  Great black-backed gull numbers at the East Caithness Cliffs SPA have decreased from 800 pairs at citation (1996) to 175 pairs in 1999. This is a small and vulnerable population; the level of annual mortality that it can sustain is estimated to be in the order of **2 breeding adults**.

  The 'worst case' prediction of **great black-backed gull** collision mortality arising from Beatrice and MORL EDA in combination is in the order of **22.5 breeding adults**, and for each proposal individually as follows:

  - An estimate of annual collision mortality from MORL EDA in the order of **~2.5 to 7.5 breeding adults**.
  - An estimate of annual collision mortality from Beatrice 'worst case' in the order of **~15 breeding adults**.

  Such levels of collision mortality would give rise to an adverse impact on site integrity at the East Caithness Cliffs SPA in respect of great black-backed gull.

- **Impacts to herring gull – collision risk**

  While the Beatrice 'most likely' scenario and MORL EDA would not individually affect the long-term maintenance of the herring gull population at East Caithness Cliffs SPA, they could in combination. Beatrice 'worst case' affects the population both alone and in combination with MORL. The estimated levels of collision mortality could give rise to an adverse impact on site integrity at this SPA in respect of herring gull. Please see Appendix (iii) for our full advice.

- **Impacts to auk species - displacement**

  The Beatrice and MORL offshore wind proposals may also lead to the displacement of auk species, although we highlight the considerable uncertainty regarding the estimation and effect of displacement. Appendix (iii) provides our full advice in this regard, however, we highlight key impacts to **puffin, guillemot** and **razorbill** at East Caithness Cliffs SPA; and also **puffin** at North Caithness Cliffs SPAs where levels of displacement could give rise to adverse impacts on the site integrity of these SPAs.

  We therefore request a meeting with Marine Scotland to discuss these predicted impacts to key SPA seabird species, particularly the predicted mortality to great black-back gull.

ii) Construction impacts

For a number of key natural heritage interests it is the construction phase of development which gives rise to the highest levels of impact, including marine and freshwater fish interests and marine mammals. Management and mitigation of construction impacts are addressed in Appendix F which sets out JNCC and SNH's advice on the natural heritage matters to be addressed by conditions. Please also see Appendix B(iii) in this regard for advice on EPS licensing requirements for cetacean species (whales and dolphins).

SUMMARY OF KEY NATURAL HERITAGE INTERESTS AND IMPACTS TO CONSIDER

The following natural heritage interests and impacts are those which are key for consideration of the MORL proposals and together with the adjacent Beatrice Offshore Wind Limited (BOWL) windfarm proposal:

a) Qualifying Interests of Special Protection Areas (SPAs)

Habitats Regulations Appraisal (HRA) of operational windfarm impacts on key seabird species during the breeding season. Further to our interim advice (18 December 2012) we had a meeting of the Moray Firth Offshore Wind Developers' Group (MFOWDG) to discuss bird interests and cumulative impact assessment; 1 February 2013.

Please see Appendix A(i) for an outline of the process and summary of our overall advice on bird interests. Our review of the technical aspects of assessments – collision risk modelling, estimation of displacement impacts and population modelling – is provided in Appendix A(ii) and supporting spreadsheets.

Our advice on HRA for the key SPA seabird species is presented in Appendix A(iii), supported by the spreadsheet provided in Appendix (iv) which identifies the seabird species and SPAs to be addressed under HRA.

b) Qualifying Interests of Special Areas of Conservation (SACs)

HRA of windfarm construction impacts on harbour seals as a qualifying interest of the Dornoch Firth & Morrich More SAC and on bottlenose dolphin as a qualifying interest of the Moray Firth SAC.

Please see Appendix B(i) for our key comments on marine mammals from review of the MORL ES, and Appendix B(ii) for our HRA advice on SAC marine mammal species. This is largely based on the advice provided in our interim advice in December 2012.

Similarly, please see Appendix C(i) for our advice on fish interests, and Appendix C(ii) for our HRA advice on SAC freshwater interests. This advice is based on our interim advice and provides advice on HRA of windfarm construction impacts on freshwater fish and associated species – Atlantic salmon, freshwater pearl mussel and sea lamprey – which are qualifying interests of riverine SACs in the area.

c) European Protected Species

Please see Appendix B(iii) for advice on EPS licensing requirements for cetacean species (whales and dolphins).

d) Marine Fish

Please see Appendix C(i) for our key comments on marine fish.

e) Benthic Ecology & other Habitat Interests

Further to our interim advice (18 December 2012), we have had further discussion with Marine Scotland and the developer over use of gravity bases. From this, there is resolution in how to address uncertainty over the amount of dredged material, and resulting impacts, that may arise from use of this foundation option on-site. Please see Appendix D for HRA advice on SAC habitat interests.

f) Seascape, Landscape and Visual Impacts

Please see our advice on the impacts of Beatrice and MORL presented in Appendix E.

CONCLUSION

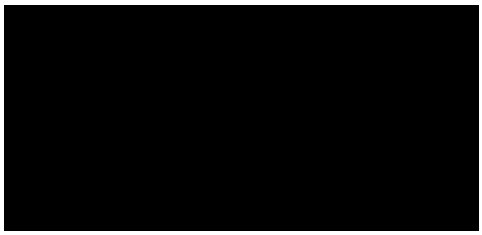
We trust this advice is of assistance in your determination of this application both individually and cumulatively with the BOWL proposal.

If Marine Scotland are minded to grant consent than both JNCC and SNH would be willing to be involved in the negotiation and agreement of conditions with Marine Scotland and developers, to ensure that these natural heritage matters are addressed in any consents and licences issued.

If you have any queries on any aspect of this advice, please do not hesitate to contact either Karen Hall – Karen.hall@jncc.gov.uk 01224 266559 or Catriona Gall – Catriona.gall@snh.gov.uk 01738 458665.

Yours faithfully

John Goold
Director of Marine Advice, JNCC



Susan Davies
Director of Policy & Advice, SNH

APPENDIX A (i)

SUMMARY of ASSESSMENT PROCESS & ADVICE for BIRD INTERESTS

Background

Pre-application dialogue on bird interests has been facilitated via the Moray Firth Offshore Wind Developer's Group (MFOWDG) comprising BOWL for Beatrice and MORL for proposed development in the Round 3 zone. The meetings have been attended by Marine Scotland; Crown Estate; the developers and their consultants; JNCC and SNH.

Towards the start of the process, JNCC and SNH provided scoping advice for each proposal (scoping response for Beatrice, 14 May 2010; scoping response for MORL, 28 October 2010). We outlined the process of Habitats Regulations Appraisal (HRA) for the range of seabird species under consideration, these being qualifying interests of Special Protection Areas – see Appendix D of each response.

Further to this, the developers (as MFOWDG) indicated how they would approach cumulative impact assessment in a discussion document, on which we provided comment, 26 May 2011. All parties (the developers, ourselves, Marine Scotland and the Crown Estate) worked from an initial 'long-list' of bird species and SPAs (submitted 11 February 2011) to scope potential impacts and work up the eventual 'short-list' of key species as discussed at the MFOWDG meeting held earlier this year (1 February 2013). This short-list is presented in Appendix A(v).

We advised that the HRA process would take precedence over EIA for the key SPA seabird species of concern, and made a request (26 August 2011) to BOWL and MORL (together as MFOWDG) for 'preliminary analysis' of the cumulative impacts that could be presented by the proposed offshore windfarms to these species, prior to the submission of any licence applications. Unfortunately it did not prove possible for the developers to co-ordinate this work together as MFOWDG, and no further meetings were held with them jointly until 1 February this year.

HRA for key SPA seabird species

Appendix A(ii) provides our review of the technical assessments submitted by BOWL and MORL for key SPA seabird interests: collision risk modelling, the estimation of displacement impacts and population modelling. We have reviewed the range of methodologies and approaches for each of these technical aspects, in order to provide our overall advice.

Our advice to inform HRA for key SPA seabird species is presented in Appendix(iii). In it, we outline the overall process of HRA, and present our advice for each decision stage. During pre-application discussion and in our response (26 May 2011) to the developers' cumulative impact discussion document, we recommended that "it would be helpful to consider the 'long-list' in respect of the seasonality of each bird interest – whether the species is present during breeding, post-breeding, passage and / or wintering periods".

This consideration of the seasonal presence of each key species in the Moray Firth informs our HRA advice, as presented in Appendix(iii). We are identifying that the reference population for HRA is the **breeding population**, against which to consider the impacts of the Beatrice and MORL windfarm proposals. The most up-to-date counts for each species are presented in Appendix A(v), although we highlight that further counts are currently underway (work commissioned by SNH, taking place this summer, 2013).

For most of the key species under consideration, the HRA assessment is focused to consideration of windfarm impacts during the breeding season, where we have identified connectivity between the individual seabirds recorded on the windfarm sites and SPA breeding colonies within foraging range. It is more difficult to assign connectivity in the non-

breeding season, when the individuals recorded at sea do not necessarily form part of the summer SPA breeding colonies in the vicinity – see further discussion in Appendix (iii).

Impacts to other seabird species

At the MFOWDG ornithology meeting held earlier this year (1 February 2013), we advised that gannet should be addressed using breeding numbers at Troup Head Site of Special Scientific Interest (SSSI) as the reference population for impact assessment. Please see Appendix (iv) for our advice in respect of gannet. We are not identifying any likely significant effect for this species as a qualifying interest of any SPAs within foraging range.

For all other seabird species originally included in the 'long-list' for assessment, such as cormorant, shag, Manx shearwater, Arctic tern, we confirm that there is no likely significant to these species as qualifying interests of any SPAs within foraging range. We have read the respective environmental statements for the Beatrice and MORL offshore wind proposals and we confirm that we are in agreement with the conclusions reached regarding these other seabird species.

Reference populations for seabirds in the non-breeding season

The UK statutory nature conservation advisers with Marine Scotland are letting a research contract to establish the scale at which non-breeding (wintering) populations of seabirds should be defined, and thus derive relevant population figures for impact assessment. .

SNH and JNCC will be able to provide an assessment of impacts to seabirds outwith the breeding season only once population estimates for seabirds in the non-breeding season have been agreed. In the meantime, for all seabird species other than great black-backed gull and herring gull (for which we direct you to our advice in Appendix (iii)) we confirm that windfarm impacts in the non-breeding season will not be significant.

Impacts on migratory wildfowl and waders

Our discussion at MFOWDG meetings concentrated on assessment of impacts to seabirds, however, we recognised that migratory wildfowl and waders would also need consideration (see our scoping advice for Beatrice, 14 May 2010 and MORL, 28 October 2010). We had only limited pre-application discussion on approaches to assessing the potential collision risk presented by the proposed windfarms to wildfowl and wader species on migration.

While MFOWDG attempted land-based and boat-based watches for migratory wildfowl and waders, we indicated concern about collating robust data on numbers of birds crossing the Firth (see our comments on first year survey reports, 26 August 2011). Under current knowledge, we do not consider it possible to apply a site-specific HRA process to migratory wildfowl and waders as we cannot identify to, or from, which particular SPA(s) any individuals may be travelling.

We therefore support the strategic assessment that Marine Scotland has commissioned in respect of these species, providing an overall estimate of collision risk that current offshore windfarm proposals in Scotland (territorial waters and Round 3) may present to migratory wildfowl and waders. Assessment will be made against the numbers of individuals of each species estimated to cross Scottish waters on migration – a 'Scottish' reference population that is relevant to the windfarms under consideration and may or may not equate to the overall UK migratory / wintering population of the species.

We consider the MS project to be sufficient to inform judgements regarding the significance of potential collision risk to migratory wildfowl and waders. We do not identify any further work for applicants to undertake in this regard in the case of BOWL and MORL.

APPENDIX A (ii)

ORNITHOLOGY
SNH & JNCC REVIEW of TECHNICAL ASSESSMENTS & MODELLING

As discussed at the MFOWDG meeting held 1 February 2013, collision risk is a concern for great black-backed gull, herring gull, kittiwake, fulmar and gannet. Displacement impacts have been assessed for guillemot, razorbill, puffin, kittiwake, fulmar and gannet. Each developer, BOWL & MORL, have undertaken their own individual technical assessments – collision risk modelling, the estimation of displacement effects and population modelling.

In this appendix, SNH & JNCC provide comments on these technical assessments, based on our review of the approaches used in each of the submitted environmental statements (ES) for these windfarm proposals in the Moray Firth. We highlight the points of similarity and points of disparity in the methodologies used by BOWL & MORL, and we provide our recommendations for the assessment of impacts.

We highlight that there are currently a number of precautionary assumptions that have had to be used in assessments, due to the lack of evidence (post-construction monitoring) regarding seabird interactions with built and operational offshore windfarms. Current recommendations will therefore have to be reviewed and updated over time as the knowledge base improves and there is greater certainty regarding the effects that offshore windfarms may have on seabirds, and on other bird interests.

COLLISION RISK MODELLING

Use of Band (2012)
Band (2012)[1] provides guidance on collision risk modelling for offshore windfarms. It includes a 'basic' model and an 'extended' version in situations where the data is adequate to support an extended analysis taking account of flight heights. The 'extended' model is particularly relevant for those species, such as seabirds, where the flight height distribution may be skewed towards low heights (see further discussion under paragraphs 61 - 75 of the guidance; Annex 3 provides the supporting mathematics of the 'basic' model and Annex 5 provides the maths for the 'extended version').

Under the 'extended' model, option 3 uses flight height distributions modelled from a generic dataset (Cook *et al.* 2012). We note some concerns over the accuracy of this generic dataset as it is solely derived from boat-based survey data and there could be associated observer error (due to the difficulty of measuring flight heights at sea, and over distance, where there are no points of reference).

The avoidance rates that are subsequently applied to the collision risk outputs from the 'extended' model have been derived from the 'basic' model, which does not account for flight height distribution in this manner. While 'avoidance' rates by name account for any avoidance action undertaken by a bird (either in close proximity or over distance, e.g. micro and macro), they also, by nature of their calculation, encompass other error and uncertainty within the modelling. Therefore we are currently investigating whether it is appropriate to apply the same avoidance rates to different models (i.e. 'basic' and 'extended') without correcting for differences in uncertainty between these models.

Due to these matters, we are mindful that in future we may suggest that a correction factor is applied to the 'extended' model. The advice we present in Appendix (iii) to inform HRA for key SPA seabird interests is based on collision risk modelling that uses the 'extended' model, option 3 at a 98% avoidance rate. However, to provide context, our supporting spreadsheets

[1] SOSS Project 02; Band, B. 2012 Using A Collision Risk Model To Assess Bird Collision Risks For Offshore Windfarms http://www.bto.org/science/wetland-and-marine/soss/projects

include the collision risk outputs from the 'basic' model, and from both models using a wider range of avoidance rates, i.e. including outputs at 95% and 99% as well as 98%.

BOWL and MORL approaches to collision risk modelling

- BOWL and MORL have based their assessment of collision on the predicted number of collisions from option 3 of Band (2012).
- BOWL have only updated collision risk for fulmar, gannet, kittiwake, great black-backed gull and herring gull within the ES addendum.
- MORL have only updated collision risk for gannet, kittiwake, great black-backed and herring gull within the ES addendum.
- BOWL and MORL have accounted for collision of immatures birds by adjusting the juvenile mortality within the population models in proportion with the numbers of immatures/adults recorded on site surveys.
- BOWL have applied a 99% avoidance rate for all species considered.
- MORL have applied species-specific avoidance rates, i.e. 99.5% for gannet, 98% for kittiwake, 98.5% for great black-backed gull and herring gull.
- Beatrice and MORL have used different input parameters for the bird species, most notably differing on nocturnal activity and flight behaviour (flapping or gliding). MORL have used the less precautionary input parameters. In our checks of the great black-backed gull and herring gull collision models we have used the parameters as set out by BOWL (see Table 1), as we consider these to be more appropriate in the light of concerns regarding these species population trends at the SPAs of concern. Although for other species we have considered the predicted number of collisions as presented in each ES addendum.
- MORL have undertaken collision risk modelling for each of the three windfarm sites (MacColl, Telford and Stevenson) for two scenarios, one at 3.6MW and the other at 5MW. They have also used different combinations of these sites.
- BOWL have included a 'most likely scenario' (MLS) and a 'worst case scenario' (WCS).
- For each windfarm scenario MORL has run the collision risk model four times to provide a weighted average based on a realistic turbine speed (rpm).
- MORL for all species, and Beatrice for great black-backed gull have both apportioned the number of collisions to estimate the number of breeding adults predicted to be impacted (i.e. removing non-breeding adult collisions from the breeding season estimates). MORL have multiplied the breeding season total by 50% whereas BOWL have suggested once collision of immatures have been removed a ratio of 65:35 is applied to the adult collisions. This has the effect of multiplying the total number of breeding season predictions by 24.4%.

  We acknowledge that there is some merit in this approach for species where adults are easily recorded and there is a good understanding and wealth of literature resources on the size of non-breeding adults associated with colonies. However, we also consider in reality that any collision impacts on immatures will have a delayed impact on recruitment into the population size, possibly affecting the population growth rate, and that similarly any non-breeding birds can act as a reservoir of potential breeders that can occupy breeding sites and territories should they come available, i.e. after wrecks.

  In our advice for great black-backed gull we have applied the approach suggested by Beatrice, however we consider this to be a minimum level of impact, and would advise that the impact may be larger than this.

Table 1 SNH & JNCC recommended input parameters for collision risk modelling

Species	Bird length	Wingspan	Flight Speed	Nocturnal Activity	Flight behaviour
Fulmar	0.475[1]	1.07[1]	13[2]	4[4]	Gliding
Gannet	0.935[1]	1.725[1]	14.9[2]	2[4]	Gliding
Kittiwake	0.39[1]	1.075[1]	13.1[3]	3[4]	Flapping
Herring gull	0.61[1]	1.44[1]	12.8[3]	3[4]	Flapping
Great black-backed gull	0.71[1]	1.575[1]	13.7[3]	3[4]	Flapping
[1] Snow and Perrins, 1998; [2] Pennycuick, 1997; [3] Alerstam *et al.,* 2007; [4] Garthe & Hüppop					

Summary of SNH and JNCC advice on collision risk

- In our advice we have used a combination of the number of collisions estimated for option 3 at a 98% avoidance rate, but with consideration of the range of collisions that has been estimated for option 1 and other avoidance rates, i.e. 95% and 99% as context for our advice.
- In our checks of the great black-backed gull and herring gull collision models we used the parameters as set out by BOWL. For other species we have considered the predicted number of collisions as presented in each ES addendum, although we acknowledge there are limitations in the comparability between developments for some species.
- For great black-backed gull we have used the approach outlined by BOWL to consider the number of collisions during the breeding season on the breeding birds only, i.e. multiplying the total number of breeding season predictions by 24.4%. This means the number we have considered is the least precautionary, and therefore we have little doubt in the magnitude of this impact.
- For herring gull we have used the approach outlined by MORL to consider the number of collisions during the breeding season on the breeding birds only, i.e. multiplying the total number of breeding season predictions by 50%. This approach is different to our approach for great black-backed gull due to the lack of survey data to establish the ratio of adults and immatures observed on the development site and is therefore more precautionary.
- We considered the number of collisions of SPA birds that may occur outwith the breeding season for herring gull and great black-backed gull as they are more sedentary than other species. To account for immigration during the wintering period we used the proportions outlined by BOWL.

