4 Biological Environment

4.4 Marine Ornithology

4.4.1 Baseline Information

Introduction

4.4.1.1 This section provides a description of the ornithological baseline conditions within the proposed modified offshore transmission infrastructure (modified OfTI). Ornithological interests associated with the three consented wind farms and the onshore transmission infrastructure (modified OnTI) are provided separately in MORL (2012) Chapter 4.5 (Ornithology) and Chapter 4.7 (Terrestrial Ecology) of this ES respectively.

4.4.1.2 The baseline study consists of the following aspects:

- Consultation with relevant statutory and non-statutory bodies;
- Detailed desk study to establish the baseline conditions within the study area;
- Contemporary surveys (2009 to 2012) to inform the baseline assessment including
  - Boat-based surveys (2010 to 2012) and
  - Aerial surveys (2009 to 2010 and 2011); and
- Consideration of the relevant key legislative and planning information.

4.4.1.3 A more detailed account of all the information summarised in this chapter can be found in:

- MORL (2012) Technical Appendix 4.5 A (Ornithology Baseline and Impact Assessment); and
- MORL (2012) Technical Appendix 4.5 B (Aerial Ornithology Surveys for the Moray Firth Zone, Summer 2011).

4.4.1.4 This baseline is used to inform the ornithology impact assessment described in Sections 4.4.2 and 4.4.3.

4.4.1.5 The Moray Firth area holds internationally important numbers of breeding seabirds and over–wintering waterbirds (e.g. ducks, divers, grebes and waders). In addition, this area is also important during the spring and autumn migration periods as a flyway and feeding area for migratory species. The aim of this baseline assessment is to describe the use by ornithological interests of the areas in which modified OfTI is proposed.

4.4.1.6 Within the vicinity of the Moray Firth are several sites designated for ornithological interests: SPAs (Special Protection Areas), Ramsar sites, and SSSIs (Sites of Special Scientific Interest). Information on the designated sites in the area is provided in Section 1.3 of MORL (2012) Technical Appendix 4.5 A.

Consultations

4.4.1.7 A summary of the key consultation responses in relation to ornithological issues, specific to the modified OfTI, is included in Table 4.4-1 below.

Table 4.4-1 Summary of Key Ornithology Consultation Responses

Organisation	Consultation Response	MORL Approach
SNH / JNCC	JNCC & SNH consider that desk-based appraisal is sufficient to consider potential disturbance or indirect impacts on ornithological interests arising from the OfTI.	The effects of the modified OfTI on ornithological interests were based on desk–study as recommended by JNCC and SNH (desk–study results presented in the 'Baseline Characteristics' section).
	Potential disturbance to waterbirds is the key impact to address. Refer to JNCC survey data and WeBS count data.	Potential disturbance effects from the modified OfTI are considered in Section 4.4.2 below. To inform impact assessments for waterbirds, both JNCC and BTO survey data have been collated and referred to (desk-study results presented in the 'Baseline Characteristics' section and impact assessment Table 4.4-8).
RSPB	Consideration should be made of any potential implications of the proposal on white-billed divers.	White-billed divers are considered in the 'Baseline Characteristics' section below and in both the EIA and CIA of this document.

Baseline Characteristics

Desktop Studies

4.4.1.8 Desk–based literature reviews were carried out to collate the most up to date information on aspects of seabird and migratory species ecology, such as foraging ranges and behaviour, to determine the likely key species within the modified OfTI requiring assessment. Full details of these literature reviews are provided on a species–by–species basis in Section 4 of MORL (2012) Technical Appendix 4.5 A. A review of recent literature was undertaken to check for additional data that would further inform the impact assessment and the results are provided in Table 4.4-2 to Table 4.4-4 below. Bird foraging distances, taken from Thaxter *et al.* (2012), are summarised in Table 4.4-2 below.

Table 4.4-2 Summary of bird foraging distances, taken from Thaxter *et al.* (2012)

	Foraging distance (km)		
Species	**Maximum**	**Mean maximum**	**Mean**
Fulmar	580	400.0	47.5
Gannet	590	229.4	92.5
Cormorant	35	25.0	5.2
Shag	17	14.5	5.9
Arctic skua	75	62.5	6.4
Great skua	219	86.4	35.8
Puffin	200	105.4	4.0

	Foraging distance (km)		
Species	**Maximum**	**Mean maximum**	**Mean**
Razorbill	95	48.5	23.7
Guillemot	135	84.2	37.8
Common tern	30	15.2	4.5
Arctic tern	30	24.2	7.1
Kittiwake	120	60.0	24.8

4.4.1.9 For assessment of the modified OfTI, bird density data were taken from the literature to provide information for near–shore areas. These data were taken from an analysis of 26 years of ESAS surveys undertaken by JNCC (Kober *et al.* 2010), and are summarised in Table 4.4-3 below. For species occurring in near-shore areas where ESAS data are not available, peak count data were taken from the British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) for the Grampian / Moray region (Austin *et al.* 2014) and are presented in Table 4.4-4 below (see Section 5 of MORL (2012) Technical Appendix 4.5 A). Data from JNCC aerial surveys (Dean *et al.* 2004; Söhle *et al.* 2006; Wilson *et al.* 2008; Lewis *et al.* 2008, 2009) were also used to inform the baseline conditions.

4.4.1.10 The RSPB have identified white-billed diver as a species potentially at risk from the modified OfTI. This species has not been recorded during JNCC or BTO surveys and was previously considered a vagrant to the UK. However, low numbers of white-billed divers (peak count of 14 individuals) have been known to be present in near-shore areas of the Moray Firth since 2011 between March and May, predominantly in the Portsoy area (data available from e.g. www.birdguides.com).

Table 4.4-3 Density estimates (km²) for Moray Firth from Kober *et al.* (2010)

Species	Breeding season	Non-breeding season	Autumn
Fulmar	5 to 16	3 to 7	-
Sooty shearwater	0.14 to 1.48	-	-
Manx shearwater	0.1 to 3.7	-	-
Gannet	0.9 to 2.9	0.4 to 1	-
Cormorant	0.03 to 0.288	0 to 0.21	-
Shag	0 to 5.73	0 to 8	-
Arctic skua	0.019 to 0.21	-	0.014 to 1.112
Great skua	0.10 to 1.15	0.01 to 0.31	-
Puffin	0.1 to 14.8	0.1 to 3.8	-
Razorbill	0.1 to 22.0	0.1 to 15.8	0.1 to 30.5
Guillemot	0.1 to 713.4	0.1 to 62.7	0.1 to 254.8
Kittiwake	0.1 to 185.0	0.1 to 20.5	-

