Technip UK Limited

Report

Aberdeen Offshore Wind Farm Habitat Regulations Appraisal Addendum

June 12

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Aberdeen Offshore Wind Farm Habitat Regulations Appraisal Addendum

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PREFACE

On 1st August 2011 Aberdeen Offshore Wind Farm Limited (AOWFL) applied to the Scottish Ministers under Section 36 of the Electricity Act 1989 (as amended), and applied for a Marine Licence under the Marine (Scotland) Act 2010 to construct, operate and decommission an offshore wind farm and deployment centre off the coast of Aberdeen, Aberdeen Offshore Wind Farm, also known as the European Offshore Wind Deployment Centre (EOWDC).

The application comprised an Environmental Statement (ES), prepared in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended) and Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) and followed current best practice.

The August 2011 submission comprises the following volumes:

- Volume 1 – Non-Technical Summary
- Volume 2 – Environmental Statement
- Volume 3 – Figures
- Volume 4 – Technical Appendices

Project Description / Rochdale Envelope

When the ES was submitted to Marine Scotland in August 2011, it had been agreed that further information would be required in support of the application. This further information was referred to as an 'Addendum' to the ES.

An application for an Offshore Wind Farm requires some flexibility to enable subsequent detailed design. This is particularly important in the context of the scheme to be developed as a demonstrator site. In order to carry out an environmental assessment of the project, parameters require to be defined and sufficient information provided to enable the identification of the significant effects. These parameters form the Rochdale Envelope.

At the time of defining the Rochdale Envelope (as submitted August 2011) the project engineers undertook consultation with the supply chain to understand their ambitions and likely details of their future wind turbines, which were at an early stage of development. The results of this initial consultation were inevitably a reflection of the supply chain at the time, and the stated ambitions of manufacturers at the time.

In keeping with the concept of a demonstrator site, over recent months, AOWFL has engaged with global turbine suppliers who wish to demonstrate their next generation turbine technology at the AOWF site. AOWFL has commenced a formal commercial process to identify and refine the turbine supply options for the site. This process is at an early and confidential stage, however revised turbine specifications have been made available to the project by the manufacturers.

The overarching objective of the EU grant associated with AOWF, is to deploy new equipment, systems, processes and initiate R&D to improve the competitiveness of offshore wind energy production, whilst generating environmentally sound marketable electricity and to increase the supply chain capabilities in Scotland, the wider UK and Europe.

The commercial evaluation of prospective turbine suppliers who can meet the EU requirements has revealed that a number of manufacturer's turbines marginally exceed the Rochdale Envelope parameters (as submitted). These turbines would require an adjustment to the tip height of up to 198.5m, and rotor radius of up to 86m as summarised in the table below.

Please note that the maximum dimensions are likely only to be applicable to specific wind turbine locations and are unlikely to be relevant to all 11 turbine locations. Please also note that a minimum clearance of 22 m above Mean High Water Springs (MHWS) will be maintained for marine navigation.

Table 1: As submitted Rochdale Envelope and proposed adjusted Rochdale Envelope

Parameter	Rochdale Envelope as submitted	Rochdale envelope (as requested)	Differential
Tip Ht (aLAT)	Up to 195 m	Up to 198.5 m	3.5 m
Hub Ht (aLAT)	Up to 120 m	Up to 120 m	Nil (likely reduction)
Rotor radius (diameter)	Up to 75 m (150 m)	Up to 86 m (172 m)	11 m (22 m)

Environmental Statement Addendum (June 2012)

Addenda are commonly submitted as a project evolves through time to clarify issues or to provide additional baseline data and updated environmental assessment information. This report (Information to inform a Habitats Regulations Appraisal - Addendum) forms part of the ES Addendum.

The June 2012 Addendum contains the following information:

- Additional bird and marine mammal baseline data.
- An additional visualisation from Girdleness lighthouse.
- Results of a geo-locational study into golf courses and Round 1 offshore wind farms.
- Requested minor adjustments to turbine dimensions which form a part of the project description information, known as the 'Rochdale Envelope'.
- Supporting statement and representative viewpoints of landscape and visual effects taking account of the adjustments to the Rochdale Envelope and preliminary design principles.
- Updated ornithological collision risk modelling resulting from the updated Rochdale Envelope, updated ornithological impact assessment, and updated Habitats Regulations Assessment.

Where to View the Consent Application

The ES addendum submission may be viewed at the following locations during normal office hours:

Vattenfall Wind Power Ltd 3rd Floor The Tun Holyrood Edinburgh EH8 8AE	Balmedie Library Eigie Rd Balmedie AB23 8YF
Aberdeen Central Library Rosemount Viaduct Aberdeen AB25 1GW	Peterhead Library 51 St Peter Street Peterhead AB42 1QD
Ellon Library Station Road Ellon AB41 9AE	Bridge Of Don Library Scotstown Road Bridge Of Don Aberdeen AB22 8HH

The ES addendum can also be viewed at the Scottish Government Library at Victoria Quay, Edinburgh, EH6 6QQ.

OBTAINING YOUR OWN COPY OF THE ES ADDENDUM

The ES addendum is available on the Vattenfall website:

http://www.vattenfall.co.uk/en/aberdeen-bay.htm

Contents

1.0 INTRODUCTION

The purpose of this addendum is provide additional information based on advice received during consultation on the original '*information to inform a Habitats Regulations Appraisal*' document submitted in July 2011. Furthermore, it considers new information that has become available since the application was made.

The document provides a summary of the information required to inform any possible Habitats Regulations Appraisal (HRA) that may be required to be undertaken by the competent authority with respect to the proposed European Offshore Wind Deployment Centre (EOWDC) as required under the EU Habitats and Birds Directives.

Further detailed information on the potential impacts is presented in the *Ornithological Baseline and Impact Assessment Addendum* and this document should be referred to for further information.

The document aims to identify all qualifying species or habitats that, based on data collected at the proposed development site, have the potential of a Likely Significant Effect. A high level assessment on the risk of a possible adverse effect has been undertaken and a conclusion made on the qualifying species or habitat. The assessment is made against all the conservation objectives of each of the relevant sites and the condition of each species obtained from SNH Sitelink (SNH 2012).

This assessment is based on site specific data collected from the surveys undertaken so far and, where appropriate, relevant data from other offshore wind farms. The aim of this assessment is to identify species or habitats that may be required to be assessed by the competent authority as part of a Habitats Regulations Assessment and potential future Appropriate Assessments.

This assessment takes into consideration comments received during consultation with SNH including responses to the EOWDC Scoping Opinion request from SNH to Marine Scotland dated 29 September 2010 (SNH 2010) and further response from Marine Scotland to the *Assessment against the Habitats Regulations and cumulative impacts screening* (Genesis 2011; Marine Scotland 2011). It is also takes into account advice received during meetings held with the regulator and statutory advisor on 8 February 2012.

2.0 QUALIFYING SITES

Under Article 6 of the Habitats Directive and Regulation 45 of the Conservation (Natural Habitats etc.) Regulations 1994 (as amended) the competent authority is required to assess whether or not a plan or programme will adversely affect the integrity of a Special Protection Area (SPA) or Special Area of Conservation (SAC).

There are a number of SPAs and SACs that have the potential to be impacted by the proposed development. The scope of this assessment is based on the Natura 2000 sites identified within the scoping document for which there is some evidence that the qualifying species could be present in the area of the proposed wind farm and subsequent advice from SNH and Marine Scotland (SNH 2010; Marine Scotland 2011). Additional sites and associated species are included following the response to the application from Scottish Natural Heritage (SNH 2011). Additional sites identified by SNH in their response as having either a potentially high or moderate connectivity have been considered further.

2.1 Special Protection Areas

Eleven SPAs were originally identified as having qualifying species that have the potential to be impacted by the proposed development and an assessment made for each of the species cited against the site's Conservation Objectives. Following subsequent advice from SNH (SNH 2011) an additional 14 SPAs have been considered (Appendix A).

The assessment is based on whether the species is at risk of:

Collision – The risk of collision depends on a number of variables, in particular species specific near and far field avoidance rates, flight heights, speed of flight, frequency of movements in or near to the turbines as well as the size and location of the turbines themselves. Additional factors such as weather and species' behaviour can also affect the risk of collision.

Displacement – Evidence from existing offshore wind farms have identified that some species of seabird may avoid entering wind farms and therefore be displaced from areas that they would otherwise utilise. The level of displacement is very species specific and the duration of displacement may vary across species, with some species avoiding wind farms immediately post-construction and returning to the area after a period of time and other species showing little or no evidence of returning to the wind farm area post construction. Displacement from an area may cause reduced foraging areas, increasing inter and intra specific competition and consequently lowering survival rates. Secondary impacts such as reducing prey availability, i.e. less fish in an area during construction, may also cause displacement as birds forage elsewhere for food.

Barrier effects – In order to avoid flying through wind farms many species have been recorded flying around or over them and consequently may have to fly further than prior to the construction of the wind farm. This increase in flying distance may cause an increase in energy expenditure, which could have a detrimental effect on the fitness of the individual and reduce survival or fecundity rates. This may be of particular concern should there be regular, daily, movements around a wind farm, i.e. to and from foraging or roosting areas.

Cumulative and In-combination impacts – Cumulative impacts need to be assessed under Schedule 3 of the Electricity Works EIA (Scotland) Regulations 2000 and in-combination impacts under the Conservation (Natural Habitats & c.) Regulations 1994 (as amended) impacts include those arising from existing and reasonably foreseeable activities including:

- Other wind farms,
- Aggregate extraction and dredging,
- Navigation and shipping,
- Established fishing activities,
- Existing and planned construction subsea cables and pipelines,
- Potential port/harbour developments,
- Oil and gas installations.

Unlike the cumulative impacts, the assessments of in-combination impacts relates specifically to those from other plans or projects on European Sites.

The Conservation Objectives for the SPAs are generic for all Scottish SPAs and although the assessment considers all Conservation Objectives specific impacts may be more relevant to certain Conservation Objectives than others:

Conservation Objective		Principal potential impact
To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained		Collision, Barrier effect and Displacement.
To ensure for the qualifying species that the following are maintained in the long term	*Population of the species as a viable component of the site*	Collision, Barrier effect and Displacement.
	Distribution of the species within site	None as development outwith any SPA.
	Distribution and extent of habitats supporting the species	Displacement
	Structure, function and supporting processes of habitats supporting the species	Displacement
	No significant disturbance of the species	Displacement

2.2 Special Areas of Conservation

Four SACs have been identified close to the area of the proposed development that have qualifying species or habitats that may have the potential to be impacted by the proposed development. This assessment has considered each of the species or habitats cited for each site and their Conservation Objectives.

The assessment is based on potential risks arising from:

Habitat disturbance – The qualifying habitats may be sensitive to physical impacts arising from the proposed offshore wind farm, in particular direct physical impacts caused by construction or less direct impacts caused by reduced or increased sediment loads.

Displacement – Species listed within the relevant SACs may be impacted by noise that may cause an increase in mortality, temporary injury, or displacement away from the area.

The following assessment attempts to assess the potential impacts arising from the proposed EOWDC against the qualifying species and habitats. For species or habitats where no potential for a likely significant effect has been identified no further assessment has been undertaken.

3.0 PROJECT DESCRIPTION

A detailed description of the proposed EOWDC project is presented in Chapter 3 of the Environmental Statement.

The proposed development is approximately 2.4 km from the coastline at its closest point in Aberdeen Bay (Figure 3-1). The total area of the turbine layout is 4.3 km^2 within the lease boundary area of 20 km^2. Water depth ranges from between 20 m and 30 m Lowest Astronomical Tide (LAT). The key project characteristics are presented in Table 3-1.

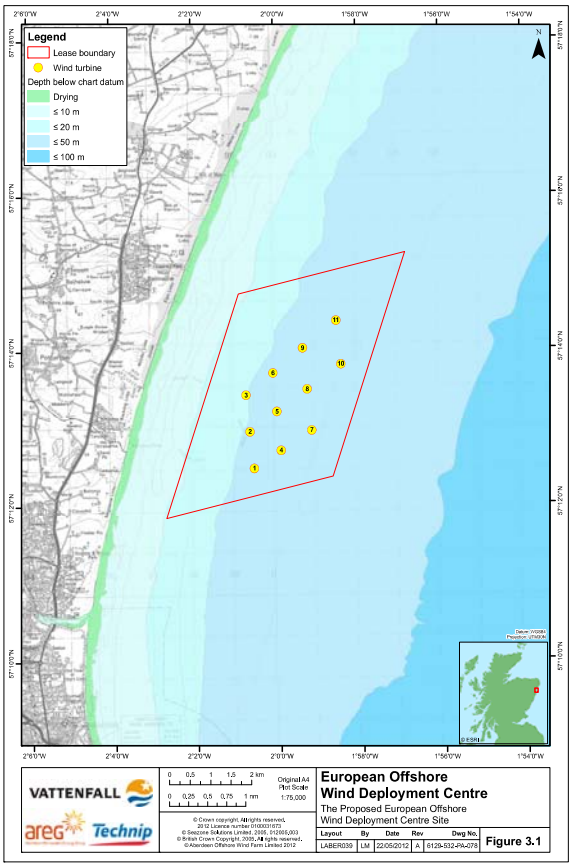

Figure 3-1: Location of proposed EOWDC

It is predicted that the construction phase of the proposed project will be undertaken over the course of a single year. However, there is potential for the construction to be phased over two years. The actual deployment of wind turbines is at this stage is not known and the numbers deployed in each year may be variable but for the purposes of the EOWDC assessment, the following has been assumed for the phasing:

Year 1 - 4 wind turbines installed
Year 2 - 7 wind turbines installed

This is a worst-case scenario as some of the potential impacts associated with construction will be more prolonged if the installation is undertaken in two years as opposed to one.

Table 3-1: key project characteristics

Key Project Characteristics	
Maximum Capacity	100 MW
Maximum Number of Wind Turbines	11
Lease Boundary Area	20 km^2
Distance to Shore	2.4 km
Water Depth Across Wind Turbine Locations	20 – 30 m
Individual Wind Turbine Capacity	4 to 10 MW
Maximum Rotor Diameter above LAT	186 m
Maximum Hub Height above LAT	120 m
Maximum Tip Height above LAT	198.5 m
Minimum Clearance Above MHSW	22 m
Indicative Spacing between Wind Turbines	Between 790 m and 1,050 m
Foundation Types	Potential foundations include monopiles, jackets, tripods, gravity base structure, suction caisson/ buckets
Inter-array Cables	Maximum number of 12. Total length of 13 km.
Export Cables	Maximum number of 4 will run from the wind turbine array back to Mean High Water Spring (MHWS) Total length of 26 km

4.0 SCOPE OF ASSESSMENT

4.1 Likely species present

In order to undertake this initial step a review has been undertaken of the site specific data collected at the proposed EOWDC location in Aberdeen Bay from both land, boat based and radar surveys since 2007 and aerial surveys undertaken by the JNCC in 2005 and 2006.

Boat based survey data were used from surveys undertaken between January 2007 and April 2008 and reported in a number of reports and August 2010 to August 2011:

- Monthly survey reports for February 2007 – April 2008,
- 6-month interim report for February 2007 – July 2007,
- 1st year survey report for February 2007 – January 2008,
- Bird boat survey data for February 2007 – April 2008,
- Bird boat survey data for August 2010 – August 2011.

Additional survey data have been collected since August 2011 but has not been available for this assessment. However, to help with the collision risk modelling analysis some specific data collected post August 2011 have been used.

Land based surveys from four vantage points across Aberdeen Bay were undertaken between April 2006 and March 2008. The surveys provided good coverage for the near-shore waters particularly areas inaccessible by boat due to shallow water depth. A number of reports presenting the results of the Vantage Point (VP) surveys have been produced:

- Monthly survey reports for April 2007 – March 2008.
- Six-month reports completed for
    - October 2006 – March 2007
    - April – September 2007
    - October 2007 – March 2008
- VP data for April 2006 – March 2008 (including opportunistic recordings of birds on surface and marine mammals).

Radar Surveys have been undertaken on three occasions from two sites within Aberdeen Bay between 2005 and 2010. A total of ten days of radar surveys were undertaken in 2005 and fifteen in 2007 and further five days in 2010.

In April 2005 a study using both s-band and x-band radar was undertaken at two locations within Aberdeen Bay: Drums and East Hatton. A further fifteen day study in April 2007 was undertaken at Blackdog, just south of Drums. In 2010 a further survey was undertaken during April aimed to focus efforts on recording pink-footed goose migration. The study also recorded all other species observed during the study.

In addition to surveys undertaken specifically to obtain information relevant to the proposed project other ornithological surveys have been undertaken in Aberdeen Bay, the results from which have been used in this report. In particular, the results of three aerial bird surveys undertaken by the JNCC between December 2005 and May 2006. It is recognised that there are other potential sources of data including local bird reports or Wetland Bird Survey (WeBS) counts (Calbrade *et al.* 2010; NESBR). For the purposes of this assessment these data sources have been used for reference purposes. Species recorded in Aberdeen Bay from site specific surveys are presented in (Table 4-1).

For further detailed information on the species recorded within Aberdeen Bay the addendum to the Ornithological Baseline and Impact Assessment should be referred to.

4.2 Potential sensitivity to offshore wind farms

There are a number of publications presenting the likely sensitivity of bird species to offshore wind farms (e.g. Zucco *et al.* 2006; Langston 2010) and there is general agreement between the various publications as to the main potential risks to birds and individual species sensitivities from wind farms.

For the purposes of this assessment the report published by Langston 2010 has been used to provide some relevant information on species' potential sensitivities. These are identified as being broadly 'High', 'Moderate' or 'Low'.

For species that were not included in the RSPB publication a score has been given based on existing data from offshore wind farms, e.g. Pettersson (2005); Petersen *et al*. (2006). Where no information is available on the likely sensitivity of a species to a particular type of impact then an assumption has been made that its sensitivities are similar to those of similar species, e.g. glaucous gull is similar to great black-backed gull. Potential sensitivities for waders and freshwater wildfowl are judgement based. These are identified as either ***, **, or * which are also high, moderate or low.

The potential sensitivities to wind farm developments based on the review by Langston (2010) and other offshore wind farm developments are presented in Table 4-1 for the species recorded in Aberdeen Bay from site specific surveys.

Table 4-1: Species recorded in Aberdeen Bay from site specific surveys and their potential vulnerability

Vulnerability to wind farm development	Collision.	Displacement	Barrier	Habitat/Prey	Feature of SPA with potential for interaction with site? (Y/N)	Use of site (breeding, wintering, passage)
Whooper swan	***	*	*	-	Y	P
Mute swan	High	Low	Low	-	N	B/W/P
Pink-footed goose	**	**	*	-	Y	P
Greylag goose	**	**	*	-	Y	P
Barnacle goose	**	**	*	-	Y	P
Brent goose	**	**	*	-	N	P
Shelduck	Mod	Low	Low	-	Y	P
Eurasian Wigeon	Mod	Low	Low	-	Y	P
Eurasian Teal	Mod	Low	Low	-	Y	P
Mallard	Mod	Low	Low	-	Y	B/W/P
Tufted duck	Mod	Low	Low	-	N	B/W/P
Gadwall	Mod	Low	Low	-	N	P
Common eider	*	*	**	**	Y	B/W
Long-tailed duck	*	**	**	**	N	W
Common scoter	*	**	**	**	N	W/P
Velvet scoter	*	**	**	**	N	W/P
Surf scoter	Low	Mod	Mod	Mod	N	P
Common goldeneye	*	*	**	**	N	W/P
Red-breasted merganser	*	*	**	**	N	W/P
Red-throated diver	*	***	**	**	N	W/P
Black-throated diver	*	***	**	**	N	W/P
Great northern diver	*	***	**	**	N	W/P

Vulnerability to wind farm development					Feature of SPA with potential for interaction with site? (Y/N)	Use of site (breeding, wintering, passage)
	Collision.	Displacement	Barrier	Habitat/Prey		
Northern Fulmar	*	*	*	**	Y	B/W
Manx shearwater	*	*		**	N	P
Sooty shearwater	*	*		**	N	P
European storm petrel	*	*	-	**	N	P
Gannet	**	*	*	*	Y	B/W/P
Cormorant	**	*	**	**	Y	B/W
European Shag	*	**	**	**	Y	B/W
Grey heron	High	Low	Low	-	N	B/W/P
Oystercatcher	Mod	Low	Low	-	Y	B/W/P
Ringed plover	Mod	Low	Low	-	N	B/W/P
Golden plover	Mod	Low	Low	-	N	P
Lapwing	Mod	Low	Low	-	Y	B/W/P
Knot	Mod	Low	Low	-	N	P
Sanderling	Mod	Low	Low	-	N	W/P
Dunlin	Mod	Low	Low	-	N	P
Black-tailed godwit	Mod	Low	Low	-	N	P
Bar-tailed godwit	Mod	Low	Low	-	N	W/P
Redshank	Mod	Low	Low	-	Y	B/W/P
Whimbrel	Mod	Low	Low	-	N	P
Curlew	Mod	Low	Low	-	N	B/W/P
Turnstone	Mod	Low	Low	-	N	W/P
Pomarine skua	**	*	*	*	N	P
Arctic skua	**	*	*	*	N	P
Long-tailed skua	**	*	*	*	N	P
Great skua	**	*	*	*	N	P

Vulnerability to wind farm development					Feature of SPA with potential for interaction with site? (Y/N)	Use of site (breeding, wintering, passage)
	Collision.	Displacement	Barrier	Habitat/Prey		
Glaucous gull	Mod	Low	Low	Low	N	W
Little gull	*	*	*	*	N	P
Black-headed gull	*	*	*	*	N	B/W/P
Sabine's gull	*	*	*	*	N	P
Common gull	*	*	*	*	N	B/W/P
Lesser black-backed gull	**	*	*	*	Y	B
Herring gull	**	*	*	*	Y	B/W/P
Great black-backed gull	**	*	*	*	N	B/W
Kittiwake	**	*	*	*	Y	B/W
Little tern	**	*	*	*	Y	B
Sandwich tern	**	*	*	**	Y	B
Common tern	**	*	*	**	Y	B
Arctic tern	**	*	*	**	Y	B
Guillemot	*	**	**	**	Y	B/W
Razorbill	*	**	**	**	Y	B/W
Black guillemot	*	**	**	**	N	B/W
Puffin	*	**	**	**	Y	B
Little auk	*	**	**	**	N	W/P

Note – High/mod/low designations have been made based on published data from offshore wind farms either for that particular species or similar 'sister' species.

* = low sensitivity, ** = moderate sensitivity, *** = high sensitivity (Langston 2010).

5.0 SPAS

There is no clear guidance on how to define the extent and scope of a seabird population that could potentially be impacted by a proposed development. King *et al*. (2009) suggests that regional populations should be the Round 2 strategic areas (Renewable Energy Zones) or the Round 3 zones. However, as the proposed development is not in such an area there is no clear guidance as to how to identify the regional population for this assessment.

The original scope of the review undertaken for this document was, with the exception of Fair Isle, based on all coastal SPAs between Troup, Pennan and Lion's Heads SPA, on the Moray Firth and the Forth Islands SPA to the south; covering approximately 300 km of coastline. This covered a greater length shoreline than any of the Round 2 Renewable Energy Zones and a significant proportion of eastern Scotland's coastline. Consequently, it covered an area greater than suggested as guidance within the COWRIE report (King *et al*. 2009); therefore a representative area was covered. The area covered in the original review was based largely on the predicted mean maximum foraging ranges of most of the breeding seabirds recorded within the proposed development area; the exceptions being gannet and fulmar.

The original review covered sites advised in the formal scoping opinion from SNH (SNH 2010). Following subsequent advice from SNH the original area considered has been enlarged to include additional species and colonies previously not considered to be at risk of a Likely Significant Effect. This document includes the additional sites advised by SNH in their formal response to the application (SNH 2011).

All coastal or near coastal SPAs were identified using information from the SNH and JNCC websites (JNCC 2011, SNH 2011). The 11 SPAs that were originally identified as having qualifying species that were at potential risk of Likely Significant Effect from the proposed project were:

- Buchan Ness to Collieston SPA,
- Fair Isle SPA,
- Firth of Forth SPA,
- Firth of Tay & Eden Estuary SPA,
- Forth Islands SPA,
- Fowlsheugh SPA,
- Loch of Skene SPA,
- Loch of Strathbeg SPA,
- Montrose Basin SPA,
- Troup, Pennan and Lion's Heads SPA,
- Ythan Estuary, Sands of Forvie and Meikle Loch SPA.

See (Figure 5-1)

An additional 14 SPA have subsequently been identified as having potential connectivity:

- East Caithness Cliffs SPA,
- Copinsay SPA,
- Noss SPA,
- Foula SPA,
- Caithness and Sutherland Peatlands SPA,
- Orkney Mainland Moors SPA,
- Otterswick and Graveland SPA,
- North Caithness Cliffs SPA,
- Sumburgh Head SPA,
- Fetlar SPA,
- Upper Solway Flats and Marshes SPA,
- Hoy SPA,
- Hermaness Saxa Vord and Valla Field SPA,
- Ronas Hill and Tingon SPA,

See (Figure 5-2)

Further details on each of the SPAs including their qualifying species and Conservation Objectives are presented in Appendix A. Not all those species listed within the site designations have been recorded within the area of the proposed development and consequently not all qualifying species are at risk of a potential impact.

Table 5-1 identifies the species that have been recorded within the proposed development area (Table 4-1) with the relevant SPAs (Appendix A). In addition, the table presents the distance from the SPA the proposed development is and the population of each species at the time of designation and when available, more recent populations.

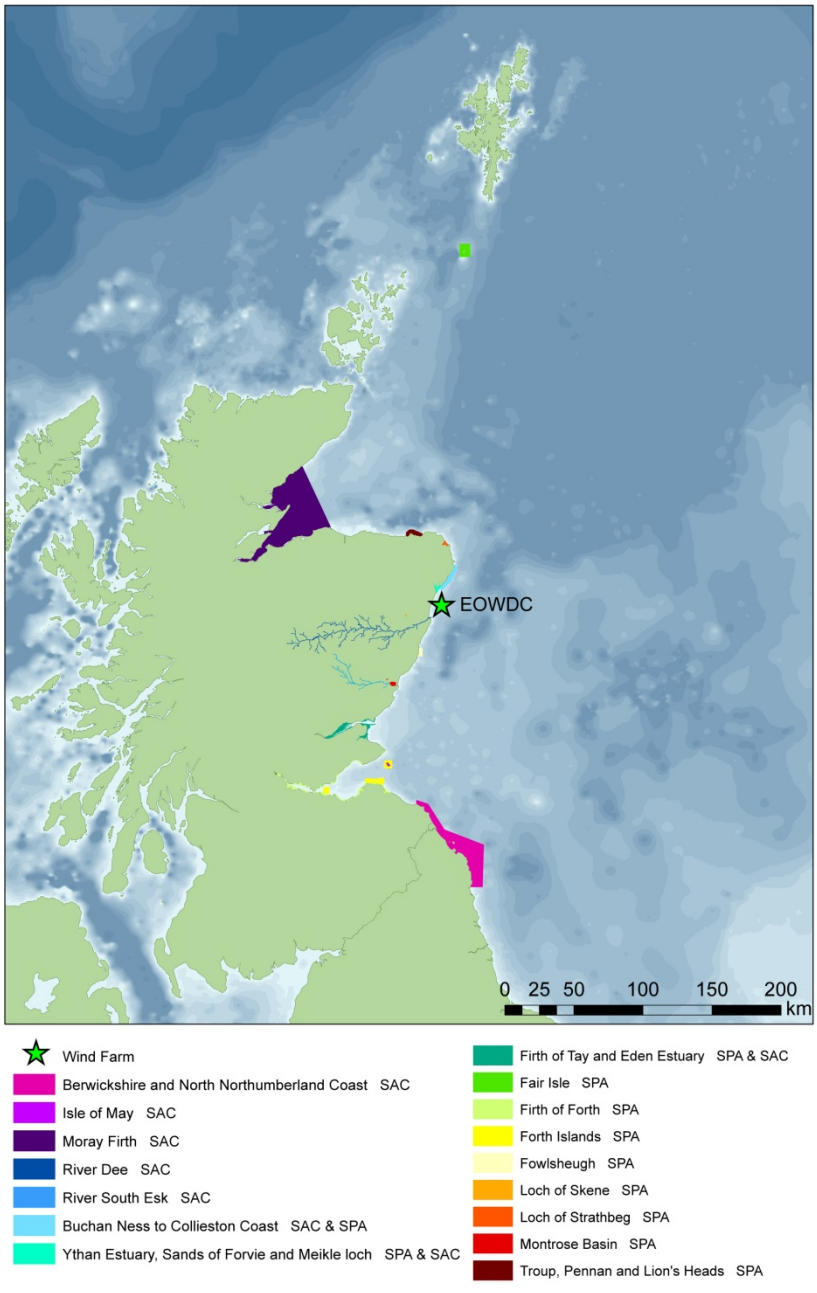

Figure 5-1: Designated sites originally scoped in to the HRA

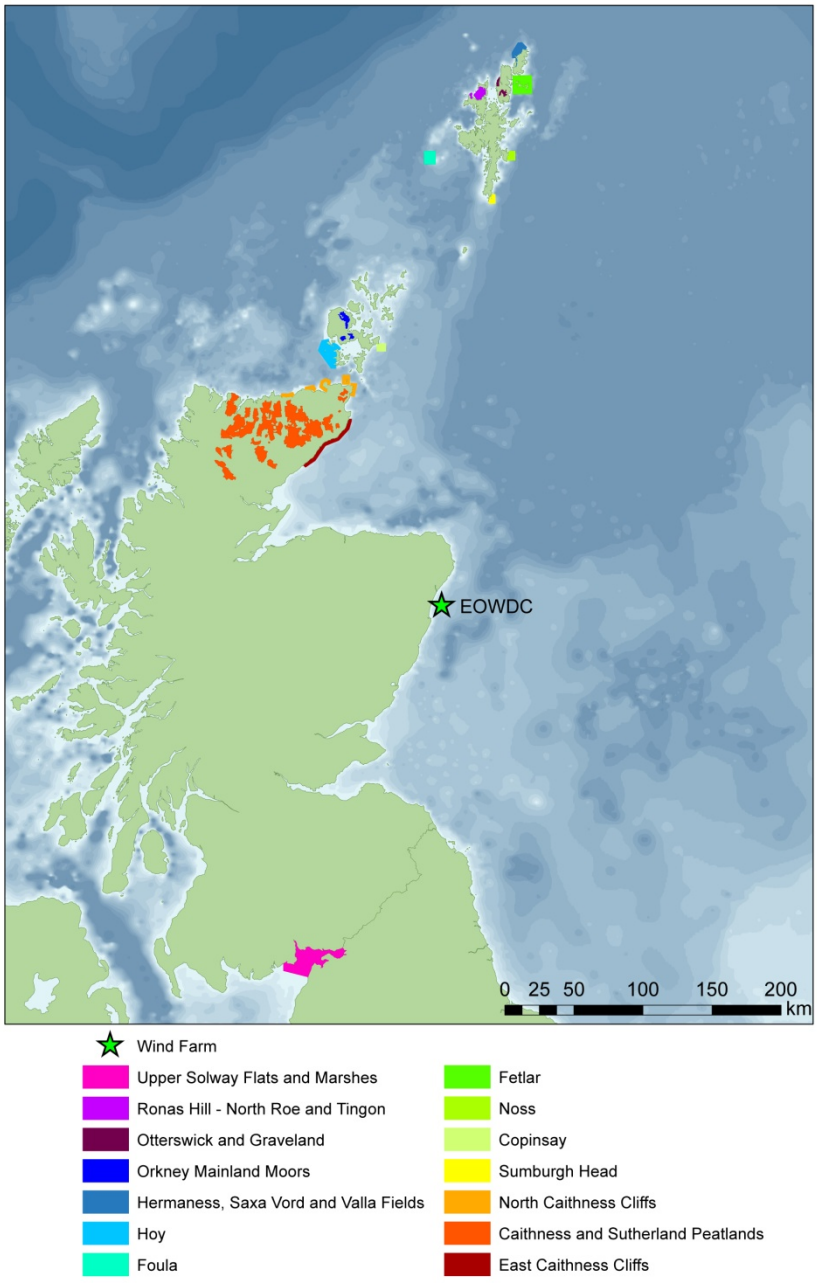

Figure 5-2: Additional designated sites included following consultation

Table 5-1: Qualifying species recorded within the proposed development area and the distance from Special Protection Area.