DISPLACEMENT

Background

For many existing windfarms in Europe the approach used in impact assessment was to assess displacement of seabirds as an impact on adult survival as opposed to breeding productivity. This was due to the presence of predominantly non-breeding birds within the proposed development areas, i.e. impacts to birds outwith the breeding season.

For current applications in Scotland, our key concerns relate to breeding seabirds, where the birds are tied to particular colonies as 'centrally-placed foragers', attending nests to incubate and/or provision young. There is a paucity of information on the behavioural reaction and level of response that breeding seabirds may show to windfarms potentially constructed in their foraging areas. Initial monitoring of other European offshore windfarms are showing sometimes contrasting results between species and for the same species, and indicate that disturbance shown varies between and within species for responses to turbine structures (e.g. Leopold *et al.,* 2011, Canning *et al.,* 2012, Furness & Wade, 2013).

There is limited understanding of any resulting effects on the birds displaced, such as how to quantify the increased energetic demands on the adult, through additional flying around a wind farm or to alternative foraging locations, and decreased nest attendance and provisioning of

chicks during the breeding season. As such the assumptions used for assessment are currently highly precautionary: of the proportion of birds displaced from a windfarm site, it is assumed that 100% of them will fail to breed (for example, 100 birds are displaced by the windfarm so that 100 breeding units – Apparently Occupied Sites or Apparently Occupied Nests etc. – will fail). Marine Scotland Science have commissioned a research project to model the effects of displacement and we may, in the future, be able to refine these assumptions.

At the MFOWDG meeting held 1 February 2013, it was agreed that BOWL & MORL should use a similar displacement matrix to that developed by Natural England & JNCC. We amended it for Scottish waters to assess displacement in relation to breeding success (rather than mortality), for the reasons outlined above. For each site (Beatrice and MORL), we recommended using the mean peak population estimate for each species recorded on site (where displacement is the concern) and then the matrix provides a range of estimates for the numbers of birds that could fail to breed due to displacement.

BOWL approach to assessing displacement

BOWL revised their displacement assessment in line with our discussions at the MFOWDG meeting on 1 February 2013. They have summarised their approach as follows:

1. Average (across breeding seasons) peak total abundance (of flight and water) multiplied by a correction factor for turnover.
2. Taking the results from the first step above, multiplied by estimated % of the population made up of breeding individuals (obtained from pop modelling)
3. Finally, taking the result form step 2 and entering this into displacement table

All birds that were displaced were assumed to fail and assessed using population modelling.

In order to determine the proportion of the population likely to be displaced, sensitivity scores from Furness *et al.* 2013 have been converted into a percentage displaced figure (e.g. 1 = 20% and 5 = 50%). This approach is flawed as the sensitivity analysis is based on interactions between seabirds and boat disturbance. As mentioned above there is a growing body of evidence from wind farms in Europe and English waters, which suggest that some species, such as gannet, are not overly sensitive to boat disturbance, but are sensitive to the presence of wind farms.

Turnover has been taken into account by using species-specific estimates of number of foraging trips made by an individual per day and estimates of average duration of foraging trips. This is one of the first attempts at including a calculation for turnover. At this stage we do not have guidance on a specific approach; therefore given the reasoning presented behind the calculations we feel this approach is suitable and sufficiently precautionary. It would, in light of these cases, be advisable for further research into estimating turnover to be undertaken in future.

MORL approach to assessing displacement

MORL revised their displacement assessment in line with our discussions at the MFOWDG meeting on 1 February 2013. They have summarised their approach as follows:

1. Average (across breeding seasons) peak total abundance (of flight and water) was combined for the three proposed wind farm sites.
2. The site population is then apportioned to each of the SPAs for each qualifying interest.
3. This is then multiplied by the proportion of the site population assumed to be breeding (50%).
4. The proportion of birds displaced is taken from higher values for the ‘worst-case scenario’ analysis and lower values for the ‘realistic scenario’.

5. The proportion of these breeding birds that are predicted to fail in the current breeding attempt is 100% for both WCS and RS for all species, excluding fulmar and gannet. For the latter species this is taken at 50%, due to larger foraging ranges and spatial flexibility.

Key differences in the Beatrice and MORL displacement approaches

Different approaches were taken to assessing displacement between the two developments. BOWL used a percentage displaced and assumed that all birds displaced fail to breed, while MORL presented a range of displacement for the same species (see Table 2 below). Both developers used average peak estimates to derive the number of birds being displaced.

- Both developers have built precaution into their approaches to displacement, but in slightly different ways. BOWL, as mentioned above, has taken account of turnover at the development site, while MORL have summed estimates of proportions of birds from different SPAs to greater than 100% (up to 150%), where they are qualifying interests at more than one SPA.
- Both developers have included birds in flight as well as on the water.
- Both developers have used average peak rather than mean population estimates.

Table 2 Displacement ranges / percentages used in BOWL & MORL calculations

Species	% displaced – MORL	% displaced – BOWL
Fulmar	50 – 100%	20 %
Gannet	50 – 100%	60%
Kittiwake	10 – 50%	40%
Guillemot	50 – 100%	60%
Razorbill	50 – 100%	60%
Puffin	50 – 100%	40%

Summary of SNH and JNCC advice on displacement

- The use of turnover in the BOWL assessment this meant that it is difficult to directly compare the values for the two wind farms. While we were encouraged to see this being considered we did have to recalculate the BOWL displacement figures inline with the approach outlined by MORL to carry out an in combination assessment.
- For fulmar we assessed displacement at 50%, based on MORL's assessment, for all other species we assessed the level of displacement at the percentage outlined by BOWL. We do not necessarily agree with the level of displacement outlined for puffin (i.e. 40%) and would advise that they should be considered to be displaced at a similar level to other auk species. However, given that there is still uncertainty in the proportion of displaced birds that are likely to fail to breed and that our assessment found this level was sufficiently high to have a significant effect. We concluded that any further increases would only increase the magnitude of this impact and not change the conclusion for this species.
- For gannet, fulmar and kittiwake we have considered both collision and displacement as potential impacts but basing our advice on the most significant impact, collision risk. These species are all k-selected, with high adult survival rates and are therefore more severely impacted by wind farm mortality than by a decrease in productivity (Desholm, 2009 and Furness *et al.* 2013).
- For the auk species we used a combination of methods to assess the level of predicted impact in the context of the SPA populations, including the population models and PBR (outlined below). While these methods are not directly comparable, together they can provide context and an overall indication of the level of impact that may be acceptable.

POPULATION MODELLING

BOWL and MORL approaches to population modelling

Each developer has commissioned their own population models to examine the effects of displacement (reduction in productivity) and collision (increase in mortality) for the key SPA seabird species and colonies identified in Appendix (v) and discussed in Appendix (iii).

(i) Structure

- Both are stochastic, age-class structured models, based on the entire population (i.e. all age classes are included): so population impact of additional mortality to all ages is considered.
- Both model closed populations (no net immigration or emigration), and do not include density dependence.
- BOWL include both environmental and demographic stochasticity and MORL only include environmental stochasticity.
- MORL forecast to both 25 and 35 years (the period of wind farm operation, and plus 10 years respectively, while BOWL forecasts to 25 years (the period of wind farm operation).
- Demographic parameters (productivity, survival, age at first breeding and clutch size) were sourced from the published literature.

(ii) Outputs

- They model a range of increasing effects to the population from both collision (represented by additional mortality) and displacement (numbers displaced = numbers failing to breed).
- Both models present probabilistic outputs of population decline.
- The probabilities of the population dropping below a series of thresholds based on the current population size at 25 years (and at 25 year plus 10 years recovery for MORL) are presented, along with the change in probability between the no-wind farm scenario, and the range of wind-farm scenarios.
- The probabilities of the population dropping below a series of thresholds based on the forecast population size at 25 years (and at 25 year plus 10 years recovery for MORL) are also presented.
- Estimated growth rates are provided in either tabulated or graph form (MORL and BOWL respectively).

(iii) Key differences between MORL and BOWL population models

While the models are structurally similar, and examine the same species (and populations in most cases), the outputs differ, there are a number of potential reasons for this (over and above the fact that stochastic models, by definition, are not directly replicable):

- MORL does not include demographic stochasticity (this is only likely to have an effect at small population sizes).
- Demographic parameters selected differ in some instances (see table).
- Number of simulations (MORL = 1000, BOWL = 10000)
- For some species, the population scale at which modelling was conducted differs, e.g. gannet.
- Potentially there is a difference in how probability of decline is calculated. BOWL present the probability that the final population will be smaller than the current population (or median forecast one). It is unclear if MORL present the probability that the final population will be lower, or the probability that at any point during the forecast the population will be lower.

SNH & JNCC review of the suitability of the models

Parameterisation of population models is limited to the demographic data available, in most cases these data have either been collected at colonies remote from the Moray region, or at a much broader scale (e.g. national), and during earlier periods. The inputs are therefore neither spatially nor temporally specific to the colonies under consideration, and this will influence the confidence we can place in the predictive power of these models.

The outputs from population models can be useful in terms of comparing relative change (e.g. the difference in probability of a population decline under baseline (no wind farms) and impacted (presence of wind farms) between a wind farm and no-wind farm scenario, or a change in growth rates) as opposed to absolute changes (e.g. a wind farm scenario causes x level of decline). However, even relative comparisons may be influenced by the appropriateness of the model to predict changes to the population under consideration.

SNH & JNCC advice is to consider if the growth rates estimated by the model match current understanding of how the population under consideration is behaving.

In the case of the Moray region, most of the qualifying interests at the relevant SPAs have not been fully surveyed since Seabird 2000, and as such we do not have up to date population estimates, or colony specific trends. In Appendix (iii) we note the UK and Scottish trends for each species. In addition, SNH has commissioned plot counts for fulmar, kittiwake, guillemot, razorbill and puffin at East Caithness Cliffs SPA. This is work is currently being undertaken (summer 2013).

Other approaches to population modelling

As noted, there are a number of species where the presented population models may not be appropriate or sufficient to form the basis of our advice. We have therefore investigated the use of 'potential biological removal' (PBR) to aid interpretation, complementing the outputs from the BOWL and MORL models for certain species, and instead of the developers' models in those cases where we do not have confidence in the approaches used. We discuss this method under section (i) below.

We have also reviewed the population viability analysis (PVA) for gannet, commissioned by SOSS (WWT 2012). We discuss this under our advice for gannet presented in Appendix (iv). The ES assessments for BOWL and MORL make extended reference to the sandwich tern model produced for the North Norfolk Coast SPA population. There are a number of reasons why we do not think this approach is applicable to the windfarm proposals in the Moray Firth which we discuss under section (ii) below.

(i) Potential Biological Removal (PBR)

PBR is a simple form of population modelling, which was first formulated for marine mammals (Wade 1998) to estimate allowable bycatch. PBR calculates the number of additional mortalities that can be sustained annually by a population. The data requirements are reasonably simple: population size (Nmin), maximum annual recruitment (Rmax, calculated from age at first breeding and adult survival), and a recovery factor (f). Despite the limited input requirements the model allows for density dependence and stochasticity (Dillingham and Fletcher, 2008).

PBR outputs are very sensitive to f, the recovery factor, and the setting of f is a conservation management decision. Dillingham and Fletcher (2008) recommend that for threatened or endangered species, and SPA populations in decline (Dillingham, *pers comm*) an upper value of 0.1 should be used. They go on to suggest the following for IUCN classes;
f = 0.5 for 'least concern' species, f = 0.3 for 'near threatened', and f = 0.1 for all threatened species. A value of f = 1.0 may be appropriate for 'least concern' species known to be increasing or stable.

In our calculations we have determined PBRs for each species, at a range of f values. For our HRA advice in Appendix (iii) we use the outputs for the f value we consider to be appropriate

given the condition status and national trend of the qualifying interest. It should also be noted that:

- Adult survival rates used in PBRs should be estimated from survival in optimal conditions, however the PBRs presented here use the values supplied by BOWL for adult survival. Higher survival rates would result in a more precautionary output.

- Similarly, age at first breeding should ideally be a mid-point value, as opposed to the earliest breeding age, and the use of earliest breeding is less precautionary.

Nmin (the population size) should be a conservative estimate of population size, and is normally presented as a lower percentile of the estimated population to account for measurement error. In this case we have not corrected estimates for measurement error; again, this correction would lead to a more precautionary figure. The population estimates used are those agreed for each SPA, as presented in Appendix (v). However, we highlight the considerable uncertainty regarding the current population sizes at these SPA colonies.

(ii) Sandwich tern model

This model was commissioned by Centrica, to assess impacts from the Greater Wash wind farms on the North Norfolk Coast Sandwich Tern SPA. It differs from those currently under consideration for the Moray Firth for a number of reasons:

- The key input parameters were up-to-date and colony specific, with a long time series of colony-specific data on population size and productivity.
- Survival rates were calculated from all ringing data, at a UK level.
- The North Norfolk Coast Sandwich tern population was known to be relatively stable, and the population model reflected this (via incorporating a level of density dependence).

As such, JNCC had a reasonable level of confidence in the population model and due to the stable population (neither increasing nor decreasing), the use of either the starting or forecast (no wind farm) populations made no difference to the conclusions.

For the populations of seabird species at SPAs in the Moray Firth, the issue with applying this particular approach is to the poor quality of the input parameters, the fact we do not have up-to-date population counts and that there is a high level of uncertainty around the growth rates and consequently the population forecast. Therefore SNH & JNCC advise that the sandwich tern model **cannot be used to specifically inform advice on any of the species under consideration for Beatrice and MORL**.

References

Alerstam, T., Rosén, M., Bäackman, J., Ericson, P.G.P., and Hellgren, O. 2007. Flight speeds among bird species: allometric and phylogenetic effects. *PLoS Biol.* 5(8): e197.

Band, B. 2012. Using a collision risk model to assess bird collision risks for offshore windfarms. *Report to The Crown Estate, SOSS-02.*

Canning, S., Lye, G., Givens, L., Pendlebury, C. 2012. Analysis of Marine Ecology Monitoring Plan Data from the Robin Rigg Offshore Wind Farm, Scotland (Operational Year 2) Technical report, Birds. *Report: 1012206*. Natural Power Ltd.
Cook, A.S.C.P., Johnston, A., Wright, L.J., and Burton, N.H.K. 2012. A review of flight heights and avoidance rates of birds in relation to offshore wind farms. *BTO Research Report No. 618*

Desholm, M. 2009. Avian sensitivity to mortality: prioritizing migratory bird species for assessment at proposed wind farms. *Journal of Environmental Management.* 90: 2672-2679.

Dillingham, P.W., & Fletcher, D. 2008. Estimating the ability of birds to sustain additional human-caused mortalities using a simple decision rule and allometric relationships. *Biological Conservation*. 141: 1783-1792.

Furness, R.W., Wade, H.M and Masden, E.A. 2013. Assessing vulnerability of marine bird populations to offshore wind farms. *Journal of Environmental Management* 199: 56-66.

Garthe, S., and Hüppop, O. 2004. Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. *Journal of Applied Ecology.* 41: 724-734.

Leopold, MF, Dijkman, L. 2011. Local birds in and around the Offshore Wind Farm Egmond aan Zee (OWEZ). *Report number C187/11.*

Pennycuick, C.J. 1997. Actual and 'optimum' flight speeds: field data reassessed. *Journal of Experimental Biology.* 200: 2355-2361.

Snow, D.W., and Perrins, C.M. 1998. *The Birds of the Western Palearctic.* Concise edition. Oxford University Press.

Wade, P.R., 1998. Calculating limits to the allowable human-caused mortality of cetaceans and pinnipeds. *Marine Mammal Science*. 14: 1–37.

WWT, 2012. Gannet Population Viability Analysis: Demographic data, population model and outputs. *Report to The Crown Estate, SOSS-04.*

APPENDIX A (iii)

SPA SEABIRD SPECIES
SNH & JNCC ADVICE for HABITATS REGULATIONS APPRAISAL

Introduction

Habitats Regulations Appraisal (HRA) is the process which applies to any plan or project with the potential to affect the qualifying interests of a Natura site. In our scoping advice on Beatrice (14 May 2010), we outlined the HRA requirements (Appendix B) and discussed how this assessment process could apply to mobile seabird species where the impacts from an offshore windfarm proposal will be presented to the birds while they are away from the SPA breeding colonies, out foraging at sea (Appendix D).

We advised that the HRA process would take precedence over EIA for the key SPA seabird species of concern, and made a request (26 August 2011) to MFOWDG for 'preliminary analysis' of the cumulative impacts that could be presented by the Beatrice and MORL offshore windfarms, prior to the submission of any licence applications.

JNCC & SNH advice for Habitats Regulations Appraisal

We provide the following advice to Marine Scotland for informing HRA in respect of SPA seabird species:

1. Is the proposal connected with or necessary for SPA conservation management?

The proposal is not directly connected with or necessary for the conservation management of any of the SPAs listed in Appendix A(v).

2. Is the proposal likely to have a significant effect on the qualifying interests of the SPAs either alone or in combination with other plans or projects?

During pre-application dialogue and in our reponse (26 May 2011) to the developers' cumulative impact discussion document, we advised that a 'long-list' was drawn up to include all relevant SPA seabirds within foraging range of the windfarm sites, based on data available from the Birdlife International seabird database[2], and any other available sources such as the the Future of the Atlantic Marine Environment (FAME) project[3].

This 'long-list' informs judgements on **connectivity –** whether there could be any linkage between the proposed windfarm sites and SPAs. During the breeding season (and see further discussion below), if a species is recorded on-site in boat-based survey work, then we judge there to be connectivity between the windfarm proposal and all the SPAs for which the species is a qualifying interest, within foraging range.

The initial 'long-list' has been refined and iterated during the pre-application process: in particular it has been reviewed on the basis of the survey data collected by developers, as well as in respect to the seasonal presence of bird species. Where a species is recorded on-site and there are a number of SPAs within foraging range, **apportioning** has been carried out to determine the proportion of the birds recorded on-site from each of the SPAs.

Apportioning can help to inform judgements at this stage on **likely significant effect (LSE)**, so that any SPA to which a larger proportion of birds is assigned may be judged to experience LSE. However, SPAs to which smaller proportions of birds are assigned may in some

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[2] Birdlife International seabird database, available at: http://seabird.wikispaces.com/

[3] For further information please see:
http://www.rspb.org.uk/ourwork/projects/details/255106-future-of-the-atlantic-marine-environment-fame-

instances still need further consideration (i.e. LSE is determined) if the SPA population is small and/or declining.