Species	Breeding season	Non-breeding season	Autumn
Common gull	0.01 to 0.19	0.1 to 1.1	-
Lesser black-backed gull	0.1 to 4.0	0.1 to 4.0	-
Herring gull	0.1 to 44.8	0.1 to 9.2	-
Great black-backed gull	0.01 to 0.81	0.01 to 1.21	-

Table 4.4-4 Count Data for Moray Firth from Austin *et al*. (2014)

Species	Five year mean	Peak count
Eider	478	939
Long-tailed duck	616	1,139
Common scoter	614	1,439
Velvet scoter	68	150
Red-throated diver	13	34
Great northern diver	1	2

Site-Specific Surveys

Boat-Based Surveys 2010 to 2012

4.4.1.11 Natural Power Consultants (NPC) were contracted to undertake 28 boat–based bird surveys between April 2010 and March 2012 for the three consented wind farm sites. The survey methodology followed the technique for ship–based seabird surveys outlined by Camphuysen *et al*. (2004) and the recommendations to improve this methodology outlined by MacLean *et al*. (2009). The survey followed a line–transect method with a strip width of 300 m on one side of the vessel. The 18 transects were 2 km apart, orientated in an east–west direction across the three consented wind farm sites plus a buffer of approximately 4 km (Figure 4.4-1 of Volume 3 of this ES). Three experienced ornithological observers were involved in each survey; this involved one acting as observer, one acting as scribe and a third available to rotate positions in order to reduce fatigue. The method was designed to enable distance sampling of ornithological data and calculation of densities. Full details of the methodology can be found in Section 2.1 of MORL (2012) Technical Appendix 4.5 A.

4.4.1.12 Where possible, distance sampling software (Distance version 6.1; Thomas *et al*. 2010) was used to calculate density and abundance estimates of birds on the sea (Table 4.4-5 below). Design–based methods were used to produce density estimates for all species with at least 80 observations so that robust detection functions could be fitted (Buckland *et al*. 2001). Density surface models (model–based methods) were produced for six species (fulmar, gannet, kittiwake, guillemot, razorbill and puffin) as data was sufficient to allow model convergence (see Section 2.1.6 of MORL (2012) Technical Appendix 4.5 A for full details of the methodology; Figures 4.5-2 to 4.5-7 of MORL (2012) Volume 6 b). For species with fewer than 80 observations, density estimates could not be produced; counts of all species recorded during the boat–based surveys can be found in Section 3.1.1 of MORL (2012) Technical Appendix 4.5 A.

Table 4.4-5 Density (birds per km²) and abundance estimates (birds on the sea) for species which were recorded at a sufficient frequency to allow model-based or design-based analysis, taken from 2010 to 2012 NPC boat-based survey data

Species	Breeding season				Non-breeding season				Model basis
	Density		Abundance		Density		Abundance		
	Site	Buffer	Site	Buffer	Site	Buffer	Site	Buffer	
Fulmar	2.77	1.91	782	750	0.25	0.20	197	189	Model
Gannet	0.66	0.46	100	86	0.04	0.05	23	20	Model
Great skua	0.34	0.17	101	62	N/A	N/A	N/A	N/A	Design
Puffin	6.55	5.55	1,916	1,971	0.75	1.05	450	463	Model
Razorbill	6.03	3.53	1,661	1,674	2.64	3.04	892	899	Model
Little auk	N/A	N/A	N/A	N/A	0.51	0.38	151	136	Design
Guillemot	25.57	18.60	6,732	6,943	2.84	3.47	990	1,021	Model
Guillemot & razorbill combined	9.20	5.10	2,732	1,815	2.39	2.78	711	989	Design
Arctic tern	0.77	5.35	229	1,903	N/A	N/A	N/A	N/A	Design
Kittiwake	7.90	4.69	1,963	1,532	0.79	0.29	261	204	Model
Herring gull	0.02	0.05	7	18	0.14	0.13	41	47	Design
Great black-backed gull	0.91	1.48	271	526	0.36	0.22	106	77	Design

Aerial Surveys 2009 to 2010

4.4.1.13 Seven aerial surveys were undertaken over the three consented wind farm sites in 2009 (May, June, August, November and December) and 2010 (two in February). The surveys covered the entire MORL Zone plus a 4 km buffer (Figure 4.5-8 of MORL (2012) Volume 6 b). The first three surveys were undertaken by HiDef Aerial Surveying (Hexter, 2009) using high definition video. The four surveys in winter 2009 / 2010 were carried out by WWT Consulting using traditional aerial survey methods (Camphuysen *et al*. 2004). Full details of the methodology can be found in MORL (2012) Technical Appendix 4.5 A. Density estimates were produced for the most numerous species (those with an estimate of > 10 birds / 100 km within the three consented wind farm sites in either the breeding or non-breeding season) by calculating the numbers of birds per 100 km of linear transect (Table 4.4-6 below).

Table 4.4-6 Density estimates (birds per 100 km of linear 2 km wide survey transect) of most numerous species recorded during the 2009 to 2010 aerial surveys within Telford, Stevenson and MacColl and the 4 km buffer area

	Breeding season		Non-breeding season	
Species	**Site**	**Buffer**	**Site**	**Buffer**
Fulmar	23.1	31.0	56.1	62.1
Gannet	11.9	15.3	1.0	0.5

	Breeding season		Non-breeding season	
Species	**Site**	**Buffer**	**Site**	**Buffer**
Kittiwake	96.0	76.7	20.4	7.9
Gulls	63.8	43.8	30.7	27.1
Auks	366.5	233.7	135.0	94.5

Aerial Surveys 2011

4.4.1.14 Additional aerial surveys, designed by NPC to put the site distributions into a wider context were undertaken by APEM Ltd. in summer 2011. These involved the collection of digital still images over Telford, Stevenson and MacColl sites and over a wider study area between the Troup, Pennan and Lion's Head SPA to the south and the East Caithness Cliffs and North Caithness Cliffs SPAs to the north (Figure 4.4-1 of Volume 3 of this ES). The survey aircraft was flown along transects 2 km apart from each other aligned in a NNE to SSE direction and images were captured every 250 m along each transect line at a resolution of 2 cm ground sample distance (GSD). The images were then quality assured in two stages. First, a sample of the images not containing birds was re–examined and then when all images containing birds had been isolated, a sample of these was taken and quality assured for identification.

4.4.1.15 Population estimates and smoothed density surface distribution maps for the surveyed area were also derived from these data for each of the six species which breed at more than one of the three closest SPAs (fulmar, great black-backed gull, kittiwake, guillemot, razorbill and puffin; Table 4.4-7 below). Species densities within the modified OfTI were low (see Figures 4.5-16 to 4.5-21 of MORL (2012) Volume 6 b). Full details of the methods and results are provided in MORL (2012) Technical Appendix 4.5 B.