Species	SPA name	Distance from SPA (km)	Qualifying feature at time of designation	Pop^{n} of SPA	
				Designation or SPA review	Recent
Whooper swan	Loch of Strathbeg	47.6	3.3% of GB wintering pop^{n}	183	333$^{-(1)}$
Pink-footed goose	Ythan Estuary, Sands of Forvie and Meikle Loch	7.2	7.7% of GB Wintering pop^{n}	17,213	16,300$^{-(1)}$
	Firth of Forth	134	5.5% of GB wintering pop^{n}	12,400	4,463$^{-(1)}$
	Firth of Tay & Eden	96	1.7% of GB wintering pop^{n}	3,769	2,704$^{-(1)}$
	Loch of Strathbeg	47.6	17.7% of GB Wintering pop^{n}	39,924	53,454$^{-(1)}$
	Montrose Basin	61	14.1% of GB Wintering pop^{n}.	31,622	38,911$^{-(4)}$
Greylag goose	Loch of Skene	21	Migratory species	10,840	790$^{-(3)}$
	Loch of Strathbeg	47.6	3.3% of GB Wintering pop^{n}	3,325	580$^{-(3)}$
	Montrose Basin	61	1.1% GB Wintering pop^{n}	1,080	275$^{-(4)}$
	Firth of Tay & Eden Estuary	96	1.0% of GB Wintering pop^{n}	1,200	2,640$^{-(3)}$
Barnacle goose	Loch of Strathbeg	47.6	1.9% of GB wintering pop^{n}	226	726$^{-(1)}$
	Upper Solway Flats and Marshes	*c.* 267	100% of biogeographical pop^{n}	13,595	29,537
Shelduck	Montrose Basin	61	Waterfowl assemblage	unavailable	988$^{-(4)}$
	Firth of Forth	134	1.2% of NW European pop^{n}	3,586	3,166$^{-(1)}$
	Firth of Tay & Eden	96	Waterfowl assemblage	unavailable	1,114$^{-(1)}$
Teal	Loch of Strathbeg	47.6	Waterfowl assemblage	unavailable	504$^{-(3)}$
Wigeon	Montrose Basin	61	Waterfowl assemblage	unavailable	3,944$^{-(1)}$
	Firth of Forth	134	Waterfowl assemblage	2,139	2,139$^{-(1)}$
Mallard	Firth of Forth	134	Waterfowl assemblage	unavailable	2546$^{-(5)}$
Common eider	Ythan Estuary, Sands of Forvie and Meikle Loch	7.2	Waterfowl assemblage	unavailable	3,688$^{-(1)}$
	Montrose Basin	61	Waterfowl assemblage	unavailable	1,983$^{-(4)}$
	Firth of Tay & Eden	96	Waterfowl assemblage	unavailable	4,378$^{-(1)}$
	Firth of Forth	134	Waterfowl assemblage	9,400	5,188$^{-(1)}$
Long-tailed duck	Firth of Forth	134	Waterfowl assemblage	1,045	215$^{-(1)}$
	Firth Tay and Eden	96	Waterfowl assemblage	unavailable	204$^{-(1)}$
Common scoter	Firth of Forth	134	Waterfowl assemblage	unavailable	635
	Firth of Tay & Eden	96	Waterfowl assemblage	unavailable	unavailable
Velvet scoter	Firth of Forth	134	Waterfowl assemblage	2,880	731$^{-(1)}$

Species	SPA name	Distance from SPA (km)	Qualifying feature at time of designation	Popⁿ of SPA	
				Designation or SPA review	Recent
	Firth of Tay & Eden	96	Waterfowl assemblage	unavailable	326[-(1)]
Common Goldeneye	Firth of Forth	134	Waterfowl assemblage	unavailable	581-[(1)]
	Firth of Tay & Eden Estuary	96	Waterfowl assemblage		255 [-(1)]
Red-breasted merganser	Firth of Forth	134	Waterfowl assemblage	670 ind.	410[-(1)]
Red-throated diver	Firth of Forth	134	1.8% of GB popⁿ	88	317[-(1)]
	Caithness and Sutherland Peatlands	*c.* 165	9.5% of National popⁿ	89	unavailable
	Hoy	210	6.0% of National popⁿ	56	unavailable
	Orkney Mainland Moors	*c.* 220	1.6% of National popⁿ	15	unavailable
	Foula	320	1.2% of National popⁿ	11	unavailable
	Hermaness, Saxa Vord and Valla Field	411	3.0% of National popⁿ	28	unavailable
	Otterswick and Graveland	*c.* 365	2.9% of National popⁿ	27	unavailable
	Ronas Hill – North Roe and Tingon	*c.* 350	5.4% of National popⁿ	50	unavailable
Fulmar	Buchan Ness to Collieston	9.5	0.3% of National popⁿ	1,765 prs	1,370[-(3)]
	Fowlsheugh	31.1	0.2% of National popⁿ	1,170 prs	246[-(3)]
	Forth Islands	124.4	0.3% of National popⁿ	1,600 prs	402[-(3)]
	Troup, Pennan and Lion's Head	74.3	0.8% of National popⁿ	4,400 prs	636[-(3)]
	East Caithness Cliffs	168	2.8% of National popⁿ	15,000 prs	13,000 prs
	North Caithness Cliffs	180	3.0% of National popⁿ	16,310 prs	*c.* 10,000 prs
	Copinsay	200	0.3% of National popⁿ	1,615 prs	1,630 prs
	Fair Isle	260	8.0% of National popⁿ	43,320 prs	29,649 prs
	Sumburgh Head	296	0.5% of National popⁿ	2,542 prs	233 prs
	Noss	330	1.1% of National popⁿ	5,870 prs	6,144 prs
	Fetlar	376	1.8% of National popⁿ	9.800 prs	c. 5,700 prs
	Foula	320	8.7% of National popⁿ	46,800 prs	21,106 prs
Gannet	Forth Islands	124.4	13.1% of N. Atlantic breeding popⁿ	34,400 prs	48,065 prs[(-2)]
	Fair Isle	260	0.6% of GB popⁿ	1,166 prs	3,582 AoN[-(12)]
	Noss	330	3.6% of National popⁿ	7,310 prs	
Cormorant	Forth Islands	124.4	Waterfowl assemblage	200 prs	198 prs [(-2)]
	Forth Islands	124.4	Wintering assemblage	682 ind-	unavailable

Species	SPA name	Distance from SPA (km)	Qualifying feature at time of designation	Pop[n] of SPA	
				Designation or SPA review	Recent
	Firth of Tay & Eden Estuary	96	Wintering assemblage	230 ind	unavailable
European shag	Buchan Ness to Collieston	9.5	Waterfowl assemblage	1,045 prs	331 prs[-(3)]
	Forth Islands	124.4	2.3% of biogeographical pop[n]	2,887 prs	480 prs
Great-crested grebe	Firth of Forth	134	7% of GB wintering pop[n]	720	unavailable
Curlew	Firth of Forth	134	2% of GB pop[n]	1,928	3,939[-(1)]
Oystercatcher	Montrose Basin	61	Waterfowl assemblages	unavailable	1,385[-(4)]
	Firth of Tay & Eden Estuary	96	Waterfowl assemblage	unavailable	unavailable
	Firth of Forth	134	Waterfowl assemblage	2,368	7,638[-(1)]
Golden plover	Firth of Forth	134	Waterfowl assemblage	2,970	unavailable
Lapwing	Ythan Estuary, Sands of Forvie and Meikle Loch.	7.2	Waterfowl assemblage	unavailable	6,269[-(3)]
	Firth of Forth	134	Waterfowl assemblages	4,184	unavailable
Sanderling	Firth Tay & Eden	96	Waterfowl assemblages	unavailable	277[-(1)]
Ringed plover	Firth of Forth	134	Waterfowl assemblage	328	471[-(1)]
Turnstone	Firth of Forth	134	1% of western Palaearctic pop[n]	1,286	853[-(1)]
Redshank	Ythan Estuary, Sands of Forvie and Meikle Loch.	7.2	Waterfowl assemblage	unavailable	2,471[-(1)]
	Firth of Forth	134	Waterfowl assemblage	3,700	5,111[-(1)]
	Firth of Tay & Eden	96	2.5% of wintering pop[n]	1,800	1,162[-(1)]
	Montrose Basin	61	1.5% of wintering pop[n]	2,259	1,951[-(4)]
Lesser black-backed gull	Forth Islands	124.4	2.4% of west European pop[n].	2,920 prs	2,779 [(-2)]
Herring gull	Buchan Ness to Collieston	9.5	Waterfowl assemblage	4,292 prs	3,079[-(3)]
	Fowlsheugh	31.1	Waterfowl assemblage	3,190 prs	122[-(2)]
	Forth Islands	124.4	Waterfowl assemblage	6,600 prs	2,968
	Troup, Pennan and Lion's Head	74.3	Waterfowl assemblage	4,200 prs	1,597[-(3)]
Kittiwake	Buchan Ness to Collieston	9.5	Waterfowl assemblage	30,452 prs	12,542 [-(2)]
	Fowlsheugh	31.1	1.1% of East Atlantic Breeding pop[n]	34,870 prs	11,140[-(2)]
	Forth Islands	124.4	Waterfowl assemblage	8,400 prs	2,316[-(2)]
	Troup, Pennan and Lion's Head	74.3	Waterfowl assemblage	unavailable	14,896[-(3)]
Little tern	Ythan Estuary, Sands of Forvie and Meikle Loch.	7.2	1.7% of GB Breeding pop[n].	41 prs	36 prs [-(3)]
Sandwich tern	Ythan Estuary, Sands of Forvie	7.2	4.3% of GB Breeding pop[n]	600 prs	645 AoN

Species	SPA name	Distance from SPA (km)	Qualifying feature at time of designation	Pop[n] of SPA	
				Designation or SPA review	Recent
	and Meikle Loch.				
	Loch of Strathbeg	47.6	3.8% of GB Breeding pop[n]	530 prs	1-2 AoN
	Firth of Forth	134	3.8% of GB passage	1,617 ind	unavailable
	Forth Islands	124.4	0.2% of GB Breeding pop[n]	22 prs	0
Common tern	Ythan Estuary, Sands of Forvie and Meikle Loch.	7.2	2.2% of GB Breeding pop[n]	265 prs	6 prs
	Forth Islands	124.4	6.5% of GB Breeding pop[n]	800 prs	378 prs [-2]
Arctic tern	Forth Islands	124.4	1.2% of GB Breeding pop[n]	540 prs	908 prs [-2]
Guillemot	Buchan Ness to Collieston	9.5	Waterfowl assemblage	8,640 prs	19,296 ind.
	Fowlsheugh	31.1	1.8% of East Atlantic Breeding pop[n].	40,140 prs	50,566 ind.
	Troup, Pennan and Lion's Head	74.3	1.3% of East Atlantic Breeding pop[n].	29,902 prs	16,325 ind.
	Forth Islands	124.4	Waterfowl assemblage	16,000 prs	2,550 ind.
Razorbill	Buchan Ness to Collieston	9.5	Waterfowl assemblage	unavailable	4,179 ind.
	Fowlsheugh	31.1	Waterfowl assemblage	5,800 ind	4,632 ind
	Forth Islands	124.4	Waterfowl assemblage	1,400 prs	3,464 ind
	Troup, Pennan and Lion's Head	74.3	Waterfowl assemblage	unavailable	1,069 ind
Puffin	Forth Islands	124.4	2.3% of breeding pop[n].	21,000 prs	58,867 AoN

1 = Calbrade, *et al.* 2010 2 = BTO 2011 3 = JNCC 2011 4 = Montrose Basin 2011 5 = SNH 2011

5.1 Potential for in-combination impacts

The consideration of potential cumulative impacts is of key importance when undertaking a Habitats Regulations Appraisal.

Having identified the species of seabird occurring within the proposed development area and the relevant SPAs for which the species may be a qualifying feature the next step is identify the potential for cumulative or in-combination impacts. '*Cumulative effects may arise when several wind farms are present within an area or along a flyway corridor, or as the result of the combined impacts of wind farms and other types of development.*' (EC 2010).

Additional EC Guidance (EC 2000) advises that '*when determining likely significant effects, the combination of other plans or projects should also be considered to take account of cumulative impacts. It would seem appropriate to restrict the combination provision to other plans or projects which have been actually proposed*.

Guidance produced by COWRIE (King, *et al*. 2009) proposes that assessments should include:

- Projects that have been consented but which are yet to be constructed.
- Projects for which an application has been made,
- Projects that are reasonably foreseeable – i.e. those for which an application has yet to be made but where such application is known to be imminent.

Activities identified that may cause a potential cumulative or in-combination impact include:

- Shipping
- Fishing
- Aggregates
- Subsea cables and pipelines
- Dredging
- Oil and Gas
- Renewable Energy
- Port/harbour developments

Shipping and Fishing

Impacts from shipping and fishing activities are 'unregulated' activities, in that they do not require a specific permit before being undertaken. They are ongoing and impacts arising from them are reflected in the baseline environmental data. Currently, approximately 7,700 vessels arrive each year to Aberdeen harbour and there are no known planned increases in either shipping of fishing in the area (AHB 2011). EC Guidance indicates that completed plans and projects are excluded from assessment requirements of Article 6(3) unless the continuing effects on the site point to a pattern of progressive loss of site integrity, which is not the case in the area of the proposed development with regards to either shipping or fishing activities. Consequently, they have not been considered as part of any cumulative impact assessment (EC 2000).

Aggregates

There are no aggregate activities in the vicinty of the proposed EOWDC.

Dredging

There are no dredging deposit sites within Aberdeen Bay. Dredging associated with Aberdeen Harbour can occasionally occur, although it is infrequent. There are currently plans to undertake dredging in Aberdeen Harbour during 2012. This will be completed prior to any proposed construction activites associated with the proposed EOWDC. Consequenlty, there will no in-combination impacts associated with dredging.

Oil and Gas

Aside from shipping activites associated with the oil and gas industry there are are no oil and gas acitivities in the wider Aberdeen Bay area.

Subsea cables and pipelines

A single disused telecommunications cable was identified during surveys. There is no information available on potential plans for future cable or pipelines in Aberdeen Bay, aside from those associated with the proposed EOWDC.

Port or harbour developments

On going redevelopment of quays within Aberdeen harbour include the development of more quayside space and deep water berthing (Aberdeen Harbour 2010; Aberdeen Harbour 2012).

Renewable Energy Projects

There are currently five proposed offshore wind farms in the Firth of Forth and Moray Firth. The Beatrice and Moray Firth Offshore Wind Farms are in the Moray Firth; approximately 150 km away and Neart na Gaoithe and Inch Cape and Firth of Forth are in the Firth of Forth, approximately 70 km to the south of the proposed EOWDC (Table 5-2 Figure 3-1). There is currently one operational demonstrator project in the Moray Firth, the Beatrice Demonstrator.

Table 5-2: Proposed offshore wind farm projects that may have potential in-combination impacts

Name of development	Developer	MW	Possible / Actual number of Turbines	Project timeframe construction
The Beatrice Demonstrator	Joint Venture Talisman and Scottish and Southern Energy	10	2	Installed operational
The Moray Firth Eastern Development	Moray Offshore Renewables Ltd	1,300	c.200	2015
The Moray Firth Western Development			Not yet known	>2015
Beatrice	Sea Energy Renewables Ltd & Scottish and Southern Energy	920	184	2014
Firth of Forth: Phase 1	SeaGreen	1,075	215	2016
Firth of Forth: Phase 2		1,435	287	2019
Firth of Forth: Phase 3		955	191	2020
Neart na Gaoithe	Mainstream Renewable Power	420	130	2015
Inch Cape	SeaEnergy	905	181	2016

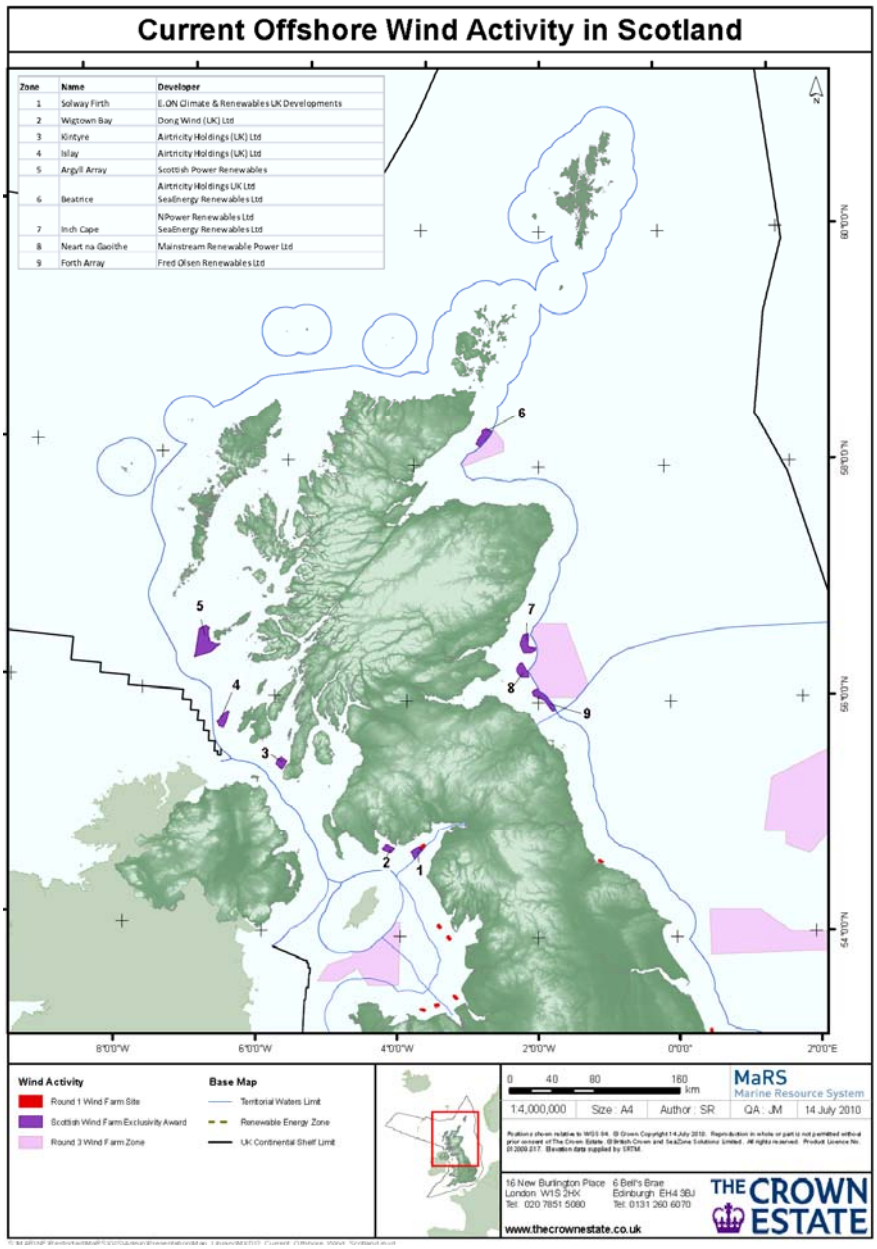

Figure 5-3: Map showing nine initial proposed offshore wind farms in Scottish Territorial Waters

Based on the known foraging ranges of breeding seabirds occuring in the proposed EOWDC (Thaxter *et al.* 2012) it has been identifed that there is the potential for an in-combination impact on the following plans or projects (Table 5-2):

- Beatrice Demonstrator Project (operational),
- The Beatrice Offshore Wind Farm (proposed),
- The Moray Firth Offshore Wind Farm (proposed),
- Inch Cape Offshore Wind farm (proposed),
- Firth of Forth Offshore Wind Farm (proposed),
- Neart na Gaoithe Offshore Wind Farm (proposed).

In order to undertake a cumulative impact assessment it is necessary to know details of the proposed plans. Currently, the only development for which data are available that could be used within an in-combination assessment is from the proposed Beatrice offshore wind farm in the Moray Firth (BOWL 2012). There is little information from other proposed developments particularly, survey data to inform the species and abundance of birds present at each of the sites. For those projects where there are little or no data available it is not possible to undertake a detailed cumulative impact assessment.

5.2 Identifying potential for interaction

Having identified the relevant SPAs and qualifying species an assessment has been undertaken to identify which species have the potential to interact with the proposed development either alone or in-combination with other plans or projects. For breeding species recorded during boat-based surveys the assessment is based on the mean maximum reported foraging ranges for each species and based on data published in Thaxter *et al*. (2012).

For non-breeding birds that are listed as qualifying species for an SPA they are considered to be at potential risk but the level of significance is based on the number of birds recorded within the proposed development area, their behaviour and advice from SNH (SNH 2011).

Based on the below screening assessment, species identified as having a likely potential for an interaction with the proposed development are further considered in the high level screen assessment in Section 6.0. The information presented is a summary of that presented for each species in the Ornithological Baseline and Impact Assessment Addendum (July 2012) and this should be used in conjunction with the summarised information presented here to further inform any possible future Habitats Regulations Appraisal.

Table 5-3: Breeding seabirds associated with a relevant SPA for which potential impacts could occur either alone or in-combination

Breeding bird species known to frequent area of development	Known foraging range from breeding colony (km)		Potential overlap with SPA colony	Distance from proposed EOWDC (km)	Potential overlap with proposed EOWDC (based on mean-max foraging distance)	Potential overlap with other offshore wind farms and proposed EOWDC
	Max	Mean Max				
Common eider	80	80	Ythan Estuary, Sands of Forvie and Meikle Loch.	7.2	Y	No
			Montrose Basin	61	Y	Firth of Forth, Neart na Gaoithe, Inch Cape
			Firth of Tay & Eden Estuary	96	N	Firth of Forth, Neart na Gaoithe, Inch Cape
			Firth of Forth SPA	134	N	No
Fulmar	580	400	Buchan Ness – Collieston,	9.5	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			Fowlsheugh	31.1	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			Forth Islands	124.4	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			Troup, Pennan and Lion's Heads	74.3	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			East Caithness Cliffs	168	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			North Caithness Cliffs	180	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			Copinsay	200	Y	Moray Firth, Firth of Forth,

Breeding bird species known to frequent area of development	Known foraging range from breeding colony (km)		Potential overlap with SPA colony	Distance from proposed EOWDC (km)	Potential overlap with proposed EOWDC (based on mean-max foraging distance)	Potential overlap with other offshore wind farms and proposed EOWDC
	Max	Mean Max				
						Beatrice, Neart na Gaoithe, Inch Cape
			Fair Isle	260	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			Sumburgh Head	296	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			Noss	330	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			Fetlar	376	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
			Foula	320	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape
Gannet	590	229	Forth Islands	124.4	Y	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape.
			Fair Isle	260	N	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape.
			Noss	330	N	Moray Firth, Firth of Forth, Beatrice, Neart na Gaoithe, Inch Cape.
Cormorant	35	25	Forth Islands	124.4	N	No

Breeding bird species known to frequent area of development	Known foraging range from breeding colony (km)		Potential overlap with SPA colony	Distance from proposed EOWDC (km)	Potential overlap with proposed EOWDC (based on mean-max foraging distance)	Potential overlap with other offshore wind farms and proposed EOWDC
	Max	Mean Max				
European Shag	17	14.5	Buchan Ness to Collieston Coast	9.5	Y	No
			Forth Islands	124.4	N	No
Lesser black-backed gull	181	141	Forth Islands	124.4	Y	Firth of Forth, Neart na Gaoithe, Inch Cape
Herring gull	92	61	Buchan Ness to Collieston Coast	9.5	Y	No
			Fowlsheugh	31.1	Y	Firth of Forth, Neart na Gaoithe, Inch Cape
			Troup, Pennan and Lion's Heads	74.3	N	No
			Forth Islands	124.4	N	No
Kittiwake	120	60	Buchan Ness to Collieston Coast	9.5	Y	No
			Fowlsheugh	31.1	Y	Firth of Forth
			Forth Islands	124.4	N	No
			Troup, Pennan and Lion's Heads	74.3	Y	Moray Firth, Beatrice
			East Caithness Cliffs	168	N	No
Little tern	11	6	Ythan Estuary, Sands of Forvie and Meikle Loch	7.2	Y	No
Sandwich tern	54	49	Ythan Estuary, Sands of Forvie and Meikle Loch	7.2	Y	No
			Loch of Strathbeg	47.6	Y	No

Breeding bird species known to frequent area of development	Known foraging range from breeding colony (km)		Potential overlap with SPA colony	Distance from proposed EOWDC (km)	Potential overlap with proposed EOWDC (based on mean-max foraging distance)	Potential overlap with other offshore wind farms and proposed EOWDC
	Max	Mean Max				
Common tern	30	15.2	Ythan Estuary, Sands of Forvie and Meikle Loch	7.2	Y	No
			Forth Islands	124.4	N	No
Arctic tern	30	24.2	Forth Islands	124.4	N	No
Guillemot	135	84.2	Buchan Ness to Collieston	9.5	Y	Firth of Forth, Neart na Gaoithe, Inch Cape
			Forth Islands	124.4	Y	Firth of Forth, Neart na Gaoithe, Inch Cape
			Fowlsheugh	31.1	Y	Firth of Forth, Neart na Gaoithe, Inch Cape
			Troup, Pennan and Lion's Heads	74.3	Y	Moray Firth, Beatrice
Razorbill	95	48.5	Buchan Ness to Collieston	9.5	Y	Firth of Forth, Neart na Gaoithe, Inch Cape
			Fowlsheugh	31.1	Y	Firth of Forth, Neart na Gaoithe, Inch Cape
			Forth Islands	124.4	N	No
			Troup, Pennan and Lion's Heads	74.3	Y	Moray Firth, Beatrice
Puffin	200	105.4	Forth Islands	124.4	Y	Firth of Forth, Neart na Gaoithe, Inch Cape

6.0 HIGH LEVEL SCREENING ASSESSMENT

Whooper swan		Loch of Strathbeg
Population	SPA	203 individuals representing up to 3.7% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)
	Recent population	333 individuals
Data	Aerial surveys	None
	Boat based (WF)	10 birds sitting on the sea on 24 march 2011.
	VP Surveys (Abdn Bay)	No sightings
	Radar	Five at Drums 28 October 2005.
Impact	Collision risk	One sighting of five birds below 20 m. Whooper swans are known to fly at turbine height.
	Displacement	Only one flock of whooper swans were recorded on the sea surface. Whooper swans only occasionally settle on the sea.
	Barrier effect	Unknown
Evidence base	Site specific	Very few whooper swans recorded at proposed EOWDC
	Generic	Good data on flight height and direction from tagging studies (e.g. Griffen, Rees & Hughes 2010)
Evidence of potential impact	No	No evidence from existing wind farms of impacts but there is recognised to be potential risk of collisions.
Potential to assess	Yes	
Risk	Low	Very few recorded sightings at proposed location.
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**

Pink-footed goose		Ythan Estuary, Sands of Forvie and Meikle Loch	Montrose Basin	Loch of Strathbeg	Firth of Forth	Firth of Tay & Eden Estuary
Population	SPA	17,213 ind	31,622 ind	39,924 ind	12,400 ind	3,769
	Recent population	07/08 – 16,300	*c.*65,000 (2010)	08/09 - 53,454	3,220 (08/09)	2,704 (08/09)
Data	Aerial surveys	No data				
	Boat based (WF)	No definite sightings				
	VP Surveys (Abdn Bay)	5.8 (birds per hour Oct – Mar 2006). A total of 646 were recorded from all sites Oct – Mar 08.				
	Radar	858 at Drums. Four sightings of 102 birds between 11 & 26th April 2007; 90 in April 2010.				
Impact	Collision risk	Flight height – of the 858 recorded at Drums, all were flying between 44 m and 60 m in October 2008. 90 birds in April 2007 were below 30 m.				
	Displacement	No				
	Barrier effect	Geese fly over or around wind farms.				
Evidence base	Site specific	Little evidence of significant usage of the site. Radar data has not recorded significant geese movements in April or October. Between half and 100% were recorded flying above 25 m.				
	Generic	Flight height data from R1 & R2 wind farms. Collision Risk Modelling, PVA by SNH and DECC				
Evidence of potential impact	No	No evidence of any impact on Geese species from either onshore or offshore wind farms. Barrow Offshore Wind Farm recorded avoidance behaviour (Petterson 2005; Petersen *et al*. 2006; Jensen 2006; BOW 2007)				
Potential to assess	Yes					
Risk	Low	Site specific data is limited but indicated high proportion at turbine height. Published data from other constructed wind farms indicating a very high avoidance rate and no impacts recorded. Potential cumulative impact.				
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Ythan Estuary, Sands of Forvie and Meikle Loch, Montrose Basin, Loch of Strathbeg, Firth of Forth, Firth of Tay & Eden Estuary				

Greylag goose		Loch of Skene	Montrose Basin	Firth of Tay & Eden Estuary	Loch of Strathbeg
Population	SPA	10,840 (5 year peak mean 1991/2 - 1995/6)	1,080	1,200	3,325
	Recent population	790 (2010). 5 year peak mean of 2,555 (03 – 08)	2,519 (Jan 2011)	2,640 08/09	580 (2007)
Data	Aerial surveys	No data			
	Boat based (WF)	No sightings			
	VP Surveys (Abdn Bay)	Peak average of 0.5 birds per hour (Oct 06 – Mar 07)			
	Radar	None reported			
Impact	Collision risk	None at rotor height offshore but up to 33% at rotor height from other onshore studies.			
	Displacement	No			
	Barrier effect	Geese fly either around or over wind farms. Minor barrier effect.			
Evidence base	Site specific	Few records with none from radar or boat based surveys.			
	Generic	Evidence that geese, including greylag geese, avoid wind turbines (e.g. Petterson 2005; Petersen *et al*. 2006; Jensen 2006; BOW 2007).			
Evidence of potential impact	No	No offshore wind farms have been shown to impact on geese.			
Potential to assess	Yes				
Risk	Low	Very few recorded sightings of greylag goose during either onshore or offshore surveys.			
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**			