The key seabird species and SPAs where Beatrice, alone and in combination with MORL, may result in likely significant effect are presented in Appendix (v). The effects to consider for each species are listed below and require further consideration under appropriate assessment (see step 3):

- Collision risk to **great black-backed gull** of the East Caithness Cliffs SPA.
- Collision risk to **herring gull** of the East Caithness Cliffs SPA.
- Displacement to **Atlantic puffin** of the East Caithness Cliffs SPA, North Caithness Cliffs SPA & Hoy SPA.
- Displacement to **common guillemot** of the East Caithness Cliffs SPA & North Caithness Cliffs SPA.
- Displacement to **Razorbill** of the East Caithness Cliffs SPA & North Caithness Cliffs SPA.
- Collision risk and/or displacement to **black-legged kittiwake** of the East Caithness Cliffs SPA & North Caithness Cliffs SPA.
- Collision risk and/or displacement to **Northern fulmar** of the East Caithness Cliffs SPA & North Caithness Cliffs SPA.
- Collision risk to **Arctic skua** of Hoy SPA.
- Collision risk to **Great skua** of Hoy SPA.

In determining connectivity and likely significant effect, judgements also need to be informed by the seasonal presence of each species. Windfarm impacts that occur to individuals during the breeding season, can clearly be considered against the **breeding population** present at each of the SPAs under consideration above. For these SPAs, the breeding population is the reference population for HRA.

For windfarm impacts that occur outwith the breeding season, we are required to make a judgement as to whether it is possible to assign such impacts against the SPA breeding populations. For the majority of these species under consideration we are limiting the HRA to consideration of windfarm impacts during the breeding season only. This is because we cannot establish whether there is connectivity between the individuals of each species and SPAs, as designated, outwith the breeding season. During this time, individuals do not exhibit central place foraging and hence are not tied to their breeding colonies. In the non-breeding season, seabird dispersal and migration means that the individuals recorded in the Moray Firth will originate from multiple breeding colonies (both UK and abroad).

So we are not currently in a position to apply an HRA process to black-legged kittiwake, common guillemot, razorbill, Atlantic puffin, Northern fulmar, Arctic skua and great skua during the non-breeding season (see further discussion under Appendix A(i)).

However, great black-backed gull and herring gull are more sedentary and a proportion of the SPA breeding colony will remain in the Moray Firth during the non-breeding season. It is therefore possible under HRA to address impacts that may occur to these two species in the non-breeding season, and both developers have attempted do this using different approaches. We present our collision risk estimates for both the breeding and non-breeding seasons and we have based the non-breeding season estimates on the approach provided by BOWL:

- For **great black-backed gull**, BOWL estimated an overall non-breeding reference population for great black-backed gull (including gulls immigrating from Scandinavia and elsewhere) of which they considered the breeding season birds to represent 1.5% of the total.

- For **herring gull**, BOWL calculated that the wintering population was 30% larger, and estimated the breeding season population contributed 20% of the non-breeding reference population. Of this remaining number, 50% could be assigned to the breeding population of the East Caithness Cliffs SPA

3. Can it be ascertained that the proposal will not adversely affect the integrity of the SPA, either alone or in combination with other plans or projects?

This step is termed **appropriate assessment**, and it is to be undertaken by Marine Scotland, based on information submitted by developers, and with advice from ourselves. As identified, in Appendix (iv) the Beatrice and MORL offshore windfarm proposals are impacting on the same key seabird species and SPAs to which they are apportioned. Therefore our advice below, considers the implications of each proposed windfarm alone and in combination for the key SPA seabirds species, as identified.

The conservation objectives[4] to consider for each SPA are as follows:

To ensure that site integrity is maintained by:

(i) Avoiding deterioration of the habitats of the qualifying species.

(ii) Avoiding significant disturbance to the qualifying species.

To ensure for the qualifying species that the following are maintained in the long term:

(iii) Population of the bird species as a viable component of the SPA.

(iv) Distribution of the bird species within the SPA.

(v) Distribution and extent of habitats supporting the species.

(vi) Structure, function and supporting processes of habitats supporting the species.

repeat of (ii) No significant disturbance of the species.

As discussed in our scoping advice (Beatrice, 14 May 2010, and MORL 28 October 2010), the key conservation objective requiring consideration is to ensure the **long-term maintenance of the population of the bird species as a viable component of the SPA**. This is because it encompasses direct impacts to the species, such as significant disturbance to qualifying bird interests when they're outwith the SPA. It can also address indirect impacts such as the degradation or loss of supporting habitats which are outwith the SPA but which help to maintain the population of the bird species of the SPA in the long-term.

We confirm that none of the other conservation objectives require consideration at this time. Most relate to maintenance of favourable conditions at each of the SPA breeding colonies, and thus will not directly apply to individual seabirds when they are outwith the boundaries of the SPA. Some may need further consideration in the future, depending on the ports and harbours, and vessel routes, identified for windfarm construction and operation / maintenance activities.

- **Great black-backed gull** **East Caithness Cliffs SPA**

Great black-backed gull (GBBG) numbers at the East Caithness Cliffs SPA have decreased from 800 pairs at citation (1996) to 175 pairs in 1999. SNH has commissioned an up-to-date colony count, being undertaken this summer (2013), which is likely confirm a continuing decline in the great black-backed gull population at this SPA. Overall trends for the species also indicate a decline in numbers – in Scotland by 53% since 1986, and in the UK overall by 35% over the same time period.

[4] Further information on SPA conservation objectives available from: http://www.snh.org.uk/snhi/

We note that there is considerable disparity between these observed declines and the strongly positive growth rates that have been used in the BOWL and MORL population models. We do not consider that using growth rates in excess of 1.1 is biologically realistic for the population under consideration. We also note that available demographic data for GBBG is limited. An adult survival estimate is available, but there are no estimates for juvenile survival, and instead either the adult rate is used (MORL), which will be an over-estimate of survival, or a proxy species is used (BOWL).

For these key reasons, we have low confidence in the population models submitted by BOWL and MORL in support of assessments. Instead we have used 'potential biological removal' (PBR, discussed in Appendix A(ii)) to help inform our judgements on great-black backed gull. PBR calculates the number of additional mortalities that can be sustained annually by a population. The data requirements are reasonably simple: population size (Nmin), maximum annual recruitment, (Rmax, calculated from age at first breeding and adult survival) and a recovery factor (f).

For GBBG we have carried out PBR using a population size of 360 individuals with an Rmax value of 1.1086. For recovery, we recommend that an f value of 0.1 is used, due to the vulnerability of the population at East Caithness Cliffs SPA, and in light of the national trends for this species**.** Using these parameters, PBR indicates that **the population of great black back gull at East Caithness Cliffs SPA can only sustain an additional annual mortality of 2 breeding adults per year.**

As discussed at the MFOWDG ornithology meeting, held 1 February 2013, it is collision risk that is of key concern with respect to offshore wind impacts on great black-backed gull. Collision risk is a year-on-year impact that will last throughout the operational lifespan of the proposed offshore windfarms, estimated to be at least 25 years. The potential for collision mortality has been modelled by each developer as discussed in Appendix (ii).

The calculations and spreadsheets for each of BOWL and MORL have been checked by SNH and JNCC, and we have reworked the CRM to provide some consistency to the input parameters (such as nocturnal flight activity) and methods adopted (see above the discussion over modelled estimates for the breeding and non-breeding periods). Below we present our calculations of estimated collision mortality to great black-backed gull, using the extended model from Band (2012), 'option 3', and applying a 98% avoidance rate.

For the Beatrice 'worse case' scenario, we estimate that there would be ~12 collisions of breeding adults from the SPA during the breeding season and a further ~3 collisions of SPA birds during the non-breeding season. **This gives an annual estimate of collision mortality from the Beatrice windfarm proposal in the order of ~15 breeding adults per year.** For the Beatrice 'most likely' development scenario, the collision estimates are ~6.0 and ~1.4 breeding adults respectively for the breeding and non-breeding seasons.

The estimate for the MORL eastern development area (the three proposed windfarms together) is in the order of ~2 to 6 collisions of breeding adults from the SPA during the breeding season and a further ~0.5 to 1.5 collisions of SPA birds during the non-breeding season. **This gives an annual estimate of collision mortality from the MORL windfarm proposal in the order of ~2.5 to 7.5 breeding adults per year.**

Under HRA, we are required to consider these estimates alongside those for onshore wind development in Caithness. The cumulative annual collision mortality to GBBG for all relevant onshore windfarms (operational, consented, or at application) is in the order of **1 individual per year**. (This collision risk modelling for the onshore windfarms uses the 'basic' Band model, and applies an avoidance rate of 98%. We confirm that any estimate for breeding adult collisions would be less than 1.)

Conclusions

The estimated collision mortality to great black-backed gull arising from the Beatrice and MORL eastern development area (EDA) alone, and in combination, will affect the long-term maintenance of the GBBG population as a viable component of the East Caithness Cliffs SPA. **We therefore advise that each of the Beatrice and MORL (EDA) windfarm proposals alone, and in combination, would give rise to an adverse impact on site integrity at the East Caithness Cliffs SPA in respect of great black-backed gull.**

- **Herring gull** **East Caithness Cliffs SPA**

Herring gull numbers at the East Caithness Cliffs SPA have decreased from 9,400 pairs in the period 1985-88 to 3,393 pairs in 1999. SNH has commissioned an up-to-date colony count, being undertaken this summer (2013), which is likely confirm a continuing decline in the herring gull population at this SPA. Overall trends for the species also indicate a decline in numbers – in Scotland by 57% since 1986, and in the UK overall by 24% over the same time period.

We note that there is considerable disparity between these observed declines and the strongly positive growth rates that have been used in the BOWL and MORL population models. It should be noted that while both models estimate a positive growth rate they both also predict a greater than 50% likelihood that the population will be lower than it is now in 25 years time, in the absence of wind farm impacts.

For herring gull we have carried out PBR using a population size of 360 individuals with an Rmax value of 1.126. For recovery, we recommend that an f value of 0.1 is used, due to the vulnerability of the population at East Caithness Cliffs SPA, and in light of the national trends for this species**.** Using these parameters, PBR indicates that **the population of herring gull at East Caithness Cliffs SPA can only sustain an additional annual mortality of 43 breeding adults per year.**

The potential for collision mortality has been modelled by each developer as discussed in Appendix (ii). The calculations and spreadsheets for each of BOWL and MORL have been checked by SNH and JNCC, as discussed we have reworked the CRM to provide some consistency to the input parameters and methods adopted. Below, we present our calculations of estimated collision mortality to herring gull, using the extended model from Band (2012), 'option 3', and applying a 98% avoidance rate.

For the Beatrice 'worse case' scenario, we estimate that there would be ~10 collisions of breeding adults from the SPA during the breeding season. Outwith the breeding season, it is not possible to attribute impacts specifically to the SPA population, however, using the approach suggested by BOWL (see discussion under step 2 above) we estimate that there could be up to ~31.7 collisions of herring gull (from the regional breeding population) arising from the Beatrice proposal in the non-breeding season. **This gives an annual estimate of collision mortality from the Beatrice windfarm proposal in the order of ~41.7 breeding adults per year.** For the Beatrice 'most likely' development scenario, the collision estimates are ~6.4 and ~20.4 breeding adults respectively for the breeding and non-breeding seasons.

The estimate for MORL eastern development area (the three proposed windfarms together) is in the order of ~10.8 collisions of breeding adults from the SPA during the breeding season. Outwith the breeding season, it is not possible to attribute impacts specifically to the SPA population, however, using the approach suggested by BOWL (see discussion under step 2) we estimate that there could be up to ~15.8 collisions of herring gull (from the regional breeding population) arising from the MORL proposal in the non-breeding season. **This gives an annual estimate of collision mortality from the MORL windfarm proposal in the order of ~26.6 breeding adults per year.**

We acknowledge the uncertainty in deriving these estimates for herring gull, in particular, the absence of boat-based derived data on the ratio of adults to immatures and how to define the

proportion of SPA birds occurring in the non-breeding season. This uncertainty could be addressed using information on age ratios from the survey datasets and determining the proportion of collision mortality in the non-breeding season to assign specifically to the East Caithness Cliffs SPA population.

Conclusions

While Beatrice 'most likely' and MORL (EDA) individually would not affect the long-term maintenance of the herring gull population at East Caithness Cliffs, they could in combination. Beatrice 'worst case' affects the population both alone and in combination with MORL. **We therefore advise that Beatrice and MORL, in combination, could give rise to an adverse impact on site integrity at the East Caithness Cliffs SPA in respect of herring gull.**

- **Atlantic puffin** **East & North Caithness Cliffs SPAs, and Hoy SPA**

The status of puffins in the Moray region is unclear, this uncertainty is compounded by the difficulty in obtaining accurate colony counts for this species (due to its burrow nesting behaviour). BOWL and MORL both present models with positive growth rates, however, this may not be supported for East Caithness Cliffs and Hoy SPAs which both appear to be declining. The colony at East Caithness displayed a decrease from 1750 pairs in the citation year (1985-88) to 274 pairs in 1999, and the Hoy colony decreased from 3500 pairs at time of designation to 417 pairs in 2004.

We therefore use PBR to gain some understanding of the level of impact that these puffin populations could sustain. For the colonies at East Caithness Cliffs and Hoy SPAs we recommend an f value of 0.1-0.3 as being appropriate. The North Caithness SPA population may be increasing (from 1750 pairs at citation (1996) up to 7071 pairs in 1999) so we recommend an f value of 0.3-0.5. The PBR uses a population size of 514 individuals for East Caithness Cliffs SPA, 14,142 for North Caithness Cliffs SPA and 834 for Hoy SPA. The Rmax value is 1.0966.

The PBR outputs indicate that the population of puffin at East Caithness Cliffs can sustain an additional annual mortality of 2 – 7 breeding adults per year. For puffin at North Caithness Cliffs PBR indicates the population can sustain an additional annual mortality of 205 – 341 breeding adults. For puffin at Hoy, PBR indicates the population can sustain an additional annual mortality of 4 – 12 breeding adults.

We note that PBR is a method of assessing acceptable levels of additional mortality, so it is not directly comparable to the reduction in productivity that is hypothesised to result from birds being displaced. We would predict that higher numbers of pairs failing to breed would be more sustainable than adult mortality, so that the PBR outputs can be viewed as precautionary.

Conclusions

There is considerable uncertainty regarding displacement impacts (see Appendix (ii)), and in the case of puffins this is compounded by uncertainty regarding the colony population sizes. At present, our estimates are based on the assumptions that puffin will show 40% displacement from the proposed windfarm sites, leading to 100% failure in the breeding success of the birds displaced. Using our (draft) apportioning method, we consider how much of the estimated displacement should be assigned against each SPA. This indicates that ~21.4% of the impact will be to the puffin population of East Caithness Cliffs SPA, ~77.5% to the population of North Caithness Cliffs SPA and ~1.2% to the population at Hoy SPA.

For **East Caithness Cliffs SPA**, ~80 puffin are estimated to be displaced from the Beatrice windfarm and ~136 puffin from MORL (EDA), with associated breeding failure. While these figures are likely to be precautionary they indicate that there could be an effect to this SPA population when considered against the PBR (2 – 7 breeding adults). **We therefore advise that Beatrice and MORL, in combination, could give rise to an adverse impact on site integrity at the East Caithness Cliffs SPA in respect of puffin.**

For **North Caithness Cliffs SPA**, ~323 puffin are estimated to be displaced from the Beatrice windfarm and ~492 puffin from MORL (EDA), with associated breeding failure. While these figures are likely to be precautionary they indicate that there could be an effect to this SPA population when considered against the PBR (205 – 341 breeding adults). **We therefore advise that Beatrice and MORL, in combination, could give rise to an adverse impact on site integrity at the North Caithness Cliffs SPA in respect of puffin.**

For **Hoy SPA**, **~**5 puffin are estimated to be displaced from the Beatrice windfarm and ~8 puffin from MORL (EDA), with associated breeding failure. In combination, these figures are just above the PBR range of 4 – 12 breeding adults and as PBR is a precautionary method for considering the effects of displacement, we consider that the Hoy puffin population can sustain an estimated ~13 birds displaced / failing to breed. **We therefore advise that Beatrice and MORL, alone or in combination, will <u>not</u> give rise to any adverse impact on site integrity at the Hoy SPA in respect of puffin.**

- **Common guillemot East & North Caithness Cliffs SPAs**

The Scottish trend suggests a decline in numbers of common guillemot (by 24% since 1986), while for the same time period the UK numbers indicate a strong increase (by 41%). The guillemot colonies at East & North Caithness Cliffs SPAs display a strong increase from the citation counts (each based on data from 1985-88) to the Seabird 2000 counts at each SPA, undertaken in 1999. SNH has commissioned an up-to-date colony count, being undertaken this summer (2013). The plots counts conducted so far at the East Caithness Cliffs SPA suggest that guillemot numbers are down 35% since 1999, if this is indicative of the wider colony (and North Caithness Cliffs SPA) then it suggests that these guillemot populations are now displaying negative growth rates, which would be supported by the Scottish trend.

As indicated, evidence from Scottish trends and plot counts suggests that guillemot populations may now be declining in the Moray region (albeit after a period of growth), however, both BOWL and MORL predict positive growth rates in their population models. For this key reason, we are unable to place confidence in the interpretations made from these models.

Therefore we have used PBR to crudely investigate the level of displacement that each of the SPA guillemot populations could sustain. As discussed earlier, PBR is a method of assessing acceptable levels of additional mortality, so it is not directly comparable to the reduction in productivity that is hypothesised to result from birds being displaced. We would predict that higher numbers of pairs failing to breed would be sustainable than adult mortality, thus the PBR outputs we discuss can be viewed as precautionary.

The PBR uses a population size of 158,985 individuals for East Caithness Cliffs SPA and 70,154 for North Caithness Cliffs, with an Rmax value of 1.0708. As each of these SPA populations appears to be declining, we recommend using an f value of 0.1- 0.3. The PBR outputs indicate that the population of guillemot at East Caithness Cliffs SPA could sustain an additional annual mortality of 563 – 1689 breeding adults per year. For guillemots at the North Caithness Cliffs SPA, PBR indicates that the population could sustain an additional annual mortality of 248 – 745 breeding adults.

Conclusions

At present, our estimates are based on the assumptions that guillemot will show 60% displacement from the proposed windfarm sites, leading to 100% failure in the breeding success of the birds displaced. Using our (draft) apportioning method, we consider how much of the estimated displacement should be assigned against each SPA population. This indicates that ~93.2% of the impact will be to the guillemot population of East Caithness Cliffs SPA and ~5.8% on the population of North Caithness Cliffs SPA.

For **East Caithness Cliffs SPA**, 2118 guillemot are estimated to be displaced from the Beatrice windfarm and 3209 guillemot from MORL, with associated breeding failure. While these figures are likely to be precautionary they indicate that there could be an effect to this

SPA population when considered against the PBR (563 – 1689 breeding adults). **We therefore advise that Beatrice and MORL, in combination, could give rise to an adverse impact on site integrity at the East Caithness Cliffs SPA in respect of guillemot.**

For **North Caithness Cliffs SPA**, 132 guillemot are estimated to be displaced from the Beatrice windfarm and 200 guillemot displaced from MORL, with associated breeding failure. These figures are within the range of precautionary PBR outputs for this SPA population (248 – 745 breeding adults). **We therefore advise that Beatrice and MORL, alone or in combination, will <u>not</u> give rise to any adverse impact on site integrity at the North Caithness Cliffs SPA in respect of guillemot.**

- **Razorbill** **East & North Caithness Cliffs SPAs**

The UK and Scottish trends indicate an overall positive growth rate for razorbill: an increase of 37% in Scotland since 1986, and 66% for the UK over the same time period, however, they have shown an 18% decline in Scotland since 2000. The razorbill colonies at East & North Caithness Cliffs have displayed increases from the citation year (1986-88) to the Seabird 2000 count in 1999. SNH has commissioned an up-to-date colony count, being undertaken this summer (2013). The plots counts conducted so far at the East Caithness Cliffs SPA suggest that while numbers are up 62% since 1999, they have declined by 10% since 2005. If this is indicative of the wider colony (and North Caithness) this suggests razorbill populations in the region are now displaying negative growth rates, which would be supported by the emerging wider Scottish trend.

