MORAY WEST

OFFSHORE WINDFARM

Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI) Application Addendum

Moray Offshore Windfarm (West) Limited

Volume 1: Addendum Report

Non-Technical Summary

1.1 Introduction

In July 2018 Moray West submitted applications to Scottish Ministers for a Section 36 Consent (under the Electricity Act 1989) and Marine Licences (under the Marine and Coastal Access Act 2009 and the Marine (Scotland) Act 2010) to develop the Moray West Offshore Wind Farm (comprising up to 85 Wind Turbine Generators (WTGs) and inter-array cables) and associated Offshore Transmission Infrastructure (OfTI) (including Offshore Substation Platforms (OSPs), interconnector cables and the offshore export cables) (collectively referred as the Development).

The consent applications were supported by an Environmental Impact Assessment (EIA) Report (Volumes 1 to 4) and a Report to Inform an Appropriate Assessment (RIAA) prepared in accordance with relevant legislation (see Section 2, Volume 2 - Policy and Legislative Context). The applications also included a draft Decommissioning Programme which will be required under the Energy Act 2004 and a Safety Zone Statement which will be required under the Energy Act 2004 and the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.

The Moray West Site covers an area of approximately 225 km^2 on the Smith Bank in the Outer Moray Firth, approximately 22.5 km from the Caithness coastline (Figure 1.1 – Volume 2). The offshore export cable corridor extends south from the Moray West Site for approximately 65 km to a Landfall Area which is located on the Aberdeenshire Coast (Figure 1.1 – Volume 2).

1.2 Representation received on the application

A number of representations on the applications have been received from statutory consultees and a number of stakeholders who have an interest in the proposed Development. Representations received to date (as of 20th November 2018), and Moray West's response to these representations, are presented in the Stakeholder Response Analysis spreadsheet. A copy of this spreadsheet (excluding ornithology) is included in Annex A of this Addendum Document. Ornithoogy representations are presented separately in PART 1 of this Addendum Document (Chapter 1). Copies of each of the representations received are also available to view on the Marine Scotland website:

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

1.2.1 Objections to the Development

Moray West has received, to date, a number of objections to the proposed Moray West Development. These objections include:

- Objection from the Ministry of Defence (MoD's) due to impacts on their Primary Surveillance Radar (PSRs) at Lossiemouth and other aviation concerns raised by NATS;
- Objection from the Scottish Fishermen's Federation due to impacts on fisheries due to long term exclusion from fishing grounds; and
- Objection from SNH due to adverse effects on the integrity of the East Caithness Cliffs SPA and the North Caithness Cliffs SPA due to in-combination collision impacts on kittiwake and an objection from the RSPB on ornithological grounds including in relation to adverse effects on a number of qualifying features of the East Caithness Cliffs SPA and the North Caithness Cliffs SPA including guillemot, razorbill and great-black backed gull.

In addition to this Moray West has been advised that The Highland Council (THC) may also object to the Development on the grounds of impacts on seascape, landscape and visual receptors.

1.2.2 Moray West approach to addressing objections

Table 1.1 below provides a summary of the approach that has been taken by Moray West to address the key concerns raised in the representations received to date (as of the 20th November 2018) on the Moray West applications.

Table 1.1 Summary of objections on Moray West Development

Consultee	Objection	Approach taken to address concerns associated with objection raised	Requirement for additional information in this Addendum?
MOD	Impacts on the Ministry of Defence (MoD's) Primary Surveillance Radar (PSRs) at Lossiemouth	Moray West has appointed an aviation specialist to engage with the MOD to agree an appropriate solution for mitigating the adverse effects identified. This mitigation will be secured through appropriate consent conditions.	No - for further information see the Stakeholder Response Analysis spreadsheet presented in Annex A.
NATS	Aviation radar impacts	Moray West has appointed an aviation specialist to engage with NATS to agree an appropriate solution for mitigating the adverse effects identified. This mitigation will be secured through appropriate consent conditions.	No - for further information see the Moray West Stakeholder Response Analysis spreadsheet presented in Annex A.
SFF	Impacts on fisheries due to long term exclusion from fishing grounds	Moray West held a meeting with the SFF on 01/10/18 to discuss key concerns raised and how these concerns can be addressed through measures to be included in the Commercial Fisheries Mitigation Strategy (CFMS). A key requirement will be ongoing consultation and engagement with fisheries in both the preparation, and subsequent implementation of the CFMS. A further meeting with SFF to discuss specific actions relating to sustainable scallop fisheries was held on the 15th November 2018.	No - for further information see the Moray West Stakeholder Response Analysis spreadsheet presented in Annex A.
SNH	Adverse effects on the integrity of the East Caithness Cliffs (ECC) SPA and the North Caithness Cliffs (NCC) SPA	In addition to the objection relating to adverse effects on the East Caithness Cliffs SPA and North Caithness Cliffs SPA due to in-combination effects on kittiwake (collision), SNH also identified that they were unable to conclude no adverse effect on East Caithness Cliffs SPA due to displacement impacts on guillemot and	Yes – additional information has been provided to address comments raised by SNH (and comments also received from RSPB and Marine Scotland Science (MSS)). This information is provided in PART 1 of this Addendum

Table 1.1 Summary of objections on Moray West Development			
Consultee	**Objection**	**Approach taken to address concerns associated with objection raised**	**Requirement for additional information in this Addendum?**
		razorbill and a requirement for further information on great black-backed gull.	Document (this PART) – Chapters 2, 3 and 4.
RSPB	Adverse effects on the integrity SPAs included in the RIAA for a range of qualifying features.	Additional information addressing concerns raised with respect to impacts on the East Caithness Cliffs SPA and North Caithness Cliffs SPA has been provided in PART 1 of this Addendum Document.	Additional Information addressing key concerns raised by RSPB has been included in PART 1 of this Addendum Document – Chapters 2, 3 and 4.
THC	Adverse effects on seascape, landscape and visual receptors along the East Caithness / Sutherland Coast	A meeting was held with both THC and SNH on 10th October 2018 to discuss comments received in the representation from SNH and to identify any potential concerns held by THC (formal response from THC will be no earlier than 27th November 2018). It was made clear during this meeting that both THC and SNH (although no objection has been made on SLVIA grounds) have concerns over the extent to which adverse effects could be experienced along a large proportion of the East Caithness and Sutherland coast. These concerns and proposed options for mitigating these adverse effects, including a proposed variation to the Moray West Site boundary are discussed in more detail in Section 1.3.2 below.	Additional information relating to SLVIA and the proposed variation to the Moray West Site is provided in **PART 2 of this Addendum**. This is on the basis that Alternative Moray West Site area has been identified as a possible option for reducing the extent of potential adverse effects on SLVIA. With regard to **PART 1 of this Addendum**, no additional information has been identified as being required to address comments received in the representation from SNH or on the basis of consultation with THC. However, a slight error has been noticed with some of the distances quoted in the EIA Report – Volume 2, Chapter 14 Table 14.4.1. These distances have been corrected – with updated information presented in Chapter 5 of PART 1 of this Addendum Document.

1.3 SLVIA considerations

Both Scottish Natural Heritage (SNH) and The Highland Council (THC) have raised concerns on the extent to which there is potential for adverse effects on both landscape and coastal character and visual receptors along the East Caithness and Sutherland coast. The basis for these concerns is in relation to the scale of the proposed Development (both turbine size and number), the relationship of the Development with Moray East and Beatrice offshore wind farms in terms of increased turbine size; orientation of the Development with regard to the coastline; and sensitivity of the receiving environment, in particular effects on the East Sutherland Coast which due to its distinctive character, is recognised as a regionally important landscape.

1.3.1 Removal of the Model 4 WTG

In order to address concerns relating to the scale of the Development (turbine size) and relationship with the Moray East and Beatrice offshore wind farms, Moray West has proposed the removal of Model 4 turbine from the Design Envelope. The effect of this will be to help mitigate concerns relating to the larger turbine sizes.

1.3.2 Variations to the Moray West Site boundary

In addition to removing the Model 4 WTG from the Design Envelope, it was also suggested, during the meeting with THC and SNH on 10th October 2018, that some of the adverse effects on SLVIA could be further mitigated by reducing the western extent of the Moray West Site. In addition to this it was also suggested that extending the boundary of the Moray West Site in a southerly direction may help achieve such mitigation while maintaining a viable project.

In particular SNH and THC both agreed that transposing a mitigation area from the west of the Moray West Site to the south would help to mitigate SLVIA effects as follows:

- Reduction to the horizontal extent of the Development thereby reducing the total distance over which significant adverse effects are likely to be experienced and, would reduce the number of viewpoints from which there would be a loss of views to open sea;
- By extending the site in a southerly direction would create more of a ‘block’ shape site which would be preferred from an SLVIA perspective (would reduce the number of views where views to open sea are limited or blocked); and
- Creation of a more uniform shaped site (block) would lead to a more even distribution of turbines within a clearly defined boundary. This would help to reduce the creation of outliers (turbines that appear to be separate from the wider wind farm) in areas where turbine numbers are limited due to the shape of the site.

In response to this advice, Moray West undertook to explore the extent to which a reduction in the western extent of the Moray West Site and a southerly extension would be viable in terms of the development of the project and whether such a variation could be accommodated within the current application, taking into account the views of other key stakeholders.

For example, it was noted during the meeting with SNH and THC on 10th October 2018, that a southerly extension would move the turbines closer to the southern Moray Firth coast. The proposal to vary the Moray West Site boundary and potential effects on SLVIA receptors along the southern Moray Firth coast were therefore discussed at meetings with the Moray Council and Aberdeenshire Council on 6th November 2018. It was identified during these discussions that, while the proposed changes are not expected to lead to any change in overall effect significance with respect to viewpoints along the Moray and Aberdeenshire coasts, it would be necessary for the proposed changes to be assessed as part of any variation to the current application. Conclusions from this re-assessment are therefore presented in PART 2 of this Addendum Document. Further information on Moray West’s approach to requesting a variation to the Moray West Site boundary is provided in Section 1.6 below.

1.4 Other project design changes

In addition to the proposed variation to the Moray West Site boundary and removal of the Model 4 WTG Moray West is also requesting a reduction in the duration of the wind farm operation from 50 years to 25 years. As with the reduction in maximum number of WTGs to be installed within the site, the basis of this reduction is to give further increased confidence that the Development will not give rise to any adverse effects on the East Caithness Cliffs SPA and North Caithness Cliffs SPA.

1.5 Ornithology mitigation

In addition to reducing the duration of the operational period for the Development from 50 years to 25 years, Moray West has made a commitment to reducing kittiwake collisions by 7% (57 to 53 per annum). This reduction in kittiwake collisions is one of the adjustment factors that has been applied to the calculation of in-combination collision mortality for East Caithness Cliffs SPA and North Caithness Cliffs SPA (Section 1.10.2.3 below and PART 1 of this Addendum – Chapter 3). It is proposed that the reduction in kittiwake collisions from 57 to 53 per annum will be achieved through a reduction in turbine numbers from 85 to 79 unless it can be demonstrated through changes to other design parameters identified during preparation of the final Development design and layout that the total number of annual collisions for 85 turbines does not exceed 53 birds kittiwakes.

Moray West at this stage, is therefore not proposing a final reduction in turbine numbers (these remain at 85 for the Model 2 WTG).

1.6 Proposed variation

Moray West is of the view that, with the removal of the Model 4 WTG and a reduction in the duration of the operational period from 50 years to 25 years (which it proposes be secured by consent conditions), the predicted effects of the Moray West Development are acceptable or can be mitigated or be controlled by relevant conditions. However, following engagement with stakeholders with respect to SLVIA impacts as described above, Moray West has also undertaken a significant exercise to understand if it can present an alternative option by varying the Moray West Site application boundary. The proposed variation to the Moray West Site would allow an alternative site configuration involving a reduced western extent and limited expansion of the southern boundary of the Moray West Site. The two site options (current Moray West Site area and Alternative Moray West Site area) are presented in Figure 1.2 – Volume 2.

Moray West is still investigating whether an option of moving development from the Current Moray West Site area to the Alternative Moray West Site area is feasible from a technical and commercial perspective. Pending this confirmation it is necessary to seek consent for the option to develop in either area. Moray West, through this addendum, is applying for consent from Scottish Ministers for **BOTH** the current application as submitted (based on the current Moray West Site area) **AND** the Alternative Moray West Site area as alternatives to each other. This approach ensures that only one of the options could ever be developed.

1.7 Purpose and structure of this addendum

Given that Moray West has proposed that both the current Moray West Site area option and the Alternative Moray West Site area option presented are consented on the basis that they are alternatives to each other and only one option will be developed it has been necessary to provide information relating to both options within the same addendum document (this Addendum Document). This Addendum Document therefore has been split into two distinct parts:

- **PART 1** focuses on providing information required to address comments and issues raised on the current application (including objections). This includes:

  - Additional ornithological information (EIA and HRA) including consideration of a revised operational period of 25 years;
  - Results from additional underwater noise modelling undertaken to demonstrate any potential differences in the assessments when using a 0.5% and a 1% Conversion Factor (CF);
  - Updated SLVIA distances to address an error in distances presented in the Moray West EIA Report – Volume 2 Chapter 14 for six viewpoints; and
  - Additional information relating to socio-economic effects of the Development.
- **PART 2** focuses on providing additional information relating to the proposed variation to the consent application. This includes an assessment of the revised design parameters (removal of Model 4 WTG and change in duration of the operational period of the Development from 50 years to 25 years) and presents an assessment of the Alternative Moray West Site area to determine whether there would be any changes in the conclusions of effect significance presented in the EIA Report – Volume 2 with respect to the current Moray West Site.

This structure will ensure Scottish Ministers receive all the information required at this stage to enable them to grant consent for both the current application as submitted in July 2018 (Current Moray West Site area) and the proposed variation (the Alternative Moray West Site area).

1.8 Definition of terms

The following terminology has been used within PARTS 1 and 2 of this Addendum Document to describe the potential effects associated with the variation to the Moray West Site boundary:

- **Moray West EIA Report 2018** – this is the EIA Report (Volumes 1 to 4) that was submitted to Scottish Ministers on 10th July 2018 as part of the Moray West Offshore Wind Farm and OfTI consent applications;
- **Moray West RIAA 2018** – this is the Report to Inform an Appropriate Assessment (RIAA) that was also submitted on 10th July 2018 as part of the Moray West Offshore Wind Farm and OfTI consent applications;
- **Current Moray West Site area** – this is the Moray West Site that was included in the July 2018 consent applications and supporting EIA and RIAA documents;
- **Alternative Moray West Site area** – this is the alternative development which includes the Moray West Site (other than the mitigation area to the West of the site), and also includes the variation area to the south of the site**.**
- **Proposed mitigation area** – this is the western extent of the current Moray West Site area (Figure 1.1 – Volume 2);
- **Proposed variation area** – this is the area located to the south of the current Moray West Site area forming part of the Alternative Moray West Site area but not the current Moray West Site area (Figure 1.1 – Volume 2);
- **Northern extent of the current Moray West Export Cable Corridor** – this refers to the funnelled area located at the northern extent of the Moray West Export Cable Corridor that lies immediately to the south of the current Moray West Site Boundary. The variation area lies within this northern extent of the current Moray West Export Cable Corridor;
- **Moray West Offshore Wind Farm** – this comprises the WTGs, all associated substructures and inter-array cables. The Moray West Offshore Wind Farm will be located entirely within either the Current Moray West Site area or the Alternative Moray West Site area; and
- **Moray West Offshore Transmission Infrastructure (OfTI)** - this comprises the Offshore Substation Platforms (OSPs) (up to two), interconnector cables and the export cables. The OSPs and interconnector cables will be located entirely within either the current Moray West Site area or the proposed Alternative Moray West Site area. The export cable circuits will be located within

the Moray West Offshore Export Cable Corridor. It should be noted that there is no requirement to amend this cable corridor to accommodate the proposed variation area.

1.9 Overview of proposed design changes and implications for Moray West Design Envelope

Table 1.2 below provides an overview of the key design parameters included in the consent application (July 2018) and the influence of the removal of the Model 4 WTG on these parameters. Further information on the effects of a reduction in operational period from 50 years to 25 years and removal of the Model 4 WTG with respect to both the current Moray West Site area and Alternative Moray West Site area in terms of conclusions of effect significance is presented in PART 2 of this Addendum Document.

Table 1.2 Design Parameters – Comparative Assessment

Design Envelope Parameter	Maximum parameter included the Moray West EIA Report – Volume 2 Chapter 4 (July 2018)	Maximum parameters included in this Addendum Document (applies to development within both the current Moray West Site area and the Alternative Moray West Site area)	Implications for the current application and the Alternative Moray West Site area
Maximum WTG numbers			
WTG Model 1	85	85	No change
WTG Model 2	85	85	No change
WTG Model 3	72	72	No change
WTG Model 4	62	n/a	Model 4 turbine removed from the Design Envelope
Maximum tip height (WTGs)			
WTG Model 1	199 m	199 m	No change
WTG Model 2	230 m	230 m	No change
WTG Model 3	265 m	265 m	No change
WTG Model 4	285 m	n/a	Model 4 turbine removed from the Design Envelope
Maximum rotor blade diameter			
WTG Model 1	164 m	164 m	No change
WTG Model 2	195 m	195 m	No change
WTG Model 3	230 m	230 m	No change
WTG Model 4	250 m	n/a	Model 4 turbine removed from the Design Envelope
Other WTG parameters			

Table 1.2 Design Parameters – Comparative Assessment			
Design Envelope Parameter	**Maximum parameter included the Moray West EIA Report – Volume 2 Chapter 4 (July 2018)**	**Maximum parameters included in this Addendum Document (applies to development within both the current Moray West Site area and the Alternative Moray West Site area)**	**Implications for the current application and the Alternative Moray West Site area**
Minimum air gap (m) for all WTG models	Originally 22 m Amended to 35 m to mitigate potential effects on ornithology	35 m	No change
Minimum spacing (downwind)	1,200 m	1,200 m	No change
Minimum spacing (crosswind)	1,050 m	1,050 m	No change
WTG colour	RAL 7035 (light grey)	RAL 7035 (light grey)	No change
Lighting	In accordance with Article 223 of the Air Navigation Order 2016 (reproduced in CAP 393 Air Navigation: The Order and the Regulations) and IALA Recommendation O-117	In accordance with Article 223 of the Air Navigation Order 2016 (reproduced in CAP 393 Air Navigation: The Order and the Regulations) and IALA Recommendation O-117	No change
Substructures – monopiles			
Maximum number	85 (for Model 2 WTGs)	85 (for Model 2 WTGs)	
Maximum diameter	15 m	15 m was considered for the Model 4 WTG which is no longer considered. However, noise modelling was based on 85 x 15 m diameter piles. Therefore this parameter remains the WCS for this addendum.	No change
Embedment depth (below seabed)	50 m (for all WTG models)	50 m (for all WTG models)	No change
Substructures – jacket foundations			
Maximum number of jacket foundations	85	85	No change

Table 1.2 Design Parameters – Comparative Assessment			
Design Envelope Parameter	**Maximum parameter included the Moray West EIA Report – Volume 2 Chapter 4 (July 2018)**	**Maximum parameters included in this Addendum Document (applies to development within both the current Moray West Site area and the Alternative Moray West Site area)**	**Implications for the current application and the Alternative Moray West Site area**
Number of legs per jacket	3 or 4	3 or 4	No change
Maximum separation of adjacent legs at seabed level	40 m (Model 4 WTG)	35 m (Model 3 WTG)	Within assessed WCS design parameters for current application
Max piles per foundation	4	4	No change
Pin-pile diameter	4 m (Model 4 WTG)	3.5 (Model 3 WTG)	Within assessed WCS design parameters for current application
Embedment depth (below seabed)	60 m	60 m	No change
Substructures – gravity base foundations			
External diameter at sea surface	15 m (Model 4 WTG)	13 m (Model 3 WTG)	Within assessed WCS design parameters for current application
External diameter at seabed	55 m (Model 4 WTG)	50 m (Model 3 WTG)	Within assessed WCS design parameters for current application
Height of installed base above seabed	30 m (Model 4 WTG)	20 m (Model 3 WTG)	Within assessed WCS design parameters for current application
Substructures – suction caisson parameters (for jackets)			
Suction caissons per foundation	4	4	No change
Suction caisson diameter	25 m (Model 4 WTG)	25 m (Model 3 WTG)	No change
Caisson penetration depth (below seabed)	20 m (Model 4 WTG)	20 m (Model 3 WTG)	No change

Table 1.2 Design Parameters – Comparative Assessment			
Design Envelope Parameter	**Maximum parameter included the Moray West EIA Report – Volume 2 Chapter 4 (July 2018)**	**Maximum parameters included in this Addendum Document (applies to development within both the current Moray West Site area and the Alternative Moray West Site area)**	**Implications for the current application and the Alternative Moray West Site area**
Height of caisson remaining above seabed once installed	10 m	10 m	No change
Substructures – suction caisson parameters (for monopile)			
Suction caissons per foundations	1	1	No change
Suction caisson diameter	55 m (Model 4 WTG)	50 m (Model 3 WTG)	Within assessed WCS design parameters for current application
Caisson penetration depth (below seabed)	35 m (Model 4 WTG)	35 m (Model 3 WTG)	No change
Height of caisson remaining above seabed once installed	10 m	10 m	No change
Substructures – OSPs			
Topside length	100 m for large OSP (x1) 75 m for small OSPs (x2) (per OSP)	100 m for large OSP (x1) 75 m for small OSPs (x2) (per OSP)	No change
Topside width	100 m for large OSP (x1) 75 m for small OSPs (x2) (per OSP)	100 m for large OSP (x1) 75 m for small OSPs (x2) (per OSP)	No change
Topside height above HAT	70 m for large OSP (x1) 60 m for small OSPs (x2)	70 m for large OSP (x1) 60 m for small OSPs (x2)	No change
Substructures – OSP substructure parameters - monopiles			
Diameter of monopile	15 m	15 m	No change

Table 1.2 Design Parameters – Comparative Assessment			
Design Envelope Parameter	**Maximum parameter included the Moray West EIA Report – Volume 2 Chapter 4 (July 2018)**	**Maximum parameters included in this Addendum Document (applies to development within both the current Moray West Site area and the Alternative Moray West Site area)**	**Implications for the current application and the Alternative Moray West Site area**
Embedment depth (below seabed)	50 m	50 m	No change
Substructures – OSP substructure parameters – jack-ups			
Number of legs per jack up	4	4	No change
Separation of adjacent legs at seabed level	100 m (one large OSP) 50 m (two small OSPs) (per OSP)	100 m (one large OSP) 50 m (two small OSPs) (per OSP)	No change
Leg diameter	3.5 m	3.5 m	No change
Substructures – OSP substructure parameters – pin-pile jackets			
Number of legs per jacket	8 for large OSP 4 for small OSPs (x2)	8 for large OSP 4 for small OSPs (x2)	No change
Leg diameter	3.5 m	3.5 m	No change
Piles per jacket	8 for large OSP 4 for small OSPs (x2)	8 for large OSP 4 for small OSPs (x2)	No change
Pin-pile diameter	4 m for large OSP pin piles 3.5 m for small OSP pin piles	4 m for large OSP pin piles 3.5 m for small OSP pin piles	No change
Substructures – OSP substructure parameters – suction caisson jackets			
Number of legs per jacket	4	4	No change
Separation of adjacent legs at seabed level	40 m for large OSP (x1) 35 m for small OSP (x 2)	40 m for large OSP (x1) 35 m for small OSP (x 2)	No change
Leg diameter	3.5 m	3.5 m	No change
Suction caissons per foundation	4	4	No change

Table 1.2 Design Parameters – Comparative Assessment			
Design Envelope Parameter	**Maximum parameter included the Moray West EIA Report – Volume 2 Chapter 4 (July 2018)**	**Maximum parameters included in this Addendum Document (applies to development within both the current Moray West Site area and the Alternative Moray West Site area)**	**Implications for the current application and the Alternative Moray West Site area**
Suction caisson diameter	30 m for large OSP (x1) 20 m for small OSP (x2)	30 m for large OSP (x1) 20 m for small OSP (x2)	No change
Caisson penetration depth (below seabed) (m)	25 m for large OSP (x1) 15 m for small OSP (x2)	25 m for large OSP (x1) 15 m for small OSP (x2)	No change
Height of caisson remaining above seabed once installed	10 m	10 m	No change
Substructures – OSP substructure parameters – suction caisson monopiles			
Suction caissons per substructure	1	1	No change
Suction caisson diameter	45 m for large OSP (x1) 55 m for small OSP (x2)	45 m for large OSP (x1) 55 m for small OSP (x2)	No change
Caisson penetration depth (below seabed)	30 m for large OSP (x1) 35 m for small OSP (x2)	30 m for large OSP (x1) 35 m for small OSP (x2)	No change
Height of caisson remaining above seabed once installed	10 m	10 m	No change
Substructures – OSP substructure parameters – gravity base structures			
Number of gravity base substructures	1 for 1 OSP 2 for 2 OSPs	1 for 1 OSP 2 for 2 OSPs	No change
External diameter at sea surface	15 m	15 m	No change
External diameter at seabed	80 m for large OSP (x1)	80 m for large OSP (x1) 55m for small OSPs (x2)	No change

Table 1.2 Design Parameters – Comparative Assessment			
Design Envelope Parameter	**Maximum parameter included the Moray West EIA Report – Volume 2 Chapter 4 (July 2018)**	**Maximum parameters included in this Addendum Document (applies to development within both the current Moray West Site area and the Alternative Moray West Site area)**	**Implications for the current application and the Alternative Moray West Site area**
	55 m for small OSPs (x2)		
Seabed preparation diameter	120 m for large OSP (x1) 95 m for small OSP (x2)	120 m for large OSP (x1) 95 m for small OSP (x2)	No change
Seabed excavated depth	8 m large OSP (x1) 5 m for small OSP (x2)	8 m large OSP (x1) 5 m for small OSP (x2)	No change
Height of installed base above seabed	30 m for large OSP (x1) 20 m for small OSP (x2)	30 m for large OSP (x1) 20 m for small OSP (x2)	No change
Inter-array cable circuit parameters			
Cable specification	3-core cable, most likely with integrated fibre optics	3-core cable, most likely with integrated fibre optics	No change
Length of cable (km)	275 km	275 km	No change
Voltage range (kV)	33 - 72.5 kV	33 - 72.5 kV	No change
Inter-array cable installation parameters			
Burial Technique	Ploughing, Jetting, Cutting	Ploughing, Jetting, Cutting	No change
Typical trench depth (m)	1	1	No change
Maximum trench depth (m)	3	3	No change
Number of cable circuits per trench	1 (2 if fibre optic cables are installed separate from the power cable)	1 (2 if fibre optic cables are installed separate from the power cable)	No change
Maximum trench width (m)	3	3	No change

Table 1.2 Design Parameters – Comparative Assessment			
Design Envelope Parameter	**Maximum parameter included the Moray West EIA Report – Volume 2 Chapter 4 (July 2018)**	**Maximum parameters included in this Addendum Document (applies to development within both the current Moray West Site area and the Alternative Moray West Site area)**	**Implications for the current application and the Alternative Moray West Site area**
Maximum trench affected width	15 m	15 m	No change
Inter-array cable crossing protection parameters			
Crossing technique	Rock placement, concrete mattressing, grout bags	Rock placement, concrete mattressing, grout bags	No change
Number of cable crossings	15	15	No change
Length of crossings	200 m	200 m	No change
Width of crossings	< 6 m	< 6 m	No change
OSP interconnector cable parameters			
Cable specification	3-core cable with integrated fibre optics	3-core cable with integrated fibre optics	No change
Cable diameter (mm)	200 (subject to crossing agreement)	200 (subject to crossing agreement)	No change
Total length of cable circuit	15 km	15 km	No change
Voltage range (kV)	33 - 400	33 - 400	No change
Export cable parameters			
Number of export cable circuits	Up to 2	Up to 2	No change
Cable circuit specification	3-core cable, most likely with integrated fibre optics	3-core cable, most likely with integrated fibre optics	No change
Total length of cable (km)	65 per circuit	65 per circuit	No change
Voltage range (kV)	132 – 400 kV	132 – 400 kV	No change

1.10 Summary of key information and conclusions presented in this Addendum Document PART 1

1.10.1 Legislative requirements for PART 1 of the Addendum

The additional information provided in PART 1 of this addendum has been submitted in accordance with the following legislation:

- The Electricity Act 1989;
- Marine (Scotland) Act 2010;
- Marine and Coastal Access Act 2009;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Electricity (Application for Consent) (Scotland) Regulations 1990;
- The Marine Works (Environmental Impact Assessment) Regulations 2007;
- The Conservation (Natural Habitats &c.) Regulations 1994; and
- The Conservation of Offshore Marine Habitats and Species Regulations 2017.

1.10.2 Additional Ornithological Information (EIA and HRA)

1.10.2.1 Additional ornithological information provided

Additional information presented in PART 1 – Chapters 2 and 3 has been provided in direct response to specific comments raised in the representations from SNH, MSS and RSPB (these representations are summarised in Chapter 1). Where there has been a requirement to update or amend a specific assessment methods or other methodologies such as those used to apportion birds from the current Moray West Site to relevant Special Protection Area (SPA) such as East Caithness Cliffs SPA and North Caithness Cliffs SPA, detail on the specific changes or updates made is presented in the relevant chapters (PART 1 Chapter 2 for EIA information and PART 1 Chapter 3 for HRA information).

Additional information provided with respect to the **EIA** (PART 1 – Chapter 2) includes:

- Update to Technical Appendix 10.1A – Report on the Decision Support System (DSS). The DSS was developed to identify density estimates for the Moray West Site for key species. The density estimates from the DSS process were then used to inform the impact assessment (EIA) and the assessment of effects on site integrity (HRA). The report presenting the results (Technical Appendix 10.1A) has been updated to include additional information to assist understanding of the process and how specific density estimates have been derived. This includes for example some additional maps showing the overlaps between the various data sets used to derive the density estimates and a selection of tables which summarise various densities calculated rather than this just being discussed in the text. There have been no changes to the actual density estimates that have been used in either the EIA or HRA assessment. A copy of the updated version of Technical Appendix 10.1A – Report on the Decision Support System (DSS) is included in Annex A of this Addendum;
- Information on approach used to define breeding and non-breeding seasons and how these differ from SNH seasonal definitions;
- Influence of these differences in breeding seasons on regional populations used in the assessment of displacement impacts and collision risk impacts;
- Updated displacement results for guillemot, razorbill and kittiwake taking into account season variations and assessment of Moray West Site in addition to the Moray West Site + 2 km buffer;
- Updated collision risk results for gannet and kittiwake reflecting seasonal variations; and
- Combined updated displacement and collision risk impacts for kittiwake.

Additional information provided with respect to the **HRA** (PART 1 – Chapter 3) includes:

- Apportioning – approach to apportioning (use of sections to apportion birds to the East Caithness Cliffs SPA rather than the whole colony counts and the two-stage process to apportioning) and use of Seabird 2000 colony data;
- Displacement (guillemot, razorbill and kittiwake) – updated PVA results combining breeding season and non-breeding season PVAs and presenting PVAs in increments of 10 birds (guillemot and razorbill) and mortality specific (kittiwake) for 25, 35 and 50 years;
- Collision risk (kittiwake) – updated collision risk results and PVAs (mortality specific) for 25, 35 and 50 years following application of adjustment factors (such as changes in project design envelope, application of findings from current research on avoidance rates and flight speed and consideration of weighted apportioning for birds from non-Scottish projects during the non-breeding season);
- Great black-backed gull – provision of additional information to inform assessment of effects on great black-backed gull within the HRA; and
- Final conclusions.

1.10.2.2 Key conclusions – ornithology (EIA)

In terms of the additional information presented with respect to the EIA (PART 1 – Chapter 2) it was concluded that although there is a slight difference in the seasonal definitions used by Moray West compared to the SNH seasons, these differences only equate, at most, to an increase or decrease of one bird assigned to the breeding season. There are no changes in total annual collision or displacement mortalities and therefore there are no changes to the conclusions of effect significance.

With regard to displacement impacts, annual mortality for the Moray West Site alone is approximately 40% less than predicted for the Moray West Site + 2 km buffer. These reductions in mortality apply to all three species (guillemot, razorbill and kittiwake).

1.10.2.3 Key conclusions – ornithology (HRA)

Information presented in PART 1 of this Addendum Document - Chapter 3 further supports conclusions presented in the RIAA (2018) that there will be no adverse effects of the Development (Moray West alone and in-combination) on the integrity of the East Caithness Cliffs SPA (for guillemot, razorbill, kittiwake and great black-backed gull) or the North Caithness Cliffs SPAs (for kittiwake). These conclusions take into account additional information provided with respect apportioning and the application of collision risk adjustment factors (with respect to effects on kittiwake only).

East Caithness Cliffs SPA

With respect to guillemot and razorbill, additional modelling was undertaken to assess the potential effects from displacement for the Moray West Site alone (with and without a 2 km buffer) and in-combination. The outputs from the Population Viability Analysis (PVA) modelling based on predicted levels of displacement mortality of 89 guillemot per annum and 10 razorbill per annum indicate that after 25 years, for the Moray West Site alone + 2 km buffer, both the guillemot and razorbill populations would be 99% the size of the unimpacted populations. When considered in-combination with other projects, the PVA modelled outputs indicate that the size of both the guillemot and razorbill populations after 25 years would be 97% of the unimpacted populations. The overall magnitude of these effects are considered to be negligible. It is therefore concluded that there would be no adverse effects on the East Caithness Cliffs SPA for either guillemot or razorbill qualifying interests.

In terms of kittiwake displacement, when assessed for the Moray West Site + 2 km the outputs from the PVA modelling based on predicted levels of displacement mortality of 29 birds per annum indicate that after 25 years the population would be 98% the size of the unimpacted population of the East Caithness Cliffs SPA. When assessed in-combination with other projects the PVA model predicts that after 25 years the population will be 96% of the unimpacted population.

With regard to kittiwake collision impacts, for the Moray West Site alone, predicted collision mortality apportioned to the East Caithness Cliffs SPA is 57 collisions per annum. The PVA modelled outputs indicate that after 25 years, based on this predicted collision mortality the kittiwake population of the East Caithness Cliffs SPA would be 97% the size of the unimpacted population. It is therefore concluded that there would be no adverse effect on the kittiwake feature of the East Caithness Cliffs SPA for Moray West alone.

With respect to in-combination effects, depending on the application of the various adjustment factors discussed in PART 1 of this Addendum Document – Chapter 3, kittiwake collision mortality apportioned to East Caithness Cliffs SPA would be no greater than **236 birds per annum.** A further refinement to use a avoidance rate of 99.2% as opposed to 98.9% would lead to a reduction of 27% for the in-combination collision risk total for kittiwake to **172 birds per annum**. These adjustment factors include a reduction in kittiwake collisions apportioned to the Moray West Development of 7% (57 birds per annum to 53 birds per annum). The modelled PVA outputs based on these numbers predict that after 25 years the size of the kittiwake population of the East Caithness Cliffs SPA would be 87% to 90% the unimpacted population. Based on these levels of collision mortality and the PVA modelled outputs it is concluded that there would be no adverse effect on the kittiwake population of the East Caithness Cliffs SPA due to collision mortality for either Moray West alone or in-combination with other projects.

It is also noted that, with further refinements applied to projects located in English waters (e.g. updates to design parameters), the number of kittiwake collisions apportioned to the East Caithness Cliffs SPA would be between 190 and 138 birds per annum. The corresponding modelled PVA outputs after 25 years for this number of predicted kittiwake collisions is 89% to 92%.

The key potential impact for great black-backed gull relates to collision mortality. It is considered that given no more than 1.6 collisions are apportioned to adult birds in total and that there is very limited evidence of any connectivity to East Caithness Cliffs SPA breeding colony, the impact magnitude is negligible therefore it is concluded that there will be no adverse effect on this interest feature.

North Caithness Cliffs

In terms of kittiwake displacement, when assessed for the Moray West Site + 2 km the outputs from the PVA modelling based on predicted levels of displacement mortality of one bird per annum indicate that after 25 years the population would be 99% the size of the unimpacted population of the North Caithness Cliffs SPA. When assessed in-combination with other projects the PVA model predicts that after 25 years the population will still be 99% of the unimpacted population.

With regard to kittiwake collision impacts, for the Moray West Site alone, predicted collision mortality apportioned to the East Caithness Cliffs SPA is **three birds per annum**. The PVA modelled outputs indicate that after 25 years, based on this predicted collision mortality the kittiwake population of the North Caithness Cliffs SPA would be 99% the size of the unimpacted population. It is therefore concluded that there would be no adverse effect on the kittiwake feature of the North Caithness Cliffs SPA for Moray West alone.

With respect to in-combination effects, depending on the application of the various adjustment factors discussed in PART 1 of this Addendum Document – Chapter 3, kittiwake collision mortality apportioned to North Caithness Cliffs SPA would be no greater than **41 birds per annum.** A further refinement to use a avoidance rate of 99.2% as opposed to 98.9% would lead to a reduction of 27% for the in-combination collision risk total for kittiwake to **30 birds per annum**. These adjustment factors include a reduction in kittiwake collisions apportioned to the Moray West Development of 7% (57 birds per annum to 53 birds per annum). The modelled PVA outputs predict that after 25 years the size of the kittiwake population of the North Caithness Cliffs SPA would be 90% to 92% the unimpacted population. Based on these levels of collision mortality and the PVA modelled outputs it is concluded that there would be no adverse effect on the kittiwake population of the East Caithness Cliffs SPA due to collision mortality for either Moray West alone or in-combination with other projects.

It is also noted that, with further refinements applied to projects located in English waters (e.g. updates to design parameters), the number of kittiwake collisions apportioned to the North Caithness Cliffs SPA would be between 30 and 22 birds per annum. The corresponding modelled PVA outputs after 25 years for this number of predicted kittiwake collisions is 92% to 94%.

1.10.3 Additional information relating to marine mammals

1.10.3.1 Additional information provided

Chapter 4 of this Addendum Document (PART 1) presents additional information which sets out the results of additional underwater noise modelling and changes to potential impact significance for marine mammals when using a 1% acoustic energy Conversion Factor (CF) compared to a 0.5% CF for both Permanent Threshold Shift (PTS) and disturbance impacts. This information has been provided in response to advice received from Marine Scotland Science (MSS) on the use of the 0.5% CF in the underwater noise modelling work undertaken to inform the assessment of the effects of piling noise on marine mammals as presented in the EIA Report – Volume 2 Chapter 9. The 0.5% CF was used to calculate the amount of acoustic energy that is transferred from the pile driving hammer blow into the water (the conversion factor). Although the 0.5% CF is the standard variable used by CEFAS for modelling underwater noise, MSS advised that additional information modelling should be undertaken to demonstrate any potential differences in the assessments when using a 0.5% and a 1% CF.

1.10.3.2 Key conclusions – marine mammals

The additional modelling and reassessment using a 1% CF compared to a 0.5% CF has demonstrated that the use of a 1% CF for noise modelling resulted in no changes to the significance of predicted impacts for most of the marine mammal species assessed, when considering PTS as well as disturbance effects. The exception being minke whales where the change from 0.5% CF to 1% CF resulted in a change in the PTS assessment from negligible to low magnitude which resulted in a change of impact significance from minor to moderate. The predicted increase in noise levels as a result of assuming a higher energy conversion efficiency has affected minke whales proportionately more than the other species because of their specialised low frequency hearing relative to the low frequency content of the piling noise.

The residual impact of PTS for all species after the application of appropriate mitigation in the form of a Piling Strategy including appropriate mitigation (e.g. soft start and the use of ADDs) to reduce the risk of PTS to individuals remains either negligible or minor and are therefore not significant in EIA terms.

The impact of disturbance for all species remains minor and therefore not significant in EIA terms.

1.10.4 Updated SLVIA Information

During the preparation of the SLVIA information required for inclusion in PART 2 of this Addendum Document, it emerged that there were some errors with some of the separation distances included in the EIA Report – Volume 2, Chapter 14 Table 14.4.1 for six viewpoints. Further detail on the viewpoints and corresponding figures and text that these errors relate to is provided in Chapter 5 of PART 1 of this Addendum Document. The corrected distances and references have also been provided.

The differences in the distances have been reviewed and it is concluded that these make no difference to the assessment of the effects as presented in the EIA Report – Volume 2, Chapter 14.

In addition to this it is noted that with removal of the Model 4 WTG, the new WCS for SLVIA is the Model 3 WTG. A comparative Zone of Theoretical Visibility (ZTV) was prepared for the Model 4 WTG layout (worst case scenario) and the Model 3 WTG layout (based on 72 turbines). This was included in the Moray West EIA Report – Volume 2 Chapter 14 and Volume 3a Figures. In addition to this cumulative Model 3 WTG wirelines were also prepared for a selection of viewpoints (five). These cumulative layouts for Model 3 WTG were also assessed in the EIA Report – Volume 2 Chapter 14 and presented in Volume 3b SLVIA Visualisations. Further information on the assessment of the Model 3 WTG as part of the Alternative Moray West Site is presented in PART 2 of this Addendum Document (Chapter 11).

1.10.5 Information on socio-economics

In light recent changes to baseline conditions with respect to the local study area, Moray West felt it was prudent to present updated information on these changes in order for this information to be taken into account when considering the conclusions presented in the EIA Report – Volume 2 Chapter 15 with respect to socio-economic effects. The updated information, which relates to recent significant investment decisions and commitments made by Moray East relating to three key harbour facilities (Port of Cromarty Firth, Fraserburgh Harbour and a third location (confidential) is considered to provide increased confidence in the conclusions from the assessment as presented in the EIA Report – volume 2 Chapter 15 with respect to employment opportunities and Gross Value Added (GVA) creation. This updated information is presented in Chapter 6 of PART 1 of this Addendum Document and considered in the assessment of the Alternative Moray West Site presented in PART 2 of this Addendum Document (Chapter 12).

1.11 Summary of key information and conclusions presented in PART 2 - additional information provided as part of the application variation (design changes and assessment of the Alternative Moray West Site area)

1.11.1 Legislative requirements for PART 2 of the Addendum

The additional information included in PART 2 of this addendum is being submitted to Scottish Ministers as part of an application to vary the current applications (the application boundaries) for Section 36 Consent (under the Electricity Act 1989) and the offshore wind farm Marine Licence (under the Marine and Coastal Access Act 2009 and the Marine (Scotland) Act 2010) submitted in July 2018.

In support of this application to vary the current Section 36 Consent and Offshore Wind Farm Marine Licence application for the Moray West Development and to support other proposed design envelope changes, additional environmental information has been provided in PART 2 of this addendum in accordance with the following legislation:

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;

- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Electricity (Application for Consent) (Scotland) Regulations 1990; and
- The Marine Works (Environmental Impact Assessment) Regulations 2007.

Additional Habitat Regulations Appraisal (HRA) information has also been provided in accordance with:

- The Conservation (Natural Habitats &c.) Regulations 1994; and
- The Conservation of Offshore Marine Habitats and Species Regulations 2017.

1.11.2 Key conclusions from the assessment of the changes to the Moray West Design Envelope

Information on the implication of the changes to the Moray West Design Envelope (removal of the Model 4 WTG and reduction in the operational period of the Development from 50 years to 25 years) in relation to both the current Moray West Site and the Alternative Moray West Site is presented in PART 2 of this Addendum Document – Chapter 2.

1.11.2.1 Implication of changes to the Design Envelope – removal of the Model 4 WTG

In terms of the removal of the Model 4 WTG, where this comprised the worst case scenario turbine option (e.g. for SLVIA and aviation due to maximum tip height of 285 m and rotor diameter of 250 m), its removal will contribute to a reduction in impact magnitude. However, it has been concluded that this reduction in does not alter the overall assessed level of impact magnitude based on the assessment criteria included in the EIA Report – Volume 2 Chapters 14 and 13 respectively. It is therefore concluded that, with respect to both the current Moray West Site area and Alternative Moray West Site area, removal of the Model 4 WTG would not affect the conclusions of effect significance for either SLVIA or aviation.

For other topics such as commercial fisheries, shipping and navigation and ornithology the Model 4 WTG represented a best case option on the basis it was the lowest number of turbines. However, given that the assessment associated with both the current Moray West Site area and the Alternative Moray West Site area for these receptors is based on the Model 2 WTG (worst case), removal of the Model 4 WTG will not affect the overall conclusions of effect significance.

For a number of topics, the Model 4 turbine has been identified as the worst case scenario (WCS) design parameter where there are direct impacts on the seabed (e.g. in relation to impacts on physical processes, benthic ecology, fish and shellfish and marine archaeology). As with SLVIA and aviation, removal of this turbine model is expected to lead to a reduction in impact magnitude. However, it is noted that in some scenarios depending on how seabed impacts are calculated, Model 2 WTG was also a worst case options. This was due variations in the total area of impact or calculated volumes of material being influence by maximum turbine numbers (62 x Model 4 WTGs compared to 85 x Model 2 WTGs). With removal of the Model 4 WTG, the Model 3 WTG becomes the new WCS for some impacts. Although the Model 3 WTGs are smaller than the Model 4 WTGs, the maximum number of Model 3 WTGs is slightly higher than the maximum number of Model 4 WTGs (72 compared to 62). Therefore while, there will be a reduction in the overall footprint on the seabed associated with removal of the Model 4 WTG and consideration of the Model 3 WTG as WCS, the reduction is not sufficiently material to lead to a change in impact magnitude for seabed impacts associated with these topics.

Although the underwater noise modelling for marine mammals was based on design parameters for the Model 4 WTG substructures (15 m diameter monopile or jacket foundations with 4 m diameter pin piles), the assessment was based on a worst case of 85 turbines (for all WTG model scenarios). Therefore, while there might be a reduction in maximum hammer energy required to install the substructures (due to the removals of the largest foundations) the reduction is not expected to be sufficiently material to result in a change in overall effect significance based on the banding of the assessment criteria presented in the EIA Report – Volume 2, Chapter 9.

Overall, it is concluded that while removal of the Model 4 WTG could lead to a slight reduction in impact magnitude for some receptors, it is not expected to affect any of the conclusions of effect significance presented in the Moray East EIA Report – Volume 2. These conclusions apply to both the current Moray West Site area and the Alternative Moray West Site area.

1.11.2.2 Influence of the reduction in duration of the operational period of the development from 50 years to 25 years

Topics that will be most affected by the reduction in the duration of the operational period of the Development from 50 years to 25 years will be:

- Ornithology due to a reduction in the timescales over which there is potential for effects on birds due to collision and displacement to occur;
- Commercial fisheries due to a reduction in the duration over which fishing vessels will potentially have reduced access to fishing grounds;
- Shipping and navigation due to a reduction in the duration over which there is the presence of a potential risk to navigation;
- SLVIA due to a reduction in the duration over which the turbines will be visible within the current Moray West Site or the Alternative Moray West Site;
- Aviation due to a reduction in the duration over which there is potential for radar interference; and
- Other human activities due to a reduction in the duration over which there is potential for interference with other human activities.

Overall, as with the removal of the Model 4 WTG, it can be concluded that while a reduction in the operational period of the Development could lead to a reduction in impact magnitude through a reduction in the duration of the predicted impact, the reduction is not expected to lead to an overall reduction in the conclusions of effect significance for any of these receptors. Effect significance will therefore remain as assessed within the Moray West EIA Report – Volume 2. These conclusions apply to development within both the current Moray West Site area and the Alternative Moray West Site area.

1.11.3 Overview of the approach to the assessment of the Alternative Moray West Site area

The approach taken to assessing the potential effects of developing the Moray West Offshore Wind Farm within the Alternative Moray West Site area is summarised below.

- Step 1: Baseline review – identification of key features of interest / sensitive receptors identified within the current Moray West Site (in particular the proposed mitigation area), and the Alternative Moray West Site (in particular the proposed variation area where receptors have previously only been assessed with respect to impacts associated with the installation and operation of export cables);
- Step 2: Overview of impacts and associated design parameters assessed in Moray West EIA 2018 for the current Moray West Site area;
- Step 3: Review of effect significance associated with the current Moray West Site area;
- Step 4: Identification of impacts and associated design parameters requiring assessment within the Alternative Moray West Site area;
- Step 5: Assessment of potential effect within the Alternative Moray West Site area and conclusions of effect significance in context of conclusions from the assessment of the current Moray West Site area;
- Step 6: Conclusions on changes to effect significance (cumulative); and

- Step 7: Conclusions on potential differences arising from the application of additional proposed project mitigation (other than the variation to the Moray West Site boundary).

1.11.4 Key conclusions from the assessment of the Alternative Moray West Site area

Table 1.3 below presents a summary of the key conclusions from the assessment of the Alternative Moray West Site area.

Table 1.3 Key conclusions from the assessment of the Alternative Moray West Site				
Chapter number (PART 2)	**EIA topic**	**Differences in baseline between current Moray West Site and Alternative Moray West Site area**	**Changes to conclusions of assessment presented in the EIA Report 2018 associated with Alternative Moray West Site area**	
			Project specific (note – these conclusions include embedded mitigation measures and any additional mitigation measures (where relevant) identified in each chapter of the Moray West EIA Report – Volume 2)	**Cumulative**
3	Physical processes and water quality	No new or additional receptors with increased sensitivity to the development of the Moray West Offshore Wind Farm infrastructure and components of the OfTI have been identified within the Alternative Moray West Site.	It was concluded from the assessment of development within the Alternative Moray West Site that the conclusions of effect significance presented in the EIA Report – Volume 2 Chapter 6 remain as assessed for the current Moray West Site. This is on the basis that for all impacts there will be no change in the assessed WCS design parameters or any change in receptor sensitivity.	Given that there is no change in the conclusions of effect significance presented in the Moray West EIA Report – Volume 2 Chapter 7 for project specific impacts, it can be concluded that the conclusions of cumulative effect significance will also remain as assessed for the current Moray West Site.
4	Benthic	No new or additional benthic receptors with increased sensitivity to the development of the Moray West Offshore Wind Farm infrastructure and components of the OfTI have been identified within the Alternative Moray West Site.	It was concluded from the assessment of development within the Alternative Moray West Site that the conclusions of effect significance presented in the EIA Report – Volume 2 Chapter 7 remain as assessed for the current Moray West Site. This is on the basis that for all impacts there will be no change in the assessed WCS design parameters or any change in receptor sensitivity.	Given that there is no change in the conclusions of effect significance presented in the Moray West EIA Report – Volume 2 Chapter 8 for project specific impacts, it can be concluded that the conclusions of cumulative effect significance will also remain as assessed for the current Moray West Site.
5	Fish and shellfish ecology	Slight increases in densities of sandeel, scallop, Nephrops and herring identified in the variation area, although, not sufficient to result in a change in overall species sensitivity across the Alternative Moray	It was concluded from the assessment of development within the Alternative Moray West Site that the conclusions of effect significance presented in the EIA Report – Volume 2 Chapter 8 remain as assessed for the current Moray West Site. This is on the basis that for all impacts there will be no	Given that there is no change in the conclusions of effect significance presented in the Moray West EIA Report – Volume 2 Chapter 9 for project specific impacts, it can be concluded that the conclusions of cumulative effect

Table 1.3 Key conclusions from the assessment of the Alternative Moray West Site				
Chapter number (PART 2)	**EIA topic**	**Differences in baseline between current Moray West Site and Alternative Moray West Site area**	**Changes to conclusions of assessment presented in the EIA Report 2018 associated with Alternative Moray West Site area**	
			Project specific (note – these conclusions include embedded mitigation measures and any additional mitigation measures (where relevant) identified in each chapter of the Moray West EIA Report – Volume 2)	**Cumulative**
		West Site. No other changes in baseline identified.	change in the assessed WCS design parameters or any change in receptor sensitivity.	significance will also remain as assessed for the current Moray West Site.
6	Marine mammals	The proposed mitigation area (western extent of the current Moray West Site) is closer to areas of higher density of coastal species such as bottlenose dolphin, grey and harbour seals. This location was therefore considered to be the most sensitive location in terms of piling. The variation area (southern part of the Alternative Moray West Site) is located at further distance from these coastal species and therefore less sensitive. However, the variation area is closer to areas where there are higher densities of minke whale (Southern Trench possible Nature Conservation Marine Protected Area (pNCMPA). This change triggered the requirement for additional underwater noise modelling to be completed to inform an assessment of the effects on the Alternative Moray West Site on minke whale.	With regard to marine mammals, in terms of potential Permanent Threshold Shift (PTS) and disturbance impacts from piling it was concluded that, although there is predicted to a slight increase in the number of minke whale potentially affected, the increase is not considered significant, therefore there is predicted to be no change in the magnitude of impact and effect significance remains as assessed for the current Moray West Site. With respect to all other species, conclusions of effect significance for the Alternative Moray West Site remain as assessed in the Moray West EIA Report – Volume 2, Chapter 9 for the current Moray West Site. This is on the basis that the worst case location for pile driving has only changed for minke whales based on the current assessment of noise modelling at species specific sensitive locations. Conclusions of effect significance for all other impacts on marine mammals associated with the Alternative Moray West Site remain assessed in the EIA Report – Volume 2, Chapter 9 for the current Moray West Site area.	Given that there is no change in the conclusions of effect significance presented in the Moray West EIA Report – Volume 2 Chapter 6 for project specific impacts, it can be concluded that the conclusions of cumulative effect significance will also remain as assessed for the current Moray West Site.

Table 1.3 Key conclusions from the assessment of the Alternative Moray West Site

Chapter number (PART 2)	EIA topic	Differences in baseline between current Moray West Site and Alternative Moray West Site area	Changes to conclusions of assessment presented in the EIA Report 2018 associated with Alternative Moray West Site area	
			Project specific (note – these conclusions include embedded mitigation measures and any additional mitigation measures (where relevant) identified in each chapter of the Moray West EIA Report – Volume 2)	Cumulative
7	Ornithology	Based on results from the re-assessment of the recommended densities for kittiwake, guillemot and razorbill using the Decision Support System (DSS) process it has been concluded that there are very little, if any, changes associated with the Alternative Moray West Site area. These densities are the fundamental values used to determine the inputs to both CRM and displacement assessment using the matrix approach. Based on this analysis it was also concluded that there is not expected to be any changes in densities of other key seabirds associated with the Alternative Moray West Site (gannet, fulmar, herring gull and great black-backed gull).	It was concluded from the assessment of development within the Alternative Moray West Site that the conclusions of effect significance presented in the EIA Report – Volume 2 Chapter 6 for all impacts remain as assessed for the current Moray West Site. However, it is noted that further information on displacement impacts (on guillemot, razorbill and kittiwake) and collision impacts on kittiwake has been provided in PART 1 of this addendum (Chapters 2 and 3). Based on this information it is concluded that potential effects of displacement on guillemot, razorbill and kittiwake and collision on kittiwake remain as assessed (magnitude = low). The magnitude of the effect is also expected to remain the same for gannet, herring gull and great black-backed gull on the basis that the assessed WCS design parameters for collision will remain within those assessed in the Moray West EIA 2018. Given that it is concluded that there is no change in species sensitivity, overall effect significance remains as assessed in the Moray West EIA Report – Volume 2 Chapter 10 with respect to displacement and collision impacts.	In terms of cumulative effects, as concluded above, given that there are predicted to be no changes in the conclusions of effect significance presented in the EIA Report – Volume 2 Chapter 10 for the current Moray West Site there will also be no changes in conclusions of cumulative effect significance. Further information on the conclusions from the in-combination assessment and influence of the reduction in the operation period from 50 years to 25 years in terms of displacement and collision impacts is provided in PART 1 Chapter 3 in relation to the HRA process. These conclusions are also considered in PART 2 with respect to the assessment of the Alternative Moray West Site area.
8	Commercial fisheries	With regard to commercial fisheries, key grounds identified for the majority of the key fleets in the Moray Firth (creels, mackerel, squid and Nephrops) are located	For most fleets, given that there will be no change in the WCS design parameters assessed in the Moray West EIA Report – Volume 2 Chapter 11, and that most grounds are located to the south of the Alternative Moray West Site, it is concluded	Given that there is no change in the conclusions of effect significance presented in the Moray West EIA Report – Volume 2 Chapter 11 for project

Table 1.3 Key conclusions from the assessment of the Alternative Moray West Site				
Chapter number (PART 2)	**EIA topic**	**Differences in baseline between current Moray West Site and Alternative Moray West Site area**	**Changes to conclusions of assessment presented in the EIA Report 2018 associated with Alternative Moray West Site area**	
			Project specific (note – these conclusions include embedded mitigation measures and any additional mitigation measures (where relevant) identified in each chapter of the Moray West EIA Report – Volume 2)	**Cumulative**
		to the south of the variation area and therefore sensitivity of these fleets to development within the Alternative Moray West Site remains unchanged. Whitefish and scallop dredge fleets are active in the variation area, with levels of activity for scallop dredgers increasing from low to moderate in the variation area. However, the sensitivity of both fleets remain as assessed when considered across the entire Alternative Moray West Site area.	that there will be no change in the conclusions of effect significance assessed for the current Moray West Site. With respect to scallop fisheries, although effort increases from low to moderate within the variation area, there is no change in sensitivity across the Alternative Moray West Site. Given that there are no changes in the assessed WCS design parameters, the conclusions of effect significance for the Alternative Moray West Site remain as assessed for the current Moray West Site.	specific impacts, it can be concluded that the conclusions of cumulative effect significance will also remain as assessed for the current Moray West Site.
9	Shipping and navigation	It is noted in the shipping and navigation chapter that the variation area encroaches into an area of slightly higher marine traffic than that within the current Moray West Site and the rest of the Alternative Moray West Site. Given that the variation area has only previously been assessed for offshore export cables, and the slight increase in traffic in this area, it is concluded that there is an increase in the sensitivity of marine traffic to offshore wind farm development within the variation area, and therefore the Alternative Moray West Site area.	Based on the conclusions from the qualitative assessment of effects of development within the Alternative Moray West Site it was concluded that, although the variation area extends south into an area of higher density marine traffic, with mitigation which includes quantitative collision and allision re-routeing modelling to be completed post-consent, the potential risk to all shipping and navigation receptors for most impacts will be broadly acceptable and for vessel collision (vessel to vessel) and allision risk (vessel to structure) will be tolerable with mitigation. These conclusions represent a slight increase in the collisions of effect significance (based on risk) presented in the Moray West EIA Report – Volume 2, Chapter 12.	Given that the variation area extends south into an area of higher density marine traffic, it has been concluded there may be increased deviations from the baseline commercial vessel routeing when compared against those estimated in the assessment of the current Moray West Site area on an in-isolation basis. There may also be increased displacement to third party activity, namely fishing, recreational activity, and decommissioning of the Beatrice platforms. However, any such deviations

Table 1.3 Key conclusions from the assessment of the Alternative Moray West Site				
Chapter number (PART 2)	**EIA topic**	**Differences in baseline between current Moray West Site and Alternative Moray West Site area**	**Changes to conclusions of assessment presented in the EIA Report 2018 associated with Alternative Moray West Site area**	
			Project specific (note – these conclusions include embedded mitigation measures and any additional mitigation measures (where relevant) identified in each chapter of the Moray West EIA Report – Volume 2)	**Cumulative**
				on a cumulative basis would be unlikely to affect the cumulative impact significance already assessed (at most broadly acceptable for all phases), however it will be necessary to repeat the cumulative re-routeing assessment in terms of MGN 543 to validate the conclusions pre-construction.
10	Civil and military aviation	The study area considered for the current Moray West Site and the offshore export cable corridor covered a large geographical area (beyond the boundaries of the current application). It is therefore concluded that a revised boundary to include the Alternative Moray West Site area would be insignificant as it is entirely within the same airspace environment as the current Moray West Site. Therefore there is no change in the sensitivity of key civil or military aviation receptors.	It was concluded from the assessment of development within the Alternative Moray West Site that the conclusions of effect significance presented in the EIA Report – Volume 2 Chapter 13 remain as assessed for the current Moray West Site. This is on the basis that although there is a reduction in the maximum tip height (reduced from 285 m to 265 m with removal of the Model 4 WTG) potential for radar interference and changes to Airport Instrument Flight Procedures remains as assessed in the EIA Report – Volume 2 Chapter 13 and there is no change in receptor sensitivity.	Cumulative effects for civil and military aviation were scoped out of the Moray West EIA on the basis that the potential effects of each Development are always considered on a case by case (project by project basis).
11	Seascape, landscape and visual	In terms of SLVIA, the current Moray West Site covers an area of open sea that extends into the narrower part of the Moray Firth where there is a greater association	It was concluded in the SLVIA assessment that changes associated with the development in the Alternative Moray West Site area while not reducing overall conclusions of effect significance, would reduce the magnitude of impacts	In terms of cumulative effects it was concluded that while there may be some reduction in the cumulative magnitude of the impact in the views from Moray

Table 1.3 Key conclusions from the assessment of the Alternative Moray West Site				
Chapter number (PART 2)	**EIA topic**	**Differences in baseline between current Moray West Site and Alternative Moray West Site area**	**Changes to conclusions of assessment presented in the EIA Report 2018 associated with Alternative Moray West Site area**	
			Project specific (note – these conclusions include embedded mitigation measures and any additional mitigation measures (where relevant) identified in each chapter of the Moray West EIA Report – Volume 2)	**Cumulative**
		between the Highland and Moray coastlines through inter-visibility in excellent visibility conditions and extends the horizontal extent of the offshore wind farm views created by BOWL (and Moray East) further south. The Alternative Moray West Site covers an area of open sea that extends the Moray West Site area closer to parts of the Moray and Aberdeenshire coasts but within a broader expanse of open sea, rather than the more constrained area of the inner Moray Firth that occurs further to the south-west. It is also noted that there is a change to the onshore wind farms that were considered in the Moray West EIA Report – Volume 2 Chapter 14. Three of the projects / single turbines are now operational (were consented).	on landscape and visual receptors along the East Caithness / Sutherland coast (although the reductions do no alter the assessed levels of the overall magnitude based on the assessment criteria included in the EIA Report – Volume 2 Chapter 14). These reductions in impact magnitude are attributed to both the reduction in turbine height (with removal of the Model 4 WTG) and in the event the Alternative Moray West Site area is taken forward, a reduction in the horizontal field of view affected by the development due to the removal of turbines from the western extent of the current Moray West Site. The assessment also concluded that, while turbines located in the southern part of the Alternative Moray West Site (the variation area) would be closer in proximity to both Aberdeenshire and Moray Coasts, there would be no change in impacts magnitude or conclusions of effect significance. This is on the basis that the revised Model 3 WTGs are comparatively smaller than the Model 4 WTGs (now removed) therefore, although closer, when viewed from the Aberdeenshire and Moray coasts will appear to be of a very similar scale to the Model 4 WTGs layout as presented for the current Moray West Site. With the revised layout associated with the Alternative Moray West Site area, the horizontal field of view affected by the Development would be reduced. There will also be a reduction in the magnitude of night-time	and Aberdeenshire as a result of the reduced impact of the reduction in turbine height and development in the Alternative Moray West Site area and the reduced impact of the Moray East DSLP layout these would not be sufficient to alter the findings of the cumulative assessment whereby the significant cumulative effects occur as a result of the successive visibility of development in the Alternative Moray West Site in the context of the Moray East DSLP layout. In terms of other consent projects that are in application, consented and operational/under construction the previously assessed significant effect on the Coastal Shelf area of the Loch Fleet, Loch Brora and Glen Loth SLA would be reduced on the basis that development in the Alternative Moray West Site would not be seen in succession and sequentially with the West Garty onshore wind farm as it is been refused

Table 1.3 Key conclusions from the assessment of the Alternative Moray West Site				
Chapter number (PART 2)	**EIA topic**	**Differences in baseline between current Moray West Site and Alternative Moray West Site area**	**Changes to conclusions of assessment presented in the EIA Report 2018 associated with Alternative Moray West Site area**	
			Project specific (note – these conclusions include embedded mitigation measures and any additional mitigation measures (where relevant) identified in each chapter of the Moray West EIA Report – Volume 2)	**Cumulative**
			impacts due to a reduction in the field of view (narrower) and reduction in vertical height of the turbines.	consent and therefore not part of the cumulative wind farm context.
12	Socio-economics, recreation and tourism	Given that socio-economic receptors relating to GVA creation and employment occur onshore, these will be unaffected by development within the Alternative Moray West Site in terms of changes in development area. The proposed variation area is also generally not utilised for marine tourism and recreation activities, it was therefore concluded that there would also be no change in the sensitivity of these receptors. It is noted that, in general there has been a change in the baseline conditions within the local study area since submission of the Moray West Application in July 2018. These include the recent award of three contracts to harbour facilities around the Moray Firth by Moray East. These investments are a strong indicator of the certainty and validity attached to the	It was concluded in the assessment that impacts on employment or GVA creation would be unaffected by development in the Alternative Moray West Site area. The assessment also concluded that there is no change in marine tourism or recreation activities occurring with the Alternative Moray West Site therefore impact magnitude and conclusions of effect significance remain as assessed for the current Moray West Site in the EIA Report – Volume 2 Chapter 15. The recent change in baseline conditions within the local study area resulting from significant investments in three local harbour facilities by Moray East provides further confidence to the conclusions of effect significance presented in the EIA Report – Volume 2 Chapter 15 in terms of the predicted economic and social benefits that will be provided in the Moray Firth region by the Moray West development.	Given that there is no change in the conclusions of effect significance presented in the Moray West EIA Report – Volume 2 Chapter 11 for project specific impacts, it can be concluded that the conclusions of cumulative effect significance will also remain as assessed for the current Moray West Site. However, it should be noted that the changes in baseline conditions in the local study area resulting from the Moray East harbour investments provide greater clarity on the potential for cumulative effects to arise from consecutive development activities across the Moray Firth region.

Table 1.3 Key conclusions from the assessment of the Alternative Moray West Site				
Chapter number (PART 2)	**EIA topic**	**Differences in baseline between current Moray West Site and Alternative Moray West Site area**	**Changes to conclusions of assessment presented in the EIA Report 2018 associated with Alternative Moray West Site area**	
			Project specific (note – these conclusions include embedded mitigation measures and any additional mitigation measures (where relevant) identified in each chapter of the Moray West EIA Report – Volume 2)	**Cumulative**
		conclusions from the Moray West assessment presented in the EIA Report – Volume 2 Chapter 15.		
13	Marine archaeology and cultural heritage	No new or additional marine archaeological features with increased sensitivity to the development of the Moray West Offshore Wind Farm infrastructure and components of the OfTI have been identified within the Alternative Moray West Site. Although the changes to the Moray West application boundary have been proposed to mitigate adverse effects on SLVIA, which includes effects on the setting of cultural heritage assets, due to the location of the assets identified in the Moray West EIA Report – Volume 2 Chapter 16 the sensitivity of these to development in the Alternative Moray West Site area remains the same as assessed for the current Moray West Site area.	It was concluded from the assessment of development within the Alternative Moray West Site that the conclusions of effect significance presented in the EIA Report – Volume 2 Chapter 16 remain as assessed for the current Moray West Site. This is on the basis that no new or additional marine archaeology assets have been identified within the Alternative Moray West Site and there will be no change in the assessed WCS design parameters therefore impact magnitude remains unchanged. In terms of potential effects on the setting of cultural heritage assets onshore, as noted in the conclusions from the SLVIA assessment, although there will be a reduction in impact magnitude due to the reduction in turbine size and reduction in the horizontal field of view affected by the Development should the Alternative Moray West Site be taken forward, overall conclusions of effect significance remain as assessed in the EIA Report – Volume 2 Chapter 16.	Given that there is no change in the conclusions of effect significance presented in the Moray West EIA Report – Volume 2 Chapter 16 for project specific impacts, it can be concluded that the conclusions of cumulative effect significance will also remain as assessed for the current Moray West Site.
14	Other human activities	There are no changes to the presence of sensitive receptors within the Alternative Moray West Site on the basis that the	It was concluded from the assessment of development within the Alternative Moray West Site that the conclusions of effect significance presented in the EIA Report – Volume 2	Given that there is no change in the conclusions of effect significance presented in the Moray West EIA Report

Table 1.3 Key conclusions from the assessment of the Alternative Moray West Site

Chapter number (PART 2)	EIA topic	Differences in baseline between current Moray West Site and Alternative Moray West Site area	Changes to conclusions of assessment presented in the EIA Report 2018 associated with Alternative Moray West Site area	
			Project specific (note – these conclusions include embedded mitigation measures and any additional mitigation measures (where relevant) identified in each chapter of the Moray West EIA Report – Volume 2)	Cumulative
		location of key receptors remains as assessed for the current Moray West Site and no new receptors have been identified in the variation area.	Chapter 14 remain as assessed for the current Moray West Site. This is on the basis that for all impacts there will be no change in the assessed WCS design parameters or any change in receptor sensitivity.	– Volume 2 Chapter 6 for project specific impacts, it can be concluded that the conclusions of cumulative effect significance will also remain as assessed for the current Moray West Site.

1.12 Contributors to the Addendum

The Addendum Document is split into two parts (PART 1 and PART 2), as shown in Table 1.4 below. This Table also identifies the contributing organisations with relevant technical expertise to provide inputs to each chapter.

Table 1.4: Structure of the Offshore EIA Report		
Chapter No.	**Chapter Title**	**Technical Specialist / Author**
PART 1: Additional Information - Current Moray West Application		
1	Overview of Consultation Responses Relating to Ornithology	Moray West / NIRAS Consulting Ltd
2	Additional Ornithological Information (EIA)	NIRAS Consulting Ltd
3	Additional Ornithological Information (HRA)	NIRAS Consulting Ltd
4	Marine Mammals – Assessment of Differences Between the 0.5% and 1% Conversion Factor	Sea Mammal Research Unit Consulting Ltd CEFAS (updated underwater noise modelling)
5	Seascape, Landscape and Visual Assessment (SLVIA) – Updated Distances	OPEN Ltd
6	Socio-Economics – Changes to Baseline Conditions	Xodus Group
PART 2: Additional Information - Assessment of the Alternative Moray West Site		
1	Introduction	Moray West
2	Scope of Assessment	Moray West
3	Physical Processes and Water Quality	ABPmer Ltd
4	Benthic and Intertidal Ecology	Xodus Group
5	Fish and Shellfish Ecology	Xodus Group
6	Marine Mammal Ecology	Sea Mammal Research Unit Consulting Ltd
7	Ornithology	Hi-Def Consulting
8	Commercial Fisheries	Brown and May Ltd
9	Shipping and Navigation	Anatec Ltd
10	Military and Civil Aviation	Coleman Associates Ltd
11	Seascape, Landscape and Visual Assessment	OPEN Ltd
12	Socio-economics, Recreation and Tourism	Xodus Group
13	Archaeology and Cultural Heritage	Xodus Group
14	Other Human Activities	Xodus Group

MORAY WEST
OFFSHORE WINDFARM

Addendum – PART 1

Additional Environmental Information - Current Moray West Application

Moray Offshore Windfarm (West) Limited

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1 Summary of Responses Received in Relation to Ornithology

1.1 Introduction

Table 1.1 provides information on the following:

- A summary of the key comments received in relation to:
  - The Moray West EIA Report - Volume 2 - Chapter 10: Ornithology;
  - The Moray West EIA Report - Volume 4 - Technical Appendices 10.1 to 10.4; and
  - The Moray West Report to Inform an Appropriate Assessment (RIAA).
- Identification of key comments for which additional information is required; and
- Reference to relevant sections of PART 1 of this addendum where additional information has been provided.

Where necessary, further reference to additional comments received prior to, and during a meeting with, Scottish Natural Heritage (SNH), Marine Scotland Science (MSS) and Marine Scotland Licencing Operations Team (MSLOT) on 5th November 2018 is included in relevant sections included in Chapters 2 and 3 of this addendum (PART 1).

Table 1.1: Comments received on Moray West EIA Report and RIAA with respect to Ornithology

Comment	Requirement for additional information
SNH response (07/09/18)	
We have reviewed the Environmental Impact Assessment (EIA) Report, Habitat Regulations Appraisal (HRA) Report and undertaken a preliminary appraisal of the updated Population Viability Assessment (PVA) reports. In our view, this proposal will have an adverse effect on the site integrity for kittiwake as a qualifying interest of the East and North Caithness Cliffs in-combination with the Moray East and Beatrice offshore wind farms. Therefore we object to the proposal. The key impact is collision risk. It is also noted that there may be a an issue with the combined impact of collision and displacement, but we have been unable to fully assess this due to our inability to follow the process undertaken by the developer.	Additional information provided in Chapter 2: Additional Ornithological Information (EIA) Chapter 3: Additional Ornithological Information (HRA)
For Moray West on its own we have insufficient information to conclude no adverse effect on site integrity for kittiwake as a qualifying interest of the East Caithness Cliffs SPA. This is due to our uncertainty with the impact assessment methodology, in particular not presenting modelled outputs for combined mortality from collision and displacement and how the PVA was undertaken.	Additional information provided in Chapter 2: Additional Ornithological Information (EIA) Chapter 3: Additional Ornithological Information (HRA)
For Moray West in-combination with other wind farm projects we have insufficient information to conclude no adverse effect on site integrity for common guillemot and razorbill of the East Caithness Cliffs SPA. This is due to our uncertainty issues with the impact assessment methodology, in particular how displacement has been calculated.	Additional information provided in Chapter 2: Additional Ornithological Information (EIA) Chapter 3: Additional Ornithological Information (HRA)

Table 1.1: Comments received on Moray West EIA Report and RIAA with respect to Ornithology	
Comment	**Requirement for additional information**
Great black-backed gull is not included in the HRA. Therefore, we have insufficient information to reach a conclusion for great black-backed gull as a qualifying feature of the East Caithness Cliffs SPA.	Additional information provided in Chapter 2: Additional Ornithological Information (EIA) Chapter 3: Additional Ornithological Information (HRA)
In addition to not reaching an agreement about the suitable baseline values to take forward to impact assessment prior to submission, insufficient information has been provided to assess the validity of the values used. Notably the absence of the Technical Appendix 10.1A Baseline Data Decision Support Flow Charts, but also the absence of clear explanations and justifications for the values taken forward. We requested this in pre-application meetings with Moray West, as noted in the minutes of the meeting held on the 13th April 2018. As a result, we have no certainty over the validity of the values underpinning the impact assessment process, which impacts our ability to be confident in the level of impact being predicted.	Technical Appendix 10.1A Baseline Data Decision Support Flow Charts and Report is included in Appendix A. This has been updated to address further comments raised during consultation relating to inconsistencies with numbers.
The PVA models, although following appropriate methods, calculate impacts of the proposed wind farm in increments of 50 bird deaths. This seems to be based on theoretical scales of impact rather than being informed by the impact values predicted by displacement or collision risk modelling. As a result, the scale of impact is only broadly suitable for assessing the in-combination impacts on kittiwakes from East and North Caithness Cliff SPAs, but not for kittiwake alone or other species with lower mortality figures. This has prevented us from being able to fully assess population level impacts for these species.	Revised PVAs for auks and kittiwake are provided in Chapter 3: Additional Information (HRA) Ornithology – Sections 3.3 and 3.4 respectively. PVAs for kittiwake are presented at an impact level (individual bird mortality). PVAs for auks are presented in increments of 10 bird deaths.
Moray West has used different species-specific flight speed parameters (from ORJIP Thanet Project) to those usually recommended for CRM. Although no agreement was reached in pre-application discussions about whether these flight speeds are appropriate, we are content for these updated flight speeds to be used in the CRM. This is based on the very low sample sizes (n=2-32) used to inform the recommended flight speeds (which until now have represented best available evidence), compared to the sample sizes used to inform the more recent flight speed estimates (n=287-790). Moray West has also presented the outputs of CRM using the originally recommended flight speeds to enable comparison.	Noted. The effect of changes to flight speeds are also considered on an in-combination basis in Section 3.6 in reference to in-combination effects on kittiwake as a qualifying interest of the East and North Caithness Cliffs
Moray West presents collision risk calculated using the SNCB recommended avoidance rates (ARs) in addition to the estimates using a variety of other AR's. Our advice is based on outputs calculated using the agreed SNCB AR recommendations.	Noted. The influence of avoidance rates on in-combination totals for kittiwake as a qualifying interest of the East and North Caithness Cliffs are further considered in Section 3.6.
Our advice is not based on the collision outputs from the Option 1 Band Models, but if considered in the future it should be borne in mind that boat based survey data flight bands do not accord with the size of the proposed turbines. This will lead to an over/underestimation of collisions.	Noted. No further information provided in this addendum.
A correction factor has been applied to collision estimates from all developments included in the in-combination assessment that intends to take account of changes in nocturnal factors applied in the collision risk modelling. This is a novel approach that was not discussed or agreed prior	Noted. Further information on nocturnal factors and their influence on collision rates is provided in Chapter 3: Additional Information (HRA) Ornithology –

Table 1.1: Comments received on Moray West EIA Report and RIAA with respect to Ornithology	
Comment	**Requirement for additional information**
to submission. The correction factor will act to reduce in-combination collision impacts.	Section 3.6 in reference to in-combination effects on kittiwake as a qualifying interest of the East and North Caithness Cliffs
Although there are inconsistencies across the documents regarding the minimum blade tip height above Highest Astronomical Tide (HAT) (between 22 m and 35 m) parameters given in Table 3.4 in Appendix 10.2 indicate 35 m above HAT is used in the CRM.	Noted. Moray West confirms a minimum air gap of 35 m.
Standard deviations around AR's do not seem to be presented. This is contrary to agreed SNCB guidance on avoidance rates and prevents us from fully understanding the range of potential mortality resulting from collisions.	Collision risk estimates calculated using the standard deviations around avoidance rates are presented for all species across all Band model Options in the EIA Report – Volume 4, Technical Appendix 10.2 in Section 1.4 and both Appendix A and Appendix B.
Non-breeding season assessments have not been calculated in an agreed way. Cumulative collision risk has been calculated for kittiwake and gannet during post-breeding and pre-breeding periods rather than as a non-breeding season total. Pre-application discussions about impact assessment methods, as advised in our scoping opinion, would have enabled us to advise Moray West on how to appropriately undertake this part of the assessment. During autumn 2017, we produced an illustrative example for Marine Scotland to assist developers in undertaking cumulative non-breeding season assessments. The current assessment does not allow us to fully quantify cumulative collision risk.	Noted. Information provided to address specific comments relating to breeding season variations and the influence on cumulative collision risk for kittiwake and gannet is provided in Chapter 2: Additional Information (EIA) Ornithology – Section 2.6 respectively. The influence of breeding season variations on collision risk for kittiwake is also presented in Chapter 3: Additional Information (HRA) Ornithology – Section 3.4
Displacement As the Marine Scotland tool was not available a matrix approach has been applied. The displacement assessment broadly follows SNCB displacement guidance and provides estimates for a range of mortality and displacement rates.	Noted. Updated information on displacement is provided in Chapter 2: Additional Information (EIA) Ornithology – Section 2.5 and Chapter 3: Additional Information (HRA) Ornithology – Sections 3.3, 3.4 and 3.5.
Our advice is based on displacement rates of 60% for the auk species and 30% for kittiwake, and a mortality rate of 2% for puffin and kittiwake and 1% for guillemot and razorbill (for both adults and immatures).	Noted. Reference to these displacement rates is included in Chapter 2: Additional Information (EIA) Ornithology – Section 2.5 and Chapter 3: Additional Information (HRA) Ornithology – Sections 3.3, 3.4 and 3.5.
Seasonal mean peak population estimates, including both birds on the water and in flight, have been used in the impact assessment for displacement as recommended to Marine Scotland. Population estimates have been derived from the decision support system for guillemot, razorbill, puffin and kittiwake, and taken directly from the single year of aerial survey data for fulmar (Section 10.5.4.18, Chapter 10, EIA Report). It is not clear why a different approach has been taken for fulmar.	Fulmar was not considered to be a focal species through the consultation process. It was therefore considered that it would not be included in the decision support tree process.

Table 1.1: Comments received on Moray West EIA Report and RIAA with respect to Ornithology	
Comment	**Requirement for additional information**
The breeding season definitions Moray West has used in displacement analysis (and collision risk analysis) do not follow SNH recommended seasonal definitions. SNH has previously provided guidance to Marine Scotland on how to incorporate half months into impact assessment. The use of different seasonal definitions will reduce breeding season predicted impacts for auk species and fulmar and increase impacts for kittiwake.	Noted. Information provided to address specific comments relating to breeding season variations is provided in Chapter 2: Additional Information (EIA) Ornithology – Section 2.5 and 2.6 and Chapter 3: Additional Information (HRA) Ornithology – Section 3.4
Displacement impact assessment provides population estimates for the Moray West Site + 2 km buffer, but does not include estimates for the Moray West Site alone, as is recommended in the SNCB displacement guidance.	Displacement impacts have been re-assessed for the Moray West Site alone and Moray West Site + 2 km buffer. Results from this additional assessment are presented in Chapter 2: Additional Information (EIA) Ornithology – Section 2.5 and 2.6 and Chapter 3: Additional Information (HRA) Ornithology – Section 3.4
Count adjustments and corrections for survey coverage and availability bias are not fully documented, as recommended in the SNCB displacement guidance. This prevents us from assessing how the data have been processed prior to input into the impacts assessment.	Details of the survey methodology including availability bias are detailed in EIA Report – Volume 4: Technical Appendix 10.3, Section 1.2. No further information provided.
SNCB displacement guidance advises that breeding season assessment should be undertaken against appropriate regional populations agreed with SNCBs but likely to cover total colony counts within mean max foraging range of the development. It is not clear what regional population Moray West has used when calculating breeding season impacts (by comparing the predicted displacement mortality to the 1% baseline mortality of the regional population). The tables in the EIA Report – Volume 4: Technical Appendix 10.3 provide a breeding season regional population figure but this is labelled as a regional BDMPS figure. BDMPS is a non-breeding season tool. As it isn't clear how the breeding season regional populations have been generated, we cannot assess whether displacement impacts have been compared against the appropriate regional population. This will affect whether an impact is deemed significant or not, and whether that impact should be taken through to PVA or considered in the HRA. For example, the regional breeding population for puffin is cited as 119,600 birds (EIA Report – Volume 4: Technical Appendix 10.3, Table 4.5 and Sections 10.7.2 and 10.8.4 in Chapter 10 of the EIA Report – Volume 2), whereas the North Caithness Cliffs SPA population of puffin within mean max foraging range of Moray West comprises 3,053 individuals (most recent counts). As such, the population values Moray West has used appear to underestimate the impacts of displacement on connected populations.	Spreadsheet response to this comment is provided in Section 2.5.3.
Apportioning of Impacts to SPA Populations In absence of Marine Scotland apportioning tool being available, Moray West has broadly followed SNH apportioning guidance.	Noted. Further information on the approach to apportioning has been provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.2

Table 1.1: Comments received on Moray West EIA Report and RIAA with respect to Ornithology	
Comment	**Requirement for additional information**
Despite Section 3.1.1, Appendix 4.4 of the HRA Report describing a two stage apportioning process was followed. HRA Appendix 4.4 Section 7, suggests that Stage 2 apportioning between SPAs has been undertaken using seabird 2000 data rather than the most recent colony counts provided by SNH (in Annex of the Moray West memo to Marine Scotland dated 18th December 2017). From a rough comparison of weightings calculated using both colony counts for kittiwake, there does not seem to be much difference between the two values. However, the counts used could lead to over/underestimation of bird mortality figures attributed to each SPA.	Noted. Further information on the approach to apportioning has been provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.2
SPAs considered in apportioning appear to have been included in the HRA based on a mix of mean max and mean max ± 1 SD foraging ranges as reported in Thaxter *et al* 2012 (see section 3.1.1, Appendix 4.4 of the HRA Report). Mean max ± 1 SD has been used to ensure kittiwake and razorbill from North Caithness Cliffs SPA are considered. Although SNH usually recommends mean max ± 1 SD, using mean max foraging ranges for the other species should not alter the species and SPAs considered.	Noted although we assume that the final sentence in SNH's comment should read "Although SNH usually recommends mean max, using mean max ± 1 SD foraging ranges for the other species should not alter the species and SPAs considered.
Colony weighting has been calculated using Seabird 2000 data in accordance with SNH guidance and using the recommended colony counts provided for kittiwake and herring gull (Annex of the Moray West memo to Marine Scotland dated 18th December 2017). However, Seabird 2000 colony counts for guillemot, razorbill and puffin do not match the recommended values provided by SNH. It is not clear which colony counts have been used in the apportioning process or why discrepancies between the figures occur. This could be related to issues recently highlighted regarding the use of a 1.34 correction factor for auks but this is not clear from the information provided.	Noted. Further information on the approach to apportioning has been provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.2
Sabbatical birds are taken into account in the apportioning process, using agreed rates advised for the most recent Forth and Tay offshore wind farm applications. These rates are appropriate for the Moray West application, although there is no established or agreed position on how best to account for sabbatical birds in the impact assessment.	Noted. Further information on how sabbatical birds are taken into account in the apportioning process has been provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.2
A novel method has been used to apportion impacts between age classes for kittiwake, which was not previously discussed or agreed with SNH (HRA Report, Appendix 4.4, Section 5). It draws on an approach developed for Hornsea II wind farm. The approach uses age-specific survival rates to calculate the proportion of different age-classes likely to be present at the Moray West site rather than using site specific or agreed proportions. This could increase or decrease the impacts attributed to SPA populations.	Noted. Further information on the approach to apportioning has been provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.2
Collision mortality is apportioned to adult birds during the apportioning to SPA stage (Section 6.8, HRA Report e.g. Table 6.8.4). Apportioning to adult birds should not be done at this stage as the apportioned mortality figure is then used in PVA modelling. PVAs allocate impact mortality across all age classes in the models (including immatures), which will underestimate the population impact on adult birds. Although the effect of this error may be small at an individual SPA level (e.g. 58 instead of 61 bird deaths attributed to East Caithness Cliffs SPA for kittiwake for Moray West alone) it is not fully known what effect this could have on in-combination impacts if the same process has been followed when calculating mortality for other developments.	The PVA modelling produced for Moray West requires the adult mortality for the relevant SPA. The PVA model uses the adult mortality and calculates the mortality attributable to other age classes based on the stable age population. For example, for gannet, where an adult mortality of 50 adult birds is assumed, the total mortality is 83 birds

Table 1.1: Comments received on Moray West EIA Report and RIAA with respect to Ornithology	
Comment	**Requirement for additional information**
Population Viability Analysis Methods: The population models used for the PVA are described as stochastic, density independent, age structured Leslie matrix models. These models use matched runs between impacted and unimpacted scenarios. These models are in accordance with currently recommended methods to estimate population impacts.	Noted. No further information provided in this addendum.
Population models give outputs for 35 year and 50 year timespans. Models for at least one species are optimistic about the trajectories for the populations involved (kittiwake), although counterfactual/ration outputs should be robust to this. When calculating population growth rates, the first five years of stimulations are discarded, as per scoping recommendations, to remove the influence of starting conditions. The use of 35 years rather than 25 years prevents the comparison of impacts with other developments that have routinely used a 25 year runtime.	Noted. Collision and displacement impacts have been presented at 25, 35 and 50 years for auks and kittiwake – see Chapter 3: Additional Information (HRA) Ornithology – Section 3.3
Stochasticity is introduced to the population model by sampling from appropriate probability distributions for demographic rates.	Noted. No further information provided in this addendum.
Model parameters are derived from Horswill and Robinson (2016), as advised in our scoping opinion response - except for maximum number of eggs per pair, which is taken from Snow and Perrins (1998). Mean ± SD of clutch size would have been preferred rather than a maximum clutch size, with sampled rates taken from within this distribution to reflect observed variation in clutch size.	Noted. However, it is noted that that mean clutch size and SD is unavailable for several of the species assessed (e.g. kittiwake).
PVA models appear to be based on theoretical impact levels rather than informed by predicted mortality figures, with the model outputs presented in increments of 50 bird deaths. For most species, these thresholds are uninformative as impact levels are lower. The increments used are of some use for kittiwake as the scale of estimated impact is similar to the increments presented, although it would still be useful to present population impact increments below 50 bird deaths, particularly in the case of impacts on kittiwake from Moray West alone.	Revised PVAs kittiwake are provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.4, 3.5 and 3.6.These are now mortality specific.
Mortality is applied within the model immediately following chick fledging. This should result in a slightly less precautionary output than if mortality were applied at the beginning of the breeding season, as all breeding birds in the population are allowed to breed before collision / displacement mortality is applied, despite collisions occurring during the breeding season and removing some of these individuals. This should not have a large impact on the population modelling results, but it is worth bearing in mind when considering the outputs.	Noted. No further information provided in this addendum.
Stable age structure models were used to compile age classes. Stable age structure models tend to allocate a greater proportion of non-breeding age birds to populations than is usually observed in near-shore development sites like Moray West. This can lead to a lower impact modelled for adults, as impacts are allocated equally among adult and non-breeding age birds equally. This effect in the modelling process is greater during the breeding season, when adults are central place foragers, than the non-breeding season, when birds of all ages tend to be more dispersed.	Noted. Additional information on age classes is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.2
Combined impacts from collision and displacement have not been modelled for kittiwake. If combined then the level of impact increases.	Section 3.5 includes consideration of combined impacts for kittiwake
Habitat Regulations Assessment (HRA): The impacts are not presented for all species and all site combinations	Following discussions to clarify this point with SNH on 05/10/18 it was

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where it was considered that likely significant effects would exist, as was requested in the Scoping Advice and subsequent advice provided to Marine Scotland on 18th December 2017.	confirmed that this comment relates specifically to the absence of information on GBBG in the HRA. Further information on GBBG is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.7
Connectivity of SPAs with the Development site is based on Thaxter *et al.* (2012) foraging ranges that largely follow SNH recommendations.	Noted. No further information provided in this addendum.
HRA has been undertaken for collision risk for (species and site): Herring gull (Buchan Ness to Collieston Coast SPA; East Caithness Cliffs SPA; and Troup, Pennan and Lion's Head SPA) Kittiwake (East Caithness Cliffs SPA; North Caithness Cliffs SPA; and Troup, Pennan and Lion's Head SPA). HRA has been undertaken for displacement risk for (species and site): Guillemot (Buchan Ness to Collieston Coast SPA; East Caithness Cliffs SPA; North Caithness Cliffs SPA; and Troup, Pennan and Lion's Head SPA) Razorbill (East Caithness Cliffs SPA; North Caithness Cliffs SPA; and Troup, Pennan and Lion's Head SPA) Puffin (North Caithness Cliffs SPA) Kittiwake (East Caithness Cliffs SPA; North Caithness Cliffs SPA; and Troup, Pennan and Lion's Head SPA) Fulmar (Buchan Ness to Collieston Coast SPA; East Caithness Cliffs SPA; North Caithness Cliffs SPA; and Troup, Pennan and Lion's Head SPA)	Noted. No further information provided in this addendum.
The tables in Section 6.8 of the HRA Report than present disturbance/displacement impacts at each of the SPAs for the relevant species are difficult to understand. It is not clear where the figures presented originate from. As such, they may be affected by issues outlined in the displacement section above, which have made it difficult to come to a conclusion about the significance of displacement effects.	A breakdown of the individual disturbance / displacement figures for each SPA and species was provided in the RIAA Report Technical Appendix 4.6. As required to address specific comments relating to guillemot, razorbill and kittiwake, a breakdown of displacement rates is presented in Chapter 3: Additional Information (HRA) Ornithology – Section 3.3 and 3.4
Great black-backed gull as a qualifying interest of the East Caithness Cliffs SPA was not taken through to HRA despite scoping advice to do so. Breeding season collision estimates indicate an increase in baseline mortality for great black backed gull of over 20% (Table 10.7.10 Chapter 10 EIA Report). Potential impacts of this level warrant this species inclusion in the HRA.	Further information on GBBG with respect to HRA is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.7.
Moray West's reasons for not taking this species through to HRA are attributed to 1) results of tracking from East Caithness Cliffs SPA suggesting that great black-backed gulls from that colony remain near the coast and do not enter the Moray West Site, 2) the inclusion of immature and non-breeding (sabbatical) birds observed in the Moray West Site in collision risk modelling population figures where only breeding pairs are considered in colony counts against which the collision estimates are compared, and 3) that 70% of breeding season collisions occur in August when it is suggested a significant proportion of individuals in the region will be immature or passage birds (Section 10.7.2.1.30, Chapter 10 EIA Report).	Further information on GBBG with respect to HRA is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.7.

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PVA modelling results indicate the population trajectory for great black-backed gull drops to extinction almost immediately following impact (extinct by first increment of 50 bird deaths). Collision risk mortality indicates 9-10 birds killed per annum but PVA modelling output presentation does not allow assessment of this lower level impact on the population. More detailed assessment for this species is required to establish impacts on the SPA population.	Further information on GBBG with respect to HRA is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.7.
Conclusions: **Impacts on populations:** Impacts resulting in likely significant effect on qualifying interests are generally at the in-combination level and at East and North Caithness Cliffs SPAs; the exception being kittiwake collision mortality at East Caithness Cliffs SPA, which is also likely significant effect for Moray West alone.	Moray West has presented in Chapter 3: Additional Information (HRA) Ornithology – Section 3.6 a number of refinements that can be applied to the in-combination assessment for kittiwake at East Caithness Cliffs SPA and North Caithness Cliffs SPA. These refinements would reduce total in-combination collision impacts both during the breeding season and non-breeding season.
PVA for kittiwake collision at East Caithness Cliffs SPA modelled with impacts from Moray West alone suggest a population size after 35 years of 96% the unimpacted population. For 50 years the population is predicted to be 94% the unimpacted population. This has been calculated based on 50 bird deaths whereas the actual collision mortality figure for kittiwake alone at East Caithness Cliffs SPA is 58 birds. This will result in a slight increase in the population level impact, although it is not possible to establish how much of an increase owing to the way the data has been presented in 50 bird death increments. Considering this assessment is based on collision alone (i.e. without combining impacts from displacement), then we conclude insufficient information to ascertain no adverse effect on site integrity for kittiwake as a qualifying interest of East Caithness Cliffs SPA.	This has been corrected. PVAs have now been run for individual levels of mortality for the CRM (for Kittiwake). These revised PVAs are presented in Chapter 3: Additional Information (HRA) Ornithology – Section 3.4, 3.5 and 3.6.
PVA for kittiwake collision at East Caithness Cliffs SPA modelled with impacts from Moray West in-combination with Beatrice and Moray East suggest a population size after 35 years of 75% the unimpacted population. For 50 years the population is predicted to be 65% the unimpacted population. We conclude the Moray West in-combination impacts for kittiwake collision will lead to an adverse effect on site integrity at the East Caithness Cliffs SPA. This has been calculated based on 350 bird deaths whereas the actual in-combination collision mortality figure for kittiwake at East Caithness Cliffs SPA is 325 birds. this result will slightly decrease in the population level impacts, although it is not possible to establish how much of a decrease owing to the way the data has been presented in 50 bird death increments. If collision and displacement were combined, then the level of impact is likely to increase.	This has been corrected. PVAs have now been run for individual levels of mortality for the CRM (for Kittiwake). These revised PVAs are presented in Chapter 3: Additional Information (HRA) Ornithology – Section 3.4, 3.5 and 3.6.
PVA for kittiwake collision at North Caithness Cliffs SPA modelled with impacts from Moray West in-combination with Moray East and Beatrice suggest a population size after 35 years of 83% the unimpacted population. For 50 years the population is predicted to be 77% the unimpacted population. We conclude that Moray West in-combination impacts for kittiwake collision will lead to an adverse effect on site integrity at the North Caithness Cliffs SPA. This has been calculated on 50 bird deaths,	This has been corrected. PVAs have now been run for individual levels of mortality for the CRM (for Kittiwake). These revised PVAs are presented in Chapter 3: Additional Information (HRA) Ornithology – Section 3.4, 3.5 and 3.6.

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whereas the actual in-combination collision mortality figure for kittiwake at North Caithness Cliffs SPA is 49. This should not change the population level impact. If collision and displacement are combined, then the level of impact is likely to increase.	
PVA for guillemot displacement at East Caithness Cliffs SPA modelled with impacts from Moray West in-combination suggests a population size after 35 years of 96% the unimpacted population. For 50 years the population is predicted to be 95% the unimpacted population. Guillemot populations at East Caithness Cliffs SPA have increased since 1977 but have shown a decline of 6% since 1999 (Swann, B. 2016. Seabird Counts at East Caithness Cliffs SPA for marine renewables casework. SNH Commissioned Report No. 902). Due to concerns about how displacement impacts have been calculated we have insufficient information to ascertain no adverse effect on site integrity for common guillemot as qualifying interest of the East Caithness Cliffs SPA.	Further information on the method used to calculate displacement impacts and provide revised PVAs based on 10 bird death increments is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.3.
PVA for razorbill displacement at East Caithness Cliffs SPA modelled with impacts from Moray West in-combination suggest a population size after 35 years of 95% the unimpacted population. For 50 years the population is predicted to be 93% the unimpacted population. Razorbill populations at East Caithness Cliffs SPA have been increasing since 1977. Due to concerns about how displacement impacts have been calculated we have insufficient information to ascertain no adverse effect on the site integrity for razorbill as a qualifying interest of the East Caithness Cliffs SPA.	Further information on the method used to calculate displacement impacts and provide revised PVAs based on 10 bird death increments is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.3
RSPB response	
Whilst the assessment contains errors, omissions and inaccuracies that are discussed below, the presented in-combination impacts on seabird populations from the Moray Firth and other UK east coast projects are unacceptable; are significant in EIA (Environmental Impact Assessment) terms; and constitute an adverse effect on integrity of relevant Special Protection Areas (SPAs). For these reasons, RSPB Scotland object to the Moray West offshore wind farm application.	Objection noted. Responses to specific points discussed below.
The Moray West assessment, using more up to date methods than those used for the consented Beatrice and Moray East assessments, confirms our long-held concerns that the impacts of already consented projects, exceed the environmental capacity of regional seabird populations to cope with these new threats. This very concerning situation demands a robust and strategic approach to decision making. To grant more damaging development in the Moray Firth will certainly limit future expansion of offshore wind in better, less environmentally sensitive locations (e.g. further from shore and deeper water locations) and increase the already unacceptable impacts on seabird populations in the Firth and further afield.	Comment noted.
Black-legged kittiwake: Kittiwake was recently transferred from 'least concern' to 'vulnerable' on the IUCN Red List of Threatened Species as the global population has seen a decline of 40% since the 1970s. In Scotland, which hosts 70% of the UK's breeding kittiwake, a long term downward trend as been recorded over the last 30 years. The in-combination assessment of all relevant UK projects (primarily Scottish and English east coast sites), after applying the developers' own 'correction factors' predicts a total of 3,854 kittiwake deaths per annum. This is considered to be a significant impact in EIA	Comment noted.

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terms on the kittiwake population both at regional breeding and non-breeding periods.	
Black-legged kittiwake: East Caithness Cliffs SPA The kittiwake population has seen a 39.5% decline at this site since 1999 and the latest condition assessment, despite this decline, concluded the population to be in Favourable condition (2015). The predicted counterfactual of population size of 35% over 50 years (i.e. the population is expected to be 35% smaller with the wind farm developments in the Moray Firth than without) is an adverse effect on integrity of this SPA.	Comment noted. Counterfactuals for 25 years for kittiwake at East Caithness Cliffs are presented in Chapter 3: Additional Information (HRA) Ornithology – Section 3.4, 3.5 and 3.6.
Black-legged kittiwake: North Caithness Cliffs SPA The kittiwake population has seen a 55% decline at this site since 1999 and is assessed as being in Unfavourable condition (2016). The predicted counterfactual of population size of 38% over 50 years (i.e. the population is expected to be 38% smaller with the wind farm developments in the Moray Firth than without) is an adverse effect on integrity of this SPA.	Comment noted. Moray West only contributed 2 birds to the total in-combination collision impacts on kittiwake at North Caithness Cliffs. As presented in Chapter 3: Additional Information (HRA) Ornithology – Section 3.4, 3.5 and 3.6.
Black-legged kittiwake: Troup, Pennan and Lions' Head SPA Latest condition assessment concluded that kittiwake were in an Unfavourable condition at this site (2007). The proposal in-combination with other consented and partially constructed development is estimated to cause 79 mortalities per annum. This impact is likely to cause population scale effects, but these have not been presented in the assessment. We conclude that these impacts, on an unfavourable population, are likely to constitute an adverse effect on the integrity of this SPA.	Comment noted. It was concluded in the RIAA that there would be no adverse effect on the integrity of the Troup, Pennan and Lions' Head SPA for kittiwake. Based on information presented in the RIAA specifically for this site these conclusions remain valid.
Great black-backed gull (GBBG): The assessment of GBBG in the EIA is not accurate and is insufficient in terms of HRA. GBBGs are presently in nationally important numbers on the site during breeding and post breeding periods (see paragraph 10.4.2.114 of the EIA Report - Chapter 10). The predicted mortalities of the project in isolation and in-combination with other offshore wind sites on the UK's east coast is significant in EIA terms. The in-combination assessment, after applying the developers own 'correction factors' predicts a total of 755 GBBG deaths per annum. This equates to an increase in baseline mortality of 217% on the regional breeding population and 9.9% on the pre-breeding Biologically Defined Minimum Population Scale (BDMPS) population (see paragraph 10.8.4.117 of the EIA Report - Chapter 10).	Comment noted.
The assessment as omitted providing any information to support the HRA for this species and a PVA has not been undertaken. Instead, the assessment has relied on tagging data from a limited number of individuals over a limited time frame as justification for there being no connectivity with the Project site. A full appropriate assessment is required for this species at relevant SPAs during the breeding season and the non-breeding season where the in-combination impacts are likely to undermine SPA conservation objectives.	Further information on GBBG with respect to HRA is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.7.
Gannet The assessment states that the mean max foraging range for a number of SPA breeding colonies overlap and so gannet is included in the Moray West Offshore Wind Farm HRA (see Technical Appendix 10.1 Section 5.16.1, page 67). However, gannet is not considered in the HRA as it is stated as not being an SPA species (see paragraph 6.6.6.13 of the RIAA). The in-	As noted in the RIAA, gannet is not an SPA species and therefore does not require consideration in the HRA. It is a feature of the Troup, Pennan and Lions' Head SSSI and has been assessed with respect to

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combination assessment including all relevant UK east coast projects, after applying the developers own 'correction factors' predicts a total of 2,919 gannet deaths per annum. An appropriate assessment on gannet at relevant SPAs is required, particularly due to the potential in-combination impacts on SPA populations during the non-breeding season.	collision risk impacts as part of the EIA (EIA Report – Volume 2, Chapter 10).
Herring gull: A qualifying feature of both the East Caithness Cliffs and Troup, Pennan and Lions Head SPAs, the herring gull populations are recorded as being unfavourable and unfavourable declining condition at both sites respectively. The in-combination assessment including all relevant UK east coast projects, after applying the developers own 'correction factors' predicts a total of 406 herring gull deaths per annum.	Comment noted. Potential effects on herring gull as a qualifying feature of the East Caithness Cliffs SPA, Buchan Ness and Collieston Coast SPA and Troup, Pennan and Lions' Head SPA were assessed in the RIAA. It was concluded that there would be no adverse effect on the integrity of the site with respect to this qualifying feature. SNH has also concluded no adverse effects on these SPAs for herring gull.
Herring gull: The most recent population count at East Caithness Cliffs SPA indicates a continuation of the decline in the population totalling 79% decline since 1977, with no up to date information available for Troup, Pennan and Lion's Head SPA. These important contextual facts are not referenced in the HRA, which is a clear omission. If included, this information would likely result in different conclusions being made in the assessment. We disagree with the current conclusions on impacts to both SPAs.	Comment noted. SNH has also concluded in their response that there is no adverse effect on herring gull as a qualifying feature of the East Caithness Cliffs SPA.
The auks: For razorbill, guillemot and puffin, RSPB Scotland disagree with the various and inconsistent HRA tests that have been applied in the assessment to determine whether the impacts equate to an adverse effect on integrity of the relevant SPAs and their qualifying features.	Comment noted.
The auks: In the original report one test applied for guillemot and razorbill is to compare the predicted impacted end population against the SPA citation population. If the end population is above the citation population then it is concluded to have no adverse effect (presumably if it were to be below then it is an adverse effect?). For puffin, the assessment relies on a comparison of the relative impact of Moray West against committed impacts from the consented Moray East and Beatrice projects. Stating that this additional impact is small and would not materially alter the existing effects predicted for already consented development. This comparison itself does not help conclude what the effects on integrity may be. If impacts from already consented development are having an effect on the integrity of the SPA (North Caithness Cliffs) then any additional impact would exacerbate this state. No information is provided on what that population consequences of a 0.95-1.14% increase in baseline mortality could be.	Consideration of displacement impacts on auk species is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.3
The auks: The additional updated PVA Report (14th August 2018) seems to apply a test whereby if the population can grow with minimal delay in reaching the same population level as the unimpacted population, post project, there is no adverse effect. This is an inappropriate test.	Updated PVA outputs for auk species are presented throughout Chapter 3: Additional Information (HRA) Ornithology – Section 3.3

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The auks: A consistent approach to determining effects on integrity of an SPA for auks is required in addition to new information presented on what the population consequences of the projects in-combination could be on the puffin population at North Caithness Cliffs SPA.	Consideration of displacement impacts on auk species is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.3
Precaution: The environmental reports repeatedly refer to the 'excessive degree of precaution' contained within assessment methods. A number of reasons for this excessive precaution are presented. RSPB Scotland agree that some potential risks of offshore wind to seabirds are reducing. For example, through the installation of fewer, larger turbines as improved turbine technology becomes available, allowing the same amounts of energy to be generated but reducing the risks to seabirds. Also, in terms of improvements in scientific understanding of the risks to seabirds, which is reducing estimated risks in some, but not all, cases.	Comment noted.
The relative reduction in risks to seabirds is certainly welcomed, however, the operational capacity of offshore wind in UK waters is now over 7 GW. The predicted in-combination impacts to seabirds are of an unprecedented scale - there is no other sector which has progressed in the knowledge that it is causing this scale of impact to internationally important wildlife. The growth of the sector, and the growth of its impact on seabirds, is happening at a rate that far outpaces existing and potential future reductions in impact that can be realised by better science and new turbine designs. We accept in principle the potential impact reductions that could be realised through the 'consented' compared with 'as built' developments from new data on nocturnal activity, avoidance rates and flight speeds used in collision risk modelling. However, we do not agree with the extent of reductions that these bring for the reasons set out below.	Comment noted.
Survey effort: The lack of a full two year dedicated site survey record is an important and fundamental omission to the assessment. The justification provided for why the baseline data of one years' worth of data is considered to be sufficiently robust is inadequate. Furthermore the assessment first attempts to demonstrate the robustness of the baseline data but then takes advantage of the fact that the data set has been extrapolated, by suggesting that it has 'likely overestimated' the presence of seabirds on the project site. This suggestion is used as a means to conclude that the predicted in-combination impact is much less than predicted (see RIAA, page 125, paragraph 6.9.3.18)	Further information on the approach to the extrapolation of data for inclusion in the baseline is presented in Appendix A: Technical Appendix 10.1A Baseline Data Decision Support Flow Charts and Report. This has been updated to address further comments raised during consultation relating to inconsistencies with numbers.
Nocturnal Flight Activity: For kittiwake and large gulls, there is no peer reviewed evidence for a change in the factor used. The current factors is derived from the expert opinion collected by Garthe and Huppop (2004) and this is endorsed by Band (2012). A review of seabird vulnerability to offshore wind farms (Furness *et al*., 2013) recommended no changes be made to the nocturnal activity scores for this species, and an update, including the same authors (Wade *et al*., 2016) maintained this recommendation. Furthermore, the Skov *et al*., 2018 report does not fully account for the distinction between the definition of daylight as used in the Band model and with the official concept of 'twilight' and 'night'. This is an issue as the Band (2012) model considers the nocturnal period as between sunset and sunrise and so treats flight activity that occurs at twilight as being within the nocturnal flight	Comment noted. The Applicant's approach follows that advised by SNH and Marine Scotland

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period. Evidence from tagging shows that a number of seabirds actively forage at twilight.	
The Nocturnal Activity Score presented for gannet is not in accordance with the latest published evidence (Furness *et al.,* 2018), which recommends 8% in the breeding season and 3% in the non-breeding season. The value used in the assessment, 1, corresponds to 0% nocturnal activity, and will result in predictions of fewer collisions. While we welcome this review, we are concerned that the mortalities predicted using revised nocturnal activity rates for gannet (and this applicable to other species) are potentially underestimated because they do not account for the potential interaction between survey timing and diurnal behavioural patterns, whereby peaks in foraging activity at first and last light (See Figure 3 in Furness *et al.,* 2018) will not be accounted for in the assessment if these did no coincide with surveys (the timings of which are currently unknown but likely to be midday if aerial), and the survey may have been carried out at a time of much lower activity. Thereby the application of the revised nocturnal activity factor recommended by Furness *et al.,* 2018 could result in an inaccurate underestimation of collision risk.	Comment noted. The Applicant's approach follows that advised by SNH and Marine Scotland.
Flight Height: Given the emphasis put on the results of Skov *et al*., (2018) elsewhere in the assessment it is perhaps surprising that that flight height data used for the assessment is not derived for this report or referenced anywhere in the documentation. Flight heights in Skov *et al*., were measured using laser rangefinders to a high level of accuracy. Conversely the flight heights used for Option 1 of the collision risk model in the assessment were from historic surveys of Moray East wind farm and buffer, between April 2010 and March 2012, where boat based surveyors estimated the heights of birds and allocated them into broad height bands. For Options 2 and 3 the generic data from Johnston *et al*., (2014) was used. These aggregated data are based almost entirely on boat based estimates, and while the manner in which they were analysed by Johnston *et al*., was statistically robust and the paper that presented them was an important step forward, there was still a reliance on observers ability to estimate the height of a flying bird; a wholly questionable proposition. The ORJIP BCA study has generated the most extensive dataset of observations of seabird behaviour in an around operational offshore wind farm that is currently available. this includes species specific data on flight height as measured using laser rangefinders. The use of these data in collision risk modelling would result in greater predicted mortalities, as higher numbers of birds were measured at collision risk height than either the historical estimates from Moray East surveys or the modelled data from Johnston *et al*., 2014.	Skov *et al.* (2018) do not present flight height data outside of the wind farm at which the study was conducted, in a format which can be used in collision risk modelling. No statistical analysis has been undertaken by Skov *et al.* (2018) to assess for flight height variation with distance to the wind farm. Some species, including kittiwake, were found to fly higher inside the wind farm in comparison to outside. Until such time the flight height data is processed and a dataset made available that is agreed to be representative of flight height distribution for species in the absence of a wind farm, the findings of Skov *et al.* (2018) are not available to be incorporated into collision risk modelling.
Consideration of Uncertainty in Collision Risk Modelling (CRM): In the guidance accompanying Band (2012) model, explicit mention is made of the need to consider uncertainty and variability in the modelled predictions. As such we welcome the inclusion of some consideration of uncertainty in the assessment. However, this consideration is limited to flight height only; uncertainty is inherent in not only the collision risk modelling but through the assessment process and it is afforded scant concern. In terms of CRM only, the assessment does not take into account uncertainty and variability in bird density, nocturnal activity, flight height, flight speed, or avoidance rates. For all of these the confidence intervals and/or probability distributions around all the variables used (or in those	Noted. Consideration of uncertainty in collision risk modelling has been incorporated for flight height data and avoidance rates.

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we would recommend to be used) are available and statistically robust method for carrying out the analysis is also available. There is no reason for these analyses to have been carried out and we suggest that they are.	
Avoidance Rate: We acknowledge that the avoidance rates used in collision risk modelling that inform the assessment were in accordance with those recommended in Cook *et al*., 2015 and 2018) and the SNCB guidance. However, it is claimed that the predicted mortalities arising from modelling using these rates is an overestimate and more realistic values are presented in Skov *et al*., (2018). However, the empirically derived avoidance rates presented in Skov *et al*., (2018) are functionally different from the avoidance rates used in the Band (2012) model as the latter incorporate error and variability in relation to both the data used and the model itself (Cook *et al*., 2015), which means the Band model avoidance rates will be lower than empirically derived avoidance rates. Debate is ongoing as to how to apply the empirically derived avoidance rates into the Band model and so it is not clear how, if at all, predicted mortalities would be different if the Skov *et al*. rates were considered.	Comment noted. The assessments are conducted using collision risk estimates calculated using avoidance rates advised by SNH/MSS. Reference to Skov *et al.* (2018) is provided qualitatively to indicate that the current recommended avoidance rates may under-estimate the level of collision mortality.
Marine Scotland Science (MSS) response	
Annex 10.1A was missing from the Technical Appendix document (EIA Report Volume 4 Technical Appendices). SNH in their advice (SNH consultation response 7th September, Appendix A, section Detailed advice, point 1) also raise this issue flagging that without this they cannot have a view on the validity of the values used in the assessment. This document is important to be able to follow the process of the assessment, for it sets out the framework through which appropriate numbers were used with respect to at sea survey data for later analyses of displacement and collision risk modelling. MSS has a copy of an earlier draft of this annex (draft 2, dated 17/05/18) from earlier advice requested from MS-LOT. As such MSS provide a few comments on this, however, note that the version intended to be included in the application may have been revised from that MSS viewed.	This was an omission from the original application. Technical Appendix 10.1A Baseline Data Decision Support Flow Charts and Report is now included in Appendix A. This has been updated to address further comments raised during consultation relating to inconsistencies with numbers.
The baseline data decision support flow charts therein for birds in flight used for collision risk modelling (Figure 2.1) and for bird densities for displacement effects (Figure 3.1) indicates that values were chosen following a suitability precautionary approach. However, the large variation between densities of birds found between the different survey data sources (e.g. figures 2.2 and 2.10) may raise questions of whether Moray West's approach is justified in using a single year's baseline survey data rather than the typical two. it would be helpful for SNH to review Annex 10.1A so that they can form a view on the appropriateness of the method used in the baseline data decision support flow charts. RSPB in their consultation response (dated 7th September, Section 2.0 under heading 'Survey Effort' state that they believe the lack of a full two year site survey to be an important and fundamental omission to the assessment. Presumably RSPB also lacked access to Annex 10.1A, thus may not have been able to fully review the appropriateness of using a single years survey data, nor of how values were chosen for the assessment analysis.	This was an omission from the original application. Technical Appendix 10.1A Baseline Data Decision Support Flow Charts and Report is now included in Appendix A. This has been updated to address further comments raised during consultation relating to inconsistencies with numbers.

Table 1.1: Comments received on Moray West EIA Report and RIAA with respect to Ornithology

Comment	Requirement for additional information
Collision Risk Modelling: For assessing the collision risk impacts (EIA report section 10.7.2.88, Technical Appendix 10.2) the developer uses bird flight speed data from Skov *et al*.(2018) rather than more typically used flight speed data (Alerstam *et al*., 2007 and Pennycuick 1987). However, they do also present model results based on the typically used values (Annex 10.2B). The developer argues for using the Skov *et al*. values as these have a much larger sample size. SNH have advised that they are content with this approach (SNH consultation response 7th September, Appendix A, Section Detailed advice, point 5). The Skov *et al*. measured flight speed for a large number of birds but these values were collected from a single site and in the vicinity of a constructed wind farm. As such these flight speeds may then not be representative of bird flight speeds elsewhere . In the longer term more data on flight speed and flight behaviour for key species from a range of sites will be helpful in ensuring appropriate flight speeds are used to inform flux and probability of collision, components of collision risk models sensitive to flight speed.	Comments noted.
Collision Risk Modelling: The developer presents collision results using a range of avoidance rates (ARs). In agreement with SNH (SNH consultation response 7th September, Appendix A, section Detailed advice, point 6) we recommend that assessments are for now based on the SNCB advised ARs. At this point it is unclear whether it is appropriate to apply empirical ARs.	Noted. Collision risk estimates presented throughout Chapter 2: Additional Ornithological Information (EIA) and Chapter 3: Additional Ornithological Information (HRA) use the avoidance rates advised by the SNCBs. Consideration is also given in Chapter 3: Additional Ornithological Information (HRA) Section 3.6 to additional avoidance rates.
Displacement Effects: SNCB advice is to calculate displacement effects for both the development footprint alone and the development footprint plus a 2 km buffer, however the developer have only presented displacement effects for the development plus buffer. A point raised by SNH (SNH consultation response 7th September, Appendix A, section Detailed advice, point 16). For context it would be helpful for the developer to present displacement numbers for both scenarios (footprint alone and footprint plus 2 km buffer).	Displacement impacts have been re-assessed for the Moray West Site alone and Moray West Site + 2 km buffer. Results from this additional assessment are presented in Chapter 2: Additional Information (EIA) Ornithology – Section 2.5 and Chapter 3: Additional Information (HRA) Ornithology – Section 3.3
Displacement effects: How regional population numbers were calculated to assess the displacement effects for each assessed species through the matrix approach is unclear. As SNH raised in their consultation response (SNH consultation response 7th September, Appendix A, section Detailed advice, point 17) breeding season numbers should be calculated for colonies within foraging range of the development, whereas table footnotes (e.g. tables	A response to this comment is provided in Section 2.5.3.

Table 1.1: Comments received on Moray West EIA Report and RIAA with respect to Ornithology	
Comment	**Requirement for additional information**
4.5, 4.8) indicate that BDMPS populations were used. It will be useful for the developer to clarify what populations were used to fill out the breeding season displacement matrices. If BDMPS populations were used the developer may need to recalculate matrices following the SNCB advised approach to calculating regional population numbers.	
PVA calculations: PVA calculations largely follow SNH advised methods, though there are some differences (see SNH consultation response 7th September, Appendix A, section Detailed advice, points 26-33) such as including outputs for 35 years and 50 years rather than the more typical 25 and 50 years. PVAs appear not to have been ran directly on the predicted mortality impacts but rather on theoretical impact levels (see also SNH consultation response 7th September, Appendix A, section Detailed advice, point 30). For several species these scenarios are outside of (greater than) mortality rates calculated for a species. It would be useful to get clarification from Moray West on how PVA results should be interpreted where effects are lower than those in the PVA scenarios ran.	Noted. Collision and displacement impacts have been presented at 25, 35 and 50 years for auks and kittiwake – see Chapter 3: Additional Information (HRA) Ornithology – Section 3.5 PVAs for auks are presented in increments of 10 birds, PVAs for kittiwake are now presented at an mortality impact level. Results are presented in Chapter 3: Additional Information (HRA) Ornithology – Sections 3.3, 3.4, 3.5 and 3.6
Great black-backed gull from East Caithness Cliffs SPA: MSS support SNH's view (SNH consultation response 7th September) that there is insufficient information to assess the potential impact on the species for East Caithness Cliffs SPA. RSPB make a similar point saying that the assessment for the species is insufficient in terms of the HRA (RSPB consultation response dated 7th September, Annex, section 1.0, under heading Great Black Backed Gull). MSS reach this view for the following reasons. Great black-backed gull are a qualifying interest of East Caithness Cliffs SPA, 19.9 km distant from the development (Technical Appendix 10.1, table 5.66). The species were observed in relatively large numbers, with monthly peak numbers exceeding regional 1% threshold for June, July, and August. For September the regional and national 1% threshold was also exceeded (Technical Appendix 10.1, section 5.34.3). However, based on a GPS tracking study from 2014 (Archibald., K., Evans, D. and Votier, S. (2014). East Caithness Cliffs SPA gull Tracking Report 2014. Environment & Sustainability Institute, University of Exeter.) that indicated no connectivity between East Caithness Cliffs SPA the developer screened out the species. The 2014 tracking study provides useful contextual data, however the dataset is limited. Only 11 individuals were tracked and all for 5 days or fewer, thus these data are unlikely to be sufficiently representative to justify screening out the species for this SPA, especially given the numbers observed during the at sea surveys.	Further information on GBBG with respect to HRA is provided in Chapter 3: Additional Information (HRA) Ornithology – Section 3.7.
Fulmar – numbers used in assessment of displacement impacts: To assess displacement impacts on fulmar the developer use numbers directly from their one year of digital aerial survey data (Section 10.5.4.18, Chapter 10, EIA Report). It is unclear why the baseline decision support	The approach taken with fulmar to base population density on the kernel density estimates (KDEs) from the Aerial survey data rather

Table 1.1: Comments received on Moray West EIA Report and RIAA with respect to Ornithology	
Comment	**Requirement for additional information**
system approach (outlined in Appendix 10.1 Annex 10.1A) was not followed for this species. It would be helpful for the developer to explain the reasoning for the different approach used for fulmar over that used for other species. This point was also raised by SNH in their consultation response (SNH consultation response 7th September, Appendix A, section Detailed advice, point 14).	than running through the DSS was discussed with SNH and MSS during the meeting on 5th February 2018. This was on the basis that fulmar was considered to not be sensitive to the proposed development and therefore apporiate to use the KDEs.

2 Additional Ornithological Information (EIA)

2.1 Introduction

This chapter of the Moray West Addendum presents additional information identified as being required to address specific comments provided by SNH, RSPB and MSS with respect to the ornithological assessment presented in the Moray West EIA Report.

Additional information required to address comments made by SNH, RSPB and MSS with respect the HRA as presented in the Report to Inform an Appropriate Assessment (RIAA) is presented in Chapter 3: Additional Information (HRA) – Ornithology.

2.2 Additional information requirements (EIA)

Additional information has been provided in Sections 2 and 3.1 to 3.5 to address comments relating to :

- Seasonal variations
- Displacement impacts:
  - Assessment scales
  - Population estimates
  - Regional populations
  - Updated results for displacement for razorbill, guillemot and kittiwake
- Collision risk impacts:
  - Clarifications on Avoidance Rates (ARs); and
  - Updated results for collision risk impacts for gannet and kittiwake taking into account seasonal variations.
- Combining updated displacement and collision risk impacts for kittiwake

Consideration of further proposed refinements in relation to collision risk impacts on kittiwake at East Caithness Cliffs SPA and North Caithness Cliffs SPA is then provided in Section 3.6.

2.3 Addressing comments on seasonal variations

The seasonal extents defined for use as part of the EIA and HRA assessments conducted for Moray West were based on those provided by SNH and then adapted where considered appropriate in light of the trends in seabird abundance recorded during site-specific surveys. The seasons defined are therefore considered to reflect trends in the abundance of the species at Moray West.

It is noted that SNH (no date) indicates:

"*The indicated periods apply to Scottish Waters - timings throughout Scotland will vary slightly (for example breeding attendance may be earlier in south, wintering departure later in north)*."

It was therefore considered that seasonal extents defined using site-specific data would follow this statement and allow an assessment based on best available evidence.

The differences in the seasons used at Moray West are summarised in Table 2.1 alongside those recommended by SNH. There are differences for fulmar, gannet, kittiwake, guillemot, razorbill and puffin and these are primarily due to SNH recommended use of half months at either the start or end of the breeding season.

Another difference relates to a further subdivision of the non-breeding seasons into pre- and post-breeding seasons where recommended in Furness (2015). As differing regional populations occur in pre and post-breeding seasons, this considered to provide the best representation of risk from predicted mortality from Moray West.

2.4 Implications for EIA

Notwithstanding these differences, a sensitivity test indicates that there is no substantial difference between the predictions made using the seasons advised by SNH compared to those developed to reflect site specific conditions at Moray West (see Section 2.6.1).

Displacement analyses rely on calculating a seasonal peak density and in all cases this peak density is not affected by slight differences in the definition of each season. Since the displacement is selected from the peak mean (see EIA Report Volume 4 Technical Appendix 10 - Annex 10.1A), and that none of the key months are in the split months defined by SNH then how the start and end of the season is defined is academic. As detailed in Table 2.2, population estimates for the breeding season (with 2 km buffer) remain unaltered from those applied to the EIA Report and HRA.

Collision risk modelling utilises monthly mean densities, and although these do vary slightly when using the different seasonal definitions (see Section 2.6.2 below), these differences are negligible.

Table 2.1 Seasonal extents

Species	Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fulmar	Moray West	Pre-breeding			Breeding					Post-breeding		Non-breeding	Pre-breeding
	SNH	Non-breeding			Breeding					Non-breeding			
Gannet	Moray West	Pre-breeding			Breeding						Post-breeding		Pre-breeding
	SNH	Non-breeding		Breeding							Non-breeding		
Kittiwake	Moray West	Pre-breeding			Breeding					Post-breeding			
	SNH	Non-breeding			Breeding					Non-breeding			
Herring gull	Moray West	Non-breeding			Breeding					Non-breeding			
	SNH	Non-breeding			Breeding					Non-breeding			
Great black-backed gull	Moray West	Non-breeding			Breeding					Non-breeding			
	SNH	Non-breeding			Breeding					Non-breeding			
Guillemot	Moray West	Non-breeding			Breeding				Non-breeding				
	SNH	Non-breeding			Breeding				Non-breeding				
Razorbill	Moray West	Pre-breeding			Breeding					Post-breeding		Non-breeding	
	SNH	Non-breeding			Breeding				Non-breeding				
Puffin	Moray West	Non-breeding			Breeding					Non-breeding			
	SNH	Non-breeding			Breeding				Non-breeding				

2.5 Addressing Comments on Displacement Impacts

2.5.1 Assessment scale

The HRA and EIA Report provided population estimates and a subsequent assessment of seabirds at a scale of the Moray site plus 2 km buffer as reflected in the deemed sensitivity of the species involved (JNCC *et al.*, 2017). SNH however point out the following in their response to the application:

"Displacement impact assessment provides population estimates for the Moray West site + 2 km buffer, but does not include estimates for the Moray West site alone, as is recommended in the SNCB displacement guidance."

There is value in presenting both population estimates (see Table 2.2 below). First, it is unlikely that, for auks and kittiwake, all individuals are displaced up to 2 km from the wind farm and that the effect lies between 0 – 2 km. Second, Moray West lies contiguous to Moray East and calculating displacement effects to 2 km would lead to a double counting of birds affected where the assumed displacement area overlaps with the adjacent wind farm (for which displacement has already been assumed).

2.5.2 Population estimates

To calculate seasonal population estimates, the Decision Support System (DSS) has been applied (see Annex 10.1A: Baseline Data Decision Support Flow Charts) and these are presented in Table 2.2.

Table 2.2: Population estimates derived through DST process for seabirds assessed for displacement impacts – SNH seasonal definitions

Species	Season	Moray West + 2 km buffer	Moray West (site alone)
Guillemot	Breeding Season (peak mean)	24,426	14,570
	Post-breeding season (peak mean)	38,174	22,771
	Non-breeding season (peak mean)	8,217	4,901
Razorbill	Breeding season (peak mean)	2,808	1,675
	Post-breeding (peak mean)	3,544	2,114
	Non-breeding (peak mean)	3,585	2,139
Kittiwake	Breeding season (peak mean)	6,902	4,117
	Non-breeding season	1,470	877

2.5.3 Regional populations

The regional breeding season populations for relevant species that are used as part of assessments presented in the EIA are defined in the EIA Report – Volume 4 Technical Appendix 10.1. These populations are calculated based on the total population of birds within mean-maximum or maximum foraging range from Moray West. These populations are presented in EIA Report – Volume 4 Technical Appendix 10.1 (Table 1-4 of Appendix 1) with footnote 15 explaining the derivation of these populations.

In the example provided, Moray West is within the mean-maximum foraging range of puffin from North Caithness Cliffs SPA however, this is not the only breeding colony that is within the foraging range of puffin from Moray West and as such birds from all of these colonies may occur at Moray West. Consideration is then given in the EIA to the affect impacts may have on the regional population whereas impacts on individual colonies, specifically designated sites are considered in the HRA (discussed further in Chapter 3 of this Addendum (PART 1).

Impacts presented in the EIA therefore do not underestimate impacts on connected populations; rather the use of regional populations provides an accurate representation of the likely impacts on the total population. Impacts on designated sites (e.g. North Caithness Cliffs) are considered on an individual basis in the HRA with apportioning of total impacts undertaken to calculate the impact on these sites. It is also worth noting that the populations used to calculate displacement impacts represent all birds that may occur at Moray West (i.e. a population that has not been apportioned to individual colonies). As such, to assume that the total impact would therefore be attributable to an individual colony would grossly over-estimate the impact on that colony. This is why, in the HRA apportioning is conducted in order to calculate the impact on individual colonies.

Although the concept of BDMPS has previously been discussed on a non-breeding season basis this does not preclude it's use in the breeding season. the BDMPS is a Biologically Defined Minimum Population Size which is defined based on the number of birds in a given geographic area. This can also be applied in the breeding season by, for example, using the foraging range of a species from a project (i.e. biologically defined) to calculate the total population that may interact with the project (i.e. minimum population size).

2.5.4 Updated results for displacement mortality (EIA)

Displacement mortality for each species and season is presented in Table 2.3 for both the wind farm + 2km buffer and for the site alone. Although a range of displacement rates were presented in the EIA Report, the rates applied here are those recommended by SNH.

Table 2.3 Seabird displacement mortality from Moray West – SNH seasons

Species	Season	Displacement / mortality rates	Moray West + 2 km buffer	Moray West alone
Guillemot	Breeding Season (peak mean)	60% / 1%	147	87
	Post-breeding season (peak mean)	60% / 1%	229	137
	Non-breeding season (peak mean)	60% / 1%	49	29
Razorbill	Breeding season (peak mean)	60% / 1%	17	10
	Post-breeding (peak mean)	60% / 1%	21	13
	Non-breeding (peak mean)	60% / 1%	22	13

Table 2.3 Seabird displacement mortality from Moray West – SNH seasons				
Species	**Season**	**Displacement / mortality rates**	**Moray West + 2 km buffer**	**Moray West alone**
Kittiwake	Breeding season (peak mean)	30% / 2%	41	25
	Non-breeding season	30% / 2%	9	5

2.6 Addressing comments in relation to collision risk impacts (EIA)

2.6.1 Updated results for collision mortality (EIA) for Moray West alone taking into account seasonal variations

Further collision risk modelling was conducted for gannet and kittiwake to determine whether there are differences in the predicted collision rates between the different seasonal definitions shown in Table 2.1. Kittiwake and gannet are the only species for which collision risk modelling was conducted for which there are differences between the species proposed by the Applicant and by SNH.

Where the SNH seasonal definitions represent half a month, the collision risk estimate has been split between the two relevant seasons with 50% contributing to the total for each season.

The values in the following tables are rounded to the nearest whole number, therefore, in some cases, the seasonal totals may not equal the annual total presented in the relevant table.

2.6.1.1 Gannet

Table 2.4 presents seasonal collision risk estimates for gannet using both the site-specific seasonal definitions and those recommended by SNH. Gannet is assessed for Moray West as part of the EIA Report only.

Table 2.4 Gannet predicted collision mortality from Moray West							
Band Option	**Site-specific seasonal definitions**				**SNH seasonal definitions**		
	Breeding	**Post-breeding**	**Pre-breeding**	**Annual**	**Breeding**	**Non-breeding**	**Annual**
Option 2 (98.9%)	10	2	1	12	11	2	12
Option 3 (98%)	5	1	0	6	5	1	6

Annual collision risk remains the same (12 birds, Option 2) when applying the SNH seasonal definitions for gannet.

On this basis it is considered that there are no implications for the assessment of collision risk undertaken for gannet.

2.6.1.2 Kittiwake

Table 2.5 presents seasonal collision risk estimates for kittiwake using both the site-specific seasonal definitions and those recommended by SNH.

Table 2.5 Kittiwake predicted mortality from Moray West							
Band Option	**Site-specific seasonal definitions**				**SNH seasonal definitions**		
	Breeding	**Post-breeding**	**Pre-breeding**	**Annual**	**Breeding**	**Non-breeding**	**Annual**
Option 2 (98.9%)	79	24	7	109	78	31	109
Option 3 (98%)	40	12	3	56	40	16	56

Breeding season collisions (Option 2) differ by one bird only, with the SNH seasonal definitions producing the lower value. Non-breeding collisions are identical when using Option 2 when the post- and pre-breeding values are summed but are lower when using the Applicant's seasonal definitions for Option 3.

On this basis it is considered that there are no implications for the assessment of collision risk undertaken in for kittiwake.

2.6.2 Method for assessing cumulative / in-combination collision mortality

SNH have queried the approach used to derive non-breeding season estimates of collision mortality for projects considered cumulatively/in-combination. This section provides further detail on the approach applied in the EIA and HRA with respect to the assessment of cumulative collision risk in the non-breeding season. The response has been provided in the form of a worked example. Moray West considers that the approach carried forward is robust and does allow SNH to quantify cumulative collision risk.

2.6.2.1 Background

The approach recommended by SNH (SNH, 2017a) for calculating cumulative non-breeding season impacts consists of four steps:

1. Assess contribution of the focal colony to the BDMPS region (i.e. what proportion of birds in the BDMPS region consist of birds from the focal colony)
2. Extract seasonal collision estimates calculated for projects considered cumulatively / in-combination submitted in the Hornsea / East Anglia 3 (EA3) PINS documentation (Cumulative Impacts table).
3. Apply correction factors:
    a. Calculate the number of collisions in period/s outside the breeding season for consented ('original') and as-built scenarios ('updated'). As-built scenarios should be taken from TCE 'headroom' estimates in MacArthur Green (2017).
    b. Apportion the number of non-breeding period collisions to the SPA of interest, according to age class, by adjusting the as-built/new scenario collision estimates by the proportion of SPA birds estimated to be within the BDMPS region during non-breeding period/s.
    c. Where seasonal definitions differ between SNH guidance and TCE 'headroom' report, recalculate collision estimates to reflect SNH defined non-breeding period duration/s.
4. Repeat for all wind farms identified for consideration in cumulative impact assessment / in-combination effects. Sum all collision estimates for a non-breeding period/s cumulative impact total.

The cumulative assessment for Moray West broadly follows the approach set out by SNH, but includes some additional steps that are described in Table 2.6. This revised approach is consistent with that used to calculate the cumulative impacts obtained for Hornsea Project Two and East Anglia Three, as referenced in the SNH guidance for the calculation of cumulative non-breeding season impacts.

Table 2.6 identifies where the steps described by SNH are followed in the cumulative / in-combination assessment for Moray West.

Table 2.6 Non-breeding season approach for cumulative / in-combination assessments	
Step in SNH guidance	**Moray West approach**
1	As described – proportion of adult population from relevant SPA calculated using populations presented in Furness (2015).
2	Relevant data have been extracted from cumulative / in-combination assessments.
3a	The Moray West assessments have identified where differences between assessed/as-built, and consented/as-built turbine scenarios occur. Using this information correction factors, either those presented in MacArthur Green (2017) or based on the difference between the assessed and consented turbine scenarios, have been applied for various projects. Applying correction factors for all projects does not represent a precautionary approach. Some projects have not been built to their maximum permitted extent, at this stage, and the potential for future development (to reach the maximum permitted), although unlikely, cannot be discounted therefore to apply a correction factor to these projects would not necessarily represent the worst case scenario. The approach taken by Moray West has therefore been to assume the maximum permitted development for these projects which is considered to be precautionary. The approach taken in the Moray West assessments for these projects, is to assume the maximum permitted development and this, therefore, represents a precautionary approach.
3b	As described.
3c	At a high level this step has been followed although using a more accurate approach than described in the SNH guidance. A worked example is provided in the following section.
4	A consistent approach has been followed for all projects considered cumulatively/in-combination.

2.6.2.2 Worked example – applicants approach

The aim of the cumulative / in-combination analyses undertaken for a project is to obtain monthly collision risk estimates which can then be used to calculate seasonal collision risk estimates which can then be used in EIA assessments or apportioned to relevant SPA colonies. However, monthly collision estimates are often not presented in relevant project-specific documentation (e.g. application documents, consent variations, etc.). An exercise was therefore developed that provides monthly collision risk estimates for each project considered cumulatively/in-combination. This exercise is described in the flow chart shown in Table 2.7. Following the process in Table 2.7 allows seasonal collision risk estimates to be calculated using the seasonal definitions defined by a project.

Table 2.7 Stepwise process applied to source in-combination collision data		
Step	**Process**	**Decision**
Step 1	Are monthly collision risk estimates available?	Yes
		No – go to step 2
Step 2	Are annual collision risk estimates available	Yes – go to Step 3

Table 2.7 Stepwise process applied to source in-combination collision data		
Step	**Process**	**Decision**
		No – go to Step 5
Step 3	Are monthly abundance data available?	Yes – go to Step 4
		No – go to Step 6
Step 4	Use monthly abundance data to attribute annual collision risk estimates	
Step 5	Project cannot be considered quantitatively	
Step 6	Attribute annual collision risk estimate equally across all months	

There are four possible outcomes of the process presented in Table 2.7:

1. Monthly collision risk estimates available;
2. Annual collision risk estimates available – attribute to individual months using monthly abundance data;
3. Annual collision risk estimates available – no abundance data available, split collision risk estimate equally across all months; and
4. No collision risk estimates available.

As monthly collision risk estimates are not available for Galloper Offshore Wind Farm, the approach described in Step 4 was applied to that project for kittiwake. Although monthly collision risk estimates are unavailable for this species at Galloper, an annual estimate (119.95 collisions) is available. Monthly population estimates are presented in the Technical Report for Galloper and these are used to attribute the annual collision risk estimate to individual months. As density is the main input parameter in the Band (2012) CRM driving the calculation of collision risk across months (the majority of other parameters are either consistent across all months or have less influence of resulting collision risk), this approach is considered to provide an accurate appraisal of monthly collision risk.

The approach described in Table 2.7 was applied as part of the planning applications for projects in the Dogger Bank Zone and subsequently for projects in the Hornsea Zone, East Anglia Zone and in the Firth of Forth.

Results for cumulative / in-combination collision mortality, based on the approach outlined above, were presented in the RIAA and are used to inform the analyses and assessments presented in Chapter 3, Section 3.4.2with respect to the HRA and in-combination effects on the East Caithness and North Caithness SPAs.

3 Additional Ornithological Information (HRA)

3.1 Additional information requirements (HRA)

Additional information has been provided with respect to addressing comments on:

- Apportioning;
- Displacement impacts – East Caithness Cliffs SPA and North Caithness Cliffs SPA:
    - Updated displacement mortality for guillemot, razorbill and kittiwake for Moray West alone taking into account comments on apportioning (Section 3.2 below);
    - Updated displacement mortality for guillemot, razorbill and kittiwake for Moray West in-combination with other projects taking into account comments on apportioning; and
    - Updated PVAs for 25 years (in addition to 35 and 50 years as presented in the RIAA) and presented for specific impact mortality (kittiwake only); and
    - Updated PVAs for 25 years (in addition to 35 and 50 years as presented in the RIAA) for guillemot and razorbill based on 10 bird increments.

- Collision risk impacts - East Caithness Cliffs SPA and North Caithness Cliffs SPA:
    - Updated collision mortality for kittiwake for Moray West alone taking into account comments on seasonal variations (Chapter 2) and apportioning (Section 3.2 below);
    - Updated collision mortality for kittiwake for Moray West alone taking into account comments on seasonal variations (Chapter 2) and apportioning (Section 3.2 below); and
    - Updated PVAs for 25 years (in addition to 35 and 50 years as presented in the RIAA) and presented for specific impact mortality.
- Collision risk impacts – refinement factors;
- Updated collision mortality and corresponding PVAs for kittiwake at East Caithness Cliffs SPA and North Caithness Cliffs SPA for Moray West alone and in-combination with other projects taking into account refinement factors;
- Further HRA considerations - great black-backed gull; and
- Final conclusions – impacts on populations of guillemot, razorbill and kittiwake at the East Caithness Cliffs SPA and North Caithness Cliffs SPA.

3.2 Apportioning

3.2.1 Apportioning estimated effects from the breeding season to SPAs

When apportioning impacts associated with an offshore wind farm that may occur in the breeding season to seabirds from those SPAs within a species' foraging range of the proposed development, Scottish Ministers have advised recent projects to follow the two-step approach advised by SNH (e.g. Marine Scotland 2017a, b).

3.2.2 SNH Comments on two-stage apportioning

With respect to the apportioning of estimated effects from the breeding season, SNH have made the following comment in their response to the submission by Moray West of the HRA Report:

Despite Section 3.1.1, Appendix 4.4 of the HRA Report describing that a two-stage apportioning process was followed, it is not clear that recommendations for Stage 2 of process have been followed. HRA Appendix 4.4 Section 7, suggests that Stage 2 apportioning between SPAs has been undertaken using Seabird 2000 data rather than the most recent colony counts provided by SNH (in the Annex of the Moray West memo to Marine Scotland dated 18th December 2017). From a rough comparison of weightings *calculated using both colony counts for kittiwake, there does not seem to be much difference between the two values. However, the counts used could lead to over/underestimates of bird mortality figures attributed to each SPA.*

This section provides further detail on the approach applied in the Report to Inform an Appropriate Assessment (RIAA) and where it differs to that advised by SNH to provide a more representative apportionment. In practice, the differences between the approaches described here are very slight (Table 3.1), but Moray West considers that the approach carried forward is more robust and will allow SNH to quantify displacement impacts.

3.2.3 Two step process

The apportioning process as advised by SNH for Moray West involves a two-step process.

3.2.3.1 Step One

When counting breeding seabirds, the UK coast is divided into count sectors. The resolution of these sectors is such that the East Caithness Cliffs SPA comprises of 45 count sector along the entirety of its coast line of over 48 km. Step One of SNH's apportioning process calculates for each sector within the species foraging range of Moray West, the proportion of breeding birds of a species to be apportioned to the Project site. This is calculated for count sectors at SPAs and non-SPA breeding sites. Apportioning is calculated on the basis of distance between count sector and project, available sea area from each sector within foraging range and the numbers of breeding seabirds. For colonies that occupy long stretches of coast such as those comprising the East Caithness Cliffs SPA and North Caithness Cliffs SPA, SNH guidance (2016) advises it is more appropriate to apportion at the sector level and then reconstruct the combined SPA impact.

SNH advise the use of the online Seabird 2000 dataset for which all sectors have been counted at a similar time, if relatively old. The latest national census, Seabird Counts, is on-going with all the data collected up to the present not accessible online.

3.2.3.2 Step Two

Step One is repeated but (1) only for the SPAs and (2) using the most recent count data as supplied to the Moray West by SNH (SNH 2017). However, repetition of Step One is possible for each SPA at a whole site level only (i.e. not by using each of its constitute count sector level) on account of the data made available. The apportioning values for the SPAs derived from Step Two are then applied to the summated contributions of the SPAs calculated from the apportionment in Step One, i.e. re-distribution of the birds originally apportioned to the project from the SPAs in Step One to the proportion calculated in Step Two. The proportion of birds that are apportioned to non-SPA component remains as calculated in Step One, irrespective of any changes in their colony sizes since Seabird 2000.

3.2.4 Apportioning included in the HRA report

The apportioning value used at submission by the Moray West project solely uses Step One as described above i.e. the "Submitted" value given in the Table 3.1. Step Two was not conducted by Moray West as intended by SNH on account of it being a variation to Step One that has the likelihood to lead to exaggerating or understating impacts on SPA breeding birds. These differences in approach of Step Two to Step One and their limitations are:

- Apportionment at the level of the whole SPA and not its constituent count sector levels, prior to summating for an individual SPA. For SPA colonies that occupy long stretches of coastline, and may consist of separate sub-colonies, e.g. East Caithness Cliffs SPA, a single weighting factor for colony size, distance to Moray West, and extent of foraging area is not considered to be appropriate; and

- The proportion of birds that are apportioned to non-SPA component remains as calculated in Step One, irrespective of changes in their colony sizes since Seabird 2000. This is in clear contradiction to SNH's guidance on apportioning impacts (SNH 2016) on which current advice is based, with the former considered ecologically and mathematically more robust and, thereby, defensible.

3.2.5 SNH apportioning formulas – corrections provided by SNH

The equation used for apportioning in Step One is that stated in SNH's 2016 apportioning guidance note. Moray West was specifically advised to follow that guidance by SNH[1]. MSS have advised elsewhere though, that SNH have identified an equation contained in that guidance is incorrect. Table 3.1 presents the "Submitted" value alongside that when using the corrected equation for Step One i.e. "Submitted + corrected eq.". The correct equation is:

$$\text{Colony Weight} = \frac{\text{Colony Population}}{\text{Sum of Populations}} \times \frac{\text{Sum of Distance}^2}{\text{Colony Distance}^2} \times \frac{{}^{1}\!/_{\text{Colony Sea Proportion}}}{\text{Sum of } \left({}^{1}\!/_{\text{Colony Sea Proportions}}\right)}$$

3.2.6 SNH Comments on Seabird 2000 data

With respect to the Seabird 2000 data used at Step One (Section 3.2.3.1) in apportioning of estimated effects from the breeding season, SNH have made the following comment in their response to the submission by Moray West of the HRA Report:

"Colony weighting has been calculated using Seabird 2000 data in accordance with SNH guidance and using the recommended colony counts provided for kittiwake and herring gull (Annex of the Moray West memo to Marine Scotland dated 18th December 2017). However, Seabird 2000 colony counts for guillemot, razorbill and puffin do not match the recommended values provided by SNH. It is not clear which colony counts have been used in the apportioning process or why discrepancies between the figures occur. This could be related issues recently highlighted regarding the use of a 1.34 correction factor for auks but this is not clear from the information provided."

This section provides further detail on why Seabird 2000 colony counts used in the HRA for guillemot and razor-bill do not match the recommended values provided by SNH.

3.2.6.1 Provenance of Seabird 2000 dataset

SNH have advised that a summation of counts of the constitute count sectors of East Caithness Cliffs SPA and North Caithness Cliffs SPA as used in Step One of the apportioning approach by Moray West at submission, is incorrect for the breeding auks (only). The individual values used by Moray West for each count sector are however those assigned to the constituent sectors of the two SPAs when using the online Seabird 2000 dataset (available at http://jncc.defra.gov.uk/page-1548) as SNH referred Moray West to use for sector level count data in Step One of apportionment. No alternative source for count sector level breakdown was provided to Moray West by SNH alongside the recommended values for colony counts derived from the Seabird 2000 dataset. Furthermore, the summated totals for these two SPAs as provided by SNH to other projects e.g. Seagreen, equate to those used by Moray West i.e. using the online Seabird

[1] Email dated 12th March 2018 from SNH to MSS forwarded on 13th March 2018 by recipient to EDPR (Moray West).

2000 dataset. This points to SNH having since altered the count sector data used to inform Moray West without updating count sector data of the online Seabird 2000 dataset.

For Moray West to use SNH's summated total for the two SPAs with respect to the auks, would involve apportioning at the level of the whole SPA for Step One and not the advised constituent count sector level (prior to summating for an individual SPA). East Caithness Cliffs SPA and North Caithness Cliffs SPA occupy long stretches of coastline consisting of separate sub-colonies such that, in accordance with SNH (2016) guidance it is not considered to be appropriate to use a single weighting factor for colony size, distance to Moray West, and extent of foraging area. Moray West therefore retains use of the online Seabird 2000 dataset.

3.2.7 Resulting apportioning values from the different approaches

Table 3.1 presents the apportioning values resulting from the apportionment approach by Moray West at submission, the "Submitted" value, alongside that when using the corrected equation for Step One i.e. "Submitted + corrected eq." and that following the two step approach intended by SNH using the corrected equation and, for the two auk species only, SNH recommended values for East Caithness Cliffs SPA and North Caithness Cliffs SPA colony counts derived from Seabird 2000 data.

Table 3.1 Apportioning values from different approaches (breeding season)

Species	SPA	Apportioning value		
		Submitted	Submitted + corrected eq.	SNH
Kittiwake	East Caithness SPA	0.86	0.85	0.87
	North Caithness SPA	0.03	0.04	0.03
	Troup, Pennan and Lion's Heads SPA	0.08	0.09	0.07
Guillemot	Buchan Ness-Collieston Coast SPA	0.01	0.01	0.01
	East Caithness SPA	0.84	0.81	0.87
	North Caithness SPA	0.05	0.07	0.04
	Troup, Pennan and Lion's Heads SPA	0.06	0.06	0.03
Razorbill	East Caithness SPA	0.91	0.90	0.94
	North Caithness SPA	0.02	0.03	0.02
	Troup, Pennan and Lion's Heads SPA	0.06	0.06	0.03

3.2.8 Age composition and sabbaticals

In addition to the above, the following additional apportionment of impacts to cohorts i.e. age classes and those adults breeding or not in a given year, have been made.

3.2.8.1 Age composition

When assigning displacement impacts from the Moray West Offshore Wind Farm between age classes for the auk species (puffin, razorbill and guillemot), the numbers of birds in each age class estimated by Furness (2015) using a stable (equilibrium) model population for the relevant species have be applied.

This approach follows the recommendations on assigning impacts between age classes as provided by Marine Scotland (2017a, b) to the Inch Cape and Moray East Offshore Wind Farms. This results in the apportionment of 57.5%, 57.1% and 49.0% of an impact to adult guillemot, razorbill and puffin respectively.

When assigning impacts from the Moray West Offshore Wind Farm between age classes for kittiwake, impacts are apportioned to age classes using proportions derived from site survey data gathered at the Moray West Site plus a 4 km buffer.

The ageing of birds in both aerial and boat-based surveys can prove problematic for certain species. Immature kittiwake beyond their first year are essentially indistinguishable from adult birds during surveys (Coulson 2011, Malling Olsen and Larsson 2003) but they do not breed until their fourth year. This means that using the age proportions from site-specific data would represent a considerable over-estimate of the proportion of adult birds present at the Moray West Site. In order to address this limitation during the breeding season, an approach was developed during the examination for Hornsea Offshore Wind Farm Project Two (SMart Wind 2015b). This approach utilises age-specific survival rates (Horswill and Robinson 2015) to calculate the proportion of different age classes likely to be present at the Moray West Site.

The approach used for Hornsea Project Two (SMart Wind 2015b) and adopted in the current assessment is considered to be precautionary. The main area of precaution is the affinity exhibited by different immature age classes to natal waters during the breeding season. First year birds show considerably less affinity for natal waters than do older immatures with many birds remaining thousands of kilometres away (Coulson 2011). Applying the approach used at Hornsea Project Two (SMart Wind 2015b) assumes that the proportion of older immatures in natal waters is consistent with the proportion of first year immatures. This under-estimates the proportion of older immature age classes present at the Moray West Site, as these birds show a much greater affinity for natal waters with much higher proportions of these age classes present in natal waters. This and other sources of uncertainty and precaution related to the calculated apportioning values are discussed in the species-specific sections below.

It is certain that an unknown proportion of the cohort of unaged ‘adult type’ kittiwakes at the Moray West Site will include two and three-year-old birds. Coulson (2011) provides evidence that shows that immature kittiwake visit natal waters with increasing numbers of older immatures visiting breeding colonies. This therefore supports the conclusion that the approach proposed to calculate an apportioning value for the breeding season will under-estimate the proportion of second and third year immatures which will show a much greater affinity for natal waters than first year birds.

Whilst maintaining the proportion represented of each year class of immatures at the Moray West Site, mortality reduces the absolute number of birds present from each successive year class of kittiwake. In calculating the number of two and three-year-old kittiwakes at the Moray West Site, the analysis uses survival rates of each immature year class of kittiwake that follows the Model KI1 in SMart Wind (2015c) (i.e. 0.79 for juveniles, 0.85 for one-year olds and 0.87 for two year olds).

A programme of 28 boat-based surveys covering the Moray East Offshore Wind Farm site plus a 4 km buffer were undertaken between April 2010 and March 2012. This survey’s coverage overlapped with the eastern end of the Moray West Offshore Wind Farm. The analysis used data from the 10 surveys undertaken during the months April to July. Use of this subset of the breeding season (April to August) avoids any error arising from the age code used for newly fledged juveniles from late July. The following analyses present data from this dataset alone. Section 5.1.1, Appendix 4.4 of the HRA Report presents a discussion as to why the boat-based surveys covering the Moray East Offshore Wind Farm provides a better estimate of the age structure of the population present at the Moray West Site than the digital aerial surveys of the latter area.

The proportion of adult and immature kittiwake recorded during the Moray East Offshore Wind Farm boat-based surveys for the months April to July were 96.7% and 3.3% respectively; sample size of 1,395 birds. The dataset is used in Table 3.2 to calculate the likely proportion of adult birds at the Moray West Site taking into account the presence of older immatures which are indistinguishable from adult birds using plumage characteristics.

Table 3.2 Estimated breeding season contribution of adult birds to the total predicted to be present at the Moray West Site using immature proportions as calculated from survival rates and numbers of one-year old birds recorded on boat-based survey transects covering the Moray East Offshore Wind Farm

Analysis step	Formula (using the parameters identified as part of each analysis step	Value
(a) Survival rate of juvenile birds		0.79
(b) Survival rate of one year old birds		0.85
(c) Survival rate of two year old birds		0.87
(d) % of kittiwake at the Moray East Offshore Wind Farm assigned to one year old birds		3.3%
% of kittiwake at the Moray East Offshore Wind Farm assigned to other immature age classes (e) two years old (f) three years old	$e = \frac{a \times b}{a} \times \frac{d}{100} \times 100$ $f = \frac{(a \times b) \times c}{a} \times \frac{d}{100} \times 100$	2.8% 2.4%
(g) % of kittiwakes at the Moray East Offshore Wind Farm assigned to adults	$g = 100\% - (d + e + f)$	91.5%

Based on the proportion of first year birds observed from the boat-based surveys, and the likely age structure of the kittiwake population it is considered that adults will comprise 91.5% of the individuals observed at the Moray West Site. However, this range, is considered to be precautionary due to the following:

- The value doesn't account for adults in the population not breeding in a given year – this could account for a further reduction of 10% as discussed in the following section (Marine Scotland 2017a, b); and
- A smaller proportion of first year birds are likely to be present in natal waters with a much greater proportion of older age classes of immature birds showing affinity with natal waters.