Table 4.4-7 Population estimates from the APEM Ltd. aerial surveys

Species	Population estimate		Confidence intervals
Fulmar	Survey area	21,241	(20,973 to 21,541)
	Three sites	880	(872 to 887)
Puffin	Survey area	11,780	(11,686 to 11,874)
	Three sites	541	(537 to 544)
Razorbill	Survey area	59,846	(58,936 to 60,861)
	Three sites	2,517	(2,495 to 2,538)
Guillemot	Survey area	69,485	(68,801 to 70,247)
	Three sites	6,832	(6,774 to 6,893)
Guillemot & razorbill combined	Survey area	149,353	(147,161 to 151,610)
	Three sites	6,832	(6,774 to 6,893)
Kittiwake	Survey area	47,765	(46,484 to 48,993)

Species	Population estimate		Confidence intervals
	Three sites	1,225	(1,197 to 1,256)
Great black-backed gull	Survey area	950	(903 to 1,000)
	Three sites	5	(5 to 5)

Legislative and Planning Framework

4.4.1.16 The following legislation has been taken into account as part of the ornithological assessment process:

- The European Directive 2009/147/EC on the Conservation of Wild Birds (EU Birds Directive);
- Ramsar Convention on Wetlands of International Importance 1971;
- Bonn Convention on the Conservation of Migratory Species of Wild Animals 1979, as amended;
- Conservation of Habitats and Species Regulations 2010;
- Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007;
- Conservation (Natural Habitats, &c.) Regulations 1994;
- Wildlife and Countryside Act 1981, as amended;
- The Nature Conservation (Scotland) Act 2004; and
- The Marine (Scotland) Act 2010.

4.4.1.17 The following guidance has also been taken into account as part of the ornithological assessment process:

- Camphuysen, C.J., Fox, T., Leopold, M.F. & Petersen, I.K. (2004). Towards standardised seabirds at sea census techniques in connection with environmental impact assessments for offshore wind farms in the UK. A report for COWRIE;
- Maclean, I.M.D., Wright, L.J., Showler, D.A. & Rehfisch, M.M. (2009). A review of assessment methodologies for offshore wind farms. A report for COWRIE;
- Walls, R., Pendlebury, C., Budgey, R., Brookes, K. & Thompson, P. (2009). Revised best practice guidance for the use of remote techniques for ornithological monitoring at offshore wind farms. A report for COWRIE;
- King, S., MacLean, I., Norman, T. & Prior, A. (2009). Developing guidance on ornithological cumulative impact assessments for offshore wind farm developers. A report for COWRIE;
- Institute of Ecology and Environmental Management (2010) Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal;
- Planning Advice Note 60 on Planning for Natural Heritage (2000); and
- Draft Scottish Planning Policy (SPP), 2013.

4.4.2 Impact Assessment

Summary of Effects and Mitigation

4.4.2.1 This section addresses the likely significant effects associated with the modified OfTI on ornithological receptors. Baseline conditions are presented for the following species: fulmar, gannet, shag, eider, long-tailed duck, common scoter, velvet scoter, white-billed diver, red-throated diver, great northern diver, kittiwake, herring gull, great black-backed gull, guillemot, razorbill, and puffin. Short-listing was undertaken based on numbers of species recorded on the site plus those present in relatively high numbers in near-shore areas of the modified OfTI (see Table 4.4-4 and MORL (2012) Technical Appendix 4.5 A). The likely significant effects on ornithological receptors associated with the three consented wind farms and the OnTI are assessed separately in MORL (2012) Chapter 7.4 (Ornithology) and Chapter 4.6 (Terrestrial Ecology) of this ES respectively.

4.4.2.2 Information supporting this assessment has been collected through desk-based review of the data for the area as explained in the 'Baseline Characteristics' section above.

Summary of Effects

4.4.2.3 The effects on ornithology receptors that were assessed for the modified OfTI include:

- Disturbance caused by increased vessel traffic, especially during construction and decommissioning;
- Displacement caused by the presence of the OSPs; and
- Indirect effects on prey species.

Summary of Proposed Mitigation Measures and Residual Effects

4.4.2.4 No significant effects on ornithological receptors are predicted to arise due to construction, operation and decommissioning of the modified OfTI.

4.4.2.5 As part of the existing commitments for the three consented wind farm sites, vessel traffic will be along set routes where possible, thus increasing the likelihood of habituation to disturbance. Further mitigation measures in addition to this embedded mitigation are not proposed.

4.4.2.6 A summary of the effects is provided in Table 4.4-8 below.

Table 4.4-8 Impact assessment summary

Effect	Receptor	Pre-mitigation effect	Mitigation	Post-mitigation effect
Construction & Decommissioning				
Disturbance, displacement & indirect effects	Fulmar Gannet Shag Eider Long-tailed duck Common scoter Velvet scoter Red-throated diver Great northern diver White-billed diver	Minor risk (probable; short-term, temporary). No significant effect predicted.	Wind farm and OfTI vessel corridors.	Not significant.

Effect	Receptor	Pre-mitigation effect	Mitigation	Post-mitigation effect
	Puffin Razorbill Guillemot Kittiwake Herring gull Great black-backed gull			
Operation				
Disturbance, displacement and indirect effects	Fulmar Gannet Shag Eider Long-tailed duck Common scoter Velvet scoter Red-throated diver Great northern diver White-billed diver Puffin Razorbill Guillemot Kittiwake Herring gull Great black-backed gull	Minor risk (probable; medium-term, temporary). No significant effect predicted.	Wind farm and OfTI vessel corridors.	Not significant.

Introduction to Impact Assessment

4.4.2.7 The following technical reports support this chapter:

- MORL (2012) Technical Appendix 4.5 A (Ornithology Baseline and Impact Assessment); and
- MORL (2012) Technical Appendix 4.5 B (Aerial Ornithology Survey for the Moray Firth Zone, Summer 2011).

Details of Impact Assessment

4.4.2.8 Full details of the Design Envelope for the modified OfTI are provided in Chapter 2.2 (Project Description) of this ES. The key components of the modified OfTI design for this ornithological impact assessment are the:

- Length and location of the export cable route;
- The location and number of offshore substation platforms (OSPs); and
- Duration, timing and intensity of construction / decommissioning activity.