As indicated, evidence from Scottish trends and plot counts suggests that razorbill populations may now be declining in the Moray region (albeit after a period of growth), however, both BOWL and MORL predict positive growth rates in their population models. For this key reason, we are unable to place confidence in the interpretations made from these models. Therefore we have used PBR to crudely investigate the level of displacement that each of the SPA razorbill populations could sustain. As discussed earlier, PBR is a method of assessing acceptable levels of additional mortality, so it is not directly comparable to the reduction in productivity that is hypothesised to result from birds being displaced. We would predict that higher numbers of pairs failing to breed would be sustainable than adult mortality, thus the PBR outputs we discuss can be viewed as precautionary.

The PBR uses a population size of 17,830 individuals for East Caithness Cliffs SPA, 2,463 individuals for North Caithness Cliffs SPA and an Rmax value of 1.125. As each of these SPA populations appears to be declining, so we recommend an f value of 0.1- 0.3 as being appropriate. The PBR outputs indicate that the population of razorbill at East Caithness Cliffs SPA could sustain an additional annual mortality of 111 – 334 breeding adults per year. For razorbills at the North Caithness Cliffs SPA, PBR indicates that the population could sustain an additional annual mortality of 15-46 breeding adults.

Conclusions

At present, our estimates are based on the assumptions that razorbill will show 60% displacement from the proposed windfarm sites, leading to 100% failure in the breeding success of the birds displaced. Using our (draft) apportioning method, we consider how much of the estimated displacement should be assigned against each SPA. This indicates that ~98.1% of the impact will be to the razorbill population of East Caithness Cliffs SPA and ~1.9% to the population of North Caithness Cliffs SPA.

For **East Caithness Cliffs SPA**, 357 razorbill are estimated to be displaced from the Beatrice windfarm and 776 razorbill displaced from MORL, with associated breeding failure. While these figures are likely to be precautionary they indicate that there could be an effect to this SPA population when considered against the PBR (111 – 334 breeding adults). **We therefore advise that Beatrice and MORL, in combination, could give rise to an adverse impact on site integrity at the East Caithness Cliffs SPA in respect of razorbill.**

For **North Caithness Cliffs SPA**, 7 razorbill are estimated to be displaced from the Beatrice windfarm and 15 razorbill displaced from MORL, with associated breeding failure. These figures are within the range of the precautionary PBR outputs (15 – 46 breeding adults) for this SPA population. **We therefore advise that Beatrice and MORL, alone or in combination, will <u>not</u> give rise to any adverse impact on site integrity at the North Caithness Cliffs SPA in respect of razorbill.**

- **Black-legged kittiwake** **East & North Caithness Cliffs SPAs**

The Scottish and UK trends suggest declining kittiwake numbers (in Scotland by 66% since 1986, at the UK level by 55% over the same time period). At the East Caithness Cliffs SPA, however, numbers increased from 32,500 pairs in the period 1985-88 to 40,140 pairs in 1999. While North Caithness displayed a decrease in numbers from 13,100 to 10,147. Since then neither colony has been surveyed. Plots counts conducted in 2013 at East Caithness Cliffs SPA suggest that kittiwake numbers are down 24% since 2005, although this was a 17% increase on the 1999 counts. If this is indicative of the wider colony (and North Caithness Cliffs SPA) then it suggests that these populations are now displaying negative growth rates, which would be supported by the Scottish and UK trends.

There is uncertainty regarding the status of kittiwake colonies in the Moray region, so it is unclear if either the BOWL or MORL population models are appropriate. Each of the models predict different growth rates for East Caithness Cliffs; BOWL do not provide modelling for North Caithness Cliffs and MORL's modelling appears to use the wrong starting population.

We therefore use PBR to gain some understanding of the level of impact that these kittiwake populations could sustain. The PBR uses a population size of 80,820 individuals for East Caithness Cliffs SPA, 20,294 for North Caithness Cliffs and an Rmax value of 1.1155. As each of these SPA populations appears to be declining, so we recommend an f value of 0.1- 0.3 as being appropriate. PBR indicates that the population of kittiwake at East Caithness Cliffs SPA can sustain an additional annual mortality of 467 – 1400 breeding adults per year. For kittiwakes at the North Caithness Cliffs SPA, PBR indicates that the population can sustain an additional annual mortality of 117 – 352 breeding adults.

There is currently very little available information on the behavioural reaction of kittiwake to wind turbines. It is not known whether kittiwake are more likely to display collision risk or displacement effects, so in coming to a view we have considered both (see our supporting spreadsheets). For HRA, however, we base our advice on the impact that would be most significant to these kittiwake populations. This would be the risk of collisions rather than displacement because kittiwake are a *K*-selected species[5] and thus more sensitive to changes in adult survival rates (increases in mortality of adult birds) than to decreases in productivity (which could result from the displacement of breeding adults away from key foraging areas). See Desholm, 2009 and Furness *et al.* 2013 for further discussion.

We therefore make our judgements based on the assessment of collision risk to black-legged kittiwake at the East Caithness Cliffs SPA & North Caithness Cliffs SPA. For the Beatrice 'worse case' scenario, we estimate that there would be ~21 collisions of breeding adults during the breeding season and ~23 collisions during the non-breeding season. These estimates are made using the extended model from Band (2012), 'option 3', and applying a 98% avoidance rate.

The estimate for the MORL eastern development area (the three proposed windfarms together) is in the order of ~70 collisions of breeding adults during the breeding season and a further 26 collisions of SPA during the non-breeding season. As before, these estimates are made using Band (2012), 'option 3' with a 98% avoidance rate.

[5] *K*-selected species have longer life expectancy, and produce fewer offspring, which require greater parental care until maturity.

Conclusion

Using our (draft) approach to apportioning, we consider how many of the estimated collisions should be assigned against each SPA population. This indicates that ~95.1% of the impact will be on kittiwakes from the East Caithness Cliffs SPA and ~3.4% on those from the North Caithness Cliffs SPA. At these levels, it is clear that neither windfarm alone, or in combination, will affect the long-term maintenance of kittiwake as a viable component of either SPA.

We therefore advise that Beatrice and MORL, alone or in combination, will <u>not</u> give rise to any adverse impact on site integrity at either the East Caithness Cliffs SPA or the North Caithness Cliffs SPA in respect of kittiwake.

- **Northern fulmar** **East & North Caithness Cliffs SPAs**

Scottish and UK trends for Northern fulmar suggest a decline in numbers since 1986 (by 7% in Scotland, and 4% at a UK level). The populations at East & North Caithness Cliffs SPAs remained fairly stable from citation to the Seabird 2000 count in 1999. Since then neither colony has been completely surveyed. Plots counts conducted at East Caithness suggest that numbers are up 63% since 1999, so we could tentatively conclude that fulmar is increasing in the Moray Firth area (but noting the limitations around extrapolating the plot counts).

The models presented by MORL and BOWL predict growth rates in opposite directions (BOWL predicts a positive growth rate and MORL a negative one). It is uncertain which may be more appropriate. Furthermore MORL present models specific to both East and North Caithness Cliffs, while it is unclear at what population sizes the BOWL models are conducted.

We therefore use PBR to gain some understanding of the level of impact that these fulmar populations could sustain. The PBR uses a population size of 28,404 individuals for East Caithness Cliffs SPA, 27,900 individuals for North Caithness Cliffs and an Rmax value of 1.0447. We recommend an f value of 0.3- 0.5 as being appropriate, as the populations may be increasing. PBR indicates that the population of Fulmar at East Caithness Cliffs SPA can sustain an additional annual mortality of 190 – 317 breeding adults per year. For fulmars at the North Caithness Cliffs SPA, PBR indicates that the population can sustain an additional annual mortality of 187 – 312 breeding adults.

There is currently very little available information on the behavioural reaction of fulmar to wind turbines. It is not known whether fulmar are more likely to display collision risk or displacement effects, so in coming to a view we have considered both (see our supporting spreadsheets). For HRA, however, we base our advice on the impact that would be most significant to the fulmar populations East & North Caithness Cliffs SPAs. This would be the risk of collisions rather than displacement because fulmar are a *K*-selected species and thus more sensitive to changes in adult survival rates (increases in mortality of adult birds) than to decreases in productivity (which could result from the displacement of breeding adults away from key foraging areas). See Desholm, 2009 and Furness *et al.* 2013 for further discussion.

In this regard, no fulmar were observed flying at collision risk height height (20-200m) in the MORL eastern development area (refer to section 4.1.6 of technical Appendix 4.5A of the MORL ES). For the Beatrice 'worse case' scenario, we estimate there would be ~5 collisions of breeding adults during the breeding season and ~23 collisions in the non-breeding season. These estimates are made using the extended model from Band (2012), 'option 3', and applying a 98% avoidance rate.

Conclusions

We have used our (draft) apportioning method to consider how many of the estimated collisions should be assigned against each SPA population. This indicates that ~82.7% of the impact will be to the fulmar population of East Caithness Cliffs SPA and ~11.4% to the population of North Caithness Cliffs SPA. At these levels, it is clear that neither windfarm alone, or in combination, will affect the long-term maintenance of fulmar as a viable component of either SPA.

We therefore advise that Beatrice and MORL, alone or in combination, will <u>not</u> give rise to any adverse impact on site integrity at either the East Caithness Cliffs SPA or the North Caithness Cliffs SPA in respect of fulmar.

- **Arctic skua** **Hoy SPA**
  We have read the Environmental Statements for both MORL and BOWL and are in agreement with the conclusions reached with regard to Arctic skua.

- **Great skua** **Hoy SPA**
  We have read the Environmental Statements for both MORL and BOWL and are in agreement with the conclusions reached with regard to great skua.

APPENDIX A (iv)

EIA SEABIRD SPECIES
JNCC & SNH ADVICE for GANNET

The qualifying interests of Troup, Pennan and Lion's Head SPA do not include gannet and therefore gannet is not required to be assessed under HRA. However, as part of the Gamrie and Pennan Coast SSSI, the gannet colony at Troup Head are a notified feature and for this reason have been assessed further below as part of the EIA.

(i) Gannet PVA

As part of the Crown Estate offshore wind enabling actions, the Strategic Ornithological Support Services (SOSS) commissioned a stochastic, age structured population model that assessed the cumulative impact of all existing and consented offshore wind farms on UK gannet populations, and determined a threshold mortality rate that could be sustained from the cumulative effects of collisions with existing and future wind farm developments without causing population decline (WWT, 2012)[6]. We discuss this further with regard to our assessment for gannet – see ii. For general context it is worth summarising the following findings, which based on an increasing population the model predicted that:

1. Additional mortality equivalent to 1.93% of population would cause 50% of simulations to display negative growth rate.

2. Additional mortality equivalent to 0.72% of population would cause 5% of simulations to display negative growth rate.

This mortality applies to all birds within the population, not just breeding adults.

(ii) Gannet EIA Assessment – Troup Head

Gannet numbers at Troup Head have been expanding since it was established in the 1980s. Counts of the colony in 2010 estimated the population was 2787 Apparently Occupied Nests (AON) and initial surveys from 2013 indicate the population is stable (RSPB *pers comm.*). This reflects both Scottish and UK trends for this species.

The population models presented by MORL and BOWL both predict that the Gannet population will exhibit a positive growth rate (BOWL use 1.022, and MORL use 1.0116). As the colony at Troup Head has been expanding it is likely to display a more strongly positive growth rate than that of the models. We also note that a population model commissioned by SOSS is also available for gannets – this model predicts a positive growth rate.

The demographic data for both adults and juvenile gannets are good, and the growth rates are supported by wider trend information. However, the two models created by MORL and BOWL are at very different population scales. As there is a third model available - the SOSS PVA model, that has already assessed acceptable levels of mortality, we have used this for context in our assessment.

The SOSS PVA model used changes to growth rates to assess acceptable level of mortality (at both a national and SPA level) – two metrics can be derived:

1. The level of mortality that reduces the growth rate to 1 – effectively stabilising an increasing population, or to put that another way when 50% of the simulations display a negative growth rate
2. A more precautionary measure of the level of mortality that causes the lower 95% confidence interval of the growth rate to equal 1 (when 5% of the simulations display a negative growth rate.

[6] http://www.bto.org/science/wetland-and-marine/soss/projects

For Troup Head the results would be:

1. 50% chance of decline = 108
2. 5% chance of decline = 40

However, it should be noted that the population growth rate at Troup Head is likely to be much higher than the national growth rate (used in the SOSS model), and hence the values above are precautionary.

For gannet we also carried out PBR using a population size of 360 individuals with an Rmax value of 1.0989. For recovery, we recommend that an f value of 0.3- 0.5 is acceptable, as the Troup Head colony is displaying a strong increase, and is not an SPA population**.** Using these parameters, PBR indicates that **the population of gannet at Troup Head can sustain an additional annual mortality of 83-138 breeding adults per year.**

Collision Risk

Collision risk is a year-on-year impact that will last throughout the operational lifespan of the proposed offshore windfarms, estimated to be at least 25 years.

The potential for collision mortality has been modelled by each developer as discussed in Appendix (ii). The calculations and spreadsheets for each of BOWL and MORL have been reviewed by SNH and JNCC. Presented below is the summary of estimated collision mortality to gannet as shown within the ES addendums for BOWL and MORL.

For the Beatrice 'worse case' scenario, BOWL have estimated that there would be ~17 collisions of breeding adults during the breeding season, **with an annual estimate of collision mortality from the Beatrice windfarm proposal in the order of ~42 gannets per year.** These estimates are made using the extended model from Band (2012), 'option 3', and applying a 98% avoidance rate.

The estimate for the MORL eastern development area (the three proposed windfarms together) is in the order of ~29 collisions of breeding adults from the SPA during the breeding season. As before, these estimates are made using Band (2012), 'option 3' with a 98% avoidance rate. **This gives an annual estimate of collision mortality from the MORL windfarm proposal in the order of ~53 breeding adults per year.**

We acknowledge that gannets disperse away from their colonies after breeding, and agree with the description BOWL have outlined regarding non-breeding gannets passage at the wind farm site, within their ES addendum (section 7.6.5.1). Therefore we consider it is precautionary to apply the annual in-combination estimates to the Troup Head population.

As the annual estimates presented are within the upper limit of suggested mortality range for Troup Head, this would suggest that in reality collision is likely to be within an acceptable range. We are however mindful that initial evidence from offshore wind farms in Europe indicates higher levels of displacement for gannet (Canning *et al.*, 2012 and Leopold and Dijkman, 2011). We have therefore also considered the impact of displacement on gannets.

Displacement

At present, our estimates are based on the assumptions that gannet will show 60% displacement from the proposed windfarm sites, leading to 100% failure in the breeding success of the birds displaced (i.e. productivity of 0%). Based on this level of displacement 126 gannet pairs at Troup Head may fail to breed due to estimated displacement from the Beatrice and MORL windfarm proposals together. However, gannet, like fulmar, undertake few but long foraging trips and it is reasonable to consider these species have a large area of habitat available to them. In addition gannet are adapted to using efficient gliding flight, so the extra costs of additional distance from displacement are likely to be relatively small (Masden *et al*. 2010)

Conclusion

We conclude that neither collision nor displacement (as a consequence of both the proposed MORL and BOWL windfarms) are going to have a significant adverse affect on the gannet population of Troup Head SSSI. In addition, although we cannot quantify the combined impacts of some mortality through collision and some failure through displacement, it is possible that these impacts in combination may reduce the level of effect of each.

References

Canning, S., Lye, G., Givens, L., Pendlebury, C. 2012. Analysis of Marine Ecology Monitoring Plan Data from the Robin Rigg Offshore Wind Farm, Scotland (Operational Year 2) Technical report, Birds. *Report: 1012206*. Natural Power Ltd.

Leopold, MF, Dijkman, L. 2011. Local birds in and around the Offshore Wind Farm Egmond aan Zee (OWEZ). *Report number C187/11.*

Masden, E.A., Haydon, D.T., Fox, A.D., and Furness, R.W. 2010. Barriers to movement: Modelling energetic costs of avoiding marine wind farms amongst breeding seabirds. *Marine Pollution Bulletin.* 60: 1085-1091.

APPENDIX A (v)

SPA SEABIRD SPECIES
JNCC & SNH ADVICE for HABITATS REGULATIONS APPRAISAL – LIKELY SIGNIFICANT EFFECT (SHORTLIST ADVICE)

(Sent as a separate attachment)

APPENDIX B (i)

JNCC & SNH ADVICE on MARINE MAMMALS

Background

Pre-application dialogue on marine mammal species has been facilitated via the Moray Firth Offshore Wind Developer's Group (MFOWDG) comprising MORL for proposed development in the Round 3 zone and BOWL for Beatrice. The meetings have been attended by Marine Scotland; Crown Estate; the developers and their consultants; JNCC and SNH.

Towards the start of the process, JNCC and SNH provided scoping advice for each proposal (scoping response for MORL, 28 October 2010 and scoping response for Beatrice, 14 May 2010). We outlined the process of Habitats Regulations Appraisal (HRA) for the marine mammal species which are designated as a qualifying interest of Special Areas of Conservation – see Appendix D of each response.

Further to this, the developers (as MFOWDG) indicated how they would approach cumulative impact assessment in a discussion document, on which we provided comment, 26 May 2011.

We have reviewed the MORL ES and we provide our advice to Marine Scotland to inform HRA for harbour seal and bottlenose dolphin as SAC qualifying interests – given in Appendix B(ii).

We provide over-arching comments on marine mammal species below. Appendix B(iii) provides our advice on licensing requirements for cetaceans (whales and dolphins) as European Protected Species.

Discussion & assessment of impacts on marine mammals

- **Underwater noise impacts**

  Underwater noise assessment is presented throughout Chapters 7.3, 10.3, 12 and 14.2 of the original ES and various Technical Appendices.

  The zones of disturbance impact from underwater noise have been modelled for harbour seal and bottlenose dolphin, see Technical Appendices 7.3F for the maps of the model outputs. Noise from pile-driving foundations is modelled to extend beyond the windfarm footprint and result in disturbance of individuals. In this regard, the implications for European Protected Species (EPS) are discussed in Appendix B(iii).

  For the species where this noise disturbance to individuals may be such as to result in population level effects – harbour seals and bottlenose dolphin – this has been investigated through modelling. The population models for each species are presented in Chapters 7.3 (and Technical Appendix 7.3B) and we are satisfied it uses the best scientific approach, currently available – see Appendix B(ii) for further detail. The models are precautionary and predict some impact on the populations during construction, but no long-term effect.