The evidence reviewed here, therefore suggests the proportion of adult kittiwake at the Moray West Site will be lower than the 91.5% value obtained through boat-based surveys. In addition, the use of survival rates in the apportioning approach presented in Table 3.2 is considered to be appropriately precautionary. Older immature year classes are known to show a greater affinity for natal waters with the proportion of older immature year classes returning to natal waters during the breeding season therefore higher than the proportion of first year birds returning to natal waters. The approach applied in Table 3.2 assumes that a consistent proportion of each year group will be present at the Moray West Site and therefore likely under-estimates the proportions of older immature year classes present at the Moray West Site. The apportioning value calculated using boat-based survey data from across two seasons is considered to be appropriately precautionary for use in further analyses.

3.2.8.2 Sabbaticals

In accordance with Marine Scotland guidance (Marine Scotland 2017a, b), the impacts assigned to sabbaticals are removed from the assessment using the value of 7% (i.e. are birds on sabbatical) for all three species of auk as advised by SNH following an initial review of the literature. For kittiwake it is assumed that in any one year a proportion of adult birds, 10% in this case, take a breeding sabbatical. This is also in accordance with Marine Scotland guidance (Marine Scotland 2017a, b).

3.2.9 Apportioning values for the non-breeding season

The calculation of apportioning values for non-breeding seasons (post-breeding, non-breeding and pre-breeding) follows the approach used previously in the application and examination documentation for multiple offshore wind farms (e.g. East Anglia THREE Ltd. 2015, Forewind 2013, SMart Wind 2015a). The contribution of adult birds from an individual SPA, as estimated by Furness (2015), to the relevant BDMPS population for each species/season combination is divided by the total BDMPS population to calculate the proportion of the BDMPS population represented by adult birds from the SPA considered. An example of the computation involved is given in Section 4.2 of Appendix 4.4 Phenology and apportioning within the RIAA of the HRA submitted by Moray West.

Table 3.3 Apportioning values for Moray West for the non-breeding season

Species	SPA	Apportioning value	
		Post-breeding (August - December)	Pre-breeding (January - April)
Kittiwake	East Caithness SPA	0.01 (0.058)	0.02 (0.02)
	North Caithness SPA	0.01	0.02

3.3 Displacement mortality for guillemot, razorbill and kittiwake at East Caithness Cliffs SPA and North Caithness Cliffs SPA for Moray West alone and in-combination

3.3.1 Moray West alone displacement mortality results apportioned to SPAs

The following tables summarise predicted mortality due to displacement for each relevant European site and feature. Predictions are provided for both the wind farm alone (no buffer) and with a 2 km buffer included. It is assumed that the likely impact lies between these values. Results are shown using the apportioning values calculated using the approaches applied by the Applicant and SNH.

3.3.1.1 Guillemot – East Caithness Cliffs SPA

Table 3.4 Predicted displacement mortality for guillemot at East Caithness Cliffs SPA Moray West alone (no buffer) using the Applicant's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	14,570	0.575	0.930	0.809	6,305	60% / 1%	**38**
Post-breeding season (peak mean)	22,771	n/a	n/a	0.092	2,099	60% / 1%	**13**
Non-breeding season (peak mean)	4,901	n/a	n/a	0.092	452	60% / 1%	**3**

Table 3.5 Predicted displacement mortality for guillemot at East Caithness Cliffs SPA Moray West alone (no buffer) using SNH's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	14,570	0.575	0.930	0.873	6,800	60% / 1%	**41**
Post-breeding season (peak mean)	22,771	n/a	n/a	0.092	2,099	60% / 1%	**13**
Non-breeding season (peak mean)	4,901	n/a	n/a	0.092	452	60% / 1%	**3**

Table 3.6 Predicted displacement mortality for guillemot at East Caithness Cliffs SPA Moray West with 2km buffer using the Applicant's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	24,426	0.575	0.930	0.809	10,569	60% / 1%	**63**
Post-breeding season (peak mean)	38,174	n/a	n/a	0.092	3,519	60% / 1%	**21**
Non-breeding season (peak mean)	8,217	n/a	n/a	0.092	758	60% / 1%	**5**

Table 3.7 Predicted displacement mortality for guillemot at East Caithness Cliffs SPA Moray West with 2km buffer using SNH's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	24,426	0.575	0.930	0.873	11,400	60% / 1%	**68**
Post-breeding season (peak mean)	38,174	n/a	n/a	0.092	3,519	60% / 1%	**21**
Non-breeding season (peak mean)	8,217	n/a	n/a	0.092	758	60% / 1%	**5**

3.3.1.2 Razorbill – East Caithness Cliffs SPA

Table 3.8 Predicted displacement mortality for razorbill at East Caithness Cliffs SPA Moray West alone (no buffer) using the Applicant's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	1,675	0.571	0.930	0.898	799	60% / 1%	**5**

Table 3.8 Predicted displacement mortality for razorbill at East Caithness Cliffs SPA Moray West alone (no buffer) using the Applicant's apportioning approach							
Season	**Unapportioned population**	**Age structure correction**	**Sabbatical**	**SPA proportion**	**Apportioned Population**	**Displacement / mortality rates**	**Mortality**
Post-breeding season (peak mean)	2,114	n/a	n/a	0.042	89	60% / 1%	**1**
Non-breeding season (peak mean)	2,139	n/a	n/a	0.034	73	60% / 1%	**0**

Table 3.9 Predicted displacement mortality for razorbill at East Caithness Cliffs SPA Moray West alone (no buffer) using SNH's apportioning approach							
Season	**Unapportioned population**	**Age structure correction**	**Sabbatical**	**SPA proportion**	**Apportioned Population**	**Displacement / mortality rates**	**Mortality**
Breeding Season (peak mean)	1,675	0.571	0.930	0.940	836	60% / 1%	**5**
Post-breeding season (peak mean)	2,114	n/a	n/a	0.042	89	60% / 1%	**1**
Non-breeding season (peak mean)	2,139	n/a	n/a	0.034	73	60% / 1%	**0**

Table 3.10 Predicted displacement mortality for razorbill at East Caithness Cliffs SPA Moray West with 2km buffer using the Applicant's apportioning approach							
Season	**Unapportioned population**	**Age structure correction**	**Sabbatical**	**SPA proportion**	**Apportioned Population**	**Displacement / mortality rates**	**Mortality**
Breeding Season (peak mean)	2,808	0.571	0.930	0.898	1,339	60% / 1%	**8**
Post-breeding season (peak mean)	3,544	n/a	n/a	0.042	150	60% / 1%	**1**

Table 3.10 Predicted displacement mortality for razorbill at East Caithness Cliffs SPA Moray West with 2km buffer using the Applicant's apportioning approach							
Season	**Unapportioned population**	**Age structure correction**	**Sabbatical**	**SPA proportion**	**Apportioned Population**	**Displacement / mortality rates**	**Mortality**
Non-breeding season (peak mean)	3,585	n/a	n/a	0.034	123	60% / 1%	**1**

Table 3.11 Predicted displacement mortality for razorbill at East Caithness Cliffs SPA Moray West with 2km buffer using SNH's apportioning approach							
Season	**Unapportioned population**	**Age structure correction**	**Sabbatical**	**SPA proportion**	**Apportioned Population**	**Displacement / mortality rates**	**Mortality**
Breeding Season (peak mean)	2,808	0.571	0.930	0.940	1,402	60% / 1%	**8**
Post-breeding season (peak mean)	3,544	n/a	n/a	0.042	150	60% / 1%	**1**
Non-breeding season (peak mean)	3,585	n/a	n/a	0.034	123	60% / 1%	**1**

3.3.1.3 Kittiwake – East Caithness Cliffs SPA

Table 3.12 Predicted displacement mortality for kittiwake at East Caithness Cliffs SPA Moray West alone (no buffer) using the Applicant's apportioning approach							
Season	**Unapportioned population**	**Age structure correction**	**Sabbatical**	**SPA proportion**	**Apportioned Population**	**Displacement / mortality rates**	**Mortality**
Breeding Season (peak mean)	4,117	0.915	0.9	0.848	2,877	30% / 2%	**17**
Non-breeding season (peak mean)	877	n/a	n/a	0.058	51	30% / 2%	**0**

Table 3.13 Predicted displacement mortality for kittiwake at East Caithness Cliffs SPA Moray West alone (no buffer) using SNH's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	4,117	0.915	0.9	0.872	2,956	30% / 2%	**18**
Non-breeding season (peak mean)	877	n/a	n/a	0.058	51	30% / 2%	**0**

Table 3.14 Predicted displacement mortality for kittiwake at East Caithness Cliffs SPA Moray West with 2km buffer using the Applicant's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	6,902	0.915	0.9	0.848	4,822	30% / 2%	**29**
Non-breeding season (peak mean)	1,470	n/a	n/a	0.058	86	30% / 2%	**1**

Table 3.15 Predicted displacement mortality for kittiwake at East Caithness Cliffs SPA Moray West with 2km buffer using SNH's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	6,902	0.915	0.9	0.872	4,956	30% / 2%	**30**
Non-breeding season (peak mean)	1,470	n/a	n/a	0.058	86	30% / 2%	**1**

3.3.1.4 Kittiwake – North Caithness Cliffs SPA

Table 3.16 Predicted displacement mortality for kittiwake at North Caithness Cliffs SPA Moray West alone (no buffer) using the Applicant's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	4,117	0.915	0.9	0.040	134	30% / 2%	**1**
Non-breeding season (peak mean)	877	n/a	n/a	0.01	13	30% / 2%	**0**

Table 3.17 Predicted displacement mortality for kittiwake at North Caithness Cliffs SPA Moray West alone (no buffer) using SNH's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	4,117	0.915	0.9	0.031	104	30% / 2%	**1**
Non-breeding season (peak mean)	877	n/a	n/a	0.01	13	30% / 2%	**0**

Table 3.18 Predicted displacement mortality for kittiwake at North Caithness Cliffs SPA Moray West with 2km buffer using the Applicant's apportioning approach

Season	Unapportioned population	Age structure correction	Sabbatical	SPA proportion	Apportioned Population	Displacement / mortality rates	Mortality
Breeding Season (peak mean)	6,902	0.915	0.9	0.040	225	30% / 2%	**1**
Non-breeding season (peak mean)	1,470	n/a	n/a	0.01	22	30% / 2%	**0**

Table 3.19 Predicted displacement mortality for kittiwake at North Caithness Cliffs SPA Moray West with 2km buffer using SNH's apportioning approach							
Season	**Unapportioned population**	**Age structure correction**	**Sabbatical**	**SPA proportion**	**Apportioned Population**	**Displacement / mortality rates**	**Mortality**
Breeding Season (peak mean)	6,902	0.915	0.9	0.031	174	30% / 2%	**1**
Non-breeding season (peak mean)	1,470	n/a	n/a	0.01	22	30% / 2%	0

3.3.2 In-combination displacement mortality results apportioned to SPAs

3.3.2.1 Guillemot East Caithness Cliffs SPA

Table 3.20 presents a full breakdown of in-combination guillemot displacement mortality apportioned to East Caithness Cliffs SPA.

Table 3.20 Guillemot displacement mortality apportioned to East Caithness Cliffs SPA from Moray West alone and in-combination with other projects[2]				
Project	**Mean-Peak Population in Breeding Season**	**Mean-Peak Population Apportioned to SPA in Breeding Season (SNH apportioned numbers in brackets)**	**Mean-Peak Population in Non-Breeding Season**	**Mean-Peak Population Apportioned to SPA in Non-Breeding Season (includes post- and non-breeding seasons for Moray West)**
Moray West	14,570 - 24,426	6,305 – 10,569 (6,800 – 11,400)	22,771 – 38,174[3]	2,511 – 4,277
Moray East	9,820	9,151	1,245	115
Beatrice	13,610	12,466	2,755	254
Seagreen A	-	-	0	0
Seagreen B	-	-	0	0
Inch Cape	-	-	3,177	293
Neart na Gaoithe	-	-	3,291	303
Aberdeen	-	-	225	21
Hywind	-	-	0	0
Kincardine	-	-	0	0
Blyth Demonstration	-	-	1,274	117

[2] Where ranges are shown this reflects Moray West site with and without 2 km buffer
[3] Taken as peak population from either post or non-breeding (former).

Table 3.20 Guillemot displacement mortality apportioned to East Caithness Cliffs SPA from Moray West alone and in-combination with other projects[2]

Project	Mean-Peak Population in Breeding Season	Mean-Peak Population Apportioned to SPA in Breeding Season (SNH apportioned numbers in brackets)	Mean-Peak Population in Non-Breeding Season	Mean-Peak Population Apportioned to SPA in Non-Breeding Season (includes post- and non-breeding seasons for Moray West)
Dogger Bank Creyke Beck A	-	-	6,724	620
Dogger Bank Creyke Beck B	-	-	11,302	1042
Dogger Bank Teesside A	-	-	2,870	265
Dogger Bank Teesside D	-	-	1,525	141
Dudgeon	-	-	692	64
East Anglia ONE	-	-	713	66
East Anglia Three	-	-	1,405	130
Galloper	-	-	588	54
Greater Gabbard	-	-	698	64
Hornsea Project One	-	-	7,318	675
Hornsea Project Two	-	-	13,164	1214
Humber Gateway	-	-	158	15
Lincs and LID6	-	-	931	86
London Array I & II	-	-	492	45
Race Bank	-	-	925	85
Sheringham Shoal	-	-	822	76
Teesside	-	-	918	85
Thanet	-	-	137	13
Triton Knoll	-	-	843	78
Westermost Rough	-	-	556	51
Total population apportioned to ECC SPA		**27,923– 32,187 (28,418 - 33.018)**		**8,520 – 10,246**
Displacement mortality apportioned to ECC SPA		**168 – 193 (171 – 198)**		**51 – 61**

3.3.2.2 Razorbill - East Caithness Cliffs SPA

Table 3.21 presents a full breakdown of in-combination razorbill displacement mortality apportioned to East Caithness Cliffs SPA. Where pre- and post-breeding season estimates were available, the highest value has been used to provide a non-breeding season value.

Table 3.21 Razorbill displacement mortality apportioned to East Caithness Cliffs SPA from Moray West alone and in-combination with other projects

Project	Mean-Peak Population in Breeding Season	Mean-Peak Population Apportioned to SPA in Breeding Season (SNH apportioned numbers in brackets)	Mean-Peak Population in Non-Breeding Season (includes post- and non-breeding seasons for Moray West)	Mean-Peak Population Apportioned to SPA in Non-Breeding Season
Moray West	1,675 – 2,808[4]	799 – 1,339 (836 – 1,402)	4,253 – 7,129[5]	–162 – 273
Moray East	2,423	2,377	1,103	47
Beatrice	873	855	833	35
Seagreen A	-	-	0	0
Seagreen B	-	-	0	0
Inch Cape	-	-	2,870	121
Neart na Gaoithe	-	-	5,492	232
Aberdeen	-	-	64	3
Hywind	-	-	0	0
Kincardine	-	-	0	0
Blyth Demonstration	-	-	91	4
Dogger Bank Creyke Beck A	-	-	4,149	175
Dogger Bank Creyke Beck B	-	-	5,119	216
Dogger Bank Teesside A	-	-	1,919	81
Dogger Bank Teesside D	-	-	2,953	125
Dudgeon	-	-	745	26
East Anglia ONE	-	-	336	14
East Anglia Three	-	-	1,547	65
Galloper	-	-	394	17
Greater Gabbard	-	-	387	13
Hornsea Project One	-	-	7,132	301
Hornsea Project Two	-	-	4,221	178
Humber Gateway	-	-	20	1

[4] Range shown reflects Moray West site with and without 2 km buffer
[5] Taken as peak population from either post or non-breeding (former).

Table 3.21 Razorbill displacement mortality apportioned to East Caithness Cliffs SPA from Moray West alone and in-combination with other projects

Project	Mean-Peak Population in Breeding Season	Mean-Peak Population Apportioned to SPA in Breeding Season (SNH apportioned numbers in brackets)	Mean-Peak Population in Non-Breeding Season (includes post- and non-breeding seasons for Moray West)	Mean-Peak Population Apportioned to SPA in Non-Breeding Season
Lincs and LID6	-	-	34	1
London Array I & II	-	-	8	0
Race Bank	-	-	16	1
Sheringham Shoal	-	-	1,343	57
Teesside	-	-	57	2
Thanet	-	-	21	1
Triton Knoll	-	-	855	29
Westermost Rough	-	-	152	5
Total population apportioned to ECC SPA		**4,031 – 4,571 (4,068 – 4,634)**		**1,962 - 2,072**
Displacement mortality apportioned to ECC SPA		**24 - 27 (24 – 28)**		**12**

3.3.2.3 Kittiwake - East Caithness Cliffs SPA

Table 3.22 presents a full breakdown of in-combination kittiwake displacement mortality apportioned to East Caithness Cliffs SPA. Where pre- and post-breeding season estimates were available, the highest value has been used to provide a non-breeding season value

Table 3.22 Kittiwake displacement mortality apportioned to East Caithness Cliffs SPA from Moray West alone and in-combination with other projects

Project	Breeding season displacement mortality	Breeding season displacement mortality apportioned to SPA[6]	Non -breeding season displacement mortality	Non-breeding season displacement mortality apportioned to SPA
Moray West	25 – 41	17 – 29 (18 – 30)	5 – 9	0 - 1
Moray East	24	23	9	1
Beatrice	13	12	No assessment conducted	
Displacement mortality apportioned to ECC SPA		**53 – 65 (53 – 65)**		**1**

3.3.2.4 Kittiwake - North Caithness Cliffs SPA

Table 3.23 presents a full breakdown of in-combination kittiwake displacement mortality apportioned to North Caithness Cliffs SPA. Where pre- and post-breeding season estimates were available, the highest value has been used to provide a non-breeding season value.

Table 3.23 Kittiwake displacement mortality apportioned to North Caithness Cliffs SPA from Moray West alone and in-combination with other projects

Project	Breeding season displacement mortality	Breeding season displacement mortality apportioned to SPA[6]	Non -breeding season displacement mortality	Non-breeding season displacement mortality apportioned to SPA
Moray West	25 – 41	1	5 – 9	0
Moray East	24	1	9	0
Beatrice	13	0	No assessment conducted	
Displacement mortality apportioned to ECC SPA		**2 - 3**		**0**

3.3.3 Population Viability Analysis (PVAs) – displacement impacts: East Caithness Cliffs SPA and North Caithness Cliffs SPA

3.3.3.1 SNH comments

With regards to the PVA modelling undertaken for Moray West and reported in the HRA, SNH have made the following comments regarding the outputs:

'PVA models appear to be based on theoretical impact levels rather than informed by predicted mortality figures, with the model outputs presented in increments of 50 bird deaths. For most species, these thresholds are uninformative as impact levels are lower. The increments used are of some use for kittiwake as the scale of estimated impact is similar to the increments presented, although it would still be useful to present population impact increments below 50 bird deaths, particularly in the case of impacts on kitti-wake from Moray West alone.'

Whilst Moray West has reservations on the usefulness of more precise outputs related to predicted mortality due to inherent uncertainty over PVA modelling, these have been provided below (kittiwake to 1 bird intervals and auks to 10 bird intervals). The PVA outputs presented in the HRA were given at 35 and 50 years scenarios; Tables 3.24 and 3.31 provide an addition of a 25 year scenario.

3.3.3.2 Guillemot - East Caithness Cliffs SPA

Tables 3.24 and 3.25 presents full PVA outputs for the guillemot feature of East Caithness Cliffs SPA at 25, 35 and 50 year scenarios for displacement impacts for Moray West Site + 2 km buffer and Moray West Site alone (no buffer) respectively. A range of results are provided to reflect differing viewpoints on phenology and apportioning methodology. Differences are however slight or non-existent in terms of PVA outputs which leads to the outcome that the current HRA conclusion remains unchanged. The current HRA conclusion of no adverse effect on the East Caithness Cliffs SPA for guillemot displacement remain unchanged.

Table 3.24 PVA results for the guillemot feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West plus a 2 km buffer

Impact Scenario	Predicted Mortality[6]	Years / mortality interval	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (breeding season)	63 - 68	25 / 70 birds	1.000	0.990	0.449
		35 / 70 birds	1.000	0.986	0.463
		50 / 70 birds	1.000	0.981	0.450
Impacted - Moray West alone (Non - breeding season	26	25 / 30 birds	1.000	0.996	0.479
		35 / 30 birds	1.000	0.994	0.488
		50 / 30 birds	1.000	0.992	0.475
Impacted – Moray West alone (all seasons)	89-94	25 / 90 birds	0.999	0.987	0.439
		35 / 90 birds	0.999	0.982	0.452
		50 / 90 birds	0.999	0.975	0.437
Impacted – Incombination (breeding)	193-198	25 / 200 birds	0.999	0.972	0.372
		35 / 200 birds	0.999	0.961	0.390
		50/ 200 birds	0.999	0.945	0.346
Impacted – Incombination (non-breeding)	61	25 / 60 birds	1.000	0.992	0.457
		35 / 60 birds	1.000	0.988	0.471
		50 / 60 birds	1.000	0.983	0.455
Impacted – Incombination (all seasons)	254 - 259	25 / 250-260 birds	0.999 – 0.999	0.965 – 0.964	0.345 – 0.342
		35 / 250-260 birds	0.999 – 0.999	0.952 – 0.950	0.359 – 0.352
		50 / 250-260 birds	0.999 – 0.999	0.932 – 0.930	0.307 – 0.302

Table 3.25 PVA results for the guillemot feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West alone (no buffer)

Impact Scenario	Predicted Mortality[6]	Years / mortality interval	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (breeding season)	38-41	25 / 40 birds	1.000	0.994	0.470
		35 / 40 birds	1.000	0.992	0.480
		50 / 40 birds	1.000	0.989	0.465
Impacted - Moray West	16	25 / 20 birds	1.000	0.997	0.483
		35 / 20 birds	1.000	0.996	0.491

[6] The ranges presented are the impacts arising from Moray West plus 2 km buffer when applying both the Applicant’s and SNH’s apportioning approaches

Table 3.25 PVA results for the guillemot feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West alone (no buffer)					
Impact Scenario	**Predicted Mortality[6]**	**Years / mortality interval**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
alone (Non - breeding season		50 / 20 birds	1.000	0.994	0.483
Impacted – Moray West alone (all seasons)	54 – 57	25 / 60 birds	1.000	0.992	0.457
		35 / 60 birds	1.000	0.988	0.471
		50 / 60 birds	1.000	0.983	0.455
Impacted – Incombination (breeding)	168 - 171	25 / 170 birds	0.999	0.976	0.391
		35 / 170 birds	0.999	0.967	0.411
		50 / 170 birds	0.999	0.953	0.369
Impacted – Incombination (non-breeding)	51	25 / 50 birds	1.000	0.993	0.462
		35 / 50 birds	1.000	0.990	0.475
		50 / 50 birds	1.000	0.986	0.459
Impacted – Incombination (all seasons)	219 – 222	25 / 220 birds	0.999	0.970	0.357
		35 / 220 birds	0.999	0.958	0.379
		50 / 220 birds	0.999	0.940	0.329

3.3.3.3 Razorbill - East Caithness Cliffs SPA

Table 3.26 and Table 3.27 presents full PVA outputs for the razorbill feature of East Caithness Cliffs SPA at 25, 35 and 50 year scenarios for displacement impacts for Moray West Site + 2 km buffer and Moray West Site alone (no buffer) respectively. A range of results are provided to reflect differing viewpoints on phenology and apportioning methodology. Differences are however slight or non-existent in terms of PVA outputs which leads to the outcome that the current HRA conclusion remain unchanged. The current HRA conclusion of no adverse effect on the East Caithness Cliffs SPA for razorbill displacement remains unchanged.

Table 3.26 PVA results for the razorbill feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West plus a 2 km buffer					
Impact Scenario	**Predicted Mortality[6]**	**Years / mortality interval**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (breeding season)	8	25 / 10	1.000	0.993	0.493
		35 / 10	1.000	0.990	0.495
		50 / 10	1.000	0.986	0.493
Impacted - Moray West alone (Non - breeding season	2	25 / 0-10	1.000	0.993-1.000	0.493-0.500
		35 / 0-10	1.000	0.990-1.000	0.495-0.500
		50 / 0-10	1.000	0.986-1.000	0.493-0.500

Table 3.26 PVA results for the razorbill feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West plus a 2 km buffer					
Impact Scenario	**Predicted Mortality[6]**	**Years / mortality interval**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Impacted – Moray West alone (all seasons)	10	25 / 10	1.000	0.993	0.493
		35 / 10	1.000	0.990	0.495
		50 / 10	1.000	0.986	0.493
Impacted – Incombination (breeding)	27-28	25 / 30	0.986	0.979	0.478
		35 / 30	0.986	0.970	0.474
		50 / 30	0.986	0.958	0.470
Impacted – Incombination (non-breeding)	12	25 / 10	1.000	0.993	0.493
		35 / 10	1.000	0.990	0.495
		50 / 10	1.000	0.986	0.493
Impacted – incombination (all seasons)	39-40	25 / 40	0.999	0.972	0.475
		35 / 40	0.999	0.961	0.465
		50 / 40	0.999	0.945	0.462

Table 3.27 PVA results for the razorbill feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West alone (no buffer)					
Impact Scenario	**Predicted Mortality[6]**	**Years / mortality interval**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (breeding season)	5	25 / 10	1.000	0.993	0.493
		35 / 10	1.000	0.990	0.495
		50 / 10	1.000	0.986	0.493
Impacted - Moray West alone (Non - breeding season)	1	25 / 0-10	1.000	0.993-1.000	0.493-0.500
		35 / 0-10	1.000	0.990-1.000	0.495-0.500
		50 / 0-10	1.000	0.986-1.000	0.493-0.500
Impacted - Moray West alone (all seasons)	6	25 / 10	1.000	0.993	0.493
		35 / 10	1.000	0.990	0.495
		50 / 10	1.000	0.986	0.493
Impacted – Incombination (breeding)	24	25 / 20	0.986	0.986	0.487
		35 / 20	0.986	0.980	0.491
		50 / 20	0.986	0.972	0.479

Table 3.27 PVA results for the razorbill feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West alone (no buffer)					
Impact Scenario	**Predicted Mortality[6]**	**Years / mortality interval**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Impacted – Incombination (non-breeding)	12	25 / 10	1.000	0.993	0.493
		35 / 10	1.000	0.990	0.495
		50 / 10	1.000	0.986	0.493
Impacted - Incombination (Non - breeding season)	36	25 / 40	0.999	0.972	0.475
		35 / 40	0.999	0.961	0.465
		50 / 40	0.999	0.945	0.462

3.3.3.4 Kittiwake - East Caithness Cliffs SPA

Table 3.28 and Table 3.29 presents full PVA outputs for the razorbill feature of East Caithness Cliffs SPA at 25, 35 and 50 year scenarios for displacement impacts for Moray West Site + 2 km buffer and Moray West Site alone (no buffer) respectively. A range of results are provided to reflect differing viewpoints on phenology and apportioning methodology. Differences are however slight or non-existent in terms of PVA outputs which leads to the outcome that the current HRA conclusion remain unchanged. The current HRA conclusion of no adverse effect on the East Caithness Cliffs SPA for kittiwake displacement remains unchanged.

Table 3.28 PVA results for the kittiwake feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West plus a 2 km buffer					
Impact Scenario	**Predicted Mortality[6]**	**Years**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (breeding season)	29 - 30	25	0.999-0.999	0.982-0.983	0.478-0.479
		35	0.999-0.999	0.975-0.976	0.473-0.475
		50	0.999-0.999	0.964-0.965	0.471-0.471
Impacted - Moray West alone (Non - breeding season	1	25	1.000	0.999	0.500
		35	1.000	0.999	0.499
		50	1.000	0.999	0.499
Impacted – Moray West alone (all seasons)	29 - 30	25	0.999-0.999	0.982-0.983	0.478-0.479
		35	0.999-0.999	0.975-0.976	0.473-0.475
		50	0.999-0.999	0.964-0.965	0.471-0.471
Impacted – Incombination (breeding)	66-67	25	0.998-0.998	0.960-0.961	0.452-0.452
		35	0.998-0.998	0.945-0.946	0.446-0.446
		50	0.998-0.998	0.922-0.923	0.430-0.432

Table 3.28 PVA results for the kittiwake feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West plus a 2 km buffer

Impact Scenario	Predicted Mortality[6]	Years	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Impacted – Incombination (non-breeding)	1	25	1.000	0.999	0.500
		35	1.000	0.999	0.499
		50	1.000	0.999	0.499
Impacted – Incombination (all seasons)	66 - 67	25	0.998-0.998	0.960-0.961	0.452-0.452
		35	0.998-0.998	0.945-0.946	0.446-0.446
		50	0.998-0.998	0.922-0.923	0.430-0.432

Table 3.29 PVA results for the kittiwake feature of East Caithness Cliffs SPA for displacement impacts calculated for Moray West alone (no buffer)

Impact Scenario	Predicted Mortality[6]	Years	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (breeding season)	17-18	25	1.000-1.000	0.989-0.990	0.487-0.488
		35	1.000-1.000	0.985-0.986	0.487-0.489
		50	1.000-1.000	0.978-0.980	0.478-0.480
Impacted - Moray West alone (Non - breeding season	1	25	1.000	0.999	0.500
		35	1.000	0.999	0.499
		50	1.000	0.999	0.499
Moray West alone (all seasons)	18	25	1.000	0.989	0.487
		35	1.000	0.985	0.487
		50	1.000	0.978	0.478
Impacted – Incombination (breeding)	53	25	0.999	0.968	0.459
		35	0.999	0.956	0.458
		50	0.999	0.938	0.443
Impacted – Incombination (non-breeding)	1	25	1.000	0.999	0.500
		35	1.000	0.999	0.499
		50	1.000	0.999	0.499
Impacted – Incombination (all seasons)	54	25	0.999	0.968	0.459
		35	0.999	0.955	0.456
		50	0.999	0.937	0.440

3.3.3.5 Kittiwake - North Caithness Cliffs SPA

Table 3.30 and Table 30.31 presents full PVA outputs for the kittiwake feature of North Caithness Cliffs SPA at 25, 35 and 50 year scenarios for displacement impacts for Moray West Site + 2 km buffer and Moray West Site alone (no buffer) respectively. A range of results are provided to reflect differing viewpoints on phenology and apportioning methodology. Differences are however slight or non-existent in terms of PVA outputs which leads to the outcome that the current HRA conclusion remain unchanged. The current HRA conclusion of no adverse effect on the North Caithness Cliffs SPA for kittiwake displacement remains unchanged.

Table 3.30 PVA results for the kittiwake feature of North Caithness Cliffs SPA for displacement impacts calculated for Moray West plus a 2 km buffer

Impact Scenario	Predicted Mortality[6]	Years / mortality interval	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (breeding season)	1	25	1.000	0.997	0.496
		35	1.000	0.996	0.499
		50	1.000	0.995	0.498
Impacted - Moray West alone (Non - breeding season)	0	25	1.000	1.000	0.500
		35	1.000	1.000	0.500
		50	1.000	1.000	0.500
Impacted - Moray West alone (all seasons)	1	25	1.000	0.997	0.496
		35	1.000	0.996	0.499
		50	1.000	0.995	0.498
Impacted – Incombination (breeding)	3	25	1.000	0.995	0.491
		35	1.000	0.993	0.495
		50	1.000	0.989	0.492
Impacted – Incombination (non-breeding)	0	25	1.000	1.000	0.500
		35	1.000	1.000	0.500
		50	1.000	1.000	0.500
Impacted – Incombination (all seasons)	3	25	1.000	0.998	0.499
		35	1.000	0.997	0.499
		50	1.000	0.996	0.497

Table 3.31 PVA results for the kittiwake feature of North Caithness Cliffs SPA for displacement impacts calculated for Moray West alone (no buffer)					
Impact Scenario	**Predicted Mortality[6]**	**Years / mortality interval**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (breeding season)	1	25	1.000	0.997	0.496
		35	1.000	0.996	0.499
		50	1.000	0.995	0.498
Impacted - Moray West alone (Non - breeding season)	0	25	1.000	1.000	0.500
		35	1.000	1.000	0.500
		50	1.000	1.000	0.500
Impacted - Moray West alone (all seasons)	1	25	1.000	0.997	0.496
		35	1.000	0.996	0.499
		50	1.000	0.995	0.498
Impacted – Incombination (breeding)	2	25	1.000	0.995	0.491
		35	1.000	0.993	0.495
		50	1.000	0.989	0.492
Impacted – Incombination (non-breeding)	0	25	1.000	1.000	0.500
		35	1.000	1.000	0.500
		50	1.000	1.000	0.500
Impacted – Incombination (all seasons)	2	25	1.000	0.995	0.491
		35	1.000	0.993	0.495
		50	1.000	0.989	0.492

3.4 Collision mortality for kittiwake at East Caithness Cliffs SPA and North Caithness Cliffs SPA for Moray West alone and in-combination

3.4.1 Moray West alone collision risk results apportioned to SPAs

Table 3.32 presents kittiwake collision risk estimates from Moray West alone apportioned to the relevant three SPAs (East Caithness Cliffs (ECC) and North Caithness Cliffs (NCC). This table includes seasonal definitions as advised by SNH and that adapted for the Moray West application. Apportioned values are presented as a range where appropriate to reflect the slightly different breeding season apportioning values as detailed in Section 2.6.1 above. Values presented in bold type reflect those using the full methodology promoted by the Applicant but now rectifying the error in SNH's stage 1 equation. Results are provided at Option 2 using a 98.9% avoidance rate only. Further consideration of Band model option choice and avoidance rate are presented in Section 3.5 below.

Table 3.32 Apportioned kittiwake collisions using the Applicant's and SNH's approach to seasonality and apportioning							
Collisions	**Site-specific seasonal definitions**				**SNH seasonal definitions**		
	Breeding	**Post-breeding**	**Pre-breeding**	**Annual**	**Breeding**	**Non-breeding**	**Annual**
Unapportioned collisions	79	24	7	109	78	31	109
Collision risk apportioned to ECC SPA	55	1	1	57	56	2	58
Collision risk apportioned to NCC SPA	3	0	0	3	2	0	2

When applying the SNH seasonal definitions and apportioning approach the number of collisions apportioned to ECC SPA increases by one bird. When applying similar assumptions to the seasonality and apportioning used for North Caithness SPA the resulting collision risk decreases by one bird.

3.4.2 Moray West in-combination collision risk results apportioned to SPAs

3.4.2.1 East Caithness Cliffs SPA

Table 3.33 presents a full breakdown of in-combination kittiwake collision mortality apportioned to East Caithness Cliffs SPA. Where pre- and post-breeding season estimates were available, these have been summed to provide a non-breeding season value. As with the Moray West alone results, the results below are provided at Option 2 98.9% avoidance only.

Table 3.33 Kittiwake collision mortality apportioned to East Caithness Cliffs SPA from Moray West alone and in-combination with other projects				
Project	**Annual unapportioned collision mortality**	**Seasonal collision mortality apportioned to SPA (values in brackets are those obtained when applying the SNH apportioning approach)**		
		Breeding	**Non-breeding**	**Annual**
Moray West	109	55 (56)	2	57 (58)
Moray East	86	69	1	70
Beatrice	45	28	1	29
Aberdeen EOWDC	19	-	0	0
Blyth Demonstration	5	-	0	0
Dogger Bank Creyke Beck Projects A and B	719	-	29	29
Dogger Bank Teesside Projects A and B	445	-	22	22

Table 3.33 Kittiwake collision mortality apportioned to East Caithness Cliffs SPA from Moray West alone and in-combination with other projects

Project	Annual unapportioned collision mortality	Seasonal collision mortality apportioned to SPA (values in brackets are those obtained when applying the SNH apportioning approach)		
		Breeding	Non-breeding	Annual
Dudgeon	0	-	0	0
East Anglia One	581	-	34	34
East Anglia Three	106	-	6	6
Galloper	66	-	4	4
Greater Gabbard	28	-	1	1
Hornsea Project One	123	-	5	5
Hornsea Project Two	27	-	0	0
Humber Gateway	7	-	0	0
Hywind	18	-	0	0
Inch Cape	301	-	18	18
Kentish Flats Extension	3	-	0	0
Kincardine	19	-	0	0
Lincs	3	-	0	0
London Array	6	-	0	0
Methil	1	-	0	0
Neart na Gaoithe	93	-	4	4
Race Bank	31	-	1	1
Seagreen Alpha	371	-	18	18
Seagreen Bravo	343	-	14	14
Teesside	81	-	1	1
Thanet	0	-	0	0
Triton Knoll	209	-	11	11
Westermost Rough	0	-	0	0

Table 3.33 Kittiwake collision mortality apportioned to East Caithness Cliffs SPA from Moray West alone and in-combination with other projects				
Project	**Annual unapportioned collision mortality**	**Seasonal collision mortality apportioned to SPA (values in brackets are those obtained when applying the SNH apportioning approach)**		
		Breeding	**Non-breeding**	**Annual**
TOTAL		**152 (154)**	**173**	**325 (326)**

3.4.2.2 North Caithness Cliffs SPA

Table 3.34 presents a full breakdown of in-combination kittiwake collision mortality apportioned to North Caithness Cliffs SPA. Where pre- and post-breeding season estimates were available, these have been summed to provide a non-breeding season value.

Table 3.34 Kittiwake collision mortality apportioned to North Caithness Cliffs SPA from Moray West alone and in-combination with other projects				
Project	**Annual unapportioned collision mortality**	**Seasonal collision mortality apportioned to SPA (values in brackets are those obtained when applying the SNH apportioning approach)**		
		Breeding	**Non-breeding**	**Annual**
Moray West	109	3 (2)	0	3 (2)
Moray East	86	2	0	2
Beatrice	45	1	0	1
Aberdeen EOWDC	19	-	0	0
Blyth Demonstration	5	-	0	0
Dogger Bank Creyke Beck Projects A and B	719	-	8	8
Dogger Bank Teesside Projects A and B	445	-	5	5
Dudgeon	0	-	0	0
East Anglia One	581	-	9	9
East Anglia Three	106	-	2	2
Galloper	66	-	1	1
Greater Gabbard	28	-	0	0
Hornsea Project One	123	-	1	1
Hornsea Project Two	27	-	0	0

Table 3.34 Kittiwake collision mortality apportioned to North Caithness Cliffs SPA from Moray West alone and in-combination with other projects				
Project	**Annual unapportioned collision mortality**	**Seasonal collision mortality apportioned to SPA (values in brackets are those obtained when applying the SNH apportioning approach)**		
		Breeding	**Non-breeding**	**Annual**
Humber Gateway	7	-	0	0
Hywind	18	-	0	0
Inch Cape	301	-	4	4
Kentish Flats Extension	3	-	0	0
Kincardine	19	-	0	0
Lincs	3	-	0	0
London Array	6	-	0	0
Methil	1	-	0	0
Neart na Gaoithe	93	-	2	2
Race Bank	31	-	0	0
Seagreen Alpha	371	-	4	4
Seagreen Bravo	343	-	4	4
Teesside	81	-	0	0
Thanet	0	-	0	0
Triton Knoll	209	-	2	2
Westermost Rough	0	-	0	0
TOTAL		**6 (5)**	**43**	**49 (49)**

3.4.3 PVAs – collision mortality at the East Caithness Cliffs SPA and North Caithness Cliffs SPA

3.4.3.1 East Caithness Cliffs SPA Collision Mortality PVAs

Table 3.35 presents full PVA outputs for the kittiwake feature of East Caithness Cliffs SPA at 25, 35 and 50 year scenarios. A range of results are provided to reflect differing viewpoints on phenology and apportioning methodology. Differences are however slight or non-existent in terms of PVA outputs. Note that these outputs have been recalculated for each specific predicted impact, rather than in intervals.

Table 3.35 PVA results for the kittiwake feature of East Caithness Cliffs SPA					
Impact Scenario	**Predicted annual collisions**	**Years**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Unimpacted		-	-	1	0.50
Impacted – Moray West alone	57 (58)	25	0.999 (0.999)	0.966 (0.965)	0.456 (0.455)
		35	0.999 (0.999)	0.953 (0.952)	0.452 (0.451)
		50	0.999 (0.999)	0.933 (0.932)	0.436 (0.435)
Impacted – In-combination	325 (326)	25	0.992 (0.992)	0.821 (0.820)	0.266 (0.266)
		35	0.992 (0.992)	0.759 (0.758)	0.228 (0.227)
		50	0.992 (0.992)	0.674 (0.673)	0.210 (0.209)

3.4.3.2 North Caithness Cliffs SPA Collision Mortality PVAs

Table 3.36 presents full PVA outputs for the kittiwake feature of North Caithness Cliffs SPA at 25, 35 and 50 year scenarios. A range of results are provided to reflect differing viewpoints on phenology and apportioning methodology. Differences are however slight or non-existent in terms of PVA outputs. Note that these outputs have been recalculated for each specific predicted impact, rather than in intervals.

Table 3.36 PVA results for the kittiwake feature of North Caithness Cliffs SPA					
Impact Scenario	**Predicted annual collisions**	**Years**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone	3 (2)	25	1.000	0.992 (0.995)	0.486 (0.491)
		35	1.000	0.989 (0.993)	0.489 (0.495)
		50	1.000	0.984 (0.989)	0.488 (0.492)
Impacted – Incombination	49 (49)	25	0.995	0.878	0.329
		35	0.995	0.833	0.320
		50	0.995	0.770	0.293

3.5 Collision and displacement mortality for kittiwake at East Caithness Cliffs SPA and North Caithness Cliffs SPA

Table 3.37 provides the combined impact (collision + displacement (Moray West plus 2 km buffer)) for kittiwake at East Caithness Cliffs SPA alongside relevant PVA metrics. Table 3.38 provides similar totals using the displacement impact from the Moray West project alone (i.e. no buffer).

Table 3.37 PVA results for the kittiwake feature of East Caithness Cliffs SPA for collision and displacement impacts (Moray West plus 2 km buffer) combined

Impact Scenario	Predicted impact	Years	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (all seasons)	86-88	25	0.998-0.998	0.948-0.949	0.430-0.433
		35	0.998-0.998	0.928-0.930	0.426-0.428
		50	0.998-0.998	0.899-0.901	0.407-0.409
Impacted – Incombination (all seasons)	390-391	25	0.991-0.991	0.788-0.789	0.222-0.224
		35	0.991-0.991	0.717-0.718	0.179-0.180
		50	0.991-0.991	0.622-0.622	0.162-0.163

Table 3.38 PVA results for the kittiwake feature of East Caithness Cliffs SPA for collision and displacement impacts (Moray West alone (no buffer)) combined

Impact Scenario	Predicted impact	Years	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (all seasons)	74-76	25	0.998-0.998	0.955-0.956	0.443-0.444
		35	0.998-0.998	0.938-0.939	0.436-0.437
		50	0.998-0.998	0.912-0.914	0.419-0.419
Impacted – Incombination (all seasons)	378-379	25	0.991-0.991	0.794-0.795	0.229-0.229
		35	0.991-0.991	0.724-0.725	0.190-0.192
		50	0.991-0.991	0.631-0.632	0.169-0.169

Table 3.39 provides the combined impact (collision + displacement (Moray West plus 2 km buffer)) for kittiwake at North Caithness Cliffs alongside relevant PVA metrics. Table 3.40 provides similar totals using the displacement impact from the Moray West project alone (i.e. no buffer).

Table 3.39 PVA results for the kittiwake feature of North Caithness Cliffs SPA for collision and displacement impacts (Moray West plus 2 km buffer) combined

Impact Scenario	Predicted impact	Years	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (all seasons)	4-5	25	0.999-1.000	0.987-0.989	0.479-0.483
		35	0.999-1.000	0.982-0.985	0.481-0.483
		50	0.999-1.000	0.974-0.979	0.477-0.482
Impacted – Incombination (all seasons)	52	25	0.994	0.871	0.318
		35	0.994	0.824	0.314
		50	0.994	0.758	0.280

Table 3.40 PVA results for the kittiwake feature of North Caithness Cliffs SPA for collision and displacement impacts (Moray West alone (no buffer)) combined

Impact Scenario	Predicted impact	Years	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Unimpacted		-	1.000	1.000	0.500
Impacted – Moray West alone (all seasons)	3-4	25	1.000-1.000	0.989-0.992	0.483-0.486
		35	1.000-1.000	0.982-0.985	0.481-0.483
		50	1.000-1.000	0.974-0.979	0.477-0.482
Impacted – Incombination (all seasons)	51-52	25	0.994-0.995	0.871-0.873	0.318-0.323
		35	0.994-0.995	0.824-0.827	0.314-0.315
		50	0.994-0.995	0.758-0.762	0.280-0.282

3.6 Refinement of collision risk modelling for kittiwake

3.6.1 Introduction

Collision risk modelling requires a number of assumptions to be made, some of which are highly precautionary (e.g. avoidance rates) and lead to an over-estimation of the likely risk to seabird species. Furthermore, the model used to calculate collision risk and the assumptions made evolve over time as new evidence comes to light. Finally, the designs for projects can change and many projects are not built out in a way which leads to the worst case impacts that were predicted.

This note identifies those areas where modelling predictions can be refined to take account of emerging evidence and up to date information about the actual effects of other projects. The following refinements are considered:

- Apportioning;
- Nocturnal activity factors;
- Updated project designs/design refinements;
- Flight speeds;
- Avoidance rate and Band model; and
- BDMPS.

This note distinguishes which are the most important refinements to consider and also where these can be confidently applied, particularly where they apply to other projects considered cumulatively. For example, in relation to the flight speed parameter used in CRM. There is strong empirical evidence (Skov *et al*. 2018) that the values typically used in CRM are inaccurate and lead to a significant over-estimation of collision risk. Updated values are now available, but these can be retrospectively applied more easily to projects where the collision risk modelling details are available compared to those projects where only predicted rates are available. In these cases an assumed correction factor would need to be applied to take account of this refinement. There are also different approaches applied to those projects considered as part of the updated project designs refinement.

3.6.2 Refinements

3.6.2.1 Apportioning

The cumulative and in-combination assessment presented in the EIA Report and Report to Inform an Appropriate Assessment (RIAA) respectively applied apportioning values direct from the respective assessments of Moray East and Beatrice undertaken in 2012 (i.e. no reassessment was undertaken). These assessments were undertaken prior to any notable guidance on apportioning being made available, and therefore, certain factors will not have been accounted for in the approach used. These include consideration of:

- Immature and non-breeding birds; and
- Sabbaticals.

Boat-based data from Moray East was used to inform the apportioning analysis for Moray West. The analysis calculated that the proportion of immature birds present during boat-based surveys at Moray East was 3.3% (of 1,395 birds). As explained in Section 5.1.2 of the SPA Apportioning Appendix, this proportion represents first year birds only and therefore represents an under-estimation of the proportion of immature kittiwake present due to older immature birds being indistinguishable from adult birds. In order to ensure the apportioning approach accounted for older immatures an analysis was conducted utilising survival rates to estimate the proportion of older immature age classes that would be present. This provided an immature proportion of 91.5%. It is therefore considered appropriate to apply this value in this report to the collision risk estimates calculated for Moray East and Beatrice.

Raw data that would allow for the calculation of the proportion of immature birds present at Beatrice is unavailable. However, due to the close proximity of Beatrice to Moray East it is considered appropriate to apply the immature proportion calculated for Moray East to the collision risk estimates calculated for Beatrice.

It also appears that kittiwake sabbaticals were not factored into the apportioning process for either Moray East or Beatrice, as the advice from SNH on this matter was only made available recently. To include any impacts occurring on any sabbatical birds would seem likely to overestimate the effects to these species/populations. The proportion of adult kittiwake taking a sabbatical from breeding in a given year is 10%.

The change in collision risk estimates calculated for kittiwake in the breeding season at Moray East and Beatrice as a result of applying the updated apportioning approach is presented in Table 3.41. There are no changes to the collision risk estimates calculated in the non-breeding season as a result of the apportioning refinements considered in this Section.

Table 3.41: Changes to collision risk estimates at Moray East and Beatrice as a result of applying the updated apportioning approach

Apportioning refinement	Moray East		Beatrice	
	Apportioning value (%)	Collision risk estimate	Apportioning value (%)	Collision risk estimate
Original collision risk estimate (breeding season) – unapportioned	-	69	-	28
Immature birds	8.5	67	8.5	27
Sabbaticals	10	60	10	25
ECC SPA proportion	95.1	57	92.9	23

The effect these reductions have on the in-combination total for kittiwake at ECC SPA and NCC SPA is considered in Section 3.6.3 and Section 3.6.4, respectively.

3.6.2.2 Nocturnal activity factors

Collision risk modelling conducted for projects considered in-combination are considered to have most certainly used the nocturnal activity factors from Garthe and Hüppop (2004) and therefore it is necessary to correct the collision risk estimates to account for this over-estimation.

The correction factor to apply to the collision risk estimates for each project considered in-combination will depend on the latitude at which a project is located. An analysis was conducted in Annex C of the EIA Report Volume 4 - Technical Appendix 10.2: Collision Risk Modelling that calculated correction factors for four geographic areas into which each of the projects considered in-combination have been assigned (Table 3.42). This analysis was considered qualitatively in the assessments presented in Volume 2 - Chapter 10: Ornithology and the RIAA. For the purposes of the analysis presented here the minimum correction factor, representing the minimum monthly change that can be applied across all months, has been used. This is almost certainly precautionary however, it is difficult to provide a more precise correction factor without increasing the potential for this correction factor to potentially under-estimate the in-combination collision risk total. The application of the 'minimum' correction factor is considered to be precautionary as this represents the minimum change that would occur across all months.

Table 3.42: Reductions to apply to collision risk estimates for projects in each geographic region to account for changes to nocturnal activity factors		
Geographic region	**Projects within region**	**% reduction in collision risk estimates**
East Anglia and English Channel	East Anglia One East Anglia Three Galloper Greater Gabbard Kentish Flats Extension London Array Thanet	9.2
Southern North Sea	Dogger Bank Creyke Beck A & B Dogger Bank Teesside A & B Hornsea Project One Hornsea Project Two Humber Gateway Lincs Race Bank Teesside Triton Knoll Westermost Rough	8.5
Firth of Forth	Aberdeen (EOWDC) Inch Cape Methil Neart na Gaoithe Seagreen Alpha Seagreen Bravo	7.8
Moray Firth	Hywind	7.1

The effect reductions in nocturnal activity factor have on the in-combination collision risk total for ECC SPA and NCC SPA is considered in Section 3.6.3 and Section 3.6.4, respectively.

3.6.2.3 Updated project designs

Moray West

In addition to reducing the duration of the operational period for the Development from 50 years to 25 years, Moray West has made a commitment to reducing kittiwake collisions by 7% (57 to 53 per annum). This reduction in kittiwake collisions is one of the adjustment factors that has been applied to the calculation of in-combination collision mortality for East Caithness Cliffs SPA and North Caithness Cliffs SPA. It is proposed that the reduction in kittiwake collisions from 57 to 53 per annum will be achieved through a reduction in turbine numbers from 85 to 79 unless it can be demonstrated through changes to other design parameters identified during preparation of the final Development design and layout that the total number of annual collisions for 85 turbines does not exceed 53 kittiwakes.

Moray West at this stage, is therefore not proposing a final reduction in turbine numbers (these remain at 85 for the Model 2 WTG).

With respect to other offshore windfarms, due to the extensive timescales across which consenting and pre-planning activities occur, it is often the case that as-built turbine scenarios are different to those that were assessed. Often, due to advances in technology, as-built scenarios are composed fewer, higher capacity turbines which is likely to result in associated reductions in collision risk. Differences between assessed and as-built scenarios creates uncertainty associated with cumulative and in-combination assessments although attempts at capturing this (e.g. by tiering projects) have been applied in assessments for offshore wind farms.

The use of collision risk estimates calculated based on the assumptions applied by projects at the point of application or, at the latest, point of decision, that are subsequently used as part of cumulative or in-combination assessments for Moray West has the potential to significantly over-estimate the total collision impact in terms of both EIA and HRA assessments. This was considered as part Chapter 10: Offshore Ornithology and the RIAA using previously calculated correction factors as reported in MacArthur Green (2017). Annex C builds on the approach presented in the EIA Report – Volume 2 Chapter 10: Offshore Ornithology and the RIAA considering the implications for collision risk estimates if the as-built scenarios for all projects were incorporated into the cumulative and in-combination assessments for Moray West, calculating correction factors for additional projects where relevant information exists to facilitate this process.

Moray East

The cumulative and in-combination assessment presented in the EIA Report and HRA respectively applied the design from Moray East involving 159 x 7 MW turbines. The potential for a revised as built scenario for Moray East was discussed (involving a 100 x 9.5 MW design) which would equate to a substantial reduction in collision estimates. This was not included quantitatively in the assessment and discussed only in a qualitative fashion as the design scenario had not been finalised.

Since the submission of Moray West, the proposed revised design of Moray East has been finalised with the 100 turbine as built layout included in the now approved Design Specification and Layout Plan (DSLP). Collision risk modelling incorporating this turbine scenario has therefore been conducted with the results presented in Table 3.43.

Table 3.43: Collision risk modelling for Moray East incorporating a 100 x 9.5 MW turbine scenario presented alongside the collision risk estimates used in the Moray West assessments

Turbine scenario	Seasonal collision risk estimates			Annual collision risk estimate
	Breeding	Post-breeding	Pre-breeding	
159 x 7 MW	73	2	12	86
100 x 9.5 MW	24	2	5	31

The use of the final turbine scenario reduces the annual collision risk estimate at Moray East by 64%. The effect this reduction has on in-combination totals for ECC SPA and NCC SPA is considered in Section 3.6.3 and Section 3.6.4, respectively.

Neart na Gaoithe

The collision risk estimates used for Neart na Gaoithe as part of the cumulative / in-combination assessments for Moray West represented the turbine scenario used as part of the application submission for Neart na Gaoithe (127 x 3.6 MW). However, the subsequent consent decision was based on a 75 x 6 MW turbine scenario, with collision risk modelling for this scenario not presented as part of the application.

In July 2015, Neart na Gaoithe submitted a Section 36 consent variation. The documentation associated with this consent variation contains collision risk estimates for a 75 x 6 MW turbine scenario with these presented in Table 3.44 alongside the collision risk estimates used for Neart na Gaoithe as part of the cumulative and in-combination assessments conducted for Moray West.

Table 3.44: Collision risk estimates for Neart na Gaoithe incorporating a 75 x 6 MW turbine scenario presented alongside the collision risk estimates used in the Moray West assessments

Turbine scenario	Seasonal collision risk estimates		Annual collision risk estimate
	Post-breeding	Pre-breeding	
Original	35	26	93
75 x 6 MW	26	2	40

The use of the turbine scenario associated with the consent variation results in a 57% reduction in collision risk estimates for Neart na Gaoithe. The effect this reduction has on in-combination totals for ECC SPA and NCC SPA is considered in Section 3.6.3 and Section 3.6.4, respectively.

Other projects

Consideration of the changes to the in-combination collision risk total that result when considering as-built turbine scenarios are provided in Annex C. The effect this refinement has on in-combination totals for ECC SPA and NCC SPA is considered in Section 3.6.3 and Section 3.6.4, respectively.

3.6.2.4 Flight speeds

Overview

Moray West presented a case in the EIA Report and RIAA that the flight speed data presented in Skov *et al.*, (2018) represented the best available evidence to inform collision risk modelling. SNH have, in their response to Moray West, concurred with this view and therefore it is considered appropriate to explore what effect a change in flight speed may have on the projects considered in the cumulative and in-combination assessments conducted for Moray West.

Beatrice and Moray East

Collision risk modelling conducted for Moray East and Beatrice has been updated to use the flight speeds from Skov *et al.* (2018) with the resulting collision risk estimates presented in Table 3.45 alongside those originally used in the assessments for Moray West. Note that the updated collision risk estimates for Moray East (based on final layout presented in the approved DSLP (2018)) presented in Table 3.43 have been used in Table 3.45 below.

Table 3.45: Collision risk modelling for Moray East and Beatrice using updated flight speed for kittiwake as presented in Skov *et al.* (2018)				
Flight speed	**Seasonal collision risk estimates**			**Annual collision risk estimate**
	Breeding	**Post-breeding**	**Pre-breeding**	
Beatrice				
Alerstam *et al.* (2007)	30	4	10	45
Skov *et al.* (2018)	23	3	8	34
Moray East				
Alerstam *et al.* (2007)	24	2	5	31
Skov *et al.* (2018)	19	2	4	24

The use of the flight speed for kittiwake from Skov *et al.* (2018) reduces the collision risk estimates from Beatrice and Moray East by 24% and 23% respectively. The effect this reduction has on in-combination totals for ECC SPA and NCC SPA is considered in Section 3.6.3 and Section 3.6.4, respectively.

Other projects considered cumulatively/in-combination

Other projects considered in the cumulative and in-combination assessments will have based their CRM for kittiwake on flight speeds sourced from Alerstam *et al.*, (2007) which represents data of comparatively poor sample size. The difference is stark – 13.1 m/s in Alerstam et al (2007) and 8.71 m/s from Skov *et al.* (2018). It is therefore proposed that a correction to in-combination results would be appropriate to account for the increased knowledge in kittiwake flight behaviour.

However, the relation between bird flight speed and resultant collision risk estimates varies depending on the turbine being used. As presented in Table 3.45, collision risk estimates for Beatrice and Moray East reduced by 24% and 23% respectively when changing the flight speed used. For Moray West, a reduction of approximately 24% occurred. However, collision risk modelling conducted for each of these projects was based on turbine with relatively large capacities (8 MW+). The effect changes to flight speed may have on smaller turbines (e.g. 3.6 MW) as have been constructed at many projects incorporated into the in-combination assessment for Moray West may potentially be lower. It is therefore proposed that a guidance correction factor of 15% be applied to all other projects which should provide an appropriate level of precaution for those projects that have deployed a turbine scenario consisting of lower capacity turbines.

The effect this reduction has on in-combination totals for ECC SPA is considered in Section 3.6.3.

3.6.2.5 Avoidance rate and Band model

Species specific generic avoidance rates that currently inform collision risk modelling have been estimated based on studies, often onshore, that compare the number of recorded collisions with the number predicted prior to construction, in the absence of any avoidance behaviour (Cook *et al.* 2014). These avoidance rates therefore reflect the proportion of birds taking action to avoid collision whilst also accounting for uncertainty arising as a result of other factors including weather conditions and model error (Band 2012, Cook *et al.* 2014, Masden 2015). Bird avoidance behaviour is, however, considered to be the most important source of error in uncorrected model outputs and hence the most important component of the species specific generic avoidance rates (Skov *et al*., 2018). The ORJIP BCA study, 2014 – 2017 (Skov *et al*., 2018), was designed to improve the evidence base for seabird avoidance behaviour and collisions around offshore wind farms. This study generated the most extensive dataset of observations of seabird behaviour in and around an operational offshore wind farm.

An avoidance rate of 98.9% has been used for kittiwake throughout the assessments presented in the EIA Report – Volume 2 Chapter 10: Offshore Ornithology and the RIAA. The use of this avoidance rate is based on the SNCB review of Cook *et al.* (2014) which disagreed with that papers conclusion that kittiwake avoidance rate should be sourced from the ‘small gull’ data set for which an avoidance rate of 99.2% was calculated. The SNCBs preferred to apply the avoidance rate based on data from ‘all gulls’ equating to 98.9%.

Cook *et al.* (2018) provides a contemporary overview of avian avoidance including that of kittiwake. Based on flight behaviour and morphology, the authors of the paper state that they believe it to be reasonable that kittiwake is most accurately described in the ‘small gull’ category so that an avoidance rate of 99.2% is recommended. Moray West have held an identical opinion on this matter and it was highlighted in the EIA Report. Moray West therefore suggest that CRM results from the Band (2012) basic model are over-estimated through the use of a 98.9% avoidance rate and that greater consideration should be given to results calculated using a 99.2% avoidance rate.

The use of a 99.2% avoidance rate would result in collision risk estimates for kittiwake reducing by 27%.

Information presented in Skov *et al.* (2018) suggests, however, that the use of a 99.2% avoidance rate may still over-estimate the in-combination collision risk. The key finding of the study by Skov *et al.* (2018) was that there is very strong, empirical evidence to assume very high avoidance of offshore wind turbines by the five seabird species investigated (gannet, kittiwake, herring gull, great black-backed gull and lesser black-backed gull). This provides a compelling basis for using higher avoidance rates, for these species, than are currently advised for use in collision risk assessment in the UK. Those rates should, as advised by Skov *et al.* (2018), be closer to those indicated by the Empirical Avoidance Rates (EARs) derived in their study. However, the behaviour-based EAR’s of Skov *et al.* (2018) are not for the reasons described above, directly comparable to the species specific generic avoidance rates used to date. Consequently, work has been commissioned by the SNCBs to understand the transferability of EARs for use with the basic and extended versions of the Band model (2012). Meanwhile, Skov *et al.* (2018) recommend that the EARs obtained in their study are used as a range in CRMs that allow for consideration of uncertainty. These EARs are also considered applicable in the basic and extended version of the Band model (Band 2012). Thus, provided that empirically derived input parameters on flight speed in offshore wind farms and flight height out-side offshore wind farms are applied, Skov *et al.* (2018) advise the EARs can be readily used in the Band model. Previously, no avoidance rate has been specifically recommended for kittiwake with regards the extended model. The empirical avoidance rate (EAR) developed by Skov *et al*. (2018) is 99.8% for kittiwake.

The Moray West EIA Report 2018 recognised that the SNCBs have not to date assessed how the EARs should be applied to the Band (2012) model and for this reason the assessment focussed on avoidance rates from both Cook *et al*. (2014) and JNCC *et al.* (2014). The effect the use of these two avoindace rate have on the in-combination total for kittiwake at ECC SPA and NCC SPA is considered in Section 3.6.3 and Section 3.6.4, respectively.

3.6.2.6 BDMPS

A key area that requires further exploration relates to BDMPS assumptions. The current approach assumes that non-breeding birds are mixed homogenously throughout the relevant BDMPS region. This leads, in this case, to the assumption that projects located in the southern North Sea are as equally likely to cause collision mortality of breeding birds from East Caithness Cliffs SPA and North Caithness Cliffs SPA as projects located in Scotland or, indeed, the Moray Firth. There is emerging evidence that this does not reflect the actual behaviour of seabirds, including kittiwake. For example, a recent tagging study of kittiwake carried out on the Scottish West Coast (presented at the first ScotMER meeting) highlights that birds are likely to disperse over different spatial scales. That study indicated that a sizeable proportion remained close to the breeding colony throughout the winter, a further proportion remained within the wider region and others travelled a considerable distance.

One option would be to consider whether geographical tiering of projects included in the non-breeding assessment is appropriate, such as, for example:

1. Tier one: Moray West, Moray East and Beatrice (local winter population)
2. Tier two: Moray West, Moray East and Beatrice with all other Scottish Projects (regional winter population)
3. Tier three: Moray West, Moray East and Beatrice with all Scottish and English (Southern North Sea projects) (wider area population)

Consideration of the changes to the in-combination impact for kittiwake at ECC SPA and NCC SPA using the three tiers identified above is provided in Section 3.6.3 and Section 3.6.4, alongside PVA outputs for each respective scenario.

3.6.3 In-combination totals incorporating refinements

This section combines the changes to collision risk estimates considered in the previous section and calculates the in-combination collision risk estimate for East Caithness Cliffs SPA. Table 3.46 lists the refinements considered in Section 3.6.3 and identifies the level of confidence that can be attributed to each.

Table 3.46: Refinements considered for the in-combination collision impact for kittiwake at East Caithness Cliffs SPA

Refinement	Projects affected	Refinement number as used in Table 3.47 and Table 3.48	Importance for inclusion
Updated project designs/Design refinements	Moray East	1	High – there is a difference between the assessed and as-built scenario used for Moray East. Updated collision risk estimates are available from revised collision risk modelling produced for Moray East and therefore it is proposed that the associated estimates are used
Flight speeds	Beatrice and Moray East	2	High – empirical evidence suggests that the flight speeds historically used to inform collision risk modelling over-estimated the risk posed to kittiwake. It is proposed that these are updated to take account of the best available evidence

Table 3.46: Refinements considered for the in-combination collision impact for kittiwake at East Caithness Cliffs SPA			
Refinement	**Projects affected**	**Refinement number as used in Table 3.47 and Table 3.48**	**Importance for inclusion**
			Moray West has access to collision risk models used for these projects and therefore accurate collision risk estimates can be calculated
Apportioning	Moray East and Beatrice	3	High – methodology for apportioning has developed since the assessments for Moray East and Beatrice were conducted
Updated project designs/Design refinements	Neart na Gaoithe	4	High – subsequent to the granting of consent for Neart na Gaoithe, a Section 36 variation was submitted and approved which committed the project to the use of fewer, higher capacity turbines. Updated collision risk estimates are available from revised collision risk modelling and therefore it is proposed that the associated estimates are used
Nocturnal activity factors	All projects except Moray West, Moray East, Beatrice and Kincardine	5	High – empirical evidence suggests that the nocturnal activity factors historically used to inform collision risk modelling over-estimated the impact posed to kittiwake. Without re-conducting collision risk modelling it is difficult to quantify the precise change that would occur however it is possible to calculate the minimum change. Collision risk estimates calculated for this refinement therefore represent a minimum reduction and are likely to represent an under-estimate of the actual reduction that would occur
Updated project designs/Design refinements	Multiple projects	6	Moderate – due to the timeframes between the assessments conducted for a project and construction, the design scenario for many projects is often revised to take advantage of newer turbine scenarios often providing scenarios with fewer, larger turbines. The collision risk estimates provided in application documentation therefore, in some cases, do not provide an accurate appraisal of the collision risk posed to birds as a result of as-built turbine scenarios. The potential changes to collision risk have been calculated in Annex C using a correction factor approach.
Flight speeds	All other projects (except Moray West)	7	Moderate - although this issue (see refinement 2) applies to other projects it is difficult to calculate the potential change in collision risk estimates as a result of altering flight speed due to the relationship between the flight speed parameter and

Table 3.46: Refinements considered for the in-combination collision impact for kittiwake at East Caithness Cliffs SPA			
Refinement	**Projects affected**	**Refinement number as used in Table 3.47 and Table 3.48**	**Importance for inclusion**
			other aspects of the Band (2012) CRM, especially in relation to the turbine scenario used for each project. A correction factor, based on the reductions observed at other projects has therefore been assumed, however, the majority of corrections are likely to be higher than the factor applied.
BDMPS	All projects	8	High – it is highly likely that the BDMPS method significantly over-estimates the risk to non-breeding kittiwake due to the assumption of homogenous distribution throughout the North Sea. This in turn leads to relatively high impacts arising from English projects.
Avoidance rates	All projects	9	Moderate – further evidence suggests that 98.9% is too low with further work ongoing to determine an appropriate avoidance rate which is likely to be in the range 98.9-99.2%. Collision risk estimates are therefore presented using this range.
Band model	All projects for which Extended model outputs are available	-	Low – the Extended model provides a more accurate appraisal of collision risk due to the consideration of variation in the risk posed to birds at different heights of the rotor. Uncertainty still remains however, in relation to the relationship of certain parameters and the Extended model (e.g. avoidance rate) and therefore any associated changes to the in-combination impacts have not been quantified in the following sections.

Table 3.47 and Table 3.48 presents collision risk estimates for kittiwake from projects considered in-combination taking into account the refinements presented in Table 3.46 and described in Section 3.6.1. Note that the collision risk estimates presented for Moray West in the 'original collision risk estimates' column have been updated following a revision to the apportioning formula (see Section 3.2).

Table 3.47: Predicted in-combination collision mortality for kittiwake from the East Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project	Original collision risk estimates (presented in the EIA Report – Volume 2 Chapter 10 and RIAA)			Refinement = 1 (updated project design – Moray East)			Refinement = 2 (updated flight speeds – Moray East and Beatrice)			Refinement = 3 (Apportioning – Moray East and Beatrice)			Refinement = 4 (updated project design – Neart na Gaoithe)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Breeding and non-breeding season															
Moray West	51	1	0	51	1	0	51	1	0	51	1	0	51	1	0
Moray East	69	0	1	23	0	0	18	0	0	16	0	1	16	0	1
Beatrice	28	0	1	28	0	1	21	0	1	14	0	0	14	0	0
Non-breeding season															
Aberdeen European Offshore Wind Deployment Centre		0	0		0	0		0	0		0	0		0	0
Blyth Demonstration Project		0	0		0	0		0	0		0	0		0	0
Dogger Bank Creyke Beck Projects A and B		6	23		6	23		6	23		6	23		6	23
Dogger Bank Teesside Projects A and B		5	17		5	17		5	17		5	17		5	17
East Anglia One		23	11		23	11		23	11		23	11		23	11
East Anglia Three		4	2		4	2		4	2		4	2		4	2
Galloper		2	2		2	2		2	2		2	2		2	2
Greater Gabbard		0	1		0	1		0	1		0	1		0	1
Hornsea Project One		3	2		3	2		3	2		3	2		3	2
Hornsea Project Two		0	0		0	0		0	0		0	0		0	0
Humber Gateway		0	0		0	0		0	0		0	0		0	0
Hywind		0	0		0	0		0	0		0	0		0	0

Table 3.47: Predicted in-combination collision mortality for kittiwake from the East Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project	Original collision risk estimates (presented in the EIA Report – Volume 2 Chapter 10 and RIAA)			Refinement = 1 (updated project design – Moray East)			Refinement = 2 (updated flight speeds – Moray East and Beatrice)			Refinement = 3 (Apportioning – Moray East and Beatrice)			Refinement = 4 (updated project design – Neart na Gaoithe)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Inch Cape		13	5		13	5		13	5		13	5		13	5
Kentish Flats Extension		0	0		0	0		0	0		0	0		0	0
Kincardine		0	0		0	0		0	0		0	0		0	0
Lincs		0	0		0	0		0	0		0	0		0	0
London Array		0	0		0	0		0	0		0	0		0	0
Methil		0	0		0	0		0	0		0	0		0	0
Neart na Gaoithe		2	2		2	2		2	2		2	2		2	0
Race Bank		1	0		1	0		1	0		1	0		1	0
Seagreen Alpha		9	9		9	9		9	9		9	9		9	9
Seagreen Bravo		7	7		7	7		7	7		7	7		7	7
Teesside		1	0		1	0		1	0		1	0		1	0
Thanet		0	0		0	0		0	0		0	0		0	0
Triton Knoll		6	5		6	5		6	5		6	5		6	5
Westermost Rough		0	0		0	0		0	0		0	0		0	0
Total	148	83	89	102	83	89	90	83	88	81	83	88	81	83	86
Total collision risk estimate	321			274			262			253			250		
PVA outputs (25 years) – Ratio of Unimpacted to Impacted Growth Rate	0.992			0.993			0.994			0.994			0.994		

Table 3.47: Predicted in-combination collision mortality for kittiwake from the East Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project		Original collision risk estimates (presented in the EIA Report – Volume 2 Chapter 10 and RIAA)			Refinement = 1 (updated project design – Moray East)			Refinement = 2 (updated flight speeds – Moray East and Beatrice)			Refinement = 3 (Apportioning – Moray East and Beatrice)			Refinement = 4 (updated project design – Neart na Gaoithe)		
		Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
	Ratio of Unimpacted to Impacted Population Size	0.823			0.847			0.853			0.858			0.859		
	Centile for Impacted Population	0.269			0.306			0.313			0.318			0.320		

Table 3.48: Predicted in-combination collision mortality for kittiwake from the East Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project	Collision risk estimates from Table 3.47 (see columns for refinement 4 in Table 3.47)			Refinement = 5 (Nocturnal activity factors)			Refinement = 6 (Updated project designs)			Refinement = 7 (flight speeds)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Breeding and non-breeding season												
Moray West	51	1	0	51	1	0	51	1	0	51	1	0
Moray East	16	0	1	16	0	1	16	0	1	16	0	1
Beatrice	14	0	0	14	0	0	14	0	0	14	0	0
Non-breeding season												
Aberdeen European Offshore Wind Deployment Centre		0	0		0	0		0	0		0	0
Blyth Demonstration Project		0	0		0	0		0	0		0	0
Dogger Bank Creyke Beck Projects A and B		6	23		6	21		6	21		5	18
Dogger Bank Teesside Projects A and B		5	17		4	15		4	15		4	13
East Anglia One		23	11		21	10		8	4		7	3
East Anglia Three		4	2		3	2		3	2		3	2
Galloper		2	2		1	2		1	2		1	2
Greater Gabbard		0	1		0	1		0	1		0	1
Hornsea Project One		3	2		2	2		1	1		1	1
Hornsea Project Two		0	0		0	0		0	0		0	0
Humber Gateway		0	0		0	0		0	0		0	0
Hywind		0	0		0	0		0	0		0	0
Inch Cape		13	5		12	4		12	4		10	4

Table 3.48: Predicted in-combination collision mortality for kittiwake from the East Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project	Collision risk estimates from Table 3.47 (see columns for refinement 4 in Table 3.47)			Refinement = 5 (Nocturnal activity factors)			Refinement = 6 (Updated project designs)			Refinement = 7 (flight speeds)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Kentish Flats Extension		0	0		0	0		0	0		0	0
Kincardine		0	0		0	0		0	0		0	0
Lincs		0	0		0	0		0	0		0	0
London Array		0	0		0	0		0	0		0	0
Methil		0	0		0	0		0	0		0	0
Neart na Gaoithe		2	0		1	0		1	0		1	0
Race Bank		1	0		1	0		1	0		0	0
Seagreen Alpha		9	9		8	8		8	8		7	7
Seagreen Bravo		7	7		6	6		6	6		5	5
Teesside		1	0		1	0		1	0		1	0
Thanet		0	0		0	0		0	0		0	0
Triton Knoll		6	5		5	5		2	2		1	1
Westermost Rough		0	0		0	0		0	0		0	0
Total	81	83	86	81	76	79	81	58	69	81	50	59
Total collision risk estimate	250			236			209			190		
PVA outputs (25 years) – Ratio of Unimpacted to Impacted Growth Rate	0.994			0.994			0.995			0.995		

Table 3.48: Predicted in-combination collision mortality for kittiwake from the East Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project		Collision risk estimates from Table 3.47 (see columns for refinement 4 in Table 3.47)			Refinement = 5 (Nocturnal activity factors)			Refinement = 6 (Updated project designs)			Refinement = 7 (flight speeds)		
		Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
	Ratio of Unimpacted to Impacted Population Size	0.859			0.867			0.881			0.891		
	Centile for Impacted Population	0.320			0.331			0.347			0.359		

3.6.3.1 Further refinements

BDMPS (refinement 8)

The effect of introducing a tiered system to reflect the likely movements of kittiwake throughout the BDMPS in the non-breeding system is presented in Table 3.49. Table 3.49 tiers the projects presented in Table 3.47 and Table 3.48 using the tiering system presented in Section 3.6.2.6 alongside relevant PVA outputs.

Table 3.49: Tiered approach to in-combination collision risk for kittiwake at ECC SPA

Tiers **1 = Moray Firth** **2 = Moray Firth and Scottish Projects** **3 = All BDMPS projects**	**Collision risk estimates**				**PVA outputs (25 years)**		
	Breeding	**Post-breeding**	**Pre-breeding**	**Annual**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Original collision risk estimates							
1	148	2	2	152	0.996	0.912	0.380
1 + 2	148	33	24	205	0.995	0.883	0.350
1 + 2 + 3	148	83	89	321	0.992	0.823	0.269
Refinement = 1 (updated project design – Moray East)							
1	102	2	2	105	0.997	0.938	0.419
1 + 2	102	33	24	159	0.996	0.908	0.375
1 + 2 + 3	102	83	89	274	0.993	0.847	0.306
Refinement = 2 (updated flight speeds – Moray East and Beatrice)							
1	90	2	1	93	0.998	0.945	0.425
1 + 2	90	33	24	146	0.996	0.915	0.387
1 + 2 + 3	90	83	88	262	0.994	0.853	0.313
Refinement = 3 (Apportioning – Moray East and Beatrice)							
1	81	2	1	84	0.998	0.950	0.433
1 + 2	81	33	24	138	0.997	0.920	0.393
1 + 2 + 3	81	83	88	253	0.994	0.858	0.318
Refinement = 4 (updated project design – Neart na Gaoithe)							
1	81	2	1	84	0.998	0.950	0.433
1 + 2	81	32	22	135	0.997	0.921	0.395
1 + 2 + 3	81	83	86	250	0.994	0.859	0.320
Refinement = 5 (Nocturnal activity factors)							
1	81	2	1	84	0.998	0.950	0.433

Table 3.49: Tiered approach to in-combination collision risk for kittiwake at ECC SPA							
Tiers **1 = Moray Firth** **2 = Moray Firth and Scottish Projects** **3 = All BDMPS projects**	**Collision risk estimates**				**PVA outputs (25 years)**		
	Breeding	**Post-breeding**	**Pre-breeding**	**Annual**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
1 + 2	81	30	20	131	0.997	0.924	0.397
1 + 2 + 3	81	76	79	236	0.994	0.867	0.331
Refinement = 6 (Updated project designs)							
1	81	2	1	84	0.998	0.950	0.433
1 + 2	81	30	20	131	0.997	0.924	0.397
1 + 2 + 3	81	58	69	209	0.995	0.881	0.347
Refinement = 7 (flight speeds)							
1	81	2	1	84	0.998	0.950	0.433
1 + 2	81	26	17	124	0.997	0.928	0.402
1 + 2 + 3	81	50	59	190	0.995	0.891	0.359

Avoidance rate (refinement 9)

As explained in Section 3.6.2.5 the use of a 99.2% avoidance rate would lead to a reduction of 27% for the in-combination collision risk total for kittiwake at ECC SPA. However, the use of a 98.9% avoidance rate may prove to over-estimate collision risk. In order to account for this, the tiered in-combination totals calculated for each refinement are presented in Table 3.50: using both 98.9% and 99.2% avoidance rates.

Table 3.50: Tiered approach to in-combination collision risk for kittiwake at ECC SPA

Tiers 1 = Moray Firth 2 = Moray Firth and Scottish Projects 3 = All BDMPS projects	Annual collision risk estimates at a range of avoidance rates		PVA outputs (25 years) associated with the collision risk estimates calculated using 98.9% and 99.2% avoidance rates		
	98.9	99.2	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
Original collision risk estimates					
1	152	111	0.996 - 0.997	0.912 - 0.935	0.38 - 0.413
1 + 2	205	149	0.995 - 0.996	0.883 - 0.914	0.35 - 0.383
1 + 2 + 3	321	233	0.992 - 0.994	0.823 - 0.868	0.269 - 0.331
Refinement = 1 (updated project design – Moray East)					
1	105	77	0.997 - 0.998	0.938 - 0.954	0.419 - 0.440
1 + 2	159	115	0.996 - 0.997	0.908 - 0.933	0.375 - 0.412
1 + 2 + 3	274	199	0.993 - 0.995	0.847 - 0.886	0.306 - 0.356
Refinement = 2 (updated flight speeds – Moray East and Beatrice)					
1	93	68	0.998 - 0.998	0.945 - 0.96	0.425 - 0.451
1 + 2	146	106	0.996 - 0.997	0.915 - 0.938	0.387 - 0.418
1 + 2 + 3	262	190	0.994 - 0.995	0.853 - 0.891	0.313 - 0.359
Refinement = 3 (Apportioning – Moray East and Beatrice)					
1	84	61	0.998 - 0.999	0.950 - 0.964	0.433 - 0.454
1 + 2	138	100	0.997 - 0.998	0.920 - 0.941	0.393 - 0.423
1 + 2 + 3	253	184	0.994 - 0.996	0.858 - 0.894	0.318 - 0.361
Refinement = 4 (updated project design – Neart na Gaoithe)					
1	84	61	0.998 - 0.999	0.950 - 0.964	0.433 - 0.454
1 + 2	135	98	0.997 - 0.998	0.921 - 0.942	0.395 - 0.424
1 + 2 + 3	250	182	0.994 - 0.996	0.859 - 0.896	0.320 - 0.362
Refinement = 5 (Nocturnal activity factors)					
1	84	61	0.998 - 0.999	0.95 - 0.964	0.433 - 0.454
1 + 2	131	95	0.997 - 0.998	0.924 - 0.944	0.397 - 0.425

Table 3.50: Tiered approach to in-combination collision risk for kittiwake at ECC SPA

Tiers 1 = Moray Firth 2 = Moray Firth and Scottish Projects 3 = All BDMPS projects	Annual collision risk estimates at a range of avoidance rates		PVA outputs (25 years) associated with the collision risk estimates calculated using 98.9% and 99.2% avoidance rates		
	98.9	99.2	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
1 + 2 + 3	236	172	0.994 - 0.996	0.867 - 0.901	0.331 - 0.370
Refinement = 6 (Updated project designs)					
1	84	61	0.998 - 0.999	0.950 - 0.964	0.433 - 0.454
1 + 2	131	95	0.997 - 0.998	0.924 - 0.944	0.397 - 0.425
1 + 2 + 3	209	152	0.995 - 0.996	0.881 - 0.912	0.347 - 0.380
Refinement = 7 (flight speeds)					
1	84	61	0.998 - 0.999	0.95 - 0.964	0.433 - 0.454
1 + 2	124	90	0.997 - 0.998	0.928 - 0.947	0.402 - 0.428
1 + 2 + 3	190	138	0.995 - 0.997	0.891 - 0.92	0.359 - 0.393

3.6.4 North Caithness Cliffs SPA

The following section provides an identical process for North Caithness Cliffs as has been presented above in Section 3.6.3 for East Caithness Cliffs SPA.

Table 3.51: Predicted in-combination collision mortality for kittiwake from the North Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project	Original collision risk estimates (presented in the EIA Report – Volume 2 Chapter 10 and RIAA)			Refinement = 1 (updated project design – Moray East)			Refinement = 2 (updated flight speeds – Moray East and Beatrice)			Refinement = 3 (Apportioning – Moray East and Beatrice)			Refinement = 4 (updated project design – Neart na Gaoithe)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Breeding and non-breeding season															
Moray West	2	0	0	2	0	0	2	0	0	2	0	0	2	0	0
Moray East	2	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Beatrice	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Non-breeding season															
Aberdeen European Offshore Wind Deployment Centre		0	0		0	0		0	0		0	0		0	0
Blyth Demonstration Project		0	0		0	0		0	0		0	0		0	0
Dogger Bank Creyke Beck Projects A and B		2	6		2	6		2	6		2	6		2	6
Dogger Bank Teesside Projects A and B		1	4		1	4		1	4		1	4		1	4
East Anglia One		6	3		6	3		6	3		6	3		6	3
East Anglia Three		1	1		1	1		1	1		1	1		1	1
Galloper		0	1		0	1		0	1		0	1		0	1
Greater Gabbard		0	0		0	0		0	0		0	0		0	0

Table 3.51: Predicted in-combination collision mortality for kittiwake from the North Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project	Original collision risk estimates (presented in the EIA Report – Volume 2 Chapter 10 and RIAA)			Refinement = 1 (updated project design – Moray East)			Refinement = 2 (updated flight speeds – Moray East and Beatrice)			Refinement = 3 (Apportioning – Moray East and Beatrice)			Refinement = 4 (updated project design – Neart na Gaoithe)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Hornsea Project One		1	0		1	0		1	0		1	0		1	0
Hornsea Project Two		0	0		0	0		0	0		0	0		0	0
Humber Gateway		0	0		0	0		0	0		0	0		0	0
Hywind		0	0		0	0		0	0		0	0		0	0
Inch Cape		3	1		3	1		3	1		3	1		3	1
Kentish Flats Extension		0	0		0	0		0	0		0	0		0	0
Kincardine		0	0		0	0		0	0		0	0		0	0
Lincs		0	0		0	0		0	0		0	0		0	0
London Array		0	0		0	0		0	0		0	0		0	0
Methil		0	0		0	0		0	0		0	0		0	0
Neart na Gaoithe		1	1		1	1		1	1		1	1		0	0
Race Bank		0	0		0	0		0	0		0	0		0	0
Seagreen Alpha		2	2		2	2		2	2		2	2		2	2
Seagreen Bravo		2	2		2	2		2	2		2	2		2	2
Teesside		0	0		0	0		0	0		0	0		0	0
Thanet		0	0		0	0		0	0		0	0		0	0
Triton Knoll		1	1		1	1		1	1		1	1		1	1

Table 3.51: Predicted in-combination collision mortality for kittiwake from the North Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project		Original collision risk estimates (presented in the EIA Report – Volume 2 Chapter 10 and RIAA)			Refinement = 1 (updated project design – Moray East)			Refinement = 2 (updated flight speeds – Moray East and Beatrice)			Refinement = 3 (Apportioning – Moray East and Beatrice)			Refinement = 4 (updated project design – Neart na Gaoithe)		
		Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Westermost Rough			0	0		0	0		0	0		0	0		0	0
Total		6	21	22	4	21	22	4	21	22	3	21	22	3	21	22
Total collision risk estimate		49			47			47			46			45		
PVA outputs (25 years)	Ratio of Unimpacted to Impacted Growth Rate	0.995			0.995			0.995			0.995			0.995		
	Ratio of Unimpacted to Impacted Population Size	0.878			0.882			0.882			0.885			0.887		
	Centile for Impacted Population	0.329			0.338			0.338			0.342			0.344		

Table 3.52: Predicted in-combination collision mortality for kittiwake from the North Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project	Collision risk estimates from Table 3.51 (see columns for refinement 4 in Table 3.51)			Refinement = 5 (Nocturnal activity factors)			Refinement = 6 (Updated project designs)			Refinement = 7 (flight speeds)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Breeding and non-breeding season												
Moray West	2	0	0	2	0	0	2	0	0	2	0	0
Moray East	0	0	0	0	0	0	0	0	0	0	0	0
Beatrice	0	0	0	0	0	0	0	0	0	0	0	0
Non-breeding season												
Aberdeen European Offshore Wind Deployment Centre		0	0		0	0		0	0		0	0
Blyth Demonstration Project		0	0		0	0		0	0		0	0
Dogger Bank Creyke Beck Projects A and B		2	6		1	5		1	5		1	4
Dogger Bank Teesside Projects A and B		1	4		1	4		1	4		1	3
East Anglia One		6	3		5	2		2	1		2	1
East Anglia Three		1	1		1	1		1	1		1	0
Galloper		0	1		0	0		0	0		0	0
Greater Gabbard		0	0		0	0		0	0		0	0
Hornsea Project One		1	0		1	0		0	0		0	0
Hornsea Project Two		0	0		0	0		0	0		0	0
Humber Gateway		0	0		0	0		0	0		0	0
Hywind		0	0		0	0		0	0		0	0
Inch Cape		3	1		3	1		3	1		3	1

Table 3.52: Predicted in-combination collision mortality for kittiwake from the North Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)

Project	Collision risk estimates from Table 3.51 (see columns for refinement 4 in Table 3.51)			Refinement = 5 (Nocturnal activity factors)			Refinement = 6 (Updated project designs)			Refinement = 7 (flight speeds)		
	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding	Breeding	Post-breeding	Pre-breeding
Kentish Flats Extension		0	0		0	0		0	0		0	0
Kincardine		0	0		0	0		0	0		0	0
Lincs		0	0		0	0		0	0		0	0
London Array		0	0		0	0		0	0		0	0
Methil		0	0		0	0		0	0		0	0
Neart na Gaoithe		0	0		0	0		0	0		0	0
Race Bank		0	0		0	0		0	0		0	0
Seagreen Alpha		2	2		2	2		2	2		2	2
Seagreen Bravo		2	2		2	2		2	2		1	1
Teesside		0	0		0	0		0	0		0	0
Thanet		0	0		0	0		0	0		0	0
Triton Knoll		1	1		1	1		0	0		0	0
Westermost Rough		0	0		0	0		0	0		0	0
Total	3	21	22	3	19	20	3	15	17	3	13	15
Total collision risk estimate	45			41			34			30		
PVA outputs (25 years) – Ratio of Unimpacted to Impacted Growth Rate	0.995			0.996			0.996			0.997		
PVA outputs (25 years) – Ratio of Unimpacted to Impacted Population Size	0.887			0.897			0.914			0.923		

Table 3.52: Predicted in-combination collision mortality for kittiwake from the North Caithness Cliffs SPA taking into account refinements (blue shading shows projects affected for each refinement)													
Project		**Collision risk estimates from Table 3.51 (see columns for refinement 4 in Table 3.51)**			**Refinement = 5 (Nocturnal activity factors)**			**Refinement = 6 (Updated project designs)**			**Refinement = 7 (flight speeds)**		
		Breeding	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**
	Centile for Impacted Population	0.344			0.359			0.379			0.395		

3.6.4.1 Further refinements

BDMPS (refinement 8)

The effect of introducing a tiered system to reflect the likely movements of kittiwake throughout the BDMPS in the non-breeding system is presented in Table 3.53. Table 3.53 tiers the projects presented in Table 3.51 and Table 3.52 using the tiering system presented in Section 3.6.2.6 alongside relevant PVA outputs.

Table 3.53: Tiered approach to in-combination collision risk for kittiwake at NCC SPA							
Tiers **1 = Moray Firth** **2 = Moray Firth and Scottish Projects** **3 = All BDMPS projects**	**Collision risk estimates**				**PVA outputs (25 years)**		
	Breeding	**Post-breeding**	**Pre-breeding**	**Annual**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Original collision risk estimates							
1	6	0	1	7	0.999	0.982	0.473
1 + 2	6	8	6	20	0.998	0.948	0.424
1 + 2 + 3	6	21	22	49	0.995	0.878	0.329
Refinement = 1 (updated project design – Moray East)							
1	4	0	0	5	0.999	0.987	0.479
1 + 2	4	8	6	18	0.998	0.953	0.436
1 + 2 + 3	4	21	22	47	0.995	0.882	0.338
Refinement = 2 (updated flight speeds – Moray East and Beatrice)							
1	4	0	0	5	0.999	0.987	0.479
1 + 2	4	8	6	18	0.998	0.953	0.436
1 + 2 + 3	4	21	22	47	0.995	0.882	0.338
Refinement = 3 (Apportioning – Moray East and Beatrice)							
1	3	0	0	3	1.000	0.992	0.486
1 + 2	3	8	6	17	0.998	0.956	0.439
1 + 2 + 3	3	21	22	46	0.995	0.885	0.342
Refinement = 4 (updated project design – Neart na Gaoithe)							
1	3	0	0	3	1.000	0.992	0.486
1 + 2	3	8	5	16	0.998	0.958	0.444
1 + 2 + 3	3	21	22	45	0.995	0.887	0.344
Refinement = 5 (Nocturnal activity factors)							
1	3	0	0	3	1.000	0.992	0.486

Table 3.53: Tiered approach to in-combination collision risk for kittiwake at NCC SPA

Tiers 1 = Moray Firth 2 = Moray Firth and Scottish Projects 3 = All BDMPS projects	Collision risk estimates				PVA outputs (25 years)		
	Breeding	Post-breeding	Pre-breeding	Annual	Ratio of Unimpacted to Impacted Growth Rate	Ratio of Unimpacted to Impacted Population Size	Centile for Impacted Population
1 + 2	3	8	5	15	0.998	0.961	0.446
1 + 2 + 3	3	19	20	41	0.996	0.897	0.359
Refinement = 6 (Updated project designs)							
1	3	0	0	3	1.000	0.992	0.486
1 + 2	3	8	5	15	0.998	0.961	0.446
1 + 2 + 3	3	15	17	34	0.996	0.914	0.379
Refinement = 7 (flight speeds)							
1	3	0	0	3	1.000	0.992	0.486
1 + 2	3	6	4	13	0.999	0.966	0.456
1 + 2 + 3	3	13	15	30	0.997	0.923	0.395

Avoidance rate (refinement 9)

As explained in Section 3.6.2.5 the use of a 99.2% avoidance rate would lead to a reduction of 27% for the in-combination collision risk total for kittiwake at NCC SPA. The evidence supports that use of a 98.9% avoidance rate over-estimates collision risk. In order to account for this, the tiered in-combination totals calculated for each refinement are presented in Table 3.54 using both 98.9% and 99.2% avoidance rates with the latter precautionary value considered closer to the true avoidance rate.

Table 3.54: Tiered approach to in-combination collision risk for kittiwake at NCC SPA					
Tiers **1 = Moray Firth** **2 = Moray Firth and Scottish Projects** **3 = All BDMPS projects**	**Annual collision risk estimates at a range of avoidance rates**		**PVA outputs (25 years) associated with the collision risk estimates calculated using 98.9% and 99.2% avoidance rates**		
	98.9	**99.2**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
Original collision risk estimates					
1	7	5	0.999 - 0.999	0.982 - 0.987	0.473 - 0.479
1 + 2	20	15	0.998 - 0.998	0.948 - 0.961	0.424 - 0.446
1 + 2 + 3	49	36	0.995 - 0.996	0.878 - 0.909	0.329 - 0.372
Refinement = 1 (updated project design – Moray East)					
1	5	4	0.999 – 1.000	0.987 - 0.989	0.479 - 0.483
1 + 2	18	13	0.998 - 0.999	0.953 - 0.966	0.436 - 0.456
1 + 2 + 3	47	34	0.995 - 0.996	0.882 - 0.914	0.338 - 0.379
Refinement = 2 (updated flight speeds – Moray East and Beatrice)					
1	5	3	0.999 – 1.000	0.987 - 0.992	0.479 - 0.486
1 + 2	18	13	0.998 - 0.999	0.953 - 0.966	0.436 - 0.456
1 + 2 + 3	47	34	0.995 - 0.996	0.882 - 0.914	0.338 - 0.379
Refinement = 3 (Apportioning – Moray East and Beatrice)					
1	3	2	1.000 – 1.000	0.992 - 0.995	0.486 - 0.491
1 + 2	17	12	0.998 - 0.999	0.956 - 0.969	0.439 - 0.460
1 + 2 + 3	46	33	0.995 - 0.996	0.885 - 0.916	0.342 - 0.383
Refinement = 4 (updated project design – Neart na Gaoithe)					
1	3	2	1.000 – 1.000	0.992 - 0.995	0.486 - 0.491
1 + 2	16	12	0.998 - 0.999	0.958 - 0.969	0.444 - 0.460
1 + 2 + 3	45	33	0.995 - 0.996	0.887 - 0.916	0.344 - 0.383
Refinement = 5 (Nocturnal activity factors)					
1	3	2	1.000 – 1.000	0.992 - 0.995	0.486 - 0.491
1 + 2	15	11	0.998 - 0.999	0.961 - 0.971	0.446 - 0.465

Table 3.54: Tiered approach to in-combination collision risk for kittiwake at NCC SPA					
Tiers **1 = Moray Firth** **2 = Moray Firth and Scottish Projects** **3 = All BDMPS projects**	**Annual collision risk estimates at a range of avoidance rates**		**PVA outputs (25 years) associated with the collision risk estimates calculated using 98.9% and 99.2% avoidance rates**		
	98.9	**99.2**	**Ratio of Unimpacted to Impacted Growth Rate**	**Ratio of Unimpacted to Impacted Population Size**	**Centile for Impacted Population**
1 + 2 + 3	41	30	0.996 - 0.997	0.897 - 0.923	0.359 - 0.395
Refinement = 6 (Updated project designs)					
1	3	2	1.000 – 1.000	0.992 - 0.995	0.486 - 0.491
1 + 2	15	11	0.998 - 0.999	0.961 - 0.971	0.446 - 0.465
1 + 2 + 3	34	25	0.996 - 0.997	0.914 - 0.936	0.379 - 0.410
Refinement = 7 (flight speeds)					
1	3	2	1.000 – 1.000	0.992 - 0.995	0.486 - 0.491
1 + 2	13	10	0.999 - 0.999	0.966 - 0.974	0.456 - 0.468
1 + 2 + 3	30	22	0.997 - 0.998	0.923 - 0.943	0.395 - 0.417

3.7 Further HRA considerations – great black-backed gull

3.7.1 Introduction

Great black-backed gull is not listed under Annex I of the EU Birds Directive (2009/147/EEC) or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). The species is currently amber-listed on the UK Birds of Conservation Concern (Eaton *et al.*, 2015).

Great black-backed gull is a common resident species in the UK, occurring in coastal areas. Seabird 2000 recorded 17,394 pairs in Britain, with the largest numbers recorded on western coasts (Mitchell *et al.,* 2004). Great black-backed gulls are omnivorous, foraging at sea, on estuaries and beaches, and less commonly at rubbish dumps (Forrester *et al.*, 2007).

Great black-backed gull were recorded in 10 of the aerial surveys undertaken across the Moray West Site plus 4 km buffer with peak abundance occurring in September followed by a secondary peak in February.

The peak population of great black-backed gull estimated during aerial surveys exceeded 1% of the regional population in the breeding season in June, July and August. The peak population estimate in September exceeded both the regional and national 1% thresholds.

The mean-maximum foraging range for great black-backed gull is approximately 40 km (Thaxter *et al*. 2012) and on this basis it is assumed that, during the breeding season that the only SPA within foraging range is East Caithness Cliffs SPA.

3.7.2 Potential impacts

An assessment of potential impacts of the proposed Moray West offshore wind farm has been undertaken during construction / decommissioning and operational phases, including with respect to:

- Indirect effects (prey and habitat loss)
- Pollution
- Collision mortality
- Attraction to lit structures

In all cases no significant effects were identified. With respect to the potential for collision mortality, it was noted that GPS tracking work from East Caithness Cliffs in 2014 (Archibald *et al.* 2014) found that none of the great black-backed gulls fitted with tags foraged within the boundary of the Moray West Site. It was therefore considered in the Moray West RIAA a reasonable conclusion that there is no connectivity between great black-backed gull from East Caithness Cliffs SPA, or more distant SPAs, and the Moray West Site, and therefore was screened out. SNH has however requested that further consideration is given of the likely consequences of collision mortality for the East Caithness Cliffs SPA breeding interest feature.

3.7.3 Predicted collision mortality

An annual mortality of nine collisions/annum is predicted for great black-backed gull using Band Option 2 at an avoidance rate of 99.5%, with ten collisions/annum when using Band Option 3 at a 98.9% avoidance rate (Table 3.51). When following SNH guidance on seasonality (SNH 2017) four of the nine collisions/annum (Option 2) as predicted for great black-backed gull would be during the breeding season (April- August). The remaining five of the nine collisions/annum as predicted for great black-backed gull would be during the non-breeding season (September - March).

Table 3.55 Great Black-Backed Gull Seasonal Collision Risk Results		
CRM Option (Avoidance rate)	**Season**	**Collision Mortality**
Band Option 2 (99.5%)	Breeding	4
	Non-breeding	5
	Total	**9**
Band Option 3 (98.9%)	Breeding	4
	Non-breeding	6
	Total	**10**

These predictions include, however, birds of all ages and analysis of the survey data has been undertaken to determine how many birds are likely to have been birds of breeding age and hence potentially associated with the breeding colony.

3.7.4 Apportionment of collisions in the breeding season to adult birds

The digital aerial site-specific baseline characterisation surveys that were carried out between April 2016 and March 2017, aged two of the 12 great black-backed gulls observed in the breeding season on the basis of plumage. Both birds were immatures. A more robust sample size of birds aged on plumage in the Moray West Site plus a 4 km buffer area is provided by the data collected by Moray East 28 boat-based surveys between April 2010 and March 2012. 17% (163 birds) of the 955 great black-backed gulls observed in the breeding season during the Moray East boat based surveys west of 2° 46′ W, the approximate eastern limit of Moray West plus a 4 km buffer area, were aged on the basis of plumage. 36% (58 birds) of those 163 great black-backed gulls that were aged were identifiable as immatures. The remainder were in adult plumage as far as could be discernible from the observations.

On this basis 36% of the predicted 4 collisions/annum during the breeding season (April- August) can be apportioned to birds identifiable as immatures on the basis of the Moray East boat based survey observations. Consequently 64% (2.5) can be apportioned to adult plumaged birds.

Every breeding season a proportion of adults skip breeding and take a sabbatical. To include any impacts occurring on any sabbatical birds would seem likely to overestimate the effects to these species/populations (Marine Scotland 2017a, b), as breeding colony population size estimates do not include these sabbatical birds. Therefore in accordance with Marine Scotland guidance (Marine Scotland 2017a, b), the impacts assigned to sabbaticals are removed from the assessment. Following an review of the literature, SNH have advised 35% as the proportion of adult great black-backed gulls taking sabbaticals from breeding in a given year. On the basis of that assumption, less than two (1.664) adult plumaged birds are predicted to collide per breeding season.

3.7.4.1 Other factors to be considered

Although the predicted annual collision mortality is expected to involve no more than 2 adult birds, it is considered that a simple apportionment of these to the East Caithness Cliffs SPA breeding colony would over-estimate any impact on that population.

The digital aerial site-specific baseline characterisation surveys that were carried out between April 2016 and March 2017, recorded only 12 great black-backed gulls in the breeding season (none in April and May, 1 in June, 2 in July and 9 in August). Whilst precautionary, extrapolation of such few individuals to calculate a density for the Moray West project area (225 km^2 area) plus 4 buffer, is likely to over-estimate the true numbers of birds in the population.

Boat-based survey data from Moray East and Beatrice have been used to inform the Decision Support Tree process which has been used to establish baseline densities for use in collision risk modelling for this species. There is potential for these baseline densities to represent an overestimation of densities of great black-backed gulls at Moray West. This is a consequence of boat-based surveys will be affected by foraging gulls investigating the trawler-like survey vessel as a potential source of fishery discards.

On account of the paucity of birds recorded by the digital aerial site-specific of Moray West and the tendency for attraction to survey vessels by foraging birds, a more realistic assessment is that less than one breeding adult bird is predicted to collide per breeding season.

3.7.4.2 Connectivity between East Caithness Cliffs SPA and Moray West

Great black-backed gulls were tracked at East Caithness Cliffs SPA during May and June 2014 (Archibald *et al.*, 2015). Eleven great black-backed gulls were caught on the nest and fitted with remotely downloadable GPS tags. It is however noted that tracking studies from East Caithness Cliffs SPA in 2014 (Archibald *et al.*, 2014) found that none of the great black-backed gulls fitted with tags foraged within the boundary of the Moray West Site. Moreover the results of this study showed that great black-backed gulls foraged mainly across inshore areas with a maximum distance recorded from the nest of approximately 20 km although the vast majority of trips were shorter than this. It is therefore considered a reasonable assumption that there is no connectivity between great black-backed gull from East Caithness Cliffs SPA, or more distant SPAs, and the Moray West Site.

There is also evidence from dietary studies that reinforce the results from tracking studies indicating a largely coastal distribution. Great black-backed gull is omnivorous, and will prey on other (sea)birds and/or their eggs or terrestrial mammals, feeding in intertidal areas and kleptoparasitising other seabirds returning to the colony to feed their chicks (Cramp 1983). Field observations and opportunistically collected diet samples by Archibald *et al.* (2014) also support this, with birds and intertidal invertebrates forming a substantial proportion (65%) of the content of diet samples, and the remaining 35% consisting of fish (30%) and rabbits (5%).

A comparative study of great black-backed gull and herring gull, for example, found that both species consume a large percentage of marine invertebrates (30-60%), especially crabs. Foraging between species differed though with great black-backed gull consumed more crabs from the shallow subtidal zone than herring gull (Steenweg *et al.* 2011).

Regardless of the high variation in habitat use, all three individuals mainly used onshore habitats. The pellets collected from this colony support this finding, with most identified prey being coastal in nature (crabs and mussel, 77% combined) compared with fish (21%), which may have been scavenged from coastlines or captured offshore.

Bennet *et al.* (2018) observed, in a study at the Isle of May, that puffins comprised over 70% of the diet of some breeding great black-backed gulls observed.

Both Harris (1965) and Threlfall (1968) report large numbers of Manx shearwaters (*Puffinus puffinus*) and Leachs ’ petrels (*Oceanodroma leucorhoa*), respectively, being taken.

Likely collision mortality that can be apportioned to the East Caithness Cliffs SPA breeding colony

On the basis of the above analysis it is considered that the potential risk lies in the range of 0 – 1.6 adult birds per annum. Where there is evidence on the specific foraging behaviour of individuals from this colony, this indicates that birds tend to forage within more coastal areas and this observation is consistent with an understanding of the species' dietary requirements.

Given that there is limited evidence of connectivity to the East Caithness Cliffs SPA, of the 0 – 1.6 adult birds per annum at risk from collision, the total number of collisions that can be apportioned back to this site will be 0 or close to 0.

3.7.5 Apportionment of collisions in the non-breeding season to adult birds

The digital aerial site-specific baseline characterisation surveys that were carried out between April 2016 and March 2017, aged 38 of the 163 great black-backed gulls observed in the breeding season on the basis of plumage. A more robust sample size of birds aged on plumage in the Moray West Site plus a 4 km buffer area is provided by the data collected by Moray East 28 boat-based surveys between April 2010 and March 2012. 76% (386 birds) of the 510 great black-backed gulls observed in the non-breeding season during the Moray East boat based surveys west of 2° 46' W, the approximate eastern limit of Moray West plus a 4 km buffer area, were aged on the basis of plumage. 45% (172 birds) of those 386 great black-backed gulls that were aged were identifiable as immatures. The remainder were in adult plumage as far as could be discernible from the observations.

On this basis 45% of the predicted 5 collisions/annum during the non-breeding season (September - March) can be apportioned to birds identifiable as immatures on the basis of the Moray East boat based survey observations. Consequently 55% (2.77) can be apportioned to adult plumaged birds.

Breeding great black-backed gulls in the UK are mainly sedentary, and are rarely found far from their breeding locations. What little dispersive short distance movement does occur of these adult birds in the winter, it is less common in northern Scotland (Wernham *et al.* 2002). The breeding populations of great black-backed gull along the Scottish east coast within the Moray Firth region, an estimated 8,864 pairs at the time of the last complete census (Mitchell *et al.* 2004 include Shetland, Orkney, Caithness, east coast Sutherland, east coast Ross & Cromarty, Inverness, Nairn, Moray and Banff and Buchan).

Large numbers of the great black-backed gulls from arctic Norway and the Murmansk region on the northern coast of Russia are present on the east coast of the U.K. during the winter (Furness 2015, Wernham *et al.* 2002, Wright *et al.* 2012). They form almost all of the wintering great black-backed gull, in places along the eastern side of northern England (Coulson *et al.* 1984). This pattern of movement matches the months when most birds were recorded by the aerial surveys undertaken across the Moray West Site and consequently a large proportion of the mortality. The influx of great black-backed gulls from arctic coasts of Norway and Russian with much smaller numbers of breeding birds from Faroe, are estimated to form up to about 63% of the wintering adult great black-backed gull in the UK North Sea, with this rising to 68% when including immatures (Furness 2015). On the precautionary assumption that only 10% of those non-UK breeding birds will be within the Moray Firth region, this also assumed for the Beatrice Offshore Wind Farm assessment (Beatrice Offshore Wind Farm 2016), this equates to 2,040 of the 20,400 adults estimated by Furness (2015) to be in the UK North Sea in the non-breeding season.

SNH (2017b) advised Moray West that the latest colony count at East Caithness Cliff SPA for great black-backed gull is 266 pairs and at the time of the last complete census (Mitchell *et al.* 2004), 180 pairs. The latter two census figures are respectively 4.9% and 3.3% of the Moray Firth region population of adults in the non-breeding season when comprising of the regional breeding population (8,864 birds) and non-UK breeding birds (2,040 birds). On the basis of the preceding assumptions, less than one breeding adult from East Caithness Cliffs SPA (0.14 of an adult plumaged bird) is predicted to collide per non-breeding season.

3.7.6 East Caithness Cliffs SPA

East Caithness Cliffs SPA is located on the north-eastern mainland Scottish coast covering the sea cliff areas between Wick and Helmsdale and the adjacent marine area out to 2 km. The SPA provides suitable nesting habitat for a number of seabird species and the SPA is designated for guillemot (106,700 individuals), razorbill (15,800 individuals), herring gull (9,400 pairs), kittiwake (32,500 pairs), shag (2,300 pairs) and a breeding seabird assemblage incorporating additional breeding populations of great black-backed gull, cormorant and fulmar.

At designation the site supported 800 pairs of breeding great black-backed gulls, although the population has declined since then and is currently considered to be in unfavourable condition.

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"*

3.7.7 Assessment of Moray West alone

The predicted collision mortality for Moray West alone was calculated in the Environmental Impact Assessment Report (paragraphs 10.7.2.129 - 134).

The predicted collision mortality arising from the project alone is 9-10 individuals (see Table 10.7.10) which is above 1% of the baseline adult mortality (9-10 cf. 0.19 individuals). It is considered, however, that, of these birds, no more than 1.6 are likely to comprise adult birds in the breeding season.

The available evidence on the foraging behaviour of adult birds from this colony indicated no interaction with the proposed wind farm area, preferring coastal habitats instead, an observation seen in other similar studies and consistent with the dietary requirements of this species. This strongly suggests that it is very unlikely that any birds in adult plumage observed at the wind farm site in the breeding season are adult birds associated with the colony at East Caithness Cliffs, it being more likely that these are non-breeding adults or birds that appear to be in adult plumage but that are yet to commence breeding activity. Furthermore, no more than 0.14 of an adult plumaged bird associated with the colony at East Caithness Cliffs is predicted to collide per non-breeding season.

On this basis the predicted impact on the great black-backed gull breeding colony of the East Caithness Cliffs SPA is considered to be 0, or close to 0, and hence of no adverse effect on this interest feature.

3.7.8 Assessment of the project in-combination

The cumulative collision mortality of great black-backed gull arising from Moray West and other relevant offshore wind farms as calculated in the Environmental Impact Assessment Report (paragraphs 10.8.4.116 – 120, Moray West EIA Report). Cumulative collision mortality was estimated as 40 individuals (Table 10.8.47) during the breeding season which is above 1% of the baseline adult mortality (40 cf. 0.19

individuals) and 631 during the non-breeding season (see paragraphs 10.8.4.121 – 122, Table 10.8.17), although it is noted that there is considerable precaution included in the estimation of these numbers.

With respect to the in-combination effects arising from Moray West in-combination with the Moray East and Beatrice offshore wind farms, given that the predicted collisions for these wind farms were made prior to the availability of tracking data from the colony (which indicates a lower likelihood of connectivity with these sites than was assumed in each assessment) and that both projects have subsequently made project design refinements (e.g. Beatrice reduced turbine numbers from 125 consented to 84 as built and Moray East reduced from 156 consented to 100 presented in the approved DSLP), predicted collision mortality for great black-backed gull will be lower than consented. Overall it can be concluded that Moray West makes no material contribution to any in-combination effects on the great black-backed gull breeding colony of the East Caithness Cliffs SPA.

3.7.9 Conclusions

The potential effects of Moray West on the great black-backed gull interest feature of the East Caithness Cliffs SPA have been assessed alone and in-combination with other relevant projects. The key potential impact relates to collision mortality. On the basis that East Caithness Cliffs SPA lies within potential foraging distance of Moray West, this SPA has been screened into HRA.

It is considered that given no more than 1.6 collisions in total are apportioned to adult birds and that there is very limited evidence of any connectivity to East Caithness Cliffs SPA breeding colony, the magnitude of any impact will be negligible. It is therefore concluded that there will be no adverse effect on this interest feature.

The table below summarises the outcome of the assessment with respect to all conservation objectives.

Table 3.56 Outcome of the assessment with respect to ECC SPA conservation objectives

Conservation objectives	**East Caithness Cliffs SPA**
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	*No Adverse Effect on Site Integrity* Predicted additional annual adult mortality will not be of a magnitude that will prevent the qualifying interest from remaining a viable component of the site in the long term. The lack of connectivity between the site and the colony during the breeding season means that no impact on this breeding colony is predicted. Furthermore, no adult plumaged bird associated with the colony at East Caithness Cliffs is predicted to collide per non-breeding season. Consequently there is no indication that the population at the end of the project will be less than that at designation.
Distribution of the species within site	*No Adverse Effect on Site Integrity* Moray West is located outwith the European site. The potential effect of displacement will therefore not impact the distribution of the qualifying interests within site.
Distribution and extent of habitats supporting the species	*No Adverse Effect on Site Integrity* Moray West is located outwith the European site and impacts related to changes in habitat were scoped out of this assessment.
Structure, function and supporting processes of habitats supporting the species	*No Adverse Effect on Site Integrity* Moray West is located outwith the European site and impacts related to changes in habitat were scoped out of this assessment.

Table 3.56 Outcome of the assessment with respect to ECC SPA conservation objectives	
Conservation objectives	**East Caithness Cliffs SPA**
No significant disturbance of the species	*No Adverse Effect on Site Integrity* Moray West is located outwith the European site and the impact of disturbance was scoped out of this assessment.

It is therefore concluded that there will be no adverse effect on the great black-backed gull interest feature of the East Caithness Cliffs SPA arising from Moray Firth alone or in-combination.

3.8 Final conclusions – population impacts East Caithness Cliffs SPA and North Caithness Cliffs SPA

3.8.1 East Caithness Cliffs SPA

The potential effects of Moray West on the great black-backed gull, kittiwake, guillemot and razorbill interest features of the East Caithness Cliffs SPA have been assessed alone and in-combination with other relevant projects. The key potential impact for guillemot and razorbill relates to displacement mortality. The key potential impact for kittiwake relates to displacement mortality collision mortality. The key potential impact for great black-backed gull relates to collision mortality. The preceding analysis has presented additional information on the calculation of the above mentioned impacts and interest features of East Caithness Cliffs SPA. With respect to displacement, the analysis provided predictions for both the wind farm alone (no buffer) and with a 2 km buffer included. It is assumed that the likely impact lies between these values.

3.8.1.1 Guillemot

The predicted displacement mortality for guillemot at East Caithness Cliffs SPA for Moray West alone plus a 2 km buffer is with 60% displacement and 1% mortality rates, no greater than 89 birds per annum using the Applicant's apportioning approach. If additional mortality of 90 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted project alone + 2 km buffer) then the model predicts after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.999; (2) a ratio of unimpacted to impacted population size of 0.987; and, (3) a centile for impacted populations at 0.439. For Moray West in combination with other wind farm projects, guillemot displacement mortality apportioned to East Caithness Cliffs SPA is no greater than 260 birds per annum. If additional mortality of 260 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted in combination total) then the model predicts after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.999; (2) a ratio of unimpacted to impacted population size of 0.964; and, (3) a centile for impacted populations at 0.342. For Moray West alone (+ 2 km buffer) and in combination, the impact magnitude is considered negligible therefore it is concluded that there will be no adverse effect on this interest feature at East Caithness Cliffs SPA.

3.8.1.2 Razorbill

The predicted displacement mortality for razorbill at East Caithness Cliffs SPA for Moray West alone plus a 2 km buffer is with 60% displacement and 1% mortality rates, no greater than 10 birds per annum irrespective of whether using the Applicant's or SNH's apportioning approach. If additional mortality of 10 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted project alone + 2 km buffer) then the model predicts after 25 years (1) a ratio of unimpacted to impacted growth rate of 1.000, (2) a ratio of unimpacted to impacted population size of 0.993 and (3) a centile for impacted populations at 0.493. For Moray West in combination with other wind farm projects, razorbill displacement mortality apportioned to East Caithness Cliffs SPA is no greater than 40 birds per annum. If additional mortality of 40 birds per annum is assumed for PVA modelling (the closest modelled output to the predicted in combination total) then the model predicts after 25 years (1) a ratio of unimpacted to impacted growth rate of 0.999, (2) a ratio of unimpacted to impacted population size of 0.972 and (3) a centile for impacted populations at 0.475. For Moray West alone (+ 2 km buffer) and in combination, the impact magnitude is considered negligible therefore it is concluded that there will be no adverse effect on this interest feature at East Caithness Cliffs SPA.

3.8.1.3 Kittiwake

The predicted displacement mortality for kittiwake at East Caithness Cliffs SPA for Moray West alone plus a 2 km buffer with 30% displacement and 2% mortality rates is no greater than 29 birds per annum using the Applicant's apportioning approach. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.999; (2) a ratio of unimpacted to impacted population size of 0.983; and, (3) a centile for impacted populations at 0.479. For Moray West in combination with other wind farm projects, kittiwake displacement mortality apportioned to East Caithness Cliffs SPA is no greater than 65 per annum. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.998; (2) a ratio of unimpacted to impacted population size of 0.961; and, (3) a centile for impacted populations at 0.453. For Moray West alone (+ 2 km buffer) and in combination, the impact magnitude is considered negligible therefore it is concluded that there will be no adverse effect on this interest feature at East Caithness Cliffs SPA.

The predicted kittiwake collision mortality apportioned to East Caithness Cliffs SPA from Moray West alone is 57 birds annually at Option 2 and 98.9% avoidance. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.999; (2) a ratio of unimpacted to impacted population size of 0.966; and, (3) a centile for impacted populations at 0.456. For Moray West in combination with other wind farm projects, kittiwake collision mortality apportioned to East Caithness Cliffs SPA is no greater than 325 per annum. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.992; (2) a ratio of unimpacted to impacted population size of 0.821; and, (3) a centile for impacted populations at 0.266.

In addition to reducing the duration of the operational period for the Development from 50 years to 25 years, Moray West has made a commitment to reducing kittiwake collisions by 7% (57 to 53 per annum). This reduction in kittiwake collisions is one of the adjustment factors that has been applied to the calculation of in-combination collision mortality for East Caithness Cliffs SPA and North Caithness Cliffs SPA. It is proposed that the reduction in kittiwake collisions from 57 to 53 per annum will be achieved through a reduction in turbine numbers from 85 to 79 unless it can be demonstrated through changes to other design parameters identified during preparation of the final Development design and layout that the total number of annual collisions for 85 turbines does not exceed 53 birds kittiwakes.

Moray West at this stage, is therefore not proposing a final reduction in turbine numbers (these remain at 85 for the Model 2 WTG).

When also taking account of emerging evidence on parameters such as flight speed, avoidance rates and apportioning, and up to date information about the actual effects of other projects, such refinements significantly further reduce the magnitude of collision mortality. For example, if refined the parameter values as suggested for apportioning (Moray East and Beatrice only), nocturnal activity factor (all projects), updated project design (Moray East and Neart na Gaoithe only) and flight speed (Moray East and Beatrice only), for Moray West in combination with other wind farm projects, kittiwake collision mortality apportioned to East Caithness Cliffs SPA is no greater than **236 per annum.** The use of a 99.2% as opposed 98.9% avoidance rate would lead to a reduction of 27% for the in-combination collision risk total for kittiwake to **172 birds per annum**.

Based on these refinements, additional mortality of either 236 collisions per annum or 172 collisions per annum (with the 99.2% avoidance rate) assumed for PVA modelling (the closest modelled output to the predicted in combination total) then the model predicts after 25 years the following:

- (1) a ratio of unimpacted to impacted growth rate of 0.994 (for 236 collisions) to 0.996 (for 172 collisions);
- (2) a ratio of unimpacted to impacted population size of 0.867 (for 236 collisions) and 0.901 (for 172 collisions); and
- (3) a centile for impacted populations at 0.331 (for 236 collisions) and 0.370 (for 172 collisions).

For Moray West alone and in combination, it is concluded that there is no adverse effect on the integrity of the kittiwake feature of the East Caithness Cliffs SPA as a result of collision risk impacts.

With further refinements applying updated project designs and flight speeds to other projects (in addition to Moray West, Moray East, Beatrice and Neart na Gaoithe) and considering avoidance rates of 98.9% and 99.2% the number of collisions apportioned to East Caithness Cliffs SPA reduces to between 190 collisions per annum and 138 collisions per annum. The corresponding PVAs after 25 years are calculated as follows:

- (1) a ratio of unimpacted to impacted growth rate of 0.995 (for 190 collisions) to 0.997 (for 138 collisions);
- (2) a ratio of unimpacted to impacted population size of 0.891 (for 190 collisions) and 0.920 (for 138 collisions); and
- (3) a centile for impacted populations at 0.359 (for 190 collisions) and 0.393 (for 138 collisions).

The combined impact (collision + displacement (Moray West plus 2 km buffer)) for kittiwake at East Caithness Cliffs SPA has been presented using the parameter values of 30% displacement and 2% mortality rates for displacement and for the CRM Option 2 and 98.9% avoidance. The predicted combined displacement and collision mortality for kittiwake at East Caithness Cliffs SPA for Moray West alone (no buffer) is no greater than 82 birds per annum using the Applicant's apportioning approach. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.998; (2) a ratio of unimpacted to impacted population size of 0.952; and, (3) a centile for impacted populations at 0.436. For Moray West in combination with other wind farm projects, kittiwake collision and displacement mortality combined apportioned to East Caithness Cliffs SPA is no greater than 386 per annum. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.991; (2) a ratio of unimpacted to impacted population size of 0.791; and, (3) a centile for impacted populations at 0.226.

Summing the predicted mortalities arising from collision and displacement impacts risks some degree of double counting as a bird that collides with a turbine cannot be displaced and vice versa. However irrespective that the combined impact of collision and displacement is an over-estimate for Moray West alone and in combination, it is concluded that there is no adverse effect on the integrity of the kittiwake feature of the East Caithness Cliffs SPA as a result of the combined impacts.

3.8.1.4 Great black-backed gull

The key potential impact for great black-backed gull relates to collision mortality. It is considered that given no more than 1.6 collisions are apportioned to adult birds in total and that the available evidence does not indicate connectivity to East Caithness Cliffs SPA breeding colony, the impact magnitude is negligible and it is concluded that there will be no adverse effect on this interest feature.

3.8.2 North Caithness Cliffs SPA

The potential effects of Moray West on the kittiwake interest feature of the North Caithness Cliffs SPA has been assessed alone and in-combination with other relevant projects. The key potential impacts for kittiwake relate to displacement and collision mortality. The preceding analysis has presented additional information in the calculation of the above mentioned impacts and interest feature of North Caithness Cliffs SPA. With respect to displacement, the analysis provided predictions for both the wind farm alone (no buffer) and with a 2 km buffer included. It is assumed that the likely impact lies between these values.

3.8.2.1 Kittiwake

The predicted displacement mortality for kittiwake at North Caithness Cliffs SPA for Moray West alone is with 30% displacement and 2% mortality rates, no greater than one bird per annum irrespective of inclusion of the 2 km buffer or whether using the Applicant's or SNH's apportioning approach. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 1.000; (2) a ratio of unimpacted to impacted population size of 0.997; and, (3) a centile for impacted populations at 0.496. For Moray West in combination with other wind farm projects, kittiwake displacement mortality apportioned to North Caithness Cliffs SPA is no greater than three per annum. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 1.000; (2) a ratio of unimpacted to impacted population size of 0.992; and, (3) a centile for impacted populations at 0.486. For Moray West alone and in combination, the impact magnitude is considered negligible therefore it is concluded that there will be no adverse effect on this interest feature at North Caithness Cliffs SPA.

The predicted kittiwake collision mortality apportioned to North Caithness Cliffs SPA from Moray West alone is 3 birds annually at Option 2 and 98.9% avoidance. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 1.000; (2) a ratio of unimpacted to impacted population size of 0.992; and, (3) a centile for impacted populations at 0.486. For Moray West in combination with other wind farm projects, kittiwake collision mortality apportioned to North Caithness Cliffs SPA is no greater than 49 per annum. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.995; (2) a ratio of unimpacted to impacted population size of 0.878; and, (3) a centile for impacted populations at 0.329.

In addition to reducing the duration of the operational period for the Development from 50 years to 25 years, Moray West has made a commitment to reducing kittiwake collisions by 7% (57 to 53 per annum). This reduction in kittiwake collisions is one of the adjustment factors that has been applied to the calculation of in-combination collision mortality for East Caithness Cliffs SPA and North Caithness Cliffs SPA. It is proposed that the reduction in kittiwake collisions from 57 to 53 per annum will be achieved through a reduction in turbine numbers from 85 to 79 unless it can be demonstrated through changes to other design parameters identified during preparation of the final Development design and layout that the total number of annual collisions for 85 turbines does not exceed 53 birds kittiwakes.

Moray West at this stage, is therefore not proposing a final reduction in turbine numbers (these remain at 85 for the Model 2 WTG).

When also taking account of emerging evidence on parameters such as flight speed, avoidance rates and apportioning, and up to date information about the actual effects of other projects, such refinements significantly further reduce the magnitude of collision mortality.   For example, if refined the parameter values as suggested for apportioning (Moray East and Beatrice only), nocturnal activity factor (all projects), updated project design (Moray East and Neart na Gaoithe only) and flight speed (Moray East and Beatrice only), for Moray West in combination with other wind farm projects, kittiwake collision mortality apportioned to North Caithness Cliffs SPA is no greater than **41 per annum.** The use of a 99.2%

as opposed 98.9% avoidance rate would lead to a reduction of 27% for the in-combination collision risk total for kittiwake to **30 birds per annum**.

Based on these refinements, additional mortality of either 41 collisions per annum or 30 collisions per annum (with the 99.2% avoidance rate) assumed for PVA modelling (the closest modelled output to the predicted in combination total) then the model predicts after 25 years the following:

- (1) a ratio of unimpacted to impacted growth rate of 0.996 (for 41 collisions) to 0.997 (for 30 collisions);
- (2) a ratio of unimpacted to impacted population size of 0.897 (for 41 collisions) and 0.923 (for 30 collisions); and
- (3) a centile for impacted populations at 0.359 (for 41 collisions) and 0.395 (for 30 collisions).

With further refinements applying updated project designs and flight speeds to other projects (in addition to Moray West, Moray East, Beatrice and Neart na Gaoithe) and considering avoidance rates of 98.9% and 99.2% the number of collisions apportioned to North Caithness Cliffs SPA reduces to between 30 collisions per annum and 22 collisions per annum. The corresponding PVAs after 25 years are calculated as follows:

- (1) a ratio of unimpacted to impacted growth rate of 0.997 (for 30 collisions) to 0.998 (for 22 collisions);
- (2) a ratio of unimpacted to impacted population size of 0.923 (for 30 collisions) and 0.943 (for 22 collisions); and
- (3) a centile for impacted populations at 0.395 (for 30 collisions) and 0.417 (for 22 collisions).

For Moray West alone and in combination, it is concluded that there is no adverse effect on the integrity of the kittiwake feature of the North Caithness Cliffs SPA as a result of collision risk impacts.

The combined impact (collision + displacement (Moray West plus 2 km buffer)) for kittiwake at North Caithness Cliffs SPA has been presented using the parameter values of 30% displacement and 2% mortality rates for displacement and for the CRM Option 2 and 98.9% avoidance. The predicted combined displacement and collision mortality for kittiwake at North Caithness Cliffs SPA for Moray West alone (no buffer) is no greater than four birds per annum using the Applicant's apportioning approach. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 1.000; (2) a ratio of unimpacted to impacted population size of 0.989; and, (3) a centile for impacted populations at 0.483 For Moray West in combination with other wind farm projects, kittiwake collision and displacement mortality combined apportioned to North Caithness Cliffs SPA is no greater than 52 per annum. At this level of mortality PVA modelling predicts that after 25 years: (1) a ratio of unimpacted to impacted growth rate of 0.994; (2) a ratio of unimpacted to impacted population size of 0.871; and, (3) a centile for impacted populations at 0.318. Summing the predicted mortalities arising from collision and displacement risks some degree of double counting as a bird that collides with a turbine cannot be displaced and vice versa. However irrespective that the combined impact of collision and displacement is an over-estimate, for Moray West alone and in combination, it is concluded that there is no adverse effect on the integrity of the kittiwake feature of the North Caithness Cliffs SPA as a result of the combined impacts.

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4 Additional Information - Marine Mammals: Comparing a 0.5% and a 1% Acoustic Energy Conversion Factor

4.1 Introduction

This additional information sets out the results of additional underwater noise modelling and assessment of potential effect significance for marine mammals when using a 1% acoustic energy Conversion Factor (CF) compared to a 0.5% CF for both Permanent Threshold Shift (PTS) and disturbance impacts.

4.2 Requirement for the additional modelling using a 1% conversion factor

The assessment of piling noise impacts on marine mammals, presented in Volume 2: EIA Report Chapter 9 (Marine Mammal Ecology), is supported by underwater noise modelling undertaken by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) presented in Technical Appendix 9.2 (Underwater Noise Modelling Report). The Cefas model uses a range of parameters, to predict the propagation of underwater noise generated from pile driving during the installation of wind turbine foundations. This includes the use of a 0.5% acoustic energy conversion factor to calculate the amount of acoustic energy that is transferred from the pile driving hammer blow into acoustic energy transferred into the water (the 'conversion factor', denoted as CF). This conversion factor is used by Cefas as a standard variable in their modelling of the underwater noise generated by pile-driving.

There is currently ongoing discussion on the most suitable conversion factor to be used to assess piling noise impacts on marine mammals, following the development of the Beatrice Offshore Wind Farm Ltd. (BOWL) piling strategy, which adopted the use of a 1% conversion factor. This was to support precautionary modelling of near field effects to support development of the piling mitigation strategy.

Although Scottish Natural Heritage (SNH) advised that no further modelling was required with respect to the 1% CF, MSS advised that additional information modelling should be undertaken to demonstrate any potential differences in the assessments when using a 0.5% and a 1% CF. Through further consultation with MSS and MSLOT it was agreed that the additional modelling would not be required. However, Moray West has provided this information to futher support our response on this point. The results from this additional modelling are presented below.

4.3 Minke Whale Density Surface Erratum

Since the submission of the EIA Report, it has been determined that there was an error in the calculations of the density of minke whales in the Moray Firth that had been used to estimate the number of minke whales impacted by disturbance. During the investigation of this error, a consultation meeting was carried out with Dr Charles Paxton of the Centre for Research into Ecological & Environmental Modelling (University of St Andrews), the main author of the SNH report presented in the previous analysis (Paxton *et al*. 2014), and the main author of subsequent JCP analyses. On the basis of this consultation, it was determined that the density surface used in the previous assessment in the EIA Report was not appropriate as it was a surface providing a summary of the relevant input data for the prediction and so was a way to display the sightings data that went into the model rather than the modelled density surface itself. The modelled point estimate density surface for summer 2012 (Figure 28b of Paxton *et al*. (2014)) was discussed and considered, however Dr Paxton recommended that this density surface was not ideal for the assessment of impacts in the Moray Firth as a) it was a coastal only density surface and b) analysis of JCP data has since been revised in Paxton *et al*. (2016) which would therefore provide a more up to date and better estimate of minke whale density across the Moray Firth. Therefore two alternative density estimates are considered here, which were considered the most appropriate for the assessment of impacts in the Moray Firth: the more recent JCP III analyses presented in 2016 (Paxton *et al*. 2016) and the SCANS III density estimate (Hammond *et al*. 2017). The justification for providing both estimates was that the JCP analysis has shown that minke whale abundance fluctuates both within and between years and therefore, in order to account for this, the JCP Phase III analysis was used as it provides an estimate of the average density across the Moray Firth across multiple years and multiple seasons and the SCANS III estimate as it provides the most recent data available for the Moray West (more up to date than the JCP data but for a single summer snapshot only).

The Moray Firth was considered as an area of commercial interest in Paxton *et al*. (2016) and so seasonal abundance estimates are provided specifically for the Moray Firth. The area considered in Paxton *et al*. (2016) as the Moray Firth is shown in Figure 4.1. The 2010 summer estimated abundance for the Moray Firth was 210 minke whales which equates to a density of 0.027 whales/km^2, with much lower densities in the spring, autumn and winter (0.003 to 0.004 whales/km^2) (Table 4.1).

The area covered by the noise modelling was mostly within SCANS III Block S, however some of the noise contours for the disturbance modelling extended east into Block T and southeast into Block R (Figure 4.2 – presented in Volume 2 Figures). Therefore, where noise contours extended into different survey blocks, the area within the relevant survey block was multiplied by the block-specific density estimate (Table 4.1) in order to estimate the total number of animals impacted.

Both of the two density estimates (Paxton *et al*. 2016 and Hammond *et al*. 2017) were taken forward for impact assessment for minke whale using both the 0.5% CF consistent with the previous assessment as well as the 1% CF noise modelling outputs.

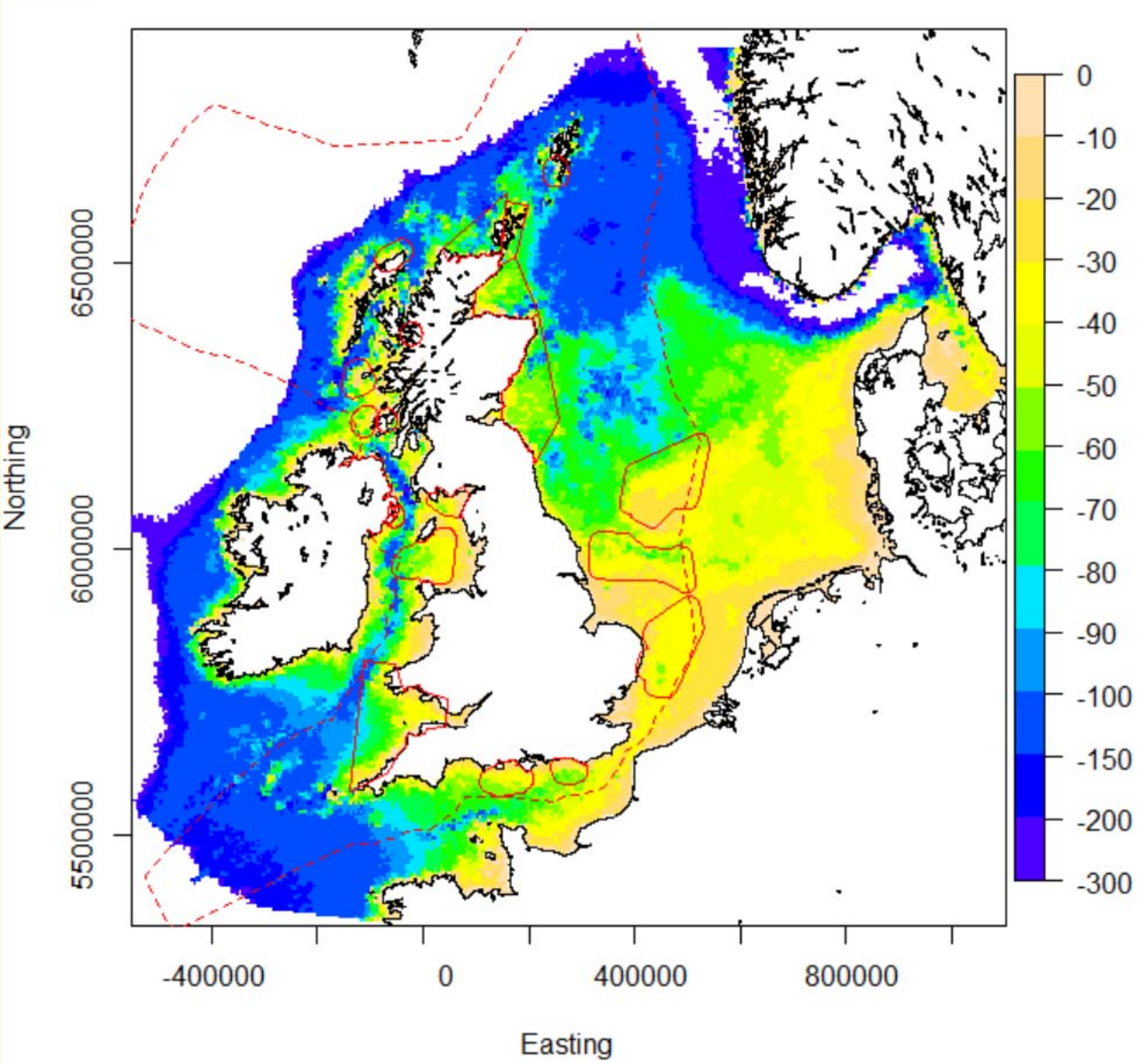

Figure 4-1 The core JCP Phase III region showing areas of interest for offshore development where estimates of abundance are of special commercial interest (solid red lines). Dashed red lines indicate the British EEZ. The colour scale shows the depth in meters.

Table 4.1 Abundance and density estimates available for minke whales in the Moray Firth		
Data Source	**Abundance within the Moray Firth**	**Average Density within the Moray Firth (#/km^2)**
Paxton *et al*. (2016) JCP Phase III abundance estimate	Spring: 30 Summer: 210 Autumn: 20 Winter: 20	Spring: 0.004 Summer: 0.027 Autumn: 0.003 Winter: 0.003
Hammond *et al*. (2017) SCANS III Block-wide estimates	Block S: 383 Block T: 2,068 Block R: 2,498	Block S: 0.010 Block T: 0.032 Block R: 0.039

4.4 PTS comparison – 1% and 0.5% CF

As per the EIA Report Chapter, the NOAA thresholds for PTS were used to predict impact ranges for the remodeling with the 1% CF.

4.4.1 High Frequency Cetaceans

The EIA Report using noise modelling with a 0.5% CF concluded that the sensitivity of harbour porpoise to PTS as a result of both single vessel and concurrent monopile or pin-pile installation was **high** and, after the adoption of a piling strategy including appropriate mitigation (e.g. a piling soft start and the use of acoustic deterrent devices (ADDs)), the magnitude of the impact was **negligible**, therefore the effect of PTS on harbour porpoise was of **minor significance,** and was therefore **not significant** in EIA terms.

The results of the noise modelling using the 1% CF resulted in very small PTS impact ranges (all <500 m) (Table 4.2). This suggests that alongside the adoption of a piling strategy including appropriate mitigation (e.g. a piling soft start and the use of ADDs), the risk of PTS to any harbour porpoise will be of **negligible** magnitude. Therefore the effect of PTS on harbour porpoise is of **minor significance,** and is therefore **not significant** in EIA terms.

This represents **no change in the overall impact significance** between the results of the 0.5% and 1% CF noise modelling for harbour porpoise PTS.

Table 4.2 PTS Impact Area and Ranges for Harbour Porpoise Using the NOAA$_{HF}$ weighted SEL$_{cum}$ 155 dB re 1 μPa^{2}s Threshold

Scenario	Hammer Energy (kJ)	Area (km^2)	Max Range (m)
0.5% CF			
Concurrent Pin-pile	3000	<0.01	<50 m
Concurrent Monopile	5000	<0.01	<50 m
Single Pin-pile	3000	<0.01	81 m
Single Monopile	5000	<0.01	90 m
1% CF			
Concurrent Pin-pile	3000	<0.01	<200 m
Concurrent Monopile	5000	0.33	324 m
Single Pin-pile	3000	<0.01	<200 m
Single Monopile	5000	0.22	289 m

4.4.2 Mid Frequency Cetaceans

The EIA Report using a 0.5% CF concluded that the sensitivity of mid-frequency cetaceans (bottlenose dolphins) to PTS as a result of both single vessel and concurrent monopile or pin-pile installation was **high** and, after the adoption of a piling strategy including appropriate mitigation (e.g. a piling soft start and the use of acoustic deterrent devices (ADDs), the magnitude of the impact was **negligible**, therefore the effect of PTS on bottlenose dolphins was of **minor significance,** and was therefore **not significant** in EIA terms.

The results of the noise modelling using the 1% CF resulted in no discernable PTS impact range (<50 m). This suggests that alongside the adoption of an appropriate piling strategy including appropriate mitigation (e.g. soft start and the use of ADDs) the risk of PTS to any bottlenose dolphin is of **negligible** magnitude. Therefore the effect of PTS on bottlenose dolphins is of **minor significance,** and is therefore **not significant** in EIA terms.

This represents **no change in the overall impact significance** between the results of the 0.5% and 1% CF noise modelling for bottlenose dolphin PTS.

4.4.3 Low Frequency Cetaceans

The EIA Report using a 0.5% CF concluded that the sensitivity of low-frequency cetaceans (minke whales) to PTS as a result of both single vessel and concurrent monopile or pin-pile installation was **high** and alongside the adoption of an appropriate piling strategy including appropriate mitigation (e.g. soft start and the use of ADDs), the magnitude of the impact was **negligible**, therefore the effect of PTS on minke whales was of **minor significance,** and was therefore **not significant** in EIA terms.

The SEL_{cum} PTS impact areas and ranges are all larger using a 1% CF compared to a 0.5% CF. The scenario with the largest PTS impact area for minke whales using the 1% CF is the concurrent installation of pin-piles which has an estimated PTS impact area of 3,269.77km^2 and a maximum range of 38 km (Table 4.3 and Figure 4.3 – see Volume 2). Under this scenario the worst-case number of minke whales predicted to experience PTS on a single piling day varies between 33 animals (using the SCANS III estimate) and 88 animals (using the JCP Phase III Summer estimate) (Table 4.5). However the JCP Phase III estimate for this scenario is only 13.1 animals in spring, and only 9.8 animals in both autumn and winter. Therefore the average number of animals predicted to experience PTS on a single piling day (across all four seasons) for the concurrent pin-pile scenario is 30.3 animals (0.13% of the MU) (Table 4.5).

Table 4.3 PTS Impact Area and Ranges for Minke Whales Using the $NOAA_{LF}$ weighted SEL_{cum} 183 dB re 1 µPa^{2}s Threshold

Scenario	Hammer Energy (kJ)	Area (km^2)	Max Range (km)
0.5% CF			
Concurrent Pin-pile	3000	367.83	28.5
Concurrent Monopile	5000	0.80	0.9
Single Pin-pile	3000	0.01	0.1
Single Monopile	5000	0.64	0.5
1% CF			
Concurrent Pin-pile	3000	3,269.77	38
Concurrent Monopile	5000	234.30	32
Single Pin-pile	3000	360.46	28
Single Monopile	5000	6.97	2

Table 4.4 Number of minke whales predicted to experience PTS using a 0.5% CF

Scenario	JCP Phase III (Paxton *et al*. 2016)			SCANS III (Hammond *et al*. 2017)	
	Season	# animals	% MU	# animals	% MU
Concurrent Pin-pile	Spring	1.5	0.01%	3.7	0.02%
	Summer	9.9	0.04%		
	Autumn	1.1	0.00%		
	Winter	1.1	0.00%		
	Average	**3.4**	**0.01**%		
Concurrent Monopile	Spring	0.0	0.00%	0.0	0.00%
	Summer	0.0	0.00%		
	Autumn	0.0	0.00%		
	Winter	0.0	0.00%		
	Average	**0.0**	**0.00**%		
Single Pin-pile	Spring	0.0	0.00%	0.0	0.00%
	Summer	0.0	0.00%		
	Autumn	0.0	0.00%		
	Winter	0.0	0.00%		
	Average	**0.0**	**0.00%**		
Single Monopile	Spring	0.0	0.00%	0.0	0.00%
	Summer	0.0	0.00%		
	Autumn	0.0	0.00%		
	Winter	0.0	0.00%		
	Average	**0.0**	**0.00%**		

Table 4.5 Number of minke whales predicted to experience PTS using a 1% CF

Scenario	JCP Phase III (Paxton *et al*. 2016)			SCANS III (Hammond *et al*. 2017)	
	Season	# animals	% MU	# animals	% MU
Concurrent Pin-pile	Spring	13.1	0.06%	32.7	0.14%
	Summer	88.3	0.38%		
	Autumn	9.8	0.04%		
	Winter	9.8	0.04%		
	Average	**30.3**	**0.13%**		
Concurrent Monopile	Spring	0.9	0.00%	2.3	0.01%
	Summer	6.3	0.03%		
	Autumn	0.7	0.00%		
	Winter	0.7	0.00%		
	Average	**2.2**	**0.01%**		

Table 4.5 Number of minke whales predicted to experience PTS using a 1% CF					
Scenario	**JCP Phase III (Paxton *et al*. 2016)**			**SCANS III (Hammond *et al*. 2017)**	
	Season	**# animals**	**% MU**	**# animals**	**% MU**
Single Pin-pile	Spring	1.4	0.01%	3.6	0.02%
	Summer	9.7	0.04%		
	Autumn	1.1	0.00%		
	Winter	1.1	0.00%		
	Average	**3.3**	**0.01%**		
Single Monopile	Spring	0.0	0.00%	0.1	0.00%
	Summer	0.2	0.00%		
	Autumn	0.0	0.00%		
	Winter	0.0	0.00%		
	Average	**0.1**	**0.00%**		

It is expected that the use of ADDs prior to the soft-start will cause minke whales to move away from the piling site and therefore reduce the number of whales impacted. McGarry *et al*. (2017) showed that minke whales at a distance of 1 km from an ADD responded by displaying a clear and sustained movement away from the ADD deployment site. After the 15 minute ADD activation period, most whales continued to move away from the ADD deployment location, with whales tracked to >4 km from the ADD source. Unfortunately no data were available for the responses of minke whales at distances further than 1 km from the ADD at the start of activation so it is unknown at what range from the ADD source minke whales do not respond. Therefore it can be concluded that ADD mitigation will be effective at deterring minke whales away from the piling location, and therefore reduce the number of animals predicted to experience PTS.

A precaution inherent in this modelling approach is the fact that there is no consideration of how the sound characteristics of the pulse change with increasing range from the source. The noise modelling for pile driving is conducted using the impulsive noise PTS threshold of SEL_{cum} 183 dB re 1 µPa^2s, however, previous work has demonstrated that as a result of propagation effects, the sound signal loses its impulsive characteristics (e.g. duration, rise time) and could potentially be characterised as a non-impulsive beyond a certain distance. This is important to consider since the PTS threshold for non-impulsive noise (SEL_{cum} 199 dB re 1 µPa^2s) is much higher than for impulsive noise. Hastie *et al*. (2016) recorded pile driving noise during the installation of offshore wind turbines at the Wash and in the Moray Firth at increasing distances from the pile driving. Their analysis showed that the noise signal experienced a high degree of change in its impulsive characteristics within 5-10 km from the source. Therefore at distances beyond this, due to changes in the characteristics of the noise signal it becomes more non-impulsive. However, the noise modelling does not account for this, and continues to model exposure to impulsive noise out to the maximum impact ranges here of 38 km from the source. Given the results of Hastie *et al*. (2016) these predicted PTS impact ranges will be large overestimates since beyond distances of 5-10 km the noise signal should be considered non-impulsive and should therefore subject to a much higher PTS threshold.

Given the overestimates outlined above regarding the range dependent characteristics of the noise signal and that with the inclusion of ADD based mitigation prior to pile driving; the true number of minke whales expected to experience PTS will be much lower than presented in Table 4.3. Even if a number of minke whales were to experience PTS, the magnitude of this PTS would likely be low and the consequences of this PTS on their ability to survive and reproduce would be minimal. At a recent BEIS funded expert elicitation workshop, experts in marine mammal hearing discussed the nature, extent and potential consequence of PTS to UK marine mammal species including harbour porpoise, bottlenose dolphins, harbour seals and grey seals (Booth and Heinis 2018) as a result of exposure to pile driving noise (note, minke whales were not explicitly included in this elicitation although it is expected that the conclusions can be broadly applied to other species). Experts agreed that any threshold shifts as a result of pile driving would manifest themselves somewhere in the 2-10 kHz range (Finneran 2015, Kastelein *et al*. 2017). Most piling noise is relatively low frequency, and therefore the effect of PTS is predicted to manifest as a small "notch" within the 2-10 kHz frequency range and therefore the effect on all cetacean species may be minimal. In light of this, a PTS of 6 dB in a narrow frequency band within the 2-10 kHz region is unlikely to significantly affect the fitness of individuals which rely on broadband and/or high frequency signals. For minke whales, Tubelli *et al*. (2012) estimated the most sensitive hearing range (defined as the region with thresholds within 40 dB of best sensitivity) to extend from 30 to 100 Hz up to 7.5 to 25 kHz, depending on the specific model used. Therefore notch in the 2-10 kHz band of 6 dB will only affect a small region of minke whale hearing. In addition, minke whale communication signals have been demonstrated to be below 2 kHz (Edds-Walton 2000, Mellinger *et al*. 2000, Gedamke *et al*. 2001, Risch *et al*. 2013, Risch *et al*. 2014) and therefore a change in their hearing sensitivity at a notch between 2-10 kHz is unlikely to have any significant effect on their communication ability and therefore their ability to survive and reproduce. In addition, like other mysticete whales, minke whales are also thought to be capable of hearing sounds through their skull bones (Cranford and Krysl 2015) which would not be subject to the same anatomical and neurophysiological changes associated with high noise levels.

In conclusion, the number of minke whales predicted to experience PTS varies with the differing density estimates and with the different build scenarios.

The magnitude of impact has been assessed as **low**, given the low proportion of the MU predicted to experience PTS and the fact that these estimates are likely overestimates as they do not account for ADD deterrence or the change in noise characteristics with distance; in addition, recent advances in our understanding of how this PTS manifests demonstrates that any PTS experienced will unlikely result in any change to the ability of minke whales to communicate, survive or reproduce. The high sensitivity score combined with the **low** magnitude score results in the effect of PTS on minke whales being assessed as **moderate significance** which is significant in EIA terms.

The use of ADDs as mitigation prior to the piling soft-start will serve to reduce the number of animals predicted to experience PTS. A detailed piling strategy with a refined soft/slow start will also reduce these ranges considerably. Therefore, it is expected that with the application of an appropriate piling strategy and the use of ADDs as mitigation, the **residual effect** of PTS on minke whales can be reduced to **minor significance**, which is therefore **not significant** in EIA terms.

4.4.4 Pinnipeds

The EIA Report using a 0.5% CF concluded that the sensitivity of pinnipeds (both harbour and grey seals) to PTS as a result of both single vessel and concurrent monopile or pin-pile installation was **medium** and, after the adoption of a piling strategy including appropriate mitigation (e.g. a piling soft start and the use of ADDs), the magnitude of the impact was **negligible**, therefore the effect of PTS on either seal species was of **minor significance,** and was therefore **not significant** in EIA terms.

The results of the noise modelling using the 1% CF resulted in no discernable PTS impact range (<50 m). This suggests that alongside the adoption of an appropriate piling strategy including appropriate mitigation (e.g. soft start and the use of ADDs) the risk of PTS to any seal is of negligible magnitude.

Therefore the effect of PTS on either seal species is of **minor significance,** and is therefore **not significant** in EIA terms.

This represents **no change in the overall impact significance** between the results of the 0.5% and 1% CF noise modelling for either seal species PTS.

4.5 Disturbance comparison – 1% and 0.5% CF

4.5.1 Bottlenose dolphins

The EIA Report using a 0.5% CF concluded that the sensitivity of bottlenose dolphins to behavioural disturbance as a result of both single vessel and concurrent monopile or pin-pile installation was **medium** and the magnitude of the impact, considering the outcome of modelling the population consequences of disturbance using the interim Population Consequences of Disturbance framework (iPCoD) was **low**, therefore the effect of behavioural disturbance on bottlenose dolphins was of **minor significance,** and was therefore **not significant** in EIA terms.

The results of the noise modelling using the 1% CF (Table 4.6) resulted in a maximum number of 22 bottlenose dolphins predicted to be disturbed on a single day of piling under the concurrent monopile scenario (11.28% of the MU). As per the EIA Report, the three build scenarios were modelled using iPCoD to determine if the predicted level of disturbance resulted in a predicted long-term population level effect in order to inform the assessment of magnitude.

Table 4.6 Predicted number of bottlenose dolphins potentially disturbed on each piling day under the 3 build scenarios that were modelled

Scenario	Hammer Energy (kJ)	# Individuals Disturbed	% of MU
0.5% CF			
Concurrent Monopile	5000	14.6	7.49%
Concurrent Pin-pile	3000	11.9	6.10%
Single Pin-pile	3000	10.0	5.13%
1% CF			
Concurrent Monopile	5000	22.0	11.28%
Concurrent Pin-pile	3000	16.1	8.26%
Single Pin-pile	3000	14.8	7.59%

4.5.1.1 iPCoD Modelling

The three build scenarios were modelled using the publically available iPCoD code v4.1. The piling schedule for each build scenario was the same as that used in the EIA Report (see EIA Report Table 9.7.6). The summary results for each of the three build scenarios are presented in Table 4.7. None of the three scenarios using the 1% CF modelling resulted in any significant impact on the bottlenose dolphin population. The installation of single pin-piles resulted in the largest change in median population size after 24 years, but this was still only a difference in population size between the impacted and un-impacted of 7 animals. The centile for un-impacted population which matches the 50th centile for the impacted population ranges between 45 and 46% depending on the build scenario after year 1 which is when most of the impact occurs. By the end of year 24 the centile for un-impacted population which matches the 50th centile for the impacted population is 49 or 50% meaning there is little or no difference between the impacted and un-impacted populations. The results from all three build scenarios are very similar, however, as per the results of the EIA Report, the iPCoD modelling identified the single installation of pin-piles as the worst case scenario, therefore the results of this scenario has been detailed further below.