Rochdale Envelope Parameters Considered in the Assessment

4.4.2.9 The Rochdale Envelope parameters that will be considered in this assessment are summarised in Table 4.4-9 below.

Table 4.4-9 Rochdale envelope parameters relevant to the ornithological impact assessment

Potential Effect	Rochdale Envelope Scenario Assessed
Construction & Decommissioning	
Disturbance	• The offshore export cable route corridor (including the area of the three consented wind farms where the OSPs will be located) is shown in Figure 1.1-4 of Volume 3 of this ES. • The worst case scenario estimate for disturbance arising from installation and decommissioning of the OSPs and export cable is 1.67 km^2. • The number and type of vessels to be utilised in OSPs and export cable installation and decommissioning is yet to be confirmed but it is expected to be low in comparison to those normally using the Firth (see Chapter 5.2: Shipping and Navigation of this ES). Installation vessels will travel at slow speeds along predefined corridors.
Indirect Effects	• Piling for OSPs may have the potential to affect fish stocks locally and thus affect those ornithological receptors that prey upon them (see Chapter 4.2: Fish and Shellfish Ecology of this ES).
Operation	
Disturbance	• The number and type of vessels to be utilised in the OSPs operation and maintenance is yet to be decided but will not represent a significant increase in existing vessel activity within the Firth (see Chapter 5.2: Shipping and Navigation of this ES).
Displacement	• The worst case scenario estimate for displacement arising from the presence of OSPs is 0.02 km^2.
Indirect Effects	• Electro-magnetic fields (EMF) may have the potential to affect fish stocks locally and thus affect those ornithological receptors that prey upon them (see Chapter 4.2: Fish and Shellfish Ecology of this ES).

EIA Methodology

4.4.2.10 The impact assessment methodology used for ornithology is that recommended by CIEEM (Chartered Institute of Ecology and Environmental Management) for marine and coastal developments (IEEM, 2010).

4.4.2.11 The basis of this assessment process is as follows:

- Identification of the activities associated with the development of the modified OfTI that may result in effects on ornithological receptors;
- Identification of potential ornithological receptors;
- Identification of likely significant effects on the ornithological receptors during construction, operation and decommissioning of the modified OfTI;
- Description of development activity in terms of whether the effect is likely to be positive or negative, along with its magnitude, extent, duration, reversibility, timing and frequency;
- Characterisation of effect, including the risk / likelihood of its occurrence;
- Assessment of whether the likely (pre-mitigation) effects are ecologically significant and the geographical scale at which they are predicted to occur, including an indication of certainty in the predictions made;
- Provision of details of proposed mitigation (if applicable);

- Assessment of whether the residual (with mitigation) effects are ecologically significant and the geographical scale at which they are predicted to occur, including an indication of certainty in the predictions made; and
- Assessment of cumulative effects (with mitigation where applicable) as outlined in Section 4.4.3.

4.4.2.12 Ecological significance, in the context of the EIA Regulations, is used to describe the relative importance of a potential effect on a feature of importance. An ecologically significant effect is an effect that has an effect on the integrity of the site or ecosystem. A significant effect in the context of this marine ornithology assessment has been considered to be above moderate.

4.4.2.13 Further details regarding the impact assessment methodology are provided in paragraph 7.4.4 of MORL (2012) Chapter 7.4 (Ornithology).

Description of Key Risks to Ornithological Receptors

Disturbance

4.4.2.14 Disturbance effects could operate by denying ornithological receptors the use of suitable or preferred habitat. During construction, disturbance has the potential to arise as a result of the presence of vessels, equipment, noise and vibration. There is also the potential for disturbance effects to continue into the operation phase due to operation / maintenance activities.

4.4.2.15 Different species show differing sensitivities to disturbance. Short-listing species of birds sensitive to disturbance was based upon: the number of each species on the sites; their estimated sensitivities to vessel presence (Furness *et al*. 2013; Table 4.4-10); whether their distribution over the wider area was highly localised or widespread; their reliance on specific habitat types (Furness *et al*. 2013; Table 4.4-10); and any known rates of habituation. For further details, please see Section 2.5 of MORL (2012) Technical Appendix 4.5 A. It is worth noting that the species concern index for great northern diver in Table 4.4-10 is based upon that for red-throated divers. In practice, great northern divers appear far less sensitive to disturbance from vessel and helicopter traffic than red-throated divers, with regular sightings in harbours and shipping lanes along the east coast of the USA.

Table 4.4-10 Ranked species concern in the context of disturbance and/or displacement from habitat (disturbance score x habitat flexibility score x conservation importance score; taken from Furness *et al*. 2013).

Species	Disturbance by ship and helicopter traffic	Habitat use flexibility	Conservation importance score	Species concern index value
Fulmar	1	1	16	2
Gannet	2	1	17	3
Shag	3	3	15	14
Eider	3	4	13	16
Long-tailed duck	3	4	8	10
Common scoter	5	4	12	24
Velvet scoter	5	3	11	16
Red-throated diver	5	4	16	32
Great northern diver	5	3	18	27

Species	Disturbance by ship and helicopter traffic	Habitat use flexibility	Conservation importance score	Species concern index value
White-billed diver	-	-	-	-
Puffin	2	3	16	10
Razorbill	3	3	16	14
Guillemot	3	3	16	14
Kittiwake	2	2	14	6
Herring gull	2	1	16	3
Great black-backed gull	2	2	15	6

Displacement

4.4.2.16 There is the potential for displacement to arise during the operation phase from the presence of up to two OSPs. Given the relatively small footprint of the infrastructure, (0.02 km^2 as detailed in Table 4.4-9 above) effects on all ornithological receptors are predicted to be negligible and are not considered further in this impact assessment.

Indirect Effects

4.4.2.17 There may also be effects upon prey species, which then go on to have effects on the populations that prey upon them. Full details of prey species are provided in MORL (2012) Technical Appendix 4.5 A. Activities such as piling during the construction phase and electro-magnetic fields (EMF) during operation have the potential to affect fish stocks locally, thus affecting those species of birds that prey on them (the assessment of likely significant effects of the modified OfTI on fish and shellfish are presented in Chapter 4.2: Fish and Shellfish Ecology of this ES, and cross references have been made to this chapter where relevant.

Impact Assessment

4.4.2.18 A list of the relevant ornithological receptors for consideration in the impact assessment, along with their legislative and conservation statuses, is provided in Table 4.4-11 below.

4.4.2.19 The short-list was determined by inclusion of species short-listed for the offshore generating station (MORL (2012) Chapter 7.4: Ornithology) plus species considered as being regularly present in near-shore waters (Kober *et al*. 2010). A summary of each of these receptors, (based on the ornithology baseline described in MORL (2012) Chapter 4.5 (Ornithology) and associated MORL (2012) Technical Appendices 4.5 A, 4.5 B and 4.5 C) is provided in Table 4.4-12 below. Density calculations for each species are estimates of the mean densities within the three consented wind farm sites, obtained from density surface modelling (Table 25, MORL (2012) Technical Appendix 4.5 A). Based on the results of desktop literature reviews (see 'Baseline Characteristics' section above) these estimates are not expected to be higher for the offshore export cable route and OSPs.