  It may be possible to further reduce disturbance impacts through consideration of construction programming at each site, and adoption of mitigation. Please see the discussion below on mitigation and monitoring and in Appendix F on natural heritage matters to be addressed by conditions.

  Potential auditory injury spatial footprints for the majority of species considered appear to fall within the mitigation zone advised in the JNCC guidance and can be mitigated for within proposed plan(s) for Beatrice and MORL (see below).

- **Corkscrew injury**

  Collision risk is considered, in light of ship strikes and corkscrew injuries, with the uncertainty around cause and effect for corkscrew injuries highlighted through the ES and as such this potential impact pathway is not considered further. We advise that, depending on the information available at the time, both in terms of the types of vessels to be deployed and best available scientific evidence on the issue, this potential impact should be considered for each proposal (MORL & Beatrice) by an independent expert panel as recommended in Appendix F and, if required addressed via a vessel management plan, construction method statement and / or in mitigation proposals (discussed below and in Appendix F).

- **Grid connection: export cable**

  MORL have not considered the potential impacts from installation of the export cable, particularly as it comes to shore crossing coastal waters to the south side of the Moray Firth, established as an area of higher dolphin use. As discussed in Appendix B(ii), we advise that this matter can be addressed by construction programming for cable installation and/or in a construction method statement – see our recommendations in Appendix F.

- **Mitigation**

  Mitigation measures for construction impacts are noted in the ES, including the commitment to follow JNCC piling guidelines, including use of MMOs, a 500m mitigation zone, soft start, and PAM monitoring. We note that potential use of acoustic deterrent devices (ADDs) is currently under discussion via the ORJIP (Offshore Renewables Joint Industries Programmes) working group.

  We recommend that a strategic overview is taken of mitigation measures for MORL and Beatrice together in order to minimise cumulative impacts during construction (including with regard to SAC qualifying interests, as discussed in Appendix B(ii)). Please see Appendix F for our recommended conditions: we advise that mitigation and monitoring is considered by an independent expert panel as discussed below and in Appendix F.

  We advise that Marine Scotland, as the regulator and licensing authority, should take the strategic overview of licensed development activity occurring in the Moray Firth. While MORL and BOWL can advise on their construction programmes and piling plans (possibly via the Expert Panel, as discussed), Marine Scotland will need to consider the timing and duration of this windfarm construction alongside other proposed development activity (that may potentially come on-stream over the same time period) including oil & gas; ports & harbours (development proposed in the National Renewables Infrastructure Plan); SHETL and other cable proposals. We would be happy to provide further advice on these aspects as more information becomes available.

- **Monitoring**

  We welcome the impact monitoring work suggested by the windfarm developers in the *Scoping document for the BOWL & MORL Marine Mammal Monitoring Programme* (March 2013). We recommend that monitoring proposals are taken forward for discussion and agreement via an independent expert panel, facilitated by Marine Scotland, and comprising representatives from each of MORL and BOWL, alongside ourselves (SNH & JNCC) and independent experts / academia – as advised in Appendix F.

  As well as facilitating co-ordination of monitoring across the MORL and Beatrice windfarms, the expert panel could act as an appropriate mechanism to align developers' site (impact) monitoring with any wider / strategic research that is commissioned, for example, the MS project for acoustic monitoring down the east coast of Scotland, and potentially any agreed workstreams resulting from the Offshore Renewables Joint Industries Programmes (ORJIP).

  For marine mammals, we recommend that site (impact) monitoring focuses on appropriately designed surveys to determine species responses to piling noise in particular and any other construction impacts, including dose–response relationships and the temporal span of impacts.

However, the expert panel should discuss and agree a monitoring plan that across all phases of development (pre, during and post construction) in order to validate ES impact assessment predictions (and increase the evidence base on such issues).

APPENDIX B (ii)

SAC MARINE MAMMAL INTERESTS
JNCC and SNH ADVICE for HABITATS REGULATIONS APPRAISAL

Introduction

Habitats Regulations Appraisal is the process which applies to any plan or project with the potential to affect the qualifying interests of a Natura site. As set out in our scoping response, we advise that the marine mammal interests of the following Special Areas of Conservation (SACs) will need to be addressed under HRA for the MORL offshore windfarm proposals:

- **Dornoch Firth & Morrich More SAC** - designated for its population of harbour seals (*Phoca vitulina*) and for coastal and marine habitats including sand dune habitats, intertidal mudflats and sandflats; subtidal sandbanks and reefs.
- **Moray Firth SAC** - designated for bottlenose dolphin (*Tursiops truncatus*) and for subtidal sandbank habitat.

JNCC & SNH advice for Habitats Regulations Appraisal

We provide the following advice to Marine Scotland for informing HRA in respect of the marine mammal interests of each of these SACs:

1. **Is the proposal connected with or necessary for SAC conservation management?**

   The proposal is not directly connected with or necessary for the conservation management of either the Dornoch Firth & Morrich More SAC or the Moray Firth SAC.

2. **Is the proposal likely to have a significant effect on the qualifying interests of the SACs either alone or in combination with other plans or projects?**

- **Harbour seals** of the Dornoch Firth SAC.

  The seals are not confined to this SAC itself and will range more widely within the Firth and beyond. Construction (and other) noise arising from the proposal is modelled to extend beyond the windfarm footprint and may overlap with seal use of the surrounding environment (see Technical Appendix 7.3F for noise propagation and SAFESIMM model outputs for marine mammal risk assessment). Boat movements, cable-laying and other construction activity may also give rise to disturbance, although likely to a lesser degree than piling. There may also be impacts to the prey species of seals – either from the placement of infrastructure or due to noise.

  We therefore advise **likely significant effect** from the MORL windfarm proposal on the harbour seals of the Dornoch Firth SAC, so impacts (including cumulative) will need to be considered in appropriate assessment (see step 3 below).

- **Bottlenose dolphins** of the Moray Firth SAC.

  The dolphins are not confined to this SAC and will range more widely within the Firth and beyond. Construction (and other) noise arising from the proposal is modelled to extend beyond the windfarm footprint and may overlap with dolphin use of the surrounding environment (see Technical Appendix 7.3F for noise propagation and SAFESIMM model outputs for marine mammal risk assessment). Boat movements, cable-laying and other construction activity may give rise to disturbance. There may also be impacts to the prey species of dolphin – either from the placement of infrastructure or due to noise.

  We therefore advise **likely significant effect** from the MORL windfarm proposals on the bottlenose dolphins of the Moray Firth SAC, so impacts (including cumulative) will need to be considered in appropriate assessment (see step 3 below).

3. **Can it be ascertained that the proposal will not adversely affect the integrity of the SAC, either alone or in combination with other plans or projects?**

This step is termed **appropriate assessment**, and it is to be undertaken by Marine Scotland, based on information supplied by developers, with advice from ourselves. It considers the implications of the proposed MORL windfarms for conservation objectives identified to maintain site integrity relating to the harbour seals of the Dornoch Firth SAC and the bottlenose dolphins of the Moray Firth SAC.

Please refer to http://www.snh.org.uk/snhi/ for a full list of these conservation objectives as we only discuss the relevant ones below.

- **Harbour seals** of the Dornoch Firth SAC.

The relevant conservation objective to consider is the maintenance of the harbour seal population as a viable component of the Dornoch Firth SAC. This encompasses any significant disturbance to individuals while they are outwith the SAC, such as underwater noise impacts arising from windfarm construction.

A harbour seal impact assessment framework has been developed initially for the MFOWDG windfarms and is now in press for wider use[7]. This framework considers whether any noise (and other) impacts to individuals would result in population level effects, please see Technical Appendix 7.3B

JNCC and SNH are satisfied that this framework constitutes the best possible approach to impact assessment for harbour seals under current scientific knowledge. It sets out a process for considering the outcomes of noise disturbance and behavioural displacement as a reduction in the individual fitness of animals and then models the consequences of this for the population, using reproductive success as the key parameter that is affected. Key areas of scientific uncertainty are highlighted, including their significance to the assessment framework.

As presented in the ES, the framework makes a base assumption that noise and other impacts from windfarm construction will reduce the breeding success of the harbour seal population to zero for the duration of construction. While this results in population-level effects during windfarm construction (a construction phase of up to 6 years for Beatrice and MORL together), the population is predicted to recover in the long-term once this construction is complete. The modelling is for a 'worst case' that considers the construction impacts of both windfarms together on harbour seals, and alongside continuing seal mortality due to licensed shooting.

Therefore SNH and JNCC are satisfied with the conclusions in the ES - that disturbance from underwater noise will not result in any long-term effects on the harbour seal population of the Dornoch Firth SAC and thus **there will be no adverse impacts on SAC site integrity.**

It has not been established whether there is any link between the use of vessels with ducted propellers and the fatal injuries (corkscrew lacerations) that have been recorded to seal species over the last couple of years[8]. Marine Scotland and SNH have commissioned research in this regard, currently being undertaken by SMRU. We will continue discussion with Marine Scotland to agree any mitigation, monitoring and conditions required in this regard.

- **Bottlenose dolphins** of the Moray Firth SAC.

The relevant conservation objective to consider for maintaining site integrity is the maintenance of the bottlenose dolphin population as a viable component of the Moray Firth

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[7] Paul M. Thompson P.M., Hastie G., Nedwell J., Barham R., Brookes K.L., Cordes L.S., Bailey H., McLean N. (2013) Framework for assessing impacts of pile-driving noise from offshore wind farm construction on a harbour seal population *Environmental Impact Assessment Review* 43 (2013) 73–85.

[8] Thompson, D., Bexton, S., Brownlow, A., Wood, D., Patterson, T., Pye, K., Lonergan, M. & Milne, R. (2010). Report on recent seal mortalities in UK waters caused by extensive lacerations. SMRU.

SAC. This encompasses any significant disturbance to individuals while they are outwith the SAC, such as underwater noise impacts arising from windfarm construction.

MORL have modelled potential underwater noise impacts to bottlenose dolphins during construction (see Technical Appendix 7.3F Predicted zones of impact from the noisiest construction activities (associated with pile-driving the turbine foundations) could slightly extend into areas used by bottlenose dolphin transiting along the coast in the Moray Firth: this is for a 'worst case' of piling activity at MORL and Beatrice windfarm sites together.

MORL have then modelled whether any resulting disturbance to individuals could result in population level effects (see Chapter 7 & Technical Appendix 7.3B). We are satisfied with the method adopted and the conclusion reached in the ES - that there are no long-term effects from underwater noise disturbance on the bottlenose dolphin population of the Moray Firth SAC. As such there is **no adverse impact to SAC site integrity**.

We also agree with the conclusion in the ES that potential disturbance to bottlenose dolphin from other construction activities will not result in population level effects. The potential for disturbance from, for example, the installation of export cable routes, may if necessary be managed through construction programming for MORL and Beatrice. We provide our advice on the natural heritage matters to be addressed by conditions in Appendix F.

APPENDIX B (iii)

MORL OFFSHORE WINDFARM PROPOSAL
JNCC and SNH ADVICE on EUROPEAN PROTECTED SPECIES

Background

The legislative framework for European Protected Species (EPS) is outlined in our scoping advice (see Appendix C of our response, 28th October 2010). In this regard, we consider Technical Appendix 7.3 H of the MORL ES to summarise the requirements for EPS licensing and the information that will be required for EPS licensing for bottlenose dolphin, harbour porpoise and minke whale.

EPS licensing guidance is currently under development for the marine environment both in Scottish and UK offshore waters. JNCC is the statutory nature conservation body who provides advice on EPS in respect of the Habitats Regulations for UK waters, outside of 12nm (territorial waters). A summary of the licence application tests[9] for EPS in offshore waters is as follows:

Any licence application (under regulation 53(1) of the HR and 49(6) of the OMR) will necessitate a detailed assessment of whether the licence should be granted. The licence assessment will be comprised of three tests to ascertain:

1. whether the activity fits one of the purposes specified in the Regulations;
2. whether there are no satisfactory alternatives to the activity proposed (that would not incur the risk of offence); and
3. that the licensing of the activity will not result in a negative impact on the species'/population's Favourable Conservation Status. The licence assessment will be carried out by the appropriate authority with the information provided by the developer and advice from nature conservation agencies.

Scottish Government Interim Guidance[10] sets out the three tests that must be satisfied before the licensing authority can issue an EPS licence under Regulation 44(2) of the Conservation (Natural Habitats &c.) Regulations 1994 (as amended):

Test 1 - The licence application must demonstrably relate to one of the purposes specified in Regulation 44(2) (as amended). For development proposals, the relevant purpose is likely to be Regulation 44(2)(e) for which Scottish Government is currently the licensing authority. This regulation states that licences may be granted by Scottish Government only for the purpose of "preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment."

Test 2 - Regulation 44(3)(a) states that a licence may not be granted unless Scottish Government is satisfied "that there is no satisfactory alternative".

Test 3 - Regulation 44(3)(b) states that a licence cannot be issued unless Scottish Government is satisfied that the action proposed "will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range" (Scottish Government will, however, seek the expert advice of SNH on this matter).

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9 JNCC advice on EPS under the Offshore Marine Regulations 2007 (as amended) at: http://www.jncc.gov.uk/page-4550 and http://jncc.defra.gov.uk/default.aspx?page=5473

10 SG Interim EPS Guidance available from: http://www.scotland.gov.uk/library3/environment/epsg.pdf

JNCC and SNH advice on impacts on EPS Favourable Conservation Status

Under the above regulations it is the responsibility of the statutory nature conservation advisers to provide advice with regard the 'third test' in each set of regulations – that the proposal will not be detrimental to maintenance of the population of the species concerned at a favourable conservation status in their natural range. For those EPS recorded more frequently in the Firth – harbour porpoise, bottlenose dolphin and minke whale – our judgements are informed by the JNCC species reports in preparation[5], alongside the risk assessments provided by each of the windfarm developers (MORL and BOWL).

For all EPS that may potentially be recorded in the Moray Firth, JNCC & SNH agree with the conclusion of the ES that disturbance arising to these species from the MORL windfarm proposals, alone or in combination with development in the Beatrice application, **will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status of these species in their natural range.** This is due to the scale of the impacts identified for these species within the impact assessments, the very conservative, worst case scenarios used in the impact assessments and the intermittent nature of the piling noise itself as described in the impact assessment, alongside the current favourable conservation status of all three species within UK waters[11] (draft Habitats Directive Article 17 species reports in preparation)).

An EPS licence (or licences) will be required for the MORL proposals, however, due to the potential for disturbance of individuals of each species. As outlined in their ES – technical Appendix 7.3H, MORL intend to apply for an EPS licence closer to the commencement of construction, once final windfarm layout, design and foundation options have been confirmed and submitted to Marine Scotland. Any licence applications, mitigation plans and construction methods statement etc must be provided to both JNCC and SNH in sufficient time for consultation on the proposals in order to ensure time for effective consultation.

Both JNCC and SNH note MORL's commitment to implementing the JNCC piling guidelines as mitigation and will review the development of an effective marine mammal mitigation plan as the developers plans are further refined closer to the point of construction. This includes effective monitoring for the full area over which auditory injury (i.e. PTS) could occur for species, as well as any further developments in relation to potential mitigation options (e.g. development of ORJIP project 4 and the use of ADDs etc).

The planned offshore renewable windfarm developments in UK waters could involve multiple piling events occurring concurrently, across a species range, over several years. This has the potential to have a detrimental impact on the FCS of populations of marine mammal species occurring in UK waters. Therefore, continued strategic discussion is needed between UK Regulators (including Marine Scotland) and statutory nature conservation advisers (including JNCC & SNH) to consider the wider issue of an EPS licensing framework across UK waters as a whole.

[11] DRAFT Third Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2007 to December 2012. JNCC (2013). Conservation status assessments for Species: S1351, Harbour porpoise (*Phocoena phocoena*), Species: S1349, Bottlenose dolphin (*Tursiops truncatus*) and Species: S2618, Minke whale (*Balaenoptera acutorostrata*).

APPENDIX C (i)

SNH & JNCC ADVICE on FISH INTERESTS

Summary of key advice on diadromous fish species

- **Underwater noise impacts**
  The ES recognises the principle areas that could lead to adverse impacts on Atlantic salmon, sea trout, sea lamprey and European eel. The ES also recognises the uncertainties regarding the behaviour of these diadromous[12] fish species in the marine environment, and their potential interaction with construction / operation / decommissioning of the proposed windfarm.

  The effect of noise on Atlantic salmon and sea trout is assessed to be negative, of minor-moderate significance and probable. For sea / river lamprey the effect is estimated to be small, and for European eel, the effect is thought to be between medium and small. For these species, we consider that noise disturbance to individuals will not result in population level effects.

  While MORL has spatially modelled the impacts, they have not explored or discussed the temporal aspects in any detail. We advise on the need for further discussion of construction programming and possible mitigation measures if / when windfarm proposals are consented – please see the discussion under HRA in Appendix C(ii).
  We recommend that mitigation options could be considered by the independent expert panel as discussed in Appendix F.

- **Grid connection: export cable**
  We highlight that MORL has not provided a thorough assessment of the impacts arising from installation of the export cable on diadromous fish, particularly where it draws close to shore. While the noise arising from cable installation may be considered less than that from pile-driving foundations, the noise will be emitted closer distance to shore and potential migration routes.

  We recommend that these matters are considered via construction programming for cable installation and/or in a construction method statement – please see the discussion under HRA in Appendix C(ii) as well as Appendix F.

- **Electro-magnetic fields (EMF)**
  The ES notes the considerable degree of uncertainty regarding the impacts of electromagnetic fields (EMF) on diadromous fish. Nevertheless, on the basis of existing knowledge, we consider that the mitigation (cable burial / rock armouring) proposed in the ES will be sufficient to avoid any significant EMF effects on diadromous fish.

Summary of key advice on marine fish species

- **Underwater noise impacts**
  Our key concern in respect of marine fish relates to underwater noise impacts from the pile-driving of turbine foundations during construction: cod and herring being the key species of concern in this regard.

  For **herring**, recent evidence from the ICES working group indicates an improved status of the relevant stock. While this leads us to conclude that impacts from each proposal (Beatrice, MORL) are minor, their cumulative impacts remain moderate.

  For **cod**, the MORL (and BOWL) ES has identified a major-moderate impact, with which we have agreed (see our interim advice, dated 18th December 2012). We do, however, continue to refer to Marine Scotland Science (MSS) for advice on the status of the stock, any updated

[12] Diadromous - fish migrating between fresh and salt waters

information on spawning grounds and for expert opinion on the significance of the impact upon wider North Sea stocks.

While a spatial zone of impact for the 'worst case' piling scenario is presented, neither MORL or BOWL have explored the temporal aspects. We advise that there should be discussion of construction programming and other potential mitigation measures to reduce or manage underwater noise impacts if / when proposals are consented – please see our recommendations in Appendix F.

It has been raised for consideration whether the use of reduced blow-forces for pile-driving could mitigate noise impacts during peak spawning periods of cod and / or herring. The value and / or viability of such a mitigation proposal could be considered further by the independent expert panel, as discussed in Appendix F.