Table 4.7 Results of the iPCoD modelling for bottlenose dolphins under 3 scenarios: concurrent installation of monopiles (5,000 kJ), single vessel installation of pin-piles (3,000 kJ) and concurrent installation of pin-piles (3,000 kJ) using the 1% CF model

Result Parameter		Concurrent Monopile	Single Pin-pile	Concurrent Pin-pile
Median Population Size Year 24	Un-impacted	300	307	304
	Impacted	296	300	300
	Difference	4	7	4
	Impacted as % of un-impacted	98.7%	97.7%	98.7%
Ratio of the impacted to un-impacted population size	Yr 1 Min	0.8542	0.8700	0.8737
	Yr 6 Min	0.8519	0.8198	0.8526
	Yr 12 Min	0.8452	0.8110	0.8333
	Yr 18 Min	0.8333	0.8121	0.8376
	Yr 24 Min	0.8370	0.7969	0.8018
	Yr 1 Median	0.9903	0.9905	0.9907
	Yr 6 Median	0.9909	0.9808	0.9912
	Yr 12 Median	0.9918	0.9816	0.9923
	Yr 18 Median	0.9927	0.9810	0.9938
	Yr 24 Median	0.9951	0.9821	1.0000
	Yr 1 Mean	0.9871	0.9881	0.9881
	Yr 6 Mean	0.9867	0.9771	0.9864
	Yr 12 Mean	0.9868	0.9783	0.9863
	Yr 18 Mean	0.9867	0.9782	0.9865
	Yr 24 Mean	0.9873	0.9778	0.9868
	Yr 1 Median	0.9903	0.9905	0.9907
	Yr 6 Median	0.9985	0.9968	0.9985
Ratio of impacted to un-impacted annual growth rate	Yr 12 Median	0.9993	0.9985	0.9994
	Yr 18 Median	0.9996	0.9989	0.9997
	Yr 24 Median	0.9998	0.9992	1.0000
	Yr 1 Mean	0.9871	0.9881	0.9881
	Yr 6 Mean	0.9977	0.9960	0.9976
	Yr 12 Mean	0.9988	0.9981	0.9988
	Yr 18 Mean	0.9992	0.9987	0.9992
	Yr 24 Mean	0.9994	0.9990	0.9994
	Yr 1	45%	45%	46%

Table 4.7 Results of the iPCoD modelling for bottlenose dolphins under 3 scenarios: concurrent installation of monopiles (5,000 kJ), single vessel installation of pin-piles (3,000 kJ) and concurrent installation of pin-piles (3,000 kJ) using the 1% CF model

Result Parameter		Concurrent Monopile	Single Pin-pile	Concurrent Pin-pile
Centile for un-impacted population which matches the 50th centile for the impacted population	Yr 6	48%	49%	50%
	Yr 12	49%	50%	49%
	Yr 18	49%	50%	50%
	Yr 24	50%	50%	49%

Table 4.8 Predicted number of bottlenose dolphins potentially disturbed on each piling day under the 3 build scenarios

Scenario	Hammer Energy (kJ)	# Individuals Disturbed	% of MU	Median Population Size Year 24		Ratio population size
				Difference	Impacted as % of un-impacted	Median Year 24
0.5% CF						
Concurrent Monopile	5000	14.6	7.49%	1	99.6%	1
Concurrent Pin-pile	3000	11.9	6.10%	5	98.2%	1
Single Pin-pile	3000	10.0	5.13%	4	98.5%	0.9946
1% CF						
Concurrent Monopile	5000	22.0	11.28%	4	98.7%	0.9951
Concurrent Pin-pile	3000	16.1	8.26%	4	98.7%	1
Single Pin-pile	3000	14.8	7.59%	7	97.7%	0.9821

4.5.1.2 Single vessel pin-pile installation

The median predicted population size for the un-impacted population after 24 years was 307 (mean 311, 95% CI 176 - 384). The median predicted population size for the impacted population after 24 years was 300 (mean 304, 95% CI 172 – 382) which is 97.7% of the size of the un-impacted population. This means that after a simulated 24 years the size difference between the median un-impacted and impacted population was 7 animals, with a large overlap in confidence intervals. Therefore, there was no significant difference between the predicted un-impacted and impacted population sizes as a result of the predicted levels of disturbance.

The population trajectory for both the un-impacted and the impacted populations (the mean and each individual 1,000 simulated outcomes) are presented in Figure 4.2 below. This demonstrates that the mean impacted population is predicted to experience an initial decline in growth rate relative to the un-impacted population, after which it then returns to the same growth rate as the un-impacted population and continues to increase at the same rate as the un-impacted population for the remainder of the simulations.

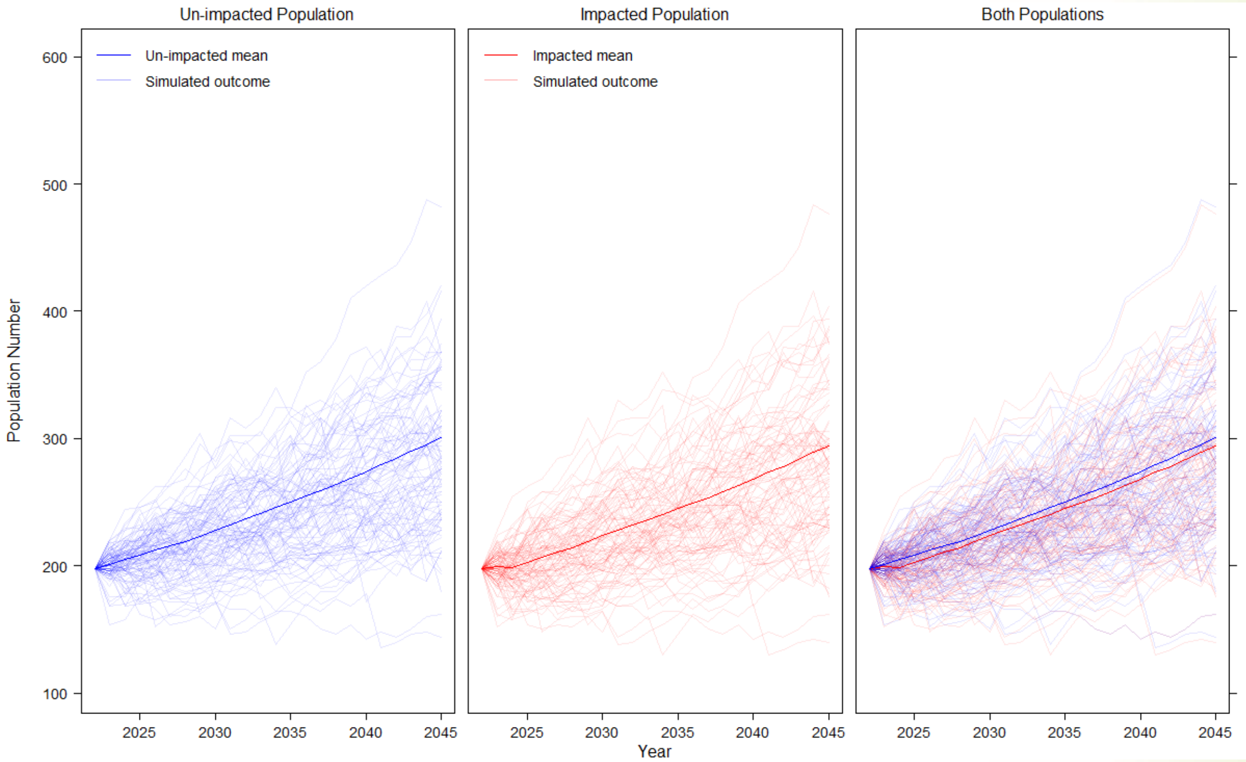

Figure 4-2 Simulated bottlenose dolphin population sizes for both the un-impacted and the impacted populations after single piling of pin-piles at 3,000 kJ using the 1% CF

Comparing across all 1,000 paired simulations, the median ratio of un-impacted and impacted population sizes ranged between 0.981 and 0.990 and the mean ratio of the un-impacted and impacted population sizes ranged between 0.977 and 0.988. This means that a small number of the simulations resulted in impacted populations that were smaller than the paired un-impacted population in all simulation years, although the effect was very small.

The maximum ratio of the impacted to the baseline population (Table 4.9) ranged between 1.05 and 1.1, which means that in a small number of the 1,000 paired simulations, the impacted population size was greater than that of the paired un-impacted population size. The minimum ratio between the impacted and the un-impacted population size was between 0.797 and 0.870, which means that the minimum impacted population size across all pairs was between 79.7% and 87% of the size of the paired un-impacted population. This is further demonstrated in Figure 4.3 which provides a series of histograms of the ratio of the impacted population to the un-impacted population across all 1,000 paired simulations at a range of time steps in the simulation. Across all years examined (1, 6, 12, 18 and 24), in most of the 1,000 paired simulations there was little/no difference between the impacted and the un-impacted population size (as depicted by the histogram bar at and around x value 1.00).

Table 4.9 Summary Statistics for the Ratio of the Impacted to Un-Impacted Population Size Between 1,000 Paired Bottlenose Dolphin Simulations for the Installation of Single Pin-Piles (3,000 kJ) using a 1% Conversion Factor						
Simulation Year	**Min.**	**1st Qu.**	**Median**	**Mean**	**3rd Qu.**	**Max.**
1	0.87	0.977778	0.990476	0.988104	1.009434	1.054348
6	0.81982	0.950413	0.98083	0.977139	1	1.118812
12	0.811024	0.951574	0.981623	0.978255	1.006757	1.1
18	0.812081	0.95191	0.981042	0.978182	1	1.112782
24	0.796875	0.952592	0.982114	0.977824	1	1.094595

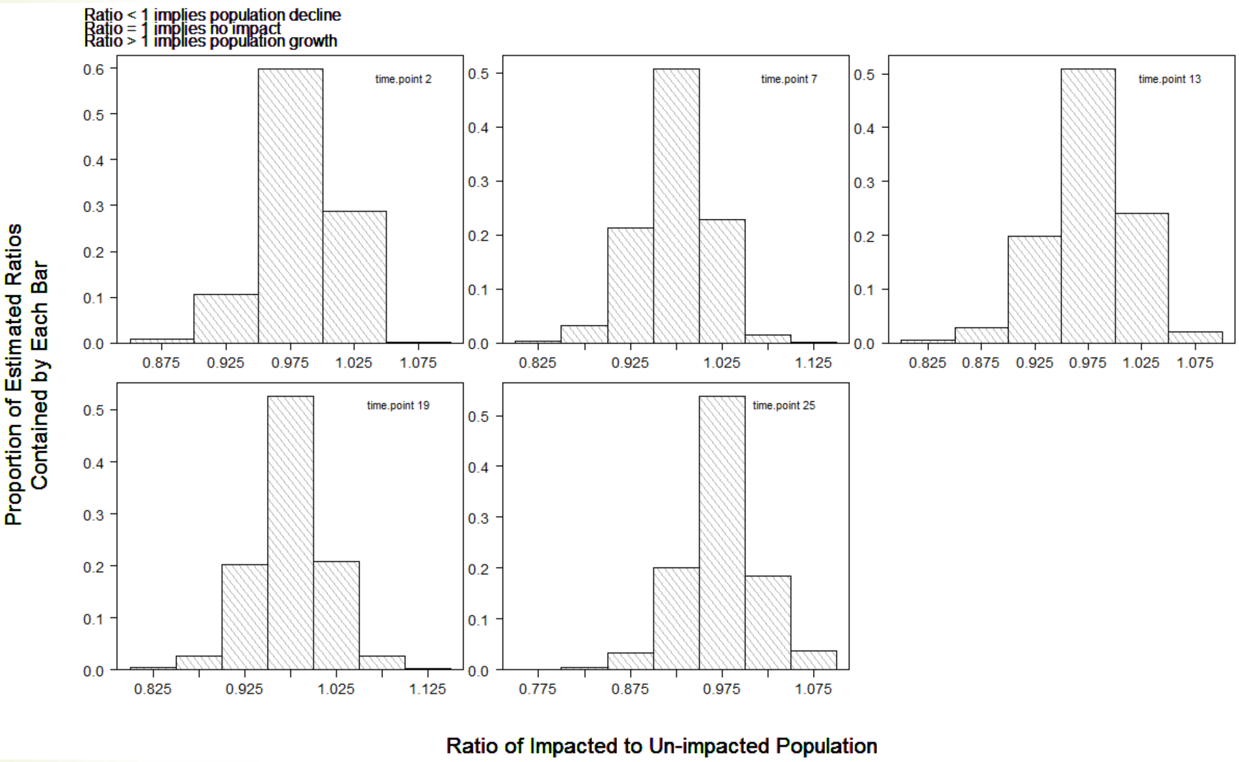

Figure 4-3 Ratio of bottlenose dolphin impacted to un-impacted bottlenose dolphin population size for years 1, 6, 12, 18 and 24 for the single vessel installation of pin-piles at 3,000 kJ using the 1% CF

Across all 1,000 paired simulations, the median ratio of the impacted to un-impacted annual growth rates in all the years examined, was between 0.990 and 0.999 (Table 4.10). This means that a small number of the simulations resulted in a change from one year to the next that was lower for the impacted population compared to the paired un-impacted population in all simulation years, although the effect was very small. This is further demonstrated in Figure 4.4 which provides a series of histograms of the ratio of the impacted to un-impacted annual growth rate across all 1,000 paired simulations at a range of time steps in the simulation. Across all years examined (1, 6, 12, 18 and 24), in most of the 1,000 paired simulations there was little/no difference between the impacted and the un-impacted population size (as depicted by the histogram bar at and around x value 1.00).

Table 4.10 Summary Statistics for the Ratio of the Impacted to Un-Impacted Annual Growth Rate Across Years for the Bottlenose Dolphin Simulations for the Installation of Single Pin-Piles (3,000 kJ) using a 1% Conversion Factor				
Simulation Year	**1st Qu.**	**Median**	**Mean**	**3rd Qu.**
1	0.977778	0.990476	0.988104	1.009434
6	0.991559	0.996779	0.996043	1
12	0.995872	0.998456	0.998106	1.000561
18	0.997266	0.998937	0.998729	1
24	0.997978	0.999248	0.999029	1

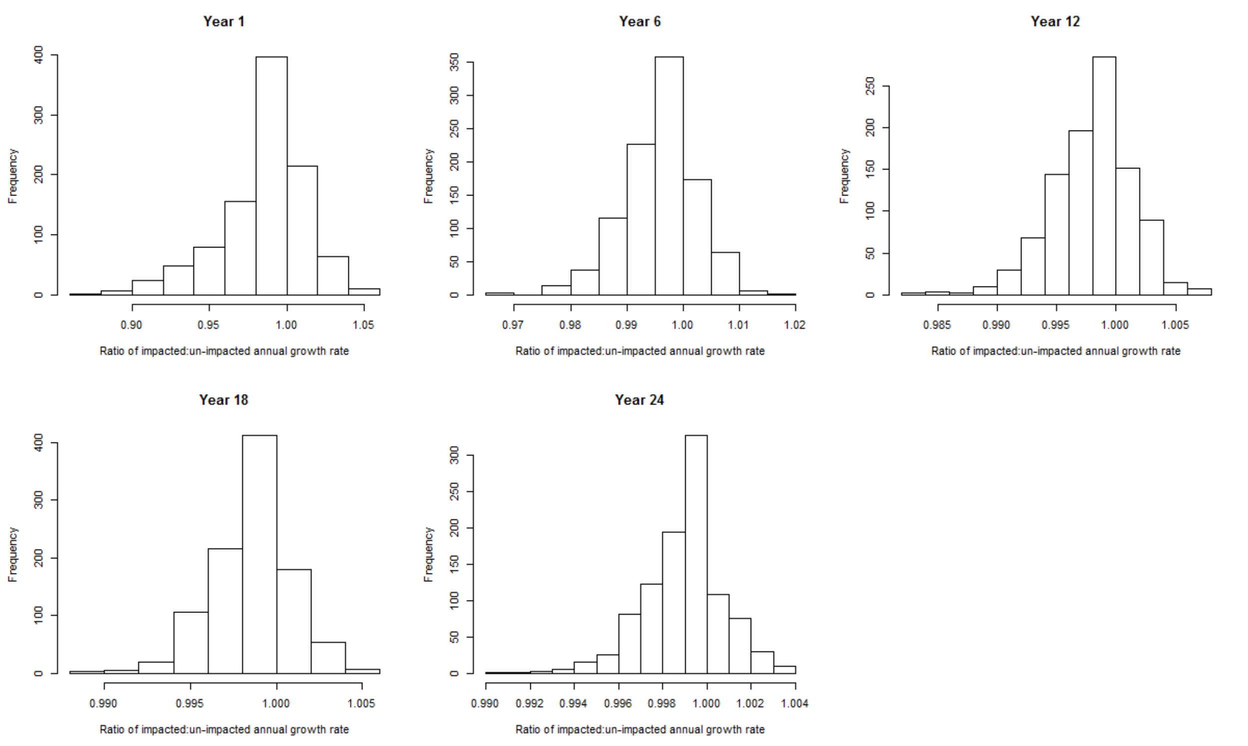

Figure 4-4 Ratio of bottlenose dolphin impacted to un-impacted annual growth rate for years 1, 6, 12, 18 and 24 for the single vessel installation of pin-piles at 3,000 kJ using the 1% CF

4.5.1.3 Conclusions

None of the bottlenose dolphin impact scenarios resulted in a significant long term population effect when considering the results from the 1% CF noise modelling. As was the case with the 0.5% CF results, overall, when considering the difference in annual growth rates and predicted population sizes between the matched pairs, the single pin-pile scenario resulted in fractionally more of a population level impact compared to the other scenarios. The population trajectory for both the un-impacted and the impacted populations demonstrates that the mean impacted population is predicted to experience an initial decline in size relative to the un-impacted population, after which it then returns to the same growth rate as the un-impacted population and continues to increase at the same rate as the un-impacted population for the remainder of the simulations. Overall, the level of disturbance cause by the single vessel installation of pin-piles (3,000 kJ) is unlikely to result in any significant differences between the un-impacted and the impacted population.

The sensitivity of bottlenose dolphins to behavioural disturbance has been assessed as **medium** and, given the results of the iPCoD population modelling, across all scenarios with the lack of an overall long term difference in population growth rates or predicted size, the magnitude of the impact has been assessed as **low**, in terms of the effect on the long term population trajectory, therefore the effect behavioural disturbance as a result of single and concurrent, monopile and pin-pile installation on bottlenose dolphins is of minor significance, and therefore **not significant in EIA terms**.

This represents **no change in the overall impact significance** between the results of the 0.5% and 1% CF noise modelling for bottlenose dolphin behavioural disturbance.

4.5.2 Harbour Porpoise

The EIA Report using a 0.5% CF concluded that the sensitivity of harbour porpoise to behavioural disturbance as a result of both single vessel and concurrent monopile or pin-pile installation was **medium** and the magnitude of the impact was **negligible**, therefore the effect of behavioural disturbance on harbour porpoise was of **minor significance,** and was therefore **not significant** in EIA terms.

The results of the noise modelling using the 1% CF resulted in a maximum number of 2,207 harbour porpoise predicted to be disturbed on a single day of piling under the concurrent monopile scenario (0.64% of the MU) (Table 4.11). This results in a **low** magnitude score, therefore the effect of behavioural disturbance on harbour porpoise is of **minor significance,** and is therefore **not significant** in EIA terms.

This represents **no change in the overall impact significance** between the results of the 0.5% and 1% CF noise modelling for harbour porpoise behavioural disturbance.

Table 4.11 Predicted number of harbour porpoise potentially disturbed on each piling day under the 3 build scenarios

Scenario	Hammer Energy (kJ)	# Individuals Disturbed	% of MU	Sensitivity Score	Magnitude Score	Impact Significance
0.5% CF						
Concurrent Monopile	5000	1609	0.47%	Medium	Negligible	Minor
Concurrent Pin-pile	3000	1348	0.39%	Medium	Negligible	Minor
Single Pin-pile	3000	639	0.19%	Medium	Negligible	Minor
1% CF						
Concurrent Monopile	5000	2207	0.64%	Medium	Low	Minor
Concurrent Pin-pile	3000	1824	0.53%	Medium	Low	Minor
Single Pin-pile	3000	1432	0.41%	Medium	Low	Minor

4.5.3 Harbour Seal

The EIA Report using a 0.5% CF concluded that the sensitivity of harbour seals to behavioural disturbance as a result of both single vessel and concurrent monopile or pin-pile installation was **medium** and the magnitude of the impact was **low**, therefore the effect of behavioural disturbance on harbour seals was of **minor significance,** and was therefore **not significant** in EIA terms.

The results of the noise modelling using the 1% CF resulted in a maximum number of 35.9 harbour seals predicted to be disturbed on a single day of piling under the concurrent monopile scenario (2.75% of the MU) (Table 4.12). This results in a **low** magnitude score, therefore the effect of behavioural disturbance on harbour seals is of **minor significance,** and is therefore **not significant** in EIA terms.

This represents **no change in the overall impact significance** between the results of the 0.5% and 1% CF noise modelling for harbour seal behavioural disturbance.

Table 4.12 Predicted number of harbour seals potentially disturbed on each piling day under the 3 build scenarios

Scenario	Hammer Energy (kJ)	# Individuals Disturbed	% of MU	Sensitivity Score	Magnitude Score	Impact Significance
0.5% CF						
Concurrent Monopile	5000	19.6	1.50%	Medium	Low	Minor
Concurrent Pin-pile	3000	11.0	0.84%	Medium	Low	Minor
Single Pin-pile	3000	6.4	0.49%	Medium	Low	Minor
1% CF						
Concurrent Monopile	5000	35.9	2.75%	Medium	Low	Minor
Concurrent Pin-pile	3000	23.3	1.79%	Medium	Low	Minor
Single Pin-pile	3000	14.2	1.09%	Medium	Low	Minor

4.5.4 Grey Seal

The EIA Report using a 0.5% CF concluded that the sensitivity of grey seals to behavioural disturbance as a result of both single vessel and concurrent monopile or pin-pile installation was **low** and the magnitude of the impact was **low**, therefore the effect of behavioural disturbance on grey seals was of **minor significance,** and was therefore **not significant** in EIA terms.

The results of the noise modelling using the 1% CF resulted in a maximum number of 346.2 grey seals predicted to be disturbed on a single day of piling under the concurrent monopile scenario (9.8% of the MU) (Table 4.13). This results in a **medium** magnitude score, therefore the effect of behavioural disturbance on grey seals is of **minor significance,** and is therefore **not significant** in EIA terms.

This represents **no change in the overall impact significance** between the results of the 0.5% and 1% CF noise modelling for grey seal behavioural disturbance.

Table 4.13 Predicted number of grey seals potentially disturbed on each piling day under the 3 build scenarios

Scenario	Hammer Energy (kJ)	# Individuals Disturbed	% of MU	Sensitivity Score	Magnitude Score	Impact Significance
0.5% CF						
Concurrent Monopile	5000	207	5.86%	Low	Low	Minor

Table 4.13 Predicted number of grey seals potentially disturbed on each piling day under the 3 build scenarios						
Scenario	**Hammer Energy (kJ)**	**# Individuals Disturbed**	**% of MU**	**Sensitivity Score**	**Magnitude Score**	**Impact Significance**
Concurrent Pin-pile	3000	125	3.54%	Low	Low	Minor
Single Pin-pile	3000	74	2.09%	Low	Low	Minor
1% CF						
Concurrent Monopile	5000	346	9.80%	Low	Medium	Minor
Concurrent Pin-pile	3000	244	6.90%	Low	Medium	Minor
Single Pin-pile	3000	139	3.94%	Low	Low	Minor

4.5.5 Minke Whale

The EIA Report using a 0.5% CF concluded that the sensitivity of minke whales to behavioural disturbance as a result of both single vessel and concurrent monopile or pin-pile installation was **medium** and the magnitude of the impact was **negligible**, therefore the effect of behavioural disturbance on minke whales was of **minor significance,** and was therefore **not significant** in EIA terms. However, as detailed in section 4.3, an error was identified in the calculation used to derive the estimates and advice was provided on the most appropriate density surface to use, therefore revised 0.5% CF results have been presented alongside the new 1% CF results.

The results of the noise modelling using the 1% CF resulted in a maximum number of 59 minke whales predicted to be disturbed on a single day of piling under the concurrent monopile scenario (0.25% of the MU) using the JCP Phase III summer density estimate (Table 4.15). Using the JCP Phase III average density estimate across all four seasons resulted in a maximum number of 37 minke whales predicted to be impacted under the concurrent monopile scenario (0.16% of the MU) (Table 4.15). The equivalent estimate using the SCANS III density estimate is 39 minke whales predicted to be disturbed on a single day of piling under the concurrent monopile scenario (0.17% of the MU) (Table 4.14). Regardless of which density estimate is used, this results in a **negligible** magnitude score, therefore the effect of behavioural disturbance on minke whales is of **minor significance,** and is therefore **not significant** in EIA terms.

In all cases, for both the 0.5% CF and the 1% CF under all build scenarios, the magnitude score was **negligible**, resulting in an overall **minor** impact significance which is **not significant** in EIA terms.

Table 4.14 Predicted number of minke whales potentially disturbed on each piling day using the Hammond *et al*. (2017) SCANS III densities						
Scenario	**Hammer Energy (kJ)**	**# Individuals Disturbed**	**% of MU**	**Sensitivity Score**	**Magnitude Score**	**Impact Significance**
0.5% CF						
Concurrent Monopile	5000	39.4	0.17%	Medium	Negligible	Minor
Concurrent Pin-pile	3000	30.2	0.13%	Medium	Negligible	Minor
Single Pin-pile	3000	26.3	0.11%	Medium	Negligible	Minor

Table 4.14 Predicted number of minke whales potentially disturbed on each piling day using the Hammond *et al*. (2017) SCANS III densities

Scenario	Hammer Energy (kJ)	# Individuals Disturbed	% of MU	Sensitivity Score	Magnitude Score	Impact Significance
1% CF						
Concurrent Monopile	5000	58.8	0.25%	Medium	Negligible	Minor
Concurrent Pin-pile	3000	43.4	0.18%	Medium	Negligible	Minor
Single Pin-pile	3000	31.5	0.13%	Medium	Negligible	Minor

Table 4.15 Predicted number of minke whales potentially disturbed on each piling day using the Paxton *et al*. (2016) JCP Phase III Summer (S) estimated density and the average (A) estimated density across all four seasons

Scenario	Hammer Energy (kJ)	# Individuals Disturbed	% of MU	Sensitivity Score	Magnitude Score	Impact Significance
0.5% CF						
Concurrent Monopile	5000	80.6 (S) 26.9 (A)	0.34% (S) 0.11% (A)	Medium	Negligible	Minor
Concurrent Pin-pile	3000	63.3 (S) 21.1 (A)	0.27% (S) 0.09% (A)	Medium	Negligible	Minor
Single Pin-pile	3000	52.6 (S) 17.5 (A)	0.22% (S) 0.07% (A)	Medium	Negligible	Minor
1% CF						
Concurrent Monopile	5000	111.2 (S) 37.1 (A)	0.47% (S) 0.16% (A)	Medium	Negligible	Minor
Concurrent Pin-pile	3000	87.7 (S) 29.2 (A)	0.37% (S) 0.12% (A)	Medium	Negligible	Minor
Single Pin-pile	3000	66.7 (S) 22.2 (A)	0.28% (S) 0.09% (A)	Medium	Negligible	Minor

4.6 Conclusions

This assessment has demonstrated that the use of a 1% CF for noise modelling resulted in no changes to the significance of predicted impacts for most of the marine mammal species assessed, when considering PTS as well as disturbance effects. The exception being minke whales where the change from 0.5% CF to 1% CF resulted in a change in the PTS assessment from negligible to low magnitude which resulted in a change of impact significance from minor to moderate. The predicted increase in noise levels as a result of assuming a higher energy conversion efficiency has affected minke whales proportionately more than the other species because of their specialised low frequency hearing relative to the low frequency content of the piling noise.

The residual impact of PTS for all species after the application of appropriate mitigation in the form of a Piling Strategy including appropriate mitigation (e.g. soft start and the use of ADDs) to reduce the risk of PTS to individuals remains either **negligible or minor** and are therefore **not significant in EIA terms**.

The impact of disturbance for all species remains **minor** and therefore **not significant in EIA terms**.

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5 Seascape, Landscape and Visual Impact Assessment (SLVIA)

5.1 Introduction – amended distances

During the preparation of additional information for inclusion in the Addendum to the Moray West Offshore Wind Farm application in relation to the assessment of the Alternative Moray West Site (Addendum Document PART 2) it emerged that there were some errors in the separation distances presented in the EIA Report - Volume 2 Chapter 14 for six viewpoints. The affected viewpoints, corresponding EIA Report figures (presented in the EIA Report – Volume 3b) and sections of text in the EIA Report Chapter 14 are noted in Table 5.1 below. The corrected distances and references have also been provided.

Table 5.1 Updated distances for Moray West SLVIA viewpoints

Viewpoint	Distance to nearest turbine in Moray West Worst Case Scenario SLVIA Layout as stated in the Application EIA Report 2018 SLVIA (km)	Corrected distance to nearest turbine in Moray West Worst Case Scenario SLVIA Layout (km)	Figures and main text sections affected
1: Duncansby Head	53.35	51.1	Figure 14.7.9, SLVIA Tables 14.4.1, 14.7.1
2: Keiss	43.01	40.8	Figure 14.7.10, SLVIA Tables 14.4.1, 14.7.1
3: Wick	32.28	30.1	Figure 14.7.1, SLVIA Tables 14.4.1, 14.7.1, 14.7.5
4: Sarclet	26.55	24.6	Figure 14.7.12, SLVIA Tables 14.4.1, 14.7.1
5: Whaligoe Steps	25.77	24	Figure 14.7.13, SLVIA Tables 14.4.1, 14.7.1
18: Bin Hill	43.01	42.8	Figure 14.7.28, SLVIA Tables 14.4.1, 14.7.1

The incorrect distances have been reviewed and it is concluded that they make no difference to the conclusions of effect significance as presented in the EIA Report – Volume 2 Chapter 14: SLVIA.

5.2 Consideration of Design Envelope changes

As noted in the Non-Technical Summary, Moray West, in addition to the variation to the application boundary to include the Alternative Moray West Site, has proposed two further changes to the design envelope including the removal of the Model 4 WTG and a reduction in operational period of the Development from 50 years to 25 years.

A consequence of removing the Model 4 WTG, is that with respect to SLVIA, the Model 3 WTG becomes the new Worst Case Scenario (WCS). Further detail on the Model 3 WTG as the revised WCS is provided in PART 2 of the Addendum Document – Chapter 11. This is based on layouts involving 72 of the Model 3 WTGs (the maximum number of turbines for this model included in the Design Envelope – EIA Report – Volume 2 Chapter 4 Description of Development).

With respect to the current Moray West Site, Moray West presented, as part of the original application (July 2018) visualisations illustrating the worst case scenarios for the Model 3 layouts (based on 72 WTGs). These were included as cumulative wirelines for Viewpoint 3: Wick (path south of South View); Viewpoint 7: Lybster (end of Main Street); Viewpoint 9a: Dunbeath (nr Heritage Centre); Viewpoint 12: Navidale; and Viewpoint 16: Lossiemouth Harbour. These are included in in the EIA Report - Volume 3b after each of the other figures corresponding to these viewpoints (Figure 17.7.11, 17.7.15, 17.7.17, 14.7.21, 14.7.27 respectively).

In addition to this a comparative ZTV was prepared for the Model 4f Layout and Model 3 layouts. This was also presented in the EIA Report – Volume 3b Figure 14.7.1d).

With respect to the reduction in the duration of the operational period from 50 years to 25 years, while there might be a reduction in magnitude of the effect in terms of effect duration, the overall conclusions of effect significance presented in the EIA Report – Volume 2, Chapter 14 are not expected to change.

6 Socio-economics

6.1 Changes to baseline conditions within the Moray West Study Area

Since submission of the Moray West application in July 2018, there have been a number of significant investments and commitments within the local study area. These include in particular, the placement of three contracts by Moray East with key harbour facilities. Namely:

- Port of Cromarty Firth – Moray East have awarded a contract to Port of Cromarty Firth (Invergordon) to be Intermediate Delivery Port for the construction of the wind farm. This contract will allow Port of Cromarty Firth to enact delivery of their Phase 4 delivery plan which will create;
    - Land reclamation providing an additional 4.5 Ha of laydown space;
    - 215 m of berthing to create Berth 6, adjacent to Berth 5 providing a 369 m long combined quay face; and
    - Fendering of Berths 5 and 6.

  This development will require a capex investment of £25 m, and will bolster facilities allowing the Port to reinforce its position for securing future works. It is also notable that whilst offshore wind is the catalyst for investment, the improved facilities will considerably increase the facility's capacity to handle cruise vessels indicating the associated synergies for wider economic benefit that offshore wind can enable.

- A further contract for similar services is known to have been placed within the local study area, but is still subject to confidentiality restrictions. This will provide a future pipeline of work to an existing facility, helping further underpin its resilience and increase its long term viability and likelihood of securing future works, thus increasing the possibility for retaining value in the local study area.

- Fraserburgh Harbour – Fraserburgh has been contracted as the Operations and Maintenance base for Moray East. In the delivery of this contract new quay facilities will be constructed along with offices, warehousing and workshop facilities. Whilst these facilities are inherently driven by the turbine choice elected for Moray East, they indicate the scale of commitment and model that is likely to be deployed in the local study area and the willingness of the local supply chain to embrace the opportunity.

None of the changes to the baseline lead to a change in the conclusions of effect significance presented in the Moray West EIA Report – Volume 2, Chapter 15 on the basis that in EIA terms these changes to the baseline are not measurable within the parameters of the current study. However they are indications of certainty and validity of the assumptions made in the EIA Report. They provide increased confidence that the potential for value, in terms of GVA and employment, to be captured in the local study area can be realised closer to the High scenario values presented in the EIA Report.

6.2 Revisions to the Moray West Design Envelope with respect to the current application

The proposed changes to the Moray West Design Envelope in terms of the removal of the Model 4 WTG and reduction in the operational period from 50 years to 25 years are not expected to affect the overall conclusions of effects significance presented in the Moray West EIA Report – Volume 2, Chapter 15. This is on the basis that the with respect to the creation of local employment and GVA, the worst case scenario (which contributes to the lowest benefit) was identified as the Model 4 WTG on the basis that this was the lowest number of turbines. With removal of the Model 4 WTG, Model 3 WTG becomes the revised WCS. However, given that the number of WTGs associated with Model 3 is higher than Model 4 (72 compared to 62) there is expected to be a slight improvement in the levels of expenditure associated with the revised WCS.

With respect to the change in the operational period from 50 year to 25 years, given that the assessment of operation and maintenance impacts presented in the EIA Report – Volume 2, Chapter 15 was based on a 25 year operational period (see Table 15.7.3) it can be concluded that there would be no change in the conclusions of effect significance.

Addendum – PART 2

Additional Information - Assessment of the Alternative Moray West Site and Design Changes

Moray Offshore Windfarm (West) Limited

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1 Addendum PART 2: Additional Information – Alternative Moray West Site area

1.1 Introduction

This part the Addendum Document (PART 2) focuses on providing additional information relating to the proposed variation to the consent application. This includes an assessment of the revised design parameters (removal of Model 4 WTG and change in duration of the operational period of the Development from 50 years to 25 years) and presents an assessment of the Alternative Moray West Site area to determine whether there would be any changes in the conclusions of effect significance presented in the EIA Report – Volume 2, Chapters 6 to 17 with respect to the current Moray West Site.

1.2 Basis for the variation to the application and associated design changes

1.2.1 Basis for the variation to current application

As discussed in the non-technical summary, while Moray West is of the view that, with the removal of the Model 4 WTG and a reduction in the duration of the operational period from 50 years to 25 years, the predicted effects of the Moray West Development are acceptable or can be mitigated or be controlled by relevant conditions, the variation to the Moray West application boundary has been identified as an option for further reducing potential adverse effects identified by stakeholders with respect to seascape, landscape and visual receptors.

By reducing the western extent of the current Moray West Site, and varying to application boundary to accommodate a limited extension to the south of the Moray West Site (part of the Alternative Moray West Site), potential effects on seascape, landscape and visual receptors would be reduced by:

- Reducing the horizontal extent of the Development thereby reducing the total distance over which significant adverse effects are likely to be experienced;
- Extending the site in a southerly direction would create more of a 'block' shaped site which would reduce the number of viewpoints from which there would be a loss of views to open sea; and
- Changing the shape of the site in a way that limits the potential for layouts to include 'outlier' turbines (turbines that appear to be separated from the rest of the offshore wind farm). This is of particular importance for the larger turbine models where an associated increase in spacing exacerbates the appearance of outliers.

1.2.2 Basis for the removal of the Model 4 WTG

In addition to the variation to the current Moray West Site (the Alternative Moray West Site) removal of the Model 4 WTG would help mitigate concerns relating to the larger turbine sizes by reducing the scale of the Development and limiting potential discord between the Moray West turbines and adjacent and smaller turbines associated with the Beatrice Offshore Wind Farm.

1.2.3 Reduction on the duration of the wind farm operation from 50 years to 25 years

Moray West is also requesting a reduction in the duration of the windfarm operation under the consent from 50 years to 25 years. As with the reduction in maximum number of WTGs to be installed within the site, the basis of this reduction is to give further increased confidence that the Development will not give rise to any adverse effects on the East Caithness Cliffs SPA and North Caithness Cliffs SPA.

1.3 Ornithology considerations

Moray West has made a commitment to reducing kittiwake collisions by 7% (57 to 53 per annum). This reduction in kittiwake collisions is one of the adjustment factors that has been applied to the calculation of in-combination collision mortality for East Caithness Cliffs SPA and North Caithness Cliffs SPA. It is proposed that the reduction in predicted kittiwake collisions from 57 to 53 per annum will be achieved through a reduction in turbine numbers from 85 to 79 unless it can be demonstrated through changes to other design parameters identified during preparation of the final Development design and layout that the total number of annual collisions for 85 turbines is not predicted exceed 53 birds kittiwakes.

Moray West at this stage, is therefore not proposing a final reduction in turbine numbers (the assessment of the Alternative Moray West Site is still based on a maximum of 85 Model 2 WTGs).

1.4 Overview of site boundary amendments

The Alternative Moray West Site area in relation to the current Moray West Site area is illustrated in Figure 1.1 (presented in Volume 2). This also identifies the proposed mitigation area and the proposed variation area.

1.5 Implications of the variation in relation to the OfTI Marine Licence application

As shown in Table 1.1 there are no plans to change any of the design parameters for the OfTI in terms of OSPs, interconnector cables and offshore export cable circuits. Given that both the current Moray West Site and the Alternative Moray West Site lie wholly within the current Moray West OfTI boundary (Figure 1.2 – Volume 2), there are also no plans to amend the current OfTI application boundary as submitted in July 2018.

1.6 Legislation, Policy and Guidance updates since Moray West Offshore Windfarm application

There have been no changes in the legislation relevant to the Moray West Offshore Windfarm application since application submission in July 2018. However, it is worth noting the following updates to policy and guidance:

- Scottish Offshore Wind Sectorial Plan; and
- Marine Scotland Consenting and Licensing Guidance.

1.6.1 Scottish Offshore Wind Sectorial Marine Plan

In 2011 The Scottish Government published its plan for offshore wind development in Scottish Territorial Waters – Blue Seas Green Energy. This plan included 6 short-term option sites and a number of medium-term areas of search for further consideration. In 2013, a Draft Sectoral Plan for progressing ten medium-term option areas was published for consultation. This Offshore Wind Sectoral Marine Plan remains to be finalised and is the subject of ongoing work by Marine Scotland, closely linked to the Crown Estate Scotland offshore wind leasing process announced in May 2018. The Plan represents Scottish Ministers' spatial policy for the development of commercial scale offshore wind at a national and regional level. All commercial scale offshore renewables energy developments should be included in in a published Sectoral Marine Plan before they can be considered by Marine Scotland Licensing Operations Team (MS-LOT) under consenting and licensing procedures[1]. The areas referred to in the Sectoral Marine Plan are referred to as adopted Plan Options.

[1] Non-commercial or demonstrator scale development do not need to be included in a Sectoral Marine Plan.

Marine Scotland has undertaken work to define a number of Areas of Search (AoS) for the Offshore Wind Sectoral Marine Plan which were consulted on in summer 2018. These AoS are being refined following consultation feedback and through the development of Regional Locational Guidance (RLG) in order to identify Draft Plan Option Areas (DPOs). The DPOs will be the subject of a Strategic Environmental Assessment (SEA), strategic Habitats Regulations Appraisal (sHRA) and a Social and Economic Assessment which will be consulted on ahead of adoption. Adoption of these Plan Options is expected to be during 2019.

As these areas are still very much in draft format and likely to be refined ahead of being adopted, it is not considered appropriate for them to be considered in the assessment of cumulative impacts presented in this addendum.

1.6.2 Marine Scotland Consenting and Licensing Guidance

In October 2018, Marine Scotland issued updated consenting and licensing guidance for offshore wind, wave and tidal energy applications, which replaces the draft guidance published in 2013. The guidance covers the consenting and licensing process for pre-application, through to application and post determination (including post consent condition requirements), highlighting legislative and process requirements. Moray West are aware of the updated guidance and will take account of it as the application for the Moray West Offshore Wind Farm progresses.

1.7 Chapter structure

Information to inform this assessment has been provided for each of the EIA topics included in the Moray West EIA 2018. A list of each of the EIA topic chapters and corresponding chapter in the Moray West EIA 2018 is provided in Table 1.1 below.

Table 1.1 Chapter and technical appendix references

EIA topic	Addendum PART 2 chapter reference	Relevant Moray West EIA 2018 – Volume 2 Chapter reference	Relevant Moray West EIA 2018 – Volume 4 Technical Appendix reference
Physical processes and water quality	Chapter 3	Chapter 6	Technical Appendix 6.1 Physical Processes Baseline Technical Appendix 6.2 Physical Processes Numerical Modelling Technical Appendix 6.3 Physical Processes Impact Assessment
Benthic ecology[2]	Chapter 4	Chapter 7	Technical Appendix 7.1 Benthic Survey Report
Fish and shellfish ecology	Chapter 5	Chapter 8	-
Marine mammals	Chapter 6	Chapter 9	Technical Appendix 9.1 Marine Mammal Baseline Technical Appendix 9.2 Underwater Noise Modelling Technical Appendix 9.3 Information to Support an EPS Licence

[2] This does not include intertidal ecology on the basis that the information presented in PART 2 of this addendum relates entirely to changes to the boundary of the Moray West Site only and therefore do not affect intertidal ecology.

Table 1.1 Chapter and technical appendix references			
EIA topic	**Addendum PART 2 chapter reference**	**Relevant Moray West EIA 2018 – Volume 2 Chapter reference**	**Relevant Moray West EIA 2018 – Volume 4 Technical Appendix reference**
Ornithology	Chapter 7	Chapter 10	Technical Appendix 10.1 Technical Report Technical Appendix 10.1A Annex A Decision Support System Technical Appendix 10.2 Collision Risk Modelling Technical Appendix 10.3 Displacement
Commercial fisheries	Chapter 8	Chapter 11	Technical Appendix 11.1 Commercial Fisheries Technical Report Technical Appendix 11.2 Draft Commercial Fisheries Mitigation Strategy (CFMS)
Shipping and navigation	Chapter 9	Chapter 12	Technical Appendix 12.1 NRA
Civil and military aviation	Chapter 10	Chapter 13	-
SLVIA	Chapter 11	Chapter 14	Technical Appendix 14.1 SLIVA Methodology Technical Appendix 14.2 SLVIA Baseline Technical Appendix 14.3 Visibility Technical Appendix 14.4 Moray East
Socio-economics, tourism and recreation	Chapter 12	Chapter 15	Technical Appendix 15.1 Socio-economics Technical Report
Marine archaeology and cultural heritage	Chapter 13	Chapter 16	Technical Appendix 16.1 Marine Archaeology Baseline Report
Other human activities	Chapter 14	Chapter 17	Technical Appendix 17.1 Moray Firth High Level Screening Assessment Technical Appendix 17.2 Unexploded Ordnance (UXO) Risk Assessment

1.8 Scope of the Assessment

1.8.1 Overview of approach to the assessment of design changes

The implications of the proposed changes to the Moray West Design Envelope are summarised in Chapter 2. These changes include removal of the Model 4 WTG and a reduction in the duration of the operational period of the Development from 50 years to 25 years. These changes apply to both the current Moray West Site area and the Alternative Moray West Site area.

1.8.2 Overview of approach to the assessment of the Alternative Moray West Site area

The approach taken to assessing the potential effects of developing the Moray West Offshore Wind Farm within the Alternative Moray West Site area is summarised below.

- Step 1: Baseline review – identification of key features of interest / sensitive receptors identified within the current Moray West Site (in particular the proposed mitigation area), and the proposed revised Moray West Site (in particular the proposed variation area where receptors have previously only been assessed with respect to impacts associated with the installation and operation of export cables);
- Step 2: Overview of impacts and associated design parameters assessed in Moray West EIA 2018 for the current Moray West Site area;
- Step 3: Review of effect significance associated with the current Moray West Site area;
- Step 4: Identification of impacts and associated design parameters requiring assessment within the Alternative Moray West Site area;
- Step 5: Assessment of potential effect within the Alternative Moray West Site area and conclusions of effect significance in context of conclusions from the assessment of the current Moray West Site area;
- Step 6: Conclusions on changes to effect significance (cumulative); and
- Step 7: Conclusions on potential differences arising from the application of additional proposed project mitigation (other than the variation to the Moray West Site boundary).

This is an addendum to the Moray West EIA 2018. Therefore, rather than reproduce all of the information included in the EIA documents (Volumes 1 to 4) cross references to relevant chapter and chapter sections of the Moray West EIA Report have been provided. This applies in particular to following sections of the EIA chapters:

- Legislation and policy;
- Consultation (updated to include reference to consultation undertaken specifically in reference to the preparation of this addendum only);
- Baseline characteristics – each chapter includes a summary of key features of interest / sensitive receptors as described above only. Detailed baseline descriptions have not been reproduced for inclusion in this addendum;
- Assessment methods – these have not been reproduced unless there have been changes or updates to particular assessment methods introduced following submission of the Moray West EIA in July 2018;
- Mitigation measures – cross references included to the relevant sections of the assessment chapters included in the Moray West EIA 2018;
- Assessment of potential effects and validation of effect significance – this information has been presented in a table format. This section does not reproduce any of the detailed technical material used to inform the assessment of effects presented in the Moray West EIA 2018. Where necessary cross references to this technical information have been provided; and
- Assessment of cumulative impacts – conclusions provided where necessary with cross references to detailed assessment information presented in the Moray West EIA 2018.

Where appropriate updated figures have been prepared for the various EIA chapters presented in PART 2 of this addendum. These figures are presented in Volume 2 – Figures.

1.9 HRA considerations

As with the approach set out above (Section 2.1) for assessing the effects of developing the Moray West Offshore Wind Farm in the Alternative Moray West Site area and effects associated with removal of the Model 4 WTG and a reduction in operational period of the wind farm from 50 years to 25 years, it is also necessary to consider whether there are any HRA considerations. Further detail on the key HRA considerations associated with the Alternative Moray West Site and design changes is provided in Chapter 15 of this part of the Addendum Document (PART 2).

2 Conclusions from Assessment of Design Changes

2.1 Introduction

The implications of the proposed changes to the Moray West Design Envelope are summarised below. These changes include removal of the Model 4 WTG and a reduction in the duration of the operational period of the Development from 50 years to 25 years. These changes apply to both the current Moray West Site area and the Alternative Moray West Site area.

2.2 Implication of changes to the Design Envelope – removal of the Model 4 WTG

The implications of the other changes to the Moray West Design Envelope (removal of Model 4 WTG and reduction in duration of the operation period from 50 year to 25 years) are summarised below. These changes apply to development within both the current Moray West Site area and the Alternative Moray Site area.

For a number of topics, the Model 4 turbine has been identified as the worst case scenario (WCS) design parameter where there are direct impacts on the seabed (e.g. in relation to impacts on physical processes, benthic ecology, fish and shellfish and marine archaeology). This is due to the design parameters of the substructures that would be required for the Model 4 WTG (e.g. monopiles or gravity base structures). Removal of this WTG model introduces the Model 3 WTG as the new WCS design parameter. As identified in Table 1.2, the design parameters for the substructures associated with the Model 3 WTG are generally less than those identified for the Model 4 WTG substructures. However, the maximum number of Model 3 WTGs is slightly higher than the maximum number of Model 4 WTGs (72 compared to 62). Therefore, the overall footprint on the seabed associated with removal of the Model 4 WTG and introduction of the Model 3 WTG while reduced, the reduction is not sufficiently material to lead to a change in impact magnitude for seabed impacts associated with these topics.

Although the underwater noise modelling for marine mammals was based on design parameters for the Model 4 WTG (15 m diameter monopile) and pin pile jacket foundations (4 m diameter pin piles), the assessment was based on a worst case of 85 turbines (for all WTG model scenarios). It is likely that removal of the Model 4 WTG will lead to a reduction in impact magnitude on the basis that monopile and pin pile diameters for the Model 3 WTG are smaller and therefore have a lower maximum hammer energy. However, the reduction is not expected to be sufficiently material to result in a change in overall effect significance based on the banding of the assessment criteria presented in the EIA Report – Volume 2, Chapter 9. These conclusions apply to both the current Moray West Site area and the Alternative Moray West Site area.

The Model 4 WTG is the best case for ornithology on the basis that it is the lowest number of turbines and presents the lowest risk of collision. Removal of this option will therefore not affect the overall conclusions of effect significance for the current Moray West Site area or the Alternative Moray West Site area on the basis that the assessed worst case scenario for ornithology is the Model 2 WTG.

In terms of SLVIA and impacts on aviation, removal of the Model 4 WTG leads to an reduction in maximum blade tip height (285 m reduced to 265 m for the Model 3 WTG). In terms of SLVIA impacts, although it has been concluded that removal of the Model 4 WTG will have a positive effect by reducing the scale of the Development and reducing potential discord between Moray West and smaller turbines associated with the Beatrice Offshore Wind Farm the reductions do no alter the assessed levels of the overall magnitude based on the assessment criteria included in the EIA Report – Volume 2 Chapter 14. Further information on the changes associated with the removal of the Model 4 WTG is presented in Table 1.4 below and PART 2 of this Addendum Document (Chapter 11).

Removal of the Model 4 WTG from the Design Envelope is also not expected to change any of the conclusions of effect significance for aviation on the basis that while magnitude of the effect may change, at 265 m tip height there is still potential for radar interference.

The Model 4 WTG was also assessed as the best case option with respect to both commercial fisheries and shipping and navigation on the basis that this is the option with the lowest number of turbines. Removal of this option will therefore not affect the overall conclusions of effect significance for the current Moray West Site area or the Alternative Moray West Site area on the basis that the assessed worst case scenario for both topics is the Model 2 WTG.

2.3 Implication of changes to the Design Envelope – reduction in the duration of the operation of Development from 50 years to 25 years

Table 2.1 below presents a summary of key conclusions from the assessment of a reduction in the duration of the operational period of the Development from 50 years to 25 years.

Table 2.1 Chapter and technical appendix references

EIA Topic	Implications of a reduction in the duration of operational period of the Development from 50 year to 25 years
Physical processes and water quality	Reduction in duration over which there is potential for scour effects and hydrodynamic changes (wave, tidal currents) to occur. While this change may lead to a reduction in impact magnitude due to the reduced impact duration, overall effect significance will not change on the basis that the impact is still considered to be long term in duration.
Benthic ecology	A reduction in the duration of the operational period is not expected to have any effects on benthic ecology. This is on the basis that key impacts during operation relating to habitat loss and the introduction of hard substrate / habitat creation are expected to occur within the first few years of operation (depending on the rate at which habitats and species will be re-established, and substructures and other infrastructure are colonised). The overall duration is not expected to alter the magnitude of these effects long term (whether 25 or 50 years). Based on this no changes to impact magnitude or conclusions on effect significance.
Fish and shellfish ecology	As with benthic ecology, potential impacts during operation relating to the permanent habitat loss and the introduction of hard substrate / habitat creation are expected to occur during the first few years of operation. The overall duration is not expected to alter the magnitude of these effects long term (whether 25 or 50 years). Based on this no changes to impact magnitude or conclusions on effect significance.
Marine mammals	Potential impacts on marine mammals occurring during operation of the wind farm are limited to vessel disturbance (maintenance vessels) and change in prey availability. While the reduction in the duration of the operational period will potentially lead to a reduction in the magnitude of impact from vessel noise (due to reduced duration over which vessels are active in either the current Moray West Site area or the Alternative Moray West Site area) overall conclusions of effect significance are not expected to change. This is on the basis that vessel disturbance (and impacts on prey availability) will still occur long term (over 25 years).
Ornithology	A reduction in the duration of the operation of the Development from 50 years to 25 years will lead to a reduction in period over which there is potential for effects on birds due to collision and displacement. Given that there is potential for collision and displacement impacts to lead to long term

Table 2.1 Chapter and technical appendix references	
EIA Topic	**Implications of a reduction in the duration of operational period of the Development from 50 year to 25 years**
	species mortality, it is expected that a reduction in the duration over which these impacts could occur would result in a reduction in impact magnitude. However, given that these impacts are still expected to occur long term (over 25 years) overall conclusions of effect significance will remain as assessed in the Moray West EIA Report – Volume 2 Chapter 10.
Commercial fisheries	There is expected to be a reduction in impact magnitude on the basis that there will be a reduction in the duration over which fishing vessels will potentially have reduced access to fishing grounds. However, given that these effects are still expected to occur over 25 years, conclusions of effect significance will remain as assessed in the Moray West EIA Report – Volume 2 Chapter 11.
Shipping and navigation	As with commercial fisheries there is expected to be a reduction in impact magnitude on the basis that there will be a reduction in the duration over which there is the presence of a potential risk to navigation. However, given that these effects are still expected to occur over 25 years, conclusions of effect significance will remain as assessed in the Moray West EIA Report – Volume 2 Chapter 12.
Civil and military aviation	It is unlikely that a reduction in the duration of the operational period of the Development would lead to a reduction in impact magnitude or change the conclusions of effect significance. This is on the basis that to ensure aviation safety requirement are met, appropriate mitigation will be required to be in place prior to the wind farm becoming operational. It is expected that the mitigation solution will be in place for the duration of the operational period of the Development and beyond. A reduction in the duration of the operational period of the Development is therefore not expected to alter the mitigation solution required on the basis that there is still potential for radar interference. Overall effect significance is therefore expected to remain as assessed in the Moray West EIA Report – Volume 2 Chapter 13.
Seascape, landscape and visual impacts	A reduction in the duration of the operational period of the Development is expected to lead to a reduction in the magnitude of impacts on seascape, landscape and visual receptors on the basis that the duration over which the turbines will be present / visible will be reduced by 25 years. However, as with impacts on commercial fisheries and shipping and navigation given that potential impacts are still expected to occur long term (for 25 years) overall conclusions of effect significance will remain as assessed in the Moray West EIA Report – Volume 2 Chapter 14.
Socio-economic, recreation and tourism	The assessment of effects on socio-economic, recreation and tourism presented in the Moray West EIA Report – Volume 2, Chapter 15 were assessed on the basis of a 25 year operational development. This is the recognised best practice approach to assessing impacts on employment and GVA creation. It is therefore concluded that changes in the duration of the operational period of the Development will not affect the conclusions of effect significance presented in the Moray West EIA Report – Volume 2, Chapter 15.
Marine archaeology and cultural heritage	Most potential impacts on marine archaeology are associated with construction activities and therefore will be unaffected by a reduction in the duration of the operational period of the Development. There is however, potential for a reduction in the magnitude of impacts on the setting of cultural heritage assets. This is on the basis that, as with SLVIA, the duration

Table 2.1 Chapter and technical appendix references	
EIA Topic	**Implications of a reduction in the duration of operational period of the Development from 50 year to 25 years**
	over which turbines will be present / visible and therefore potentially impacting the setting of cultural heritage features will be reduced. However, given the impacts are still expected to occur over 25 years, overall conclusions of effect significance will remain as presented in the Moray West EIA Report – Volume Chapter 16.
Other human activities	There is expected to be a reduction in impact magnitude on the basis that there will be a reduction in the duration over which there is potential for interference with other human activities. However, given that these effects are still expected to occur over 25 years, conclusions of effect significance will remain as assessed in the Moray West EIA Report – Volume 2 Chapter 12.

3 Physical Processes and Water Quality

3.1 Introduction

This section presents additional information with respect to potential effects of the proposed variation to the current Moray West Site on physical processes and water quality.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 6: Physical Processes and Water Quality and Volume 4, Technical Appendix 6.1, 6.2 and 6.3.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

3.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on physical processes and water quality are provided in the EIA Report – Volume 2, Chapter 6: Section 6.2.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

3.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key responses received during preparation of the EIA Report are provided in the EIA Report – Volume 2 Chapter 6: Physical Processes and Water Quality**.** Specific comments received to date (20th November 2018) on the application, as submitted in July 2018 (Moray West EIA Report), have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

No further consultation specific to physical processes and water quality has been undertaken as part of the preparation of this addendum.

3.4 Baseline conditions

3.4.1 Overview of baseline characteristics within the current Moray West Site area

The physical processes and water quality baseline within the current Moray West Site area and Offshore Export Cable Corridor is described in detail in the EIA Report – Volume 2, Chapter 6: Section 6.4, and Volume 4, Technical Appendix 6.1.

The information provided in relation to water levels, currents, waves, stratification and fronts and water quality within the current Moray West Site and Offshore Export Cable Corridor also apply to the proposed variation area. The sections on sediments and morphology also apply, with the following additional supporting information.

Information on water depth and sediment type were taken from navigation charts, high resolution swath bathymetry data that was available for the majority of the proposed variation area and from the Maritime and Coastguard Agency (MCA) survey, undertaken in 2006. The extent of these data and general bathymetry are shown in the EIA Report – Volume 4, Technical Appendix 6.1: Figure 5.2.

3.4.2 Baseline characteristics of the proposed variation area

The proposed variation area is shown to also be situated on the main body of Smith Bank in similar (and into slightly greater) water depths than the current Moray West Site area. The proposed variation area is, therefore, reasonably expected to have a similar seabed type and environmental setting to the nearby parts of the current Moray West Site, for which a range of detailed measured data are available.

The baseline characteristics of the proposed variation area are the same as described for the current Moray West Site area in the EIA Report – Volume 2, Chapter 6: Section 6.4. The proposed variation area includes areas of very slightly deeper water (35 to 57 m below LAT) than the current Moray West Site area (35 to 54 m below LAT).

No new or additional physical processes or water quality sensitive receptors are identified in the proposed variation area that were not also considered in the EIA Report submitted in July 2018.

3.4.3 Limitations with the baseline characterisation

Other than the limitations listed in the EIA Report – Volume 2, Chapter 6: Section 6.5.5, no other limitations have been identified that could affect the assessment of the Alternative Moray West Site area.

3.5 Assessment method

The method for assessing potential effects of the Development on physical processes and water quality within the current Moray West Site area and Offshore Export Cable Corridor is described in detail in the EIA Report – Volume 2, Chapter 6: Section 6.5.

There have been no changes to this assessment method since submission of the application in July 2018. These methods, and associated assessment criteria therefore remain applicable for the assessment of the Alternative Moray West Site area.

3.6 Potential effects associated with the Alternative Moray West Site area

Potential effects associated with the construction, operation and decommissioning of the components of the Development that are intended to be located within the Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Tables 3.1 to 3.3 below. The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated WCS design parameters assessed in the EIA Report – Volume 2, Chapter 6, Section 6.6.1: Table 6.6.1 for the current Moray West Site; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and decommissioning of the components of the Development located within the current Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 6, Section 6.8.

3.6.1 Mitigation measures

The assessment and conclusions presented in Tables 3.1 to 3.3 below also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 6: Section 6.6.2. No additional measures were identified with respect to effects on physical processes and water quality.

<table>
<tr><th colspan="5">Table 3.1 Assessment of effects associated with the Alternative Moray West Site area</th></tr>
<tr><th colspan="5">Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)</th></tr>
<tr><th>Impacts assessed in the current EIA (July 2018)</th><th>Relevant WCS design parameters (for current Moray West Site area)[3]</th><th>Conclusions from assessment of impacts within the current Moray West Site area</th><th>Commentary on potential impacts within the Alternative Moray West Site area</th><th>Assessment of effect significance and conclusions</th></tr>
<tr><td>Increases in SSC and deposition of disturbed sediments to the seabed due to dredging for seabed preparation prior to foundation installation</td><td>Greatest volume of sediment disturbed and released at a single WTG or OSP foundation location (largest WTG monopile, Model 4, 35,441 m^3; largest OSP monopile, 90,478 m^3).

Greatest total volume of sediment disturbed and released within the Moray West Site (85 x Model 1 WTG gravity bases and 1 x largest OSP gravity base; total 2,502,141 m^3).</td><td rowspan="3">(These are described as pathways of effect but do not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).

There is the potential for the creation of sediment plumes from dredging, drilling and cable installation. However, most material (coarse to medium grained sands and gravels) is expected to settle out of the water column within 10 to 50 m of the source. Finer sandy material ejected higher into the water column will likely settle out of the water column within 100 m to 500 m from source. Settlement of such coarser sediment is likely to result in localised spoil deposits ranging from a few cm to few metres (5 to 10 m) in thickness (decreasing with distance from the foundation). Fines (muds and clays) will persist in suspension and so will be dispersed widely, becoming rapidly diluted to low concentrations, and are unlikely to settle with any measurable thickness.</td><td rowspan="3">The key variables in these assessments are:
The environmental setting (range of sediment types, current speeds and water depths at the locations of the activities);
The nature of the activity causing sediment disturbance; and
The WCS design parameters and so the greatest volumes of sediment disturbed and associated rate of disturbance.
The Alternative Moray West Site area and design envelope either do not change these variables or are within the WCS design parameters. Therefore, no change in the predicted nature, or increase in the magnitude, extent or duration of these potential impacts is expected.</td><td rowspan="3">(These are described as pathways of effect but do not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).

The current assessment descriptions remain valid.</td></tr>
<tr><td>Increases in SSC and deposition of disturbed sediments to the seabed due to the release of drill arisings during foundation installation</td><td>Greatest volume of sediment disturbed and released at a single WTG or OSP foundation location (largest WTG monopile, Model 4; largest OSP monopile; each 8,836 m^3).

Greatest total volume of sediment disturbed and released within the Moray West Site (85 x Model 1 WTG monopiles and 2 x smaller OSP monopiles; total 565,486 m^3).</td></tr>
<tr><td>Increases in SSC and deposition of disturbed sediment to the seabed due to cable installation within the Moray West Site</td><td>Inter-array cables (trenching for multiple inter array cables; up to 275 km total length within the Moray West Site; V-shape trench; width = 3 m; depth = 3 m; total volume of disturbance = (275 km x 3 m x 3 m x 0.5) = 1,237,500 m^3).

OSP interconnector cable (trenching; up to 15 km in length between two OSPs within the Moray West Site; V-shape trench; width = 3 m; depth = 3 m; total volume of disturbance= (15 km x 3 m x 3 m x 0.5) = 67,500 m^3).</td></tr>
</table>

[3] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 3.1 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[3]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Indentations left on the seabed by jack-up vessels and large anchors	Jack-up barge (up to 6 legs in total, area of up to 275 m^2 per spudcan; maximum area of seabed disturbance for the jack-up vessel of 1,650 m^2, with a penetration depth of approximately 0.5 m to 11 m for each spudcan; maximum vessel anchor size 3 m).	**(This is described as a pathway of effect but does not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).** Jack up vessels will insert their legs into the seabed during operation. As the legs are withdrawn, indentations or pits may remain in the seabed. Over the short to medium term, the pits are likely to be filled by natural sediment transport and will tend to become shallower and less distinct, becoming largely infilled in time scales in the order of 0.1 to 5 years following construction (depending on the frequency and intensity of storms).	The key variables in this assessment are: • The environmental setting (range of seabed types at the locations of the activities); and • The WCS design parameters and so the greatest area of seabed affected locally. The Alternative Moray West Site area and design envelope either do not change these variables or are within the WCS design parameters. Therefore, no change in the predicted nature, or increase in the magnitude, extent or duration of this potential impact is expected.	**(This is described as a pathway of effect but does not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).** The current assessment description remains valid.
Impacts to designated marine features (due to construction activities)	**Not applicable** - ***as proposed mitigation relevant to Moray West Site only***	**Not applicable**	**Not applicable**	**Not applicable**
Impacts to designated coastal geomorphological features (due to construction activities)				

Table 3.1 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[3]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Impacts to recreational surfing venues (due to construction activities)				
Impacts to Smith Bank (due to construction activities)	Greatest seabed area impacted by WTG and OSP Foundations (85 x smaller WTG gravity base foundations, Model 1, with scour protection diameter 85 m; 2 x OSP gravity base foundations with scour protection diameter 95 m; total 496,509 m^2). Greatest seabed area impacted by inter-array and interconnector cables (275 km of inter-array cables and 15 km of interconnector cable, 15 m width of trenching related seabed disturbance; total 4,350,000 m^2). Greatest seabed area of jack-up barge spudcan imprints (jack-up barge spudcan imprints of 1,650 m^2 (6 legs, area up to 275 m^2 per spudcan) for each jack-up barge; installing 85 x WTG foundations, Model 1, and 2 x OSP foundations; total 143,550 m^2). Greatest total seabed area impacted 4,990,059 m^2.	Impact magnitude = **low** (based on the nature of the effects and the affected area being only 1.9% of total Moray West Site area). Sensitivity of receptor = **negligible** (because the form and function of the Smith Bank as a sedimentary feature is not directly sensitive to the predicted potential impact types of this magnitude). **Significance = negligible** Not significant in EIA terms.	The key variables in this assessment are: • The environmental setting (range of seabed types at the locations of the activities); and • The WCS design parameters and so the greatest area of seabed affected. The Alternative Moray West Site area and design envelope either do not change these variables or are within the WCS design parameters. Therefore, no change in the predicted nature, or increase in the magnitude, extent or duration of this potential impact is expected.	The details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **negligible** **Significance = negligible** Not significant in EIA terms.

Table 3.1 Assessment of effects associated with the Alternative Moray West Site area

Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[3]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Changes to water quality from chemical releases	Synthetic compound, heavy metal and hydrocarbon contamination may be released accidentally as a result of offshore infrastructure installation and the presence of various construction vessels during the construction period (up to 25 at any one time and will comprise of installation, support, transport and cable lay vessels, tugs, cranes and barges). Water-based drilling muds associated with drilling to install foundations may also be required.	Impact magnitude = **low** (the magnitude of impact from an accidental release is considered to be of low frequency and very localised through the application of contingency plans / management systems and other embedded mitigation). Sensitivity of receptor = **moderate** (although not designated, water quality in the Moray Firth is of a good standard both offshore and inshore and supports a wide range of fish, shellfish and other invertebrate communities that are dependent upon good water quality and are of regional to national importance). **Significance = minor adverse** Not significant in EIA terms.	The key variables in these assessments are: • The environmental setting (range of sediment types, current speeds and water depths at the locations of the activities); • The nature of the activities causing chemical or contaminated sediment disturbance; and • The WCS design parameters and so the likelihood, type or volume of a chemical release, and the greatest volumes of sediment disturbed and associated rate of disturbance. The Alternative Moray West Site area and design envelope either do not change these variables or are within the WCS design parameters. Therefore, no change in the predicted nature, or increase in the magnitude, extent or duration of these potential impacts is expected.	The details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
Changes to water quality from contaminated sediments	The greatest area of seabed preparation and disturbance (62 x WTG gravity base foundations, Model 4, total 1,043,120 m^2; 2 x OSP gravity base foundations, total 24,544 m^2; 85 x jack-up barge spudcan imprints of 1,650 m^2 (6 legs, area up to 275 m^2 per spudcan) for each jack-up barge, installing 85 x WTG foundations, Model 1, and 2 x OSP foundations, total 143,550 m^2; 275 km of inter-array cables and 15 km of interconnector cable, 15 m width of trenching related seabed disturbance; total 4,350,000 m^2; overall total 5,538,397 m^2 (5.538 km^2).	Impact magnitude = **low** (dispersion of substances within the water column or settlement onto the seabed during construction would be localised and temporary over the short-term. No significant level of contamination was measured to be present within the seabed in the area of the current Moray West Site area. Sensitivity of receptor = **moderate** (although not designated, water quality in the Moray Firth is of a good standard both offshore and inshore and supports a wide range of fish, shellfish and other		The details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

Table 3.1 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[3]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		invertebrate communities that are dependent upon good water quality and are of regional to national importance). **Significance = minor adverse** Not significant in EIA terms.		

Table 3.2 Assessment of effects associated with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[4]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Changes to the tidal regime	Greatest total blockage cross section area presented by WTG and OSP foundations (62 x WTG larger 'inverted T' shape gravity bases, Model 4, minimum spacing 1,200 m downwind and 1,050 m crosswind, associated base diameter of 55 m,	**(These are described as pathways of effect but do not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).** Changes to the tidal regime (water levels, current speed and direction) will be negligible in absolute and relative terms (not measurable within the range of natural variability).	The key variables in these assessments are: • The environmental setting (range of sediment types, current speeds, wave climate and water depths at the locations of the impact or activities);	**(These are described as pathways of effect but do not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other**

[4] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 3.2 Assessment of effects associated with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[4]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Changes to the wave regime	base plate height up to 30 m above seabed, monopole diameter 15 m above the base plate to the water surface; 2 x 'inverted T' shape OSP gravity bases, associated base diameter of 55 m, base plate height up to 20 m above seabed, monopole diameter 15 m above the base plate to the water surface. Cable burial (all cables will be buried to a target depth of 1 m. Depending on seabed conditions it may be possible to achieve burial depths of up to 3 m; where it is not possible to achieve 1 m burial depth, additional	**(These are described as pathways of effect but do not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).** Changes to wave climate (wave height, wave period and direction) will be small in absolute and relative terms. Any measurable effects will be largely localised to the downwind edge of the site area offshore and will not extend as far as the adjacent coastlines.	• The nature of the interactions between the installed infrastructure and the environmental setting; and • The WCS design parameters and so the greatest dimensions and total blockage cross section area of foundations, the dimensions of cable burial and cable protection, and the greatest volumes of sediment disturbed and associated rate of disturbance. The Alternative Moray West Site area and design envelope either	**sensitive receptors in other topic sections).** The details and conclusions of the current assessment remain valid.
Changes to sediment transport and sediment transport pathways		**(These are described as pathways of effect but do not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).** The very small magnitude and locally intermittent nature of potential changes to the tidal regime and wave climate make it unlikely that patterns or rates of sediment transport will be measurably affected.		

Table 3.2 Assessment of effects associated with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[4]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Scour of seabed sediments	cable protection will be required (see below). Cable protection measures (options include rock placement, concrete mattresses, polymer/steel sleeve protection and/ or grout bags; rock berm width 1.5 m and height 1 m. Sloped profile above seabed level; total length (and location) of cables which may potentially require seabed protection to be calculated during FEED but anticipated to be up to 20% of the export cable length (20% of 130 km = 26 km) and up to 10% of the inter-array and interconnector cable length (10% of 275 + 15 km = 29 km); total area of cable protection for export cables (26 km x 1.5 m = 39,000 m²) and for inter-array and interconnector cables (29 km x 1.5 m = 43,500 m²).	**(These are described as pathways of effect but do not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).** Scour may cause depressions of varying area and volume to develop in unprotected seabed sediments around individual foundations. If installed, scour protection would prevent the development of scour. Scour or scour protection would affect only a very small proportion (at most ~0.16%) of the Moray West Site area.	do not change these variables or are within the WCS design parameters. Therefore, no change in the predicted nature, or increase in the magnitude, extent or duration of these potential impacts is expected. In relation to waves, it is also noted that the more rounded shape of the Alternative Moray West Site area is likely to decrease the predicted magnitude of wave height reduction (as a result of waves from the east passing through the long axis of the current Moray West Site area). Conversely, the slightly greater width of the Alternative Moray West Site area presented to waves coming from closer to north-south aligned directions may slightly increase the magnitude of wave height reduction in this case. However, waves from the south are relatively low energy and occur only infrequently compared to other directions. The magnitude	
Impacts to designated marine and coastal geomorphological features (due to operation)		Impacts to designated coastal geomorphological features (at the export cable landfall) are **Not applicable** change relevant to Moray West Site area and not the export cable landfall. Impacts to designated marine features (controlled or defined by the tide, wave and sediment transport regimes) are separately addressed in this table.		The details and conclusions of the current assessment remain valid. Impacts to designated coastal geomorphological features (at export cable landfall) are **Not applicable** Impacts to designated marine features (controlled or defined by the tide, wave and sediment transport regimes) are separately addressed in this table.

Table 3.2 Assessment of effects associated with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[4]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Impacts to recreational surfing venues (due to operation)	Scour is assessed for gravity base, piled jacket and monopile WTG (Model 1 and Model 4) and OSP foundation types, dimensions and numbers.	Impact magnitude = **negligible** (based on the very small magnitude and intermittent effect on waves, it is concluded that there will be no measurable change to the surfing wave climate at surfing venues in the Moray Firth). Sensitivity of receptor = **moderate** (as the receptor has a moderate to high capacity to accommodate the proposed form of change and is not designated but is of regional level importance). **Significance = negligible** Not significant in EIA terms.	of any local reduction in wave height would remain small in absolute and relative terms and would remain not measurable within the range of natural variability. The relevant downwind receptors (the rocky East Caithness cliffs) are also largely insensitive to changes in wave climate.	The details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **moderate** **Significance = negligible** Not significant in EIA terms.
Impacts to stratification fronts (due to operation)		Impact magnitude = **negligible** (based on the very small magnitude and intermittent effect on waves and no change to currents, it is concluded that there will be no measurable change to the location, form or function of stratification fronts and features). Sensitivity of receptor = **low** (due to Priority Marine Features (PMFs) and small area of potential Annex I habitat in the Moray West Site). **Significance = negligible** Not significant in EIA terms.		The details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **low** **Significance = negligible** Not significant in EIA terms.
Impacts to Smith Bank (due to operation)		Impact magnitude = **low** (based on the very small magnitude and intermittent effect on waves, no change to currents, the resulting very small effect on sediment transport, and the limited impact area of scour and other installed infrastructure, it is concluded that there will be no measurable change to the location, form or function of Smith Bank).		The details and conclusions of the current assessment remain valid. Impact magnitude = **low**

Table 3.2 Assessment of effects associated with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[4]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		Sensitivity of receptor = **negligible** (because the form and function of the Smith Bank is not directly sensitive to the predicted potential impact types of this magnitude). **Significance = negligible** Not significant in EIA terms.		Sensitivity of receptor = **negligible** **Significance = negligible** Not significant in EIA terms.
Changes to water quality from chemical releases	Synthetic compound, heavy metal and hydrocarbon contamination resulting from up to 85 WTGs and two OSPs. Accidental pollution may also result from O&M vessels (including crew supply vessels and jack-up vessels). A typical WTG is anticipated to require grease, synthetic or hydraulic oil, and other operating compounds or materials such as liquid nitrogen, silicone oil and gas. The OSP is expected to require chemicals and other operating compounds such as diesel, water, coolants, oil,	Impact magnitude = **low** (the magnitude of impact from an accidental release is considered to be of low frequency and very localised through the application of contingency plans / management systems and other embedded mitigation). Sensitivity of receptor = **moderate** (although not designated, water quality in the Moray Firth is of a good standard both offshore and inshore and supports a wide range of fish, shellfish and other invertebrate communities that are dependent upon good water quality and are of regional to national importance). **Significance = minor adverse** Not significant in EIA terms.	The key variables in these assessments are: • The environmental setting (range of sediment types, current speeds and water depths at the locations of the activities); • The nature of the activities causing chemical or contaminated sediment disturbance; and • The WCS design parameters and so the likelihood, type or volume of a chemical release, and the greatest volumes of sediment disturbed and associated rate of disturbance.	The details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

Table 3.2 Assessment of effects associated with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[4]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	batteries and fire suppressant material. Various operation and maintenance vessels will be required over the operation period.		The Alternative Moray West Site area and design envelope either do not change these variables or are within the WCS design parameters. Therefore, no change in the predicted nature, or increase in the magnitude, extent or duration of these potential impacts is expected.	
Changes to water quality from contaminated sediments	Greatest total local scour footprint (62 x WTG monopile foundations, Model 4; 2 x larger OSP monopile foundations, total 289,920 m^2, approximately 0.11% of the Current Moray West Site area). Greatest total global scour footprint (85 x WTG piled jacket foundations, Model 1; 1 x larger OSP piled jacket foundation; total 355,163 m^2, approximately 0.16% of the Current Moray West Site area).	Impact magnitude = **low** (dispersion of substances within the water column or settlement onto the seabed during construction would be localised and temporary over the short-term. No significant level of contamination was measured to be present within the seabed in the area of the current Moray West Site area. Sensitivity of receptor = **moderate** (although not designated, water quality in the Moray Firth is of a good standard both offshore and inshore and supports a wide range of fish, shellfish and other invertebrate communities that are dependent upon good water quality and are of regional to national importance). **Significance = minor adverse** Not significant in EIA terms.		The details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

Table 3.3 Assessment of effects associated with the Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[5]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Increases in SSC and deposition of disturbed sediment to the seabed within the Moray West Site	Largest number and dimensions of foundations to remove (85 x WTG gravity base foundations, Model 1; 2 x OSP gravity base foundation. Buried inter-array, interconnector and export cables to be left in situ (but to be determined in consultation with key stakeholders as part of the decommissioning plan and following best practice at the time). Scour and cable protection left in-situ.	**(This is described as pathways of effect but does not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).** The impact of decommissioning activities that will disturb sediment is anticipated to be similar in nature and of similar or smaller magnitude to that previously described for construction. Representative activities may include dredging, drilling and trenching.	The key variables in these assessments are: • The environmental setting (range of sediment types, current speeds and water depths at the locations of the activities); • The nature of the activity causing sediment disturbance; and • The WCS design parameters and so the greatest volumes of sediment disturbed and associated rate of disturbance. The Alternative Moray West Site area and design envelope either do not change these variables or are within the WCS design parameters. Therefore, no change in the predicted nature, or increase in the magnitude, extent or duration of these potential impacts is expected.	**(This is described as a pathway of effect but does not affect any physical processes or water quality receptors that are directly sensitive to the changes described. Assessments of significance are provided in relation to other sensitive receptors in other topic sections).** The details and conclusions of the current assessment remain valid.
Impacts to designated marine and coastal geomorphological features (due to decommissioning activities)		Impacts to designated coastal geomorphological features (at the export cable landfall) are **Not applicable** Impacts to designated marine features (controlled or defined by the tide, wave and sediment transport regimes) are separately addressed in this table.		Impacts to designated coastal geomorphological features (at the export cable landfall) are **Not applicable** Impacts to designated marine features (controlled or defined by the tide, wave and sediment transport regimes) are separately addressed in this table.
Impacts to Smith Bank (due to decommissioning activities)		Impact magnitude = **low** (decommissioning activities will require either a similar or lesser duration and intensity than the previously described construction activity types (depending on the agreed Decommissioning Plan), therefore, the magnitude of the impact		The details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **negligible**

[5] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 3.3 Assessment of effects associated with the Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[5]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		will be similar or less than that previously assessed). Sensitivity of receptor = **negligible** (because the form and function of the Smith Bank is not directly sensitive to the predicted potential impact types of this magnitude). **Significance = negligible** Not significant in EIA terms.		**Significance = negligible** Not significant in EIA terms.
Changes to water quality from chemical releases	Synthetic compound, heavy metal and hydrocarbon contamination resulting from a maximum of 85 x WTGs, Model 1, and 2 x OSPs. Various decommissioning vessels (number currently undetermined) will also be active over the decommissioning period.	Impact magnitude = **low** (the magnitude of impact from an accidental release is considered to be of low frequency and very localised through the application of contingency plans / management systems and other embedded mitigation). Sensitivity of receptor = **moderate** (although not designated, water quality in the Moray Firth is of a good standard both offshore and inshore and supports a wide range of fish, shellfish and other invertebrate communities that are dependent upon good water quality and are of regional to national importance). **Significance = minor adverse** Not significant in EIA terms.	The key variables in these assessments are: • The environmental setting (range of sediment types, current speeds and water depths at the locations of the activities); • The nature of the activities causing chemical or contaminated sediment disturbance; and • The WCS design parameters and so the likelihood, type or volume of a chemical release, and the greatest volumes of sediment disturbed and associated rate of disturbance.	The details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

Table 3.3 Assessment of effects associated with the Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 6, Section 6.6.2. Where additional mitigation is required this is presented for the relevant impacts described below.)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[5]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Changes to water quality from contaminated sediments	The greatest area of seabed preparation and disturbance (62 x WTG gravity base foundations, Model 4, total 1,043,120 m^2; 2 x OSP gravity base foundations, total 24,544 m^2; 85 x jack-up barge spudcan imprints of 1,650 m^2 (6 legs, area up to 275 m^2 per spudcan) for each jack-up barge, installing 85 x WTG foundations, Model 1, and 2 x OSP foundations, total 143,550 m^2; 275 km of inter-array cables and 15 km of interconnector cable, 15 m width of trenching related seabed disturbance; total 4,350,000 m^2; overall total 5,538,397 m^2 (5.538 km^2).	Impact magnitude = **low** based on affected area comprising 2.5% of total Moray West Site. Sensitivity of receptor = **moderate** (due to PMFs and small area of potential Annex I habitat in the Moray West Site). **Significance = minor adverse** Not significant in EIA terms.	The Alternative Moray West Site area and design envelope either do not change these variables or are within the WCS design parameters. Therefore, no change in the predicted nature, or increase in the magnitude, extent or duration of these potential impacts is expected.	The details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

3.7 Cumulative effects

An assessment of potential cumulative effects is provided for the current Moray West Site in the EIA Report – Volume 2, Chapter 6, Section 6.9.

The cumulative effects assessed in relation to the current Moray West Site area also apply to the Alternative Moray West Site area with respect to construction, operation and decommissioning. All relevant differences either do not affect the nature, extent, magnitude or duration of the effect, or are within the envelope of the WCS design parameters.

3.8 Conclusion on the effects of proposed changes to the Moray West Site

No new or additional physical processes or water quality receptors are identified in the proposed variation area. The proposed changes to the Moray West Site area do not affect the nature, extent, magnitude or duration of any predicted effects, and are within the envelope of the previously assessed WCS design parameters.

It is however worth noting that in relation to waves, that the more rounded shape of the Alternative Moray West Site area is likely to decrease the predicted magnitude of wave height reduction (as a result of waves from the east passing through the long axis of the current Moray West Site area). Conversely, the slightly greater width of the Alternative Moray West Site area presented to waves coming from closer to north-south aligned directions may slightly increase the magnitude of wave height reduction in this case. However, waves from the south are relatively low energy and occur only infrequently compared to other directions. The magnitude of any local reduction in wave height would remain small in absolute and relative terms and would remain not measurable within the range of natural variability. The relevant downwind receptors (the rocky East Caithness cliffs) are also largely insensitive to changes in wave climate.

4 Benthic Ecology

4.1 Introduction

This section presents additional information with respect to potential effects of the proposed variation to the current Moray West Site on benthic ecology. It should be noted that in the Moray West EIA 2018, Volume 2 - Chapter 7 considered impacts on both benthic and intertidal ecology. However, given that the variation to the application relates specifically to components of the Development that will be located within the proposed Alternative Moray West Site area only (e.g. WTGs, substructures, inter-array cables, OSPs, interconnector cables and sections of the export cable circuits) and therefore does not influence the offshore export cable corridor or landfall, it has not been necessary to re-assess potential effects of the proposed variation on intertidal ecology.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 7: Benthic and Intertidal Ecology and Volume 4, Technical Appendix 7.1: Benthic Survey.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

4.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on benthic ecology are provided in the EIA Report – Volume 2, Chapter 7: Section 7.2.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

4.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key consultation responses received during preparation of the EIA Report are provided in EIA Report – Volume 2, Chapter 7: Section 7.3. Specific comments received to date (20th November 2018) on the application, as submitted in July 2018 (Moray West EIA Report), have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

No further consultation with regards to benthic ecology has been undertaken as part of the preparation of this addendum.

4.4 Baseline characteristics

An overview of baseline characteristics associated with the current Moray West Site (including proposed mitigation area) and the Alternative Moray West Site area (including proposed variation area) is provided below. Further detailed information on the baseline conditions in the current Moray West Site and along the Offshore Export Cable Corridor (including the northern extent of the export cable corridor which corresponds to the proposed variation area) is provided in the EIA Report – Volume 2, Chapter 7: Section 7.4. Table 4.1 below extracts survey data specific to the proposed mitigation area and the proposed variation area.

A survey was carried out between May and June 2017 to characterise the current Moray West Site with respect to benthic ecology. Specific sampling locations from this survey were provided in the EIA Report – Volume 3a, Figure 7.3.1 and have been reproduced in Volume 2 of this Addendum Document - Figure 4.1 with reference to the proposed Alternative Moray West Site area. The survey concluded that most habitats and species present in the current Moray West Site are commonly occurring and representative of the wider area and are considered to have low sensitivity to any potential effects from the Development. The survey did identify some habitats and species of conservation importance in the current Moray West Site. These include the following Priority Marine Features (PMFs):

- 'Tide-swept coarse sands with burrowing bivalves (SS.SCS.ICS.MoeVen '*Moerella* spp. With venerid bivalves in infralittoral gravelly sand' at four locations in the current Moray West Site (W6, W12 and W50)). Of these locations, one (W12) is located within the proposed mitigation area and therefore would be excluded from the Alternative Moray West Site area;
- Offshore subtidal sands and gravels (SS.SSa.CFiSa.EpusOborApri (or transitional with this biotope) '*Echinocyamus pusillus*, Ophelia borealis and *Abra prismtica* in circalittoral fine sand). These were present at 47 locations, all of which are within the eastern part of the current Moray West Site and therefore will remain within the Alternative Moray West Site area;
- Flame shells (*Limaria hians)* were identified at one station (W51) located in the south east part of the current Moray West Site. Therefore, will also be present within the Alternative Moray West Site area; and
- Ocean quahog (*Arctica islandica*). This was identified at station W27 located within the centre of the current Moray West Site and therefore will also be located within the Alternative Moray West Site area.

In addition to the PMFs, a small area of potential Annex 1 habitat (stony reef), approximately 25 m wide, was identified just west of station W39. This lies south of the centre of the current Moray West Site and therefore will also be present within the Alternative Moray West Site area.

The proposed variation area for the Alternative Moray West Site area lies wholly within the northern extent of the current Moray West Offshore Export Cable Corridor. Key habitats and species of importance associated with this area are presented below. This is based on information presented in the Benthic Survey Report (EIA Report – Volume 4, Technical Appendix 7.1) and EIA Report – Volume 2, Chapter 7: Section 7.4.

A number of sampling locations associated with the current Moray West Offshore Export Cable Corridor also occur within the proposed variation area (C26, C28, W8 and C3) as illustrated in Volume 2 -Figure 4.1 of this Addendum Document and detailed in Table 4.1 below. No PMFs or areas of potential Annex I habitat have been identified in this area. At station C26, an area of mixed muddy shell gravel/muddy gravelly sand and shell debris/stones was present. This habitat has been classified as SS.SMx.CMx (Circalittoral mixed sediment) as illustrated in Volume 2 - Figure 4.2 and Figure 4.3 of this Addendum Document and detailed in Table 4.1 below.

Further west (outside the proposed variation area) patches of seapens were identified although not in sufficient densities to qualify as the seapens biotope, as illustrated in Volume 2 - Figure 4.3 of this Addendum Document.

The proposed variation area does not overlap the Southern Trench possible Nature Conservation Marine Protected Area (pNCMPA).

Table 4.1 Benthic ecology characteristics of the proposed mitigation and proposed variation areas (interpreted from benthic survey data)						
Seabed sediment type	**Key characteristics of the proposed mitigation area**			**Key characteristics of the proposed variation area**		
	Sample station Nos	**Biotope description**	**Taxa in >25% of recorded habitats**	**Sample station Nos**	**Biotope description**	**Taxa in >25% of recorded habitats**
Rippled (slightly muddy) sand often with shell debris/grit	W10, W11, W12, W14, W15, W16, W17, W18, W24, W74, W76	**SS.SSa** (Sublittoral sands and muddy sands).	*Asterias rubens* (73% R-F), Hydrozoa/Bryozoa (54% R-C*)*, *Pagurus bernhardus* (32% R-F), *Astropecten irregularis* (27% R), *Ophiura* (27% R-O), *Callionymus lyra* (24% R)	C2, C25, C28	Densities of sea pens were not high enough to qualify as a sea pen biotope although may be an intermediate variant with **SS.SSa** (Sublittoral sands and muddy sands).	Hydrozoa/Bryozoa (80% R-O), *Ophiura* (60% R-A), *Pennatula phosphorea* (50% R-O), *Antalis entalis* (40% R-O), *Asterias rubens* (40% R), *Callionymus lyra* (40% R), *Astropecten irregularis* (30% R)
Muddy sand (often with shell fragments/debris)	W13	**SS.SSa** (Sublittoral sands and muddy sands).	*Asterias rubens* (80% R-O), Hydrozoa/Bryozoa (80% R-F), *Pagurus bernhardus* (50% R), Pleuronectidae (50% R)	N/a	N/a	N/a
Muddy shell gravel or muddy gravelly sand with shell debris	N/a	N/a	N/a	C26	**SS.SMx.CMx** (Circalittoral mixed sediment).	Hydrozoa/Bryozoa (O), *Antalis entalis* (R), Asteroidea (R), *Lanice conchilega* (R), *Microchirus variegatus* (R)
Variable mixed coarse sediment including sand or gravelly sand with stones, gravel or cobble	N/a	N/a	N/a	C3	Stations could to be a variant of biotopes such as **SS.SSa.IFiSa.ScupHyd** (*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles) or even an impoverished **SS.SMx.CMx.FluHyd** (*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment) but were too variable/patchy to derive a definitive biotope.	Hydrozoa/Bryozoa (100% R-A), Serpulidae (100% O-C), *Lithothamnion* spp. (100% R-C), *Lanice conchilega* (100% R-F), Pectinidae (66% R-O), *Asterias rubens* (50% O-C), *Corella parallelogramma* (50% R-O), *Munida rugosa* (50% R-C), *Securiflustra securifrons* (50% R-O), *Callionymus lyra* (33% R), Ctenophora (33% R-O*)*, *Flustra foliacea* (33% R-O), *Henricia* (33% R), *Nemertesia antennina* (33% R), *Porania pulvillus* (33% R-F)

4.4.1 Limitations with the baseline characterisation

Other than the limitations listed in the EIA Report – Volume 2, Chapter 7: Section 7.5.4, no other limitations have been identified that could affect the assessment of the Alternative Moray West Site area.

4.5 Assessment method

The method for assessing potential effects of the Development on benthic habitats and species within the current Moray West Site and Offshore Export Cable Corridor is described in detail in the EIA Report – Volume 2, Chapter 7: Section 7.5.

There have been no changes to this assessment method since submission of the application in July 2018. Therefore, these methods, and associated assessment criteria, remain applicable for the assessment of the Alternative Moray West Site area.

As noted above, specific comments raised on the application as submitted in July 2018 (Moray West EIA Report) have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A). Comments raised with regards to benthic ecology have not altered the overall conclusions of the assessment presented in the Moray West EIA Report. The assessment presented in the Moray West EIA Report, forms the basis for the assessment presented in this addendum.

4.6 Potential effects associated with the Alternative Moray West Site area

Potential effects associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the proposed Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Tables 4.2 to 4.4 below. The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated Worst Case Scenario (WCS) design parameters assessed in the EIA Report – Volume 2, Chapter 7: Section 7.6.1: Table 7.6.1 for the current Moray West Site; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the current Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 7: Section 7.7.

4.6.1 Mitigation measures

The assessment and conclusions presented in Tables 4.2 to 4.4 below also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 7: Section 7.6.2 and additional measures presented in the EIA Report – Volume 2, Chapter 7: Section 7.7.5.

Table 4.2 Assessment of effects associated with the proposed Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[6]**	**Conclusions from assessment of effects within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Temporary habitat loss / habitat disturbance (subtidal)	Total area of disturbance within the Moray West Site calculated to be 5,561,214 m^2. Based on: dredge affected area for 85 x Model 4 Gravity Base Structure (GBS) foundations[7] and 2 OSPs + jack-up vessel footprint + inter-array cables + OSP interconnector cabling.	Impact magnitude = **low** based on affected area comprising only 2.5% of total Moray West Site. Sensitivity of receptor = **low to moderate** due to PMFs and small area of potential Annex I habitat in the Moray West Site. **Significance = negligible - minor adverse** Not significant in EIA terms.	The revised WCS dredge affected area for 72 x Model 3 WTGs is 747,856 m^2 (based on total dredge affected area for each Model 3 GBS foundation of 115 m^2). When considered with 2 OSPs + jack-up vessel footprint + inter-array cables + OSP interconnector cabling the total area affected is 5,220,950. Given that this maximum area of disturbance for Model 3 WTG is within the assessed WCS, the magnitude of impact remains unchanged. As presented in Section 4.4 above, no habitats or species of conservation importance have been identified in the proposed variation area. Station C3 considered to be potentially impoverished **SS.SMx.CMx.FluHyd** which is considered to have moderate sensitivity (EIA Report – Volume 2, Chapter 7: Table 7.7.1). An area of PMF (tide-swept coarse sands with burrowing bivalves) present in the proposed mitigation area (sample station W12) will be avoided as a result of the Alternative Moray West Site area. The proposed variation area does not overlap the Southern trench pMPA. Sensitivity is therefore considered to remain as low to be moderate.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** based on the fact there is no increase in the maximum area of seabed disturbance (in fact the revised design parameters will result in a decrease in the maximum area of seabed disturbance). Sensitivity of receptor = **low to moderate**. **Significance = negligible - minor adverse** Not significant in EIA terms.

[6] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

[7] The WCS presented in EIA Report – Volume 2, Chapter 7: Table 7.6.1 refers to 62 x Model 4 GBS foundations. However, due to an error in the calculations the total dredge affected area was calculated as 1,043,120 m^2. This equates 85 x 12,272 m^2 (total dredge affected area per Model 4 GBS foundation based on 125 m diameter dredge affected area) not 62 x 12,272 m^2.

Table 4.2 Assessment of effects associated with the proposed Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[6]**	**Conclusions from assessment of effects within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Temporary habitat loss/habitat disturbance (intertidal)	Not applicable – *as proposed Alternative Moray West Site area over 30 km from the intertidal area*	Not applicable	Not applicable	Not applicable
Increased suspended sediment concentrations (SSC)/sediment deposition (subtidal)	Maximum amount of sediment disturbance within the Moray West Site of 3,807,141 m^3. Based on: maximum excavation area for 85 x Model 1 WTGs with GBS foundations + excavations for one large OSP, inter-array cables and OSP interconnector cables.	**Impact magnitude:** There is the potential for the creation of plumes from dredging or drilling. However, most material (coarse to medium grained) is expected to have settled out of the water column with 10 to 50 m from source. Sandy material will settle out of the water column within 100 m to 500 m from source. Finer grade material may be dispersed widely but will not settle with any measureable thickness. Settlement is likely to result in localised spoil deposits ranging from a few cm to few metres (5 to 10 m) in thickness (decreasing with distance from the foundation). Overall there is potential for 33.6% of Moray West Site to be covered with 0.05 m average thickness of sediment (based on dredging and burial of the inter-array and OSP interconnector cables). Given the temporary and short term nature of installation activities (36 months) and intermittent nature of the activities, overall impact magnitude is assessed as **low.** Sensitivity of receptor = **low to moderate** (due to presence of species with moderate sensitive to smothering based on MarSEA assessment EIA Report – Volume 2, Chapter 7: Table 7.7.3). **Significance = negligible - minor adverse** Not significant in EIA terms.	On basis that there are no changes to the WCS design parameters, the predicted SSC levels and sediment deposition rates and volumes will remain unchanged from those assessed WCS (Moray West EIA Report – Volume 2, Chapter 7: Table 7.6.1.). Therefore, the magnitude of impact remains unchanged. As presented in Section 4.4 above, no habitats or species of conservation importance have been identified in the proposed variation area. Station C3 considered to be potentially impoverished **SS.SMx.CMx.FluHyd** which is considered to have negligible to low sensitivity (EIA Report – Volume 2, Chapter 7: Table 7.7.3). An area of PMF (tide-swept coarse sands with burrowing bivalves) present in the proposed mitigation area (sample station W12) will be avoided as a result of the Alternative Moray West Site area. Therefore, sensitivity can be considered to be low.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** based on the fact there is no change in levels of SSC or sediment deposition. Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.

Table 4.2 Assessment of effects associated with the proposed Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[6]**	**Conclusions from assessment of effects within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Increased suspended sediment concentrations (SSC)/sediment deposition (intertidal)	Not applicable – *as above*	Not applicable	Not applicable	Not applicable
Noise and vibration	Maximum duration of piling is nine months (based on installation of 340 pin-piles (85 jackets) with maximum hammer energy of 3,000 KJ). Spatial extent is 85 x 15 m diameter monopiles installed over five months. Maximum hammer energy is 5,000 KJ.	Impact magnitude = **negligible.** area of effect in terms of noise propagation is in the order of metres from the piling location. Sensitivity of receptor = **negligible.** MarESA sensitivity assessments for the benthic habitats and species identified during the benthic characterisation surveys not relevant to the majority of habitats and species. **Significance = no impact - negligible** Not significant in EIA terms.	The WCS modelled for underwater noise for both temporal (duration) and spatial extents was based on 85 x maximum design parameters for pin piles (Model 4) and monopiles (Model 4). The maximum WCS for the Alternative Moray West Site area is 72 Model 3 WTGS. Given that the maximum WCS design parameters for 72 Model 3 WTG is within the assessed WCS, the magnitude of impact (temporal or spatial) remains unchanged. As presented in Section 4.4 above, no habitats or species with increased sensitivity to underwater noise or vibration have been identified in the proposed variation area. Therefore, sensitivity remains negligible.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **negligible** **Significance = no impact - negligible** Not significant in EIA terms.
Accidental and controlled discharges	The current assessment assumes that there is likely to be a requirement for the use of water based drilling muds during piling and requirement for grout for joining offshore infrastructure. There is also potential for the accidental release of synthetic	Impact magnitude = **negligible**. The risk of impact from accidental discharges to subtidal benthic receptors is predicted to be of local to regional extent, short term duration, intermittent and reversible. Sensitivity of receptor = **negligible – high.** Intertidal species and habitats considered to have negligible to high sensitivity to pollutants; subtidal species and	There will be no changes in the requirement of water based drilling muds or grout associated with the Alternative Moray West Site area. There will also be no change in maximum number of vessels expected to be required during construction (25) and associated risk of an accidental release of synthetic compounds, heavy metals and hydrocarbons. Therefore, there will be no change in impact magnitude.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **negligible** as concerned with subtidal habitats only

Table 4.2 Assessment of effects associated with the proposed Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[6]**	**Conclusions from assessment of effects within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	compounds, heavy metals and hydrocarbons from vessels involved in construction activities (up to 25 at any one time).	habitats considered to have negligible sensitivity to pollutants (based on MarSEA assessment). **Significance = negligible – minor adverse** Not significant in EIA terms.	As presented in Section 4.4 above, no habitats or species with increased sensitivity to accidental contamination have been identified in the proposed variation area. As the proposed variation area does not incorporate any intertidal areas sensitivity of receptor in the proposed variation area is negligible.	**Significance = negligible** Not significant in EIA terms.
Risk of introduction of Marine Invasive Non-Native Species (MINNS)	The current assessment assumes that there will be up to 25 construction vessels present at any one time during the construction period. There is potential risk of the introduction of MINNS from ballast water and biofouling associated with these vessels.	Impact magnitude = **negligible**. The potential risk of the introduction and spread of MINNS will be minimised through adherence to the Environmental Management Plan (EMP) Sensitivity of receptor = **moderate - high** based on MarSEA assessment. **Significance = negligible - minor adverse** Not significant in EIA terms.	There will be no change in the maximum number of vessels expected to be required during construction within the Alternative Moray West Site area (25 vessels). Therefore, there will be no change in impact magnitude. As presented in Section 4.4 no habitats or species with increased sensitivity to the introduction of MINNS have been identified in the proposed variation area. Therefore, sensitivity of receptor remains moderate - high.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **moderate - high** **Significance = negligible - minor adverse** Not significant in EIA terms.

Table 4.3 - Assessment of effects associated with the proposed Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[8]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Long term habitat loss	The maximum area of long term habitat loss during operation is 601,509 m^2. This is based on 85 x 45 m GBS foundations with 40 m additional scour protection (total area affected per foundation = 5,675 m^2) + two OSPs with 55 m diameter gravity base foundations and 95 m scour protection (including foundation). The total area affected also assumes a requirement for up to 10% additional cable protection (3 m wide) on inter-array and OSP interconnector cables and up to 15 cable crossings for inter-array cables extending 200 m in length and 6 m in width. *Note: although noted in the table, the calculated area of 545,516 m^2 is incorrect – this was miscalculated with the area of habitat loss associated with the inter-array cables taken as 27,500 m not the figure of 82,500 m^2 also presented in the table. The assessment has been based on 85,500 m^2.*	Impact magnitude = **negligible** due to small spatial scale and localised nature Sensitivity of receptor = **high** based on MarSEA assessment that identified all subtitdal biotopes have a high sensitivity to the introduction of hard substrate. **Significance = minor adverse** Not significant in EIA terms.	The maximum area of long term habitat loss for the Model 3 GBS foundations is 6,362 m^2 per foundation based on 50 m diameter foundation + 40 m scour protection (90 m diameter total). The maximum total area of long term habitat loss within the Alternative Moray West Site area = 577,220 m^2 also including two OSPs with 55 m diameter gravity base foundations and 95 m scour protection (including foundation), 10% protection on inter-array cables and OSP interconnectors and cable crossings (15). Given that this is within the assessed WCS it can be concluded that there will be no change in impact magnitude. As presented in Moray West EIA Report (Moray West EIA Report – Volume 2, Chapter 7: Section 7.7.3 Potential Operational Effects) all subtidal biotopes are considered to have a high sensitivity to habitat loss / change to a different seabed type as this counts as a complete loss of the old habitat and consequently there can be no recovery of impact (although some species may remain / recolonise the hard substrate through recruitment from neighbouring areas). The proposed variation area does not overlap the Southern Trench pMPA. The sensitivity of receptor therefore remains unchanged for the proposed variation area.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.

[8] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

Table 4.3 - Assessment of effects associated with the proposed Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[8]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Accidental and controlled discharges	Synthetic compound, heavy metal and hydrocarbon contamination resulting from up to 85 turbines and two OSPs. Accidental pollution may also result from O&M vessels. A typical turbine is anticipated to require grease, synthetic or hydraulic oil, and other operating compounds or materials. The OSPs are expected to require chemicals and other operating compounds. Various O&M vessels will be required over the operation and maintenance period.	Impact magnitude = **negligible**. The risk of impact from accidental discharges to subtidal benthic receptors is predicted to be of local to regional extent, short term duration, intermittent and reversible. Sensitivity of receptor = **negligible – high.** Intertidal species and habitats considered to have negligible to high sensitivity to pollutants; subtidal species and habitats considered to have negligible sensitivity to pollutants (based on MarSEA assessment). **Significance = negligible – minor adverse** Not significant in EIA terms.	There will be no changes in the chemicals and vessel movements required during operation and maintenance of the Moray West Offshore Wind Farm and components of the OfTI occurring within the proposed Alternative Moray West Site area. Impact magnitude therefore remains unchanged. As presented in Section 4.4 above, no habitats or species with increased sensitivity to accidental contamination have been identified in the proposed variation area. As the proposed variation area does not incorporate any intertidal areas sensitivity of receptor in the proposed variation area is negligible.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **negligible** as concerned with subtidal habitats only **Significance = negligible** Not significant in EIA terms.
Scouring of benthic habitats at foundations and around cables	For the Moray West Site as a whole, the greatest total local scour footprint is 284,265 m², (based on 62 x 15 m diameter monopile foundations for Model 4 WTGs and one large 15 m diameter OSP monopile foundation). For the Moray West Site as a whole, the greatest total WTG foundation global scour footprint is 355,163 m² (based on array of 85 smaller 35 m base diameter piled jacket WTG foundations and 1 larger piled jacket OSP).	Impact magnitude = **negligible** Although the impact from scouring is predicted to be of long term duration, continuous, and irreversible for the lifetime of the Development, it is expected to be of local spatial extent (i.e. restricted to the surrounding area of foundations and cable protection). Sensitivity of receptor = **negligible – high.** All subtidal biotopes identified within the within the Moray West Site and Offshore Export Cable Corridor were assessed as being not sensitive to local water flow changes, according to the MarESA sensitivity assessments (and therefore determined to be of negligible sensitivity), apart from **SS.SMu.CFiMu.SpnMeg** (seapens biotope)	As described in Section 3 of this addendum, the key variables in the assessments are: • The environmental setting (range of sediment types, current speeds, wave climate and water depths at the locations of the impact or activities); • The nature of the interactions between the installed infrastructure and the environmental setting; and • The WCS design parameters and so the greatest dimensions and total blockage cross section area of foundations, the dimensions of cable burial and cable protection, and the greatest volumes of	Details and conclusions of the current assessment remain valid. All biotopes in the proposed variation area are considered to have negligible sensitivity to scouring, impact assessment updated to reflect this. Impact magnitude = **negligible** Sensitivity of receptor = **negligible** **Significance = negligible** Not significant in EIA terms.

Table 4.3 - Assessment of effects associated with the proposed Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[8]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		which was recoded as having a high sensitivity. **Significance = negligible – minor adverse** Not significant in EIA terms.	sediment disturbed and associated rate of disturbance. The proposed variation area and associated design envelope either do not change these variables, or are within the WCS design parameters. Therefore, no change in the predicted nature, or increase in the magnitude, extent or duration of these potential impacts is expected. As presented in Section 4.4 above, no habitats or species with increased sensitivity to scouring have been identified in the proposed variation area. All biotopes in the proposed variation area are considered to be negligible sensitivity to scouring.	
Creation of new substrate and habitat	The maximum area of new substrate and habitat within the current Moray West Site created during was assessed as 601,509 m^2. This is based on 85 x 45 m GBS foundations with 40 m additional scour protection (total area affected per foundation = 5,675 m^2) + two OSPs with 55 m diameter gravity base foundations and 95 m scour protection (including foundation). The total area affected also assumes a requirement for up to 10% additional cable protection (3 m wide) on inter-array and OSP interconnector cables and up to 15 cable crossings for inter-array cables	Impact magnitude = **low** given the localised nature of habitat alteration. Sensitivity of receptor = **moderate.** Sensitivity of the receptors is difficult to assess but due to their ubiquity in the region and the scale of these changes in relation to the communities present in the wider area, it is unlikely that the changes would result in any significant broad scale community or biodiversity changes. The sensitivity of the receptor is therefore considered to be moderate at the worst. **Significance = minor adverse** Not significant in EIA terms.	As presented for maximum area of habitat loss above, the maximum area of new substrate and habitat creation within the Alternative Moray West Site area is 577,220 m^2. This is based on a combined total area of GBS foundations and scour protection for the Model 3 GBS foundations of 6,362 m^2 per foundation (based on 50 m diameter foundation + 40 m scour protection (90 m diameter total)) in addition to two OSPs with 55 m diameter gravity base foundations and 95 m scour protection (including foundation), 10% protection on inter-array cables and OSP interconnectors and cable crossings (15). Given that this is within the assessed WCS it can be concluded that there will be no change in impact magnitude. As presented in Moray West EIA Report (Moray West EIA Report – Volume 2, Chapter 7: Section 7.7.3 Potential Operational Effects) the sensitivity	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

Table 4.3 - Assessment of effects associated with the proposed Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[8]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	extending 200 m in length and 6 m in width.		of receptors is difficult to assess, but due to their ubiquity in the region and the scale of the proposed changes in relation to the scale of communities present in the, it is unlikely that any of the changes would result in any significant broad scale community or biodiversity changes. The sensitivity of receptor within the proposed Alternative Moray West Site area is therefore also considered to be moderate at worst.	
Electromagnetic fields (EMF)	The assessed WCS for Development within the current Moray West Site (offshore wind farm and associated OfTI) assumes maximum length of inter-array (up to 72.5 kV of alternating current) cables up to 275,000 m and a maximum length of OSP interconnector cables (up to 400 kV) 15,000 m. Total length of cables within the current Moray West Site is 290,000 m.	Impact magnitude = **low** Emissions will be of limited strength (e.g. well below the North Sea natural magnetic field of 50 µT) and will be highly localised in terms of spatial extent. Sensitivity of receptor = **low** **Significance = negligible – minor adverse** Not significant in EIA terms.	There will be no changes in cable design or total length of inter-array cabling, OSP interconnector cabling or export cable circuits to be installed within the Alternative Moray West Site area. Therefore, the magnitude of the impact assessed in the Moray West EIA Report remains unchanged. Based on information presented in the EIA Report – Volume 2, Chapter 7: Section 7.7.3 the sensitivity of subtidal benthic biotopes to EMFs the sensitivity of subtidal biotopes present within the proposed Alternative Moray West Site area including the variation area is low. This is the same as the biotopes within the mitigation area which were also assessed in the EIA Report – Volume 2 Chapter 7 as low.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible – minor adverse** Not significant in EIA terms.
Seabed sediment heating from subsea cables	Refer to EMF impact above.	Impact magnitude = **low** Although there is a lack of field data on the impact of thermal radiation on benthic habitats, it is clear that the impact is predicted to be highly localised. Sensitivity of receptor = **low** as majority of benthic burrowing infauna would be able to	There will be no changes in cable design or total length of inter-array cabling, OSP interconnector cabling or export cable circuits to be installed within the Alternative Moray West Site area. Therefore, the magnitude of impact remains unchanged.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low**

Table 4.3 - Assessment of effects associated with the proposed Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[8]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		move away from the areas that are impacted by any seabed sediment heating. **Significance = negligible – minor adverse** Not significant in EIA terms.	As presented in Moray West EIA Report (Moray West EIA Report – Volume 2, Chapter 7: Section 7.7.3 Potential Operational Effects) it is thought that the majority of benthic burrowing infauna are able to move away from areas that are impacted by any seabed sediment heating. The sensitivity of benthic receptors within the proposed Alternative Moray West Site area including the variation area is therefore also considered to be low.	**Significance = negligible – minor adverse** Not significant in EIA terms.
Risk of introduction of Marine Invasive Non-Native Species (MINNS)	Various O&M vessels will be present during the operation and maintenance period (exact number is currently unavailable) - MINNS risk would be from vessel ballasting and biofouling.	Impact magnitude = **negligible**. The potential risk of the introduction and spread of MINNS will be minimised through adherence to the Environmental Management Plan (EMP) Sensitivity of receptor = **moderate - high** based on MarSEA assessment. **Significance = negligible - minor adverse** Not significant in EIA terms.	There will be no change in the maximum number of vessels expected to be required during operations and maintenance within the proposed Alternative Moray West Site area. Therefore, the magnitude of impact remains unchanged. As presented in Section 4.4 above. no habitats or species with increased sensitivity to the introduction of MINNS have been identified in the proposed variation area. Therefore, sensitivity of receptor remains moderate - high.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **moderate - high** **Significance = negligible - minor adverse** Not significant in EIA terms.

Table 4.4 Assessment of effects associated with the proposed Alternative Moray West Site area

Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[9]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Temporary habitat loss / habitat disturbance	The maximum area of disturbance during decommissioning would be 4,990,059 m^2. This is based on removal of 85 turbines with 45 m diameter gravity base foundations and 40 m scour protection (482,333 m^2); two OSPs GBS foundations + scour protection (95 m diameter total area) and spud cans (157,726 m^2); total of 4,125,000 m^2 disturbance for removal of inter-array cables and 225,000 m^2 disturbance for removal of OSP interconnector cables.	Impact magnitude = **low** based on affected area comprising only 0.51% of total Moray West Site and Offshore Export Cable Corridor. Sensitivity of receptor = **low to moderate** due to PMFs and small area of potential Annex I habitat in the Moray West Site. **Significance = negligible - minor adverse** Not significant in EIA terms.	There will be a slight reduction in the total area of disturbance during removal of the Model 3 WTGs (458,044 m^2) compared to disturbance from 85 x Model 1 WTGs. The total area of disturbance regarding OSP and cable removal (inter-array and OSP interconnector) will remain the same. Given that this maximum area of disturbance during decommissioning is within the assessed WCS, the magnitude of impact remains unchanged. As presented in Section 4.4 above, no habitats or species of conservation importance have been identified in the proposed variation area. Station C3 considered to be potentially impoverished **SS.SMx.CMx.FluHyd** which is considered to have moderate sensitivity (EIA Report – Volume 2, Chapter 7: Table 7.7.1). An area of PMF (tide-swept coarse sands with burrowing bivalves) present in the proposed mitigation area (sample station W12) will be avoided as a result of the Alternative Moray West Site area. The proposed variation area does not overlap the Southern Trench pMPA. Sensitivity considered to remain as low to be moderate.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** based on the fact there is no increase in the maximum area of seabed disturbance (in fact the revised design parameters will result in a decrease in the maximum area of seabed disturbance). Sensitivity of receptor = **low to moderate**. **Significance = negligible - minor adverse** Not significant in EIA terms.
Loss of habitat from removal of introduced hard substrate	The maximum area of hard substrate created within the current Moray West Site was assessed as 601,509 m^2. This is based on 85 x 45 m GBS foundations with 40 m additional scour protection (total area affected per foundation = 5,675 m^2) + two OSPs with 55 m diameter gravity base foundations and 95 m scour protection (including foundation). The total area	Impact magnitude = **low** due very localised nature of effect. Sensitivity of receptor = **moderate** While the removal of the substrate will result in localised declines in biodiversity, areas of bare habitat, lost during construction, will be exposed and will be open to recolonization by the original benthic species. It is expected that the	Based on information presented in the Decommissioning Programme (EIA Report, Volume 4 Technical Appendix 4.2) all structures located above the seabed will be removed during decommissioning. The total area of hard substrate removal within the proposed Alternative Moray West Site will therefore similar to that identified for the current Moray West Site (601,509 m^2). This is based on 85 x Model 2 turbines. In the event that development within the proposed Alternative Moray West Site area is based on 72 x Model 3 turbines, the total area of hard substrate to be removed will be reduced to 577,220 m^2 (based on	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse**

[9] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

Table 4.4 Assessment of effects associated with the proposed Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[9]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	affected also assumes a requirement for up to 10% additional cable protection (3 m wide) on inter-array and OSP interconnector cables and up to 15 cable crossings for inter-array cables extending 200 m in length and 6 m in width.	baseline benthic communities will recover in these areas to their pre-construction state based on the recovery rates for disturbed sediment, which would equate to a maximum sensitivity for the baseline habitats of moderate. **Significance = minor adverse** Not significant in EIA terms.	50 m diameter GBS foundations + 40 m scour protection). Therefore, there will be no change in impact magnitude. As presented in Section 4.4 above. no habitats or species with increased sensitivity to substrate removal have been identified in the proposed variation area. The proposed variation area does not overlap the Southern Trench pMPA. The sensitivity of receptor therefore remains unchanged for the proposed variation area.	Not significant in EIA terms.
Increased SSC / sediment deposition	As per details in construction impact (above) for increased suspended sediment concentration and sediment deposition (although predicted to be much less in reality due to lower impact of decommissioning activities involved e.g. no dredging of seabed).	Impact magnitude = **low** similar to that for construction – see above Sensitivity of receptor = **low** **Significance = negligible – minor adverse** Not significant in EIA terms.	As presented for construction impacts above, on basis that there are no changes to the WCS design parameters, the predicted SSC levels and sediment deposition rates and volumes will remain unchanged from those assessed WCS (Moray West EIA Report – Volume 2, Chapter 7: Table 7.6.1). Therefore, the magnitude of impact remains unchanged. As presented in Section 4.4 above, no habitats or species of conservation importance have been identified in the proposed variation area. Station C3 considered to be potentially impoverished **SS.SMx.CMx.FluHyd** which is considered to have negligible to low sensitivity (EIA Report – Volume 2, Chapter 7: Table 7.7.3). An area of PMF (tide-swept coarse sands with burrowing bivalves) present in the proposed mitigation area (sample station W12) will be avoided as a result of the removal of the mitigation area (western extent) from the current Moray West Site. Therefore, sensitivity can be considered to be low.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible – minor adverse** Not significant in EIA terms.
Noise and vibration	Noise created by the removal of foundations using cutting machinery.	Impact magnitude = **low** Sensitivity of receptor = **low**	There will be no change in the predicted levels of noise associated with the removal of foundations or use of cutting machinery within the Alternative Moray West Site area on the basis that	Details and conclusions of the current assessment remain valid.

Table 4.4 Assessment of effects associated with the proposed Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[9]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		Significance = negligible – minor adverse Not significant in EIA terms.	there will be no increase in the total number or dimensions of structures requiring removal. Impacts magnitude therefore remains unchanged. As presented in Section 4.4 above, no habitats or species with increased sensitivity to underwater noise or vibration have been identified in the proposed variation area. Therefore, sensitivity remains low.	Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible – minor adverse** Not significant in EIA terms.
Accidental and controlled discharges	There is also potential for the accidental release of synthetic compounds, heavy metals and hydrocarbons from vessels involved in decommissioning activities (up to 25 at any one time).	Impact magnitude = **negligible** As for construction, the risk of impact from accidental discharges to subtidal benthic receptors is predicted to be of local to regional extent, short term duration, intermittent and reversible. Sensitivity of receptor = **negligible – high** Intertidal species and habitats considered to have negligible to high sensitivity to pollutants; subtidal species and habitats considered to have negligible sensitivity to pollutants (based on MarSEA assessment). **Significance = negligible – minor adverse** Not significant in EIA terms.	There will be no change in the potential for the accidental release of synthetic compounds, heavy metals and hydrocarbons from vessels involved in decommissioning activities (up to 25 at any one time) within the proposed Alternative Moray West Site area. Therefore, the magnitude of impact remains unchanged. As presented in Section 4.4 above, no habitats or species with increased sensitivity to accidental contamination have been identified in the proposed variation area. As the proposed variation area does not incorporate any intertidal areas sensitivity of receptor in the proposed variation area is negligible.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **negligible** as concerned with subtidal habitats only **Significance = negligible** Not significant in EIA terms.
Risk of introduction of Marine Invasive Non-Native Species (MINNS)	Various vessels will be present during the decommissioning period (exact number is currently unavailable but expected to be less than or similar to those required for construction (max 25 vessels at any one time) - MINNS	Impact magnitude = **negligible** The potential risk of the introduction and spread of MINNS will be minimised through adherence to the	There will be no change to the maximum number of vessels expected to be required during decommissioning (up to 25 vessels based on construction requirements). Therefore, the magnitude of impact remains unchanged.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible**

Table 4.4 Assessment of effects associated with the proposed Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report Volume 2, Chapter 7: Section 7.6.2 and additional mitigation presented in Volume 2, Chapter 7: Section 7.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[9]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	risk would be from vessel ballasting and biofouling.	Environmental Management Plan (EMP) Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.	As presented in Section 4.4 no habitats or species with increased sensitivity to the introduction of MINNS have been identified in the proposed variation area. Therefore, sensitivity of receptor remains moderate - high.	Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.

4.7 Cumulative effects

An assessment of potential cumulative effects is provided for the current Moray West Site in the EIA Report – Volume 2, Chapter 7: Section 7.8.

As outlined in Tables 4.1 to 4.4, the significance of the effects of the Development on benthic habitats and species considering the Alternative Moray West Site area would be as identified in the EIA Report, Volume 2, Chapter 7, Section 7.7 with respect to the current Moray West Site. This is on the basis that the proposed changes to the current Moray West Site area do not affect the nature or magnitude of any of the effects assessed with respect to the current Moray West Site and no habitats or species of increased sensitivity to the installation and operation (and maintenance) of WTGs, substructures, inter-array cables and components of the OfTI within the variation area.

It can therefore also be concluded that the conclusions from the cumulative assessment of the Alternative Moray West Site area remain unchanged from those assessed for the current Moray West Site as presented in the EIA Report, Volume, Chapter 7, Section 7.8.

4.8 Conclusion on the effects of proposed changes to the Moray West Site

With respect to the Alternative Moray West Site area, no new or additional benthic ecology receptors are identified in the variation area. There are also no habitats or species of conservation importance in the variation area. However, an area of PMF (tide-swept coarse sands with burrowing bivalves) present in the mitigation area (sample station W12 within the western extent of the current Moray West Site) will be avoided as a result of the Alternative Moray West Site area. The Alternative Moray West Site area also does not overlap the Southern Trench pMPA.

Based on the above and the impact assessments presented in Sections 4.6 and 4.7 both the project specific and cumulative impact assessments as presented in Chapter 7 of the EIA Report 2018 (Volume 2), remain valid for the Alternative Moray West Site area (including updated design parameters).

5 Fish and Shellfish Ecology

5.1 Introduction

This section presents additional information with respect to potential effects of the proposed variation to the current Moray West Site on fish and shellfish ecology.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 8: Fish and Shellfish Ecology.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

5.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on fish and shellfish ecology are provided in the EIA Report – Volume 2, Chapter 8: Section 8.2.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

5.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key consultation responses received during preparation of the EIA Report are provided in EIA Report – Volume 2, Chapter 8: Section 8.3**.** Specific comments received to date (20th November 2018) on the application, as submitted in July 2018 (Moray West EIA Report), have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

No further consultation with regards to fish and shellfish ecology has been undertaken as part of the preparation of this addendum.

5.4 Baseline characteristics

Overview of baseline characteristics associated with the current Moray West Site (including proposed mitigation area) and the Alternative Moray West Site area (including proposed variation area) is provided below. A detailed description of the baseline conditions with the current Moray West Site and along the Offshore Export Cable Corridor (including the northern extent of the export cable corridor which corresponds to the proposed variation area) are provided in the EIA Report – Volume 2, Chapter 8: Section 8.4.

There are extensive data on the fish and shellfish populations of the Moray Firth and wider area. The fish and shellfish baseline was informed by a combination of desktop data and information sources, and survey data collected as part of the characterisations of the Moray East Offshore Wind Farm, the former Moray Firth Zone, and the Beatrice Offshore Wind Farm.

Various types of fish and shellfish are present either within the Moray West Site and / or along the Offshore Export Cable Corridor. Some have high commercial value such as scallop, crab and lobster, Nephrops (Norway lobster), squid and haddock. Other species are of conservation importance due to declining populations such as Atlantic salmon, European eel, sea lamprey, sea trout, plaice, herring, cod and sandeel. Certain species, in particular sandeel, comprise important prey for marine mammals (whales, dolphins, porpoise and seals) and seabirds.

Table 5.1 summarises the key characteristics of, and differences between, the current Moray West Site including the proposed mitigation area (western extent of the current Moray West Site) and the

Alternative Moray West Site area including the variation area. Volume 2 - Figures 5.1 and 5.2 of this Addendum document provide information on fish spawning grounds.

The current Moray West Site spans ICES rectangles 45E6 and 45E7. The proposed Alternative Moray West Site area also spans both rectangles, although the extent to which the site extends west into ICES rectangle 45E6 is reduced. Consequently, the majority of the variation area associated with the proposed Alternative Moray West Site area is located in 45E7 while the mitigation area (western extent of the current Moray West Site) is located entirely within 45E6. Table 5.1 below provides an overview of the main differences in fish and shellfish interests between the two ICES rectangles, focusing in particular in the differences between the proposed mitigation area and the proposed variation area.

Table 5.1 Fish and shellfish ecology characteristics of the proposed mitigation and proposed variation areas

Fish species	Key characteristics of the proposed mitigation area (ICES rectangle 45E6)	Key characteristics of the proposed variation area (ICES rectangle 45E7)
Shellfish		
Scallop	Both the proposed mitigation and proposed variation areas (as well as the wider Moray West Site) are located on the Smith Bank, which is known scallop ground. Scallop fishing grounds identified (through consultation) in both the proposed mitigation and proposed variation areas (EIA Report – Volume 3a, Figure 11.4.17).	
	Value (up to £6,000 annual average) and effort (up to 20 hours annual average) of dredging (EIA Report – Volume 3a, Figure 11.4.12 and Figure 11.4.13). EIA Report – Volume 3a, Figure 11.4.5 shows that scallops are present in ICES rectangle 45E6 – most probably in the area of the proposed mitigation area (as this is located at the edge of the Smith Bank (a known scallop ground).	Value (up to £12,000 annual average) and effort (up to 50 hours annual average) of dredging (EIA Report – Volume 3a, Figure 11.4.12 and Figure 11.4.13). EIA Report – Volume 3a, Figure 11.4.5 shows that scallops are more established within the northern area of the Moray Firth, with the highest scallop landings recorded in ICES rectangle 45E7. The slighter greater importance of the proposed variation area for scallop is also confirmed by AIS tracks of known scallop dredgers that target the Moray Firth EIA Report – Volume 3a, Figure 11.4.18.
Nephrops	EIA Report – Volume 3a, Figure 11.4.5 shows that Nephrops are more established in the southern area of the Moray Firth, with the largest landings occurring in the two ICES rectangles to the south of the proposed mitigation and proposed variation areas (ICES rectangles 44E6 and 44E7).	
	No Nephrops fishing grounds identified (through consultation) in the proposed mitigation area (EIA Report – Volume 3a, Figure 11.4.5 and Figure 11.4.10).	Nephrops fishing grounds identified (through consultation) immediately to the south of (but outwith) the proposed variation area (EIA Report – Volume 3a, Figure 11.4.5 and Figure 11.4.10).
Squid	Squid fishing grounds identified (through consultation) identified throughout the Moray West Site and along the Offshore Export Cable Corridor including the proposed mitigation and variation areas (EIA Report – Volume 3a, Figure 11.4.11).	
Crab	Unlikely to be present in either the proposed mitigation or proposed variation areas as in the Moray Firth, crabs are mainly targeted in coastal waters located to the south and west of the Moray West Site (EIA Report – Volume 3a, Figure 11.4.5 and Figure 11.4.6).	
Lobster	Unlikely to be present in either the proposed mitigation or proposed variation areas as most commonly found on rocky grounds in water depths of less than 30 m. Lobsters are mainly targeted in coastal waters of the Moray Firth (EIA Report – Volume 3a, Figure 11.4.5).	
Whelk	Will not be present in either the proposed mitigation or proposed variation areas as whelk inhabit the littoral / subtidal zone. It is not a species of commercial importance within the Moray Firth (EIA Report - Volume 2, Section 8.4.2).	
Demersal species		
Haddock	Both areas outwith identified spawning areas for haddock, but within an identified nursery area that covers a large area in the Moray Firth and into the North Sea (EIA Report – Volume 3a, Figure 8.4.5).	

Table 5.1 Fish and shellfish ecology characteristics of the proposed mitigation and proposed variation areas		
Fish species	**Key characteristics of the proposed mitigation area (ICES rectangle 45E6)**	**Key characteristics of the proposed variation area (ICES rectangle 45E7)**
Monkfish (angler fish)	Unlikely to be present in either the proposed mitigation area (EIA Report – Volume 3a, Figure 11.4.5) and in low densities only in the proposed variation area.	
Whiting	Not within an identified spawning ground. Located within a recognised nursery ground	Located within a low intensity spawning ground Located within a recognised nursery ground
Cod	Both areas within an identified low intensity cod spawning area as defined in Coull *et al.,* (1998). Cod spawning surveys carried out for the Moray East Site (2013) and Beatrice offshore wind farm site (2014) indicated relatively low abundance of spawning cod. However, there is a high intensity nursery ground that extends throughout the Moray Firth, covering both the mitigation area and the variation area. The cod population of the Moray Firth is thought to be genetically distinct from other North Sea populations (population processes may operate at a smaller spatial scale than the stock level, with spawning aggregations functioning as local populations within a metapopulation). It has been shown that between 67% and 97% of cod remain within 100 km of their spawning areas throughout the year.	
Plaice	Both areas are located within low intensity spawning and nursery grounds for this species. This species is widely distributed throughout the North Sea and is not considered to be of commercial importance within the Moray Firth.	
Pelagic species		
Herring	Herring spawning hots spots are located to the east and north of Orkney and of the east coast of Scotland (in the Peterhead and Fraserborough region. (Volume 2 - Figure 5.1 of this Addendum document) Herring is not a key commercial fishery in the Moray Firth.	
	A heat map of herring spawning areas derived from data collected during the International Herring Larvae Survey (IHLS) indicates the proposed mitigation area is located in a low intensity spawning area for herring. The current Moray West Site lies in a high intensity nursey area for herring as defined by Ellis *et al.* (2010a).	Data from the IHLS also indicates that the variation area is located in an area of low intensity for herring spawning although slightly higher than the mitigation area within the current Moray West Site (Volume 2 -Figure 5.2 of this Addendum document) The Alternative Moray West Site area also lies in a high intensity nursery area for herring defined by Ellis *et al.* (2010a).
Sandeel	As discussed in the Moray West EIA Report – Volume 2, Chapter 8, although the current Moray West Site is located an area identified as a high intensity spawning ground and a low intensity nursery ground for sandeels (Ellis *et al.*, 2010) evidence from surveys carried out across the Moray Firth Zone (2012) and the Beatrice Offshore Wind Farm Site (2014) confirmed that the distribution of sandeel across the current Moray West Site is patchy. (Volume 2 - Figure 5.1 of this Addendum document)	The abundance and distribution of sandeels within the Alternative Moray West Site area is similar to that identified for the current Moray West Site. Although it is noted that in the 2012 MORL survey report sandeels were found in highest numbers in areas where sediments containing a high proportion of coarse sands and a low proportion of silt and fine sands were recorded in grab samples. Sediment characteristics in the proposed variation area more suited to sandeels (see Table 4.1 in the Section 4 Benthic and Intertidal Ecology Ecology and Volume 2 – Figure 4.2 of this Addendum document).
Lemon sole	Both areas within an extensive area of spawning and nursery grounds for lemon sole (EIA Report – Volume 3a, Figure 8.4.3). This species is widely distributed throughout the North Sea.	
Sprat	Both areas outwith identified spawning areas for sprat, but within an identified nursery area that covers the entire Moray Firth and norther North Sea (EIA Report – Volume 3a, Figure 8.4.4).	
Diadromous migratory species		
River & sea lamprey	River lamprey have been recorded in a number of rivers in the Moray Firth (recorded in River Conon, River Spey and Loch Ness), but unlikely to be present in either the proposed mitigation or proposed variation areas as are generally found in coastal waters, estuaries and accessible rivers (EIA Report Volume 2, Section 8.4.2). Sea lamprey have been recorded in a number of rivers in the Moray Firth (e.g. Loch Ness, River Conon and River Spey). Sea lamprey is a primary reason for the designation of the River Spey as a Special Area of	

Table 5.1 Fish and shellfish ecology characteristics of the proposed mitigation and proposed variation areas		
Fish species	**Key characteristics of the proposed mitigation area (ICES rectangle 45E6)**	**Key characteristics of the proposed variation area (ICES rectangle 45E7)**
	Conservation (SAC). Sea lamprey could be present in both the proposed mitigation or proposed variation areas as are thought to be widely dispersed at sea (EIA Report Volume 2, Section 8.4.2).	
European eel	Unlikely to be present in significant densities in either the proposed mitigation or proposed variation areas (EIA Report Volume 2, Section 8.4.2).	
Allis & twaite shad	Unlikely to be present in either the proposed mitigation or proposed variation areas. Allis shad have occasionally been recorded in the estuarine and coastal areas of the Moray Firth. Taite shad have been occasionally recorded in coastal areas of the Moray Firth (EIA Report Volume 2, Section 8.4.2).	
European smelt	Unlikely to be present in significant densities in either the proposed mitigation or proposed variation areas (EIA Report Volume 2, Section 8.4.2).	
Salmon	There are a number of rivers that run into the Moray Firth that are known to be important for salmon (some are designated as SACs for their salmon interests). The general understanding / evidence is that the migrations routes for salmon between their natal rivers and distant feeding grounds (around Greenland) tend to be coastal. Salmon are therefore unlikely to be present in significant densities in the proposed mitigation or proposed variation areas.	
Sea trout	Sea trout generally expected to be present in greatest abundance in the coastal waters of the Moray Firth adjacent to rivers. Although there is some evidence of longer migrations they are unlikely to be present in significant densities in the proposed mitigation or proposed variation areas (EIA Report Volume 2, Section 8.4.2).	
Freshwater pearl mussel	Fresh Water Pearl Mussel (FWPM) are found as adult mussels in riverine environments only. FWPM are known to be present in a number of river systems that flow into the Moray Firth (EIA Report Volume 2, Section 8.4.2).	
Skates and rays (elasmobranchs)		
Sharks	Both areas within a low intensity nursery ground spurdog in the wider Moray Firth (EIA Report – Volume 3a, Figure 8.4.7). Other shark species potentially present in the Moray Firth and therefore could be present in both areas are Portuguese dogfish, porbeagle, tope (EIA Report – Volume 3a, Figure 8.4.7) and leafscale gulper shark. With the exception of porbeagle, all have been recorded in the landings data from the wider Moray Firth study area. It should be noted that the majority of these species are either rare or tend to be more prevalent in offshore waters and the west and north coast of Scotland, than in the Moray Firth (EIA Report Volume 2, Section 8.4.2).	
Skates & rays	Both areas within a low intensity nursery ground for thornback ray and spotted ray (EIA Report – Volume 3a, Figure 8.4.7). Other skate and ray species potentially present in the Moray Firth and therefore could be present in both areas are common skate, long nosed skate and white skate, sandy ray and spotted ray (EIA Report Volume 2, Section 8.4.2).	

5.4.1 Limitations with the baseline characterisation

Other than the limitations listed in the EIA Report – Volume 2, Chapter 8: Section 8.5.4, no other limitations have been identified that could affect the assessment of the Alternative Moray West Site area.

5.5 Assessment method

The method for assessing potential effects of the Development on fish and shellfish ecology within the current Moray West Site and Offshore Export Cable Corridor is described in detail in the EIA Report – Volume 2, Chapter 8: Section 8.5.

There have been no changes to this assessment method since submission of the application in July 2018. These methods, and associated assessment criteria therefore remain applicable for the assessment of development within the Alternative Moray West Site area.

As noted above, specific comments raised on the application as submitted in July 2018 (Moray West EIA Report) have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A). Comments raised with regards to fish and shellfish ecology have not altered the overall conclusions of the assessment presented in the Moray West EIA Report. The assessment presented in the Moray West EIA Report, forms the basis for the assessment presented in this addendum.

5.6 Potential effects associated with the Alternative Moray West Site area

Potential effects associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Tables 5.2 to 5.4 below. The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated WCS design parameters assessed in the EIA Report – Volume 2, Chapter 8: Section 8.6: Table 8.6.1 for the current Moray West Site; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the current Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 8: Section 8.7.

5.6.1 Mitigation measures

The assessment and conclusions presented in Tables 5.2 to 5.4 also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 8: Section 8.6.2. No additional measures were identified with respect to fish and shellfish ecology.

Table 5.2 Assessment of effects associated with the proposed Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)**[10]	**Receptors**	**Conclusions from assessment of effects within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Temporary term habitat loss	Total area of disturbance within the Moray West Site calculated to be 5,561,214 m^2. Based on: dredge affected area for 85 x Model 4 Gravity Base Structure (GBS) foundations[11] and 2 OSPs + jack-up vessel footprint + inter-array cables + OSP interconnector cabling.	***Brown crab, European lobster, scallops, Nephrops*** ***Sandeel*** ***Herring, cod and other spawning adults***	Impact magnitude = **low** on the basis of local spatial extent, short term duration, intermittent and reversible Sensitivity of receptor = **moderate** based on high vulnerability, medium to high recoverability and of regional importance within the study area. **Significance = minor adverse** Not significant in EIA terms.	The revised WCS dredge affected area for 72 x Model 3 WTGs is 747,856 m^2 (based on total dredge affected area for each Model 3 GBS foundation of 115 m^2). When considered with 2 OSPs + jack-up vessel footprint + inter-array cables + OSP interconnector cabling the total area affected is 5,220,950. Given that this maximum area of disturbance for Model 3 WTG is within the assessed WCS, the magnitude of impact remains unchanged. With regards to sensitivity of receptor (see Section 5.4): • ***Brown crab, European lobster, scallops, Nephrops*** = Remains as **moderate** due to the presence of scallop in both the proposed mitigation and proposed variation areas. Scallop potentially present in the proposed variation area in slightly higher densities than the proposed mitigation area, but not in a density would warrant a higher sensitivity ranking. Note: lobster, crab and Nephrops not expected to be present in either the proposed mitigation or proposed variation areas. • ***Sandeel*** = Remains as **moderate** due to presence of sandeel in both the proposed mitigation and proposed variation areas. Sandeel potentially present in the proposed variation area in slightly higher densities than the proposed mitigation	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
		All other fish and shellfish	Impact magnitude = **low** see above Sensitivity of receptor = **low** based on low vulnerability, high recoverability and of local to international importance within the study area. **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.

[10] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

[11] The WCS presented in EIA Report – Volume 2, Chapter 7: Table 7.6.1 refers to 62 x Model 4 GBS foundations. However, due to an error in the calculations the total dredge affected area was calculated as 1,043,120 m^2. This equates 85 x 12,272 m^2 (total dredge affected area per Model 4 GBS foundation based on 125 m diameter dredge affected area) not 62 x 12,272 m^2.

Table 5.2 Assessment of effects associated with the proposed Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[10]**	**Receptors**	**Conclusions from assessment of effects within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
				area, but not in a density that would warrant a higher sensitivity ranking. • ***Herring, cod and other spawning adults*** = Remains as **moderate** due to the presence of cod, herring (and other spawning adults) in both the proposed mitigation and proposed variation areas. Herring spawning indicated to be slightly higher intensity in the proposed variation area compared to the proposed mitigation area, but not in an intensity that would warrant a higher sensitivity rating. • ***All other fish and shellfish*** = Remains as **low.**	
Increased SSC / sediment deposition	Maximum amount of sediment disturbance within the Moray West Site of 3,807,141 m^3. This is based on: maximum excavation area for 85 x Model 1 WTGs with GBS foundations + excavations for one large OSP, inter-array cables and OSP interconnector cables	*Scallops*	Impact magnitude = **low –** the potential for increased SSC and deposition from seabed preparation for foundations is determined to be short-term (lasting a day at the longest) and localised (with a worst case of one tidal excursion extent). Sensitivity of receptor = **moderate** - Feeding sensitivity to increased SSC / sediment deposits and their inability to apply avoidance behaviour quickly due to their limited mobility. **Significance = minor adverse** Not significant in EIA terms.	On basis that there are no changes to the design parameters, the predicted SSC levels and sediment deposition rates and volumes will remain unchanged from the assessed WCS (Moray West EIA Report – Volume 2, Chapter 8: Table 8.6.1.). Therefore, the magnitude of impact remains unchanged. With regards to sensitivity of receptor (see Section 5.4): • ***Scallops*** = Remains as **moderate** due to the presence of scallop in both the proposed mitigation and proposed variation areas. Scallop potentially present in the proposed variation area in slightly higher densities than the proposed mitigation area, but not in a density would warrant a higher sensitivity ranking.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

Table 5.2 Assessment of effects associated with the proposed Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[10]**	**Receptors**	**Conclusions from assessment of effects within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		Spawning grounds	Impact magnitude = **low** see above Sensitivity of receptor = **moderate** based on medium vulnerability, high recoverability and of regional importance in the study area. **Significance = minor adverse** Not significant in EIA terms.	• ***Spawning grounds*** = Remains as **moderate** as spawning ground for herring, sandeel, cod, plaice and lemon sole present in both proposed mitigation and proposed variation areas. • ***Fish*** **=** Remains as **low.** • ***Shellfish*** = Reduced to **negligible** due to the lack of shellfish species (except scallops – see above) in the proposed variation area. Crab and lobster are unlikely to be present in the proposed variation area as these species are mainly fished for in coastal waters located to the south of the Alternative Moray West Site area.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
		Other fish and shellfish	Impact magnitude = **low** see above Sensitivity of receptor = **low** based on medium vulnerability, high recoverability and regional importance in the study area. **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Note due to lack of shellfish species (other than scallop – see previous column) in the proposed variation area sensitivity of receptor reduced to **negligible.** Impact magnitude = **low** Sensitivity of receptor = **negligible - low** **Significance = negligible - minor adverse** Not significant in EIA terms.
Noise and vibration	Maximum duration of piling is nine months (based on installation	***Sea lamprey***	Impact magnitude = **low** based on modelling results and use of soft start during piling (that will allow fish to	The WCS modelled for underwater noise for both temporal (duration) and spatial extents was based on 85 x maximum design parameters for pin piles (Model 4) and monopiles	Details and conclusions of the current assessment remain valid.

Table 5.2 Assessment of effects associated with the proposed Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[10]**	**Receptors**	**Conclusions from assessment of effects within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	of 340 pin-piles (85 jackets) with maximum hammer energy of 3,000 KJ). Spatial extent is 85 x 15 m diameter monopiles installed over five months. Maximum hammer energy is 5,000 KJ.		avoid sound pressure and particle motion) Sensitivity of receptor = **low** on basis the species does not possess a swim bladder. **Significance = minor adverse** Not significant in EIA terms.	(Model 4). The maximum WCS for the Alternative Moray West Site area is 72 Model 3 WTGS. Given that the maximum WCS design parameters for 72 Model 3 WTG is within the assessed WCS, the magnitude of impact (temporal or spatial) remains unchanged. With regards to sensitivity of receptor (see Section 5.4): • ***Sea lamprey =*** Remains as **low** as sea lamprey could potentially be present in the proposed mitigation and proposed variation areas. • ***Herring, sprat, cod, whiting, salmonids*** = Remains as **moderate** as herring, sprat, cod, whiting and potentially salmon are expected to be present in the proposed variation area. • ***Other fish and shellfish*** = Remains as **low**.	Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = minor adverse** Not significant in EIA terms.
		Herring, sprat, cod, whiting, salmonids	Impact magnitude = **low** see above Sensitivity of receptor = **moderate** Medium vulnerability, high recoverability and of regional to international importance. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
		Other fish and shellfish	Impact magnitude = **low** see above Sensitivity of receptor = **low** based on low vulnerability, high recoverability and of local to international importance. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = minor adverse** Not significant in EIA terms.

Table 5.2 Assessment of effects associated with the proposed Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[10]**	**Receptors**	**Conclusions from assessment of effects within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Accidental release of hydrocarbons and chemicals	The current assessment assumes that there is likely to be a requirement for the use of water based drilling muds during piling and requirement for grout for joining offshore infrastructure. There is also potential for the accidental release of synthetic compounds, heavy metals and hydrocarbons from vessels involved in construction activities (up to 25 at any one time).	***All fish and shellfish***	Impact magnitude = **low** due to embedded mitigation and contingency planning in the unlikely event of a spill. Sensitivity of receptor = **moderate** Irrespective of whether they are PMFs or other receptors with higher conservation protection all fish and shellfish would potentially suffer the same fate with limited capacity to recover. **Significance = minor adverse** Not significant in EIA terms.	There will be no changes in the requirement of water based drilling muds or grout associated with the Alternative Moray West Site area. There will also be no change in maximum number of vessels expected to be required during construction (25). Therefore, there will be no change in impact magnitude. With regards to sensitivity of receptor (see Section 5.4): • ***All fish and shellfish*** = Remains as **moderate**.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

Table 5.3 Assessment of effects associated with the proposed Alternative Moray West Site area

Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)

Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)**[12]	**Receptors**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Long term habitat loss	The maximum area of long term habitat loss = 601,509 m^2. This is based on 85 x 45 m GBS foundations with 40 m additional scour protection (total area affected per foundation = 5,675 m^2) + two OSPs with 55 m diameter gravity base foundations and 95 m scour protection (including foundation). The total area affected also assumes a requirement for up to 10% additional cable protection (3 m wide) on inter-array and OSP interconnector cables and up to 15 cable crossings for inter-array cables extending 200 m in length and 6 m in width. *Note: although noted in the table, the calculated area of 545,516 m^2 is incorrect – this was miscalculated with the area of habitat loss*	***Herring*** ***Sandeel*** ***Nephrops*** ***Brown crab*** ***European lobster***	Impact magnitude = **low** due to the limited area of habitat loss in comparison to the wider area, along with the habitat being widespread and commonplace. Sensitivity of receptor = **moderate** based on high vulnerability of species (specific habitat requirement) and regional importance of species within the study area. Development area also coincides with known *Nephrops* spawning habitat. **Significance = minor adverse** Not significant in EIA terms.	The maximum area of long term habitat loss for the Model 3 GBS foundations is 6,362 m^2 per foundation based on 50 m diameter foundation + 40 m scour protection (90 m diameter total). The maximum total area of long term habitat loss within the Alternative Moray West Site area = 577,220 m^2 also including two OSPs with 55 m diameter gravity base foundations and 95 m scour protection (including foundation), 10% protection on inter-array cables and OSP interconnectors and cable crossings (15). Given that this is within the assessed WCS it can be concluded that there will be no change in impact magnitude. With regards to sensitivity of receptor (see Section 5.4): • ***Herring*** = Remains as **moderate** due to the presence of herring in both the proposed mitigation and proposed variation areas. Herring spawning indicated to be slightly higher intensity in the proposed variation area compared to the proposed mitigation area, but not in an intensity that would warrant a higher sensitivity rating. • ***Sandeel*** = Remains as **moderate** due to presence of sandeel in both the proposed mitigation and proposed variation areas.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **negligible to moderate** as discussed in previous column **Significance = minor adverse** Not significant in EIA terms.
		All other fish and shellfish	Impact magnitude = **low** see above Sensitivity of receptor = **low** based on low vulnerability and, although some species are considered to be of international importance (recoverability is not applicable for this impact due to the impact occurring over the lifetime of the project), given the widespread nature		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low**

[12] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

Table 5.3 Assessment of effects associated with the proposed Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[12]**	**Receptors**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	associated with the inter-array cables taken as 27,500 m not the figure of 82,500 m^2 also presented in the table. The assessment has been based on 85,500 m^2.		of spawning and nursery habitat in the wider northern North Sea, the overall sensitivity of these receptors is considered to be low. **Significance = negligible - minor adverse** Not significant in EIA terms.	Sandeel potentially present in the proposed variation area in slightly higher densities than the proposed mitigation area, but not in a density that would warrant a higher sensitivity ranking. • ***Nephrops =*** Reduced to **low** as proposed variation area outwith main Nephrops fishing grounds (these lie to the south of the proposed Alternative Moray West Site area including the variation area). • ***Brown crab =*** Reduced to **negligible** due to the lack of brown crab in the proposed variation area (coastal waters of the export cable corridor only). • ***European lobster =*** Reduced to **negligible** due to the lack of lobster in the proposed variation area (coastal waters of the export cable corridor only). • ***All other fish and shellfish =*** Remains as **low.**	Significance = **negligible - minor adverse** Not significant in EIA terms.
Noise and vibration	Each WTG and OSP would require a number vessel visits during operation and maintenance. The frequency of the visits would depend if operations are coordinated form an onshore base or support vessel.	***Herring, sprat, cod, whiting, migratory fish (turbine noise only)***	Impact magnitude = **negligible** based on extremely localised spatial extent of the potential impact and low noise levels. Sensitivity of receptor = **moderate** based on medium vulnerability, high recoverability and of regional to international importance.	There will be no change in noise levels created by vessels involved in operation and maintenance activities within the proposed Alternative Moray West Site area or the frequency of vessel visits. Therefore, the magnitude of impact remains unchanged. With regards to sensitivity of receptor (see Section 5.4):	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = moderate

Table 5.3 Assessment of effects associated with the proposed Alternative Moray West Site area

Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)

Impacts assessed in the current EIA (July 2018)	Relevant WCS design parameters (for current Moray West Site area)[12]	Receptors	Conclusions from assessment of impacts within the current Moray West Site area	Commentary on potential impacts within the Alternative Moray West Site area	Assessment of effect significance and conclusions
			Significance = negligible - minor adverse Not significant in EIA terms.	• ***Herring, sprat, cod, whiting, migratory fish (turbine noise only)*** = Remains as **moderate** as herring, sprat, cod, whiting and potentially salmon are expected to be present in the proposed variation area. • ***All other fish and shellfish (turbine noise only)*** = Remains as **low**. • ***All fish and shellfish (vessel noise)*** = Remains as **negligible.**	**Significance = negligible - minor adverse** Not significant in EIA terms.
		All other fish and shellfish (turbine noise only)	Impact magnitude = **negligible** see above Sensitivity of receptor = **low** Low vulnerability, high recoverability and of local to international importance in terms of turbine noise. **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.
		All fish and shellfish (vessel noise)	Impact magnitude = **negligible** see above Sensitivity of receptor = **negligible.** In terms of vessel operation noise, fish and shellfish are very much accustomed to shipping traffic within their natural environment and are generally present within environments with such activity present. It is unlikely that the vessel movements and operations associated with O&M activities will be of any more significance than the regularly occurring shipping traffic		Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **negligible** **Significance = negligible** Not significant in EIA terms.

Table 5.3 Assessment of effects associated with the proposed Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[12]**	**Receptors**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
			that occurs and vulnerability will not increase. **Significance = negligible** Not significant in EIA terms.		
Accidental release of hydrocarbons and chemicals	Synthetic compound, heavy metal and hydrocarbon contamination resulting from up to 85 turbines and two OSPs. Accidental pollution may also result from O&M vessels. A typical turbine and OSP is expected to require chemicals and other operating compounds. A number of vessels (currently undetermined) will be required during O&M activities.	***All fish and shellfish***	Impact magnitude = **low** due to embedded mitigation and contingency planning in the unlikely event of a spill. Sensitivity of receptor = **moderate.** Irrespective of whether they are PMFs or other receptors with higher conservation protection all fish and shellfish would potentially suffer the same fate with limited capacity to recover. **Significance = minor adverse** Not significant in EIA terms.	There are no changes expected to the nature of the contaminants or the risk of accidental discharges, or the total worst case number of turbines (85) and OSPs (2). With regards to sensitivity of receptor (see Section 5.4): • ***All fish and shellfish*** = Remains as **moderate**.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
Creation of new substrate and habitat	The maximum area of new substrate and habitat within the current Moray West Site created during was assessed as 601,509 m^2. This is based on 85 x 45 m GBS foundations with 40 m additional scour protection (total area affected per	***Scallop and other shellfish***	Impact magnitude = **low** on basis that overall a noticeable change to only a small proportion of the receptor population. Sensitivity of receptor = **low** on basis that potential for benefits to fisheries as these species will colonise new hard substrate.	As presented for maximum area of habitat loss above, the maximum area of new substrate and habitat creation within the Alternative Moray West Site area is 577,220 m^2. This is based on a combined total area of GBS and scour protection for the Model 3 GBS foundations of 6,362 m^2 per foundation (based on 50 m diameter foundation + 40 m scour protection (90 m diameter total)) in addition to two OSPs with 55 m diameter gravity base foundations and 95 m scour	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible - minor adverse**

Table 5.3 Assessment of effects associated with the proposed Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[12]**	**Receptors**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	foundation = 5,675 m²) + two OSPs with 55 m diameter gravity base foundations and 95 m scour protection (including foundation). The total area affected also assumes a requirement for up to 10% additional cable protection (3 m wide) on inter-array and OSP interconnector cables and up to 15 cable crossings for inter-array cables extending 200 m in length and 6 m in width.		**Significance = negligible - minor adverse** Not significant in EIA terms.	protection (including foundation), 10% protection on inter-array cables and OSP interconnectors and cable crossings (15). Given that this is within the assessed WCS it can be concluded that there will be no change in impact magnitude. With regards to sensitivity of receptor (see Section 5.4): • ***Scallop and other shellfish*** **=** Remains as **low** due to the presence of scallop in both the proposed mitigation and proposed variation areas. Scallop potentially present in the proposed variation area in slightly higher densities than the proposed mitigation area, but not in a density would warrant a higher sensitivity ranking. *Note*: lobster and crab not expected to be present in either the proposed mitigation or proposed variation area on basis these tend to be closer to shore along export cable corridor. • ***Soft substrate species (e.g. Nephrops, sandeel, flatfish)*** **=** Remains as **moderate** due to presence of sandeel in both the proposed mitigation and proposed variation areas. Sandeel potentially present in the proposed variation area in slightly higher densities than the proposed mitigation area, but not in a density that would warrant a higher sensitivity ranking.	Not significant in EIA terms.
		Soft substrate species (e.g. Nephrops, sandeel, flatfish)	Impact magnitude = **low** see above Sensitivity of receptor = **moderate.** For fish and shellfish species that are present within / require softer substrates, the vulnerability is higher and these species are more sensitive to change. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
		Fish	Impact magnitude = **low** see above Sensitivity of receptor = **low** on basis of low vulnerability as they can react to changes in habitat type and adapt their behaviour, moving to more suitable habitats. **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.