Table 4.4-11 Summary of legislative / conservation statuses for relevant ornithological receptors

Species	Legislative status	Distribution	Importance
Fulmar	SPA feature	Common and widespread UK breeder, except around the south-east coast.	International

Gannet	SPA feature	Breeds in large colonies around the UK, most numerous in Scotland.	International
Shag	SPA feature	Present along UK coasts year-round. Breeds in colonies around the UK, most numerous in Scotland.	International
Eider	SPA feature	Locally common breeder around Scotland. Large wintering concentrations around all Scottish coasts.	International
Long-tailed duck	SPA feature	Winter visitor, largest concentrations on northern and eastern coasts.	International
Common scoter	SPA feature	Very rare breeding species. Winter and summer moult aggregations on eastern coasts.	International
Velvet scoter	SPA feature	Non-breeding visitor. Winter and summer moult aggregations on eastern coasts.	International
Red-throated diver	SPA feature	Very rare breeding species. Winter and passage aggregations on eastern coasts.	International
Great northern diver	Birds Directive Annex I	Winter visitor. Largest aggregations on northern and western coasts.	National
White-billed diver	IUCN Near Threatened	Rare spring visitor. Concentrations recorded along northern coasts.	National
Puffin	SPA feature	Locally common breeder around Scotland, less common elsewhere and not breeding around south-east coast.	International
Razorbill	SPA feature	Locally common, widespread UK breeder, except around south-east coast.	International
Guillemot	SPA feature	Common and widespread UK breeder, except around south-east coast.	International
Kittiwake	SPA feature	Common and widespread UK breeder, particularly around north-eastern areas.	International
Herring gull	SPA feature	Common and widespread breeder around UK, though less abundant around the south-east coast.	International
Great black-backed gull	SPA feature	Common breeder around north and west Scotland, less common elsewhere and largely absent from south-east coast.	International

Table 4.4-12 Summary of baseline conditions of relevant ornithological receptors

Species	Summary
Fulmar	**Seasonality:** present in all months; highest numbers in spring. **Distribution:** evenly distributed throughout the Moray Firth. **Mean monthly density estimates (birds km²):** 2.77 in breeding season and 0.25 in non-breeding season within the three consented wind farm sites (see 'Baseline Characteristics' section); 5 to 16 in breeding season and 3 to 7 in non-breeding season in wider Moray Firth (Kober *et al.* 2010).

Species	Summary
Gannet	**Seasonality:** present in all months; highest numbers in spring. **Distribution:** evenly distributed throughout the Moray Firth. **Mean monthly density estimates (birds km²):** 0.66 in breeding season and 0.04 in non-breeding season within the three consented wind farm sites (see 'Baseline Characteristics' section); 0.9 to 2.9 in breeding season and 0.4 to 1.0 in non-breeding season in wider Moray Firth (Kober *et al*. 2010).
Shag	**Seasonality:** present in all months; highest numbers in spring. **Distribution:** distributed throughout the Moray Firth, with highest densities in inshore areas. In winter, highest densities of birds tend to be coastal. **Mean monthly density estimates (birds km²):** 0 to 5.73 in breeding season and 0 to 8.0 in non-breeding season in wider Moray Firth (Kober *et al*. 2010).
Eider	**Seasonality:** present in all months. **Distribution:** restricted to coastal areas, with highest densities in western parts. **Mean monthly density estimates (birds km²):** too low for estimates to be made.
Long-tailed duck	**Seasonality:** present in winter and early spring. **Distribution:** restricted to coastal areas, with highest densities in western parts. Observer-based aerial surveys have shown concentrations along the Morayshire coast and in the inner Moray Firth, particularly around Spey and Burghead Bays. Of 524 birds recorded on aerial surveys during January and February 2006, a minimum of 396 were in the Spey Bay area, with the majority of these within the 20 m isobath (Dean *et al*. 2004; Söhle *et al*. 2006; Wilson *et al.* 2008; Lewis *et al.* 2008, 2009). **Mean monthly density estimates (birds km²):** too low for estimates to be made.
Common scoter	**Seasonality:** present in all months, peaking in summer. **Distribution:** restricted to coastal areas, with highest densities in western parts. Observer-based aerial surveys have shown concentrations of these birds in Spey and Burghead Bays, off Culbin Sands and in the great Dornoch Firth. All records were within the 20 m isobath (Dean *et al*. 2004; Söhle *et al*. 2006; Wilson *et al.* 2008; Lewis *et al.* 2008, 2009). **Mean monthly density estimates (birds km²):** too low for estimates to be made.
Velvet scoter	**Seasonality:** present in all months, peaking in summer and autumn. **Distribution:** restricted to coastal areas, with highest densities in western parts. Observer-based aerial surveys have shown concentrations can occur in Spey Bay. All records were from within the 20 m isobath (Dean *et al*. 2004; Söhle *et al*. 2006; Wilson *et al.* 2008; Lewis *et al.* 2008, 2009). **Mean monthly density estimates (birds km²):** too low for estimates to be made.
Red-throated diver	**Seasonality:** present during the winter months, peaking in late spring. **Distribution:** restricted to coastal areas, with highest densities in western parts within the 20 m isobath (Dean *et al*. 2004; Söhle *et al*. 2006; Wilson *et al.* 2008; Lewis *et al.* 2008, 2009). **Mean monthly density estimates (birds km²):** too low for estimates to be made.
Great northern diver	**Seasonality:** present during the winter months. **Distribution:** this species is less restricted to areas within the 20 m isobath, but is generally restricted to to areas within the 50 m isobath (Dean *et al*. 2004; Söhle *et al*. 2006; Wilson *et al.* 2008; Lewis *et al.* 2008, 2009). **Mean monthly density estimates (birds km²):** too low for estimates to be made.