- **Electro-magnetic fields (EMF)**
  The ES notes the considerable degree of uncertainty regarding the impacts of electromagnetic fields (EMF) on fish and shellfish. Nevertheless, on the basis of existing knowledge, we consider that the mitigation (cable burial / rock armouring) proposed in the ES will be sufficient to avoid any significant EMF effects on marine fish.

- **Impacts to sandeels**
  Although the scale of impact upon sandeel populations is not likely to be large in the context of the Moray Firth or wider region, sandeels were present in the development site during the MORL surveys. Greater densities however, were surveyed by MORL in their western development area. We refer to MSS for knowledge or predictions of local sandeel stocks. The potential for pre- and post-construction monitoring of sandeels, in conjunction with other monitoring, could present a valuable learning opportunity. We recommend that such a proposal could be considered by the independent expert panel, as discussed in Appendix F.

APPENDIX C (ii)

FRESHWATER FISH of CONSERVATION CONCERN
SNH & JNCC ADVICE for HABITATS REGULATIONS APPRAISAL

Introduction

Habitats Regulations Appraisal is the process which applies to any plan or project with the potential to affect the qualifying interests of a Natura site. As set out in our scoping response, we advise that the freshwater fish interests of the following Special Areas of Conservation (SACs) will need to be addressed under HRA for the MORL offshore windfarm proposals:

- **Berriedale & Langwell Waters SAC** - designated for Atlantic salmon (*Salmo salar*).
- **River Evelix SAC** - designated for freshwater pearl mussel (*Margaritifera margaritifera*).
- **River Moriston SAC** - designated for Atlantic salmon and for freshwater pearl mussel.
- **River Oykel SAC** - designated for Atlantic salmon and for freshwater pearl mussel.
- **River Spey SAC** - designated for Atlantic salmon, sea lamprey (*Petromyzon marinus*) and freshwater pearl mussel.
- **River Thurso SAC** - designated for Atlantic salmon.

We have considered other SACs and included only those that we consider relevant i.e. where there may be connectivity between the windfarm proposal and the SAC.

JNCC & SNH advice for Habitats Regulations Appraisal

We provide the following advice to Marine Scotland for informing HRA in respect of the freshwater fish interests of each of the above riverine SACs:

1. Is the proposal connected with or necessary for SAC conservation management?

The proposal is not directly connected with or necessary for the conservation management of any of the above riverine SACs.

2. Is the proposal likely to have a significant effect on the qualifying interests of the SACs either alone or in combination with other plans or projects?

- **Atlantic salmon**

We have listed a wide range of SACs due to the current uncertainty about the migratory movements of Atlantic salmon – they are recorded in the Moray Firth, but we do not know which SAC watercourses adult fish or post smolts are going to, or coming from.

We advise **likely significant effect** from the MORL windfarm proposals on Atlantic salmon due to the possibility that they could be disturbed by construction noise and / or possible effects of electro-magnetic fields (EMF) arising from installed cables. We are satisfied that operational noise would not result in likely significant effects to salmon.

Impacts will therefore need to be considered in appropriate assessment (see step 3 below).

- **Freshwater Pearl Mussel**

Atlantic salmon (and other salmonids) are integral to the life cycle of freshwater pearl mussel (FWPM), therefore any impacts to Atlantic salmon that prevent them from returning to their natal rivers may have a resulting effect on FWPM populations.

We therefore advise **likely significant effect** from the MORL windfarm proposal on FWPM, potential indirect impacts to this species will need to be considered in appropriate assessment.

- **Sea Lamprey**

  Sea lamprey is a qualifying interest of the River Spey SAC where it is virtually at the northern limit of its range in Britain. We note that there is little available information on the movements of sea lamprey in general, and within the Moray Firth in particular.

  We advise **likely significant effect** from the MORL windfarm proposals on sea lamprey due to the possibility that they could be disturbed by construction noise and / or possible effects of electro-magnetic fields (EMF) arising from installed cables. We are satisfied that operational noise would not result in likely significant effects to this species.

  Impacts (including cumulative) will therefore need to be considered in appropriate assessment (see step 3 below).

3. **Can it be ascertained that the proposal will not adversely affect the integrity of the SAC, either alone or in combination with other plans or projects?**

   This step is termed **appropriate assessment**, and it is to be undertaken by Marine Scotland, based on information supplied by developers, with advice from ourselves, as presented below. It considers the implications of the proposal for the (relevant) conservation objectives relating to the SAC qualifying species of concern to maintain site integrity. Please refer to http://www.snh.org.uk/snhi/ for a full list of these conservation objectives as we only discuss the relevant ones below.

- **Atlantic salmon**

  The relevant conservation objective to consider is whether or not the proposed MORL windfarms would result in any impacts on the viability of Atlantic salmon populations supported by the SACs listed above. While there may be some level of noise disturbance to individuals during construction we confirm that this will not result in population level effects. We are satisfied that operational noise would not result in likely significant effects to salmon.

  The applicant proposes to adopt soft-start piling methods to help mitigate any noise disturbance and to bury cables to reduce EMF. We are satisfied that this mitigation will further reduce impacts to individuals, and avoid population level effects, therefore we advise that the MORL windfarm will not result in any impact to the site integrity of the SACs listed above.

  The proposed Beatrice windfarm is the proposal of concern in this regard, rather than MORL, as it lies closer to this coastline.

  We recommend that monitoring proposals in respect of cumulative impacts are considered by the independent expert panel, as discussed in Appendix F.

  The applicant proposes to bury cables to reduce EMF and we are satisfied that this will be sufficient to avoid any significant EMF effects on diadromous fish. However, potential impacts arising from installation of the export cable have not been thoroughly evaluated, particularly where it draws close to shore along the Aberdeenshire coast. The ES indicates that installation of this section of the cable could just take a matter of days, so that mitigation, or avoidance, of impacts could be possible by timing the work to avoid peak smolt runs (if the timing of these can be established). We recommend that this matter is considered by the independent expert panel, as discussed in Appendix F.

  With the mitigation discussed above, we are satisfied potential impacts from cable installation can be reduced or avoided and that while there may be some noise disturbance to individual salmon, there will not be population level effects. Thus we advise **that the MORL windfarm proposals will not result in any adverse impacts on site integrity of any of the freshwater SACs listed above.**

- **Freshwater Pearl Mussel**

  As there will not be population level effects to Atlantic salmon, nor significant effects to other salmonid species, we advise that there will be no indirect effects on freshwater pearl mussel

(FWPM) in the Rivers Evelix, Moriston, Oykel and Spey SACs. Thus we advise that **the MORL windfarm proposals will not result in any adverse impacts on site integrity of any of the freshwater SACs listed above.**

- **Sea Lamprey**

  The relevant conservation objective to consider is whether or not the proposed MORL windfarm would result in any impacts on the viability of the sea lamprey population of the River Spey SAC. While there may be some level of noise disturbance to individuals during construction we confirm that this will not result in population level effects. We are satisfied that operational noise would not result in likely significant effects to sea lamprey.

  The applicant proposes to adopt soft-start piling methods to help mitigate any noise disturbance and to bury cables to reduce EMF. We are satisfied that this mitigation will further reduce impacts to individuals, and avoid population level effects, therefore we advise that the MORL windfarm will not result in any impact to the site integrity of the River Spey SAC.

APPENDIX D

BENTHIC ECOLOGY & OTHER HABITAT INTERESTS

BENTHIC ECOLOGY

Summary of key advice

- **Gravity bases**

Since the provision of our advice in December 2012 to MORL, further consideration has taken place regarding the deployment of gravity bases as a proposed foundation type for all turbines. It has now been confirmed by Marine Scotland that the use of gravity bases across all turbine locations would be the subject of a further marine licence - to consider the required dredging and disposal of sediment. We welcome and support this approach.

We advise that we can **confirm no adverse effect on site integrity on the Moray Firth SAC habitat interests.** This may require further consideration if a Marine Licence is submitted for the deployment of gravity bases.

- **Annex 1 habitats**

Benthic survey work for MORL has identified Annex I habitat within the export cable route: *Sabellaria spinulosa* reef and stony and rocky reefs. As discussed at pre-application, and presented in the submitted ES, the applicant proposes micro-siting the export cable around the Sabellaria reef (which is patchily distributed) and using installation aids to prevent damage.

JNCC and SNH seek further discussion over proposed micro-siting and installation methods for the export cable as part of a construction method statement for the expert cable – See Appendix F.

- **Non native species**

We would welcome further discussion of this aspect in order to inform good practice to reduce / avoid the possibility of introducing non-native species into the Moray Firth from the range of activities associated with the proposed windfarm developments.

APPENDIX E

MORL & BEATRICE OFFSHORE WINDFARM PROPOSALS
SNH ADVICE ON COASTAL LANDSCAPE, SEASCAPE AND VISUAL IMPACTS

Background

SNH's *Landscape Policy Framework* (Policy Statement 05/01) outlines our overall landscape remit within the context set by Government policy. For our advice on impact assessment, we follow the *Guidelines for Landscape and Visual Impact Assessment* (GLVIA)[13] and we have prepared guidance on applying this method to the assessment of marine renewables development[14]. Our guidance on seascape, landscape and visual impact assessment (SLVIA) takes into account the need to consider the key qualities and issues specific to the marine and coastal environment: for example, the conjunction of land, intertidal areas, and open seas; the shape, scale and experience of the coastline; views from the coast and from the sea. These are the key issues supplementary to those considered in an LVIA.

We have also recently updated our guidance on *Siting and Designing Windfarms in the Landscape*[15]. Although this guidance aims to inform onshore development, some aspects are relevant to consider in respect of offshore proposals.

Structure of our Advice on the Moray Firth windfarms

We provide our advice on Beatrice and MORL together, as follows:

- Summary of key impacts on coastal landscape, seascape and visual receptors.
- Core area – Noss Head (Wick) to Dunbeath.
- North area – Duncansby Head to Noss Head (Wick).
- South area – Dunbeath to Helmsdale.
- Moray and Aberdeenshire coastline.
- Key transport routes.
- Effects of lighting.
- Cumulative impacts of offshore & onshore windfarms.

The **coastal character areas (CCAs)** that we refer to in our advice are named and illustrated in Figure 8.1 of the Beatrice ES addendum (Volume 3) and Figure 5.4-4 of the MORL ES (with the numbering taken from the latter). Viewpoint mapping is given on Figure 5.4-7 of the MORL ES and Figure 14.8 of the Beatrice ES. Key viewpoints have been agreed between the developers, in consultation with Marine Scotland, Highland Council and ourselves. So the naming and numbering of viewpoints is largely consistent between each ES, in the few instances where there are differences we provide both ES references below.

Windfarm Design Envelopes

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[13] *Guidelines for Landscape and Visual Impact Assessment* (LI-IEMA, 2002). Recently updated (2013), the release post-dates the submission of the Beatrice and MORL Environmental Statements.

[14] *Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape* (SNH, March 2012). Available from:
http://www.snh.gov.uk/docs/A702206.pdf

[15] SNH guidance on *Siting and Designing Windfarms in the Landscape* is available from:
http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/landscape-impacts-guidance/

The **Beatrice** offshore wind proposal (131.5km^2) is located in Scottish territorial waters east of Caithness, at a distance of some 13.5km from Sarclet, at its closest point. The ES considers two scenarios to cover the range of potential turbine sizes, the final selection falling within:

- the maximum number and smallest-size turbine - 277 turbines @ 132m to blade tip; spaced at a minimum of 642m from each other; and
- the minimum number and largest-size turbine - 142 turbines @ 198m to blade tip; spaced at a minimum of 990m from each other.

The ES demonstrate that landscape and visual impacts do not significantly differ between these scenarios. The ancillary infrastructure for the windfarm proposal includes 1-3 offshore meteorological (met) masts, and up to three offshore substation platforms.

The SLVIA for **MORL** addresses the Eastern Development Area (EDA) of the Round 3 windfarm zone in the Moray Firth. The EDA lies offshore beyond the 12 nautical mile (STW) limit – its inshore boundary aligned with the offshore boundary of Beatrice. There are three proposed windfarms in the EDA: Telford (93km^2), Stevenson (77 km^2) and MacColl (125 km^2).

Indicative layouts are considered (presented in ES Figure 8.4-1), turbines being arranged on a grid, or 'diamond' (offset grid) pattern (see Section 2.2.6.13). A number of design scenarios are presented: Scenario 4c being nominated as the 'worst case' for SLVIA comprising the largest turbine size (204m to blade tip) and densest layout.

The ancillary infrastructure for MORL includes up to two offshore meteorological (met) masts, and up to six offshore substation platforms.

Finalising Windfarm Layout and Design

If consent is granted for either or both of these proposals, we recommend that landscape consultants continue to be employed post-consent to work with the project and engineering teams to iterate and finalise the windfarm design (see Appendix F).

This will ensure cohesiveness in the design of Beatrice and MORL (Stevenson, Telford and MacColl projects) as these proposals will be seen together as one single large windfarm development. There should be consideration of layout and design across the proposals so that a positive visual image is achieved in views from key / sensitive locations in the core area (such as areas of significant settlement or 'gateway' views on the main transport corridors).

Summary of Key Impacts

The Caithness coast varies in character and is experienced differently according to elevation – whether at sea level or on the elevated coastal edge. When at the coast, attention lies seaward and there are few views inland. The sea views are open, with limited development – the two Beatrice demonstrator turbines and five offshore platforms – and incidental marine traffic. Most settlement is situated along the coast, and mostly along the major routes – the A9, A99 and the minor roads leading off them. There is a strong maritime influence on the settlement in this area and many houses are oriented so as to take advantage of the sea views.

The key landscape, seascape and visual impacts of the Beatrice and MORL (EDA) windfarms will occur along a 39km stretch of the Caithness coast from Noss Head (lying north of Wick) to Dunbeath. Here BOWL, at its closest, is around 13km from shore, and MORL (EDA) is around 22km. The impacts of each windfarm individually and together are discussed in more detail below under the section: **Core area – Noss Head (Wick) to Dunbeath.**

In summary, there will be a major change to Caithness' coastal character and scenery in this core area impacted by the windfarms. Beatrice and MORL are likely to be perceived as one single windfarm lying offshore, parallel to the coast. They will form a prominent new feature (some 19km in length) on the skyline of the open sea and views to the windfarms from the Caithness coast will be widespread.

Where a viewpoint / location has a panoramic and expansive context, the offshore development may well appear 'incidental' on the horizon. However, landscape and visual effects will be adverse at specific viewpoints and locations, especially elevated clifftops and landmarks. This will be the case at key viewpoints such as Wick (the main centre of population), Sarclet, Whaligoe Steps, Lybster Harbour, Dunbeath Castle and from stretches of the A9. Due to lighting requirements, the windfarms will change the night-time character of seas and skies in this area, where there is currently limited light pollution.

These landscape and visual impacts are primarily caused by Beatrice, rather than MORL, due to its closer proximity to shore. Cumulative assessment demonstrates that MORL will only marginally increase these impacts as it lies further offshore, behind Beatrice, and is constantly more 'recessive' in views from Caithness.

Coastal Landscape, Seascape and Visual Impacts of the Moray Firth Windfarm Proposals

<u>Core area</u> – Noss Head (Wick) to Dunbeath

- **Noss Head CCA** (CCA 10), situated just north of Wick, demarcates the northern limit to the core area of impact. This promontory, oriented to the north and east, is made up of rugged, inaccessible coastal cliffs topped by a gently sloping farmed 'plateau'. Wick Airport and Noss Head Lighthouse are prominent features, strongly associated with Wick. There is a feeling of being 'on the edge' of the coast, but also the edge of Wick.

  The windfarms will form a new, major skyline feature in sea views out from the majority of the plateau and its coast, from Noss Head to Sealby Head; the coast of Staxigoe and Papigoe, leading into Wick itself. Due to the extent of human activity and character of the promontory, the extensive outer seascape can be considered a suitable background for offshore wind, thus impacts will be **moderate**.

- The town of **Wick** (pop. 7,300) clusters directly around Wick Bay and harbour, where shipping, harbour traffic and characteristic sea views, all give Wick a strong maritime character. Views of the windfarms will largely be restricted from within the town, and the main views will be from the harbour and the hill slopes to the north and south of the town. Seen from Wick Bay (VP 4), the windfarms will extend from behind Oldwick headland, across the open sea-horizon. The nature of the town and its maritime activities can be considered a suitable background for offshore wind, impacts here will be **moderate to minor**.

  Beatrice primarily contributes to these visual impacts seen from Wick, with turbines extending from beyond South Head across the open horizon of Wick Bay (at ~18km). The MacColl and Stevenson proposals lie at more than 35km from Wick, and at such distance they are unlikely to be picked up behind the Beatrice turbines. The Telford project (MORL Round 3 zone) will laterally extend the amount of development seen along the horizon, but is located ~25-36km.

  In the south of **Wick Bay CCA** (CCA 11) from Oldwick, we consider that the windfarms will have **moderate or major impacts**. This reflects the higher elevation of the coast, its orientation and the siting of 'The Old Man of Wick', a notable landmark and well-visited viewpoint. The castle sits on a narrow promontory '*dramatically jutting out into the sea with steep cliffs and deep geos on either side*', its topographical and defensive relationship lies clearly with the sea, thus the setting is of high sensitivity to offshore wind development.

- The **Sarclet-Lybster coast** (Sarclet Head CCA and Lybster CCA) is experienced differently according to elevation – whether at sea level or on the high coast. Settlement in this area – Whiterow, Hempriggs, Sarclet, Thrumster, Ulbster and the Clyths – is relatively dispersed along the elevated coastline, and contrasts with the less-settled, expansive, interior moorland. Historic landmarks are concentrated on the coastal edge including traditional fishing harbours at The Haven, Sarclet and the spectacular Whaligoe. The coast is irregular and rocky, with innumerable geos, stacks and caves. These are not easily accessible, but can be appreciated from high-level views, with waymarked viewpoints. Access to the shoreline is limited along this coast, found only at the compact fishing villages and harbours nestling at cliff-foot.

The effects of the offshore windfarms will be **major** on this coastline, particularly in views from cultural sites and visitor attractions such as Sarclet (VP5), Whaligoe Steps (VP10, Beatrice; VP15, MORL), Lybster (VP7) and Hill o' Many Stanes (VP6). These major visual effects are primarily due to Beatrice, rather than MORL, due to its closer proximity to shore.

From much of the coastal hinterland, views offshore to the windfarms will be limited by the presence of forestry on a number of seaward facing slopes. Elsewhere, the sweeping moorland of Moss of Whilks and Oliclate (~6km inland) has views to the sea which will change to a moderate extent due to the presence of these proposed windfarms in the Moray Firth.

Arguably, this complex coastline may best be appreciated from the sea, and a number of boat tours head out from Wick. From the sea, the coast feels remote, with a 'wild' untamed nature: cliffs rising 30m in height, featuring natural rock arches, caves, sea stacks, gloups and geos. During a boat tour, people's attention is likely to be focussed on the coast rather than directed to the open sea where the windfarms would be located. We therefore consider it unlikely that Beatrice or MORL will significantly affect people's experience or appreciation of this dramatic coastline while on a boat tour.