Table 5.3 Assessment of effects associated with the proposed Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[12]**	**Receptors**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
				• ***Fish =*** Remains as **low**.	
EMF	The assessed WCS for Development within the current Moray West Site (offshore wind farm and associated OfTI) assumes maximum length of inter-array (up to 72.5 kV of alternating current) cables up to 275,000 m and a maximum length of OSP interconnector cables (up to 400 kV) 15,000 m. Total length of cables within the current Moray West Site is therefore 290,000 m.	***Shellfish***	Impact magnitude = **low** given the localised nature of potential EMF emissions. Sensitivity of receptor = **low** low vulnerability and are of local to regional importance in the study area. **Significance = negligible - minor adverse** Not significant in EIA terms.	There will be no changes in cable design or total length of inter-array cabling, OSP interconnector cabling or export cable circuits to be installed within the Alternative Moray West Site area. Therefore, the magnitude of impact remains unchanged. With regards to sensitivity of receptor (see Section 5.4): • ***Shellfish =*** Remains as **low** as the only shellfish species expected to be present in the proposed variation area are scallop. Nephrops to the south (outwith the variation area) and brown crab and lobster generally closer to shore along the export cable corridor. • ***Elasmobranchs =*** Remains as **low** as species of skates and rays expected to be present in the proposed variation area. • ***Migratory fish =*** Reduced to **low** as sea trout and salmon are unlikely to be present in significant densities in the proposed variation area due to migration routes	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.
		Elasmobranchs	Impact magnitude = **low** see above Sensitivity of receptor = **low** based on medium vulnerability and local importance in the study area. **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.

Table 5.3 Assessment of effects associated with the proposed Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[12]**	**Receptors**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		Migratory fish	Impact magnitude = **low** see above Sensitivity of receptor = **moderate** based on medium vulnerability and regional to international importance in the study area. **Significance = negligible - minor adverse** Not significant in EIA terms.	generally being more inshore than as far offshore as the proposed variation area. • ***All other fish =*** Remains as **low**.	Details and conclusions of the current assessment remain valid. Note: Sensitivity reduced to low as sea trout and salmon are not expected to be present in the proposed variation area Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.
		All other fish	Impact magnitude = **low** see above Sensitivity of receptor = **low** due to low vulnerability and are of local to regional importance in the study area. **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.

<table>
<tr><th colspan="6">Table 5.3 Assessment of effects associated with the proposed Alternative Moray West Site area</th></tr>
<tr><th colspan="6">Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)</th></tr>
<tr><th>Impacts assessed in the current EIA (July 2018)</th><th>Relevant WCS design parameters (for current Moray West Site area)[12]</th><th>Receptors</th><th>Conclusions from assessment of impacts within the current Moray West Site area</th><th>Commentary on potential impacts within the Alternative Moray West Site area</th><th>Assessment of effect significance and conclusions</th></tr>
<tr><td rowspan="2">Seabed sediment heating</td><td rowspan="2">Refer to EMF impact above.</td><td>Fish</td><td>Impact magnitude = low. Although it is noted that there is limited field data on the effect of thermal radiation on fish and shellfish receptors, based on evidence presented in the EIA Report – Volume 2, Chapter 8 it was concluded that the magnitude of any impacts on fish would be low.

Sensitivity of receptor = negligible. Fish species are not vulnerable, can recover and adapt their behaviour to move away from areas that may not have tolerable temperatures.

Significance = negligible - minor adverse

Not significant in EIA terms.</td><td rowspan="2">There will be no changes in cable design or total length of inter-array cabling, OSP interconnector cabling or export cable circuits to be installed within the Alternative Moray West Site area. Therefore, the magnitude of impact remains unchanged.

With regards to sensitivity of receptor (see Section 5.4):

• Fish = Remains as negligible.
• Shellfish = Remains as low as some shellfish species are expected to be present in the proposed mitigation area e.g. scallop. Nephrops, brown crab and lobster generally in waters closer to shore along the export cable corridor.
• Spawning activity = Remains as moderate as spawning activity occurs in the proposed variation area.</td><td>Details and conclusions of the current assessment remain valid.

Impact magnitude = low

Sensitivity of receptor = negligible

Significance = negligible - minor adverse

Not significant in EIA terms.</td></tr>
<tr><td>Shellfish</td><td>Impact magnitude = low see above

Sensitivity of receptor = low on basis that these species (particularly those species that show burial behaviour) can also adapt and move to more suitable locations, albeit over a slightly longer period due to slower mobility.</td><td>Details and conclusions of the current assessment remain valid.

Impact magnitude = low

Sensitivity of receptor = low

Significance = negligible - minor adverse

Not significant in EIA terms.</td></tr>
</table>

Table 5.3 Assessment of effects associated with the proposed Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[12]**	**Receptors**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
			Significance = negligible - minor adverse Not significant in EIA terms.		
		Spawning activity	Impact magnitude = **low** see above Sensitivity of receptor = **moderate.** Fish spawning activity may be sensitive to higher temperature and any spawning that may take place in areas of increased seabed temperatures, may be exposed to higher mortality rates / reduced recruitment success. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

Table 5.4 Assessment of effects assocaited with the proposed Alternative Moray West Site area

Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)

Impacts assessed in the current EIA (July 2018)	Receptors	Relevant WCS design parameters (for current Moray West Site area)[13]	Conclusions from assessment of impacts within the current Moray West Site area	Commentary on potential impacts within the Alternative Moray West Site area	Assessment of effect significance and conclusions
Temporary habitat loss/ habitat disturbance	***Demersal / spawning adults (sandeel, herring, cod)***	The maximum area of disturbance during decommissioning would be 4,990,059 m². This is based on removal of 85 turbines with 45 m diameter gravity base foundations and 40 m scour protection (482,333 m²); two OSPs GBS foundations + scour protection (95 m diameter total area) and spud cans (157,726 m²); total of 4,125,000 m² disturbance for removal of inter-array cables and 225,000 m² disturbance for removal of OSP interconnector cables.	Impact magnitude = **low** on the basis that the impact will be of local spatial extent (i.e. within the Development area), short term duration and reversible. Sensitivity of receptor = **moderate** based on high vulnerability, medium recoverability and of regional importance within the study area. **Significance = minor adverse** Not significant in EIA terms.	There will be a slight reduction in the total area of disturbance during removal of the Model 3 WTGs (458,044 m²) compared to disturbance from 85 x Model 1 WTGs. The total area of disturbance regarding OSP and cable removal (inter-array and OSP interconnector) will remain the same. Given that this maximum area of disturbance during decommissioning is within the assessed WCS, the magnitude of impact remains unchanged. With regards to sensitivity of receptor (see Section 5.4): • ***Demersal / spawning adults (sandeel, herring, cod)*** = Remains as **moderate** due to the presence of sandeel, herring and cod (and other spawning adults) in both the proposed mitigation and proposed variation areas. Herring spawning indicated to be slightly higher intensity in the proposed variation area compared to the proposed mitigation area, but not in an intensity that would warrant a higher sensitivity rating. • ***Brown crab, European lobster, scallop, Nephrops =*** Remains as **moderate** due to the presence of scallop in both the proposed mitigation and proposed variation areas. Scallop potentially present in the proposed variation area in slightly higher densities than the proposed mitigation area,	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
	Brown crab, European lobster, scallop, Nephrops		Impact magnitude = **low** see above Sensitivity of receptor = **moderate** based on high vulnerability, medium to high recoverability and of regional importance within the study area. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
	All other fish and shellfish		Impact magnitude = **low** see above Sensitivity of receptor = **low** based on low vulnerability, high		Details and conclusions of the current assessment remain valid. Impact magnitude = **low**

[13] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

Table 5.4 Assessment of effects assocaited with the proposed Alternative Moray West Site area					
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Receptors**	**Relevant WCS design parameters (for current Moray West Site area)[13]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
			recoverability and of local to international importance within the study area. **Significance = negligible - minor adverse** Not significant in EIA terms.	but not in a density would warrant a higher sensitivity ranking. Note: lobster, crab and Nephrops not expected to be present in either the proposed mitigation or proposed variation area. • ***All other fish and shellfish =*** Remains as **low**.	Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.
Increased SSC / sediment deposition	***Scallops***	As per details in construction impact (above) for increased suspended sediment concentration and sediment deposition (although predicted to be much less in reality due to lower impact of decommissioning activities involved e.g. no dredging of seabed).	Impact magnitude = **low** due to local spatial extent, short term duration, intermittent and reversible. Sensitivity of receptor = **moderate.** Feeding sensitivity to increased SSC / sediment deposits and their inability to apply avoidance behaviour quickly due to their limited mobility. **Significance = minor adverse** Not significant in EIA terms.	As presented for construction impacts above, on basis that there are no changes to the WCS design parameters, the predicted SSC levels and sediment deposition rates and volumes will remain unchanged from those assessed WCS (Moray West EIA Report – Volume 2, Chapter 8: Table 8.6.1.). Therefore, the magnitude of impact remains unchanged. With regards to sensitivity of receptor (see Section 5.4): • ***Scallops*** = Remains as **moderate** due to the presence of scallop in both the proposed mitigation and proposed variation areas. Scallop potentially present in the proposed variation area in slightly higher densities than the proposed mitigation area, but not in a density would warrant a higher sensitivity ranking. • ***Spawning grounds*** = Remains as **moderate** as spawning ground for herring, sandeel, cod, plaice and lemon sole present in both	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
	Spawning grounds		Impact magnitude = **low** see above Sensitivity of receptor = **moderate** based on medium vulnerability, high recoverability and of regional importance in the study area. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.

Table 5.4 Assessment of effects assocaited with the proposed Alternative Moray West Site area					
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Receptors**	**Relevant WCS design parameters (for current Moray West Site area)[13]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	Fish		Impact magnitude = **low** see above Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.	proposed mitigation and proposed variation areas. • ***Fish =*** Remains as **low.** • ***Shellfish*** = Reduced to **negligible** due to the lack of shellfish species (except scallops – see above) in the proposed variation area.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.
	Shellfish		Impact magnitude = **low** see above Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Note sensitivity reduced to negligible due to the lack of shellfish species (except scallops – see previous column) in the proposed variation area. Impact magnitude = **low** Sensitivity of receptor = **negligible** **Significance = negligible - minor adverse** Not significant in EIA terms.
Noise and vibration	***Sea lamprey***	Noise created by the removal of foundations using cutting machinery. Decommissioning methods may include high powered water jetting / cutting apparatus and grinding of drilling	Impact magnitude = **negligible.** Highly local spatial extent, short term duration, intermittent and reversible.	There will be no change to noise levels created by removal of foundations and cutting with the proposed Alternative Moray West Site area. Therefore, the magnitude of impact remains unchanged.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **low** **Significance = negligible**

Table 5.4 Assessment of effects assocaited with the proposed Alternative Moray West Site area

Impacts assessed in the current EIA (July 2018)	**Receptors**	**Relevant WCS design parameters (for current Moray West Site area)[13]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
		techniques. Exact methods will be set out in a Decommissioning Plan and will be agreed in advance with consenting authorities. Abrasive cutting, often anticipated for wind turbine removal, would not be expected to be significantly higher than general surface vessel. **noise.**	Sensitivity of receptor = **low** on basis that the species does not possess a swim bladder. Significance = **negligible** Not significant in EIA terms.	With regards to sensitivity of receptor (see Section 5.4): • ***Sea lamprey =*** Remains as **low** as sea lamprey could potentially be present in the proposed mitigation and proposed variation areas. • ***Herring, sprat, cod, whiting, salmonids*** = Remains as **moderate** as herring, sprat, cod, whiting and potentially salmon are expected to be present in the proposed variation area. • ***Other fish and shellfish*** = Remains as **low**.	Not significant in EIA terms.
	Herring, sprat, cod, whiting, salmonids		Impact magnitude = **negligible** see above Sensitivity of receptor = **moderate** due to medium vulnerability, high recoverability and of regional to international importance. **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **moderate** **Significance = negligible - minor adverse** Not significant in EIA terms.
	All other fish and shellfish		Impact magnitude = **negligible** see above Sensitivity of receptor = **low** based on low vulnerability, high recoverability and of local to international importance. **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.

Table 5.4 Assessment of effects assocaited with the proposed Alternative Moray West Site area					
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Receptors**	**Relevant WCS design parameters (for current Moray West Site area)[13]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Removal of structures and hard substrates	***Shellfish***	The removal of introduced hard structures maximum surface area is approximately 601,509 m^2. This is based on 85 x 45 m GBS foundations with 40 m additional scour protection (total area affected per foundation = 5,675 m^2) + two OSPs with 55 m diameter gravity base foundations and 95 m scour protection (including foundation). The total area affected also assumes a requirement for up to 10% additional cable protection (3 m wide) on inter-array and OSP interconnector cables and up to 15 cable crossings for inter-array cables extending 200 m in length and 6 m in width.	Impact magnitude = **low** due to localised impact. Sensitivity of receptor = **moderate** based on medium vulnerability and of local to regional value in the study area (recoverability is not relevant to this impact). **Significance = minor adverse** Not significant in EIA terms.	Based on information presented in the Decommissioning Programme (EIA Report, Volume 4 Technical Appendix 4.2) all structures located above the seabed will be removed during decommissioning. The total area of hard substrate removal within the proposed Alternative Moray West Site area will therefore similar to that identified for the current Moray West Site (601,509 m^2). This is based on 85 x Model 1 turbines. In the event that development within the proposed Alternative Moray West Site area is based on 72 x Model 3 turbines, the total area of hard substrate to be removed will be reduced to 577,220 m^2 (based on 50 m diameter GBS foundations + 40 m scour protection). Therefore, there will be no change in impact magnitude. With regards to sensitivity of receptor (see Section 5.4): • ***Shellfish =*** Remains as **moderate** as some shellfish species are expected to be present in the proposed mitigation area e.g. scallop. • ***Fish =*** Remains as **low**.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse** Not significant in EIA terms.
	Fish		Impact magnitude = **low** see above Sensitivity of receptor = **low** based on vulnerability and local to international value in the study area (recoverability is not relevant to this impact). **Significance = negligible - minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **low** **Significance = negligible - minor adverse** Not significant in EIA terms.
Accidental release of hydrocarbons and chemicals	***All fish and shellfish***	Synthetic compound, heavy metal and hydrocarbon contamination may be released accidentally from vessels involved in decommissioning activities and removal of	Impact magnitude = **low** based on embedded mitigation and contingency planning in the unlikely event of a spill. Sensitivity of receptor = **moderate.** Irrespective of whether they are PMFs or other receptors with	The potential for accidental release of synthetic compounds, heavy metals and hydrocarbons from vessels and removal of infrastructure during decommissioning will remain the same for the proposed Alternative Moray West Site area. Therefore, the magnitude of impact remains unchanged.	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **moderate** **Significance = minor adverse**

Table 5.4 Assessment of effects assocaited with the proposed Alternative Moray West Site area					
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 8: Section 8.6.2)					
Impacts assessed in the current EIA (July 2018)	**Receptors**	**Relevant WCS design parameters (for current Moray West Site area)[13]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		substructures and other infrastructure.	higher conservation protection all fish and shellfish would potentially suffer the same fate with limited capacity to recover. **Significance = minor adverse** Not significant in EIA terms.	With regards to sensitivity of receptor (see Section 5.4): • ***All fish and shellfish =*** Remains as **moderate**.	Not significant in EIA terms.

5.7 Cumulative effects

An assessment of potential cumulative effects is provided for the current Moray West Site in the EIA Report – Volume 2, Chapter 8: Section 8.8.

As outlined in Tables 5.1 to 5.4, the significance of the effects of the Development on fish and shellfish considering the Alternative Moray West Site area would be as identified in the EIA Report, Volume 2, Chapter 8, Section 8.7 with respect to the current Moray West Site. This is on the basis that the proposed changes to the Moray West Site do not affect the nature or magnitude of any of the effects assessed with respect to the current Moray West Site and fish or shellfish species of increased sensitivity to the installation and operation (and maintenance) of WTGs, substructures, inter-array cables and components of the OfTI within the variation area.

It can therefore also be concluded that the conclusions from the cumulative assessment of the Alternative Moray West Site area remain unchanged from those assessed for the current Moray West Site as presented in the EIA Report, Volume, Chapter 8, Section 8.8.

5.8 Conclusion on the effects of proposed changes to the Moray West Site

No new or additional fish and shellfish receptors are identified in the proposed variation area, neither are there any major differences in the characteristics of the fish and shellfish populations expected between the proposed mitigation and proposed variation areas. There are potentially are some minor differences in scallop, Nephrops, whiting, herring and sandeel characteristics, but nothing that increases the sensitivity of these receptors to impacts.

Based on the above and the impact assessments presented in sections 5.6 and 5.7 both the project specific and cumulative impact assessments as presented in Chapter 8 of the EIA Report 2018 (Volume 2), remain valid for the Alternative Moray West Site area (including updated design parameters).

6 Marine Mammals

6.1 Introduction

This section presents additional information with respect to potential effects of the proposed variation to the Moray West Site on marine mammals.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 9: Section 9.1 and Marine Mammals EIA Report – Volume 4, Technical Appendix 9.1: Marine Mammal Baseline Characterisation Report.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

6.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on marine mammals are provided in the EIA Report – Volume 2, Chapter 9: Section 9.2 and Marine Mammals and in EIA Report – Volume 4, Technical Appendix 9.1: Marine Mammal Baseline Characterisation Report**.**

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

6.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key responses received during preparation of the EIA Report are provided in EIA Report – Volume 2 Chapter 9: Section 9.2 and Marine Mammals**.** Specific comments received to date (20th November 2018) on the application, as submitted in July 2018 (Moray West EIA Report), have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

No further consultation specific to marine mammals has been undertaken as part of the preparation of this addendum.

6.4 Baseline characteristics associated with the Alternative Moray West Site area

6.4.1 Overview of baseline characteristics within the current Moray West Site

A detailed description of the baseline conditions with the current Moray West Site and along the offshore export cable corridor (including the northern extent of the export cable corridor which corresponds to the proposed variation area) is provided in the EIA Report – Volume 2, Chapter 9, Section 9.4 and in EIA Report – Volume 4, Technical Appendix 9.1: Marine Mammal Baseline Characterisation Report.

The species of marine mammal likely to be found at the Moray West Site and the offshore export cable corridor are bottlenose dolphins, harbour porpoise, minke whales, grey seals and harbour seals.

6.4.2 Baseline characteristics of the Alternative Moray West Site area including the variation area

The variation area is located wholly within the northern extent of the offshore export cable corridor. Given that this area was included in the baseline characterisation and covered fully by the marine mammal species density datasets used in the assessment, no updates to the baseline are required for the variation area or the wider Alternative Moray West Site area. The proposed mitigation area, which comprises the western extent of the current Moray West Site actually represents the most sensitive location for piling for the more coastal marine mammals in the respect that it was closest to the coastal higher density areas for bottlenose dolphins, harbour and grey seals in the inner Moray Firth. Therefore removing pile driving for the installation of WTG foundations in this area will result in no change or most likely a reduction in the predicted impacts to these species.

6.5 Assessment method

The method for assessing potential effects of the Development on marine mammals within the current Moray West Site area and offshore export cable corridor is described in detail in the EIA Report – Volume 2, Chapter 9: Section 9.5 and 9.7.

Other than the additional noise modelling at a 1% CF and the change in the minke whale density used in the assessment, which is detailed in PART 1 of this addendum, there have been no changes to this assessment method since submission of the application in July 2018. These methods, and associated assessment criteria therefore remain applicable for the assessment of the proposed site variation area.

6.6 Potential effects associated with the Alternative Moray West Site area

The only change to the potential effects associated with the Development as a result of the Alternative Moray West Site area on marine mammals, is in relation to pile driving during the installation of WTGs. Under the proposed revision, pile driving may occur in an area that was not explicitly covered by any of the underwater noise modelling carried out to inform the assessment presented in the EIA Report – Volume 2, Chapter 9: Section 9.7.1 and detailed in EIA Report – Volume 4, Technical Appendix 9.2: Underwater Noise Modelling Report.

The locations chosen for noise modelling within the current Moray West Site area to predict the magnitude of piling noise related impacts were selected to capture a worst case location for each marine mammal receptor. These locations were chosen to capture the pile driving site closest to the areas of highest density for each of the species considered in the assessment. For the assessment of impacts on grey seals, harbour seals and bottlenose dolphins, the noise modelling location that was chosen was location 1, in the southern western most point of the current Moray West Site, closest to the coastal areas of highest density for these species (this was also the single location used to demonstrate the effect of increasing the acoustic energy conversion factor from 0.5% to 1%). This location is within the proposed mitigation area. If this area is no longer included in the project envelope for pile driving then there will be no increase, and may even be a small decrease in the predicted effect of pile driving on these species.

For harbour porpoise the chosen worst case location was location 2 on the north east boundary of the current Moray West Site. Given this part of the site also forms part of the Alternative Moray West Site area, the changes in site boundary will not affect the existing harbour porpoise assessment.

For minke whales, the previous worst case location was on the southern edge of the current Moray West Site, therefore when considering the Alternative Moray West Site area, the worst case location for this species would potentially be within the variation area, since the area of highest predicted minke whale density is to the south of the Alternative Moray West Site area. Because of this, an additional set of noise modelling was carried out to inform whether there would be any change in the level of predicted impact to minke whales resulting from piling activities within the Alternative Moray West Site area.

A new noise modelling location (Location N) was identified at the farthest south point of the Alternative Moray West Site area. The modelling results presented and compared here focus on the worst case parameters for each impact: for PTS the concurrent pin pile scenario was modelled as this represents the largest impact area as assessed in the EIA Report 2018 and in Part 1 of this Addendum. For disturbance, the concurrent monopile scenario was assessed as this represents the largest magnitude of impact as assessed in the EIA Report 2018 and in Part 1 of this Addendum.

The noise modelling outputs are presented in Volume 2 - **Error! Reference source not found.** for PTS and REF _Ref529549097 \h * MERGEFORMAT **Error! Reference source not found.** for disturbance of this Addendum Document (for clarity, the single monopile scenario is presented in Figure 6.2 to demonstrate the change in noise propagation conditions although the assessment is based on the concurrent scenario as presented in Table 6.1 and Table 6.2).

The resulting comparison in the quantification of impact are presented in Table 6.1 for PTS and Table 6.2 for disturbance. The comparison for both impacts indicate that the magnitude of impact is slightly higher when considering the new modelling location on the southern boundary of the Alternative Moray West Site area compared to that calculated using the current modelling location. This results in a small increase in the numbers of animals predicted to be at risk from each impact. However, the magnitude remains low with the percentage of the reference population affected remaining well below 1% (maximum of 0.52%). In addition, it can be seen that the assumptions made in the noise modelling with regard to the proportion of hammer energy converted to acoustic energy, have a larger relative effect on the outcome of the assessment than the change in location.

The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated WCS design parameters assessed in the EIA Report – Volume 2, Chapter 9, Section 9.6: Table 9.6.1 for the current Moray West Site, and presented in Part 1 of this Addendum specifically for minke whales; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and decommissioning of the components of the Development located within the current Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 9, Section 9.7.5: Table 9.7.33 and in Part 1 of this Addendum.

Table 6.1 Assessment of potential minke whale PTS impacts associated with the Alternative Moray West Site area compared to the current Moray West Site.

Scenario	CF	Location(s)	Area (km^2)	Number of animals (based on maximum summer density from the JCP III analysis)	% of reference population
Concurrent pin pile installation (3,000 kJ)	0.5%	1 & 3 (current assessment)	367.8	9.9	0.04
		N & 3 (revised assessment)	588.7	15.9	0.07
	1%	1 & 3 (current assessment)	3269.8	88.3	0.38
		N & 2 (revised assessment)	3610.5	97.5	0.41

Table 6.2 Assessment of potential minke whale disturbance impacts associated with the Alternative Moray West Site area compared to the current Moray West Site.				
Scenario	**CF**	**Location(s)**	**Number of animals (based on average density from the JCP III analysis)**	**% of reference population**
Concurrent monopile installation (5,000 kJ)	0.5%	1 & 3 (current assessment)	80.6	0.34
		N & 2 (revised assessment)	90.9	0.39
	1%	1 & 3 (current assessment)	111.2	0.47
		N & 2 (revised assessment)	123.1	0.52

6.6.1 Mitigation measures

The assessment and conclusions presented in Table 6.3 to Table 6.5 also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 9, Table 9.6.2.

Table 6.3 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 9, Table 9.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[14]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
PTS from piling noise	Worst case cumulative energy scenario based on longest duration of piling (maximum temporal extent) for up to 85 pin piled foundations using the following worst case parameters: • Maximum hammer driving energy 3,000 kJ • Up to four pin-piles per foundation – total of a maximum of 340 pin-piles • Maximum 2 simultaneous piling events • Maximum 6 piles per 24 hours (assuming simultaneous piling events) • Total number of piling days 170 (single vessel), 85 (two vessel) Due to comments received on the noise modelling presented in the EIA report, additional noise modelling to predict impacts of piling activity was carried out using a 0.5% CF (EIA Report, Volume 2, Chapter 9) and using 1% CF (Part 1 of this Addendum).	For 0.5% CF: Impact magnitude = negligible for all marine mammal species. For 1% CF: Impact magnitude = low for minke whales, negligible for all other species. Magnitude reduced to negligible for all species with the adoption of a Piling Strategy to ensure the risk of PTS is reduced. Sensitivity of receptor = high for all cetaceans, medium for seals. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.	It can be seen on Volume 2 - **Error! R eference source not found.** of this Addendum document that the total area of PTS SEL_{cum} risk for minke whales at the new modelling location, for the worst case pin pile scenario is larger than the area of PTS SELcum risk from the previous modelling location for minke whales (Location 3). This increases the number of animals potentially affected (Table 6.1). However, the increase in the total number of minke whales is not considered significant, therefore there is predicted to be no change in the magnitude of impact. All other species remain as presented in the Moray West EIA Report – Volume 2, Chapter 9, Table 9.7.33. This is on the basis that the worst case location for pile driving has only changed for minke whales based on the current assessment of noise modelling at species specific sensitive locations.	Details and conclusions of the current assessment remain valid. Impact magnitude = negligible for all marine mammal species. Sensitivity of receptor = high for cetaceans, medium for seals. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.
Disturbance from piling noise (displacement)	Worst case parameters from the maximum spatial impact scenario: pile driving of up to 85 monopile foundations using the following worst case parameters:	For 0.5% CF: Impact magnitude = negligible for minke whale and harbour porpoise and low for all other marine mammal species.	It can be seen from Table 6.2 that the number of minke whales potentially affected by disturbance increases as a result of noise modelling at the new	Details and conclusions of the current assessment remain valid.

[14] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 6.3 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 9, Table 9.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[14]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	• Maximum hammer driving energy 5,000 kJ • Maximum 2 piles per 24 hours (assuming simultaneous piling events) • Maximum 2 simultaneous piling events • Total number of piling days 87 (single vessel), 44 (two vessel) Due to comments received on the noise modelling presented in the EIA report, additional noise modelling to predict impacts of piling activity was carried out using a 0.5% CF (EIA Report, Volume 2, Chapter 9) and using 1% CF (Part 1 of this Addendum).	For 1% CF: Impact magnitude = negligible for minke whale, low for all other marine mammal species except grey seals where magnitude = Medium. Sensitivity of receptor = medium for all marine mammal species except grey seals which have a low sensitivity. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.	location. However the increase in the total number of minke whales is not considered significant, therefore there is predicted to be no change in the magnitude of impact. All other species remain as presented in the Moray West EIA Report – Volume 2, Chapter 9, Table 9.7.33. This is on the basis that the worst case location for pile driving has only changed for minke whales based on the current assessment of noise modelling at species specific sensitive locations.	Impact magnitude = medium for grey seals, negligible for minke whale and low for all other marine mammal species. Sensitivity of receptor = low for grey seals, medium for all other marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.
Disturbance from other construction noise (including vessels)	Duration of construction period = over a period of 36 months (2022 to 2024). Presence of various construction vessels during the construction period (up to 25 at any one time, comprising of installation, support, transport and cable lay vessels, tugs and barges). Cable Installation activities with the potential to generate underwater noise: Seabed preparation requirements: • Dredging/boulder clearance	Impact magnitude: In conclusion, the impact of disturbance from vessel noise and other associated construction activities (dredging, cable laying etc.) is predicted to be of local spatial extent, short term duration and reversible. The magnitude of impact is therefore considered to be low for all marine mammal species. Given the baseline use of the Moray West Site by other vessels (on average four vessels per day in the summer and two vessels per day in winter (see EIA Report, Volume 2 - Chapter 12: Shipping and Navigation), it is likely that marine mammals using this area are habituated, to some degree, to the underwater	On the basis that there will be no change in the duration of the construction period (36 months) or requirement for construction vessels (up to 25 at any one time) associated with development within the Alternative Moray West Site area, there is predicted to be no change in impact magnitude for any marine mammal species.	Details and conclusions of the current assessment remain valid. Impact magnitude = low for all marine mammal species. Sensitivity of receptor = medium for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.

Table 6.3 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 9, Table 9.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[14]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	• Cable laying methods under consideration: • Pre-trench and post-lay burial using plough • Free lay and post-lay burial using cutting or jetting trenching tool • Simultaneous lay and burial using cable plough or trenching tool	noise produced by vessels and will tolerate vessel presence. Given the temporary and short term nature of installation activities (36 months) and intermittent nature of the activities, overall impact magnitude is assessed as low for all species. Sensitivity of receptor = medium for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.		
Vessel collision risk	<u>WTG & OSP(s):</u> • Maximum 2 installation vessels (JUVs or HLVs) • Maximum 3 support vessels • Maximum 6 transport vessels (barges and tugs) <u>OSP(s), Export and Inter-array Cables:</u> • Maximum 2 main laying vessels • Maximum 2 main burial vessels • Maximum 2 support vessels	Impact magnitude: It is not expected that the level of vessel activity during construction would cause an increase in the risk of mortality from collisions. The adoption of a vessel management plan during construction that includes preferred transit routes and guidance for vessel operations in the vicinity of marine mammals and around seal haul-outs will minimise the potential for any impact. Given the temporary and short term nature of installation activities (36 months) and intermittent nature of the activities, the overall impact magnitude is assessed as low for all marine mammal species.	On the basis that there will be no changes in the number of vessels required during construction (up to 25 at any one time) associated with development within the Alternative Moray West Site area, there is predicted to be no change in impact magnitude for any marine mammal species.	Details and conclusions of the current assessment remain valid. Impact magnitude = low for all for all marine mammal species. Sensitivity of receptor = low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.

Table 6.3 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 9, Table 9.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[14]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		Sensitivity of receptor = low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.		
Reduction in prey availability	Any impacts to marine mammals are dependent on the significance of impacts on fish and shellfish ecology and benthic habitats, therefore the maximum adverse scenarios for those receptors are those considered for prey related impacts on marine mammals. The WCS design parameters for the Benthic Ecology are presented in Table 4.2. The WCS design parameters for the Fish and Shellfish Ecology assessment are presented in Table 5.2.	Impact magnitude: As significant effects on prey species or the habitats supporting them are not predicted, it is reasonable to assume that secondary effects on marine mammals would not be significant, although in the short term, some small changes in prey availability may occur. Therefore the magnitude of the impact of changes in prey availability is expected to be low for all marine mammal species. Sensitivity of receptor: It is recognised that most marine mammal species are opportunistic feeders and feed on a variety of prey around UK coasts and therefore will feed on a variety of species. Therefore the sensitivity of marine mammal species to changes in prey availability is considered low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.	Based on the conclusions presented in Table 4.2 for Benthic Ecology and in Table 5.2. for Fish and Shellfish Ecology, no change in the magnitude of this impact is predicted as a result of the Alternative Moray West Site area.	Details and conclusions of the current assessment remain valid. Impact magnitude = low for all for all marine mammal species. Sensitivity of receptor = low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.

Table 6.3 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 9, Table 9.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[14]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Reduction in foraging ability	Maximum amount of sediment disturbance within the Moray West Site of 3,807,141 m^3. This is based on: maximum excavation area for 85 x Model 1 WTGs with GBS foundations + excavations for one large OSP, inter-array cables and OSP interconnector cables.	Impact magnitude = low for all marine mammal species as impact is likely to be local and temporary. Sensitivity of receptor = low for all species as marine mammals are well known to forage in conditions of low visibility. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.	Based on the commentary and conclusions presented in Table 3.1 for Physical Processes and water quality, that there will be no change in predicted levels of SSC and sediment deposition, no change to the magnitude of this impact is predicted as a result of the Alternative Moray West Site area.	Details and conclusions of the current assessment remain valid. Impact magnitude = low for all for all marine mammal species. Sensitivity of receptor = low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.

Table 6.4 Assessment of effects assocaited with Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 9, Table 9.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[15]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Vessel collision risk and disturbance	A number of vessel visits to each turbine and OSP would be required each year to allow for scheduled and unscheduled maintenance.	The levels of increase will not represent a significant increase above baseline levels of ship activity in the Moray Firth. It is not expected that the level of vessel activity during operation would cause an increase in the risk of mortality	On the basis that there will be no changes in the number of vessels required during the Operational phase associated with development within the Alternative Moray West Site area, there	Details and conclusions of the current assessment remain valid. Impact magnitude = low for all for all marine mammal species.

[15] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 6.4 Assessment of effects assocaited with Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 9, Table 9.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[15]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	A maximum of 150-200 return trips per year for O&M activity are predicted during wind farm operation.	from collisions, nor will it add significantly to levels of noise disturbance. The adoption of a vessel management plan during operation and maintenance that includes preferred transit routes and guidance for vessel operation in the vicinity of marine mammals and around seal haul-outs will minimise the potential for any impact. Impact magnitude: low for all marine mammal species. Sensitivity of receptor: low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.	is predicted to be no change in impact magnitude for any marine mammal species.	Sensitivity of receptor = low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.
Reduction in prey availability	The maximum adverse design scenario for the Benthic Ecology is presented in Table 4.3 in Chapter 4: Benthic Ecology. The maximum adverse design scenario for the fish and shellfish ecology assessment is presented in Table 5.3 in Chapter 5: Fish & Shellfish Ecology.	Impact magnitude = **low for all species** as no significant impacts were predicted for any prey species or habitats supporting prey species. Sensitivity of receptor = **low for all species** **Significance = minor adverse** Not significant in EIA terms.	Based on the conclusions presented in Table 4.3 for Benthic Ecology and in Table 5.3. for Fish and Shellfish Ecology, no change in the magnitude of this impact is predicted on any species of marine mammal as a result of the Alternative Moray West Site area.	Details and conclusions of the current assessment remain valid. Impact magnitude = low for all for all marine mammal species. Sensitivity of receptor = low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.

Table 6.5 Assessment of effects associated with the Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 9, Table 9.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[16]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Vessel collision risk and disturbance	Impacts from decommissioning are expected to be similar to those listed above for construction, if infrastructure is removed from the seabed at the end of the development's operational life. If it is deemed closer to the time of decommissioning that removal of certain parts of the development (e.g. cables) would have a greater environmental impact than leaving in-situ, it may be preferable to leave those parts in-situ. In this case, the impacts would be similar to those described for the operational phase.	During the decommissioning of the Development there would be increased vessel activity. It is estimated that vessel numbers will be similar to those during the construction period and therefore the impacts of collision risk and noise disturbance will be of similar impact magnitude. The adoption of a vessel management plan that includes preferred transit routes and guidance for vessel operation in the vicinity of marine mammals and around seal haul-outs will minimise the potential for any impact. Impact magnitude: low for all marine mammal species. Sensitivity of receptor: low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.	On the basis that there will be no changes in the number of vessels required during the Decommissioning phase associated with development within the Alternative Moray West Site area, there is predicted to be no change in impact magnitude for any marine mammal species.	Details and conclusions of the current assessment remain valid. Impact magnitude = low for all for all marine mammal species. Sensitivity of receptor = low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.

[16] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 6.5 Assessment of effects associated with the Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 9, Table 9.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[16]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Reduction in prey availability		Impact magnitude = low for all marine mammal species as impact is likely to be local and temporary. Sensitivity of receptor = low for all species as marine mammals are well known to forage in conditions of low visibility. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.	Based on the conclusions presented in Table 4.3 for Benthic Ecology and in Table 5.3. for Fish and Shellfish Ecology, no change in the magnitude of this impact predicted on any species of marine mammal as a result of the Alternative Moray West Site area.	Details and conclusions of the current assessment remain valid. Impact magnitude = low for all for all marine mammal species. Sensitivity of receptor = low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.
Reduction in foraging ability		Impact magnitude = low for all marine mammal species as impact is likely to be local and temporary. Sensitivity of receptor = low for all species as marine mammals are well known to forage in conditions of low visibility. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.	Based on the conclusions presented in Table 4.3 for Benthic Ecology and in Table 5.3. for Fish and Shellfish Ecology, no change in the magnitude of this impact predicted on any species of marine mammal as a result of the Alternative Moray West Site area.	Details and conclusions of the current assessment remain valid. Impact magnitude = low for all for all marine mammal species. Sensitivity of receptor = low for all marine mammal species. **Significance = minor adverse for all marine mammal species.** Not significant in EIA terms.

6.7 Cumulative effects

As outlined in Table 6.3 to Table 6.5, the significance of the effects of the Development on marine mammals considering the Alternative Moray West Site area would be as identified in the EIA Report, Volume 2, Chapter 9, Section 9.7 with respect to the current Moray West Site.

With this in mind, it is reasonable to assume that the contribution of the Alternative Moray West Site area to any cumulative effect would be as described in the EIA Report, Volume 2, Chapter 9, Section 9.8 for the current Moray West Site.

It therefore follows that the conclusions of the cumulative assessment presented in the EIA Report, Volume 2, Chapter 9, Section 9.8, also apply when considering the Alternative Moray West Site area. These are summarised in Table 6.6 below for the construction and operation phase of the Development (note: because of the low certainty in the timing and nature of decommissioning activities and the lack of any information to inform on the likely nature and location of other plans and projects at that time the decommissioning phase was not included in the marine mammal cumulative assessment).

Table 6.6 Cumulative Assessment Summary

Potential impact	Impact magnitude	Receptor Sensitivity	Effect Significance
Construction			
Construction noise (disturbance)	Medium for grey seals, low for all other marine mammal species.	Low for grey seals, medium for all other marine mammal species.	Minor Adverse for all marine mammal species. Not significant in EIA terms.
Vessel disturbance and collision	Low for all marine mammal species.	Medium for all marine mammal species.	Minor Adverse for all marine mammal species. Not significant in EIA terms.
Operation			
Vessel disturbance and collision	Low for all marine mammal species.	Medium for all marine mammal species.	Minor Adverse for all marine mammal species. Not significant in EIA terms.

6.8 Conclusion on the effects of proposed changes to the Moray West Site

With respect to the Alternative Moray West Site area, no new or additional marine mammal receptors are identified in the variation area. The assessment carried out in respect of the construction, operation and decommissioning phases of the Development considering the proposed changes to the Moray West Site area (Table 6.1 to Table 6.6), has not identified significant effects (i.e. above minor significance) on marine mammals. This applies to the assessment in relation to the Development alone and cumulatively with other projects. This is on the basis that the proposed changes to the Moray West Site area do not affect the nature or magnitude of any of the effects assessed with respect to the current Moray West Site.

It should be noted that the outcomes of this assessment are in line with those described in the EIA Report, Volume 2, Chapter 9, Section 9.7 and Section 9.8.

Therefore, considering the Alternative Moray West Site area, there is no material change in the significance of any marine mammal impacts in comparison to that identified in respect of the current Moray West Site in the EIA Report, Volume 2, Chapter 9, Section 9.7 and 9.8.

7 Ornithology

7.1 Introduction

This section presents additional information with respect to potential effects of the proposed variation to the Moray West Site on offshore ornithology.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 10: Offshore Ornithology and Volume 4, Technical Appendix 10.1A Technical Report**.**

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

7.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on offshore ornithology are provided in the EIA Report – Volume 2, Chapter 10: Section 10.2 Offshore Ornithology.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

7.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018 and takes into account representations received from Scottish Natural Heritage (SNH), Marine Scotland Science (MSS) and RSPB on the application. These representations, and Moray West's response to specific comments are summarised in PART 1 of this addendum – Chapter 1 and the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

A meeting to discuss the representations received was held with SNH and MSS on 5th November 2018. It was identified during this meeting that there is a requirement for Moray West to submit additional information in response to some of the comments raised in the representations. This information has been provided in the following chapters of the PART 1 of this addendum:

- Addendum PART 1 – Chapter 2: Additional Ornithological Information (EIA)
- Addendum PART 1 – Chapter 3: Additional Ornithological Information (HRA)

No further consultation with regards to offshore ornithology has been undertaken as part of the preparation of this addendum. However, where appropriate reference has been made to the information included in Chapters 2 and 3 of PART 1 of the addendum, in particular where the information provided influences the conclusions presented in the Moray West EIA Report – Volume 2 Chapter 10. HRA considerations relating to the Alternative Moray West Site area are presented in this part of the addendum (PART 2) Chapter 15.

7.4 Ornithology mitigation

It should be noted that, as identified in PART 1 Chapter 3 Moray West has made a commitment to *reducing collisions (kittiwake) by 7% (57 to 53 per annum). This will be achieved through a reduction in turbine numbers from 85 to 79 unless it can be demonstrated through changes to other design parameters identified during preparation of the final Development design and layout that the total number of annual collisions for 85 turbines does not exceed 53 birds kittiwakes.*

Although there is potential for the total number of Model 2 WTGs installed within the Moray West Site to change from 85 to 79, the assessment of the Alternative Moray West Site area has been based on the maximum WCS design parameters (85 Model 2 WTGs). This has been necessary in order to ensure that any options to reduce collisions through changes to design parameters rather than a reduction in total turbine numbers can still be accommodated within the assessed WCS design parameters.

7.5 Baseline characteristics associated with the Alternative Moray West Site area

7.5.1 Overview of baseline characteristics within the current Moray West Site

A detailed description of the baseline conditions with the current Moray West Site and along the offshore export cable corridor (including the northern extent of the export cable corridor which corresponds to the proposed variation area) are provided in the EIA Report – Volume 2, Chapter 10, Section 10.4.

A range of data sources were used to determine the characteristics of the current Moray West Site and offshore export cable corridor with respect to ornithology. These include:

- Digital video aerial surveys that were carried out by HiDef Aerial Surveying from April 2016 to March 2017;
- Moray East boat-based surveys – Data collected during 28 boat-based surveys between April 2010 and March 2012 covering Moray East Site plus a 4 km buffer;
- BOWL boat-based surveys – Data collected during boat-based surveys of the Beatrice Offshore Wind Farm plus a 4 km buffer between October 2009 and September 2011; and
- BOWL pre-construction aerial surveys – Data collected during aerial surveys of the area between the East Caithness Cliffs SPA and the Beatrice offshore wind farm plus a 10 km buffer between May and August 2015.

These data sources were inputted to the Decision Support System (DSS) (presented in the EIA Report – Volume 4 Technical Appendix 10.1 Annex 10.1A) in order to derive population estimates and densities of key seabird species for the Current Moray West Site and offshore export cable corridor. An updated version of the DSS Report is also provided in Annex B of this Addendum Document.

Further details of the baseline spatial densities of all species in all seasons, including density surface maps, were provided in detail in EIA Report - Volume 4, Technical Appendix 10.1A Technical Report.

Based on the information presented in the EIA Report – Volume 2, Chapter 10 – Section 10.4, the key species identified within the current Moray West Site include: gannet, puffin, razorbill, common guillemot (hereafter guillemot), black-legged kittiwake (hereafter kittiwake), herring gull, fulmar and Arctic skua. Of these kittiwake, guillemot, razorbill and great black-backed gull were the key species of interest referred to in the representations received on application.

Kittiwake are of interest due to collisions in all seasons and displacement in the breeding season only. Guillemot and razorbill are of interest due to displacement effects in all seasons. Great black backed gull was identified as requiring further consideration from a HRA perspective – see Chapter 15 for further information with respect to this.

7.5.2 Baseline characteristics of the proposed variation area

The baseline conditions of the proposed variation area are at too small a spatial scale for relevance to highly mobile species, such as seabirds. As such, for most species there is expected to be little difference in terms of the spatial densities across both the current Moray West Site and the Alternative Moray West Site area.

However, given that it has been necessary to provide additional information on kittiwake, guillemot and razorbill in response to representations received on the application, it was considered appropriate to re-assess these three species using the DSS system in order to determine whether or not there is potential for the change in the application boundary and associated buffers, to effect the estimated density, and hence seabird abundance, within each area i.e. the current Moray West Site and the Alternative Moray West Site area.

In addition, since densities, and hence abundances, of seabirds were subject to a separate assessment using a decision support system (DSS) (see EIA Report – Volume 4, Technical Appendix 10.1A) the changes in area may, or may not, have any effect on the recommended values used for the impact assessment. Therefore, in order to assess the effect of Development within the Alternative Moray West Site area, it is necessary to re-assess the DSS to determine whether there is potential for a change to the recommended densities for kittiwake, guillemot and razorbill. These results from the re-assessment of kittiwake, razorbill and guillemot densities using the DSS are presented in Section 7.7 below.

7.5.3 Limitations with the baseline characterisation

Other than the limitations listed in the EIA Report – Volume 2, Chapter 10: Section 10.5.6, no other limitations have been identified that could affect the assessment of the Alternative Moray West Site area.

7.6 Assessment method

The method for assessing potential effects of the Development on offshore ornithology within the current Moray West Site is described in detail in the EIA Report – Volume 2, Chapter 10: Section 10.5**.** Updates to this methodology (in terms of displacement and collision risk) have been described in detail in PART 1 of this addendum document (Chapters 2 and 3). These updates are reflected in the assessment of effects of Development within the Alternative Moray West Site area as presented in Table 7.3 to 7.5.

To assess the effect of the change in overall application boundary to accommodate the Alternative Moray West Site area on density estimates from the DSS, initial densities were extracted from the results of MRSea modelling from the Moray West Aerial Survey Data (see EIA Report – Volume 4, Technical Appendix 10.1A). The grid (0.25km^2) of predicted densities from the density surface model were extracted by clipping the information from the grid to the Alternative Moray West Site area, including a 2 km and 4 km buffer, using ESRI ArcGIS. It is important to note that since the original digital aerial survey methodology was based on the current Moray West Site area, the aerial survey data, and hence density surface model predictions, did not cover all the Alternative Moray West Site area 2 km and 4 km buffers, but the 4 km buffer around the current Moray West site did cover the Alternative Moray West Site area without buffers.

Since the DSS is a process for recommending density data, it is possible to extrapolate the recommended densities to the area where there is an absence of survey data, and hence density surface model predictions. This is an assumption, and therefore a limitation to the method described here. However, the DSS process is designed to provide a suitable precautionary assessment based on density information extracted from smaller area of overlapping survey effort. These data are then extrapolated to the appropriate area for impact assessment. This aspect of the DSS process is unaffected by the Alternative Moray West Site area.

The assessment method used here made comparisons using density information and whether density changes as a result of the change to the Alternative Moray West Site area.

7.7 Potential effects associated with the Alternative Moray West Site area

7.7.1 Re-assessment of recommended densities for kittiwake, guillemot and razorbill

To determine whether there is potential for a change to the conclusions of effect significance presented in the Moray West EIA 2018 associated with development in the Alternative Moray West Site area it was necessary to determine whether there is a change to the recommended densities used in the impact assessment. Potential changes in recommended densities were assessed for:

- Kittiwake aerial densities in the breeding season, post-breeding season, and pre-breeding season;
- Kittiwake sitting densities (i.e. birds on the water) in the breeding season, post-breeding season, and pre-breeding season;
- Guillemot sitting densities in the breeding season; post-breeding season and non-breeding season; and
- Razorbill sitting densities in the breeding season, post-breeding season, and pre-breeding season.

For each combination of species and season the new predicted densities from the Alternative Moray West Site area (derived from the MRSea analysis of the digital aerial survey data) were reapplied to the DSS process and new recommended densities were derived. This was undertaken using both the DSS for collision risk modelling densities and for displacement matrices. The DSS flow charts for each are shown in Figure 7.1 and Figure 7.2.

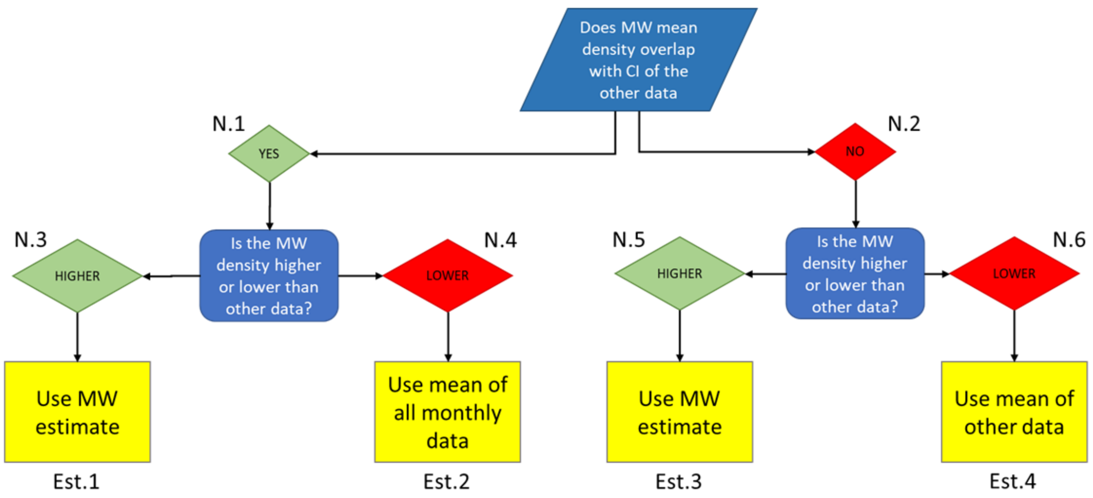

Figure 7.1 Decision Support System flow chart for selecting suitable 'aerial density' data (MW = Moray West, CI = Confidence Interval).

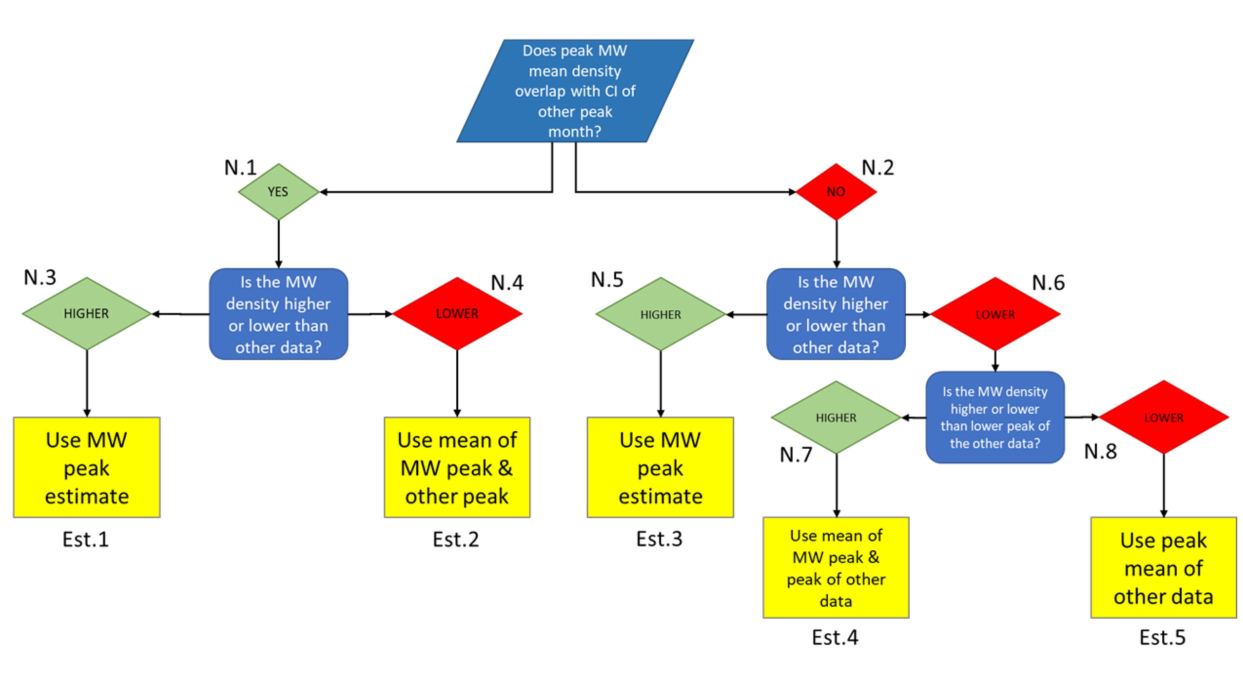

Figure 7.2 Decision Support System flow chart for selecting suitable displacement density data (MW = Moray West, CI = Confidence Interval).

7.7.2 Re-assessment of recommended densities for kittiwake, guillemot and razorbill

Detailed results from the re-assessment of the recommended densities for kittiwake, guillemot and razorbill using the DSS process taking account of the changes due to the Alternative Moray West Site area are presented in **Annex B.**

It is concluded from this re-assessment of the recommended densities from the DSS process for kittiwake, guillemot and razorbill that there are very little, if any, changes associated with the Alternative Moray West Site area. These densities are the fundamental values used to determine the inputs to both CRM and displacement assessment using the matrix approach.

Changes to the aerial densities of kittiwake in each month are summarised in Table 7.1. This shows a mix of changes, with most months showing no change, three months showing a decrease in densities and two months showing an increase in densities. All the changes are less than 1 bird.km^{-2} and are therefore negligible to the likely predicted collision risk to kittiwakes.

Table 7.1 Summary of the density estimates (birds.km^{-2}) for kittiwake in flight inside the current Moray West Site area and Alternative Moray West Site area from the DSS process. Differences are relative to the current Moray West Site area, so decreases are shown as negative values.

Month	Current Moray West Site area	Alternative Moray West Site area	Difference
April	0.21	0.21	0
May	2.49	2.49	0
June	7.53	7.53	0
July	7.63	7.63	0

Table 7.1 Summary of the density estimates (birds.km^{-2}) for kittiwake in flight inside the current Moray West Site area and Alternative Moray West Site area from the DSS process. Differences are relative to the current Moray West Site area, so decreases are shown as negative values.			
Month	**Current Moray West Site area**	**Alternative Moray West Site area**	**Difference**
August	2.38	2.38	0
September	2.21	1.97	-0.24
October	1.61	1.66	0.05
November	3.49	4.14	0.65
December	2.15	2.09	-0.06
January	0.36	0.36	0
February	0.67	0.67	0
March	1.48	1.47	-0.01

For sitting densities of kittiwake, guillemot and razorbill in all seasons the re-assessment using the DSS has resulted in either no change or decreases in the recommended densities for matrix approach assessment. Therefore there will be no change in predicted displacement impacts from the Alternative Moray West Site area.

Table 7.2 Summary of the recommended seasonal peak density (birds.km^{-2}) for each species and relevant season inside the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer from the DSS process. Differences are relative to the current Moray West Site area, so decreases are shown as negative values.				
Species	**Season**	**Current Moray West Site area**	**Alternative Moray West Site area**	**Difference**
Kittiwake	Breeding	18.3	18.3	0
Guillemot	Breeding	64.76	64.76	0
	Post-breeding	74.86	74.86	0
	Non-breeding	21.79	21.39	-0.4
Razorbill	Breeding	7.44	5.84	-1.6
	Post-breeding	37.59	37.59	0
	Non-breeding	0.49	0.46	-0.03
	Pre-breeding	9.51	4.82	-4.69

In conclusion, the Alternative Moray West Site area will result in no increases to the predicted impacts to all key species assessed, and in all likelihood will result in reductions to predicted impacts.

7.7.3 Mitigation measures

The assessment and conclusions presented in Table 7.1 and 7.2 also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 10, Section 10.6.2.

As noted in Section 7.4, Moray West is also committed to *reducing collisions (kittiwake) by 7% (57 to 53 per annum). This will be achieved through a reduction in turbine numbers from 85 to 79 unless it can be demonstrated through changes to other design parameters identified during preparation of the final Development design and layout that the total number of annual collisions for 85 turbines does not exceed 53 birds kittiwakes.*

For the purpose of this assessment, while it is acknowledged that Moray West may be required to reduce turbine numbers from 85 to 79, the assessment of potential effects associated with development within the Alternative Moray West Site area presented in Table 7.3 to 7.5 is based on a current WCS of 85 Model 2 WTGs. This is to ensure that should it be possible for Moray West to reduce kittiwake collisions through changes to other design parameters (other than reducing turbine numbers) that Moray West maintains flexibility to install up to 85 WTGs (based on maximum modelled parameters for the Model 2 WTG).

7.7.4 Assessment of effects associated with the Alternative Moray West Site area

Conclusions from the assessment of effects of development within the Alternative Moray West Site area in the context of the current Moray West Site are presented in Table 7.3 to 7.5

Table 7.3 Assessment of effects associated with the Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 10: Section 10.6.2 and information presented in PART 1 of this addendum document – Chapters 2 and 3)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[17]**	**Receptor sensitivity (species identified within Moray West Site Aerial Survey area + 4 km buffer only)**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Disturbance / displacement	Vessels: Total number of vessels is 25 based on at any one time, with total 46 return trips per week during installation and 5 return trips per week for transport vessels. Construction period expected is 36 months 85 monopiles of maximum spatial WCS for piling = 85 monopiles with maximum 5,000 kj hammer energy for 5 months. Underwater noise: 5,000 kJ maximum anticipated hammer energy for monopile installation and maximum of 3 monopiles installed in one day. Maximum piling duration is 9 months (based on pin piles with 3,000 kJ hammer energy) The temporal WCS is 85 x 4 pin piled jacket structures (340 pin piles) at 3,000kJ hammer energy over 9 months. Seabed preparation and cable installation activities (plough or jet trencher).	Razorbill, guillemot and puffin = medium sensitivity	Although disturbance during the construction may displace birds from an area, it is expected that the effects are likely to last only for the duration of the construction activities. Given construction is only expected to last 36 months, impact magnitude was assessed as negligible to low on the basis potential effects will temporary, reversible and short-term in nature. **Magnitude = low** **Significance = minor adverse** Not significant in EIA terms	There will be no changes to the assessed WCS design parameters associated with development within the Alternative Moray West Site area in terms of duration of the construction period, vessel numbers (25 at any one time) and noise (from piling). Therefore, there will be no change in impact magnitude. Species identified in the Moray West Aerial Surveys + 4 km buffer are also expected to be present in the Alternative Moray West Site area (proposed variation area is within the buffer area). Outputs from the DSS process (Section 7.7.1) also conclude no change in density estimates for razorbill and guillemot (species for which additional information is required as presented in PART 1 of the Addendum) within the proposed variation area. Therefore, sensitivity of these remains as **medium**. Effect significance remains as **minor adverse** which is Not significant in EIA terms.	**Magnitude = low (for guillemot, razorbill and puffin)** **Significance = minor adverse** Not significant in EIA terms

<table>
<tr><th colspan="6">Table 7.3 Assessment of effects associated with the Alternative Moray West Site area</th></tr>
<tr><th colspan="6">Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 10: Section 10.6.2 and information presented in PART 1 of this addendum document – Chapters 2 and 3)</th></tr>
<tr><th>Impacts assessed in the current EIA (July 2018)</th><th>Relevant WCS design parameters (for current Moray West Site area)[17]</th><th>Receptor sensitivity (species identified within Moray West Site Aerial Survey area + 4 km buffer only)</th><th>Conclusions from assessment of impacts within the current Moray West Site area</th><th>Commentary on potential impacts within the Alternative Moray West Site area</th><th>Assessment of effect significance and conclusions</th></tr>
<tr><td rowspan="2">Indirect effects (prey species and habitat loss)</td><td rowspan="2">In terms of effects on prey species (fish) and habitat loss the assessed WCS design parameter assessed in the Moray West EIA 2018 are presented in the EIA Report – Volume 2 Chapter 7 (Benthic and Intertidal Ecology) Table 7.6.1 and Chapter 8 (Fish and Shellfish Ecology) Table 8.6.1. These parameters are also summarised in Chapter 4: Benthic Ecology (Table 4.2) and Chapter 5: Fish and Shellfish Ecology (Table 5.2) of this Addendum.

No significant adverse effects on prey species or in relation to habitat loss were identified in either chapter.</td><td>Razorbill, guillemot and puffin = medium sensitivity</td><td>Temporary habitat loss/disturbance increased suspended sediment and redeposition and underwater noise can result in potential effects on prey. Despite direct habitat loss may result in removal or fragmentation of foraging or loafing habitat for particular species for offshore wind farms, this long-term habitat loss is generally relatively small, amounting to the area lost to turbine bases and associated infrastructure; typically, <1% of the total development footprint.

Magnitude = Low

Significance = Minor adverse

Not significant in EIA terms</td><td rowspan="2">There will be no changes to WCS design parameters assessed in the EIA Report – Volume 2 Chapters 7 and 8 with respect to habitat loss/disturbance increased suspended sediment and redeposition and underwater noise. Therefore, there will be no change in impact magnitude.

Species identified in the Moray West Aerial Surveys + 4 km buffer are also expected to be present in the Alternative Moray West Site area (proposed variation area is within the buffer area). Species sensitivity to indirect effects (prey and habitat loss) is expected to remain unchanged for these species (low – medium).

Effect significant will also remain unchanged:

Razorbill, guillemot and puffin = minor adverse

Fulmar, gannet, kittiwake, herring gull, great black-backed gull = negligible to low.</td><td>Magnitude = Low

Significance = Minor adverse

Not significant in EIA terms</td></tr>
<tr><td>Fulmar, gannet, kittiwake, herring gull, great black-backed gull = Low – medium sensitivity</td><td>As above, long-term habitat loss is generally relatively small.

Magnitude = Negligible

Significance = Negligible to low

Not significant in EIA terms</td><td>Magnitude = Negligible

Significance = Negligible to low

Not significant in EIA terms</td></tr>
</table>

Table 7.3 Assessment of effects associated with the Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 10: Section 10.6.2 and information presented in PART 1 of this addendum document – Chapters 2 and 3)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[17]**	**Receptor sensitivity (species identified within Moray West Site Aerial Survey area + 4 km buffer only)**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Effects of pollution	Synthetic compound, heavy metal and hydrocarbon contamination may be released accidentally due to offshore infrastructure installation and construction vessels. Water-based drilling muds associated with drilling to install foundations and HDD may also be required. Grout may be required to secure joints. Possible contamination of intertidal habitats resulting from machinery use and vehicle movement.	Fulmar, gannet, shag, guillemot, razorbill, kittiwake, herring gull, great black-backed gull = Negligible	Best available records show that the most frequent spills from vessels relates to upsets in the bilge treatment systems resulting usually in small losses. The worst-case would be the very unlikely occurrence of a spill from a single tank rupture in the large installation vessels releasing diesel into the marine environment. Any spill or leak within the offshore regions would likely be immediately diluted and quickly dispersed through natural process. **Magnitude = Negligible** **Significance = Negligible** Not significant in EIA terms	There will be no changes in the chemicals and vessel movements required during operation of the Moray West Offshore Wind Farm and components of the OfTI occurring within the Alternative Moray West Site area. **Impact magnitude therefore remains negligible**. Species identified in the Moray West Aerial Surveys + 4 km buffer are also expected to be present in the Alternative Moray West Site area (proposed variation area is within the buffer area). **Species sensitivity** to effects of pollution is expected to remain unchanged for these species (**negligible**). **Effect significant = negligible** Not significant in EIA terms	**Magnitude = Negligible** **Significance = negligible** Not significant in EIA terms

Table 7.4 Assessment of effects associated with the Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 10: Section 10.6.2 and information presented in PART 1 of this addendum document – Chapters 2 and 3)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[18]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Operational					
Disturbance	Expected approximately 150-200 return trips per year (O&M vessels). If O&M activity is coordinated entirely from an onshore base, small crew vessels will be sailing to and from the Moray West Site daily. If SOV option is preferred, most crew vessels would be operated daily from a single SOV, although further support vessels are also likely to transit daily to and from shore. OSPs would require one visit a week maximum.	Guillemot, razorbill and puffin = Medium	The disturbance of birds due to the presence of operational offshore WTGs is considered to be of a lower intensity than during the construction/decommissioning phases and limited to maintenance activities and vessel and helicopter trips to and also post-construction monitoring survey activity. **Magnitude = No change to negligible** **Significance = negligible to minor adverse** Not significant in EIA terms.	There will be no changes in vessel movements or requirements required during operation of the Moray West Offshore Wind Farm within the Alternative Moray West Site area. Impact magnitude therefore remains unchanged (no change to negligible). Species identified in the Moray West Aerial Surveys + 4 km buffer are also expected to be present in the Alternative Moray West Site area (proposed variation area is within the buffer area). **Species sensitivity** to disturbance remains unchanged (medium) **Effect significant = negligible to minor adverse** Not significant in EIA terms.	**Magnitude = No change to Negligible** **Significance = negligible to minor adverse** Not significant in EIA terms.
Displacement and barrier effects	Operation of maximum number of 85 turbines within the total area of the Moray West Site (225 km^2), with a minimum spacing 1,200 m downwind and 1,050 m crosswind. Operation of associated transmission infrastructure (up to two OSPs).	Fulmar, puffin, razorbill, guillemot, kittiwake = medium	As identified in the EIA Report – Volume 2 Chapter 10 Section 10.7.2 Potential Operational Effects, there is potential for the presence of the operational WTGs to potentially lead to displacement of birds from within the current Moray West Site area. Displacement can lead to mortality where it affects the ability of certain species to forage, in particular during	The maximum number of turbines is still expected to be the same (85 WTGs) for Model 2 over the same area (225 km^2) - these parameters are not expected to change. As discussed in PART 1 of the addendum, queries were raised on the methods used to assess displacement. These queries related mainly to the way in which the breeding and non-breeding season were defined and the assessment scales used in the assessment presented in the EIA Report – Volume 2 Chapter 10	**Sensitivity = medium** (Fulmar, puffin, razorbill, guillemot, kittiwake) **Magnitude = Negligible to Low**

Table 7.4 Assessment of effects associated with the Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 10: Section 10.6.2 and information presented in PART 1 of this addendum document – Chapters 2 and 3)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[18]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
			the breeding season where they are feeding chicks. The assessment concluded that, although the impact is expected to be of long term duration and continuous any displacement will be of a local spatial extent and therefore would be of **low magnitude** for puffin, razorbill, guillemot and kittiwake and **negligible** for fulmar. **Effect significance = minor adverse** puffin, razorbill, guillemot and kittiwake and **negligible** for fulmar. Not significant in EIA terms.	Section 10.7.2 Potential Operational Effects Displacement. Based on information presented in PART 1 of this addendum it is concluded that potential effects of displacement on razorbill, guillemot and kittiwake remain as assessed (magnitude = low). The magnitude of the effect is also expected to remain the same for puffin (low) and fulmar (negligible) on the basis that the design parameter in terms of turbine number and developable site area will remain within the assessed WCS design parameters. Based on the information presented in Section 7.7 it is also concluded the density estimates for kittiwake, guillemot and razorbill within the Alternative Moray West Site area will be similar to those identified for the Current Moray West Site and included in the displacement matrices. There are also not expected to be any changes to puffin or fulmar numbers. Overall effect significance is therefore expected to remain as assessed (**minor adverse** puffin, razorbill, guillemot and kittiwake and **negligible** for fulmar). Not significant in EIA terms.	**Significance = negligible to minor adverse** Not significant in EIA terms.
Collision Risk	CRM Assessment: Operation of maximum number of up to 85 x Model 2 WTGs with rotor diameter of 195 m, hub height of 132.5 m and lowest rotor tip height of 35 m above the Highest Astronomical Tide (HAT). Assessment also assumes grid distribution within	Kittiwake, gannet, herring gull = high Great black-backed gull = medium	Results from the Collision Risk Modelling (CRM) presented in the EIA Report – Volume 2, Chapter 10, Section 10.7 concluded that for all four species, based on the predicted number of birds at risk of collision (collision mortality) during the breeding and non-breeding	Based on the maximum number of turbines it is still expected to be the same (85 WTGs) for Model 2 over the same area (225 km^2) - these parameters are not expected to change. As discussed in PART 1 of the addendum, queries were raised on the number of collisions predicted for kittiwake and ways in which breeding and non-breeding	**Sensitivity = medium to high** **Magnitude = low**

Table 7.4 Assessment of effects associated with the Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 10: Section 10.6.2 and information presented in PART 1 of this addendum document – Chapters 2 and 3)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[18]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	the Moray West Site (225 km^2), with a minimum spacing 1,200 m downwind and 1,050 m crosswind.		season, **impact magnitude would be low.** **Magnitude = low** **Significance = minor adverse** Not significant in EIA terms	season were defined in the assessment presented in the EIA Report – Volume 2 Chapter 10 Section 10.7.2 Potential Operational Effects Displacement. Based on information presented in PART 1 of this addendum it is concluded that potential effects of collision on kittiwake remain as assessed (magnitude = low). This has been reflected through proposed measures to limit the total number of kittiwake collisions to 53 which will be achieved through either a reduction in turbine numbers (from 85 to 79 for the Model 2 WTGs) or other design parameter amendments. The magnitude of the effect is also expected to remain the same for gannet, herring gull and great black-backed gull on the basis that the assessed WCS design parameters for collision will remain within those assessed in the Moray West EIA 2018. Based on the information presented in Section 7.7 it is also concluded the density estimates for kittiwake within the Alternative Moray West Site area will be similar to those identified for the Current Moray West Site and included in the CRM. Kittiwake sensitivity therefore remains as assessed (high). There are also not expected to be any changes to gannet, herring gull and great black-backed gull numbers or sensitivity (medium to high). Overall **effect significance** is therefore expected to remain as assessed = **minor adverse** for all four species. Not significant in EIA terms.	**Significance = minor adverse** Not significant in EIA terms

Table 7.4 Assessment of effects associated with the Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 10: Section 10.6.2 and information presented in PART 1 of this addendum document – Chapters 2 and 3)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[18]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Attraction to lit structures and associated disorientation	Medium intensity (2000 candela), flashing (morse code 'W') red lights located on the turbine hubs of the peripheral turbines in the layout. Lights may be visible from the coast and intensity would reduce to low (200 candela) during suitable visibility conditions. Low intensity lighting for navigation purposes also fixed to the turbines (transition pieces).	Fulmar, gannet, puffin, razorbill, guillemot, kittiwake, herring gull, great black-backed gull, Artic skua = low	For maximum visibility, each structure would be fitted with lighting requirements for aviation and shipping. Studies has found that key species (kittiwake, gannet and guillemot) are unlikely to be active at night, either returning to colonies or roosting on the water surface. Gulls are visual foragers (following trawlers) and therefore are unlikely to be disorientated lighting. Given impacts will be of local spatial extent and intermittent overall impact magnitude for receptors was assessed as low. **Magnitude = low** **Significance = negligible to minor adverse** Not significant in EIA terms	The maximum number of turbines is still expected to be the same (85 WTGs) for Model 2 over the same area (225 km^2). The flashing scheme and intensity is also not expected to change. Therefore, there will be no change in impact magnitude. Species identified in the Moray West Aerial Surveys + 4 km buffer are also expected to be present in the Alternative Moray West Site area (proposed variation area is within the buffer area). Outputs from the DSS process (Annex B) also conclude no change in density estimates for razorbill, guillemot and kittiwake (species for which additional information is required as presented in PART 1 of the Addendum) within the proposed variation area. Therefore, sensitivity of these remains as **low**. Effect significance remains as **minor adverse** which is not significant in EIA terms.	**Magnitude = low** **Significance = negligible to minor adverse** Not significant in EIA terms
Indirect effects (prey species and habitat loss)	In terms of effects on prey species (fish) and habitat loss the assessed WCS design parameter assessed in the Moray West EIA 2018 are presented in the EIA Report – Volume 2 Chapter 7 (Benthic and Intertidal Ecology) Table 7.6.1 and Chapter 8 (Fish and Shellfish Ecology) Table 8.6.1. These parameters are also summarised in Chapter 4: Benthic Ecology (Table 4.2) and Chapter	Fulmar, gannet, puffin, razorbill, guillemot, kittiwake, herring gull, great black-backed gull = Low	Based on conclusions from the assessment of prey species affected by long term habitat loss, underwater noise, introduction of hard substrate and habitat creation, seabed sediment heating from subsea cables and EMF presented in the EIA Report – Volume 2 Chapters 7 and 8 it was concluded that the magnitude of any impact = low.	There will be no changes to WCS design parameters assessed in the EIA Report – Volume 2 Chapters 7 and 8 with respect to long term habitat loss, underwater noise, introduction of hard substrate and habitat creation, seabed sediment heating from subsea cables and EMF. Therefore, there will be no change in impact magnitude. Species identified in the Moray West Aerial Surveys + 4 km buffer are also expected to be present in the	**Magnitude = Low** **Significance = Negligible to Minor adverse** Not significant in EIA terms

Table 7.4 Assessment of effects associated with the Alternative Moray West Site area

Impacts assessed in the current EIA (July 2018)	Relevant WCS design parameters (for current Moray West Site area)[18]	Receptor sensitivity	Conclusions from assessment of impacts within the current Moray West Site area	Commentary on potential impacts within the Alternative Moray West Site area	Assessment of effect significance and conclusions
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 10: Section 10.6.2 and information presented in PART 1 of this addendum document – Chapters 2 and 3)					
	5: Fish and Shellfish Ecology (Table 5.2) of this Addendum.		**Magnitude = low** **Significance = negligible to minor adverse** Not significant in EIA terms	Alternative Moray West Site area (proposed variation area is within the buffer area). Species sensitivity to indirect effects (prey and habitat loss) is expected to remain unchanged for these species (low – medium). **Effect significant will also remain unchanged:** Razorbill, guillemot and puffin = **minor adverse** Fulmar, gannet, kittiwake, herring gull, great black-backed gull **= negligible to low.**	
Effects of pollution	Synthetic compound, heavy metal and hydrocarbon contamination resulting from up to 85 turbines and two OSPs. Accidental pollution may also result from O&M vessels. A typical turbine is anticipated to require grease, synthetic or hydraulic oil, and other operating compounds or materials. The OSP is expected to require chemicals and other operating compounds. Various operation and maintenance vessels will be required over the operation period.	Guillemot, razorbill, puffin = medium to high Fulmar, kittiwake, herring gull, great black-backed gull = low	Given the likely limited size of potential pollution incidents due to the limited volumes of chemicals and other substances carried by vessels or associated with the WTGs or OSPs) any potential effects is predicted to be of local spatial extent, short term duration, intermittent and high reversibility within the context of the regional populations. Impacts also have low likelihood of occurrence. Potential magnitude is therefore assessed as negligible. **Magnitude = negligible** **Significance = negligible** Not significant in EIA terms	There will be no changes in requirements for chemicals and vessel movements required during operation of the Moray West Offshore Wind Farm and components of the OfTI occurring within the Alternative Moray West Site area. Therefore, there are no changes to impact magnitude. Species identified in the Moray West Aerial Surveys + 4 km buffer are also expected to be present in the Alternative Moray West Site area (proposed variation area is within the buffer area). Species sensitivity to pollution is expected to remain unchanged for these species (guillemot, razorbill, puffin = medium to high and fulmar, kittiwake, herring gull, great black-backed gull = low). **Magnitude = Negligible** **Significance = Negligible** Not significant in EIA terms	**Magnitude = Negligible** **Significance = Negligible** Not significant in EIA terms

Table 7.5 Assessment of effects associated with the Alternative Moray West Site area					
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 10: Section 10.6.2 and information presented in PART 1 of this addendum document – Chapters 2 and 3)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[19]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Decommissioning					
Impacts from decommissioning activities	Impacts from decommissioning are expected to be similar to those listed above for construction If it is deemed closer to the time of decommissioning that removal of certain parts of the development (e.g. cables) would have a greater environmental impact than leaving in-situ, it may be preferable to leave those parts in-situ. In this case, the impacts would be similar to those described for the operational phase.	As per construction/operational phase sensitivities	As per construction/operational impacts	No changes expected to the decommissioning plan of the Current Moray West Site at this point	As per construction/operational significance

7.8 Cumulative effects

An assessment of potential cumulative effects is provided for the current Moray West Site in the EIA Report – Volume 2, Chapter 10: Section 10.8.

As outlined in Tables 7.3 to 7.5 above, changes associated with development within the Alternative Moray West Site area are considered to be not applicable to any of the impacts assessed in the Moray West EIA Report – Volume 2, Chapter 10: Section 10.7. It can therefore also be concluded that potential cumulative impacts associated with the Alternative Moray West Site area will also not be applicable. The conclusions from the cumulative assessment of the Alternative Moray West Site area therefore remain unchanged from those assessed for the current Moray West Site as presented in the EIA Report, Volume, Chapter 10, Section 10.8.

7.9 Conclusion on the effects of proposed changes to the Moray West Site

Of the key species of interest, i.e. kittiwake, guillemot and razorbill, overall, the predicted changes to the densities of kittiwakes in flight and kittiwakes, guillemots and razorbills on the water between the current Moray West Site and the Alternative Moray West Site area, were either no change, negligible increase or reduction in predicted density used in impact assessment.

Therefore, in conclusion the change to the Alternative Moray West Site area would not result in an increase in the predicted impacts to the seabirds assessed from the Current Moray West Site. Either from a project specific or cumulative perspective.

8 Commercial Fisheries

8.1 Introduction

This section presents additional information with respect to potential effects of the proposed variation to the Moray West Site on commercial fisheries.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 11: Commercial Fisheries and Volume 4, Appendix 11.1: Commercial Fisheries Technical Report.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

8.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on commercial fisheries are provided in the EIA Report – Volume 2, Chapter 11: Section 11.2.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

8.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key consultation responses received during preparation of the EIA Report are provided in EIA Report – Volume 2, Chapter 11: Section 11.3. Specific comments received to date (20th November 2018) on the application, as submitted in July 2018 (Moray West EIA Report), have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

No further consultation specific to commercial fisheries has been undertaken as part of the preparation of this addendum.

8.4 Baseline characteristics associated with the Alternative Moray West Site area

8.4.1 Overview of baseline characteristics within the current Moray West Site

A detailed description of the baseline conditions with the current Moray West Site and along the offshore export cable corridor (including the northern extent of the export cable corridor which includes the proposed variation area) are provided in the EIA Report – Volume 2, Chapter 11, Section 11.4 and in Volume, 4 Appendix 11.1: Commercial Fisheries Technical Report.

As described in the EIA Report, fishing fleets operating in areas relevant to the current Moray West Site and the offshore export cable corridor, include:

- Creel fleet (crabs and lobster);
- Mackerel jigging;
- Demersal trawl fleet (Nephrops, squid and whitefish);
- Scallop dredging fleet; and
- Scottish seine net fleet (whitefish).

As illustrated in Volume 2- Figure 8.1 to 8.10 of this Addendum document, in the proposed mitigation area (area to be removed) fishing activity is for the most part undertaken by scallop dredgers and demersal trawlers and it occurs at relatively low levels in comparison to other areas in the Moray Firth.

8.4.2 Baseline characteristics of the proposed variation area

Fishing activity in the proposed variation area is similar to that identified above with regards to the proposed mitigation area, with activity being predominantly by scallop dredgers and demersal trawlers and also occurring at a similar, relatively low, levels (see Volume 2- Figure 8.1 to 8.10 of this Addendum Document).

With reference to the distribution and levels of fishing activity by each individual fleet and the potential implications of development of the Moray West offshore wind farm within the Alternative Moray West Site area, the following key points are noted:

- Creel fleet: fishing grounds targeted by this fleet in areas relevant to the Development concentrate close to shore, in the inshore section of the export cable corridor south of the proposed variation area. Therefore, the fisheries baseline in relation to this fleet taking account of the proposed variation area remains unchanged from that presented in the EIA Report, Volume 2, Chapter 11 (Volume 2- Figure 8.2 of this Addendum Document);
- Mackerel jigging: fishing grounds targeted by this fleet in areas relevant to the Development extend over a similar area to that described above for the creel fleet, concentrating close to shore, in the inshore section of the export cable corridor south of the proposed variation area. Therefore, the fisheries baseline in relation to this fleet taking account of the variation area, also remains unchanged from that presented in the EIA Report, Volume 2, Chapter 11 (Volume 2- Figure 8.3 of this Addendum Document);
- Nephrops fishery: demersal trawling for Nephrops in areas relevant to the Development is primarily carried out in parts of the export cable corridor. The proposed variation area does not overlap with the main Nephrops grounds but is located immediately to the north. Therefore, the fisheries baseline in relation to this fleet taking account of the variation area remains unchanged from that presented in the EIA Report, Volume 2, Chapter 11 (Volume 2- Figure 8.4, Figure 8.5 and Figure 8.6 of this Addendum Document);
- Squid fishery: fishing grounds for squid in areas relevant to the Development extend across the current Moray West Site and the northern and southern sections of the export cable corridor, overlapping with both the mitigation area and the proposed variation area. VMS data for demersal trawlers suggest that fishing activity takes place at similar levels in both areas. As such, the fisheries baseline in relation to this fleet taking account of the variation area, remains unchanged from that presented in the EIA Report, Volume 2, Chapter 11 (Volume 2- Figure 8.4, Figure 8.5 and Figure 8.7 of this Addendum Document);
- Whitefish fishery: demersal trawling for whitefish, as indicated in the EIA Report, Volume 2, Chapter 11, Section 11.4.2, occurs for the most part in areas relevant to the offshore cable corridor. As suggested by VMS data, along the export cable corridor, the majority of demersal trawling activity takes place south of the variation area. With this in mind, it is considered that the fisheries baseline in relation to this fleet, taking account of the variation area, remains unchanged from that presented in the EIA Report, Volume 2, Chapter 11;
- Scallop fishery (local and nomadic fleet): scallop fishing grounds in areas relevant to the Development extend across the current Moray West Site and the northern and southern sections of the export cable corridor, overlapping with both the mitigation area and the proposed variation area (Volume 2- Figure 8.10 of this Addendum document). VMS data for scallop dredgers suggest that fishing activity takes place at similar levels in both areas, with the exception of a small section of the eastern part of the variation area, where fishing levels appear to be higher than in the mitigation area (Volume 2- Figure 8.8 and Figure 8.9

of this Addendum document). In the context of the distribution and levels of fishing activity across the overall current Moray West Site and the overall Alternative Moray West Site area, however, the difference would be negligible; and

- Seine netting: As suggested by surveillance sightings (Volume 2- Figure 8.1 of this Addendum document) fishing activity by seine netters is understood to concentrate in areas north of the current Moray West Site and further offshore. Therefore, the fisheries baseline in relation to this fleet taking account of the variation area remains unchanged from that presented in the EIA Report, Volume 2, Chapter 11.

8.4.1 Limitations with the baseline characterisation

Other than the limitations listed in the EIA Report – Volume 2, Chapter 11: Section 11.5.6, no other limitations have been identified that could affect the assessment of the Alternative Moray West Site area.

8.5 Assessment method

The method for assessing potential effects of the Development on commercial fisheries is described in detail in the EIA Report – Volume 2, Chapter 11: Section 11.5.

There have been no changes to this assessment method since submission of the application in July 2018. These methods, and associated assessment criteria therefore remain applicable for the assessment of the Alternative Moray West Site area.

8.6 Potential effects associated with the Alternative Moray West Site area

Potential effects associated with the construction, operation and decommissioning of the components of the Development located within the Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Table 8.1 to Table 8.3 below. The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated WCS design parameters assessed in the EIA Report – Volume 2, Chapter 11, Section 11.6: Table 11.6.1 for the current Moray West Site; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and decommissioning of the components of the Development located within the current Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 11, Section 11.7: Table 11.7.3.

8.6.1 Mitigation measures

The assessment and conclusions presented in Table 8.1 to Table 8.3 also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2.

Table 8.1 Assessment of effects associated with the Alternative Moray West Site area

Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[20]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative site area**	**Assessment of effect significance and conclusions**
Adverse impacts on commercially exploited fish and shellfish populations	As defined in the Moray West EIA Report, Volume 2, Chapter 8: Fish and Shellfish Ecology. These include: Temporary habitat loss / habitat disturbance; Increased suspended sediment concentrations (SSC) / sediment deposition; Noise and vibration; and Accidental release of hydrocarbons and chemicals from infrastructure installation processes or from vessels.	All fleets (See EIA Report – Volume 2, Chapter 8: Fish and Shellfish)	The EIA Report, Volume 2, Chapter 8: Fish and Shellfish, assesses the potential impacts of the Development on fish and shellfish species, including those of commercial importance, and concluded impacts would not exceed minor significance (for all impacts assessed). On that basis the significance of any resulting impacts on commercial fisheries is considered to not exceed minor significance. **Significance =** not exceeding **minor** significance Not significant in EIA terms	The potential impacts of the proposed development on fish and shellfish species, including those of commercial importance, considering the Alternative Moray West Site area, are described in Section 5.6 of Chapter 5 (Fish and Shellfish Ecology) in this addendum. The assessment presented in Section 5.6 concludes that impacts would not exceed minor significance (for all impacts assessed). On that basis, the significance of any resulting effects on commercial fisheries is also considered to not exceed minor significance.	**Significance** = not exceeding **minor** significance**.** Not significant in EIA terms.
Temporary loss of or restricted access to traditional fishing grounds	Maximum extent of safety zones in the current Moray West Site associated with the installation of the maximum number of turbines (85) and OSPs (2) and the maximum length of inter array and OSP interconnector cables. Maximum duration of construction works: 36	Creel fleet = moderate Mackerel jigging fleet = moderate Local demersal trawl fleet (Nephrops and whitefish) = low	Impact magnitude = **low** based on the temporary nature of construction activities, the relatively small areas where fishing may be excluded in the context of the extent of fishing grounds available to each fleet and the embedded mitigation measures outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2.	The worst case parameters outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the Alternative Moray West Site area. Similarly, the embedded mitigation measures outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2 would also apply in relation to the Alternative Moray West Site area.	Impact magnitude = **low** based on no change in worst case parameters within the Alternative Moray West Site area and no change in embedded mitigation measures. Sensitivity of receptors = **negligible to moderate** based on no material change

[20] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 8.1 Assessment of effects associated with the Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[20]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative site area**	**Assessment of effect significance and conclusions**
	months overall construction period. 500 m safety zones around construction vessels and cable lay vessels; and 50 m safety zones around partially and completely installed infrastructure prior to commissioning.	Local squid fleet = moderate Local scallop fleet = moderate Demersal trawl fleet in general= low Nomadic scallop fleet = low Scottish seine fleet = negligible	Sensitivity of receptor = **negligible to moderate** (depending on the level of activity in areas potentially affected by safety zones and the operational range and versatility of vessels involved in a given fishery. **Significance = negligible to minor** Not significant in EIA terms.	As presented in Volume 2 of this Addendum, fishing within the proposed variation area is undertaken by the same fleets identified as being active with the current Moray West Site and occurs at similar levels to those recorded in the proposed mitigation area (see Figure 8.1 to 8.10 in Volume 2 of this Addendum document). Therefore, there is predicted to be no change in impact magnitude. In the particular case of scallop dredging, it is noted that fishing activity in a section to the east of the variation area is slightly higher than in the mitigation area, However, considering the level and distribution of scallop dredging activity within the overall Alternative Moray West Site area in comparison to that in the overall current Moray West Site, the difference would be negligible. Therefore, sensitivity remains as identified in the EIA Report, for all fleets.	in types and levels of fishing activity in the Alternative Moray West Site area compared to those recorded current Moray West Site. **Significance = negligible to minor** Not significant in EIA terms
Safety issues for fishing vessels	Maximum number of turbines (85) and OSPs (2) and maximum length of inter-array and OSP interconnector cables.	All fleets – n/a (see EIA Report, Volume 2, Chapter 11, Section 11.7.2)	Safety risks **within acceptable limits.** This takes account of the embedded mitigation measures, including safety measures, outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2. Not significant in EIA terms.	The worst case parameters outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the Alternative Moray West Site area. Similarly, the embedded mitigation measures, including safety measures,	Safety risks **within acceptable limits** based on no change in worst case parameters and no change in embedded mitigation measures when considering

Table 8.1 Assessment of effects associated with the Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[20]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative site area**	**Assessment of effect significance and conclusions**
	Maximum number of vessels movements and of construction vessels on site.			outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2 would also apply in relation to the Alternative Moray West Site area.	the Alternative Moray West Site area. Not significant in EIA terms.
Increased steaming times to fishing grounds	As above for temporary loss or restricted access to fishing grounds; • Maximum extent of safety zones in the current Moray West Site associated with the installation of the maximum number of turbines (85) and OSPs (2) and the maximum length of inter array and OSP interconnector cables. • Maximum duration of construction works: 36 months overall construction period. • 500 m safety zones around construction vessels and cable lay vessels; and • 50 m safety zones around partially	Creel fleet = low Mackerel jigging fleet = low Demersal trawl fleet (including local fleets) = low Scallop dredging fleet (local and nomadic) = low Scottish seine fleet = low	Impact magnitude = **negligible** based on the discrete areas affected by safety zones at any one time and their temporary nature. Sensitivity of receptor: **low** based on the operational ranges of the fleets. **Significance = negligible**	Maximum number of turbines, OSPs, length of cables, extent of safety zones and duration of construction works remains as presented in the EIA Report, Volume 2, Chapter 11, Table 11.6.1, therefore there is predicted to be no change in impact magnitude. As presented in Volume 2 of this Addendum, fishing within the proposed variation area is undertaken by the same fleets identified as being active with the current Moray West Site and occurs at similar levels to those recorded in the proposed mitigation area (see Figure 8.1 to 8.10 in Volume 2 of this Addendum document). In the particular case of scallop dredging, it is noted that fishing activity in a section to the east of the variation area is slightly higher than in the mitigation area, However, considering the level and distribution of scallop dredging activity within the overall Alternative Moray West Site area in comparison to that in the	Impact magnitude = **negligible** based on no change in worst case parameters within the Alternative Moray West Site area. Sensitivity of receptor = **low** based on no material change in types and level of fishing activity in the Alternative Moray West Site area compared to those recorded in the current Moray West Site. **Significance = negligible** Not significant in EIA terms.

Table 8.1 Assessment of effects associated with the Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[20]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative site area**	**Assessment of effect significance and conclusions**
	and completely installed infrastructure prior to commissioning.			overall current Moray West Site, the difference would be negligible. Therefore, sensitivity remains as identified in the EIA Report, Volume 2, Chapter 11, Section 11.7.2, for all fleets.	
Interference with fishing activities (navigational conflict)	Maximum number of vessels movements and of construction vessels on site.	Creel fleet = moderate Mackerel jigging fleet = low Demersal trawl fleet (including local fleets) = low Scallop dredging fleet (local and nomadic) = low Scottish seine fleet = low	Impact magnitude = **negligible**. This takes account of the embedded mitigation measures outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2, to minimise potential interactions between fishing vessels and construction vessels. Sensitivity of receptor= **low to moderate** (depending on whether vessels deploy mobile or static gear as identified in the previous column). **Significance = negligible to minor** Not significant in EIA terms	The worst case parameters outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the Alternative Moray West Site area. Similarly, the embedded mitigation measures outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2 would also apply in relation to the Alternative Moray West Site area. Therefore, impact magnitude is not expected to change As presented in Volume 2 of this Addendum, fishing within the proposed variation area is undertaken by the same fleets identified as being active with the current Moray West Site and occurs at similar levels to those recorded in the proposed mitigation area (see Figure 8.1 to 8.10 in Volume 2 of this Addendum document). In the particular case of scallop dredging, it is noted that fishing activity in a section to the east of the variation area is slightly higher than in the mitigation area,	Impact magnitude = **negligible**, based on no change in worst case parameters and embedded mitigation measures. Sensitivity of receptors =**low to moderate**, based on no material change in types and level of fishing activity in the Alternative Moray West Site compared to those recorded in the current Moray West Site. **Significance = negligible to minor** Not significance in EIA terms

Table 8.1 Assessment of effects associated with the Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[20]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative site area**	**Assessment of effect significance and conclusions**
				However, considering the level and distribution of scallop dredging activity within the overall Alternative Moray West Site area in comparison to that in the overall current Moray West Site, the difference would be negligible. Therefore, sensitivity remains as identified in the EIA Report, Volume 2, Chapter 11, Section 11.7.2, for all fleets.	
Displacement of fishing activity into other areas	As above for temporary loss of or restricted access to traditional fishing grounds; • Maximum extent of safety zones in the current Moray West Site associated with the installation for the maximum number of turbines (85) and OSPs (2) and the installation of the maximum length of inter array and OSP interconnector cables.	Creel fleet = moderate Mackerel jigging fleet = moderate Local demersal trawl fleet (Nephrops and whitefish) = low Local squid fleet = moderate Local scallop fleet = moderate	Impact magnitude = **low**, on the basis that the impact magnitude applied in relation to temporary loss or restricted access to fishing grounds also applies in relation to displacement. Sensitivity of receptor = **negligible to moderate**, on the basis that the receptor sensitivity applied in relation to temporary loss or restricted access to fishing grounds also applies in relation to displacement as indicated in previous column. **Significance = negligible to minor** Not significant in EIA terms.	The worst case parameters outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the Alternative Moray West Site area. Similarly, the embedded mitigation measures outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2 would also apply in relation to the Alternative Moray West Site area. Therefore, there is predicted to be no change in impact magnitude. As presented in Volume 2 of this Addendum, fishing within the proposed variation area is undertaken by the same fleets identified as being active with the current Moray West Site and occurs at similar levels to those recorded in the proposed mitigation area (see Figure 8.1 to	Impact magnitude = **low** based on no change in worst case parameters within the Alternative Moray West Site area and no change in embedded mitigation measures. Sensitivity of receptors = **negligible to moderate** based on no material change in types and levels of fishing activity in the Alternative Moray West Site area compared to those recorded in the current Moray West Site.

Table 8.1 Assessment of effects associated with the Alternative Moray West Site area					
Construction impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[20]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative site area**	**Assessment of effect significance and conclusions**
	• Maximum duration of construction works: 36 months overall construction period. • 500 m safety zones around construction vessels and cable lay vessels; and • 50 m safety zones around partially and completely installed infrastructure prior to commissioning.	Demersal trawl fleet in general = low Nomadic scallop fleet = low Scottish seine fleet = negligible		8.10 in Volume 2 of this Addendum document). In the particular case of scallop dredging, it is noted that fishing activity in a section to the east of the variation area is slightly higher than in the mitigation area, However, considering the level and distribution of scallop dredging activity within the overall Alternative Moray West Site area in comparison to that in the overall current Moray West Site, the difference would be negligible. Therefore, sensitivity remains as identified in the EIA Report, Volume 2, Chapter 11, Section 11.7.2, for all fleets.	**Significance = negligible to minor** Not significant in EIA terms
Obstacles on the seabed	Installation for the maximum number of turbines (85) and OSPs (2) and the maximum length of inter array and OSP interconnector cables. Potential for objects to be dropped on the seabed	All fleets – n/a (see EIA Report, Volume 2, Chapter 11, Section 11.7.2)	Safety risks associated with seabed obstacles **within acceptable limits.** This takes account of the embedded mitigation measures, including safety measures, outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2. Not significant in EIA terms.	Maximum number of turbines, OSPs and length of cables remains as presented in the EIA Report, Volume 2, Chapter 11, Table 11.6.1. Embedded mitigation measures, including safety measures, remain as outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2.	Safety risks associated with seabed obstacles **within acceptable limits.** This is based on no change in worst case parameters and no change in embedded mitigation measures when considering the Alternative Moray West Site area. Not significant in EIA terms

Table 8.2 Assessment of effects assocaited with the Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[21]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Adverse impacts on commercially exploited fish and shellfish population	As defined in the Moray West EIA Report, Volume 2, Chapter 8: Fish and Shellfish Ecology. These include: Long term habitat loss / habitat disturbance; Noise and vibration; Accidental release of hydrocarbons and chemicals from infrastructure installation processes or from vessels; Creation of new substrate and habitat; EMF; and Seabed sediment heating from subsea cables.	All fleets (See EIA Report – Volume 2, Chapter 8: Fish and Shellfish)	The EIA Report, Volume 2, Chapter 8: Fish and Shellfish, assesses the potential impacts of the Development on fish and shellfish species, including those of commercial importance, and concluded impacts would not exceed minor significance (for all impacts assessed). On that basis the significance of any resulting impacts on commercial fisheries is considered to not exceed minor significance. **Significance =** not exceeding **minor** significance Not significant in EIA terms	The potential effects of the Development on fish and shellfish species, including those of commercial importance, with regards to the Alternative Moray West Site area are described in Section 5.6 of Chapter 5 (Fish and Shellfish Ecology) in this addendum. The assessment presented in Section 5.6 concludes that impacts would not exceed minor significance (for all impacts assessed). On this basis, the significance of any resulting impacts on commercial fisheries is also considered to not exceed minor significance.	Significance = not exceeding **minor** significance Not significant in EIA terms.
Permanent loss of or restricted access to	Presence of the maximum number of turbines (85), OSPs (2), the maximum length of inter array and	Creel fleet = negligible	Impact magnitude = **negligible to low**. This takes account of the relatively small extent of the area from which fishing may be excluded during operation in the context of the grounds	The worst case parameters outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the	Impact magnitude = **negligible to low** based on no change in worst case parameters within the

[21] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 8.2 Assessment of effects assocaited with the Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[21]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
traditional fishing grounds	inter OSP cables and the maximum number of cables crossings. Minimum spacing between turbines (1,200m downwind and 1,050m crosswind). 500m safety zones around major maintenance works	Mackerel jigging fleet = negligible Local demersal trawl (all local fleets) = low Local scallop fleet = moderate Nomadic scallop fleet = low Scottish seine fleet = negligible	available to each fleet and the embedded mitigation measures outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2. Sensitivity of receptor = **negligible to moderate**, depending on the operational range, fishing opportunities and ability to resume fishing within the current Moray West Site of each fishing fleet). **Significance = negligible to minor** Not significant in EIA terms.	Alternative Moray West Site area. Similarly, the embedded mitigation measures outlined in the EIA Report, Chapter 11, Section 11.6.2 and Technical Appendix 11.2 would also apply in relation to the Alternative Moray West Site area. Therefore, there is predicted to be no change in impact magnitude. As presented in Volume 2 of this Addendum, fishing within the proposed variation area is undertaken by the same fleets identified as being active with the current Moray West Site and occurs at similar levels to those recorded in the proposed mitigation area (see Figure 8.1 to 8.10 in Volume 2 of this Addendum document). In the particular case of scallop dredging, it is noted that fishing activity in a section to the east of the variation area is slightly higher than in the mitigation area. However, considering the level and distribution of scallop dredging activity within the overall Alternative Moray West Site area in comparison to that in the overall current Moray West Site, the difference would be negligible.	Alternative Moray West Site area. Sensitivity of receptors = **negligible to moderate** based on no material change in types and level of fishing activity in the Alternative Moray West Site area compared to those recorded in the current Moray West Site. **Significance = negligible to minor** Not significant in EIA terms.

Table 8.2 Assessment of effects assocaited with the Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[21]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
				Therefore, sensitivity remains as identified in the EIA Report, Volume 2, Chapter 11, Section 11.7.3, for all fleets.	
Safety issues for fishing vessels	Maximum number of turbines (85) and OSPs (2) and maximum length of inter-array and OSP interconnector cables. Minimum spacing between turbines (1,200 m downwind and 1,050 m crosswind). Maximum number of vessels during operation and maintenance. Inter array and inter OSP cables buried to a minimum depth of 1 m and protected where burial is not possible.	All fleets – n/a (see EIA Report, Volume 2, Chapter 11, Section 11.7.3)	Safety risks **within acceptable limits.** This takes account of the embedded mitigation measures, including safety measures, outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.3 and Technical Appendix 11.2. Not significant in EIA terms.	The worst case parameters outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the Alternative Moray West Site area. Similarly, the embedded mitigation measures, including safety measures, outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2 would also apply in relation to the Alternative Moray West Site area.	Safety risks **within acceptable limits** based on no change in worst case parameters and no change in embedded mitigation measures when considering the Alternative Moray West Site area. Not significant in EIA terms.
Increased steaming times to fishing grounds	Presence of the maximum number of turbines (85) and OSPs. Minimum spacing between turbines (1,200m downwind and 1,050m crosswind).	All fleets = negligible	Impact magnitude = **negligible**, based on small extent of areas where fishing may be excluded (i.e. safety zones around major maintenance works and advisory safety zones around infrastructure). Sensitivity of receptors = **negligible**, given that fishing vessels would be able to steam thought	The worst case parameters outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the Alternative Moray West Site area. Fishing vessels would also be able to steam through the Alternative Moray	Impact magnitude = **negligible**, based on no change to worst case parameters. Sensitivity of receptors = **negligible**, given that fishing vessels would be able to steam through the

Table 8.2 Assessment of effects assocaited with the Alternative Moray West Site area

Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)

Impacts assessed in the current EIA (July 2018)	Relevant WCS design parameters (for current Moray West Site area)[21]	Receptor sensitivity	Conclusions from assessment of impacts within the current Moray West Site area	Commentary on potential impacts within the Alternative Moray West Site area	Assessment of effect significance and conclusions
	Maximum extent of safety zones: 500m around major maintenance works.		the current Moray West Site during the operational phase. **Significance = negligible** Not significant in EIA terms	West Site area. Therefore, sensitivity remains negligible.	Alternative Moray West Site area. **Significance = negligible** Not significant in EIA terms
Interference with fishing activities (navigational conflict)	Maximum number of operation and maintenance vessels	Creel fleet = moderate Mackerel jigging fleet = low Demersal trawl fleet (including local fleets) = low Scallop dredging fleet (local and nomadic) = low	Impact magnitude = **negligible**. This takes account of the embedded mitigation measures outlined in the Moray West EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2, to minimise potential interactions between fishing vessels and operation and maintenance vessels. Sensitivity of receptor= **low to moderate** (depending on whether vessels deploy mobile or static gear). **Significance = negligible to minor** Not significant in EIA terms	The worst case scenario outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the Alternative Moray West Site area. Similarly, the embedded mitigation measures outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2 would also apply in relation to the Alternative Moray West Site area. Therefore, impact magnitude is not expected to change As presented in Volume 2 of this Addendum, fishing within the proposed variation area is undertaken by the same fleets identified as being active with the current Moray West Site and occurs at similar levels to those recorded in the proposed mitigation area (see Figure 8.1 to 8.10 in Volume 2 of this Addendum document).	Impact magnitude = **negligible**. This is based on no change in worst case parameters and embedded mitigation measures. Sensitivity of receptors = **low to moderate**, based on no material change in types and level of fishing activity in the Alternative Moray West Site compared to those recorded in the current Moray West Site. **Significance = negligible to minor** Not significance in EIA terms

Table 8.2 Assessment of effects assocaited with the Alternative Moray West Site area

Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[21]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
		Scottish seine fleet = low		In the particular case of scallop dredging, it is noted that fishing activity in a section to the east of the variation area is slightly higher than in the mitigation area. However, considering the level and distribution of scallop dredging activity within the overall Alternative Moray West Site area in comparison to that in the overall current Moray West Site, the difference would be negligible. Therefore, sensitivity remains as identified in the EIA Report, Volume 2, Chapter 11, Section 11.7.3, for all fleets.	
Displacement of fishing activity into other areas	As above for permanent loss or restricted access to traditional fishing grounds; Presence of the maximum number of turbines (85), OSPs (2), the maximum length of inter array and inter OSP cables and the maximum number of cables crossings.	Creel fleet = moderate Mackerel jigging fleet = low	Impact magnitude = **negligible to low**, on the basis that the impact magnitude applied in relation to temporary loss or restricted access to fishing grounds also applies in relation to displacement. Sensitivity of receptor = **negligible to moderate**, on the basis that the receptor sensitivity applied in relation to temporary loss or restricted access to fishing grounds also applies in relation to displacement	The worst case parameters outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the Alternative Moray West Site area. Similarly, the embedded mitigation measures outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2 would also apply in relation to the Alternative Moray West Site area.	Impact magnitude = **negligible to low** based on no change in worst case parameters within the Alternative Moray West Site area. Sensitivity of receptors = **negligible to moderate** based on no material change in types and level of fishing activity in the

Table 8.2 Assessment of effects assocaited with the Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[21]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	Minimum spacing between turbines (1,200m downwind and 1,050m crosswind). 500m safety zones around major maintenance works.	Demersal trawl fleet (including local fleets) = low Scallop dredging fleet (local and nomadic) = low Scottish seine fleet = low	**Significance = negligible to minor** Not significant in EIA terms.	Therefore, there is predicted to be no change in impact magnitude. As presented in Volume 2 of this Addendum, fishing within the proposed variation area is undertaken by the same fleets identified as being active with the current Moray West Site and occurs at similar levels to those recorded in the proposed mitigation area (see Figure 8.1 to 8.10 in Volume 2 of this Addendum document). In the particular case of scallop dredging, it is noted that fishing activity in a section to the east of the variation area is slightly higher than in the mitigation area. However, considering the level and distribution of scallop dredging activity within the overall Alternative Moray West Site area in comparison to that in the overall current Moray West Site, the difference would be negligible. Therefore, sensitivity remains as identified in the EIA Report, Volume 2, Chapter 11, Section 11.7.3, for all fleets.	Alternative Moray West Site area compared to those recorded in the current Moray West Site. **Significance = negligible to minor** Not significant in EIA terms
Obstacles on seabed	Potential for objects to be accidentally dropped on the	All fleets – n/a (see EIA Report, Volume 2,	Safety risks associate with seabed obstacles **within acceptable limits.**	The worst case scenarios outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1	Safety risks associated with seabed obstacles **within acceptable limits.** This is

Table 8.2 Assessment of effects assocaited with the Alternative Moray West Site area					
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[21]**	**Receptor sensitivity**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	seabed by contractors during operation. Presence of boulders or berms form cable burial or boulder relocation.	Chapter 11, Section 11.7.3)	This takes account of the embedded mitigation measures, including safety measures, outlined in the Moray West EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2. Not significant in EIA terms.	would also apply in relation to the Alternative Moray West Site area. Embedded mitigation measures, including safety measures, remain as outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.2 and Technical Appendix 11.2.	based on no change in worst case parameters and no change in embedded mitigation measures when considering the Alternative Moray West Site area.

Table 8.3 Assessment of effects assocaited with the Alternative Moray West Site area					
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[22]**	**Receptors**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Impacts as assessed for construction phase, including: Adverse impacts on commercially	As outlined in the EIA Report, Volume 2, Chapter 11, Table 11.6.1, in the absence of detailed methodologies and schedules, decommissioning works and the implications for commercial fisheries are	Creel fleet = moderate Mackerel jigging fleet = moderate	Impact magnitude: **Negligible to low**. Given the nature of works associated with decommissioning (similar to construction) the magnitude of impacts associated with this phase would not be greater than	The worst case scenarios outlined in the EIA Report, Volume 2, Chapter 11, Section 11.6.1, Table 11.6.1 would also apply in relation to the Alternative Moray West Site area.	Impact magnitude: **Negligible to low,** based on no change to the worst case parameters when considering the Alternative Moray West Site area and

[22] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 8.3 Assessment of effects assocaited with the Alternative Moray West Site area					
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 11, Section 11.6.2)					
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[22]**	**Receptors**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
exploited fish and shellfish populations; Temporary loss of or restricted access to traditional fishing grounds; Safety issues for fishing vessels; Increased steaming times to fishing grounds; Interference with fishing activities (navigational conflict); Displacement of fishing activity into other areas; and Obstacles on the seabed.	considered analogous with or likely less than those of the construction phase. Therefore, the worst case parameters defined for the construction phase also apply to decommissioning.	Local demersal trawl fleet (Nephrops and whitefish) = low Local squid fleet = moderate Local scallop fleet = moderate Demersal trawl fleet in general = low Nomadic scallop fleet = low Scottish seine fleet = negligible	those identified for the construction phase. Receptor sensitivity: **Negligible to moderate**. Assumes that the sensitivities of the receptors identified in relation to construction are not materially different at the end of the Development's life and therefore at the time when decommissioning works would start. **Impact Significance = Negligible to Minor** Not significant in EIA terms	Embedded mitigation measures, in respect of the Alternative Moray West Site area would remain as outlined in the Moray West EIA Report, Volume 2, Chapter 11, Section 11.6.2. As presented in Volume 2 of this Addendum, fishing within the proposed variation area is undertaken by the same fleets identified as being active with the current Moray West Site and occurs at similar levels to those recorded in the proposed mitigation area (see Figure 8.1 to 8.10 in Volume 2 of this Addendum document). In the particular case of scallop dredging, it is noted that fishing activity in a section to the east of the variation area is slightly higher than in the mitigation area. However, considering the level and distribution of scallop dredging activity within the overall Alternative Moray West Site area in comparison to that in the overall current Moray West Site, the difference would be negligible.	no changes to embedded mitigation measures. Receptor sensitivity: **Negligible to Moderate.** This is based on no material change in types and level of fishing activity in the Alternative Moray West Site area compared to those recorded in the current Moray West Site. Impact Significance = **Negligible to Minor** Not significant in EIA terms

8.7 Cumulative effects

As outlined in Table 8.1 to Table 8.3, the significance of the effects of the Development on commercial fisheries considering the Alternative Moray West Site area would be as identified in the EIA Report, Volume 2, Chapter 11, Section 11.7 with respect to the current Moray West Site.

With this in mind, it is reasonable to assume that the contribution of the Alternative Moray West Site area to any cumulative effect would be as described in the EIA Report, Volume 2, Chapter 11, Section 11.8 for the current Moray West Site.

It therefore follows that the conclusions of the cumulative assessment presented in the EIA Report, Volume 2, Chapter 11, Section 11.8, also apply when considering the Alternative Moray West Site area. These are summarised in Table 6.6 below for the construction, operation and maintenance and decommissioning phase of the Development.

Table 8.4 Cumulative Assessment Summary

Potential impact	Projects Considered	Receptor	Impact magnitude	Sensitivity	Effect Significance
Construction					
Adverse impacts on commercially exploited fish and shellfish population	All projects	All fleets	For full details on effect magnitude and receptor sensitivity in respect of fish and shellfish ecology see Section 5.7		Not exceeding minor Not significant in EIA terms
Temporary loss or restricted access to traditional fishing grounds	Moray Firth Projects	Creel fleet	Low	Low to Moderate	Minor Not significant in EIA terms
Temporary loss or restricted access to traditional fishing grounds	Moray Firth Projects	Mackerel jigging fleet	Low	Low to Moderate	Minor Not significant in EIA terms
Temporary loss or restricted access to traditional fishing grounds	Moray Firth Projects	Local demersal trawl fleet (Nephrops and whitefish)	Low	Low to Moderate	Minor Not significant in EIA terms
Temporary loss or restricted access to traditional fishing grounds	Moray Firth Projects	Local squid fleet	Low	Low to Moderate	Minor Not significant in EIA terms
Temporary loss or restricted access to traditional fishing grounds	Moray Firth Projects	Local scallop fleet	Low	Low to Moderate	Minor Not significant in EIA terms
Temporary loss or restricted access to traditional fishing grounds	Projects in the Moray Firth, Forth and Tay, wider area and English Projects	Demersal Trawl Fleet	Low	Low to Moderate	Minor Not significant in EIA terms
Temporary loss or restricted access to traditional fishing grounds	Projects in the Moray Firth, Forth and Tay, wider area and English Projects	Nomadic scallop fleet	Low	Low to Moderate	Minor Not significant in EIA terms
Increased steaming times to fishing grounds	Moray Firth Projects	Creel fleet and mackerel jigging fleet	Negligible to Low	Low	Negligible to Minor Not significant in EIA terms
Increased steaming times to fishing grounds	Moray Firth Projects	Local demersal and scallop fleet	Negligible to Low	Low	Negligible to Minor Not significant in EIA terms
Increased steaming times to fishing grounds	Projects in the Moray Firth, Forth and Tay, wider area and English Projects	Demersal Trawl Fleet	Negligible to Low	Low	Negligible to Minor Not significant in EIA terms
Increased steaming times to fishing grounds	Projects in the Moray Firth, Forth and Tay, wider area and English Projects	Nomadic scallop fleet	Negligible to Low	Low	Negligible to Minor Not significant in EIA terms
Interference with fishing activities (navigational conflict)	Moray Firth Projects	Creel fleet	Negligible	Low to Moderate	Negligible to Minor Not significant in EIA terms
Interference with fishing activities (navigational conflict)	Moray Firth Projects	Mackerel jigging, local demersal and scallop fleet	Negligible	Low to Moderate	Negligible to Minor Not significant in EIA terms
Interference with fishing activities (navigational conflict)	Projects in the Moray Firth, Forth and Tay, wider area and English Projects	Demersal Trawl Fleet	Negligible	Low to Moderate	Negligible to Minor Not significant in EIA terms
Interference with fishing activities (navigational conflict)	Projects in the Moray Firth, Forth and Tay, wider area and English Projects	Nomadic scallop fleet	Negligible	Low to Moderate	Negligible to Minor Not significant in EIA terms

Table 8.4 Cumulative Assessment Summary					
Potential impact	**Projects Considered**	**Receptor**	**Impact magnitude**	**Sensitivity**	**Effect Significance**
Displacement of fishing activity into other areas	As above for temporary loss or restricted access to traditional fishing grounds				
Operation and maintenance					
Adverse impacts on commercially exploited fish and shellfish population	All projects	All fleets	For full details on effect magnitude and receptor sensitivity in respect of fish and shellfish ecology see Section 5.7		Not exceeding minor
Permanent loss or restricted access to traditional fishing grounds	Moray Firth Project	Creel fleet and mackerel jigging fleet	Negligible to Low	Negligible to Moderate	Negligible to Minor Not significant in EIA terms
		Local demersal trawl fleet (including Nephrops, squid and whitefish fisheries)			
		Local scallop fleet			
	Projects in the Moray Firth, Forth and Tay, wider area and English Projects	Demersal Trawl Fleet			
		Nomadic scallop fleet			
Increased steaming times to fishing grounds	All Projects	All fleets	Negligible	Negligible	Negligible
Interference with fishing activities (navigational conflict)	All Projects	Creel fleet	Negligible	Low to Moderate	Negligible to Minor
		All other fleets			
Displacement of fishing activity into other areas	As above for permanent loss or restricted access to traditional fishing grounds				
Decommissioning					
Assume to be less or in worst case equal to the effect levels identified for the construction phase					

8.8 Conclusion on the effects of proposed changes to the Moray West Site

The assessment carried out in respect of the construction, operation and decommissioning phase of the Development considering the proposed changes to the Moray West Site (Table 6.3 to Table 6.6), has not identified significant effects (i.e. above minor significance) on commercial fisheries. This applies to the assessment in relation to the Development alone and cumulatively with other projects.

It should be noted that the outcomes of this assessment are in line with those described in the EIA Report, Volume 2, Chapter 11, Section 11.7 and Section 11.8. In this context it is important to note that the worst case scenario parameters and the embedded mitigation measures described in the EIA Report, Volume 2, Chapter 11, Section 11.6, would remain unchanged if the Alternative Moray West Site area was implemented. Furthermore, as outlined in Section 0, fishing within the proposed variation area is undertaken by the same fleets identified as being active with the current Moray West Site and occurs at similar levels to those recorded in the proposed mitigation area (see **Error! Reference source not found.** t o **Error! Reference source not found.**).

In the particular case of scallop dredging, it is noted that fishing activity in a section to the east of the variation area is slightly higher than in the mitigation area, However, considering the level and distribution of scallop dredging activity within the overall Alternative Moray West Site area in comparison to that in the overall current Moray West Site, the difference would be negligible.

Therefore, taking the Alternative Moray West Site area, there is no material change in the commercial fisheries baseline in comparison to that identified in respect of the current Moray West Site in the EIA Report, Volume 2, Chapter 11, Section 11.4.

9 Shipping and Navigation

9.1 Introduction

This section of the addendum presents a qualitative assessment with respect to potential effects of the Alternative Moray West Site area on shipping and navigation receptors.

Potential effects on shipping and navigation associated with the current Moray West Site were assessed in the Moray West EIA Report – Volume 2, Chapter 12: Shipping and Navigation. The assessment presented in this chapter of the addendum document focuses on providing a qualitative re-assessment of each of the impacts presented in Chapter 12 of the Moray West EIA Report with respect to changes in risk associated with the Alternative Moray West Site area. This includes, in particular, the introduction of surface piercing structures (WTGs) into an area previously only assessed for export cables.

It should be noted that the information presented in this chapter of PART 2 of the addendum document does not meet the quantitative requirements that would ensure full compliance with the Maritime and Coastguard Agency's (MCA) Marine Guidance Note (MGN) 543 (MCA, 2016), the primary guidance document for Offshore Renewable Energy Installations (OREI). However, whilst identifying changes in risk, this section will also identify post consent quantitative exercises that will be undertaken to ensure the MGN 543 requirements are met. This proposed approach was discussed and agreed with the MCA and Northern Lighthouse Board (NLB) on 6th November 2018.

This addendum should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 12: Shipping and Navigation.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

9.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on shipping and navigation are provided in the EIA Report – Volume 2, Chapter 12: Shipping and Navigation: Section 12.2.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

9.3 Consultation

This addendum has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key consultation responses received during preparation of the EIA Report provided in EIA Report – Volume 2, Chapter 12: Shipping and Navigation: Section 12.3: Specific comments received to date (20th November 2018) on the application, as submitted in July 2018 (Moray West EIA Report), have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

The proposed approach to the qualitative assessment of the Alternative Moray West Site area presented in this addendum was presented to the MCA and NLB during a consultation meeting (teleconference) held on the 6th November 2018. MCA and NLB both noted that they were content with the addendum being submitted in advance of quantitative modelling being undertaken post consent.

The MCA stated that they would like the additional assessment work to be secured through a condition on the Section 36 and a Marine Licence consent condition to ensure that it is undertaken.

9.4 Assessment method and Worst Case Parameters

Impacts to shipping and navigation receptors were assessed within the EIA Report – Volume 2, Chapter 12: Shipping and Navigation: Section 12.6 using the Formal Safety Assessment (FSA) approach, as is required under the MCA methodology (MCA, 2015). The FSA for shipping and navigation receptors is usually informed by a thorough and robust Navigation Risk Assessment (NRA) which includes software modelling to assess collision and allision risks based on a worst case layout.

An NRA was produced for the current Moray West Site area (Anatec, 2018), which was used to inform the FSA within the EIA Report – Volume 2, Chapter 12: Shipping and Navigation. This NRA has now been used to inform the addendum and qualify impacts associated with the construction, operation and decommissioning of development within the Alternative Moray West Site area.

The NRA was based on a worst case layout filling the extent of the current Moray West Site area. Given that any layout utilising the full extent of the Alternative Moray West Site area will extend into a new sea area previously only considered for the OfTI infrastructure, additional quantitative validation modelling will be undertaken post consent to account for the presence of surface piercing infrastructure. This reassessment will be included within an addendum to the NRA.

9.5 Baseline characteristics associated with the Alternative Moray West Site area

This section of the addendum identifies any shipping and navigation receptors that may be sensitive to the Alternative Moray West Site area via a high level baseline characterisation. This is primarily based on the assessment of baseline conditions relative to the current Moray West Site area and along the offshore export cable corridor as summarised within EIA Report – Volume 2, Chapter 12: Shipping and Navigation: Section 12.4.

9.5.1 Limitations with the baseline characterisation

Full details of other limitations associated with the data sources considered for the baseline characterisation within this addendum are discussed in EIA Report – Volume 2, Chapter 12: Shipping and Navigation.

9.5.2 Navigational features

The original navigational features assessment is considered suitable for baseline characterisation of the Alternative Moray West Site area, given the geographical extent within which it was undertaken. The original assessment is summarised in EIA Report – Volume 2, Chapter 12: Shipping and Navigation.

The Moray East Site has not been considered a baseline navigational feature on the basis that the project has not yet commenced construction therefore the impacts on marine traffic routeing are not yet known. Further details of cumulative assessment are provided in Section 9.7.3.

9.5.3 Marine traffic

Marine traffic was assessed within the EIA Report – Volume 2, Chapter 12: Shipping and Navigation using 53 days of marine traffic data collected during 2016 and 2017, with periods chosen to account for seasonal variations. The summer data was collected via Automatic Identification System (AIS) data and Radar from an on-site vessel, and the winter survey captured AIS data only from onshore receivers. The collected data is shown relative to the current Moray West Site area and the Alternative Moray West Site area in Volume 2 - Figure 9.1 of this Addendum document.

Based on the output of the marine traffic assessment undertaken for the current Moray West Site area, an average of ten unique vessels were recorded during summer (AIS and Radar) within the Moray West offshore wind farm study area, falling to four during winter (AIS only). The majority of the recorded traffic was from vessels associated with the Beatrice Oil Field and fishing vessels.

It is important to note that vessel density within the proposed mitigation area was generally observed to be lower than that within the proposed variation area. This is largely due to traffic preference to pass a safe distance north or south of the Beatrice platforms and the Beatrice Offshore Wind Farm, which shields the proposed mitigation area, but pushes the southern traffic into the proposed variation area.

9.5.3.1 Commercial vessel routeing

An assessment into vessel routeing undertaken for the current Moray West Site area in the NRA identified eight main routes, as shown in Volume 2 - Figure 9.2 of this Addendum document. Based on a preliminary assessment it is considered likely that four of these routes would each require deviation as a result of the Alternative Moray West Site area. Details of these four routes are summarised in Table 9.1.

Table 9.1 Summary of baseline Routes requiring deviation

Route ID[23]	Ports	Approximate vessels per year	Summary
2	Invergordon - Lerwick	145	Mainly used by passenger vessels
3	Invergordon – Captain Field	100	Mainly used by vessels associated with the Captain Field.
7	Buckie - Beatrice Field	370	Crew transfer to the Beatrice Oil Field
8	Aberdeen/Peterhead – Beatrice Field	140	Supply vessel traffic to the Beatrice Oil Field

The most common traffic type recorded as transiting through both the current Moray West Site area and the Alternative Moray West Site area was from vessels associated with the oil and gas industry. Of these, the majority were associated with the neighbouring Beatrice Oil Field; however transits to fields further offshore were also recorded.

For reference, the Moray East Site and the charted positions of the structures associated with the Beatrice Offshore Wind Farm are included in Volume 2 - Figure 9.2 of this Addendum document.

9.5.3.2 Fishing activity

Fishing vessel activity was recorded within the Alternative Moray West Site area, with the majority from vessels engaged in active fishing rather in transit. Of note was active beam trawling recorded within the southern extent of the Alternative Moray West Site area (within the variation area) outwith the current Moray West Site area.

Based on the preliminary assessment within this addendum, there is a minor increase in fishing vessel density within the Alternative Moray West Site area (mainly within the variation area) when compared against the current Moray West Site area.

It should be considered that given the highly seasonal nature of commercial fishing, the 53 days of data assessed may not be representative of overall fishing activity. Detailed information based on longer term

[23] Route ID corresponds to the route numbering system presented in EIA Report – Volume 2, Chapter 12: Shipping and Navigation.

data for commercial fishing is provided in the EIA Report Volume 2, Chapter 11: Commercial Fisheries and an update for the Alternative Moray West Site area in Chapter 8.

9.5.3.3 Recreational activity

The recreational activity baseline was limited both within the current Moray West Site area, and the Alternative Moray West Site area due to the marine traffic data. It should be considered that the time period of the summer marine traffic survey (August and September 2017) may not represent peak recreational levels.

However, the RYA Coastal Atlas (RYA, 2016) indicates that recreational traffic remains largely coastal within the Moray Firth, and it is noted that recreational stakeholders did not raise concern over the presented recreational traffic levels during consultation.

The winter survey was AIS only which means that non AIS vessels (noting that recreational vessels are not obliged to transmit via AIS) were not accounted for. However recreational activity would be expected to be low during winter given less favourable transit conditions.

9.5.3.4 Anchoring vessels

No vessels were identified at anchor within the marine traffic survey data periods studied, and it is noted that there are no charted anchorages within the vicinity of the Alternative Moray West Site area (including the variation area), and the Admiralty Sailing Directions for the area (UKHO, 2015) indicates all nearby preferred anchorage areas are coastal.

9.5.4 Maritime incident reports

A total of two incidents were recorded as occurring within the offshore wind farm study area by the Marine Accident Investigation Branch (MAIB) between 2005 and 2014. The Royal National Lifeboat Institution (RNLI) recorded 13 incidents within the offshore wind farm study area over the same period. Neither the MAIB nor RNLI recorded incidents within the current Moray West Site area or the Alternative Moray West Site area.

9.6 Potential effects associated with the Alternative Moray West Site area

Potential effects associated with the construction, operation and decommissioning of the components of the Development located within the Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Table 9.2 (construction), Table 9.3 (operation and maintenance), and Table 9.4 (decommissioning) below.

Each impact (split by receptor where deemed necessary) assessed in EIA Report – Volume 2, Chapter 12: Shipping and Navigation is included with the effect significance as it was originally assessed (i.e., based on the current Moray West Site area) for reference. Following this, the worst case significance ranking for each impact determined for the Alternative Moray West Site area is presented, which is based on the qualitative assessment undertaken within this section of the addendum. Finally, any additional quantitative validation assessment considered as being required to be undertaken post consent in accordance with MGN 543 is then listed.

It is noted that the original assessment classed the Beatrice Offshore Wind Farm as baseline, given it was under construction at the time of writing. The Moray East Offshore Wind Farm was only considered on a cumulative basis (i.e., the rankings shown in Table 9.2 to Table 9.4 account for Beatrice but not Moray East). A cumulative assessment for the Alternative Moray West Site area (which does include a qualitative assessment of Moray East) is given in Section 9.7.

9.6.1 Mitigation measures

The assessment and conclusions presented in Table 9.2 to Table 9.4 also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 12: Shipping and Navigation, Section 12.6.2. No additional mitigation beyond that considered embedded was identified in the original assessment.

<table>
<tr><th colspan="8">Table 9.2 Assessment of effects associated with the Alternative Moray West Site area (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 12, Section 12.6.2)</th></tr>
<tr><th colspan="8">Construction impacts</th></tr>
<tr><th rowspan="2">Impacts assessed in the current EIA (July 2018)</th><th rowspan="2">Receptor</th><th colspan="3">Conclusions from assessment of impacts within the current Moray West Site area</th><th rowspan="2">Commentary on potential impacts within the Alternative Moray West Site area</th><th rowspan="2">Worst case effect of significance associated with the Alternative Moray West Site area</th><th rowspan="2">Proposed additional validation assessment to be carried out post consent in accordance with MGN 543) (if needed)</th></tr>
<tr><th>Frequency of occurrence</th><th>Severity of consequence</th><th>Effect significance</th></tr>
<tr><td rowspan="3">Vessel displacement</td><td>Commercial vessels</td><td>Reasonably probable</td><td>Negligible</td><td>Broadly acceptable</td><td>Commercial vessels on baseline routes intersecting or passing in close proximity to the Alternative Moray West Site area may be required to deviate to avoid the construction works. Based on the preliminary findings of this addendum, four main routes as listed in Table 1.1 would require deviation as a result of the Alternative Moray West Site area. Vessel density is higher within the proposed variation area than within the proposed mitigation area, and overall displacement is therefore expected to increase.</td><td>Tolerable with Mitigation</td><td>Additional quantitative modelling (as per MGN 543) of displacement of each affected route.</td></tr>
<tr><td>Oil and gas vessels</td><td>Frequent</td><td>Negligible</td><td>Tolerable with mitigation</td><td>Oil and gas vessels on baseline routes intersecting or passing in close proximity to the Alternative Moray West Site area may be required to deviate to avoid the construction works. Based on the preliminary findings of this addendum, four main routes as listed in Table 1.1 would require deviation as a result of the Alternative Moray West Site area, including routes associated with oil and gas vessels. Vessel density is higher within the proposed variation area of the Alternative Moray West Site area than within the proposed mitigation area, and overall displacement is therefore expected to increase. However, it should be noted that overall total deviation for oil and gas vessels may decrease following decommissioning of the Beatrice Oil Field and associated infrastructure.</td><td>Tolerable with Mitigation</td><td>Additional quantitative modelling (as per MGN 543) of displacement of each affected route.</td></tr>
<tr><td>Recreational vessels</td><td>Extremely unlikely</td><td>Negligible</td><td>Broadly acceptable</td><td>Baseline recreational activity within the Alternative Moray West Site area may be displaced by the ongoing construction works. It is noted that recreational activity was observed to be low based on the preliminary findings of this addendum.</td><td>Broadly Acceptable</td><td>N/A</td></tr>
</table>

Table 9.2 Assessment of effects associated with the Alternative Moray West Site area (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 12, Section 12.6.2)

Impacts assessed in the current EIA (July 2018)	Receptor	Conclusions from assessment of impacts within the current Moray West Site area			Commentary on potential impacts within the Alternative Moray West Site area	Worst case effect of significance associated with the Alternative Moray West Site area	Proposed additional validation assessment to be carried out post consent in accordance with MGN 543) (if needed)
		Frequency of occurrence	Severity of consequence	Effect significance			
Construction impacts							
	Fishing vessels	Remote	Minor	Broadly acceptable	Baseline fishing activity within the Alternative Moray West Site area may be displaced by the ongoing construction works. Active fishing was observed within the Alternative Moray West Site area, including within the proposed variation area, as part of the preliminary findings of this addendum. There is potential for a minor increase in fishing vessel density within the proposed variation area of the Alternative Moray West Offshore Wind farm Site area when compared to the proposed mitigation area.	Broadly Acceptable	N/A
Increased collision risk (vessel to vessel)	All vessels	Extremely unlikely	Moderate	Broadly acceptable	Vessel displacement may lead to increased vessel density around the Alternative Moray West Site area, which may lead to increased collision risk between third party vessels. Baseline vessel density was observed to be higher within the proposed variation area of the Alternative Moray West Site area than in within the proposed mitigation area, and therefore a 'hot spot' of collision risk may be created south of the Alternative Moray West Site area through increased displacement.	Tolerable with Mitigation	Additional vessel to vessel collision risk modelling based on a revised routeing assessment.
Allision risk (vessel to structure)	All vessels	Extremely unlikely	Moderate	Broadly acceptable	The structures within the Alternative Moray West Site area pose an allision risk to passing traffic. Of note is that structures within the proposed variation area of the Alternative Moray West Site area will mean that the southern area will no longer form a straight line edge. Such a protrusion will present a higher allision risk to passing traffic passing south of the Alternative Moray West Site area, which is the area into which most traffic is anticipated to be displaced.	Tolerable with mitigation	Updated allision risk modelling based on a revised routeing assessment. It is noted that the DSLP is an embedded mitigation and the NRA modelling will support this.

Table 9.2 Assessment of effects associated with the Alternative Moray West Site area (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 12, Section 12.6.2)

Construction impacts							
Impacts assessed in the current EIA (July 2018)	**Receptor**	**Conclusions from assessment of impacts within the current Moray West Site area**			**Commentary on potential impacts within the Alternative Moray West Site area**	**Worst case effect of significance associated with the Alternative Moray West Site area**	**Proposed additional validation assessment to be carried out post consent in accordance with MGN 543) (if needed)**
		Frequency of occurrence	**Severity of consequence**	**Effect significance**			
Anchor interaction or snagging	All vessels	Extremely unlikely	Minor	Broadly acceptable	The cables within the Alternative Moray West Site area create a snagging risk to vessel anchors.	Broadly Acceptable	N/A

Table 9.3 Assessment of effects associated with the Alternative Moray West Site area (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 12, Section 12.6.2)

Operation and maintenance impacts							
Impacts assessed in the current EIA (July 2018)	**Receptor**	**Conclusions from assessment of impacts within the current Moray West Site area**			**Commentary on potential impacts within the Alternative site area**	**Worst case effect of significance associated with the Alternative Moray West Site area**	**Proposed additional assessment to be carried out post consent in accordance with MGN 543 (if needed)**
		Frequency of occurrence	**Severity of consequence**	**Effect significance**			
Vessel displacement	Commercial vessels	Extremely unlikely	Negligible	Broadly acceptable	Commercial vessels on baseline routes intersecting or passing in close proximity to the Alternative Moray West Site area may be required to deviate to avoid the operational structures. Based on the preliminary findings of this addendum, four main routes as listed in Table 1.1 would require deviation as a result of the Alternative Moray West Site area. Vessel density is higher within the proposed variation area of the Alternative Moray West Site area than within the proposed mitigation area, and overall displacement is therefore expected to increase.	Tolerable with Mitigation	Additional quantitative modelling (as per MGN 543) of displacement of each affected route.

Table 9.3 Assessment of effects associated with the Alternative Moray West Site area (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 12, Section 12.6.2)							
Operation and maintenance impacts							
Impacts assessed in the current EIA (July 2018)	**Receptor**	**Conclusions from assessment of impacts within the current Moray West Site area**			**Commentary on potential impacts within the Alternative site area**	**Worst case effect of significance associated with the Alternative Moray West Site area**	**Proposed additional assessment to be carried out post consent in accordance with MGN 543 (if needed)**
		Frequency of occurrence	**Severity of consequence**	**Effect significance**			
	Oil and gas vessels	Extremely unlikely	Negligible	Broadly acceptable	Oil and gas vessels on baseline routes intersecting or passing in close proximity to the Alternative Moray West Site area may be required to deviate to avoid the operational structures. Based on the preliminary findings of this addendum, four main routes as listed in Table 1.1 would require deviation as a result of the Alternative Moray West Site area. Vessel density is higher within the proposed variation area of the Alternative Moray West Site area than within the proposed mitigation area, and overall displacement is therefore expected to increase, however it should be noted that overall total deviation for oil and gas vessels may decrease.	Tolerable with Mitigation	Additional quantitative modelling (as per MGN 543) of displacement of each affected route.
	Recreational vessels	Extremely unlikely	Negligible	Broadly acceptable	Baseline recreational activity within the Alternative Moray West Site area may be displaced by the operational structures. It is noted that recreational activity was observed to be low based on the preliminary findings of this addendum.	Broadly Acceptable	N/A
	Fishing vessels	Extremely unlikely	Negligible	Broadly acceptable	Baseline fishing activity within the Alternative Moray West Site area may be displaced by the operational structures. Active fishing was observed within the Alternative Moray West Site area, including within the proposed variation area, as part of the preliminary findings of this addendum. There is potential for a minor increase in fishing vessel density within the proposed variation area of the Alternative Moray West Offshore Wind farm Site area when compared to the proposed mitigation area.	Broadly Acceptable	N/A

Table 9.3 Assessment of effects associated with the Alternative Moray West Site area (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 12, Section 12.6.2)

Operation and maintenance impacts							
Impacts assessed in the current EIA (July 2018)	**Receptor**	**Conclusions from assessment of impacts within the current Moray West Site area**			**Commentary on potential impacts within the Alternative site area**	**Worst case effect of significance associated with the Alternative Moray West Site area**	**Proposed additional assessment to be carried out post consent in accordance with MGN 543 (if needed)**
		Frequency of occurrence	**Severity of consequence**	**Effect significance**			
Increased collision risk (vessel to vessel)	All vessels	Negligible	Moderate	Broadly acceptable	Vessel displacement may lead to increased vessel density around the Alternative Moray West Site area, which may lead to increased collision risk between third party vessels. Baseline vessel density was observed to be higher within the proposed variation area of the Alternative Moray West Site area than in within the proposed mitigation area, and therefore a 'hot spot' of collision risk may be created south of the Alternative Moray West Site area through increased displacement.	Tolerable with Mitigation	Additional vessel to vessel collision risk modelling based on a revised routeing assessment.
Allision risk (vessel to structure)	All vessels excluding commercial fishing	Extremely unlikely	Minor	Broadly acceptable	The structures within the Alternative Moray West Site area pose an allision risk to passing traffic. Of note is that structures within the proposed variation area of the Alternative Moray West Site area will mean that the southern area will no longer form a straight line edge. Such a protrusion will present a higher allision risk to passing traffic passing south of the Alternative Moray West Site area, which is the area into which most traffic is anticipated to be displaced.	Tolerable with mitigation	Updated allision risk modelling based on a revised routeing assessment. It is noted that the DSLP is an embedded mitigation and the NRA modelling will support this..
	Fishing vessels	Remote	Minor	Broadly acceptable	The structures within the Alternative Moray West Site area pose an allision risk to fishing vessels. There is potential for a minor increase in fishing vessel density within the proposed variation area of the Alternative Moray West Offshore Wind farm Site area when compared to the proposed mitigation area.	Broadly Acceptable	N/A
Anchor interaction or snagging	All vessels	Extremely unlikely	Minor	Broadly acceptable	The cables within the Alternative Moray West Site area create a snagging risk to vessel anchors.	Broadly Acceptable	N/A

Table 9.3 Assessment of effects associated with the Alternative Moray West Site area (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 12, Section 12.6.2)

Operation and maintenance impacts							
Impacts assessed in the current EIA (July 2018)	**Receptor**	**Conclusions from assessment of impacts within the current Moray West Site area**			**Commentary on potential impacts within the Alternative site area**	**Worst case effect of significance associated with the Alternative Moray West Site area**	**Proposed additional assessment to be carried out post consent in accordance with MGN 543 (if needed)**
		Frequency of occurrence	**Severity of consequence**	**Effect significance**			
Diminishing emergency response capability	Emergency response resources	Negligible	Minor	Broadly acceptable	The Development may lead to an increase in baseline incident rates, reducing the capabilities of emergency response resources within the area. However, incident rates are considered low for the area.	Broadly Acceptable	N/A
Reduction in under keel clearance	All vessels	Extremely unlikely	Minor	Broadly acceptable	Increased length of cable within the new southern extent of the Alternative Moray West Site area may increase potential for under keel clearance issues resultant of cable protection reducing navigable water depths.	Broadly Acceptable	N/A

Table 9.4 Assessment of effects associated with the Alternative Moray West Site area (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 12, Section 12.6.2)

Decommissioning impacts							
Impacts assessed in the current EIA (July 2018)	**Receptor**	**Conclusions from assessment of impacts within the current Moray West Site area**			**Commentary on potential impacts within the Alternative site area**	**Worst case effect of significance associated with the Alternative Moray West Site area**	**Proposed additional assessment to be carried out post consent in accordance with MGN 543 (if needed)**
		Frequency of occurrence	**Severity of consequence**	**Effect significance**			
Vessel displacement	Commercial fishing vessels	Remote	Minor	Broadly acceptable	Fishing vessels that choose to fish within the Alternative Moray West Site area during operation may be displaced by ongoing decommissioning activities. Post decommissioning, fishing activity will likely return to the pre wind farm case.	Broadly Acceptable	N/A

Table 9.4 Assessment of effects associated with the Alternative Moray West Site area (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 12, Section 12.6.2)

Decommissioning impacts							
Impacts assessed in the current EIA (July 2018)	**Receptor**	**Conclusions from assessment of impacts within the current Moray West Site area**			**Commentary on potential impacts within the Alternative site area**	**Worst case effect of significance associated with the Alternative Moray West Site area**	**Proposed additional assessment to be carried out post consent in accordance with MGN 543 (if needed)**
		Frequency of occurrence	**Severity of consequence**	**Effect significance**			
Allision risk (vessel to structure)	All vessels	Extremely unlikely	Moderate	Broadly acceptable	The structures within the Alternative Moray West Site area during decommissioning pose an allision risk to passing traffic. Given that no surface structures are anticipated to remain in situ following decommissioning, the only potential increase in risk will be during the active decommissioning.	Broadly Acceptable	N/A
Anchor interaction or snagging	All vessels	Extremely unlikely	Moderate	Broadly acceptable	The decommissioned cables within the Alternative Moray West Site area create a snagging risk to vessel anchors.	Broadly Acceptable	N/A

9.7 Cumulative effects

This section provides commentary as to how the Alternative Moray West Site area may influence the cumulative impact assessment for shipping and navigation receptors already undertaken in the EIA Report – Volume 2, Chapter 12: Shipping and Navigation, and proposes reassessment strategy (if deemed necessary) to ensure compliance with MGN 543.

Cumulative assessment methodology, and the projects considered on a cumulative basis would remain unchanged from that detailed in the EIA Report – Volume 2, Chapter 12: Shipping and Navigation: Section 12.8.

9.7.1 Vessel displacement

As discussed in Section 9.6, there may be increased deviations from the baseline commercial vessel routeing when compared against those estimated within the assessment of the current Moray West Site area on an in-isolation basis. There may also be increased displacement to third party activity, namely fishing, recreational activity, and decommissioning of the Beatrice platforms.

Based on the findings of this addendum, any such deviations on a cumulative basis would be unlikely to affect the cumulative impact significance already assessed (at most broadly acceptable for all phases), however it will be necessary to repeat the cumulative re-routeing assessment in terms of MGN 543 to validate the conclusions pre-construction.

9.7.2 Vessel to vessel collision

Changes in vessel to vessel collision risk on a cumulative basis are dependent on cumulative deviations. As for cumulative displacement, there is not anticipated to be a change in the effect significance of cumulative collision risk when comparing the Alternative Moray West Site area against the current Moray West Site area.

9.7.3 Vessel to structure allision

Cumulative allision risk was assessed as broadly acceptable for the construction and operational phases within the assessment for the current Moray West Site area, and was scoped out of the decommissioning assessment. It is important to state that this ranking was determined on the basis that the southern area of the current Moray West Site area was assessed as being in alignment with (i.e., forming a straight line edge with) the Moray East Site.

The additional southern extent of the Alternative Moray West Site area ‘protrudes’ beyond the straight line edge formed by the two sites originally assessed (Moray West and Moray East), and therefore allision risk is anticipated to be higher than that already cumulatively assessed in combination with Moray East , noting that (based on the preliminary findings of the addendum) vessels on certain routes will deviate south of the sites, and therefore be exposed to the protruding structures.

Based on a qualitative assessment the significance of effect is expected to remain within limits with mitigation including additional quantitative routeing post consent to inform the DSLP post consent.

9.7.4 Anchor interaction with cables

Given that anchoring in the vicinity of the current Moray West Site area and Alternative Moray West Site area is considered a low frequency event based on the findings of the baseline assessment, it is anticipated that reassessment of this impact on a cumulative basis will not be necessary.

9.7.5 Diminishment of emergency response resources

Given baseline incident rates in the vicinity of the current Moray West Site area and Alternative Moray West Site area are considered low, it is anticipated that reassessment of this impact on a cumulative basis will not be necessary.

9.8 Conclusion

This addendum presents conclusions from a qualitative assessment of changes to risk associated with the Alternative Moray West Site area.

Based on a baseline characterisation and the Moray West EIA Report – Volume 2, Chapter 12: Shipping and Navigation it is concluded that impacts associated with the Alternative Moray West Site are within Tolerable with Mitigation limits. The following should be considered:

- It is noted that vessel density is higher within the proposed variation area of the Alternative Moray West Site area when compared against the proposed mitigation area and that quantitative reassessment should be undertaken pre-construction to validate no additional mitigation is required;
- Installing structures within the proposed variation area of the Alternative Moray West Site area will lead to the southern area protruding beyond the southern area of the Moray East site whereas the current Moray West Site area formed a straight line edge with the Moray East Site. The majority of passing traffic intersecting the Alternative Moray West Site area is anticipated to pass to the south, and will therefore be exposed to the protruding structures mentioned in the previous point. Therefore, further quantitative allision risk modelling will need to be undertaken to inform the DSLP.

9.9 Additional work required

The following additional quantitative modelling (in terms of MGN 543) will be required to ensure that the assessment of the Alternative Moray West Site area is validated (confirming mitigation proposals) pre-construction:

- Updated assessment of likely vessel deviations post wind farm based on the Alternative Moray West Site area;
- Updated vessel to vessel collision risk assessment based on updated deviation assessment;
- Updated allision risk modelling assessing risk to passing commercial traffic, based on updated vessel deviations and the new worst case layout; and
- Updated fishing vessel to structure allision risk modelling based on the new worst case layout and updated fishing vessel densities.

Post consent, these tasks will be presented in an NRA addendum that will demonstrate that the Alternative Moray West Site area is within ALARP parameters; confirming mitigation conclusions.

The proposed NRA addendum will be submitted to the MCA and NLB separate to the main submission.

During consultation on this addendum the MCA requested that the additional quantitative work identified as being required post consent / pre construction to validate conclusions from this qualitative assessment in accordance with MGN 543 and inform the Moray West DSLP be secured via a condition within the Section 36 and/or a Marine Licence consent condition.

10 Civil and Military Aviation

10.1 Introduction

This section presents additional information with respect to potential effects from the variation to the Moray West Site on military and civil aviation.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 13: Military and Civil Aviation.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

10.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on military and civil aviation are provided in the EIA Report – Volume 2, Chapter 13: Section 13.2.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

10.3 Consultation

This assessment has been informed by consultation carried out in preparation of the EIA Report submitted in July 2018. A summary of key consultation responses received during preparation of the EIA Report is provided in EIA Report – Volume 2, Chapter 13: Section 13.3. Specific comments received to date (20th November 2018) on the application, as submitted in July 2018 (Moray West EIA Report), have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

Consultation to resolve issues identified with respect to the current application, as presented in the Stakeholder Response Analysis spreadsheet, is ongoing. However, no further consultation specific to aviation has been undertaken specific to this addendum.

10.4 Baseline characteristics

A detailed description of the baseline conditions of the current Moray West Site and along the Offshore Export Cable Corridor (including the northern extent of the export cable corridor which corresponds to the proposed variation area) are provided in the EIA Report – Volume 2, Chapter 13, Section 13.4. In this section, it was explained that the size of the aviation study area was determined by the range of the potential aviation receptors; in particular, Air Traffic Control (ATC) and Air Defence (AD) radar systems. As such, the aviation receptors affected by Moray West were identified over a large geographical area, extending well beyond the boundaries of the Current Moray West Site and the Moray West Offshore Export Cable Corridor. In terms of aviation therefore, the Alternative Moray West Site area is virtually insignificant as it is entirely within the same airspace environment as the current Moray West Site. Therefore, the key aviation receptors, and aviation issues associated with those key receptors, are exactly the same for the Alternative Moray West Site area as the Current Moray West Site.

10.4.1 Limitations with the baseline characterisation

As detailed in the EIA Report – Volume 2, Chapter 13, Section 13.5.5, there are no known data limitations affecting the aviation impact assessment for the Development. The same is therefore also true for the assessment of the Alternative Moray West Site area.

10.5 Assessment method

The method for assessing potential effects of the Development on military and civil aviation within the Current Moray West Site area and Offshore Export Cable Corridor is described in detail in the EIA Report – Volume 2, Chapter 13: Section 13.5.

There have been no changes to this assessment method since submission of the application in July 2018. These methods, and associated assessment criteria therefore remain applicable for the assessment of the Alternative Moray West Site area.

As noted above, specific comments received as of 20th November 2018 on the application as submitted in July 2018 (Moray West EIA Report) are presented in the Stakeholder Response Analysis spreadsheet (Annex A). Consultation required to resolve specific issues identified with respect to the current application, as presented in the spreadsheet, is ongoing. Comments raised with regards to military and civil aviation have not altered the overall conclusions of the assessment presented in the Moray West EIA Report. The assessment presented in the Moray West EIA Report, forms the basis for the assessment presented in this addendum.

10.6 Potential effects associated with the Alternative Moray West Site area

Potential effects associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Tables 10.1 to 10.3 below. The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated WCS design parameters assessed in the EIA Report – Volume 2, Chapter 13, Section 13.6: Table 13.6.1 for the current Moray West Site; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and decommissioning of the components of the Development located within the current Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 13, Section 13.7: Table 13.7.1.

10.6.1 Mitigation measures

The assessment and conclusions presented in Tables 10.1 to 10.3 also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional measures presented in the EIA Report – Volume 2, Chapter 13: Section 13.7.5.

Table 10.1 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 13: Section 13.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[24]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Interference with Wick Airport Approach Procedures	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	During crane lift operations, crane tips could temporarily exceed turbine tip heights. At these heights, this would encroach on the safety altitude for aircraft approaching Wick Airport. The sensitivity of this receptor was therefore considered **high** and impact magnitude was also considered **high**; the overall effect was assessed as **significant**. Wick Airport had advised that a review of the airport's Instrument Flight Procedures would be required to ensure that appropriate changes are made. It is considered that the lowest altitude to which inbound aircraft can currently descend (1,800 ft) will need to be increased to 2,000 ft to ensure that at least 1,000 ft vertical separation is maintained from all terrain and obstacles.	The WCS design parameters were based on WTG Model 4 (maximum tip height 285 m (935 ft)) which has since been removed from the Design Envelope. The WCS design parameters now need to be based on WTG Model 3 which has a maximum turbine blade tip height of 265 m (870 ft) above HAT. Whilst this is a reduction in tip height, this will require the lowest altitude to which inbound aircraft can currently descend (1,800 ft) to be increased to 1,900 ft to ensure that at least 1,000 ft vertical separation is maintained from all terrain and obstacles. The Alternative Moray West Site area itself still encroaches on the area where Wick Airport's Instrument Flight Procedures could be affected and Wick Airport will still require a full review of the Airport's Instrument Flight Procedures to be carried out.	The sensitivity and impact magnitude of this receptor is still considered **high**; and the overall effect is assessed as **significant**. Once Wick Airport's Instrument Flight Procedures have been reviewed and appropriate changes made, the residual effect can be assessed as not significant. There is therefore no change to the impact significance from that previously assessed.
Interference with helicopter Approach Procedures to offshore installations	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	Turbines in construction will need to be considered as physical obstructions and could potentially infringe the minimum obstacle clearance criteria of 1,000 ft on helicopter approaches to the offshore oil platforms. Although existing platforms will be removed as part of the decommissioning of the Beatrice Oil Field, this is not due to commence until 2024 and it is expected that helicopters will continue to require access to the platforms during the Moray West construction period.	The WCS design parameters were based on WTG Model 4 (maximum tip height 285 m (935 ft)) which has since been removed from the Design Envelope. The WCS design parameters now need to be based on WTG Model 3 which has a maximum turbine blade tip height of 265 m (870 ft) above HAT. Whilst this is a reduction in tip height, helicopters will still need to maintain the minimum obstacle clearance criteria of 1,000 ft on approaches to the offshore oil platforms.	The sensitivity and impact magnitude of this receptor is still considered **high**; and the overall effect is assessed as **significant**. Once mitigation is implemented, the residual effect can be assessed as not significant.

[24] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 10.1 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 13: Section 13.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[24]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		The sensitivity of this receptor was assessed as **high** and the impact magnitude was also considered **high**. The overall effect was assessed as **significant**. In terms of mitigation, to reduce the risk of safety incidents, it would be necessary to notify the presence of physical obstructions to NATS AIS for inclusion in appropriate aviation related documentation and addition to aviation mapping. Once this mitigation is implemented, the residual effect can be assessed as not significant.	The Alternative Moray West Site area itself still encroaches on the area where helicopter approach procedures to offshore installations may be affected; therefore, there is predicted to be no change in impact magnitude, sensitivity or significance.	There is therefore no change to the impact significance from that previously assessed.
Impacts on Minimum Safe Altitude	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	The Minimum Safe Altitude dictates the height at which instrument approaches to offshore platforms commence. The Minimum Safe Altitude for aircraft operations in Instrument Meteorological Conditions (IMC), essentially poor weather, in the Moray Firth region is 1,500 ft (457 m). This allows for a minimum of 1,000 ft (305 m) clearance between aircraft and known en-route obstacles (the highest point the Beatrice platform complex). The maximum tip height of the proposed turbines was 285 m (935 ft). Therefore, the Minimum Safe Altitude would need to be raised to ensure that a minimum of 1,000 ft vertical separation between the anticipated turbine tip heights and aircraft is maintained. The sensitivity of this receptor was therefore considered **high**. The impact magnitude was also considered to be **high**. The overall effect was therefore assessed as **significant**.	The WCS design parameters were based on WTG Model 4 (maximum tip height 285 m (935 ft)) which has since been removed from the Design Envelope. The WCS design parameters now need to be based on WTG Model 3 which has a maximum turbine blade tip height of 265 m (870 ft) above HAT. Whilst this is a reduction in tip height, Minimum Safe Altitude in the Moray Firth region will still need to be raised to 1,900 ft from the point of the first turbine being installed. This will allow a minimum 1,000 ft vertical clearance between aircraft and the turbines to be maintained. The Alternative Moray West Site area itself still encroaches the area where the Minimum Safe Altitude for commencement of instrument approaches to offshore platforms may be affected; therefore, there is predicted to be no change in impact magnitude, sensitivity or significance.	The sensitivity and impact magnitude of this receptor is still considered **high**; and the overall effect is assessed as **significant**. Once mitigation is implemented, the residual effect can be assessed as not significant. There is therefore no change to the impact significance from that previously assessed.