Barnacle goose		Loch of Strathbeg	Upper Solway Flats and Marshes
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000 - Recorded as for all species as 95,000 individuals	Article 4.1 – 12,300 individuals representing at least 100% of the wintering population in Great Britain of the Svalbard population.
	Recent population	121 (2008); 5 year peak mean 733 (03 – 08)	29,583 peak mean (2005 – 2010).
Data	Aerial surveys	No data	
	Boat based (WF)	No sightings	
	VP Surveys (Abdn Bay)	46 passed Balmedie (Oct 07 – Mar 08). 1,820 between April & September 2006	
	Radar	281 observed at Easter Hatton. Mean flock size of 56.	
Impact	Collision risk	All 281 observed barnacle geese were below 30 m in height.	
	Displacement	No	
	Barrier effect	Geese are known to fly around, over or between turbines.	
Evidence base	Site specific	Evidence of passage occurring. Some data on flight heights.	
	Generic	Data from Kalmar Sound and other offshore wind farms indicated high avoidance rates (e.g. Petterson 2005; Petersen *et al*. 2006; Jensen 2006; BOW 2007).	
Evidence of potential impact	No	Geese have a very high avoidance rate. Relatively low numbers recorded at proposed development location.	
Potential to assess	Yes		
Risk	Low	Published data from other constructed wind farms indicating a very high avoidance rate and no impacts recorded. Collision risk modelling indicates no adverse effect on barnacle geese based on the cumulative impacts with four developments in the Firth of Forth and 1,070 turbines. Potential cumulative impact.	
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Loch of Strathbeg, Upper Solway Flats and Marshes	

Shelduck		Montrose Basin	Firth of Forth	Firth of Tay & Eden estuary
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000	3,586	Article 4.2 - Waterfowl assemblage of at least 20,000
	Recent population	988 (08/09)	3,166 (08/09)	1,114
Data	Aerial surveys	No data		
	Boat based (WF)	No Records		
	VP Surveys (Abdn Bay)	1 – 2 May 2007, Jan and March 2008,		
	Radar	No records		
Impact	Collision risk	Very low. All records from boat based surveys were of birds flying below 10 m		
	Displacement	No		
	Barrier effect	No		
Evidence base	Site specific	Very few sightings		
	Generic	Wildfowl tend to fly around wind farms (Petterson 2005; Petersen *et al*. 2006).		
Evidence of potential impact	No	No evidence from existing wind farms of any impact on shelduck		
Potential to assess	Yes			
Risk	Low	Very low numbers recorded at proposed development area. No SPAs in the predicted foraging range of breeding shelduck.		
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**		

Teal		Loch of Strathbeg
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000
	Recent population	504 (2007)
Data	Aerial surveys	No data
	Boat based (WF)	Two individuals
	VP Surveys (Abdn Bay)	27 pass Blackdog (Oct 07 – Mar 08)
	Radar	No records
Impact	Collision risk	One of the two teal recorded was between 25 – 200 metres
	Displacement	No
	Barrier effect	No
Evidence base	Site specific	Very few sightings
	Generic	Wildfowl tend to fly around wind farms (e.g. Petterson 2005; Petersen *et al*. 2006).
Evidence of potential impact	No	No evidence from existing wind farms of any impact on teal.
Potential to assess	Yes	
Risk	Low	Very low numbers recorded at proposed development area. No evidence from other offshore wind farms of any impacts on teal.
Likely Significant Effect on SPA based on Conservation Objectives.		**No**

Wigeon		Montrose Basin	Firth of Forth
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000	2,139
	Recent population	3,944 (08/09)	-
Data	Aerial surveys	No data	
	Boat based (WF)	1 April 2008	
	VP Surveys (Abdn Bay)	13 in March 2008	
	Radar	No data	
Impact	Collision risk	38% of all reported flight heights from offshore wind farm surveys are at rotor height.	
	Displacement	No	
	Barrier effect	No	
Evidence base	Site specific	Very few sightings	
	Generic	Wildfowl tend to fly around wind farms (e.g. Petterson 2005; Petersen *et al*. 2006).	
Evidence of potential impact	No	No evidence from existing wind farms of any impact on wigeon.	
Potential to assess	Yes		
Risk	Low	Very low numbers recorded at proposed development area. No evidence from other offshore wind farms of any impacts on wigeon.	
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**	

Common eider		Ythan Estuary, Sands of Forvie and Meikle Loch	Montrose Basin	Firth of Forth	Firth of Tay and Eden
Population	SPA	Article 4.2.	Article 4.2.	9,400	Article 4.2
	Recent population	3,688	1,983 (July 2010)	5,188	4,378
Data	Aerial surveys	JNCC data for Winter surveys in 2003, Dec 2005, Jan 2006 & May 2006 & summer surveys in 2006 both showed that extensive near-shore usage in waters <20 m. Peak count of 283 in May 2006.			
	Boat based (WF)	A total of 14 eider were recorded in the wind farm area from Feb 2007 – Mar 2008. With a max of 5 in April 2007. In the control area a total of 68 were recorded with a maximum of 26 in October 2007. Maximum counts of between 400 – 500 birds in August and September			
	VP Surveys (Abdn Bay)	877 recorded during VP surveys Oct 2007 to Mar 2008. An average of 8.1 per hour			
	Radar	Peak count of 680 common eider recorded October 2005, 0 – 4,000 m from shore.			
Impact	Collision risk	October 2005 – maximum flight height of 10 m from 680 sightings. All 835 in April 2007 were below 30 m. 98% of VP sightings were below 30 m.			
	Displacement	May be temporary displacement during construction but wind farm predominantly in waters > 20 m. Tuno Knob identified initial displacement followed by birds entering the wind farm.			
	Barrier effect	Evidence from Denmark and Sweden clearly indicate that common eider fly over or around wind turbines (e.g. Petterson 2005; Petersen *et al*. 2006).			
Evidence base	Site specific	The majority of common eiders are within 500 m of the shore (>500 out 835 April 2007).			
	Generic	Flight height data from Denmark and Sweden shows common eiders fly predominantly below turbine height with very low collision risk. Evidence of barrier effect as common eider fly around turbines.			
Evidence of potential impact	Yes	Possible evidence of short-term displacement. No evidence of collision risk. Potential barrier effect.			
Potential to assess	Yes				
Risk	Low	Relatively few common eider recorded within proposed wind farm area and evidence of very low collision risk. Possible displacement may occur.			
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Ythan Estuary, Sands of Forvie and Meikle Loch SPA, Montrose Basin SPA, Firth of Forth SPA (SNH 2011).			

Red-throated diver		Caithness & Sutherland Peatlands	Hoy	Orkney Mainland Moors	Foula
Population	SPA	Article 4.1 – 89 pairs representing at least 9.5%of the breeding GB population.	Article 4.1 - 58 territories. 6% of GB population	Article 4.1 - 18 pairs. 2% of GB population	Article 4.1 - 11 prs. 1.2% of GB population
	Recent population	89 prs (1993/94)	58 territories (2000)	18 prs (2000)	11 prs (1994)
		Hermaness, Saxa Vord and Valla Field	**Otterswick & Graveland**	**Ronas Hill – North Roe & Tingon**	-
	SPA	Article 4.1 - 26 pairs 3% of GB population	Article 4.1 - 26 pairs 3% of GB population	Article 4.2 - 50 Pairs (5.3% of GB population	-
	Recent population	26 Prs (1994 -1999)	26 Prs (1994 -1999)	50 prs (1994)	-
Data	Aerial surveys	Three aerial surveys recorded a maximum of 39 red-throated diver in May 2006			
	Boat based (WF)	Peak densities of 1.26 per km^2 were recorded in November 2010.			
	VP Surveys (Aberdeen Bay)	Recorded throughout the year with peak numbers recorded during April with a mean of up to 40 birds per hour passing in April 2007			
	Radar	Not reported.			
Impact	Collision risk	4.7% of the 194 recorded flight heights were above 25 m.			
	Displacement	Good evidence of potential displacement effects from existing offshore wind farms.			
	Barrier effect	Regularly recorded during all radar surveys.			
Evidence base	Site specific	Two years of boat data, flight height data available. Supported with data from VP.			
	Generic	Data and monitoring results from other offshore wind farms indicating high risk of displacement.			
Evidence of potential impact	Yes	Good data from Danish and other wind farms.			
Potential to assess	Yes				
Risk	Low	Low risk of collision due to low flight heights and relatively low numbers in the wind farm area. Potential for high degree of displacement but likely low risk of effect. Relevant SPAs a considerable distance away and low proportion of birds predicted to be displaced			
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes**: Caithness & Sutherland Peatlands, Hoy, Orkney Mainland Moors, Foula			

Fulmar		Buchan Ness to Collieston Coast	Fowlsheugh	Forth Islands	Troup Pennan and Lion Head
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000	Article 4.2 - Waterfowl assemblage of at least 20,000.	Article 4.2 - Waterfowl assemblage of at least 20,000.	Article 4.2 - Waterfowl assemblage of at least 20,000.
	Recent population	1,370	193 (2009)	Isle of May – 358 (2009 Bass Rock – 44 (2009)	636 (2007)
		East Caithness Cliffs	**North Caithness Cliffs**	**Copinsay**	**Fair Isle**
	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000.	Article 4.2 - Waterfowl assemblage of at least 20,000.	Article 4.2 - Waterfowl assemblage of at least 20,000.	Article 4.2 - Waterfowl assemblage of at least 20,000.
	Recent population	16,164 (1999)	4,551 (1999)	1,366 (2008)	27,896 (2006)
		Sumburgh Head	**Noss**	**Fetlar**	**Foula**
	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000.	Article 4.2 - Waterfowl assemblage of at least 20,000.	Article 4.2 - Waterfowl assemblage of at least 20,000.	Article 4.2 - Waterfowl assemblage of at least 20,000.
	Recent population	1,487 (1999)	6,144 (2006)	9,203 (1999- 2001)	21,106 (2000)
Data	Aerial surveys	No data			
	Boat based (WF)	Peak count of 92 (Feb 2011). Peak density of c. 1 fulmar/km^2.			
	VP Surveys (Aberdeen Bay)	Up to 75 birds per hour during peak spring periods. Decreased to < 3 birds per hour during winter period.			
	Radar	Up to three birds per hour reported in April 2007.			
Impact	Collision risk	0.6% of flights were above 25 m.			
	Displacement	No evidence of displacement.			
	Barrier effect	No evidence of barrier effect			
Evidence base	Site specific	Two years of boat data, flight height data available. Supported with data from VP and radar studies			
	Generic	Few sightings from SNS wind farms showing no evidence of an effect.			
Evidence of potential impact	No	Relatively few records of fulmar at constructed offshore wind farms.			
Potential to assess	Yes				
Risk	Low	Low risk of collision due to low flight heights and relatively low numbers in the wind farm area. Should it occur low level of displacement and barrier effects predicted.			
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**			

Gannet		Forth Islands	Fair Isle	Noss
Population	SPA	34,400 pairs representing at least 13.1% of the breeding North Atlantic population (Count, as at 1994	1,166 nests	Article 4.2. 6,800 pairs, 3% of Western European population
	Recent population	55,482 prs (2010)	3,582 (2009) nests	8,652 (2003)
Data	Aerial surveys	No data		
	Boat based (WF)	Peak densities of up to 3.1 birds/km^2 during July 2007 and 0.96 birds/km2 during July 2011.		
	VP Surveys (Abdn Bay)	Peak of 120 birds per hour (July 2007).		
	Radar	110 recorded by radar in spring 2005. Peak numbers 3.0 km and 5 km from shore. 633 gannets were recorded in autumn 2007, most between 1.5 and 3.0 km from shore.		
Impact	Collision risk	8.5% of recorded flights were above 25 m.		
	Displacement	Possible displacement effects if birds avoid entering the wind farm.		
	Barrier effect	Birds may fly around the wind farm.		
Evidence base	Site specific	Two years of boat data, flight height data available. Supported with data from VP and radar studies		
	Generic	Evidence of displacement from Horns Rev Offshore Wind Farm and Egmond aan Zee		
Evidence of potential impact	Yes	Possible collision risk and displacement and barrier effects.		
Potential to assess	Yes	Based on flight height data and distribution.		
Risk	Medium	Frequently recorded and at rotor height.		
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Forth Islands SPA, Fair Isle SPA, Noss SPA (SNH 2011)		

Cormorant		Forth Islands
Population	SPA	200 prs - Article 4.2 - Waterfowl assemblage of at least 20,000
	Recent population	198 pairs
Data	Aerial surveys	No data
	Boat based (WF)	Peak of 17 in the wind farm area during October 2007; 20 in the control area during September 2007. Peak of 0.3 birds per km surveyed in October 2010.
	VP Surveys (Abdn Bay)	Peak average of 4.2 birds per hour (Apr 06 – Sept 06)
	Radar	96 recorded during October 2005
Impact	Collision risk	98% of all sightings from boat-based surveys were below 25 m. 89% of all flights at Nysted Offshore Wind Farm were below turbine height.
	Displacement	None reported
	Barrier effect	None reported
Evidence base	Site specific	Boat based data demonstrating birds are in water depths of <20 m.
	Generic	Evidence indicates very low collision risk and no displacement (Zucco *et al*. 2006).
Evidence of potential impact	No	None reported from offshore wind farms.
Potential to assess	Yes	
Risk	Low	Birds outwith wind farm area and low collision risk.
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**

European shag		Buchan Ness to Collieston Coast	Forth Islands
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000	2,887 pairs
	Recent population	331 (2007)	Isle of May – 465 (2009) Bass Rock – 15 (2009)
Data	Aerial surveys	No	
	Boat based (WF)	Peak encounter rate of up to 0.1 shag per km surveyed during July but peak densities estimated during spring and autumn with up to 5 birds per km^2 in March 2011.	
	VP Surveys (Abdn Bay)	Peak of 3 birds per hour during April 2007 and an average peak of 0.9 birds per hour (Oct 06 – Mar 07).	
	Radar	14 records of 10 observations (spring 2007).	
Impact	Collision risk	Low, 98% of all sighting at below 25 m.	
	Displacement	Birds have been recorded near or in wind farms.	
	Barrier effect	Possible, due to regular flight movements. Not known if there is a barrier effect.	
Evidence base	Site specific	Relatively few sightings, predominantly near shore.	
	Generic	Uncommon at offshore wind farms. Little evidence available.	
Evidence of potential impact	No	Possible displacement or barrier.	
Potential to assess	Yes		
Risk	Low	Very low risk of collision and very low numbers recorded in EOWDC development area low risk of displacement or barrier effects.	
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**	

Oystercatcher		Montrose Basin
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000
	Recent population	1,766 (Feb 2010)
Data	Aerial surveys	No data
	Boat based (WF)	None recorded
	VP Surveys (Abdn Bay)	Up to 190 birds recorded during summer 2007. Peak movements along the coast of 3.1 birds/hr at the Don Mouth during the winter of 2006 & 2007.
	Radar	None
Impact	Collision risk	Few data available on flight heights. No evidence of concentrations or commuting routes across wind farm.
	Displacement	No
	Barrier effect	Waders have been recorded flying around wind farms.
Evidence base	Site specific	Little evidence of any usage of the site.
	Generic	Few nearshore wind farms have recorded oystercatcher behaviour and flight heights.
Evidence of potential impact	No	
Potential to assess	Yes	
Risk	Low	No evidence of any usage of the site or evidence of any regular passage.
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**

Lapwing		Ythan Estuary, Sands of Forvie and Meikle Loch
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000 - Recorded as a total of all species as 51,265
	Recent population	Peak numbers in Ythan in August with maximum of 6,269 in August 2006.
Data	Aerial surveys	No data
	Boat based (WF)	None recorded
	VP Surveys (Abdn Bay)	None recorded offshore.
	Radar	680 lapwing recorded October 2005. 835 birds in April 2007, 0 – 4.0 km from shore
Impact	Collision risk	Possible risk of collision. No evidence of any significant usage of the site.
	Displacement	No
	Barrier effect	May have barrier effect.
Evidence base	Site specific	Little evidence of any impacts to lapwing from offshore wind farms.
	Generic	Flight height data from Denmark and Sweden. Evidence of barrier effect.
Evidence of potential impact	No	Possible evidence of short-term displacement. No evidence of collision risk. Potential barrier effect. Few records from other offshore wind farms show majority fly below turbine height.
Potential to assess	Yes	
Risk	Low	Due to low numbers present offshore and those recorded from onshore being at Drums to the north of the proposed development and therefore at no risk of collision to and from the Ythan Estuary SPA.
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**

Redshank		Ythan Estuary, Sands of Forvie and Meikle Loch	Montrose Basin	Firth of Forth	Firth of Tay & Eden Estuary
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000 - Recorded as for all species as 51,265 individuals	Article 4.2 - Waterfowl assemblage of at least 20,000 ind.	Waterfowl assemblage	Waterfowl assemblage
	Recent population	1,497 in 2008; 5 year peak mean of 2,216 between 03 - 08	1,951 (Nov 2010)	5,111	1,162
Data	Aerial surveys	No data			
	Boat based (WF)	None recorded			
	VP Surveys (Abdn Bay)	A total of 11 birds at the Donmouth (Oct 2007 – Mar 2008). Peak of 7 in Nov 2007.			
	Radar	None			
Impact	Collision risk	Few data available on flight heights. No evidence of concentrations or commuting routes across wind farm.			
	Displacement	No			
	Barrier effect	Waders have been recorded flying around wind farms.			
Evidence base	Site specific	Little evidence of any usage of the site.			
	Generic	Few nearshore wind farms have recorded redshank behaviour and flight heights.			
Evidence of potential impact	No				
Potential to assess	Yes				
Risk	Low	No evidence of any usage of the site or evidence of any regular passage. Very small numbers recorded.			
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**			

Lesser black-backed gull		Forth Islands
Population	SPA	2,920 pairs representing at least 2.4% of the breeding Western Europe/Mediterranean/Western Africa population (Count, as at 1994)
	Recent population	2,779 apparently occupied nests
Data	Aerial surveys	No
	Boat based (WF)	Low numbers recorded with a peak encounter rate on less than 0.08 birds per km surveyed during September 2010.
	VP Surveys (Abdn Bay)	Peak average of 2 birds per hour (Apr 06 – Sept 06).
	Radar	None reported.
Impact	Collision risk	Birds regularly fly at turbine height. Extensive data from other offshore wind farms.
	Displacement	No
	Barrier effect	No
Evidence base	Site specific	Relatively low number of sightings.
	Generic	Data from other offshore wind farms have shown overall 27% of flights at rotor height and little or no displacement or barrier effects.
Evidence of potential impact	Yes	Collision risk.
Potential to assess	Yes	
Risk	Low	Low numbers of gulls recorded in the area and significant distance (124 km) from SPA.
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**

Herring gull		Buchan Ness to Collieston Coast	Fowlsheugh	Forth Islands
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000	Article 4.2 - Waterfowl assemblage of at least 20,000	Article 4.2 - Waterfowl assemblage of at least 20,000
	Recent population	3,079 AoN (2007)	122 AoN (2008)	Isle of May 2,962 (2008) Bass Rock 169 (2004)
Data	Aerial surveys	No data		
	Boat based (WF)	Up to 456 July 2007, 417 June 2007 and 320 in July 2011 within wind farm survey area. Considerably fewer during other months. Peak densities of 3.86 birds/km^2 in April and 3.87 birds/km^2 in July 2011.		
	VP Surveys (Abdn Bay)	7,737 herring gulls recorded between Oct 07 and Mar 08 with a peak average of 54 birds per hour.		
	Radar	Gull species only recorded. >10,000 recordings but no distance or height measurements		
Impact	Collision risk	32% of recorded flights at greater than 25 m.		
	Displacement	No evidence for displacement may be an attraction.		
	Barrier effect	No evidence of a barrier effect.		
Evidence base	Site specific	Two years of boat data, flight height data available. Supported with data from VP and radar studies		
	Generic	Herring gulls frequently fly at rotor height but have relatively high avoidance rates.		
Evidence of potential impact	Yes	Collision risk.		
Potential to assess	Yes	A common species at many offshore wind farms. Good flight height data.		
Risk	Medium	Frequently recorded within wind farm area at rotor height.		
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Buchan Ness to Collieston Coast, Fowsheugh, Forth Islands		

Kittiwake		Buchan Ness to Collieston Coast	East Caithness Cliffs	Fowlsheugh	Forth Islands	Troup Pennan & Lion's Heads
Population	SPA	Article 4.2 - Waterfowl assemblage	Article 4.2 - Waterfowl assemblage	Article 4.2 - Waterfowl assemblage	Article 4.2 - Waterfowl assemblage	Article 4.2 - Waterfowl assemblage
	Recent population	12,542 AoN [1] (2007)	40,410 AoN (1999)	11,140 nests in 2006	3,354 on Isle of May in 2008	14,896 AoN
Data	Aerial surveys	No data				
	Boat based (WF)	Maximum of 1,116 in July 2007 in WF and 859 in control area (July 2007). Peak density of c.13 birds/km2 in July 2007 and July 2011.				
	VP Surveys (Abdn Bay)	Average of up 70 birds per hour Summer 2006. 1 per hour from October to March 2007.				
	Radar	None reported				
Impact	Collision risk	18.5% above 25 m.				
	Displacement	No – studies indicate little or no displacement effects on gulls.				
	Barrier effect	No - Gulls tend not to avoid flying through wind farms.				
Evidence base	Site specific	Extensive usage of Aberdeen Bay but relatively low usage of the site. Flight heights recorded.				
	Generic	Some evidence available from other sites.				
Evidence of impact	Yes	Possible collision risk.				
Potential to assess	Yes	Collision risk				
Risk	Low	Site regularly used. Potential risk of collision. Possible displacement.				
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Buchan Ness to Collieston Coast SPA, Fowlsheugh SPA. Other sites identified as having low level of connectivity (SNH 2011).				

Little tern		Ythan Estuary, Sands of Forvie and Meikle Loch
Population	SPA	41 pairs
	Recent population	21 (2008) 36 (2009)
Data	Aerial surveys	None
	Boat based (WF)	0
	VP Surveys (Abdn Bay)	0.1 (birds per hour)
Impact source	Collision risk	Flight height, 3 to 8 m at Scroby Sands Offshore Wind Farm.
	Displacement	There is no evidence of displacement of little terns.
Evidence base	Site specific	No little terns recorded within wind farm location.
	Generic	Scroby Sands Offshore Wind Farm monitoring report (ECON 2006; ECON 2008).
Evidence of potential impact	Yes	Possible collision risk but none reported from Scroby Sands Offshore Wind Farm (e.g. ECON 2006).
Potential to assess	Yes	
Risk	Low	None recorded within wind farm location. Evidence from other sites show low flight height and low likelihood of foraging offshore. Although possible evidence of prey displacement (ECON 2006; ECON 2008).
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes**

Sandwich tern		Ythan Estuary, Sands of Forvie and Meikle Loch	Loch of Strathbeg	Forth Islands
Population	SPA	600 pairs	530 pairs	22 pairs
	Recent population	0 (1993 & 1994) peak of 1,802 pairs in 1987; mean 517pairs over 20 years. 645 AoN 2009	0 – No breeding since 2000. 1 pr in 2010	0 in 2007
Data	Aerial surveys	No data		
	Boat based (WF)	43 birds between May & July 2007 and 22 in Year 2. Peak encounter rate of 0.6 birds per km surveyed in May.		
	VP Surveys (Abdn Bay)	Up to 300 birds per hour in August 2007.		
Impact	Collision risk	5.7% of all flights from boat-based surveys were at rotor height.		
	Displacement	Little evidence that Sandwich terns avoid flying through wind farms (e.g. Evaraert & Stienen 2006).		
Evidence base	Site specific	Boat based data indicates low usage of the site compared to elsewhere. 5.7% of flights at rotor height from boat based surveys. Nearly all sightings in waters of *c* 10 m and less than 20 m.		
	Generic	Generic flight height data modelled, indicates 7% of flights at rotor height.		
Evidence of potential impact	Yes	Although site specific data indicates predominantly low flight heights below probable turbine height, data from other wind farms identify potential collision risk.		
Potential to assess	Yes			
Risk	Medium	Based on site specific boat based data the risk is low but data from elsewhere identify probable collision risk.		
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Ythan Estuary, Sands of Forvie & Meikle Loch SPA, Loch of Strathbeg SPA (SNH 2011).		

Common tern		Ythan Estuary, Sands of Forvie and Meikle Loch	Forth Islands
Population	SPA population	265 prs	800 prs
	Recent data	6 (2004), 0 (2005), 6 (2006),	378 AoN
Data	Aerial surveys	None	
	Boat based (WF)	55 peak monthly count (July 2007) but none within EOWDC during Year 1 surveys. Three within EOWDC in Year s	
	VP Surveys (Abdn Bay)	16.7 (birds per hr)	
	Radar surveys	14 common terns at Blackdog in April 2007.	
Impact source	Collision risk	97% of all flights were recorded as being below 25 m.	
	Displacement	Common terns are not known to be displaced	
Evidence base	Site specific	All sightings within the wind farm footprint are in waters of <20 m. To the north they occur further offshore. Majority of flight heights below turbine height.	
	Generic	Generic modelled flight heights available and evidence of avoidance rates from existing wind farms.	
Evidence of potential impact	Yes	Collision risk data from Zeebrugge indicates potential collision risk (e.g. Evaraert & Stienen 2006).	
Potential to assess	Yes		
Risk	Medium	Relatively high numbers recorded in wider wind farm area. Majority fly below turbine heights.	
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Ythan Estuary, Sands of Forvie and Meikle Loch SPA. (SNH 2011).	

Arctic tern		Forth Islands
Population	SPA population	540 prs
	Recent data	908 prs
Data	Aerial surveys	None
	Boat based (WF)	Low numbers recorded with a peak encounter rate in July of 0.26 birds/km surveyed.
	VP Surveys (Abdn Bay)	Peak of 150 birds per hour at Drums July 2008, In 2007 a peak of 10 birds per hour
	Radar surveys	None recorded
Impact source	Collision risk	None recorded flying at >25 m.
	Displacement	Arctic terns are not known to be displaced.
Evidence base	Site specific	Few sightings within proposed development area. The majority of sightings to the north.
	Generic	Generic modelled flight heights indicate 4% at collision risk.
Evidence of potential impact	Yes	Data from Zeebrugge indicates potential collision risk for Terns (e.g. Evaraert & Stienen 2006).
Potential to assess	Yes	
Risk	Low	Low numbers recorded and relevant SPA 124 km away
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**

Guillemot		Buchan Ness to Collieston Coast	Fowlsheugh	Troup, Pennan and Lion's Heads	Forth Islands
Population	SPA	Article 4.2	Article 4.2	Article 4.2	Article 4.
	Recent population	19,296 ind. in 2007	50,566 ind. in 2009	16,325 ind. in 2007	2,550 ind. in 2009
Data	Aerial surveys	No			
	Boat based (WF)	Widespread and recorded throughout the year. Peak densities in July in both years when up to 51 birds/km^2 were recorded. Lower densities during the winter period.			
	VP Surveys (Abdn Bay)	Up to 250 birds per hour in March 2007; Average of 59 birds per hour (Apr 2006 – Sept 2006). Ave of 24 per hour (Oct 2006 – Mar 2007).			
	Radar	259 sightings in 2005. Peak numbers 4 km & 4.5 km in spring and 2.0 & 2.5 km in autumn.			
Impact	Collision risk	Very low. 99.4% of all recorded flights were below 25 m.			
	Displacement	Possible. No significant effect reported from North Hoyle Offshore Wind Farm or Kentish Flats (Gill *et al*. 2008). Reported increase in avoidance at Horns Rev Offshore Wind Farm.			
	Barrier effect	Some evidence that guillemots detour around offshore wind farms			
Evidence base	Site specific	Extensive usage of the site. No specific concentrations recorded in the proposed development area.			
	Generic	Evidence from Horns Rev and North Hoyle Offshore Wind Farm.			
Evidence of potential impact	Yes	Low risk of collision. Possible displacement.			
Potential to assess	Yes				
Risk	Low	Extensive usage of the site, possible evidence of displacement. Low risk of collision.			
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Buchan Ness to Collieston Coast SPA, Fowlsheugh SPA (SNH 2012).			

Razorbill		Buchan Ness to Collieston Coast	Fowlsheugh	Troup, Pennan & Lion's Heads	Forth Islands
Population	SPA	Article 4.2 - Waterfowl assemblage of at least 20,000	Article 4.2 - Waterfowl assemblage of at least 20,000	Article 4.2 - Waterfowl assemblage of at least 20,000	Article 4.2 - Waterfowl assemblage of at least 20,000
	Recent population	4,179 individuals in 2007	4,632 individuals in 2009	3,216 Ind	3,464 individuals in 2008
Data	Aerial surveys	No			
	Boat based (WF)	Widespread and regularly recorded species with peak counts and densities during summer months when between 4 to 5 birds/km^2 were recorded.			
	VP Surveys (Abdn Bay)	Peak average of 1.5 birds per hour (Oct 06 – Mar 07); Peak of seven birds per hour in March 2006			
	Radar	Yes but data combined with guillemot.			
Impact	Collision risk	Very low. 99.9% of all recorded flights were below 25 m.			
	Displacement	Possible			
	Barrier effect	Possible depending on flight line.			
Evidence base	Site specific	Two years of boat data, flight height data available. Supported with data from VP and radar studies			
	Generic	Limited data from other offshore wind farms.			
Evidence of potential impact	Yes	No evidence of collision risk but possible displacement effect.			
Potential to assess	Yes				
Risk	Low	Relatively small numbers of birds widely distributed.			
Likely Significant Effect on any SPA based on Conservation Objectives.		**Yes:** Buchan Ness to Collieston Coast, Fowlsheugh, Troup, Pennan and Lion's Heads, Forth Islands			

Puffin		Forth Islands
Population	SPA	21,000 pairs representing at least 2.3% of the breeding population (Count, as at 1992).
Data	Recent population	56,867 apparently occupied nests in 2009.
	Aerial surveys	None
Data	Boat based (WF)	Peak numbers during July and August with densities of between 3.5 and 7 birds/km^2.
	VP Surveys (Abdn Bay)	Peak average of 0.3 birds per hour (Apr 06 – Sept 06).
	Radar	One recorded in October 2005.
Impact	Collision risk	Very low. All flights below turbine height
	Displacement	Possible – most sightings were in water depths of greater than 20 m. Up 8 puffins may be displaced.
	Barrier effect	Possible but little evidence for puffin
Evidence base	Site specific	Two years of boat data, flight height data available. Supported with data from VP and radar studies
	Generic	None
Evidence of potential impact	No	Puffins have not been a species regularly recorded at offshore wind farms.
Potential to assess	Yes	
Risk	Low	Nearest SPA 124 km away. Relatively low numbers recorded and potential small area of displacement.
Likely Significant Effect on any SPA based on Conservation Objectives.		**No**

7.0 SPECIES ASSESSMENTS

7.1 Pink-footed goose

See Section 4.2 of *Ornithological Baseline and Impact Assessment Addendum*

Pink-footed goose is a qualifying species for the

- Ythan Estuary, Sands of Forvie & Meikle Loch SPA,
- Loch of Strathbeg SPA,
- Montrose Basin SPA.
- Firth of Forth SPA,
- Firth of Tay & Eden Estuary SPA.