Species	Summary
White-billed diver	**Seasonality:** present during the spring months in recent years. **Distribution:** restricted to coastal areas, predominantly in the Portsoy area (data available from e.g. www.birdguides.com). **Mean monthly density estimates (birds km²):** too low for estimates to be made.
Guillemot	**Seasonality:** present in all months with peaks in early summer. **Distribution:** distributed throughout the Moray Firth, with highest densities in inshore areas and western parts. In winter, highest densities of birds tend to be coastal. **Mean monthly density estimates (birds km²):** 25.57 in breeding season and 2.84 in non-breeding season within the three consented wind farm sites (see 'Baseline Characteristics' section); 0.1 to 713.4 (highest densities at colonies) in breeding season and 0.1 to 15.8 in non-breeding season in wider Moray Firth (Kober *et al*. 2010).
Razorbill	**Seasonality:** present in all months with peaks in late spring / early summer. **Distribution:** distributed throughout the Moray Firth, with highest densities in inshore areas and western parts. In winter, highest densities of birds tend to be coastal. **Mean monthly density estimates (birds km²):** 6.03 in breeding season and 2.64 in non-breeding season within the three consented wind farm sites (see 'Baseline Characteristics' section); 0.1 to 22.0 (highest densities at colonies) in breeding season and 0.1 to 15.8 in non-breeding season in wider Moray Firth (Kober *et al*. 2010).
Puffin	**Seasonality:** present in all months with peaks in spring and summer. **Distribution:** distributed throughout the Moray Firth, with highest winter densities in eastern areas. **Mean monthly density estimates (birds km²):** 6.55 in breeding season and 0.75 in non-breeding season within the three consented wind farm sites (see 'Baseline Characteristics' section); 0.1 to 14.8 (highest densities at colonies) in breeding season and 0.1 to 3.8 in non-breeding season in wider Moray Firth (Kober *et al*. 2010).
Kittiwake	**Seasonality:** small peak in winter: present in small numbers at other times. **Distribution:** distributed throughout the Moray Firth, with highest densities in western parts. **Mean monthly density estimates (birds km²):** 7.90 in breeding season and 0.79 in non-breeding season within the three consented wind farm sites (see 'Baseline Characteristics' section); 0.1 to 85 (highest densities at colonies) in breeding season and 0.1 to 20.5 in non-breeding season in wider Moray Firth (Kober *et al*. 2010).
Herring gull	**Seasonality:** present in all months; small peak in winter. **Distribution:** distributed throughout the Moray Firth, with highest densities in inshore areas and western parts. **Mean monthly density estimates (birds km²):** 0.02 in breeding season and 0.14 in non-breeding season within the three consented wind farm sites (see 'Baseline Characteristics' section); 0.1 to 44.8 in breeding season and 0.1 to 9.2 in non-breeding season in wider Moray Firth (Kober *et al*. 2010).
Great black-backed gull	**Seasonality:** present in all months. **Distribution:** distributed throughout the Moray Firth, with highest densities in inshore areas and western parts. **Mean monthly density estimates (birds km²):** 0.91 in breeding season and 0.36 in non-breeding season within the three consented wind farm sites (see 'Baseline Characteristics section); 0.01 to 0.81 in breeding season and 0.01 to 1.21 in non-breeding season in wider Moray Firth (Kober *et al*. 2010).

Construction

Disturbance

4.4.2.20 Likely effects are predicted to be limited to disturbance. These will depend on the intensity of vessel traffic and construction strategy (see Chapter 5.2: Shipping and Navigation of this ES) and are expected to be of short-term duration and reversible. Disturbance effects are predicted to be of **minor risk (probable)**, due mainly to the short-term duration of the construction period.

Indirect Effects

4.4.2.21 Indirect effects on benthic and fish populations resulting from piling have been assessed in Chapter 4.1 (Benthic Ecology) and 4.2 (Fish and Shellfish Ecology) of this ES and effects have been judged to be of **minor risk (probable)** for all prey species considered.

Significance

4.4.2.22 Given the small scale and duration of the likely effects during the construction period, they are predicted to be **minor risk (probable)** for all bird species, and considered to be **not significant**.

Operation

Disturbance

4.4.2.23 Likely effects are predicted to be limited to disturbance caused by maintenance vessels, and displacement caused by the presence of up to two OSPs (see Chapter 5.2: Shipping and Navigation of this ES). These are expected to be of short-term duration and reversible. Disturbance effects are predicted to be of **minor risk (probable)**, due to potential disturbance being limited to maintenance vessels during this period, with the number of vessels involved not representing a significant increase over the current situation.

Indirect Effects

4.4.2.24 Indirect effects resulting from EMF effects on benthic and fish populations have been assessed in Chapters 4.1 (Benthic Ecology) and 4.2 (Fish and Shellfish Ecology of this ES) and effects have been judged to be of **minor risk (probable)** for all prey species considered.

Significance

4.4.2.25 Given the small scale and duration of the likely significant effects during the operation period, they are predicted to be **minor risk (probable)** for all species, and considered to be **not significant**.

Decommissioning

Disturbance

4.4.2.26 Likely effects are predicted to be limited to disturbance. These are expected to be of short-term duration and reversible. The timing of the decommissioning will dictate the magnitude of the effect due to seasonal variation in bird numbers. Disturbance effects are predicted to be of **minor risk (probable)**, due mainly to the short-term duration of the decommissioning period.

Indirect Effects

4.4.2.27 Indirect effects on benthic and fish populations resulting from decommissioning have been assessed in Chapter 4.1 (Benthic Ecology) and 4.2 (Fish and Shellfish Ecology) of this ES and effects have been judged to be of **minor risk (probable)** for all prey species considered.

Significance

4.4.2.28 Given the small scale and duration of the likely significant effects during the decommissioning period, they are predicted to be **minor risk (probable)** for all species, and considered to be **not significant**.

Proposed Monitoring and Mitigation

Construction, Operation & Decommissioning

4.4.2.29 As part of existing commitments for the three consented MORL wind farm sites (Scottish Government 2014) vessel traffic will be along set routes during all phases where possible, thus increasing the likelihood of habituation to disturbance. Further mitigation and monitoring measures in addition to this embedded mitigation are not proposed. Since all potential effects were considered to be **not significant**, this is still the case post-mitigation.

4.4.3 Cumulative Impact Assessment

Summary of Effects

4.4.3.1 This section presents the results of assessment of the potential cumulative effects upon ornithology arising from the proposed modified OfTI in conjunction with other existing or reasonably foreseeable marine coastal developments and activities. MORL's approach to the assessment of cumulative effects is described in Chapter 1.3 (Environmental Impact Assessment) of this ES.

4.4.3.2 A summary of the impact assessment when cumulative effects are taken into account is provided in Table 4.4-13 below.

Summary of Residual Effects and Mitigation

No mitigation specific to cumulative effects on ornithology has been proposed, in addition to that described for the three consented wind farms (MORL (2012) Chapter 7.4: Ornithology).

Primary mitigation includes best-practice in terms of setting standard wind farm vessel corridors in order to minimise any potential disturbance. Operational monitoring requirements will be agreed with regulators and Statutory Nature Conservation Bodies (SNCBs).