- **Dunbeath CCA** (CCA 14) is the southern limit to the core area of impact. Here, the coast is a broad, indented sweep, oriented south-east. Small pocket bays punctuate some of the coast with harbours set at Latheronwheel and Dunbeath (VP9), where the Burn of Latheronwheel and the Dunbeath Water break out through steep valleys to the sea. These points form relatively intensive clusters of human activity compared to inland Caithness, and are linked by the A9 close set to the coast. There are wide, expansive sea panoramas from the upland coastal edge, with housing largely oriented seawards. The older settlements sit downslope, sheltered, enclosed and associated with the junction of the inland straths and sea.

  We consider the impacts of the proposed offshore windfarms as **moderate to minor** along this coastline. However, **major impacts** will be encountered at locations where the Moray Firth forms a panoramic backdrop, particularly to historic and cultural features, such as at Latheron (VP8, Latheron Church and the Clan Gunn Heritage centre), Dunbeath (including Dunbeath Castle Garden and Designed Landscape, GDL), and Laidhay. These impacts are primarily attributable to Beatrice, lying to the fore-front, with MORL recessive in the views.

  Dunbeath Castle is perched on a high promontory jutting out into the sea. The Castle and its marine backdrop are a major axis of the landscape design, as designated. There will be impacts on this designation - Dunbeath Castle Garden and Designed Landscape. Historic Scotland are the key advisers in respect of impacts on GDLs.

<u>North area</u> – Duncansby Head to Noss Head

- **Duncansby Head** (VP1) is the most north-easterly point on mainland Britain. It is notable for its spectacular scenery – the wild seascapes and jagged Duncansby Stacks. The coast here is rugged, dynamic, with an overall feeling of remoteness: the views to sea are impressive, including those out to Orkney. Highland Council, in order to recognise this scenic and amenity value, have designated this coast as a Special Landscape Area (SLA) – a landscape of regional importance. This designation informs the Local Development Plan, alongside the Highland Coastal Classification which notes the 'isolated' character of this coast[16]. The offshore windfarms will create a new visual focus across a significant proportion of the horizon, vying with the Stacks of Duncansby, currently the key focal point of this coast. Impacts here will be **major**.

- At **Freswick Bay** and **Nybster** (CCA 8) the coast is largely low and rocky, set with small farms and crofts along the A99, and on the minor road to Skirza, north of Freswick Bay. In the townships of Auckengill and Nybster the crofts are set out on a grid pattern perpendicular to the coast. The associated hinterland is sweeping moorland, where wide open views are interrupted by crofts and some forestry blocks. Views from these areas lie out to sea, where turbines will be

[16] For information on the Highland Council Special Landscape Areas and coastal classification see: http://www.highland.gov.uk/yourenvironment/planning/coastalplanning/classificationofthehighlandcoast/

seen on the horizon, however, effects will be only **minor** due to distance, settlement context and the intermittency of views.

- **Sinclair's Bay** (CCA 9) is a large, deeply indented, sweeping bay. It is backed by the A99, which is set on a ridge and gives extensive panoramas north to Duncansby Head and South Ronaldsay, and south to Noss Head. Keiss (VP 2) on the north edge of the bay is a small, picturesque fishing port tucked into the foot of the elevated coast – it has seen little change and retains a traditional character. Cultural attractions close-by – Keiss Castle, Keiss broch and the Whitegait broch – are all located on the elevated coast with spectacular eastward sea views. A focal point in these views is Noss Head lighthouse on Noss Head; the windfarms will appear beyond and flanked by Noss Head. Overall, the windfarms will give rise to **moderate** impacts on Keiss, and the coast in this area, primarily attributable to Beatrice.

  Inland from Sortat (VP3) and Catchory (VP13), the windfarms will be seen at a greater distance, further away on the sea-horizon. Impacts on these inland areas will be **minor.**

South area – Dunbeath to Helmsdale

- There is one Special Landscape Area (SLA) in this south area – The Flow Country and Berriedale Coast. Views of Beatrice and MORL from the south-east / eastwards facing-slopes and high hilltops of Scaraben (VP11), Morven and Maiden Pap will not fundamentally alter the relationship and character of the hills to flows so the **Flow Country peatlands** will be largely unaffected. Impacts here will be **minor**.

- While the major focus of the SLA is The Flow Country, the citation notes its contrast with the **Berriedale Coast** – specifying the Berriedale Cliffs, Badbea village, and Berriedale Castle. There will be views to Beatrice and MORL from all these points, as well as from the high hills and walks above Berriedale at Inver Hill and Cnoc na Croiche. This will alter the current sense of remoteness to be found along the Berriedale Coast, resulting in **major to moderate** impacts on landscape character and visual amenity.

- Further south towards Helmsdale the impacts will lessen towards **moderate** then **minor**, as the windfarms become further away and will only be seen under clear weather conditions (VP12 Navidale).

Key transport routes

Three major routes traverse the area: the A9 (Brora to Thurso), the A99 (Latheron to Wick) and the A882 (south of Thurso to Wick). The impacts of the offshore windfarms are as follows:

- ***A9***
  The A9 follows the coast from south of Brora to Latheron, a length of some 30-50km. The sections of the route where offshore windfarms (primarily Beatrice) will be visible are:

  Helmsdale to Berriedale: travelling northwards there will be limited effects of the A9 between Berriedale and Ousedale. However, south of Ousedale there will be a **locally major** effect on views from the Ord of Caithness, the gateway into Caithness; and the filling-in of 'keyhole' views to the sea at Ousedale.

  Berriedale to Latheron: the offshore windfarms will be almost continuously visible for 14.5km, travelling north or south, appearing on the sea-horizon, parallel to the A9. Impacts here are **moderate**.

- ***A99***
  Between Latheron and Thrumster, the A99 largely follows the coast for some 20km. Beatrice and MORL will form a prominent feature on the sea horizon, changing seaward views (VP6, VP 15). These impacts are **major to moderate**.

- ***A882***
  This road is oriented at right angles to the coast. Blade tips may be visible when travelling eastwards towards Wick, but at a distance of >30km – therefore impacts will be **negligible**.

Effects of lighting

There is limited light pollution in Caithness with lighting from residential properties and street lights concentrated at the main settlements of Wick (VP9, Beatrice ES Figure 14.27) and Helmsdale, with smaller clusters at Lybster, Latheronwheel and Dunbeath.[17]

The offshore windfarms will require a variety of lighting and marking, although the turbine marking (painted yellow RAL 1004) will not be visible from land. Impacts may arise from the following:

a) Red CAA lighting on the nacelles of turbines situated on the periphery.

b) Red perimeter lighting on buoys or beacons to mark groups of structures or routes through the windfarms.

c) Yellow lights on 'significant peripheral structures' and 'intermediate structures' on corners, significant points and the periphery - these will flash every 5 secs. with a range of 5 nm.

The lighting impacts of Beatrice and MORL are likely to be most significant on the unlit areas found within the core area, including Dunbeath (VP9, Beatrice ES Figure 14.28), Sarclet (VP5), Whaligoe and Ulbster (VP10), Lybster and Latheronwheel – all low density settled areas on the elevated coast. The offshore windfarms, particularly Beatrice, will change the night-time character of the Caithness coastline with the introduction of lighting in landscapes and seascapes that currently experience little or limited lighting.

Moray and Aberdeenshire coastline

MORL, lying south of Beatrice, is closer to Moray and Aberdeenshire, but still lies over 41km from this coastline. It will only be seen in periods of exceptional / excellent weather and light conditions. Even when visible, the wind turbines will only be seen along 10-20^{o} of the horizon, and are incidental upon its vast expanse. Impacts will be **negligible**.

Cumulative Impacts of Offshore & Onshore Windfarms

In the core area of impact, the main cumulative effect of Beatrice and MORL in combination with onshore schemes is to introduce windfarm development eastwards into a new part of the view, and a new context – the open sea.

In a limited number of locations, onshore and offshore development may combine to diminish the prominence of coastal landmarks or other notable features. From Keiss (VP2), for example, the offshore windfarms will diminish Noss Head as a dominant focal point in the view. From this same viewpoint, a cluster of operational windfarms (Achairn, Wathegar, Flex Hill) and Camster (constructed / near operation) are seen inland, and vie with the distinctive and prominent peaks of Morven and Scaraben.

There is limited cumulative impact of onshore and offshore windfarm development on settlement in the core area. From **Wick** it is unlikely that the offshore windfarms will be seen in the same views as onshore development. Views to onshore windfarms are limited: there will only be occasional views to Achairn, Wathegar and Flex Hill (all operational) on the skyline, and both Camster (constructed / near operation) and Burn of Whilk (consented) are likely to be screened by buildings in most views. Cumulative effects will arise at **Sarclet** and **Lybster** from Burn of Whilk (consented) together with the offshore proposals. At **Dunbeath**, the Buolfruich windfarm (operational) is prominent in the landscape, which will give rise to cumulative effects in combination with the offshore proposals.

[17] British Astronomical Association – http://www.britastro.org/dark-skies/maps.html?7O

From **key transport routes** there will be some sequential impacts of onshore and offshore windfarms. It is primarily the **A99** where such effects will be experienced with views to onshore windfarms along a 3km stretch of road between Lybster and Thrumster, and successive views to the offshore proposals as described earlier.

APPENDIX F

NATURAL HERITAGE MATTERS TO BE ADDRESSED BY CONDITIONS

Our recommendations below should inform consideration of conditions for the MORL windfarm proposals, if consented. We consider that, as part of any S36 consent, an appendix is attached to the decision letter with a description of the proposal including all aspects that are consented. This will be particularly important for proposals submitted and assessed on the basis of a design envelope, such as is the case for MORL.

We also request that all environmental survey and monitoring information is made publicly available. As stated in our covering letter and throughout all the relevant appendices, we would welcome the opportunity to advise further on the detail of conditions to address the following:

Confirmed Layout

Confirmed turbine locations, map and co-ordinates of the final turbine layout and location of other infrastructure – offshore substation platforms, met masts and cabling (inter array and offshore transmission works) shall be submitted to Marine Scotland prior to commencement of works, within a timeframe to be agreed.

Visualisations for Final Windfarm Layout & Design

Visualisations, to an agreed standard and format, from a list of agreed viewpoints, will be provided for the final layout and design of the development. These are for statutory consultee and public information. They will be submitted to Marine Scotland prior to commencement of works, within a timeframe to be agreed.

Expert Panel

Within a timeframe to be agreed, Marine Scotland will establish an inter-disciplinary expert panel to provide advice and agree on monitoring requirements (including any adaptive management requirements) for pre-construction, construction and operational periods of this development. Marine Scotland will decide its constituent membership and terms of reference, in agreement with relevant consultees. Key aspects for consideration by an Expert Panel include, but are not limited to:

i. Underwater noise impact monitoring for key receptors: marine mammals, marine fish, diadromous fish and marine fish to take account of response, temporal span of response etc. (Appendix Bi).

ii. Monitoring of benthic impacts to include consideration of damage, recovery, colonisation and management for the prevention of marine invasive non natives.

iii. Consideration of evaluation of bird impacts from collision and displacement to take account of evaluating collision and/or avoidance behaviours of key species such as great black backed gull, herring gull and for displacement consideration of methods to calculate displacement and to measure impacts to key species such as auk species (guillemot, razorbill and puffin).

iv. Consideration of monitoring of sandeel populations pre, during and post construction

v. Provision of advice on the relevant temporal and spatial scale of monitoring to take account of individual and cumulative impact predictions within and beyond the Moray Firth and to take account of other marine renewable projects in Scottish waters.

vi. Export cable route monitoring requirements to consider damage and recovery to Annex 1 habitats, disturbance to marine mammals and fish interests.

vii. Consultation and sign off on the Environmental Monitoring Programme and any associated documentation such as construction method statements, vessel management plans, O& M programme etc.

Environmental Monitoring Programme

The expert panel shall oversee and direct a monitoring programme to investigate the environmental impacts of this, and any other relevant, development. The expert panel will agree the environmental interests to be monitored and appropriate monitoring methodologies. The monitoring programme will cover pre-construction – including the geo technical survey results, construction and operational periods of development. The programme of monitoring works will be signed off by the expert panel, subject to input from relevant consultees, and it will be regularly reviewed – the review cycle to be decided by Marine Scotland in consultation with the panel and relevant consultees.

The agreed monitoring will be implemented and the data collected will be reported on and made publicly available. Consideration should also be given to the storage of data, analysis and reporting as well as the review and application of knowledge gained to future development proposals.

Construction: Environmental Manager

Within a timeframe agreed with Marine Scotland, the developer shall employ an Environmental Manager for the development . The role, responsibilities and work programme shall be submitted to Marine Scotland and relevant consultees for approval. The Environmental Manager responsibility on-site for ensuring implementation of the Construction: Environmental Management Plan; Construction: Method Statements; Construction: Vessel Management Plan; Construction: Export Cables: including any required mitigation measures or monitoring and compliance with all consent / licence conditions. The Environmental Manager role should also be employed in sufficient time to have regard to any requirements for pre –construction monitoring.

Construction: Environmental Management Plan

Within a timeframe agreed with Marine Scotland, the developer shall draft and submit a plan for environmental management during construction. The final draft of the plan will be signed off by the Environmental Manager prior to submission. The plan shall be submitted to Marine Scotland for approval in consultation with relevant consultees. The approved plan will be implemented.

The plan will detail mitigation measures to prevent adverse impacts to species and habitats during construction, including management measures to prevent the introduction of invasive non native marine species. It shall cross-reference any relevant monitoring requirements during construction, taken from the Environmental Monitoring Programme. It will provide the overall framework in which the construction method statements (or equivalent) and vessel management plan will sit.

The Environmental Management Plan will also set out the role, responsibilities and work programme of the Environmental Manager. It will detail how each and all contractors and sub contractors will be made aware of environmental sensitivities, what requirements they are expected to adhere to and how chains of command will work.

It will also confirm the reporting mechanisms that will be used to provide Marine Scotland and relevant consultees with regular updates on construction activity, including any environmental issues that have been encountered and how these have been addressed.

Construction: Method Statements

Construction method statements (or equivalent) shall be submitted prior to the commencement of work and within a timescale to be agreed with Marine Scotland. The final draft of each statement will be signed off by the Environmental Manager prior to submission. The statements shall be submitted to Marine Scotland for approval in consultation with relevant consultees. The statements will include details of commencement dates, duration and phasing for key elements of construction.

Construction: Vessel Management Plan

Within a timeframe agreed with Marine Scotland, the developer shall draft and submit a plan for vessel management during construction. It shall present details on the type and overall number of vessels required during construction, including a specification for each individual vessel to be deployed. It shall set out how vessel management will be co-ordinated, specifying the location of working port(s), the routes of passage and how often vessels will be required to passage between port(s) and site.

If helicopters are required during construction, then an equivalent plan for their use is needed.

Arrangements for Environmental Inspection

When requested, the developer must provide access (and, if necessary, appropriate transportation) to the offshore windfarm site and associated infrastructure for inspection by Marine Scotland personnel, or their appointees. This right of access will apply during pre-construction and construction, and for the operational lifespan of the windfarm.

Construction: Offshore transmission Works (Export Cable(s))

Within a timeframe agreed with Marine Scotland, the developer shall draft and submit a construction method statement with the locations and method of installation of the grid export cable(s) and landfall. The export cables are to be buried to a minimum depth to be agreed with Marine Scotland and relevant consultees.

Operations & Maintenance (O&M): Programme

Within a timeframe agreed with Marine Scotland, the developer shall draft and submit their programme for operations & maintenance (O&M). The programme will be approved by Marine Scotland in consultation with the Expert Panel and relevant consultees. It will take account of environmental sensitivities which may influence the timing of O&M activities. It will set out O&M vessel requirements and vessel management.

The approved O&M programme will be implemented, and it will be reviewed regularly – the reporting cycle will be agreed by Marine Scotland in consultation with relevant consultees. It will cross-reference to the Environmental Monitoring Programme and O&M Environmental Management Plan where relevant.

O&M: Environmental Management Plan

Within a timeframe agreed with Marine Scotland, the developer shall draft and submit a plan for environmental management over the operational lifespan of windfarm development. It will be approved by Marine Scotland in consultation with relevant consultees and will detail measures to prevent adverse impacts to species and habitats during operation.

The O&M Environmental Management Plan will detail how each and all contractors and sub contractors will be made aware of environmental sensitivities, what requirements they are expected to adhere to and how chains of command will work during O&M activity.

The approved plan will be implemented, and it will be reviewed regularly – the reporting cycle will be agreed by Marine Scotland in consultation with relevant consultees.

O&M: Offshore transmission Works (Export Cable(s))

A monitoring and maintenance programme for the grid export cable(s) and landfall site shall be agreed with Marine Scotland. It will include the agreed actions to be taken in the event of erosion / re-exposure of cables.

Decommissioning

A decommissioning plan will be required for the entire scheme. As part of any consent, the Regulator shall consider and recommend a timeframe for the production, consultation and implementation of a decommissioning plan. We recommend that this is an iterative process and that an initial decommissioning strategy is produced by the developer.

Key seabird species and SPAs where JNCC and SNH identify 'likely significant effect'

Seabird Species	Breeding Season	SPA: Name	LSE?	SPA Citation Population	P/I	Citation Year	% change	Most Recent Population (SMP Count)	P/I	SMP Year
Northern fulmar	May - September	East Caithness Cliffs	LSE	15,000	prs	*1996*	-7	14,202	prs	*1999*
Northern fulmar	May - September	North Caithness Cliffs	LSE	14,700	prs	*1985-1988*	-7	13,950	prs	*1999*
Black-legged kittiwake	April - August	East Caithness Cliffs	LSE	32,500	prs	*1985-1988*	-66	40,140	prs	*1999*
Black-legged kittiwake	April - August	North Caithness Cliffs	LSE	13,100	prs	*1996*	-66	10,147	prs	*1999*
Great black-backed gull	April - August	East Caithness Cliffs	LSE	800	prs	*1996*	-53	175	prs	*1999*
Herring gull	April - August	East Caithness Cliffs	LSE	9,400	prs	*1985-1988*	-58	3,393	prs	*1999*
Common guillemot	April - July	East Caithness Cliffs	LSE	106,700	ind	*1985-1988*	-24	158,985	ind	*1999*
Common guillemot	April - July	North Caithness Cliffs	LSE	38,300	ind	*1985-1988*	-24	70,154	ind	*1999*
Razorbill	April - July	East Caithness Cliffs	LSE	15,800	ind	*1985-1988*		17,830	ind	*1999*
Razorbill	April - July	North Caithness Cliffs	LSE	4,000	ind	*1985-1988*		2,466	ind	*1999*
Atlantic puffin	April - August	East Caithness Cliffs	LSE	1,750	prs	*1985-1988*		274	ind	*1999*
Atlantic puffin	April - August	North Caithness Cliffs	LSE	1,750	prs	*1996*		7,071	ind	*1999*
Atlantic puffin	April - August	Hoy, Orkney	LSE	3,500	prs	*unknown*		417	ind	*2004*
Arctic skua		Hoy, Orkney	LSE	59	prs	*1996*	-74	12	prs	*2010*
Great skua		Hoy, Orkney	LSE	1900	prs	*1996*		1,346	prs	*2010*

LSE: likely significant effect, see Appendix (iii) of the JNCC & SNH responses.
SMP: seabird monitoring programme, database managed by JNCC.
% change is from 1986 to 2011, taken from the SNH Trend Note, where available.