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

7.1.1 Evidence of site usage

There have been no definite sightings of pink-footed geese within the proposed development area from boat based surveys, although a flock of 180 geese sp. were recorded in November 2007. Vantage Point (VP) surveys have recorded a total of 646 pink-footed geese and from radar studies a total of 858 individuals. Over half the geese were reported to be flying at rotor height.

The coastal waters of Aberdeen Bay are regularly used by pink-footed geese but in relatively lower numbers compared to onshore sites.

7.1.2 Evidence of collision risk

Results from collision risk modelling indicate that up to four pink-footed geese per year may collide with the proposed EOWDC based on an avoidance rate of 99%.

The results from the collision risk modelling indicate that should all the predicted number of collisions be from a single SPA population then for the Ythan estuary, Meikle Loch and sands of Forvie SPA and for Loch of Strathbeg SPA the predicted number of collisions are below 1% of the baseline mortality rate. For SPAs further away, Montrose Basin SPA, Firth of Forth and the Firth Tay & Eden Estuary SPAs the predicted number of collisions are similar to the 1% baseline mortality rates.

The very low numbers predicted to collide indicate that there will not be an effect on the integrity of any of the SPAs for which pink-footed goose is a qualifying species.

No adverse effect

7.1.3 Evidence of displacement

No pink-footed geese have been recorded using the site and post construction monitoring at existing offshore wind farms have not reported any displacement effects on pink-footed geese.

No adverse effect

7.1.4 Evidence of barrier effect

Should a barrier effect occur then pink-footed geese will fly around the proposed development. By doing so, this could cause an overall increase in flying distance of up to approximately 3.2 km. For a bird migrating from Iceland to North-east Scotland, a distance of over 1,000 km then this will cause an increase of approximately 0.3% in flight distance. This small increase in potential flight distance will not cause an effect that will affect the integrity of any of the SPAs.

No adverse effect

7.1.5 Evidence of in-combination impact

Collision risk modelling undertaken for the proposed Beatrice Offshore Wind Farm, located in the Moray Firth, indicates that up to 36 pink-footed geese per year may collide with the wind farm (BOWL 2012).

Cumulative collision risk totals from all consented offshore wind farms indicate between 185 and 203 pink-footed geese may collide based on a 99% avoidance rate.

The cumulative impacts arising from the proposed EOWDC and the currently operational wind turbines in Aberdeenshire indicate that 150 pink-footed geese per year may collide with onshore wind turbines.

The proposed EOWDC may result in an additional four pink-footed gees collisions per year.

Population Viability Analysis (PVA) undertaken on pink-footed geese indicates that the pink-footed goose population may be able to withstand an increase in mortality (from whichever source) of 5,000 birds per year (Trinder *et al.* 2005). Further PVA commissioned by DECC to model the possible effects of additional mortality on the pink-footed goose population over a 25 year period indicated that over a 25 year period there was a 2% chance of the pink-footed goose population decreasing to below 150,000 if, due to collisions, wind farms increase the annual mortality by more than 1,000 birds over and above current impacts, e.g. hunting. (Trinder, 2008). The predicted level of mortality from all offshore wind farms based on precautionary collision risk modelling indicates that the level of mortality is below the threshold above which cumulative mortality rates could have an adverse effect.

No adverse effect

7.1.6 Conclusion

Five SPAs have been recognised as being potentially affected by the proposed development:

- Ythan Estuary, Sands of Forvie & Meikle Loch SPA,
- Loch of Strathbeg SPA,
- Montrose Basin SPA.
- Firth of Forth SPA,
- Firth of Tay & Eden Estuary SPA.

Based on all the Conservation Objectives of the SPAs and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPAs with regard to pink-footed goose.

7.2 Barnacle goose

See Section 4.4 of *Ornithological Baseline and Impact Assessment Addendum*

Barnacle goose is a qualifying species for the

- Solway Firth SPA,
- Loch of Strathbeg SPA.

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

7.2.1 Evidence of site usage

Barnacle geese were the most frequently recorded goose in Aberdeen Bay where large numbers were recorded passing through the bay during September 2006 and on one date in October 2007. Relatively few barnacle geese were recorded outwith these peak periods. No geese were reported as having landed in the bay. Land based observations recorded the majority of birds within 2 km from shore but there were sightings out to at least 3 km. Of those birds recorded in flight from boat-based surveys, 6 were flying above 25 m but below 200 m. Land-based observations recorded all barnacle geese as flying below 35 m.

7.2.2 Evidence of collision risk

Collision risk modelling predicted that a total of 7 collisions per year may occur with the proposed development. The annual mortality rate for barnacle goose is 9% (BTO 2011). Consequently, out of a population of 32,000 an annual mortality of 2,880 barnacle geese may be predicted. The potential incremental increase of seven birds per year will not impact on the barnacle goose population as a whole.

Based on the results from the precautionary collision risk modelling undertaken, the number of barnacle geese that may collide is lower than that that may cause concern or a potentially affect the integrity of the barnacle goose population as a whole or for each of the SPAs

No adverse effect

7.2.3 Evidence of displacement

Barnacle geese do not use the proposed development area. Post construction monitoring at existing offshore wind farms have not reported any displacement effects on barnacle geese.

No adverse effect

7.2.4 Evidence of barrier effect

Although barnacle geese may fly through wind farms they have also been recorded avoiding wind farms, consequently there may be a barrier effect (Pettersson 2005).

Should a barrier effect occur then barnacle geese would fly around the proposed development. By doing so this could cause an overall increase in flying distance of up to approximately 3.2 km. For a bird migrating from Svalbard to North-east Scotland, a distance of approximately 2,500 km, then this will cause an increase of 0.1% in flight distance. This is

considered to be a negligible impact and will not cause any effect that will impact on the integrity of the SPA populations.

No adverse effect

7.2.5 Evidence of in-combination impact

Barnacle geese migrating from Svalbard to the Solway Firth do so by travelling down the west coast of Norway before crossing to north-east and eastern Scotland and flying south-west to the Solway where they winter. Their return flights are more direct and to the south of the proposed development area (Griffin, Rees and Hughes 2011). Consequently, there are little cumulative or in-combination impacts from existing offshore wind farms. There is the potential for cumulative impacts arising with planned developments in the Firth of Forth and Moray Firth areas. Cumulative collision risk modelling undertaken by SNH indicates up to 37 barnacle geese per year are at risk of collision with the proposed Firth of Forth developments and less than one per year is predicted to collide with the Beatrice offshore wind farm (BOWL 2012). The relatively low numbers predicted to be impacted indicate that there will not be an impact on the integrity of the SPA populations.

No adverse effect

7.2.6 Conclusion

Two SPAs have been identified as being potentially affected by the proposed development:

- Loch of Strathbeg SPA,
- Solway Firth SPA.

Based on all the Conservation Objectives of the SPAs and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPAs with regard to barnacle geese.

7.3 Red-throated diver

See Section 4.15 of *Ornithological Baseline and Impact Assessment Addendum*

Red-throated diver is a qualifying species for the following SPAs that have the potential for a likely significant affect (SNH 2011).

- Caithness & Sutherland Peatlands SPA,
- Hoy SPA,
- Orkney Mainland Moors SPA,
- Foula SPA,
- Hermaness, Saxa Vord and Valla Field SPA,
- Otterswick & Graveland SPA,
- Ronas Hill – North Roe & Tingon SPA

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

7.3.1 Evidence of site usage

Red-throated diver occur throughout the year in Aberdeen Bay with peak numbers occurring during the winter and spring periods. Peak density of 0.9 birds/km^2 occurred in February 2007 and 1.26 birds/km^2 in November 2010. Data obtained from boat-based surveys supports the findings from the vantage point and radar studies that most red-throated diver occur within 2 km of the shore and in water depths of less than ten metres. Estimated numbers of red-throated diver recorded in Aberdeen Bay were below the threshold for a site of international importance but the bay may, on occasions, hold nationally important numbers. Data from elsewhere, e.g. North-east Scotland Bird Reports indicate peak numbers of red-throated diver occur during the late winter and spring periods (NESBR).

7.3.2 Evidence of collision risk

Studies undertaken at constructed offshore wind farms indicate that red-throated divers are at low risk of collision. Studies undertaken at Horns Rev and Nysted offshore wind farms in Denmark indicate that red-throated divers avoid wind farms. Of the 61 Divers tracked using radar none were recorded flying into the wind farm. Instead they were recorded as being deflected westward and flying around the wind farm (Petersen *et al*. 2006). Red-throated divers are therefore unlikely to come into direct contact with them (Petersen *et al*. 2006) and consequently the avoidance rate is likely to be higher than the precautionary 98% used. Based on the results from existing wind farms it is predicted that the avoidance rate will be higher than 99% and therefore virtually no collisions are predicted.

No adverse effect

7.3.3 Evidence of a displacement

Red-throated divers were considered to be at high risk of displacement in the review undertaken by Langston on the potential impacts of wind farms (Langston 2010). Displacement assessment undertaken predicts between 0 and 5 red-throated diver may be impacted from proposed development area alone and between 0 and 41 individuals if displacement occurs out to 2 km.

Based on densities of red-throated diver derived from *ad hoc* land based observations and published in the North-east Scotland Bird Report it is estimated that between 0 and 11 red-throated diver may be impacted from proposed development area and between 0 and 90 individuals, if displacement occurs out to 2 km.

Red-throated divers feed on small fish such as herring and sprat. Monitoring studies on the effects on fish from offshore wind farms indicate that there is little effect on fish from offshore wind farms (e.g. Lindeboom *et al*. 2011) and consequently, should red-throated divers be displaced it is predicted that prey will be available outwith the proposed EOWDC area during the period of construction and that fish will return following cessation of any piling activities.

If it is assumed that all red-throated divers breeding in SPAs winter in Scottish waters (which ringing data indicates is not the case), then out of a total Scottish wintering population of 2,270 individuals, 25% are from the SPAs in Orkney, Shetland and Caithness. Consequently, if a total of 90 red-throated divers are displaced from the proposed development area, 25% may be from the relevant SPAs, i.e. 22 birds out of a breeding population of 568 individuals. The displacement of 22 red-throated divers on passage is predicted not to impact on the integrity of any SPAs.

Red-throated divers are predicted to be disturbed by vessels both during construction and during operation from maintenance vessels. The assessment on potential disturbance effects indicates that displacement by vessels may impact up to three red-throated divers at any one time based on the highest recorded density of 1.26 birds/km^2 or a total of 7 birds based on densities derived from North-east Scotland Bird Reports.

The construction period will be of short duration and the impacts of construction vessels temporary. Consequently, any potential impact is predicted to also be of short duration and localised and therefore negligible.

Displacement by service boats within the EOWDC area assumes that red-throated divers are not already deterred from the area by the turbines. If red-throated divers are not displaced by the presence of the turbines then the presence of service boats may reduce the re-population of the site. It is not known exactly how many service vessels may be required but based on the scale of the proposed development it is predicted to be no more than four vessels on any one occasion. The presence of the proposed development in the vicinity of the intensively used Aberdeen Harbour means that the potential increase in vessel movement on a regular basis associated with the proposed EOWDC will not have any noticeable difference to the overall number of vessels already using Aberdeen Bay that are approximately 7,700 per year (AHB 2011). Any specific displacement caused by the service vessels will be temporary as Divers will be able to move into the area once the vessel has passed or leaves the area. In addition, the wide distribution of Divers within the bay is such that there are alternative suitable sites that displaced Divers could utilise.

It is concluded that the effect of displacement will not cause an adverse effect on red-throated divers breeding in Shetland, Orkney and Northern Scotland.

No adverse effect

7.3.4 Evidence of barrier effect

Should a barrier effect occur out to a distance of 1 km from the proposed development then a Diver may detour around the wind turbines causing it to increase its flight by a total of 3.2 km. Energetics modelling predicts that by flying around the proposed development the

additional 3.2 km will cause an increase in energy usage of 8.5 Kj or 1% of daily energy expenditure (Speakman, Gray and Furness 2009).

The flying of an additional 3.2 km is not predicted to have an adverse effect on red-throated divers flying to or from their breeding grounds in Orkney or Shetland.

No adverse effect

7.3.5 Evidence of in-combination impact

There is the potential for cumulative impacts with other offshore wind farms, planned or proposed and other activities such as shipping.

With respect to other wind farms, three occur in the Firth of Forth (Inch Cape, Neart na Gaoithe and Firth of Forth) in an area not known to hold significant numbers of red-throated diver. Consequently, there is not predicted to be any cumulative impact from these three wind farms.

A total of five red-throated divers were recorded from two years of boat-based surveys undertaken at the proposed Beatrice offshore wind farm (BOWL 2012). Consequently, the likelihood of a cumulative impact arising is considered to be low.

There is the potential for a cumulative impact with respect to disturbance arising from other activities, notably vessel activities in the area. Although there will be an increase in vessel movements during the construction period, post-construction it is likely that there will be less than four vessels per day. This increase is within the day-to-day variation in the number of vessels operating in and out of Aberdeen Harbour and is therefore unlikely to be noticeable.

The potential future Ocean Laboratory will require an estimated one additional vessel movement every three months and occasional *ad hoc* maintenance visits, within the proposed development area during its construction and operation. Should this occur then there is the potential for a cumulative effect on red-throated diver. It is not yet known what type of structure the Ocean Laboratory may be or how it will be installed or the number of vessel movements will be required. However, it is a single structure and it is predicted that the level of disturbance will be no greater than that arising from the installation of a single wind turbine. The scale of disturbance is therefore predicted to be localised and of short duration and not affect the integrity of any of the SPAs.

No adverse effect

7.3.6 Conclusion

Seven SPAs have been identified as being potentially affected by the proposed development:

- Caithness & Sutherland Peatlands SPA,
- Hoy SPA,
- Orkney Mainland Moors SPA,
- Foula SPA,
- Hermaness, Saxa Vord and Valla Field SPA,
- Otterswick & Graveland SPA,
- Ronas Hill – North Roe & Tingon SPA.

Based on all the Conservation Objectives of the SPAs and taking into account data obtained from the proposed EOWDC site and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPAs with regard to red-throated diver.

7.4 Common eider

See Section 4.19 of *Ornithological Baseline and Impact Assessment Addendum*

Common eider is a qualifying species for the following SPAs that have the potential for a likely significant affect.

- Ythan Estuary, Sands of Forvie and Meikle Loch SPA,
- Montrose Basin SPA,
- Firth of Tay & Eden Estuary SPA,
- Firth of Forth SPA (not considered by SNH (SNH 2011)).

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

Common eiders occur in the area throughout the year but most adult's winter in the Firth of Forth and Tay estuaries. First winter birds remain near the estuary (Baillie & Milne 1988). Peak numbers occur in the Ythan during May with maximum counts of up to 4,212 in 2004 and a five year peak mean of 3,333 individuals. Within Aberdeen Bay, peak counts of common eider occur in late summer when up to 6,003 eider have been recorded in 2005 and the peak mean between 2003 and 2008 in Aberdeen Bay was 4,833. In the Montrose Basin peak counts of common eider occur during July with 1,983 in July 2010.

7.4.1 Evidence of site usage

Aberdeen Bay has the fourth largest population of common eider in the UK (Holt *et al*. 2009).

Site specific boat based surveys undertaken between February 2007 and January 2008 and August 2010 to August 2011 recorded a indicate that the majority of eiders occur within nearshore waters with most sightings in water depths of 10 m or less. In contrast to the boat based surveys, common eider were frequently recorded from the four land based vantage point survey locations with a total of 877 recorded in flight between October 2007 and March 2008 and an overall average of 8.1 birds per hour flying past each point. Indicating extensive near-shore coastal usage. Data from Denmark supports the evidence obtained from within Aberdeen Bay that common eider occur very infrequently in water depths of >20 m with less than 1% of 36,700 records in the relatively deeper waters.

7.4.2 Evidence of collision risk

Data from other offshore wind farms indicate that common eider fly predominantly below rotor height. Observations from Denmark indicate that more than 80% of all common eider flights occur below 30 m (Kahlert *et al* 2000). Further evidence from Denmark and Sweden have demonstrated that common eider have a very high avoidance rate with no collisions detected at Horns rev offshore wind farm that has an annual autumn passage of between 40,000 to 60,000 common eider per year (Petersen *et al.* 2006). Similar avoidance rates were found at Kalmar Sound Offshore Wind Farm (Pettersson 2005).

Collision risk modelling undertaken for the proposed EWODC indicates between zero and one collision per year. The potential increase in mortality of up to 1 bird per year will not cause an adverse affect.

No adverse effect

7.4.3 Evidence of a displacement

Based on the results from the boat-based data, the worst-case scenario is that should displacement occur, that between 1 and 14 eider may be displaced from the proposed development area alone and between 10 and 140 eider if displacement occurs out to 2 km.

However, the distribution of eider within Aberdeen Bay is clustered with peak numbers occurring at various sites across the bay during different seasons (Sohle *et al*. 2006). The area off Blackdog regularly records the peak counts of eider in Aberdeen Bay (NESBR) and should displacement occur a greater proportion of eider might be affected than is estimated using densities obtained from boat based surveys. Using data from published North-east Scotland Bird Reports then between 0 and 509 may be displaced, if displacement occurs out to 2 km.

The Tuno Knob Offshore Wind Farm in Denmark is a relatively small wind farm of ten turbines in an area that holds up to 5,800 eiders. Post-construction monitoring at Tuno Knob has indicated that the distribution of eider is closely related to their prey and although there may be some displacement immediately post-construction there is unlikely to be any significant displacement of eider from the proposed development area as long as their prey remain available (Guillemette *et al.* 1999). Evidence from studies undertaken at Nysted Offshore Wind Farm have indicated that although there was an avoidance of the area during construction there was a subsequent increase of 48% within the wind farm area post-construction but a decrease in numbers out to 2 and 4 km (Zucco *et al.* 2006).

These two studies demonstrate that eiders do not avoid wind farms post-construction and their distribution is closely aligned to the availability of prey. The main prey items for eider are mussels (*Mytilus edulis*). Evidence from constructed wind farms indicates that there is likely to be an increase in mussels around the base of turbines and that no significant impacts have been detected on mussels from the construction of wind farms. Consequently, there is unlikely to be a negative impact on prey availability for eiders within Aberdeen Bay due to the proposed EOWDC and that monitoring data from existing offshore wind farms indicates potential for displacement only during the construction period.

Vessels may disturb eiders both during the construction phase and during operations from maintenance vessels and consequently cause some displacement effects. Studies have indicated that there may be displacement from large vessels out to 1,000 m (Larsen & Laubek 2005).

During construction there may be a number of vessels operating within the area but they will likely be focussed around a single point where the turbine is being installed. Consequently, eider may be displaced from within 1 km radius of the installation; an area of 3 km^2. Based on the highest recorded density of 16.17 birds/km^2, it is therefore predicted that up to 49 eider may be displaced from the vicinity during construction. This equates to approximately 1% of the peak eider population within Aberdeen Bay based on the peak estimated figure of 4,200 individuals. The construction period will be of short duration and the impacts from construction vessels temporary. Displacement by service boats may diminish the re-population potential of the EOWDC. Between one and four service vessels may be required on a regular basis. The presence of the proposed development in the vicinity of the intensively used Aberdeen Harbour means that the potential increase of up to four vessel movements on a regular basis will not have any noticeable difference to the number of vessels already using Aberdeen Bay, up to 7,700 arrivals per year (AHB 2011). Any specific displacement caused by the service or construction boats will be temporary as eiders will be able to move into the area once the vessels leave.

No effects will have an effect on the integrity of the site such that the population will not be maintained.

No adverse effect

7.4.4 Evidence of barrier effect

Evidence from Denmark and Sweden suggest that common eider fly around, rather than through, wind farms (Petersen *et al*. 2006). Consequently, there will be an increase in energy expenditure. Research at the substantially larger Nysted Offshore Wind Farm comprising of 72 turbines calculated an increase of flight distance of 500 m caused by flying around the wind farm. The conclusions of the study were that such a flight would not have any adverse effect on migrating common eider.

Regular daily movements of eider within Aberdeen Bay to and from feeding or roosting areas have not been recorded from vantage point surveys or boat-based surveys. Nor have there been any reports in published literature (e.g. NESBR). Should it occur with eider making daily movements from the Ythan Estuary to Aberdeen Bay to the south of the proposed development and the birds select to fly around the turbines up to 1 km away then they may incur an additional flight distance of up 3.2 km each way, or a total of 6.4 km. This may increase the daily energy expenditure to between 2.0 – 2.5% (Caldrow, Stillman & West 2007; Speakman, Gray & Furness 2009). This is a relatively small increase in daily energy expenditure and is unlikely to have an adverse effect on eiders in Aberdeen Bay.

The peak numbers of eider in Aberdeen Bay occur during July and August when the adult eider undergo a complete wing moult over a period of four weeks, during which time they become flightless. The daily energetic costs during this period increase but the birds remain within certain areas where they can forage and cannot undergo daily flight movements (Guillemette *et al.* 2007). Consequently, there is no incremental increase in daily energy expenditure due to the barrier effect during this period of higher energy expenditure.

Data obtained from two years of Vantage Point surveys did not detect any regular daily flights by eider across the proposed development area and so a regular barrier effect that may cause a long-term increase in daily energetic costs is not predicted. There is the potential for a relatively small *ad hoc* increase as birds move around the bay but as most movements are near the coast, regular barrier effects are unlikely. No effects are predicted that will affect the integrity of any of the SPAs.

No adverse effect

7.4.5 Evidence of in-combination impact

There is the potential for an in-combination effect with other shipping activities within Aberdeen Bay and the vessels associated with the proposed development. Currently up to 7,700 vessels arrive in to Aberdeen harbour per year and the incremental increase in vessel usage associated with the development, operation and decommissioning of the proposed EOWDC will be relatively small, particularly during the period of operation (AHB 2011). Vessels associated with the proposed development will be no closer than 2.4 km from shore, the distance of the nearest turbine, and therefore unlikely to have an impact on the nearshore eider. The proposed development is located too far from other planned offshore wind farms for a significant in-combination effect from the proposed development.

No adverse effect

7.4.6 Conclusion

Four SPAs have been identified as being potentially affected by the proposed development:

- Ythan Estuary, Sands of Forvie and Meikle Loch SPA,
- Montrose Basin SPA,
- Firth of Tay & Eden Estuary SPA,
- Firth of Forth SPA.

Based on all the Conservation Objectives of the SPAs and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPAs with regard to common eider.

7.5 Gannet

See Section 4.17 of *Ornithological Baseline and Impact Assessment Addendum*

Gannet is a qualifying species for the following SPAs that have the potential for a likely significant affect:

- Forth Islands SPA,
- Fair Isle SPA,
- Noss SPA.

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

Gannets occur as a qualifying species for the Forth Islands SPA with a breeding population of 44,000 pairs (Mitchell *et al.,* 2004).

The Bass Rock is approximately 124 km from the proposed wind farm location. Data from tagged gannets at Bass Rock have recorded breeding gannets foraging up to 540 km from the colony with a mean distance of 230 km and consequently could occur within the proposed wind farm area.

Elsewhere the nearest SPA with gannet as a qualifying species is Fair Isle which is located 260 km to the north of the proposed development. The foraging ranges from gannets from their breeding colonies means that Fair Isle and all the other SPA colonies are within range of the proposed development.

Noss SPA gannet population is 8,652 pairs. The SPA lies 330 km away and is therefore beyond the mean maximum foraging for this species which is 229 km (Thaxter *et al*. 2012) but is considered to have moderate connectivity with the proposed development (SNH 2011).

Troup Head is the closest gannetry to the proposed development located approximately 73 km to the north. This gannetry has increased in size over the last twenty years and now contains 1,810 nests (NESBR 2009). Being considerably closer than other existing colonies the Troup Head colony is likely to be the main source of gannets in Aberdeen Bay during the breeding season but gannet is not listed in the citation as a qualifying species for the SPA and therefore not considered as part of this assessment (SNH 2011).

7.5.1 Evidence of site usage

Gannet occur throughout the year in Aberdeen Bay with peak numbers between June and August and relatively few records between November and April. Gannets were more frequently recorded within the 'control' area and to the north of the Ythan compared to the proposed development area. Results from the vantage point and radar studies suggest that the majority of gannets occur between 2 - 3 km offshore.

Peak densities from boat-based surveys were recorded during July 2007 at 3.1 gannets/km^2. Vantage Point surveys recorded up to 43 birds per hour between April and September 2006.

The majority of sightings were greater than 1.5 km from shore with peak numbers between 3.0 and 3.5 km from the coast.

There is no evidence to suggest that the gannets recorded in Aberdeen Bay are those from either the Bass Rock or Fair Isle SPAs. However, the area is within the mean maximum foraging range of the species and it is likely that at least some of the gannets recorded are associated with these SPAs (Thaxter *et al*. 2012).

7.5.2 Evidence of collision risk

Results from site specific monitoring indicate that gannets are widespread across Aberdeen Bay with peak numbers of passing birds between 1 km and 3 km from shore. A total of 8.5% of all sightings of flying birds were of birds flying greater than 25 m above sea surface. Consequently, gannets are at risk of collision with the proposed development.

Based on a 98% avoidance rate it is predicted that up to 17 gannets may collide at the proposed EODWC each year. During the breeding season from March to August the number predicted to collide is nine individuals.

Fair Isle SPA has a current population of 3,582 AoN (7,164 adults); therefore an annual mortality rate of 580 adults. 1% of baseline mortality is therefore 5 individuals.

Forth Islands SPA has a current population of 48,065 AoN (96,130 adults); therefore an annual mortality rate of 7,786 adults. 1% of baseline mortality is therefore 78 individuals.

Noss SPA has a current population of 8,652 AoN (17,304 adults); therefore an annual mortality rate of 1,384 adults. 1% of baseline mortality is therefore 13 individuals.

Tagging studies undertaken at other Shetland gannet colonies indicate a maximum foraging range during the breeding season of 150 km with most activity within 37 km (BirdLife International 2012). Although foraging ranges vary between colonies, evidence from Shetland indicates that foraging activity will likely remain within the waters around Shetland (Lewis *et al.* 2001).

A recent study commissioned by The Crown Estate concludes that the UK population may be able to withstand an increase in mortality of up to 10,000 birds per year and that mortality to gannets from the distant colonies in St Kilda and Shetland will be very low (WWT *in prep*.).

It is therefore predicted that there will not be any significant impact on gannets associated with the Fair Isle SPA during the breeding season.

Tagging data of birds from the Bass Rock colony (part of the Forth Islands SPA) indicates that they forage widely and are potentially at collision risk with the proposed development (Hamer *et al.* 2000). Based on the collision risk modelling undertaken, should all the potential collisions be of birds arising from the Bass Rock colony in the Forth SPA, 124 km away, then there will be a very small increase in the baseline mortality rate and below the level that may be of concern. Population modelling undertaken for the Bass Rock gannet colony, indicates that the current population may be able to withstand an increase in mortality of up to 2,000 birds per year (WWT *in prep*.).

Evidence from existing offshore wind farms indicates that gannets avoid flying through wind farms and that those that do reduce flight height to be below rotor height and therefore are not at risk of collision (e.g. Zucco *et al*. 2006; Leopold *et al*. 2011) and may have a significant far field avoidance rate (Cook *et al*. 2012). This behaviour will further reduce the risk of potential collision and it is predicted that avoidance rates for gannet are significantly greater than the 98% used in the modelling.

Consequently, based on the information available it is predicted that there will be an effect on gannets from the Bass Rock SPA, Fair Isle SPA or Noss SPA due to collision mortality that will affect the integrity of any of the SPAs.

No adverse effect

7.5.3 Evidence of displacement

Although gannets are primarily an aerial species evidence from tracking studies indicate that they may spend up to half their time away from colonies on the sea surface and that they avoid using areas of operating wind farms (Lewis *et al*. 2001, Leopold *et al*. 2011). Consequently, gannets may be displaced from an area if they avoid entering wind farms.

Data from boat-based surveys recorded a peak count of 107 gannets in August at a density of 0.7 birds/km^2 in the proposed EOWDC survey area (SMRU 2011a); this is less than 0.1% of the SPA populations. Gannets have large foraging ranges and feed on a variety of prey items. Evidence from tracking studies (e.g. Langston 2011) indicates that gannets can forage across a very wide area and that the potential loss of 4 km^2 of sea surface is very small compared to the total area in which they forage.

There is the potential for displacement of prey species from the area during construction, should pile driving be undertaken. During this period it may be that gannets may be displaced from a wider area until such time their prey returns. Piling, should it occur, will be undertaken over a relatively short period of time and consequently the duration of potential displacement impact will also likely be relatively short and the area potentially impacted relatively small compared to the wider foraging ranges of gannets. Adult gannets are known to exhibit a great degree of flexibility in selection of prey, foraging locations and distances travelled. Consequently, they are adaptable to forage outwith the area during the period of potential impact (Hamer *et al.* 2007). Consequently, there will not be an effect on the integrity of any SPA.

No adverse effect

7.5.4 Evidence of barrier effects

Gannets are extremely efficient fliers and during the breeding season can travel many hundreds of kilometres in single feeding trips up to 364 km from the colony and over 900 km in a single trip (Hamer *et al.* 2007). The mean foraging range is approximately 100 km (Thaxter *et al.* 2012). The additional distance of up to 3.2 km an individual gannet may have to fly in order to detour around the proposed development is therefore negligible for a species that can and does forage widely. Site specific monitoring data from boat based and vantage points have not reported any regular passage or feeding locations in Aberdeen Bay. Published literature has also not reported any such behaviour (e.g. NESBR; Buckland, Bell and Picozzi 1990). Consequently, no effects are predicted that will affect the integrity of any SPA.

No adverse effect

7.5.5 Evidence of in-combination impact

The theoretical very large foraging range that gannets can fly suggest that any individual gannet may interact with a number of the proposed offshore wind farms in Scottish waters. Published data elsewhere indicates that gannets from colonies in Shetland or eastern England are unlikely to occur in Aberdeen Bay during the breeding season (Langston 2011), although they may occur during periods of passage.

Collision risk modelling undertaken for Beatrice demonstrator project predicted a total of five gannets per year might collide based on a 98% avoidance rate (Talisman 2005). Collision risk modelling undertaken at the proposed Beatrice offshore wind farm indicates that up to 265 gannets per year may be at risk of collision based on a 98% avoidance rate and 132 per year based on a 99% avoidance rate. Up to 160 gannets are predicted to collide from the Moray Firth offshore wind farm (BOWL 2012).

The scale of the proposed EOWDC development is significantly smaller than those proposed in the Moray Firth as are the number of potential collisions predicted by the collision risk modelling.

There is currently very limited information on the proposed developments in the Firth of Forth and no assessment can be made.

There is a significant difference in scale between the proposed development and those planned elsewhere and it is a significantly greater distance from the Forth Islands SPA, Fair Isle and Noss SPAs than other developments. Any potential incremental increase in mortality of up to 17 birds per year arising from the proposed development will likely make a relatively minor additive impact to the potential in-combination affects.

No adverse effect

7.5.6 Conclusion

Three SPAs have been identified as being potentially affected by the proposed development:

- Forth Islands SPA,
- Fair Isle SPA
- Noss SPA.

Based on all the Conservation Objectives of the SPAs and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPAs with regard to gannet.

7.6 Herring gull

See Section 4.28 of *Ornithological Baseline and Impact Assessment Addendum*

Herring gull is a qualifying species for the following SPAs that have the potential for a likely significant affect:

- Buchan Ness to Collieston Coast SPA,
- Fowlsheugh SPA,
- Troup Pennan and Lion's Heads SPA.