Table 4.4-13 Cumulative Impact Summary

Effect/Receptor	Residual significance level for modified TI	Whole project assessment: Modified TI + Stevenson, Telford and MacColl	Mitigation Method
Construction & Decommissioning			
Fulmar	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Gannet	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		

Effect/Receptor	Residual significance level for modified TI	Whole project assessment: Modified TI + Stevenson, Telford and MacColl	Mitigation Method
Shag	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Eider	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Long-tailed duck	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Common scoter	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Velvet scoter	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Red-throated diver	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Great northern diver	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
White-billed diver	No effect Not significant	No effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4

Effect/Receptor	Residual significance level for modified TI	Whole project assessment: Modified TI + Stevenson, Telford and MacColl	Mitigation Method
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	No effect. Not significant		
Puffin	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Razorbill	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Guillemot	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Kittiwake	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Herring gull	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Great black-backed gull	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Operation			
Fulmar	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		

Effect/Receptor	Residual significance level for modified TI	Whole project assessment: Modified TI + Stevenson, Telford and MacColl	Mitigation Method
Gannet	Minor effect Not significant	Moderate effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Moderate effect. Not significant		
Shag	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Eider	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Long-tailed duck	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Common scoter	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Velvet scoter	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Red-throated diver	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Great northern diver	Minor effect Not significant	Negligible effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4

Effect/Receptor	Residual significance level for modified TI	Whole project assessment: Modified TI + Stevenson, Telford and MacColl	Mitigation Method
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
White-billed diver	No effect Not significant	No effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	No effect. Not significant		
Puffin	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Razorbill	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Guillemot	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Kittiwake	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		
Herring gull	Minor effect Not significant	Moderate effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Moderate effect. Not significant		
Great black-backed gull	Minor effect Not significant	Minor effect Not significant	None additional to that outlined in MORL (2012) Chapter 7.4
Total Cumulative Impact Assessment (Whole project plus those developments listed in Section 4.4.3.3)	Minor effect. Not significant		

Assessment of Cumulative Effects

4.4.3.3 The developments and activities considered in detail within this cumulative impact assessment are listed below.

- MORL Telford, Stevenson and MacColl wind farms;
- MORL Western Development Area (WDA);
- Beatrice Offshore Wind Farm (BOWL) and associated infrastructure;
- European Offshore Wind Deployment Centre (EOWDC);
- MeyGen Tidal Stream Project;
- Nigg Energy Park; and
- Port of Ardersier.

4.4.3.4 It should be noted that the number of turbines consented for the MORL and BOWL wind farms are reduced, and the turbine design changed in comparison to the WCS assessed in the MORL and BOWL ES Chapters (MORL, 2012; BOWL, 2012 and 2013), such that predicted effects are likely to be reduced.

4.4.3.5 The geographical scope of the cumulative assessment is principally focused in the Moray Firth area. It is, however, recognised that some mobile species may spend varying periods of time outside the Moray Firth and, as a result, there is potential for these to be affected by other activities / developments further afield. It is considered that the proposed Firth of Forth wind farm projects (Neart Na Gaoithe, Inch Cape and Seagreen) are outwith the area that should be considered as part of the CIA for the modified OfTI.

4.4.3.6 In addition, the following developments have been identified which may have cumulative effects over the life of the Project (including the three consented wind farms and associated transmission infrastructure) but where there is insufficient information available for a detailed assessment of cumulative effects to be carried out:

- Dredging and sea disposal in the Moray Firth;
- Port and harbour developments in the Moray Firth;
- Oil and gas developments;
- Hywind pilot park project;
- Kincardine offshore wind project; and
- Additional marine energy developments in the Pentland Firth and Orkney waters.

4.4.3.7 Aggregate dredging and port / harbour developments are not included since there are currently none planned in the vicinity of three consented wind farm sites or the transmission infrastructure.

4.4.3.8 The OnTI is not included in this assessment as no cumulative effects are predicted to occur from this development.

Methodology

4.4.3.9 The impact assessments presented for the three consented MORL wind farms (Telford, Stevenson and MacColl), the MORL WDA, the consented BOWL wind farm and associated transmission infrastructure, EOWDC, the MeyGen tidal stream project, Nigg Bay Energy Park and the Port of Ardersier are taken directly from the appropriate ESs. The predictions for the MORL WDA are taken from the MORL ES (MORL, 2012).

MORL Telford, Stevenson and MacColl wind farms

4.4.3.10 The three consented MORL wind farms (Telford, Stevenson and MacColl) are situated within the Eastern Development Area (EDA) in the Outer Moray Firth, approximately 22 km from the Caithness coastline. MORL has been granted a maximum of 1,116 MW for the three consented wind farm sites, with each site generating 372 MW.

MORL WDA

4.4.3.11 The MORL WDA comprises part of the MORL Zone and is adjacent to the MORL EDA are located. The maximum capacity to be installed in the entire Zone is 1.5 GW and MORL has been granted a maximum of 1.116 MW for the three consented wind farm sites in the EDA. The WDA will comprise a maximum capacity of 500 MW subject to the overall 1.5 GW cap for the Zone.

BOWL wind farm and OfTI

4.4.3.12 The BOWL wind farm will be located in the Outer Moray Firth, adjacent to the MORL EDA and covering an approximate area of 131.5 km2. Consent has been granted for the installation of up to 140 x 8 MW wind turbines, with a maximum capacity of up to 750 MW.

EOWDC

4.4.3.13 The EOWDC will be located in Aberdeen Bay, approximately 2 km east of Blackdog, Aberdeenshire. Consent has been granted for 11 wind turbines with a maximum capacity of up to 100 MW.

MeyGen Tidal Stream Project

4.4.3.14 The MeyGen tidal stream project covers an area of 3.5 km^2 in the channel between the island of Stroma and the north-eastern tip of the Scottish mainland. The Agreement for Lease is for 398 MW of installed capacity and will be consented in two separate phases. Phase 1 will involve the installation of up to 86 tidal turbines, with a maximum capacity of 86 MW.

Nigg Energy Park

4.4.3.15 The works comprise of an extension to the south quayside harbour and berthing facilities at Nigg Yard with the construction of a closed sheet piled quay structure. The construction will extend the south quayside some 135 m to 155 m into the adjacent Cromarty Firth. To accommodate future vessel traffic, the seabed local to the extension will be dredged to depths of approximately -10 m to -16 m.

Port of Ardersier

4.4.3.16 The works are sited on the former McDermott Fabrication Yard, which lies some 7.5 km to the west of Nairn, 18 km north-east of Inverness. The site is bounded by the Moray Firth to the north and extends to some 307 hectares.

Other Developments

4.4.3.17 Developments that are at an earlier stage, and for which there are limited development details at this stage, are also considered. Detailed cumulative impact assessment of these developments is not possible as insufficient information is available. Instead, a commentary on the potential for cumulative effects on the basis of the information available is presented, but no quantitative conclusions on the likely significance of any effects can be drawn.

4.4.3.18 All marine renewable projects considered in the CIA are shown in Figure 1.3-1 of MORL (2012) Volume 6 a.

Cumulative Assessment

4.4.3.19 The likely significant effects that will be considered in this CIA on ornithological receptors are:

- Disturbance and displacement caused by the presence of turbines, OSPs and other offshore infrastructure together with increased vessel traffic, especially during construction and decommissioning; and
- Indirect habitat effects due to changes in prey availability associated with construction, operation and decommissioning of offshore developments.