Table 10.1 Assessment of effects associated with the Alternative Moray West Site area				
Construction impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 13: Section 13.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[24]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		Minimum Safe Altitude in the Moray Firth region would need to be raised from 1,500 ft to 2,000 ft from the point of the first turbine being installed. This would allow a minimum 1,000 ft vertical clearance between aircraft and the turbines. Updates to aviation charts and other relevant documentation would need to reflect this change. Once this mitigation was implemented, the residual effect could be assessed as not significant.		

Table 10.2 Assessment of effects assocaited with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 13: Section 13.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[25]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Radar interference with NERL Allanshill Primary Surveillance Radar (PSR)	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	NERL controllers are responsible for maintaining typically 5 nm lateral separation between aircraft. Where line of sight to a PSR exists, turbines may appear as genuine aircraft targets and could mask genuine aircraft responses. The radar may also be de-sensitised by its clutter processing within the sector containing turbines meaning that real aircraft targets may disappear from radar. NERL had confirmed that there is potential for the Moray	The WCS design parameters were based on WTG Model 4 (maximum tip height 285 m (935 ft)) which has since been removed from the Design Envelope. The WCS design parameters now need to be based on WTG Model 3 which has a maximum turbine blade tip height of 265 m (870 ft) above	The sensitivity and impact magnitude of this receptor is still considered **high**; and the overall effect is assessed as **significant**. Once mitigation is implemented, the residual effect can be assessed as not significant.

25 The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 10.2 Assessment of effects assocaited with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 13: Section 13.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[25]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		West Offshore Wind Farm to have an impact on the Allanshill PSR. The sensitivity of this receptor was considered **high** and impact magnitude was also considered **high**. The overall effect is assessed as **significant**. NERL had identified that the impact of Moray West could be mitigated by means of Multi-Radar Tracker (MRT) blanking; a technical mitigation technique offered by NERL and the same as the mitigation agreed for the consented Moray East Offshore Wind Farm. NERL had confirmed that a commercial agreement could be negotiated once the development was in planning and negotiations have since commenced. Once MRT blanking is implemented, the residual effect can be assessed as not significant.	HAT. Whilst this reduction in tip height is favourable, the impact on the Allanshill PSR will not be reduced. The turbines within the Alternative Moray West Site area will still be in line of sight to the Allanshill PSR and MRT blanking mitigation will still be required.	There is therefore no change to the impact significance from that previously assessed.
Radar interference with RAF Lossiemouth PSR	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	The Moray West Site is within the operational range of Lossiemouth PSR and will be detectable on ATC radar displays. This direct, permanent effect will hamper the ATC operators' ability to distinguish actual aircraft returns from those created by the wind turbines and degrade the safety and efficiency of the Air Traffic Services (ATS) being provided and increased complexity of the ATC task. The sensitivity of this receptor was therefore considered **high** and the impact magnitude was also considered **high**. The overall effect is assessed as **significant**. MoD has a recognised process for entering into mitigation agreements. This process requires developers receiving an ATC PSR objection to submit a proposal to the MoD outlining their intention to mitigate the impacts of their windfarm. Moray West has submitted such a proposal to the MoD. Once accepted, the MoD will be in a position to withdraw its objection subject to agreeing a suitably worded planning condition. Once the planning condition is	The WCS design parameters were based on WTG Model 4 (maximum tip height 285 m (935 ft)) which has since been removed from the Design Envelope. The WCS design parameters now need to be based on WTG Model 3 which has a maximum turbine blade tip height of 265 m (870 ft) above HAT. Whilst this reduction in tip height is favourable, the impact on the Lossiemouth PSR will not be reduced. The turbines within the Alternative Moray West Site area will still be in line of sight to the Lossiemouth PSR and mitigation will still be required.	The sensitivity and impact magnitude of this receptor is still considered **high**; and the overall effect is assessed as **significant**. Once mitigation is implemented, the residual effect can be assessed as not significant. There is therefore no change to the impact significance from that previously assessed.

Table 10.2 Assessment of effects assocaited with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 13: Section 13.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[25]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		in place, Moray West will engage with the MoD to commence the process for entering into such a mitigation agreement. Once PSR mitigation is implemented, the residual effect can be assessed as not significant.		
Interference with Wick Airport Approach Procedures	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	As the minimum altitude that inbound aircraft can descend to Wick Airport would have been changed from 1,800 ft to 2,000 ft in the revised Approach Procedures to mitigate potential impacts during construction, it was concluded that there was no potential for impacts to occur during the operational phase of the Development. Therefore, no further assessment of impacts on Wick Airport Approach Procedures was required.	Not applicable.	Not applicable.
Interference with HMR X-Ray	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	Construction of turbines within 2 nm either side of the route of HMR X-RAY would have the potential to restrict operations below the routine operational altitudes when icing conditions exist. The ability of a helicopter to operate at the expected altitudes would be dependent upon the 0° isotherm (icing level); the presence of turbines within the Moray West Site may preclude the aircraft from operating on days of low cloud base if the 0° isotherm (icing level) was at 3,000 ft or below. However, it was identified that an overland route already existed and which could be used in icing conditions to mitigate the potential impact on HMR X-RAY operations below 2,000 ft. The sensitivity of this receptor was therefore considered **low** and impact magnitude was considered **negligible**. The overall effect is assessed as **not significant**. No mitigation was required as there were no significant effects resulting from the operation of the proposed development.	The WCS design parameters were based on WTG Model 4 (maximum tip height 285 m (935 ft)) which has since been removed from the Design Envelope. The WCS design parameters now need to be based on WTG Model 3 which has a maximum turbine blade tip height of 265 m (870 ft) above HAT. This reduction in tip height and the Alternative Moray West Site area will not affect the assessment previously carried out.	The sensitivity of this receptor is still considered **low** and the magnitude is still considered **negligible**. The overall effect is assessed as not significant. There is therefore no change to the impact significance from that previously assessed.

Table 10.2 Assessment of effects assocaited with the Alternative Moray West Site area

Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 13: Section 13.7.5)

Impacts assessed in the current EIA (July 2018)	Relevant WCS design parameters (for current Moray West Site area)[25]	Conclusions from assessment of impacts within the current Moray West Site area	Commentary on potential impacts within the Alternative Moray West Site area	Assessment of effect significance and conclusions
Interference with helicopter Approach Procedures to offshore installations	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	Moray Firth helicopter operators had accepted that changes to operational procedures would be achievable and deliverable to mitigate the impact of Moray West. However, it was understood that mitigation measures cannot be agreed until the final turbine layouts were decided. Further to that, decommissioning of the Beatrice oil field was anticipated to take place between 2024 - 2027. It was also understood that preparatory works for decommissioning of the Jacky Platform commenced in 2017 and will involve removal of the platform. Consequently, mitigation measures involving changes to operational procedures would potentially need to be implemented if decommissioning activities coincide with the construction and operation of the Moray West Offshore Wind Farm. The sensitivity of this receptor was considered **high** and the magnitude of effect was also considered **high**. The overall effect is assessed as **significant**. To reduce the risk of safety incidents, it would also be necessary to notify the presence of physical obstructions to NATS AIS for inclusion in appropriate aviation related documentation and addition to aviation mapping. Once this mitigation was implemented, the residual effect could be assessed as not significant.	The WCS design parameters were based on WTG Model 4 (maximum tip height 285 m (935 ft)) which has since been removed from the Design Envelope. The WCS design parameters now need to be based on WTG Model 3 which has a maximum turbine blade tip height of 265 m (870 ft) above HAT. Whilst this is a reduction in tip height, helicopters will still need to maintain the minimum obstacle clearance criteria of 1,000 ft on approaches to the offshore oil platforms. The Alternative Moray West Site area itself still encroaches the area where helicopter approach procedures to offshore installations may be affected; therefore, there is no change in impact magnitude, sensitivity or significance.	The sensitivity and impact magnitude of this receptor is still considered **high**; and the overall effect is assessed as **significant**. Once mitigation is implemented, the residual effect can be assessed as not significant. There is therefore no change to the impact significance from that previously assessed.
Impacts on Minimum Safe Altitude	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	As Minimum Safe Altitude would have been changed from 1,800 ft to 2,000 ft to mitigate potential impacts during construction, it was concluded that there was no potential for impacts to occur during the operational phase. Therefore, no further assessment of effects on Minimum Safe Altitude was required.	Not applicable.	Not applicable.

Table 10.3 Assessment of effects associated with the proposed Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 13: Section 13.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[26]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Radar interference with NERL Allanshill PSR	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	The static nature of the turbines during decommissioning is such that it will not be processed and presented onto ATC displays by the radar. As a result, there will be no effect on the NERL Allanshill PSR during decommissioning.	Not applicable.	Not applicable.
Radar interference with RAF Lossiemouth PSR	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	The static nature of the turbines during decommissioning is such that it will not be processed and presented onto ATC displays by the radar. As a result, there will be no effect on the MoD Lossiemouth PSR during decommissioning.	Not applicable.	Not applicable.
Interference with Wick Airport Approach Procedures	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	During decommissioning operations, crane tips could temporarily exceed turbine tip heights. However, the implemented Minimum Sector Altitude of 2,000 ft would continue to provide the required minimum 1,000 ft vertical separation over the turbines and any decommissioning infrastructure. As a result, there will be no effect on Wick Airport.	Not applicable.	Not applicable.
Interference with HMR X-Ray	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	Turbine decommissioning infrastructure (e.g. cranes) could present a physical obstruction for helicopters operating on the section of HMR X-RAY between Aberdeen and Wick Airports; However, given that it was concluded there would be no significant effects due to the existence of an overland route that could be used in icing conditions to mitigate any potential	The WCS design parameters were based on WTG Model 4 (maximum tip height 285 m (935 ft)) which has since been removed from the Design Envelope. The WCS design parameters now need to be based on WTG Model 3 which has a maximum turbine blade tip height of 265 m (870 ft) above HAT.	Not applicable.

[26] The design parameters provided are for the Moray West Site only not the offshore export cable corridor.

Table 10.3 Assessment of effects associated with the proposed Alternative Moray West Site area				
Decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in EIA Report – Volume 2, Chapter 13, Section 13.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 13: Section 13.7.5)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[26]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
		impact on HMR X-RAY operations, effects associated with turbine decommissioning were also assessed as not significant.	This reduction in tip height and the Alternative Moray West Site area will not affect the assessment previously carried out.	
Interference with helicopter Approach Procedures to offshore installations	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	Given that the offshore oil installations were expected to be decommissioned early into the operation of the Moray West Offshore Wind Farm, there would be no effect on helicopter approach procedures associated with these platforms as the platforms will have been removed.	Not applicable.	Not applicable.
Impacts on Minimum Safe Altitude	Maximum turbine blade tip height of 285 m (935 ft) above HAT.	The increased Minimum Safe Altitude would remain at 2,000 ft until all turbines are decommissioned. As a result, there would be no effect on Minimum Safe Altitude.	Not applicable.	Not applicable.

10.7 Cumulative effects

The impact on any aviation receptor is generally treated as a standalone effect. Whilst other wind turbine developments may be located in close proximity, the effect on each receptor is considered on a case-by-case basis and any significant effect is sufficient to trigger an objection from the relevant aviation stakeholder. Although some of the mitigation agreed for Moray East and BOWL through consultation has been identified as also being of relevance for Moray West, it is still necessary for negotiations and discussions with aviation stakeholders on these mitigation measures to be carried out under separate arrangements. No further assessment with respect to cumulative effects is therefore required.

10.8 Conclusion on the effects of proposed changes to the Moray West Site

The proposed changes to the Moray West Site will have no effects other than those already identified in the EIA Report submitted in July 2018.

11 Seascape, Landscape and Visual Assessment (SLVIA)

11.1 Introduction

This section presents additional information with respect to potential likely significant effects that may arise as a result of the proposed variation to the Moray West Site and design proposals on the seascape, landscape and visual resource.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 14: Seascape, Landscape and Visual Resource and Volume 4, Technical Appendix 14.1, 14.2, 14.3 and 14.4.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

11.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on seascape, landscape and visual resource are provided in the EIA Report – Volume 2, Chapter 14: Section 14.2.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

11.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key responses received during preparation of the EIA Report are provided in the EIA Report – Volume 2, Chapter 14: Section 14.3. Specific comments received to date (20th November 2018) on the application as submitted in July 2018 (Moray West EIA Report) have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

In addition, the effects on the seascape, landscape and visual resource were raised in the application consultation response received from SNH dated 7 September 2018. The full response is included in the Stakeholder Response Analysis Spreadsheet. However, their key advice was set out as follows:

'The extensive cumulative scale of Moray West in addition to Beatrice and Moray East offshore wind farms contributes to widespread significant adverse effects on sensitive landscape, seascape and visual receptors, and in particular on the distinctive landscape character of the East Sutherland Coast.

Moray West cumulatively with Beatrice will introduce extensive and significant adverse effects on landscape, seascape and visual receptors almost continuously along a substantial 60km length of coastline in east Sutherland, including both daytime and night-time impacts. The open waters of the Moray Firth are a key characteristic of the landscape and coastal character of East Sutherland Coast. The extensive scale of the development running parallel to the East Sutherland Coast will cause the loss of views to open waters from most of this coast'.

Following the SNH response a meeting was held on 10 October 2018 with SNH and The Highland Council (THC) to discuss SLVIA effects. This was necessitated by the fact that THC is not due to provide its feedback on the application until 27 November 2018, which is beyond the date whereby Moray West can submit further information without delaying the current programme for determination of the application. Early feedback from THC was therefore considered to be beneficial by Moray West.

The minutes for the meeting available on the Marine Scotland Website, however of note in relation to this Addendum is that THC consider the SLVIA effects of the horizontal and vertical scale of the Moray West Offshore Wind Farm worst case scenario as assessed in the July 2018 Environmental Impact

Assessment Report to be significant. THC advised that without mitigation the planning officer would be recommending to the THC planning committee that it objects to the proposal. THC advised that a reduction in the potential vertical scale (as illustrated by the SLVIA WCS (worst case scenario)) would not be sufficient to mitigate such effects and that a reduction in horizontal extents would also be required in order to reduce the effects on the inner Moray Firth and the sensitive coastline of south-east Sutherland. The potential to extend the site to the south was discussed as it was considered that a site boundary that consolidated the proposals in closer proximity to the Moray East and BOWL sites would be beneficial.

The requirement for information to be submitted to THC and SNH was discussed and representative viewpoints for comparative 90 degree field of view wirelines agreed. In addition, THC requested that visualisations suitable for use in its panoramic viewer software for presentation to the Planning Committee are provided for Viewpoint 4: Sarclet; Viewpoint 7: Lybster; Viewpoint 12: Navidale and Viewpoint 13a: Brora.

Moray West has also consulted Moray Council and Aberdeenshire Council regarding the selected viewpoints to be included as wireline views within this Addendum Document.

11.4 Baseline conditions associated with the variation area

11.4.1 Overview of baseline characteristics within the current Moray West Site

The current Moray West Site area extends to the south-west of the Alternative Moray West Site area and is located at a minimum distances of approximately 21.2 km from the Highland coast, 31.2 km from the Moray coast and 38 km from the Aberdeenshire coast at its closest points. It covers an area of open sea that extends the Alternative Moray West Site area into the narrower part of the Moray Firth where there is a greater association between the Highland and Moray coastlines through inter-visibility in excellent visibility conditions and extends the horizontal extent of the offshore wind farm views created by BOWL (and Moray East) further south.

11.4.2 Baseline characteristics of the proposed variation area

The Alternative Moray West Site area lies to the south of the current Moray West Site area and lies at distances of 27.71 km from the Highland coast, 33.18 km from the Moray coast and 35.06 km from the Aberdeenshire coast at its closest points. It covers an area of open sea that extends the Moray West Site area closer to parts of the Moray and Aberdeenshire coasts but within a broader expanse of open sea, rather than the more constrained area of the inner Moray Firth that occurs further to the south-west.

11.4.3 Baseline characteristics of the Alternative Moray West Site area

The Alternative Moray West Site area is located at distances of 22.16 km from the Highland coast, 33.18 km from the Moray coast and 35.06 km from the Aberdeenshire coast at its closest points. It covers an area of open sea that extends across a less contained part of the Moray Firth and where the Highland and Moray coastlines are at a greater distance apart.

11.4.4 Limitations with the baseline characterisation

Other than the limitations listed in the EIA Report – Technical Appendix 14.1: SLVIA Methodology, no other limitations have been identified that could affect the assessment of the Alternative Moray West Site area.

11.5 Baseline conditions associated with the SLVIA study area

Since the July 2018 EIA Report was submitted there has been some change to the cumulative wind farm context for the Development as illustrated on A0 Figure 11.2: Blade Tip ZTV with Viewpoints (Detail).

The Myreton, Garlhill and Wathegar 2 wind farms/single turbines are now operational as part of the wind farm context within the Study area. The following sections set out how the Alternative Moray West Site area relates to these sites and the influence they would have on its effect.

11.5.1 Myreton and Garlhill

The Myreton and Garlhill turbines are located in Moray close to the southern edge of the study area. Their location and scale mean that they will have little association with the coastal locations where the highest levels of impact, as a result of the Alternative Moray West Site area, would occur.

11.5.2 Wathegar 2

The Wathegar 2 wind farm is now in the baseline and forms part of an operational cluster located between Achairn, Flex Hill and Wathegar. Whilst it will intensify the operational wind farms within this local area its location inland and between these other wind farms ensures that its association and relationship with the Alternative Moray West Site area does not have a material bearing on the cumulative effect of the Alternative Moray West Site area in any of the scenarios.

There has also been some change to the potential future cumulative wind farm context. A description of these changes and consideration of these as part of the context for the Alternative Moray West Site area are set out in Section 11.9.

11.6 Assessment method

The method for assessing potential effects of the Development on the Seascape, Landscape and Visual resource within the current Moray West Site area and offshore export cable corridor is described in detail in the EIA Report – Volume 2, Technical Appendix 14.1 SLVIA Methodology.

There have been no changes to this assessment method since submission of the application in July 2018. These methods, and associated assessment criteria therefore remain applicable for the assessment of the Alternative Moray West Site area.

The Study Area for the SLVIA has not been altered for the EIA Addendum as this is considered unnecessary and could lead to confusion. Parts of the Study Area in the south-west are located at distances of greater than 50 km from the Alternative Moray West Site area. Parts of Moray and Aberdeenshire are now located within 50 km of the Alternative Moray West Site area but are not included in the Study Area. There is no potential for significant effects on these more inland parts of Moray and Aberdeenshire. This is as a result of there being no part of the area having a heightened sensitivity due to a nationally important landscape planning designation and the fact that there were no significant seascape, landscape and visual effects assessed in Moray or Aberdeenshire except for the cumulative effects with Moray East in the consented scenario, which would only occur close to the coast (which is within the study area).

11.7 Potential effects associated with the Alternative Moray West Site area

Potential effects associated with the construction, operation and decommissioning of the components of the Development located within the Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Table 11.3 below. The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated WCS design parameters assessed in the EIA Report – Volume 2, Chapter 14, Section 14.6 - for the current Moray West Site; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and decommissioning of the components of the Development located within the current

Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 14, Section 14.7.

References to figures relating to the EIA Report 2018 are to be found in Volume 3 of this Addendum.

11.7.1 Worst Case Scenario

As set out in Chapter 4 of the Moray West EIA Report 2018 Moray West is considering a range of potential construction methods and design options for the Development. This remains the case, however as described in Chapter 1 of Part 2 of this report a number of mitigation measures have been proposed with the purpose of reducing the potential ornithological and SLVIA effects. At this stage in the process the exact WTG and OSP positions within the Alternative Moray West Site area have not yet been determined by Moray West.

In order to determine the likely significant effects of the two options now being considered it is necessary to define the 'realistic WCS. The realistic WCS represents, for any given receptor and potential impact on that receptor, various options in the Design Envelope that would result in the greatest potential for change to the receptor in question whilst also taking account of factors known to result in an option being realistic.

Given that the realistic WCS is based on the design option (or combination of options) that represents the greatest potential for change, confidence can be held that development of any alternative options within the design parameters will give rise to no worse effects than assessed in this impact assessment.

The Model 4f layout (with turbines of up to 285 m to blade tip) is no longer being considered by Moray West. The mitigated Model 2 and 3 layouts have been prepared by Moray West with advice from the SLVIA authors so that turbines have been positioned close to the outer boundaries of the Alternative Moray West Site area.

The orientation of the WTG rows now coincides with the rows of the Moray East DSLP layout and realistic setbacks have been included for known constraints.

The mitigated Model 2 and 3 layouts can be described as follows:

- Mitigated Model 2 – 85 WTG in a grid layout with 49 peripheral turbines with medium intensity red flashing lights on their hubs. Turbines of up to 230 m to tip. This layout and turbine height equate to a maximum height and number of turbines spread across the available area of the Alternative Moray West Site area; and
- Mitigated Model 3 – 72 WTG in a grid layout with 33 peripheral turbines with medium intensity red flashing lights on their hubs. Turbines of up to 265 m to tip. This layout and turbine height equate to a maximum height and number of turbines spread across the available area of the Alternative Moray West Site area.

In accordance with the responses to the consultation on the WCSs agreed for the SLVIA contained in the EIA Report 2018 it has been determined that the WCS for daytime assessment would be the Model 3 layout due to its taller turbines. This layout has also been assessed for night time effects. The Mitigated Model 2 layout has also been considered in the night time assessment to illustrate the potential additional lit peripheral turbines that would be visible due to the greater maximum number of turbines as shown in Volume 3 - Figure 11.4 when compared with Volume 3 -Figure 11.5 (in this Addendum).

11.7.2 Mitigation measures

The assessment and conclusions presented in Table 11.1 have been investigated in the absence of mitigation measures as part of the review of the WCS layout for the Development. It was described in Section 14.6.2 that:

'*As part of the final wind farm design and layout Moray West will work with stakeholders to seek to reduce, where possible, the perception of turbines as 'outliers' which could appear to extend the horizontal extent of the wind farm disproportionately when compared to the energy gained, or potentially appear to 'close off' views of the open sea that lie between Moray West and the coast. The final wind farm design and layout will also be required to take into account other stakeholder requirements such as navigation, commercial fisheries and search and rescue (SAR); other technical and environmental factors within the Moray West Site (ground conditions, wind resources etc.); and proximity to the neighbouring BOWL and Moray East offshore wind farms.'*

No additional measures were identified with respect to effects on the seascape, landscape and visual resource.

11.7.3 Types of effect on the seascape, landscape and visual resource

The effects on the seascape, landscape and visual resource of the operation, construction and decommissioning associated with the Alternative Moray West Site area are considered with reference to the effects on the selected representative day and night time viewpoints which are assessed in Table 11.1: Effects on Representative Viewpoints and Table 11.2: Effect on Night Time Viewpoints.

Thereafter this information will be interpreted to provide a reassessment of the material changes to the effects on settlements, roads, rail lines, landscape character types (LCTs), Regional Coastal Character Areas (RCCAs), landscape planning designations and Wild Land Areas (WLA).

This is considered a suitable approach since the effects on all the receptors are as a result of the changes in the view from them rather than as a result of any physical changes to them.

It should be noted that the Representative Viewpoints included in this Addendum are a selection of those that were included in the Moray West EIA Report (2018). This selection has been agreed with THC, MC and AC during consultation on this Addendum Document.

Wireline visualisations illustrating the realistic WCSs for the Model 2 and Model 3 layouts have been included as cumulative wirelines for Viewpoints 3: Wick (path south of South View); Viewpoint 4: Sarclet (Sarclet Haven info Board); Viewpoint 7: Lybster (end of Main Street); Viewpoint 9a: Dunbeath (nr Heritage Centre); Viewpoint 12: Navidale; Viewpoint 13a: Brora (picnic area off Salt Street); Viewpoint 16: Lossiemouth Harbour; Viewpoint 19: Portnockie (Bow Fiddle Rock info point); Viewpoint 21: Findlater Castle; Viewpoint 22 Sandend; and Viewpoint 23: Portsoy. For ease of reference the same viewpoint numbering has been used in this Moray West EIA Addendum Document as was used in the EIA Report 2018.

These wirelines differentiate the Development turbines located within the proposed variation area by illustrating these as brown.

It should be noted that wirelines tend to lead to an overestimate of turbine visibility, particularly where the turbines would be viewed at a long distance, against a sky backdrop and often in less than optimum viewing conditions.

53.5 degree field of view, planar, numbered wirelines have been included for all viewpoints to illustrate the Model 3 layout. These also indicate the positions of the BOWL turbines in these views.

Night time photomontages are included for both the Model 2 and Model 3 layouts for Viewpoint 12: Navidale and Viewpoint 16: Lossiemouth Harbour. These are accompanied by 53.5 degree field of view, planar, numbered wirelines for the Model 2 and Model 3 layouts (see Volume 3 of this Addendum Document):

- Figure 11.1 illustrates the Blade tip ZTV with viewpoints at A3 (Figure 11.1a) and A0 size. The A0 version (Figure 11.1b) is based on the 1:50,000 Ordnance Survey mapping and also includes the selected viewpoints, visual receptors, cumulative wind farms, landscape planning designations and Wild Land Areas within the SLVIA study area. The ZTV illustrates the areas that may theoretically gain visibility of the Model 3 has been included to illustrate the Mitigated Model 3 layout WTGs.
- Figure 11.2: Comparative ZTV illustrates the comparison of the ZTVs for the daytime WCS (Model 4f) included in the EIA Report 2018 and the Mitigated Model 3 realistic WCS being considered in this chapter of the Moray West EIA Addendum.
- Figure 11.3: Hub Height ZTV illustrates the extent of the theoretical visibility of the hubs of the Model 3 Layout which is used in the consideration of the magnitude of change in the daytime assessment and also indicates the areas that may gain visibility of the lighting in the night time assessment.
- Figure 11.4: Mitigated Model 2 Medium Intensity Lighting and Figure 11.5: Mitigated Model 3 Medium Intensity Lighting illustrate the numbering of all turbines and also those turbines that would have medium intensity (2000 candela) flashing red lights fixed to their hubs. This information informs the night time viewpoint assessment contained in Table 11.3.

11.7.4 Effects on the visual resource

The effects on the visual resource are re-assessed with reference to the representative viewpoints for daytime and night time effects as set out in Tables 11.2 and 11.3 below.

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
Viewpoint 3: Wick (path south of South View) – day and night time Located in Wick Bay RCCA and within the Town LCT. The viewpoint is not located within and does not look out over any landscape planning designations. Sensitivity: medium-high	**Operation** Field of view affected by the Development is approximately 32 degrees. Distance to the Development (closest turbine of WCS) 30.1 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 49 km. This distance results in the turbines theoretically appearing as moderate scale, vertical features visible in only 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.51 degree of the field of view. The Development would theoretically add approximately 19 degrees to the offshore wind farm views created by BOWL, which would be visible more frequently and at closer proximity. The ZTVs illustrate that 51-62 turbines are theoretically visible with all of these visible to below hub level. The Development is located on the skyline within a part of the broad, partially undeveloped, sea views that lie to the south between the coastal headlands and the part of the view that is influenced by BOWL. Within a few years it is likely that the Beatrice Demonstrator Turbines and the associated oil platforms would no longer form part of the view. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away having only a relatively short section of their towers visible above the skyline. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing markedly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is apparent within this view, as is the gap necessitated by the cable wayleave that runs through the site. This pattern of turbines is similar to that of BOWL. The view direction to the centre of the Development is approximately south. This means that the turbines would generally be back lit and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west or east sides during early morning or late afternoon/evening. This could potentially increase contrast, making them more apparent when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The Development, when visible, would appear less prominent than BOWL due to its greater distance. Where the wind farms overlap there would be the possibility of a greater density of turbines being apparent at ranges of greater than 22 km (BOWL) and 30.1km (the Development). The greater distance to the Development ensures that its turbines would be recessive and that their larger dimensions are not apparent. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as very small, relatively low elements within the context of the much larger, moving turbines. The wireline view shows that the spread of the Development would theoretically create a link between the coast and the turbines of BOWL and this is considered adverse and to locally increase the magnitude of change. The Development would generally appear as an extension to BOWL due to its apparent similarity of scale and layout as well as the context within	**Operation** Significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 30.1 km to closest turbine.	**Operation** Field of view affected by the Development is approximately 25 degrees. Distance to the Development (closest turbine of WCS) 31.1 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 47.5 km. This distance results in the turbines theoretically appearing as moderate scale, vertical features visible in only 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.49 degree of the field of view. The Development would theoretically add approximately 13 degrees to the offshore wind farm views created by BOWL, which would be visible more frequently and at closer proximity. The ZTVs illustrate that 61-72 turbines are theoretically visible with all of these visible to below hub level. The Development is located on the skyline within a part of the broad, partially undeveloped, sea views that lie to the south between the coastal headlands and the part of the view that is influenced by BOWL. Within a few years it is likely that the Beatrice Demonstrator Turbines and the associated oil platforms would no longer form part of the view. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away having only a relatively short section of their towers visible above the skyline. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing markedly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is apparent within this view, particularly for the turbine rows that appear closest to the coast. This pattern of turbines is similar to that of BOWL in places. The view direction to the centre of the Development is approximately south. This means that the turbines would generally be back lit and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west or east sides during early morning or late afternoon/evening. This could potentially increase contrast, making them more apparent when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The Development, when visible, would appear less prominent than BOWL due to its greater distance. Where the wind farms overlap there would be the possibility of a greater density of turbines being apparent at ranges of greater than 22 km (BOWL) and 31.1km (the Development). The greater distance to the Development ensures that its turbines would be recessive and that their larger dimensions are not apparent. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as very small, relatively low elements within the context of the much larger, moving turbines. The wireline view shows that the spread of the Development would not create a link between the coast and the turbines of BOWL so that the land and the offshore wind farms remain separate. The Development would generally appear as an extension to BOWL due to its apparent similarity of scale and layout as well as the context within which they are both located. When apparent the Development would extend offshore	**Operation** Significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 31.1 km to closest turbine.	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, This reduces the effect of the Development and also improves its consistency with BOWL. The distance from the viewpoint to the nearest turbine is slightly greater for the mitigated Model 3 layout than for the Model 4f layout. The horizontal and vertical fields of view occupied by the mitigated Model 3 layout are reduced when compared with those of the Model 4f layout. There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense but this in turn makes it more consistent with the BOWL layout. The mitigated Model 3 layout appears set back from the coastline when compared with the Model 4f layout. This separation by the open sea horizon ensures that there is no encroachment of turbines close to the land. The alignment of the turbine rows in the mitigated Model 3 layout is apparent in the part of the Development that appears to lie closest to the coast. The combined turbine array of BOWL and the Development continues to take up most of the open sea horizon within this view.

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
	which they are both located. When apparent the Development would extend offshore wind farm visibility across a further wide part of the available sea views from this location. This, in addition to the existing onshore wind farm influence, results in increasing the overall effect of wind farm development across the wide views from this part of Wick. However, the turbine that is theoretically apparent where the Development appears to meet the shoreline is located at a distance of 49 km so that even in clear weather its influence would be limited. Figure 14.7.11a illustrates the extent of the ZTV within this vicinity. This shows that there is theoretical visibility of the Development from limited locations with the settlement of Wick and the surrounding settled areas. Actual visibility is further reduced due to the screening influence of buildings. Visibility such as is represented by the viewpoint would be possible from sections of the Core Paths in the vicinity and on the south side of Wick Bay. Visibility from nearby sections of the A99 is limited. ***Magnitude of change: medium - low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium - low***		wind farm visibility across a further wide part of the available sea views from this location. This, in addition to the existing onshore wind farm influence, results in increasing the overall effect of wind farm development across the wide views from this part of Wick. However, the turbines that are theoretically apparent where the Development appears to meet the shoreline is located at a distance of 49 km so that even in clear weather its influence would be limited. Figure 11.1b illustrates the extent of the ZTV within this vicinity. This shows that there is theoretical visibility of the Development from limited locations with the settlement of Wick and the surrounding settled areas. Actual visibility is further reduced due to the screening influence of buildings. Visibility such as is represented by the viewpoint would be possible from sections of the Core Paths in the vicinity and on the south side of Wick Bay. Visibility from nearby sections of the A99 is limited. ***Magnitude of change: medium - low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium - low***		
Viewpoint 4: Sarclet (Sarclet Haven Info Board) Located in RCCA – Sarclet Head and the Small Farms and Crofts LCT. The viewpoint is not located within and does not look out over any landscape planning designations. Sensitivity: medium - high	**Operation** Field of view affected by the Development is approximately 43 degrees. Distance to the Development (closest turbine of WCS) 24.6 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 41 km. This distance results in the turbines theoretically appearing as moderate scale, moving, vertical features visible in only 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.5-1 degrees of the field of view. The Development would theoretically add approximately 28 degrees to the offshore wind farm views created by BOWL. The Development would be visible less frequently and at a greater distance than BOWL. The ZTVs illustrate that 51-62 turbines are theoretically visible with all of these visible to below hub level. The Development is located on the skyline within a part of the broad, partially undeveloped, sea views that lie to the south. Within a few years it is likely that the Beatrice Demonstrator Turbines and the associated oil platforms would no longer form part of the view. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away having notably shorter sections of their towers visible above the skyline. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing slightly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is apparent within this view, as is the gap necessitated by the cable wayleave that runs through the site. This pattern of turbines is similar to that of BOWL.	**Operation** Significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 26.55 km to closest turbine.	**Operation** Field of view affected by the Development is approximately 34 degrees. Distance to the Development (closest turbine of WCS) 25.4 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 40 km. This distance results in the turbines theoretically appearing as moderate scale, moving, vertical features visible in only 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.5-1 degrees of the field of view. The Development would theoretically add approximately 21 degrees to the offshore wind farm views created by BOWL. The Development would be visible less frequently and at a greater distance than BOWL. The ZTVs illustrate that 61-72 turbines are theoretically visible with all of these visible to below hub level. The Development is located on the skyline within a part of the broad, partially undeveloped, sea views that lie to the south. Within a few years it is likely that the Beatrice Demonstrator Turbines and the associated oil platforms would no longer form part of the view. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away having notably shorter sections of their towers visible above the skyline. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing slightly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is apparent within this view, particularly for the turbine rows that appear closest to the coast. This pattern of turbines is similar to that of BOWL in places. The view direction to the centre of the Development is approximately south. This means that the turbines would generally be back lit and therefore seen in shadow, resulting in them generally being less contrasting with the sky	**Operation** Significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 25.4 km to closest turbine.	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, This reduces the effect of the Development due the smaller scale of the turbine components and this also improves its consistency with BOWL. The distance from the viewpoint to the nearest turbine is slightly greater for the mitigated Model 3 layout than for the Model 4f layout. The horizontal and vertical fields of view occupied by the mitigated Model 3 layout are reduced when compared with those of the Model 4f layout and this has the effect of increasing the field of the view occupied by open sea. There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense but this in turn makes it more consistent with the BOWL layout. The alignment of the turbine rows in the mitigated Model 3 layout is apparent in the part of the Development that appears at the southern end of the array The views from this location are wide and panoramic with sea views obtainable across over 180 degrees to the north-north-east round to the south-west. As a result of the reduction in the extent of the wind farm array

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area

Representative Viewpoint and baseline sensitivity	Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area	Significance of Effects as a result of the WCS within the current Moray West Site area	Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area	Assessment of effect significance and conclusions	Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS
	The view direction to the centre of the Development is approximately south. This means that the turbines would generally be back lit and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west or east sides during early morning or late afternoon/evening. This could potentially increase contrast, making them more apparent when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The Development, when visible, may at times appear slightly less prominent than BOWL due to its greater distance. Where the wind farms overlap there would be a greater density of turbines apparent at ranges of greater than 17 km (BOWL) and 24.6 km (the Development). The greater distance to the Development ensures its larger turbine dimensions are not readily apparent. Due to the low elevation of the viewpoint the BOWL turbine bases all appear behind or close to the skyline with those of the Development being generally beyond the horizon. At this range it will not be possible to readily distinguish the varied actual distances to the turbines so that the turbines of the Development are not immediately distinguishable as being larger. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as relatively small, low elements within the context of the much larger, moving turbines. Their bulkier form will appear much like the Beatrice oil platforms. The Development would generally appear as a large extension to BOWL due to its apparent similarity of scale and layout as well as the context within which they are both located. When apparent the Development would extend offshore wind farm visibility across a further wide part of the available sea views from this location. The offshore wind farm influence would be apparent out in the open sea rather than encroaching close to the land. However, this, in addition to a degree of existing onshore wind farm influence, results in increasing the overall effect of wind farm development across the wide views from this part of the coast. Figure 14.7.12a illustrates the extent of the ZTV within this vicinity. This shows that there is theoretical visibility of the Development from limited locations but the settlement of Wick and the surrounding settled areas. Actual visibility is further reduced due to the screening influence of buildings. Visibility such as is represented by the viewpoint would be possible from sections of the Core Paths in the vicinity and on the south side of Wick Bay. Visibility from nearby sections of the A99 is limited. ***Magnitude of change: medium*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium***		background than turbines lit by the sun. The sun may strike the turbines on their west or east sides during early morning or late afternoon/evening. This could potentially increase contrast, making them more apparent when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The Development, when visible, may at times appear slightly less prominent than BOWL due to its greater distance. Where the wind farms overlap there would be a greater density of turbines apparent at ranges of greater than 17 km (BOWL) and 25.4 km (the Development). The greater distance to the Development ensures its larger turbine dimensions are not apparent. Due to the low elevation of the viewpoint the BOWL turbine bases all appear behind or close to the skyline with those of the Development being generally beyond the horizon. At this range it will not be possible to readily distinguish the varied actual distances to the turbines so that the turbines of the Development are not immediately distinguishable as being larger. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as relatively small, low elements within the context of the much larger, moving turbines. Their bulkier form will appear much like the Beatrice oil platforms. The Development would generally appear as a large extension to BOWL due to its apparent similarity of scale and layout as well as the context within which they are both located. When apparent the Development would extend offshore wind farm visibility across a further wide part of the available sea views from this location. The offshore wind farm influence would be apparent out in the open sea rather than encroaching close to the land. However, this, in addition to a degree of existing onshore wind farm influence, results in increasing the overall effect of wind farm development across the wide views from this part of the coast. Figure 11.1b illustrates the extent of the ZTV within this vicinity. This shows that there is theoretical visibility of the Development from limited locations but the settlement of Wick and the surrounding settled areas. Actual visibility is further reduced due to the screening influence of buildings. Visibility such as is represented by the viewpoint would be possible from sections of the Core Paths in the vicinity and on the south side of Wick Bay. Visibility from nearby sections of the A99 is limited. ***Magnitude of change: medium*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium***		there is an increase in the view of the open sea horizon to the south. Open sea views would also be available from the east round to the north-north-east from this location. The combined turbine array of BOWL and the Development would be seen across a reduced proportion of this wide view. The offshore wind farms together span horizontally across part of the view. The turbines will be seen as moving, vertical forms on the distant skyline seen against a sky backdrop across a small proportion of the large scale vertical field of view. The turbines do not obscure the view of the sea and are also very distinct from the land due to their separation by open sea.
Viewpoint 7: Lybster (end of Main Street)	**Operation** Field of view affected by the Development is approximately 57 degrees.	**Operation** Significant, negative, long term, reversible.	**Operation** Field of view affected by the Development is approximately 44 degrees. Distance to the Development (closest turbine of WCS) 24.5 km.	**Operation** Significant, negative, long term, reversible.	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout,

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
Located in RCCA – Lybster Bay and the Small Farms and Crofts LCT. No scenic designations but will be locally valued as coastal outlook. Sensitivity: medium-high	Distance to the Development (closest turbine of WCS) 24.6 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 33 km. This distance results in the turbines theoretically appearing as moderate scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.5-1 degrees of the field of view. The Development would theoretically add approximately 50 degrees to the offshore wind farm views created by BOWL, which may be visible more frequently and at a closer range. The ZTVs illustrate that 51-62 turbines are theoretically visible with all of these visible to below hub level. The Development is located on the skyline within a part of the broad, partially undeveloped, sea views that lie to the south round to the south east. Within a few years it is likely that the Beatrice Demonstrator Turbines and the associated oil platforms would no longer form part of the view. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away having slightly shorter sections of their towers visible above the skyline. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing slightly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is apparent within this view. This pattern of turbines is similar to that of BOWL. The view direction to the centre of the Development is approximately south south east. This means that the turbines would generally be back lit and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west or east sides during early morning or late afternoon/evening. This could potentially increase contrast, making them more apparent when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. There is a relatively small apparent overlap between the Development and BOWL in views from this angle. Where the wind farms overlap there would be a greater density of turbines apparent at ranges of greater than 20 km (BOWL) and 26.6 km (the Development). The proximity and larger scale of the Development means that its turbines appear larger in scale than those of BOWL. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as relatively small, low elements within the context of the much larger, moving turbines. Their bulkier form will appear much like the Beatrice oil platforms. The Development would generally appear as a large extension to BOWL. However, there is some discord between the wind farms due to the notably larger scale and spacing of the Development turbines. This is particularly noticeable where there are outliers to the turbine grouping at the south western extents of the Development. As part of the final wind farm design and layout Moray West will work with stakeholders to seek to reduce, where possible, the perception of turbines as 'outliers' which could appear	**Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 24.6 km to closest turbine.	The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 36 km. This distance results in the turbines theoretically appearing as moderate scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.5-1 degrees of the field of view. The Development would theoretically add approximately 40 degrees to the offshore wind farm views created by BOWL, which may be visible more frequently and at a closer range. The ZTVs illustrate that 61-72 turbines are theoretically visible with all of these visible to below hub level. The Development is located on the skyline within a part of the broad, partially undeveloped, sea views that lie to the south round to the south east. Within a few years it is likely that the Beatrice Demonstrator Turbines and the associated oil platforms would no longer form part of the view. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away having slightly shorter sections of their towers visible above the skyline. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing slightly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is not distinct within this view. This pattern of turbines is similar to that of BOWL and the Development would therefore appear as a large extension of it. The view direction to the centre of the Development is approximately south south east. This means that the turbines would generally be back lit and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west or east sides during early morning or late afternoon/evening. This could potentially increase contrast, making them more apparent when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. There is a relatively small apparent overlap between the Development and BOWL in views from this angle. Where the wind farms overlap there would be a greater density of turbines apparent at ranges of greater than 20 km (BOWL) and 24.5 km (the Development). The larger scale of the Development is not apparent in this view due to its greater distance from the viewpoint when compared with the turbines of BOWL. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as relatively small, low elements within the context of the much larger, moving turbines. Their bulkier form will appear much like the Beatrice oil platforms. The Development would generally appear as a large extension to BOWL extending offshore wind farm visibility across a further, wide part of the open sea horizon. This would occur across a part of the sea view that can be seen along the alignment framed by Main Street. The offshore wind farm influence would be apparent out in the open sea rather than encroaching close to the land and there is a wide stretch of open sea visible from this slightly elevated coast. The southerly extents of the Development may be seen against a backdrop of the low Moray coastline when visibility is very clear.	**Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 24.5 km to closest turbine.	This reduces the effect of the Development and also improves its consistency with BOWL. The distance from the viewpoint to the nearest turbine is slightly less for the mitigated Model 3 layout than for the Model 4f layout. The horizontal and vertical fields of view occupied by the mitigated Model 3 layout are reduced when compared with those of the Model 4f layout. There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense but this in turn makes it more consistent with the BOWL layout. The open sea views available to the south round to the south-west from this location are increased as a result of the reduction in the south-westerly extent of the Development.

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
	to extend the horizontal extent of the wind farm disproportionately when compared to the energy gained. The final wind farm design and layout will also be required to take into account other stakeholder requirements such as navigation, commercial fisheries and search and rescue (SAR); other technical and environmental factors within the Moray West Site (ground conditions, wind resources etc.); and proximity to the neighbouring BOWL and Moray East offshore wind farms. When apparent the Development would extend offshore wind farm visibility across a further, wide part of the available sea views from this location so that offshore windfarms would be seen across most of the sea horizon. This would occur across a part of the sea view that can be seen along the alignment framed by Main Street. The offshore wind farm influence would be apparent out in the open sea rather than encroaching close to the land and there is a wide stretch of open sea visible from this slightly elevated coast. The southerly extents of the Development may be seen against a backdrop of the low Moray coastline when visibility is very clear. Figure 14.7.15a17b illustrates the ZTV within the local area and this shows that there would be a similar degree of visibility from much of the coastline and immediate hinterland where there is scattered settlement and several Core Paths. The A99 and the numerous properties strung out along it may also have visibility of the Development, however, the magnitude of change is likely to be slightly less from non-coastal locations due to characterising foreground influences and/or less focused views. ***Magnitude of change: medium*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium***		Figure 11.1b illustrates the ZTV within the local area and this shows that there would be a similar degree of visibility from much of the coastline and immediate hinterland where there is scattered settlement and several Core Paths. The A99 and the numerous properties strung out along it may also have visibility of the Development, however, the magnitude of change is likely to be slightly less from non-coastal locations due to characterising foreground influences and/or less focused views. ***Magnitude of change: medium*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium***		
Viewpoint 9a: Dunbeath (nr Heritage Centre) Located in RCCA – Dunbeath Bay and within Small Farms and Crofts LCT. No scenic designations. Similar views would be available from Dunbeath Castle and its associated GDL located just along the coast to the south-west. Sensitivity: medium - high	**Operation** Field of view affected by the Development is approximately 49 degrees. Distance to the Development (closest turbine of WCS) 24.3 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 35 km. This distance results in the turbines theoretically appearing as moderate scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.5-1 degrees of the field of view. The Development would theoretically span across approximately 49 degrees of the open sea views. The ZTVs illustrate that 51-62 turbines are theoretically visible with almost all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, largely undeveloped, sea views that lie approximately to the south south east round to the south-east. The most northerly extents of the Development as well as the entire BOWL would be screened from view by intervening landform. Within a few years it is likely that the Beatrice	**Operation** Significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 24.3 km to closest turbine.	**Operation** Field of view affected by the Development is approximately 41 degrees. Distance to the Development (closest turbine of WCS) 25.7 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 37.6 km. This distance results in the turbines theoretically appearing as moderate scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.5-1 degrees of the field of view. The Development would theoretically span across approximately 40 degrees of the open sea views. The ZTVs illustrate that 61-72 turbines are theoretically visible with almost all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, largely undeveloped, sea views that lie approximately to the south south east round to the south-east. The most northerly extents of the Development as well as the entire BOWL would be screened from view by intervening landform. Within a few years it is likely that the Beatrice Demonstrator Turbines and the associated oil platforms would no longer form part of the view.	**Operation** Significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 25.7 km to closest turbine.	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, This reduces the effect of the Development and also improves its consistency with BOWL. The distance from the viewpoint to the nearest turbine is greater for the mitigated Model 3 layout than for the Model 4f layout. The horizontal and vertical fields of view occupied by the mitigated Model 3 layout are reduced when compared with those of the Model 4f layout. There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense but this in turn makes it more consistent with the BOWL layout. The open sea views available to the south from this location are increased as a result of

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
	Demonstrator Turbines and the associated oil platforms would no longer form part of the view. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away having slightly shorter sections of their towers visible above the skyline. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing slightly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is apparent within this view. The view direction to the centre of the Development is approximately south east. This means that the turbines would generally be back lit and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west sides and this may be apparent from this direction from mid-afternoon through to the evening. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle or perpendicular to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as relatively small, low elements within the context of the much larger, moving turbines. Their bulkier form will appear much like the Beatrice oil platforms. The Development would introduce offshore wind farm visibility across a wide extent of the available sea views from this location. The Development would be apparent out in the open sea rather than encroaching above land. There is a relatively wide stretch of intervening, open sea visible from this section of coast. The extent of the view towards the Development would be less from the car park/ picnic area or further west and from parts of narrow road that leads to the main road due to the intervening cliffs and valley formation. ***Magnitude of change: medium- high*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium – high***		At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away having slightly shorter sections of their towers visible above the skyline. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing slightly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is apparent within parts of this view. The pattern of turbines is similar to that of BOWL in places. The view direction to the centre of the Development is approximately south east. This means that the turbines would generally be back lit and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west sides and this may be apparent from this direction from mid-afternoon through to the evening. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle or perpendicular to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as relatively small, low elements within the context of the much larger, moving turbines. Their bulkier form will appear much like the Beatrice oil platforms. The Development would introduce offshore wind farm visibility across a large proportion of the available sea views from this location. The Development would be apparent out in the open sea rather than encroaching above land. There is a relatively wide stretch of intervening, open sea visible from this section of coast. The extent of the view towards the Development would be less from the car park/ picnic area or further west and from parts of narrow road that leads to the main road due to the intervening cliffs and valley formation. ***Magnitude of change: medium- high*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium – high***		the reduction in the south-westerly extent of the Development. It should be noted that the increased expanse of open sea to the south is likely to be more apparent from other locations around Dunbeath where this is not obscured by intervening landform. From other locations in Dunbeath visibility of the BOWL is also less widespread so that the overall effect of wind farm development on the open sea views is less marked than is the case for this viewpoint.
Viewpoint 12: Navidale Located in RCCA – Helmsdale to Berriedale Coastal Shelf and within Coastal Shelf LCT. No scenic designations. Locally valued coastal views from A9 which is part of North Coast 500 route. Sensitivity: medium to high	**Operation** Field of view affected by the Development is approximately 38 degrees. Distance to the Development (closest turbine of WCS) 27.6 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 45 km. This distance results in the turbines theoretically appearing as moderate scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.51 degrees of the field of view. The Development would theoretically add approximately 37 degrees to the offshore wind farm views created by BOWL. The Development is likely to be	**Operation** Significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be	**Operation** Field of view affected by the Development is approximately 29 degrees. Distance to the Development (closest turbine of WCS) 30.5 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 45 km. This distance results in the turbines theoretically appearing as moderate scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0.5-1 degrees of the field of view. The Development would theoretically add approximately 29 degrees to the offshore wind farm views created by BOWL. The Development is likely to be	**Operation** Significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, This reduces the effect of the Development and also improves its consistency with BOWL. The distance from the viewpoint to the nearest turbine is greater for the mitigated Model 3 layout than for the Model 4f layout. The horizontal and vertical fields of view occupied by the mitigated Model 3 layout are reduced when compared with those of the Model 4f layout.

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
	visible more frequently and would be at a closer range than BOWL. The ZTVs illustrate that 51-62 turbines are theoretically visible with all of these visible to below hub level. The Development is located on the skyline within a part of the broad, partially undeveloped, sea views that lie approximately to the south east round to the east north east. Within a few years it is likely that the Beatrice Demonstrator Turbines and the associated oil platforms would no longer form part of the view. At this distance the curvature of the earth reduces the apparent height of some of the turbines with those furthest away having slightly shorter sections of their towers visible above the skyline. The closest turbines would be visible down to where their foundations meet the sea. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing slightly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is apparent within this view. This pattern of turbines is similar to that of BOWL. The view direction to the centre of the Development is approximately east. This means that the turbines would generally be back lit in the mornings and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west sides and this may be apparent from this direction during the afternoon through to the evening. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most northerly turbines of the wind farm would be most apparent due to the prevalent angle of view. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as relatively small, low elements within the context of the much larger, moving turbines. Their bulkier form will appear much like the Beatrice oil platforms. There is a very small apparent overlap between the Development and BOWL in views from this angle. The proximity and larger scale of the Development means that its turbines appear larger in scale than those of BOWL. The Development would generally appear as a large extension to BOWL. However, there is some discord between the wind farms due to the notably larger scale and spacing of the Development turbines. This is particularly noticeable where there are outliers to the turbine grouping at the south western extents of the Development. When apparent the Development would extend offshore wind farm visibility across a further, wide part of the available sea views from this location so that offshore windfarms would be seen across a large part of the sea horizon. The Development would be apparent out in the open sea rather than encroaching close to the land and there is a wide stretch of intervening, open sea visible from this slightly elevated coast. Figure 14.7.21a illustrates the ZTV within the local area and this shows that there would be a similar degree of visibility from much of the coastline and	visible at 27.6 km to closest turbine.	visible more frequently and would be at a closer range than BOWL. The ZTVs illustrate that 61-72 turbines are theoretically visible with all of these visible to below hub level. The Development is located on the skyline within a part of the broad, partially undeveloped, sea views that lie approximately to the south east round to the east north east. Within a few years it is likely that the Beatrice Demonstrator Turbines and the associated oil platforms would no longer form part of the view. At this distance the curvature of the earth reduces the apparent height of some of the turbines with those furthest away having slightly shorter sections of their towers visible above the skyline. The closest turbines would be visible down to where their foundations meet the sea. The angle of view and the depth of the layout of the Development within it result in the most distant turbines appearing slightly lower in the view than those to the front of the wind farm. The alignment of the turbines of the WCS is apparent within parts of this view. This pattern of turbines is similar to that of BOWL. The view direction to the centre of the Development is approximately east. This means that the turbines would generally be back lit in the mornings and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west sides and this may be apparent from this direction during the afternoon through to the evening. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most northerly turbines of the wind farm would be most apparent due to the prevalent angle of view. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these will be seen as relatively small, low elements within the context of the much larger, moving turbines. Their bulkier form will appear much like the Beatrice oil platforms. There is a no overlap between the Development and BOWL in views from this angle. The proximity and larger scale of the Development means that its turbines appear larger in scale than those of BOWL. The Development would generally appear as a large extension to BOWL. However, there is some discord between the wind farms due to the notably larger scale and spacing of the Development turbines. When apparent the Development would extend offshore wind farm visibility across a further, wide part of the available sea views from this location so that offshore wind farms would be seen across a part of the sea horizon but open sea views would remain possible further to the south. The Development would be apparent out in the open sea rather than encroaching close to the land and there is a wide stretch of intervening, open sea visible from this slightly elevated coast. Figure 11.1b illustrates the ZTV within the local area and this shows that there would be a similar degree of visibility from much of the coastline and immediate hinterland which includes several Core Paths and the hamlet of Navidale and the elevated and coastal parts of Helmsdale. The A9 would also have visibility of the Development, however, the magnitude of change may be slightly less where the road runs away from the coast due to a	visible at 30.5 km to closest turbine.	There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense but this in turn makes it more consistent with the BOWL layout. The open sea views available to the east round to approximately south from this location are increased by approximately 9 degrees as a result of the reduction in the south-westerly extent of the Development. It should be noted that the increased expanse of open sea to the south is likely to be more apparent from other locations in this vicinity along the A9. This occurs where the open sea views of approximately 180 degrees are not obscured by intervening landform and the views of open sea are more widely panoramic than are seen from this specific viewpoint.

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
	immediate hinterland which includes several Core Paths and the hamlet of Navidale and the elevated and coastal parts of Helmsdale. The A9 would also have visibility of the Development, however, the magnitude of change may be slightly less where the road runs away from the coast due to a higher degree of characterising foreground influences and/or less focused views. The A897 is shown to have no visibility of the Development. ***Magnitude of change: medium*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium***		higher degree of characterising foreground influences and/or less focused views. The A897 is shown to have no visibility of the Development. ***Magnitude of change: medium*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant with the construction of the cable route occurring at even greater distances, beyond the wind farm. ***Magnitude of change: medium***		
Viewpoint 13a: Brora (picnic area off Salt Street) Located in RCCA Brora to Helmsdale Deposition Coast and within the Long Beaches Dunes and Links LCT. The viewpoint is not located within any landscape planning designations. The land rising up from the coast seen in the view to the north is located within the Loch Flett, Loch Brora and Glen Loth SLA. Sensitivity: medium to high	**Operation** Field of view affected by the Development is approximately 20 degrees. Distance from the Development (closest turbine of WCS) 37.3 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be markedly less visible than the closest. The distance to the most distant turbine of the WCS 60 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. The ZTVs illustrate that parts of 51-62 turbines are theoretically visible with almost all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, largely undeveloped, sea views that lie approximately to the east round to the east north east. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away theoretically visible as blades only above the skyline. The alignment of the rows of turbines in the WCS is apparent to a small degree within this view. The view direction to the centre of the Development is approximately east. This means that the turbines would generally be back lit in the mornings and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west sides and this may be apparent from this direction during the afternoon through to the evening. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most distant, northerly turbines of the wind farm would be seen appearing and disappearing above the skyline, however their distance at over 40km would mean that excellent visibility would be required to see these limited parts.	**Operation** Not significant, negative, long term, reversible. This is largely due to narrow vertical and horizontal fields of view affected as part of a wide panorama of open sea view. Also, the location of the Development set away from the coast. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 37.3 km to closest turbine.	**Operation** Field of view affected by the Development is approximately 18 degrees. Distance to the Development (closest turbine of WCS) 42.6 km. The Development would theoretically add approximately 18 degrees to the offshore wind farm views created by BOWL, and would be visible more frequently and at closer proximity than BOWL, which is barely perceptible. The increased separation of the viewpoint and the more distant turbines means that they are likely to be markedly less visible than the closest. The distance to the most distant turbine of the WCS 60 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'excellent visibility' conditions. The closest of the turbines at the far right of the turbine array in this view is at a distance of 44.3 km so that these turbines would only be visible in 'excellent visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. The ZTVs illustrate that parts of 61-72 turbines are theoretically visible with almost all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, largely undeveloped, sea views that lie approximately to the east round to the east north east. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away theoretically visible as blades only above the skyline. The alignment of the rows of turbines in the WCS is apparent within some sections of this view. The view direction to the centre of the Development is approximately east. This means that the turbines would generally be back lit in the mornings and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their west sides and this may be apparent from this direction during the afternoon through to the evening. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the influence of the blade movement and also the overall dimension of the part of	**Operation** Not significant, negative, long term, reversible. This is largely due to narrow vertical and horizontal fields of view affected as part of a wide panorama of open sea view. Also, the location of the Development set away from the coast and at a considerable distance from the viewpoint. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 42.6 km to closest turbine.	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, This reduces the effect of the Development. The distance from the viewpoint to the nearest turbine is greater for the mitigated Model 3 layout than for the Model 4f layout. The horizontal and vertical fields of view occupied by the mitigated Model 3 layout are reduced when compared with those of the Model 4f layout. There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense. The alignment of the turbine rows in the mitigated Model 3 layout is slightly apparent in the part of the Development that appears at the eastern end of the array. Whilst offshore wind farm views would generally be a new addition to this view they would be seen only in excellent visibility at a considerable distance as pale coloured, moving, vertical structures against a sky backdrop. There are substantial parts of the wide, panoramic horizon that remain as open sea in views from this location.

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area

Representative Viewpoint and baseline sensitivity	Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area	Significance of Effects as a result of the WCS within the current Moray West Site area	Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area	Assessment of effect significance and conclusions	Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS
	Due to the distance between the viewpoint and the OSPs, combined with the curvature of the earth, only the upper parts of one of the OSPs would be visible within this view. The Development would introduce offshore wind farm visibility across a relatively narrow extent of the panoramic sea views from this location. The Development would be apparent out in the open sea rather than encroaching above land. There is a wide stretch of intervening, open sea visible from this section of coast. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south, however this would occur at greater distances than the construction of the wind farm and would involve few vessels. ***Magnitude of change: medium – low***		the view affected by each turbine. The rotating blades of the most distant, northerly turbines of the wind farm would be seen appearing and disappearing above the skyline, however their distance at 42.6-60 km would mean that excellent visibility would be required to see these limited parts. Due to the distance between the viewpoint and the OSPs, combined with the curvature of the earth, only the upper parts of one of the OSPs would be visible within this view. The Development would introduce offshore wind farm visibility across a relatively narrow extent of the panoramic sea views from this location. The Development would be apparent out in the open sea rather than encroaching above land. There is a wide stretch of intervening, open sea visible from this section of coast. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south, however this would occur at greater distances than the construction of the wind farm and would involve few vessels. ***Magnitude of change: medium – low***		
Viewpoint 16: Lossiemouth Harbour Located in RCCA Spey Bay and within the Moray Coastal LCT. There are no landscape planning designations. Sensitivity: medium - high	**Operation** Field of view affected by the Development is approximately 22.5 degrees. Distance from the Development (closest turbine of WCS) 31.7 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be markedly less visible than the closest. The distance to the most distant turbine of the WCS is 55 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The ZTVs illustrate that parts of 51-62 turbines are theoretically visible with almost all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, undeveloped, sea views that lie approximately to the north north east. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away theoretically visible as blades only above the skyline. The closest turbines would have hubs and part of their towers visible. The view direction to the centre of the Development is approximately north north east. This means that the turbines would generally be back lit until mid-morning and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their south east round to their west sides and this may be apparent from this direction during mid-morning through to the evening. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are generally facing directly towards the viewpoint. The	**Operation** Not significant, negative, long term, reversible. This is largely due to narrow vertical and horizontal fields of view affected as part of a wide panorama of open sea view. Also, the location of the Development set away from the coast. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 31.7 km to closest turbine.	**Operation** Field of view affected by the Development is approximately 17 degrees. Distance from the Development (closest turbine of WCS) 34.4 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be markedly less visible than the closest. The distance to the most distant turbine of the WCS is 56 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The ZTVs illustrate that parts of 61-72 turbines are theoretically visible with almost all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, undeveloped, sea views that lie approximately to the north north east. At this distance the curvature of the earth reduces the apparent height of all of the turbines with those furthest away theoretically visible as blades only above the skyline. The closest turbines would have hubs and part of their towers visible. The view direction to the centre of the Development is approximately north north east. This means that the turbines would generally be back lit until mid-morning and therefore seen in shadow, resulting in them generally being less contrasting with the sky background than turbines lit by the sun. The sun may strike the turbines on their south east round to their west sides and this may be apparent from this direction during mid-morning through to the evening. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are generally facing directly towards the viewpoint. The rotating blades of the most distant, northerly turbines of the wind farm would be seen	**Operation** Not significant, negative, long term, reversible. This is largely due to narrow vertical and horizontal fields of view affected as part of a wide panorama of open sea view. Also, the location of the Development set away from the coast. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 34.4 km to closest turbine.	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, This reduces the effect of the Development. The distance from the viewpoint to the nearest turbine is greater for the mitigated Model 3 layout than for the Model 4f layout. The horizontal and vertical fields of view occupied by the mitigated Model 3 layout are reduced when compared with those of the Model 4f layout. There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense. Whilst offshore wind farm views would generally be a new addition to this view they would be seen only in very good visibility at a considerable distance as pale coloured, moving, vertical structures against a sky backdrop. There are substantial parts of the wide, panoramic horizon that remain as open sea in views from this location.

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
	rotating blades of the most distant, northerly turbines of the wind farm would be seen appearing and disappearing above the skyline, however their distance at over 40km would mean that excellent visibility would be required to see these limited parts and some may not be noticed. Due to the distance between the viewpoint and the OSPs, combined with the curvature of the earth, only the upper parts of one of the OSPs would be visible within this view. The Development would introduce offshore wind farm visibility across a relatively narrow extent of the wide panoramic sea views from this location. The Development would be apparent out in the open sea rather than encroaching above or near to land. There is a wide stretch of intervening, open sea visible from this section of coast. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south and east of the wind farm, and this would occur at closer proximity to the viewpoint. However, this would involve relatively few vessels. ***Magnitude of change: medium-low***		appearing and disappearing above the skyline, however their distance at over 40km would mean that excellent visibility would be required to see these limited parts and some may not be noticed. Due to the distance between the viewpoint and the OSPs, combined with the curvature of the earth, only the upper parts of one of the OSPs would be visible within this view. The Development would introduce offshore wind farm visibility across a relatively narrow extent of the wide panoramic sea views from this location. The Development would be apparent out in the open sea rather than encroaching above or near to land. There is a wide stretch of intervening, open sea visible from this section of coast. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south and east of the wind farm, and this would occur at closer proximity to the viewpoint. However, this would involve relatively few vessels. ***Magnitude of change: medium-low***		
Viewpoint 19: Portnockie (Bow Fiddle Rock Info Point) Located within RCCA Portgordon to Portknockie and Coastal LCT. There are no scenic landscape designations. Sensitivity: medium - high	**Operation** Field of view affected by the Development is approximately 32.5 degrees. Distance from the Development (closest turbine of WCS) 39 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 52 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The ZTVs illustrate that parts of 51-62 turbines are theoretically visible with all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, largely undeveloped, sea views that lie approximately to the north north west. At this distance the curvature of the earth would reduce the apparent height of all of the turbines with those furthest away having hubs and a small section of their towers theoretically visible. The view direction to the centre of the Development is approximately north of north north west. This means that the sun may strike the turbines on their east round to their west sides and this may be apparent from this direction from morning to late afternoon. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most	**Operation** Not significant, negative, long term, reversible. This is largely due to narrow vertical and horizontal fields of view affected as part of a wide panorama of open sea view. Also, the location of the Development set away from the coast. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect** Excellent visibility required for the Development to be visible at 39 km to closest turbine.	**Operation** Field of view affected by the Development is approximately 22 degrees. Distance from the Development (closest turbine of WCS) 35.9 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 53 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'very good visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The ZTVs illustrate that parts of 61-72 turbines are theoretically visible with all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, largely undeveloped, sea views that lie approximately to the north north west. At this distance the curvature of the earth would reduce the apparent height of all of the turbines with those furthest away having hubs and a small section of their towers theoretically visible. The view direction to the centre of the Development is approximately north of north north west. This means that the sun may strike the turbines on their east round to their west sides and this may be apparent from this direction from morning to late afternoon. This could potentially increase contrast, making them more noticeable when the visibility is very good. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most northerly turbines of the wind farm would be most apparent due to the prevalent angle of view.	**Operation** Not significant, negative, long term, reversible. This is largely due to narrow vertical and horizontal fields of view affected as part of a wide panorama of open sea view. Also, the location of the Development set away from the coast. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect** Very Good visibility required for the Development to be visible at 35.9 km to closest turbine.	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, This reduces the effect of the Development. The distance from the viewpoint to the nearest turbine is greater for the mitigated Model 3 layout than for the Model 4f layout. The horizontal and vertical fields of view occupied by the mitigated Model 3 layout are reduced when compared with those of the Model 4f layout. There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense. Whilst offshore wind farm views would generally be a new addition to this view they would be seen only in very good visibility at a considerable distance as pale coloured, moving, vertical structures against a sky backdrop. There are substantial parts of the wide, panoramic horizon that remain as open sea in views from this location. The mitigated Model 3 layout array does not link across to the distant landform of Caithness. This is an improvement when compared with the Model 4f layout which extends to the distant coastline. The alignment of the turbine rows in the mitigated Model 3 layout is slightly apparent in the part of the Development that appears at the eastern end

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
	northerly turbines of the wind farm would be most apparent due to the prevalent angle of view. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these would only just be theoretically visible above the skyline. The Development would introduce offshore wind farm visibility across a moderate extent of the wide panoramic sea views from this location. The alignment of the turbines of the WCS is apparent within parts of this view. The large turbine spacing is made more noticeable by the outlying turbines on the south western extents of the Development. The Development would be apparent out in the open sea rather than encroaching above or near to land. There is a wide stretch of intervening, open sea visible from this section of coast. However, it would occur in the direction of the view that is towards Bow Fiddle Rock, which is the focus of views from this location. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south and east of the wind farm, and this would occur at closer proximity to the viewpoint. However, this would involve relatively few vessels. ***Magnitude of change: medium-low***		Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these would only just be theoretically visible above the skyline. The Development would introduce offshore wind farm visibility across a moderate extent of the wide panoramic sea views from this location. The alignment of the turbines of the WCS is apparent within parts of this view. The Development would be apparent out in the open sea rather than encroaching above or near to land. There is a wide stretch of intervening, open sea visible from this section of coast. However, it would occur in the direction of the view that is towards Bow Fiddle Rock, which is the focus of views from this location. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south and east of the wind farm, and this would occur at closer proximity to the viewpoint. However, this would involve relatively few vessels. ***Magnitude of change: medium-low***		of the array. This was also the case with the Model 4f layout.
Viewpoint 21: Findlater Castle Located in RCCA Sandend Bay and within The Coast LCT. Lies within locally designated SLA – North Aberdeenshire Coast. Sensitivity: medium- high	**Operation** Field of view affected by the Development is approximately 31.5 degrees. Distance from the Development (closest turbine of WCS) 42.3 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 53.5 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'excellent visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The ZTVs illustrate that parts of 51-62 turbines are theoretically visible with all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, panoramic, largely undeveloped, sea views that lie approximately north of north north west of the viewpoint. At this distance the curvature of the earth would reduce the apparent height of all of the turbines with those furthest away having hubs and a small section of their towers theoretically visible. The view direction to the centre of the Development is approximately north of north north west. This means that the sun may strike the turbines on their east round to their west sides and this may be apparent from this direction from morning to late afternoon. This could potentially increase contrast, making them more noticeable when the visibility is excellent. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the	**Operation** Not significant, negative, long term, reversible. This is largely due distance and the narrow vertical and horizontal fields of view affected. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect** Excellent visibility required for the Development to be visible at 42.3 km to closest turbine.	**Operation** Field of view affected by the Development is approximately 22 degrees. Distance from the Development (closest turbine of WCS) 38.9 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 55 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'excellent visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The ZTVs illustrate that parts of 61-72 turbines are theoretically visible with all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, panoramic, largely undeveloped, sea views that lie approximately north of north north west of the viewpoint. At this distance the curvature of the earth would reduce the apparent height of all of the turbines with those furthest away having hubs and a small section of their towers theoretically visible. The view direction to the centre of the Development is approximately north of north north west. This means that the sun may strike the turbines on their east round to their west sides and this may be apparent from this direction from morning to late afternoon. This could potentially increase contrast, making them more noticeable when the visibility is excellent. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the	**Operation** Not significant, negative, long term, reversible. This is largely due distance and the narrow vertical and horizontal fields of view affected. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect** Very good visibility required for the Development to be visible at 38.9 km to closest turbine.	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, The distance from the viewpoint to the nearest turbine is less for the mitigated Model 3 layout than for the Model 4f layout. The horizontal field of view occupied by the mitigated Model 3 layout is reduced by almost 10 degrees when compared with that of the Model 4f layout. The vertical field of view occupied by the smaller turbines of the mitigated Model 3 layout is very similar to that of Model 4f (due to their closer proximity). There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense. Whilst offshore wind farm views would generally be a new addition to this view (except when there is exceptionally good visibility that allow views of BOWL) there are substantial parts of the wide, panoramic horizon that remain as open sea in views from this location. The mitigated Model 3 layout array does not link across to the distant landform of Caithness. This is an improvement when compared with the Model 4f layout which extends to the distant coastline.

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area

Representative Viewpoint and baseline sensitivity	Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area	Significance of Effects as a result of the WCS within the current Moray West Site area	Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area	Assessment of effect significance and conclusions	Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS
	influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most northerly turbines of the wind farm would be most apparent due to the prevalent angle of view. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these would only just be theoretically visible above the skyline. The Development would introduce offshore wind farm visibility across a moderate extent of the partially constrained but wide sea views from this location. The layout of the WCS turbines appears regular and legible within this view. The large turbine spacing is made more noticeable by the outlying turbines on the south western extents of the Development. The Development would be apparent out in the open sea rather than encroaching above or near to land. There is a wide stretch of intervening, open sea visible from this section of coast. The south westerly turbines would potentially be partially backclothed by the distant Caithness coast. However, at a range of over 60 km this would require very clear conditions. The direction of the Development would lie within the distant backdrop of the view towards Findlater Castle (just visible in the viewpoint photo) which is the key focus of views from this location. There is, however, a broad stretch of sea between the Castle and the Development. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south and east of the wind farm, and this would occur at closer proximity to the viewpoint. However, this would involve relatively few vessels. ***Magnitude of change: medium-low***		influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most northerly turbines of the wind farm would be most apparent due to the prevalent angle of view. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these would only just be theoretically visible above the skyline. The Development would introduce offshore wind farm visibility across a moderate extent of the partially constrained but wide sea views from this location. The layout of the WCS turbines appears regular and legible within this view. The Development would be apparent out in the open sea rather than encroaching above or near to land. There is a wide stretch of intervening, open sea visible from this section of coast. The south westerly turbines would potentially be partially backclothed by a small section of the distant Caithness coast (but not the most visible sections). However, at a range of over 60 km this would require very clear conditions. The direction of the Development would lie within the distant backdrop of the view towards Findlater Castle (just visible in the viewpoint photo) which is the key focus of views from this location. There is, however, a broad stretch of sea between the Castle and the Development. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south and east of the wind farm, and this would occur at closer proximity to the viewpoint. However, this would involve relatively few vessels. ***Magnitude of change: medium-low***		
Viewpoint 22: Sandend Located within RCCA 21 Sandend Bay and The Coast LCT. Sensitivity – medium - high	**Operation** Field of view affected by the Development is approximately 4.5 degrees. Distance from the Development (closest turbine of WCS) 43.7 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 55 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'excellent visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The Development would theoretically span across approximately 4.5 degrees of the panoramic, open sea views. The ZTVs illustrate that parts of 11-20 turbines are theoretically visible with all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, panoramic, largely undeveloped, sea views that lie approximately north of north north west of the viewpoint.	**Operation** Not significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. This is a precautionary assessment of the effects due to the potential options for short term works located close to this viewpoint or short term views of large vessels/rigs located relatively close to the shore.	**Operation** Field of view affected by the Development is approximately 4 degrees. Distance from the Development (closest turbine of WCS) 40.3 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 56 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in 'excellent visibility' conditions. The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The Development would theoretically span across approximately 4 degrees of the panoramic, open sea views. The ZTVs illustrate that parts of 13-24 turbines are theoretically visible with all of these visible to just below hub level. The Development would be located on the skyline within a part of the broad, panoramic, largely undeveloped, sea views that lie approximately north of north north west of the viewpoint. At this distance the curvature of the earth would reduce the apparent height of all of the turbines with those furthest away having hubs and a small section of their towers theoretically visible.	**Operation** Not significant, negative, long term, reversible. **Construction and decommissioning** Significant, negative, short term, reversible. This is a precautionary assessment of the effects due to the potential options for short term works located close to this viewpoint or short term views of large vessels/rigs located relatively close to the shore.	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, The distance from the viewpoint to the nearest turbine is less for the mitigated Model 3 layout than for the Model 4f layout but remains at distance where the visual impact is limited. The horizontal field of view occupied by the mitigated Model 3 layout is slightly smaller when compared with that of the Model 4f layout. The vertical field of view occupied by the smaller turbines of the mitigated Model 3 layout is very similar to that of Model 4f (due to their closer proximity). Whilst offshore wind farm views would generally be a new addition to this view they would be seen only in very good visibility at a considerable distance as pale coloured, moving, vertical structures against a sky backdrop. There are substantial parts of the

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
	At this distance the curvature of the earth would reduce the apparent height of all of the turbines with those furthest away having hubs and a small section of their towers theoretically visible. The view direction to the centre of the Development is approximately north of north north west. This means that the sun may strike the turbines on their east round to their west sides and this may be apparent from this direction from morning to late afternoon. This could potentially increase contrast, making them more noticeable when the visibility is excellent. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most northerly turbines of the wind farm would be most apparent due to the prevalent angle of view. The OSPs would not be visible within this view. The Development would introduce offshore wind farm visibility across a relatively narrow extent of the partially constrained sea views from this location. The layout of the WCS turbines appears regular and legible within this view. The Development would be apparent extending out to sea from behind the craggy, settled shoreline which may result in some visual confusion between the built form and the more distant turbines. ***Magnitude of change: low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when the majority of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route would introduce visibility of further vessels and activity particularly during the laying of the near shore cables to the landfall which would occur within or near to this bay. This may include a large cable lay vessel. A support vessel(s) and offshore HDD rig if using HDD. The support vessel and HDD rig may be visible from the shore at relatively close range for a few weeks. If alternative trenching techniques used there would be visibility of a plough or jet trenching tool on the beach/nearshore waters. Depending on the conditions at the coast there may be a requirement for a coffer dam (steel sheeting to hold the trench open while the cable is pulled ashore). This would be temporary, lasting a small number of days. Such changes to this view would be short or medium in duration. ***Magnitude of change: medium-low***	**Likelihood of effect** Excellent visibility required for the Development to be visible at 43.7 km to closest turbine. ‘	The view direction to the centre of the Development is approximately north of north north west. This means that the sun may strike the turbines on their east round to their west sides and this may be apparent from this direction from morning to late afternoon. This could potentially increase contrast, making them more noticeable when the visibility is excellent. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, slightly reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most northerly turbines of the wind farm would be most apparent due to the prevalent angle of view. The OSPs would not be visible within this view. The Development would introduce offshore wind farm visibility across a relatively narrow extent of the partially constrained sea views from this location. The layout of the WCS turbines appears regular and legible within this view. The Development would be apparent extending out to sea from behind the craggy, settled shoreline which may result in some visual confusion between the built form and the more distant turbines. ***Magnitude of change: low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when the majority of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route would introduce visibility of further vessels and activity particularly during the laying of the near shore cables to the landfall which would occur within or near to this bay. This may include a large cable lay vessel. A support vessel(s) and offshore HDD rig if using HDD. The support vessel and HDD rig may be visible from the shore at relatively close range for a few weeks. If alternative trenching techniques used there would be visibility of a plough or jet trenching tool on the beach/nearshore waters. Depending on the conditions at the coast there may be a requirement for a coffer dam (steel sheeting to hold the trench open while the cable is pulled ashore). This would be temporary, lasting a small number of days. Such changes to this view would be short or medium in duration. ***Magnitude of change: medium-low***	**Likelihood of effect** Excellent visibility required for the Development to be visible at 40.3 km to closest turbine. ‘	wide, panoramic horizon that remain as open sea in views from this location.
Viewpoint 23: Portsoy Located within RCCA Sandend Bay and The Coast LCT. Sensitivity – medium-high	**Operation** Field of view affected by the Development is approximately 29.5 degrees. Distance from the Development (closest turbine of WCS) 44.7 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 55 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in ‘excellent visibility’ conditions.	**Operation** Not significant, negative, long term, reversible. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect**	**Operation** Field of view affected by the Development is approximately 22 degrees. Distance from the Development (closest turbine of WCS) 41.1 km. The increased separation of the viewpoint and the more distant turbines means that they are likely to be less visible than the closest. The distance to the most distant turbine of the WCS is 56 km. This distance results in the turbines theoretically appearing as small scale, vertical, moving features visible in ‘excellent visibility’ conditions.	**Operation** Not significant, negative, long term, reversible. **Construction and decommissioning** Not significant, negative, short term, reversible. **Likelihood of effect**	The maximum height of the mitigated Model 3 layout turbines is smaller than those of the Model 4f layout, The distance from the viewpoint to the nearest turbine is less for the mitigated Model 3 layout than for the Model 4f layout. The horizontal field of view occupied by the mitigated Model 3 layout is reduced when compared with that of the Model 4f layout. The vertical field of view occupied by the smaller turbines of the mitigated Model 3 layout is very

Table 11.1 Assessment of effects on representative viewpoints associated with the Alternative Moray West Site area					
Representative Viewpoint and baseline sensitivity	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**	**Comparison between the impacts of the Model 4f WCS and the mitigated Model 3 WCS**
	The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The ZTVs illustrate that parts of 51-62 turbines are theoretically visible with all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, panoramic, largely undeveloped, sea views that lie approximately north north west of the viewpoint. At this distance the curvature of the earth would markedly reduce the apparent height of all of the turbines with those furthest away having only hubs theoretically visible. The view direction to the centre of the Development is approximately north of north north west. This means that the sun may strike the turbines on their east round to their west sides and this may be apparent from this direction from morning to late afternoon. This could potentially increase contrast, making them more noticeable when the visibility is excellent. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most northerly turbines of the wind farm would be most apparent due to the prevalent angle of view. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these would not be visible within this view. The Development would introduce offshore wind farm visibility across a moderate extent of the wide sea views from this location. The layout of the WCS turbines appears regular and legible within this view. The large turbine spacing is made more noticeable by the outlying turbines on the south western extents of the Development. The Development would be apparent out in the open sea rather than encroaching above or near to land. There is a wide stretch of intervening, open sea visible from this section of coast. The south westerly turbine would potentially be partially backclothed by the distant Caithness coast. However, at a range of over 65 km this would require very clear conditions. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south and east of the wind farm, and this would occur at closer proximity to the viewpoint. However, this would involve relatively few vessels. ***Magnitude of change: medium-low***	Excellent visibility required for the Development to be visible at 44.7 km to closest turbine.	The vertical angle of view occupied by the Development theoretically takes up 0-0.5 degrees of the field of view. This is reduced due to the curvature of the earth, which screens the lower extents of the turbine towers. The ZTVs illustrate that parts of 61-72 turbines are theoretically visible with all of these visible to below hub level. The Development would be located on the skyline within a part of the broad, panoramic, largely undeveloped, sea views that lie approximately north north west of the viewpoint. At this distance the curvature of the earth would markedly reduce the apparent height of all of the turbines with those furthest away having only hubs theoretically visible. The view direction to the centre of the Development is approximately north of north north west. This means that the sun may strike the turbines on their east round to their west sides and this may be apparent from this direction from morning to late afternoon. This could potentially increase contrast, making them more noticeable when the visibility is excellent. Due to the prevailing wind the turbines would most usually be seen so that the rotor faces are aligned at an angle to the viewpoint, reducing the influence of the blade movement and also the overall dimension of the part of the view affected by each turbine. The rotating blades of the most northerly turbines of the wind farm would be most apparent due to the prevalent angle of view. Due to the distance between the viewpoint and the OSPs combined with the curvature of the earth these would not be visible within this view. The Development would introduce offshore wind farm visibility across a moderate extent of the wide sea views from this location. The layout of the WCS turbines appears regular and legible within this view. The large turbine spacing is made more noticeable by the outlying turbines on the south western extents of the Development. The Development would be apparent out in the open sea rather than encroaching above or near to land. There is a wide stretch of intervening, open sea visible from this section of coast. ***Magnitude of change: medium-low*** **Construction and decommissioning** The WCS of both the construction and decommissioning will be when large numbers of turbines are in place in addition to concentrations of activity in the form of marine vessels and cranes. These activities associated with the Development turbines and OSPs will be distant. The construction of the offshore cable route may introduce visibility of further vessels to the south and east of the wind farm, and this would occur at closer proximity to the viewpoint. However, this would involve relatively few vessels. ***Magnitude of change: medium-low***	Excellent visibility required for the Development to be visible at 41.1 km to closest turbine.	similar to that of Model 4f (due to its closer proximity). There are more turbines within the mitigated Model 3 layout than in the Model 4f layout so that the layout appears slightly more dense. Whilst offshore wind farm views would be a new addition to this view there are substantial parts of the wide, panoramic horizon that remain as open sea in views from this location. The mitigated Model 3 layout array does not link across to the distant landform of Caithness. This is an improvement when compared with the Model 4f layout which extends to the distant coastline.

Table 11.2 Assessment of effects on represenative night time viewpoints associated with the Alternative Moray West Site area				
Impacts assessed in the current EIA (July 2018)	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Viewpoint 12: Navidale Sensitivity to change: medium	**Operation** The red turbine lights on the hubs of the perimeter turbines of the Development would be visible in the view. The lights would be visible across much of the sea skyline. The Development would appear as an extension to BOWL and extend lights across the area currently affected by the lights of the Beatrice Demonstrator Turbines and the oil platforms and beyond across an area that is unaffected by static light sources. The lights of the Development would initially be seen in the context of the lit oil platforms, which would likely be in existence for part of the operational life of the Development. The turbine lights are higher than these structures. The difference in height of the turbines of the Development compared to those of BOWL would not be immediately noticeable. The apparent intensity of the lights would be slightly stronger than those of BOWL due to the closer range of the Development at 26.7 km (model 4f layout). The lights of both the model 2 and model 4f layouts appear randomly spaced across the view with the slightly lower height and higher density of lights in the model 2 layout noticeable when they are directly compared. The prevailing south westerly wind would mean that the lights on the hubs would mostly be intermittently obscured by intervening blades so that they would generally appear to flicker slightly. The appearance of the red turbine lights will be of similar intensity to the lights on the Beatrice Demonstrator Turbines, with the effect extended over a larger portion of the sea skyline, such that a large proportion of the sea skyline in the view would be occupied by a loose smattering of red turbine lights. The red	**Operation** Significant, negative, long term, reversible **Construction and decommissioning** Significant, negative, short term, reversible	**Operation** The red turbine lights on the hubs of the perimeter turbines of the Development would be visible in the view. The lights would be visible across much of the sea skyline. The Development would appear as an extension to BOWL and extend lights across the area currently affected by the lights of the Beatrice Demonstrator Turbines and the oil platforms and beyond across an area that is unaffected by static light sources. The lights of the Development would initially be seen in the context of the lit oil platforms, which would likely be in existence for part of the operational life of the Development. The turbine lights are higher than these structures. The difference in height of the turbines of the Development compared to those of BOWL would not be immediately noticeable. The apparent intensity of the lights would be slightly stronger than those of BOWL due to the closer range of the Development at 30.4 km (mitigated Model 3 layout). The lights of both the mitigated Model 2 and Model 3 layouts appear randomly spaced across the view with the slightly lower height and higher density of lights in the model 2 layout noticeable when they are directly compared. The prevailing south westerly wind would mean that the lights on the hubs would mostly be intermittently obscured by intervening blades so that they would generally appear to flicker slightly. The appearance of the red turbine lights will be of similar intensity to the lights on the Beatrice Demonstrator	Operation Significant, negative, long term, reversible Construction and decommissioning Significant, negative, short term, reversible

Table 11.2 Assessment of effects on represenative night time viewpoints associated with the Alternative Moray West Site area				
Impacts assessed in the current EIA (July 2018)	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	turbine lights will be substantially diminished due to the distance of the Development offshore. Although the lighting introduces further lights into the seascape, the lights are an extension/increase in intensity of an existing light characteristic of the baseline view and due to their relatively low position on the distant skyline, do not impede the view of the night sky. The lights are likely to be viewed with the dark silhouette of the wind turbines during the hours around dusk and as point features of light during the darker hours of the night. It is considered that the level of the magnitude of change would not differ for the two layouts. This is largely due to similarity of the distance from the viewpoint to the lights and also the horizontal extent of the view they extend across. ***Magnitude of change: medium*** **Construction and decommissioning** During this period the maximum levels of change in the views would be when there are large numbers of vessels and jack-up barges visible in the view, potentially in addition to lit turbines. The light levels and point source nature of these vessels would be similar to those currently constructing BOWL or the oil platforms seen within the view. ***Magnitude of change: medium***		Turbines, with the effect extended over a larger portion of the sea skyline, such that a large proportion of the sea skyline in the view would be occupied by a loose smattering of red turbine lights. The red turbine lights will be substantially diminished due to the distance of the Development offshore. Although the lighting introduces further lights into the seascape, the lights are an extension/increase in intensity of an existing light characteristic of the baseline view and due to their relatively low position on the distant skyline, do not impede the view of the night sky. The lights are likely to be viewed with the dark silhouette of the wind turbines during the hours around dusk and as point features of light during the darker hours of the night. It is considered that the level of the magnitude of change would not differ for the two layouts. This is largely due to similarity of the distance from the viewpoint to the lights and also the horizontal extent of the view they extend across. ***Magnitude of change: medium*** **Construction and decommissioning** During this period the maximum levels of change in the views would be when there are large numbers of vessels and jack-up barges visible in the view, potentially in addition to lit turbines. The light levels and point source nature of these vessels would be similar to those currently constructing BOWL or the oil platforms seen within the view. ***Magnitude of change: medium***	

Table 11.2 Assessment of effects on represenative night time viewpoints associated with the Alternative Moray West Site area				
Impacts assessed in the current EIA (July 2018)	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Viewpoint 16: Lossiemouth Harbour Sensitivity to change: medium	**Operation** The red turbine lights on the hubs of the perimeter turbines of the Development would be visible in the view. The lights would be visible above a relatively narrow part of the wide sea view (22.4 degrees). The prevailing south westerly wind would mean that the lights on the hubs would mostly be intermittently obscured by intervening blades so that they may appear to flicker slightly. The red turbine lights will be substantially diminished due to the distance of the Development offshore (31.7 km – Model 4f layout). This would increase with distance with the turbines on the far perimeter appearing lower above the skyline and often much less intense than those nearer. The lights of both the model 2 and model 4f layouts appear randomly spaced across the view with the slightly lower height and higher density of lights in the model 2 layout noticeable when they are directly compared. Some of the lights of the most distant turbines in the Model 2 layout view would appear close to or on the distant horizon (when it is also visible). The perimeter turbine lighting introduces static light sources into a wide seascape which otherwise has few the lights and is a large expanse of darkness. Due to their relatively low position on the distant skyline, the lights do not impede the view of the night sky. The lights of the Development would be seen at a great distance so that the lit point sources would appear very small. Whilst they may be apparent in clear atmospheric conditions they would not be	**Operation** Not significant, negative, long term, reversible **Construction and decommissioning** Not significant, negative, short term, reversible	**Operation** The red turbine lights on the hubs of the perimeter turbines of the Development would be visible in the view. The lights would be visible above a relatively narrow part of the wide sea view (17 degrees). The prevailing south westerly wind would mean that the lights on the hubs would mostly be intermittently obscured by intervening blades so that they may appear to flicker slightly. The red turbine lights will be substantially diminished due to the distance of the Development offshore (34.4 km – mitigated Model 3 layout). This would increase with distance with the turbines on the far perimeter appearing lower above the skyline and often much less intense than those nearer. The lights of both the model 2 and model 3 layouts appear randomly spaced across the view with the slightly lower height and higher density of lights in the model 2 layout noticeable when they are directly compared. Some of the lights of the most distant turbines in the Model 2 layout view would appear close to or on the distant horizon (when it is also visible). The perimeter turbine lighting introduces static light sources into a wide seascape which otherwise has few the lights and is a large expanse of darkness. Due to their relatively low position on the distant skyline, the lights do not impede the view of the night sky. The lights of the Development would be seen at a great distance so that the lit point sources would appear very small. Whilst they may be apparent in clear atmospheric conditions they	**Operation** Not significant, negative, long term, reversible **Construction and decommissioning** Not significant, negative, short term, reversible

Table 11.2 Assessment of effects on represenative night time viewpoints associated with the Alternative Moray West Site area				
Impacts assessed in the current EIA (July 2018)	**Magnitude of impact identified in the assessment of effects as a result of the WCS within the current Moray West Site area**	**Significance of Effects as a result of the WCS within the current Moray West Site area**	**Commentary on potential magnitude of impact as a result of the WCS within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	sufficiently prominent to materially diminish the otherwise dark seascape. The lights are likely to be viewed with the dark silhouette of the wind turbines during the hours around dusk and as point features of light during the darker hours of the night. It is considered that the level of the magnitude of change would not differ for the two layouts. This is largely due to similarity of the distance from the viewpoint to the lights and also the horizontal extent of the view they extend across. ***Magnitude of change: medium- low*** **Construction and decommissioning** During this period the maximum levels of change in the views would be when there are large numbers of vessels and jack-up barges visible in the view, potentially in addition to lit turbines. ***Magnitude of change: medium-low***		would not be sufficiently prominent to materially diminish the otherwise dark seascape. The lights are likely to be viewed with the dark silhouette of the wind turbines during the hours around dusk and as point features of light during the darker hours of the night. It is considered that the level of the magnitude of change would not differ for the two layouts. This is largely due to similarity of the distance from the viewpoint to the lights and also the horizontal extent of the view they extend across. ***Magnitude of change: medium- low*** **Construction and decommissioning** During this period the maximum levels of change in the views would be when there are large numbers of vessels and jack-up barges visible in the view, potentially in addition to lit turbines. ***Magnitude of change: medium-low***	

Through the process of the reassessment of the selected daytime and night time viewpoints it has been established that there is, in all cases, a reduction in the magnitude of change in the views when the WCS mitigated Model 3 Layout is compared with the WCS Model 2 and Model 4f layouts considered in the EIA Report, Chapter 14, SLVIA.

This is due to a combination of the reduction in the maximum turbine height, a reduction in the field of view affected by the Development and in many cases also an increase in the distance to the nearest turbines. In some views the Development turbines are now set away from the coastline (Viewpoint 3: Wick) or are no longer back-clothed by the opposite coastline of the Moray Firth (Viewpoint 21: Findlater Castle). The layout, although slightly more dense when compared with the Model 4f Layout (due to the greater number of turbines located within a similar area) has a greater consistency so that it no longer has the 'outliers' of the Model 4f WCS layout. In addition, in many views a larger expanse of open sea horizon would be visible.

The reduction in turbine height between the WCSs has a three-fold influence in reducing the impacts. The scale of the turbines in the views is reduced where they are seen at the same or greater distance than was the case with the WCS Model 4f layout when assessed in the EIA Report 2018 SLVIA. The lower tip height is also more similar to the tip height of the BOWL turbines that would often be seen in the same views and this reduces the discord when they are seen together. In addition, the lower turbine tip height reduces the overall spread of theoretical visibility as shown in Figure 11.2: Comparative ZTV – SLVIA 4f and Model 3 layouts.

In the views from around the more confined area of the Moray Firth along the east Sutherland coast and north-western Moray at (Viewpoint 13a: Brora and Viewpoint 16: Lossiemouth) the nearest turbines are at a substantially greater distance than was the case for the Model 4f layout assessed as the WCS in the EIA Report 2018 SLVIA.

Further along the Moray Coast at Viewpoint 19: Portnockie (Bow Fiddle Rock Information Point) the turbines are closer than was previously the case, however due to their comparatively smaller size (when compared with the Model 4f WCS) they appear of a very similar scale overall. In addition, the horizontal field of view affected by the Development would be smaller.

In the distant views from Aberdeenshire (Viewpoint 21: Findlater Castle, Viewpoint 22: Sandend and Viewpoint 23: Portsoy) the turbines are located at slightly closer proximity than was previously the case in the Model 4f layout assessed as the WCS in the EIA Report 2018 SLVIA. However, due to their comparatively smaller size (when compared with the Model 4f WCS) they appear of a very similar scale. In addition, the horizontal field of view affected by the development in the Alternative Moray West Site area would be less in all of these views so that overall the impacts are reduced.

In the night time assessment the magnitudes of impact would be slightly less than those assessed in the SLVIA due to the narrower field of view affected and the reduced vertical height of the turbines proposed. In addition, there are less lit peripheral turbines in both the mitigated Model 2 (49 No.) and the Mitigated Model 3 (33 No.) scenarios than were assessed in the EAI Report 2018 SLVIA whereby the Model 2 scenario had 52 peripheral turbines lit and Model 4f had 40 peripheral turbines lit. The hub height ZTV for the mitigated Model 3 layout (Figure 11.3) shows the theoretical visibility of the medium intensity lights on the peripheral turbine hubs. The lower hub height of the mitigated Model 3 Layout ensures that the area of theoretical visibility is reduced when compared with the Model 4f WCS assessed in the EIA Report 2018.

As described in the tables above the changes to the WCS have resulted in a reduced magnitude of impact in all cases. However, these changes do not alter the assessed levels of the overall magnitude, which remain within the same bands.

This information can be extrapolated to inform the re-assessment of the effects on the visual receptors in the study area.

It is assessed that there would be no change to the levels of impact magnitude attributed to the changes in the views from the visual receptors in relation to the mitigated Model 3 WCS and therefore no change to the receptors where significant effects were identified.

11.7.5 Effects on seascape and landscape receptors

The effects on the character of the seascape and landscape receptors would occur purely as a result of the change in the views as part of the wider context of the receptors. The assessment of the effects on views can be extrapolated to inform the assessment of the effects of the Mitigated Model 3 layout on the seascape and landscape receptors in the study area.

It is assessed that there would be no change to the levels of magnitude attributed to the impacts in the views from the seascape, landscape receptors in relation to the Mitigated Model 3 WCS when compared with the effects of the Model 4f WCS assessed in the EIA Report 2018 SLVIA.

11.7.6 Summary of Development Specific Assessment

Table 11.4 summarises the findings of the assessment of the Alternative Moray West Site area contained in Section 11.8 where effects have been considered.

Table 11.3 Summary of Development Specific Assessment of the Alternative Moray West Site area					
Receptor	**Sensitivity of Receptor**	**Magnitude of Impact- Operation**	**Effect Significance Operation**	**Magnitude of Impact- Construction/ Decommissioning**	**Effect Significance Construction/ Decommissioning**
Visual -selected representative viewpoints (Day)					
Viewpoint 3: Wick (path south of South View)	Medium-high	Medium-low	Significant, negative, long term, reversible	Medium-low	Significant, negative, short term, reversible
Viewpoint 4: Sarclet (Sarclet Haven Info Board)	Medium-high	Medium	Significant, negative, long term, reversible	Medium	Significant, negative, short term, reversible
Viewpoint 7: Lybster (end of Main Street)	Medium-high	Medium	Significant, negative, long term, reversible	Medium	Significant, negative, short term, reversible
Viewpoint 9a: Dunbeath (nr Heritage Centre)	Medium-high	Medium	Significant, negative, long term, reversible	Medium	Significant, negative, short term, reversible
Viewpoint 12: Navidale	Medium-high	Medium	Significant, negative, long term, reversible	Medium	Significant, negative, short term, reversible
Viewpoint 13a: Brora (picnic area off Salt Street)	Medium-high	Medium-low	Not-significant, negative, long term, reversible	Medium-low	Not-significant, negative, short term, reversible
Viewpoint 16: Lossiemouth Harbour	Medium-high	Medium-low	Not-significant, negative, long term, reversible	Medium-low	Not-significant, negative, short term, reversible
Viewpoint 19 Portnockie (Bow Fiddle Rock Info Point):	Medium-high	Medium-low	Not-significant, negative, long term, reversible	Medium-low	Not-significant, negative, short term, reversible
Viewpoint 21: Findlater Castle	Medium-high	Medium-low	Not-significant, negative, long term, reversible	Medium-low	Not-significant, negative, short term, reversible
Viewpoint 22: Sandend	Medium-high	low	Not-significant, negative, long term, reversible	Medium-low	Significant, negative, short term reversible

Table 11.3 Summary of Development Specific Assessment of the Alternative Moray West Site area					
Receptor	**Sensitivity of Receptor**	**Magnitude of Impact- Operation**	**Effect Significance Operation**	**Magnitude of Impact- Construction/ Decommissioning**	**Effect Significance Construction/ Decommissioning**
Viewpoint 23: Portsoy	Medium-high	Medium-low	Not-significant, negative, long term, reversible	Medium-low	Not-significant, negative, short term, reversible
Visual – People in Settlements					
Wick	Medium-high	South facing aspects and gardens of the properties on the south eastern extents of Proudfoot, Papigoe and Staxigoe: east of Proudfoot Road; South View and Murray Avenue; Broadhaven Road; Mowat Place; Cormack Crescent; Cliff Cottages; and from the south eastern extents of Old Wick: Kennedy Terrace; Roxburgh Road; and Battery Road. Core Paths out to North Head and South Head as well as coastal path to the Castle of Old Wick. **Medium-low** Other locations in Wick. **Low or negligible**	South facing aspects and gardens of the properties on the south eastern extents of Proudfoot, Papigoe and Staxigoe: east of Proudfoot Road; South View and Murray Avenue; Broadhaven Road; Mowat Place; Cormack Crescent; Cliff Cottages; and from the south eastern extents of Old Wick: Kennedy Terrace; Roxburgh Road; and Battery Road. Core Paths out to North Head and South Head as well as coastal path to the Castle of Old Wick. **Significant, negative, long term, reversible** Other locations in Wick. **Not-significant, negative, long term, reversible**	South facing aspects and gardens of the properties on the south eastern extents of Proudfoot, Papigoe and Staxigoe: east of Proudfoot Road; South View and Murray Avenue; Broadhaven Road; Mowat Place; Cormack Crescent; Cliff Cottages; and from the south eastern extents of Old Wick: Kennedy Terrace; Roxburgh Road; and Battery Road. Core Paths out to North Head and South Head as well as coastal path to the Castle of Old Wick. **Medium-low** Other locations in Wick. **Low or negligible**	South facing aspects and gardens of the properties on the south eastern extents of Proudfoot, Papigoe and Staxigoe: east of Proudfoot Road; South View and Murray Avenue; Broadhaven Road; Mowat Place; Cormack Crescent; Cliff Cottages; and from the south eastern extents of Old Wick: Kennedy Terrace; Roxburgh Road; and Battery Road. Core Paths out to North Head and South Head as well as coastal path to the Castle of Old Wick. **Significant, negative, short term, reversible** Other locations in Wick. **Not-significant, negative, short term, reversible**
Thrumster	Medium	Low	Not-significant, negative, long term, reversible	Low	Not-significant, negative, short term, reversible

Table 11.3 Summary of Development Specific Assessment of the Alternative Moray West Site area					
Receptor	**Sensitivity of Receptor**	**Magnitude of Impact- Operation**	**Effect Significance Operation**	**Magnitude of Impact- Construction/ Decommissioning**	**Effect Significance Construction/ Decommissioning**
Lybster	Medium-high	In open sea views to the south round to the south east from the end of Main Street and properties on Southend, Shelligoe Road, Golf View Place, Golf View Drive, Gray's Place/Main Street, the golf course and the Core Paths that lead to the coast. **Medium** Other locations in Lybster. **Low or negligible**	In open sea views to the south round to the south east from the end of Main Street and properties on Southend, Shelligoe Road, Golf View Place, Golf View Drive, Gray's Place/Main Street, the golf course and the Core Paths that lead to the coast. **Significant, negative, long term, reversible.** Other locations in Lybster. **Not-significant, negative, long term, reversible**	In open sea views to the south round to the south east from the end of Main Street and properties on Southend, Shelligoe Road, Golf View Place, Golf View Drive, Gray's Place/Main Street, the golf course and the Core Paths that lead to the coast. **Medium** Other locations in Lybster. **Low or negligible**	In open sea views to the south round to the south east from the end of Main Street and properties on Southend, Shelligoe Road, Golf View Place, Golf View Drive, Gray's Place/Main Street, the golf course and the Core Paths that lead to the coast. **Significant, negative, short term, reversible** Other locations in Lybster. **Not-significant, negative, short term, reversible**
Latheronwheel	Medium-high	In open sea views to the east south east round to the south south east from a small number of properties in Sinclair Terrace and Parkview Terrace and from the nearby Core Paths. **Medium**	In open sea views to the east south east round to the south south east from a small number of properties in Sinclair Terrace and Parkview Terrace and from the nearby Core Paths. **Significant, negative, long term, reversible**.	In open sea views to the east south east round to the south south east from a small number of properties in Sinclair Terrace and Parkview Terrace and from the nearby Core Paths. **Medium**	In open sea views to the east south east round to the south south east from a small number of properties in Sinclair Terrace and Parkview Terrace and from the nearby Core Paths. **Significant, negative, short term, reversible**.
Dunbeath	Medium-high	In open views gained from the south to east facing aspects of a small number of properties and gardens near the mouth of the Dunbeath Water and on high ground near the Heritage Centre and to the north and south of the A9, east of the bridge as well as the coastal Core Paths. **Magnitude of impact: medium**	In open views gained from the south to east facing aspects of a small number of properties and gardens near the mouth of the Dunbeath Water and on high ground near the Heritage Centre and to the north and south of the A9, east of the bridge as well as the coastal Core Paths. **Significant, negative, long term, reversible.**	In open views gained from the south to east facing aspects of a small number of properties and gardens near the mouth of the Dunbeath Water and on high ground near the Heritage Centre and to the north and south of the A9, east of the bridge as well as the coastal Core Paths. **Magnitude of impact: medium**	In open views gained from the south to east facing aspects of a small number of properties and gardens near the mouth of the Dunbeath Water and on high ground near the Heritage Centre and to the north and south of the A9, east of the bridge as well as the coastal Core Paths.

Table 11.3 Summary of Development Specific Assessment of the Alternative Moray West Site area					
Receptor	**Sensitivity of Receptor**	**Magnitude of Impact- Operation**	**Effect Significance Operation**	**Magnitude of Impact- Construction/ Decommissioning**	**Effect Significance Construction/ Decommissioning**
		Other locations within Dunbeath where intermediate landform and buildings reduce visibility and influence. **Magnitude of impact: low or negligible**	Other locations within Dunbeath where intermediate landform and buildings reduce visibility and influence. **Not-significant, negative, long term, reversible**	Other locations within Dunbeath where intermediate landform and buildings reduce visibility and influence. **Magnitude of impact: low or negligible**	**Significant, negative, short term, reversible.** Other locations within Dunbeath where intermediate landform and buildings reduce visibility and influence. **Not-significant, negative, short term, reversible**
Helmsdale	Medium-high	In open views gained from some of the properties to the east of the village, within the more modern housing area on Dunrobin Street and Simpson Crescent and along the A9 where they have their aspects to the south east and east as well as from coastal core paths and the café. **Medium** Elsewhere within Helmsdale. **Low or negligible**	In open views gained from some of the properties to the east of the village, within the more modern housing area on Dunrobin Street and Simpson Crescent and along the A9 where they have their aspects to the south east and east as well as from coastal core paths and the café. **Significant, negative, long term, reversible.** Elsewhere within Helmsdale. **Not-significant, negative, long term, reversible**	In open views gained from some of the properties to the east of the village, within the more modern housing area on Dunrobin Street and Simpson Crescent and along the A9 where they have their aspects to the south east and east as well as from coastal core paths and the café. **Medium** Elsewhere within Helmsdale. **Low or negligible**	In open views gained from some of the properties to the east of the village, within the more modern housing area on Dunrobin Street and Simpson Crescent and along the A9 where they have their aspects to the south east and east as well as from coastal core paths and the café. **Significant, negative, short term, reversible.** Elsewhere within Helmsdale. **Not-significant, negative, short term, reversible**
Brora	Medium-high	Medium- low or lower	Not-significant, negative, long term, reversible	Medium- low or lower	Not-significant, negative, short term, reversible
Sandend	Medium-high	Negligible	Not-significant, negative, long term, reversible	Medium-low	Significant, negative, short term, reversible.
Visual – People Using Routes					
A9 (Brora to Spittal)	Brora to Latheron	On the views obtained from the A9 from Brora to east of Crakaig.	On the views obtained from the A9 from Brora to east of Crakaig and	On the views obtained from the A9 from Brora to east of Crakaig.	On the views obtained from the A9 from Brora to east of Crakaig

Table 11.3 Summary of Development Specific Assessment of the Alternative Moray West Site area					
Receptor	**Sensitivity of Receptor**	**Magnitude of Impact- Operation**	**Effect Significance Operation**	**Magnitude of Impact- Construction/ Decommissioning**	**Effect Significance Construction/ Decommissioning**
	Medium-high Latheron to Spittal **Medium**	**Low-medium** On the views obtained predominantly by north bound travellers from the A9 between east of Crakaig and west of Ousedale at a maximum distance from the Development of 33.4 km. **Medium** On the views obtained from the A9 between west of Ousedale and east of Berriedale due to a general lack of visibility out to sea. **Low or none** On the views obtained from the A9 between east of Berriedale and west of Latheron. **medium**	between west of Ousedale and east of Berriedale. **Not significant, negative, long term, reversible** On the views obtained predominantly by north bound travelers from the A9 between east of Crakaig and west of Ousedale and by north and south bound travellers between east of Berriedale and west of Latheron. **Significant, negative, long term, reversible**	**Low-medium** On the views obtained predominantly by north bound travellers from the A9 between east of Crakaig and west of Ousedale at a maximum distance from the Development of 33.4 km. **Medium** On the views obtained from the A9 between west of Ousedale and east of Berriedale due to a general lack of visibility out to sea. **Low or none** On the views obtained from the A9 between east of Berriedale and west of Latheron. **medium**	and between west of Ousedale and east of Berriedale. **Not significant, negative, short term, reversible** On the views obtained predominantly by north bound travellers from the A9 between east of Crakaig and west of Ousedale and by north and south bound travellers between east of Berriedale and west of Latheron. **Significant, negative, short term, reversible**
A99 (Latheron to Wick)	Medium	On the views obtained from the A99 from north of Ulbster to Latheron **medium** On the views obtained from the A99 from Wick to north of Ulbster **Low or negligible**	On the views obtained predominantly by south bound travelers from the A99 between north of Ulbster and Latheron. **Significant, negative, long term, reversible** On the views obtained from the A99 from Wick to north of Ulbster. **Not significant, negative, long term, reversible**	On the views obtained from the A99 from north of Ulbster to Latheron **medium** On the views obtained from the A99 from Wick to north of Ulbster **Low or negligible**	On the views obtained predominantly by south bound travelers from the A99 between north of Ulbster and Latheron. **Significant, negative, short term, reversible** On the views obtained from the A99 from Wick to north of Ulbster. **Not significant, negative, short term, reversible**

Table 11.3 Summary of Development Specific Assessment of the Alternative Moray West Site area					
Receptor	**Sensitivity of Receptor**	**Magnitude of Impact- Operation**	**Effect Significance Operation**	**Magnitude of Impact- Construction/ Decommissioning**	**Effect Significance Construction/ Decommissioning**
Far North Line (Brora to Helmsdale)	Medium-high	On the views obtained from the Far North Line from Brora to 1 km east of Crakaig. **Low-medium** On the views obtained by passengers on the Far North Line between 1 km east of Crakaig and Helmsdale. **Medium**	On the views obtained from the Far North Line from Brora to 1 km east of Crakaig. **Not significant, negative, long term, reversible** On the views obtained by passengers on the Far North Line between 1 km east of Crakaig and Helmsdale. **Significant, negative, long term, reversible**	On the views obtained from the Far North Line from Brora to 1 km east of Crakaig. **Low-medium** On the views obtained by passengers on the Far North Line between 1 km east of Crakaig and Helmsdale. **Medium**	On the views obtained from the Far North Line from Brora to 1 km east of Crakaig. **Not significant, negative, short term, reversible** On the views obtained by passengers on the Far North Line between 1 km east of Crakaig and Helmsdale. **Significant, negative, short term, reversible**
Visual – Representative Viewpoints (Night)					
Viewpoint 12: Navidale	Medium	Medium	**Significant, negative, long term, reversible**	Medium	**Significant, negative, short term, reversible**
Viewpoint 16: Lossiemouth Harbour	Medium	Medium-low	**Not significant, negative, long term, reversible**	Medium-low	**Not significant, negative, short term, reversible**
Landscape / Seascape Receptors - LCTs					
Sweeping Moorland - 25	Medium-high in SLA, medium elsewhere	Medium-low or lower	Not significant	Medium-low or lower	Not significant
Small Farms and Crofts -23	Medium	Medium between Berriedale and Sarclet Head and the coast and the A9. Elsewhere low	**Significant, negative, long term, reversible** –between Berriedale and Sarclet Head and the coast and the A9. **Not-significant, negative, long term, reversible –** elsewhere	Medium between Berriedale and Sarclet Head and the coast and the A9. Elsewhere low	**Significant, negative, short term, reversible** –between Berriedale and Sarclet Head and the coast and the A9/A99. **Not-significant, negative, short term, reversible –** elsewhere

Table 11.3 Summary of Development Specific Assessment of the Alternative Moray West Site area					
Receptor	**Sensitivity of Receptor**	**Magnitude of Impact- Operation**	**Effect Significance Operation**	**Magnitude of Impact- Construction/ Decommissioning**	**Effect Significance Construction/ Decommissioning**
Moorland Slopes and Hills - 18	Medium	Medium in the vicinity of Badbea and the south east facing slopes of Cnoc na Croiche. Elsewhere lower.	**Significant, negative, long term, reversible –** in the vicinity of Badbea and the south east facing slopes of Cnoc na Croiche. **Not-significant, negative, long term, reversible –** elsewhere	Medium in the vicinity of Badbea and the south east facing slopes of Cnoc na Croiche. Elsewhere lower.	**Significant, negative, short term, reversible –** in the vicinity of Badbea and the south east facing slopes of Cnoc na Croiche. **Not-significant, negative, short term, reversible –** elsewhere
Coastal Shelf -6	Medium- high in SLA, medium elsewhere	Medium-low	Not significant, negative, long term, reversible	Medium-low	Not significant, negative, short term, reversible
Coastal High Cliffs and Sheltered Bays - 11	Medium- high in SLA, medium elsewhere	Medium	**Significant, negative, long term, reversible**	Medium	**Significant, negative, short term, reversible**
Long Beaches Dunes and Links - 16	Medium-high in SLA, medium elsewhere	Low	Not significant, negative, long term, reversible	Low	Not significant, negative, short term, reversible
Regional Coastal Character areas					
Sarclet Head - G	Medium	Medium south of Sarclet. Lower elsewhere.	**Significant, negative, long term, reversible –**to the south west of Sarclet Head itself. Not significant, negative, long term, reversible –to the north east of Sarclet Head itself.	Medium south of Sarclet. Lower elsewhere.	**Significant, negative, short term, reversible –**to the south west of Sarclet Head itself. Not significant, negative, short term, reversible –to the north east of Sarclet Head itself.
Lybster Bay - H	Medium	Medium	**Significant, negative, long term, reversible**	Medium	**Significant, negative, short term, reversible**
Dunbeath Bay - I	Medium	Medium	**Significant, negative, long term, reversible**	Medium	**Significant, negative, short term, reversible**

Table 11.3 Summary of Development Specific Assessment of the Alternative Moray West Site area					
Receptor	**Sensitivity of Receptor**	**Magnitude of Impact- Operation**	**Effect Significance Operation**	**Magnitude of Impact- Construction/ Decommissioning**	**Effect Significance Construction/ Decommissioning**
Helmsdale to Berriedale Coastal Shelf - J	Medium-high	**Magnitude of impact: medium** to the north east of Helmsdale. **Medium-low** elsewhere.	**Significant, negative, long term, reversible –** to the north east of Helmsdale. Not -significant, negative, long term, reversible – elsewhere within this RCCA.	**Magnitude of impact: medium** to the north east of Helmsdale. **Medium-low** elsewhere.	**Significant, negative, short term, reversible** – to the north east of Helmsdale. *Not -significant, negative, short term, reversible* – elsewhere within this RCCA.
Brora to Helmsdale Deposition Coast - K	Medium-high in SLA, medium elsewhere	Medium-low	Not -significant, negative, long term, reversible	Medium-low	Not -significant, negative, short term, reversible
Landscape Planning Designations					
Dunbeath Castle GDL	High	Medium	**Significant, negative, long term, reversible**	Medium	**Significant, negative, short term, reversible**
Dunrobin Castle GDL	Medium-high	Low	Not -significant, negative, long term, reversible	Low	Not -significant, negative, short term, reversible
Flow Country and Berriedale Coast SLA	Medium-high	Medium to the south east of the A9. Lower elsewhere.	**Significant, negative, long term, reversible –** on the areas to the south east of the A9. Not significant, negative, long term, reversible – elsewhere on the character of the Flow Country and Berriedale Coast SLA.	Medium to the south east of the A9. Lower elsewhere.	**Significant, negative, short term, reversible –** on the areas to the south east of the A9. Not significant, negative, short term, reversible – on the character of the Flow Country and Berriedale Coast SLA.
Loch Fleet, Loch Brora and Glen Loth SLA	Medium-high	Medium-low near to the coast. Lower elsewhere.	Not -significant, negative, long term, reversible	Medium-low near to the coast or lower	Not -significant, negative, short term, reversible

11.8 Cumulative effects

The CSLVIA focuses on the cumulative effect of the Development with the two offshore wind farms BOWL and Moray East and the closest onshore wind farms in Caithness where they affect views from the coast or sequentially along the A9/A99.

The existing and potential future cumulative wind farm context for the Alternative Moray West Development has altered since the SLVIA was undertaken as was set out in section 14.8 of Chapter 14 of the EIA Report 2018.

The cumulative developments are shown on Figure 11.1b. When compared with those considered as part of the cumulative context in the EIA Report 2018 (Table 14.8.1: Cumulative Wind Farms in the Study Area) the following changes have occurred:

The changes shown include the following:

- The removal of several scoping sites due to the time elapsed since a scoping request was submitted;
- Three turbines (74-79m to tip) at Myreton are now operational in Moray;
- A single turbine (74m to tip) at Garalhill is now operational in Moray;
- The Wathegar 2 wind farm is now operational (was consented) in Highland;
- A single turbine (79m to tip) at Drodland has been consented in Moray;
- Three turbines (74m to tip) at Hill of Lychrobbie have been consented to the north-east of Dunbeath;
- The submission of the Development Layout and Specification Plan (DSLP) for the Moray East Offshore Wind Farm and Associated Offshore Transmission Infrastructure, providing increased certainty on the consented development that will be taken forward for construction;
- The East Kirk single turbine (80m to tip) in Highland is no longer an application; and
- The West Garty onshore wind farm application has been refused at appeal.

The implications of each of these changes for each of the contextual scenarios assessed in the EIA Report 2018 SLVIA is considered in the following section.

11.8.1 Consented and operational/under construction wind farm context

Drodland

The Drodland turbine would be located in Moray close to the southern edge of the study area. Its location and scale mean that it will have little association with the coastal locations where the highest levels of impact, as a result of development in the Alternative Moray West Site area, would occur.

Hill of Lychrobbie

This small wind farm is located between Dunbeath and Latheronwheel approximately 1km inland of the A9 and within the Sweeping Moorland Landscape Character Type (LCT). Its influence would be fairly localised with views from a short stretch of the A9 and the edges of these small settlements, scattered dwellings being the most pronounced. Views from these locations tend to be generally out to sea due to the south-east and east facing aspect of the sloping coastline.

Moray East Offshore Wind Farm

The implications of the Moray East Offshore Wind Farm and Associated Offshore Transmission Infrastructure project reaching a more advanced stage in its proposals is two-fold. Firstly, the SLVIA included the July 2018 Environmental Impact Assessment Report assessed the Development in the context of the WCS that was included in the Moray East ES 2012. This WCS included 216 WTGs of up to

204 m (LAT) to tip and these were arranged across the part of the Moray East Site closest to the coastline, resulting in a dense array of turbines with some stacking of turbines in views from the Caithness.

The Moray East DSLP layout includes 100 WTGs of a maximum height of 198.9 m above LAT spread across the area of the site with the turbine orientated in rows running in a north-south direction. There is a large area with fewer turbines in the middle of the site and this means that a proportion of the turbines are located at a greater distance from the shore than was the case in the WCS layout.

Overall the effect of the Moray East Wind Farm itself has reduced and therefore this in turn serves to reduce the cumulative effects of development in the Alternative Moray West Site area when seen alongside it.

Secondly the advanced nature of the layout of the Moray East Offshore Wind Farm means that it has been possible for Moray West to set out more likely layouts for development in the Alternative Moray West Site area. This takes account of the necessary set-backs from the Moray East and Beatrice Demonstrator WTGs as well as under-sea pipelines and cable routes. It also orientates the turbine rows to be the same as those of the Moray East DSLP layout, which accords with navigational and shipping requirements.

11.8.2 Application, consented and operational/under construction wind farm context

11.8.2.1 West Garty Wind Farm

The West Garty application for an onshore wind farm no longer forms part of the wind farm context included in the assessment of the cumulative effects in the application scenario (operational/under construction and consented wind farms plus application stage wind farms).

This is important in reducing the potential sequential and successive cumulative effects of development in the Alternative Moray West Site area on a number of receptors including: the landscape character of the moorland slopes and hills, the high tops of the Lone Mountains LCT and the section of the Sutherland coastline predominantly between Brora and Navidale, which is considered sensitive by THC and SNH; views from the A9 and the Far North rail routes around Navidale, from Brora and Dornoch and around the Dornoch Firth and on the sweeping moorland and coastal areas east of Latheron and along the A9 and A99 road corridors in the vicinity. This largely occurs as a result of a reduction on the interaction of visibility of both onshore and offshore wind farm development from this section of the coast.

Combined visibility with West Garty (Figure 14.8.21) across moorland slopes and hills around the site and including areas close to shore and the A9, Far North Line rail route around Navidale. High tops of lone mountains. From Brora and Dornoch and around the Dornoch Firth and on the sweeping moorland and coastal areas east of Latheron and along the A99 and A9 road corridors in the vicinity.

11.8.2.2 East Kirk

This single turbine located inland from Keiss and Sinclair’s Bay had little bearing on the cumulative assessment and was scoped out of the EIA Report 2018 SLVIA due to its scale and localised influence as well as its long distance from the Development.

11.8.3 Cumulative effects

The following section provides information on the changes to the cumulative effects (as assessed in Chapter 14, Section 14.8 of the SLVIA) that would occur as a result of the changed cumulative context described above along with the reduced magnitude of the impacts of the development in the Alternative Moray West Site area (although not the level of the impact magnitude assessed) as assessed in Section 11.8 of this Addendum Document.

11.8.3.1 Consented and operational/under construction wind farm context

In the consented and operational/under construction wind farm context the alteration to the Moray East consented development and the introduction of the three turbines of the Hill of Lychrobbie in Highland as part of the cumulative context for development of the Moray West Offshore Wind Farm in the Alternative Moray West Site area are the key considerations.

Whilst it may be visible from parts of Dunbeath and Latheronwheel and the A9 the addition of the Hill of Lychrobbie onshore wind farm would not alter the findings of Table 14.8.4 in Chapter 14 of the EIA Report 2018 or the assessments of the Principal Visual Receptors, or the Seascape and Landscape Receptors in Highland.

Whilst there would be some reduction in the cumulative magnitude of the impact in the views from Moray and Aberdeenshire as a result of the reduced impact of development in the Alternative Moray West Site area and the reduced impact of the Moray East DSLP layout these would not be sufficient to alter the findings of the cumulative assessment whereby the significant cumulative effects occur as a result of the successive visibility of the development in the Alternative Moray West Site area in the context of the Moray East DSLP layout.

11.8.3.2 Application, consented and operational/under construction wind farm context

In the application, consented and operational/under construction wind farm context there would not be a significant effect on the Coastal Shelf area of the Loch Fleet, Loch Brora and Glen Loth SLA, where the development in the Alternative Moray West Site area would not be seen in succession and sequentially with the West Garty onshore wind farm as it is not part of the cumulative wind farm context.

11.9 Conclusion on the effects of proposed changes to the Moray West Site

Development in the Alternative Moray West Site area would result in some reduction in the magnitude of the impacts on the seascape, landscape and visual resource when compared with those of the current Moray West Offshore Wind Farm as assessed in Chapter 14 of the EIA Report 2018. This is as a result of the smaller horizontal fields of view affected, the reduced turbine height and the increased distance between the Alternative Moray West Site area and many of the closer viewpoints. However, these changes have not been enough to alter the assessed levels of the magnitude of impacts and therefore there is no change to the significance of the effects assessed.

This is with the exception of the significant cumulative effect assessed in Chapter 14 of the EIA Report on the Coastal Shelf area of the Loch Fleet, Loch Brora and Glen Loth SLA which would no longer occur in the application, consented and operational/under construction wind farm context due to West Garty no longer forming part of the cumulative context in that scenario.

12 Socio-economics

12.1 Introduction

This section presents additional information with respect to potential effects of the proposed variation to the current Moray West Site area on socio-economics, tourism and recreation.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 15: Socio-economics, Tourism and Recreation.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

12.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on socio-economics, recreation and tourism are provided in the EIA Report – Volume 2, Chapter 15: Section 15.2.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

12.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key responses received during consultation are provided in EIA Report – Volume 2, Chapter 15: Section 15.3. No further consultation with regard to socio-economics, recreation and tourism has been undertaken as part of the preparation of this addendum.

Specific comments raised on the application as submitted in July 2018 (Moray West EIA Report) have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

12.4 Baseline characteristics

A detailed description of the baseline conditions relevant to the current Moray West Site and Offshore Export Cable Corridor are provided in the EIA Report – Volume 2, Chapter 15: Section 15.4.

The socio-economic receptors identified as being affected are:

- Wealth creation as measured through Gross Value Added (GVA)[27];
- Employment creation;
- Measures of community vitality and viability (e.g. changes in demand for local housing, accommodation and services); and
- Access to and enjoyment of marine based recreation and tourism and the associated economic value.

The proposed changes relate specially to the Moray West Site only (there will be no changes to the OfTI). Additionally there will be no change in the overall total developable area of the Moray West Site. Therefore, it has been concluded that the only socio-economic receptor that could potentially be impacted as a result of the Alternative Moray West Site area is marine based recreation and tourism. Table 12.1 summarises the key marine based recreation and tourism characteristics with specific reference to features of the proposed mitigation area and proposed variation area where possible.

[27] GVA is a measure of wealth creation (i.e. additional profits generated in businesses benefiting from the activity plus additional salaries that are paid to their employees).

Table 12.1 Marine recreation and tourism characteristics of the proposed mitigation and proposed variation areas		
Receptor	**Key characteristics of the proposed mitigation area**	**Key characteristics of the proposed variation area**
Sailing and yachting	The majority of recreational sailing activity in and immediately around the Moray West Site and Offshore Export Cable Corridor takes place in the nearshore area of the Offshore Export Cable Corridor. Data from the Royal Yachting Association (RYA) shows moderate activity along the coast from Lossiemouth to Fraserburgh. There are 14 harbours or marinas along the coast that can facilitate yachting activities. There is evidence of only limited recreational sailing in the proposed mitigation and proposed variation areas and recreational stakeholders didn't raise any concern over the recreational traffic data presented in the original Navigational Risk Assessment (NRA) and EIA report.	
	Cruising routes may pass through the proposed mitigation area, from both the north and south see EIA report: Volume 3a, Figure 12.4.8. One record of recreational vessel passing through the proposed mitigation area during the 25 day survey in summer 2017. No records of recreational vessels passing through the proposed mitigation area during the winter survey.	Cruising route may pass through the proposed variation area, from the south east see EIA report: Volume 3a, Figure 12.4.8. No records of recreational vessels passing through the proposed variation area during the 25 day survey in summer 2017 (or winter survey).
Wildlife watching	Wildlife watching in the Moray Firth is one of the region's major tourist attractions. The majority of the activity takes place in coastal and nearshore areas outwith the proposed mitigation and proposed variation areas as the area has an abundance of wildlife, including at Dornoch Firth, as well as multiple estuaries of Scotland's major rivers such as the Ness, Findhorn and Spey. VisitScotland also promotes the area to visitors interested in wildlife for its grey and harbour seals, harbour porpoises and otters. A number of interesting birds are also present in the location such as ospreys, waders and various wildfowl. There are a number of businesses and centers servicing the wildlife tourist market. The most prominent is the Scottish Dolphin Centre located in Spey Bay. Part of the Moray Firth (Inner Moray Firth) is designated as a Special Area of Conservation (SAC) for its resident population of bottlenose dolphin. A number of private businesses also offer wildlife boat trips, in particular to spot bottlenose dolphin. These tours do not generally take place in the proposed mitigation and proposed variation areas.	
Watersports	Watersports including surfing, kayaking, canoeing, wind surfing and kite surfing occur along the Moray coast, generally within a few hundred metres of the shore and not within either the proposed mitigation or proposed variation areas.	
Sea-angling	Sea angling generally conducted along the coastline with cliffs and local beaches providing casting spots. Sea-angling does also occur offshore from specialist chartered vessels, but the surveys and data analysis undertaken to support the shipping and navigation assessment do not show any evidence of these types of vessels being present in either the proposed mitigation or proposed variation areas.	
Scuba diving	A number of businesses in the region offer a variety of recreational diving opportunities in the Moray Firth (including multi day expeditions in the summer months). None of the key areas of interest / wrecks for diving are located in either the proposed mitigation or proposed variation areas (see EIA report: Volume 2, Image 15.4.11).	

12.4.1 Limitations with the baseline characterisation

Other than the limitations listed in the EIA Report – Volume 2, Chapter 15: Section 15.5.5, no other limitations have been identified that could affect the assessment of the Alternative Moray West Site area.

Whilst not a limitation, it is noted in reconsidering the baseline that a number of significant investments and commitments have occurred in the local study area since the original EIAR was compiled. Principally, these are three contracts placed by Moray East with key harbour facilities. Namely:

- Port of Cromarty Firth – Moray East have awarded a contract to Port of Cromarty Firth (Invergordon) to be Intermediate Delivery Port for the construction of the windfarm. This contract will allow POCF to enact delivery of their Phase 4 delivery plan which will create;
    - land reclamation providing an additional 4.5Ha of laydown space;

- 215m of berthing to create Berth 6, adjacent to Berth 5 providing a 369m long combined quay face; and
- Fendering of Berths 5 and 6.

This development will require a capex investment of £25m, and will bolster facilities allowing the Port to reinforce its position for securing future works. It is also notable that whilst offshore wind is the catalyst for investment, the improved facilities will considerably increase the facility's capacity to handle cruise vessels indicating the associated synergies for wider economic benefit that offshore wind can enable.

- A further contract for similar services is known to have been placed within the local study area, but is still subject to confidentiality restrictions. This will provide a future pipeline of work to an existing facility, helping further underpin its resilience and increase its long term viability and likelihood of securing future works, thus increasing the possibility for retaining value in the local study area.

- Fraserburgh Harbour – Fraserburgh has been contracted as the Operations and Maintanence base for Moray East. In the delivery of this contract new quay facilities will be constructed along with offices, warehousing and workshop facilities. Whilst these facilities are inherently driven by the turbine choice elected for Moray East, they indicate the scale of commitment and model that is likely to be deployed in the local study area and the willingness of the local supply chain to embrace the opportunity.

None of the changes to the baseline lead to a change in the assessment process, the parameters of the studies undertaken or the consideration of effects. In EIA terms these changes to the baseline are not measurable within the parameters of the current study. However they are indications of certainty and validity of the assumptions made in the EIAR. They provide increased confidence that the potential for value, in terms of GVA and employment, to be captured in the local study area can be realised closer to the High scenario values presented in the EIAR.

12.5 Assessment method

The method for assessing potential effects of the Development on socio-economics, tourism and recreation within the current Moray West Site and Offshore Export Cable Corridor is described in detail in the EIA Report – Volume 2, Chapter 15: Section 15.5.

There have been no changes to this assessment method since submission of the application in July 2018. These methods, and associated assessment criteria therefore remain applicable for the assessment of the proposed Alternative Moray West Site area.

As noted above, specific comments raised on the application as submitted in July 2018 (Moray West EIA Report) have been addressed in the gap analysis. Comments raised with regards to socio-economics, tourism and recreation have not altered the overall conclusions of the assessment presented in the Moray West EIA Report. The assessment presented in the Moray West EIA Report, forms the basis for the assessment presented in this addendum.

12.6 Potential effects associated with the proposed Alternative Moray West Site area

Potential effects associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Tables 12.2 and 12.3 below. The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated WCS design parameters assessed in the EIA Report – Volume 2, Chapter 15: Section 15.6: Table 15.6.1 for the current Moray West Site; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the current Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 15: Section 15.7.

As noted above, and indicated in the tables below, the change to the current Moray West Site only impacts on one area of study. The remainder of the considerations from the EIA Report – Volume 2 Chapter 15 are static, because the WTG count for models 1,2 and 3 has remained constant. Again, whilst not strictly within the consideration of effects, this is of importance as scale will be critical to delivery and viability of the project. To make the project economically viable it must be of a magnitude of c.800 MW to efficiently carry the underlying infrastructure costs of two offshore substations, two export circuits, two onshore transmission circuits and onshore substations. This cost needs to be amortised over a viable total capacity that allows production of electricity at a price which is commercially competitive in order to secure a supply contract at auction. As the mass of development has not changed the viability of the scheme and its ability to deliver the socio-economic benefits identified in the original assessment remains unchanged.

12.6.1 Mitigation measures

The assessment and conclusions presented in Tables 12.2 and 12.3 also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 15: Section 15.6.2. No additional measures were identified with respect to socio-economics, tourism and recreation.

Table 12.2 Assessment of effects associated with the proposed Alternative Moray West Site area					
Construction and decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 15: Section 15.6.2)					
Impacts assessed in the current EIA (July 2018)	**Receptor**	**Relevant WCS design parameters (for current Moray West Site area)[28]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Direct and indirect construction employment	*Construction employment*	Not applicable - *as Alternative Moray West Site area doesn't affect this receptor*	Not applicable	Not applicable	Not applicable
Direct and indirect construction GVA	*GVA*	Not applicable - *as Alternative Moray West Site area doesn't affect this receptor*	Not applicable	Not applicable	Not applicable
Change in demand for housing and local services associated with influx of labour to the local study area	*Housing and local services in local study area*	Not applicable - *as Alternative Moray West Site area doesn't affect this receptor*	Not applicable	Not applicable	Not applicable
Access to and enjoyment of watersports activity	*Watersports activity in local study area*	Not applicable - *as all watersports (with the exception of recreational sailing) do not take place in either the proposed mitigation or proposed variation areas.* ***Potential impacts on recreational sailing covered in Section 9 Shipping and Navigation***	Not applicable; other than recreational sailing (see Section 9)	Not applicable; other than recreational sailing (see Section 9)	Not applicable; other than recreational sailing (see Section 9)
	Moray Firth Surf Riders	Not applicable - *as surfing does not take place in either the proposed mitigation or proposed variation areas*	Not applicable	Not applicable	Not applicable
Change in economic activity onshore supported by local watersports activity	*Economic activity onshore supported by local watersports activity in local study area*	Not applicable - *as watersports not present in either the proposed mitigation or proposed variation areas*	Not applicable	Not applicable	Not applicable

[28] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

Table 12.3 Assessment of effects assocaited with the proposed Alternative Moray West Site area					
Operation and Maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 15: Section 15.6.2)					
Impacts assessed in the current EIA (July 2018)	**Receptor**	**Relevant WCS design parameters (for current Moray West Site area)[29]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Direct and indirect O&M employment: Scotland and local study area	*O&M employment*	Not applicable - *as Alternative Moray West Site area doesn't affect this receptor*	Not applicable	Not applicable	Not applicable
Direct and indirect O&M employment: Scotland and local study area	*GVA*	Not applicable - *as Alternative Moray West Site area doesn't affect this receptor*	Not applicable	Not applicable	Not applicable

[29] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

12.7 Cumulative effects

An assessment of potential cumulative effects is provided for the current Moray West Site in the EIA Report – Volume 2, Chapter 15: Section 15.8.

As outlined in Tables 12.2 and 12.3 above, changes associated with development within the Alternative Moray West Site area are not considered to be applicable to any of the impacts assessed in the Moray West EIA Report – Volume 2, Chapter 15: Section 15.7. It can therefore also be concluded that potential cumulative impacts associated with the Alternative Moray West Site area will also not be applicable. The conclusions from the cumulative assessment of the Alternative Moray West Site area therefore remain unchanged from those assessed for the current Moray West Site as presented in the EIA Report, Volume, Chapter 15, Section 15.8. However, the changes noted above to the baseline of local resources do provide greater clarity of consecutive cumulative activity. As before they make no changes to the conclusions of the assessment, however they do provide greater certainty of the potential for positive cumulative effects during construction.

At the point of assessment the Operations and Maintenance Port had not been appointed by Moray East. As noted this has now been confirmed as Fraserburgh. Given that O&M facilities are geographically tied to the local study area this does not change the assessment. Similarly the appointment of Invergordon as construction port by Moray East, again unknown at the time of the EIAR, does not change the assessment for cumulative construction impacts. However, both of these appointments offer greater certainty of the ability and nature of cumulative benefit that can be captured in the local study area.

Finally, it is noted that since the original assessment was written the UK government has significantly advanced the Sector Deal for Offshore Wind Sector, and is likely to soon make an announcement on the final form of the proposal.

The preliminary work for the Sector Deal has placed considerable emphasis work around the development of Clusters around the UK. While not finalised, it is expected that North of Scotland will seek to form one Cluster. The Beatrice, Moray East and Moray West projects would sit within this Cluster. It is expected that Cluster development will evolve around the relevant existing and planned:

- Offshore wind projects,
- Port and manufacturing infrastructure,
- Supply chain businesses, and
- Skills.

A key part of the success of any of the Clusters will be visibility and security of a pipeline of projects. A nascent pipeline has started to coalesce within the North of Scotland cluster with the pipeline of projects in the East of Scotland and the existing yard and harbour infrastructure. Moray East will now form an important part of the Cluster development with construction work ongoing from 2019 through to 2022, followed by long term O&M work. The resulting strengthening of the Cluster will benefit not just a range of renewables projects but will also act as a primer for investment that will deliver further opportunities throughout Scotland – a notable example being the Port of Cromarty Firth, which with the certainty of renewables work has been able to diversify its asset base to the benefit of the economic community at large.

Moray West stands to be a core part of an ongoing pipeline for the North of Scotland Cluster. The risk to the Cluster from a break in the pipeline of projects to support the supply chain is real. A break may occur if Moray West is either not eligible or does not secure a Contract for Difference from the 2019 round. The 2019 CfD round is expected to be confirmed by the UK government in late 2018. The success of the Cluster will be enhanced by the Moray West project moving through to operation on the timeline stated in the

EIA i.e. operations in 2024. The corollary will be true that a delay or failure of Moray West to reach construction stage will likely harm the North of Scotland Cluster.

Whilst the Sector Deal has advanced considerably, as there is no offer in place there can be no change to the assessment at this time. However it is clear that there is an increased cumulative opportunity and consideration should be given to the risk presented to this in not consenting the scheme and an awareness should be maintained of further changes to this baseline as the project moves through determination.

12.8 Conclusion on the effects of proposed changes to the Moray West Site

Whilst the Development occurs offshore, the socio-economic impacts (e.g. wealth creation as measured through GVA, employment creation and measures of community vitality and viability) and those impacts associated with recreation value occur onshore and will be unaffected by the Alternative Moray West Site area. The only exception is effects on marine recreation and tourism. However, as the proposed variation area is not generally utilised for marine recreation and tourism (other than recreational sailing), it has been concluded that all effects, other than those on recreational sailing that were previously assessed are not relevant to the Alternative Moray West Site area. Potential effects on recreational sailing are covered in Section 9 Shipping and Navigation.

13 Marine Archaeology and Cultural Heritage

13.1 Introduction

This section presents additional information with respect to potential effects of the proposed variation to the current Moray West Site area on archaeology and cultural heritage.

This section should be read in conjunction with the Moray West EIA Report – Volume 2, Chapter 16: Archaeology and Cultural Heritage and Volume 4, Technical Appendix 16.1: Marine Archaeology Baseline Report.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

13.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on archaeology and cultural heritage are provided in the EIA Report – Volume 2, Chapter 16: Section 16.2.

No updates to any of the legislation, policy and guidance presented in the Moray West EIA Report have been identified in the preparation of this addendum.

13.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key consultation responses received during preparation of the EIA Report are provided in EIA Report – Volume 2, Chapter 16: Section 16.3. Specific comments received to date (20th November 2018) on the application, as submitted in July 2018 (Moray West EIA Report), have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A of this Addendum Document).

No further consultation with regards to archaeology and cultural heritage has been undertaken as part of the preparation of this addendum.

13.4 Baseline characteristics

A detailed description of the baseline conditions with the current Moray West Site and along the Offshore Export Cable Corridor (including the northern extent of the export cable corridor which corresponds to the proposed variation area) are provided in the EIA Report – Volume 2, Chapter 16: Section 16.4.

The approach to defining the archaeology and cultural heritage baseline involved the analysis and interpretation of geophysical data acquired for the Moray West Site in 2010 and a review of findings from the geophysical data interpretation in the context of additional data obtained from desk based assessments, historical data, known archaeological sites and other previous investigations in and around the current Moray West Site and Offshore Export Cable Corridor.

There are currently no known prehistoric sites within the archaeological study area (ASA) and no individual paleogeographic features (e.g. individual buried palaeochannels) of archaeological interest were identified within the geophysical data assessed by Wessex Archaeology (for the current Moray West Site and 2 km buffer only). However, the potential for archaeological material of a prehistoric date to exist cannot be overlooked.

A total of 39 marine geophysical anomalies ranging from previously recorded wrecks to unidentifiable features with possible anthropogenic origin have been identified in the geophysical data obtained from the current Moray West Site (and 2 km buffer[30]). These are illustrated in Volume 3a, Figure 16.4.2 (Seabed Features of Archaeological Potential within Moray West Site).

Of the 39 identified marine geophysical anomalies, 29 anomalies are located within the current Moray West Site, with one confirmed wreck site (WA7228). This recorded wreck has been identified in the UKHO database as the Sunbeam (Possibly), however it lies out with the proposed mitigation area.

The remaining 28 anomalies have been classified as being of A2 archaeological discrimination – uncertain origin of possible archaeological interest, ranging from seafloor disturbance to magnetic anomalies. One of these anomalies (WA7216) lies on the eastern border of the proposed mitigation area. This anomaly is 28.9 m long and 2.4 m wide. It is a long and thick linear dark reflector with no shadow. It appears to be anthropogenic in origin and is possibly a rope or chain.

No geophysical data exists for the Offshore Export Cable Corridor, therefore there is no geophysical data available for the proposed variation area on the basis that this part of the Alternative Moray West Site area is located within the northern extent of the Offshore Export Cable Corridor. However, records in the UKHO datasets reviewed as part of the Marine Archaeology and Cultural Heritage Technical Report (EIA Report – Volume 4 Technical Appendix 16.1) identified ten sites within the Offshore Export Cable Corridor (and 2 km buffer). None of these sites are located within the proposed variation area, although there are two records immediately to the south (Volume 2 – Figure 13.1):

- WA7234 is located 1.35 km to the south of the southern boundary of the proposed variation area. This is a possible aircraft recorded by UKHO in 1965 as a non-dangerous wreck. Thought to be the wreck of a ditched Day Jet aircraft. In 1987 wreck was not located and the following year no wreck was found within 1 mile to the north of the original position; and
- WA7229 is located 1.5 km to the south of the southern boundary of the proposed variation area. Recorded by UKHO as a wreck of a German WWI UE-class minelaying submarine, identified as U77. It sank by gunfire from an unnamed British ship on 7th July 1916 after having left Heligoland on 5th July 1916 to lay mines off Kinnaird Head, but did not return or send any reports. It is believed that the wreck was first located in 1990. The wreck is described as lying with a bow up attitude, her stern section of her deck gun completely buried in deep mud...The port side of the wreck is intact, but the plating on the starboard side has fallen away, the conning tower unrecognisable, although to periscoped project upwards from amongst the debris. Her forward hatch is closed.

13.4.1 Baseline characteristics for setting of designated onshore cultural heritage receptors

With regards to the assessment of the potential setting effects on onshore cultural heritage receptors, EIA Report, Volume 2, Section 16.4 identified that the Moray West Offshore Wind Farm would be visible from six designated cultural heritage assets found along the coastlines of Moray and Caithness:

- Dunbeath Inver Forth – scheduled monument;
- Latheronwheel promontory fort – scheduled monument;
- The Tulloch (Usshilly) Broch and field system – scheduled monument;
- Dunbeath Castle (Category A listed building) & Designed Landscape;
- Dunrobin Castle (Category A listed building) & Designed Landscape; and
- Covesea Skerries Lighthouse, Keepers Cottage and Steading - Category A listed building.

[30] 2 km buffer allowed for to account for potential effects associated with scour and sedimentation, address uncertainty regarding spatial accuracy of offshore cultural heritage records and to account for the potential for cultural heritage features to extend beyond the boundaries of the Moray West Site and Offshore Export Cable Corridor.

These assets lie within the ZTV for both the current Moray West Site and the Alternative Moray West Site area.

13.4.2 Limitations with the baseline characterisation

Other than the limitations listed in the EIA Report – Volume 2, Chapter 16: Section 16.5.5, no other limitations have been identified that could affect the assessment of the Alternative Moray West Site area.

13.5 Assessment method

The method for assessing potential effects of the Development on the archaeology and cultural heritage within and surrounding the current Moray West Site area and Offshore Export Cable Corridor is described in detail in the EIA Report – Volume 2, Chapter 16: Section 16.5.

There have been no changes to this assessment method since submission of the application in July 2018. These methods, and associated assessment criteria therefore remain applicable for the assessment of the Alternative Moray West Site area.

13.6 Potential effects associated with the Alternative Moray West Site area

Potential effects associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Tables 13.1 and 13.2 below. The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated WCS design parameters assessed in the EIA Report – Volume 2, Chapter 16: Section 16.6: Table 16.6.1 for the current Moray West Site; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the current Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 16: Section 16.7.

13.6.1 Mitigation measures

The assessment and conclusions presented in Tables 13.1 and 13.2 also take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 16: Section 16.6.2. No additional measures were identified with respect to archaeology and cultural heritage in the previous assessment.

However, it is noted that the proposed SLVIA mitigation which involves the removal turbines from the western extent of the current Moray West Site is also considered relevant to the assessment of effects on setting of cultural heritage assets. The effect of this mitigation is discussed in Table 13.2 below.

Table 13.1 Assessment of effects associated with the Alternative Moray West Site area				
Construction and decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 16: Section 16.6.2)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[31]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Contamination, damage to, or loss of, marine archaeological assets resulting from direct physical impacts	Total area of disturbance within the Moray West Site calculated to be 5,561,214 m^2. Based on: dredge affected area for 85 x Model 4 Gravity Base Structure (GBS) foundations[32] and 2 OSPs + jack-up vessel footprint + inter-array cables + OSP interconnector cabling.	Impact magnitude = **Negligible** as embedded mitigation will ensure effects are minimised. Sensitivity of receptor = **High** due to the potential for 1) above average example and/or high potential to contribute to knowledge and understanding and/or outreach. Assets with a demonstrable national dimension to their importance are likely to fall within this category. 2) Wrecked ships and aircraft with statutory protection, plus as-yet undesignated sites that are demonstrably of equivalent archaeological value. 3) Palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape. **Significance = Minor or Positive** (where unknown remains are identified and recorded) Not significant in EIA terms.	The revised WCS dredge affected area for 72 x Model 3 WTGs is 747,856 m2 (based on total dredge affected area for each Model 3 GBS foundation of 115 m^2). When considered with 2 OSPs + jack-up vessel footprint + inter-array cables + OSP interconnector cabling the total area affected is 5,220,950 m^2. Given that this maximum area of disturbance for Model 3 WTG is within the assessed WCS, the magnitude of impact remains unchanged. As presented in Section 13.4, there are no known archaeological assets within the proposed variation area. There are records of a possible aircraft and submarine wreck on the seabed 1.35 km and 1.5 km south of the proposed variation area. A geophysical anomaly (WA7216) interpreted to be possible rope or chain (located on the eastern boundary of the proposed mitigation area) will potentially be avoided as a result of the Alternative Moray West Site area. Due to uncertainty with potential presence of unknown assets and the close proximity of possible aircraft and submarine wrecks, the sensitivity of the receptor is still considered to be high.	Details and conclusions of the current assessment remain valid. Impact magnitude = **Negligible** Sensitivity of receptor = **High** **Significance = Minor or Positive** (where unknown remains are identified and recorded) Not significant in EIA terms.

[31] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

[32] The WCS presented in EIA Report – Volume 2, Chapter 7: Table 7.6.1 refers to 62 x Model 4 GBS foundations. However, due to an error in the calculations the total dredge affected area was calculated as 1,043,120 m^2. This equates 85 x 12,272 m^2 (total dredge affected area per Model 4 GBS foundation based on 125 m diameter dredge affected area) not 62 x 12,272 m^2.

Table 13.2 Assessment of effects associated with the Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 16: Section 16.6.2 and additional mitigation requested by THC for SLVIA)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[33]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Destabilisation of marine archaeology assets through changed hydrography and sediment regimes	For the Moray West Site as a whole, the greatest total local scour footprint is 284,265 m², (based on 62 x 15 m diameter monopile foundations for Model 4 WTGs and one large 15 m diameter OSP monopile foundation). For the Moray West Site as a whole, the greatest total WTG foundation global scour footprint is 355,163 m² (based on array of 85 smaller 3.5 m base diameter piled jacket WTG foundations and 1 larger piled jacket OSP).	Impact magnitude = **negligible** as changes in hydrodynamic and sedimentary regimes which may cause increased erosion/protection of marine archaeology assets, are predicted to be limited to the mobilisation of fine sand-sized sediments. Sensitivity of receptor = **high** due to the potential for 1) above average example and/or high potential to contribute to knowledge and understanding and/or outreach. Assets with a demonstrable national dimension to their importance are likely to fall within this category. 2) Wrecked ships and aircraft with statutory protection, plus as-yet undesignated sites that are demonstrably of equivalent archaeological value. 3) Palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape. **Significance = minor adverse** Not significant in EIA terms.	As described in Section 3 of this addendum, the key variables in the assessments are: • The environmental setting (range of sediment types, current speeds, wave climate and water depths at the locations of the impact or activities); • The nature of the interactions between the installed infrastructure and the environmental setting; and • The WCS design parameters and so the greatest dimensions and total blockage cross section area of foundations, the dimensions of cable burial and cable protection, and the greatest volumes of sediment disturbed and associated rate of disturbance. There are no changes in the assessed WCS design parameters. Therefore there will be no change in the predicted nature, or magnitude of the assessed impacts. As presented in Section 13.4, there are no known archaeological assets within the proposed variation area. There are records of a possible aircraft and submarine wreck on the seabed 1.35 km and 1.5 km south of the proposed variation area.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.

[33] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

Table 13.2 Assessment of effects associated with the Alternative Moray West Site area

Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 16: Section 16.6.2 and additional mitigation requested by THC for SLVIA)

Impacts assessed in the current EIA (July 2018)		**Relevant WCS design parameters (for current Moray West Site area)[33]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
				A geophysical anomaly (WA7216) interpreted to be possible rope or chain (located on the eastern boundary of the proposed mitigation area) will potentially be avoided as a result of the Alternative Moray West Site area. Due to uncertainty with potential presence of unknown assets and the close proximity of possible aircraft and submarine wrecks, the sensitivity of the receptor is still considered to be high.	
Indirect effect due to changes to the setting of designated cultural heritage assets	Dunbeath Inver Forth	The WCS assessed for the current Moray West Site area was based on 62 WTGs with maximum tip height of 285 m and a rotor diameter of 250 m. The WCS also included plus 2 OPSs.	Impact magnitude = **low** Sensitivity of receptor = **high** due to its status as a designated cultural heritage asset. **Significance = minor adverse** Not significant in EIA terms.	As part of the proposed project mitigation the Model 4 WTG will be removed. The new WCS for the Alternative Moray West Site area is now 72 x Model 3 WTG with maximum tip height of 265 m and a rotor diameter of 230 m. In addition to the removal of the Model 4 WTG, the Alternative Moray West Site area will result in the introduction of turbines into an area that has not previously been assessed for turbines (the proposed variation area). Although the variation area lies to the south of the current Moray West Site, results from the SLVIA conclude that, while the WTGs will be located at a closer proximity to viewpoints on the Aberdeenshire and Moray Coast, the Model 3 WTGs (new WCS) are smaller than the Model 4 WTGs (removed). Due to their comparative smaller size (when compared to the Model 4 WTGs) they appear a very similar scale. In addition the horizontal field of view affected by the development will be less from all cultural	Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.
	Latheronwheel promontory fort		Impact magnitude = **low** Sensitivity of receptor = **high** due to its status as a designated cultural heritage asset. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.
	The Tulloch (Usshilly)		Impact magnitude = **low** Sensitivity of receptor = **high** due to its status as a designated cultural heritage asset.		Details and conclusions of the current assessment remain valid.

Table 13.2 Assessment of effects associated with the Alternative Moray West Site area

Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 16: Section 16.6.2 and additional mitigation requested by THC for SLVIA)

Impacts assessed in the current EIA (July 2018)		Relevant WCS design parameters (for current Moray West Site area)[33]	Conclusions from assessment of impacts within the current Moray West Site area	Commentary on potential impacts within the Alternative Moray West Site area	Assessment of effect significance and conclusions
	Broch and field system		**Significance = minor adverse** Not significant in EIA terms.	heritage assets including those located on the East Caithness and Sutherland coast. When viewed from assets located on the East Caithness and Sutherland coast, the reduction in turbine height will also reduce impacts due to a reduction in comparative scale of the WTGs and will be closer in scale to BOWL turbines, reducing the potential for discord between the two developments. Based on this it is concluded that the magnitude of effects on the setting of cultural heritage assets remains unchanged for all assets identified. The sensitivity of the each of the assets identified remains unchanged.	Impact magnitude = **low** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.
	Dunbeath Castle & Designed Landscape		Impact magnitude = **low** Sensitivity of receptor = **high** due to its status as a designated cultural heritage asset. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **low** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.
	Dunrobin Castle & Designed Landscape		Impact magnitude = **negligible** Sensitivity of receptor = **high** due to its status as a designated cultural heritage asset. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.
	Covesea Skerries Lighthouse		Impact magnitude = **negligible** Sensitivity of receptor = **high** due to its status as a designated cultural heritage asset. **Significance = minor adverse** Not significant in EIA terms.		Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.

13.7 Cumulative effects

An assessment of potential cumulative effects is provided for the current Moray West Site in the EIA Report – Volume 2, Chapter 16: Section 16.8.