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

The UK breeding population has undergone a significant decline in recent years although the exact reasons for this decline are unknown and the species is considered to be in unfavourable and either declining or remaining unchanged at all three SPAs.

During the breeding season herring gulls remain largely coastal with mean maximum foraging ranges from the breeding colony of 61 km (Thaxter *et al.* 2012).

7.6.1 Evidence of site usage

The reported foraging range of breeding herring gulls indicates that herring gulls from the Troup Pennan and Lion's Heads SPA will not occur in Aberdeen Bay during the breeding season. Birds from Buchan Ness to Collieston Coast SPA and Fowlsheugh SPA may use the area.

Herring gulls were recorded throughout the year with peak numbers from boat-based surveys during June and July and relatively few records during other times of year. Land-based observations recorded higher numbers of herring gulls than the boat-based surveys in particular during the winter and spring periods when few if any were seen offshore.

The majority of sightings were within 2 km of the coast with relatively few records beyond 2 km from the shore. Of those recorded in flight up to 32% were recorded flying between 30 m and 150 m.

No counts of herring gull from any of the surveys within Aberdeen Bay were of national importance.

7.6.2 Evidence of potential collision risk

Collision risk modelling indicates that up to 2 herring gulls from the Buchan Ness to Collieston Coast SPA may collide during the breeding period and one from the Fowlsheugh SPA.

The Buchan Ness to Collieston Coast SPA lies approximately 9.5 km away from the proposed development and, based on the latest available counts in 2007, holds approximately 6,228 breeding herring gulls.

The colony will therefore have an estimated annual mortality of approximately 747 birds and 1% baseline mortality of 7.5 adults per year. The results from the collision risk modelling predict a mortality of 2 herring gulls during the breeding season, which is below 0.1% of the breeding population.

The Fowlsheugh SPA lies 32 km away from the proposed development and holds 214 breeding pairs of herring gull based on latest counts. Therefore, the annual mortality rate from this colony is 51 birds per year. Based on the results from the collision risk modelling it is predicted that, at most, one herring gull, 0.2% of the breeding population, will be at risk of collision each breeding season.

Troup Pennan and Lion's Heads SPA lies 74.3 km away and is considered to have a low level of connectivity. The collision risk modelling predicts less than 1 collision per year.

The number of herring gulls recorded within the proposed development area was lower than areas to the south or north of the proposed EOWDC and consequently, the results from the modelling is derived from higher numbers of herring gulls than were recorded from boat-based surveys from within the development area. Consequently, the number of collisions that will occur will be lower than the modelling predicts.

Evidence of avoidance rates greater than 99% have been reported from other wind farms (including onshore) where the chances of a collision by herring gulls flying at rotor height have been reported as being between 1 in 695 and 1 in 2,100 and for herring gulls flying at all heights of between 1 in 1,119 and 1 in 3,700 (Everaert and Kuijken 2007). By using a more likely, but less precautionary, avoidance rate of 99% then the number of herring gulls predicted to collide is approximately halved. Furthermore, the modelling does not separate between non-breeding immature herring gulls and breeding adults and some collision mortality will be with non-breeding immature birds and therefore not associated with breeding populations at SPAs.

It is predicted that the number of collisions by herring gulls during the breeding season from each of the SPAs will be less than one per year and not cause an impact that will affect the integrity of any SPA.

No adverse effect

7.6.3 Evidence of displacement

Data from post-construction monitoring studies undertaken in Denmark and Sweden indicate that although herring gulls may make some avoidance response they are generally not affected by offshore wind turbines and do not avoid entering wind farms. Consequently, there is not thought to be a significant barrier effect on herring gulls from the proposed development (Zucco *et al*. 2006).

No adverse effect

7.6.4 Evidence of barrier effects

There have been no reported displacement effects on herring gulls from offshore wind farms but some evidence of an increase in numbers within the constructed offshore wind farm areas (Zucco *et al.* 2006). No displacement is predicted.

No adverse effect

7.6.5 In-combination effects

Outwith Aberdeen Bay there are a number of planned offshore wind farms in the Firth of Forth and the Moray Firth. The only data available are from the Beatrice Demonstrator Project which recorded 193 herring gulls over a period of 12 months of pre-construction surveys and the Beatrice offshore wind farm, which recorded 415 herring gulls over two years of surveys (BOWL 2012; Talisman 2005).

The only SPA which has potential for an in-combination effect with the propose Beatrice Offshore Wind Farm is the Troup Pennan and Lion's Heads SPA. No Likely Significant Effects have been predicted from the proposed Beatrice offshore wind farm on herring gulls from the Troup Pennan and Lion's Heads SPA (BOWL 2012) and less than one collision per year is predicted from the proposed EOWDC. Therefore no adverse effects will occur.

No adverse effect

7.6.6 Conclusion

Three SPAs identified as being potentially affected by the proposed development:

- Troup Pennan and Lion's Heads SPA,
- Buchan Ness to Collieston Coast SPA,
- Fowlsheugh SPA.

Based on all the Conservation Objectives of the SPAs and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPAs with regard to herring gull.

7.7 Kittiwake

See Section 4.24 of *Ornithological Baseline and Impact Assessment Addendum*

Kittiwake is a qualifying species for the following SPAs that have the potential for a high level of connectivity and potential for a likely significant affect:

- Buchan Ness to Collieston Coast SPA,
- Fowlsheugh SPA,

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

Kittiwake is a qualifying species for Buchan Ness to Collieston Coast SPA, Fowlsheugh SPA Forth Islands SPA and Troup Pennan and Lion's Heads SPA as part of the waterbird assemblages under Article 4.2 of the Directive. Populations of kittiwakes at these colonies have decreased over recent years. The colony at Fowlsheugh was the largest and held 35,000 breeding pairs in 1992 but has decreased to below 11,000 pairs in 2006. The largest colony is now at Troup Pennan and Lion's Heads SPA where 14,896 pairs nest, followed by Buchan Ness to Collieston Coast SPA that has 12,542 apparently occupied nests, i.e. 25,000 individuals.

It is recognised that kittiwake population at Buchan Ness to Collieston Coast SPA is rated as being in unfavourable condition.

The mean maximum foraging range for kittiwake is 60 km and therefore birds from Troup, Pennan and Lion's Heads and those from the Forth Islands SPAs will unlikely to be foraging within the proposed development area during the breeding season. Kittiwakes from Buchan Ness to Collieston Coast SPA and Fowlsheugh SPA may occur within the proposed development area.

7.7.1 Evidence of site usage

Kittiwakes were recorded throughout Aberdeen Bay in highly seasonally variable numbers. During the winter periods very few kittiwakes were recorded. However during the breeding season kittiwakes were frequently recorded with estimated populations within the control area during this period of 1,676 birds and 663 birds in the proposed EOWDC development area. Peak densities of 33 birds/km^2 were recorded to the north of the proposed development during the summer months. Land-based observations also recorded peak numbers during the summer months with a peak in July. Of those for which flight height was recorded, 18.5% were greater than 25 m above the sea surface. The majority of sightings were between 1 and 3 km from the coast.

7.7.2 Evidence of collision risk

Based on the precautionary avoidance rate of 98% it is predicted that up to 34 collisions per year may occur.

During the breeding season (April to August) an estimated 27 kittiwakes are, predicted to collide. Of those that were aged 94% were aged as adults during the breeding season and therefore 25 kittiwakes at risk of collision during the breeding season will be potentially breeding adults.

Apportioning the predicted number of collisions between the two SPAs it is predicted that up to 19 of the potential collisions will be to kittiwakes associated with the Buchan Ness to Collieston Coast SPA and six may be from Fowlsheugh SPA.

The Buchan Ness to Collieston Coast SPA lies approximately 9.5 km away from the proposed development and the results from the collision risk modelling predict up to 19 adult kittiwakes per breeding season may collide with the proposed development, which is 0.06% of the SPA breeding population and an increase in baseline mortality of 1.1%.

In 1995 the population of kittiwakes at Buchan Ness to Collieston Coast SPA was 24,957 pairs and decreased to 14,133 pairs by 2007. This is a decrease of 902 pairs, 1,804 individuals per year. The additional potential increase in mortality of up to 19 birds per year is relatively small compared to the current rate of decline and is not predicted to significantly affect the current population levels and the current integrity of the SPA.

The Fowlsheugh SPA lies 32 km away from the proposed development. Based on the results from the collision risk modelling it is concluded that six collisions per breeding season may occur from the proposed development area, which is 0.02% of the SPA breeding population and an increase in baseline mortality of 0.4%.

Other SPAs are further away from the proposed development and the number of potential collisions is predicted to be less than one bird per year.

Based on the results of the collision risk modelling and the current regional and SPA populations, it is predicted that the potential population affect caused by collision impacts with the proposed development on kittiwakes is negligible. However, it also recognised that the breeding population of kittiwakes at Buchan Ness to Collieston SPA is in an unfavourable but maintained condition and any increase in adult mortality will not improve the condition of the SPA. The predicted number of collisions is relatively small, less than 0.1% of the breeding population, and therefore it is predicted that this relatively small potential increase in mortality will not affect the current integrity of the SPA nor have a significant incremental effect on the population over and above those factors causing the more significant decline in breeding numbers.

No adverse effect

7.7.3 Evidence of barrier effects

Data from post-construction monitoring studies undertaken in Denmark and Netherlands indicate that although kittiwakes may make some avoidance response they are generally not affected by offshore wind turbines and do not avoid entering wind farms. Consequently, there is not thought to be a significant barrier effect on kittiwakes from the proposed development (Zucco *et al*. 2006; Leopold *et al.* 2011).

No adverse effect

7.7.4 Evidence of displacement

Evidence from Denmark and the Netherlands indicate that there is no significant displacement effect from operating wind farms on kittiwakes (Zucco *et al*. 2006; Leopold *et al.* 2011). Therefore no displacement is predicted.

No adverse effect

7.7.5 In-combination effects

There are no other additional activities within Aberdeen Bay that may cause either cumulative or in-combination impacts on kittiwakes.

Outwith Aberdeen Bay there are a number of planned offshore wind farms in the Firth of Forth and the Moray Firth all of which have the potential to contribute to a possible in-combination effect. Surveys undertaken for the Beatrice Demonstrator Project recorded 2,943 kittiwakes over a period of 12 months of pre-construction surveys (Talisman 2005). Data for the proposed Beatrice offshore wind farm recorded 2,519 kittiwakes over a two year period (BOWL 2012). Collision risk modelling undertaken for the Beatrice Demonstrator Project predicted up to 9 kittiwakes per year might collide with the two turbines. Up to 263 kittiwakes per year (based on 98% avoidance rate) or 130 per year (based on 99% avoidance rate) are predicted to collide with the Beatrice offshore wind farm (BOWL 2012). Data presented in the Beatrice offshore wind farm environmental statement reports potential 186 kittiwake collisions per year for the Moray Firth offshore wind farm based on a 99% avoidance rate (BOWL 2012).

Data from the other Round 3 wind farms and those in Scottish Territorial Waters are not available.

The only SPA for which kittiwake is a qualifying species that could potentially have an in-combination impact between the proposed EOWDC and the proposed Moray Firth developments is Troup Pennan and Lion's Heads SPA. Not all kittiwakes predicted to collide with the proposed developments would originate from this SPA. Kittiwakes in the Moray Firth will be from other SPAs to the north, e.g. East Caithness Cliffs and North Caithness Cliffs. The two proposed Moray Firth developments are predicted to impact 0.01% of the Troup Pennan and Lion's Heads SPA and not cause a Likely Significant Effect (BOWL 2012). The potential small additional increase in mortality from the proposed EOWDC is not predicted to adversely effect impact the integrity of the SPA.

No adverse effect

7.7.6 Conclusion

Two SPAs have been identified as being potentially affected by the proposed development:

- Buchan Ness to Collieston Coast SPA,
- Fowlsheugh SPA.

Based on all the Conservation Objectives of the SPAs and taking into account data obtained from the proposed EOWDC, supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPAs with regard to kittiwake.

7.8 Little tern

See Section 4.30 of *Ornithological Baseline and Impact Assessment Addendum*

Little tern is a qualifying species for the following SPA that have the potential for a likely significant affect:

- Ythan Estuary, Sands of Forvie and Meikle Loch SPA,

The Conservation Objectives for the SPA are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

The Ythan Estuary, Sands of Forvie and Meikle Loch SPA held 36 breeding pairs in 2009.

They arrive from their West African wintering grounds from April onwards and depart in August and September. They feed on small fish, foraging in close in-shore waters.

The numbers nesting at Sands of Forvie varies considerably across years with many years having only a few pairs and others occasionally over 70 pairs nesting. The number of young fledged also varies considerably with most years producing only a few young due to predation and weather. During years where nests fail early on birds may leave the region by the end of June and early July but in years where nesting has been successful birds may remain in the area through to August or early September.

7.8.1 Evidence of site usage

Very few little terns were recorded from any of the surveys undertaken during the study. There were no sightings from boat-based surveys and only 17 little terns over two years of vantage point surveys undertaken between April 2006 and March 2008.

Flight heights for those recorded were all below 30 m and typically little terns forage between 3 and 8 m above the sea surface.

7.8.2 Evidence of collision risk

No little terns were recorded within the proposed development area and flight heights of little terns are typically well below the turbine height (ECON 2006). Therefore, as little terns have not been recorded in the area and they fly predominantly below rotor height there is very little risk of collision and no collisions are predicted.

No adverse effect

7.8.3 Evidence of displacement

Studies undertaken in Belgium and the UK have not reported any displacement effects with some evidence of an increase in usage of a site following construction (ECON 2008). Consequently, it is predicted that there will be no displacement effects on little terns due to potential development.

Little terns may not be impacted directly by activities associated with the proposed development. i.e. vessel movements, but results from monitoring undertaken at Scroby Sands indicate that there is the potential for a secondary impact should the prey of little terns be affected (ECON 2008). Little terns forage on small fish often, young clupeids. Monitoring

undertaken at Scroby Sands, where 30 turbines were installed using piling techniques, recorded a reduction in the availability of young herring following the construction of a wind farm by pile-driving and a subsequent breeding failure of little terns (ECON 2008). The results indicated that little terns were able to compensate for the reduction in available prey by foraging further afield and changing prey items and there was not an overall population decline in the number of little terns in the area. However, the locations where the terns foraged and the sizes of different colonies varied with some increasing and others decreasing. Breeding success varied considerably across years and the size of the colonies changed significantly from one year to the next. The link between the decline in young herring and subsequent localised reduction in tern breeding success, being caused by the construction of the wind farm was not confirmed and the interaction between construction, little tern breeding success and fish availability was complex. However, an effect on little tern breeding success from the construction activities could not be discounted.

The significance of any potential effect depends on the scale of displacement and its duration. It also depends on whether other suitable foraging areas can be located.

The major source of potential disturbance that may cause displacement effects on prey is predicted to arise during piling operations. The use of monopiles is predicted to be unlikely at the proposed EOWDC due to the seabed conditions. However, they may be required and up to four monopiled turbines may be installed. Each pile will take an estimated four to twelve hours to install, depending on ground conditions.

Although potential impacts upon prey are difficult to predict they are expected to be relatively short-term, as fish will start returning to the area once piling has ceased (see Appendix 9.1 and 9.2 of ES).

The numbers of breeding little terns breeding at the Sands of Forvie each year is highly variable as is their breeding success with many years where they fail to produce many, if any young. However, the population across the years has on average ranged been between 20 to 30 pairs with no obvious population decline even following periods of unsuccessful breeding. Consequently, a season without successful breeding, should it occur, is not predicted to have a significant impact on the little tern population.

Based on the results from studies undertaken at Scroby Sands, there is the potential for a minor effect on little terns should the construction of the proposed development cause a significant decline in potential prey items of little terns during the breeding season. However, should it occur, it is not predicted to affect the integrity of the SPA.

No adverse effect

7.8.4 Evidence of barrier effects

No little terns were recorded in the proposed development area and as little terns forage predominantly within 2 km of the coast there will not be a barrier effect.

No adverse effect

7.8.5 In-combination effects

There are no other offshore developments that have the potential for an in-combination effect on little terns originating from the Ythan Estuary, Sands of Forvie and Meikle Loch SPA.

No adverse effect

7.8.6 Conclusion

One SPA has been identified as being potentially affected by the proposed development:

- Ythan Estuary, Sands of Forvie and Meikle Loch SPA

Based on all the Conservation Objectives of the SPA and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPA with regard to little tern.

7.9 Sandwich tern

See Section 4.31 of *Ornithological Baseline and Impact Assessment Addendum*

Sandwich tern is a qualifying species for the following SPAs that have the potential for a likely significant effect:

- Ythan Estuary, Sands of Forvie and Meikle Loch SPA,
- Loch of Strathbeg SPA.

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

The Ythan Estuary, Sands of Forvie and Meikle Loch SPA holds Scotland's largest breeding colony of Sandwich tern with a peak of 1,802 pairs in 1987 and an average of 517 pairs over the last 20 years. Recent counts of breeding birds at Sands of Forvie have been of 900 pairs in 2007, 670 in 2008 and 645 in 2009, indicating an on-going and steady decline in the use of this site.

Sandwich terns have not bred at the Loch of Strathbeg SPA in recent years until 2010 when 1 to 2 pairs nested.

Birds return to their breeding grounds during April and remain in the area until the autumn. The number of terns breeding is highly variable and their success depends on the availability of suitable prey, predation and weather. Sandwich terns forage offshore for small fish species, particularly sandeels and clupeids. The distance that they forage varies depending on prey availability with distances of up to 67 km reported.

7.9.1 Evidence of site usage

Relatively few Sandwich terns were recorded from boat-based surveys undertaken in Aberdeen Bay. Peak numbers from boat-based surveys were in May and July with no records in August when relatively high numbers were recorded from land-based observations. The majority of sightings were within 500 m from shore with few sightings of birds beyond 2 km. Of those recorded in flight, 5.7% were flying above 25 m.

7.9.2 Evidence of collision risk

Results from collision risk modelling predicts less than one collision per year based on a 98% avoidance rate.

Based on the regional SPA population of Sandwich tern of 645 breeding pairs the annual mortality rate will be 142 individuals and therefore the 1% baseline mortality rate is 1.4 birds per year.

Results from site specific monitoring using boat-based and land-based surveys and other data sources (e.g. NESBR) indicate that relatively few Sandwich terns occur in area of the proposed development with nearly all sightings within 2 km of the coast and the majority within 1 km. A total of five Sandwich terns were recorded from boat-based surveys in Year 1 and none in Year 2 within the proposed development area. The collision risk modelling is

based on the highest numbers recorded from all boat-based surveys, and therefore over estimates the potential number of collisions.

Data from some existing wind farms have reported relatively high number of collisions of Sandwich tern with wind turbines (e.g. Everaert and Stienen 2006). However, they have also demonstrated high avoidance rates of nearly 99% or more. The number of collisions recorded at Zeebrugge was largely due to the high number of transits made by the Sandwich terns at the sites. The risk of collision by Sandwich terns flying at rotor height at Zeebrugge was 1 in 1,130 and for birds at all flight heights it was 1 in 16,819 (Everaert & Kuijken 2007). Further assessment of the Sandwich Tern data obtained from Zeebrugge indicates that the avoidance rate of Sandwich terns may be 98.83% (DECC 2012).

Sandwich terns were the only regularly recorded Tern at Nysted (Denmark), with 1,700 birds each autumn and *c*850 each spring and there were no reported collisions (Petersen *et al.* 2006).

Site-specific data indicates a low usage of the proposed development area and low numbers of transits across the site consequently a low risk of collision.

Based on the very small numbers of Sandwich terns recorded within the proposed development area and the relatively high avoidance rates reported for Sandwich terns at other wind farms, it is predicted that approximately one Sandwich tern may collide every three to five years and therefore the risk of collision is low and will not affect site integrity.

No adverse effect

7.9.3 Evidence of displacement

Evidence from studies undertaken in Belgium and the UK has not shown any evidence of a displacement effect on Sandwich terns with birds entering operating wind farms (Everaert and Stienen 2006; Zucco *et al.* 2006).

Sandwich terns are predicted not to be significantly impacted directly by disturbance from construction or operating vessels.

Sandwich terns feed predominantly on sandeels and clupeids (young herring) and should these prey species be impacted by construction activities in the vicinity of the proposed development then Sandwich terns may have to either forage more widely or find alternative prey. It is not possible to determine whether either possible impacts are potentially likely but Sandwich terns do forage widely in the coastal waters of Aberdeen Bay and appear not to occur in the EOWDC area, so those that are effected may be able to relocate should there be a localised effect.

Monitoring at existing offshore wind farms have not reported any decreases in fish species or biomass post-construction caused by the construction or operation of the wind farm (e.g. Lindeboom *et al.* 2011; Vattenfall 2009; DBERR 2007; Jensen *et al*. 2004). Consequently, it is predicted that should piling occur, any potential impacts on fish would be of a relatively short duration. However, there is the potential for a temporary moderate effect on Sandwich terns should the construction of the proposed development cause a significant decline in the prey of Sandwich terns during the breeding season. If this effect occurs it is predicted, based on existing monitoring results that it would last no longer than a single season before fish numbers returned back to population levels expected prior to construction.

Sandwich terns breeding success is highly variable across years with the population withstanding years with very low breeding success without having a significant effect on the colony size.

Consequently, should Sandwich terns be unsuccessful in breeding due to the potential displacement of prey then it is predicted that the effects will last no longer than the construction seasons and not have an adverse effect on the integrity of the SPA.

No adverse effect

7.9.4 Evidence of barrier effects

Studies undertaken in UK and Belgium have shown that there is unlikely to be a barrier effect with Sandwich terns recorded foraging within operating wind farms and no strong avoidance behaviour (e.g. Everaert and Stienen 2006). Furthermore, boat-based data indicates that the majority of Sandwich terns in Aberdeen Bay forage predominantly within 2 km of the coast and consequently it is predicted that there will not be a significant adverse barrier effect.

No adverse effect

7.9.5 In-combination effects

There are no other additional activities within Aberdeen Bay that may cause either cumulative or in-combination impacts.

There is the potential for a cumulative impact on Sandwich terns from the two turbine onshore Keith Inch and Green Hill development at Peterhead to the north of the proposed development (SNH 2011a). There are no data available on the number of Sandwich terns recorded at the Keith Inch and Green Hill development (Green Cat Renewables 2011) and therefore cumulative collision risk modelling is not possible. The number of Sandwich terns breeding to the north of Peterhead, at the Loch of Strathbeg, is very low with usually none or occasionally one or two pairs having bred there in recent years. Therefore, the number of Sandwich terns occurring in Aberdeen Bay associated with this SPA is predicted to be low. Sandwich terns forage offshore and although capable of flying overland to and from feeding areas, the Loch of Strathbeg is approximately 54 km away from the proposed EOWDC and beyond the mean maximum foraging range for this species of 49 km and the mean foraging range of 11 km (Thaxter *et al*. 2012). It is therefore predicted that few, if any, Sandwich terns from the Loch of Strathbeg will occur in the proposed development area.

Outwith Aberdeen Bay there are further planned wind farms in the Moray Firth and Firth of Forth areas.

Surveys undertaken at the Beatrice Demonstrator Project and the proposed Beatrice offshore wind farm located in the Moray Firth did not record any Sandwich terns and there are no Sandwich tern colonies in the Moray Firth area. Therefore, Sandwich terns are unlikely to occur regularly in the Moray Firth. Sandwich tern is a qualifying species for its post-breeding passage population in the Firth of Forth SPA and as breeding species in the Forth Islands SPA. The SPA citation for the Forth Islands states 22 pairs of Sandwich tern but no pairs have nested there in recent years.

The detailed distribution of Sandwich terns in the Firth of Forth is unknown and there are no site-specific data available to indicate whether Sandwich terns occur in the vicinity of the planned offshore wind farms. However, published seabirds at sea data indicate low densities occurring in the Firth of Forth area during the summer months with no records offshore during September or October (Stone *et al.* 1995). The Firth of Forth SPA is also approximately 124 km away from the proposed development and therefore no effects on site integrity are predicted.

No adverse effect

7.9.6 Conclusion

Two SPAs have been identified as being potentially affected by the proposed development:

- Ythan Estuary, Sands of Forvie and Meikle Loch SPA,
- Loch of Strathbeg SPA.

Based on all the Conservation Objectives of the SPAs and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPAs with regard to Sandwich tern.

7.10 Common tern

See Section 4.32 of *Ornithological Baseline and Impact Assessment Addendum*

Common tern is a qualifying species for Ythan Estuary, Sands of Forvie and Meikle Loch SPA.

The Conservation Objectives for the SPA are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

At the time of designation the SPA held 2.2% of the UK breeding population with 265 pairs. Since then the population has decreased with no more than 6 pairs since 2006.

Birds return to their breeding grounds during April and remain in the area until the autumn. The number of terns breeding is highly variable and their success depends on the availability of suitable prey, predation and weather. Common terns forage offshore for small fish species, particularly sandeels and clupeids. The distance that they forage varies depending on prey availability with mean maximum foraging ranges of 15 km (Thaxter *et al*. 2012).

7.10.1 Evidence of site usage

The known foraging range of breeding common tern indicates that terns present within the wind farm study area may be associated with the Ythan Estuary, Sands of Forvie and Meikle Loch SPA but not the Forth Islands SPA.

Numbers of common terns from boat-based surveys peaked during May and July. Although land-based observations indicate that the timing of peak counts varied between years with some occurring in May and others in July and August when up to 50 birds per hour were recorded. Of all flights recorded approximately 97% were below 25 m.

7.10.2 Evidence of collision risk

Results from site specific surveys using boat-based and land-based surveys and other data sources (e.g. NESBR) indicate that common terns may occur within the proposed development area but in lower numbers than areas to the north. Only one common tern recorded from boat-based surveys within the proposed development area in year 1 and up to 3 during the breeding season in Year 2.

Three common terns were recorded as flying at rotor height from boat-based surveys.

Site specific survey results and other data sources indicate that common terns occur widely to the north of the proposed development area and are relatively scarce within the proposed development area.

Results from collision risk modelling indicate that no more than one common tern may collide with the proposed development based on a 98% avoidance rate.

Between zero and six pairs of common tern have nested on the Ythan Estuary in recent years and the population is not in favourable condition and consequently an increase in adult mortality could have an adverse effect. The Ythan Estuary lies approximately 7.2 km away from the proposed development and therefore may be within the potential foraging range of

breeding common terns, which have a reported estimated mean maximum foraging range of 15 km and a mean foraging range of 4.5 km (Thaxter *et al*. 2012).

A total of 378 pairs of common tern nest at the Firth of Forth, which lies approximately 124 km away and therefore outwith the maximum foraging range recorded for common terns.

Data obtained from Zeebrugge, where common terns frequently pass across an array of turbines, have reported relatively high collision mortalities although very low collision probabilities of 0.1% for birds flying at rotor height and 0.007% for birds at all altitudes (Everaert and Stienen 2006). Consequently, the use of a 98% avoidance rate is precautionary and it is predicted that avoidance of 99% or greater is likely. Based on these results the number of potential collisions of common terns may be between zero and one bird per year.

The numbers of common terns recorded during surveys were greater than the number of breeding pairs at the nearest SPA. Consequently, not all the common terns recorded were from the SPA. There are two other common tern colonies in the region: Loch of Strathbeg and St Fergus.

The Loch of Strathbeg lies approximately 47.6 km away and St Fergus *c.* 39 km and therefore both colonies are outwith the maximum foraging ranges of these birds during the breeding season.

Following SNH advice birds occurring at St Fergus are likely those originating from the Ythan Estuary, Sands of Forvie and Meikle Loch SPA.

Collision risk modelling undertaken based on the hypothetical higher densities indicate that up to 49 common terns per year may collide with the proposed development should the population increase to 250 pairs (500 individuals).

The wind farm at Zeebrugge comprises of a line of 25 small to medium turbines along a sea wall with hub heights varying from between 23 m and 53 m, rotor diameters up to 53 m and rotor heights of between 16 m and 50 m. Beside the turbines there is a mixed breeding colony of terns including up to 1,832 common terns. Terns flying to and from their colony cross the line of turbines (Everaert and Stienen 2006). Studies undertaken on collision mortality have reported avoidance rates by common terns higher than 99% and the risk of a collision with one of the turbines of 1 in 848 for all common terns flying at rotor height and 1 in 13,387 for common terns flying at all heights (Everaert and Stienen 2006; Everaert & Kuijken 2007).

The frequency of passages recorded at Zeebrugge are significantly greater than are predicted to occur at the proposed EOWDC with a mean number of daily flights at Zeebrugge of between 4,228 and 10,263 of which between 7% and 27% were at rotor height. The turbines at Zeebrugge are also significantly closer together, being spaced approximately 100 to 150 m apart compared to over 600 m at EOWDC. Consequently, the likelihood of a collision occurring at Zeebrugge is significantly higher than that at the proposed EOWDC where the frequency of flights through the site are significantly lower and the turbines are spaced further apart and only 2.7% of flights are at rotor height.

Site specific data indicates that the majority of Terns forage within the nearshore waters to the north of the proposed development and rarely occur further offshore. Data from other colonies in Norfolk also indicates that during the breeding season common terns forage mainly within 2 km of the coast and rarely go further, but can do so and this may vary across colonies and across months (Allcorn *et al*. 2003).

The modelling assumes that the density of birds within the proposed EOWDC area is the same as that to the north and near the Ythan Estuary. However, site specific data indicates that this is not the case with no more than a total of five common terns recorded in the area of the proposed wind farm during a single breeding season with the majority to the north,

nearer to the breeding colony (Appendix B of Ornithology addendum). Thus suggesting a very low utilisation of the area by common terns breeding within the SPA and that the modelling is unrealistic in its assumptions and overly precautionary.

It is not possible to calculate what the actual densities of common tern might be should the population of common terns increase to 250 pairs at the Sands of Forvie. However, the densities within the proposed development area are likely to be significantly lower than nearshore and near the Ythan Estuary than those used in the collision risk modelling. This is supported by the very low densities recorded for other, more abundant, species of tern also nesting in the Sands of Forvie, in particular the Arctic tern and Sandwich tern. Collision risk modelling was not possible for Arctic tern due to the very low numbers recorded and their low flight height even though nearly 400 pairs nested there in 2010. The breeding population of Sandwich terns was up to 670 pairs during the years when surveys were undertaken and the collision risk modelling indicates less than one collision per year for this species. Although not directly comparable, the very low numbers of other, more abundant, species of tern nesting in the same colony predicted to be at risk of collision indicates that similar levels of impact may be predicted should the population of common terns increase to 250 pairs.

Based on the site specific data and known distribution and flight heights of common terns present in Aberdeen Bay and evidence from existing wind farms indicating high avoidance rates it is predicted that the potential collision risk is significantly lower than modelled and will not affect the integrity of the site.

No adverse effect

7.10.3 Evidence of displacement

Monitoring studies undertaken in Denmark reported common terns entering operating wind farms indicating that there may be little or no displacement (Petersen *et al.* 2006). Common terns were not recorded regularly using the proposed development area but should displacement occur, site specific data indicates that they may forage elsewhere, particularly to the north, which based on the numbers of common terns present, is a preferred foraging area.