4.4.3.20 There is the potential for disturbance (including indirect effects) to arise from the three consented MORL wind farms, MORL WDA, BOWL, EOWDC, MeyGen, Nigg Energy Park and Port of Ardersier. Estimates of this risk from these sites are provided in Table 4.4-14 below.

4.4.3.21 For MORL, cumulative assessment has been undertaken to assess disturbance for: fulmar, gannet, kittiwake, great black-backed gull, herring gull, guillemot, razorbill and puffin (MORL (2012) Chapter 7.4: Ornithology). For these species the potential effect was predicted to be **minor or negligible** (Table 4.4-14 below).

4.4.3.22 For BOWL, cumulative assessment has been undertaken to assess disturbance for: fulmar, gannet, kittiwake, great black-backed gull, herring gull, guillemot, razorbill and puffin (BOWL, 2012). For these species the potential effect was predicted to be **minor or negligible** (Table 4.4-14 below).

4.4.3.23 For EOWDC, cumulative assessment has been undertaken to assess disturbance for three species: guillemot, razorbill, and puffin (Bloor, 2011). For these species the potential effect was predicted to be **negligible** (Table 4.4-14 below).

4.4.3.24 For MeyGen, cumulative disturbance effects on all species assessed were predicted to be **minor or negligible** for all species.

4.4.3.25 For Nigg Bay Energy Park, cumulative disturbance effects on all species assessed were predicted to be **minor or negligible** for all species.

4.4.3.26 For the Port of Ardersier, cumulative disturbance effects on all species assessed were predicted to be **minor or negligible** for all species.

Table 4.4-14 Summary of cumulative disturbance effects (including indirect effects)

Species	Summary
Fulmar	Telford, Stevenson and MacColl wind farms: 97 breeding individuals during summer – minor effect. Modified OfTI: minor effect. BOWL wind farm: a mean of 345 individuals during the summer – minor effect. EOWDC: negligible effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.

Species	Summary
Gannet	Telford, Stevenson and MacColl wind farms: 13 breeding individuals during summer – moderate effect. Modified OfTI: minor effect. BOWL wind farm: a mean of 49 individuals during the summer – minor effect. EOWDC: moderate effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **moderate effect**.
Shag	Telford, Stevenson and MacColl wind farms: negligible effect. Modified OfTI: minor effect. BOWL wind farm: negligible effect EOWDC: negligible effect. MeyGen: minor effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.
Eider	Telford, Stevenson and MacColl wind farms: negligible effect. Modified OfTI: minor effect. BOWL wind farm: negligible effect EOWDC: minor effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.
Long-tailed duck	Telford, Stevenson and MacColl wind farms: negligible effect. Modified OfTI: minor effect. BOWL wind farm: minor effect EOWDC: negligible effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.

Species	Summary
Common scoter	Telford, Stevenson and MacColl wind farms: negligible effect. Modified OfTI: minor effect. BOWL wind farm: minor effect EOWDC: negligible effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.
Velvet scoter	Telford, Stevenson and MacColl wind farms: negligible effect. Modified OfTI: minor effect. BOWL wind farm: negligible effect EOWDC: negligible effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.
Red-throated diver	Telford, Stevenson and MacColl wind farms: negligible effect. Modified OfTI: minor effect. BOWL wind farm: negligible effect EOWDC: negligible effect. MeyGen: minor effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.
Great northern diver	Telford, Stevenson and MacColl wind farms: negligible effect. Modified OfTI: minor effect. BOWL wind farm: negligible effect EOWDC: negligible effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.
White-billed diver	Telford, Stevenson and MacColl wind farms: no effect. Modified OfTI: no effect. BOWL wind farm: no effect EOWDC: no effect. MeyGen: no effect. Nigg Energy Park: no effect. Port of Ardersier: no effect. Cumulative: **no effect**.

Species	Summary
Puffin	Telford, Stevenson and MacColl wind farms: 479 breeding individuals during summer – minor effect. Modified OfTI: minor effect. BOWL wind farm: a mean of 368 individuals during the summer – minor effect. EOWDC: peak of 342 birds – minor effect, and different populations involved. MeyGen: minor effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.
Razorbill	Telford, Stevenson and MacColl wind farms: 415 breeding individuals during summer – minor effect. Modified OfTI: minor effect. BOWL wind farm: a mean of 404 individuals during the summer – minor effect. EOWDC: peak of 241 birds – minor effect, and different populations involved. MeyGen: minor effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.
Guillemot	Telford, Stevenson and MacColl wind farms: 1,683 breeding individuals during summer – minor effect. Modified OfTI: minor effect. BOWL wind farm: a mean of 2,655 individuals during the summer – minor effect. EOWDC: peak of 1,355 birds – minor effect, and different populations involved. MeyGen: minor effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**
Kittiwake	Telford, Stevenson and MacColl wind farms: 98 breeding individuals during summer – minor effect. Modified OfTI: minor effect. BOWL wind farm: a mean of 260 individuals during the summer – minor effect. EOWDC: negligible effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**

Species	Summary
Herring gull	Telford, Stevenson and MacColl wind farms: too low to model – moderate effect. Modified OfTI: minor effect. BOWL wind farm: a mean of 5 individuals during the summer – minor effect. EOWDC: moderate effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **moderate effect**.
Great black-backed gull	Telford, Stevenson and MacColl wind farms: 14 breeding individuals during summer – minor effect. Modified OfTI: minor effect. BOWL wind farm: a mean of 35 individuals during the summer – minor effect. EOWDC: minor effect. MeyGen: negligible effect. Nigg Energy Park: negligible effect. Port of Ardersier: negligible effect. Cumulative: **minor effect**.

4.4.3.27 In conclusion, **no significant effects** are predicted as a result of the inclusion of the MORL modified OfTI to the above cumulative disturbance assessment (including indirect effects).

4.4.4 Habitats Regulations Appraisal

4.4.4.1 The assessment and conclusions set out in this chapter have been used to inform an assessment of whether or not the potential impacts on birds, resulting from the modified OfTI, could, alone or in combination, lead to a significant effect on any European Site. On the basis of the assessment undertaken and the minor predicted effects on relevant bird species (and taking account of the conservation objectives of the SPAs listed within Section 14.4.7 of the MORL ES (2012) and Section 1.3 of Technical Appendix 4.5A of the MORL ES (2012)) it is concluded that there is no likely significant effect on any European Site as a result of the potential impact on birds of the modified OfTI either alone or in combination with other plans or projects. An Appropriate Assessment in relation to this topic area is therefore not considered to be required.

4.4.5 References

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