As outlined in Tables 13.1 above, changes associated with development within the Alternative Moray West Site area are considered to be alter the significance of any of the effects assessed in the Moray West EIA Report – Volume 2, Chapter 16: Section 16.7. It can therefore also be concluded that potential cumulative impacts associated with the Alternative Moray West Site area will also not be applicable. The conclusions from the cumulative assessment of the Alternative Moray West Site area therefore remain unchanged from those assessed for the current Moray West Site as presented in the EIA Report, Volume, Chapter 16, Section 16.8.

13.8 Conclusion on the effects of proposed changes to the Moray West Site

Geophysical data for the proposed variation area will be collected and analysed for any features of archaeological and cultural heritage interest ahead of construction and the embedded mitigation measures implemented if / as appropriate (as already developed in the original assessment). The proposed Alternative Moray West Site area does therefore not affect the extent, magnitude or duration of any predicted effects during construction and decommissioning and is within the envelope of the previously assessed WCS design parameters. The same is also true for the potential destabilisation of marine archaeology assets through changed hydrography and sediment regimes, during the operations and maintenance phase of the Development.

With regards to setting impacts the Alternative Moray West Site area will result in the introduction of turbines into an area that has not previously been assessed for turbines (the proposed variation area). However, it has been concluded through the SLVIA assessment (this Addendum Document PART 2 Chapter 11), that while the WTGs will be located at a closer proximity to viewpoints on the Aberdeenshire and Moray Coast, the Model 3 WTGs are comparatively smaller in size compared to the Model 4 WTGs (now removed) and therefore they appear a very similar scale. The horizontal field of view affected by the development will be less from all cultural heritage assets will also be less including those located on the East Caithness and Sutherland coast.

When viewed from assets located on the East Caithness and Sutherland coast, the reduction in turbine height will also reduce impacts due to a reduction in comparative scale of the WTGs and will be closer in scale to BOWL turbines, reducing the potential for discord between the two developments. In conclusion, there will be no change in impact magnitude associated with Development in the Alternative Moray West Site area and no change in the conclusions of effect significance as presented in the Moray West EIA Report – Volume 2 Chapter 16: Marine Archaeology and Cultural Heritage.

14 Other Human Activities

14.1 Introduction

This section presents additional information with respect to potential effects of the proposed variation to the current Moray West Site area on other human activities.

This section should be read in conjunction with:

- The Moray West EIA Report – Volume 2, Chapter 17: Other Human Activities;
- Volume 4, Technical Appendix 17.1: Pager Power (2009). Moray Firth High Level Screening Assessment; and
- Volume 4, Technical Appendix 17.2: 6 Alpha Associates (2011). Unexploded Ordnance (UXO) Risk Assessment.

https://www.gov.scot/Topics/marine/Licensing/marine/scoping/MORLWest

14.2 Legislation, policy and guidance

Details of relevant legislation, policy and guidance relating to the assessment of potential effects on other human activities are provided in the EIA Report – Volume 2, Chapter 17: Section 17.2.

As discussed in Section 1, Marine Scotland is presently developing the Scottish Offshore Wind Sectoral Marine Plan with the aim to have Plan Options adopted during 2019. The Areas of Search (AoS) are still under consideration and Strategic Environmental Assessment (SEA), strategic Habitats Regulations Assessment (sHRA) and economic and social assessment ongoing (which will be subject to future public consultation). The draft AoSs consulted on in summer 2018, included areas within the Moray Firth and the North Sea, however due to the ongoing nature of this work no definitive areas for potential future offshore wind development are yet available. This addendum has therefore focused assessment on those known areas of offshore wind development.

14.3 Consultation

This assessment has been informed by consultation carried out on the EIA Report submitted in July 2018. A summary of key consultation responses received during preparation of the EIA Report are provided in EIA Report – Volume 2, Chapter 17: Section 17.3. No further consultation with regards to archaeology and cultural heritage has been undertaken as part of the preparation of this addendum.

No further consultation with regards to other human activities has been undertaken specific to this addendum.

14.4 Baseline characteristics

8.4.1 An overview of baseline characteristics associated with the current Moray West Site (including proposed mitigation area) and the Alternative Moray West Site area (including proposed variation area) is provided below. A detailed description of the baseline conditions in the current Moray West Site and within the Offshore Export Cable Corridor (including the northern extent of the Offshore Export Cable Corridor within which the proposed variation area is located) are provided in the EIA Report – Volume 2, Chapter 17: Section 17.4.

A desk-based study of available data was used to compile details of other human activities in the area of and surrounding the current Moray West site. Those in, or in the immediate vicinity of the Moray West Site are illustrated in Volume 2 - Figure 14.1 and Volume 2 - Figure 14.3 and detailed below:

- Other offshore wind farm developments:
  - The Moray East offshore wind farm site is located immediately adjacent to the eastern boundary of both the current Moray West Site and the Alternative Moray West Site area and to the northeast of the proposed variation area. However, it lies outwith the proposed variation area;
  - The Beatrice offshore wind farm is located adjacent to the extreme north-east corner boundary of both the current Moray West Site and the Alternative Moray West Site area. However, it lies outwith the proposed variation area; and
  - The Beatrice Wind Farm Demonstrator Project is located within both the Current Moray West Site and the Alternative Moray West Site area, but outwith the proposed variation area (although due to be decommissioned - see below).
- Subsea cables:
  - The two Beatrice Demonstrator wind turbines (located within the current and Alternative Moray West Site area) are connected in series via a 0.9 km cable, and then onwards to the Beatrice A platform via a 1.9 km cable. These facilities are not located in the proposed variation area to the south (new area) and are due to be decommissioned;
  - Two 65 km export cables associated with the Beatrice offshore wind farm pass through both the current and Alternative Moray West Site area and Offshore Export Cable Corridor, including the proposed variation area. BOWL export cable installation will be complete in 2018; and
  - The Scottish Hydro Electric Transmission (SHE Transmission) Caithness Moray HVDC Link crosses the Offshore Export Cable Corridor just over half way to shore.
- Oil and gas infrastructure:
  - The platforms, pipelines and wells associated with the Beatrice Oil Field and the Jacky Platform are located either within or immediately adjacent to the northern boundary of both the current and Alternative Moray West Site area. These oil fields are no longer producing and are scheduled for decommissioning (including the associated Beatrice Demonstrator Turbines). The Beatrice pipeline runs in a southwest – north direction through the north west corner of the current Moray West Site, including through the proposed mitigation area; and
  - Areas currently identified for potential future oil and gas exploration in the Moray Firth are licenced oil and gas blocks. Suncor Energy has been granted a ‘potential award’ licence for Block 18/1 (in the 28th Round Second Tranche Blocks). This block intersects the Offshore Export Cable Corridor.
- Telecommunications:
  - Pager Power work in 2009 identified microwave links at the northern edge of both the current and alternative Moray West Site area associated with telecommunications at the Beatrice (Alpha, Bravo and Charlie Platforms) and Jacky Platforms. These are located to the east of the proposed mitigation area (see Appendix 5 of the Pager Power 2009 report; EIA Report: Volume 4, Technical Appendix 17.1).

Of the other users identified above only one intersects the proposed variation area; the export cables associated with the Beatrice offshore wind farm. In addition, future oil and gas exploration and development may take place immediately to the south of the proposed variation area in Block 18/1.

14.4.1 Limitations with the baseline characterisation

Other than the limitations listed in the EIA Report – Volume 2, Chapter 17: Section 17.5.4, no other limitations have been identified that could affect the assessment of the Alternative Moray West Site area.

14.5 Assessment method

The method for assessing potential effects of the Development on other human activities within the current Moray West Site area and Offshore Export Cable Corridor is described in detail in the EIA Report – Volume 2, Chapter 17: Section 17.5.

There have been no changes to this assessment method since submission of the application in July 2018. These methods, and associated assessment criteria therefore remain applicable for the assessment of the Alternative Moray West Site area.

As noted above, specific comments raised on the application as submitted in July 2018 (Moray West EIA Report) have been addressed in the Stakeholder Response Analysis spreadsheet (Annex A). Comments raised with regards to other human users have not altered the overall conclusions of the assessment presented in the Moray West EIA Report. The assessment presented in the Moray West EIA Report, forms the basis for the assessment presented in this addendum.

14.6 Potential effects associated with the proposed Alternative Moray West Site area

Potential effects associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the Alternative Moray West Site area (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) are presented in Tables 14.1 and 14.2 below. The conclusions from this assessment are presented in the context of the following information:

- Impacts and associated WCS design parameters assessed in the EIA Report – Volume 2, Chapter 17: Section 17.6: Table 17.6.1 for the current Moray West Site; and
- Conclusions from the assessment of effects (effect significance) associated with the construction, operation and maintenance and decommissioning of the components of the Development located within the current Moray West Site (WTGs, inter-array cables, OSPs, OSP interconnector cables, and a portion of the export cable circuits) as presented in the EIA Report – Volume 2, Chapter 17: Section 17.7.

14.6.1 Mitigation measures

The assessment and conclusions presented in Tables 14.1 and 14.2 take into account the embedded mitigation measures presented in the EIA Report – Volume 2, Chapter 17: Section 17.6.2 and additional measures presented in the EIA Report – Volume 2, Chapter 17: Table 17.7.1.

Table 14.1 Assessment of effects associated with the proposed Alternative Moray West Site area				
Construction and decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 17: Section 17.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 17: Table 17.7.1)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[34]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Disturbance of existing offshore wind farm activities	85 x Model 2 WTGs with gravity base foundations and up to two OSPs; Interconnector cable of up to 15 km length; inter-array cables of up to 275 km length. 500 m safety zones around installation activity. Construction period of approximately 36 months, supported by regular vessel movements. Decommissioning phase lasting up to approximately 36 months.	Impact magnitude = **negligible** due to the application of embedded mitigation measures. In addition, construction and decommissioning activities are relatively short term and temporary. Sensitivity of receptor = **high** given the implications for human safety. **Significance = minor adverse** Not significant in EIA terms.	There will be no change in the assessed worst case in terms of the maximum number of WTGs installed within the Alternative Moray West Site area. There will also be no change in design parameters assessed for the OfTI components within the Alternative Moray West Site area (OSPs, inter-connector cables and sections of the export cables). The impact magnitude therefore remains negligible. The sensitivity of the receptor remains unchanged.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.
Disturbance of subsea cables	85 x Model 2 WTGs with gravity base foundations and up to two OSPs; Interconnector cable of up to 15 km length; inter-array cables of up to 275 km length. 500 m safety zones around installation activity. Construction period of approximately 36 months, supported by regular vessel movements. Decommissioning phase lasting up to approximately 36 months.	Impact magnitude = **negligible** due to the application of embedded mitigation measures supported by commercial agreements and ongoing liaison with other operators. In addition, construction and decommissioning activities are relatively short term and temporary. Sensitivity of receptor = **high** given the difficulty and costs associated with cable repair. **Significance = minor adverse** Not significant in EIA terms.	There will be no change in the assessed worst case in terms of the maximum number of WTGs installed within the Alternative Moray West Site area. There will also be no change in design parameters assessed for the OfTI components within the Alternative Moray West Site area (OSPs, inter-connector cables and sections of the export cables). The impact magnitude therefore remains high. The sensitivity of the receptor remains unchanged. The additional mitigation proposed in the previous assessment of agreeing cable crossing designs and implementing crossing agreements with the cable owner / operator, remains unchanged.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.

[34] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

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Table 14.1 Assessment of effects associated with the proposed Alternative Moray West Site area				
Construction and decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 17: Section 17.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 17: Table 17.7.1)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[34]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Disturbance of oil exploration and decommissioning activities	85 x Model 2 WTGs with gravity base foundations and up to two OSPs; Interconnector cable of up to 15 km length; inter-array cables of up to 275 km length. 500 m safety zones around installation activity. Construction period of approximately 36 months, supported by regular vessel movements. Decommissioning phase lasting up to approximately 36 months.	Impact magnitude = **negligible** due to the application of embedded mitigation measures together with the fact construction and decommissioning activities are relatively short term and temporary. Sensitivity of receptor = **high** given the implications to human safety. **Significance = minor adverse** Not significant in EIA terms.	There will be no change in the assessed worst case in terms of the maximum number of WTGs installed within the Alternative Moray West Site area. There will also be no change in design parameters assessed for the OfTI components within the Alternative Moray West Site area (OSPs, inter-connector cables and sections of the export cables). Based on Section 14.4 there is the potential to impact on oil and gas exploration activities in Block 18/1 (provisionally awarded). This Block is located 1.65 km south of the proposed variation area. The key potential interaction would be during any seismic survey activities in the northern area of the Block as seismic survey vessels can have large (several km) turning areas at the end of survey acquisition lines. The sensitivity of receptor therefore remains high (despite wind turbines now being located away from the area of decommissioning activities associated with the Beatrice oil pipeline).	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **high** **Significance = minor adverse** Not significant in EIA terms.
Disturbance of marine disposal activities	Not applicable - *as Alternative Moray West Site area is located over 30 km from the nearest dredge disposal site at Buckie*	Not applicable	Not applicable	Not applicable
Risks associated with UXO	85 x Model 2 WTGs with gravity base foundations and up to two OSPs; Interconnector cable of up to 15 km length; inter-array cables of up to 275 km length.	Impact magnitude = **no impact** as adherence to standard practice will reduce the UXO risk to As Low As Reasonably Practicable (ALARP).	There will be no change in the assessed worst case in terms of the maximum number of WTGs installed within the Alternative Moray West Site area. There will also be no change in design parameters assessed for the OfTI components within the Alternative	Details and conclusions of the current assessment remain valid. Impact magnitude = **no impact** Sensitivity of receptor = very **high**

Table 14.1 Assessment of effects associated with the proposed Alternative Moray West Site area				
Construction and decommissioning impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 17: Section 17.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 17: Table 17.7.1)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[34]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
	500 m safety zones around installation activity. Construction period of approximately 36 months, supported by regular vessel movements. Decommissioning phase lasting up to approximately 36 months.	Sensitivity of receptor = **very high** given the implications for human safety. **Significance = negligible** Not significant in EIA terms.	Moray West Site area (OSPs, inter-connector cables and sections of the export cables). The impact magnitude therefore remains negligible. The sensitivity of the receptor remains unchanged.	**Significance = negligible** Not significant in EIA terms.

Table 14.2 Assessment of effects associated with the proposed Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 17: Section 17.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 17: Table 17.7.1)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[35]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Disturbance of existing offshore wind farm activities	Presence of the following infrastructure for up to 50 years - 85 x Model 2 WTGs with gravity base foundations and up to two OSPs; Interconnector cable of up to 15 km length; inter-array cables of up to 275 km length	Impact magnitude = **negligible** due to the application of embedded mitigation measures. Sensitivity of receptor = **moderate**. **Significance = negligible** - **minor adverse** Not significant in EIA terms.	Other than a reduction in the duration of the operational period of the Development from 50 years to 25 years there will be no other changes to the assessed WCS design parameters in terms of the maximum number of WTGs installed within the Alternative Moray West Site area. There will also be no change in design parameters assessed for the OfTI components within the Alternative Moray West Site area (OSPs, inter-connector cables and sections of the export cables). The sensitivity of the receptor remains unchanged.	Details and conclusions of the current assessment remain valid. Impact magnitude = n**egligible** Sensitivity of receptor = **moderate** **Significance = negligible** - **minor adverse** Not significant in EIA terms.

[35] The design parameters provided are for the Moray West Site only not the Offshore Export Cable Corridor.

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Table 14.2 Assessment of effects associated with the proposed Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 17: Section 17.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 17: Table 17.7.1)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[35]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Disturbance of existing subsea cables	Presence of the following infrastructure for up to 50 years - 85 x Model 2 WTGs with gravity base foundations and up to two OSPs; Interconnector cable of up to 15 km length; inter-array cables of up to 275 km length. Regular maintenance activity supported by vessel movements to and from the Development.	Impact magnitude = **negligible** due to the application of embedded mitigation measures supported by commercial agreements and ongoing liaison with other operators. Sensitivity of receptor = **moderate** **Significance = negligible or minor adverse** Not significant in EIA terms.	Other than a reduction in the duration of the operational period of the Development from 50 years to 25 years there will be no other changes to the assessed WCS design parameters in terms of the maximum number of WTGs installed within the Alternative Moray West Site area. There will also be no change in design parameters assessed for the OfTI components within the Alternative Moray West Site area (OSPs, inter-connector cables and sections of the export cables). The impact magnitude therefore remains moderate. The sensitivity of the receptor remains unchanged (high).	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **moderate** **Significance = negligible or minor adverse** Not significant in EIA terms.
Disturbance of oil exploration and decommissioning activities	Presence of the following infrastructure for up to 50 years - 85 x Model 2 WTGs with gravity base foundations and up to two OSPs; Interconnector cable of up to 15 km length; inter-array cables of up to 275 km length. Regular maintenance activity supported by vessel movements to and from the Development.	Impact magnitude = **negligible** due to the application of embedded mitigation measures. Sensitivity of receptor = **moderate** **Significance = negligible or minor adverse** Not significant in EIA terms.	Other than a reduction in the duration of the operational period of the Development from 50 years to 25 years there will be no other changes to the assessed WCS design parameters in terms of the maximum number of WTGs installed within the Alternative Moray West Site area. There will also be no change in design parameters assessed for the OfTI components within the Alternative Moray West Site area (OSPs, inter-connector cables and sections of the export cables). Based on Section 14.4 there is the potential to impact on oil and gas exploration activities in Block 18/1 (provisionally awarded). This Block is located 1.65 km south of the proposed variation area. The key potential interaction would be during any seismic survey activities in the northern area of the Block as seismic survey vessels can have large (several km) turning areas at the end of survey acquisition lines. The sensitivity of receptor therefore remains moderate (despite wind turbines now being located away from the area of decommissioning activities associated with the Beatrice oil pipeline).	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** Sensitivity of receptor = **moderate** **Significance = negligible or minor adverse** Not significant in EIA terms.

Table 14.2 Assessment of effects associated with the proposed Alternative Moray West Site area				
Operation and maintenance impacts (note – the assessment presented below includes embedded mitigation presented in Volume 2, Chapter 17: Section 17.6.2 and additional mitigation presented in EIA Report – Volume 2, Chapter 17: Table 17.7.1)				
Impacts assessed in the current EIA (July 2018)	**Relevant WCS design parameters (for current Moray West Site area)[35]**	**Conclusions from assessment of impacts within the current Moray West Site area**	**Commentary on potential impacts within the Alternative Moray West Site area**	**Assessment of effect significance and conclusions**
Disturbance of marine disposal activities	Not applicable - *as Alternative Moray West Site area is located over 30 km from the nearest dredge disposal site at Buckie*	Not applicable	Not applicable	Not applicable
Risks associated with UXO	Presence of the following infrastructure for up to 50 years - 85 x Model 2 WTGs with gravity base foundations and up to two OSPs; Interconnector cable of up to 15 km length; inter-array cables of up to 275 km length. Regular maintenance activity supported by vessel movements to and from the Development.	Impact magnitude = **no impact** as adherence to standard practice will reduce the UXO risk to As Low As Reasonably Practicable (ALARP). Sensitivity of receptor = **very high** given the implications for human safety. **Significance = negligible** Not significant in EIA terms.	Other than a reduction in the duration of the operational period of the Development from 50 years to 25 years there will be no other changes to the assessed WCS design parameters in terms of the maximum number of WTGs installed within the Alternative Moray West Site area. There will also be no change in design parameters assessed for the OfTI components within the Alternative Moray West Site area (OSPs, inter-connector cables and sections of the export cables). The sensitivity of the receptor remains unchanged.	Details and conclusions of the current assessment remain valid. Impact magnitude = **no impact** Sensitivity of receptor = very **high** **Significance = negligible** Not significant in EIA terms.
Interference with telecommunications	Presence of the following infrastructure for up to 50 years - 85 x Model 2 WTGs with gravity base foundations and up to two OSPs; Interconnector cable of up to 15 km length; inter-array cables of up to 275 km length. Regular maintenance activity supported by vessel movements to and from the Development.	Impact magnitude = **negligible** due to the application of embedded mitigation measures. Sensitivity of receptor = **low** **Significance = negligible or minor adverse** Not significant in EIA terms.	Other than a reduction in the duration of the operational period of the Development from 50 years to 25 years there will be no other changes to the assessed WCS design parameters in terms of the maximum number of WTGs installed within the Alternative Moray West Site area. There will also be no change in design parameters assessed for the OfTI components within the Alternative Moray West Site area (OSPs, inter-connector cables and sections of the export cables). The sensitivity of the receptor remains unchanged.	Details and conclusions of the current assessment remain valid. Impact magnitude = **negligible** due to the application of embedded mitigation measures. Sensitivity of receptor = **low** **Significance = negligible or minor adverse** Not significant in EIA terms.

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14.7 Cumulative effects

An assessment of potential cumulative effects is provided for the current Moray West Site in the EIA Report – Volume 2, Chapter 17: Section 17.8.

As outlined in Tables 14.1 and 14.2 above, changes associated with development within the Alternative Moray West Site area are considered not to alter the significance of any impacts assessed in the Moray West EIA Report – Volume 2, Chapter 17: Section 17.7. It can therefore also be concluded that potential cumulative effects associated with the Alternative Moray West Site area will also be unaffected. The conclusions from the cumulative assessment of the Alternative Moray West Site area therefore remain unchanged from those assessed for the current Moray West Site area as presented in the EIA Report, Volume, Chapter 17, Section 17.8.

14.8 Conclusion on the effects of proposed changes to the Moray West Site

The majority of other human user receptors identified in the original assessment will not be affected by the Alternative Moray West Site area as the proposed variation area is not utilised by the receptor. The results of the previous assessment with regards to the effects on existing offshore windfarm activities, marine disposal activities, UXO risks and telecommunications will be unaffected by the Alternative Moray West Site area.

The proposed variation area, introduces the following modification to potential impacts on subsea cables and oil and gas exploration and development:

- The BOWL export cables pass through a larger proportion of the Alternative Moray West Site area, compared to the current Moray West Site.
- There is also a potential to impact on oil and gas exploration activities in Block 18/1 (provisionally awarded) from construction, operations and maintenance and decommissioning activities in the proposed variation area. Block 18/1 is located 1.65 km south of the proposed variation area. The key potential interaction would be during any seismic survey activities in the northern area of the Block as seismic survey vessels can have large (several km) turning areas at the end of survey acquisition lines.

Both of the above will be managed as per the embedded mitigation identified in previous assessment and the results of the previous assessment are unaffected by the Alternative Moray West Site area.

15 HRA Considerations

15.1 Introduction

This chapter provides information on the Alternative Moray West Site area with respect to HRA considerations. Information presented in this chapter is based on conclusions from the assessment of HRA considerations for the Alternative Moray West Site area in the context of conclusions from the Report to Inform an Appropriate Assessment (RIAA) and updated information on displacement and collision risk impacts presented in PART 1 of this Addendum Document. It was determined during HRA screening carried out in September 2017 (see RIAA Report 2018), that the key sites requiring assessment are listed in Table 15.1 below. It should be noted that this list does not include the Moray Firth pSPA. This is on the basis that key effects on this site relate to the offshore export cable corridor only and it as concluded in the RIAA that there would be no adverse effects on this site.

Table 15.1 Summary Assessment the Potential for Adverse Effects Upon the Integrity of the European Site

Site	Receptor	Impacts assessed in the current RIAA (July 2018)	Conclusions from assessment of effects associated with the current Moray West Site alone	Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects
Special Protection Area (SPAs)				
Buchan Ness and Collieston Coast SPA	Fulmar	Changes to prey availability / habitat loss	No adverse effect	**No change to conclusions in relation to effects on site integrity**
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
	Herring gull	Collision risk	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
	Guillemot	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
East Caithness Cliffs SPA	Fulmar	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity

Table 15.1 Summary Assessment the Potential for Adverse Effects Upon the Integrity of the European Site				
Site	**Receptor**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**
Special Protection Area (SPAs)				
	Kittiwake	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
		Collision risk	No adverse effect	No change to conclusions in relation to effects on site integrity
	Herring Gull	Collision risk	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution.	No adverse effect	No change to conclusions in relation to effects on site integrity
	Guillemot	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
	Razorbill	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
North Caithness Cliffs SPA	Fulmar	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
	Kittiwake	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity

Table 15.1 Summary Assessment the Potential for Adverse Effects Upon the Integrity of the European Site				
Site	**Receptor**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**
Special Protection Area (SPAs)				
		Collision risk	No adverse effect	No change to conclusions in relation to effects on site integrity
	Puffin	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
	Puffin	Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
	Puffin	Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
	Guillemot	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
	Guillemot	Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
	Guillemot	Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
	Razorbill	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
	Razorbill	Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
	Razorbill	Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
Troup, Pennan and Lion's Head SPA	Fulmar	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
Troup, Pennan and Lion's Head SPA	Fulmar	Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
Troup, Pennan and Lion's Head SPA	Fulmar	Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
Troup, Pennan and Lion's Head SPA	Kittiwake	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
Troup, Pennan and Lion's Head SPA	Kittiwake	Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
Troup, Pennan and Lion's Head SPA	Kittiwake	Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
Troup, Pennan and Lion's Head SPA	Kittiwake	Collision risk	No adverse effect	No change to conclusions in relation to effects on site integrity
Troup, Pennan and Lion's Head SPA	Herring gull	Collision risk	No adverse effect	No change to conclusions in relation to effects on site integrity

Table 15.1 Summary Assessment the Potential for Adverse Effects Upon the Integrity of the European Site				
Site	**Receptor**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**
Special Protection Area (SPAs)				
		Effects of pollution.	No adverse effect	No change to conclusions in relation to effects on site integrity
	Guillemot	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
	Razorbill	Changes to prey availability / habitat loss	No adverse effect	No change to conclusions in relation to effects on site integrity
		Effects of pollution	No adverse effect	No change to conclusions in relation to effects on site integrity
		Disturbance / displacement and barrier effects	No adverse effect	No change to conclusions in relation to effects on site integrity
Special Area of Conservation (SAC)				
Harbour seal	Dornoch Firth and Morrich More SAC	Piling noise	No adverse effect	No change to conclusions in relation to effects on site integrity
		Non-piling related impacts	No adverse effect	No change to conclusions in relation to effects on site integrity
Bottlenose dolphin	Moray Firth SAC	Piling noise	No adverse effect	No change to conclusions in relation to effects on site integrity
		Non-piling related impacts	No adverse effect	No change to conclusions in relation to effects on site integrity

Based on results from the RIAA it was concluded that there would be no adverse effects on any of the SPAs or SACs for the Moray West Development alone and in-combination with other projects. Based on the information presented in Table 15.2 below it is also concluded that there would be no adverse effects on these sites as a result of development within the Alternative Moray West Site area.

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
Fulmar	Buchan Ness and Collieston Coast SPA East Caithness Cliffs SPA North Caithness Cliffs SPA Troup, Pennan and Lion's Head SPA	Changes to prey availability / habitat loss	Species has high habitat flexibility and very large foraging ranges (400 ± 245.8 km) (Thaxter et al., 2012). It was therefore concluded in the RIAA that there would be no adverse effects on any of the sites identified where fulmar is a qualifying interest due to change in prey / habitat loss.	It was concluded in the RIAA that no projects are considered to act in-combination with the Moray West Development during the construction phase on the basis that there is no spatial or temporal overlap with any other projects. It was therefore concluded that there is no potential for any in-combination effects on any sites or species as a result of impacts due to changes in prey availability / habitat loss.	"Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years.
		Disturbance / displacement / barrier effects	The magnitude of potential effects on fulmar due to disturbance, displacement and barrier effects was assessed as negligible in terms of any predicted increase in baseline mortality of the populations of the listed SPAs. It was therefore concluded in the RIAA that there would be no adverse effect on any of the sites identified where fulmar is a qualifying interest due to disturbance, displacement and barrier effects.	As noted in the RIAA Report Section 6.9.2 - Fulmar was not assessed at being at risk at either the Moray East (MORL, 2012) or Beatrice Offshore Wind Farm during any season. Fulmar range widely in the non-breeding season and have not been considered to be of any risk at additional wind projects in the North Sea with the species often not present at part of assessments for displacement based on the sensitivity of the species to such impacts (Wade *et al.*, 2016). On this basis it was concluded that fulmar did not need to be considered for in-combination effects in the RIAA.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
					which will reduce the period over which potential displacement mortality could occur.
		Effects of pollution	Fulmar is a surface feeder therefore at lower risk from pollution than species that spend large amounts of time in the water (divers or pursuit feeders). Also, in the event that a pollution incident occurred the potential to have a population level effect is very low due to low quantities of pollutants likely to be released (from vessels or equipment / structures). There is also specific industry best practice procedures and processes that will be put in place should a pollution incident occur in order to minimise the potential effects of that incident. Taking this into account it was concluded in the RIAA that there would be no adverse effects on any of the sites identified where fulmar is a qualifying interest due to effects of pollution.	As above, given that no projects are considered to act in-combination with the Moray West Development during the construction phase of the Development, there is no potential for any in-combination effects on any sites or species due to pollution impacts.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.
Guillemot	Buchan Ness and Collieston Coast SPA East Caithness Cliffs SPA North Caithness Cliffs SPA	Changes to prey availability / habitat loss	Guillemot was classified as having a moderate habitat use flexibility (Wade et al., 2016). Although guillemot may preferentially forage on sandeel they also forage on other mobile prey species. It was concluded in the EIA Report - Volume 2, Chapter 7 Benthic and Intertidal Ecology and Chapter 8 Fish and Shellfish Ecology that potential effects on prey species and habitat loss during construction and operation would at worst be minor. While there could be a temporary displacement of prey species, it was concluded in the RIAA that changes to prey availability / habitat loss would not affect foraging resources for guillemot to an extent that it would have a	It was concluded in the RIAA that no projects are considered to act in-combination with the Moray West Development during the construction phase on the basis that there is no spatial or temporal overlap with any other projects. It was therefore concluded that there is no potential for any in-combination effects on any sites or species as a result of impacts due to changes in prey availability / habitat loss.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that

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Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
	Troup, Pennan and Lion's Head SPA		detectable effect on any of the guillemot SPA populations listed.		this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.
		Effects of pollution	Guillemot as pursuit feeders are at higher risk of impacts from pollution due to spending large amounts of time in the water. However, as discussed for fulmar, the likelihood of a pollution incident occurring (due to vessel collision or equipment failure) is very low. In the event there is a pollution incident the quantities of fuel or other polluting substances released will be very small, on the basis the vessels are not expected to carry large volumes of fuel due to their size and quantities of substances associated with WTGs, OSPs and cables are limited. There are also specific industry best practice procedures and processes that will be put in place should a pollution incident occur in order to minimise the potential effects of that incident. Taking this into account it was concluded in the RIAA that there would be no adverse effects on any of the sites identified where guillemot is a qualifying interest due to effects of pollution.	Given that no projects are considered to act in-combination with the Moray West Development during the construction phase of the Development, there is no potential for any in-combination effects on any sites or species due to pollution impacts.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.
	Buchan Ness and Collieston Coast SPA	Disturbance / displacement / barrier effects	The proportion of the guillemot population of the Buchan Ness and Collieston Coast SPA affected by displacement mortality was assessed in the RIAA to be low in all seasons, representing less than a 1% increase in baseline mortality of each population. These results are based on 60% displacement rate and 1% mortality rate. The combined displacement mortality for the SPA was also assessed to be less than a 1% increase in	As presented in the RIAA, the predicted in-combination mortality of guillemot in the breeding season represents a negligible proportion of the SPA population and a negligible increase in the baseline mortality of the population. In the non-breeding season, the predicted in-combination total, 64% of which is	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
			baseline mortality of the SPA population. It was therefore concluded that there would be no adverse effect on the integrity of the Buchan Ness and Collieston Coast SPA due to displacement mortality on the guillemot feature of the site.	contributed by the Moray West Site, represents more than a 1% increase in the baseline mortality of the SPA population. The in-combination total is increased considerably by the large population of guillemot recorded in the post-breeding season at the Moray West Site. This population is calculated using data collected for the Beatrice offshore wind farm which is then extrapolated to the Moray West Site. The data collected at Beatrice only covers a small proportion of the Moray West Site and therefore the extrapolation of these data to the entire Moray West Site is likely to represent a considerable over-estimate. As such, it is considered that the actual in-combination total in the non-breeding season would be considerably lower than that predicted. Taking account of this likely overestimate, it is considered that there will be no adverse effect on the guillemot population of the Buchan Ness to Collieston Coast SPA as a result of in-combination displacement impacts.	WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential displacement mortality could occur.
	Troup, Pennan and Lion's Head SPA	Disturbance / displacement / barrier effects	The proportion of the guillemot population of the Troup, Pennan and Lion's Head SPA affected by displacement mortality was assessed in the RIAA to be low in all seasons, representing less than a 1% increase in baseline mortality of each population. These results are based on 60% displacement rate and 1% mortality rate. The combined displacement mortality for the SPA was also assessed to be less than a 1% increase in baseline mortality of the SPA populations. It was therefore concluded that there would be no adverse	As presented in the RIAA, the predicted in-combination mortality of guillemot in the breeding season represents a negligible proportion of the SPA population and a negligible increase in the baseline mortality of the population. In the non-breeding season, the predicted in-combination mortality also represents a negligible proportion of the SPA population and less than a 1% increase in baseline	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
			effect on the integrity of the Troup, Pennan and Lion's Head SPAs due to displacement mortality on the guillemot feature of the site.	mortality of that population. Therefore it is considered that there is no adverse effect on the guillemot population of the Troup, Pennan and Lion's Heads SPA as a result of displacement impacts associated with Moray West.	densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential displacement mortality could occur.
	North Caithness Cliffs SPA	Disturbance / displacement / barrier effects	The proportion of the guillemot population of the North Caithness Cliffs SPA affected by displacement mortality was assessed in the RIAA to be low in all seasons, representing less than a 1% increase in baseline mortality of each population. These results are based on 60% displacement rate and 1% mortality rate. The combined displacement mortality for both SPAs was also assessed to be less than a 1% increase in baseline mortality of the SPA populations. It was therefore concluded that there would be no adverse effect on the integrity of the North Caithness Cliffs SPA due to displacement mortality on the guillemot feature of the site.	Based on information presented in the RIAA and updated information relating to seasonal variations and change in assessment extent to consider both the Moray West Site and the Moray West Site + 2 km presented in PART 1 of this Addendum Document, it is concluded that in-combination displacement impacts apportioned to the North Caithness Cliffs guillemot population would not have an adverse effect on the integrity of the North Caithness Cliffs SPA.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential displacement mortality could occur.
	East Caithness Cliffs SPA	Disturbance / displaceme	As discussed in PART 1 of this Addendum Document, the outputs from the displacement matrices have been updated to take account of variations in seasonal definitions used by SNH and Moray West and to include	With respect to guillemot, as discussed in PART 1 of this Addendum Document, additional modelling was undertaken to assess the potential effects from displacement for	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
		nt / barrier effects	an assessment of the current Moray West Site alone (no buffer) in addition to the assessment of the current Moray West Site with 2 km buffer which was used to assess displacement mortality for all species on all SPAs. It was concluded from the updated assessment that for both the current Moray West Site (no buffer) and the current Moray West Site + 2 km buffer the magnitude of the impact of guillemot displacement mortality would be negligible. These results are based on 60% displacement rate and 1% mortality rate. It was therefore concluded that there would be no adverse effect the guillemot feature of the East Caithness Coast SPA due to displacement mortality. Further detail on the modelled PVA outputs relating to this impact is presented in PART 1 of this Addendum Document - Chapter 3.	the Moray West Site alone (with and without a 2 km buffer) and in-combination. The outputs from the Population Viability Analysis (PVA) modelling based on predicted levels of displacement mortality of 89 guillemot per annum indicate that after 25 years, for the Moray West Site alone + 2 km buffer, the guillemot population would be 99% the size of the unimpacted population. When considered in-combination with other projects, the PVA modelled outputs indicate that the size of the guillemot population after 25 years would be 96% of the unimpacted population. The overall magnitude of these effects are considered to be negligible. It is therefore concluded that there would be no adverse effects on the East Caithness Cliffs SPA for guillemot qualifying interests.	Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential displacement mortality could occur.
Razorbill	Buchan Ness and Collieston Coast SPA East Caithness Cliffs SPA North Caithness Cliffs SPA Troup, Pennan	Changes to prey availability / habitat loss	Razorbill is classified as having a moderate habitat use flexibility (Wade et al., 2016). Although razorbill may preferentially forage on sandeel they also forage on other mobile prey species such as sprat and herring. It was concluded in the EIA Report - Volume 2, Chapter 7 Benthic and Intertidal Ecology and Chapter 8 Fish and Shellfish Ecology that potential effects on prey species and habitat loss during construction and operation would at worst be minor. While there could be a temporary displacement of prey species, it was concluded in the RIAA that changes to prey availability / habitat loss would not affect foraging resources for razorbill to an extent that it would have a detectable effect on any of the razorbill SPA populations listed.	It was concluded in the RIAA that no projects are considered to act in-combination with the Moray West Development during the construction phase on the basis that there is no spatial or temporal overlap with any other projects. It was therefore concluded that there is no potential for any in-combination effects on any sites or species as a result of impacts due to changes in prey availability / habitat loss.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years.

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
	and Lion's Head SPA				It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.
		Effects of pollution	Razorbill as pursuit feeders are at higher risk of impacts from pollution due to spending large amounts of time in the water. However, as discussed for fulmar, the likelihood of a pollution incident occurring (due to vessel collision or equipment failure) is very low. In the event there is a pollution incident the quantities of fuel or other polluting substances released will be very small, on the basis the vessels are not expected to carry large volumes of fuel due to their size and quantities of substances associated with WTGs, OSPs and cables are limited. There are also specific industry best practice procedures and processes that will be put in place should a pollution incident occur in order to minimise the potential effects of that incident. Taking this into account it was concluded in the RIAA that there would be no adverse effects on any of the sites identified where razorbill is a qualifying interest due to effects of pollution.	Given that no projects are considered to act in-combination with the Moray West Development during the construction phase of the Development, there is no potential for any in-combination effects on any sites or species due to pollution impacts.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.
	Troup, Pennan and Lion's Head SPA	Disturbance / displacement / barrier effects	For the Troup, Pennan and Lion's Head SPA the proportion of the razorbill SPA population affected by displacement mortality was assessed in the RIAA to be negligible in all seasons and represents less than 1% increase in baseline mortality of the SPA population. These results are based on 60% displacement rate and 1% mortality rate. When seasonal displacement impacts are combined the resulting total level of displacement mortality (based on number of birds) also represents less than 1% increase in baseline mortality of the SPA population. It is therefore concluded that there	As discussed in the RIAA, the predicted in-combination mortality of razorbill in all seasons represents a negligible proportion of the SPA population and a negligible increase in the baseline mortality of the population. It is therefore considered that there is no adverse effect on the guillemot population of the Troup, Pennan and Lion's Heads SPA as a result of displacement impacts associated with Moray West in combination with other projects.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
			would be no adverse effect on the Troup, Pennan and Lion's Head SPA due to razorbill displacement mortality.		Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential displacement mortality could occur.
	North Caithness Cliffs SPA	Disturbance / displacement / barrier effects	For the North Caithness Cliffs SPA the proportion of the razorbill SPA population affected by displacement mortality was assessed in the RIAA to be negligible in all seasons and represents less than 1% increase in baseline mortality of the SPA population. These results are based on 60% displacement rate and 1% mortality rate. When seasonal displacement impacts are combined the resulting total level of displacement mortality (based on number of birds) also represents less than 1% increase in baseline mortality of the SPA population. It is therefore concluded that there would be no adverse effect on the North Caithness Cliffs SPA due to razorbill displacement mortality.	Based on information presented in the RIAA and updated information on seasonal variations and change in assessment extent to consider both the Moray West Site and the Moray West Site + 2 km presented in PART 1 of this Addendum Document, it is concluded that predicted in-combination mortality of razorbill in all season represents a negligible proportion of the SPA population and a negligible increase in the baseline mortality of the population. Therefore it is considered that there is no adverse effect on the razorbill population of the North Caithness Cliffs SPA as a result of displacement impacts associated with Moray West in combination with other projects.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential displacement mortality could occur.

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
	East Caithness Cliffs SPA	Disturbance / displacement / barrier effects	As discussed in PART 1 of this Addendum Document, the outputs from the displacement matrices have been updated to take account of variations in seasonal definitions used by SNH and Moray West and to include an assessment of the current Moray West Site alone (no buffer) in addition to the assessment of the current Moray West Site with 2 km buffer which was used to assess displacement mortality for all species on all SPAs. It was concluded from the updated assessment that for both the current Moray West Site (no buffer) and the current Moray West Site + 2 km buffer the magnitude of the impact of razorbill displacement mortality would be negligible. These results are based on 60% displacement rate and 1% mortality rate. It was therefore concluded that there would be no adverse effect the razorbill feature of the East Caithness Coast SPA due to displacement mortality. Further detail on the modelled PVA outputs relating to this impact is presented in PART 1 of this Addendum Document - Chapter 3.	With respect to razorbill, as discussed in PART 1 of this Addendum Document, additional modelling was undertaken to assess the potential effects from displacement for the Moray West Site alone (with and without a 2 km buffer) and in-combination. The outputs from the Population Viability Analysis (PVA) modelling based on predicted levels of displacement mortality of 10 razorbill per annum indicate that after 25 years, for the Moray West Site alone + 2 km buffer, the razorbill population would be 99% the size of the unimpacted population. When considered in-combination with other projects, the PVA modelled outputs indicate that the size of the razorbill population after 25 years would be 97% of the unimpacted population. The overall magnitude of these effects are considered to be negligible. It is therefore concluded that there would be no adverse effects on the East Caithness Cliffs SPA for razorbill qualifying interests.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential displacement mortality could occur.
Kittiwake	East Caithness Cliffs SPA North Caithness Cliffs SPA	Changes to prey availability / habitat loss	Kittiwake is considered to have high habitat use flexibility as birds forage across the continental shelf within the 200 m depth contour and are extremely pelagic foraging on a range of prey species (Wade et al., 2016). They are rated as having low vulnerability to habitat and prey interactions (Langston, 2010). Construction activities are therefore not expected to affect foraging resources for kittiwake. It is therefore concluded in the RIAA that there would be no adverse	It was concluded in the RIAA that no projects are considered to act in-combination with the Moray West Development during the construction phase on the basis that there is no spatial or temporal overlap with any other projects. It was therefore concluded that there is no potential for any in-combination effects on any sites or species as a result of	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and

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Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
	Troup, Pennan and Lion's Head SPA		effects on any of the sites identified where kittiwake is a qualifying interest due to effects on prey / habitat loss.	impacts due to changes in prey availability / habitat loss.	there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.
		Effects of pollution	Kittiwake is a surface feeder therefore at lower risk from pollution than species that spend large amounts of time in the water (divers or pursuit feeders). Also, in the event that a pollution incident occurred the potential to have a population level effect is very low due to low quantities of pollutants likely to be released (from vessels or equipment / structures). There is also specific industry best practice procedures and processes that will be put in place should a pollution incident occur in order to minimise the potential effects of that incident. Taking this into account it was concluded in the RIAA that there would be no adverse effects on any of the sites identified where kittiwake is a qualifying interest due to effects of pollution.	Given that no projects are considered to act in-combination with the Moray West Development during the construction phase of the Development, there is no potential for any in-combination effects on any sites or species due to pollution impacts.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.
	North Caithness Cliffs SPA	Disturbance / displacement / barrier effects	Based on updated outputs from the assessment of displacement mortality presented in PART 1 of this Addendum Document to take into account seasonal variations and include an assessment of the current Moray West Site alone (no buffer) in addition to the	Although kittiwake was not assessed for in-combination displacement in the RIAA, following advice from SNH and MSS, information on in-combination displacement mortality associated with the North Caithness	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area with respect to the assessment of effects relating to the Moray West Site alone. This is on the basis

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site

Species	Sites assessed	Impacts assessed in the current RIAA (July 2018)	Conclusions from assessment of effects associated with the current Moray West Site alone	Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects	Commentary on potential effects associated with the Alternative Moray West Site area
			assessment of the current Moray West Site with 2 km buffer it was concluded that in terms of kittiwake displacement, when assessed for the Moray West Site + 2 km the outputs from the PVA modelling based on predicted levels of displacement mortality of one bird per annum indicate that after 25 years the population would be 99% the size of the unimpacted population of the North Caithness Cliffs SPA. This is based on a displacement rate of 30% and 2% mortality rate. It was therefore concluded that there would be no adverse effect the kittiwake feature of the North Caithness Coast SPA due to displacement mortality. Further detail on the modelled PVA outputs relating to this impact is presented in PART 1 of this Addendum Document - Chapter 3.	Cliffs SPA has been provided. This information, presented in PART 1 of this Addendum Document concludes that in terms of kittiwake displacement, when assessed in-combination with other projects the PVA model predicts that for a displacement mortality of three birds per annum after 25 years the population will be 99% of the unimpacted population. It is therefore concluded that there will be no adverse effects on the integrity of the North Caithness Cliffs SPA due to kittiwake displacement.	that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity for effects associated with Moray West Development alone.
	Troup, Pennan and Lion's Head SPA	Disturbance / displacement / barrier effects	The proportion of the kittiwake population of the Troup, Pennan and Lion's Head SPA affected by displacement mortality was assessed in the RIAA to be low in all seasons, representing less than a 1% increase in baseline mortality of each population. The combined displacement mortality for both SPAs was also assessed to be less than a 1% increase in baseline mortality of the SPA populations. It was therefore concluded that there would be no adverse effect on the integrity of the Troup, Pennan and Lion's Head SPAs due to displacement mortality on the guillemot feature of the site.	No in-combination assessment required as presented in the RIAA Report - Section 6.9.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area with respect to the assessment of effects relating to the Moray West Site alone. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years.

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
					It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity for effects associated with Moray West Development alone.
	East Caithness Cliffs SPA	Disturbance / displacement / barrier effects	Based on updated outputs from the assessment of displacement mortality presented in PART 1 of this Addendum Document to take into account seasonal variations and include an assessment of the current Moray West Site alone (no buffer) in addition to the assessment of the current Moray West Site with 2 km buffer it was concluded that in terms of kittiwake displacement, when assessed for the Moray West Site + 2 km the outputs from the PVA modelling based on predicted levels of displacement mortality of 29 birds per annum indicate that after 25 years the population would be 98% the size of the unimpacted population of the East Caithness Cliffs SPA. This is based on a displacement rate of 30% and 2% mortality rate. It was therefore concluded that there would be no adverse effect the kittiwake feature of the East Caithness Coast SPA due to displacement mortality. Further detail on the modelled PVA outputs relating to this impact is presented in PART 1 of this Addendum Document - Chapter 3.	Although kittiwake was not assessed for in-combination displacement in the RIAA, following advice from SNH and MSS, information on in-combination displacement mortality associated with the East Caithness Cliffs SPA has been provided. When assessed in-combination with other projects the PVA model predicts that after 25 years the population will be 96% of the unimpacted population. It is therefore concluded that there will be no adverse effects on the integrity of the East Caithness Cliffs SPA due to kittiwake displacement.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential displacement mortality could occur.
	Troup, Pennan and Lion's Head SPA	Collision risk	The predicted level of collision (based on Band Model Option 2 and 98.9% avoidance rate) apportioned to the Troup, Pennan and Lion's Head SPA represents a negligible proportion of SPA population and a negligible increase in the baseline mortality of the SPA population. It was therefore concluded that there would be no adverse effect on the integrity of the Troup, Pennan and Lion's Head SPA due to kittiwake collision mortality. If	With respect to in-combination effects a total of 79 kittiwake collisions are apportioned to the Troup, Pennan and Lion's Head SPA per annum. This represents 0.13 % of the SPA population and 0.86% increase in baseline mortality. The overall magnitude of this effect is considered to be negligible. It is therefore concluded that there would be no adverse	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2

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Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
			combining displacement and collision, the resulting mortality apportioned to the Troup, Pennan and Lion's Head SPA would still represent a negligible proportion of the SPA population and a negligible increase in baseline mortality. It was therefore concluded that there would be no adverse effect on the integrity of the Troup, Pennan and Lion's Head SPA due to combined kittiwake displacement and collision mortality.	effects on the Troup, Pennan and Lion's Head SPA for kittiwake qualifying interests.	WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential collision mortality could occur.
	East Caithness Cliffs SPA	Collision risk	Updated information relating to kittiwake collision, taking into account seasonal variations, is presented in PART 1 of this Addendum Document. The predicted level of kittiwake collision mortality for the current Moray West Site alone (based on Band Model Option 2 and 98.9% avoidance rate) apportioned to the East Caithness Cliffs SPA has been modelled at 57 birds. Based on these predicted levels of collision mortality and PVA modelled outputs (presented in PART 1 of this Addendum Document) it is concluded that there would be no adverse effect on the integrity of the East Caithness Cliffs SPA due to kittiwake collision.	With respect to in-combination effects, depending on the application of the various adjustment factors discussed in PART 1 of this Addendum Document – Chapter 3, kittiwake collision mortality apportioned to East Caithness Cliffs SPA would be no greater than 236 collisions per annum. A further refinement to use an avoidance rate of 99.2% as opposed to 98.9% would lead to a reduction of 27% for the in-combination collision risk total for kittiwake to 172 collisions per annum. These adjustment factors include a reduction in kittiwake collisions apportioned to the Moray West Development of 7% (57 birds per annum to 53 birds per annum). The modelled PVA outputs based on these numbers predict that after 25 years the size of the kittiwake population of the East Caithness Cliffs SPA would be 87% to 90% the unimpacted population. Based on these levels of collision mortality and the PVA modelled outputs it is concluded that there	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential collision mortality could occur.

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
				would be no adverse effect on the kittiwake population of the East Caithness Cliffs SPA due to collision mortality for either Moray West alone or in-combination with other projects. It is also noted that, with further refinements applied to projects located in English waters (e.g. updates to design parameters), the number of kittiwake collisions apportioned to the East Caithness Cliffs SPA would be between 190 and 138 birds per annum. The corresponding modelled PVA outputs after 25 years for this number of predicted kittiwake collisions is 89% to 92%.	
	North Caithness Cliffs SPA	Collision risk	Based on updated information relating to kittiwake collision presented in PART 1 of this Addendum Document, it is concluded that the level of kittiwake collision mortality for the current Moray West Site alone (based on Band Model Option 2 and 98.9% avoidance rate) apportioned to the East Caithness Cliffs SPA has been modelled at three birds. Based on these predicted levels of collision mortality and PVA modelled outputs (presented in PART 1 of this Addendum Document) it is concluded that the magnitude of the impact on the kittiwake SPA population would be negligible and there would be no adverse effect on the integrity of the North Caithness Cliffs SPA due to kittiwake collision.	With respect to in-combination effects, depending on the application of the various adjustment factors discussed in PART 1 of this Addendum Document – Chapter 3, in-combination kittiwake collision mortality apportioned to North Caithness Cliffs SPA would be no greater than 41 birds per annum. A further refinement to use a avoidance rate of 99.2% as opposed to 98.9% would lead to a reduction of 27% for the in-combination collision risk total for kittiwake to 30 birds per annum. These adjustment factors include a reduction in kittiwake collisions apportioned to the Moray West Development of 7% (57 birds per annum to 53 birds per annum). The modelled PVA outputs based on these numbers predict that after 25 years the size of the kittiwake population of the North Caithness Cliffs SPA would be 90% to 92% the unimpacted population. Based on these levels	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential collision mortality could occur.

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
				of collision mortality and the PVA modelled outputs it is concluded that there would be no adverse effect on the kittiwake population of the North Caithness Cliffs SPA due to collision mortality for either Moray West alone or in-combination with other projects. It is also noted that, with further refinements applied to projects located in English waters (e.g. updates to design parameters), the number of kittiwake collisions apportioned to the North Caithness Cliffs SPA would be between 30 and 22 birds per annum. The corresponding modelled PVA outputs after 25 years for this number of predicted kittiwake collisions is 92% to 94%.	
Puffin	North Caithness Cliffs SPA	Changes to prey availability / habitat loss	Puffin is classified as having a moderate habitat use flexibility (Wade et al., 2016). Although razorbill may preferentially forage on sandeel they also forage on other mobile prey species such as sprat and herring. It was concluded in the EIA Report - Volume 2, Chapter 7 Benthic and Intertidal Ecology and Chapter 8 Fish and Shellfish Ecology that potential effects on prey species and habitat loss during construction and operation would at worst be minor. While there could be a temporary displacement of prey species, it was concluded in the RIAA that changes to prey availability / habitat loss would not affect foraging resources for puffin to an extent that it would have a detectable effect on any of the puffin SPA populations listed.	It was concluded in the RIAA that no projects are considered to act in-combination with the Moray West Development during the construction phase on the basis that there is no spatial or temporal overlap with any other projects. It was therefore concluded that there is no potential for any in-combination effects on any sites or species as a result of impacts due to changes in prey availability / habitat loss.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
		Effects of pollution	Puffin as pursuit feeders are at higher risk of impacts from pollution due to spending large amounts of time in the water. However, as discussed for fulmar, the likelihood of a pollution incident occurring (due to vessel collision or equipment failure) is very low. In the event there is a pollution incident the quantities of fuel or other polluting substances released will be very small, on the basis the vessels are not expected to carry large volumes of fuel due to their size and quantities of substances associated with WTGs, OSPs and cables are limited. There are also specific industry best practice procedures and processes that will be put in place should a pollution incident occur in order to minimise the potential effects of that incident. Taking this into account it was concluded in the RIAA that there would be no adverse effects on the puffin population of the North Caithness Cliffs SPA due to effects of pollution.	Given that no projects are considered to act in-combination with the Moray West Development during the construction phase of the Development, there is no potential for any in-combination effects on any sites or species due to pollution impacts.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.
		Disturbance / displacement / barrier effects	The proportion of the puffin population of the North Caithness Cliffs SPA affected by displacement mortality was assessed in the RIAA to be low in all seasons, representing less than a 1% increase in baseline mortality of each population. This is based on a displacement rate of 60% and 2% mortality rate. The combined displacement mortality for both SPAs was also assessed to be less than a 1% increase in baseline mortality of the SPA populations. It was therefore concluded that there would be no adverse effect on the integrity of the North Caithness Cliffs SPA due to displacement mortality on the puffin feature of the site.	The Moray West Offshore Wind Farm is not considered to materially alter the current level of in-combination mortality, contributing only one bird to the overall in-combination total. The overall magnitude of this effect is therefore considered to be negligible and it is concluded that there would be no adverse effects on the North Caithness Cliffs SPA due to displacement mortality impacts on puffin.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further

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Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
					reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential displacement mortality could occur.
Herring Gull	Buchan Ness and Collieston Coast SPA East Caithness Cliffs SPA Troup, Pennan and Lion's Head SPA	Pollution	Herring gull is a surface feeder therefore at lower risk from pollution than species that spend large amounts of time in the water (divers or pursuit feeders). Also, in the event that a pollution incident occurred the potential to have a population level effect is very low due to low quantities of pollutants likely to be released (from vessels or equipment / structures). There is also specific industry best practice procedures and processes that will be put in place should a pollution incident occur in order to minimise the potential effects of that incident. Taking this into account it was concluded in the RIAA that there would be no adverse effects on any of the sites identified where herring gull is a qualifying interest due to effects of pollution.	Given that no projects are considered to act in-combination with the Moray West Development during the construction phase of the Development, there is no potential for any in-combination effects on any sites or species due to pollution impacts.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. Given that this is a construction impact it will not be affected by the reduction in the duration of the operational period from 50 years to 25 years. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity.
	Buchan Ness and Collieston Coast SPA	Collision risk	The herring gull feature of the Buchan Ness and Collieston Coast SPA was assessed with respect to collision risk impacts. The predicted level of collision mortality apportioned to each site represents a negligible proportion of the herring gull populations of these sites and a negligible increase in baseline mortality of each of SPA population. It was therefore concluded that there would be no adverse effect on the integrity of the Buchan Ness and Collieston Coast SPA,	An in-combination mortality of six birds has been predicted for the herring gull population at the Buchan Ness to Collieston Coast SPA. This level of mortality does not represent a significant increase in the baseline mortality of the SPA population. In addition, the Moray West Offshore Wind Farm contributes less than one collision to the in-combination collision total and therefore does not materially alter the current level of in-	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species

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Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
			East Caithness Cliffs SPA or the Troup, Pennan and Lion's Head SPA due to collision impacts on herring gull.	combination mortality. As only a negligible proportion of the SPA population is affected by predicted mortality resulting in a negligible increase in the baseline mortality of the SPA population , there is considered to be no adverse effect on the herring gull feature of the Buchan Ness to Collieston Coast SPA as a result of in-combination collision risk impacts.	densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential collision mortality could occur.
	Troup, Pennan and Lion's Head SPA	Collision risk	The herring gull feature of the Troup, Pennan and Lion's Head SPA was assessed with respect to collision risk impacts. The predicted level of collision mortality apportioned to each site represents a negligible proportion of the herring gull populations of these sites and a negligible increase in baseline mortality of each of SPA population. It was therefore concluded that there would be no adverse effect on the integrity of the Buchan Ness and Collieston Coast SPA, East Caithness Cliffs SPA or the Troup, Pennan and Lion's Head SPA due to collision impacts on herring gull.	An in-combination mortality of six birds has been predicted for the herring gull population at the Troup, Pennan and Lion's Heads SPA. This level of mortality does not lead to an increase in the baseline mortality of the population of above 1%. In addition, the Moray West Offshore Wind Farm contributes less than one collision to the in-combination collision total and therefore does not materially alter the current level of in-combination mortality. As only a negligible proportion of the SPA population affected and the negligible increase in the baseline mortality of the SPA population as a result of the predicted in-combination mortality, there is considered to be no adverse effect on the herring gull feature of the Troup, Pennan and Lion's Heads SPA as a result of in-combination collision risk impacts.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential collision mortality could occur.
	East Caithness Cliffs SPA	Collision risk	The herring gull feature of the East Caithness Cliffs SPA was assessed with respect to collision risk impacts. The predicted level of collision mortality apportioned to each site represents a negligible proportion of the	An in-combination mortality of 18 birds has been predicted for the herring gull population at the East Caithness Cliffs SPA. This level of mortality does not lead to an increase in the	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this

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Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
			herring gull populations of these sites and a negligible increase in baseline mortality of each of SPA population. It was therefore concluded that there would be no adverse effect on the integrity of the Buchan Ness and Collieston Coast SPA, East Caithness Cliffs SPA or the Troup, Pennan and Lion's Head SPA due to collision impacts on herring gull.	baseline mortality of the population of above 1%. The Moray West Offshore Wind Farm contributes four collisions to the in-combination collision total attributable to the herring gull feature of East Caithness Cliffs SPA. The total in-combination collision risk attributable to East Caithness Cliffs SPA represents a negligible proportion of the SPA population and less than a 1% increase in the baseline mortality of the SPA population even before taking into account the precaution present in the total in-combination collision risk calculated in Table 6.9.17. There is therefore considered to be no adverse effect on the herring gull feature of the East Caithness Cliffs SPA as a result of in-combination collision risk impacts.	Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the operational period from 50 year to 25 years which will reduce the period over which potential collision mortality could occur.
Great black-backed gull	East Caithness Cliffs SPA	Collision risk	Based on additional information presented in PART 1 of this Addendum Document (Chapter 3) it has been concluded that given no more than 1.6 collisions are apportioned to adult birds and there is very limited evidence of any connectivity to the East Caithness Cliffs SPA breeding colony (based on evidence from tagging studies, consideration of age classes and sabbatical birds during apportioning and current research), the magnitude of any impact due to collision mortality would be negligible. It is therefore concluded that there would be no adverse effect on the East Caithness Cliffs SPA due to great black-backed gull collision mortality.	Given that there is no evidence of any connectivity to the East Caithness Cliffs SPA and therefore no potential for any adverse effects on the East Caithness Cliffs SPA it can be concluded that Moray West also makes no contribution to any in-combination effects on the great black-backed gull breeding colony of the East Caithness Cliffs SPA.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 7, there will be no changes in impact magnitude on the basis that the assessment is not influenced by removal of the Model 4 WTG (on the basis that 85 x Model 2 WTG remains the WCS design parameter) and there are no material changes to species densities associated with development in the Alternative Moray West Site area. It is therefore concluded that, as assessed in the RIAA, there will be no adverse effect site integrity. These conclusions are further reinforced by the reduction in duration of the

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
					operational period from 50 year to 25 years which will reduce the period over which potential collision mortality could occur.
Harbour seal	Dornoch Firth and Morrich More SAC	Piling noise	The harbour seal feature of the Dornoch Firth and Morrich More SAC was assessed with respect to piling noise impacts. The predicted ranges for lethal or physical injury and auditory injury in the form of Permanent Threshold Shift (PTS) was assessed as <50 m for the maximum hammer energy for both monopiles and pin piles. With the adoption of appropriate mitigation (e.g. the use of an ADD prior to a soft start) to ensure that marine mammals are outside of this range before piling starts, there is negligible risk of lethal or physical injury or PTS to harbour seals. In addition, the iPCoD modelling has indicated that the level of disturbance from piling would not result in any population level effects. Therefore there was considered to be no indication of an adverse effect on the integrity of the harbour seal feature of the Dornoch Firth and Morrich More SAC as a result of pile driving noise.	The iPCoD modelling for in-combination impacts from underwater piling noise predicted a decline in the harbour seal population size, however is was considered that the impacts were overestimates and that the harbour seal population is expected to recover after the disturbance and therefore no lasting population level effects are predicted. Therefore no Adverse Effect on the harbour seal population have been assessed as a result of displacement effects associated with the Moray West Offshore Wind Farm in-combination with other plans and projects.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 8, there will be no changes in the conclusions from the underwater noise modelling relating to the worst case scenario assessed for the Alternative Moray West Site area with regards to piling noise.
		Non-piling related impacts	The potential for harbour seals to be affected by underwater noise generated from other construction activities and the risk of collision with vessels were assessed. It was not considered that the level of vessel activity during construction would cause an increase in the risk of mortality from collisions. The adoption of a vessel management plan during construction will minimise the potential for any impact. It was also considered that the levels of increase in vessel activity will not represent a significant increase above baseline levels of ship activity in the Moray Firth and therefore it is not expected to increase the potential for disturbance	Given that no projects are considered to act in-combination with the Moray West Development during the construction phase of the Development, there is no potential for any non-piling related in-combination effects.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 8, there will be no changes in the conclusions from the underwater noise modelling relating to the worst case scenario assessed for the Alternative Moray West Site area with regards to piling noise.

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site					
Species	**Sites assessed**	**Impacts assessed in the current RIAA (July 2018)**	**Conclusions from assessment of effects associated with the current Moray West Site alone**	**Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects**	**Commentary on potential effects associated with the Alternative Moray West Site area**
			(including from non-piling noise) or collision above that already experienced in the region. With regards to impacts on harbour seal prey species the fish and shellfish EIA Report concluded that there would be no significant impacts to any fish species that may be considered important prey for harbour seals. It was also considered that harbour seals are able to move away from areas of higher suspended sediment concentrations (which could impair their ability to find prey) and return once the disturbance has ceased.		
Bottlenose dolphin	Moray Firth SAC	Piling noise	The bottlenose dolphin feature of the Moray Firth SAC was assessed with respect to piling noise impacts. The predicted ranges for lethal or physical injury and auditory injury in the form of Permanent Threshold Shift (PTS) was assessed as <50 m for the maximum hammer energy for both monopiles and pin piles. With the adoption of appropriate mitigation (e.g. the use of an ADD prior to a soft start) to ensure that marine mammals are outside of this range before piling starts, there is negligible risk of lethal or physical injury or PTS to bottlenose dolphins. In addition, the iPCoD modelling has indicated that the level of disturbance from piling would not result in a significant long term in population growth and no long term change in the population trajectory. Therefore there was considered to be no indication of an adverse effect on the integrity of the bottlenose dolphin feature of the Moray Firth SAC as a result of pile driving noise.	Population modelling (iPCoD) was undertaken to assess the in-combination impacts from piling noise on the bottlenose dolphin Moray Firth SAC population. The predicted in-combination assessment demonstrated that disturbance (without PTS) may cause a small and temporary change in the trajectory of the bottlenose dolphin population. Therefore it was considered that there is no Adverse Effect on the bottlenose dolphin population as a result of displacement effects associated with the Moray West Offshore Wind Farm in-combination with other plans and projects. With the inclusion of PTS will affect the outputs from the model but this inclusion is considered to result in an overestimation of impacts and therefore a more realistic scenario is that no bottlenose dolphins are expected to experience PTS and therefore the results above remain valid.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 8, there will be no changes in the conclusions from the underwater noise modelling relating to the worst case scenario assessed for the Alternative Moray West Site area with regards to piling noise.

Table 15.2 Assessment the Potential for Adverse Effects Upon the Integrity of the European Site

Species	Sites assessed	Impacts assessed in the current RIAA (July 2018)	Conclusions from assessment of effects associated with the current Moray West Site alone	Conclusions from assessment of effects associated with the current Moray West Site in combination with other projects	Commentary on potential effects associated with the Alternative Moray West Site area
		Non-piling related impacts	The potential for harbour seals to be affected by underwater noise generated from other construction activities and the risk of collision with vessels were assessed. It was considered that the predicted levels of increase in vessel activity resulting from the Moray West project alone will not represent a significant increase above baseline levels of ship activity in the Moray Firth and is not expected to increase the potential for disturbance above that already experienced in the region. It was not expected that the level of vessel activity during operation would cause an increase in the risk of mortality from collisions, nor add significantly to levels of noise disturbance. The adoption of a vessel management plan during operation and maintenance that includes preferred transit routes and guidance for vessel operation in the vicinity of bottlenose dolphins will minimise the potential for any impact. With regards to impacts on prey species, the fish and shellfish chapter concluded that there would be no significant impacts to any fish species that may be considered important prey for bottlenose dolphins. It was also considered that bottlenose dolphins are able to move away from areas of higher suspended sediment concentrations (which could impair their ability to find prey) and return once the disturbance has ceased.	Given that no projects are considered to act in-combination with the Moray West Development during the construction phase of the Development, there is no potential for any non-piling related in-combination effects.	Conclusions presented in the RIAA for the current Moray West Site area remain valid for the Alternative Moray West Site area. This is on the basis that, as concluded in PART 2 of this Addendum - Chapter 8, there will be no changes in the conclusions from the underwater noise modelling relating to the worst case scenario assessed for the Alternative Moray West Site area with regards to piling noise.

Annex A Stakeholder Response Analysis Spreadsheet

Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI) Application Addendum

Annex A – Stakeholder Response Analysis

Moray Offshore Windfarm (West) Limited

List of Tables

Table 1.1- General Responses (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Aberdeenshire Council								
Aberdeenshire Council	Application Consultation Response Letter	15/10/2018	The proposed site boundary was revised through the Pre Application Consultation process in order to remove Sanded Beach from consideration as part of the scheme. This removed some potential interaction with onshore considerations and seeks to alleviate some local concern regarding this matter. The EIAR outlines that where practical or possible, on and offshore construction operations would be run concurrently. This aspect is welcomed and we would seek further details on timings of works to be submitted so that these can be aligned as far as possible with onshore operations in order to limit any potential disruption to the local community. Protection of rocks and cliffs around the shoreline, where the proposed landfall may cross over between off and onshore is a key element requiring consideration. The details submitted address this sufficiently at this stage, but ongoing work and dialogue as the proposal evolves and any landfall point and method of installation becomes better defined will be necessary. Aside from the above and ongoing management with nearshore sensitivities, it is agreed that there would be no significant crossover impacts between Aberdeenshire and the offshore application.	Wind Farm and OfTI	n/a	n/a	Noted.	EIA Report - Volume 2
Aberdeenshire Council	Application Consultation Response Letter	15/10/2018	The submitted EIAR focusses largely on offshore ecology which is outwith the remit of Aberdeenshire Council. The intertidal survey did not highlight any issues of note, however should Horizontal Directional Drilling not be used for the installation of the landfall, further surveys of the exact landfall point would be required. Overall however, the offshore element of the project is not considered to give rise to any natural heritage concerns from Aberdeenshire Council's perspective.	Wind Farm and OfTI	n/a	n/a	Surveys of the landfall point will be taking place regardless of installation method.	EIA Report - Volume 2
Aberdeenshire Council	Application Consultation Response Letter	15/10/2018	Alongside the above measures to assist in diluting any potential impacts at or around the proposed landfall location, consultation on details relating to the finalised cable route and associated impacts upon the community of Sandend with regard to recreation, amenity or any impacts upon the water environment in terms of physical processes or any increased risk of flooding would be appreciated. Similarly any proposed impacts upon shoreline sensitivities including offshore impacts upon the Site of Special Scientific Interest (SSSI) running along the coast should also be addressed where required. Aberdeenshire Council note the conclusions of the Habitats Regulations Appraisal Screening Report with regard to an Appropriate Assessment on the proposals likelihood to significantly impact European designated sites. While this identifies that no adverse impacts upon any Aberdeenshire Council interests, we would still recommend that Marine Scotland fully consider this matter. Overall, Aberdeenshire Council have no objections to the application, subject to appropriate conditions or steps taken to cover appropriate mitigation and the demonstration that there will be no adverse noise impacts at the detailed design stage.	Wind Farm and OfTI	n/a	n/a	Noted.	EIA Report - Volume 2

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Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Moray Council								
Moray Council	Application Consultation Response Letter	13/11/2018	I refer to the above consultation, which was considered today at a meeting of the Planning and Regulatory Services Committee of Moray Council. Thank you for the short extension of time beyond the 12th November to allow for consideration of the matter by Committee today. Elected Members have agreed to respond raising no objection to the Section 36 consultation for the proposed offshore windfarm for Moray West. If you require any further clarification, please do not hesitate to contact me.	Wind Farm and OfTI	n/a	n/a	Moray West welcome these comments from Moray Council.	EIA Report - Volume 2
Fordyce, Sandend & District Community Council								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	FSDCC representing the location community in the vicinity of the proposed Offshore Transmission Infrastructure landfall area, is pleased to respond to Scottish Ministers regarding the Moray West OWF proposals. The CC has not comments in respect of the Offshore Wind Farm Site and its electricity generation infrastructure.	OfTI	EIA Report	n/a	Noted	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The objectives of the CC in determining the OfTI landfall proposal is to ensure that the installation activities and the completed works are not detrimental to the local environment during construction, the intended operational life of the scheme or post decommissioning. The key tests are therefore the potential for impact on: a. The natural beauty of the landscape b. Protection of the foreshore features that characterise the landfall area c. The historical and archaeological features of the landscape d. Change to the coastal morphodynamics of the bay and consequential effect on: Sea defence integrity (man made and natural) Flood risk to land and property Coastal erosion e. Social consequences	OfTI	EIA Report (including Chapters 6, 14, 15 and 16)	n/a	Moray West specified in the Offshore EIA Report that an Amendment to the Onshore Planning Application Boundary was made prior to submission of the Onshore Planning Application. The EIA for the Planning Permission in Principle (PPP) application being submitted for the Onshore Transmission Infrastructure (OnTI) was undertaken in parallel to the EIA for the Offshore Wind Farm and OfTI. As part of this process, and in response to the ongoing consultation with local communities (such as Fordyce, Sandend & District Community Council) and other key stakeholders, Moray West made the decision to amend the Onshore Planning Application Boundary (PAB) to exclude Sandend Beach and all potential landfall locations to the west of the beach out towards Findlater Castle. Moray West also confirmed in the Offshore EIA Report that Sandend Beach, and potential landfall locations to the west of the beach towards Findlater Castle, would no longer be considered as a potential landfall location.	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	We have noted that the OfTI landfall area was updated by the developer at a late stage of the application documentation process. The reconfiguration of the landfall area removing the beach zone at Sandend is welcomed by the CC and reflects the dialogue which has taken place between the CC, the local community, its Governmental representatives local and national, and the Developer.	OfTI	EIA Report Chapter 1 and Chapter 4	n/a	Moray West welcome this comment.	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The EIA Report has been read and considered in the context of the revised OfTI landfall area. This requires careful assessment, as many detailed aspects of the EIA are no longer relevant as it is clear that the developer's original intention was to use Sandend Beach as the landing area.	OfTI	EIA Report	n/a	Acknowledged that Moray West originally sought to include Sandend Beach within its application but this was excluded following engagement with the local community.	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The Community Council have highlighted several very important deficiencies in the EIA Report. In our opinion the current omission of a landfall geology assessment including test drillings, to inform the viability of HDD to install cables at a very complex geological site leads us to the conclusion that this solution is totally unproven at this stage. If and until the HDD method is proven as a solution for areas of engineering difficulty, it is clear that the developer has very few options, if any available, to install cables between the foreshore and the land behind the cliffs or coastal slopes due in the main to the sites topography and the stated intention of the developer not to cut rocks normally visible within the SSSI. Consequently a case can be made that at this stage the landfall cable methodology proposed in the EIA is fundamentally flawed.	OfTI	EIA Report	n/a	Significant analysis has been undertaken to determine the landfall location. The final location of the landfall within in this area will be the subject of detailed and costly site investigations which have commenced and are ongoing. Onshore site investigations surveys are currently ongoing (November 2018) to inform a type of landfall geology assessment that will inform installation methods and location of landfall point. As well as this, offshore surveys are taking place and further surveys will take place to inform the cable route onshore, offshore and in the nearshore areas. The final location and installation methodology will be subject to approval of both Marine Scotland (through the OfTI Cable Plan) and Aberdeenshire Council in terms of an application for approval of matters specified in conditions under the Planning Permission in Principle.	EIA Report

Table 1.1- General Responses (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	Similarly measured knowledge of the morphodynamics of the embayment in the area below MLWS is unknown. Any change in sea bed morphology and the hydrodynamics of the embayment will without doubt have potential impacts on the propagation of waves within the embayment. The magnitude of change is unknown and we do not believe the developer has demonstrated in the EIA, any quantifiable analysis that shows the outcome of sea bed installation works, ongoing cable burial cover over 50 years, or indefinitely if an insitu option is the decommissioning method, will have zero or negligible change on the historical morphodynamics that exists today.	OfTI	EIA Report	n/a	EEffects on physical processes and water quality are described in the Offshore EIA Report in terms of changes to physical processes pathways e.g. tidal currents, waves, sediment transport and seabed indentations and scour and effects of these changes on designated marine and coastal sites, surfing beaches and water quality. Key features of importance in the study area (Moray West Site, Offshore Export Cable Corridor and Landfall Area) include the Smith Bank (up on which the wind farm will be located), designated sites such as the Moray Firth proposed Special Area of Protection (pSPA), the Southern Trench proposed Nature Conservation Marine Protected Area (pNCMPA) and the Cullen to Stake Ness SSSI and important surfing venues such as Sandend Beach. The assessment in the Offhsore EIA Report, which are based on existing site data and physical processes modelling, concluded that any changes to physical processes pathways occurring during construction, operation and decommissioning of the Moray West Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI)would be limited and would not have any significant effects on any of the key features of importance. There will also be no significant effects on water quality. Potential cumulative effects associated with the Moray East and Beatrice Offshore Wind Farms, the Caithness Moray Interconnector and decommissioning of the Beatrice Oil Field were also assessed as not significant.	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	We therefore suggest MSLOT gives serious consideration to the adequacy and validity of the EIA in respect of the unproven OfTi landfall options. MSLOT must "determine with confidence" that a license can be granted and further site critical proposals dealt with through a future "cable plan" and "construction method statements" post consent. We further seek assurances from MSLOT that if in the fullness of time, should the HDD method or other factors in connection with the revised landfall area prove unsuitable, that the developer having previously excluded the Sandend Beach area, is not then permitted to claim a "best efforts" argument to seek to reinstate the beach as an alternative cable landing site.	OfTI	EIA Report	n/a	Moray West will continue to engage with Fordyce, Sandend and District CC as further information from the ongoing site investigations becomes available and a final location for the landfall and method for installation is selected.	EIA Report
Scottish Natural Heritage (SNH)								
SNH	Consultation Response	07/09/2018	This application is based on a design envelope consisting of a maximum of 85 turbines up to 285 m tall, two offshore substation platforms and two export cables coming ashore at a landfall points between Cullen and Portsoy on the Aberdeenshire Coast. Our advice considers only those aspects of the seaward of the landfall, with onshore transmission works covered by a separate planning application. SNH works in support of the Government's vision for an energy sector that delivers secure, affordable and clean energy for Scotland. We provide advice in the spirit of Scotland's National Marine Plan which balances the promotion of sustainable development of offshore wind whilst protecting our biodiversity and taking account of seascape, landscapes and visual impacts.	Offshore Wind Farm	EIA Report	n/a	Noted	EIA Report
SNH	Consultation Response	07/09/2018	We recognise and welcome the very significant contribution that this development would make to mitigating climate change.	Offshore Wind Farm	EIA Report	n/a	Noted	EIA Report
SNH	Consultation Response	07/09/2018	Our advice considers Moray West on its merits as well as taking into account cumulative and in-combination effects with other projects, particularly the Beatrice offshore wind farm (under construction) and Moray East offshore wind farm (construction commencing in 2019). In our assessment of the landscape and visual impacts we also raise cumulative capacity issues with onshore wind farms.	Offshore Wind Farm	EIA Report	n/a	Noted	EIA Report
SNH	Consultation Response	07/09/2018	We provide advice to help Marine Scotland undertake their appropriate assessment of the impacts on Natura interests, in their role as competent authority.	Offshore Wind Farm	EIA Report	n/a	Noted	EIA Report
SNH	Consultation Response	07/09/2018	Key Advice - Natura (see Ornithology tab)	Offshore Wind Farm	EIA Report	n/a	Noted	EIA Report
SNH	Consultation Response	07/09/2018	Key Advice - Seascape, Landscape and Visual Impacts (See SLVIA Tab)	Offshore Wind Farm	EIA Report	n/a	Noted	EIA Report
SNH	Consultation Response	07/09/2018	**Key Advice - Construction Impacts.** For a number of other key natural heritage interests, including marine mammals, the greatest level of impacts will arise during construction phase of the development. Any potential impacts, however, can be mitigated through conditions on any consent / licence. We provide our detailed advice on these receptors in **Appendix C** - SNH advice on marine mammals.	Offshore Wind Farm	EIA Report	n/a	Noted	EIA Report
SNH	Consultation Response	07/09/2018	**Key Advice - Construction Impacts.** In Appendix D we provide additional advice on the underwater noise modelling and use of the 0.5% conversion factor. We advise that the noise modelling for Moray West is not required to be repeated with a 1% conversion factor.	Offshore Wind Farm	EIA Report	n/a	Moray West welcome this comment.	EIA Report
SNH	Consultation Response	07/09/2018	**Key Advice - Construction Impacts.** We have also considered other natural heritage receptors such as diadromous fish species, marine fish and shellfish as well as benthic ecology and physical processes - **Appendix E.** We advise that any potential impacts can be mitigated through conditions on any consent.	Offshore Wind Farm	EIA Report	n/a	Noted	EIA Report

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Determination Period Responses								
SNH	Consultation Response	07/09/2018	If Marine Scotland is minded to recommend approval of this application to Scottish Ministers, we request the opportunity to provide further advice on natural heritage aspects of the conditions. We wish to provide advice to mitigate impacts to natural heritage interests, particularly with regard to the need for a piling strategy, landfall construction for the export cable and other pre-construction, construction and operation related activities.	Offshore Wind Farm	EIA Report	n/a	Noted	EIA Report
Public Representations								
R1	Public Representation	19/08/2018	I wish to bring to your attention the fact that the area in which Moray Offshore (West) Ltd. propose to make landfall for cables includes the climbing venue at Redhythe Point. I understand that the Environmental Impact Assessment undertaken by the company makes no reference to any potential risk to the integrity of the sea cliff as a result of construction work.; the risk to climbers visiting the climbing area due to changes in the structure of the rock; and the potential restrictions on access during the construction and future maintenance phases. It is unacceptable that the company has neglected to address these issues. I strongly recommend that any progress of the company's application is made subject to a full impact assessment being undertaken with respect to both the potential adverse impact on the sea cliffs and danger to climbers."	OfTI	EIA Report	n/a	The offshore export cable circuits will make landfall at a location within the Landfall Area, which extends from the rocks located at the east end of Sandend Beach to Redhythe Point on the Aberdeenshire coastline. It is important to note that the crags and cliffs from Sandend beach to Portsoy are a SSSI. Following advice received from SNH, Moray West within the EIA Report – Volume 2, Chapter 6, made a commitment that 'rocks....associated with the SSSI that are normally exposed will not be cut as part of any cable installation activities'. Moray West acknowledges this comment and reconfirms that rocks associated with the Cullen to Stake Ness SSSI that are normally exposed will not be cut during export cable installation. Moray West proposes that this commitment will be secured through a consent condition. Onshore site investigations surveys are currently ongoing (November 2018) to inform a type of landfall geology assessment that will inform installation methods and location of landfall point. As well as this, offshore surveys are taking place and further surveys will take place to inform the cable route onshore, offshore and in the nearshore areas. The final location and installation methodology will be subject to approval of both Marine Scotland (through the OfTI Cable Plan) and Aberdeenshire Council in terms of an application for approval of matters specified in conditions under the Planning Permission in Principle. Moray West undertook an offshore and onshore pre-application consultation process and incorporated all feedback received from those processes into the offshore and onshore applications. Moray West will continue to engage with Mountaineering Scotland and the concerned climbing community about the location of landfall and arrangements for access. In addition, Moray West has agreed with SNH a planning condition in relation to the onshore application which will require the approval of working methods by Aberdeenshire Council in consultation with SNH to avoid unacceptable impacts within the SSSI within which the climbing area is located.	EIA Report
R2								
R2	Public Representation	19/08/2018	To whom it may concern, I wish to bring to your attention the fact that the area in which Moray Offshore (West) Ltd. propose to make landfall for cables includes the climbing venue at Redhythe Point. I understand that the Environmental Impact Assessment undertaken by the company makes no reference to any potential risk to the integrity of the sea cliff as a result of construction work.; the risk to climbers visiting the climbing area due to changes in the structure of the rock; and the potential restrictions on access during the construction and future maintenance phases. It is unacceptable that the company has neglected to address these issues. I strongly recommend that any progress of the company's application is made subject to a full impact assessment being undertaken with respect to both the potential adverse impact on the sea cliffs and danger to climbers.	OfTI	EIA Report	n/a	The offshore export cable circuits will make landfall at a location within the Landfall Area, which extends from the rocks located at the east end of Sandend Beach to Redhythe Point on the Aberdeenshire coastline. It is important to note that the crags and cliffs from Sandend beach to Portsoy are a SSSI. Following advice received from SNH, Moray West within the EIA Report – Volume 2, Chapter 6, made a commitment that 'rocks....associated with the SSSI that are normally exposed will not be cut as part of any cable installation activities'. Moray West acknowledges this comment and reconfirms that rocks associated with the Cullen to Stake Ness SSSI that are normally exposed will not be cut during export cable installation. Moray West proposes that this commitment will be secured through a consent condition. Onshore site investigations surveys are currently ongoing (November 2018) to inform a type of landfall geology assessment that will inform installation methods and location of landfall point. As well as this, offshore surveys are taking place and further surveys will take place to inform the cable route onshore, offshore and in the nearshore areas. The final location and installation methodology will be subject to approval of both Marine Scotland (through the OfTI Cable Plan) and Aberdeenshire Council in terms of an application for approval of matters specified in conditions under the Planning Permission in Principle. Moray West undertook an offshore and onshore pre-application consultation process and incorporated all feedback received from those processes into the offshore and onshore applications. Moray West will continue to engage with Mountaineering Scotland and the concerned climbing community about the location of landfall and arrangements for access. In addition, Moray West has agreed with SNH a planning condition in relation to the onshore application which will require the approval of working methods by Aberdeenshire Council in consultation with SNH to avoid unacceptable impacts within the SSSI within which the climbing area is located.	EIA Report

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Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
R3								
R3	Public Representation	20/08/2018	To whom it may concern, I note that Moray Offshore (West) Ltd. have defined the eastern limit where the cables might come ashore as being Redhythe Point. I wish to bring to your attention that Redhythe Point is a rock-climbing venue. The sea cliffs at Redhythe Point contain over sixty climbing routes, and others have been, or are currently being, established at The Widow, roughly 200m west of Redhythe Point. Full details of the climbing routes are provided in the relevant chapter in 'Northeast Outcrops', published by the Scottish Mountaineering Club, and on-line. This crag regularly attracts climbers to the area and is also used by Glenmore Lodge (the National Outdoor Training Center), and other organisations, for training and teaching purposes. It is one of only four rockclimbing venues on the Moray Firth coast. The Environmental Impact Assessment (EIA) report, produced by Moray Offshore (West) Ltd., at: https://www.gov.scot/Resource/0053/00538033.pdf chapter 15 (page 1065/1283 of the pdf), considers the impact on Socio-economics, Recreation and Tourism; no reference is made here, or in the Other Human Activities chapter, or elsewhere, to climbing activity.	OfTI	EIA Report	n/a	The offshore export cable circuits will make landfall at a location within the Landfall Area, which extends from the rocks located at the east end of Sandend Beach to Redhythe Point on the Aberdeenshire coastline. It is important to note that the crags and cliffs from Sandend beach to Portsoy are a SSSI. Following advice received from SNH, Moray West within the EIA Report – Volume 2, Chapter 6, made a commitment that 'rocks....associated with the SSSI that are normally exposed will not be cut as part of any cable installation activities'. Moray West acknowledges this comment and reconfirms that rocks associated with the Cullen to Stake Ness SSSI that are normally exposed will not be cut during export cable installation. Moray West proposes that this commitment will be secured through a consent condition. Onshore site investigations surveys are currently ongoing (November 2018) to inform a type of landfall geology assessment that will inform installation methods and location of landfall point. As well as this, offshore surveys are taking place and further surveys will take place to inform the cable route onshore, offshore and in the nearshore areas. The final location and installation methodology will be subject to approval of both Marine Scotland (through the OfTI Cable Plan) and Aberdeenshire Council in terms of an application for approval of matters specified in conditions under the Planning Permission in Principle. Moray West undertook an offshore and onshore pre-application consultation process and incorporated all feedback received from those processes into the offshore and onshore applications. Moray West will continue to engage with Mountaineering Scotland and the concerned climbing community about the location of landfall and arrangements for access. In addition, Moray West has agreed with SNH a planning condition in relation to the onshore application which will require the approval of working methods by Aberdeenshire Council in consultation with SNH to avoid unacceptable impacts within the SSSI within which the climbing area is located.	EIA Report
R3	Public Representation	20/08/2018	The company does, nonetheless, recognise in the EIA report the importance of Sandend beach to surfers. The surfing community voiced a vigorous opposition to the cables making landfall at Sandend beach. In a letter received from Mr Stewart Stevenson MSP, dated 28th June 2018, he advises that Sandend beach is no longer included in the company's plans. Whilst the extent to which the objections of the surfing community has influenced this decision could be debated, it is clear that their views have been taken into account. A decision by Moray Offshore (West) Ltd. to ensure the concerns of the climbing community were similarly accommodated would be welcome. A list of all statutory and non-statutory stakeholders consulted during scoping and preparation of the EIA Report is provided in Table 5.3.1 (82/1283 of the pdf). At 15.3.1.1 the document states "Moray West has framed its assessment of potential effects on socio-economics and recreation and tourism activities through consultation with key stakeholders". Evidently, they did not sufficiently research who the interested parties might be; there is, in fact, no mention of the views of any climbing or walking organisations (there is a long-distance footpath) being sought. The EIA report does state that the company consulted Sport Scotland. Sport Scotland's response, however, is not noted in the report; in light of it being an umbrella organisation, it may be that they were unaware of climbing activity at Redhythe Point. That Glenmore Lodge, the National Outdoor Training Center (which is managed by Sport Scotland) were not aware of the situation, however, would suggest that Sport Scotland did not refer the matter to them. Neither Mountaineering Scotland, the National Governing body for climbing, nor the likes of the Ramblers Club are listed as having been consulted. In Chapter 3 of the EIA report, 'Site Selection and Alternatives' (31/1283 on the pdf), and particularly 3.7.3 - 'Landfall Appraisal' (page 38/1283 of the pdf), it is clear that the preferred site for bringing the cables ashore is/was at Sandend bay. That location, as the report notes, is now discounted. The only two remaining possible locations are at Redhaven Beach (which the report notes is not regarded as wide enough); and the "coast between Redhaven beach and Redhythe Point". The report accurately notes that the cliffs are smaller towards Redhaven beach (and therefore more favourable). That location is, however, only about 750m - 1000m from the climbing areas. Given the company's own criteria for a landfall site (detailed in this chapter), it might appear unlikely that they will opt to bring the cables ashore through the actual climbing areas (the cliffs being too high). This was confirmed in an e-mail (copied below) I received from Mr James Grant, Development Manager, Moray West, in response to my bringing the issue to the attention of Mr Stewart Stevenson MSP. In his e-mail (copied in its entirety below) Mr Grant states that "viable locations have been identified through desk top studies. These are all focused on a stretch of the application boundary between Redhaven and Skedam Cliff.". It should be noted that The Widow is 500m from Skedam Cliff and Redhythe 700m.	OfTI	EIA Report	n/a	Significant analysis has been undertaken to determine the landfall location. The final location of the landfall within in this area will be the subject of detailed and costly site investigations which have commenced and are ongoing. Onshore site investigations surveys are currently ongoing (November 2018) to inform a type of landfall geology assessment that will inform installation methods and location of landfall point. As well as this, offshore surveys are taking place and further surveys will take place to inform the cable route onshore, offshore and in the nearshore areas.	EIA Report

Table 1.1- General Responses (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
R3	Public Representation	20/08/2018	Mr Grant advises that in order to bury the cables "the only solution open to us is to embed the cable using Horizontal Directional Drilling (HDD)". I am neither a geologist nor an engineer and am not in a position to know what the effect of 'horizontal directional drilling', or other construction activity, might have on the integrity of the cliffs; the danger of loose rock to climbers should be obvious. Mr Black of Mountaineering Scotland related in an e-mail to me that he had discussed the matter with Mr Grant, who assured him that, "there would be no changes to rockfaces by drilling". This problematic. It is not clear on what basis Mr Grant makes that claim; there does not appear to be information in the EIA report to substantiate his assertion. As far as can be seen, no assessment of the impact of Horizontal Direction Drilling, or other construction activity, on the surrounding vicinity has been made. Irrespective of the fact, as Mr Grant advises, that the company will "not be allowed to make any material change" to the exposed Dalriadian rock face, due to the whole area being a SSSI, he provides no assurance that the integrity of the cliffs will be, or can be, maintained, or that falling rock will not present a danger to climbers. The mere fact that the company are 'not allowed' to damage the rock, does not provide any guarantee that damage, or danger, will not result from their actions. In his e-mail, Mr Grant states, "strictly speaking the Point as shown on the UKclimbing.com website lies outwith our application area". There is currently no way of verifying this statement. Firstly, there are no maps provided in the company's literature which are of sufficient detail to be certain this is the case. Secondly, the map provided by UK Climbing is devoid of any detail by which such a comparison could be made. The climbing area further west of Redhythe, The Widow, would still be within the proposed landfall area, even if the area did not include Redhythe Point itself. Whether or not the climbing areas are to one side or another of an arbitrary line is irrelevant; such man-made designations are not recognised by mother nature. Exactly where construction will take place has yet to be determined, as, according to Mr Grant, the company has yet to undertake "ground investigations to confirm viable locations". Although it appears unlikely that the actual climbing areas will not be the landfall site, it cannot be stated with any certainty that these has been entirely discounted; in any case, I would contend that it is the close proximity of the climbing areas to the landfall site that is the concern (The Widow is 500m from Skedam Cliff and Redhythe 700m) which needs to be considered.	OfTI	EIA Report	n/a	Noted	EIA Report
R3	Public Representation	20/08/2018	Mr Grant claims "There will certainly be no permanent loss of climbing areas". That can only be an assertion; there is no information in the EIA report upon which this statement is be based. I do not know if seismic activity will result from Horizontal Direction Drilling, and what its impact on the climbing areas might or might not be. The cliff collapsing would definitely result in the " permanent loss of climbing areas". I do not know if this, or any rock-fall (major or minor) is at all likely, I am not a geologist, but in terms of the EIA report, such a possibility has not been assessed. Mr Grant assumes my "principle concerns relate to safety and access". There are two distinct aspects in relation to safety; firstly, that of anyone undertaking one of the climbing routes; and, secondly, safety during the approach to the climbing area. Accessing the footpath to the climbing areas is, in fact, a separate matter. Given that most climbers access the crag by the path from Portsoy (as described in the guidebook), that route might not actually be affected, if the location of the onshore work is further west at Skedam Cliff. The EIA report, however, details the need for a 500m exclusion zone during the construction and future maintenance phases. Again, depending on the exact location of the landfall site, it is possible that although the path to the climbing areas might not be affected, the actual cliffs (particularly The Widow) might fall within the exclusion zone. Mr Grant claims he cannot "foresee that there will be any interference between our activities and those of the climbing community". It could be remarked that Mr Grant is surely blessed, having the gift of foresight, though it might be a concern if his foresight was somewhat myopic. The fact is that at present it cannot be said with any certainty that there will not be "any interference", principally because an assessment by the company of the impact on climbing activity has not been undertaken. Mr Grant states " I believe all safety and access issues will be able to be managed in a means that provides adequate comfort to both parties.". Mr Grant may very well believe that "all safety issues [...] will be managed", but I would contend that belief (or hope or faith) is in itself irrelevant. In order for a safety management plan to be arrived at, an assessment first needs to be undertaken; it is clear that this does not feature, even tangentially, in the EIA report and it is, therefor, an area that has been neglected by Moray Offshore (West) Ltd. Furthermore, any such proposed safety management plan, in order to be effective, needs to be agreed with the climbing community, not imposed on it by the company. In the first instance, the climbing community needs to be given a similar consideration to that shown to the surfing community and be included in the EIA report. The company has not demonstrated that it has given consideration to the 'Potential Change / Impact' of its operation on the climbing areas or climbing activity (whether they are considered as 'Pathways' or 'Receptors'); has not described a relevant 'sensitivity criteria'; and has not arrived at an assessment of the 'magnitude of impact' that their project is likely to have. Irrespective of whether such an assessment might conclude that the impact is 'high' or 'no change' (or any point between), such an assessment needs to be agreed with the climbing community; only at that point can there be a meaningful discussion on how best to manage any shared understanding of whatever risks might exist.	OfTI	EIA Report	n/a	Access to the area will be maintained for the duration of the works. In relation to safety concerns these will be fully assessed in any method statement accompanying works and in the delivery of the detailed design as part of the application for approval of matters specified in conditions. In addition, Moray West has agreed with SNH a planning condition in relation to the onshore application which will require the approval of working methods by Aberdeenshire Council in consultation with SNH to avoid unacceptable impacts within the SSSI within which the climbing area is located.	EIA Report

Table 1.1- General Responses (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
R3	Public Representation	43332	In view of the above, I request that the progress of the application by Moray Offshore (West) Ltd. to undertake the onshore activity related to cables making landfall in the area defined by them in their EIA report is made subject to them undertaking an assessment, employing the methodology utilised in relation to other areas dealt with in the EIA report, of the impact of such work on the climbing areas and climbing community; and, further to an assessment being undertaken, the company shares its assessment with the climbing community in order that a risk management plan can be agreed and implemented.	OfTI	EIA Report	n/a	Moray West will continue to engage with Mountaineering Scotland and the concerned climbing community about the location of landfall and arrangements for access. In addition, Moray West has agreed with SNH a planning condition in relation to the onshore application which will require the approval of working methods by Aberdeenshire Council in consultation with SNH to avoid unacceptable impacts within the SSSI within which the climbing area is located.	EIA Report
R4								
R4	Public Representation	14/09/2018	I am writing regarding the above application as a concerned homeowner in the historic village of Sandend.	OfTI	EIA Report	n/a	Noted	EIA Report
R4	Public Representation	14/09/2018	To begin with, I should like to say I have taken the time to attend all the meetings and presentation evenings staged by MWOW to enable me to understand first-hand what is being proposed and how the applicants would plan to execute the works. At those meetings I have asked questions directly of the MWOW representatives to get an idea of how deeply they have investigated the project in preparation for their application to yourselves and, now separately, to Aberdeenshire Council in respect of the onshore aspect. I have also seen and read the Environmental report from MWOW which I obtained at one of the meetings and which I see is listed on the Marine Scotland website.	OfTI	EIA Report	n/a	Noted	EIA Report
R4	Public Representation	14/09/2018	I will also say I am not a geological expert nor do I have specific knowledge or experience of marine drilling. I have however discussed the project with friends and neighbours around the village who do have such knowledge gleaned from their respective careers in the oil and associated industries and I have informed myself on a basic level of the issues which will be involved. I am also a sailor and use the harbour and surrounding sea areas when time permits so I do have knowledge of how the sea 'behaves' during normal natural conditions.	OfTI	EIA Report	n/a	Significant analysis has been undertaken to determine the landfall location. The final location of the landfall within in this area will be the subject of detailed and costly site investigations which have commenced and are ongoing. Onshore site investigations surveys are currently ongoing (November 2018) to inform a type of landfall geology assessment that will inform installation methods and location of landfall point. As well as this, offshore surveys are taking place and further surveys will take place to inform the cable route onshore, offshore and in the nearshore areas.	EIA Report
R4	Public Representation	14/09/2018	I was pleased to learn that following consultations with residents and at least 2 local MPs, MWOW has dropped the beach itself from their application. This is something they were resolutely determined not to do previously. However, due to the scope of the proposed sub-marine cable corridor which extends right across the bay and further west towards Cullen, my concern remains the impact which the laying of cables is likely to have on the sea bed and surrounding area which.	OfTI	EIA Report	n/a	Acknowledged that Moray West originally sought to include Sandend Beach within its application but this was excluded following engagement with the local community. See also Table 1.2 - Physical Processes & Water Quality of this Annex in relation to response regarding impact on sea bed.	EIA Report
R4	Public Representation	14/09/2018	You may already be aware that certain areas around the bay including housing are already prone to flooding which will become worse over time with climate change as the MHWS level rises as it is predicted to do. Flooding could be further exacerbated by disruption or alteration in any way of the seabed as a result of laying cables, particularly closer to the village area which is still within the cable corridor on the plan, and yet this vital aspect does not appear to have been considered by MWOW in their environmental assessment. The further concern is the effect on wave patterns which providing top grade surfing conditions which I believe are some of the best in the UK.	OfTI	EIA Report	n/a	Moray West has not identified in its assessments any flood risk arising from offshore activities for the following reasons: (1) the proposed development is cables that will be buried beneath the seabed (therefore Moray West will not affect sea level); (2) Moray West are not affecting the integrity of any existing flood defences (there are none); and (3) due to the location of the landfall (which excludes Sandend beach and harbour area) Moray West will not affect the integrity of the dunes (natural flood defence).	EIA Report
R4	Public Representation	14/09/2018	Having asked the applicant's representatives during meetings for information on how they propose to address the potential problems, it is very apparent that they have little or no detailed information or data at present on how they can meet these challenges without undue impact on the sea area. All they appear to have is an outline plan and a range of options for the cable installation but cannot be more specific until they have undertaken more detailed underwater investigative work. For example, they say they cannot specify the sub-marine route of the cables until they have undertaken further survey work or indeed they are working on the installation itself. And yet they have seen fit to present Marine Scotland with a detailed Environmental Impact Assessment to support their application.	OfTI	EIA Report	n/a	Significant analysis has been undertaken to determine the landfall location. The final location of the landfall within in this area will be the subject of detailed and costly site investigations which have commenced and are ongoing. Onshore site investigations surveys are currently ongoing (November 2018) to inform a type of landfall geology assessment that will inform installation methods and location of landfall point. As well as this, offshore surveys are taking place and further surveys will take place to inform the cable route onshore, offshore and in the nearshore areas. In relation to cable burial and installation a Construction Method Statement (CMS) and Cable Burial Risk Assessment (CBRA) will be produced and and approved by Marine Scotland prior to any cable installation at the Landfall Area	EIA Report

Table 1.1- General Responses (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
R4	Public Representation	14/09/2018	Speaking with neighbours who do have expertise in these matters, my understanding is that rock formations below MHWS in the immediate area where the cables would be landed are complex and likely to be very difficult to drill through. I further understand the cables must be laid to a specific depth below the seabed whereas the difficulty of drilling may mean this cannot be achieved simply by trenching thereby leaving the need to create some form of permanent raised box or cover structure to increase the cable depth. I am aware of how disruption in one area of seabed can, and usually does, affect another area, e.g. the beach itself, with typical results as consequent beach erosion and/or additional silting. The risk of this happening should in my view be addressed by a requirement on the applicants not to place or construct any such structures on or above the seabed and instead to take steps to ensure the cables can be laid at sufficient depth by other means.	OfTI	EIA Report	n/a	Moray West have undertaken significant hydrodynamic modelling as part of the EIA Report, which concluded no significant effects in relation to morphological change effects. See also Table 1.2 - Physical Processes & Water Quality of this Annex.	EIA Report
R4	Public Representation	14/09/2018	Additionally, I was told by MWOW that breaking or cutting of any rocks above MHWS will not be approved by Scottish Natural Heritage given that the area is registered as a SSSI. I understand this effectively means directional drilling is the only practical option. However, MWOW have not yet determined how or whether this is feasible within the confines imposed by the rock formations themselves, the geological structure of the cliff areas and the restrictions imposed by SNH. The yet to be taken core samples are, they say, key to this. As stated above whilst appreciating the land-side operation lies outside Marine Scotland's immediate remit, my view is this is so key to the whole project including compliance with sub-marine conditions, that it must be taken into account in the course of Marine Scotland's assessment. I understand Marine Scotland can consult with Aberdeenshire Council on this matter and trust this will result in a properly joined-up approach to the application.	OfTI	EIA Report	n/a	Moray West have undertaken significant hydrodynamic modelling as part of the EIA Report, which concluded no significant effects in relation to morphological change effects. See also Table 1.2 - Physical Processes & Water Quality of this Annex.	EIA Report
R4	Public Representation	14/09/2018	On a personal level, I am in favour in principle of finding non-oil related sources of energy and wind, particularly offshore, is in my view a positive step towards that goal. However, all such projects must be kept in balance with the impacts they will have on what already exists which in this case is a beautiful unspoilt bay and beach as well as an area of land regarded as important enough to have SSSI status. In the context of the need for balance, I have deep concerns that in spite of all the assurances MWOW seem willing to give, the practical reality will be a long term detrimental impact on the bay and the beach. They would no doubt express great regret at this but once the damage is done, it is very hard and sometimes impossible to undo it. In light of this, I do not consider any risk at all of such impact to be acceptable in the context of such a pristine site, very few of which remain around our shores.	OfTI	EIA Report	n/a	An acceptable general method for operating in the SSSI has been established with SNH and shall evolve with detailed design and consultation with them.	EIA Report
R4	Public Representation	14/09/2018	From a procedural perspective, I do not see how MWOW can present a fully formed case for Marine Scotland's consideration when, for example, they have still to undertake detailed investigative work in order to formulate a properly developed work plan. It seems to me that the Environmental Impact Assessment is not complete without this level of detail and therefore follows that application should not at this stage be regarded as competent.	OfTI	EIA Report	n/a	The assessment presented in the EIA Report has idenitified and assessed the potential effects of the Worst Case Scenario (WCS).	EIA Report
R4	Public Representation	14/09/2018	In addition to the above, I would wholeheartedly support and agree with the very detailed comments submitted to Marine Scotland by the Fordyce, Sandend & District Community Council which I gather you have already received.	OfTI	EIA Report	n/a	Noted	EIA Report
R4	Public Representation	14/09/2018	I would be most grateful if you would confirm safe receipt of this submission.	OfTI	EIA Report	n/a	Noted	EIA Report

Table 1.2 - Physical Processes and Water Quality (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Scottish Environment Protection Agency (SEPA)								
Scottish Environment Protection Agency (SEPA)	Application Consultation Response Letter	20/08/2018	We ask that the planning condition in Section 1 be attached to the consent. If this will not be applied, then please consider this representation as an objection. Please also note the advice provided below. We have also included further advice for the applicant in the attached appendix.	Wind Farm and OfTI	6	n/a	Request for condition is noted. A detailed response relating to the specific nature of the requested condition is presented in Row 12 below.	EIA Report - Volume 4: Technical Appendix 4.2
SEPA	Application Consultation Response Letter	20/08/2018	1. Decommissioning - 1.1 - It is recognised that a full decommissioning schedule, including a detailed plan and programme for the proposed decommissioning works will be submitted for consultation closer to the time of decommissioning (See Section 8 of the Moray Offshore Windfarm (West) Limited Decommissioning Programme). SEPA request that a copy of the Decommissioning Schedule and Plan are forwarded to it for review and comment. We request a condition is attached to any consent ensuring the decommissioning plan follows best practice at the time of preparation.	Wind Farm and OfTI	6	n/a	Moray West included a draft Decommissioning Plan as part of our application (Technical Appendix 4.2). This was prepared in accordance with requirements of the Energy Act 2004 and takes into account the following guidance: • Decommissioning of Offshore Renewable Energy Installations under the Energy Act 2004: Guidance notes for Industry, DECC, January 2011 (revised); • Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone, International Maritime Organisation (IMO), 19th October 1989; • Guidance Notes for Industry: Decommissioning of Offshore Installations and Pipelines under the Petroleum Act 1998, DECC, March 2011; • OSPAR Guidance on Environmental Considerations for Offshore Wind Farm Development, 2008; • Guidelines for Environmental Risk Assessment and Management – Green Leaves III, Defra, November 2011; and • United Nations Convention on the Law of the Sea (UNCLOS), 1982 Moray West is committed to preparing a Final Decommissioning Plan for the project and is content with the inclusion of a condition requiring the preparation of this plan. Wording of this condition will be agreed with MSLOT and SEPA and will ensure that the Decommissioning Plan follows best practice at the time of preparation. Moray West included a draft Decommissioning Plan as part of our application (Technical Appendix 4.2). This was prepared in accordance with requirements of the Energy Act 2004 and takes into account the following guidance: • Decommissioning of Offshore Renewable Energy Installations under the Energy Act 2004: Guidance notes for Industry, DECC, January 2011 (revised); • Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone, International Maritime Organisation (IMO), 19th October 1989; • Guidance Notes for Industry: Decommissioning of Offshore Installations and Pipelines under the Petroleum Act 1998, DECC, March 2011; • OSPAR Guidance on Environmental Considerations for Offshore Wind Farm Development, 2008; • Guidelines for Environmental Risk Assessment and Management – Green Leaves III, Defra, November 2011; and • United Nations Convention on the Law of the Sea (UNCLOS), 1982 Moray West is committed to preparing a Final Decommissioning Plan for the project and is content with the inclusion of a condition requiring the preparation of this plan. Wording of this condition will be agreed with MSLOT and SEPA and will ensure that the Decommissioning Plan follows best practice at the time of preparation.	EIA Report - Volume 4: Technical Appendix 4.2
SEPA	Application Consultation Response Letter	20/08/2018	1.2 - We note from Section 4.10.4 it is proposed to leave cables in situ once decommissioned as "there is no statutory requirement for removal of decommissioned cables" under current Regulations. However, given Scotland is moving to a Circular Economy approach it is highly likely that when it comes to the decommissioning of the offshore infrastructure it will be a Regulatory requirement. Our preference would always be for any offshore infrastructure to be removed for reuse or recycling.	Wind Farm and OfTI	6	n/a	Moray West acknowledge this comment and will consider decommissioning options for cables further in the next draft of the Decommissioning Programme. It is noted that, at this stage best practice does not require the removal of cables and advice received from Marine Scotland Science (MSS) states that it is preferable for cables to remain in-situ due to potential impacts on the seabed and marine environment associated with cable removal. However, Moray West confirms any Decommissioning Plan will be prepared in accordance with best practice available at the time and will be sent to SEPA for review and comment.	EIA Report - Volume 4: Technical Appendix 4.2

Table 1.2 - Physical Processes and Water Quality (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SEPA	Application Consultation Response Letter	20/08/2018	1.3 - Further detailed advice for the applicant on decommissioning is included in the attached Appendix.	Wind Farm and OfTI	6	n/a	Moray West notes the advice provided in the attached appendix and will take this into account in its Decommissioning Plan, where appropriate and in line with best practice at the time of preparation.	EIA Report - Volume 4: Technical Appendix 4.2
SEPA	Application Consultation Response Letter	20/08/2018	2. Flood risk - 2.1 - As specified in the Offshore Environmental Impact Assessment (EIA) a Planning Permission in Principle (PPP) will be required for the Onshore Transmission Infrastructure (i.e. landward of the Mean Low Water Springs). We confirm we have now formally been consulted on the EIA for these works and will provide further comments on flood risk through our duties outlined in the Town and Country (Scotland) Act 1997 within the timescale for this latest consultation.	Wind Farm and OfTI	6	n/a	Moray West acknowledge this comment.	EIA Report - Volume 2: Chapter 4 Description of Development
SEPA	Application Consultation Response Letter	20/08/2018	2.2 - SEPA has a duty to provide flood risk advice through the Town and Country (Scotland) Act 1997. As this legislation does not apply to this application we do not provide flood risk in this instance. For information, an approximate 1 in 200 year water level for the area is 3.0m Above Ordnance Datum based on extreme still water level calculations using the Coastal Flood Boundary Method. This does not take into account the potential effects of wave action, funnelling or local bathymetry at this location.	Wind Farm and OfTI	6	n/a	Moray West acknowledge flood risk advice will be provided on the PPP application through SEPA's remit under the Town and Country (Scotland) Act 1997.	EIA Report - Volume 2: Chapter 4 Description of Development
SEPA	Application Consultation Response Letter	20/08/2018	3. Coastal and estuarine water quality and pollution prevention - 3.1 - We will provide comments on coastal and estuarine water quality and pollution prevention via the separate consultation through our duties outlined in the Town and Country (Scotland) Act 1997.	Wind Farm and OfTI	6	n/a	Moray West acknowledge coastal and estuarine water quality and pollution advice will be provided on the PPP application through SEPA's remit under the Town and Country (Scotland) Act 1997.	EIA Report - Volume 2: Chapter 4 Description of Development
SEPA	Application Consultation Response Letter	20/08/2018	4. Marine ecological interests - 4.1 We will provide comments on any marine ecological interest relevant to us via the separate consultation through our duties outlined in the Town and Country (Scotland) Act 1997.	Wind Farm and OfTI	6	n/a	Moray West acknowledge marine ecology advice will be provided on the PPP application through SEPA's remit under the Town and Country (Scotland) Act 1997.	EIA Report - Volume 2: Chapter 4 Description of Development
SEPA	Application Consultation Response Letter	20/08/2018	5. Coastal processes - 5.1 We will provide comments on coastal process via the separate consultation through our duties outlined in the Town and Country (Scotland) Act 1997.	Wind Farm and OfTI	6	n/a	Moray West acknowledge coastal processes advice will be provided on the PPP application through SEPA's remit under the Town and Country (Scotland) Act 1997.	EIA Report - Volume 2: Chapter 4 Description of Development
SEPA	Application Consultation Response Letter	20/08/2018	Regulatory advice for the applicant - 6. Regulatory requirements - 6.1 - Details of regulatory requirements and good practice advice for the applicant can be found on the Regulations section of our website. If you are unable to find the advice you need for a specific regulatory matter, please contact a member of the regulatory services team in your local SEPA office at: 28 Perimeter Road, Pinefield, Elgin IV30 6AF Tel: 01343 540884.	Wind Farm and OfTI	6	n/a	Moray West welcome the provision of regulatory requirement information and good practice advice.	EIA Report - Volume 2: Chapter 4 Description of Development
Scottish Natural Heritage (SNH)								
SNH	Application Consultation Response	07/09/2018	The EIA Report covers both the Offshore Wind Farm (OWF) and the Offshore Transmission Infrastructure (OfTI). As part of the latter, the export cable landfall corridor has been revised (EIA Report Page 7 and Figure 1.5.1) to between Sandend Bay and West Head i.e. on the west side of Redhythe Point. This change to rule out Sandend Bay and the coast to the west was apparently made very late, as the Physical Processes chapter still assesses potential impacts in the original landfall corridor including Sandend Bay.	OfTI	6	n/a	A decision was taken to modify the Planning Application Boundary as a result of consultation with local communities on proposed export cable landfall points. This change was made following the completion of the offshore physical processes assessment and therefore this, now excluded, area is still considered in the Offshore Wind Farm and Offshore Transmission Infrastructure EIA Report. Given the area reduced in size it can be concluded that any potential impact will be less than assessed.	EIA Report - Volume 2: Chapter 1 Introduction & Chapter 6 Physical Processes
SNH	Application Consultation Response	07/09/2018	The EIA Report concludes that changes to physical processes will be limited and would not lead to significant adverse impacts on the seabed in/around the OWF site and export cable corridor, or on designated sites at the landfall and elsewhere. We agree with this conclusion.	Wind Farm and OfTI	6	n/a	Moray West acknowledge this comment.	EIA Report - Volume 2: Chapter 6 Physical Processes

Table 1.2 - Physical Processes and Water Quality (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SNH	Application Consultation Response	07/09/2018	The landfall options ostensibly still include cutting and backfilling a trench (6.8.2.17). However, trenching was only ever being considered through the coastal sediments of the soft sandy sediments of Sandend Bay, now excluded from the revised landfall corridor. Following our advice on the draft EIA Report, the wording 'rocks....associated with the SSSI that are normally exposed will not be cut' was added at 6.8.2.22. We welcome this commitment to protect the geological notified feature, which we would recommend as a condition in any consent granted.	OfTI	6	n/a	Moray West acknowledge this comment and re-confirm that rocks associated with the Cullen to Stake Ness SSSI that are normally exposed will not be cut during export cable installation. Moray West are satisfied that a condition in this regard will be attached to the OfTI marine licence.	EIA Report - Volume 2: Chapter 6 Physical Processes
SNH	Application Consultation Response	07/09/2018	That being said, we cannot rule out that the preferred option will be trenching through the less cliffed coastline at the western end of the revised landfall corridor (Red Haven area), where there is intermittent rock outcrop between beach sediments and is within the SSSI, In that scenario it is possible, though far from likely, that through detailed geological consultation a route and methodology could be agreed that avoided significant adverse impact despite minor excavation. In that case we advise there should be a condition to avoid affecting exposed rock within the SSSI, unless through a detailed landfall plan agreed in advance with MS and SNH.	OfTI	6	n/a	Moray West acknowledge this comment and confirm that exposed rocks associated with the Cullen to Stake Ness SSSI at Red Haven will not be cut during export cable installation in absence of an agreed methodology with MS and SNH. Moray West are satisfied that a condition in this regard will be attached to the consent.	EIA Report - Volume 2: Chapter 6 Physical Processes
SNH	Application Consultation Response	07/09/2018	Whatever landfall method is chosen, there is clear potential for adverse effects on the lowland heath notified feature of the SSSI, unless it is bypassed by Horizontal Directional Drilling (HDD). This potential impact has not been assessed, probably because the current application considers works below the MHWS, and work above the MHWS will be addressed in the Onshore Transmission Infrastructure application.	OfTI	6	n/a	Moray West confirm that potential adverse affects on the lowland heath feature of the SSSI, given any impact will be above MHWS, has been considered in the Onshore Transmission Infrastructure EIA Report as part of the onshore planning application.	EIA Report - Volume 2: Chapter 6 Physical Processes
Fordyce, Sandend & District Community Council								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The hydrodynamic and sea-bed characteristics of Sandend Bay are discussed in the EIA sections referred to above. We believe the analysis presented does not adequately consider the coastal morphodynamics of the Sandend embayment. The report identifies that future studies post consent are required to fully inform the cable routings within the bay in terms of achieving the desired burial depth and the susceptibility of the installed cables to long term change. Sandend Bay is a wave-dominated coastal embayment due to the wide swell entry width which is funnelled to a beach 3x narrower than the entrance. The longitudinal sea bed profile along the axis of the bay from MHWS to LAT-11m at the entry point varies little at a grade of 1:90 ±10% (Admiralty SNC Data) and therefore precipitates sea bed sediment movement over what is considered to be from wave observations a predominantly plane sea bed surface.	OfTI	EIA Report	n/a	Moray West have adequately assessed the potential impacts on physical processes in Sandend Bay in Chapter 6 of the EIA Report. As stated in Section 6.8.2.32 (of Chapter 6) 'No significant sediment volume is proposed to be removed from within Sandend Bay as part of the proposed cable installation activities and therefore the future size and shape of any local naturally occurring seabed sedimentary features will not be affected. It is noted that the bedrock platform underlying Sandend Bay which may also control the shape and location of certain seabed features will also not be affected.' More generally effects on physical processes and water quality are described (in the Offshore EIA Report) in terms of changes to physical processes pathways e.g. tidal currents, waves, sediment transport and seabed indentations and scour and effects of these changes on designated marine and coastal sites, surfing beaches and water quality. Key features of importance in the study area (Moray West Site, Offshore Export Cable Corridor and Landfall Area) include the Smith Bank (up on which the wind farm will be located), designated sites such as the Moray Firth proposed Special Area of Protection (pSPA), the Southern Trench proposed Nature Conservation Marine Protected Area (pNCMPA) and the Cullen to Stake Ness SSSI and important surfing venues such as Sandend Beach. The assessment in the Offhsore EIA Report, which are based on existing site data and physical processes modelling, concluded that any changes to physical processes pathways occurring during construction, operation and decommissioning of the Moray West Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI)would be limited and would not have any significant effects on any of the key features of importance. There will also be no significant effects on water quality. Potential cumulative effects associated with the Moray East and Beatrice Offshore Wind Farms, the Caithness Moray Interconnector and decommissioning of the Beatrice Oil Field were also assessed as not significant.	EIA Report

Table 1.2 - Physical Processes and Water Quality (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The visual evidence of sediment transport in the inter-tidal area year on year, is well known to Sandend residents and those who use or visit the beach on a regular basis. Significant changes occur in beach levels ≥2m which are propagated by a combination of tidal, meteorological conditions and the influence of two watercourses which discharge over the beach. The significant and obvious change in beach profile is observed in the area up to 120m below MHWS. Significant changes occur when storm events combine with high spring tides and the high influx of surface run-off flood water discharge into the bay at the East and West ends of the beach from the Fordyce and Scattery Burns. When these conditions occur suspended sediment concentrations are significant and sediment transport in the shallow waters of the bay are clearly visible by colour change on the sea surface. Depending on the duration of storm events and the resultant churn of SSC by wave energy and direction, the movement of SSC can be observed over long periods of time before final deposition occurs signified by the disappearance of sea surface indicators. It is clear that mobility of SSC within the bay by observation of the sediment cloud does extend into deeper water beyond the position of MLWS. The effects and distribution of deposition in the near shore and inshore areas is therefore difficult to quantify but must clearly result in localised changes to sea bed levels in this zone.	OfTI	EIA Report	n/a	Moray West notes the comments of FSDCC on sediment transport and storm events increasing suspended sediments in the water column.	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	Anecdotal evidence presented by local surfers with many years' experience at Sandend indicated there is a measurable change in wave dynamics post storm events due to the redistribution of sea bed sediments in the inshore area and lower margins of the nearshore area. We therefore believe through local site knowledge, that the developer although acknowledging the likelihood of storm effects on the sea bed profile, has underestimated the magnitude and frequency of hydrodynamic effects on beach morphology in the landfall area that could adversely affect the available cover to achieve and maintain cable burial depths at installation and post installation. The EIA report is deficient in critical information to proof that the intended cable burial depth up to 3m is achievable in the inshore and near shore areas where the rock head depth is unknown. This information is critical to determining the viability of Sandend Bay as a suitable cable landing site. The developer states that cable protection methods will not be used near to the landfall area. However the term "near to" is subjective and not defined in the report, consequently the areas of the cable routing which are prohibited from surface cable protection are unknown.	OfTI	EIA Report	n/a	Moray West acknowledge that the local surfing community have many years of experience in Sandend Bay and acquired several years of anecdotal evidence. In relation to cable burial and installation a Construction Method Statement (CMS) and Cable Burial Risk Assessment (CBRA) will be produced and and approved by Marine Scotland prior to any cable installation at the Landfall Area (and other areas that the OfTI will occupy). These will include details of the cable intsallation method (and any cable protection measures) for the nearshore and offshore areas. The CMS and CBRA will be informed by future geophysical and geotechnical surveys that will take place post consent. The areas subject to cable protection measures will become more apparent when survey data is available and as stated subject to a CBRA.	EIA Report

Table 1.2 - Physical Processes and Water Quality (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The developer states that if the cables are buried at "sufficient depth" below the level of natural sea bed mobility there is no potential for hydrodynamic or morphological change. Theoretically we agree with this hypothesis. The issue here is that without extensive repeated bathymetry surveys of the bay over a long period of time covering several annual periods of meteorological induced morphological change the extent of "natural sea bed mobility" is impossible to quantify. It therefore follows that the developer has recognised that the potential for morphological change in the embayment does exist and that there is potential for this to be disturbed by the proposed works. With no evidence base put forward by the developer to quantify the magnitude of sea bed mobility and available burial depth to the rock head, we do not believe the developer can demonstrate that cables can be installed within the embayment without risk of detrimental change to the coastal morphodynamics. The developer states that normally exposed rocks within the area of the SSSI will not be cut. The term "normally exposed" is subjective and not defined in the report. If this is taken as exposed at MLWS "normally exposed during the tide cycle" then we do not see an opportunity for cable landings to take place at any location in the defined landfall area.	OfTI	EIA Report	n/a	A Construction Method Statement (CMS) and Cable Burial Risk Assessment (CBRA) will be produced and and approved by Marine Scotland prior to any cable installation at the Landfall Area (and other areas that the OfTI will occupy). These will include details of the cable intsallation method (and any cable protection measures) for the nearshore and offshore areas. The CMS and CBRA will be informed by future geophysical and geotechnical surveys that will take place post consent. The areas subject to cable protection measures will become more apparent when survey data is available and as stated subject to a CBRA. In relation to the SSSI, Moray West will comply with condition k contained within Aberdeenshire Council's Committee Report, that state: Full details on proposed measures and mitigation to protect the Cullen to Stake Ness Coast Site of Special Scientific Interest (SSSI), to be prepared in consultation with Scottish Natural Heritage (SNH) and thereafter agreed by the Planning Authority. These will include coverage of the following matters: - Where practicable, the preferred technique for the installation of infrastructure is assumed to be horizontal directional drilling (HDD), as long as this reduces the overall impacts on all features (biological and geological). A HDD method statement for works within the zone of influence (ZoI) of the SSSI will be drawn up in consultation with SNH; - Should it prove necessary to use installation techniques other than HDD (e.g. open cut trenching), consultation will be undertaken with SNH throughout the detailed design process regarding the most appropriate approach, as well as to agree siting of infrastructure and temporary works areas; - A botanical assessment (National Vegetation Classification [NVC]) will be undertaken within the ZoI along with surveys of the designated geological features and used to refine the exact construction methods and locations (both temporary and permanent) to avoid the best representative locations of the designated features. The potential to focus on areas where scrub encroachment (and / or other factors) is compromising the Favourable Conservation Status (FCS) of the SSSI will be considered along with a suite of bespoke mitigation and compensation measures if required; and - If works are required within the intertidal areas of the SSSI, further Phase 1 / Phase 2 intertidal surveys will be undertaken to ensure there are no effects upon SSSI features or other sensitive habitats and communities.	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	This is due to the presence of rock shelfs or rock outcrops at all the accessible areas in the probable offshore cable approach direction to the landfall site. It would also be the case that cables laid in a box cut trough through a reef, would require cable protection and stabilisation within the trough. The potential areas are all very high wave energy zones in the storm condition, consequently a protection method that could sustain this action without using additional supplementary casings or concrete filling is doubtful. The detrimental aesthetic impact of such protection measures should not be considered acceptable in the unique coastal fringe of the landfall area. If it were possible to find cable landing locations for both cable circuits acceptable to Scottish Natural Heritage in terms of a SSSI impact assessment the difficulty of bringing cables up the near vertical coastal slopes to exit the foreshore environment would need to be resolved by the developer as part of the Onshore Ti application. We therefore take the view that no completed cable installation should be permitted above the original sea bed surface level. Consequently no cable protection measures in any form should be permitted in the embayment unless the finished surface levels are the same as original levels. This should be applied from LAT -12m to MHWS +1m.	OfTI	EIA Report	n/a	A Construction Method Statement (CMS) and Cable Burial Risk Assessment (CBRA) will be produced and and approved by Marine Scotland prior to any cable installation at the Landfall Area (and other areas that the OfTI will occupy). These will include details of the cable intsallation method (and any cable protection measures) for the nearshore and offshore areas. The CMS and CBRA will be informed by future geophysical and geotechnical surveys that will take place post consent. The areas subject to cable protection measures will become more apparent when survey data is available and as stated subject to a CBRA.	EIA Report

Table 1.2 - Physical Processes and Water Quality (as at 20 November 2018)								
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Determination Period Responses								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The objective of this zero tolerance approach to cable burial is to provide the maximum preservation of the existing morphology in the bay and minimise the risks of adverse outcomes of the proposed works through the use of any form of cable protection causing detrimental change to the wave regime in the bay. Any change could lead to increased flood risk, damage existing flood protection structures or affect the natural coastal structures protecting the environs of the bay. MSLOT should note that annual localised flooding already occurs every winter season at Sandend village when storm events occur. This is the reason why we place emphasis on the potential for detrimental future change through the developer's proposals. Consequently we believe a key assessment of the proposed scheme should be; does any of the proposed cable installation methods have the potential to increase flood risk over and above that which will otherwise occur in the future by sea level rise due to climate change. We therefore believe that having consulted with SEPA; MSLOT as the determining authority should consider the risk of flooding from the sea as part of its role in assessing the EIA, and consider a multiagency approach in determining the potential impact of the proposed scheme on land and property due to the potential for a change in the flood risk to the village and surrounding areas as a consequence of the works.	OfTI	EIA Report	n/a	Moray West will carry out a Cable Burial Risk Assessment (CBRA) as specified in the EIA Report and are committed to a target burial depth of a minimum of 1 m. Moray West has not identified in its assessments any flood risk arising from offshore activities for the following reasons: (1) the proposed development is cables that will be buried beneath the seabed (therefore Moray West will not affect sea level); (2) Moray West are not affecting the integrity of any existing flood defences (there are none); and (3) due to the location of the landfall (which excludes Sandend beach and harbour area) Moray West will not affect the integrity of the dunes (natural flood defence).	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The developer has indicated that in areas of engineering difficulty the technique of Horizontal Directional Drilling (HDD) would be employed to install the two cable circuits underground between an onshore location and a sub tidal location within the bay. This technique could eliminate all the issues associated with conventional cable burial within the bay as discussed above. If HDD was used to install cables from an onshore location behind the coastal slopes to a sea bed location beyond the extremity of the embayment, at say LAT -12 to -15m a distance of approximately 1000m would be required. The CC would fully support this approach subject to some conditions associated with the drill sites which we would address in the onshore planning application. The viability of this technique is entirely dependent on the local geology through which the drilling tales place. The developer has not presented any evidence of test borehole data to support the proposition that this technique is suitable at the landfall location.	OfTI	EIA Report	n/a	Moray West will undertake a campaign of ground investigations (onshore and offshore) to confirm viable locations that have been identified through desk top studies. The final location will be subject to approval of both Marine Scotland (through the OfTI Cable Plan) and Aberdeenshire Council in terms of an application for approval of matters specified in conditions under the Planning Permission in Principle.	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The CC has received two independent reports from qualified and experienced geologists who have studied the available geological record data and considered the suitability of the site for HDD. Both geologists independently concluded that the complex local Dalradian geology, comprises metamorphic rocks that are highly faulted and folded, formed from multiple rock types, from schists to indurated quartzite's, which are highly fractured in places. The formation is dominated by rocks with extreme hardness but includes some softer rock bands. This complex geological structure is considered to be very difficult to drill successfully. The drilling is compromised by the necessity to drill at an angle to deal with the height difference between the drill site at a distance behind the cliff top and the required depth under the sea bed. Technical difficulties would be expected due to the number of transitions between rock types and fractured horizons which may be intercepted at a wide range of drilling angles. The requirement for a nominal 800mm diameter casing hole may also be difficult to achieve with a potential high risk of failure during the pilot-hole drilling and enlargement reaming process. It should also be noted that there is little or no geological information available in the near or inshore area of the potential drilling routes offshore.	OfTI	EIA Report	n/a	Significant analysis has been undertaken to determine the landfall location. The final location of the landfall within in this area will be the subject of detailed and costly site investigations which have commenced and are ongoing. Onshore site investigations surveys are currently ongoing (November 2018) to inform a type of landfall geology assessment that will inform installation methods and location of landfall point. As well as this, offshore surveys are taking place and further surveys will take place to inform the cable route onshore, offshore and in the nearshore areas. The final location and installation methodology will be subject to approval of both Marine Scotland (through the OfTI Cable Plan) and Aberdeenshire Council in terms of an application for approval of matters specified in conditions under the Planning Permission in Principle.	EIA Report

Table 1.2 - Physical Processes and Water Quality (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	We conclude that although HDD presents a favourable opportunity as a less disruptive methodology to install the transmission cables in the bay which will satisfy our zero tolerance approach to cable burial and associated risks. By not presenting any proving test drilling data to demonstrate that this technique is a viable proposition considering the complex local geology and associated known difficulties, a serious omission in the EIA by the developer has occurred. We therefore believe that the technical assessment of the "Change at the Landfall" has not demonstrated a sufficiently robust analysis to show that two transmission cable circuits can be brought ashore by any of the suggested methods; either through physical obstructions in the foreshore areas, engineering difficulties on the on-shore environment due to coastal slopes, geological difficulties of the drilling environment and without the use of cable protection methods in the bay.	OfTI	EIA Report	n/a	Moray West will continue to engage with Fordyce, Sandend and District CC as further information from the ongoing site investigations becomes available and a final location for the landfall and method for installation is selected.	EIA Report

Table 1.3- Benthic and Intertidal Ecology (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Marine Scotland Science (MSS)								
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	The benthic section of this Environmental Statement has been completed to a high standard and is very thorough. The technical summary requires some improvement to the English in a few places.	Wind Farm and OfTI	7	n/a	Moray West welcome and acknowledge this comment.	EIA Report - Volume 2 Chapter 7: Benthic and Intertidal Ecology
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	From a benthic perspective MSS has concerns regarding the continued proposal to use gravity bases for the WTGs and OSPs.	Wind Farm and OfTI	7	n/a	Moray West have kept the option of Gravity Base Structure (GBS) Foundations in the design envelope to enable flexibility during the development phase of the Development. This flexibility is extremely important as the selection of the type of foundation will depend on a number of factors, including ground conditions and front end engineering design results, which will only be available post consent. The EIA was carried out taking into account the worst case foundation design considered in the design envelope and no significant impacts on the benthic and intertidal environment have been concluded.	EIA Report - Volume 2 Chapter 4 Description of Development and Chapter 7 (Table 7.6.1 Design Envelope), Section 7.6.2 Embedded Measures, Section 7.7 Assessment of Potential Effects and Section 7.8 Assessment of Cumulative Effects
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	We are also concerned about the route of the export cable and would strongly recommend HDD rather than open-cut trenching to minimise damage to the intertidal and benthic environment.	Wind Farm and OfTI	7	n/a	The export cable route and landfall installation method will be informed by offshore and nearshore (and onshore) site investigation surveys pre and post consent of the development. As identified in Section 7.7.5 of the EIA Report (Chapter 7) - Additional Mitigation this includes undertaking an intertidal survey of the preferred landfall location - pre construction. Results from this survey and the site investigations will be used to inform the preferred installation methods at the landfall. Moray West will discuss these survey data and route / installation options with Marine Scotland to determine a solution that satisfies environmental and engineering requirements. The vechicle for this discussion would likely include one or all of the following; Construction Method Statement (CMS), Cable Burial Risk Assessment (CBRA) and Environmental Management Plan (EMP).	EIA Report - Volume 2 Chapter 7 Benthic and Intertidal Ecology - Section 7.7.5
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	A further concern is the finding of a 'low grade' stony reef on the wind farm site. While it is recognised that it is an Annex I feature in the Habitats Directive, there is no direct mention that it contains a maerl bed which is a protected habitat. The only mention of maerl is in a table in the Technical Appendix (7.1) and on the photographs. MSS would like clarification that the location of this stony reef is mapped and that the developer will seek to avoid locating any WTGs/OSPs or cabling in this location.	Wind Farm and OfTI	7	n/a	There is an error with the reference to the Figure within Technical Appendix 7.1 (EIA Report Volume 4a) where the location of the potential Annex I feature is presented. The reference the EIA Report Volume 2 Chapter 7 - Page 26 - Paragraph 7.4.2.37 is Figure 4.2-11 of Technical Appendix 7.1. This is not correct. The area of potential Annex I stony reef is described in Section 3.1 of Technical Appendix 7.1 on page 24 - text directly below Table 3.14. The location of the station where the area of potential Annex I stony reef is located (Station W39) is illustrated in Figure 3.1 of Technical Appendix 7.1 (Page 27). The area of potential Annex I stony reef was identified 150 m NW of Station W39 (Page 24 of Technical Appendix 7.1). As presented in EIA Report Chapter 7 Volume 2 - Section 7.7.5 with relation to this small area of potential Annex I stony reef habitat, Moray West will seek to confirm the extent of this feature following further geophysical survey (employing the use of drop down video and or camera survey equipment), which will be undertaken pre-construction. Moray West would propose micro-siting of infrastructure to avoid this feature where present and as practicable.	EIA Report - Volume 2 Chapter 7: Benthic and Intertidal Ecology Technical Appendix 7.1 Benthic Survey Report
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Comments relating to the Technical Summary - The area quoted that could be affected by the dredging and scour protection of a gravity base foundation is large. In the Maximum Design Envelope, it states that in a worst case scenario all 85 WTG may have gravity bases. Gravity bases cause considerable loss of habitat, in addition to introduction of a hard substratum and increases in suspended sediment during construction. Would the developer be able to give MSS an indication of under what circumstances they require gravity bases and whether a less damaging method cannot be used? Likewise for the OSPs, could the developer explain why gravity base structures need to remain as an option?	Wind Farm and OfTI	7	n/a	The main reason for including GBS foundations is to allow Moray West sufficient flexibility in the design of the wind farm. This flexibility is extremely important as the selection of the type of foundation will depend on a number of factors, including ground conditions and front end engineering design results, which will only be available post consent. It is important to note however that EIA was carried out taking into account the worst case foundation design considered in the design envelope and no significant impacts on the benthic and intertidal environment have been concluded. GBS foundations would likely be installed where monopiles or jackets are not feasible. This can only be determined by further ground investigation through future geophysical and geotechnical surveys.	EIA Report - Volume 2 Chapter 4: Description of the Development

Table 1.3- Benthic and Intertidal Ecology (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Comments relating to the Technical Summary - With regards to the benthic environment, MSS would prefer to see the offshore export cable circuits installed using HDD rather than jetting or open-cut trenching to minimise damage to the intertidal and near-shore subtidal environment. The section of coastline selected for landfall is a sensitive area, containing complex rocky reef habitat. Trenching the cable will cause damage to intertidal and subtidal habitats. MSS would recommend the method which causes minimal damage to these environments.	Wind Farm and OfTI	7	n/a	The landfall installation method will be informed by nearshore and onshore site investigation surveys pre and post consent of the development. As identified in Section 7.7.5 of the EIA Report (Chapter 7) - Additional Mitigation this includes undertaking an intertidal survey of the preferred landfall location - pre construction. Results from this survey and the site investigations will be used to inform the preferred installation methods at the landfall. Moray West will discuss these survey data and route / installation options with Marine Scotland to determine a solution that satisfies environmental and engineering requirements.	EIA Report - Volume 2 Chapter 4 Description of Development and Chapter 7 Section 7.6.2 Embedded Measures Further detail is also provided in Chapter 2 Description of the Development and Chapter 6 Ecology of the Onshore EIA Report.
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	4.10.4. Cables - MSS agrees, it may be preferable to leave the cables buried upon decommissioning in order to minimise further environmental disturbance. However, if the cables are to be left in situ and not removed entirely, MSS would recommend periodic monitoring of the cables to ensure they do not become exposed over time and become a snagging hazard to fisheries.	Wind Farm and OfTI	7	4.10.4	As described in the EIA Report, including Technical Appendix 4.2 Draft Decommissioning Programme, as part of decommissioning the preferred option will be for all cables to be left *in situ* (except any exposed sections of cable which will be removed). All infrastructure including cables will be cut below the surface of the seabed to minimise potential long term impacts on other sea users such as snag risk. An assessment of potential impacts on benthic and intertidal habitats from the complete removal of cables has been presented in Chapter 7 of the EIA Report. However, this is considered very much a worst case and as stated in Chapter 7 will be subject to review at the time considering the environmental impact of removal compared to safety of leaving the cables in situ. The Draft Decommissioning Programme (Technical Appendix 4.2, Section 13) provides an overview of the currently proposed post-decommissioning monitoring approach, including seabed surveys to identify any obstacles in the seabed in order to ensure that any project infrastructure left in situ does not pose a threat to other sea users. In addition, it is noted that the risk of exposure at the Moray West site is expected to be low as a result of the relative stability of the seabed in the area and the depth at which foundations will be cut and cables buried. A finalised Decommissioning Programme will be agreed in advance of decommissioning operations which will include the most appropriate approach to decommissioning available at that time. Upon decommissioning it will be likely that in the early years monitoring of the effectiveness of the approach taken will ensue.	EIA Report - Volume 2 Chapter 7 (Table 7.6.1 Design Envelope) Further detail also provided in Technical Appendix 4.2 Draft Decommissioning Programme
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	MSS is concerned that the cable route crosses the Southern Trench pNCMPA. It has been designated partly for its burrowed mud and associated fauna and is known to be an important nursery ground for juvenile fish. Laying a cable may cause significant disturbance. Trenching effectively removes habitat and increases in suspended sediment may cause smothering of sensitive mud habitats and species.	Wind Farm and OfTI	7	n/a	The Offshore Export Cable Corridor traverses through a part of the Southern Trench pMPA and will potentially result in permanent loss, disturbance or smothering of SS.SMu.CFiMu.Spn.Meg. The extent of this habitat biotope was limited to certain areas along the Offshore Cable Corridor. The impact assessment was carried out taking into account that this habitat is a qualifying feature of the pMPA. The EIA concluded that impacts on this habitat are of minor significance and therefore not significant in EIA terms. No mitigation is therefore required as a result of the construction, operation and maintenance of the proposed development. As there will be no significant effects upon the SS.SMu.CFiMu.SpnMeg biotope, it is concluded that there will be no significant effects upon the Southern Trench pMPA overall. The SS.SMu.CFiMu.SpnMeg biotope is particularly prevalent and it was agreed in the meeting (15/11/2018) that the EIA's conclusions are accurate.	EIA Report - Volume 2 Chapter 7 Section 7.4 and 7.9
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Table 6.6.1: Design Envelope Parameters Relevant to the Physical Processes and Water Quality Impact Assessment MSS is concerned about the volume of sediment disturbed for each WTG in the worst case scenario using the gravity base options. MSS would prefer a method of installation which minimises the area of impact on the seabed.	Wind Farm and OfTI	6	Table 6.6.1	As noted above, Moray West has included GBS foundations in its design envelope in order to ensure that there is sufficient flexibility in the design process. This flexibility is extremely important as the selection of the type of foundation will depend on a number of factors, including ground conditions and front end engineering design results, which will only be available post consent. The EIA has been carried out taking into account the worst case foundation design considered in the design envelope and no significant impacts on the benthic and intertidal environment have been concluded.	EIA Report - Volume 2 Chapter 4 Description of Development

Table 1.3- Benthic and Intertidal Ecology (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Section 7.4.1.5 - As is stated in the Environmental Statement, the Phase 1 and 2 intertidal surveys were completed at Sandend where the original cable land-fall site had been selected. Subsequently, it was decided that the landfall site would avoid this bay. MSS do recommend carrying out the intertidal survey at the precise location selected for landfall.	Wind Farm and OfTI	7	7.4.1.5	As presented in Section 7.7.5 Moray West is committed to carrying out an intertidal survey at the precise location selected for landfall. The landfall location will be determined following the completion of onshore and offshore site investigation. The intertidal survey will be completed post consent as part of the discharge of consent conditions and detailed design for onshore planning.	EIA Report - Volume 2 Chapter 7 Section 7.7.5
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Section 7.4.2.3 - The benthic report has identified habitats and species of conservation interest. MSS is concerned about the recording of *Arctica islandica* and *Limaria hians.* Arctica in particular is very slow growing and very long lived. Records of Limaria offshore are lacking. Finding these species at one station indicates that they could be more widespread given a greater survey effort. MSS recommends avoiding the site where they were found.	Wind Farm and OfTI	7	7.4.2.3	Through detailed design and micro-siting of infrastructure, Moray West will seek to avoid, where possible, known areas of *Arctica islandica* and *Limaria hians* when determining final layouts for the turbines and cable routes.	EIA Report - Volume 2 Chapter 7 Section 7.6.2 Embedded Mitigation
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Section 7.4.2.34 - The Priority Marine Feature (PMF) SS.SMu.CFiMu.SpnMeg was found on the offshore export cable corridor some of which is in the proposed Southern Trench NCMPA. Seapens will be lost if dredging occurs over them and the increase in suspended sediments may cause smothering. However, this habitat is widespread within this part of the North Sea and no significant effect on the population as a whole is expected.	Wind Farm and OfTI	7	7.4.2.34	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Section 7.4.2.35 - The PMF SS.SCS.ICS.MoeVen was identified, a component of tide-swept coarse sands with burrowing bivalves. The report states that it was found in deeper water than described in the literature. However, it is often the case that biotopes exist in slightly differing conditions than originally described. MSS would advise avoiding incidences of this biotope if feasible, as it may be sensitive to habitat changes through sedimentation, changing tidal streams and of course habitat removal. There is a lack of data for this biotope in offshore regions.	Wind Farm and OfTI	7	7.4.2.35	Moray West will avoid incidences of the biotope (SS.SCS.ICS.MoeVen) if feasible when determining final layouts for the turbines and cable routes.	EIA Report - Volume 2 Chapter 7 Section 7.6.2 Embedded Mitigation
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Section 7.4.2.36 - The PMF SS.SSaCFiSa.EpusOborApri were common at the Moray West site, a component of subtidal sands and gravels. Subtidal sands and gravels are an Annex I feature; however, they are very widespread offshore in UK waters. The site of the wind farm is not within an SAC.	Wind Farm and OfTI	7	7.4.2.36	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Section 7.4.2.37 and Photos in the Technical Appendix 7.1 - The stony reef identified here has been labelled as low grade reef. The photographs in the appendix (images 17-05-18 11.34.12_Dive 64 W27 to Image 17-05-18 11.16.45_Dive63) display maerl. In the table it is described as Lithothamnion sp.. MSS would question whether this biogenic reef actually constitutes 'low grade' stony reef. The finding of a maerl bed offshore is rare. They are normally found in coastal waters in depths of up to 30 metres. MSS would strongly advise avoiding placement of any structures on or near to this stony reef. Could the developer also supply MSS with depths and positions of this reef so that it can be added to a national database as it is rare that it is found offshore? Maerl is listed in Annex 1 of the Habitats Directive, it is on the OSPAR list of threatened and declining species and habitats and it is a PMF in Scottish waters. MSS is also interested to know the species of Serpulidae that were found there.	Wind Farm and OfTI	7	7.4.2.37	As presented in EIA Report Chapter 7 Volume 2 - Section 7.7.5 with relation to this small area of potential Annex I stony reef habitat, Moray West will seek to confirm the extent of this feature following further geophysical survey, which will be undertaken pre-construction. Moray West would propose micro-siting of infrastructure to avoid this feature where present and as practicable. This mitigation will be incorporated into the Environmental Management Plan (EMP). Moray West will provide MSS with the locations and depths of the area of maerl as requested. Moray West will also provide more information on the species of Serpulidae also found in the same location of the maerl.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Landfall and intertidal habitat - 7.4.2.43 The original Phase 1 and 2 surveys were conducted at Sandend Beach. The surveys were conducted to a high standard but this area is no longer under consideration. The potential landfall area now being considered is between the east of Sandend beach and Redhythe Point. This part of the Moray Coast contains some exceptional examples of rock reef. There is a Seasearch report to the east of this location which gives an idea of the type of coastline here, http://www.seasearch.org.uk/downloads/North%20Aberdeenshire%20Coast%20web.pdf	Wind Farm and OfTI	7	7.4.2.43	Moray West welcome this comment and provision of another source of useful information. As noted in the EIA Report - Volume 2 Chapter 7 Section 7.7.5 Additional mitigation - Moray West commit to carrying out an intertidal survey at the precise location selected for landfall. The location will be known after onshore and offshore site investigation surveys have taken place and most likely post consent.	EIA Report - Volume 2 Chapter 7 Section 7.7.5

Table 1.3- Benthic and Intertidal Ecology (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Further information on near shore subtidal areas that have been surveyed may be available through Marine Recorder or the National Biodiversity Network (https://scotland.nbnatlas.org/). The habitats on this stretch of coastline that is under consideration may qualify as PMFs (e.g. tide-swept algal communities and kelp beds). Bedrock reefs within SACs are protected. This area of coastline is out with an SAC. However, MSS recommend an in depth survey of the proposed landfall site and would strongly recommend HDD for the cable installation as opposed to a 15m wide trench. This would minimise damage to rocky reefs.	Wind Farm and OfTI	7	n/a	Moray West welcome the provision of another source of useful information. A survey will be undertaken in the subtidal nearshore area to identify any new areas of these species and habitats (that will be avoided, if feasible, when installing the export cable).	EIA Report - Volume 2 Chapter 7 Section 7.7.5
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	Electromagnetic Fields (EMF) - 7.7.3.42 - MSS is in agreement that the cable should be buried to a depth of at least 1 m where possible or covered in mattresses or similar where it is not possible to bury it. As such effects of EMF to benthic species are predicted to be low. At this depth seabed heating is unlikely to be of concern except to burrowing species.	Wind Farm and OfTI	7	7.7.3.42	Moray West welcome this comment.	EIA Report - Volume 2 Chapter 7
MSS-Benthic Ecology	Application Consultation Response Letter	31/08/2018	With regard to Marine Invasive Non-Native Species, MSS would recommend periodic surveys of substructures including the cable route, the WTGs and the OTGs. This could be combined with surveying for technical purposes. MSS would like to see the results of such surveys.	Wind Farm and OfTI	7	n/a	There is little evidence from other offshore wind farm developments within the North Sea of MINNS species having any adverse effects on key species and habitats. The Moray West EMP will include measures to reduce the risk of the introduction and spread of MINNS in vessel ballast water and biofouling during construction. It is predicted that although the sensitivity of habitats are considered to be a maximum of high sensitivity the magnitude of risk of introduction of MINNS is considered to negligible. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms. No further mitigation is required following on from embedded mitigation described in Section 7.6.2 of the EIA Report (Volume 2), as there are no significant effects as a result of the construction of the proposed development. As part of engineering surveys during the Operations and Maintenance (O&M) phase, Moray West could deploy drop down video or camera survey equipment to investigate for the presence of MINNS.	EIA Report - Volume 2 Chapter 7 Section 7.6.2
Scottish Natural Heritage (SNH)								
SNH	Application Consultation Response	07/09/2018	Although some of the impacts will be permanent, most of the protected habitats and species are commonly occurring across the wider area, so the development is unlikely to have a significant impact on these habitats and species populations. Precise details of the landfall are unclear, and further work is required to assess potential impacts.	Wind Farm and OfTI	7	7.4.2.43	As noted in the EIA Report - Volume 2 Chapter 7 Section 7.7.5 Additional mitigation - Moray West commit to carrying out an intertidal survey at the precise location selected for landfall. The location will be known after onshore and offshore site investigation surveys have taken place and most likely post consent.	EIA Report - Volume 2 Chapter 7 Section 7.7.5
SNH	Application Consultation Response	07/09/2018	The cable route passes through the Southern Trench proposed Marine Protected Area (pMPA) selected for burrowed muds as well as shelf deeps, fronts and minke whale. The benthic survey shows the presence of burrowed mud (SS.Smu.CFiMu.SpnMeg, 'Seapens and burrowing megafauna in circalittoral fine mud') Priority Marine Feature (PMF) at five stages along the export cable corridor. White cluster anemone (*Parazoanthus anguicomus*), which has also been recorded in the Southern Trench, was not recorded in the benthic survey.	Wind Farm and OfTI	7	7.4.2.34	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
SNH	Application Consultation Response	07/09/2018	The pMPA, and the burrowed mud feature within it, is extensive, with burrowed mud widespread across the southern half of the Moray Firth and relatively widespread across the waters around Scotland. The area of habitat likely to be affected by the development is therefore comparatively small compared to the area of burrowed mud within the pMPA and the area should recover, although this may take some time.	Wind Farm and OfTI	7	n/a	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
SNH	Application Consultation Response	07/09/2018	We advise that the proposal is capable of affecting the burrowed mud feature of the Southern Trench pMPA. However, these effects are insignificant. Further assessment is therefore not required.	Wind Farm and OfTI	7	7.4.2.34	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
SNH	Application Consultation Response	07/09/2018	Some PMFs are present within the site and may be affected by the development.	Wind Farm and OfTI	7	n/a	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
SNH	Application Consultation Response	07/09/2018	Burrowed mud is discussed under protected sites.	Wind Farm and OfTI	7	n/a	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
SNH	Application Consultation Response	07/09/2018	Tide-swept coarse sands with burrowing bivalves (SS.SCS.ICS.MoeVen 'Moerella spp. With venerid bivalves in infralittoral gravelly sand') were identified at four sites on the benthic survey. These habitats are likely to be sensitive to physical disturbance but have low sensitivity to siltation changes and are likely to recover quickly. There are likely to be impacts on the PMF, but without significant impact on the national status.	Wind Farm and OfTI	7	7.4.2.35	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1

Table 1.3- Benthic and Intertidal Ecology (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SNH	Application Consultation Response	07/09/2018	Offshore subtidal sands and gravels (SS.Ssa.CFiSa.EpusOborApri (or transitional with this biotope) '*Echinocyamus pusillus* , Ophelia borealis and *Abra prismatica* in circalittoral fine sand) were present at 47 stations. Sand and gravel sediments are the most common subtidal habitat around the coast of the British Isles and are abundant in the offshore waters of Scotland. There are likely to be impacts on the PMF, but without significant impact on national status.	Wind Farm and OfTI	7	7.4.2.36	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
SNH	Application Consultation Response	07/09/2018	Three individual flame shells (Limaria hians) were identified at one site on the benthic survey, but these are not considered a PMF unless they form a flameshell bed. Individual flame shells are fairly widespread, and the biotope coding does not indicate that a bed was present. Although poor resolution, the images from this station in the technical appendices do not indicate that this is likely to be a flame shell bed, and look similar to other images from other stations where no flame shells were found. Flame shell beds are also not known to exist on the east coast of Scotland. These records are therefore not considered a PMF and are not considered further.	Wind Farm and OfTI	7	7.4.2.40	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
SNH	Application Consultation Response	07/09/2018	The ocean quahog (Arctica islandica) has been found in low numbers at one station. This species is considered important as Scotland holds a large proportion of the British records and due to the fact that it is long lived, under threat of decline and functionally important. However, it is widespread around Scotland and whilst there are likely to be impacts on the PMF this is likely to be without significant impacts on the national status.	Wind Farm and OfTI	7	7.4.2.40	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
SNH	Application Consultation Response	07/09/2018	There was a small area (approximately 25 m wide) of stony reef identified on the benthic survey. Other areas outside the survey stations could also have stony reef and areas of mixed coarse stony/cobble habitats with boulders which may also be considered stony reef. Reef habitat will have a low recoverability and high sensitivity to physical disturbance and smothering. However, the area likely to be affected is likely to be small in the context of the wider area and the development is unlikely to have a significant impact.	Wind Farm and OfTI	7	7.4.2.37	Moray West acknowledges this comment.	EIA Report - Volume 2 Chapter 7 and Volume 4 Technical Appendix 7.1
SNH	Application Consultation Response	07/09/2018	It is not clear where exactly within the wider area the landfall will be and what habitats are likely to be affected, though none of the landfall area falls within a designated site for intertidal features.	Wind Farm and OfTI	7	7.4.2.43	As noted in the EIA Report - Volume 2 Chapter 7 Section 7.7.5 Additional mitigation - Moray West is committed to carrying out an intertidal survey at the precise location selected for landfall. The location will be known after onshore and offshore site investigation surveys have taken place and most likely post consent.	EIA Report - Volume 2 Chapter 7 Section 7.7.5
SNH	Application Consultation Response	07/09/2018	The survey work relating to the intertidal area all relates to Sandend Bay and methods appropriate for the littoral sediment habitat of Sandend Bay. However, this area has now been discounted as an option for the landfall. The remaining area appears to be more rocky, though there is no survey work relating to it. We are unable to make an assessment of the potential impacts of the landfall on the intertidal without more information on both methods and location. HDD would be our preferred option for intertidal habitats over open cut trenching.	Wind Farm and OfTI	7	7.4.2.43	As noted in the EIA Report - Volume 2 Chapter 7 Section 7.7.5 Additional mitigation - Moray West is committed to carrying out an intertidal survey at the precise location selected for landfall. The location will be known after onshore and offshore site investigation surveys have taken place and most likely post consent.	EIA Report - Volume 2 Chapter 7 Section 7.7.5