Should the construction of the proposed development cause a reduction in the availability of prey to breeding terns then this may cause a displacement effect.

The location of nearest tern colonies and that more common terns were recorded to the north of the development area indicate that should there be a reduction of suitable prey in the vicinity of the proposed development than there are other areas where common terns may forage, e.g. in the Ythan Estuary. Any potential impact will likely last for no more than the one or two seasons as juvenile fish will be available as prey the following year.

The significance of any potential effect depends on the type of installation technique used the subsequent scale of disturbance and its duration. It also depends on whether other suitable foraging areas are available. Post construction monitoring undertaken at Kentish Flats did not record any reduction in the number of terns using the area and noted an increase in overall numbers (Gill *et al*. 2008).

Based on the results from site specific surveys indicating common terns can forage widely and evidence from studies undertaken at other constructed wind farms indicating that foraging with recently constructed wind farms can occur.

It is therefore predicted that there is unlikely to be an adverse effect from construction activities.

No adverse effect

7.10.4 Evidence of barrier effects

Studies undertaken in UK, Belgium, Denmark and Sweden have shown that there is unlikely to be a barrier effect, with common (or common/Arctic) terns recorded foraging within operating wind farms and no reports of any strong avoidance behaviour (Petersen *et al.* 2006; Pettersson 2005; Zucco *et al.* 2006). However, post-construction monitoring undertaken at Kentish Flats have shown a potential barrier effect with fewer common terns flying through the operating wind farm than compared to prior construction (Gill *et al*. 2008). The location of the proposed development to the south of the tern colony on the Sands of Forvie and that site specific monitoring indicates that areas to the north of the proposed development are preferred indicates that there are unlikely to be any significant or adverse effects to common terns caused by the potential barrier effect.

No adverse effect

7.10.5 In-combination effects

There are no other offshore developments that have the potential for an in-combination effect on common terns originating from the Ythan Estuary, Sands of Forvie and Meikle Loch SPA. Consequently, the risk of an adverse in-combination impact arising from the proposed EOWDC is predicted to be low.

No adverse effect

7.10.6 Conclusion

One SPA has been identified as being potentially affected by the proposed development:

- Ythan Estuary, Sands of Forvie and Meikle Loch SPA.

Based on all the Conservation Objectives of the SPA and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPA with regard to common tern.

7.11 Guillemot

See Section 4.34 of *Ornithological Baseline and Impact Assessment Addendum*

Guillemot is a qualifying species for the following SPAs that have the potential for a likely significant effect:

- Fowlsheugh SPA,
- Buchan Ness to Collieston Coast SPA.

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

7.11.1 Evidence of site usage

Guillemots were recorded widely across Aberdeen Bay from all surveys. Data from boat-based surveys indicate peak counts in the bay occur during the post-breeding period with highest densities recorded offshore during this period. Within the proposed EOWDC densities were greatest during September. Relatively high numbers remain within the area until November after which numbers of guillemots in the area decrease. Land based observations recorded peak numbers during April. Data from boat-based surveys recorded guillemots widely across the surveyed areas and land-based observations recorded most guillemots from between 1.5 km and 4.5 km from the coast.

7.11.2 Evidence of collision risk

Flight heights obtained from boat-based surveys undertaken in Aberdeen Bay recorded 1,631 guillemots in flight of which 99.9% were recorded as flying below 25 m and therefore not at risk of collision.

Based on the precautionary avoidance rate of 98% and the more precautionary flight heights reported in Cook *et al*. (2012) it is predicted that a up to 3 collisions per year may occur.

The Buchan Ness to Collieston Coast SPA lies approximately 9.5 km away from the proposed development and holds 19,296 individual guillemots on the latest counts in 2007. The colony has an annual mortality of approximately 1,041 guillemots. It is likely that the majority of guillemots within Aberdeen Bay during the breeding period are associated with this colony. The results from the collision risk modelling which predict an annual mortality of up to three guillemots per year indicate that there will not be an adverse effect on guillemot associated with the SPA based on the precautionary assumption that an increase of 1% above baseline mortality could be adverse, i.e. if more than ten guillemots a year collide with the turbines.

The Fowlsheugh SPA lies 31 km away from the proposed development and holds 50,566 guillemots based on latest counts. Therefore, the annual mortality rate is 2,730 birds per year. Based on the results from the collision risk modelling it is concluded that even if all the guillemots at risk of collision are from Fowlsheugh there will not be an effect on the population integrity.

No adverse effect

7.11.3 Barrier effect

Studies undertaken in Sweden and Denmark indicate that there is some potential for a barrier effect to occur with a reduced number of birds crossing the constructed wind farms.

During the breeding season it is predicted that there may be regular flights to and from colonies some of which will intersect the proposed development area. Should a barrier effect occur with guillemots from either Fowlsheugh or Buchan Ness to Collieston Coast SPAs making daily movements from one location to another around the proposed development area then they may incur an additional flight distance of up 3.2 km each way, or a total of 6.4 km. This may increase the daily energy expenditure to between 2.0 – 2.5% (Speakman, Gray & Furness 2009). Multiple flights will increase this expenditure.

The location and size of the proposed development is such that it will only occupy a relatively small zone through which birds may avoid flying. Regular daily movements by individual birds that could cause an incremental increase in distance of foraging flights on a daily basis is not predicted to occur, i.e. birds from colonies will forage over a wider area and will not need to detour around the proposed development on a regular daily basis.

Based on the above it is concluded that the potential incremental increases in foraging distances are unlikely to cause an adverse effect on guillemots.

No adverse effect

7.11.4 Evidence of displacement effect

Guillemots were considered to be at moderate risk of displacement in the review undertaken by Langston on the potential impacts of wind farms (Langston 2010).

Based on a 50% displacement then between 5 and 51 guillemots may be at increased risk of mortality due to displacement from the proposed development area alone and between 38 and 386 guillemots may be at increased risk of mortality due to displacement should displacement occur out to 2 km.

There are two SPA for which there is potentially high connectivity between birds occurring within the proposed development area and the breeding colonies: Buchan Ness to Collieston Coast SPA and Fowlsheugh SPA. The numbers of potentially displaced guillemots from each of the SPAs based on the distance from the proposed EOWDC and size of population range from between 30 and 298 for Buchan Ness to Collieston Coast SPA and 9 and 88 from Fowlsheugh.

Based on this assumption between 0.15 and 1.5% of the Buchan Ness to Collieston Coast SPA guillemot population may be displaced and less than 0.2% of the Fowlsheugh SPA population.

Density surface modelling undertaken indicates that proposed development is not used significantly more by guillemots than other areas and should there be a displacement effect guillemots will be able to utilise other areas.

Post-construction monitoring undertaken at Horns Rev offshore wind farm has indicated that displacement of guillemots can occur. However, results from other operating wind farms have not shown a total displacement of guillemots. Guillemots have been recorded at the constructed Kentish Flats offshore wind farm but in reduced numbers (Gill *et al.* 2008). No displacement effects have been recorded from Egmond aan Zee offshore wind farm or Bligh Bank (Lindeboom *et al.* 2011; Degraer *et al.* 2011). There is therefore evidence from constructed offshore wind farms to suggest that significant displacement of guillemots from within the EOWDC area will not occur. Based on the evidence from existing offshore wind farms it is predicted that should displacement occur it will not affect the population integrity.

No adverse effect

7.11.5 In-combination effects

There are no other additional activities within Aberdeen Bay that may cause significant in-combination impacts on guillemots.

Outwith Aberdeen Bay there are a number of planned offshore wind farms in the Firth of Forth and the Moray Firth. The only data available are from the Beatrice Demonstrator Project, which recorded 19 guillemots over a period of 12 months pre-construction surveys, and from the Beatrice offshore wind farm, which recorded 9,139 guillemots (BOWL 2012; Talisman 2005). Guillemots recorded in the Moray Firth may originate from a number of SPAs that are beyond the mean maximum foraging of guillemot with respect to the location of the proposed EOWDC, e.g. East Caithness Cliffs, North Caithness Cliffs and Hoy SPAs. Therefore, there will not be an in-combination impact with guillemots from those SPAs.

No adverse effect

7.11.6 Conclusion

Two SPAs have been identified as being potentially affected by the proposed development:

- Buchan Ness to Collieston Coast SPA,
- Fowlsheugh SPA.

Based on all the Conservation Objectives of the SPAs and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPAs with regard to guillemot.

7.12 Razorbill

See Section 4.35 of *Ornithological Baseline and Impact Assessment Addendum*

There are three razorbill colonies as part of SPA assemblages that have the potential to be impacted by the proposed development based on mean maximum foraging ranges during the breeding season (Thaxter *et al*. 2012):

- Buchan Ness to Collieston Coast SPA,
- Fowlsheugh SPA,
- Troup, Pennan and Lion's Heads SPA.

The Conservation Objectives for the SPAs are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- *Population of the species as a viable component of the site.*
- *Distribution of the species within site.*
- *Distribution and extent of habitats supporting the species.*
- *Structure, function and supporting processes of habitats supporting the species.*
- *No significant disturbance of the species.*

7.12.1 Evidence of site usage

Razorbills were widely recorded across Aberdeen Bay from all surveys. Low numbers were present at the beginning of the year but increased from April onwards. Data from boat-based surveys indicate peak counts in the bay between July and September but also a high count in October. Land based observations recorded peak numbers during April and September.

Data from boat-based surveys recorded razorbills widely across the surveyed areas and land-based observations recorded most birds from between 2.0 km and 4.0 km from the coast.

All but one razorbill recorded in flight from boat-based surveys were flying below 25 m.

7.12.2 Evidence of collision risk

The number of razorbills predicted to collide is less than one per year based on a 98% avoidance rate. The increase in mortality of up to one bird per year will not affect the integrity of the SPA populations.

No adverse effect

7.12.3 Barrier effect

During the breeding season it is predicted that there may be regular flights to and from colonies some of which will intersect the proposed development area. The distance razorbills forage varies depending upon the availability of suitable prey and at what stage during the breeding season they are. Mean maximum foraging range is 48.5 km (Thaxter *et al*. 2012). Should a barrier effect occur with razorbills from Fowlsheugh SPA making daily movements from one location to another around the proposed development area then they may incur an additional flight distance of up 3.2 km each way, or a total of 6.4 km. This may increase the daily energy expenditure to between 2.0% and 2.5% (Speakman, Gray and Furness 2009).

The location and size of the proposed development is such that it will only occupy a relatively small zone through which birds may avoid flying. No significant concentrations of

razorbills were recorded in the vicinity of the proposed development and therefore it is not considered to be a particularly favourable area for foraging. Regular daily movements by individual birds that could cause an incremental increase in distance of foraging flights on a daily basis is not predicted to occur, i.e. birds from colonies will forage over a wider area and will not need to detour around the proposed development on a regular daily basis.

Based on the above it concluded that the potential incremental increases in foraging distances will not affect the integrity of the site or the population of the species.

No adverse effect

7.12.4 Evidence of displacement effect

Razorbills were considered to be at moderate risk of displacement in the review undertaken by Langston on the potential impacts of wind farms (Langston 2010).

Displacement assessment predicts between 1 and 15 razorbills may be impacted due to displacement from within the proposed development area alone and between 13 and 129 should displacement effects occur out to 2 km from the proposed development.

There is one SPA for which there is potentially high connectivity between birds occurring within the proposed development area and the breeding colony (Fowlsheugh SPA) and one SPA where they breed but are not a qualifying species (Buchan Ness to Collieston Coast SPA).

The predicted number of razorbill originating from Fowlsheugh SPA predicted to be displaced is between 3 and 30 individuals, i.e. 0.6% of the SPA population.

Site specific surveys recorded razorbills throughout the survey area and no specific concentrations were detected within the area of the proposed development, although densities tended to be higher to the north. Density surface modelling indicates that proposed development was not used significantly more by razorbill than other areas and should there be a displacement effect razorbills will be able to locate elsewhere. It is predicted, based on the recorded distribution and densities of razorbills that in the event of any displacement there will not be an effect on the integrity of the SPA or the population.

No adverse effect

7.12.5 In-combination effects

There are no other additional activities within Aberdeen Bay that may cause either cumulative or in-combination impacts on razorbills.

Outwith Aberdeen Bay there are a number of planned offshore wind farms in the Firth of Forth and the Moray Firth. Razorbills recorded in the Moray Firth may originate from a number of SPAs that are beyond the mean maximum foraging of razorbill with respect to the location of the proposed EOWDC, e.g. East Caithness Cliffs, North Caithness Cliffs and Hoy SPAs. Therefore, there will not be an in-combination impact with razorbills from those SPAs.

Data from other proposed offshore wind farms are not available. Consequently, it is not possible to determine whether there will be an in-combination impact arising from all the proposed plans. However, although the developments are within the potential foraging ranges of razorbills from a number of SPAs the relatively far distance the proposed development is from the other planned offshore wind farms and beyond the mean maximum foraging range and its relatively small scale reduces the risk of a potentially significant in-combination effect and will not affect the integrity of the SPAs.

No adverse effect

7.12.6 Conclusion

One SPA has been identified as being potentially affected by the proposed development:

- Fowlsheugh SPA.

Based on all the Conservation Objectives of the SPA and taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SPA with regard to razorbill.

8.0 SAC'S

The scope of the review undertaken for this document was based on all coastal SACs in the wider region and advice received from SNH.

All coastal or near coastal SACs were identified using information from the SNH and JNCC websites (JNCC 2011, SNH 2011). A total of eight SACs have been identified as having qualifying species or habitats that are at potential risk of an adverse effect from the proposed project:

- Berwickshire and North Northumberland Coast SAC
- Buchan Ness to Collieston Coast SAC
- Firth of Tay and Eden Estuary SAC
- Isle of May SAC
- Moray Firth SAC
- River Dee SAC
- River South Esk SAC
- Sands of Forvie SAC

Further details on each of the SACs including their qualifying species and Conservation Objectives are presented in Appendix B.

Annex I habitats – Embryonic shifting sand dunes - *Ammophila arenaria, Empetrum nigrum*		**Sands of Forvie SAC**
SAC		Embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaria*, decalcified fixed dunes with *Empetrum nigrum*, humid dune slacks
Data	Site surveys	None
Impact	Physical impact	None
Evidence base	Site specific	There will be no direct or indirect impacts from the construction or presence of the wind farm on the site.
	Generic	There is no published evidence to indicate either a direct or indirect impact on sand dune habitats from offshore wind farms.
Evidence of potential impact	None	
Potential to assess	Yes	Sediment modelling would confirm lack of any potential impact.
Risk	Low	Proposed offshore wind farm too far to impact on coastal processes at Sands of Forvie SAC.
Likely Significant Effect on any SAC based on Conservation Objectives.		**No**

Large shallow inlets and bays, mudflats and sandflats reefs and submerged or partially submerged caves **Annex II species – grey seal**		**Berwickshire and North Northumberland Coast SAC**
SAC		Large shallow inlets and bays Mudflats and sandflats not covered by seawater at low tide Reefs Submerged or partially submerged sea caves Grey seal
Data	Site surveys	Boat based survey
Impact	Physical impact	None on qualifying habitats. Potential for noise impacts on grey seals
Evidence base	Site specific	There will be no direct or indirect impacts from the construction or presence of the wind farm on the site's qualifying habitats. Grey seals were present throughout the survey area during all the boat based survey months.
	Generic	There is published evidence to indicate that there is potential for an impact on grey seals arising from noise generated during piling operations.
Evidence of potential impact	Yes	Seals may avoid areas with high levels of sound
Potential to assess	Yes	Noise modelling and site specific data.
Risk	Low	
Likely Significant Effect on any SAC based on Conservation Objectives.		**Yes:** For grey seal only

Vegetated sea cliffs of the Atlantic and Baltic Coasts		**Buchan Ness to Collieston Coast SAC**
SAC		The vegetated cliff slopes support a wide range of coastal vegetation types with an abundance of such local species as Scots lovage (*Ligusticum scoticum*) and roseroot (*Sedum rosea*). Maritime heath, acid peatland and brackish flushes also occur.
Data	Site surveys	None
Impact	Physical impact	None
Evidence base	Site specific	There will be no direct or indirect impacts from the construction or presence of the wind farm on the site.
	Generic	There is no published evidence to indicate either a direct or indirect impact on vegetated cliff slopes from offshore wind farms.
Evidence of potential impact	None	
Potential to assess	Yes	
Risk	Low	
Likely Significant Effect on any SAC based on Conservation Objectives.		**No**

Estuaries, Sandbanks, Mudflats and Sandflats Annex II species – Harbour seal		**Firth of Tay & Eden Estuary SAC**
SAC		Mudflats and Sandflats not covered by seawater at low tide. Sandbanks which are slightly covered by seawater all the time Estuaries Harbour (common) seal
Data	Site surveys	Boat based surveys
Impact	Physical impact	None on qualifying habitats Potential for noise impact on harbour seal
Evidence base	Site specific	There will be no direct or indirect impacts from the construction or presence of the wind farm on the qualifying habitats: mudflats, sandflats, sandbanks and estuaries. No common (harbour) seals were observed during the boat based surveys carried out during 2007-2008. In the four months of boat based surveys carried out during 2010-2011 there were 27 harbour seals observed.
	Generic	There is published evidence to indicate that there is potential for an impact on harbour seal arising from noise generated during piling operations.
Evidence of potential impact	Yes	Seals may avoid areas with high levels of sound
Potential to assess	Yes	Noise modelling and site specific data.
Risk	Low	
Likely Significant Effect on any SAC based on Conservation Objectives.		**Yes:** For harbour seal only

Bottlenose dolphin		**Moray Firth SAC**	
SAC			
Data	Species	Bottlenose dolphin	Sandbank
	Recent population	193 – 237 individuals	Sandbanks are at least 105 km away
		Bottlenose dolphin – Marine mammal surveys have indicated that bottlenose dolphins occur within the proposed wind farm area. Previous studies have concluded that they occur off Aberdeen throughout the year with a slight increase in occurrence between November and May. Aberdeen harbour has been identified as an important feeding area for bottlenose dolphins, especially during the winter and spring when dolphins are most abundant. Their presence at this site has been linked to salmon migration up the river.	
Impact	Physical impact	Dolphins present within close proximity to the turbines during pile driving may be physically impacted. No physical impacts on Sandbank habitats *c*105 km away	
	Displacement effect	Dolphins may be displaced away from the area during the construction phase.	
Evidence base	Generic	Bottlenose dolphins from the Moray Firth SAC are known to occur in the area of the proposed wind farm and as far south as St Andrews Bay. Impacts from noise from pile driving on porpoises have indicated that there is some temporary displacement as far as 21 km away and studies from seismic surveys indicate avoidance behaviour for a range of dolphin species.	
Evidence of potential impact	Yes	Possible displacement or disturbance effect from noise during construction activities.	
Potential to assess	Yes	Noise modelling.	
Risk	Moderate		
Likely Significant Effect on any SAC based on Conservation Objectives.		**Yes**	

Presence of Annex II species, Freshwater Pearl Mussel, Atlantic Salmon, Otter		**River Dee SAC**		
SAC				
Data		Freshwater Pearl Mussel	Atlantic Salmon	Otter
	Recent population	1.5 million	-	The population of otter in the Dee catchment is estimated at 40-50 adults.
Impact	Physical	Freshwater Pearl mussel - there will be no direct impacts on fresh water pearl mussel. Potential secondary impact if significant impact on salmon occurs. Atlantic salmon – Possible displacement effect during construction period. Otter – possible disturbance effect on otters from construction noise.		
	Noise			
Evidence base	Site specific	none		
	Generic	Freshwater Pearl Mussel – use Atlantic salmon as a host species for a winter before maturing. No evidence of any impacts on freshwater pearl mussels from offshore wind farms or other offshore activities. Atlantic Salmon – No evidence of displacement effects on Atlantic salmon from noise impacts. Otter – No evidence of any impact from pile driving from offshore wind farms. Mouth of the River Dee is Aberdeen Harbour and Aberdeen City therefore very low usage of the site. Any displacement, should it occur, will only be for the duration of pile driving. No likely significant effect.		
Evidence of potential impact	Yes	Possible displacement of Atlantic salmon effect during construction.		
Potential to assess	Yes			
Risk	Low	Duration of activities will be of a relatively short duration.		
Likely Significant Effect on any SAC based on Conservation Objectives.		**Yes**		

Presence of Annex II species, Freshwater Pearl Mussel, Atlantic Salmon		**River South Esk SAC**	
SAC			
Data	Species	Freshwater Pearl Mussel	Atlantic Salmon
	Recent population	Abundant in the River South Esk. The pearl mussel population is most abundant in the middle reaches of the river where they attain densities > 20 m^2	The South Esk supports a large, high-quality salmon *Salmo salar* population in a river draining a moderate-sized catchment on the east coast.
Impact	Physical impact	Freshwater Pearl mussel - there will be no direct impacts on fresh water pearl mussel. Potential secondary impact if significant impact on salmon occurs. Atlantic salmon – Possible displacement effect during construction period.	
	Displacement effect		
Evidence base	Generic	Freshwater Pearl Mussel – use Atlantic salmon as a host species for a winter before maturing. No evidence of any impacts on freshwater pearl mussels from offshore wind farms or other offshore activities. Atlantic Salmon – No evidence of displacement effects on Atlantic salmon from noise impacts. Impacts from noise on other fish species (including Salmonids) have indicated that any displacement, should it occur, will be temporary and only for the duration of the pile driving. Fish return to the area. Recovery from temporary threshold shift should it occur may be within 48 hrs. Salmon may avoid the area during the construction period.	
Evidence of potential impact	Yes	Possible displacement effect during construction	
Potential to assess	Yes		
Risk	Low	Duration of activities will be of a relatively short duration.	
Likely Significant Effect on any SAC based on Conservation Objectives.		**Yes**	

Reefs **Annex II species – Harbour (common) seal**		**Isle of May SAC**
SAC		Reefs Grey seal
Data	Site surveys	Boat based survey
Impact	Physical impact	None on qualifying habitat. Potential for noise impacts on grey seals
Evidence base	Site specific	There will be no direct or indirect impacts from the construction or presence of the wind farm on the site's qualifying habitats. Grey seals were present throughout the survey area during all the boat based survey months.
	Generic	There is published evidence to indicate that there is potential for an impact on grey seals arising from noise generated during piling operations.
Evidence of potential impact	Yes	Seals may avoid areas with high levels of sound
Potential to assess	Yes	Noise modelling and site specific data.
Risk	Low	
Likely Significant Effect on any SAC based on Conservation Objectives.		**Yes:** For grey seal only

8.1 Bottlenose dolphin

Bottlenose dolphin is a qualifying species for the following SAC that have the potential for a likely significant effect:

- Moray Firth SAC,

The Conservation objectives are:

> *To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and*
>
> *To ensure for the qualifying species that the following are established then maintained in the long term:*
>
> - *Population of the species as a viable component of the site*
> - *Distribution of the species within site*
> - *Distribution and extent of habitats supporting the species*
> - *Structure, function and supporting processes of habitats supporting the species*
> - *No significant disturbance of the species*
>
> *Qualifying Species*
>
> *Bottlenose dolphin*

Further information on the distribution of bottlenose dolphins is presented within the is presented within the *Marine Mammal Impact Environmental Baseline* and *EIA technical report on Marine Mammals* prepared for the proposed EWODC Environmental Statement (Appendices 12.1 and 12.2 of the Environmental Statement). Bottlenose dolphins are known to occur regularly in the Aberdeen Bay area. Observations indicate they are present in the area throughout the year, with a peak occurrence during the winter and spring months (November-May), when they can be observed almost daily feeding at Aberdeen Harbour (Canning 2007; Stockin *et al*. 2006).

Analysis of cetacean distribution and habitat use along the Aberdeenshire coast, indicate that the entrance to the River Dee (Aberdeen Harbour) is an important feeding area for bottlenose dolphins, especially during the winter and spring when dolphins are most abundant (Canning 2007). The majority of sightings away from Aberdeen were of groups travelling while those sighted at Aberdeen generally exhibited foraging behaviours (Canning, 2007).

There were 200 bottlenose dolphins recorded during 62 observations both on and off effort during the boat based surveys carried out 2007-2008 and 9 observations of 59 individuals during the 2010/2011 surveys. There were 10 observations of 58 bottlenose dolphins collected on effort that would have been available for distance analysis (if statistically feasible). The mean group size of sightings both on and off effort was 5.2 individuals. The majority of sightings occurred during the spring months with sightings occurring throughout the year. A higher number of individuals were observed in the wind farm survey area in comparison to the control site.

8.1.1 Risk of physical impacts

Further detailed information on the potential impacts arising from the proposed development on bottlenose dolphins are presented in the EIA technical report on marine mammals (Appendix 12.2 of the Environmental Statement).

There is a risk of physical impacts on bottlenose dolphin from the proposed development, particularly during the construction phase when wind turbines may be pile driven into the seabed. Noise generated from pile driving has the potential to cause a range of effects

ranging from mortality to permanent physical damage, temporary physical damage and disturbance or displacement.

Underwater sound modelling using the INSPIRE sound propagation model has been used to determine the potential range of underwater noise generated by installing a single 8.5 m diameter monopile. This is based on the worst-case scenario with respect to generation of underwater noise. The INSPIRE model uses a combination of loss caused by the spreading of the energy of the sound field (geometric loss) and loss caused by energy in the water column being absorbed in the underlying sea bed (absorption losses). This is used to estimate the likely transmission losses as the sound propagates away from the source; in this case impact piling. The model is therefore capable of estimating the effect of rapidly varying water depths that are commonly found in UK coastal waters.

For the assessment of physical injury to marine mammals the assessment applies a number of different impact criteria including those proposed by Parvin *et al*. (2007), and also the audiological impact criteria that have been developed by Southall *et al*. (2007).

Sound levels used in the assessment of physical impacts to determine potential adverse effect on Bottlenose dolphin are:

- lethal effect may occur in bottlenose dolphin where peak to peak levels exceed 240 dB re.1µPa
- physical injury may occur in bottlenose dolphin where peak to peak levels exceed 220 dB re.1µPa

The results from the underwater noise modelling undertaken at four wind turbines and the results from Turbine 11, the worst-case based on the piling of an 8.5 m diameter turbine are presented in Figure 8-1. The results from the modelling indicate that the lethal effect level (240 dB peak-peak) and the physical effect level (220 dB peak-peak) will be exceeded at 3 m and 60 m, respectively. As the environmental conditions are comparable for all the wind turbines; the modelling suggests that for physical impacts the anticipated ranges at which lethal effects and physical effects will be the same for all the wind turbine positions.

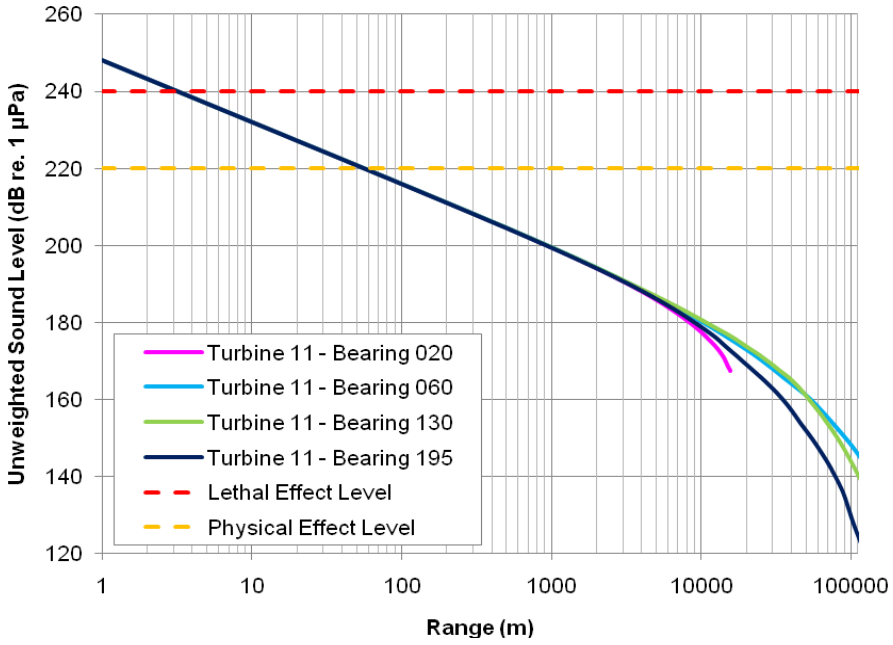

Figure 8-1: Graph showing the unweighted peak to peak noise level with range for the four transects extending from wind turbine 11

Although bottlenose dolphins frequently occur in Aberdeen Bay it is predicted that it is unlikely for a bottlenose dolphin to be within 3 m of the wind turbine during installation and therefore not at risk of mortality.

Hearing impairment in the form of a Temporary Threshold shift (TTS) in hearing may occur where a bottlenose dolphin is exposed to a levels of 130 dB_{ht} and Permanent Threshold Shift (PTS) may occur with repetitive exposure. M-weighted Sound Exposure Levels (dB re. 1 μPa^2s (M)) have also been used and TTS is predicted to occur at sound levels of 198 dB re 1 $\mu Pa^2/s$ (M_{hf}) (Table 8-1).

Table 8-1: Proposed auditory exposure criteria for bottlenose dolphin frequency specific hearing

Marine mammal group	Sound type	
	Single pulses	Multiple Pulses
Mid Frequency Cetaceans (i.e. bottlenose dolphin)		
Sound Pressure Level	230 dB re 1 µPa (peak)	230 dB re 1 µPa (peak)
Sound Exposure Level	198 dB re 1 $\mu Pa^2/s$ (M_{hf})	198 dB re 1 $\mu Pa^2/s$ (M_{hf})

The 130 dB_{ht} perceived level is used to indicate traumatic hearing damage over a very short exposure time of only a few pile strikes at most (Nedwell *et al*. 2007). Based on this measure it is predicted that there is the potential for traumatic hearing damage out to 290 m from sound source. However, when applying the criteria used by Southall it is predicted that there is the potential for a permanent threshold shift out to 5 m from source or 7 m when based on the single pulse Sound Exposure Level (SEL) criteria, which have taken consideration of the hearing capabilities of marine mammal function hearing groups (Southall *et al*. 2007).

Based on the above range of modelling results it is predicted that there is a potential for auditory injury, i.e. permanent threshold shift of between 5 m and 290 m from the sound source, depending on the criteria selected. For the purposes of this assessment the precautionary worst-case figure of 290 m has been used.

It is unlikely that bottlenose dolphin will be present in the vicinity of the proposed development during the period of construction at a range that could cause auditory injury.

As part of any potential future construction operations there will be a Marine Mammal Protection Plan developed in order to ensure that there is a minimal risk of potential impact on bottlenose dolphins arising from construction. As part of the Plan and likely industry standard Licence conditions there will be qualified and experienced marine mammal observers present during construction and the relevant JNCC guidelines will be followed and soft start procedures will be in place. These will further minimise the potential risk of a bottlenose dolphin being present in the area during construction. Consequently, it is predicted that there will not be an adverse effect with respect to auditory injury on bottlenose dolphins arising from construction.

8.1.2 Risk of disturbance impacts

Similar modelling has been undertaken to assess the potential risk of disturbance to bottlenose dolphins from construction operations. Table 8-2 presents a comparison between the mean predicted dB_{ht} behavioural avoidance impact ranges and the mean M-weighted SEL behavioural avoidance impact ranges for bottlenose dolphin.