To	Ali Ford (MS), Gayle Holland (MS), David O'Sullivan (MS), Jared Wilson (MS).
Cc.	Finlay Bennet (MS), Karen Hall (JNCC), Erica Knott (SNH), Roger May (MS).
From	Sophy Allen (JNCC), Catriona Gall (SNH), Alex Robbins (SNH), Glen Tyler (SNH).
Date	28 August 2013
Subject	**Moray Firth windfarms** **JNCC & SNH advice on the nocturnal activity of large gulls; gull attraction to boats; apportioning methods and displacement calculations.**

This memo provides JNCC & SNH advice for consideration of the collision risk and displacement calculations submitted for the Moray Firth offshore windfarms.

Nocturnal activity of large gulls

We have sought a wide range of expert opinion on this matter and the consensus is that the nocturnal activity at sea of large gull species – including great black backed gull (GBBG) and herring gull – will be less than their diurnal activity. However, large gulls can (and do) forage at night and will be more likely to do so in times of resource constraint (such as poor prey availability). Tracking data for lesser black-backed gulls collected in the Netherlands during multiple breeding seasons (five seasons: 2008 – 2013) did not show any clear diurnal rhythm to the proportion of time that the gulls spent away from the colony (Camphuysen, K. (2013), pers. comm. [e-mail], 23 August).

We consider that using an estimate of 25% nocturnal activity during the breeding season could be appropriate, however, there is no new evidence or expert opinion to support any reduction from 50% in respect of the non-breeding season.

Bob Furness has advised that he did not intend the species indices for nocturnal activity, as presented in Furness & Wade (2012), to be given a percentage value as has been done for translation into collision risk modelling.

Gull attraction to boats

We do not consider that the MORL & BOWL survey work provides sufficient data to explore, or quantify, possible gull attraction to survey vessels for the following reasons:

- The sample sizes for the MORL & BOWL boat-based and MORL digital aerial survey (undertaken by APEM) are extremely limited and it has not been possible to determine population estimates for GBBG on four of the six digital aerial surveys. Therefore we do not think it possible to determine any statistically significant differences between the population estimates / densities produced by each of these survey methods, making comparison difficult.
- We have been unable to establish how the unidentified large gulls, noted in the APEM report, have been treated in the MORL & BOWL comparisons between aerial and boat-based survey work. We note that while there were only 93 GBBG recorded in the APEM digital aerial survey, there were also 221 unidentified large gull species and 21 unidentified black-backed gull species recorded on the water, a proportion of which could be GBBG.

- It is extremely challenging to disentangle the confounding factors in any comparison of boat-based and digital aerial survey data, and it would require a carefully designed study in order to control for these (as much as possible). Surveys conducted during different time periods will be subject to varying environmental conditions, and hence natural variation in the seabird numbers (as the birds react to factors such as tide state, weather conditions and their mobile prey resource).
- The level of attraction to boats displayed by the large gull species is likely to be dependent on the natural prey available to them at any particular point in time – when levels of prey are high there is likely to be less attraction, and when prey is low there is likely to be more.

We advise that more generally, there are a number of studies which attempt to compare data collection / survey methods for seabirds at sea, although few have the specific aim of quantifying gull attraction to boats. These studies (including Burt et al 2009, 2010, and Rexstad & Buckland 2009) demonstrate the difficulty in comparing methods, even when the studies are specifically designed to make such a comparison. Altogether, we do not think that there are the available data, at this point in time, to be able to quantify any potential bias in boat-based density estimates of gull species.

Apportioning methods

(i) SPA / non SPA

For the breeding season, we advise using an apportioning method for SPA / non-SPA birds as presented by BOWL in their draft comments, dated 22 August 2013. This approach follows the weighting calculation that SNH uses for apportioning as provided to MSS and developers on 21 August 2013 for those species where displacement is a concern. As discussed at the teleconference between MSS, SNH, JNCC and the ornithologists for BOWL & MORL, held 23 August 2013, we agree that apportioning can be carried out between all SPA and non-SPA colonies within foraging range of each windfarm proposal (BOWL and the MORL eastern development area).

We note the uncertainty regarding the foraging range of great black backed gull, but we accept the value of 60km for use in BOWL & MORL apportioning calculations (based on herring gull as a proxy).

We also note and accept that the SPA / non SPA apportioning calculations will be based on the proportions derived from seabird 2000 data, in the absence of more recent information on non SPA colonies.

During the winter (i.e. non-breeding) period there is immigration of great black backed gulls (both adults and immatures) from outside the region. Therefore we agree that during the winter, the proportion of SPA birds recorded on-site should be reduced in line with the size of this immigration , and we consider BOWL's suggested approach is acceptable in this regard (as we referenced in our response letters of 8 July 2013).

(ii) Proportion of adult Gulls

MSS, ourselves and the BOWL & MORL ornithologists have agreed the approach to set the proportion of adult great black backed gull recorded on-site during the breeding season using direct measures made from boat-based surveys carried out during that period. In winter, when an additional population of adults and immatures joins from outside the region, we suggest that the proportion of adults now found on-site could be re-calculated from winter boat surveys.

(iii) Accounting for sabbatical adults

We agree with the figure of ~35% to account for the proportion of non-breeding (sabbatical) adults that form part of the SPA population. We consider apportioning of sabbatical adults should take place to adults only (as opposed to all age classes), as adults are able to switch between breeding and non-breeding state from year to year, while immatures (if they survive) will join the adult population, and only then exhibit this switching. We note that this sabbatical proportion should only be applied once.

Displacement calculations

For the calculation of displacement we advise using the mean peak values for all birds recorded (not just birds on the water). We do not consider that bird turnover can currently be accounted for in the calculation, and consider that using the mean peak values will be sufficiently precautionary in this regard.

Having received the draft outputs from the MS displacement modelling contract (work being undertaken by CEH) we advise using 50% for the proportion of auks displaced.

Apportioning between SPA and non-SPA colonies for displacement calculations is as discussed in the preceding section on apportioning.

References

Burt, M.L., Rexstad, E. and Buckland, S.T. (2009). Comparison of visual and digital aerial survey results of avian abundance for Round 3, Norfolk Region. COWRIE Ltd.

Burt, M.L., Rexstad, E. and Buckland, S.T. (2010). Comparison of design- and model-based estimates of seabird abundance derived from visual, digital still transects and digital video aerial surveys in Carmarthen Bay. COWRIE Ltd.

Furness, R.W., Wade, H.M. and Masden, E.A. (2013). Assessing vulnerability of marine bird populations to offshore wind farms. Journal of Environmental Management 119. 56-66.

Rexstad, E., and Buckland, S. T. (2009). Comparison of aerial survey methods for estimating abundance of common scoters. CREEM Technical Report 2009-1.
https://research-repository.st-andrews.ac.uk/handle/10023/784

To	Jim McKie, Gayle Holland, Robert Main
Cc.	Ian Davies (MSS), Alex Robbins (SNH), Catriona Gall (SNH), Erica Knott (SNH), Lisa Chilton (JNCC), Karen Hall (JNCC); Sophy Allen (JNCC), Finlay Bennet (MSS), Jared Wilson (MSS).
From	John Goold – Director of Marine Advice, JNCC Ron Macdonald – Director of Policy and Advice, SNH
Date	29 October 2013
Subject	**Moray Firth Offshore Wind Farms:** **Beatrice Offshore Wind Limited (BOWL) and** **Moray Offshore Renewables Limited (MORL)** **Ornithological advice from JNCC & SNH.**

This note updates the ornithological aspects of the JNCC and SNH advice dated 8th July 2013 on these two proposed offshore wind farms. It has been developed through discussions between JNCC, SNH, the developers and Marine Scotland Science (MSS).

Impacts to key SPA seabird species

In our advice of 8th July we indicated that these developments may cause adverse effects on the integrity of a number of Special Protection Areas (SPAs). The outstanding issues related to collision risk for great black backed gull and herring gull and displacement for guillemot, razorbill and puffin.

Since the provision of our advice in July, all parties have spent considerable time and effort trying to resolve 'common currency' to enable more reliable cumulative impact assessment and comparison between the two development proposals. We are now able to provide our updated advice for each of these species below.

Our advice is presented as follows:

- If we conclude that the predicted cumulative impact, based on current proposed development Rochdale envelopes, is within acceptable limits, we advise **no adverse effect on site integrity**.
- If we conclude that the predicted cumulative impact, based on current proposed development Rochdale envelopes, exceeds acceptable limits, we advise **no adverse effect on site integrity provided that the impact is no greater than a stated threshold.**

Impact thresholds

The process of defining levels of impact that a population can sustain without jeopardising the conservation objectives is essentially one of risk assessment. As levels of predicted impact increase (be that increased mortality or a reduction in productivity), so the risk that the site's conservation objectives will not be met also increases. The thresholds defined in this advice are based on best available knowledge and expert judgement. They reflect the level of risk SNH and JNCC consider appropriate to the populations in question, taking account of the considerable uncertainty in both the impact assessment process and our current understanding of the populations' status and dynamics. Hence they are not absolute limits, but if the predicted impacts exceed the advised thresholds we cannot advise that there will be no adverse effect on (SPA) site integrity.

Note on use of f values in the PBR[1] model. For most species we have adopted 0.3 as the most appropriate f value in the PBR calculation. This is based on its application in other situations and our knowledge of population status and trends. We have used a higher value where demographics permit.

Collision Risk

Great black backed gull

For great black backed gull at East Caithness Cliffs SPA, **we advise no adverse effect on site integrity if cumulative mortality is no greater than 6 birds per annum**. In reaching this conclusion we have considered:

- the maximum advised f value for use in PBR being 0.3, giving a threshold of 6 birds per annum.
- the advised ABC[2] category being 'very likely'.
- the current status of this species within the SPA, which is unfavourable declining.
- contextual background in the form of count data, regional and national trends for great black backed gull.

Herring gull

For herring gull at East Caithness Cliffs SPA, **we advise no adverse effect on site integrity**. In reaching this conclusion we have considered:

- the revised cumulative collision risk figures (32.9 – 35.6 birds) fall within acceptable thresholds identified using both the ABC and PBR methods.

Displacement

With regard to our advice on displacement for the three auk species (guillemot, razorbill and puffin), the methodologies to consider impacts arising from displacement are evolving and will very likely be subject to change in the future. The calculation of displacement effects for these developments is based on the footprint of the wind farms and the number of birds using the area. It takes no account of design (i.e. the density of turbines) because there is no agreed method and limited

[1] Potential Biological Removal
[2] Acceptable Biological Change tool

available evidence to support any such approach. It predicts impacts solely in terms of displacement and its consequences for productivity. We do not attempt to predict impacts on adult survival because the data to do this are not available in these cases. We do calculate a demographically equivalent effect on survival in order to allow us to use PBR, but this is not an actual prediction of increased mortality[3]. For this assessment we note that there are fewer assumptions made in the estimation of numbers of birds predicted to fail to breed due to displacement than there are in the estimation of adult mortality equivalent to displacement. The latter is therefore subject to greater uncertainty. In regards the assessment of numbers failing to breed, we note that the assumption that each individual displaced equates to a pair failing to breed is at the most precautionary end of the range for this parameter.

Guillemot

For guillemot at East Caithness Cliffs SPA, **we advise no adverse effect on site integrity**. Noting that:

- using both the ABC and PBR methods we are satisfied that the cumulative assessment falls within acceptable thresholds.

Razorbill

For razorbill at East Caithness Cliffs SPA, **we advise no adverse effect on site integrity**. Noting that:

- PBR f values of 0.1 - 0.3 provide an upper threshold value of 334 adult mortalities.
- the ABC categories[4] of 'very likely' and 'likely' provide threshold values for birds displaced of 700 and 1000 respectively
- the cumulative impact for BOWL and MORL is estimated at 822 birds displaced and 339 'equivalent' adult mortalities. The latter figure is slightly higher than the PBR threshold but, noting the precaution within the assumption regarding each displaced individual equating to a failed breeding pair and that the threshold is only marginally exceeded, we are able to conclude no adverse effect on site integrity.

Puffin

For puffin at East Caithness Cliffs SPA, **we advise no adverse effect on site integrity if cumulative displacement amounts to no more than 24 pairs per annum.** Noting that:

- the advised f value for use in PBR is within the range of 0.1- 0.3 (mortality of 7 birds, equating to the displacement of 22-24 pairs per annum).
- in using expert judgement to compare the outputs of PBR and ABC methods against absolute and relative changes in productivity, the predicted changes

[3] Rather, the figures presented convert the predicted change to productivity (estimated by the numbers failing to breed due to displacement) into an adult mortality figure that would result in the equivalent population consequence. For example, in the case of puffins, it has been estimated that a 7.08% decrease in productivity would have the same population consequence as a 1% increase in mortality.

[4] Only the BOWL population model (PVA) has been used for the purposes of ABC threshold determination of displacement, as it is considered to be more directly applicable to the outputs under consideration (i.e. pairs displaced).

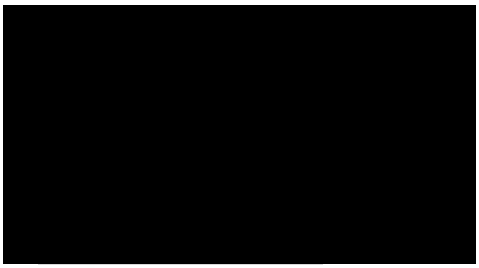
in productivity were considered to represent too high a proportion of the SPA population.
- consideration of the status of puffins both within the SPA and wider Moray Firth area i.e. limited trend information but believed to be unfavourable stable or declining.

For puffin at North Caithness Cliffs SPA, **we advise no adverse effect on site integrity**. Noting that:

- we have used a threshold based on a PBR f value of 0.5 because of the reported favourable status of the SPA population.
- the PBR threshold is 341 mortalities. This equates to the displacement of 1030-1032 pairs, which falls within the ABC category of 'likely'[4].
- we have estimated displacement impacts from MORL in line with 'common currency' discussions, but we suggest that MSS should calculate the figures for MORL to confirm that the overall cumulative total falls satisfactorily below the thresholds.

We trust that this advice is of assistance and would be happy to discuss it with you further as required.

Yours sincerely,



Ron MacDonald
Director of Policy & Advice, SNH

John Goold
Director of Marine Advice, JNCC

To	David Palmer (MS), Jim McKie (MS-LOT), Ian Davies (MSS).
Cc.	Robert Main (MS-LOT), Gayle Holland (MS-LOT), Jared Wilson (MSS), Finlay Bennet (MSS), Lisa Chilton (JNCC), Karen Hall (JNCC), Sue O'Brien (JNCC), John Uttley (SNH), Greg Mudge (SNH)Erica Knott (SNH), Alex Robbins (SNH), Catriona Gall (SNH).
From	John Goold – Director of Marine Advice, JNCC. Ron Macdonald – Director of Policy and Advice, SNH.
Date	17 January 2014.
Subject	**Moray Firth offshore wind farms: updated advice from JNCC & SNH on Atlantic puffin as a qualifying interest of East Caithness Cliffs SPA and North Caithness Cliffs SPA.**

This note updates our advice of 29 October 2013 on Atlantic puffin in respect of the Moray Firth offshore wind proposals. The update is required because of issues raised regarding uncertainty in the numbers for puffins in the citations for East Caithness Cliffs SPA and North Caithness Cliffs SPA. JNCC & SNH provide the following revised advice to inform Habitats Regulations Appraisal (HRA) for Atlantic puffin as a qualifying interest of these SPAs.

Background: MS query on SPA citation figures for puffin

MS raised a query concerning the citation figures for puffin at East Caithness Cliffs SPA and North Caithness Cliffs SPA, stated as being 1750 puffin pairs at each site. MS queried how it was possible to have exactly the same count at each SPA at time of designation, especially noting the divergence between the SPAs by the time of the Seabird 2000 counts.

There are outstanding sources of uncertainty with regard to puffin counts at these sites including: the location of individual puffin colonies and whether or not these fall within the SPA boundary proposed at the time of designation, as well as the treatment of puffin counts as pairs or individuals. These issues will be subject to further scrutiny by SNH and JNCC.

The issue with the current citation figures for East and North Caithness Cliffs SPAs relates solely to puffin, and we do not have any concerns in respect of the other species named on these citations.

Implications for impact assessment in respect of puffin

Considering the time available, and the uncertainty over the puffin counts, we have therefore undertaken an impact assessment for Atlantic puffin jointly in respect of these two SPAs. We believe that this addresses the requirements for HRA of this qualifying interest at each site.

Joint assessment of impacts to puffin at East and North Caithness Cliffs SPAs

Of the puffin recorded at the two wind farm sites (MORL and BOWL), 99% are apportioned to East and North Caithness Cliffs SPAs together, with the remaining 1% apportioned to Hoy SPA (as per original calculations). Using the same assumptions as in the original assessment[1] – that 60% of birds are displaced and that each bird displaced is equivalent to a pair failing to breed – we derive the following estimates of puffin mortality[2]:

BOWL: 28 puffin mortalities

MORL: 171 puffin mortalities

giving a cumulative total of 199 puffin mortalities for the two wind farms together.

In order to assess these impacts we have used PBR to calculate revised limits of acceptable change for a joint SPA population of 7345 pairs of puffin – the total number of puffin at East and North Caithness Cliffs recorded during Seabird 2000. The current population trends are uncertain, so we have used a range of f values from 0.3 – 0.5, making the precautionary assumption that overall trends are stable or declining. **Using PBR, the limit of acceptable change for the overall population across both SPAs, falls within a range of 212 – 354 puffin mortalities.**

SNH & JNCC updated advice on puffin

The predicted level of puffin mortality across the MORL and BOWL wind farm sites is within limits of acceptable change and will not result in any long-term impacts on the viability of the puffin population across the East and North Caithness SPAs. **We therefore advise that there would be no adverse impact on site integrity in respect of either the East or the North Caithness Cliffs SPAs.**

We trust this advice is of assistance in completing the appropriate assessments for the Moray Firth wind farms and we would be happy to discuss it with you further as required.

Yours sincerely,

[redacted]

[redacted]

Ron MacDonald
Director of Policy & Advice, SNH

John Goold
Director of Marine Advice, JNCC

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1 **Use of assumptions from the original assessment**

The assessments and advice we provided on 29 October 2013, related to the development scenarios originally submitted by MORL and BOWL, considered to be 'worst case'. Subsequently, each developer proposed revisions to their design envelopes and Marine Scotland sought further advice from us on the possible effects of increased turbine spacing on seabird displacement. While we have provided advice on this issue (in our note of 19 December 2013), we currently retain the assumptions used in the original calculations for our advice of 29 October 2013, in order that this revised assessment for puffin can be more readily compared against previous advice.

2 **Deriving puffin mortality figures from displacement assessments**

The figures we present above are a conversion of the predicted changes to productivity (estimated by the numbers failing to breed due to displacement) into figures for the adult mortalities that would result in equivalent population consequences. For puffin, we estimate that a 7.08% decrease in productivity would have the same population consequence as a 1% increase in mortality.