Table 1.4 - Fish and Shellfish Ecology (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Marine Scotland Science (MSS)								
MSS-Marine Fish Ecology	Application Consultation Response Letter	31/08/2018	Cod - The development area falls within the indicative cod spawning area (Coull et al, 1998) and cod were found to be present within baseline characterisation. Cod has therefore rightly been assessed against the relevant impact pathways.	Wind Farm and OfTI	8	Section 8.7.1.58	Comments noted.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Marine Fish Ecology	Application Consultation Response Letter	31/08/2018	Whilst it is accepted that the indicative spawning area, as presented in Coull et al (1998), is larger than the conservative area modelled for TTS, when considering displacement the EIA report states that "The overall proportion of these habitats that are likely to be affected by underwater noise from piling operations within the Development would be expected to be small in the context of the widespread nature of these habitats in the southern North Sea." Whilst MSS do not disagree with this statement in general, it is perhaps too simplistic an approach to apply to cod when it has been shown that between 67 and 97% of cod remained within 100 km of spawning areas throughout the year, suggesting resident spawning groups. The same study suggested that population processes may operate at a smaller spatial scale than the stock level, with spawning aggregations functioning as local populations within a metapopulation (Wright et al, 2006). Indeed, the EIA report finds that the cod population of the Moray Firth is genetically distinct from other North Sea populations.	Wind Farm and OfTI	8	Section 8.7.1.58	Comments noted.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Marine Fish Ecology	Application Consultation Response Letter	31/08/2018	When considering the behavioural effects of noise it is stated (section 8.7.1.58) that "research has shown that spawning adults are unlikely to show displacement as their spawning activity takes precedence over any other behaviour due to the amount of energy put into the spawning process and its importance in successful recruitment." Whilst MSS is aware of some research, particularly in relation to herring, there is no indication provided that this relates specifically to cod. It is well established that cod utilise underwater noise during their courting rituals. There does not appear to be any consideration as to the potential effects, if any, of TTS on the use of sound by cod, which could be particularly important should cod not show displacement due to noise. Whilst accepted that TTS is likely temporary effect, in order to minimise the likelihood of this occurring during the spawning period, any opportunity within a piling strategy to minimise, or avoid, piling during peak spawning period (February – March) would be welcomed.	Wind Farm and OfTI	8	Section 8.7.1.58	Concerns raised with respect to potential effects of TTS on the use of cod by sound are noted. Moray West will discuss proposed mitigation (to minimise or avoid piling during peak spawning period (February to March) with MSS and MSLOT as part of the development of the Piling Strategy as discussed in the EIA Report - Volume 2, Chapter 8 - Section 8.6.2 Embedded Mitigation.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Marine Fish Ecology	Application Consultation Response Letter	31/08/2018	Cod - MSS suggest that post construction surveys to better understand the effects of offshore development on cod presence at the local level across the site should be considered.	Wind Farm and OfTI	8	n/a	Moray West will consider post construction surveys to better understand the effects of offshore development on cod presence at the local level across the site.	n/a
MSS-Marine Fish Ecology	Application Consultation Response Letter	31/08/2018	Sandeels - As cited within the EIA report, sandeel populations are sensitive to sediment type within their habitat, preferring coarse to medium sands. When considering temporary habitat loss / habitat disturbance and long term habitat loss, the EIA report deems them to be of high vulnerability, medium recovery and of regional importance within the study area with an overall effect from long term habitat loss assessed as negligible to low and not significant in terms of EIA.	Wind Farm and OfTI	8	n/a	These conclusions (no significant effect in terms of EIA) are based on information presented in the EIA Report - Volume 2 Chapter 8: Section 8.4 (paragraphs 8.4.2.88 to 8.4.2.93) (Baseline Characteristics) which indicate that although sandeel are sensitive to habitat loss and disturbance impacts, based on evidence from sandeel surveys carried out across the Moray Firth Zone in 2012 sandeel distribution with the Moray West site is patchy and abundance is low. Consequently, the potential impacts on sandeels were assessed as negligible to low and not significant.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Marine Fish Ecology	Application Consultation Response Letter	31/08/2018	Whilst the report finds that the study area "*coincides with low intensity sandeel spawning habitat and long term habitat loss (loss of soft substrate) will result in direct impacts on this habitat. Detailed studies have been completed to ascertain whether the habitats present within the Development are important for sandeel populations and this work has shown that the Development area does not support important populations of sandeel.*" MSS would suggest that as good practice and where possible, consideration be given to micro siting of gravity bases to avoid areas of suitable habitat, after site characterisation has taken place.	Wind Farm and OfTI	8	n/a	Moray West acknowledges the challenges with the design envelope approach, in particular with regard to the requirement to assess affects against the worst case options (e.g. GBS foundations), which have a larger footprint on the seabed. It should be noted that the most likely substructures to be installed within the Moray West will be jacket or monopile foundations. However, there is potential that, following more detailed ground investigations, installation of either jackets or monopile foundations within all or part of the site may not be technically feasible. GBS foundations have therefore also been included in the consent as an alternative should it not be possible or feasible to install jackets or monopiles. As presented in EIA Report - Volume 2 Chapter 8 - Section 8.6.2 Moray West will carry out a Cable Burial Risk Assessment (CBRA) to inform detailed routeing of inter-array and export cables. In addition to this, in Chapter 7 of the EIA Report - Section 7.7.5 Moray West has identified the need to consider the micro-siting of substructures as part of detailed design in order to avoid potential effects on an area of potential Annex I habitat identified during the benthic surveys. In response to these comments, Moray West will also take into account potential areas of suitable sandeel habitat as part of micro-siting for all foundations considered in the Design Envelope.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology

Table 1.4 - Fish and Shellfish Ecology (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
MSS-Marine Fish Ecology	Application Consultation Response Letter	31/08/2018	Mitigation - MSS welcomes the embedded mitigation that is included to reduce the potential impacts on fish and shellfish ecology and would further welcome any involvement with associated plans relating to the Environmental Management Plan (EMP), Marine Pollution Contingency Plan (MPCP) Cable Burial Risk Assessment (CBRA) Piling Strategy (PS).	Wind Farm and OfTI	8	8.6.2.2	Moray West welcome the comments on embedded mitigation and will consult MSS on the Environmental Management Plan (EMP), Marine Pollution Contingency Plan (MPCP) Cable Burial Risk Assessment (CBRA) and Piling Strategy (PS).	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	Diadromous Fish - MSS has read the material related to diadromous fish in the Report to inform Appropriate Assessment, the Offshore HRA Screening Report, the EIA Report Main Text – Fish and Shellfish, and the Technical Appendices. What is assembled is in general accurate and comprehensive and our comments are mainly points of detail.	Wind Farm and OfTI	8 and RIAA	n/a	Moray West welcomes this comment from MSS.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology Report to Inform an Appropriate Assessment (RIAA)
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	Report to inform Appropriate Assessment - Although this is tabled, it is not clear how much of the diadromous fish material will be required following likely advice from SNH that salmon SACs should be screened out.	Wind Farm and OfTI	RIAA	n/a	Moray West acknowledge this comment.	Report to Inform an Appropriate Assessment (RIAA)
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	HRA Screening Report - This is a less recent document (September 2017) than the others and is less up to date.	Wind Farm and OfTI	HRA Screening Report	n/a	Moray West acknowledge this comment. The report was provided an Appendix to support the RIAA. This report (HRA Screening Report) was as submitted in September 2017 and therefore does not include all current information (as of July 2018) presented in the EIA Report or RIAA.	Report to Inform an Appropriate Assessment (RIAA) and HRA Screening Report
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	HRA Screening Report - Section 4.2.3.1 - MSS would note that as is detailed in the other documentation that more information is now becoming available on migration of salmon smolts through the Moray Firth. It is also now known to be incorrect that smolts are associated particularly with nearshore waters. MSS would also note that distances to SACs may not be a reliable indicator of probability of interaction. This is particularly true in the case of the Moriston SAC where the distance includes a long length of river which smolts are constrained to pass through is included.	Wind Farm and OfTI	HRA Screening Report	4.2.3.1	Moray West acknowledge this comment and have included up to date information in Sections 8.4.2.124 - 8.4.2.145 of the EIA Report	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	HRA Screening Report - Section 5.2.4 - MSS would note that Armstrong et al's study is just concerned with overt effects of AC EMF and that evidence that adult salmon mainly migrate along costal routes is weak other than close to home rivers.	Wind Farm and OfTI	HRA Screening Report	5.2.4	Moray West acknowledge this comment. Further discussion on the Armstrong study is provided in the EIA Report - Volume 2 Chapter 8, Section 8.7.2.63.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	HRA Screening Report - Page 78 - MSS would note relating to no salmon being caught in the general survey work that general survey techniques are not appropriate for catching salmon and sea trout and would not be expected to catch many, even if present.	Wind Farm and OfTI	HRA Screening Report	n/a	Moray West acknowledge this comment.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	HRA Screening Report - Page 79 - MSS would note that the BOWL study is now available on the internet at https://www.gov.scot/Topics/marine/Licensing/marine/scoping/Beatrice/DFM/cromartyfirthsmolttracking	Wind Farm and OfTI	HRA Screening Report	n/a	Moray West acknowledge this comment and has incorporated relevant information into the EIA Report - Volume 2, Chapter 8 - Section 8.4.2.134	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	HRA Screening Report - Page 81 - mentions the National Research and Monitoring Strategy for Diadromous Fish and indicates the need to progress project work if the Moray West site is progressed, which is good.	Wind Farm and OfTI	HRA Screening Report	n/a	Moray West acknowledge this comment.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	EIA Report Main Text – Fish and Shellfish - The above comments made in relation to diadromous fish on the Offshore HRA Screening Report also apply where relevant. MSS welcomes the inclusion of details from various recent studies. It is good that the Data Limitations section mentions the National Research and Monitoring Strategy for Diadromous Fish, although it does not mention the expectation that appropriate project work will take place if the Moray West site is progressed.	Wind Farm and OfTI	8	n/a	Moray West acknowledge this comment. Any project work commitments regarding the National Research and Monitoring Strategy for Diadromous Fish will be discussed with Marine Scotland.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology

Table 1.4 - Fish and Shellfish Ecology (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	MSS would emphasise that while gaps in our knowledge on the spatial and temporal aspects of salmon smolt movement in the Moray Firth and adjacent areas remain, that good progress is currently being made, partly thanks to studies which have or are being progressed with developers.	Wind Farm and OfTI	8	n/a	Moray West welcome this comment.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	MSS would also comment that EMFs at the seabed being less than the earth's magnetic field does not in itself necessarily mean that there will be no significant effects on fish and shellfish. Nonetheless, for various other reasons MSS would support the conclusion relating to EMF which is reached in the EIA.	Wind Farm and OfTI	8	n/a	Moray West welcome this comment.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
MSS-Diadromous Fish	Application Consultation Response Letter	31/08/2018	Additional note - MSS requests to see SNH's comments relating to diadromous fish at earliest opportunity. It is possible we may wish to add additional comment after seeing them.	Wind Farm and OfTI	8	n/a	Moray West acknowledge this comment.	EIA Report - Volume 2, Chapter 8: Fish and Shellfish Ecology
Scottish Natural Heritage (SNH)								
SNH	Application Consultation Response	07/09/2018	Technical Appendix 4.3 D (Electromagnetic Fields Modelling) was produced for the Telford, Stevenson and MacColl wind farms and has been included in the EIA Report for Moray West. The appendix states that, 'in all cases, where cables are buried to 1 m depth, the predicted magnetic field is expected to be below the earth's magnetic field (assumed to be 50 µT). Where DC cables cannot be buried and are instead protected, the magnetic field is expected to be below the earth's magnetic field within 5 m from the seabed'.	OfTI	Technical Appendix 8.1	n/a	Comment noted.	Technical Appendix 8.1
SNH	Application Consultation Response	07/09/2018	The EIA Report for Moray West states that the cables will be buried to a minimum target depth of 1 m where possible and protected (e.g. with rock placement or concrete mattresses) where burial is not feasible. Where they come ashore they will be installed beneath the ground by either trenching or horizontal drilling methods. We welcome this mitigation for diadromous fish species, as cable burial would be expected to increase the distance between the cables and the water column. The offshore cable export corridor landfall search area does not include the mouths of any SAC rivers, and is more than 20 km from the nearest riverine SAC with diadromous fish/freshwater pearl mussel interests (River Spey SAC).	OfTI	EIAR Chapter 8 (8.7.2.49)	n/a	Comment noted.	Technical Appendix 8.1
SNH	Application Consultation Response	07/09/2018	We welcome the commitment to submit a Piling Strategy to MSLOT for approval prior to the commencement of piling. This will set out any mitigation and management measures that will be implemented during pile installation. We support the commitment to soft starts which could allow fish to move away from the vicinity of piling operations. In Technical Appendix 9.2, figures 3-11, 3-12 and 3-13 indicate the extent of exposure effect zones for Atlantic salmon exposed to different piling methods at various hammer energies. The Non-Technical Summary sets out the programme for the proposed development and reflects that piling would be undertaken between start of Q2 2022 and the end of Q1 2023. Given the timespan of the proposed piling activity (spanning a 12 month period), the 'Design Envelope' scenario reflected within the EIA Report, and the extent of the area within which Temporary Threshold Shift (TSS) is expected, it would be helpful if the Piling Strategy would set out for agreement with MSLOT further details of the piling methods, cumulative impact of concurrent piling at different locations where this is anticipated to occur and timing.	Offshore Wind Farm	NTS, Technical Appendix 9.2	n/a	Figures 3-11 and 3-12 show the cumulative exposure effect zones for cod and salmon exposed to piling of a single monopile with a maximum hammer energy of 5,000 kJ, a single pin pile foundation with a maximum hammer energy of 3,000 kJ at location 1. Figure 3-13 shows the cumulative exposure effect zones for cod and salmon exposed to piling of two monopiles with a maximum hammer energy of 5,000 kJ at locations 2 and 3. Moray West will consult with MSS on the Piling Strategy and potential effects on fish, when further information on piling is available.	Technical Appendix 9.2

Table 1.5 - Marine Mammals (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Marine Scotland Science (MSS)								
MSS	Updated Application Consultation Response Letter	05/10/2018	With respect to marine mammals, Marine Scotland Science have reviewed the EIA and HRA reports for Moray West, and the relevant SNH advice (Appendix C and Appendix D) relating to these documents. MSS broadly agree with SNH's comments, recommendations and requests (where relevant), as outlined in bullet points 2 – 6, inclusive (Appendix C). With respect to bullet point number 5, MSS add that the 28.5 km PTS range is a result of the animal fleeing in the direction of, and ultimately being restricted by, the coastline. Therefore, in this scenario, the animal is unable to reduce exposure to the pile source by further responsive movement. MSS consider this scenario to be unlikely.	Wind Farm and OfTI	9	n/a	Noted.	EIA Report
MSS	Updated Application Consultation Response Letter	05/10/2018	With respect to bullet point number 1 (Appendix C), MSS share the concerns of SNH regarding the conversion factor used in the underwater noise modelling. SNH provide further detail on their concerns in Appendix D of their advice. MSS's concerns broadly mirror those of SNH, as outlined in bullet points number 5 and 6 (Appendix D). MSS take the opportunity to highlight that the reference underpinning the justification for using 0.5% is not peer-reviewed and the quoted statement extracted from the piece "about half a percent of the hammer impact energy goes into waterborne acoustic energy", could be considered a generalisation that, for application in an EIA, is taken out of context. Consequently, MSS are in agreement with SNH that a 1% conversion factor would have been preferred to a 0.5% conversion factor. Consequently, without robust justification, based on scientific evidence, MSS recommend that the 1% conversion factor is used. The principle reasoning underpinning this conclusion is that, in using the more conservative 1% conversion factor, there would be an increase in the size of the impact zones and the number of animals predicted to be affected (acknowledged by SNH in bullet point 11 in Appendix D); this would be a more precautionary approach that would align this assessment with previous advice provided by SNH to BOWL for their piling strategy.	Wind Farm and OfTI	9	n/a	Noted. Differing advice was received here from SNH. Moray West notes that MS-LOT has advised Moray West to proceed in the addendum on the basis of SNH advice. However as MSS recommended modelling using 1% an assessment of the difference between 0.5% and 1% has been presented in the Addendum (Part 1).	EIA Report and Addendum
MSS	Updated Application Consultation Response Letter	05/10/2018	SS acknowledge that the source levels as presented are within the range of piling noise levels, as presented in literature and grey literature, albeit at the lower end of the range (noted by SNH in bullet point 17 in Appendix D). MSS recognise that precaution is also built in to other aspects of the model (e.g. through other input parameters and/or assumptions, which have been highlighted in the relevant sections of Chapter 9 and Technical Appendix 9.3), and that the assessment has not included mitigation measures. Nonetheless, without undertaking the noise modelling with a 1% conversion factor, it is not clear what the predicted PTS ranges for marine mammals would be under this scenario.	Wind Farm and OfTI	9	n/a	Noted. Differing advice was received here from SNH. Moray West notes that MS-LOT has advised Moray West to proceed in the addendum on the basis of SNH advice. However as MSS recommended modelling using 1% an assessment of the difference between 0.5% and 1% has been presented in the Addendum (Part 1).	EIA Report
Scottish Natural Heritage (SNH)								
SNH	Application Consultation Response Letter	07/09/2018	Although we have residual concerns regarding the underwater noise modelling, with regard to the conversion factor (see Appendix D), we consider that further assessment is not required.	Wind Farm and OfTI	9	n/a	Noted. However, MSS has recommended modelling using 1% so an assessment of the difference between 0.5% and 1% has been presented in the Addendum (Part 1).	EIA Report

Table 1.5 - Marine Mammals (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SNH	Application Consultation Response Letter	07/09/2018	We note that the cumulative Permanent Threshold Shift (PTS) assessment has been based on the modelled maximum impact ranges, and has been estimated without mitigation included, such that once mitigation is employed, the risk of PTS is negligible. We broadly agree with this conclusion, but require clarification on the numbers of animals that are predicted to experience PTS from piling in Moray West.	Wind Farm and OfTI	9	n/a	The numbers of minke whales predicted to experience PTS are now presented in the addendum (part 1). For all other species as a result of the very low ranges and the adoption of a piling strategy, no individuals are predicted to experience PTS.	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	We interpret the PTS peak threshold as a range of instantaneous auditory injury at maximum hammer energy. However the cumulative PTS is also called a range – this is confusing as it seems the cumulative range is smaller than the instant. We interpret cumulative PTS as the maximum starting distance for an individual fleeing animal in order that PTS is accrued over the piling event.	Wind Farm and OfTI	9	n/a	Noted, and this reflects the modelling procedure used to calculate these starting distances. Although we feel we're not technically wrong in calling it a range as the starting distance can still be interpretated as the range within which, any animal present will not be able to escape a dose of sound that puts it at risk of developing PTS as a result of cumulative exposure.	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	Figure 4-6 in Technical Appendix 9.1 – marine mammal baseline - shows the harbour seal density surface obtained from Bailey 2017 (Annex 9.1A). The maps presented in Annex 9.1A however, do not appear to match the density layer used in Technical Appendix 9.1. The Bailey analysis is at a different scale to the SMRU at-sea density maps, but appears to estimate higher densities, therefore the estimates considered in the EIA Report could be considered as more precautionary. Although this may not alter the conclusions, we require clarification on the interpretation of the Bailey paper.	Wind Farm and OfTI	9	Figure 4-6 in Technical Appendix 9.1	We have discovered that the wrong version of the Bailey (2017) report was incorporated into Annex 9.1A of Technical Appendix 9.1. An interim version was uploaded in error - the final version of this Annex can be made available. The density surface in the final report matches that presented in Fig 4-6 of the Technical Appendix 9.1	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	With regard to minke whale, we require clarification as to the number of animals that are predicted to experience cumulative PTS in the concurrent scenario as the cumulative PTS range is large and at over 28.5km there is no effective mitigation. We agree that it is likely to be a low number of individuals and that this is unlikely to result in a population effect. However, the predicted number as well as range will enable us to form a view with regard to injury and the EPS licence application.	Wind Farm and OfTI	9	n/a	The number of minke whales predicted to be potentially at risk of PTS is now detailed in the Addendum (part 1)	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	The iPCoD assessment for bottlenose dolphin is done twice, one including PTS and one excluding PTS. There are two aspects to consider:	Wind Farm and OfTI	9	n/a	n/a	EIA Report

Table 1.5 - Marine Mammals (as at 20 November 2018)								
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Determination Period Responses								
SNH	Application Consultation Response Letter	07/09/2018	There is only one of the developments that predicts PTS for bottlenose dolphin (Inch Cape consented). Looking at the new application (draft) the number of bottlenose dolphin predicted to suffer PTS is now zero. Therefore the inclusion of PTS is over precautionary.	Wind Farm and OfTI	9	n/a	Noted and agreed.	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	The assessment was done using the version of iPCoD predating the latest expert elicitation round. The new version (4) has radically changed how PTS is assessed in that the effect of PTS is not at all as significant as was previously thought. Therefore, even if there were individuals predicted to suffer PTS the effect on the population would not be as marked as is suggested in the HRA report.	Wind Farm and OfTI	9	n/a	Noted and agreed.	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	Bottlenose dolphin - Based on the information in the EIA and HRA Report, we advise that there will be no adverse effect on site integrity for bottlenose dolphin as a qualifying interest of the Moray Firth Special Area of Conservation (SAC), subject to conditions on any consent / licences. We also advise that there will be no impact on the favourable conservation status (FCS) for bottlenose dolphins as an EPS, subject to conditions on any consent / licences.	Wind Farm and OfTI	9	n/a	Noted and agreed.	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	Harbour seal - Based on the information in the EIA and HRA Report, we advise that there will be no adverse effect on site integrity for harbour seal as a qualifying interest of the Dornoch Firth and Morrich More SAC, subject to conditions on any consent / licences. Both alone and in combination with other developments, there was no significant long term effect on the population trajectory of harbour seals.	Wind Farm and OfTI	9	n/a	Noted and agreed.	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	Harbour porpoise - We advise that there will be no impact on the FCS for harbour porpoise as an EPS, subject to conditions on any consent / licences.	Wind Farm and OfTI	9	n/a	Noted and agreed.	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	Minke Whale - We advise that there will be no impact on the FCS for minke whale as an EPS, subject to conditions on any consent / licences. However, please see point 5 above regarding the number of animals that are predicted to experience cumulative PTS.	Wind Farm and OfTI	9	n/a	Noted and agreed.	EIA Report
SNH	Application Consultation Response Letter	07/09/2018	Other cetaceans - We concur with the conclusion that there will be disturbance to cetaceans and, therefore, a European Protected Species (EPS) licence will be required. We advise that it is unlikely that there will be impact on the FCS for any of the cetacean species.	Wind Farm and OfTI	9	n/a	Noted and agreed.	EIA Report

Table 1.5 - Marine Mammals (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SNH	Application Consultation Response Letter	07/09/2018	APPENDIX D - SNH advice on the Moray West underwater noise modelling and use of the 0.5% conversion factor 1. Technical appendix 9.2 – Underwater noise modelling - is as we have previously seen, but we note that the units for tables 2-1 and 2-2 have not been corrected. As it stands it is not clear that the source levels are presented as SEL and not SPL. 2. We are content that the detailed approach to estimate PTS (both instantaneous and cumulative) and behavioural response to piling noise is as agreed, and uses our understanding of current good practice. 3. Our main concern has been with the use of the 0.5% conversion factor (CF). This factor is used in an energy conversion model described in De Jong and Ainslie (2008). There are and have been various methods of estimating a source level from piling, including extrapolating from measured levels and estimates using the pile diameter. We welcome the benefits of using an equation such as this; it's transparent and should lead to consistency in source level estimations – understanding that the source level isn't actually a 'real' level, but a means of describing the acoustic energy for noise propagation modelling. 4. The equation uses an energy conversion factor to estimate the proportion of hammer energy that translates into acoustic energy (that then propagates into the marine environment). To do that the parameters used are the impact hammer energy, the speed of sound through seawater and the density of seawater, plus a constant. Seabed type is not included. We assume the harder the seabed substrate is, the greater the hammer energy required, and therefore the seabed type has no bearing on the source level. The key parameter in this equation is therefore the conversion factor. 5. Our concern is that the 0.5% CF returns source level estimates that although are within source levels for piling as reported, they are at the lower end of estimates and much lower than estimates seen in contemporary applications. 6. Appendix A has been added to technical appendix 9.2 and contains CEFAS comment/reasoning on the use of the 0.5% CF, including a literature review intended to support the use of 0.5% CF. This review predominantly leans on the review paper of Dahl, deJong and Popper (2015). However, this is an article in Acoustics Today, rather than a peer reviewed paper. Having said that the authors are recognised experts in the field. Therefore, we view this as valid evidence, but not evidence in itself of a scientific consensus. 7. Evidence presented in table 1 is based on lower hammer energies than will be used for the OWF piling in Moray West, and therefore the assumption is that there is a linear relationship between hammer energy and the conversion factor to enable extrapolation. Also, these are based to some extent on received levels being back calculated to a source level and the conversion factor being calculated from that. Therefore, the sediment type is incorporated into the propagation calculation and resulting source level. SNH advice on the use of the 0.5% CF 8. There is uncertainty in any modelling used to estimate impact zones and numbers of animals predicted to experience PTS or disturbance. 9. There is uncertainty pertaining to the prediction of the source level by any method. 10. There are a range of source levels that may be predicted from offshore wind piling. 11. Recalculation using a 1% CF will increase the size of impact zones, and the numbers of animals predicted to be affected. 12. A few dB difference at source will make a difference to the propagation modelling. However, it is considered that the ultimate conclusions relating to significance will remain the same. 13. We agree that uncertainty in back-calculation from received levels could give rise to a +/- 3dB difference in SL estimation, which is the difference between a SL estimated using a 0.5% or 1 % CF. 14. Our view is that the Dahl, deJong and Popper review article (2015) is valid evidence, but is the opinion of the authors rather than proof of scientific consensus. 15. It is likely that there is a range of appropriate conversion factors, and in that case preferably one should be chosen that reflects a degree of conservatism. 16. Therefore, we remain of the view that a 1% CF would have been preferred to a 0.5% bearing in mind uncertainty and conservatism. 17. However, the source levels as presented are within the range of piling noise levels as presented in literature and grey literature, although the use of 0.5% CF appears to return levels at the lower end of the range. 18. The predictions of ranges made for Moray West are without mitigation. Although it is possible these ranges may be an underestimate, adequate mitigation is likely to be gained via a piling strategy plan. 19. Therefore, we do not recommend that the noise modelling for Moray West is repeated with a 1% conversion factor.	Wind Farm and OfTI	9 and Technical Appendix 9.2	n/a	Noted and agreed. However as MSS recommended modelling using 1% an assessment of the difference between 0.5% and 1% has been presented in the Addendum (Part 1).	EIA Report

Table 1.6 - Commercial Fisheries (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Scottish Fishermen's Federation (SFF)								
SFF	Application Consultation Response Letter	26/01/2018	The Scottish Fishermen's Federation, on behalf of the 400 plus vessels in membership of its 8 constituent associations wish to **formally object to this application.**	Offshore Wind Farm and OfTI	Chapter 11	n/a	Acknowledge objection and will engage with SFF with the aim of resolving their concerns. A meeting was held on 1st October 2018 with Moray West and the SFF. The focus of this meeting was to discuss the objection and associated key concerns raised by the SFF and to discuss options for addressing these concerns. Actions for addressing concerns relate mainly to on-going engagement as part of the continued development of the Commercial Fisheries Mitigation Strategy (CFMS).	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	The SFF would contend that this development runs contrary to Scotland's National Marine Plan, in key policies GP1 - a presumption in favour of sustainable development, where fish is further described as a food sector, GP4 on co-existence - as yet there is no proof this will be possible or happen, GP17 refers to transparency, which was not evident at the start of the planning process. Further to these, the specific Fisheries Policies, 1 refers to safeguarding existing fishing wherever possible, FP2 refers to the cultural and economic importance of fishing and the potential impacts of displacement, and on sustainable fish and shellfish stocks.	Offshore Wind Farm and OfTI	Chapter 11	n/a	As discussed with the SFF on 1st October 2018, when considering Scottish policy as set out in Scotland's National Marine Plan (NMP) it can be difficult to consider one marine user in isolation on the basis the aim of the plan is to promote sustainable growth of a number of sectors, including both offshore renewables and fisheries. The NMP also sets out general policies to manage potential interactions between the different growth sectors through coexistence. Moray West acknowledges that, with respect to fisheries, questions and concerns remain over the extent to which opportunities for coexistence with offshore renewables actually exists. However, where possible, Moray West has conducted the assessment of potential effects on commercial fisheries in line with both fisheries policy and wider general planning polices relating to sustainable development (GP1), co-existence (GP4) and GP17 transparency. In light of the potential for contractions to occur (for the reasons stated above), Moray West sought to prepare a draft Commercial Fisheries Mitigation Strategy (CFMS), the focus of which is to explore, through ongoing engagement with the SFF and wider fisheries industry, where opportunities for co-existence and safeguarding of fisheries activities exist and how these can be developed moving forwards.	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	The SFF is pleased that the developer has acknowledged that throughout the whole of its footprint in ICES squares 44E7, 45E6 and 45E7 it as an impact on creeling, jigging, nephrons trawl, squid trawl, scallop dredge and seine net. Those fisheries for these ICES squares, comprise up to £10 million p.a. at first scale, which is significant for the area, with huge proportions of scallop and nephrons in this figure and particularly the development site, which is identified as 50% scallop ground (Figure 4.6).	Offshore Wind Farm and OfTI	Chapter 11	n/a	Comment noted. The importance and value of the fisheries within these ICES squares is discussed in Section 11.4 of the EIA Report - Chapter 11 on a fleet by fleet basis. Further detail on the combined value of these fisheries (as indicated comprise up to £10 million p.a) is provided in Figure 11.4.4 (UK average annual landings values (2012-2016) by method) and 11.4.5 (UK average annual landings values (2012-2016) by species). Additional detail is also included in Technical Appendix 11.1 - Section 3.2, with information on average landing values (2012 - 2016) by species and methods for each ICES square is provided in Figures 3.5 to 3.7. This, and other information on the value of fisheries in ICES squares 44E7, 45E6 and 45E7, has been used to inform the assessment of impacts on these fisheries as presented in the EIA Report - Chapter 11 - Section 11.7. However, it is noted that the Moray West Site and export cable corridor a very small proportion of ICES squares 44E7, 45E6 and 45E7 (as illustrated in Figure 11.4.1). Consequently, the total value of £10m for fisheries in these squares is considered to be an overestimate of the actual total value of fisheries directly affected by the wind farm and along the export cable corridor.	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	The SFF would further contend that the socio-economic impacts of the potential loss of £10 m landings to the onshore supply chain must be taken into account as directed in GP2 & GP3 and F2.	Offshore Wind Farm and OfTI	Chapter 11	n/a	The Moray West Site and Offshore Export Cable Corridor occupies a small proportion of the study area (the actual footprint of the development will occupy even less of the study area) and because of the type of activities proposed to take place, effects of all potential impacts on commercial fisheries were assessed as being either of minor or negligible significance in EIA terms. Landings values will vary from year to year for a variety of reasons e.g. population of stocks targeted, quota restrictions, prices at market and others. The onshore supply chain effects are numerous. As the Moray West development is not predicted to have any moderate or major significant effects on commercial fisheries we conclude that it is extremely unlikely that the development will have any impacts on the onshore supply chain.	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)

Table 1.6 - Commercial Fisheries (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SFF	Application Consultation Response Letter	26/01/2018	Turning to the technical appendices, the SFF would point out the difficulties in the assumptions of treating the fishing industry as a homogenous single entity to arrive at the standard definition of low intensity impacts. It should be highlighted that each vessel is a separate, usually family business and should be considered as such. This lack of such an assessment is contrary to GP2, GP3, GP17 and Fishing Policy 1, 2 and 3.	Offshore Wind Farm and OfTI	Chapter 11	n/a	As noted in the EIA Report – Volume 2: Chapter 11, Section 11.3.2, in addition consultation with the SFF, Marine Scotland Science (MSS) and Marine Scotland Licensing Operation Team (MS-LOT), extensive consultation was undertaken with a sample of local fishermen. Details of these individual consultation meetings are summarised in Table 1.1 of Technical Appendix 11.1. Information from these consultations has been presented within Chapter 11, Section 11.4 and illustrated in Figures 11.4.6 (local creel grounds); 11.4.7 (local mackerel grounds); 11.4.10 (local Nephrops grounds); 11.4.11 (local squid grounds); and 11.4.17 (local scallop grounds). For the purposes of maintaining confidentiality with regard to grounds targeted by individual fishermen, it has been necessary to present the information on a fleet by fleet basis, rather than a vessel by vessel basis. However, in the EIA Report, Chapter 11 - Section 11.4, information is provided on the number of vessels associated with each of the main fleets discussed, where this information is known / has been made available during the assessment process. This approach is consistent with recognised standard practice for characterising commercial fisheries as part of the EIA process and has been adopted specifically to prevent confidential information relating to individual vessels being presented in the public domain.	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	The SFF considers that the Design Envelope approach, whilst useful in many ways, is actually making it more difficult for stakeholders to respond appropriately to many aspects of the development, again contrary to GP4 and 17. It is not apparent from this application that, once built, the development is likely to be in place for at least 50 years, thus denying fishing use of the area for a least a generation, contrary to GP4.	Offshore Wind Farm and OfTI	Chapter 11	n/a	Moray West acknowledges the challenges with the design envelope approach, and concerns raised with a consent application that extends out to 50 years (although operation life is only expected to be 35 years). As discussed during the meeting on 1st October 2018, while Moray West acknowledges that, due to it being a young industry, there is still limited evidence that offshore wind farms and fisheries will or will not be able to co-exist long term, given the size of the Moray West site, it is expected that spacing between the turbines could be up to 1.5 km depending on final turbine numbers (maximum 85) and layouts. Within the Moray West site there may also be a requirement for inclusion of wind recovery areas. There will be no turbines in these areas. The requirement for any wind recovery areas, and the area affected will only be determined post consent and will be based on detailed modelling work undertaken as part of the development of the final layout for the wind farm. Moray West remains committed to working with the SFF to discuss site layouts and identifying potential opportunities for enabling co-existence within the Moray West site. This is expected to include for example, discussions on substructure types, turbine spacing and cable burial techniques / requirements. Identifying opportunities for coexistence are a key part of the CFMS. The consent application has been revised to a 25 year operational period.	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	It is also difficult to consider how fishing may be feasible, as it is currently impossible to define what ground will be safe to use for mobile gear, as the worst case scenario could be gravity base/suction bucket which along with scour protection could end up hundreds of metres away from the base point.	Offshore Wind Farm and OfTI	Chapter 11	n/a	Moray West acknowledges the challenges with the design envelope approach, in particular with regard to the requirement to assess affects against the worst case options (e.g. GBS foundations), which have a larger footprint on the seabed, and therefore present, for certain types of gear, an increased constraint on opportunities for fishing within the Moray West Site. However, as discussed with the SFF, the most likely substructures to be installed within the Moray West will be jacket or monopile foundations. However, there is potential that, following more detailed ground investigations, installation of either jackets or monopile foundations within all or part of the site may not be technically feasible. GBS foundations have therefore also been included in the consent as an alternative should it not be possible or feasible to install jackets or monopiles.	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
			To compound this problem there is no cable plan to consider yet, but the developer seems content to postulate 10% of the inter-array and 20% of the export cables may remain unburied. All of these variables are likely to close the ground to fishing and thus contradict GP4 and 17.	Offshore Wind Farm and OfTI	Chapter 11	n/a	Moray West confirms that, as presented Section 11.6.2, in addition to preparing a Cable Plan post consent Moray West is also committed to carrying out a Cable Burial Risk Assessment (CBRA), the focus of which will be to identify routes for the cables where burial can be maximised. As discussed with the SFF during the meeting on 1st October, Moray West will engage with the SFF and wider fishing industry as part of the preparation of the CBRA to ensure cable route options, where possible, take account of key areas of importance for fisheries. During the meeting on 1st October, SFF discussed with Moray West preferred options for additional cable protection where burial is not possible. Based on these discussions, Moray West, through the CBRA, will seek to identify protection measures (where required) that will minimise potential impacts on, or risk to fisheries, therefore reducing the extent to which fisheries will be excluded along the export cables. Further detail on these discussions is provided in the minutes of the meeting with SFF (see link) and will be taken into account as part of the CBRA and Cable Plan.	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	The SFF is consistent in the demand for restoring the seabed post development, so any cable/scour protection should be conducted with that in mind. Cutting piles below the seabed is acceptable but the rigs to reef concept, already ruled out by the Oil and Gas Authority is not.	Offshore Wind Farm and OfTI	Chapter 11	n/a	At the end of the operational lifetime of the offshore wind farm, it is anticipated that all structures above the seabed level will be completely removed. Technical Appendix 4.2: Draft Decommissioning Plan has been submitted with the consent and marine licence applications. The decommissioning plan will be updated during the lifespan of the wind farm to take account of changing best practice and new technology. Moray West will consult with SFF during preparation of the finalised Decommissioning Plan.	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)

Table 1.6 - Commercial Fisheries (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SFF	Application Consultation Response Letter	26/01/2018	Referring to Appendix 8.1 - Electromagnetic Field, whilst quoting many sources, fails to point out that the common conclusion that arises from studies is that more work/knowledge is needed. Indeed very little of the published work actually refers to the species indigenous to the development area so this is in contradiction of GP19.	Offshore Wind Farm and OfTI	TA 8.1	n/a	As discussed during the meeting on 1st October 2018, the assessment of impacts from EMF presented in the EIA Report - Chapter 8 Fish and Shellfish Ecology is based on the best current available information and key findings have been extrapolated to inform the assessment on key shellfish and fish species present within the Moray West Site and along the export cable corridor. Concerns regarding the direct relevance of published work relating to species indigenous to the development area is noted. However, all studies undertaken to look at EMFs and monitoring work from existing wind farm projects, are consistent in their conclusions of there being no significant adverse effects on fish and shellfish.	EIA Report - Volume 2, Chapter 8 Fish and Shellfish and Technical Appendix 8.1.
SFF	Application Consultation Response Letter	26/01/2018	Concerning Appendix 9, the SFF would agree with the concerns about the modelling, and would rather wait for the actual survey results from BOWL before accepting this. Furthermore, there is a growing body of evidence onshore of the thrumming effect transmitted through the base of towers having negative effects.	Offshore Wind Farm and OfTI	TA 9	n/a	Moray West sought clarification relating to specific concerns outlined in this comment during meeting on 1st October. The main concern related to vibrations (particle motion) and current limitations on the development of modelling techniques outlined in the EIA Report - Volume 2: Chapter 8 Section 8.7 (Paragraphs 8.7.1.59 to 8.7.1.72) due to the limited availability of in field measurement. Limitations of the available information was noted, in particular the ability for fish and shellfish to detect particle motion and resulting impacts. In particular, SFF made particular reference to evidence of the thrumming effect from operational onshore wind turbines and impacts on wildlife. It was, however, noted that, with respect to operational offshore wind farms, evidence of a thrumming effects or resulting localised particle motion around the turbines is limited and it was agreed that information presented in Chapter 8 is representative of the most current available literature and evidence relating to particle motion and impacts have been assessed on this basis.	EIA Report - Volume 2, Chapter 8 Fish and Shellfish and Technical Appendix 8.1.
SFF	Application Consultation Response Letter	26/01/2018	The SFF is surprised that in Chapter 8, Fish and Shellfish Ecology, 8.2.2 does not quote from Scotland's National Marine Plan, particularly fisheries 1 and 2, as they are relevant to protecting the ecosystem for fish and shellfish.	Offshore Wind Farm and OfTI	Chapter 8	8.2.2	Chapter 8 is concerned with fish and shellfish ecology and focusses on the most relevant elements of the Scottish NMP in relation to fish and ecology (as opposed to fisheries): - General Policy (GEN) 9 Natural heritage: Development and use of the marine environment must: # Comply with legal requirements for protected areas and protected species; # Not result in significant impact on the national status of Priority Marine Features (PMFs); and # Protect and, where appropriate, enhance the health of the marine area. - GEN 13 Noise: Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects.	EIA Report - Volume 2, Chapter 8 Fish and Shellfish and Technical Appendix 8.1.
SFF	Application Consultation Response Letter	26/01/2018	With particular regard to herring (8.4.2.74 on) in line with ICES advice development should not occur, unless the effects of these activities have been assessed and shown not to be detrimental to any spawning ground.	Offshore Wind Farm and OfTI	Chapter 8	8.4.2.74	EIA Report Volume 2 - Chapter 8 - Section 8.4 (baseline conditions) conclude that there is limited evidence of herring spawning in the Development area. This is based on a review of a number of sources of information including Ellis et al., (2010) which includes information on larval densities recorded in the 2008 International Herring Larval Study (IHLS), Coull et al., (1998) and results undertaken at the Beatrice Offshore Wind Farm Site in 2014/2015. Similar surveys have recently concluded at the Moray East site which will provide further baseline information on herring in the Moray Firth. It is also noted in Section 8.7 the main impact on herring is associated with a loss or, or change to herring spawning grounds due to substrate removal and presence of substructures. However, given that the Development Area is not considered to be an important spawning area for herring, these impacts are not significant. Herring is also considered to be sensitive to noise. However, adult and juvenile fish are expected to be able to move out of the lethal injury impact zone, therefore minimising the potential for any impacts on this species from underwater noise.	EIA Report - Volume 2, Chapter 8 Fish and Shellfish and Technical Appendix 8.1.

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SFF	Application Consultation Response Letter	26/01/2018	Looking at the information on sediment concentration and deposition, the worst case scenario can be seen to be seabed disturbance in the development area for 36 months and the cable for 6 months. Unsurprisingly this is described as potential long term habitat loss, which, including recovery time, could last up to 10 years for shellfish over an area of 630716 m^2 whilst also, most significantly, accepting that suspended sediment concentrations will have greater effect on scallop than other species.	Offshore Wind Farm and OfTI	Chapter 7	Table 7.6.1	As described in the EIA Report - Volume 2 - Chapter 8 - Table 8.6.1, the greatest habitat loss will occur from the installation of the gravity base foundations and associated scour protection, and maximum extents of cable protection and cable crossings. This would result in a total habitat loss of 630,716 m^2 which equates to 0.14 % of the Moray West Site and Offshore Export Cable Corridor combined. This relates to long term impacts occurring during operation of the wind farm. Consequently, the impact is predicted to be of long term duration, continuous and irreversible during the lifetime of the Development. However, as described in EIA Report - Volume 2: Chapter 8, Paragraph 8.7.2.3 due to the limited area of habitat loss in comparison to the wider area, along with the habitat being widespread and commonplace the magnitude of the impact is considered to be low. Given the overall sensitivity to fish and shellfish in the study area are considered to be of low to moderate sensitivity, it was concluded that the significance of the overall effect of long term habitat loss would be negligible to minor and therefore not significant in EIA terms (EIA Report - Volume 2: Chapter 8, Paragraph 8.7.2.11). With respect to increased Suspended Sediment Concentrations (SSC) and Sediment Redeposition, this has been identified as occurring during construction only (EIA Report - Volume 2: Chapter 8, Section 8.7.1) and is therefore unrelated to long term habitat loss described under EIA Report - Volume 2: Chapter 8, Section 8.7.2 Potential Operational Effects. As described in EIA Report - Volume 2: Chapter 8, Paragraph 8.7.1.22 the potential for increased SSC and deposition from seabed preparation for foundations is determined to be short term (lasting a day at the longest) and localised (with a worst case of one tidal excursion extent). The magnitude of the effect is assessed as low. In the EIA Report - Volume 2: Chapter 8, Paragraph 8.7.1.35 it is noted that adult scallop have a higher sensitivity to increased SSC and sediment deposition than other shellfish species due their limited mobility and potential impacts on feeding apparatus. Scallops are therefore assessed as being of moderate sensitivity to increased SSC and sediment redeposition. However, given that the magnitude of the impact is low, the overall significance of effects on scallops (EIA Report - Volume 2: Chapter 8, Paragraph 8.7.1.38) is minor and not significant in EIA terms.	EIA Report - Volume 2, Chapter 8 Fish and Shellfish and Technical Appendix 8.1.
SFF	Application Consultation Response Letter	26/01/2018	The points in 8.7.2.31 are challenged by SFF. Manmade structures can attract certain fish but there is no scientific case to claim that this means commercial populations are increased.	Offshore Wind Farm and OfTI	Chapter 8	8.7.2.31	As discussed during the meeting on 1st October, information on the potential for the presence of substructures to create an 'artificial reef' or act as a fish aggregating device has been presented as an impact (habitat creation) in the EIA Report - Volume 2, Chapter 8 Section 8.7. However, the limitations associated with this are also noted in this assessment. In particular, in paragraph 8.7.2.31, the last sentence acknowledges that 'there is also potential for adverse effects in terms of displacement of soft-bottom dwelling species due to a change to hard substrate'. The assessment of significance presented in paragraph 8.7.2.48 also acknowledges that there is a some uncertainty associated with the likely effects of introduction of hard substructures into the marine environment on fish and shellfish receptors and that from research and studies to date, it is considered that fish populations are unlikely to show noticeable changes (either beneficial or adverse).	EIA Report - Volume 2, Chapter 8 Fish and Shellfish and Technical Appendix 8.1.
SFF	Application Consultation Response Letter	26/01/2018	Finally in 8.8, regarding cumulative effects the SFF are not convinced that this, or any other development have really understood how the loss of grounds will affect commercial fishing, especially when considering the catching sector as many separate family businesses.	Offshore Wind Farm and OfTI	Chapter 8	8.8	Chapter 8 focusses on fish and shellfish ecology. Section 8.8. provides an assessment of cumulative effects upon fish and shellfish receptors for the proposed development and takes into account the relevant guidance and stakeholder input received during consultation prior to the production of the EIAR. Cumulative effects for the development have been assessed as negligible to minor or minor.	EIA Report - Volume 2, Chapter 8 Fish and Shellfish and Technical Appendix 8.1.

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SFF	Application Consultation Response Letter	26/01/2018	Moving on to the commercial fisheries chapter, the development seems to want to downplay scallop fishing in the area, 11.4.2.25 calls it low level, but is contradicted by 11.4.2.88 which states high activity. Given that 11.4.2.30 also describes Seine netting activity as high on the site, it would seem that GP14 and 17, co-existence and fairness need to be considered properly here.	Offshore Wind Farm and OfTI	Chapter 11	11.4.2.25 11.4.2.28 11.4.2.30	In the regional study area (ICES rectangles 45E6, 45E7, 44E6, 44E7), and as stated in Section 11.4.2.25, scallop dredging is mainly undertaken by vessels over 15 m in length (Volume 4: Technical Appendix 11.2 - Figures 3.9, 3.10 and 3.11). Analysis of VMS data indicates that the majority of activity by over 15 m vessels concentrates east of the Moray West Site and to a lesser extent in inshore areas to the west. Albeit at relatively lower levels, scallop dredging also takes place within the Moray West Site and across the Offshore Export Cable Corridor (Volume 3a - Figure 11.4.12 and Figure 11.4.13). Section 11.4.2.28 (and Volume 3a - Figure 11.4.18) refers to AIS tracks of 19 vessels known to target the Moray Firth for scallops. A small number of these vessels (1-3) can be seen concentrating effort within the Moray West Site. However as evidenced in Volume 3a - Figure 11.4.12 the majority of landings value is from east of the Moray West Site in ICES rectangle 45E7. In relation to Section 11.4.2.30, the highest landings values (2012-2016) within the regional study area (ICES rectangles 45E6, 45E7, 44E6, 44E7) for the Scottish seine fleet are recorded in rectangle 45E7 (within which the Moray West Site is located), with the remaining rectangles recording significantly lower values (Volume 3a - Figure 11.4.4). As suggested by surveillance sightings data (2012-2016), however, fishing activity is understood to concentrate in areas north of the Moray West Site and further offshore (Volume 3a- Figure 11.4.3).	EIA Report - Volume 2, Chapter 11 and Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	Regarding 11.6.2.1 SFF would expect KIS ORCA and Kingfisher to be included in notifications to ensure dissemination to industry.	Offshore Wind Farm and OfTI	Chapter 11	11.6.2.1	Moray West will include KIS ORCA and Kingfisher Bulletin in the CFMS as platforms for disseminating notice to mariners (NtMs).	EIA Report - Volume 2, Chapter 11 and Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	The SFF notes that 11.7.2.2. onwards repeats the mantra of minor effect on commercial fisheries and would reiterate the points made earlier on the fish and shellfish ecology, that the loss of grounds for many years is not minor, indeed the claim in 11.7.3.9 that the development area is available for fishing seems little more than a platitude given the potential length of disturbances. Likewise 11.7.2.53 on displacement, SFF would contend is not minor.	Offshore Wind Farm and OfTI	Chapter 11	11.7.2.2 11.7.3.9 11.7.2.53	The conclusions from the assessment relating to the long term exclusion of fishermen from grounds within the Moray West Site, and SFF disagreement with these conclusions and ongoing concerns, were discussed during the meeting on 1st October. The basis for the disagreement / ongoing concerns relates to the fact there is currently limited evidence from other operational wind farms that it will be safe to fish within the wind farm site. As noted in the EIA Report - Volume 2, Chapter 11, paragraph 11.7.3.11, there is evidence from post construction fish and Nephrops surveys using commercial trawlers in operational wind farms such as Walney 1 & 2, West of Duddon Sands, London Array, Barrow, Ormonde, Galloper and Gunfleet Sands that it is possible to trawl between the turbines (based on surveys carried out by Brown and May Marine Limited). However, SFF conclude that, this is not evidence of fishing resuming in an area (survey work only) and is contrary to evidence from the operational Thanet offshore wind farm indicates that fishermen do not consider the wind farm safe to fish. Moray West explained that the spacing proposed for the turbines (minimum of at least 1,200 downwind and 1,050 m crosswind) which is much larger than the spacing the of the turbines for the Thanet offshore wind farm (500 m), and that in optimising the Moray West Site there is potential for spacing to increase beyond these minimum distances. Whilst acknowledging the increase in spacing, SFF noted that this was not the primary concern, the main risk to fishermen, in particular scallop dredges being the presence of inter-array cables and potential snag risk associated with these. Moray West acknowledges these concerns and confirmed that a key part of the CBRA will be to define a target Depth of Lowering providing adequate protection against key specific risks on the ite including the types of fishing activity active there. It should also minimise the need for remedial protection. Moray West has made a commitment to on-going engagement with SFF as part of the CFMS, which includes engagement on the CBRA. The objective being to identify solutions for the inter-array cables that minimise the risk of long term exclusion from grounds within the Moray West Site.	EIA Report - Volume 2, Chapter 11 and Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)

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Determination Period Responses								
SFF	Application Consultation Response Letter	26/01/2018	Moving to paragraph 11.7.2.18 experience shows that it is essential for a good working relationship between FLOs and FIRs, and to translate this into ensuring accurate data swap on local fisheries, especially creel. This needs to be included as part of any vessel management plan to avoid later problems.	Offshore Wind Farm and OfTI	Chapter 11	11.7.2.18	Moray West agree it is essential for FLOs and FIRs to have a good working relationship and will prioritise selection of FLOs and FIRs based on their experience, knowledge and professionalism to ensure each party can work together productively to get all necessary information communicated to and from the fishing industry operating in the Moray West Site and Offshore Export Cable Corridor. Measures have already been included in the current draft CFMS in relation to this (upon receiving direct input from SFF) and will be incorporated into the VMP when this is drafted.	EIA Report - Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	The SFF would hope that renewables developers would buy in to a similar set up to the Oil and Gas for notification of dropped objects / obstacles on the seabed as in 11.7.3.9, taking into account the impact of construction on the benthic population, and experience of other wind farms suggest the phrase available for fishing is irrelevant and hence contradicts GP4 and 17 and Fisheries 1 and 2.	Offshore Wind Farm and OfTI	Chapter 11	11.7.3.9	Measures have already been included in the current draft CFMS in relation to dropped objects. Moray West to refer to dropped object policies included within the Moray East CFMS and update the Moray West CFMS as necessary.	EIA Report - Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	The SFF would expect that the statements in 11.7.3.11 through to 20 would be translated into genuine trials using the vessels which are affected to see how they fare on returning to the development.	Offshore Wind Farm and OfTI	Chapter 11	11.7.3.11 - 11.7.3.20	In Section 2.3.4.3 of the Draft CFMS (EIA Report - Volume 4 Technical Appendix 11.2) Moray West makes a commitment to reviewing the outcomes from Scallop Dredge Gear Trials that were proposed as mitigation for the Moray East offshore wind farm. However, it was agreed at a recent Moray Firth Commercial Fisheries Working Group (MFCFWG) that these trials are no longer required. Alternative approaches such as supporting the north east scallop industry's current work to achieve MSC accreditation is being considered. SFF acknowledged this change in direction during the meeting on 1st October and discussed how Moray West involvement with the MSC accreditation scheme could be considered potential alternative mitigation. Such involvement or support may include for example stock assessments of the scallop population in the Moray Firth.	EIA Report - Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	Going forward, if the development achieves consent, the SFF would expect to see a real effort from the developer to host the CFWG and use it in a meaningful way to ensure that the development impact on fishing is as limited as possible. The SFF would highlight the need for real personal contact to avoid misunderstandings. It is worthless producing a list of failed calls to prove anything.	Offshore Wind Farm and OfTI	Chapter 11	n/a	Moray West involvement in the CFWG was discussed during the meeting on 1st October. It was discussed that Moray West should be part of the group but this would take place post-consent.	EIA Report - Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
SFF	Application Consultation Response Letter	26/01/2018	Furthermore the SFF would expect to be engaged in any discussion on cable plans, vessel plans, development layout and any other plan relevant to the impact on fishing, in line with all the policies quoted from Scotland's National Marine Plan.	Offshore Wind Farm and OfTI	Chapter 11	n/a	As outlined in the EIA Report - Volume 2, Chapter 11: Section 11.6.2, Moray West is committed to continuing to engage with the SFF on the preparation of relevant consents plan e.g. Vessel Management Plan (VMP), Navigation Safety Plan (NSP), Cable Plan (CaP), Design Specification and Layout Plan (DSLP) and the Lighting and Marking Plan (LMP). Moray West will also continue to engage with SFF on the ongoing development of the CFMS and preparation of the CBRA.	EIA Report - Volume 2, Chapter 11 - Section 11.6.2

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SFF	Application Consultation Response Letter	26/01/2018	The SFF would also hope that Marine Scotland would take their responsibility to ensure sustainable and co-existence is translated into some meaningful compliance measures to ensure developers pay more than lip service to the consent conditions. This should be particularly relevant for any contractors or subcontractors, developers should be held responsible for ensuring that they may adhere to the spirit of agreements.	Offshore Wind Farm and OfTI	Chapter 11	n/a	Moray West acknowledge this comment to MS-LOT.	n/a

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Marine Scotland Science (MSS)								
MSS	Application Consultation Response Letter	31/08/2018	MSS agrees with the proposed mitigation measures in Chapter 11 (Commercial Fisheries), including method for cable protection (burial and additional protection measures), appointment of an FLO and FIRs, Navigational Safety Plan and modified scallop dredge fishing trials within an operational wind farm site (11.7.3.22). It is very positive that the applicants have shared a draft Commercial Fisheries Mitigation Strategy as part of their application. A meeting with fishing representatives to discuss the CFMS will be required.	Offshore Wind Farm and OfTI	Chapter 11	11.7.3.22	Noted.	EIA Report - Volume 2, Chapter 11 and Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
MSS	Application Consultation Response Letter	31/08/2018	Paragraphs 11.7.2.7 to 11.7.2.10 assess the potential effects of the development on the creel fleet during construction. Short-term loss of grounds (6 months) for this fleet is discounted without any prior reference to disruption settlements for genuinely impacted vessels. No such references in section 11.6.2 either. Similarly, paragraphs 11.7.2.46 to 11.7.2.49 assess the interface with Fishing Activities. No reference to a resolution mechanism is mentioned in cases where transiting construction vessels cause damage to deployed strings of creels. Both elements should be covered in the CFMS.	Offshore Wind Farm and OfTI	Chapter 11	Various as specified in comment	Moray West have included disruption payment measures in the current draft CFMS Draft CFMS (EIA Report - Volume 4 Technical Appendix 11.2, Section2.1). The draft CFMS will be updated prior to construction with MSS, SFF and MS-LOT and will include resolution measures, including how to avoid (and manage) cases where transiting construction vessels cause damage to deployed strings of creels.	EIA Report - Volume 2, Chapter 11 and Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)
MSS	Application Consultation Response Letter	31/08/2018	Section 11.7.3. assess the potential operational effects of the development. The assessment for some fleets is based on the assumption that vessels would regain access to the site during the operational phase. No reference for post-construction monitoring programme focusing on commercial fisheries is mentioned to validate this assumption and the findings of the assessment. Validation of assumptions should be reflected in the CFMS.	Offshore Wind Farm and OfTI	Chapter 11	11.7.3	As noted in the EIA Report - Volume 2, Chapter 11, paragraph 11.7.3.11, there is evidence from post construction fish and Nephrops surveys using commercial trawlers in operational wind farms such as Walney 1 & 2, West of Duddon Sands, London Array, Barrow, Ormonde, Galloper and Gunfleet Sands that it is possible to trawl between the turbines (based on surveys carried out by Brown and May Marine Limited). Moray West are adopting a co-existence approach (presented in the draft CFMS) and have stated that fishing can continue. However, it should be noted that individual skippers may consider it unsafe to fish within the Moray West Site due to the presence of the wind farm infrastructure and this would result in an effective loss of access to grounds within the offshore wind farm for these vessels. As noted in the response to SFF above (row 29) in addition to spacing between turbines (which at a minimum distance of 1,200 m downwind and 1,050 m crosswind for Moray West is almost double the spacing of Thanet (the only wind farm where there is anecdotal evidence that fishermen have deemed the area unsafe to fish), the main concern with regaining access to the wind farm site is in relation to the inter-array cables. Moray West, through the CFMS and CBRA is targeting 90% burial of all inter-array cables. Where burial is not possible, appropriate protection will be required. As noted above, the outcome from the CBRA and requirements for cable protection where burial is not possible will be discussed with the SFF to determine suitable protection measures that minimise long term effects on fisheries. Moray West, as noted in row 29 above, has also discussed with SFF options for providing turbine locations pre-construction to enable fishermen to fish in the area with virtual turbines in place. However, despite these measure being put in place, individual fishermen still may consider the wind farm site unsuitable for fishing. Moray West Moray has not proposed any post construction monitoring on the basis that it understands that Marine Scotland already currently possesses the tools required to monitor vessel activity post construction and therefore would be best placed to carry this out.	EIA Report - Volume 2, Chapter 11 and Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)

Table 1.6 - Commercial Fisheries (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
MSS	Application Consultation Response Letter	31/08/2018	Section 11.8 provides information on the assessment of cumulative effects, Table 11.8.1 provides a very helpful summary of construction timeframes of relevant developments. However, it also highlights the potential of a larger number of developments to cumulatively impact on the nomadic scallop fleet. Assessment outcome (Sections 11.8.2.16 and 11.8.2.22) is based on the assumption of no parallel construction periods between projects or limited impacts from sequential construction periods. As construction schedules from relevant developments become available over time, discussion with the fishing industry as part of the CFMS condition should allow space for additional mitigation measures regarding timing.	Offshore Wind Farm and OfTI	Chapter 11	Various as specified in comment	Moray West will continue to engage the SFF and fishing industry through the CFWG on construction programmes (and the draft CFMS prior to construction) to ensure adequate mitigation measures are in place prior to construction.	EIA Report - Volume 2, Chapter 11 and Volume 4, Technical Appendix 11.2 - Draft Commercial Fisheries Mitigation Strategy (CFMS)

Table 1.7 - Shipping and Navigation (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Cruising Association (CA)								
Cruising Association (CA)	Application Consultation Response Email	27/07/2018	Thank you for notification of document availability and Section 36 application for the Moray West wind farm. The Cruising Association has no comments to make and wishes you well with the project.	Wind Farm and OfTI	n/a	n/a	No response required	EIA Report, Volume 2, Chapter 12.
Maritime Coastguard Agency (MCA)								
MCA	Application Consultation Response Letter	21/08/2018	A completed MGN 543 Checklist has been provided as part of the Navigation Risk Assessment, and MCA is content that all recommendations have been addressed.	Wind Farm and OfTI	12	n/a	Moray West acknowledges and welcomes this comment.	EIA Report, Volume 2, Chapter 12.
MCA	Application Consultation Response Letter	21/08/2018	Our main concern going forward is the proximity of the Moray West Offshore Windfarm (OWF) to the Moray East development, and the Beatrice OWF to the north, and the effect the potentially different layout designs will have on the safety of navigation and our search and rescue capability. The Moray East site is at a more advanced stage of development, and therefore the confirmed layout for Moray East will have an impact and provide constraints on what the MCA would accept for Moray West.	Wind Farm and OfTI	12	n/a	Moray West will liaise closely with the MCA in defining a layout design (via the Development Specification and Layout Plan [DSLP]) that satisfies their safety of navigation concerns and search and rescue (SAR) capabilities.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
MCA	Application Consultation Response Letter	21/08/2018	We note from the initial proposals that there is no designated navigational corridor or sufficient air space between Moray East and West sites to allow SAR helicopters to safely manoeuvre outside the turbine boundaries when conducting SAR operations. The site would be considered as one whole development and the applicant would need to liaise with the Moray East developers to ensure consistency across both sites, with regards to the layout, numbering, and lighting and marking. Therefore, consideration must be given to either lines of orientation that allow a continuous passage of vessels and/or SAR helicopters through the sites, or for sufficient air space in between Moray West and East.	Wind Farm and OfTI	12	n/a	Due to its proximity Moray East, Moray West ensure a sufficient area is put in place between the Moray West and Moray East Offshore Wind Farms. Moray West will laise closely with the MCA (and Moray East) in defining a final layout design (via the DSLP) that satisfies both the requirement for a wind recovery area and MCA concerns relaitng to navigational safety and SAR capabilities.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
MCA	Application Consultation Response Letter	21/08/2018	The indicative layout appears to show two, if not three, lines of orientation however given the proximity to Moray East (which impacts the Moray West layout) and a resultant lane length of greater than 10nm, a helicopter refuge area is likely required. This should be sufficient air space to allow SAR helicopters to safely manoeuvre outside the turbine boundaries when conducting SAR operations.	Wind Farm and OfTI	12	n/a	The layouts included in the EIA Report are based on worst case scanario layouts. It is expected that within the final layouts of the wind farm, the turbines will more closely follow orientation and alignment patterns similar to the Moray East offshore wind farm (as presented in the DSLP). Moray West will liaise closely with the MCA (and Moray East) in defining a final layout design (via the DSLP) that satisfies MCA concerns relating to navigational safety and SAR capabilities and seeks to avoid, where possible lane lenghts of more than 12 nm.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
MCA	Application Consultation Response Letter	21/08/2018	The turbine layout design must be discussed with the MCA at the earliest opportunity and will require approval prior to construction to minimise the risks to surface vessels, including rescue boats, and Search and Rescue aircraft operating within the site. MCA will seek to ensure all structures are aligned in straight rows and columns. Multiple lines of orientation provide alternative options, and developers should plan for at least two lines of orientation unless there is clear evidence that fewer are acceptable. We would expect no outliers, and no option for curved boundaries.	Wind Farm and OfTI	12	n/a	Moray West will laise closely with the MCA (and Moray East) in defining a final layout design (via the DSLP) that satisfies MCA concerns relaitng to navigational safety and SAR capabilities. This will also take into consideration concerns raised with respect to outliers and curved boundaries.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
MCA	Application Consultation Response Letter	21/08/2018	**Emergency Response Co-operation Plans** - Moray West shall agree a SAR checklist with the MCA which outlines all the requirements relevant to the development as outlined in MGN 543 Annex 5. Part of this checklist will be the provision of an Emergency Response Cooperation Plan (ERCoP). A template is available on the MCA website at www.gov.uk, and an approved ERCOP will need to be in place prior to construction works commencing.	Wind Farm and OfTI	12	n/a	Moray West will agree a SAR checklist with the MCA outlining all the requirements relevant to the development as outlined in MGN 543 Annex 5 (include the provision of an ERCoP, following MA template, to the MCA) prior to commencement of construction.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures

Table 1.7 - Shipping and Navigation (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
MCA	Application Consultation Response Letter	21/08/2018	During SAR discussions, particular consideration will need to be given to the implications of the site size and location. Attention should be paid to the level of radar surveillance, AIS and shore-based VHF radio coverage and give due consideration for appropriate mitigation such as radar, AIS receivers and in-field, Marine Band VHF radio communications aerial(s) (VHF voice with Digital Selective Calling (DSC)) that can cover the entire wind farm sites and their surrounding areas.	Wind Farm and OfTI	12	n/a	Moray West will liaise closely with the MCA in relation to SAR requirements and address radar surveillance, AIS and shore-based VHF radio coverage concerns regarding size and location of the site.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
MCA	Application Consultation Response Letter	21/08/2018	Moray West will be required to conduct a radio survey prior to any construction activity taking place.	Wind Farm and OfTI	12	n/a	Moray West to seek further clarification from MCA on specific requirements for a radio survey.	EIA Report, Volume 2, Chapter 12
MCA	Application Consultation Response Letter	21/08/2018	**Aviation Lighting -** The MCA require all aviation lighting to be visible 360° and compatible with night vision imaging systems, as detailed in CAP 764. Further information and specifications will be updated in our MGN shortly. There are lights available on the market that offer this capability therefore it is requested that Moray West comply.	Wind Farm and OfTI	12	n/a	As stated in the EIA Report - Volume 2, Chapter 12, Section 12.6.2, Moray West will ensure, through consultation with the MCA on the preparation of a Lighting and Marking Plan (LMP) that the MCA's aviation lighting requirements are implemented.	EIA Report, Volume 2, Chapter 12
MCA	Application Consultation Response Letter	21/08/2018	**Survey Data -** MGN 543 Annex 2 Paragraph 6 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager. This information has yet to be submitted.	Wind Farm and OfTI	12	n/a	Moray West will ensure (as outlined in MGN 543 Annex 2 Paragraph 6) hydrographic surveys and survey data fulfils the requirements of IHO Order 1a with final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager. These surveys will be undertaken post consent.	EIA Report, Volume 2, Chapter 12
MCA	Application Consultation Response Letter	21/08/2018	**Cable Routes -** Export cable routes, cable burial protection index and cable protections are issues that are yet to be fully developed. However due cognisance needs to address cable burial and protection, particularly close to shore where impacts on navigable water depth may become significant. Any consented cable protection works must ensure existing and future safe navigation is not compromised. The MCA would accept a maximum of 5% reduction in surrounding depth referenced to Chart Datum. We note that the Beatrice OWF cables run through the Moray West site, and this will need to be addressed in the cable burial plans.	Wind Farm and OfTI	12	n/a	Moray West will ensure the MCA's comments are taken forward into the Moray West Cable Burial Risk Assessment (CBRA) which is to be carried out post consent to inform final cable design and installation methods for all cables (inter-array, OSP interconnector and export cables). The CBRA will also identify requirements for any additional cable protection. As stated in the EIA Report - Volume 2, Chapter 6, Section 6.8.2.17, cables at the landfall area (nearshore area) will be installed using Horizontal Directional Drill (HDD) techniques or trenched to a target depth of 1 m. Moray West has made a commitment to not using any additional cable protection along this section of the export cable route. Where additional protection is required further offshore (outside the landfall area), the effect on water depths will be assessed to ensure minimum water depths are maintained (noting MGN543 requirement that depth reductions of greater than 5% of chart datum will require further consultation to the MCA).	EIA Report, Volume 2, Chapter 12 and Chapter 6 Section 6.8.2.17.
MCA	Application Consultation Response Letter	21/08/2018	**Safety Zones -** Safety zones during the construction, maintenance and decommissioning phases are supported, however it should be noted that operational safety zones may have a maximum 50 m radius from the individual turbines. A detailed justification would be required for a 50 m operational safety zone, with significant evidence from the construction phase in addition to the baseline NRA required supporting the case.	Wind Farm and OfTI	12	n/a	It is noted that there is an error in the EIA Report - Volume 2, Chapter 11, Section 11.7.3 and Section 11.8.3 which makes reference to the implementation of 50 m safety zones around installed infrastrucutre. This is no longer the case. Moray West does not plan to implement any 50 m safety zones during operation of the wind farm. As stated in the EIA Report, Volume 2 - Chapter 12, Table 12.6.1 and Section 12.6.3 the only safety zones will be 500 m safety zones during construction and where there is requirement for major maintanence works and 50 m safety zones around partially and fully installed infrastructure pre-commissioning (e.g. to be removed once the wind farm is operational). This is also stated in the EIA Report -	EIA Report, Volume 2, Chapter 12 - Table 12.6.1 and Section 12.6.2

Table 1.7 - Shipping and Navigation (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
MCA	Application Consultation Response Letter	21/08/2018	**Cumulative Impacts -** The cumulative impact assessment in section 12.8 provides a comprehensive overview. Traffic in the area will be displaced by the development and the effects therefore need to be carefully monitored.	Wind Farm and OfTI	12	12.8	As noted in the EIA Report, Volume 2 - Chapter 12 - Paragraphs 12.8.2.2 and 12.8.3.2 whilst there is expected to be displacement of vessels during construction, vessels are likely to slowly adapt to the alternative routes over time. A series of embedded mitigation measures such as preparation of a NSP and use of marine coordinators to monitor and control Moray West vessels and personnel during construction have been set out in Chapter 12 - Section 12.6.2.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
MCA	Application Consultation Response Letter	21/08/2018	**Liaison with local MCA Marine Office -** The developers should be reminded that their contractors and subcontractors must have the required certification for all vessel operations, and early engagement with the local Marine Office should be undertaken where necessary to ensure there are no issues with regards to survey and inspections, towage, and safety requirements.	Wind Farm and OfTI	12	n/a	Moray West will require contractors and sub-contractors to have the required certification for their vessels in place. Moray West will also require contractors and sub-contractors to engage in a timely manner with local MCA Marine Office (where necessary) to ensure survey, inspections, towage and safety requirements are met.	EIA Report, Volume 2, Chapter 12
Northern Lighthouse Board								
NLB	Application Consultation Response Letter	07/08/2018	We note that the marine licence application does not define the number, size and location of turbines; as such our response is correspondingly general in nature. We also note that there will be cumulative impacts resulting from the proximity of the Beatrice and Moray East windfarms.	Wind Farm and OfTI	12	n/a	Moray West acknowledge these comments. Further information on the number, size and location of turbines will be made available to, and discussed with, the NLB post consent as part of the preparation of the DSLP.	EIA Report, Volume 2, Chapter 12
NLB	Application Consultation Response Letter	07/08/2018	We require the developer to establish a Navigational Safety Plan and a Lighting and Marking Plan. The latter should indicate proposed marking and lighting for the three phases of the windfarm life, namely the construction, operational and decommissioning phases, to give the best possible indication to the mariner of the nature of the works being carried out.	Wind Farm and OfTI	12	n/a	As outlined in the EIA Report, Volume 2 - Chapter 12, Section 12.6.2 a Navigational Safety Plan (NSP) will be put in place to ensure that Moray West vessels do not interact with other third parties during the construction phase. A Lighting and Marking Plan (LMP) which will detail lighting and marking (for installations and cables) will also be developed for the three phases of the development's lifecycle; construction, operation and decommissioning phases. All lighting and marking will be agreed with NLB post consent and will be in line with IALA O-139.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
NLB	Application Consultation Response Letter	07/08/2018	The marking and lighting of the wind farm may require to be altered or amended to reflect future development of the adjacent Beatrice and Moray East sites in order to form a continuation of a suitable marking of the area occupied by turbines and substations. The licence holder will be expected co-operate fully in this matter.	Wind Farm and OfTI	12	n/a	As outlined in the EIA Report, Volume 2 - Chapter 12, Section 12.6.2 a Lighting and Marking Plan (LMP) which will detail lighting and marking (for installations and cables) will be developed and provided to the NLB for their input prior to approval and commencement of construction.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
NLB	Application Consultation Response Letter	07/08/2018	**Construction Phase -** During the construction phase we would require that the site boundary shall be marked by a mixture of lit Cardinal Mark and lit Special Mark buoys, to be agreed with Northern Lighthouse Board. These buoys shall be a minimum of 3 metres in diameter at the waterline, have a focal plane of at least 3 metres above the waterline and be fitted with a topmark and radar reflector. The light range on these buoys shall be 5 Nautical Miles. AIS Aids to Navigation (AtoN) should be fitted to Cardinal Marks.	Wind Farm and OfTI	12	n/a	During construction Moray West will mark the site boundary by a mixture of lit Cardinal Mark and lit Special Mark buoys, to be agreed with NLB and following their specific recommendations in construction phase marking comment. As specified in EIA Report, Volume 2 - Chapter 12, Section 12.6.2 the Moray West Lighting and Marking Plan (LMP) will detail lighting and marking (for installations and cables). All lighting and marking will be agreed with NLB post consent and will be in line with IALA O-139.	EIA Report, Volume 2, Chapter 12

Table 1.7 - Shipping and Navigation (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
NLB	Application Consultation Response Letter	07/08/2018	**Operational Phase -** In general terms, during the Operational Phase the windfarm site shall be marked and lit as per IALA Recommendation O-139 as follows: - The tower of every wind generator should be painted yellow all round from the level of Highest Astronomical Tide (HAT) to 15 metres or the height of the Aid to Navigation, if fitted, whichever is greater. - The structures designated as Significant Peripheral Structures (SPS) shall have lights visible from all directions in the horizontal plane. These lights should be synchronised to display a character of one yellow flash every 5 seconds, and should have a nominal range of not less than 5 nautical miles. - All lights shall be placed not less than 6 metres and not more than 30 metres above Mean High Water Springs (MHWS) - A sound signal shall be attached to Significant Peripheral Structures (SPS) as to be audible upon approaching the wind farm from any direction. The sound signal should be placed not less than 6 metres and not more than 30 metres above MHWS and should have a range of at least 2 nautical miles. The character shall be rhythmic blasts corresponding to Morse letter 'U' every 30 seconds. The minimum duration of the short blast shall be 0.75 seconds. The sound signal shall be operated when the meteorological visibility is two nautical miles or less. All sound signals should be synchronised. - AIS Aids to Navigation (AtoN) should be fitted to a limited number of turbines, indicating the name and location of the turbine. A radio licence will be required from OFCOM to establish these AtoN. - Each tower shall display identification panels with black letters or numbers one metre high on a	Wind Farm and OfTI	12	n/a	Moray West confirm that during the operation, the wind farm will be marked and lit as per International Association of Lighthouse Authorities (IALA) Recommendation 0-139 and NLB Operational Phase marking and lighting recommendations. Specific requirements for additional marking e.g. at the landfall are to be discussed further with NLB, MSLOT and other key stakeholders to agree preferred solutions. As specified in EIA Report, Volume 2 - Chapter 12, Section 12.6.2 Moray West will prepare a LMP which will set out agreed lighting and marking requirements for the Development. All lighting and marking will be agreed with the NLB post consent and will be in line with IALA O-139.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
NLB	Application Consultation Response Letter	07/08/2018	**Decommissioning Phase -** When the site reaches the end of its designed life and there is a need to enter into dialogue with stakeholders on decommissioning options, we would require that the Northern Lighthouse Board is consulted on the requirement for marking and lighting during this phase.	Wind Farm and OfTI	12	n/a	Moray West will consult / engage with the NLB on the requirement for marking and lighting in advance of and during the decommissioning phase of the development.	EIA Report, Volume 2, Chapter 12
NLB	Application Consultation Response Letter	07/08/2018	All navigational marking and lighting of the site or its associated marine infrastructure will require the Statutory Sanction of the Northern Lighthouse Board prior to deployment.	Wind Farm and OfTI	12	n/a	Moray West will obtain Statutory Sanction from the NLB for all navigational marking and lighting of the site (and associated marine infrastructure) prior to deployment and installation.	EIA Report, Volume 2, Chapter 12
NLB	Application Consultation Response Letter	07/08/2018	We would require that Notice(s) to Mariners, Radio Navigation Warning and publication in appropriate bulletins will be required stating the nature and timescale of any works carried out in the marine environment relating to this project.	Wind Farm and OfTI	12	n/a	Moray West will put in place Notice to Mariners (NtMs), Radio Navigation Warnings and publications in appropriate bulletins stating the nature and timescale of any works carried out in the marine environment relating to the development in advance of activities taking place.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
NLB	Application Consultation Response Letter	07/08/2018	We would require that the turbine installation locations, cable routes and cable landing points should be communicated to the United Kingdom Hydrographic Office in order that all relevant charts and publications can be correctly updated.	Wind Farm and OfTI	12	n/a	Moray West will communicate turbine installation locations, cable routes and cable landing points to the United Kingdom Hydrographic Office (UKHO) in order that all relevant charts and publications can be correctly updated.	EIA Report, Volume 2, Chapter 12
NLB	Application Consultation Response Letter	07/08/2018	We note that a comprehensive contingency plan will be required, detailing the emergency response to all possible catastrophic failure and collision scenarios.	Wind Farm and OfTI	12	n/a	Moray West will agree (and implement if required) a comprehensive contingency plan, detailing the emergency response to all possible catastrophic failure and collision scenarios. This will be carried out through the Emergency Response and Cooperation Plan (ERCoP) in consultation with the NLB and MCA.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
Royal Yachting Association (RYA)								
RYA	Application Consultation Response Letter	13/08/2018	I have read the relevant parts of the documentation, particularly chapter 12, relating to the consent application for the above wind farm. I have been in discussion with the developers over their plans and we have no objection to them. I note that the layout is to be agreed post consent as part of the Development Specification and Layout Plan and would wish to make comments at that stage.	Wind Farm and OfTI	12	n/a	Moray West will consult the RYA post consent once a draft DSLP has been produced.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures

Table 1.7 - Shipping and Navigation (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
RYA	Application Consultation Response Letter	13/08/2018	In section 12.7.1, it is stated that recreational activity over the site is very low based on one AIS record per three days. However, only about 20% of vessels in this area transmit an AIS signal so a better estimate would be five in three days or nearly two a day, which is hardly very low. Passing through a wind farm is not a problem for recreational craft given reasonable weather conditions. The EIA mentions the prevailing wind. However, the Meteorological Office wind roses for Wick and Aberdeen airports, unlike most others, do not show a consistent prevailing wind direction with winds from west through to south east being almost equally likely.	Wind Farm and OfTI	12	12.7.1	Moray West will take these comments on baseline into consideration when producing the Navigational Safety Plan (NSP). We came to our conclusions because as stated in the EIA Report: Volume 2, Chapter 12 - Section 12.4.5.13 there were no recreational vessels recorded throughout the winter survey period and an average of one unique vessel every three days during the summer survey period within the offshore wind farm study area. It is noted that all recreational tracks were recorded on AIS, with no tracks recorded on Radar. EIA Report: Volume 2, Chapter 12 - Section 12.4.5.14 outlines that the RYA Coastal Atlas (RYA, 2016) shows the estimated direction of offshore cruising routes, and approximate densities of recreational vessel density within the UK 12 nm limit. A plot of this data is shown in the EIA Report - Volume 3a: Figure 12.4.8, which has been overlaid with the recreational tracks recorded during the marine traffic surveys (noting that no activity was recorded during the winter survey period). It can be seen that recreational density within the offshore wind farm study area is low when compared to the coastal areas. This correlates well with the marine traffic data. The EIA Report: Volume 2, Chapter 12 - Section 12.4.5.15 states that the highest recreational AIS densities are located along Moray coast and approaches to the Cromarty Firth. The Moray West Site is located outside of the UK coastal waters 12 nm limits therefore no AIS density is available for within Moray West Site but it can be deduced that density is low.	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures
RYA	Application Consultation Response Letter	13/08/2018	It is not known what the cumulative effect would be of Moray East, BOWL and Moray West on recreational boat navigation and whether some recreational craft may choose to cross the Moray Firth using different route. Although, as is pointed out in chapter 12, the AIS tracks on the RYA UK Coastal Atlas of Recreational Boating do not extend as far as the Moray Firth wind farms, it can be inferred that the most used routes across the Firth are from Rattray Head to Wick and to a lesser extend the Whitehills to Wick, and vice versa. However, the sequence of building the wind farms may provide an opportunity to monitor the impacts of BOWL and the Moray East on routing of recreational craft which may help predict the impacts of Moray West.	Wind Farm and OfTI	12	n/a	Moray West will take these comments on baseline into consideration when producing the Navigational Safety Plan (NSP).	EIA Report, Volume 2, Chapter 12: Section 12.6.2 Embedded Measures

Table 1.8 - Aviation (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Defence Infrastructure Organisation (MOD)								
Defence Infrastructure Organisation (MOD)	Application Consultation Response Letter	16/08/2018	DIO is writing to advise you (Moray West) that the Ministry of Defence (MOD) objects to the proposal. Our assessment has been carried out on the basis that there will be up to 85 turbines, a maximum of 285 m in height from ground level to blade tip and locations within the boundary outline indicated by the grid references list in the response and Moray West Section 36 and Marine Licence application forms.	Wind Farm	13	Not specified	Comments noted.	EIA Report - Volume 2, Chapter 13
Defence Infrastructure Organisation (MOD)	Application Consultation Response Letter	16/08/2018	Air Traffic Control (ATC) Radar: The turbines will be between 33.6 and 61.9 km from, detectable by, and will cause unacceptable interference to the ATC radar used by RAF Lossiemouth.	Wind Farm	13	Not specified	Moray West has appointed a consultant and has commenced initial discussions regarding the identification of an appropriate technical mitigation solution that would enable MOD to remove their objection. This work is on-going.	EIA Report - Volume 2, Chapter 13
Defence Infrastructure Organisation (MOD)	Application Consultation Response Letter	16/08/2018	Wind turbines have been shown to have detrimental effects on the performance of Primary Surveillance Radars (PSR). These effects include the desensitisation of radar in the vicinity of the turbines, and the creation of "unwanted" aircraft returns which air traffic controllers must treat as aircraft returns. The desensitisation of radar could result in aircraft not being detected by the radar and therefore not presented to air traffic controllers. Controllers use the radar to separate and sequence both military and civilian aircraft, and in busy uncontrolled airspace radar is the only sure way to do this safely. Maintaining situational awareness of all aircraft movements within the airspace is crucial to achieving a safe and efficient air traffic service, and the integrity of radar data is central to this process. The creation of 'unwanted' returns displayed on the radar leads to increased workload for both controllers and aircrews. Furthermore, real aircraft returns can be obscured by a turbine's radar return, making tracking of both conflicting unknown aircraft and the controllers own traffic much more difficult.	Wind Farm	13	Not specified	Moray West has appointed a consultant and has commenced initial discussions regarding the identification of an appropriate technical mitigation solution that would enable MOD to remove their objection. This work is on-going.	EIA Report - Volume 2, Chapter 13
Defence Infrastructure Organisation (MOD)	Application Consultation Response Letter	16/08/2018	An operational assessment of this proposal has been conducted by an ATC subject Matter Expert (SME) who considered the position of the turbines weighed against a number of operational factors. Close examination of the proposal has indicated that the proposed turbines would have a significant and detrimental effect on operations on the provision of air traffic services at RAF Lossiemouth. MOD therefore objects to the development. In addition to the previous paragraph, reasons for this objection include, but are not limited to: a. Restrictions the development would impose upon departure routes including Standard Instrument Departures (SIDS) b. Restrictions the development would impose upon approach and arrival procedures c. Restrictions the development would impose upon traffic patterns, in particular the Radar to Visual profile d. Restrictions the development would impose upon LARS/ZONE traffic patterns e. Restrictions the development would upon special tasks conducted by the Unit f. Restrictions the development would impose upon aircraft operating areas g. Restrictions the development would impose upon Tactical Aid to Navigation (TACAN) procedures h. Restrictions the development would impose upon final approach routes i. Restrictions the development would impose upon holding areas j. Restrictions the development would impose upon instrument flight paths k. The position of the development in relation to controlled airspace l. The position of the development in relation to restricted / danger areas m. The MODs future airspace and operational requirements n. The frequency of the provision of Traffic Services and Deconfliction Service in the vicinity of the proposed windfarm o. Air traffic density in the vicinity of the proposed windfarm p. Existing clutter or windfarms in the vicinity of the proposed windfarm q. The type and characteristics of aircraft routinely using the airspace in the vicinity of the proposed windfarm r. The performance of the radar s. The complexity of the ATC task	Wind Farm	13	Not specified	Moray West has appointed a consultant and has commenced initial discussions regarding the identification of an appropriate technical mitigation solution that would enable MOD to remove their objection. This work is on-going.	EIA Report - Volume 2, Chapter 13

Table 1.8 - Aviation (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Defence Infrastructure Organisation (MOD)	Application Consultation Response Letter	16/08/2018	The MOD has also assessed the effects of the proposed wind farm development upon the effective operation of its air defence radars. It has been confirmed that the proposed wind turbines area not expected to impacts upon the operation of air defence radars. However, the MOD has recently identified that, in certain conditions, the performance of air defence radars may be adversely affected by the proposed wind farm when it is operational. Based upon the technical evidence currently available the MOD does not identify a need for any form of mitigatory measures to address this potential issue to be implemented in relation to the scheme for which consent is currently sought.	Wind Farm	13	Not specified	Comment noted.	EIA Report - Volume 2, Chapter 13
Defence Infrastructure Organisation (MOD)	Application Consultation Response Letter	16/08/2018	If the developer is able to overcome the issues stated above, the MOD will request that all turbines be fitted with aviation lighting in accordance with Article 219 of the Air Navigation Order.	Wind Farm	13	Not specified	Comment noted. The EIA Report - Volume 2, Chapter 13, Section 13.2 - Table 13.2.1 makes reference to CAP 393 - Air Navigation: The Order and the Regulations which contain the Air Navigation Order (ANO). Although no specific reference is made to Article of 219 of the ANO Moray West confirms that all turbines be fitted with aviation lighting in accordance the most recent Aviation Regulations that are in place at the time of finalising the Design Specification and Layout Plan. Specific lighting requirements will be agreed with the CAA and MOD.	EIA Report - Volume 2, Chapter 13
Defence Infrastructure Organisation (MOD)	Application Consultation Response Letter	16/08/2018	MOD Safeguarding wishes to be consulted and notified about the progress of planning applications and submissions relating to this proposal to verify that it will not adversely affect defence interests.	Wind Farm	13	Not specified	Moray West has appointed a consultant to provide support with respect to on-going consultation throughout consent determination and pre-construction activities.	EIA Report - Volume 2, Chapter 13
Maritime Coastguard Agency (MCA)								
MCA	Application Consultation Response Letter	21/08/2018	**Aviation Lighting -** The MCA require all aviation lighting to be visible 360° and compatible with night vision imaging systems, as detailed in CAP 764. Further information and specifications will be updated in our MGN shortly. There are lights available on the market that offer this capability therefore it is requested that Moray West comply.	Wind Farm	12	n/a	Moray West will ensure the MCA's aviation lighting requirements are implemented.	EIAR
National Air Traffic Control Services (NATS)								
NATS	NATS Technical and Operational Report	July 2018	3.1.1. Predicted impact on Allanshill Radar - Using the theory as described in Appendix A and development specific propagation profile it has been determined that the terrain screening available will not adequately attenuate the signal, and therefore this development is likely to cause false primary plots to be generated. A reduction in the radar's probability of detection, for real aircraft, is also anticipated.	Wind Farm	12	n/a	Moray West has appointed a consultant and has commenced initial discussions regarding the identification of an appropriate technical mitigation solution that would enable the remove of this objection. This work is on-going.	EIAR
NATS	NATS Technical and Operational Report	July 2018	3.1.2. En-route operational assessment of radar impact - Where an assessment reveals a technical impact on a specific NATS radar, the users of that radar are consulted to ascertain whether the anticipated impact is acceptable to their operations or not. Unit or role (Aberdeen En-route ATC), Comment - Unacceptable Unit or role (Prestwick Centre ATC), Comment - Unacceptable Note: The technical impact, as detailed above, has also been passed to non-NATS users of the affected radar, this may have included other planning consultees such as the MOD or other airports. Should these users consider the impact to be unacceptable it is expected that they will contact the planning authority directly to raise their concerns.	Wind Farm	12	n/a	Moray West has appointed a consultant and has commenced initial discussions regarding the identification of an appropriate technical mitigation solution that would enable the remove of this objection. This work is on-going.	EIAR

Table 1.8 - Aviation (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
NATS	NATS Technical and Operational Report	July 2018	3.2.1. Predicted impact on navigation aids - No impact is anticipated on NATS's navigation aids.	Wind Farm	12	n/a	Moray West welcomes these comments.	EIAR
NATS	NATS Technical and Operational Report	July 2018	3.3.1. Predicted impact on the radio communications infrastructure - No impact is anticipated on NATS's radio communications infrastructure.	Wind Farm	12	n/a	Moray West welcomes these comments.	EIAR
NATS	NATS Technical and Operational Report	July 2018	4.1. En-route consultation - The proposed development has been examined by technical and operational safeguarding teams. A technical impact is anticipated, this has been deemed to be **unacceptable**.	Wind Farm	12	n/a	Moray West has appointed a consultant and has commenced initial discussions regarding the identification of an appropriate technical mitigation solution that would enable the remove of this objection. This work is on-going.	EIAR

Table 1.9- Seascape, Landscape and Visual Impact Assessment (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Fordyce, Sandend & District Community Council								
Fordyce, Sandend & District Community Council	Application Response	16/08/2018	The revised landfall is not well described in the EIA, we therefore provide the following informative to provide scale and site specific details. Sandend Bay is a trapezoidal shaped embayment located between two promontories, Garron Point in the West and West Head in the East. The seaward opening of the bay is 1,800 m wide and the beach head at MHWS is 600 m wide. The inland median access distance between the beach head and the seaward promontories is 1,200 m.	Wind Farm and OfTI	Chapter 14 SLVIA	n/a	Further assessment is offered in the terrestial planning application to Aberdeenshire Council and in the supporting EIAR for that application.	EIA Report
Fordyce, Sandend & District Community Council	Application Response	16/08/2018	The developer has now restricted the proposed OfTI landfall area to the East side of the bay, nomially a 1,700 m long coastline from the East end of the beach to West Head. The whole of the landfall area is therefore within the Cullen and Stakeness SSSI.	Wind Farm and OfTI	Chapter 14 SLVIA	n/a	Noted and considered fully in terrestrial application.	EIA Report
Fordyce, Sandend & District Community Council	Application Response	16/08/2018	The coastal morphology consists of coastal slopes and rocky cliff faces, with a dry cove called Red Haven protected by a single berm. A small beach known locally as Dunnedeich is located to the south of Red Haven cove. A characteristic of the coastal slope area is that teh foreshore is mainly formed from rock outcrops and raised reefs extending seaward 30 to 100 m from MHWS. The coastal slope and cliff top heights vary from 20 m to 35 m AOD (OS 1:25,000 map contour). The inaccessible cliff areas occupy approximately 65 % of the landfall area extending from teh North corner of Red Haven cove to West Head. It therefore follows that only 35 % of the landfall coastline equating to 600 m is available for a conventional buried cable landing method at the shoreline.	Wind Farm and OfTI	Chapter 14 SLVIA	n/a	Moray West will undertake a campaign of ground investigations (onshore and offshore) to confirm viable locations that have been identified through desk top studies. The final loction will be subject to approval of both Marine Scotland (through the OfTI Cable Plan) and approval of matters specified in condition in terms of the Planning Permission in Principle in terms of the onshore consent.	EIA Report
Fordyce, Sandend & District Community Council	Application Response	43328	This is further limited by there being only two beach access poitns in the residual landing area at Red Haven (shingle beach 200 m wide) and Dunnedeich (sandy beach 60 m wide). The 'nearshore' (0 m LAT to - 5 m LAT) and shoreline approaches to both beaches are domindated by large expanses of rocky reefs nomially 1 to 3 m higher than MLWS forming a margin between teh narrow beaches and teh sandy expanse of the bay. The natural landscape beyond MHWS and behind two beaches are vegatated coastal slopes. The land at Red Haven includes semi-circular cove formed of undualting vegetated ground behind the steep shingle beach bounded by very steep vegetated coastal slopes with exposed rock outcrops. The natural beauty of the coastal landscape around Sandend Bay, particularly on the East side is characterised at the interface of the land and sea by the varied types of foreshore. The cliffs, rocky reefs, outcrops of varied rock types and boulder formations, in combination with teh shingle and sand beaches create a varied coastal fringe which is not present within such variety in a confined area elsewhere along the South Moray Coast.	Wind Farm and OfTI	Chapter 14 SLVIA	n/a	Moray West will undertake a campaign of ground investigations (onshore and offshore) to confirm viable locations that have been identified through desk top studies. The final loction will be subject to approval of both Marine Scotland (through the OfTI Cable Plan) and approval of matters specified in condition in terms of the Planning Permission in Principle in terms of the onshore consent.	EIA Report
Fordyce, Sandend & District Community Council	Application Response	43328	The village of Sandend located on the West side of the bay has histrocial vulneablities to flood risk due to its close proximity to the sea and sea front levels of 3- 4 m AOD. The village, largely built in the early 19th century has no protection by design. Only the construction of the harbour in teh early 20th century afforded protection to teh village. However, this does not protect all areas, particularly properties at teh North end of the village and to teh South of the village along the west side of the bay. Similar flood and erosion vulnerablities exist to the sand dunes behind the beach and in the SW corner of teh bay where there is very little or no protection to teh area west of Scattery Burn exposing a caracan site and adjacent properties to flood risk from the land and sea.	Wind Farm and OfTI	Chapter 14 SLVIA	n/a	The coastal character of Sandend is described in Chapter 14 of the EIA Report.	EIA Report

Table 1.9- Seascape, Landscape and Visual Impact Assessment (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Scottish Natural Heritage (SNH)								
SNH	Application Response	43350	The extensive cumulative scale of Moray West in addition to Beatrice and Moray East offshore wind farms contributes to widespread significant adverse effects on sensitive landscape, seascape and visual receptors, and in particular on the distinctive landscape character of the East Sutherland Coast. Moray West cumulatively with Beatrice will introduce extensive and significant adverse effects on landscape, seascape and visual receptors almost continuously along a substantial 60 km length of the coastline in east Sutherland, including both daytime and night time impacts. The open waters of the Moray Firth are a key characteristic of the landscape and coastal character of East Sutherland Coast. The extensive scale of the development running parallel to the East Sutherland Coast will cause the loss of views to open water from most of this coast. We present our detailed advice on seascape, landscape and visual impacts in Appendix B.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary.	EIA Report
SNH	Application Consultation Response	43350	There are two key issues identified relating to the extensive cumulative scale of Moray West in addition to Beatrice and Moray East Offshore Wind Farms. Cumulatively these developments contribute to widespread levels of significant adverse effects on sensitive landscape, seascape and visual receptors, and furthermore on the distinctive landscape character of the East Sutherland Coast.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development and discord between Moray West and BOWL turbines due to size difference. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary.	EIA Report
SNH	Application Consultation Response	43350	It is considered that this level of effect on sensitive landscape, coastal and visual receptors, and distinctive landscape character which contributes to Scotland's national landscape resources raises issues of national interest for SNH.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted. Also noted is that SNH did not consider the issues of national interest raised in their response to be of a level that merited an objection from SNH on SLVIA grounds. In a national context the sensitivity of this part of the landscape is not heightened by national desigation and only sections of the coast are locally designated. There are no specific views from this coastline out to sea that are considered iconic, which might otherwise trigger an issue of national interest.	EIA Report
SNH	Application Consultation Response	43350	Moray West in addition to Beatrice will introduce extensive and significant adverse effects on landscape, seascape and visual receptors almost continuously along a substantial 60 km length of coastline in east Sutherland, including both daytime and night-time impacts.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development. THC's Local Development Plan shows the potential for offshore renewable energy development within the Moray West site, in combination with BOWL and Moray East as part of its Caithness and Sutherland Vision and Spatial Strategy at Figure 1. Therefore, it could be said that such developments were planned and made public through consultation and therefore such effects should not be an unexpected consequence.	EIA Report
SNH	Application Consultation Response	07/09/2018	The substantial extent of significant effects arising with the addition of Moray West will be introduced into the open waters of the Moray Firth, which are a key characteristic of the landscape and coastal character of East Sutherland Coast. The extensive scale of the development running parallel to the East Sutherland Coast will entail that for most of this coast the views to open water will be lost.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development therefore increasing the views of open water.	EIA Report

Table 1.9- Seascape, Landscape and Visual Impact Assessment (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SNH	Application Consultation Response	07/09/2018	There is a national interest in safeguarding and enhancing the distinctive character and diversity of Scotland's landscapes at the regional scale. Our aim is to ensure that Scotland's landscapes retain their distinctive regional character and features that contribute to a national identity and out sense of place. Moray West is a very large proposal with extensive and significant impacts on landscape character and it will significantly erode the distinctive characteristics of the East Sutherland landscape.	Offshore Wind Farm	Chapter 14 SLVIA	NA	The effects on the East Sutherland landscape are shown on the ZTV in figure 14.7.1b: Blade Tip ZTV to be largely confined to the coastal edge, which does not have a heightened recognised value through national designation and only sections of it are locally designated. Views out across the open water from the East Sutherland coast are not considered to be iconic or rare in a Scottish context. These are all factors that have informed the selection of the BOWL and Moray sites through past processes.	EIA Report
SNH	Application Consultation Response	07/09/2018	**Onshore / Offshore Capacity and Planning for Wind Development** The application has highlighted an issue with regard to the joint consideration of landscape / coastal character impacts (see paragraphs 37 & 38 below) and the need for a more holistic consideration of the siting of both onshore and offshore developments. We are unclear on how best to take this conversation forward, but would welcome further discussion with both Marine Scotland and Energy Consents Unit on this issue.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted. This is a matter for SNH, MS and the ECU to address.	EIA Report
SNH	Application Consultation Response	07/09/2018	EIA Report - Project Scenarios: Following on from design development through the Rochdale Envelope approach, 4 development scenarios have been taken forward for consideration in the EIA Report (Chapter 14 14.6.1.19 and Volume 3a - Figure 14.6.1). A) Model 2 - 85 turbines of up to 230 m blade tip height b) Model 3 - 72 turbines of up to 265 m blade tip height c) Model 4a - 41 turbines of up to 285 m blade tip height d) Model 4f - 62 turbines of up to 285 m blade tip height	Offshore Wind Farm	Chapter 14 SLVIA	NA	Agree.	EIA Report
SNH	Application Consultation Response	07/09/2018	Of these the realistic worse-case scenario (RWCS) is Model 4f - 62 turbines of up to 285 m blade tip height, which has the greatest number of the tallest turbines. However, for the night time assessment, the photomontages have been modelled using Model 2, as it has the greatest number of turbines and therefore the greatest number of lights.	Offshore Wind Farm	Chapter 14 SLVIA	NA	The night time asseement the photomontages and assessment have been modelled and undertaken for both the Model 4f and Model 2 scenarios in order to satisfy both SNH and THC's requirements.	EIA Report
SNH	Application Consultation Response	07/09/2018	In appraising these scenarios in terms of potential mitigation, all of them extend out to the full site boundary. As such the horizontal extent of the development does not change. Moray West is further offshore than Beatrice, at 22 km distance. However, due to the large turbines assessed as the RWCS for Moray West (in comparison to Beatrice) from many views they will actually appear the same size or larger than Beatrice, and so they contribute to a similar or greater impact. This aspect of the development therefore could be mitigated by the smaller turbines suggested for Model 2 in the scenarios improving the cumulative relationship between Moray West and Beatrice in several views. Furthermore reducing turbine height would also reduce the extent of turbines visible in views from locations such as Brora, Tarbet Ness and the Moray / Aberdeenshire Coasts.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development and discord between Moray West and BOWL turbines due to size difference. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary.	EIA Report
SNH	Application Consultation Response	07/09/2018	**Understanding the scale of Moray West and the significance of effect:** With the addition of Moray West to the landscape baseline, there will be a substantial 'step change' in the extent of the significant effects arising on landscape and visual receptors in the Moray Firth.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted. However, many of the locations where significant effects arise as a result of Moray West are already materially affected by views of BOWL and Moray East so that the further addition of Moray West would not always be a new effect. Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary.	EIA Report
SNH	Application Consultation Response	07/09/2018	There are 3 main factors which contribute to the level of significant effects arising, these being: a. the larger scale of the development; b. The orientation of the development with regard to the coastline; c. Sensitivity of the receiving environment (assessed in the EIA Report as Medium to High for the majority of receptors and in this advice discussed in relation to the East Sutherland Coast).	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted. In a national context the sensitivity of this part of the landscape is not heightened by national desigation and only sections of the coast are locally designated. There are no specific views from this coastline out to sea that are considered iconic, which might otherwise trigger an issue of national interest. Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development.	EIA Report

Table 1.9- Seascape, Landscape and Visual Impact Assessment (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SNH	Application Consultation Response	07/09/2018	For all scenarios the Moray West layout is 30 km in length and 10 km in depth, orientated northeast to southwest. At its closest point the development sits 22 km offshore (equivalent to 12 nm extent of Scottish Territorial Waters).	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report
SNH	Application Consultation Response	07/09/2018	Cumulatively and partially overlapping with the 15 km length of Beatrice (now under construction) the development would contribute to an overall wind farm 45 km in length.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development.Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development.	EIA Report
SNH	Application Consultation Response	07/09/2018	The straight line length of the East Sutherland Coastline (see point 27 for definition) run approximately 70 km from the northern shore of Loch Fleet to Sarclet. The distance by road along the A9 and A99 is collectively 88 km. So for almost half of this route through this area, large scale wind turbines will run in parallel to the coast and be prominent in views.	Offshore Wind Farm	Chapter 14 SLVIA	NA	The impacts on road receptors are fully considered in the SLVIA. Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development.	EIA Report
SNH	Application Consultation Response	07/09/2018	As such, whilst wind energy development, and in particular terrestrial wind development, is increasingly familiar in some of our landscapes, the extent of Moray West both individually and cumulatively, creates a uniform continuous array of turbines of a scale unprecedented in Scotland.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development.	EIA Report
SNH	Application Consultation Response	07/09/2018	In contrast to terrestrial development, the Beatrice/Moray West (and Moray East) grouping is viewed at distances of a minimum of 13 km to 22 km within a wider seascape, which can accommodate a larger scale of wind development. However, the orientation of the development running parallel to the populated and accessible coastline entails that typically the full or a significant proportion of this 45 km length wind development will be viewed by many receptors for a considerable period of time, travelling both north and south along the coast (on known tourist routes which contribute to the popular North Coast 500).	Offshore Wind Farm	Chapter 14 SLVIA	NA	Relatively speaking (in a Scottish context) the East Sutherland coastline is not considered to be heavily populated. Within many parts of the settlements there would not be views of Moray West. NPF3 includes mapping of the routes of two Scenic Corridors through Scotland. The East Sutherland coastal route is not shown as one of these. THC is successfully promoting the North Coast 500 to encourage visitors and economic development. This section of the East Sutherland coast is not the route for any long distance routes (LDR). Visit Scotland does not encourage visitors along the section of the coast that lies between Helmsdale and Wick (which is where most of significant effects on the seascape, landscape and visual resource would arise) in any of its 31 suggested itineraries at https://www.visitscotland.com/see-do/itineraries/#revealMap Proposals for mitigation of seascape, landscape and visual effects which in many instances are cumulative) are submitted with an Addendum.	EIA Report
SNH	Application Consultation Response	07/09/2018	**Landscape, Seascape and Visual Impact:** Broadly speaking we agree with the nature, extent and level of significant impacts identified by the applicant within the EIA Report. As such the detailed assessment of landscape, seascape and visual effects contained within this report has been used as a basis to inform this advice.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report

Table 1.9- Seascape, Landscape and Visual Impact Assessment (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SNH	Application Consultation Response	07/09/2018	In summary the Moray West EIA Report Chapter 14 identifies the following significant effects on sensitive receptors:					
SNH	Application Consultation Response	07/09/2018	***Impacts on landscape and coastal character*** Significant adverse effects were identified for the following landscape character types (LCTs): a. Small Farms and Crofts LCT between Sarclet Head and Berridale; b. Moorland Slopes and Hills LCT in the vicinity of east facing slopes at Badbea and Cnoc na Croiche; and c. Coastal High Cliffs and Bays LCT	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report
SNH	Application Consultation Response	07/09/2018	Reflecting the impacts on landscape character, significant adverse effects were identified on the following coastal character areas (CCAs): a. Sarclet Head CCA (from Sarclet Head south); b. Lybster Bay CCA c. Dunbeath Bay CCA d. Helmsdale to Berridale Coastal Shelf CCA (to the north east of Helmsdale)	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report
SNH	Application Consultation Response	07/09/2018	Contrary to the EIA Report we consider that the Coastal Shelf LCTs of high sensitivity (its classification is rare in a highland context) and as such we appraise that there would be significant effect on this LCT and where it contributes to the coastal character of Brora to Helmsdale Deposition Coast CCA.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West remains of the view that they are correct in the assessment of landscape character type and does not consider a change in the assessment is needed.	EIA Report
SNH	Application Consultation Response	07/09/2018	***Impacts on Visual Receptors*** As part of the EIA Report, 24 representative viewpoints were used to assess the development (4 viewpoints had both daytime and night-time photomontages produced). Below is a summary of the key points of impacts on visual receptors: a. Of the 24 viewpoints, significant adverse effects were identified for 10 locations, representing potential visual impacts from Wick extending southwards to Navidale, a 50 km length of coastline. b. Significant effects from lighting were identified from Dunbeath and Navidale, which can be extrapolated to represent the type of effects from visual receptors within the vicinity and between these two locations for a minimum of 20 km. c. Significant adverse sequential effects were assessed for the A9 on views obtained predominantly by north bound travellers between Crackaig and Ousedale (approximately 17 km); and by north and south bound travellers between Berridale and Latheron (approximately 13 km) although it is considered that this would be greater extent up to Whaligoe (26 km). d. Along the A99 significant adverse effects were identified between Wick and the north of Ulbster, a distance of 10 km.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted	EIA Report
SNH	Application Consultation Response	07/09/2018	Extrapolating the results of the viewpoint and sequential assessment, we consider that significant effects on the wider visual amenity of East Sutherland Coast will extend from Wick, down to Ballinreach just north of Brora, a distance of approximately 60 km. This represents where Moray West (in isolation - see Figure 14.7.3) will be viewed predominantly as an array of turbines occupying a horizontal field of view, of a minimum of 30-40 degrees up to 50-60 degrees between Berridale and Whaligoe. The exception to this is the horizontal field of view between 20-30 degrees from the north of Brora to the south of Helmsdale.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development.	EIA Report
SNH	Application Consultation Response	07/09/2018	Whilst the analysis of the horizontal field of view of Moray West in isolation is useful, Beatrice is part of the baseline landscape. Combined cumulative impacts with Moray West are predicted almost continuously along the majority of the East Sutherland Coast (EIA Figure 14.8.2) and therefore the two developments will largely be viewed together. As such the reality is that Moray West in addition to Beatrice will contribute to turbines occurring across a much wider horizontal field of view of up to 90 degrees, as evidenced by the assessment of viewpoints (for example at Lybster and Latheron). This will contribute to an increased severity of impact and significance of effect on these receptors.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development.	EIA Report
SNH	Application Consultation Response	07/09/2018	From viewpoints including Brora, Tarbet Ness and Lossiemouth, at over 30 km distance from the nearest Moray West turbine, significant effects are not predicted. However, it is considered that the level of effect arising on these viewpoints is on the threshold for being significant. In these instances the scale of the development introduces the experience of large scale wind energy development into the more enclosed waters of the Moray Firth, where previously there were none. In particular Tarbet Ness has pronounced qualities of remoteness and seclusion, reinforced by the diminished hierarchy of travel (from A to B to minor roads, to track to footpath) as the approach the popular viewpoint.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development therefore increasing the views of open water.	EIA Report

Table 1.9- Seascape, Landscape and Visual Impact Assessment (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SNH	Application Consultation Response	07/09/2018	In conclusion, the large scale and extent of Moray West will introduce significant adverse effects on landscape, seascape and visual receptors almost continuously along a substantial proportion of coastline in east Sutherland, including both daytime and night-time impacts and raises issues of national interest for SNH.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary.	EIA Report
SNH	Application Consultation Response	07/09/2018	**Impacts on East Sutherland Coast:** It is considered that the landscape character along the Sutherland coast can be experienced as a distinctive regional area, referred to as East Sutherland Coast.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted	EIA Report
SNH	Application Consultation Response	07/09/2018	Our response in landscape cases are based on the approach set out in the SNH Landscape Policy Framework (LPF 2005). An overarching aim of this Policy Framework is 'To safeguard and enhance the distinct identity, the diverse character and the special qualities of Scotland's landscapes as a whole' (LPF para 9). To achieve this aim, the Policy sets out a series of four actions (Para 10), which include working with others and encouraging high standards of design of new development and upholding the 'tangible and intangible qualities that contribute to the landscapes being recognised as distinctive of Scotland through......safeguarding the diverse and distinctive regional character of different parts of Scotland'.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report
SNH	Application Consultation Response	07/09/2018	This approach to landscape character remains consistent with current Scottish Planning Policy (SPP), which 'should facilitate positive change while maintaining and enhancing distinctive landscape character' SPP para. 194). In this context it is important to recognise that protection of distinctive landscape character as part of Scotland's landscape resource, is a separate but inter-related issue from the protection of 'scenically valued' landscapes through designations such as National Scenic Areas (NSAs) and Local Landscape Areas (LLAs). There will undoubtedly be instances where distinctive landscape character will contribute to the experience and special qualities of a NSA, so distinctive landscape character and valued landscape are not mutually exclusive, but they are both afforded protection at a national level.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report
SNH	Application Consultation Response	07/09/2018	At the broad scale, the East Sutherland Coast is comprised of three categories or combinations of landscape character: a. a narrow low-lying coastal shelf or strip, to the east; b. contained by open sea; and c. to the west, backed by extensive upland moorland slopes and hills.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report
SNH	Application Consultation Response	07/09/2018	It is considered that all of the East Sutherland Coast can be experienced as a distinctive area, the characteristics of which contribute significantly to Scotland's national landscape resource, resulting from: The clarity and contrast of transition between upland, lowland and coastal strip and open sea which is almost always continually displayed. Along the East Sutherland Coast, the clarity of this transition is particularly pronounced at the transition of Moorland Slopes and Hills and Coastal Shelf LCTs. The occurrence and juxtaposition of character between these types is recognised as highly distinctive, and centrally located within the East Sutherland Coast providing a particularly intense experience of this transitional landscape. Over a distance of approximately 50 km the orientation of the Sutherland Coastline south west to north east defines the overriding and cohesive linear character. Within the East Sutherland Coast the relatively abrupt change in elevation between upland and lowland and coast creates a strong but simple visual composition, where the eye is drawn to the skyline (both terrestrial and marine) and the coast. The distinctiveness of character is experienced when travelling through the area. There is a tangible sense of entering and exiting this stretch of coast and within it a distinctive rhythm comprising open wide panoramas out to sea, views focused along the coastal strip, and enclosed views inland. This rhythm of views is distinctive to travelling north and south along the A9 through the East Sutherland Coast.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report
SNH	Application Consultation Response	07/09/2018	The experience is of the 'whole'; the combination of landscape character types which presents as views of coastal landscape - the panoramas out to sea are combined with characteristic views along the coast which draws the eye to the backdrop of hills. Unless dictated by local screening, most views along the East Sutherland Coast will combine these three elements. Views from the A9 which, by their very nature, are typically transient and experienced sequentially combine often abrupt changes from enclosed views inland, to open panoramas along the coast and out to sea.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report

Table 1.9- Seascape, Landscape and Visual Impact Assessment (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
SNH	Application Consultation Response	07/09/2018	The landscape character and experience of the East Sutherland Coast is recognisable as a cohesive area which can be defined at a regional level. The distinctiveness of character makes a significant contribution to both the Highland identity and to the national landscape resource. This formed part of SNH's evidence to the West Garty Wind Farm Public Inquiry in 2017.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report
SNH	Application Consultation Response	07/09/2018	Significant adverse effects on landscape character, coastal character, and visual amenity (including static and sequential high sensitivity receptors) have been predicted from the addition of Moray West. This is, in part due to the high sensitivity of the receiving environment, and the way it is experienced, and the scale of the development which contributes to an extensive wind farm.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report
SNH	Application Consultation Response	07/09/2018	The substantial extent of significant effects arising with the addition of Moray West will be introduced into the open waters of the Moray Firth, which are a key characteristic of the landscape and coastal character of East Sutherland Coast. The extensive scale of the development running parallel to the East Sutherland Coast will entail that for most of this coast (approx. 75%) the views to open water will be lost.	Offshore Wind Farm	Chapter 14 SLVIA	NA	A large expanse of open water will separate Moray West from the coast and from approxmately Berriedale south along the East Sutherland Coast open sea views from the south-east round to the south-west remain. Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development therefore increasing the views of open water.	EIA Report
SNH	Application Consultation Response	07/09/2018	Moray West is a very large proposal with extensive and significant impacts on landscape character and it will significantly erode the distinctive characteristics of the East Sutherland landscape.	Offshore Wind Farm	Chapter 14 SLVIA	NA	A large expanse of open water will separate Moray West from the coast and from approxmately Berriedale south along the East Sutherland Coast open sea views from the south-east round to the south-west remain. Moray West is looking at mitigating potential effects through the removal of the Model 4 WTG to reduce the scale of the development. In addition to this Moray West is also exploring options to reduce the western extent of the Moray West Site through a variation to the current application boundary which will reduce the horizontal field of view affected by the Development therefore increasing the views of open water.	EIA Report
SNH	Application Consultation Response	07/09/2018	Notwithstanding the significant offshore cumulative impacts with Moray West in addition to Moray East and in particular Beatrice, significant adverse cumulative landscape and visual impacts are identified with the combination of terrestrial and marine wind energy developments, both at the local and strategic level.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted. However with the refusal of West Garty onshore wind farm there is a reduction in the potential cumulative effects identified for the East Sutherland Coast as described in the Addendum.	EIA Report
SNH	Application Consultation Response	07/09/2018	Locally from many visual receptors significant cumulative impacts are predicted for the addition of Moray West in combination with both existing and consented marine wind energy, and existing, consented and proposed terrestrial wind energy (as evidenced by the assessment of impact from viewpoints 4, 5, 6, 8, 9, 10, 11, 12). From a landscape and visual impact perspective, this leads to the conclusion that should Moray West be consented, the already limited capacity to develop further terrestrial wind energy (avoiding extensive significant cumulative effects) will be substantially curtailed.	Offshore Wind Farm	Chapter 14 SLVIA	NA	Noted.	EIA Report

Table 1.9- Seascape, Landscape and Visual Impact Assessment (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Aberdeenshire Council								
Aberdeenshire Council	Application Consultation Response Letter	15/10/2018	Three viewpoints within Aberdeenshire are identified and assessed within the EIAR, Findlater Castle (42.34km distant from wind farm site), Sandend (43.71km) and Portsoy (44.67km). It is concluded that all three viewpoints are sufficiently distant to mean that only in exceptionally clear weather conditions would the wind turbines be visible. As a result of this relatively limited visibility, the impact is said to be non-significant. Following assessment, this is a conclusion that can be accepted and agreed upon. Sandend village is stated as having a potential significant impact visually, owing to the likely presence of construction vessels associated with the installation of infrastructure in and around the landfall point proposed near the village. These would be short term and temporary works and while classed as significant in the EIAR, are not considered to give rise to any serious concerns. The potential for cumulative visual impacts with other offshore wind farms is covered, with a significant impact being identified from Findlater Castle owing to a magnitude of change between the proposed Moray East and Moray West offshore wind farms and a difference in scale. The magnitude of change is stated as being “medium-low” notwithstanding the significant classification, this combined with the ultimately reversible impact and the requirement for excellent weather conditions to fully view any potential discrepancies means that there are no substantial concerns with this element, albeit it would be preferred if any proposed wind turbines could be of an appropriate scale to reduce any potential adverse impacts of this nature as far as possible.	Wind Farm and OfTI	14	n/a	The EIA Report (Chapter 14) did not identify any significant potential effects during construction or opertation in relation to landscape and visual receptors at Sandend.	EIA Report - Volume 2, Chapter 15

Table 1.10- Socioeconomics, Tourism and Recreation(as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Marine Scotland Science (MSS)								
Marine Scotland Science Marine Analytical Unit (MSS-MAU)	Application Consultation Response Email	13/08/2018	Baseline – the report provides comprehensive baseline information for a number of socioeconomic indicators for the study area, which is really welcome.	Wind Farm and OfTI	15	n/a	Moray West welcome this comment from MSS-MAU.	EIA Report - Volume 2, Chapter 15
MSS-MAU	Application Consultation Response Email	13/08/2018	Impact assessment - However, the assessment has failed to follow-up to provide evidence of how these indicators will change as a result of the development. In particular, the assessment only focuses on a very small set of socioeconomic indicators, that it claims was informed by "expert judgement, reflects responses provided by statutory consultees and other stakeholders" without providing the necessary criteria that applied to arrive at these indicators. This has resulted in very limited evidence to understand, especially, the social impacts of the development, for instance in terms of (a) impact on the population in local study area (b) local labour market, (c) demand for services – education, health, etc. in the O&M phases, etc. We should request that the socioeconomic impact assessment broadens the evidence provided on anticipated social impacts of the development. Otherwise, the evidence provided is too limited to form a view on the socioeconomic impact of the development.	Wind Farm and OfTI	15	n/a	The socio-economic baseline characterisation assessment in Chapter 15 comprised of the following socio-economic indicators: • Wealth creation as measured through Gross Value Added (GVA)1; • Employment creation; • Measures of community vitality and viability (e.g. changes in demand for local housing, accommodation and services); and • Access to and enjoyment of watersports activity and the associated economic value. c x However, Table 15.5.2 (of Chapter 15 of the EIA Report) outlines the impacts on socio-economics, tourism and recreation that have been scoped out of the assessment, including justifications. These include scoping out impacts from the offshore wind farm on tourism, surfing, sea-kayaking, walking, watersports and change in demand for housing and local services with influx of labour. Cumulative assessment was likewise presented at 15.8.2 to 15.8.3. The assessment has been clear about the number of jobs that will be supported and the population within which those jobs will be created. Based on conclusions from the assessment, the number of jobs predicted to be created would not merit further examination of public services. Moray West consider that the social impacts have been assessed in the chapter and that seeking further detail will not provide any greater clarity on what the social impacts will be.	EIA Report - Volume 2, Chapter 15
MSS-MAU	Application Consultation Response Email	13/08/2018	Supporting evidence – the report does not provide supporting evidence for the estimates of employment and GVA impacts presented. We would have expected, for instance, the report to set out evidence on (a) expected expenditure on the development (b) assumptions for determining number of jobs (e.g. turnover per worker at different stages). Without this information, it is difficult to test the credibility of the figures provided in the report.	Wind Farm and OfTI	15	n/a	In view of the competitive process of the CfD that we are entering into, we would appreciate a discussion with MS-MAU to understand the granularity of information required in order to preserve our commercial competitiveness at this stage. It is noted that such details have not been previously published for previous consented wind farms (Moray East). The sourcing assumptions used in estimating the GVA and employment impact of the construction and O&M phases of the Moray West Offshore Wind Farm are shown in the table below. The assumptions drew on the latest published evidence for the UK, as well as the developers own experience of constructing other offshore wind farms off the shores of Scotland. The latest information on sourcing indicates a weighted average sourcing of 48% for the UK as a whole across the OWF life cycle (and a range of between 44% and 53% for individual OWFs) [BVG Associates, 2017]. As such we consider the low and high scenario a reasonable range for what could be achieved within the Scottish and Local Study Areas, allowing for the uncertainty over the selection of construction and O&M ports and the selection of prime contractors at this stage (and implications for the retention of expenditure). Low Scenario - Local Area, Construction 4% and O&M 25% - Scotland, Construction 14% and O&M 26% High Scenario - Local Area, Construction 21% and O&M 40% - Scotland, Construction 49% and O&M 41%	EIA Report - Volume 2, Chapter 15

Table 1.10- Socioeconomics, Tourism and Recreation(as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
MSS-MAU	Application Consultation Response Email	13/08/2018	Overall, the evidence provided does not allow me to form a clear view on the socioeconomic impacts of the development, including if there are any actions that need to be taken to maximise positive impacts or to mitigate negative impacts.	Wind Farm and OfTI	15	n/a	Moray West will create jobs and GVA and therefore have a positive socio-economic impact. The EIA has presented evidence on a realistic but conservative range of impact scenarios. The scale of the positive socio-economic impact of the project will depend largely on how well equipped the Scottish and regional supply chains are to win contracts in due course. The applicant is active across a range of initiatives to engage with and develop local supply chain. This work will be reflected in a Supply Chain Plan to support the eligibility assessment of the project for the next Contracts for Difference (CfD) round. We are happy to include MS-MAU in the discussions to prepare the Scottish supply chain for successful bidding for Moray West projects. All parties will be aware that any potential benefits will only flow from securing a CfD contract and that planning consents are part of the eligibility criteria to bid. Moray West are surprised that the socio-economic chapter and appendix should have been considered deficient in any way given that the topic was scoped with minimal response from Marine Scotland (or other consultees on this topic area). In Section 4.7 of the Moray West Offshore Wind Farm scoping report you will note that all potential impacts apart from employment and GVA were scoped out. The corresponding scoping opinion was content with these proposals outlined in the scoping report. Our belief is that the work fully satisfies the needs of EIA and the offshore wind farm scoping opinion. By the nature of the timing of the planning process compared to actual contracts being awarded there is uncertainty around socio-economic effects of the project. At this stage it is not possible to know the location of some key drivers to socio-economic impacts, such as construction port. Chapter 15 of the EIA Report was prepared using two realistic impact scenarios (Chapter 15 Sections 15.5.1.3 – 15.5.1.8 and Appendix 15.1 Section 1.2). We see no benefit in providing further detail on the socio-economic impacts of the application which could compromise the competitiveness of a future Contract for Difference (CFD) bid and create a false sense of detail when the reality of contracting lies sometime in the future. Divulging more detail on the commercial inputs is extremely challenging for us given the competitive nature of the CfD process and the need to protect such sensitive information from our competitors. We are confident that the inputs do not overstate the potential gains at the local or Scottish scale and indeed have been consciously conservative.	EIA Report - Volume 2, Chapter 15
Mountaineering Scotland								
Mountaineering Scotland	Application Consultation Response Letter	20/08/2018	Mountaineering Scotland wishes to inform you of what we regard as an omission in the EIA for the transmission infrastructure associated with the proposed development. It concerns the Landfall Area for the Offshore Export Cable Corridor and the Onshore Planning Application Boundary. There is a sea cliff at Redhythe Point which is a popular low to middle grade climbing venue with around 50 documented routes. This crag and associated area called "The Widow" is popular with beginners and used for instruction and courses, including use by Glenmore Lodge, the National Outdoor Training Centre.	OfTI	15	n/a	The offshore export cable circuits will make landfall at a location within the Landfall Area, which extends from the rocks located at the east end of Sandend Beach to Redhythe Point on the Aberdeenshire coastline. It is important to note that the crags and cliffs from Sandend beach to Portsoy are a SSSI. Following advice received from SNH, Moray West within the EIA Report – Volume 2, Chapter 6, made a commitment that 'rocks....associated with the SSSI that are normally exposed will not be cut as part of any cable installation activities'. Moray West acknowledges this comment and reconfirms that rocks associated with the Cullen to Stake Ness SSSI that are normally exposed will not be cut during export cable installation. Moray West proposes that this commitment will be secured through a consent condition. Onshore site investigations surveys are currently ongoing (November 2018) to inform a type of landfall geology assessment that will inform installation methods and location of landfall point. As well as this, offshore surveys are taking place and further surveys will take place to inform the cable route onshore, offshore and in the nearshore areas. The final location and installation methodology will be subject to approval of both Marine Scotland (through the OfTI Cable Plan) and Aberdeenshire Council in terms of an application for approval of matters specified in conditions under the Planning Permission in Principle.	n/a
Mountaineering Scotland	Application Consultation Response Letter	20/08/2018	The pre-application consultation process with local communities and other key stakeholders did not identify this popular climbing venue situated at the eastern edge of your area of search, and consequently did not identify any mitigation proposals for this area, unlike Sandend Beach which was removed from the Onshore Planning Boundary. Mountaineering Scotland was alerted to this proposal only very recently, and subsequently contacted the developer with our concerns. A conversation with the representative of the developer assured us that the intended focus for development would be further west from this climbing venue at Redhythe Point. This was due to the topography of the coast and technical operational considerations for a transmission cable. It would be our expectation, following on from the conversation and subsequent email confirming the points above, that this omission would be identified in any forthcoming planning application. Subsequently we would expect early engagement with the rock climbing community to discuss any potential direct or indirect impacts on the safety and security of the documented climbing routes through horizontal directional drilling construction techniques.	OfTI	15	n/a	Moray West undertook an offshore and onshore pre-application consultation process and incorporated all feedback received from those processes into the offshore and onshore applications. Moray West will respond to Mountaineering Scotland confirming that their area of concern is outwith OfTI marine licence application area there will be no direct effects to the climbing area) and that Moray West's OfTI Cable Plan will confirm location of the landfall and installation techniques which will further ensure that impacts on the area of concern are avoided. In addition, Moray West has agreed with SNH a planning condition in relation to the onshore application which will require the approval of working methods by Aberdeenshire Council in consultation with SNH to avoid unacceptable impacts within the SSSI within which the climbing area is located.	n/a

Table 1.10- Socioeconomics, Tourism and Recreation(as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Aberdeenshire Council								
Aberdeenshire Council	Application Consultation Response Letter	15/10/2018	Sandend is a hub for recreation, including watersports and throughout the process Aberdeenshire Council have been keen to ensure that these recreational resources are protected.	Wind Farm and OfTI	15	n/a	Noted.	EIA Report - Volume 2, Chapter 15
Aberdeenshire Council	Application Consultation Response Letter	15/10/2018	The main recreational impact identified within the EIAR is derived from construction activities potentially disrupting the access to these sporting activities. Overall, the recreational receptors are classed as being of medium sensitivity, with surfing a prominent receptor and other sources less so. The EIAR concludes that ultimately, a non-significant impact would be experienced by surfers owing to short term (6 months) temporary impacts from the construction works. This would be similar for other recreational receptors within the area, with short term construction works providing the greatest level of disruption.	Wind Farm and OfTI	15	n/a	Noted.	EIA Report - Volume 2, Chapter 15
Aberdeenshire Council	Application Consultation Response Letter	15/10/2018	There is a degree of crossover between the offshore and onshore recreation here with many activities in the area potentially straddling both. As such, it is requested that ongoing and active dialogue and consultation be undertaken with local amenity/recreation groups in order to ensure that disruption is minimised as far as possible and that works are appropriately timed and viable mitigation implemented so to again limit the level of disruption to be experienced.	Wind Farm and OfTI	15	n/a	Moray West are committed to ongoing engagement with the local amenity and recreation groups.	EIA Report - Volume 2, Chapter 15
Aberdeenshire Council	Application Consultation Response Letter	15/10/2018	In addition to the above, economic impacts are outlined in terms of employment and contracting opportunities which are concluded as being positive. Any disruption to businesses such as the surf school is stated as being non-significant owing to the short term nature of the works. These conclusions are accepted, although it is again requested that local businesses are liaised with as far as possible to minimise disruption.	Wind Farm and OfTI	15	n/a	Moray West are committed to ongoing engagement with local businesses.	EIA Report - Volume 2, Chapter 15
Fordyce, Sandend & District Community Council								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	Surfing Sandend Bay is considered the best surfing beach on the South Moray Coast. The characteristics of the nearshore bathymetry, the funnel effects of the embayment shape, sea bed morphology and its geographical position outside the Moray Firth swell shadow are the reasons why it delivers good surfing waves. It had previously been inferred by the developer that the loss of surfing quality at Sandend Bay as a consequence of the OfTi landfall works is unimportant as surfers can use the other beaches on the Moray Coast. A South Moray Coast Surfing Beach Analysis has been undertaken to show what opportunities for surfing along the coast exist between Lossiemouth in the West and Fraserborugh in the East. Eleven coastal areas or beaches have been studied. The assessment was undertaken by a Senior Member of the Scottish Surf Federation. The basis of the analysis was to compare all the other sites with Sandend in terms of seven technical surfing criteria or hazards and two others, access and facilities. The colour coded table is reported at the end of this Report.	OfTI	EIA Report	n/a	Effects on physical processes and water quality are described in the Offshore EIA Report in terms of changes to physical processes pathways e.g. tidal currents, waves, sediment transport and seabed indentations and scour and effects of these changes on designated marine and coastal sites, surfing beaches and water quality. Key features of importance in the study area (Moray West Site, Offshore Export Cable Corridor and Landfall Area) include the Smith Bank (up on which the wind farm will be located), designated sites such as the Moray Firth proposed Special Area of Protection (pSPA), the Southern Trench proposed Nature Conservation Marine Protected Area (pNCMPA) and the Cullen to Stake Ness SSSI and important surfing venues such as Sandend Beach. The assessment in the Offhsore EIA Report, which are based on existing site data and physical processes modelling, concluded that any changes to physical processes pathways occurring during construction, operation and decommissioning of the Moray West Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI)would be limited and would not have any significant effects on any of the key features of importance. There will also be no significant effects on water quality. Potential cumulative effects associated with the Moray East and Beatrice Offshore Wind Farms, the Caithness Moray Interconnector and decommissioning of the Beatrice Oil Field were also assessed as not significant. The EIAR states at 15.4.2.48 that "The beach at Sandend is recognised as one of the prime surfing locations on the East Coast of Scotland". The application does therefore not seek to underplay this resource. Neither does the application at any point suggest a total loss of the resource is considered acceptable. The application does acknowledged that "there is potential for temporary access restrictions to these surfing areas during construction, potentially displacing some of the surfing activity." (15.7.2.40). These impacts are noted as low magnitude: "Although there is potential for disturbance to, and restricted access for, Sandend surfers during installation of the cable, these impacts will be temporary and short term. Impact magnitude is therefore considered to be low."	EIA Report

Table 1.10- Socioeconomics, Tourism and Recreation(as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	The analysis supports the anecdotal evidence that Sandend does deliver the best surfing opportunities available in comparison with all the other beaches on the South Moray Coast. The nearest beach offering the closest equivalent performance is Fraserborugh beach 40 miles from Sandend. This demonstrates the importance of Sandend Bay as a surfing location regionally but also nationally. As noted earlier local surfers are aware of changes in the hydrodynamics of the bay post storm events. These changes do return to a natural equilibrium in the bay over time, this can be weeks or many months depending on the nature, longevity and severity of metrological events. As discussed earlier there is potential for permanent morphological change due to cable burial depth issues during installation, during the life of the project, or if they are left insitu post decommissioning. This will not only have the potential to affect flood risk but also permanent change to the hydrodynamics affecting the surfing potential of the beach to the detriment of a local and national resource.	OfTI	EIA Report	n/a	Moray West have undertaken significant hydrodynamic modelling as part of the EIA Report, which concluded no significant effects in relation to morphological change effects. See also Table 1.2 - Physical Processes & Water Quality of this Annex.	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	We have consulted with a world renowned expert in the impact of marine & coastal development. Dr Tony Butt, PhD in Physical Oceanography from the University of Plymouth who has been a part time research fellow with the Coastal Processes Research Group for several years. Dr Butt has commented on the experiences of cable landfalls in general on the beach environment as follows: "Impacts on surfing break resources occur when offshore renewable energy development alters the hydrodynamic conditions (i.e. tidal flows, wave climate) and sedimentary environment conditions (i.e. sediment erosion, transport patterns and deposition) to such an extent that nearshore sedimentary bedforms (e.g. sand bars, beaches) change in the surf zone in such a way that they change the characteristics of the surfing waves that break there." In respect of the Moray West proposals he comments further:- "Therefore the developers cannot prove they won't ruin the beach if they trench the cables and install protective coverings which leaves the only option, if the cables are to be installed at Sandend, to use Horizontal Directional Drilling at a sufficient depth and distance to not impact the inshore and foreshore area. Sandend is one of the few beaches on the East coast of the UK that regularly delivers good surfing waves hence it is such a prized asset and needs protecting."	OfTI	EIA Report	n/a	Moray West have undertaken significant hydrodynamic modelling as part of the EIA Report, which concluded no significant effects in relation to morphological change effects. See also Table 1.2 - Physical Processes & Water Quality of this Annex.	EIA Report
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	Sandend Harbour The 19th century harbour continues to operate as the recreational boating hub of the village. It is owned and operated by a charity the Sandend Harbour Trust. The harbour use is generally seasonal with all boats removed over the winter due to the limitations of storm protection to the harbour. The impacts on the harbour due to the proposed development have the potential to be both physical and practical. The risks of change to the morphological and hydrodynamic process have the potential to silt up the harbour and approach channel through the sediment transport scenarios discussed in this report. Further potential effects of the works are the risks associated with increased flooding and wave dynamics associated with sea bed change over the life of the project. These risks are centred on the structural integrity of the structures that form the harbour and protect parts of the village from increased wave damage and flooding. Practical issues concern access to the Moray Firth and within the bay when marine works are being undertaken where exclusion zones may severely restrict Sandend vessel movements. If the project proceeds further a dialogue with the Harbour Trust and the developer is therefore recommended.	OfTI	EIA Report	n/a	Moray West have undertaken significant hydrodynamic modelling as part of the EIA Report, which concluded no significant effects in relation to morphological change effects. See also Table 1.2 - Physical Processes & Water Quality of this Annex.	EIA Report

Table 1.10- Socioeconomics, Tourism and Recreation(as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	Visiting Vessels Sandend Bay is a regular temporary anchor mooring location for yachts on passage through the Moray Firth or boats undertaking weekend sailings. Boats anchor at all times including overnight. Any prohibitions on anchoring in the bay would therefore place limitations or prevent the use the bay for this purpose. We would consider this an unacceptable loss of a maritime resource.	OfTI	EIA Report	n/a	The impact assessment has taken into account potential impacts on recreation including yachting and no adverse effects are idenitified. It is noted that the Royal Yachting Association does not raise similar concerns.	EIA Report

Table 1.11- Archaeology and Cultural Heritage (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Historic Environment Scotland (HES)								
HES	Application Consultation Response Letter	20/08/2018	We do not wish to object to the application. Our detailed comments on the application and EIA Report are contained in the annex to this covering letter. Our comments should be treated as a material consideration, and this advice should be taken into account in your decision making. Our view is that the proposals do not raise historic environment issues of national interest and therefore we do not object. Our decision not to object should not be taken as our support for the proposals. This application should be determined in accordance with national and local policy on development affecting the historic environment, together with related policy guidance.	Wind Farm and OfTI	16	n/a	Moray West welcome this comment from HES.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage
HES	Application Consultation Response Letter	20/08/2018	This response applies to the application currently proposed. An amended scheme may require another consultation with us. Guidance about national policy can be found in our 'Managing Change in the Historic Environment' series available online at www.historicenvironment.scot/advice-andsupport/planning-and-guidance/legislation-andguidance/managing-change-in-thehistoric-environment-guidance-notes/. Technical advice is available through our Technical Conservation website at www.engineshed.org. Please contact us if you have any questions about this response. The officer managing this case is Victoria Clements who can be contacted by phone on 0131 668 8730 or by email on Victoria.Clements@hes.scot.	Wind Farm and OfTI	16	n/a	Moray West welcome this comment from HES and will consult HES if the development details were amended.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage
HES	Application Consultation Response Letter	20/08/2018	Background - We were consulted at scoping stage for this wind farm proposal in 2016, when the proposal was for up to 90 turbines to maximum blade tip height of up to 272m. Our scoping response indicated that we were content with the proposed methodologies and mitigation measures for potential marine impacts. In 2017 we were consulted at scoping stage on the OfTI and we noted that full geophysical surveys had not yet been carried out and that this was proposed for post-consent which would not follow best practice. In addition we noted the requirement to assess the potential for any direct impacts at the landing point and welcomed the proposed assessment of setting impacts on terrestrial assets.	Wind Farm and OfTI	16	n/a	Moray West acknowledge this comment from HES. Interim geophysical surveys are due to take place from Q4 2018 - Q2 2019. Full scale geophysical surveys will take place post consent and and will inform identification of protected archaeological and marine assets prior to final design and construction of the development.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage
HES	Application Consultation Response Letter	20/08/2018	Marine Assets - We are content that there are no assets within the development study area that are subject to statutory protection. We welcome that a Precautionary Principle approach has been taken towards assessing potential impacts on marine archaeology. We note that this is required due to the partial nature of the baseline information available due to limited coverage of the geophysical surveys undertaken to date. It would have been best practice to have this information available prior to assessment, however, we note the available information presented in the EIA Report and the undertaking to carry out additional geophysical surveys with archaeological assessment prior to undertaking the design of the development. We note the potential for direct impacts on marine assets is assessed as of major adverse significance in the absence of mitigation and we are content to agree with this conclusion.	Wind Farm and OfTI	16	n/a	Moray West acknowledge this comment from HES. Interim geophysical surveys are due to take place from Q4 2018 - Q2 2019. Full scale geophysical surveys will take place post consent and and will inform identification of protected archaeological and marine assets prior to final design and construction of the development.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage

Table 1.11- Archaeology and Cultural Heritage (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
HES	Application Consultation Response Letter	20/08/2018	We welcome the embedded mitigation measures identified in section 16.6.2 of the archaeology and cultural heritage chapter. We are content that the proposed mitigation measures should be sufficient to deal with any unexpected discoveries made during the ongoing development and that this will result in any potential impacts being reduced to effects of minor adverse significance. We would however, wish to highlight two points in section 16.6.2.1 which could result in confusion if not clarified: - The report refers specifically to consultations and agreements with HES – this should perhaps more accurately refer to Marine Scotland or HES acting as advisors to Marine Scotland. - The report states that a Written Scheme of Investigation (WSI) containing a Protocol for Archaeological Discoveries (PAD) will be developed in consultation with HES. The phrase 'in consultation with' could allow for a scenario where HES' advice is not taken forward and we would suggest that the wording here should be clarified to ensure Marine Scotland's satisfaction for your interest. In the case of the WSI and PAD we would also recommend that any consent/approval issued by Marine Scotland should ensure that the WSI and PAD must be approved by Marine Scotland and/or HES before the relevant works are allowed to progress.	Wind Farm and OfTI	16	n/a	Moray West acknowledge this comment from HES and will consult on and have the relevant documentation (e.g. elements, WSI and PAD, of the Environmental Management Plan) approved by Marine Scoland and/or HES as Marine Scotland see fit.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage
HES	Application Consultation Response Letter	20/08/2018	Terrestrial Assets - We are content that as a result of the offshore works there will not be any direct physical impacts on nationally important designated historic environment assets.	Wind Farm and OfTI	16	n/a	Moray West welcome this comment from HES.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage
HES	Application Consultation Response Letter	20/08/2018	We have also considered the potential for impacts on the setting of terrestrial assets from the proposed development. We are content that the methodology used for assessing setting impacts is adequate, although we do have some minor comments. We would note Table 16.5.2 on sensitivity/value criteria refers specifically to category A listed buildings but not to scheduled monuments or Inventory GDLs and it is not clear why a specific asset type has been singled out. We would also note that paragraph 16.5.4.10 on magnitude of impact for setting impacts refers to reversibility reducing the magnitude of an impact. HES does not consider that reversibility reduces the magnitude of an impact during the lifetime of a development and Scottish Planning Policy (SPP) is clear at paragraph 170 that windfarms should be suitable for use in perpetuity, therefore reversibility should not be a consideration in reducing the level of impact. We are content, however, that these minor issues have not affected the conclusions of the assessment itself.	Wind Farm and OfTI	16	Table 16.5.2 and Paragraph 16.5.4.10	Moray West acknowledge this comment from HES.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage
HES	Application Consultation Response Letter	20/08/2018	Overall, we are content with the assets identified for assessment for setting impacts and the level of information provided within the assessment. We welcome the provision of wireframes for a number of the assets which proved useful in carrying out our own assessment of the impacts. We wold note that the setting assessment for Inver, fort, post-medieval house and look-out post 570m SE of (SM 5073) focuses solely on the impacts on the setting of the World War II look-out post, however we are content that the impacts would not be any greater for the other assets which form part of this scheduled monument. We are content to agree with the conclusions within the EIA Report that impacts on the setting of terrestrial assets will not be significant in EIA terms and will not raise issues of national interest for HES' remit.	Wind Farm and OfTI	16	n/a	Moray West welcome this comment from HES.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage

Table 1.11- Archaeology and Cultural Heritage (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
HES	Application Consultation Response Letter	20/08/2018	We are content that cumulative impacts on the setting of terrestrial assets will not be significant in EIA terms and will not raise issues of national interest for HES' remit.	Wind Farm and OfTI	16	n/a	Moray West welcome this comment from HES.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage
HES	Application Consultation Response Letter	20/08/2018	Our position - We do not object to the proposed development. We consider that following the implementation of the embedded mitigation measures there will not be any adverse effects on marine or terrestrial assets within our remit which would raise issues of national interest.	Wind Farm and OfTI	16	n/a	Moray West welcome this comment from HES and will implement the embedded mitigation measures ass outlined in the EIAR.	EIA Report (EIAR) - Volume 2 Chapter 16 Marine Archaeology and Cultural Heritage
Aberdeenshire Council								
Aberdeenshire Council	Application Consultation Response Letter	15/10/2018	The submitted EIAR covers archaeology in sufficient detail. The Council's Archaeology Service are satisfied with the presented methodology and assessment. The inclusion and consideration of potential visual impacts upon assets is welcomed. The arrangement with Historic Environment Scotland with regard to a Written Scheme of Investigation being considered for other archaeology is accepted, albeit we would request that the above is appropriately secured. There are no further comments to make from Aberdeenshire Council's perspective.	Wind Farm and OfTI	16	n/a	Noted.	EIA Report - Volume 2, Chapter 16
Fordyce, Sandend & District Community Council								
Fordyce, Sandend & District Community Council	Consultation Response	31/08/2018	Red Haven is the location of the earliest settlement at Sandend. The remains of old stone buildings known locally as "The Salmon Bothy" still exist at the edge of the shingle shoreline. The remains are less than 5m distance from the MHWS line. The Southern part of the cove has been extensively quarried for building materials, the depth of the old workings now backfilled is unknown. Other localised hollows exist behind the shingle beach at the South end. On the North end of Dunnedeich beach a small derelict stone cottage sits on a small promontory. The remains are less than 3m distance from the MHWS line. On the slope behind the cottage two lime kilns exist. These historical features are recorded, Canmore ID 290436 refers. Behind the Dunnedeich beach an old fort existed and is recorded by Aberdeenshire CC. It is believed no archaeological investigations as yet have been undertaken at the site. These features are located above MHWS, however we request MSLOT consider their locations and historical and archaeological importance in the approval of any future Cable Plan should the scheme progress further.	OfTI	16	n/a	The EIA Report for the onshore works assesses impacts on archaeological assets above MHWS and Moray West will comply with the conditions of the Planning Permission in Principle which ensure that unacceptable impacts will be avoided.	EIA Report

Table 1.12- Other Human Activities (as at 20 November 2018)								
Consultee	**Source**	**Date**	**Consultee's response**	**Project Component**	**EIA Report Chapter**	**Section and Paragraph**	**Moray West Response**	**Evidence**
Determination Period Responses								
Radio Network Protection								
Radio Network Protection (via Openreach) / British Telecom	Application Consultation Response Email	24/07/2018	We have studied this Windfarm proposal with respect to EMC and related problems to BT point-topoint microwave radio links. The conclusion is that, the Project indicated should not cause interference to BT's current and presently planned radio networks.	Wind Farm and OfTI	17	n/a	No response required	EIA Report (EIAR) - Volume 2 Chapter 17 Other Human Activities
Joint Radio Company								
JRC (Joint Radio Company)	Application Consultation Response Letter	18/07/2018	**Site Name:** Moray West Offshore Development (approx 27km SE of Burrigill, Wick, Highland) **Site Centre at NGR:** 341066 913471 **Development Radius:** 10km* **Hub Height:** 155m (above HAT) **Rotor Radius:** 125m This proposal ***cleared*** with respect to radio link infrastructure operated by: The local electricity utility and Scotia Gas Networks *** Please confirm turbine positions and dimensions when possible**	Wind Farm and OfTI	17	n/a	Moray West welcome these comments from JRC and will provide confirmation of turbine positions and dimensions when defined.	EIA Report (EIAR) - Volume 2 Chapter 17 Other Human Activities
JRC	Application Consultation Response Letter	18/07/2018	In the case of this proposed wind energy development, JRC does not foresee any potential problems based on known interference scenarios and the data you have provided. However, if any details of the wind farm change, particularly the disposition or scale of any turbine(s), it will be necessary to re-evaluate the proposal. Please note that due to the large number of adjacent radio links in this vicinity, which have been taken into account, clearance is given specifically for a location within the declared grid reference (quoted above).	Wind Farm and OfTI	17	n/a	Moray West welcome these comments from JRC and if any details of the wind farm change Moray West will provide these to JRC for re-evaluation.	EIA Report (EIAR) - Volume 2 Chapter 17 Other Human Activities
JRC	Application Consultation Response Letter	18/07/2018	In making this judgement, JRC has used its best endeavours with the available data, although we recognise that there may be effects which are as yet unknown or inadequately predicted. JRC cannot therefore be held liable if subsequently problems arise that we have not predicted.	Wind Farm and OfTI	17	n/a	Moray West acknowledge this comment from JRC.	EIA Report (EIAR) - Volume 2 Chapter 17 Other Human Activities
JRC	Application Consultation Response Letter	18/07/2018	It should be noted that this clearance pertains only to the date of its issue. As the use of the spectrum is dynamic, the use of the band is changing on an ongoing basis and consequently, you are advised to seek recoordination prior to submitting a planning application, as this will negate the possibility of an objection being raised at that time as a consequence of any links assigned between your enquiry and the finalisation of your project.	Wind Farm and OfTI	17	n/a	Moray West acknowledge this comment from JRC.	EIA Report (EIAR) - Volume 2 Chapter 17 Other Human Activities

Annex B Updated Decision Support System Flow Charts and Report -

Moray West impact assessment – appropriate density data selected using decision support flow charts

Authorisations

Responsibility	Name	Signature	Date
Prepared by	Dr Ross McGregor	[redacted]	09/05/2018
Checked by	Andy Webb		09/05/2018
Approved by	Andy Webb		09/05/2018

Distribution List

Name	Organisation	Email Address
Sarah Edwards	Moray West Offshore Wind Farm	Sarah.Edwards@edpr.com

Document History

Issue	Date	Status / Changes
Draft 1	10/05/2018	First draft
Draft 2	17/05/2018	Second draft following comments from Moray West
Draft 3	16/11/2018	Final draft following comments from SNH and Marine Scotland
Draft 4	21/11/2018	Final document

Contents

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1 Background

1 Moray West have undertaken High Definition Digital Video Aerial Surveys (DVAS) across the Moray West Site plus a 4 km buffer. This survey was undertaken across one year (April 2016 to March 2017), rather than across two years, which is often recommended by stakeholders. However, since there were extensive existing data available from surveys of both Moray East and Beatrice Offshore Wind Ltd. (BOWL), Moray West proposed a new approach to better characterise inter-annual variability within the site than from two years of survey alone.

2 The existing one year of DVAS survey data was compared to existing, publicly available, survey data in the Moray Firth. Suitable data was selected for comparing densities of birds sitting on the water, or in flight, in the Moray West Site plus 4 km buffer with similar data in the same months, but in other calendar years.

3 In order to select suitable densities for use in the impact assessment for the proposed Moray West Offshore Wind Farm, a decision support system (DSS) was created. The DSS compared the point density estimate from the Moray West DVAS data with the corresponding upper and lower confidence interval from other sources in other years. The DSS then provided a recommended density value to use, which was then extrapolated to the Moray West Site plus 2 km buffer, for displacement assessment, or to the Moray West Site only, for collision risk modelling. All of the density values recommended from the DSS were compared with existing densities estimated from the Moray West DVAS data analysed using MRSea (Scott-Hayward *et al.* 2013), and other data sources from the Moray Firth (e.g. Moray East boat surveys, Beatrice Offshore Wind Ltd. (BOWL) DVAS surveys analysed using MRSea. When bird numbers were too low to enable use of MRSea, density was calculated using the mean of density in each transect with bootstrapped confidence limits (Buckland *et al.* 2001).

1.1 Data sources

4 All of the density values recommended from the DSS were compared with existing densities estimated from the Moray West DVAS data analysed using MRSea (Scott-Hayward *et al.* 2013), and other data sources from the Moray Firth (Figure 1.1):

- Moray East boat-based surveys;
- Beatrice Offshore Wind Ltd. (BOWL) DVAS surveys; and
- BOWL boat-based surveys

5 Moray East boat-based survey data were obtained from the published Environmental Statements (ESs) submitted as part of the previous Telford, Stevenson and MacColl wind farm applications (now referred to as Moray East). Data from birds observed in flight were analysed to estimate the 'aerial density' by extrapolating from the area surveyed to the whole survey area. Data from birds sitting on the water were analysed using model based Distance analyses (Thomas *et al.* 2010).

6 BOWL DVAS survey data were analysed in different ways depending on the area of interest. In the overlap between the Moray West Site plus 4 km buffer and the BOWL survey area, data were analysed using Kernel Density Estimation to produce both 'aerial densities' and densities of sitting birds. At the

scale of the BOWL survey area, and the wind farm boundary within this, data were analysed by Trinder (2016) using MRSea.

7 To aid with comparisons, all of the monthly densities for each species from each overlap area are summarised in Annex A.

8 To avoid confusion with densities estimated from aerial survey techniques, throughout 'aerial densities' refers to the densities of birds in flight.

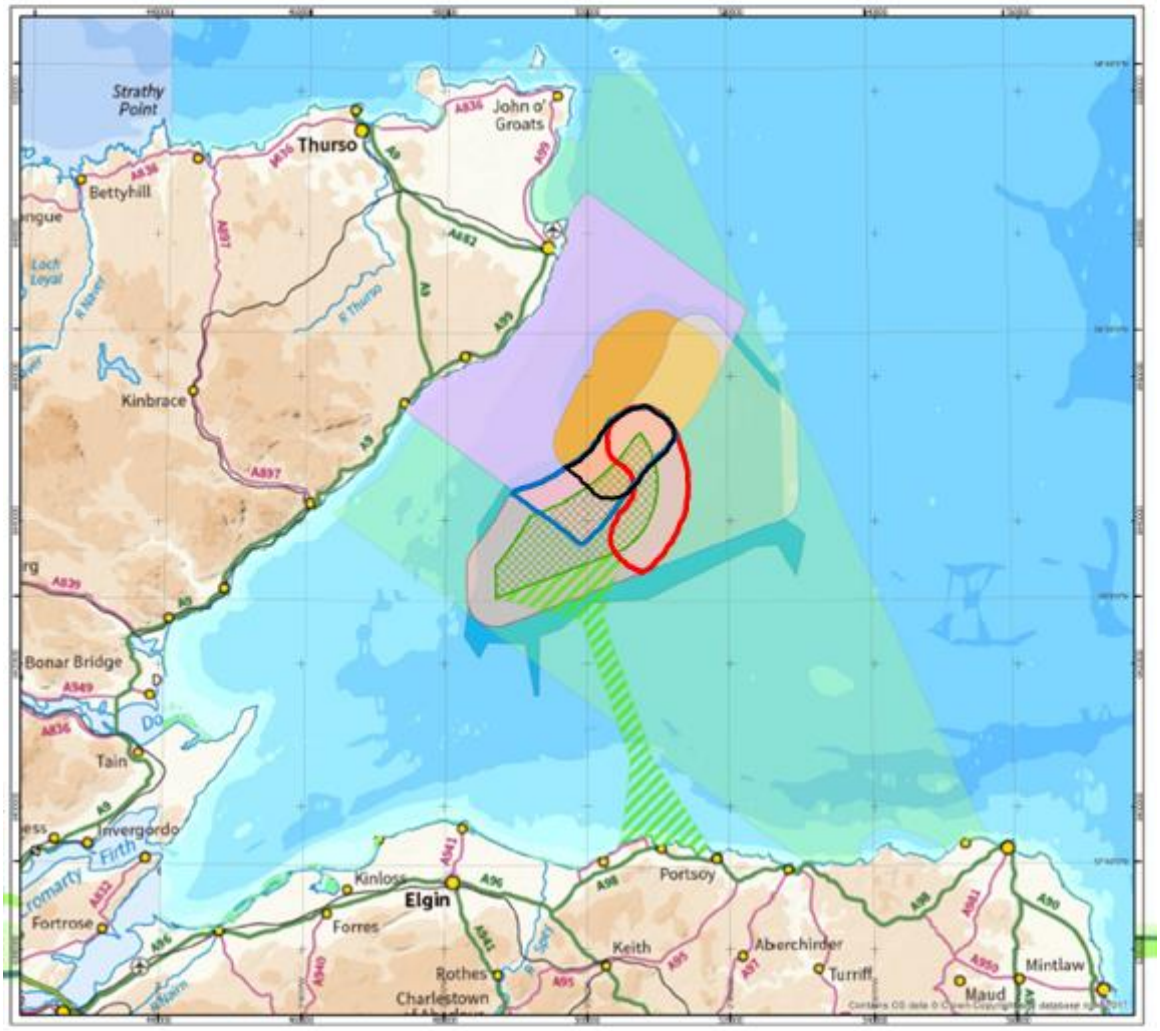

Figure 1.1 Map of the Moray Firth showing available data sources and the areas of sea where overlapping data were used as inputs to the DSS. The red line shows the overlap between the Moray West digital area survey area and the Moray East boat-based survey area. The blue line shows the overlap between the Moray West digital area survey area and the BOWL digital aerial survey area. The black line shows the overlap between the Moray West digital area survey area and BOWL boat-based survey area.