The impact ranges for dB_{ht} differ substantially from those predicted using the M-weighted SEL criteria. The ranges using the M-weighted SEL criteria are thought to be highly optimistic, and are in conflict with the limited amount of published information currently

available. For instance, harbour porpoise have been found to avoid an area around similar pile driving operations out to a distance of 15 km (Tougaard *et al*. 2006). The most precautionary estimates for the extent of potential disturbance are that there is the potential for avoidance behaviour out to 8.5 km from the possible pile-driving operations.

The accumulated exposure to sound for marine mammals has also been assessed using the auditory injury criteria proposed by Southall *et al*. (2007). This has been done by calculating a standoff range for each marine mammal group, whereby it would safely be able to escape the affected area without receiving a damaging exposure to the sound. The results indicate that a bottlenose dolphin between 120 m and 820 m from the sound source may be impacted from a multiple sound source, i.e. repeated hammering of piles.

Table 8-2: Summary of impact ranges comparing the single pulse behavioural avoidance ranges predicted using the dB_{ht} criteria (Nedwell *et al*. 2007) and the M-weighted SEL approach (Southall *et al*. 2007)

dB_{ht} (Nedwell *et al*, 2007)		**M-weighted SELs (Southall *et al*, 2007)**	
Species	**Mean behavioural avoidance range (90 dB_{ht})**	**Equivalent M-weighting group**	**Mean behavioural avoidance range**
Bottlenose Dolphin	8.5 km	Mid Frequency Cetacean	120 m

The range at which potential an adverse behavioural response is predicted is up to 8.5 km for bottlenose dolphin. However, the behavioural effects are only expected to occur during the piling activities and as such are limited to a maximum time period of 24 hours per pile, although it is expected to take considerably less time than this. The piling of jacket structures is expected to require piles with smaller diameters and will take less time to install, although there will be a greater number of piles per platform. Any behavioural effects that occur to the bottlenose dolphin are expected to be reversible, in that their behaviour will no longer be changed when the piling activity has ceased. Furthermore, as bottlenose dolphins are present along the east coast of Scotland, it is predicted that the temporary displacement of animals from the Aberdeen Bay area will be mitigated by animals moving into other areas within their natural range albeit for a short period of time. Consequently, it is predicted that any potential behavioural responses will be of short duration and not significant.

No adverse effect

8.1.3 In-combination effects

Bottlenose dolphins from the Moray Firth SAC also occur in the Tay and Firth of Forth area. And therefore there is a potential for an in-combination impact with developments in the Moray Firth and Firth of Forth.

Currently there are no known planned construction activities being undertaken at any of the Round 3 or Scottish Territorial Waters proposed offshore wind farms in 2013; the first year of potential construction planned for the EOWDC. However, there is potential for some construction to be undertaken in 2014 and this may overlap with construction of one other proposed development in the Moray Firth (Table 5-2).

Should this occur then there may be a relatively short period of overlapping construction in 2014 during which time turbines may be installed at the proposed EOWDC. It is predicted that the installation of up to 11 turbines will take place over a period of approximately two weeks and at most four turbines might be installed using piling techniques. Consequently, there will be a relatively short period when activities that could impact on bottlenose dolphins overlap. However, the projects that have the potential to be constructing during the same period are both in excess of 100 km away and therefore the impacts arising from the

construction activities are not predicted to spatially overlap to an extent that will cause a cumulative effect that could be adverse. There may be some displacement of bottlenose dolphins away from an area during the relatively short period of time it will take to install turbines but this potential displacement is not considered to be significant either alone or in-combination with the possible other projects 100 km away.

No adverse effect

8.1.4 Conclusion

Taking into account data obtained from the proposed EOWDC and supported by published data from other sites along with industry standard mitigation measures it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SAC with regard to bottlenose dolphin.

8.2 Grey and Harbour (common) seals

Grey seal is a qualifying species for Isle of May Sac and Berwickshire and North Northumberland Coast SAC.

Harbour seal is a qualifying species for Firth of Tay and Eden Estuary SAC.

The Conservation Objectives for the sites are:

> *To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and*
>
> *To ensure for the qualifying species that the following are maintained in the long term:*
>
> - *Population of the species as a viable component of the site*
> - *Distribution of the species within site*
> - *Distribution and extent of habitats supporting the species*
> - *Structure, function and supporting processes of habitats supporting the species*
> - *No significant disturbance of the species*
>
> *Qualifying Species:*
>
> - *Grey seal*

Further information on the distribution of both grey and harbour seals is presented within the *Marine Mammal Impact Environmental Baseline Addendum* and *EIA Technical Report on Marine Mammals* (June 2012) assessments prepared for the proposed EOWDC.

A total of 162 individual seals, of which a total of 61 were grey seals, 49 harbour seals and 52 were unidentified seals were observed during boat based surveys undertaken within Aberdeen Bay.

Adult grey seals routinely move large distances. Grey seal movements have been studied in the North Sea using satellite-linked telemetry. In a study of animals at the Farne Islands and Abertay Sands, McConnell *et al.* (1999) found that movements were on two geographical scales: long and distant travel (up to 2,100 km away) to known haul-out sites; and local, repeated trips from haul-out sites to discrete offshore areas. Long-distance travel included visits to Orkney, Shetland, the Faroes, and far offshore into the Eastern Atlantic and the North Sea (Hammond *et al*. 2004). Recent telemetry studies have found that seals tagged as far south as the Farne Islands, Isle of May and Moray Firth have been found to enter the Pentland Firth area (SMRU 2011b).

In 88% of trips to sea, individual seals returned to the same haul-out site from which they departed. The durations of these return trips were short (typically 2-3 days) and their destinations at sea were often localized areas characterized by a seabed of gravel/sand. This is the preferred burrowing habitat of sandeels, an important component of grey seal diet. The limited distance from a haul-out site of return trips (about 40 km) indicates that the seals were foraging within the coastal zone, rather than further offshore (Hammond *et al*., 2004).

The analysis of the seal telemetry data has shown that grey seals tagged in both the Isle of May SAC and Berwickshire and North Northumberland coast SAC appear to routinely travel past Aberdeen through the proposed location on the way to the Pentland Firth.

The radio-tracking of adult female harbour seals in the inner Moray Firth (1988, 1989, 1992) during the breeding season indicated that seals foraged up to 45 km from the haul-out site, but females with pups restricted their range markedly during the early part of the lactation period (Thompson *et al*. 1994).

Generally it has been thought that harbour seals forage relatively close inshore within a range of 60 km from their haul-out sites (Thompson *et al.* 1996). However, recent information on foraging movements and the distribution at sea of harbour seals has highlighted greater travel distances, ranging from 10 km to 120 km, with a mean of 46 km (Hammond *et al*. 2004).

Data from satellite relay data loggers (SRDLs) have highlighted different foraging behaviour of harbour seals off southeast Scotland and around Orkney and Shetland. Off south-east Scotland, animals were found to be very faithful in their use of haul-out sites on land, and moderately site-faithful in the areas individuals used to forage. Duration of trips ranged from less than one day to 23 days, with a mean of 4.5 days. Foraging in the Moray Firth was mostly closer to the shore. Around Orkney and Shetland there are indications that seals tend to move between haul-outs sites within a 40 km radius of where they were captured with one animal hauling out as far as 200 km from where it was initially tagged. Foraging behaviour is also much more variable both in distance travelled and in the duration of trips. Most foraging trips are within 40 km of haul-outs but there are also longer distance trips to areas more than 200 km from haul-out sites (Hammond *et al*. 2004).

8.2.1 Evidence of physical impacts

Further detailed information on the potential impacts arising from the proposed development on Grey and harbour seals are presented in the EIA technical report on marine mammals (Appendix 12.2 of the Environmental Statement).

There is a risk of physical impacts on grey and harbour seals from the proposed development, particularly during the construction phase when wind turbines may be pile driven into the seabed. Noise generated from pile driving has the potential to cause a range of effects ranging from mortality to permanent physical damage, temporary physical damage and disturbance or displacement.

Underwater sound modelling based on the installation of an 8.5 m diameter monopole.

For the assessment of physical injury to marine mammals a number of different impact criteria including those proposed by Parvin *et al*. (2007), and also the audiological impact criteria that have been developed by Southall *et al*. (2007) have been used.

Sound levels used in the assessment of physical impacts to determine potential adverse effect on grey and harbour seal are:

- lethal effect may occur in seals where peak to peak levels exceed 240 dB re.1µPa
- physical injury may occur in seals where peak to peak levels exceed 220 dB re.1µPa

The results from the underwater noise modelling undertaken based on the worst-case scenario from piling an 8.5 m diameter turbine indicate that the lethal effect level (240 dB peak-peak) and the physical effect level (220 dB peak-peak) will be exceeded at a distance of 3 m and 60 m, respectively.

Although both Grey and harbour seals frequently occur in Aberdeen Bay it is predicted that it is unlikely that they will be within 3 m of the wind turbine during installation and therefore not at risk of mortality. However, it is recognised that seals may be curious and therefore may approach the proposed construction activities closer than other marine mammals. The use of a soft start and marine mammal observers complying with the relevant JNCC guidance will reduce the risk of a seal being present within close proximity of the construction activities.

The nearest SAC for grey seal is the Isle of May SAC which is approximately 119 km to the south and the Berwick and Northumberland Coast SAC which is approximately 150 km from the proposed development. The nearest SAC for which harbour seal is a qualifying species is the Firth of Tay & Eden Estuary SAC which lies 96 km to the south. Although there may be some passage of seals between this SAC and others in the Pentland Firth the number of

either grey or harbour seals present in Aberdeen Bay from these sites during the relatively short period of construction is predicted to be low, particularly noting that grey seals return from foraging trips to the same haul out site on 88% of occasions and that harbour seals are not known to undertake regular foraging trips of greater than 60 km and are therefore not likely to be in Aberdeen Bay.

Based on the modelling results it is predicted that there is a potential for auditory injury, i.e. permanent threshold shift of between 5 m and 130 m from the sound source, depending on the criteria selected. For the purposes of this assessment the precautionary worst-case figure of 130 m has been used.

The accumulated exposure to sound for marine mammals has been assessed using the auditory injury criteria proposed by Southall *et al*. (2007). This has been done by calculating a standoff range for each marine mammal group, whereby it would safely be able to escape the affected area without receiving a damaging exposure to the sound. The results indicate that a seal between 190 m and 3,600 m from the sound source may be impacted from a multiple sound source, i.e. repeated piling hammers.

It is expected that the perceived loudness of the piling activity will cause the marine mammal to exhibit an aversive behavioural reaction, with the animal moving from the area before the onset of any auditory injury can occur.

There is a risk to individual marine mammals that are exposed to high sound levels in the immediate vicinity of the piling operation, given that marine mammals may be subject to sound levels that are capable of causing physical impacts, including both auditory and non-auditory impacts. Animals would have to be present within the immediate area of the pile driver to be at risk of physical effects and it is considered the risk of marine mammals receiving sound levels capable of causing their death is remote.

There is a potential risk of physical injury to both harbour and grey seals from collisions with vessels, in particular vessels with azimuth thrusters that are thought to cause the deaths of seals. The majority of injuries have occurred during the breeding seasons (Thompson *et al*. 2010). Ongoing work is being undertaken to determine the exact cause of the corkscrew injuries but until a better understanding is obtained on the cause and scale of impacts on seals best practice and latest guidance will be followed to minimise the risk of an impact on seals.

8.2.2 Evidence of disturbance impacts

Similar modelling has been undertaken to assess the potential risk of disturbance to grey and harbour seals from construction operations. Table 8-3 presents a comparison between the mean predicted dB_{ht} behavioural avoidance impact ranges and the mean M-weighted SEL behavioural avoidance impact ranges for harbour seals.

The impact ranges for dB_{ht} differ substantially from those predicted using the M-weighted SEL criteria. The ranges using the M-weighted SEL criteria are thought to be highly optimistic, and are in conflict with the limited amount of published information currently available. For instance, harbour porpoise have been found to avoid an area around similar pile driving operations out to a distance of 15 km (Tougaard *et al*. 2006). The most precautionary estimates for the extent of potential disturbance are that there is the potential for avoidance behaviour out to 8.5 km from the possible pile-driving operations.

The accumulated exposure to sound for marine mammals has also been assessed using the auditory injury criteria proposed by Southall *et al*. (2007). This has been done by calculating a standoff range for each marine mammal group, whereby it would safely be able to escape the affected area without receiving a damaging exposure to the sound. The results indicate that a bottlenose dolphin between 120 m and 820 m from the sound source may be impacted from a multiple sound source, i.e. repeated hammering of piles.

Table 8-3: Summary of impact ranges for harbour seals comparing the single pulse behavioural avoidance ranges predicted using the dB_{ht} criteria (Nedwell *et al*. 2007) and the M-weighted SEL approach (Southall *et al*. 2007)

dB_{ht} (Nedwell *et al*, 2007)		M-weighted SELs (Southall *et al*, 2007)	
Species	**Mean behavioural avoidance range (90 dB_{ht})**	**Equivalent M-weighting group**	**Mean behavioural avoidance range**
Harbour seal	9.6 km	Pinnepeds in water	1.6 km

The range at which potential adverse behavioural responses to harbour seals is up to 9.6 km and it is predicted that it will be the very similar for grey seals. The behavioural effects are only expected to occur during the piling activities and as such are limited to a maximum time period of 24 hours per pile; although it is expected to take considerably less time than this. Any behavioural effects that occur to the Seals are expected to be reversible, in that their behaviour will no longer be changed when the piling activity has ceased. Furthermore, as the seals that may be present are from SACs to the south of the proposed development area and any individuals present in Aberdeen Bay from the qualify sites are likely to be in transit and not resident, the potential displacement away from Aberdeen Bay will be temporary. It is therefore predicted that individuals in transit will not remain in the area of potential disturbance. Consequently, it is predicted that any potential behavioural responses will be of short duration and not significant.

No adverse effect

8.2.3 In-combination effects

Grey seals from the Isle of May SAC and the Berwick and Northumberland SAC are likely to occur in areas of other potential offshore renewable projects, particularly in the Firth of Forth where there are currently three proposed offshore wind farms. Therefore there is a potential for an in-combination impact with developments in the Moray Firth.

Currently there are no known planned construction activities being undertaken at any of the Round 3 or Scottish Territorial Waters proposed offshore wind farms in 2013; the first year of potential construction planned for the EOWDC. However, there is potential for construction to be delayed and undertaken in 2014, this may overlap with construction of one of the Moray Firth developments (Table 5-2).

Should this occur then there may be a relatively short period of overlapping construction in 2014 during which time seven turbines may be installed over a period of approximately seven days at the proposed EOWDC. Consequently, there will be a relatively short period when activities that could impact on seals overlap. However, the proposed Neart Na Gaoithe development is in excess of 100 km from the proposed EOWDC site and therefore the impacts arising from them, i.e. noise will not spatially overlap. There may be some displacement of grey and or harbour seals away from an area during the short period of time it will take to install up to seven turbines but this potential displacement is not considered to be significant either alone or in-combination with the possible other project 100 km away.

No adverse effect

8.2.4 Conclusion

Taking into account data obtained from the proposed EOWDC and supported by published data from other sites along with industry standard mitigation measures it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SAC with regard to grey seal or harbour seal.

8.3 Atlantic Salmon

The Atlantic Salmon is a qualifying species for the River Dee SAC and River South Esk SAC.

The Conservation Objectives are:

> *To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and*
>
> *To ensure for the qualifying species that the following are maintained in the long term:*
>
> - *Population of the species, including range of genetic types for salmon, as a viable component of the site*
> - *Distribution of the species within site*
> - *Distribution and extent of habitats supporting the species*
> - *Structure, function and supporting processes of habitats supporting the species*
> - *No significant disturbance of the species*
> - *Distribution and viability of freshwater pearl mussel host species*
> - *Structure, function and supporting processes of habitats supporting*
> - *freshwater pearl mussel host species*
>
> *Qualifying species*
>
> • *Atlantic salmon*

Further information on the Atlantic Salmon is presented within the *Salmon and Sea Trout Ecology and Fisheries Baseline Assessment* and the *Salmon and Sea trout Impact Assessment* sections of the EIA (Appendices 22.1 and 22.2 of the Environmental Statement).

Atlantic Salmon has complex lifecycles during which they spend a proportion of their lives in both freshwater and saltwater.

Young salmon remain in the rivers where they hatched for up to four or five years, although in Scottish rivers two or three years is more usual. They then migrate down river to the sea between April and June where they remain for at least one year before returning back up river, usually in the summer and autumn.

When salmon leave the rivers they do so together in shoals leaving the rivers rapidly. The exact migration routes of Salmon from Scottish rivers are not precisely known but they are known to occur in the north-west Atlantic and around West Greenland and the Faroes. The fish swim rapidly at a rate of between 7 - 30 km per day near to the sea surface and can rapidly travel over long distances.

Salmon return to the rivers throughout the year with no specific migration period; although first year salmon return predominantly during early summer through to the autumn. However for returning salmon over a year old they can return throughout most of the year. Returning salmon do not delay entry into the rivers and move into them as long as the river conditions are suitable. It is thought that returning salmon migrate along the coasts before entering their rivers.

A review paper by Malcolm *et al.* (2010), suggests a range of potential migratory routes for salmon in Scottish coastal waters, primarily using the results of adult fish tagging studies and the spatial distribution of tag returns from adult fish tagged as smolts as they left Scottish rivers.

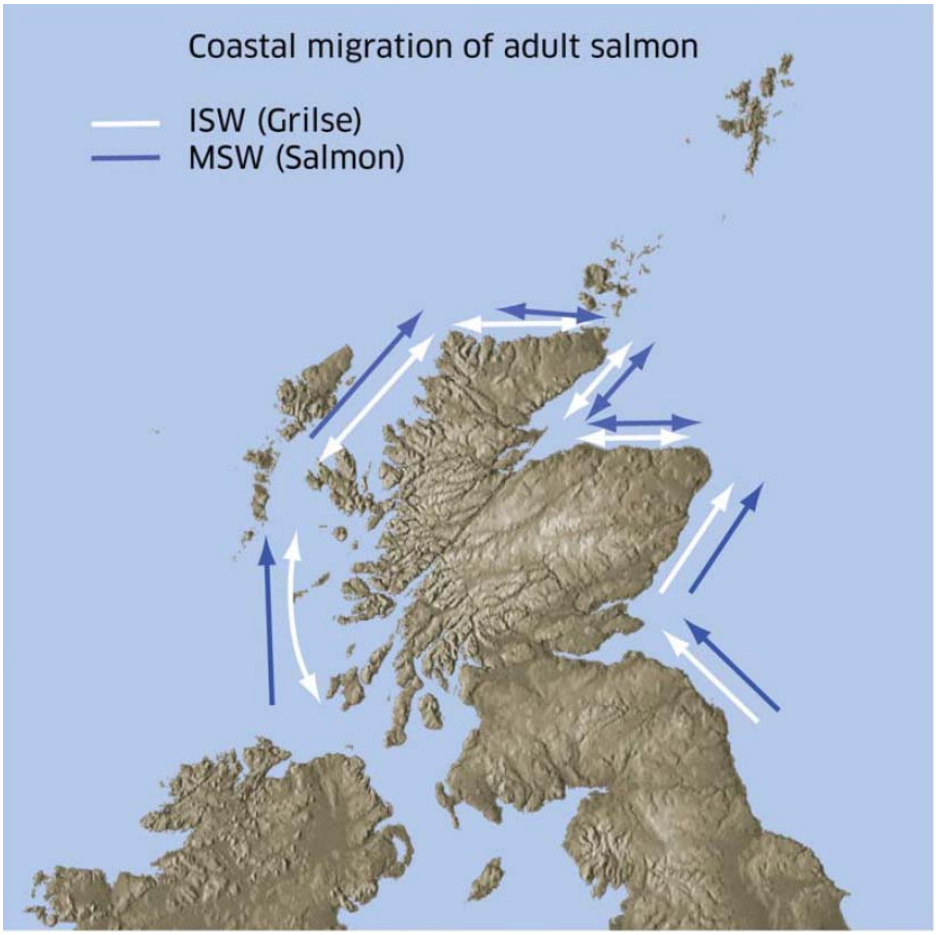

Figure 8-2: Predicted routes of Scottish Atlantic salmon (Malcolm *et al.* 2010)

Salmon entering the River South Esk SAC and River Dee SAC do so from a southerly direction and leave the rivers moving north.

8.3.1 Evidence of physical impacts from noise

Potential adverse effects could arise from noise generated during the construction, operation and decommissioning phases of the proposed development. In particular, during the construction period where, should piling occur, the highest noise levels will arise.

Noise modelling undertaken for the proposed EOWDC predict that should piling of 8.5 m diameter piles take place, there is the potential for traumatic hearing damage to Atlantic salmon (based on 130 dB_{ht}) at distances of 20 m or less from the piling operations.

The results from noise modelling undertaken indicate that lethal effects on Atlantic salmon from pile driving associated with the proposed development will only occur out to 3 m from the source. Physical hearing damage may occur out to 20 m or less. Based on the very close range at which salmon are predicted to be required to be in order to have a physical impact and the low numbers of salmon that could occur within the small spatial area it is predicted that there will not be any adverse effect on the Atlantic salmon associated with either the River Dee SAC or River South Esk SAC.

8.3.2 Evidence of behavioural impacts from noise

Modelling undertaken based on the piling of 8.5 m diameter piles indicates that there is the potential for a strong behavioural reaction out to between 3.6 km and 4.7 km from the construction activities based on a threshold of 90 dB_{ht} and that at levels of 75 dBht up to 85% of salmon may react to noise. The results from the noise modelling undertaken are presented in Figure 8-3.

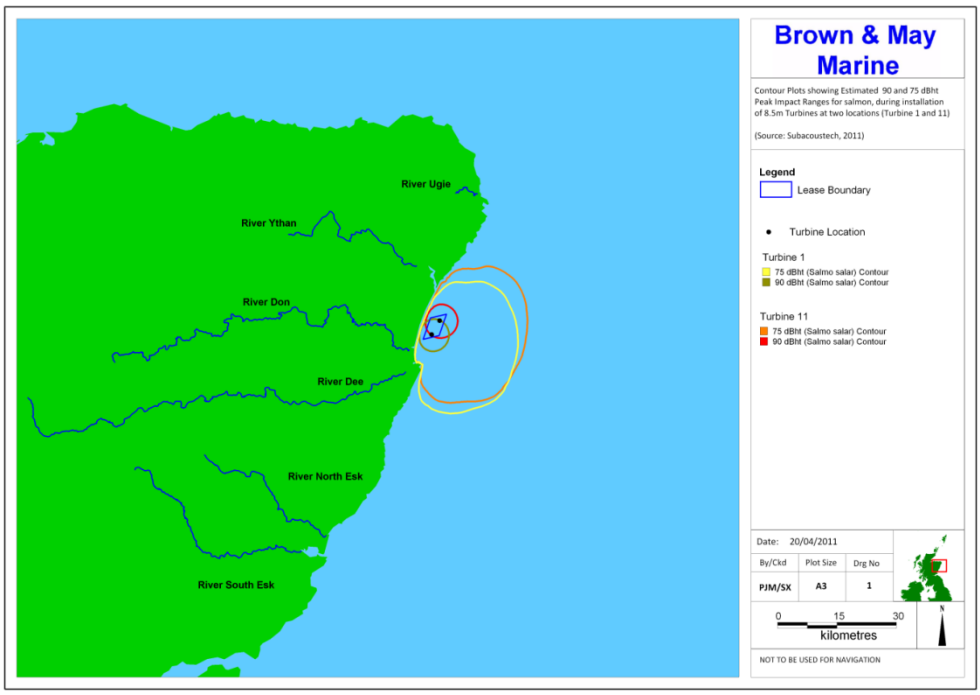

Figure 8-3: Contour Plots showing Estimated 90 and 75dB_{ht} *(Salmo salar)* peak impact ranges during installation of 8.5 m diameter wind turbines at two locations (Turbine 1 and 11)

Salmon are considered to be poor at detecting sounds within the water column although they may be able to detect substrate borne sounds (Gill and Bartlett, 2010).

Salmon smolts and post smolts leaving the SACs do so rapidly leaving the rivers between April and June and most likely move northwards towards north-west Atlantic, Greenland and the Faroes and unlike returning adults do not necessarily follow the coastlines. Therefore, there is the potential for salmon leaving the relevant SACs to occur within the vicinity of the proposed development. However, the number of salmon smolts and post smolts likely to be in the area of potential impact at any one time is predicted to be low and the consequences to those that could be effected may mean that either they delay their departure from the rivers for the relatively short period of time during construction or they may detour around the sound source during the period of migration. The scale of any detour is very small compared to the distances travelled during migration. It is predicted that any behavioural responses arising from construction of the proposed development will not have an adverse effect.

Adult salmon returning to the River South Esk will not be impacted by the construction activities associated with the proposed development as they return to the river from the south and therefore outwith any zone of potential effect. Salmon returning to the River Dee SAC may be impacted as there is a potential overlap with sound sources that could cause behavioural responses and the River Dee SAC. There are predicted to be potentially two behavioural responses that may occur. Returning Atlantic salmon may delay their entry into the river during piling activities or they may ignore the sound source and enter the river without delay. Should they delay their entry into the River Dee SAC then it will for the duration of piling operations which are predicted to last no longer than 24 hrs per wind

turbine and therefore of relatively short duration. Although Atlantic salmon do not delay entry into rivers if the conditions are right, they are known to do so if natural river conditions aren't suitable. Therefore, should there be some avoidance owing to piling operations (if they occur) during the migrating periods, then a temporary delay in migrating into the rivers would not likely have an adverse effect on the salmon.

Studies undertaken at offshore wind farms have not reported operational noise as having an adverse effect on fish species with no decreases in the numbers of fish present within turbine arrays during the operational period of a wind farm. Studies undertaken on Atlantic salmon indicate that although salmon can detect operational turbines at a distance of 0.4 km and 0.5 km behavioural responses only occurred 4 m and then only at high wind speeds (above 30m/s) (Walhberg & Westerberg 2005).

Based on the above it is predicted that the potential noise impacts arising from the proposed project will not have an adverse effect on the Atlantic salmon associated with the River Dee SAC or River South Esk SAC.

No adverse effect

8.3.3 Evidence of impacts from increased sediments

Construction activities such as cable laying, piling and rock placement have potential to result in temporary sediment re-suspension increasing turbidity.

Suspended sediment concentrations within Aberdeen Bay range from 0.1 to 43.1 mg/l with an average of 20.7 mg/l. Sediment modelling has indicated that following construction there is the potential for a sediment plume to occur with a maximum concentration of 35mg/l extending from Aberdeen Harbour to approximately 3 km south of the River Ythan.

Salmon can be affected by high sediment loads, which if high enough can be lethal or at lower levels cause behavioural changes. Lethal sediment loads typically range from between hundreds and thousands mg/l, whilst sub-lethal effects may occur at lower levels, ranging from tens to hundreds mg/l depending on species specific tolerance. Salmon are considered tolerant of relatively high sediment loads with behavioural changes occurring at between 60 to 180 mg/l and therefore unlikely to be affected by the potentially increased loads arising during construction period. The duration of any impact will be short and should it occur only during the period of construction, which is predicted to be less than 24 hrs per turbine. It is therefore predicted that there is unlikely to be an adverse effect arising from the proposed development on Atlantic salmon due to possible short-term increased in turbidity.

8.3.4 Evidence of impacts from Electromagnetic Fields

The magnetic fields anticipated to be produced by the AC cables associated with the proposed EOWDC are small (1.5 μT) in comparison to the Earth's magnetic field (approximately 50 μT). Atlantic salmon are expected to perceive these magnetic fields as new localised additions to the heterogeneous pattern of geomagnetic anomalies already occurring naturally and anthropogenically in the sea (MS, 2011).

The location of the proposed development, to the north of the River Dee SAC and River South Esk SAC means that returning salmon from the south will not be impacted by any potential EMF arising from the proposed development.

Salmon leaving the SACs may pass across the cables and therefore detect an electro magnetic field. However, studies undertaken on chum salmon and other fish species have not been able to detect any effects from magnetic fields (OSPAR 2008). Consequently, it is predicted that there will not be an adverse effect on Atlantic salmon from electro-magnetic fields.

No adverse effect

8.3.5 In-combination effects

Atlantic salmon from the relevant SACs may also occur in either the proposed developments in the Moray Firth or the Firth of Forth.

Currently there are no known planned construction activities being undertaken at any of the Round 3 or Scottish Territorial Waters proposed offshore wind farms in 2013, the first year of potential construction planned for the EOWDC. There is potential for some construction to be undertaken in 2014 and this may overlap with construction of one other proposed development in the Moray Firth (Table 5-2).

Should this occur then there may be a relatively short period of overlapping construction in 2014 during which seven turbines may be installed at the proposed EOWDC. The relatively short duration of any overlapping activities and that the projects are both in excess of 100 km away it is predicted that should there be any in-combination effects they will not cause an adverse effect on the Atlantic salmon associated with the River Dee and River South Esk SACs.

No adverse effect

8.3.6 Conclusion

Taking into account data obtained from the proposed EOWDC and supported by published data from other sites it is concluded that the proposed development either alone or in-combination will not cause an adverse effect on the integrity of the relevant SACs with regard to Atlantic Salmon.

8.4 Freshwater Pearl Mussel

The Freshwater Pearl Mussel is a qualifying species for the River Dee SAC and the River South Esk SAC.

The Conservation Objectives are:

> *To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and*
>
> *To ensure for the qualifying species that the following are maintained in the long term:*
>
> - *Population of the species, including range of genetic types for salmon, as a viable component of the site*
> - *Distribution of the species within site*
> - *Distribution and extent of habitats supporting the species*
> - *Structure, function and supporting processes of habitats supporting the species*
> - *No significant disturbance of the species*
> - *Distribution and viability of freshwater pearl mussel host species*
> - *Structure, function and supporting processes of habitats supporting*
> - *freshwater pearl mussel host species*
>
> *Qualifying species*
>
> - *Freshwater Pearl Mussel*

The freshwater pearl mussel is dependent on salmonid fish during the larval stage of their life cycle, during which time they attach themselves onto the gills of salmon or brown trout until the following summer when they drop off onto the river bed. There is therefore a theoretical possibility that, should there be any significant displacement of salmon or brown trout from their spawning rivers, there could be an adverse effect on the freshwater pearl mussel. As indicated above, it is concluded that any potential effect, either alone or in-combination on Atlantic salmon would, should one occur, be localised, of short duration and only likely to affect a small number of individuals. The same conclusions are made with respect to brown trout.

It is therefore predicted that there will not be any adverse effects on the host species from the proposed development. Consequently, it is not anticipated that there will not be any impact on the freshwater pearl mussel.

No adverse effect

9.0 CONCLUSIONS

Based on data obtained from the proposed EOWDC area and supported by published data from other sites, it is concluded that sufficient information is available to enable a Habitats Regulations Appraisal to be undertaken should it be required. It is concluded that the proposed EOWDC will not cause, on its own or in-combination, an adverse effect on the integrity of the relevant European Sites. Agreed mitigation measures will further reduce the risk of any potential impact. An agreed monitoring programme to be prepared in consultation with the Regulator and advisors will further ensure that the conclusions made are valid.

A detailed monitoring programme aimed at specific issues or concerns are to be developed with the Regulator and advisors should consent be granted.

The proposed EOWDC aims to encourage and enable environmental monitoring through research and development. The research and monitoring will seek to answer outstanding questions on environmental impacts from offshore wind, including those on birds.

In order to facilitate the delivery of research a steering group will be formed and managed by an R&D manager. Specialist working groups will provide the detailed technical competences supporting the R&D.

Future research and monitoring will be agreed through the R&D working group but potential monitoring and research includes:

- Collision risk studies on birds;
- Tagging and tracking studies of seabirds to and from breeding colonies and outwith the breeding season to look at barrier effects;
- Specific studies aimed at determining potential changes in bird distribution, i.e. displacement or attractant effects;
- Studies looking at potential secondary impacts on prey species, e.g. changes in prey fish and benthic distributions.

Further discussions will help develop these and other ideas into meaningful projects from which useful results will be obtained.

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11.0 APPENDIX A - SPAS

	Buchan Ness to Collieston Coast SPA
Area	5,400.94 ha
Article 4.1	-
Article 4.2 – Migratory Species	-
Article 4.2 – Assemblage	Assemblage Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Herring Gull *Larus argentatus*, Shag *Phalacrocorax aristotelis*, Fulmar *Fulmarus glacialis*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Fulmar (*Fulmarus glacialis)* Guillemot (*Uria aalge*) Herring gull (*Larus argentatus)* Kittiwake (*Rissa tridactyla*) Shag (*Phalacrocorax aristotelis)* Seabird assemblage	

	Caithness and Sutherland Peatlands SPA and Ramsar
Area	145,516.75 ha
Article 4.1	Breeding Red- throated diver, Black-throated diver, Hen harrier, Golden eagle, Merlin, Golden plover, Wood sandpiper, Short-eared owl
Article 4.2 – Migratory Species	Dunlin
Article 4.2 – Assemblage	-
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Black-throated diver (*Gavia arctica*) Common scoter (*Melanitta nigra*) Dunlin (*Calidris alpina schinzii*) Golden eagle (*Aquila chrysaetos*) Golden plover (*Pluvialis apricaria*) Greenshank (*Tringa nebularia*) Hen harrier (*Circus cyaneus*) Merlin (*Falco columbarius*) Red-throated diver (*Gavia stellata*) Short-eared owl (*Asio flammeus*) Wigeon (*Anas penelope*) Wood sandpiper (*Tringa glareola*)	

	Copinsay SPA
Area	3,607.7 ha
Article 4.1	-
Article 4.2 – Migratory Species	**-**
Article 4.2 – Assemblage	Seabirds Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Great Black-backed Gull *Larus marinus*, Fulmar *Fulmarus glacialis*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Great Black-backed Gull *Larus marinus*, Fulmar *Fulmarus glacialis* Seabird assemblage	

	East Caithness Cliffs SPA
Area	11,690.92 ha
Article 4.1	Breeding Peregrine *Falco peregrinus*,
Article 4.2 – Migratory Species	Breeding Guillemot *Uria aalge*, Herring Gull *Larus argentatus*, Kittiwake *Rissa tridactyla*, Razorbill *Alca torda*, Shag *Phalacrocorax aristotelis*,
Article 4.2 – Assemblage	Seabirds Puffin *Fratercula arctica*, Great Black-backed Gull *Larus marinus*, Cormorant *Phalacrocorax carbo*, Fulmar *Fulmarus glacialis*, Razorbill *Alca torda*, Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Herring Gull *Larus argentatus*, Shag *Phalacrocorax aristotelis*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Cormorant (*Phalacrocorax carbo*) Fulmar (*Fulmarus glacialis*) Great black-backed gull (*Larus marinus*) Guillemot (*Uria aalge*) Herring gull (*Larus argentatus*) Kittiwake (*Rissa tridactyla*) Peregrine (*Falco peregrinus*) Puffin (*Fratercula arctica*) Razorbill (*Alca torda*) Shag (*Phalacrocorax aristotelis*) Seabird assemblage	

	Fair Isle SPA
Area	6824.4 ha
Article 4.1	Breeding Arctic Tern *Sterna paradisaea*, Fair Isle Wren *Troglodytes troglodytes fridariensis*,
Article 4.2 – Migratory Species	Breeding Guillemot *Uria aalge*
Article 4.2 – Assemblage	Seabirds Puffin *Fratercula arctica*, Razorbill *Alca torda*, Kittiwake *Rissa tridactyla*, Great Skua *Catharacta skua*, Arctic Skua *Stercorarius parasiticus*, Shag *Phalacrocorax aristotelis*, Gannet *Morus bassanus*, Fulmar *Fulmarus glacialis*, Guillemot *Uria aalge*, Arctic tern *Sterna paradisaea*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Arctic skua (*Stercorarius parasiticus)* Arctic tern (*Sterna paradisaea)* Fair Isle wren (*Troglodytes troglodytes fridariensis)* Fulmar (*Fulmarus glacialis)* Gannet (*Morus bassanus*) Great skua (*Stercorarius skua*) Guillemot (*Uria aalge)* Kittiwake (*Rissa tridactyla)* Puffin (*Fratercula arctica)* Razorbill (*Alca torda)* Shag (*Phalacrocorax aristotelis)* Seabird assemblage	

	Fetlar SPA & Ramsar
Area	16,962.16 ha
Article 4.1	Breeding Arctic tern *Sterna paradisaea*, Red-necked phalarope *Phalaropus lobatus*
Article 4.2 – Migratory Species	**B**reeding Dunlin *Calidris alpina schinzii*, Great skua *Catharacta skua*, Whimbrel *Numenius phaeopus*.
Article 4.2 – Assemblage	Arctic Skua *Stercorarius parasiticus*, Fulmar *Fulmarus glacialis*, Great Skua *Catharacta skua*, Arctic Tern *Sterna paradisaea*, Red-necked phalarope *Phalaropus lobatus*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Arctic skua (*Stercorarius parasiticus*) Arctic tern (*Sterna paradisaea*) Dunlin (*Calidris alpina schinzii*) Fulmar (*Fulmarus glacialis*) Great skua (*Stercorarius skua*) Red-necked phalarope (*Phalaropus lobatus*) Whimbrel (*Numenius phaeopus*) Seabird assemblage	

	Firth of Forth SPA & Ramsar
Area	6,313.72 ha
Article 4.1	Passage; Sandwich Tern *Sterna sandvicensis*, Winter; Bar-tailed Godwit *Limosa lapponica*, Golden Plover *Pluvialis apricaria*, Red-throated Diver *Gavia stellata*Slavonian Grebe *Podiceps auritus*
Article 4.2 – Migratory Species	Winter; Knot *Calidris canutus*, Pink-footed Goose *Anser brachyrhynchus*, Redshank *Tringa totanus*,, Shelduck *Tadorna tadorna*, Turnstone *Arenaria interpres*,
Article 4.2 – Assemblage	Assemblage Scaup *Aythya marila*, Slavonian Grebe *Podiceps auritus*, Golden Plover *Pluvialis apricaria*, Bar-tailed Godwit *Limosa lapponica*, Pink-footed Goose *Anser brachyrhynchus*, Shelduck *Tadorna tadorna*, Knot *Calidris canutus*, Redshank *Tringa totanus*, Turnstone *Arenaria interpres*, Great Crested Grebe *Podiceps cristatus*, Cormorant *Phalacrocorax carbo*, Red-throated Diver *Gavia stellata*, Mallard *Anas platyrhynchos*, Curlew *Numenius arquata*, Eider *Somateria mollissima*, Long-tailed duck *Clangula hyemalis*, Common Scoter *Melanitta nigra*, Velvet Scoter *Melanitta fusca*, Goldeneye *Bucephala clangula*, Red-breasted Merganser *Mergus serrator*, Oystercatcher *Haematopus ostralegus*, Ringed Plover *Charadrius hiaticula*, Grey Plover *Pluvialis squatarola*, Lapwing *Vanellus vanellus*, Dunlin *Calidris alpina alpina*, Wigeon *Anas penelope*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Bar-tailed godwit (*Limosa lapponica)* Common scoter *(Melanitta nigra)* Cormorant (*Phalacrocorax carbo)* Curlew (*Numenius arquata)** Dunlin (*Calidris alpina alpina)* Eider (*Somateria mollissima)* Golden plover (*Pluvialis apricaria)*	

	Firth of Forth SPA & Ramsar
	Goldeneye (*Bucephala clangula)*
	Great crested grebe (*Podiceps cristatus)*
	Grey plover (*Pluvialis squatarola*)
	Knot (*Calidris canutus)*
	Lapwing (*Vanellus vanellus)*
	Long-tailed duck (*Clangula hyemalis)*
	Mallard (*Anas platyrhynchos)*
	Oystercatcher (*Haematopus ostralegus)*
	Pink-footed goose (*Anser brachyrhynchus)*
	Red-breasted merganser (*Mergus serrator)*
	Redshank (*Tringa totanus)*
	Red-throated diver (*Gavia stellata)*
	Ringed plover (*Charadrius hiaticula)*
	Sandwich tern (*Sterna sandvicensis)*
	Scaup (*Aythya marila)*
	Shelduck (*Tadorna tadorna)*
	Slavonian grebe (*Podiceps auritus)*
	Turnstone (*Arenaria interpres)*
	Velvet scoter (*Melanitta fusca)*
	Wigeon (*Anas penelope)**
	Waterfowl assemblage

	Firth Tay & Eden Estuary SPA & Ramsar
Area	6,923.29 ha
Article 4.1	Breeding; Little Tern *Sterna albifrons* Marsh Harrier *Circus aeruginosus*, Winter; Bar-tailed Godwit *Limosa lapponica*,
Article 4.2 – Migratory Species	Winter; Greylag Goose *Anser anser,* Pink-footed Goose *Anser brachyrhynchus*, Redshank *Tringa totanus*
Article 4.2 – Assemblage	Assemblage Velvet Scoter *Melanitta fusca*, Pink-footed Goose *Anser brachyrhynchus*, Greylag Goose *Anser anser,* Redshank *Tringa totanus*, Cormorant *Phalacrocorax carbo*, Shelduck *Tadorna tadorna*, Eider *Somateria mollissima*, Bar-tailed Godwit *Limosa lapponica*, Common Scoter *Melanitta nigra*, Black-tailed Godwit *Limosa limosa islandica*, Goldeneye *Bucephala clangula*, Red-breasted Merganser *Mergus serrator*, Goosander *Mergus merganser*, Oystercatcher *Haematopus ostralegus*, Grey Plover *Pluvialis squatarola*, Sanderling *Calidris alba*, Dunlin *Calidris alpina alpina*, Long-tailed duck *Clangula hyemalis*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Bar-tailed godwit (*Limosa lapponica*) Black-tailed godwit (*Limosa limosa islandica)* Common scoter (*Melanitta nigra*) Cormorant (*Phalacrocorax carbo*) Dunlin (*Calidris alpina alpina)* Eider *(Somateria mollissima)* Goldeneye (*Bucephala clangula)*	

	Firth Tay & Eden Estuary SPA & Ramsar
	Goosander (*Mergus merganser*)
	Grey plover (*Pluvialis squatarola*)
	Greylag goose (*Anser anser*)
	Little tern (*Sterna albifrons*)
	Long-tailed duck (*Clangula hyemalis*)
	Marsh harrier (*Circus aeruginosus*)
	Oystercatcher (*Haematopus ostralegus*)
	Pink-footed goose (*Anser brachyrhynchus*)
	Red-breasted merganser (*Mergus serrator*)
	Redshank (*Tringa totanus*)
	Sanderling (*Calidris alba*)
	Shelduck (*Tadorna tadorna*)
	Velvet scoter (*Melanitta fusca*)
	Waterfowl assemblage

	Forth Islands SPA
Area	9,796.98 ha
Article 4.1	Breeding; Arctic Tern *Sterna paradisaea*, Common Tern *Sterna hirundo* Roseate Tern *Sterna dougallii*, Sandwich Tern *Sterna sandvicensis*,
Article 4.2 – Migratory Species	Breeding; Gannet *Morus bassanus*, Lesser Black-backed Gull *Larus fuscus*, Puffin *Fratercula arctica*, Shag *Phalacrocorax aristotelis*,
Article 4.2 – Assemblage	Assemblage Razorbill *Alca torda*, Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Herring Gull *Larus argentatus*, Cormorant *Phalacrocorax carbo*, Fulmar *Fulmarus glacialis*, Puffin *Fratercula arctica*, Lesser Black-backed Gull *Larus fuscus*, Shag *Phalacrocorax aristotelis*, Gannet *Morus bassanus*, Arctic Tern *Sterna paradisaea*, Common Tern *Sterna hirundo*, Roseate Tern *Sterna dougallii*, Sandwich Tern *Sterna sandvicensis*

Conservation Objectives

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species:

Arctic tern (*Sterna paradisaea*)
Common tern (*Sterna hirundo*)
Cormorant (*Phalacrocorax carbo*)
Fulmar (*Fulmarus glacialis*)
Gannet (*Morus bassanus*)
Guillemot (*Uria aalge*)
Herring gull (*Larus argentatus*)
Kittiwake (*Rissa tridactyla*)
Lesser black-backed gull (*Larus fuscus*)
Puffin (*Fratercula arctica*)
Razorbill (*Alca torda*)
Roseate tern (*Sterna dougallii*)

	Forth Islands SPA
	Sandwich tern (*Sterna sandvicensis*)
	Shag (*Phalacrocorax aristotelis*)
	Seabird assemblage

	Foula SPA
Area	7985.49 ha
Article 4.1	Breeding Arctic Tern *Sterna paradisaea*, Leach's Storm-petrel *Oceanodroma leucorhoa* Red-throated Diver *Gavia stellata*,
Article 4.2 – Migratory Species	Breeding Great Skua *Catharacta skua*, Guillemot *Uria aalge*, Puffin *Fratercula arctica* Shag *Phalacrocorax aristotelis*,
Article 4.2 – Assemblage	Leach's Storm-petrel *Oceanodroma leucorhoa*, Razorbill *Alca torda*, Kittiwake *Rissa tridactyla*, Arctic Skua *Stercorarius parasiticus*, Fulmar *Fulmarus glacialis*, Puffin *Fratercula arctica*, Guillemot *Uria aalge*, Great Skua *Catharacta skua*, Shag *Phalacrocorax aristotelis*, Arctic Tern *Sterna paradisaea*.

Conservation Objectives

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species:

Arctic skua (*Stercorarius parasiticus*),
Arctic tern (*Sterna paradisaea*),
Fulmar (*Fulmarus glacialis*),
Great skua (*Catharacta skua),*
Guillemot (*Uria aalge),*
Kittiwake (*Rissa tridactyla*),
Leach's petrel (*Oceanodroma leucorhoa),*
Puffin (*Fratercula arctica),*
Razorbill (Alca torda),
Red-throated diver (*Gavia stellata*),
Shag (*Phalacrocorax aristotelis*),
Seabird assemblage

	Fowlsheugh SPA
Area	1,303.54 ha
Article 4.1	Breeding; -
Article 4.2 – Migratory Species	Breeding; Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*,
Article 4.2 – Assemblage	Assemblage Razorbill *Alca torda*, Herring Gull *Larus argentatus*, Fulmar *Fulmarus glacialis*, Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Fulmar (*Fulmarus glacialis*) Guillemot (*Uria aalge)* Herring gull (*Larus argentatus*) Kittiwake (*Rissa tridactyla)* Razorbill (*Alca torda*) Seabird assemblage.	

	Hermaness Saxa Vord & Valla Field SPA & Ramsar
Area	6,833.04 ha
Article 4.1	Breeding Red-throated Diver *Gavia stellata*
Article 4.2 – Migratory Species	Breeding Gannet *Morus bassanus*, Great Skua *Catharacta skua*, Puffin *Fratercula arctica*
Article 4.2 – Assemblage	Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Shag *Phalacrocorax aristotelis*, Fulmar *Fulmarus glacialis*, Puffin *Fratercula arctica*, Great Skua *Catharacta skua*, Gannet *Morus bassanus*.

Conservation Objectives

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species:

Fulmar (*Fulmarus glacialis)*
Gannet (*Morus bassanus)*
Great skua (*Catharacta skua)*
Guillemot (*Uria aalge)*
Kittiwake (*Rissa tridactyla*)
Puffin (*Fratercula arctica)*
Red-throated diver (*Gavia stellata)*
Shag (*Phalacrocorax aristotelis)*
Seabird assemblage

	Loch of Skene SPA & Ramsar
Area	120.89 ha
Article 4.1	Wintering Whooper Swan *Cygnus cygnus*
Article 4.2 – Migratory Species	Wintering Greylag goose *Anser anser*,
Article 4.2 – Assemblage	-
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: ▪ Greylag goose (*Anser anser*)	

	Loch of Strathbeg SPA & Ramsar
Area	615.94 ha
Article 4.1	Breeding Sandwich Tern *Sterna sandvicensis*, Winter; Barnacle Goose *Branta leucopsis*, Whooper Swan *Cygnus cygnus,*
Article 4.2 – Migratory Species	Winter; Greylag Goose *Anser anser*, Pink-footed Goose *Anser brachyrhynchus*,
Article 4.2 – Assemblage	Assemblage Teal *Anas crecca*, Greylag Goose *Anser anser,* Pink-footed Goose *Anser brachyrhynchus*, Barnacle Goose *Branta leucopsis,* Whooper Swan *Cygnus cygnus* .

Conservation Objectives

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species:

Barnacle goose (*Branta leucopsis*)

Greylag goose (*Anser anser)*

Pink-footed goose (*Anser brachyrhynchus*)

Sandwich tern (*Sterna sandvicensis)*

Teal (*Anas crecca)*

Whooper swan (*Cygnus cygnus)*

Waterfowl assemblage

	Montrose Basin SPA & Ramsar
Area	984.61 ha
Article 4.1	Breeding; -
Article 4.2 – Migratory Species	Winter; Greylag Goose *Anser anser,*, Knot *Calidris canutus*, Pink-footed Goose *Anser brachyrhynchus*, Redshank *Tringa totanus*,
Article 4.2 – Assemblage	Assemblage Dunlin *Calidris alpina alpina*, Oystercatcher *Haematopus ostralegus*, Eider *Somateria mollissima*, Wigeon *Anas penelope*, Shelduck *Tadorna tadorna*, Redshank *Tringa totanus*, Knot *Calidris canutus*, Greylag Goose *Anser anser,* Pink-footed Goose *Anser brachyrhynchus*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Dunlin (*Calidris alpina alpina*) Eider (*Somateria mollissima*) Greylag goose (*Anser anser*) Knot (*Calidris canutus*) Oystercatcher (*Haematopus ostralegus*) Pink-footed goose (*Anser brachyrhynchus*) Redshank (*Tringa totanus*) Shelduck (*Tadorna tadorna*) Wigeon (*Anas penelope*) Waterfowl assemblage	

	North Caithness Cliffs SPA
Area	14,621.1 ha
Article 4.1	Breeding Peregrine *Falco peregrinus*,
Article 4.2 – Migratory Species	Breeding Guillemot *Uria aalge*,
Article 4.2 – Assemblage	Seabirds Puffin *Fratercula arctica*, Fulmar *Fulmarus glacialis*, Razorbill *Alca torda*, Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Fulmar (*Fulmarus glacialis*) Guillemot (*Uria aalge*) Kittiwake (*Rissa tridactyla*) Peregrine (*Falco peregrinus*) Puffin (*Fratercula arctica*) Razorbill (*Alca torda*) Seabird assemblage	

	Noss SPA
Area	3338.34 ha
Article 4.1	Breeding Gannet *Morus bassanus*, Great Skua *Catharacta skua* Guillemot *Uria aalge*,
Article 4.2 – Migratory Species	-
Article 4.2 – Assemblage	Gannet *Morus bassanus*, Great Skua *Catharacta skua*, Guillemot *Uria aalge*, Puffin *Fratercula arctica*, Kittiwake *Rissa tridactyla*, Fulmar *Fulmarus glacialis*

Conservation Objectives

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

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

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species:

Fulmar (*Fulmarus glacialis*)
Gannet (*Morus bassanus)*
Great skua (*Catharacta skua)*
Guillemot (*Uria aalge)*
Kittiwake (*Rissa tridactyla)*
Puffin (*Fratercula arctica)*
Seabird assemblage

	Orkney Mainland Moors SPA
Area	5,342.19 ha
Article 4.1	Breeding Hen Harrier *Circus cyaneus*, Red-throated Diver *Gavia stellata*, Short-eared Owl *Asio flammeus*, Over winter Hen Harrier *Circus cyaneus*,
Article 4.2 – Migratory Species	-
Article 4.2 – Assemblage	-
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Hen Harrier *Circus cyaneus*, Red-throated Diver *Gavia stellata*, Short-eared Owl *Asio flammeus*,	

	Sumburgh Head SPA
Area	2,477.91 ha
Article 4.1	Breeding Arctic tern *Sterna paradisaea*,
Article 4.2 – Migratory Species	-
Article 4.2 – Assemblage	Seabirds Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Fulmar *Fulmarus glacialis*, Arctic tern *Sterna paradisaea*,
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Arctic tern *Sterna paradisaea*, Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Fulmar *Fulmarus glacialis*, Seabird assemblage	

	Troup Penan and Lion's Heads SPA
Area	3,367.21 ha
Article 4.1	Breeding Guillemot *Uria aalge*
Article 4.2 – Migratory Species	-
Article 4.2 – Assemblage	Assemblage Razorbill *Alca torda*, Kittiwake *Rissa tridactyla*, Herring Gull *Larus argentatus*, Fulmar *Fulmarus glacialis*, Guillemot *Uria aalge*
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Fulmar (*Fulmarus glacialis)* Guillemot (*Uria aalge*) Herring gull (*Larus argentatus)* Kittiwake (*Rissa tridactyla*) Razorbill (*Alca torda)** Seabird assemblage	

	Upper Solway Flats SPA and Ramsar
Area	43,636.73 ha
Article 4.1	Winter Whooper swans *Cygnus Cygnus*, Barnacle gooe *Branta leucopsis*, Golden plover *Pluvialis apricaria*.
Article 4.2 – Migratory Species	Wintering Pink-footed geese *Anser brachyrhynchus*, Pintail *Anas acuta*, Scaup *Aythya marila*, Oystercatcher *Haematopus ostralegus*, Knot *Calidris canutus*, Bar-tailed godwit *Limosa lapponica*, Curlew *Numenius arquata*, Redshank *Tringa tetanus*, Shelduck *Tadorna tadorna*, Teal *Anas crecca*, Shoveler *Anas clypeata*, Goldeneye *Bucaphala clangula*, Grey plover *Pluvialis squatorola*, Sanderling *Calidris alba*, Dunlin *Calidris alpina*, Turnstone *Arenaria interpress*.
Article 4.2 – Assemblage	Breeding Oystercatcher, Lapwing *Vanellus vanellus*, Redshank, Black-headed gull *Larus ridibundus*, Lesser black- backed gull *Larus fuscus*, Herring gull *Larus argentatus*, Common tern *Sterna hirundo* and Arctic tern *S. paradisaea*. Breeding Cormorant *Phalacrocorax carbo*, Greylag goose *Anser anser*, Wigeon *Anas Penelope*; Mallard *Anas platyrhynchos*, Red-breasted merganser *Mergus serrator*, Goosander *Mergus merganser*, Ringed plover *Charadrius hiaticula*, Spotted redshank *Tringa erythropus*, Greenshank *Tringa nebularia*, Lapwing and Common sandpiper *Actitis hypoleucos*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Barnacle goose (*Branta leucopsis*) Bar-tailed godwit (*Limosa lapponica*) Cormorant (*Phalacrocorax carbo*) Curlew (*Numenius arquata*) Dunlin (*Calidris alpina*) Goldeneye (*Bucaphala clangula*) Grey plover (*Pluvialis squatorola*)	

	Upper Solway Flats SPA and Ramsar
	Great crested grebe (*Podiceps cristatus*)
	Golden plover (*Pluvialis apricaria*)
	Knot (*Calidris canutus*)
	Lapwing (*Vanellus vanellus*)
	Mallard (*Anas platyrhynchos*)
	Oystercatcher (*Haematopus ostralegus*)
	Pink-footed goose (*Anser brachyrhynchus*)
	Pintail (*Anas acuta*)
	Redshank (*Tringa totanus*)
	Ringed plover (*Charadrius hiaticula*)
	Scaup (*Aythya marila*)
	Shelduck (*Tadorna tadorna*)
	Whooper swan (*Cygnus cygnus*)

	Ythan Estuary, Sands of Forvie and Meikle Loch SPA & Ramsar
Area	1,016.24 ha
Article 4.1	Breeding; Common Tern *Sterna hirundo*, Little Tern *Sterna albifrons*, Sandwich Tern *Sterna sandvicensis*,
Article 4.2 – Migratory Species	Winter; Pink-footed Goose *Anser brachyrhynchus*
Article 4.2 – Assemblage	Assemblage Redshank *Tringa totanus*, Lapwing *Vanellus vanellus*, Eider *Somateria mollissima*, Pink-footed Goose *Anser brachyrhynchus*.
Conservation Objectives	
To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: ▪ Population of the species as a viable component of the site ▪ Distribution of the species within site ▪ Distribution and extent of habitats supporting the species ▪ Structure, function and supporting processes of habitats supporting the species ▪ No significant disturbance of the species: Common Tern *Sterna hirundo*, Little Tern *Sterna albifrons*, Sandwich Tern *Sterna sandvicensis* Pink-footed Goose *Anser brachyrhynchus* Redshank *Tringa totanus*, Lapwing *Vanellus vanellus*, Eider *Somateria mollissima*, Pink-footed Goose *Anser brachyrhynchus*.	

12.0 APPENDIX B - SACS

Site	Berwickshire and North Northumberland Coast SAC
Area	60545.5 ha
Qualifying Interest	Grey seal Large shallow inlets and bays Mudflats and sandflats not covered by seawater at low tide Reefs Submerged or partially submerged sea caves
Conservation Objectives	To avoid deterioration of the qualifying habitats (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitat that the following are maintained in the long term: • Extent of the habitat on site • Distribution of the habitat within site • Structure and function of the habitat • Processes supporting the habitat • Distribution of typical species of the habitat • Viability of typical species as components of the habitat • No significant disturbance of typical species of the habitat Qualifying Habitats Large shallow inlets and bays Mudflats and sandflats not covered by seawater at low tide Reefs Submerged or partially submerged sea caves. To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: Population of the species as a viable component of the site Distribution of the species within site Distribution and extent of habitats supporting the species Structure, function and supporting processes of habitats supporting the species No significant disturbance of the species Qualifying Species: Grey seal

Site	Buchan Ness to Collieston Coast SAC
Area	207.52 ha
Qualifying Interest	Vegetated sea cliffs of the Atlantic and Baltic coasts Vegetated sea cliffs
Conservation Objectives	To avoid deterioration of the qualifying habitat (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitat that the following are maintained in the long term: • Extent of the habitat on site • Distribution of the habitat within site • Structure and function of the habitat • Processes supporting the habitat • Distribution of typical species of the habitat • Viability of typical species as components of the habitat • No significant disturbance of typical species of the habitat Qualifying Habitat Vegetated Sea Cliffs

Site	Firth of Tay and Eden Estuary SAC
Area	15,412.13 ha
Qualifying Interest	Estuaries, Sandbanks, Mudflats and Sandflats Annex II species – Harbour (common) seal
Conservation Objectives	To avoid deterioration of the qualifying habitats (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitats that the following are maintained in the long term: Extent of the habitat on site Distribution of the habitat within site Structure and function of the habitat Processes supporting the habitat Distribution of typical species of the habitat Viability of typical species as components of the habitat No significant disturbance of typical species of the habitat Qualifying Habitats: • Estuaries • Intertidal mudflats and sandflats • Subtidal sandbanks To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: Population of the species as a viable component of the site Distribution of the species within site Distribution and extent of habitats supporting the species Structure, function and supporting processes of habitats supporting the species No significant disturbance of the species Qualifying Species: Harbour (common) seal

Site	Isle of May SAC
Area	357.75 ha
Qualifying Interest	Grey seal Reefs
Conservation Objectives	To avoid deterioration of the qualifying habitats (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitats that the following are maintained in the long term: Extent of the habitat on site Distribution of the habitat within site Structure and function of the habitat Processes supporting the habitat Distribution of typical species of the habitat Viability of typical species as components of the habitat No significant disturbance of typical species of the habitat Qualifying Habitats: • Reefs To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: Population of the species as a viable component of the site Distribution of the species within site Distribution and extent of habitats supporting the species Structure, function and supporting processes of habitats supporting the species No significant disturbance of the species Qualifying Species: Grey seal

Site	Moray Firth SAC
Area	151,347 ha
Site description	
Qualifying Interest	Sandbanks which are slightly covered by sea water all the time: Subtidal sandbanks Bottlenose dolphin *Tursiops truncatus*
Conservation Objectives	To avoid deterioration of the qualifying habitat (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitat that the following are maintained in the long term: • Extent of the habitat on site • Distribution of the habitat within site • Structure and function of the habitat • Processes supporting the habitat • Distribution of typical species of the habitat • Viability of typical species as components of the habitat • No significant disturbance of typical species of the habitat Qualifying Habitat Subtidal sandbanks To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are established then maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site □ • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species Qualifying Species Bottlenose dolphin

Site	River Dee SAC
Area	
Site description	2,446.82 ha
Qualifying Interest	Otter *Lutra lutra* Freshwater pearl mussel *Margaritifera margaritifera* Atlantic salmon *Salmo salar*
Conservation Objectives	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species, including range of genetic types for salmon, as a viable component of the site • Distribution of the species within site □ Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species □ No significant disturbance of the species • Distribution and viability of freshwater pearl mussel host species • Structure, function and supporting processes of habitats supporting • freshwater pearl mussel host species Qualifying species Atlantic salmon Freshwater pearl mussel Otter

Site	River South Esk SAC
Area	478.62 ha
Qualifying Interest	Freshwater pearl mussel *Margaritifera margaritifera* Atlantic salmon *Salmo salar*
Conservation Objectives	Conservation Objectives for River South Esk Special Area of Conservation To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: Population of the species, including range of genetic types for salmon, as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats • supporting the species • No significant disturbance of the species • Distribution and viability of freshwater pearl mussel host species • Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species Qualifying Habitats: Atlantic salmon Freshwater pearl mussel

Site	Sands of Forvie SAC
Area	734 ha
Site description	
Qualifying Interest	Decalcified fixed dunes with Empetrum nigrum* Lime-deficient dune heathland with crowberry Embryonic shifting dunes Shifting dunes Humid dune slacks Humid dune slacks Shifting dunes along the shoreline with Ammophila arenaria (“white dunes”) Shifting dunes with marram
Conservation Objectives	Conservation Objectives for Sands of Forvie Special Area of Conservation To avoid deterioration of the qualifying habitats (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitats that the following are maintained in the long term: • Extent of the habitat on site • Distribution of the habitat within site • Structure and function of the habitat • Processes supporting the habitat • Distribution of typical species of the habitat • Viability of typical species as components of the habitat No significant disturbance of typical species of the habitat. Qualifying Habitats: Humid dune slacks Lime-deficient dune heathland with crowberry* Shifting dunes Shifting dunes with marram