2 CRM aerial density data

9 Collision Risk Modelling (CRM) for offshore wind farms requires the mean monthly bird 'aerial density' data as an input value (Band 2012). This value is the mean of two densities within the same month, but in different years. Since Moray West only have one year of digital video aerial survey (DVAS), it is not possible to produce a mean value. As such, there is no available context from Moray West surveys on the inter-annual variability in 'aerial densities' of key species in the Moray Firth. However, there is valuable data from other data sources, particularly BOWL DVAS data (2015) and Moray East boat-based survey data (2010 – 2011).

10 To assist decision making on selecting suitable data to inform the CRM for Moray West (MW) a decision support flow chart was produced (Figure 2.1). This flow chart was designed to select or calculate suitably precautionary bird 'aerial density' data, without relying on estimates that are too small or too large by placing the Moray West DVAS data in context.

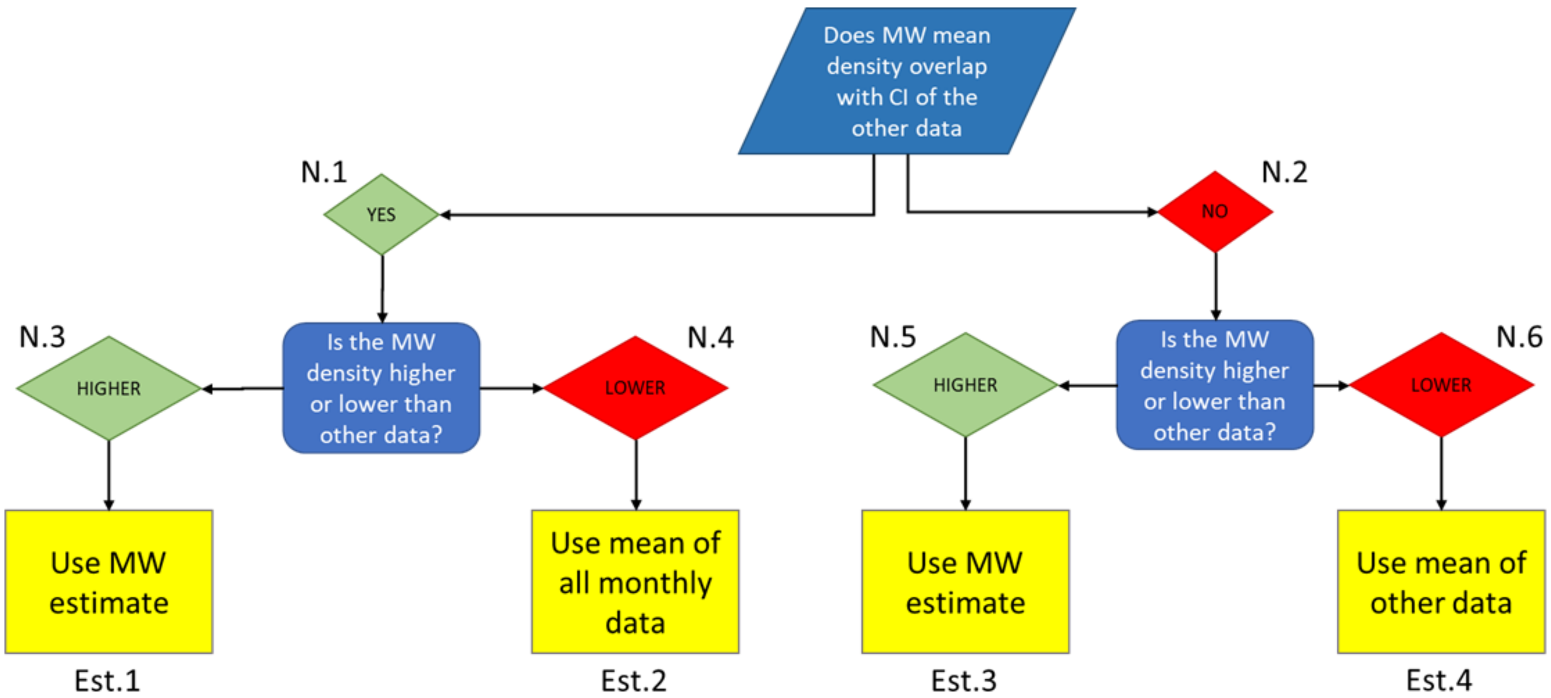

Figure 2.1 Decision Support flow chart for selecting suitable 'aerial density' data (MW = Moray West, CI = Confidence Interval)

2.1 Kittiwake aerial densities

11 Initial comparison of the aerial densities of kittiwakes in Moray West Site plus 4 km buffer was made with the mean monthly aerial densities of kittiwakes from boat-based surveys of Moray East and BOWL (Table 2.1). These showed that estimated densities were similar from January to April, but much higher in Moray West in the other months of the year. There was no overlap between the confidence intervals of the aerial densities and the densities from boat-based surveys in Moray East and BOWL from May to December (Figure 2.2).

12 Aerial densities were predicted from MRSea analyses of the spatial densities of birds across the Moray West Site plus 4 km buffer, with the exception of January, February and April. In these months there were too few sightings to successfully run the model. Consequently, transect means were used to predict the 'aerial density' of kittiwakes in those months.

13 Aerial densities of kittiwakes from the boat-based surveys of Moray East and BOWL were calculated from the number of birds observed within the total transect area for each survey programme. Boat-based surveys were undertaken in Moray East from April 2010 to March 2012 and in BOWL from October 2009 to September 2011. However, due to the form of the available data it was not possible to extract aerial densities for the overlaps between each survey area and the Moray West site plus 4 km buffer. These densities were only available at the whole survey area scale, so could not be clipped to the overlap areas only. So, these densities are provided for context only.

Table 2.1 Comparison of Moray West Site only MRSea predicted densities of kittiwake in flight with calculated aerial densities of kittiwakes from boat-based surveys of Moray East and BOWL. Results for April, January and February are transect means.

Survey platform/Model	DVAS/MRSea			Boat-based/None	
Month	MW density	LCI	UCI	Moray East	BOWL
April	0.21*	0.00	0.54	0.825	0.428
May	1.43	1.04	2.30	0.769	0.359
June	4.76	3.72	6.74	0.594	0.408
July	3.35	2.70	4.61	0.669	0.319
August	5.38	3.78	8.98	0.128	0.000
September	2.21	1.65	3.45	0.111	0.047
October	1.61	1.28	2.17	0.134	0.129
November	3.49	2.92	4.34	0.078	0.087
December	2.15	1.62	3.10	0.078	0.045
January	0.36*	0.13	0.67	0.178	0.088
February	0.67*	0.27	1.26	0.111	0.204
March	1.48	1.12	2.10	0.457	0.415

Survey platform/Model	DVAS/MRSea			Boat-based/None	
Month	MW density	LCI	UCI	Moray East	BOWL
* Density estimated using mean of transect density LCI = Lower Confidence Interval, UCI = Upper Confidence Interval.					

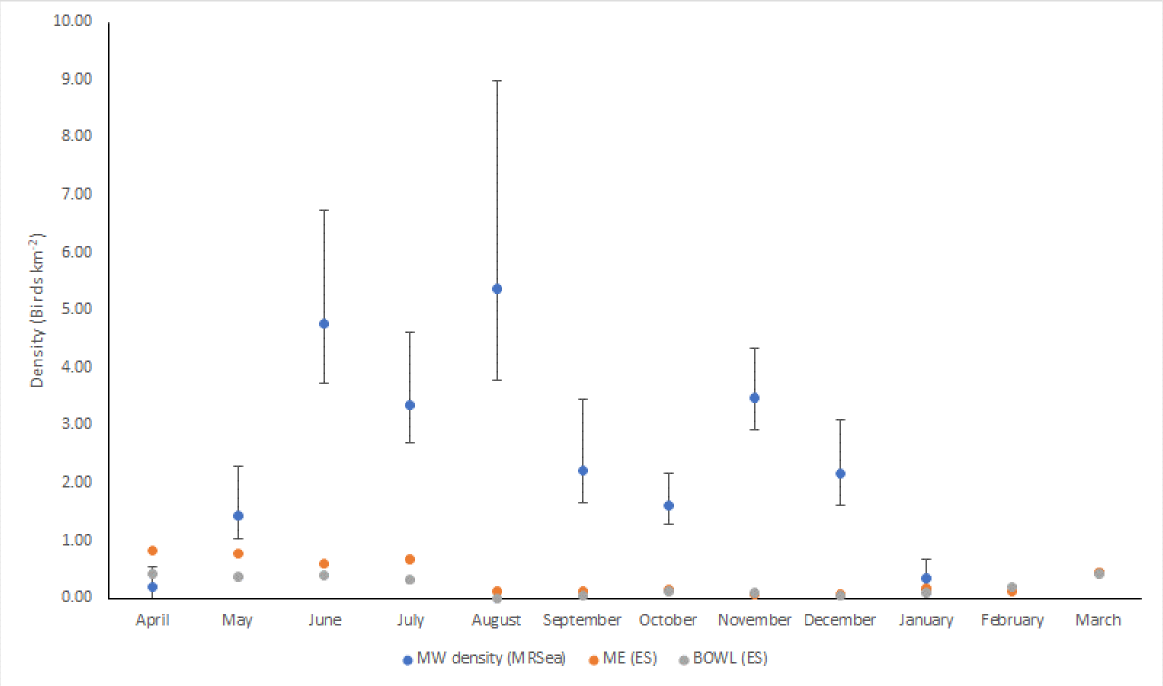

Figure 2.2 Comparison of Moray West Site only DVAS MRSea predicted densities of kittiwake in flight with calculated aerial densities of kittiwakes from boat-based surveys of Moray East and BOWL. Results for April, January and February are transect means.

2.1.1 Breeding season

14 The relative spatial density of the Moray West MRSea predictions were mapped. In the breeding season it was not possible to map the relative aerial densities in April, as there were too few observations. Relative aerial densities were mapped for May to August using relative monthly densities (Figure 2.3) and relative seasonal densities (Figure 7.1). There was a great deal of variability in the spatial abundance between months. In May there was a very discrete hotspot of birds in flight in the south-east of the Moray West Site plus 4 km buffer, while in June there was a hotspot on the western boundary of the Moray West Site plus 4 km buffer. Densities were less concentrated in July, with a diffuse area of higher density in the western half of the site. In August densities were also more diffuse, with two hotspots occurring, one to the east of the Moray West Site plus 4 km buffer and the other, less dense hotspot nearer the central part of the Moray West Site plus 4 km buffer.

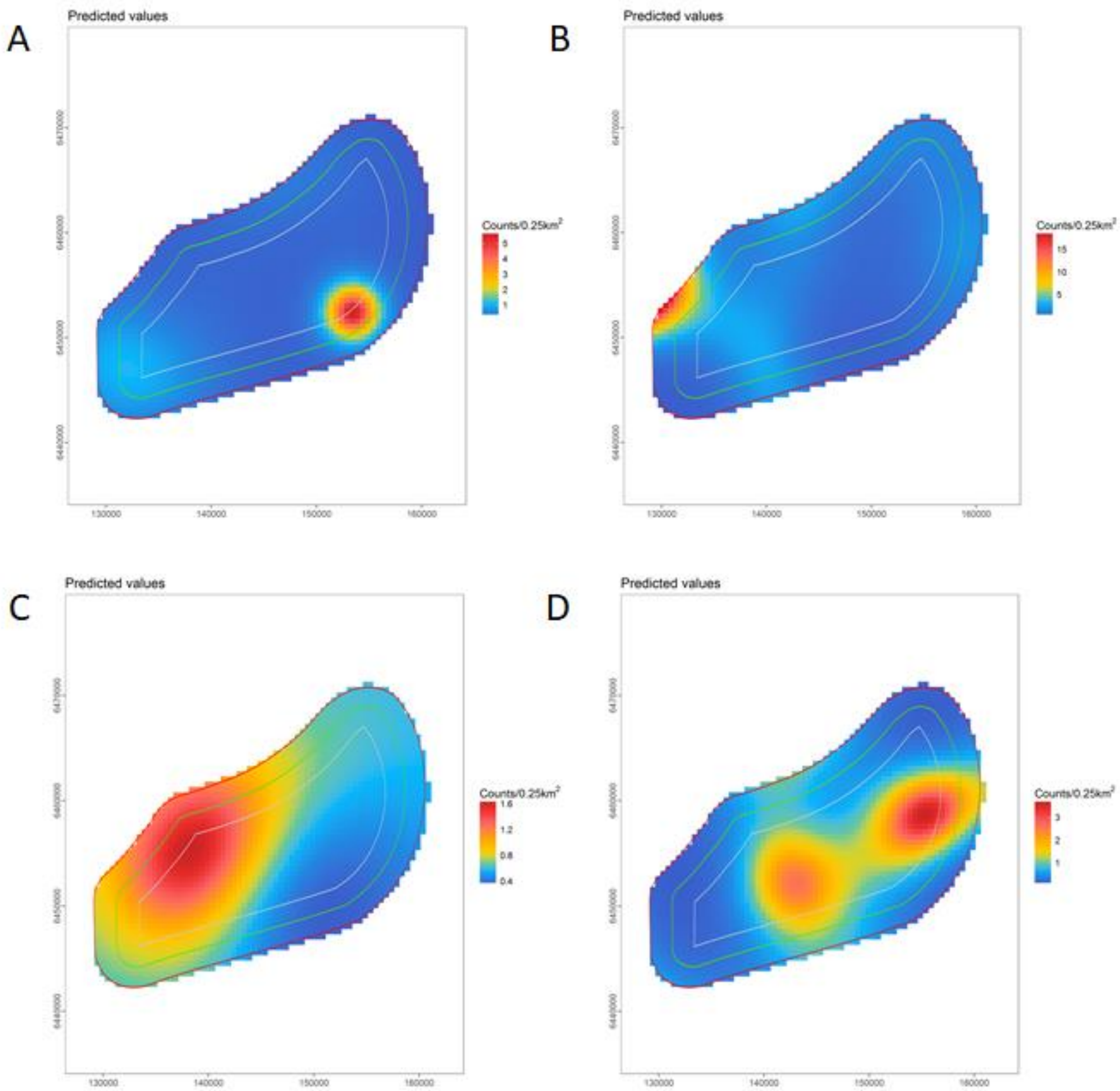

Figure 2.3 Relative aerial densities of kittiwake predicted by MRSea in: A = May, B = June, C = July, D = August.

Table 2.2 Aerial densities of kittiwakes in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals).

Month	Moray West Site and 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site and 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)
April	0.00	No survey	0.21 (0.00 – 0.54)*
May	0.64 (0.62 – 0.66)	2.49 (1.2 – 4.07)	1.43 (1.04 – 2.30)
June	5.05 (4.91 – 5.21)	10.52 (1.13 – 24.23)	4.76 (3.72 – 6.74)
June	-	21.64 (4.62 – 45.83)	-
July	3.17 (3.10 – 3.24)	9.08 (4.92 – 14.28)	3.35 (2.70 – 4.61)
July	-	30.25 (15.19 – 48.8)	-
August	2.92 (2.79 – 3.06)	4.03 (0.93 – 8.42)	5.38 (3.78 – 8.98)
* Density estimated using mean of transect density			

15 For each month Table 2.3 provides the node in the decision support system passed and the density estimate selected for use in the CRM.

Table 2.3 Node path through the decision support flow chart comparing Moray West (MW) and BOWL overlap data to select suitable densities for collision risk assessment.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Estimate no.	Density estimate
April							n/a	0.21
May		X				X	4	2.49
June	X			X			2	12.40
July		X				X	4	19.67
August	X			X			2	3.47

16 The decision support system selected aerial densities in June and July that include very high densities from the means of transect densities from the aerial surveys of BOWL where they overlapped with the aerial surveys of Moray West. These densities estimates were high as the spatial scale of the overlap area was small relative to the spatial scale of hotspots of flying kittiwakes across the surveyed areas. While these densities are believable in relation to an individual hotspot, they are being extrapolated

across a much larger spatial area and a much longer period in time than the lifespan of the hotspots. The Band (2012) CRM, which calculates the collision risk for a single turbine and then multiplies this by the total number of turbines, creates an artificially high result by extrapolating the high hotspot density both spatially and temporally. The input density estimates for the Band (2012) CRM is intended to be a mean value that in some way represents the entire wind farm, and not just the turbines that may occur within a relatively small spatial scale. The Band (2012) CRM also extrapolated this mean density estimate across a much longer temporal scale then hotspots are likely to exist. The pattern of density estimates shown in Figure 2.3 demonstrates that the location and densities of hotspots vary at least from month to month, and in reality, the temporal scales of hotpots likely vary from a few hours to a single day. The Band (2012) CRM extrapolates the input density estimate across the daylight hours in the month being modelled, and, where appropriate, a proportion of the hours of darkness too. Thus, the high aerial densities selected using the decision support system are likely unsuitable for the Band (2012) CRM to make a meaningful prediction.

17 In this situation, any process-based decision support system requires the application of expert judgment to adjust the recommended value. Here, it is apparent that in June and July some expert judgement is required to select a suitable ‘aerial density’ of kittiwake for CRM. Since it is clear that spatial scale can be important, the aerial densities of kittiwakes from similar spatial scales were compared. Results of modelling observed kittiwakes in flight from digital aerial surveys of the Moray West Site and 4 km buffer and the BOWL pre-construction digital aerial surveys of the wind farm and an approximately 10 km buffer showed the densities averaged across a broader spatial scale varied between 3.15 birds.km^{-2} and 7.63 birds.km^{-2} (Table 2.4). This comparison has other advantages. Surveys of both wind farms were conducted using high definition digital video surveys. Data from these surveys were both analysed using MRSea (Scott-Hayward *et al*. 2013)). Thus, there are no differences due to survey platform, technology type or analysis. It is also useful to show the level of intra-monthly densities within the Moray Firth, as the BOWL surveys were undertaken twice in each month. BOWL data were obtained from Trinder (2016).

Table 2.4 Aerial densities of kittiwake from Moray West digital aerial surveys and BOWL pre-construction digital aerial surveys in June and July. All results from MRSea models. Selected densities shown in bold.

Month	Area	Density	Lower 95% CI	Upper 95% CI
June	Moray West + 4km	6.05	5.20	7.69
	Moray West + 2km	5.16	4.23	6.94
	Moray West	4.76	3.72	6.74
	BOWL survey area (First survey)	4.97	-	-

Month	Area	Density	Lower 95% CI	Upper 95% CI
	BOWL survey area (Second survey)	4.96	-	-
	BOWL wind farm (First survey)	5.17	-	-
	BOWL wind farm (Second survey)	7.53	-	-
July	Moray West + 4km	3.15	2.69	4.00
	Moray West + 2km	3.27	2.77	4.26
	Moray West	3.35	2.70	4.61
	BOWL survey area (First survey)	4.77	-	-
	BOWL survey area (Second survey)	5.93	-	-
	BOWL wind farm (First survey)	7.05	-	-
	BOWL wind farm (Second survey)	7.63	-	-

18 The much narrower range of aerial densities of kittiwake in the Moray Firth in June and July that are apparent from the comparison in Table 2.4 indicates that the selected densities using the decision support system were not representative of the likely real baseline conditions in the Moray West Site. The densities within the Moray West Site and both a 2 km and 4 km buffer from 2016 are within the range of densities of the four surveys from BOWL in 2015. However, since the aerial densities in BOWL could be higher than the single year of data from Moray West, and the absence of a second year of surveys in Moray West, a suitable, precautionary density to select was the highest value across the two surveys. This was 7.53 birds.km^{-2} in June, from the second June survey of the BOWL wind farm area and 7.63 birds.km^{-2}, from the second July survey of the BOWL wind farm area. Both values are similar to the upper 95% confidence intervals for the predicted aerial densities of kittiwakes in the Moray West surveys in June.

19 It should be noted that these are likely to be precautionary values to use, as the Band (2012) CRM typically uses the average monthly aerial densities from data across two years. If either of the selected densities were averaged with the highest density from the Moray West surveys in each month the aerial densities of kittiwakes used in the CRM would be reduced.

2.1.2 Post-breeding season

20 The relative spatial density of the Moray West MRSea predictions were mapped. Relative aerial densities were mapped for September to December using relative monthly densities (Figure 2.4) and relative seasonal densities (Figure 7.2). There was a also great deal of variability in the spatial abundance between months. In September there was a fairly discrete hotspot of birds in flight in the north-west of the Moray West Site plus 4 km buffer, while in October birds were more dispersed across the Moray West Site plus 4 km buffer. Densities were concentrated on the southern boundary of the Moray West Site plus 4 km buffer in November. In December a clearly discreet hotpot occurred in the central part of the Moray West Site plus 4 km buffer, with another, lower density hotpot near the eastern boundary of the Moray West Site plus 4 km buffer.

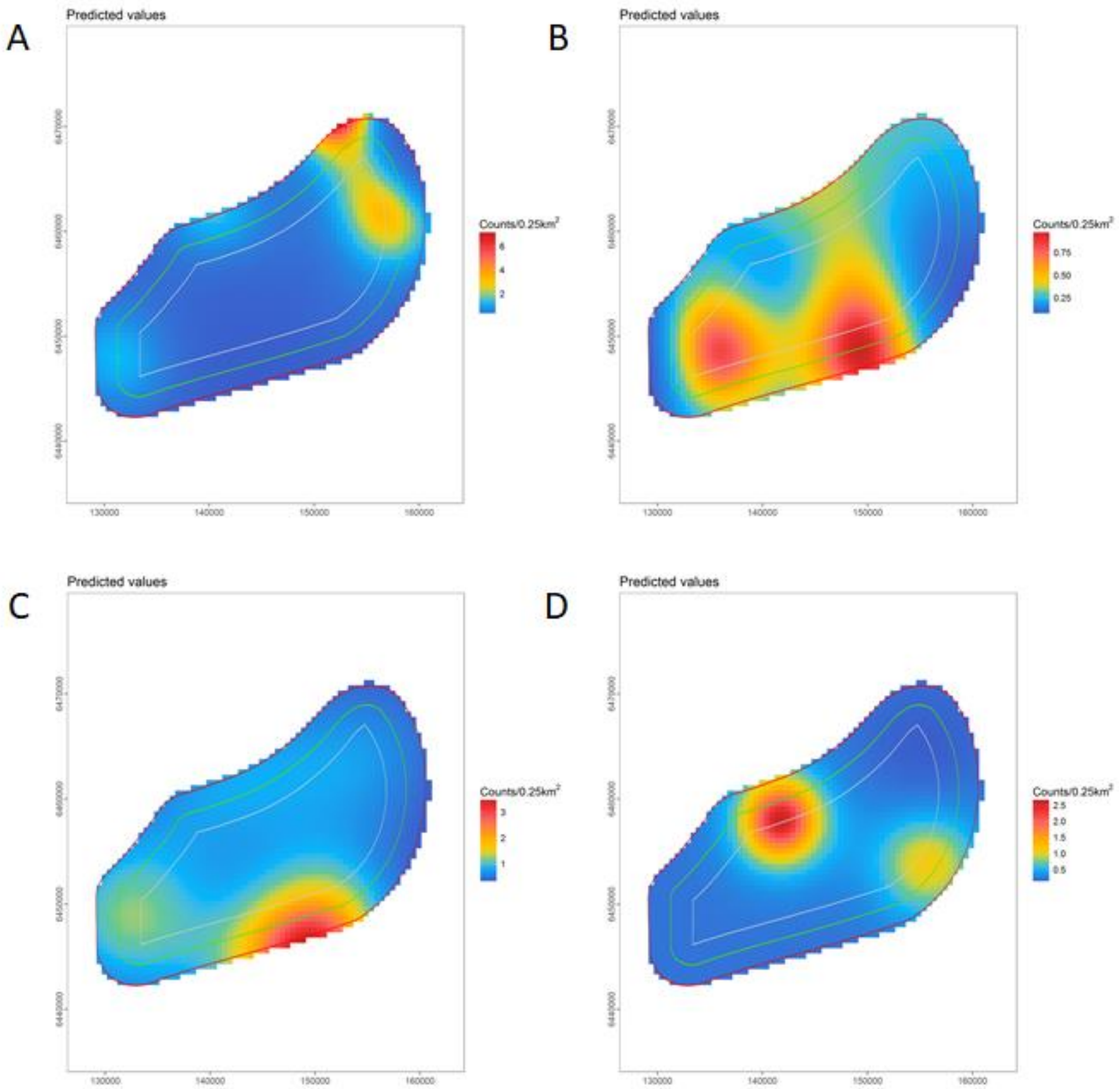

Figure 2.4 Relative aerial densities of kittiwake predicted by MRSea in: A = September, B = October, C = November, D = December.

Table 2.5 Post-breeding aerial densities of kittiwakes in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals).

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL preconstruction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East survey area (boat-based)
September	4.17 (3.90 – 4.50)	No survey	2.21 (1.65 – 3.45)	0.111
October	1.17 (1.15 – 1.19)	No survey	1.61 (1.28 – 2.17)	0.134
November	2.84 (2.80 – 2.87)	No survey	3.49 (2.92 – 4.34)	0.078
December	2.25 (2.09 – 2.43)	No survey	2.15 (1.62 – 3.10)	0.078

21 In the absence of comparable data from the BOWL digital aerial surveys, and no confidence intervals around the Moray East boat-based survey data, it was not possible to use the decision support system to select suitable aerial densities. As can be seen from the densities obtained from boat-based surveys of the Moray East survey area, densities predicted by MRSea across the Moray West Site were much larger. It was therefore considered precautionary to apply the Moray West MRSea predictions for the post-breeding season. These density predictions were between 1.61 birds.km^{-2} (in October) to 3.49 birds.km^{-2} (in November).

2.1.1 Pre-breeding season

22 The relative spatial density of the Moray West MRSea predictions were mapped. Relative aerial densities could only be mapped for March (Figure 2.5), as there were too few data to model densities using MRSea. The aerial densities in March were concentrated on the northern boundary of the Moray West Site plus 4 km buffer.

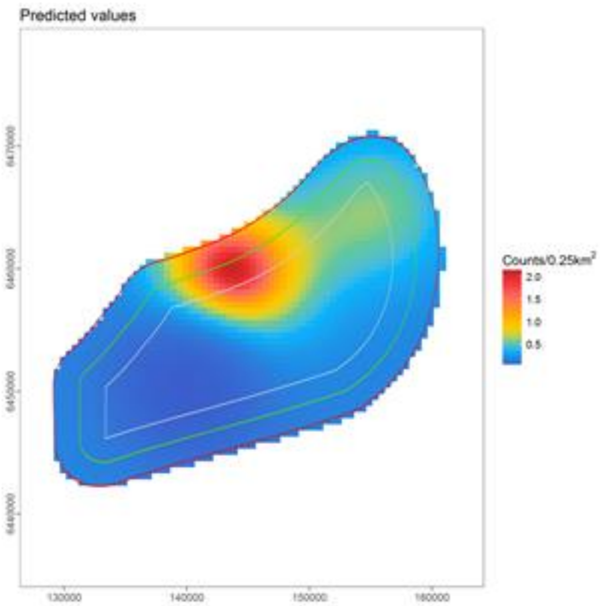

Figure 2.5 Relative aerial densities of kittiwake predicted by MRSea in March.

Table 2.6 Pre-breeding aerial densities of kittiwakes in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals).

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East survey area (boat-based)
January	n/a	No survey	0.36 (0.13 – 0.67)*	0.178
February	n/a	No survey	0.67 (0.27 – 1.26)*	0.111
March	3.15 (3.03 – 3.28)	No survey	1.48 (1.12 – 2.10)	0.457
* Density estimated mean of transect density				

23 In the absence of comparable data from the BOWL digital aerial surveys, and no confidence intervals around the Moray East boat-based survey data, it was not possible to use the decision support system to select suitable aerial densities. As can be seen from the densities obtained from boat-based surveys of the Moray East survey area, densities predicted by MRSea across the Moray West Site were larger. It was therefore considered precautionary to apply the Moray West MRSea predictions for the post-breeding season. These density predictions were between 0.36 birds.km^{-2} (in January) and 1.48 birds.km^{-2} (in March).

2.2 Gannet aerial densities

24 Initial comparison of the aerial densities of gannet in Moray West Site plus 4 km buffer was made with the mean monthly aerial densities of gannets from boat-based surveys of Moray East and BOWL (Table 2.7). These showed that estimated densities were broadly similar in all months, except September, where densities were higher in the Moray West Site. Confidence intervals of the aerial densities from Moray West overlapped in most months with the aerial densities from boat-based surveys in Moray East and BOWL (Figure 2.6).

25 Aerial densities were predicted from MRSea analyses of the spatial densities of birds across the Moray West Site plus 4 km buffer, with the exception of March – May, July – August and December. In these months there were too few sightings to successfully run the model. Consequently, the mean of transect density was used to predict the 'aerial density' of gannets in those months.

26 Aerial densities of gannets from the boat-based surveys of Moray East and BOWL were calculated from the number of birds observed within the total transect area for each survey programme. Boat-based surveys were undertaken in Moray East from April 2010 to March 2012 and in BOWL from October 2009 to September 2011. However, due to the form of the available data it was not possible to extract aerial densities for the overlaps between each survey area and the Moray West site plus 4 km buffer. These densities were only available at the whole survey area scale, so could not be clipped to the overlap areas only. So, these densities are provided for context only.

Table 2.7 Comparison of Moray West Site only MRSea predicted densities of gannet in flight with calculated aerial densities of gannets from boat-based surveys of Moray East and BOWL.

Survey platform/Model	DVAS/MRSea			Boat-based/None	
Month	MW density	LCI	UCI	Moray East	BOWL
March	0.20*	0.00	0.49	0.123	0.1225
April	0	0	0	0.223	0.0829
May	0.05*	0.00	0.13	0.163	0.1235
June	0	0	0	0.078	0
July	0.05*	0.00	0.18	0.141	0
August	0.21*	0.04	0.45	0.223	0.0942
September	1.49	1.10	2.30	0.217	0.0865
October	0.28	0.16	0.74	0.357	0.4098
November	0.40	0.24	0.90	0.323	0.4293
December	0.05*	0.00	0.13	0.156	0.2147
January	0	0	0	0.033	0
February	0	0	0	0.134	0.0455

Survey platform/Model	DVAS/MRSea			Boat-based/None	
Month	MW density	LCI	UCI	Moray East	BOWL
* Density estimated using mean of transect density LCI = Lower Confidence Interval, UCI = Upper Confidence Interval.					

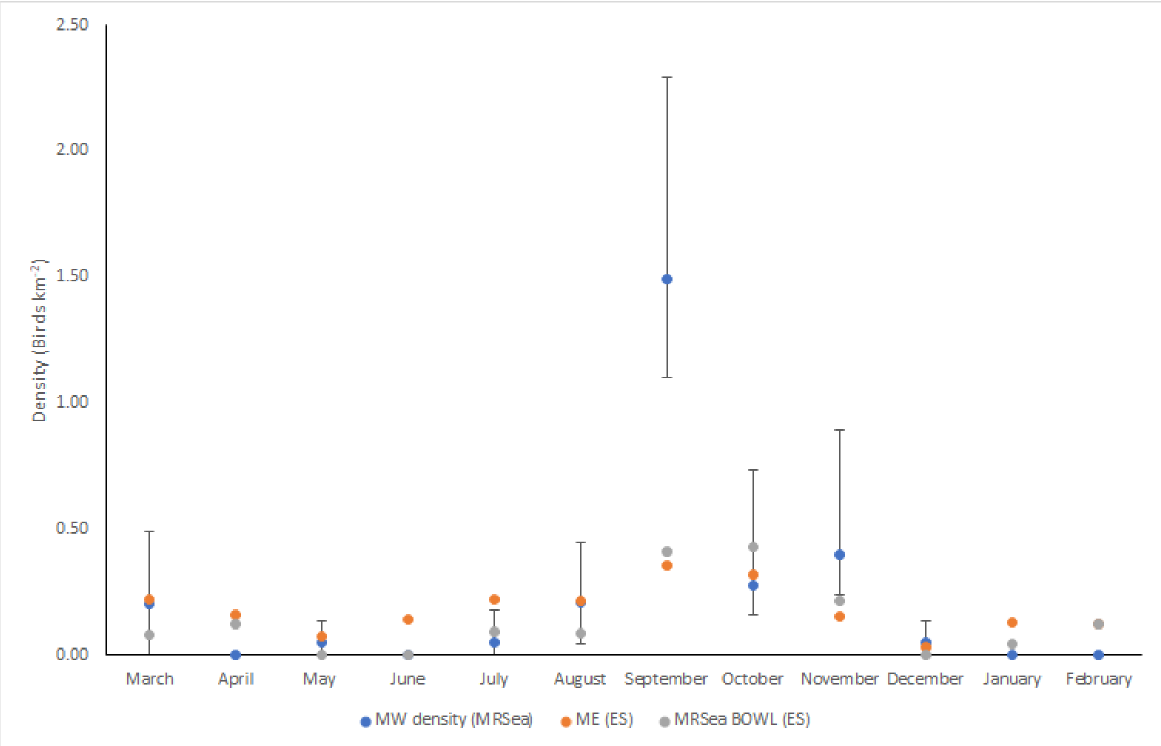

Figure 2.6 Comparison of Moray West Site only MRSea predicted densities of gannet in flight with calculated aerial densities of gannets from boat-based surveys of Moray East and BOWL.

2.2.1 Breeding season

27 The relative spatial density of the Moray West MRSea predictions were mapped. In the breeding season it was not possible to map the relative aerial densities in any months, except September, as there were too few observations (Figure 2.7). In September there was a discrete hotspot of birds in flight in the north-east of the Moray West Site plus 4 km buffer.

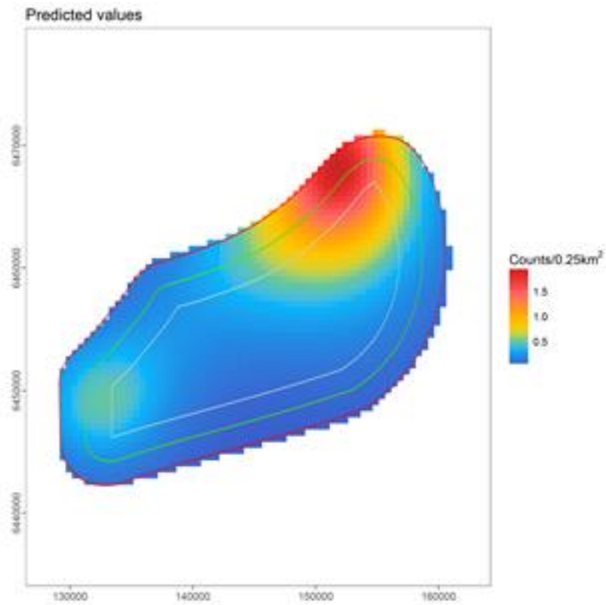

Figure 2.7 Relative aerial densities of gannets in the Moray West Site plus 4 km buffer predicted by MRSea in September.

Table 2.8 Aerial densities of gannets in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals).

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)
March	0	No survey	0.20 (0.00 – 0.49)*
April	0	No survey	0
May	0	0.48 (0.00 – 1.19)	0.05 (0.00 – 0.13)*
June	0	0.72 (0.11 – 1.51)	0
June	0	0.60 (0.22 – 1.08)	-
July	0	0	0.05 (0.00 – 0.18)*
July	0	0.24 (0.00 – 0.65)	-
August	0	0.12 (0.00 – 0.32)	0.21 (0.04 – 0.45)*
September	3.17 (3.03 – 3.32)	No survey	1.49 (1.10 – 2.30)
* Density estimated using mean of transect density			

28 In each month, Table 2.9 provides the node in the decision support system passed and the density estimate selected for use in the CRM.

Table 2.9 Node path through the decision support flow chart comparing Moray West (MW) and BOWL overlap data to select suitable densities for collision risk assessment.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Estimate no.	Density estimate
March							n/a	0.202
April							n/a	0
May	X			X			2	0.266
June		X				X	4	0.660
July	X			X			2	0.097
August	X		X				1	0.208
September							n/a	1.493

29 The selected 'aerial density' of gannet for use in the CRM are shown in Table 2.9.

2.2.1 Non-breeding season

The relative spatial density of the Moray West MRSea predictions were mapped for the non-breeding season. Relative aerial densities were mapped for October and November using relative monthly densities (Figure 2.8) and relative seasonal densities (Figure 7.3). It was not possible to map the aerial densities in December – February as there were too few observations to run the MRSea model. There was a marked difference in the relative spatial densities of flying gannets between October and November. In October, there was a large hotpot to the east of the Moray West Site plus 4 km buffer, while in November the only hotspots were small and along the boundary of the south and west of the Moray West Site plus 4 km buffer.

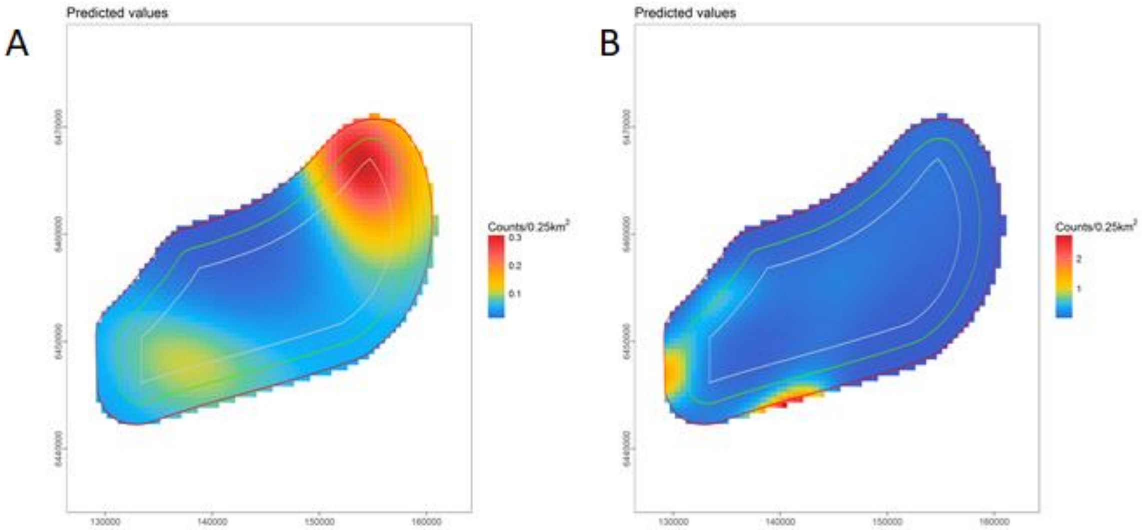

Figure 2.8 Relative aerial densities of gannet in the Moray West Site plus 4 km buffer predicted by MRSea in: A = October, B = November.

Table 2.10 Non-breeding aerial densities of gannets in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals).

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East survey area (boat-based)
October	0.11 (0.10 – 0.83)	No survey	0.28 (0.16 – 0.74)	0.323
November	0.09 (0.09 – 0.09)	No survey	0.40 (0.24 – 0.90)	0.156
December	n/a	No survey	0.05 (0.00 – 0.13)*	0.033
January	0	No survey	0	0.134
February	0	No survey	0	0.123
* Density estimated using mean of transect density				

30 In the absence of comparable data from the BOWL digital aerial surveys, and no confidence intervals around the Moray East boat-based survey data, it was not possible to use the decision support system to select suitable aerial densities. As can be seen from the densities obtained from boat-based surveys of the Moray East survey area, densities predicted by MRSea across the Moray West Site plus 4 km buffer were largely comparable. It was therefore considered precautionary to apply the Moray West

MRSea predictions for the post-breeding season. These density predictions were between 0 birds.km^{-2} (in January and February) to 0.40 birds.km^{-2} (in November).

2.3 Herring gull aerial densities

31 Initial comparison of the aerial densities of herring gull in the Moray West Site plus 4 km buffer was made with the mean monthly aerial densities of herring gulls from boat-based surveys of Moray East and BOWL (Table 2.11). These showed that estimated densities were similar in all months, except June, where densities were higher in Moray West, though confidence intervals were very large. Aerial densities from Moray West were generally very low, as were the aerial densities from boat-based surveys in Moray East and BOWL (Figure 2.9).

32 Aerial densities were predicted from mean of transect density analyses of the spatial densities of birds across the Moray West Site plus 4 km buffer. In all months there were too few sightings to successfully run the MRSea.

33 Aerial densities of herring gulls from the boat-based surveys of Moray East and BOWL were calculated from the number of birds observed within the total transect area for each survey programme. Boat-based surveys were undertaken in Moray East from April 2010 to March 2012 and in BOWL from October 2009 to September 2011. However, due to the form of the available data it was not possible to extract aerial densities for the overlaps between each survey area and the Moray West site plus 4 km buffer. These densities were only available at the whole survey area scale, so could not be clipped to the overlap areas only. So, these densities are provided for context only.

Table 2.11 Comparison of Moray West Site only mean of transect density of herring gulls in flight with calculated aerial densities of herring gulls from boat-based surveys of Moray East and BOWL. LCI = Lower 95% confidence interval, UCI = Upper 95% confidence interval.

Survey platform/Model	DVAS/MRSea			Boat-based/None	
Month	MW density	LCI	UCI	Moray East	BOWL
April	0.000	0.000	0.000	0.007	0.119
May	0.000	0.000	0.000	0.000	0.000
June	0.989	0.045	3.052	0.007	0.000
July	0.000	0.000	0.000	0.089	0.089
August	0.000	0.000	0.000	0.011	0.086
September	0.000	0.000	0.000	0.000	0.000
October	0.000	0.000	0.000	0.089	0.000
November	0.000	0.000	0.000	0.067	0.183

Survey platform/Model	DVAS/MRSea			Boat-based/None	
December	0.000	0.000	0.000	0.212	0.366
January	0.051	0.000	0.134	0.245	1.415
February	0.105	0.000	0.224	0.357	1.155
March	0.000	0.000	0.000	0.056	0.332
LCI = Lower Confidence Interval, UCI = Upper Confidence Interval.					

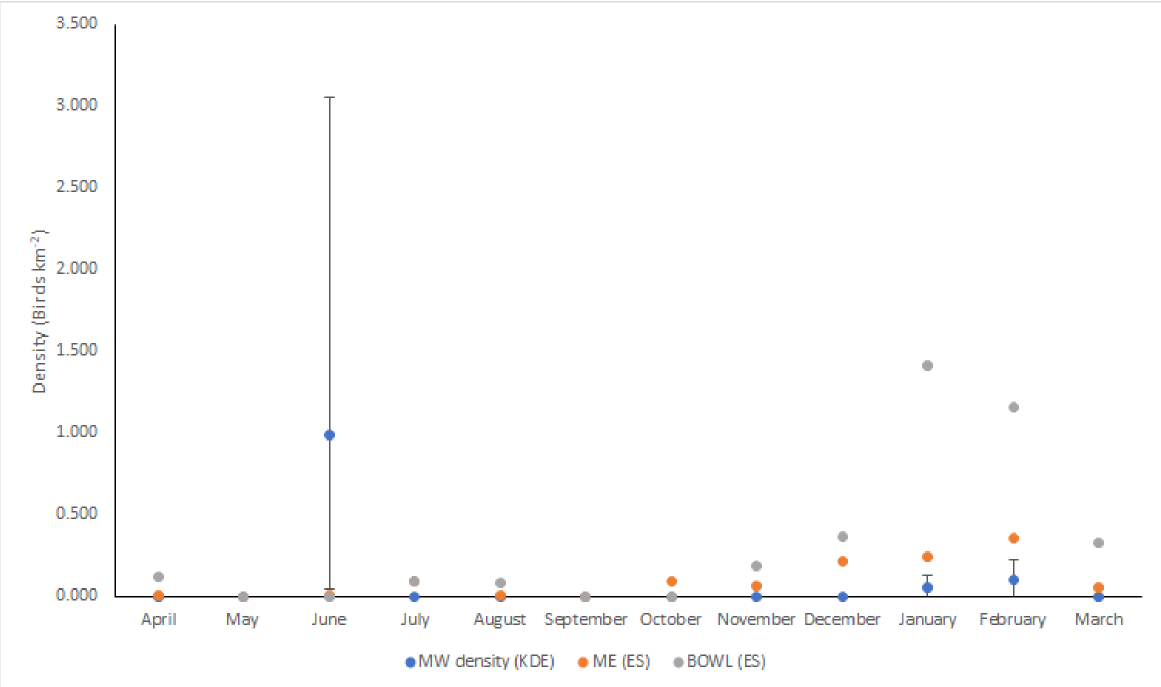

Figure 2.9 Comparison of Moray West Site only MRSea predicted densities of herring gull in flight with calculated aerial densities of herring gulls from boat-based surveys of Moray East and BOWL. Results for April, January and February are mean of transect density predictions.

2.3.1 Breeding season

34 The relative spatial density of herring gulls in Moray West could not be mapped using MRSea, due to too few observations.

Table 2.12 Aerial densities of herring gulls in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals).

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)
April	-	No survey	0
May	-	0	0
June	-	0	0.99 (0.04 – 3.05)
June	-	0.12 (0.00 – 0.33)	-
July	-	0.39 (0.18 – 0.62)	0
July	-	0	-
August	-	0.14 (0.00 – 0.34)	0

35 In each month, Table 2.13 provides the node in the decision support system passed and the density estimate selected for use in the CRM. There was only suitable data for applying the decision support system in June. In April and May there were no observations of herring gull in flight during either the Moray West or BOWL digital aerial surveys. In July, there were no observation in Moray West, so a mean of the two available BOWL digital aerial survey predictions from mean transect density was used. In August, again there were no observations from Moray West digital aerial surveys, so the value available from the BOWL data was used.

Table 2.13 Node path through the decision support flow chart comparing Moray West (MW) and BOWL overlap data to select suitable densities for collision risk assessment.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Estimate no.	Density estimate
April							n/a	0
May							n/a	0
June	X		X				1	0.989
July							n/a	0.195
August							n/a	0.140

36 The selected 'aerial density' of herring gull for use in the CRM are shown in Table 2.13.

2.3.1 Non-breeding season

37 The relative spatial density of herring gulls in Moray West in the non-breeding season could not be mapped using MRSea, due to too few observations. The predicted abundances available are shown in Table 2.14.

Table 2.14 Aerial densities of herring gulls in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals) in the non-breeding season.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)
September	-	No survey	0
October	-	No survey	0
November	-	No survey	0
December	-	No survey	0
January	-	No survey	**0.05 (0.00 – 0.13)**
February	-	No survey	**0.10 (0.00 – 0.22)**
March	-	No survey	0

38 There were only data from the Moray West surveys in January and February with no observations in any month. In these months the densities were very low. The selected 'aerial density' of herring for use in the CRM are shown in Table 2.14.

2.1 Great black-backed gull aerial densities

39 Initial comparison of the aerial densities of great black-backed gull in the Moray West Site plus 4 km buffer was made with the mean monthly aerial densities of great black-backed gulls from boat-based surveys of Moray East and BOWL (Table 2.15). These showed that estimated densities were similar in most months, except September, where densities were higher in Moray West, though confidence intervals were very large. Aerial densities from BOWL boat-based surveys in the non-breeding season were generally larger than those from either Moray West or Moray East. Perhaps due to BOWL being closer to the coast. Aerial densities from Moray West were generally very low, as were the aerial densities from boat-based surveys in Moray East and BOWL (Figure 2.10).

40 Aerial densities were predicted from mean of transect density analyses of the spatial densities of birds across the Moray West Site plus 4 km buffer. In all months there were too few sightings to successfully run the MRSea.

41 Aerial densities of great black-backed gulls from the boat-based surveys of Moray East and BOWL were calculated from the number of birds observed within the total transect area for each survey programme. Boat-based surveys were undertaken in Moray East from April 2010 to March 2012 and in BOWL from October 2009 to September 2011. However, due to the form of the available data it was not possible to extract aerial densities for the overlaps between each survey area and the Moray West site plus 4 km buffer. These densities were only available at the whole survey area scale, so could not be clipped to the overlap areas only. So, these densities are provided for context only.

Table 2.15 Comparison of Moray West Site only mean transect densities of great black-backed gull in flight with calculated aerial densities of great black-backed gulls from boat-based surveys of Moray East and BOWL.

Survey platform/Model	DVAS/MRSea			Boat-based/None	
Month	MW density	LCI	UCI	Moray East	BOWL
April	0.000	0.000	0.000	0.067	0.119
May	0.000	0.000	0.000	0.000	0.000
June	0.000	0.000	0.000	0.000	0.000
July	0.000	0.000	0.000	0.078	0.089
August	0.000	0.000	0.000	0.028	0.086
September	0.521	0.090	1.075	0.045	0.000
October	0.153	0.000	0.358	0.189	0.000
November	0.000	0.000	0.000	0.033	0.183
December	0	0	0	0.033	0.366
January	0	0	0	0.067	1.415
February	0.000	0.000	0.000	0.089	1.155
March	0.000	0.000	0.000	0.022	0.332
LCI = Lower Confidence Interval, UCI = Upper Confidence Interval.					

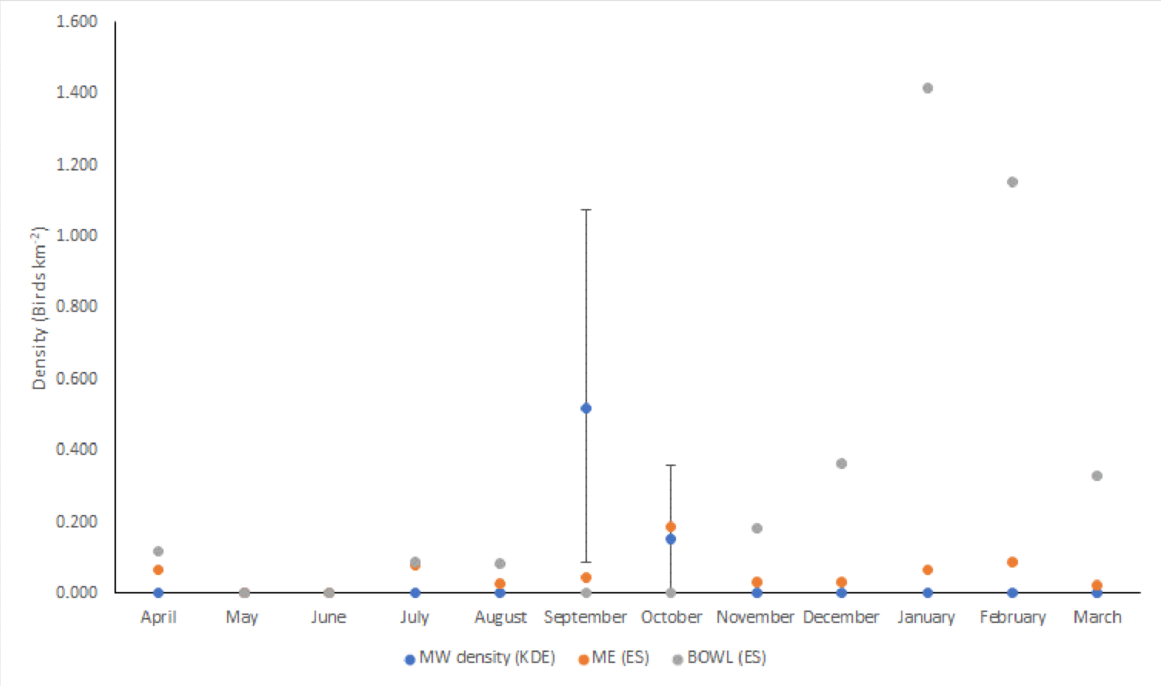

Figure 2.10 Comparison of Moray West Site only MRSea predicted densities of great black-backed gull in flight with calculated aerial densities of great black-backed gulls from boat-based surveys of Moray East and BOWL.

2.1.1 Breeding season

42 The relative spatial density of great black-backed gulls in Moray West could not be mapped using MRSea, due to too few observations.

Table 2.16 Aerial densities of great black-backed gulls in the Moray Firth Site plus 4 km buffer (and upper and lower 95% confidence intervals).

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)
April	0	No survey	0
May	0	0	0
June	0	0.13 (0.00 – 0.34)	0
June	-	0	-
July	0	0.13 (0.00 – 0.31)	0
July	-	0	-

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)
August	0	0.29 (0.00 – 0.57)	0

43 There was no suitable data for applying the decision support system in June. There were no observations of great black-backed gull in flight in Moray West during any digital aerial surveys in the breeding season. There were available data from surveys of BOWL in June, July and August. In June and July, the mean of the predicted aerial densities within the month were used, while in August the predicted 'aerial density' from BOWL was used.

44 The selected 'aerial density' of great black-backed for use in the CRM are shown in Table 2.17 Selected aerial densities of great black-backed gull in the breeding season.

Table 2.17 Selected aerial densities of great black-backed gull in the breeding season.

Month	Selected 'aerial density'
April	0
May	0
June	0.07
July	0.07
August	0.29

2.1.2 Non-breeding season

45 The relative spatial density of great black-backed gulls in the Moray West Site plus 4 km buffer in the non-breeding season could also not be mapped using MRSea, due to too few observations. The predicted abundances using mean of transect density are shown in Table 2.18.

Table 2.18 Aerial densities of great black-backed gulls in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals) in the non-breeding season.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)
September	0	No survey	0.52 (0.09 – 1.07)
October	0	No survey	0.15 (0.00 – 0.36)

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)
November	0	No survey	0
December	0	No survey	0
January	0	No survey	0
February	0	No survey	0
March	0	No survey	0

46 There were only observations from the Moray West surveys in September and October with no observations in any other month. In these months the densities were very low. The selected 'aerial density' of great black-backed gull for use in the CRM are shown in Table 2.18.

3 Displacement density data

47 Density assessments for offshore wind farms requires the use of mean peak bird density data as an input value. This value is the mean of two densities within the same season, but in different years. For each season the peak value is used to calculate the mean. Since Moray West only have one year of digital video aerial survey (DVAS), it is not possible to produce a mean value. As such, there is no available context from Moray West surveys on the inter-annual variability in densities of key species in the Moray Firth. However, there is valuable data from other data sources, particularly BOWL DVAS data (2015) and Moray East boat-based survey data (2010 – 2011).

48 To assist decision making on selecting suitable data to inform the displacement assessment for Moray West (MW) a decision support flow chart was produced (Figure 3.1). This flow chart was designed to select or calculate suitably precautionary bird density data, without relying on estimates that are too small or too large by placing the Moray West DVAS data in context.

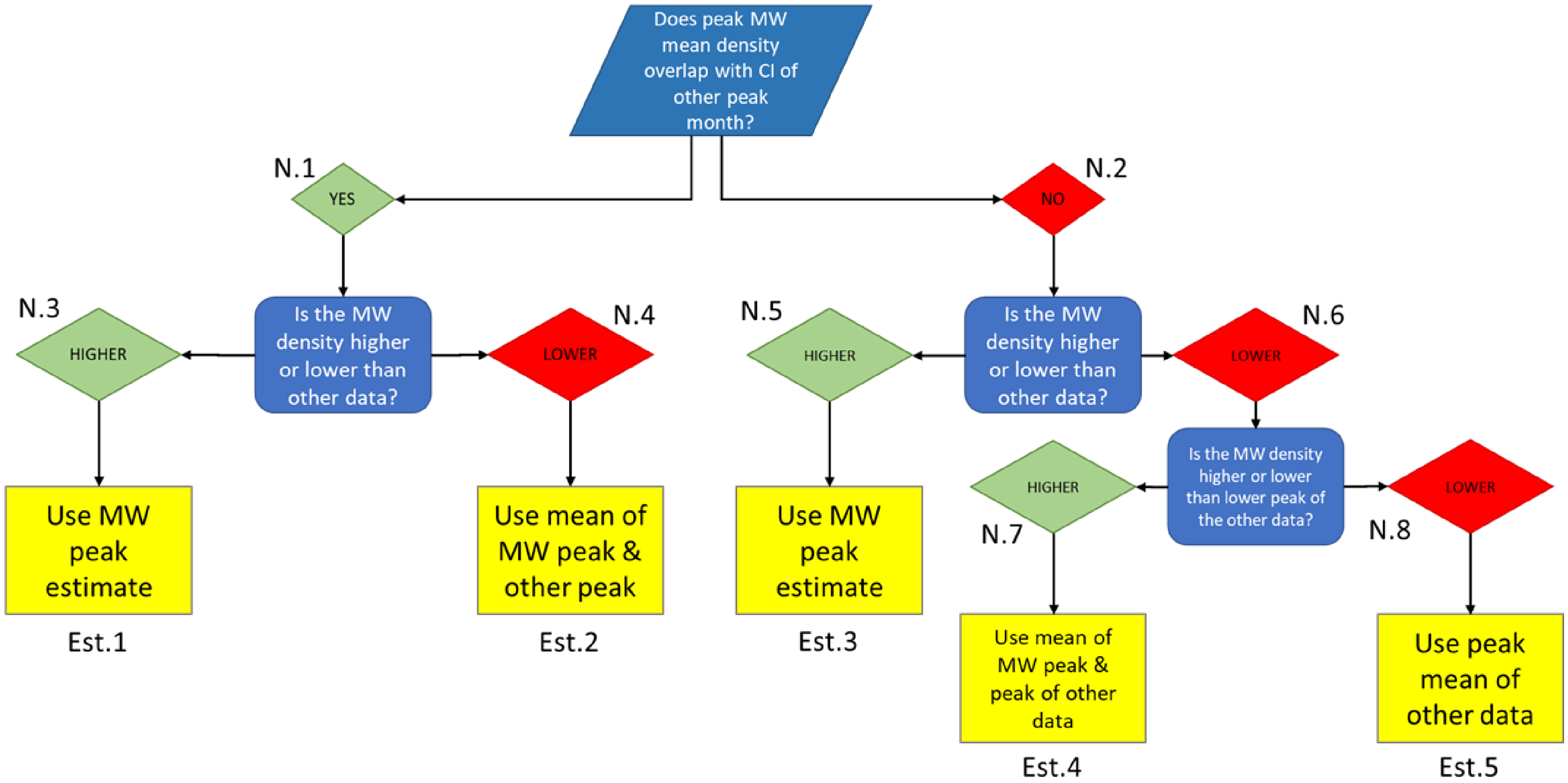

Figure 3.1 Decision Support flow chart for selecting suitable displacement density data (MW = Moray West, CI = Confidence Interval)

3.1 Guillemot sitting densities

49 Initial comparison of the densities of guillemot in the Moray West Site plus 4 km buffer was made with the monthly densities of guillemots from boat-based surveys of Moray East (Table 3.1). These showed that estimated densities were similar in most months, but much higher in Moray West in August and September. There was no overlap between the confidence intervals of the Moray West guillemot densities in August and September and the densities from boat-based surveys in Moray East in Year 1 and Year 2 (Figure 3.2).

50 Densities were predicted from MRSea analyses of the spatial densities of birds across the Moray West Site plus 4 km buffer. In all months there were sufficient sightings of guillemot to successfully run the model.

51 Densities of sitting guillemots from the boat-based surveys of Moray East were estimated using design-based Distance sampling (Thomas *et al.* 2010). Boat-based surveys were undertaken in Moray East from April 2010 to March 2012.

Table 3.1 Comparison of Moray West Site plus 4 km buffer MRSea predicted densities of guillemots on the water with calculated densities of guillemot from boat-based surveys of Moray East in Year 1 and Year 2.

Survey platform/Model	DVAS/MRSea	Boat-based/Design-based	
Month	MW density	Moray East (Year 1)	Moray East (Year 2)
April	0.50 (0.19 – 0.88)	27.45 (20.08 – 37.53)	20.48 (16.37 – 25.63)
May	27.11 (23.33 – 33.17)	88.67 (55.83 – 140.82)	34.94 (22.82 – 53.51)
June	34.71 (30.13 – 43.03)	24.58 (16.56 – 36.49)	4.95 (3.71 – 6.61)
July	23.14 (20.28 – 27.86)	0.16 (0.06 – 0.48)	3.32 (2.04 – 5.40)
August	73.33 (64.81 – 88.14)	0.51 (0.21 – 1.26)	7.40 (5.09 – 10.76)
September	101.21 (90.76 – 115.09)	1.01 (0.57 – 1.81)	7.28 (4.14 – 12.79)
October	8.58 (7.49 – 10.41)	0.10 (0.03 – 0.37)	0.80 (0.29 – 2.20)
November	2.81 (2.33 – 3.71)	0.03 (0.01 – 0.20)	0.80 (0.32 – 2.01)
December	1.02 (0.80 – 1.60)	0.93 (0.32 – 2.68)	0.98 (0.57 – 1.66)
January	7.14 (6.04 – 9.07)	2.64 (1.53 – 4.56)	1.08 (0.59 – 1.97)
February	21.79 (19.40 – 25.47)	7.74 (5.79 – 10.33)	1.38 (0.79 – 2.41)
March	12.08 (10.39 – 15.27)	7.24 (4.48 – 11.69)	5.59 (3.40 – 9.19)

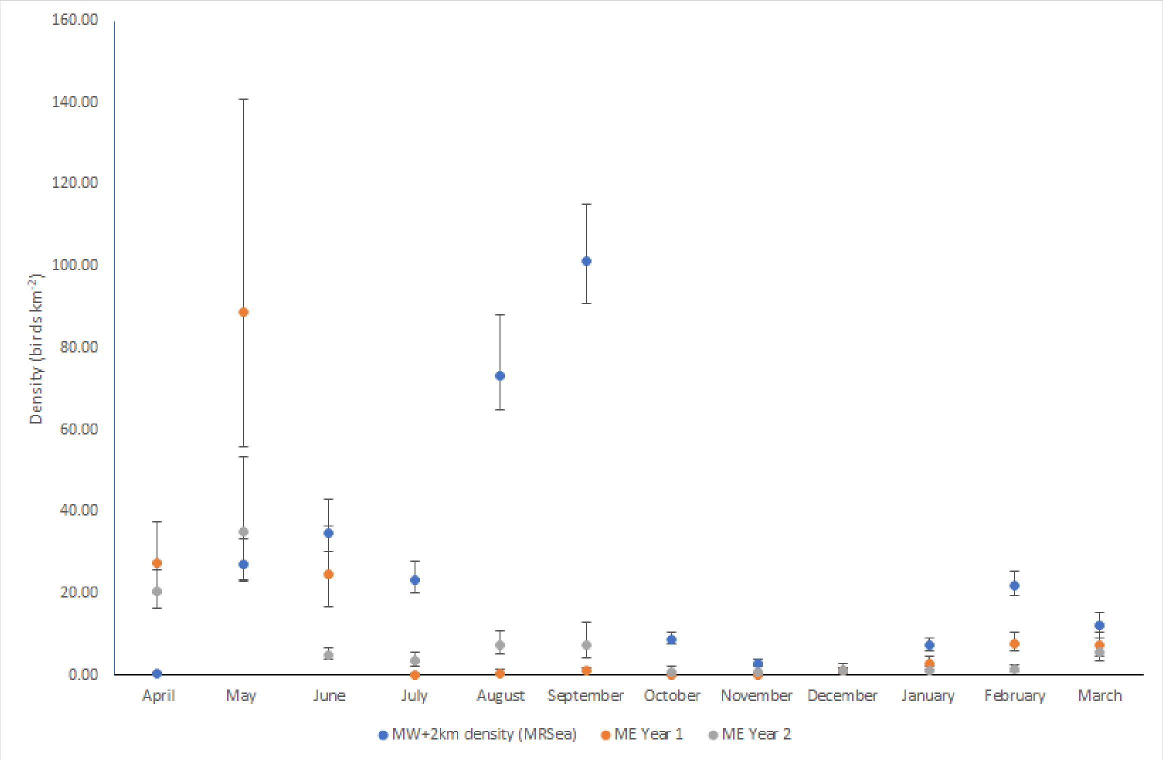

Figure 3.2 Comparison of Moray West Site plus 4 km buffer MRSea predicted densities of guillemots on the water with calculated densities of guillemots from boat-based surveys of Moray East in Year 1 and Year 2.

3.1.1 Breeding season

52 The relative spatial density of guillemots from the Moray West MRSea predictions were mapped. Relative aerial densities were mapped for April to July using relative monthly densities (Figure 3.3) and relative seasonal densities (Figure 7.4). There was variability in the spatial abundance between months. In April there was a large, diffuse hotspot of birds across the centre and eastern part of the Moray West Site plus 4 km buffer, while in May there was a small hotspot on the western boundary of the Moray West Site plus 4 km buffer, and a smaller, diffuse hotspot in the south-east of the Moray West Site plus 4 km buffer. Similarly, in June there was a hotspot on the western boundary, and another, more discrete, hotspot in the eastern part of the Moray West Site plus 4 km buffer. In July there was a larger hotspot in the south-west of the Moray West Site plus 4 km buffer, extending north-east and becoming more diffuse towards the central part of the Moray West Site plus 4 km buffer.

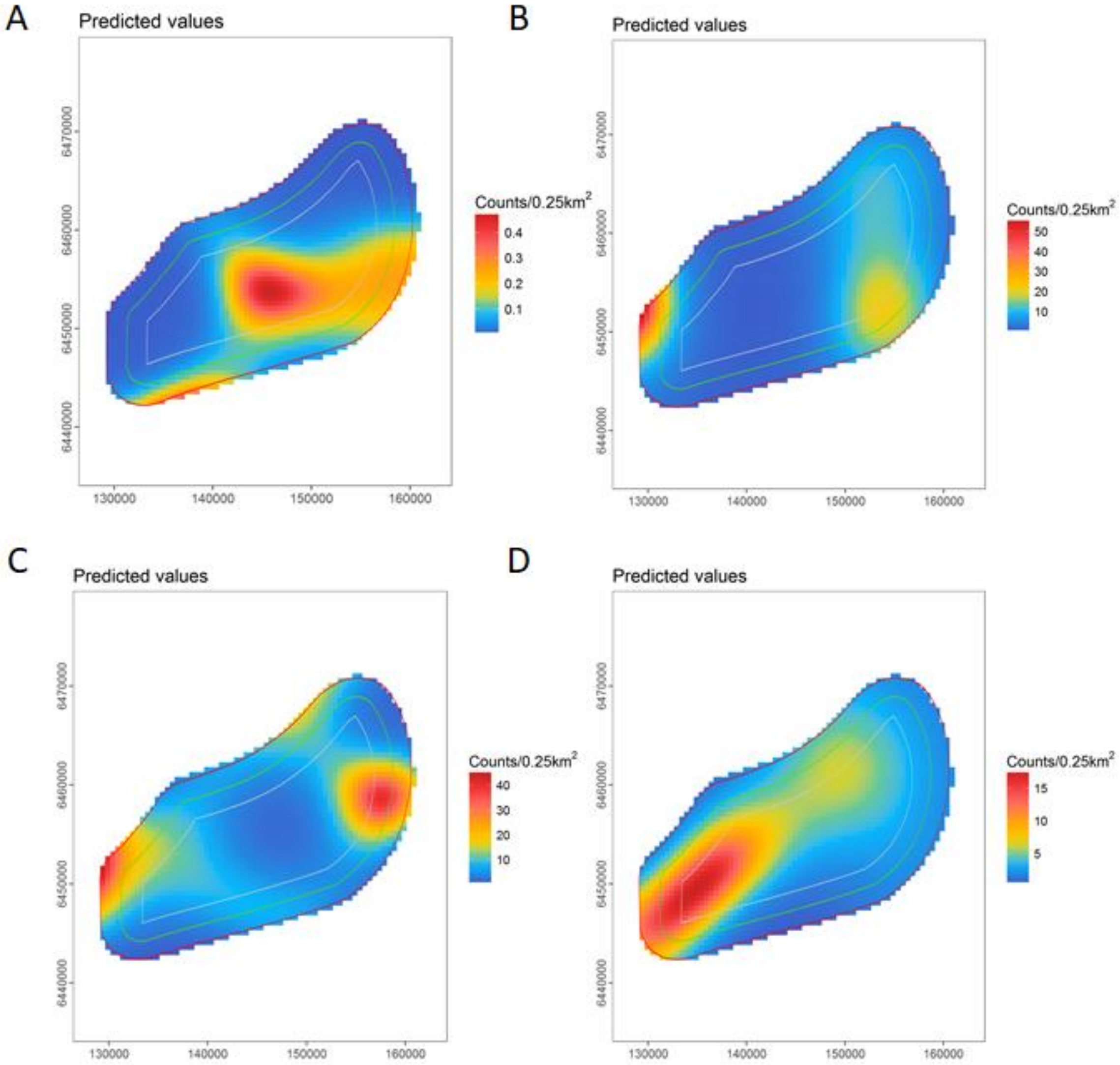

Figure 3.3 Relative densities of guillemots on the water predicted by MRSea in: A = April, B = May, C = June, D = July.

53 Bird sitting density data was also available for the overlap between Moray West and Moray East, unlike the situation with bird 'aerial density' data. Thus, comparisons were possible between the overlap between Moray West and BOWL pre-construction digital aerial surveys, and between Moray West digital aerial surveys and Moray East boat-based surveys. The boat-based survey data from Moray East was analysed using a simpler Density Surface Model (DSM) using Generalised Additive Models (GAMs) as the analyses predated the introduction of MRSea. Only the most abundant month in the breeding season was analysed using GAMs used to map spatial densities. Thus, these were the only data from Moray East that could be analysed to determine densities in the overlap with the Moray West Site plus 4 km buffer, since they were the only data with spatial predictions. It was therefore possible to apply the decision support flow chart (Figure 3.1) to both overlaps separately. This added the need for an additional decision-making level of which density value should be applied to displacement assessment. In order to provide a suitably precautionary approach, the density estimate selected by the decision support flow chart for each pair of data sets (Moray West and BOWL overlap, and Moray West and Moray East overlap) whichever was the largest was selected as the input to the displacement matrix.

Since the displacement matrix requires an abundance estimate, rather than a density estimate, the selected density was extrapolated to the area of the Moray West Site plus 2 km buffer (377.2 km^2).

Table 3.2 Densities of guillemots on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
April	0.07 (0.06 – 0.07)*	No survey	0.54 (0.49 – 0.59)	-	0.50 (0.19 – 0.88)
May	6.35 (6.09 – 6.62)	104.99 (60.09 – 151.68)	54.51 (53.03 – 56.03)	23.88 (22.39 – 25.38)	27.11 (23.33 – 33.17)
June	6.48 (6.22 – 6.73)	68.74 (13.77 – 138.11)	48.13 (44.32 – 52.36)	-	34.71 (30.13 – 43.03)
June	-	78.01 (8.68 – 182.72)	-	-	-
July	4.39 (4.29 – 4.48)	18.75 (8.03 – 35.33)	14.63 (14.27 – 15.01)	-	23.14 (20.28 – 27.86)
July	-	123.04 (67.93 – 180.22)	-	-	-
* Density estimated using mean of transect density					

54 For each comparison, Table 3.3 provides the node in the decision support system passed and the density estimate selected. This shows that the higher of the selected densities was from the comparison between the Moray West and BOWL data within the overlap of the two surveys. This value (64.76 birds.km^{-2}) was also higher than the density across the Moray West Site plus 2 km buffer (34.71 birds.km^{-2}), so this was selected as the preferred, precautionary, input. This density was then extrapolated to the Moray West plus 2 km buffer area (377 km^2), resulting in a recommended input abundance of 24,426 birds.

Table 3.3 Node path through the decision support flow chart comparing Moray West (MW) and BOWL and, Moray West and Moray East (ME) overlap data.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
MW & BOWL		X				X	X		4	64.76
MW & ME		X			X				3	54.51

3.1.2 Post-breeding season

55 The relative aerial densities were mapped for August and September using relative monthly densities (Figure 3.4) and relative seasonal densities (Figure 7.5). There was variability in the spatial abundance between the two months. In August, there was a large, distinct hotspot of birds across the centre of the Moray West Site plus 4 km buffer, while in September there was a small hotspot, but with very high densities, on the northern boundary of the Moray West Site plus 4 km buffer.

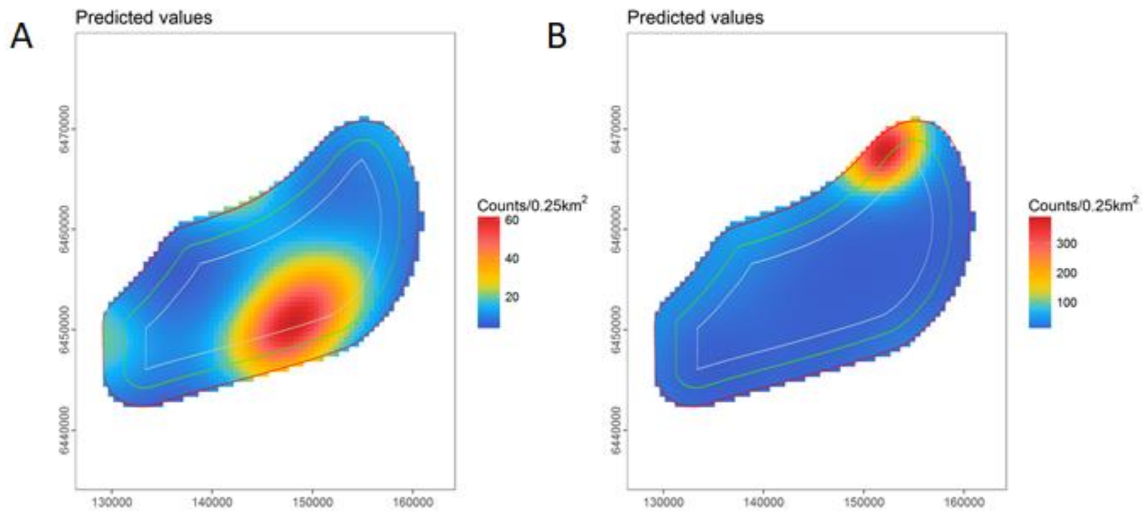

Figure 3.4 Relative densities of guillemots on the water predicted by MRSea in: A = August, B = September.

56 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.4 Densities of guillemots on the water in the Moray Firth Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site pus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
August	12.51 (12.14 – 12.93)	30.96 (19.17 – 46.30)	83.30 (76.48 – 90.65)	No data	73.33 (64.81 – 88.14)
September	74.86 (68.36 – 82.24)	No survey	95.68 (78.81 – 115.52)	No data	101.21 (90.76 – 115.09)

57 For each comparison, Table 3.5 provides the node in the decision support system passed and the density estimate selected. However, in the absence of a DSM from Moray East from which a density could be calculated, the only valid comparison with between Moray West and BOWL, in the overlap. This value (74.86 birds.km^{-2}) was lower than the density across the Moray West Site plus 2 km buffer (101.21 birds.km^{-2}). Consequently, the estimate for the Moray West Site plus 2 km buffer was selected as the preferred, precautionary, input. This density was then extrapolated to the Moray West Site plus 2 km buffer area (377 km^{2}), resulting in a recommended input abundance of 38,174 birds.

Table 3.5 Node path through the decision support flow chart comparing Moray West (MW) and BOWL and, Moray West and Moray East (ME) overlap data.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
MW & BOWL		X			X				3	74.86
MW & ME									n/a	95.68

3.1.3 Non-breeding season

58 The relative aerial densities were mapped for October to March using relative monthly densities (Figure 3.5) and relative seasonal densities (Figure 7.6). There was variability in the spatial abundance across the months sampled. In October and November, densities were concentrated around the southern

boundary of the Moray West Site plus 4 km buffer, with lower densities across the centre of the area. In December there was a large hotspot across the central part of the Moray West Site plus 4 km buffer, though densities were low. In January, densities were low across most of the Moray West Site plus 4 km buffer, with only a small hotpot along the western boundary of the Moray West Site plus 4 km buffer. In February, and March, the spatial pattern was more complex, with diffuse hotpots across the Moray West Site plus 4 km buffer, but particularly along the western boundary.

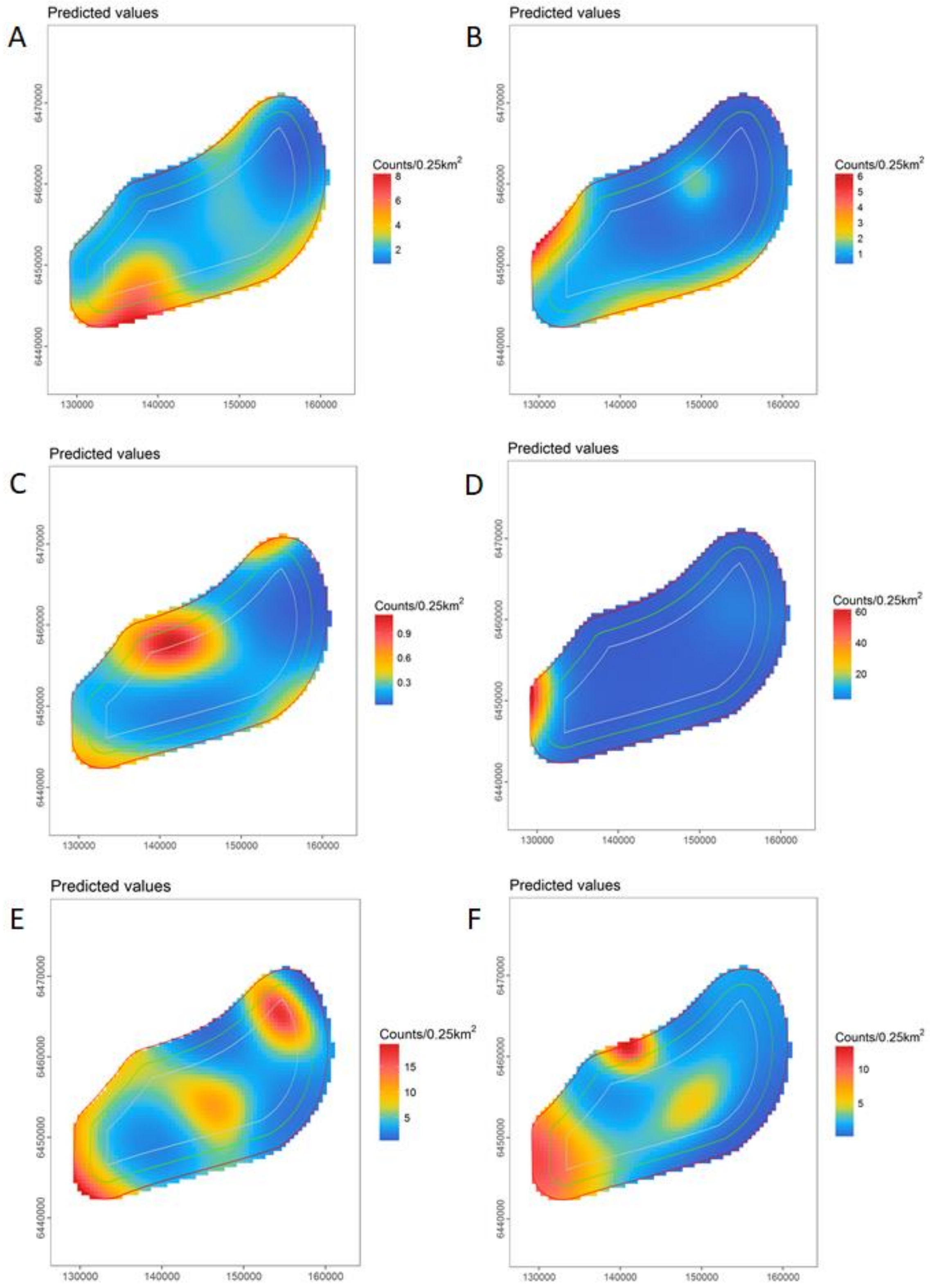

Figure 3.5 Relative densities of guillemots on the water predicted by MRSea in: A = October, B = November, C = December, D = January, E = February, F = March.

59 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.6 Densities of guillemots on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
October	1.70 (1.66 – 1.75)	No survey	6.06 (5.80 – 6.33)	No data	8.58 (7.49 – 10.41)
November	0.49 (0.46 – 0.51)	No survey	1.38 (1.31 – 1.45)	No data	2.81 (2.33 – 3.71)
December	0.32 (0.30 – 0.34)	No survey	0.43 (0.40 – 0.45)	No data	1.02 (0.80 – 1.60)
January	1.37 (1.30 – 1.44)	No survey	9.25 (8.69 – 9.83)	No data	7.14 (6.04 – 9.07)
February	6.01 (5.72 – 6.33)	No survey	25.78 (23.63 – 28.18)	No data	21.79 (19.40 – 25.47)
March	2.82 (2.67 – 3.00)	No survey	8.83 (8.38 – 9.37)	No data	12.08 (10.39 – 15.27)

60 As there were no suitable comparison data in either the overlap with BOWL or Moray East, the only suitable data were from Moray West. Therefore, the most suitable data to use were the data from Moray West Site plus a 2 km buffer and the suitable density selected was 21.79 birds.km^{-2}. As can be seen from the data comparison with Moray East (Figure 3.2, Table 3.1), this density appears reasonable, even though it's higher than other non-breeding season data. The resulting recommended input abundance was 8,217 birds.

3.2 Razorbill sitting densities

61 Initial comparison of the densities of razorbill in the Moray West Site plus 4 km buffer was made with the monthly densities of razorbills from boat-based surveys of Moray East (Table 3.7). These showed that estimated densities were variable across the year, but the Moray West data was similar to the range of densities estimated in Moray East. There was no overlap between the confidence intervals of the Moray West razorbill densities in September and March and the densities from boat-based surveys in Moray East in Year 1 and Year 2 (Figure 3.6).

62 Densities were predicted from MRSea analyses of the spatial densities of birds across the Moray West Site plus 4 km buffer. In all months there were sufficient sightings of razorbills to successfully run the model. There were insufficient data for MRSea to provide results for November, January and February, so densities were estimated using the mean of the transect density

63 Densities of sitting razorbills from the boat-based surveys of Moray East were estimated using design-based Distance sampling (Thomas *et al.* 2010). Boat-based surveys were undertaken in Moray East from April 2010 to March 2012.

Table 3.7 Comparison of Moray West Site plus 4 km buffer MRSea predicted densities of razorbills on the water with calculated densities of razorbill from boat-based surveys of Moray East in Year 1 and Year 2.

Survey platform/Model	DVAS/MRSea	Boat-based/Design-based	
Month	MW density	Moray East (Year 1)	Moray East (Year 2)
April	0.00	1.30 (0.66 – 2.59)	7.44 (5.46 – 10.14)
May	1.04 (0.81 – 1.81)	29.91 (19.22 – 46.55)	4.59 (2.28 – 9.24)
June	0.79 (0.62 – 1.54)	1.14 (0.54 – 2.39)	1.40 (0.70 – 2.83)
July	7.44 (6.21 – 10.50)	0.13 (0.05 – 0.32)	2.28 (1.52 – 3.43)
August	8.87 (7.55 – 11.45)	0.08 (0.02 – 0.26)	26.97 (19.08 – 38.12)
September	20.59 (18.13 – 24.80)	1.40 (0.78 – 2.50)	6.70 (3.58 – 12.53)
October	0.49 (0.37 – 1.00)	0.06 (0.02 – 0.25)	0.12 (0.02 – 0.63)
November	0.06 (0.00 – 0.13)*	0.06 (0.01 – 0.38)	0.16 (0.07 – 0.39)
December	0.00	0.13 (0.02 – 0.74)	0.52 (0.11 – 2.42)
January	0.49 (0.19 – 0.83)*	0.71 (0.24 – 2.12)	1.00 (0.40 – 2.50)
February	1.49 (0.16 – 3.98)*	0.56 (0.24 – 1.33)	0.59 (0.29 – 1.20)
March	9.51 (7.70 – 45.18)	1.63 (0.98 – 2.71)	1.50 (0.78 – 2.89)
* Density estimated using mean of transect density			

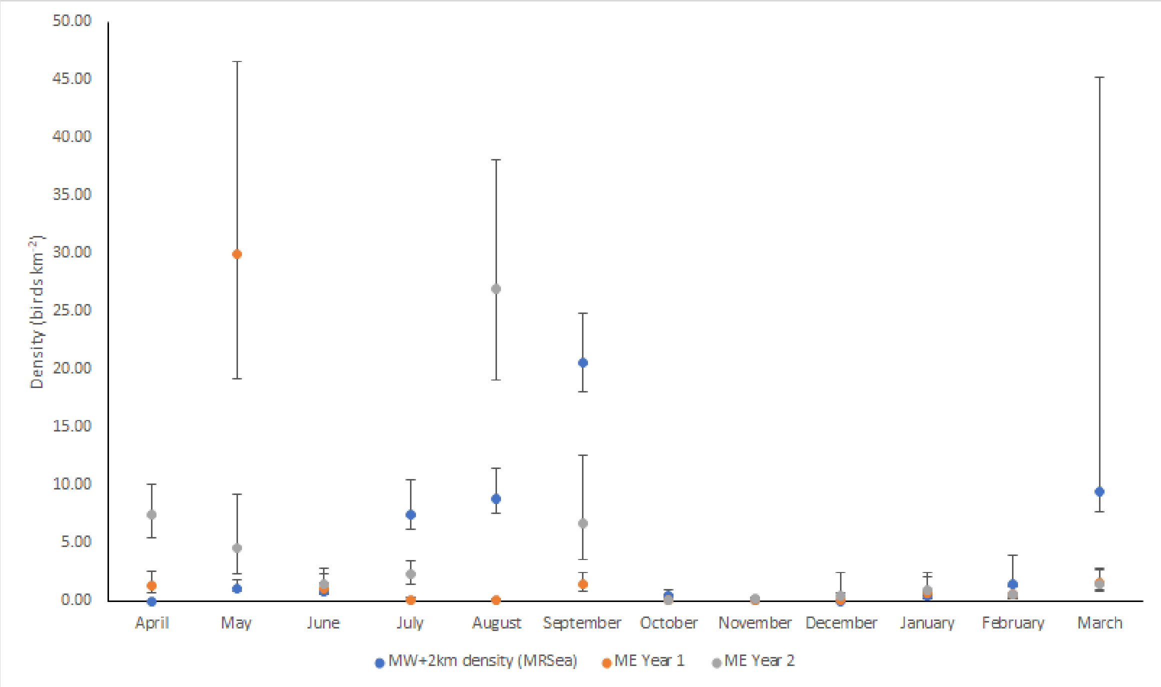

Figure 3.6 Comparison of Moray West Site plus 4 km buffer MRSea predicted densities of razorbills on the water with calculated densities of razorbills from boat-based surveys of Moray East in Year 1 and Year 2.

3.2.1 Breeding season

64 The relative spatial density of razorbills from the Moray West Site plus 4 km buffer MRSea predictions were mapped. Relative aerial densities were mapped for May to July using relative monthly densities (Figure 3.7) and relative seasonal densities (Figure 7.7). There were too few data to parameterise the MRSea model, and therefore there was no density surface map. There was variability in the spatial abundance between months. In May there was a large hotspot of birds in the western part of the Moray West Site plus 4 km buffer, while in June there was a smaller hotspot in the western part of the Moray West Site plus 4 km buffer, and two smaller, discrete hotspots in the east of the Moray West Site plus 4 km buffer. In July there was a larger hotspot in the south-west of the Moray West Site plus 4 km buffer, extending north-east and becoming more diffuse towards the central part of the Moray West Site plus 4 km buffer, which was similar to the pattern shown by guillemot, suggesting a multi-species aggregation had occurred.

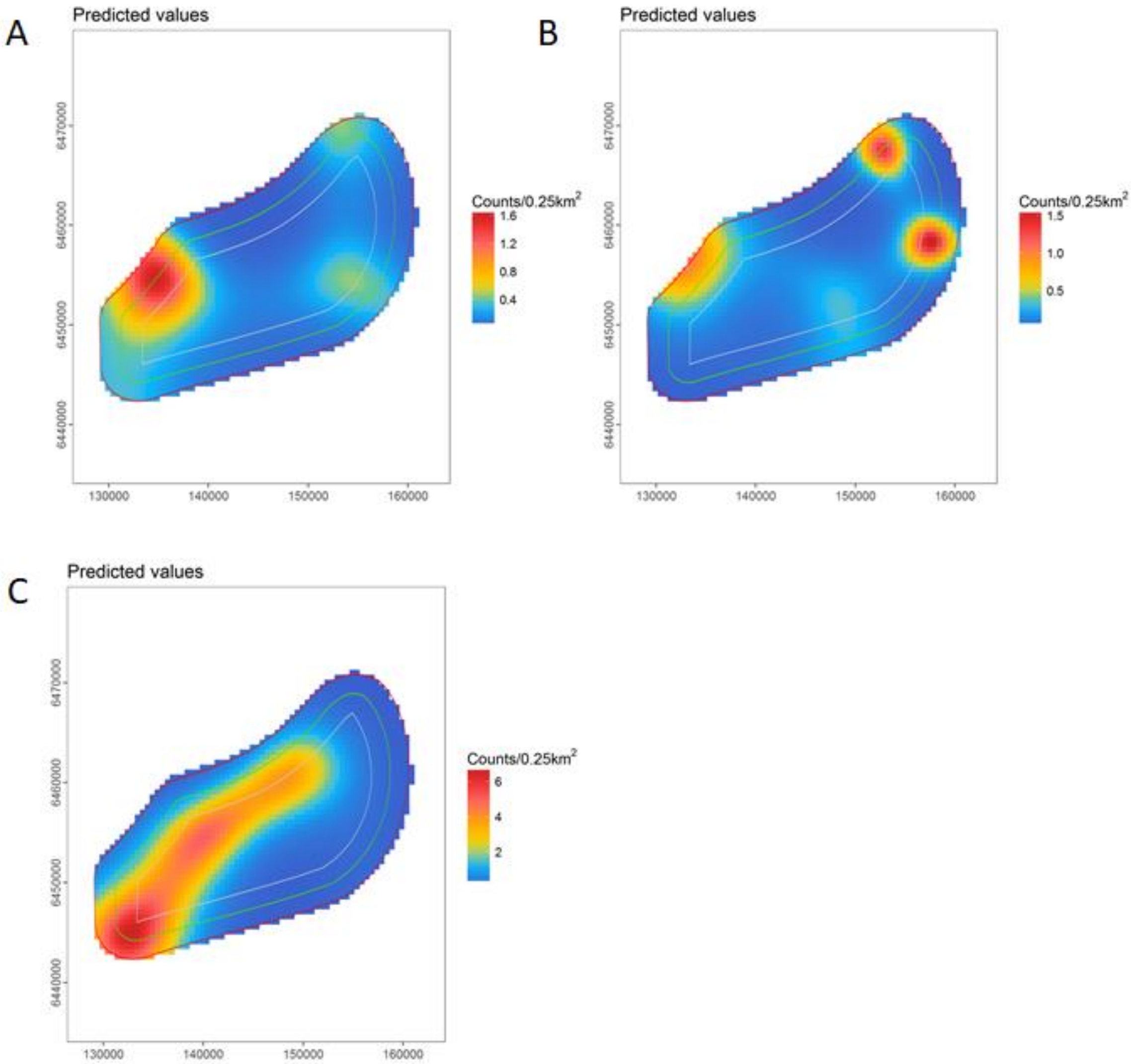

Figure 3.7 Relative densities of razorbills on the water predicted by MRSea in: A = May, B = June, C = July.

65 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.8 Densities of razorbills on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Sirte plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
April	0.00	No survey	0.00	No data	
May	0.11 (0.10 – 0.12)	1.29 (0.64 – 1.93)	0.91 (0.86 – 0.96)	No data	1.04 (0.81 – 1.81)
June	0.17 (0.15 – 0.19)	2.38 (0.27 - 4.95)	0.97 (0.88 – 1.07)	No data	0.79 (0.62 – 1.54)
June	-	3.70 (0.39 – 7.91)	-	No data	-
July	1.48 (1.39 – 1.58)	0.70 (0.00 – 1.78)	2.16 (1.99 – 2.34)	No data	7.44 (6.21 – 10.50)
July	--	0.74 (0.26 – 1.33)	-	No data	-

66 For each comparison, Table 3.9 provides the node in the decision support system passed and the density estimate selected. This shows that the higher of the selected densities was from the comparison between the Moray West and BOWL data within the overlap of the two surveys. This value (2.59 birds.km^{-2}), based on the mean of the Moray West and BOWL overlap data, was lower than the density across the Moray West Site plus 2 km buffer (7.44 birds.km^{-2}), so this was selected as the preferred, precautionary, input. This density was then extrapolated to the Moray West Site plus 2 km buffer area (377 km^{2}), resulting in a recommended input abundance of 2,808 birds.

Table 3.9 Node path through the decision support flow chart comparing Moray West (MW) and BOWL and, Moray West and Moray East (ME) overlap data.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
MW & BOWL	X			X					2	2.59
MW & ME									n/a	2.16

3.2.2 Post-breeding season

67 The relative aerial densities were mapped for August and September using relative monthly densities (Figure 3.8) and relative seasonal densities (Figure 7.8). There was variability in the spatial abundance between the two months. In August, there was a large, distinct hotspot of birds across the centre of the Moray West Site plus 4 km buffer, while in September there was a small hotspot, but with very high densities, on the northern boundary of the Moray West Site plus 4 km buffer. These were very similar patterns to guillemot spatial abundance.

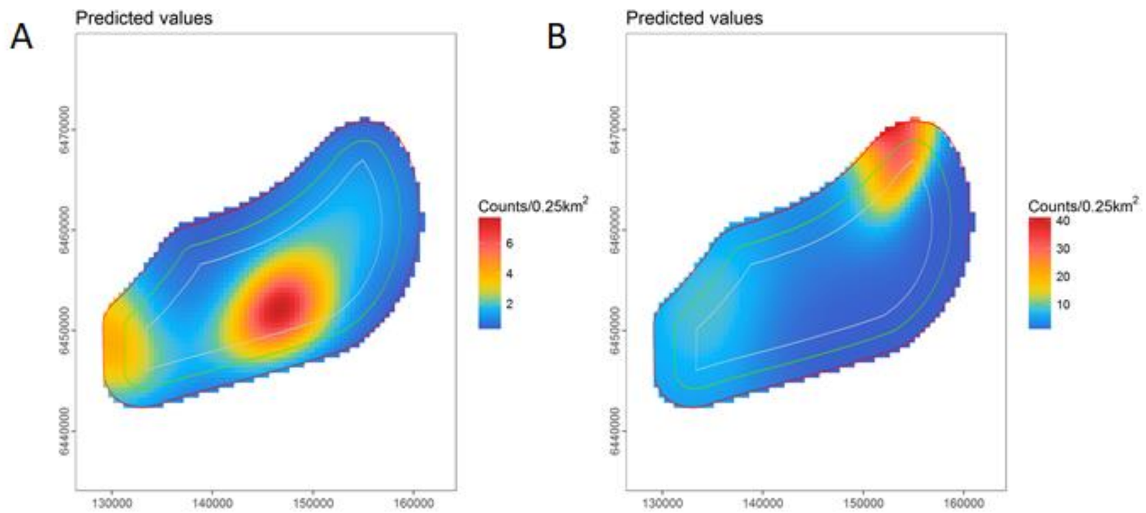

Figure 3.8 Relative densities of razorbills on the water predicted by MRSea in: A = August, B = September.

68 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.10 Densities of razorbills on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West (Site plus 4 km buffer lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
August	5.58 (5.27 – 5.92)	0.00	8.03 (7.62 – 8.50)	7.07 (6.81 – 7.30)	8.87 (7.55 – 11.45)
September	37.59 (35.02 – 40.40)	No survey	18.03 (14.99 – 21.54)	No data	20.59 (18.13 – 24.80)

69 For each comparison, Table 3.11 provides the node in the decision support system passed and the density estimate selected. However, in the absence of a DSM from Moray East from which a density could be calculated, the only valid comparison with between Moray West and BOWL, in the overlap. This value (37.59 birds.km^{-2}) was higher than the density across the Moray West Site plus 2 km buffer (20.59 birds.km^{-2}). Consequently, the estimate from Moray West in the overlap with the BOWL survey area was selected as the preferred, precautionary, input. This density was then extrapolated to the Moray West Site plus 2 km buffer area (377 km^{2}), resulting in a recommended input abundance of 14,176 birds.

Table 3.11 Node path through the decision support flow chart comparing Moray West (MW) and BOWL and, Moray West and Moray East (ME) overlap data.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
MW & BOWL		X			X				3	37.59
MW & ME		X			X				3	18.03

3.2.3 Non-breeding season

70 The relative densities were mapped from in October (Figure 3.9). Due to a lack of observations in November and December, it was not possible to predict densities of razorbills using MRSea. In October, densities were concentrated around the southern boundary of the Moray West Site plus 4 km buffer, with lower densities across the remainder of the area.

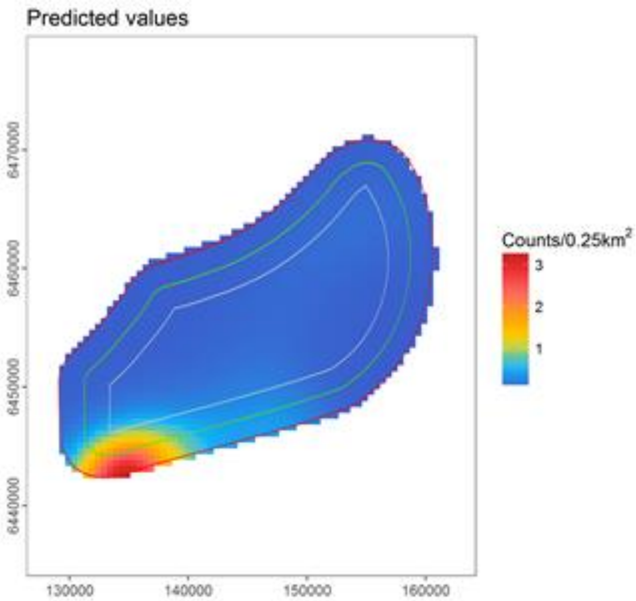

Figure 3.9 Relative densities of razorbills on the water predicted by MRSea in October.

71 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.12 Densities of razorbills on the water in the Moray Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
October	0.05 (0.05 – 0.05))	No survey	0.19 (0.17 – 0.20)	No data	0.49 (0.37 – 1.00)

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
November	0	No survey	0	No data	0.06 (0.00 – 0.13)*
December	0	No survey	0	No data	0
* Density estimated using mean of transect density					

72 As there were no suitable comparison data in either the overlap with BOWL or Moray East, the only suitable data were from Moray West. Therefore, the most suitable data to use were the data from Moray West Site plus 2 km buffer and the suitable density selected was 0.06 birds.km^{-2}. As can be seen from the data comparison with Moray East (Figure 3.6, Table 3.7), this density appears reasonable, as densities were low in both Moray East and BOWL during these non-breeding season months. The resulting recommended input abundance was 184 birds.

3.2.4 Pre-breeding season

73 The relative densities were mapped for October (Figure 3.10). Due to a lack of observations in January and February, it was not possible to predict densities of razorbills using MRSea. In March, densities were concentrated in a large hotspot in the centre of the Moray West Site plus 4 km buffer, with lower densities across the remainder of the area.

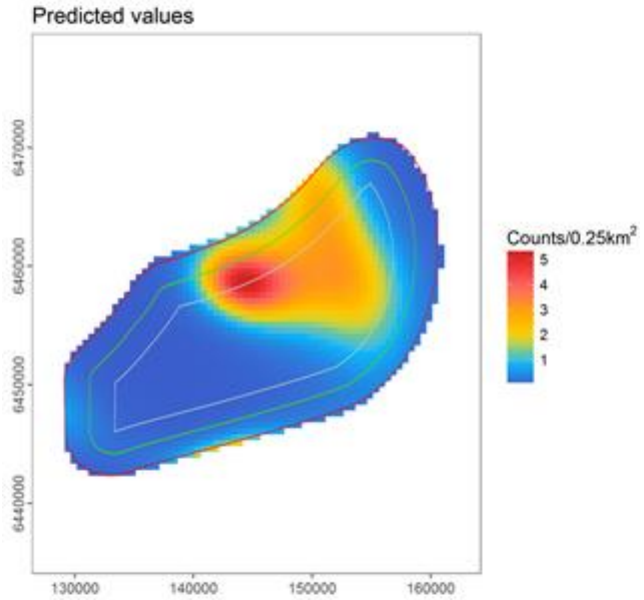

Figure 3.10 Relative densities of razorbills on the water predicted by MRSea in March.

74 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.13 Densities of razorbills on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
January	0	No survey	0	No data	0.49 (0.19 – 0.83)*
February	0	No survey	0	No data	1.49 (0.16 – 3.98)*
March	1.99 (1.90 – 2.09)	No survey	6.68 (6.31 – 7.05)	No data	9.51 (7.70 – 45.18)
* Density estimated using mean of transect density					

75 As there were no suitable comparison data in either the overlap with BOWL or Moray East, the only suitable data were from Moray West. Therefore, the most suitable data to use were the data from Moray West plus 2 km buffer and the suitable density selected was 9.51 birds.km^{-2}. As can be seen from the data comparison with Moray East (Figure 3.6, Table 3.7), this density appears reasonable, as densities were also low in both Moray East and BOWL during these non-breeding season months, and the March value for Moray West was higher than those of Moray East or BOWL in the pre-breeding season months. The resulting recommended input abundance was 3,585 birds.

3.3 Puffin sitting densities

76 Initial comparison of the densities of puffin in the Moray West Site plus 4 km buffer was made with the monthly densities of puffins from boat-based surveys of Moray East (Table 3.7). These showed that estimated densities were variable across the year, but the Moray West data was largely similar to the range of densities estimated in Moray East. There was no overlap between the confidence intervals of the Moray West Site plus 2 km buffer puffin densities in April and May and the densities from boat-based surveys in Moray East in Year 1 and Year 2 (Figure 3.11).

77 Densities were predicted from MRSea analyses of the spatial densities of birds across the Moray West Site plus 4 km buffer. There were sufficient observations to predict densities of puffins in Moray West Site plus 4 km buffer in June, July, August and September. In October, mean of transect densities were used to estimate densities. There were no observations in April and November to March.

78 Densities of sitting puffins from the boat-based surveys of Moray East were estimated using design-based Distance sampling (Thomas *et al.* 2010). Boat-based surveys were undertaken in Moray East from April 2010 to March 2012.

Table 3.14 Comparison of Moray West Site plus 4 km buffer MRSea predicted densities of puffins on the water with calculated densities of puffins from boat-based surveys of Moray East in Year 1 and Year 2.

Survey platform/Model	DVAS/MRSea	Boat-based/Design-based	
Month	MW density	Moray East (Year 1)	Moray East (Year 2)
April	0	1.18 (0.68 – 2.03)	8.58 (5.90 – 12.49)
May	0	16.22 (12.48 – 21.09)	5.79 (2.95 – 11.35)
June	0.44 (0.31 – 0.83)	0.70 (0.28 – 1.75)	2.03 (1.41 – 2.94)
July	0.62 (0.44 – 1.29)	1.05 (0.60 – 1.85)	5.34 (3.79 – 7.51)
August	4.80 (3.91 – 6.48)	3.37 (2.19 – 5.19)	21.22 (16.93 – 26.61)
September	1.53 (.125 – 2.16)	2.18 (1.60 – 2.98)	5.49 (3.36 – 8.97)
October	0.03 (0.00 – 0.08)*	0.34 (0.10 – 1.13)	0.37 (0.20 – 0.67)
November	0	0.22 (0.10 – 0.50)	0.09 (0.03 – 0.30)
December	0	0.18 (0.06 – 0.54)	0.31 (0.13 – 0.75)

Survey platform/Model	DVAS/MRSea	Boat-based/Design-based	
Month	MW density	Moray East (Year 1)	Moray East (Year 2)
January	0	0.09 (0.02 – 0.36)	0.03 (0.01 – 0.19)
February	0	0.03 (0.01 – 0.19)	0.60 (0.28 – 1.29)
March	0	0.16 (0.06 – 0.38)	0.34 (0.17 – 0.67)
* Density estimated using mean of transect density			

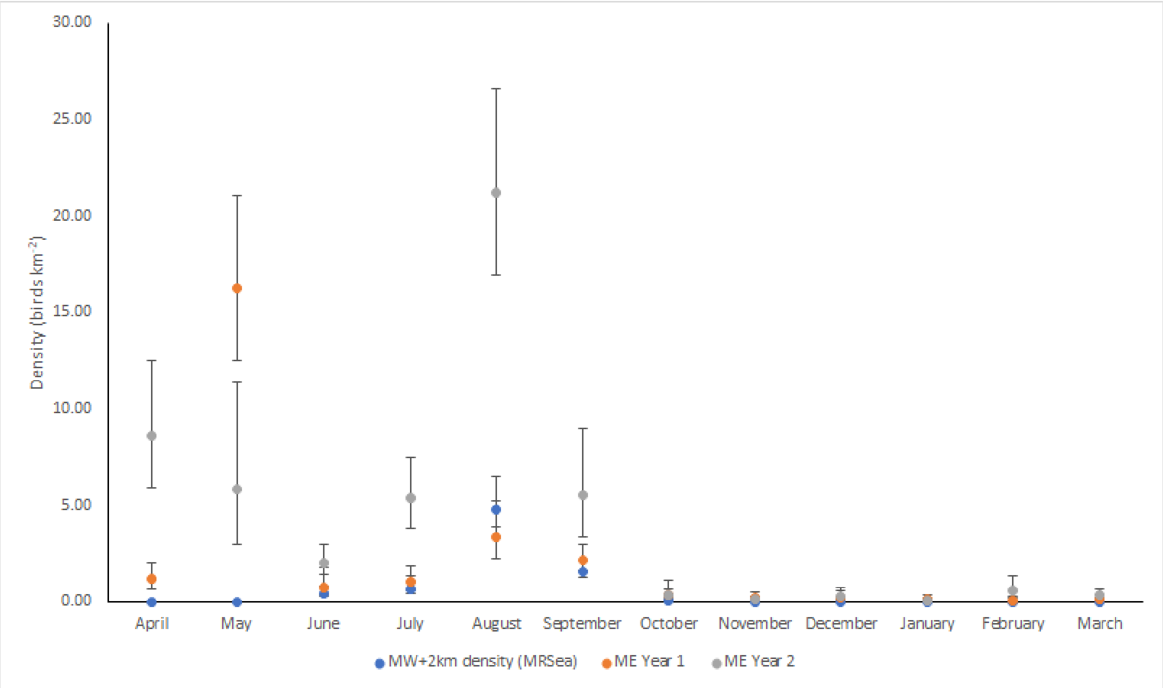

Figure 3.11 Comparison of Moray West Site plus 4 km buffer MRSea predicted densities of puffins on the water with calculated densities of puffins from boat-based surveys of Moray East in Year 1 and Year 2.

3.3.1 Breeding season

79 The relative spatial density of puffins from the Moray West MRSea predictions were mapped. Relative aerial densities were mapped for June and July using relative monthly densities (Figure 3.12) and relative seasonal densities (Figure 7.9). There were too few data to parameterise the MRSea model, and therefore there was no density surface maps for April or May. There was variability in the spatial abundance between months. In June there was a small hotspot of birds on the eastern boundary of the Moray West Site plus 4 km buffer, while in July there was a similar hotspot on the western boundary of the Moray West Site plus 4 km buffer.

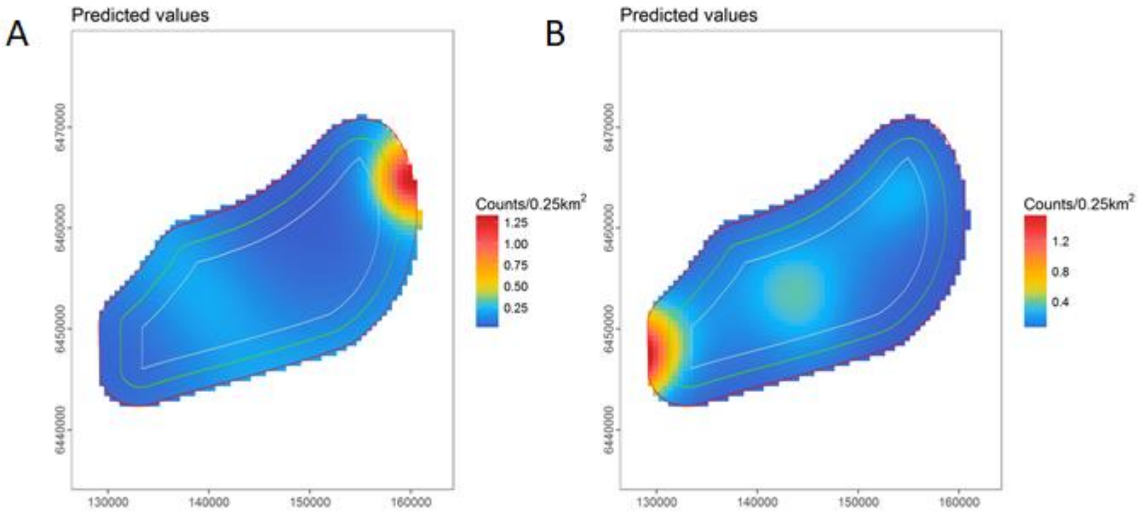

Figure 3.12 Relative densities of puffins on the water predicted by MRSea in: A = June, B = July.

80 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.15 Densities of puffins on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
April	0	No survey	0	No data	0
May	0	0.49 (0.25 – 0.76)	0	No data	0
June	0.13 (0.12 - -0.15)	2.96 (0.83 – 5.78)	0.42 (0.40 – 0.46)	No data	0.44 (0.31 – 0.83)
June	-	0.42 (0.00 – 0.99)	-	No data	-
July	0.14 (0.13 – 0.14)	0	0.49 (0.45 – 0.52)	No data	0.62 (0.44 – 1.29)

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
July	-	0	-	No data	-

81 For each comparison, Table 3.16 provides the node in the decision support system passed and the density estimate selected. This shows that the higher of the selected densities was from the comparison between the Moray West and BOWL data within the overlap of the two surveys. This value (2.96 birds.km^{-2}), based on the BOWL overlap data, was lower than the density across the Moray West Site plus 2 km buffer (0.44 birds.km^{-2}), so this was selected as the preferred, precautionary, input. This density was then extrapolated to the Moray West Site plus 2 km buffer area (377 km^{2}), resulting in a recommended input abundance of 1,115 birds.

Table 3.16 Node path through the decision support flow chart comparing Moray West (MW) and BOWL and, Moray West and Moray East (ME) overlap data.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
MW & BOWL		X				X		X	5	2.96
MW & ME									n/a	0.49

3.3.2 Post-breeding season

82 The relative aerial densities were mapped for August and September using relative monthly densities (Figure 3.13) and relative seasonal densities (Figure 7.10). There was variability in the spatial abundance between the two months. In August, there was a large, distinct hotspot of birds in the centre of the Moray West Site plus 4 km buffer, while in September there were two small hotspots on the northern boundary of the Moray West Site plus 4 km buffer.

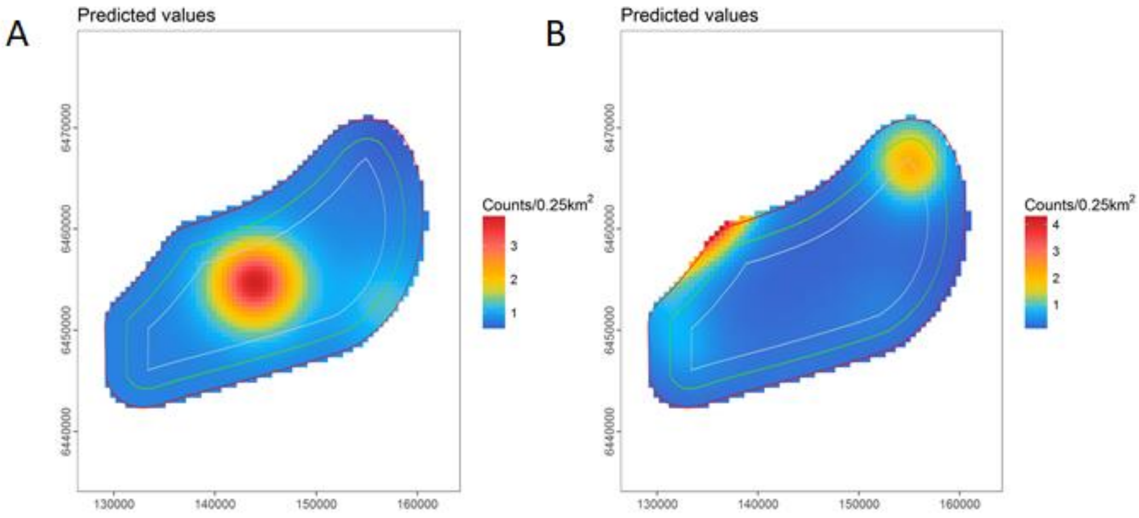

Figure 3.13 Relative densities of puffins on the water predicted by MRSea in: A = August, B = September.

83 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.17 Densities of puffins on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
August	1.09 (1.04 – 1.15)	10.51 (7.87 – 13.45)	3.51 (3.44 – 3.59)	5.07 (4.91 – 5.23)	4.80 (3.91 – 6.48)
September	0.62 (0.58 – 0.66)	No survey	2.16 (1.93 – 2.43)	No data	1.53 (1.25 – 2.16)

84 For each comparison, Table 3.18 provides the node in the decision support system passed and the density estimate selected. The highest density was from the comparison between Moray West and BOWL, where the August density from the BOWL survey was selected. This value (10.51 birds.km^{-2}) was higher than the density across the Moray West Site plus 2 km buffer (4.80 birds.km^{-2}).

Consequently, the estimate from Moray West in the overlap with the BOWL survey area was selected as the preferred, precautionary input. This density was then extrapolated to the Moray West plus 2 km buffer area (377 km^2), resulting in a recommended input abundance of 3,966 birds.

Table 3.18 Node path through the decision support flow chart comparing Moray West (MW) and BOWL and, Moray West and Moray East (ME) overlap data.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
MW & BOWL		X				X		X	5	10.51
MW & ME		X				X		X	5	5.07

3.3.3 Non-breeding season

85 Due to a lack of observations from October to March, it was not possible to predict densities of puffins using MRSea, so no density surface maps were produced.

86 There were no observations of puffins in the overlaps with either Moray East or BOWL in the non-breeding months (Table 3.19). There were only data from Moray West Site plus 2 km buffer, where there were birds observed in October, but not in any other months of the year.

Table 3.19 Densities of puffins on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
October	0	No survey	0	No data	0.03 (0.00 – 0.08)*
November	0	No survey	0	No data	0
December	0	No survey	0	No data	0

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
January	0	No survey	0	No data	0
February	0	No survey	0	No data	0
March	0	No survey	0	No data	0
* Density estimated using mean of transect density					

87 The most suitable data to use were the data from Moray West Site plus 2 km buffer and the suitable density selected was 0.03 birds.km^{-2}. As can be seen from the data comparison with Moray East (Figure 3.11,Table 3.14), this density appears reasonable, as densities were also very low in both years in Moray East during these non-breeding season months. The resulting recommended input abundance was 12 birds.

3.4 Kittiwake sitting densities

88 Initial comparison of the densities of kittiwakes in the Moray West Site plus 4 km buffer was made with the monthly densities of kittiwakes from boat-based surveys of Moray East (Table 3.20). These showed that estimated densities were variable across the year, but the Moray West data was largely similar to the range of densities estimated in Moray East. There was no overlap between the confidence intervals of the Moray West kittiwake densities in August only and the densities from boat-based surveys in Moray East in Year 1 and Year 2 (Figure 3.14). However, many density estimates had extremely large confidence intervals (Table 3.20).

89 Moray West densities were predicted from MRSea analyses of the spatial densities of birds across the Site plus 4 km buffer. There were sufficient observations to predict densities of kittiwakes in Moray West Site plus 4 km buffer in all months except October and February. There were no observations of sitting kittiwakes in January. In October and February mean of transect densities were used to estimate densities.

90 Densities of sitting kittiwakes from the boat-based surveys of Moray East were estimated using design-based Distance sampling (Thomas *et al.* 2010). Boat-based surveys were undertaken in Moray East from April 2010 to March 2012.

Table 3.20 Comparison of Moray West Site plus 4 km buffer MRSea predicted densities of kittiwakes on the water with calculated densities of kittiwakes from boat-based surveys of Moray East in Year 1 and Year 2.

Survey platform/Model	DVAS/MRSea	Boat-based/Design-based	
Month	MW density	Moray East (Year 1)	Moray East (Year 2)
April	0	3.68 (1.10 – 12.33)	12.49 (4.74 – 32.88)
May	1.68 (1.30 – 2.64)	37.61 (15.81 – 89.45)	19.55 (2.48 – 154.00)
June	8.57 (6.10 – 16.37)	1.00 (0.13 – 7.97)	0.89 (0.16 – 4.85)
July	5.18 (3.84 – 9.55)	0.13 (0.05 – 0.35)	1.73 (0.79 – 3.81)
August	10.62 (7.71 – 16.93)	0.05 (0.02 – 0.16)	1.85 (0.70 – 4.90)
September	3.90 (2.63 – 28.81)	0.03 (0.00 – 0.16)	0.08 (0.02 – 0.32)
October	0.10 (0.00 – 0.22)*	0.03 (0.00 – 0.15)	0.21 (0.05 – 0.84)
November	0.56 (0.34 – 53.69)	0	0
December	0.97 (0.65 – 3.68)	0.03 (0.00 – 0.15)	0.07 (0.01 – 0.41)
January	0	0.24 (0.07 – 0.84)	0.03 (0.00 – 0.15)
February	1.17 (0.00 – 3.07)*	1.59 (0.76 – 3.32)	0
March	2.85 (2.10 – 4.44)	6.90 (2.96 – 16.08)	1.81 (0.79 – 4.11)
* Density estimated using mean of transect density			

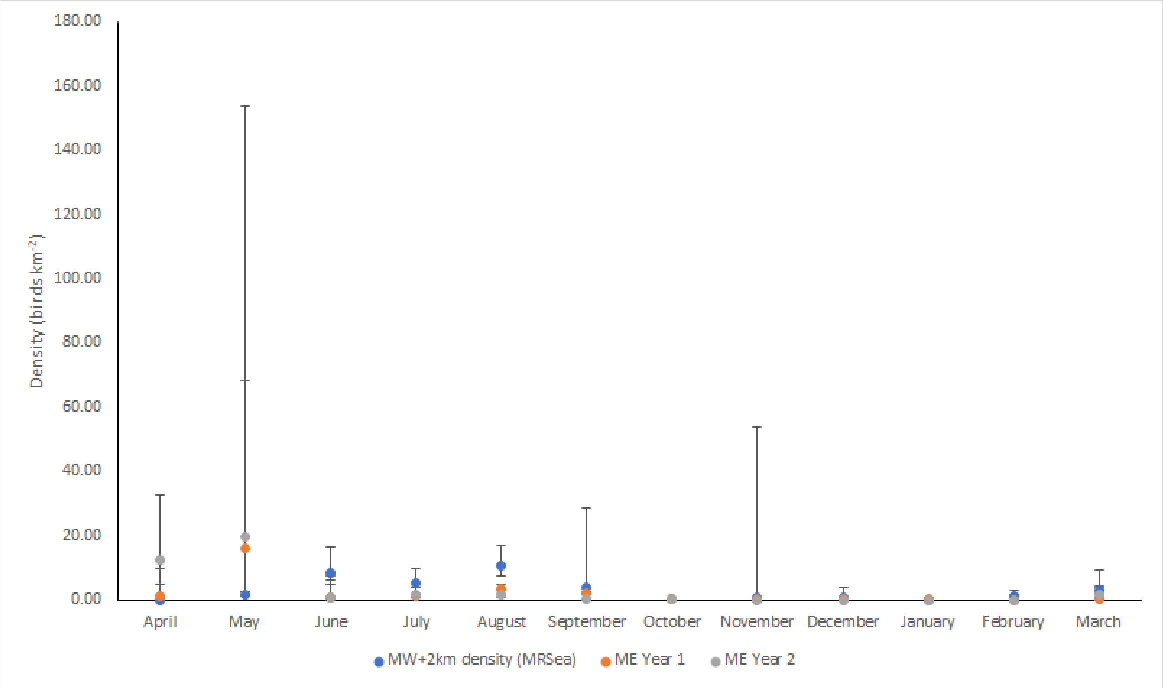

Figure 3.14 Comparison of Moray West Site plus 4 km buffer MRSea predicted densities of kittiwakes on the water with calculated densities of kittiwakes from boat-based surveys of Moray East in Year 1 and Year 2.

3.4.1 Breeding season

91 The relative spatial density of kittiwakes from the Moray West MRSea predictions were mapped. Relative aerial densities were mapped for June and July using relative monthly densities (Figure 3.15) and relative seasonal densities (Figure 7.11). There were too few data to parameterise the MRSea model, and therefore there was no density surface maps for April. There was variability in the spatial abundance between months. In May there was a small discrete hotspot of birds on the western boundary of the Moray West Site plus 4 km buffer, while in July there was a similar, but larger, hotspot also on the western boundary of the Moray West Site plus 4 km buffer. In August there were two small discrete hotspots in the central part of the Moray Wesy Site plus 4 km buffer. One nearer the northern boundary was more defined, with higher densities, then the other, which was further west. In September there was a large, well defined hotspot across the centre of the Moray West Site plus 4 km buffer.

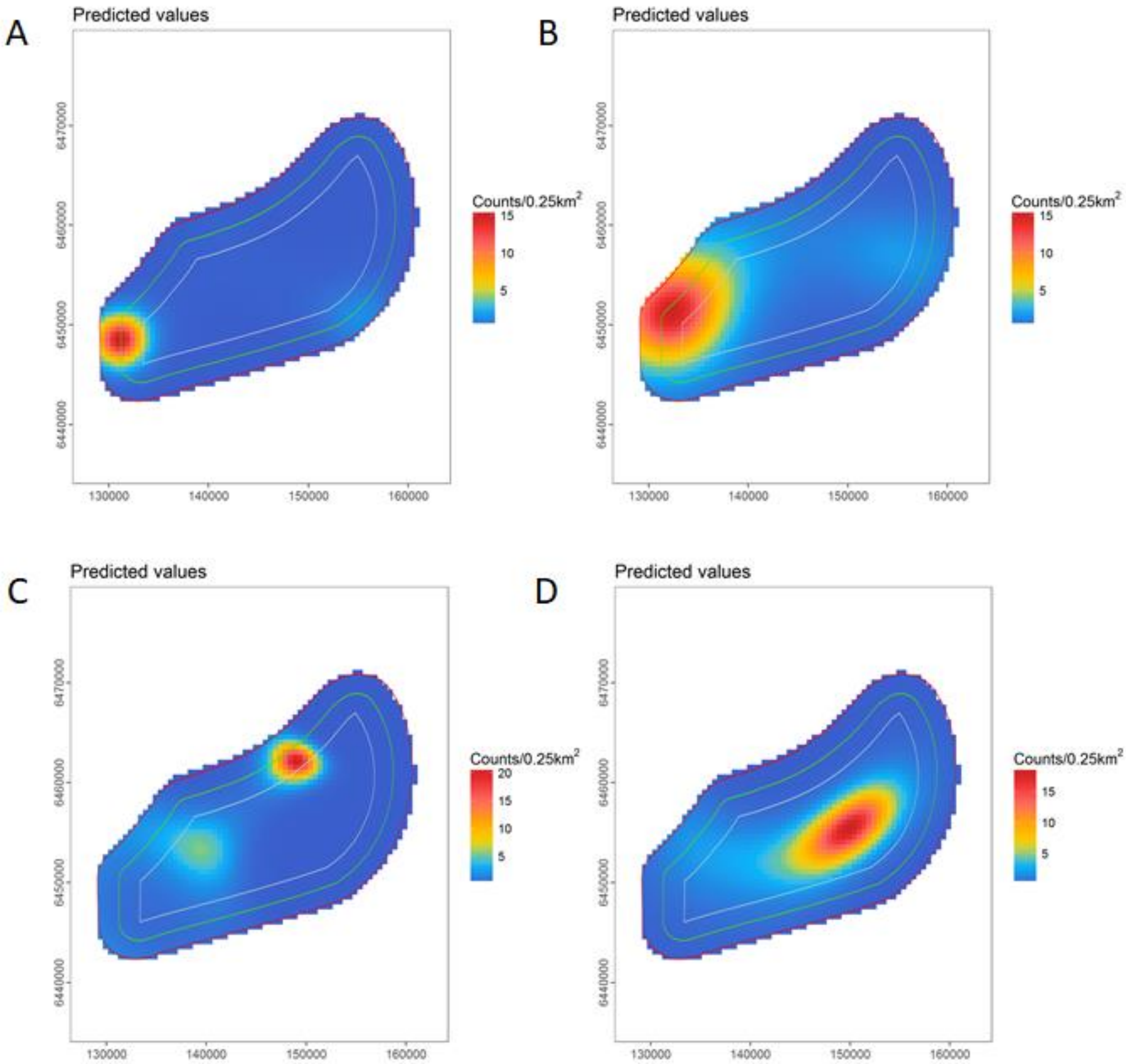

Figure 3.15 Relative densities of kittiwakes on the water predicted by MRSea in: A = May, B = June, C = July, D = August.

92 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.21 Densities of kittiwakes on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
April	0	No survey	0	No data	0
May	0.03 (0.03 – 0.03)	0.39 (0.00 – 1.04)	0.39 (0.32 – 0.47)	9.49 (8.16 – 10.92)	1.68 (1.30 – 2.64)
June	0.62 (0.58 – 0.66)	23.57 (0.69 – 61.14)	3.59 (3.34 – 3.86)	No data	8.57 (6.10 – 16.37)
June	-	3.24 (0.69 – 6.90)	-	No data	-
July	1.54 (1.31 – 1.82)	5.40 (0.30 – 13.33)	0.11 (0.07 – 0.17)	No data	5.18 (3.84 – 9.55)
July	-	35.06 (16.70 – 57.17)	-	No data	-
August	1.35 (1.17 – 1.57)	4.32 (0.50 – 9.16)	17.95 (15.85 – 20.31)	No data	10.62 (7.71 – 16.93)

93 For each comparison, Table 3.22 provides the node in the decision support system passed and the density estimate selected. This shows that the higher of the selected densities was from the comparison between the Moray West and BOWL data within the overlap of the two surveys. This value (18.30 birds.km^{-2}), based on the mean of the Moray West peak and the BOWL peak in the overlap, was higher than the density across the Moray West Site plus 2 km buffer (10.62 birds.km^{-2}), so this was selected as the preferred, precautionary, input. This density was then extrapolated to the Moray West Site plus 2 km buffer area (377 km^2), resulting in a recommended input abundance of 6,902 birds.

Table 3.22 Node path through the decision support flow chart comparing Moray West (MW) and BOWL and, Moray West and Moray East (ME) overlap data.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
MW & BOWL		X				X	X		4	18.30
MW & ME		X			X				3	17.95

3.4.2 Post-breeding season

94 The relative aerial densities were mapped for September, November and December using relative monthly densities (Figure 3.16) and relative seasonal densities (Figure 7.12). There were too few data to parameterise the MRSea model for October. There was similarity in the spatial abundance across the three months with data. In September, there was a small, discrete hotspot of birds on the northern boundary of the Moray West Site plus 4 km buffer, which was similar in November. In December there was a small, well defined hotpot, also along the northern boundary of the Moray West Site plus 4 km buffer.

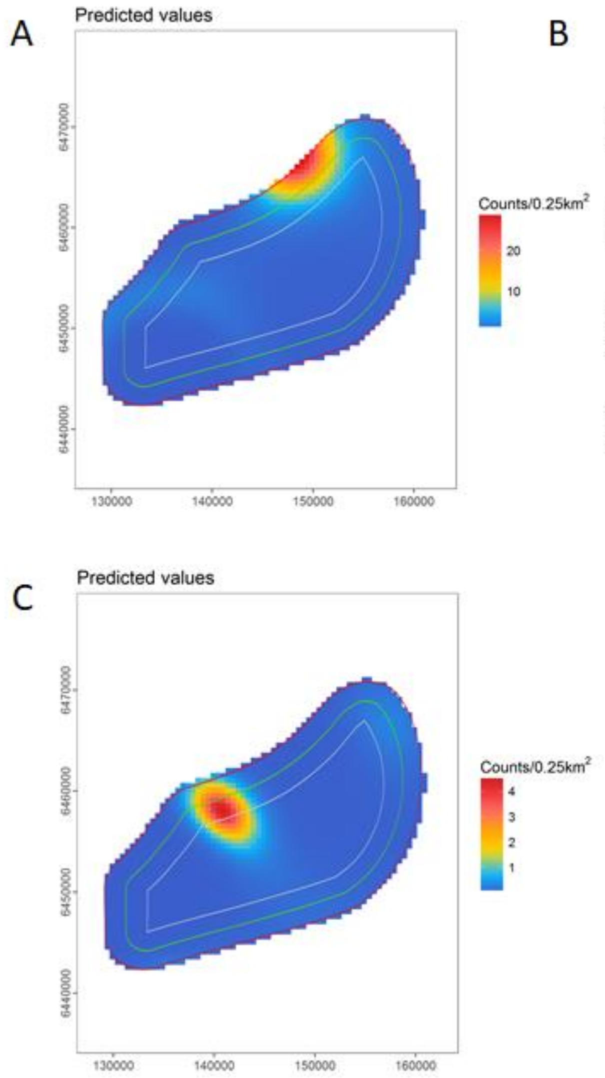

Figure 3.16 Relative densities of kittiwakes on the water predicted by MRSea in: A = September, B = November, C = December.

95 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.23 Densities of kittiwakes on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
September	3.50 (3.12 – 3.92)	No survey	3.09 (2.66 – 3.61)	No data	3.90 (2.63 – 28.81)
October	0	No survey	0	No data	0.10 (0.00 – 0.22)*
November	0.29 (0.26 – 0.32)	No survey	0.03 (0.02 – 0.03)	No data	0.56 (0.34 – 53.69)
December	0.40 (0.34 – 0.46)	No survey	0.16 (0.14 – 0.18)	No data	0.97 (0.64 – 3.68)
* Density estimated using mean of transect density					

96 With no data from Moray East or BOWL in the overlap areas there were no comparisons possible. Consequently, the density of birds from the Moray West aerial surveys was selected. This value (3.90 birds.km^{-2}) was not dissimilar from the densities in the post-breeding months in either years of boat-based survey of Moray East (Figure 3.14, Table 3.20). Consequently, the estimate from Moray West Site plus 2 km buffer was selected as the preferred, precautionary, input. This density was then extrapolated to the Moray West Site plus 2 km buffer area (377 km^2), resulting in a recommended input abundance of 1,470 birds.

3.4.3 Pre-breeding season

97 The relative densities were mapped for March (Figure 3.17). Due to a lack of observations in January and February, it was not possible to predict densities of kittiwakes using MRSea. In March, densities were concentrated in a small, discrete hotspot in the centre of the Moray West Site plus 4 km buffer, with lower densities across the remainder of the area.

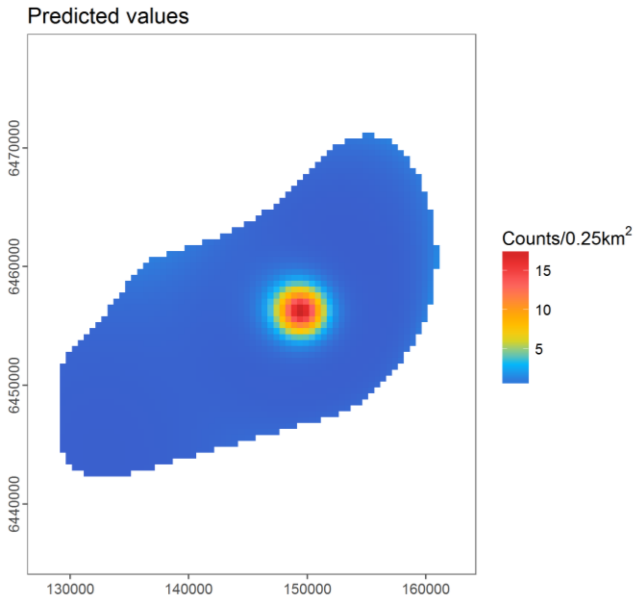

Figure 3.17 Relative densities of kittiwakes on the water predicted by MRSea in March.

98 The data selection process followed the same approach as the breeding season guillemot process.

Table 3.24 Densities of kittiwakes on the water in the Moray West Site plus 4 km buffer (and upper and lower 95% confidence intervals). Seasonal peak values for each data set is highlighted in grey.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site plus 2 km buffer density (lower – upper 95% CI)
Survey platform	Digital aerial	Digital aerial	Digital aerial	Boat	Digital aerial
January	0	No survey	0	No data	0
February	0	No survey	0	No data	1.17 (0.00 – 3.07)*
March	0.88 (0.75 – 1.05)	No survey	3.04 (2.30 – 4.07)	No data	2.85 (2.10 – 4.44)
* Density estimated using mean of transect density					

99 As there were no suitable comparison data in either the overlap with BOWL or Moray East, the only suitable data were from Moray West. Therefore, the most suitable data to use were the data from Moray West Site plus 2 km buffer and the suitable density selected was 2.85 birds.km^{-2}. As can be seen from the data comparison with Moray East (Figure 3.14, Table 3.20), this density appears reasonable, as densities were also low in both Moray East and BOWL during these pre-breeding season months, and the March value for Moray West was higher than those of Moray East or BOWL in the pre-breeding season months. The resulting recommended input abundance was 1,074 birds.

4 Summary

101 A decision support system was applied to all of the key species from the Moray West Site plus 4 km buffer to select suitable data for use in impact assessment models. This successfully provided suitably precautionary input values that helped account for the lack of inter-annual information from one year of digital aerial survey data.

102 The selected aerial densities for each species, in each month, are summarised in Table 4.1. These data were suitable as input values to the Band (2012) CRM.

Table 4.1 Summary of the selected 'aerial density' estimates for application to the collision risk model.

Month	Kittiwake	Gannet	Herring gull	Great black-backed gull
April	0.21	0.00	0.00	0.00
May	2.49	0.27	0.00	0.00
June	11.14	0.66	0.99	0.07
July	19.67	0.10	0.20	0.07
August	2.38	0.21	0.14	0.29
September	2.21	1.49	0.00	0.52
October	1.61	0.28	0.00	0.15
November	3.49	0.40	0.00	0.00
December	2.15	0.05	0.00	0.00
January	0.36	0.00	0.05	0.00
February	0.67	0.00	0.10	0.00
March	1.48	0.20	0.00	0.00

The selected abundances of birds on the water for each species, in each season, are summarised in Table 4.2. These data are suitable to inform the input values for the displacement matrices used in impact assessment.

Table 4.2 Summary of the selected abundance estimates for application to the matrices used in displacement assessment.

Species	Season	Abundance
Guillemot	Breeding season	24,426
	Post-breeding season	38,174

Species	Season	Abundance
	Non-breeding season	8,217
Razorbill	Breeding season	2,808
	Post-breeding season	3,544
	Non-breeding season	184
	Pre-breeding season	3,585
Puffin	Breeding season	1,115
	Post-breeding season	3,966
	Non-breeding season	12
Kittiwake	Breeding season	6,902
	Post-breeding season	1,470
	Pre-breeding season	1,074

5 References

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6 Annex A – summary information

Table 6.1 Aerial densities of kittiwakes in the Moray West Site plus 4 km buffer, BOWL in the overlap with Moray West (and upper and lower 95% confidence intervals) and Moray East. Selected aerial densities for CRM are shown, along with the path through the DSS flow chart and reasons for selecting the final value. Breeding season = green, post-breeding season = yellow, pre-breeding season = blue.

	Moray West Site and 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site and 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East	Selected aerial density	DSS path	Reasoning
Month	**MRSea**	**Mean of transect density**	**MRSea**	**None**	-	-	-
April	0	No survey	0.21 (0.00 – 0.54)*	0.825	0.21	n/a	Both ME values and BOWL = 0. Use MW WF KDE estimate
May	0.64 (0.62 – 0.66)	2.49 (1.2 – 4.07)	1.43 (1.04 – 2.30)	0.769	2.49	N.2, N.6, Est.4 (BOWL data)	-
June	5.05 (4.91 – 5.21)	10.52 (1.13 – 24.23) 21.64 (4.62 – 45.83)	4.76 (3.72 – 6.74)	0.594	11.14	N.1, N.4, Est. 2 (Mean of all)	Density extremely high due to overlap hotspot. Select higher density from wider area analysis. Recommend using 7.53 birds.km-2
July	3.17 (3.10 – 3.24)	9.08 (4.92 – 14.28) 30.25 (15.19 – 48.8)	3.35 (2.70 – 4.61)	0.669	19.67	N.2, N.6, Est.4 (Mean of BOWL data)	Density extremely high due to overlap hotspot. Select higher density from wider area analysis. Recommend using 7.63 birds.km-2

	Moray West Site and 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site and 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East	Selected aerial density	DSS path	Reasoning
Month	**MRSea**	**Mean of transect density**	**MRSea**	**None**	**-**	**-**	**-**
August	2.92 (2.79 – 3.06)	4.03 (0.93 – 8.42)	5.38 (3.78 – 8.98)	0.128	2.38	N.1, N.4, Est. 2 (Mean of MW & BOWL overlap)	-
September	4.17 (3.90 – 4.50)	No survey	2.21 (1.65 – 3.45)	0.111	2.21	n/a	No BOWL data, use MW WF data
October	1.17 (1.15 – 1.19)	No survey	1.61 (1.28 – 2.17)	0.134	1.61	n/a	No BOWL data, use MW WF data
November	2.84 (2.80 – 2.87)	No survey	3.49 (2.92 – 4.34)	0.078	3.49	n/a	No BOWL data, use MW WF data
December	2.25 (2.09 – 2.43)	No survey	2.15 (1.62 – 3.10)	0.078	2.15	n/a	No BOWL data, use MW WF data
January	n/a	No survey	0.36 (0.13 – 0.67)*	0.178	0.36	n/a	No BOWL data, use MW WF data
February	n/a	No survey	0.67 (0.27 – 1.26)*	0.111	0.67	n/a	No BOWL data, use MW WF data
March	3.15 (3.03 – 3.28)	No survey	1.48 (1.12 – 2.10)	0.457	1.48	n/a	No BOWL data, use MW WF data
* Density estimated using mean of transect density							

Table 6.2 Aerial densities of gannets in the Moray West Site plus 4 km buffer, BOWL in the overlap with Moray West (and upper and lower 95% confidence intervals) and Moray East. Selected aerial densities for CRM are shown, along with the path through the DSS flow chart and reasons for selecting the final value. season = green, non-breeding season = blue.

	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East	Selected aerial density	DSS path	Reasoning
Month	**MRSea**	**Mean of transect density**	**MRSea**	**None**	-	-	-
March	0	No survey	0.20 (0.00 – 0.49)*	0.223	0.20	-	MW WF KDE result as none in overlap
April	0	No survey	0	0.163	0	-	No birds seen in MW or BOWL
May	0	0.48 (0.00 – 1.19)	0.05 (0.00 – 0.13)*	0.078	0.27	N.1, N.4, Est.2.	Mean of BOWL overlap and MW WF KDE
June	0	0.72 (0.11 – 1.51) 0.60 (0.22 – 1.08)	0	0.141	0.66	-	Only BOWL data. Average of both estimates
July	0	0 0.24 (0.00 – 0.65)	0.05 (0.00 – 0.18)*	0.223	0.10	N.1, N.4, Est.2.	Mean of BOWL overlap and MW WF KDE
August	0	0.12 (0.00 – 0.32)	0.21 (0.04 – 0.45)*	0.217	0.21	N.1, N.3, est.1.	Use MW WF KDE
September	3.17 (3.03 – 3.32)	No survey	1.49 (1.10 – 2.30)	0.357	1.49	-	Only MW data, use MW WF densities

	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East	Selected aerial density	DSS path	Reasoning
Month	**MRSea**	**Mean of transect density**	**MRSea**	**None**	-	-	-
October	0.11 (0.10 – 0.83)	No survey	0.28 (0.16 – 0.74)	0.323	0.28	-	Only MW data, use MW WF densities
November	0.09 (0.09 – 0.09)	No survey	0.40 (0.24 – 0.90)	0.156	0.40	-	Only MW data, use MW WF densities
December	n/a	No survey	0.05 (0.00 – 0.13)*	0.033	0.05	-	Only MW data, use MW WF densities
January	0	No survey	0	0.134	0	-	No birds seen in MW or BOWL
February	0	No survey	0	0.123	0	-	No birds seen in MW or BOWL

* Density estimated using mean of transect density

Table 6.3 Aerial densities of herring gulls in the Moray West Site plus 4 km buffer, BOWL in the overlap with Moray West (and upper and lower 95% confidence intervals) and Moray East. Selected aerial densities for CRM are shown, along with the path through the DSS flow chart and reasons for selecting the final value. season = green, non-breeding season = blue.

	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East	Selected aerial density	DSS path	Reasoning
Month	**MRSea**	**Mean of transect density**	**MRSea**	**None**	-	-	-
April	-	No survey	0	0.007	0	-	No birds seen in MW or BOWL
May	-	0	0	0	0	-	Only BOWL data
June	-	0	0.99 (0.04 – 3.05)	0.007	0.989247	DST. N1, N.3. Est.1	
June	-	0.12 (0.00 – 0.33)					
July	-	0.39 (0.18 – 0.62)	0	0.089	0.195	-	Only BOWL data. Average of both estimates
July	-	0				-	
August	-	0.14 (0.00 – 0.34)	0	0.011	0.14	-	Only BOWL data
September	-	No survey	0	0	0	-	No birds seen in MW or BOWL
October	-	No survey	0	0.089	0	-	No birds seen in MW or BOWL
November	-	No survey	0	0.067	0	-	No birds seen in MW or BOWL

	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East	Selected aerial density	DSS path	Reasoning
Month	**MRSea**	**Mean of transect density**	**MRSea**	**None**	-	-	-
December	-	No survey	0	0.212	0	-	No birds seen in MW or BOWL
January	-	No survey	0.05 (0.00 – 0.13)	0.245	0.051175	-	Only MW WF has data
February	-	No survey	0.10 (0.00 – 0.22)	0.357	0.104678	-	Only MW WF has data
March	-	No survey	0	0.056	0	-	No birds seen in MW or BOWL
* Density estimated using mean of transect density							

Table 6.4 Aerial densities of great black-backed gulls in the Moray West Site plus 4 km buffer, BOWL in the overlap with Moray West (and upper and lower 95% confidence intervals) and Moray East. Selected aerial densities for CRM are shown, along with the path through the DSS flow chart and reasons for selecting the final value. Breeding season = green, non-breeding season = blue.

	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	Moray West Site only density (lower – upper 95% CI)	Moray East	Selected aerial density	DSS path	Reasoning
Month	MRSea	Mean of transect density	MRSea	None	-	-	-
April	0	No survey	0	0.067	0	-	No birds seen in MW or BOWL
May	0	0	0	0	0	-	No birds seen in MW or BOWL
June	0	0.13 (0.00 – 0.34)	0	0	0.07	-	Only BOWL data. Average of both estimates
June	-	0	-				
July	0	0.13 (0.00 – 0.31)	0	0.078	0.07	-	Only BOWL data. Average of both estimates
July	-	0	-				
August	0	0.29 (0.00 – 0.57)	0	0.028	0.29	-	Only BOWL data
September	0	No survey	0.52 (0.09 – 1.07)	0.045	0.52	-	Only MW WF has data
October	0	No survey	0.15 (0.00 – 0.36)	0.189	0.15	-	Only MW WF has data
November	0	No survey	0	0.033	0	-	No birds seen in MW or BOWL

December	0	No survey	0	0.033	0	-	No birds seen in MW or BOWL
January	0	No survey	0	0.067	0	-	No birds seen in MW or BOWL
February	0	No survey	0	0.089	0	-	No birds seen in MW or BOWL
March	0	No survey	0	0.022	0	-	No birds seen in MW or BOWL
* Density estimated using mean of transect density							

Table 6.5 Densities of guillemots on the water in the Moray West Site plus 4 km buffer density in the overlap with BOWL compared to BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI) and Moray West Site plus 4 km buffer density in the overlap with Moray East compared to Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI). Also shown is the Moray West Site plus 2 km buffer density (lower – upper 95% CI). Seasonal peak values for each data set is highlighted in bold. The selected peak density value used in displacement assessment is also shown. season = green, post-breeding season = yellow, non-breeding season = blue.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 2 km buffer density (lower – upper 95% CI)	Selected peak density
Survey platform	Digital aerial	Digital aerial		Digital aerial	Boat		Digital aerial	
April	0.07 (0.06 – 0.07)*	No survey	DST. N.2, N.6, N.7. Est.4 = 64.76	0.54 (0.49 – 0.59)	-	DST. N.2, N.5, Est. 3. = 54.51	0.5 (0.19 – 0.88)	64.76
May	6.35 (6.09 – 6.62)	104.99 (60.09 – 151.68)		**54.51 (53.03 – 56.03)**	**23.88 (22.39 – 25.38)**		27.11 (23.33 – 33.17)	
June	**6.48 (6.22 – 6.73)**	68.74 (13.77 – 138.11)		48.13 (44.32 – 52.36)	-		**34.71 (30.13 – 43.03)**	
June	-	78.01 (8.68 – 182.72)		-	-		-	
July	4.39 (4.29 – 4.48)	18.75 (8.03 – 35.33)		14.63 (14.27 – 15.01)	-		23.14 (20.28 – 27.86)	
July	-	**123.04 (67.93 – 180.22)**		-	-		-	

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 2 km buffer density (lower – upper 95% CI)	Selected peak density
Survey platform	Digital aerial	Digital aerial		Digital aerial	Boat		Digital aerial	
August	12.51 (12.14 – 12.93)	**30.96 (19.17 – 46.30)**	DST. N.2, N.5, Est.3 = 74.86	83.3 (76.48 – 90.65)	No data	-	73.33 (64.81 – 88.14)	74.86
September	**74.86 (68.36 – 82.24)**	No survey		**95.68 (78.81 – 115.52)**	No data		**101.21 (90.76 – 115.09)**	
October	1.7 (1.66 – 1.75)	No survey	-	6.06 (5.80 – 6.33)	No data	-	8.58 (7.49 – 10.41)	21.79
November	0.49 (0.46 – 0.51)	No survey		1.38 (1.31 – 1.45)	No data		2.81 (2.33 – 3.71)	
December	0.32 (0.30 – 0.34)	No survey		0.43 (0.40 – 0.45)	No data		1.02 (0.80 – 1.60)	
January	1.37 (1.30 – 1.44)	No survey		9.25 (8.69 – 9.83)	No data		7.14 (6.04 – 9.07)	
February	**6.01 (5.72 – 6.33)**	No survey		**25.78 (23.63 – 28.18)**	No data		**21.79 (19.40 – 25.47)**	
March	2.82 (2.67 – 3.00)	No survey		8.83 (8.38 – 9.37)	No data		12.08 (10.39 – 15.27)	

* Density estimated using mean of transect density

Table 6.6 Densities of razorbills on the water in the Moray West Site plus 4 km buffer density in the overlap with BOWL compared to BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI) and Moray West Site plus 4 km buffer density in the overlap with Moray East compared to Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI). Also shown is the Moray West Site plus 2 km buffer density (lower – upper 95% CI). Seasonal peak values for each data set is highlighted in bold. The selected peak density value used in displacement assessment is also shown. season = green, post-breeding season = yellow, non-breeding season = red, pre-breeding season = blue.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 2 km buffer density (lower – upper 95% CI)	Selected peak density
Survey platform	**Digital aerial**	**Digital aerial**		**Digital aerial**	**Boat**		**Digital aerial**	
April	0	No survey	DST, N.1, N.4, Est.2 = 2.59	0	No data	-		7.44
May	0.11 (0.10 – 0.12)	1.29 (0.64 – 1.93)		0.91 (0.86 – 0.96)	No data		1.04 (0.81 – 1.81)	
June	0.17 (0.15 – 0.19)	2.38 (0.27 - 4.95)		0.97 (0.88 – 1.07)	No data		0.79 (0.62 – 1.54)	
June		**3.70 (0.39 – 7.91)**			No data			
July	**1.48 (1.39 – 1.58)**	0.70 (0.00 – 1.78)		**2.16 (1.99 – 2.34)**	No data		**7.44 (6.21 – 10.50)**	
July		0.74 (0.26 – 1.33)			No data			

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 2 km buffer density (lower – upper 95% CI)	Selected peak density
Survey platform	Digital aerial	Digital aerial		Digital aerial	Boat		Digital aerial	
August	5.58 (5.27 – 5.92)	0	DST, N.2, N.5, Est. 3 = 37.59	8.03 (7.62 – 8.50)	7.07 (6.81 – 7.30)	DST, N.2, N.5, Est. 3 = 18.03	8.87 (7.55 – 11.45)	37.59
September	**37.59 (35.02 – 40.40)**	No survey		**18.03 (14.99 – 21.54)**	No data		**20.59 (18.13 – 24.80)**	
October	**0.05 (0.05 – 0.05)**	No survey	-	**0.19 (0.17 – 0.20)**	No data	-	**0.49 (0.37 – 1.00)**	0.06
November	0	No survey		0	No data		0.06 (0.00 – 0.13)*	
December	0	No survey		0	No data		0	
January	0	No survey	-	0	No data	-	0.49 (0.19 – 0.83)*	9.51
February	0	No survey		0	No data		1.49 (0.16 – 3.98)*	
March	**1.99 (1.90 – 2.09)**	No survey		**6.68 (6.31 – 7.05)**	No data		**9.51 (7.70 – 45.18)**	

* Density estimated using mean of transect density

Table 6.7 Densities of puffins on the water in the Moray West Site plus 4 km buffer density in the overlap with BOWL compared to BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI) and Moray West Site plus 4 km buffer density in the overlap with Moray East compared to Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI). Also shown is the Moray West Site plus 2 km buffer density (lower – upper 95% CI). Seasonal peak values for each data set is highlighted in bold. The selected peak density value used in displacement assessment is also shown. season = green, post-breeding season = yellow, non-breeding season = blue.

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 2 km buffer density (lower – upper 95% CI)	Selected peak density
Survey platform	**Digital aerial**	**Digital aerial**		**Digital aerial**	**Boat**		**Digital aerial**	
April	0	No survey	DST, N.2, N.6, N.8, Est.5 = 2.96	0	No data	-	0	2.96
May	0	0.49 (0.25 – 0.76)		0	No data		0	
June	0.13 (0.12 - -0.15)	**2.96 (0.83 – 5.78)**		0.42 (0.40 – 0.46)	No data		0.44 (0.31 – 0.83)	
June		0.42 (0.00 – 0.99)			No data			
July	**0.14 (0.13 – 0.14)**	0		**0.49 (0.45 – 0.52)**	No data		**0.62 (0.44 – 1.29)**	
July		0			No data			

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 2 km buffer density (lower – upper 95% CI)	Selected peak density
Survey platform	**Digital aerial**	**Digital aerial**		**Digital aerial**	**Boat**		**Digital aerial**	
August	**1.09 (1.04 – 1.15)**	**10.51 (7.87 – 13.45)**	DST, N.2, N.6, N.8, Est.5 = 10.51	**3.51 (3.44 – 3.59)**	5.07 (4.91 – 5.23)	DST. N.2, N.6, N.8, Est.5 = 5.07	**4.8 (3.91 – 6.48)**	10.51
September	0.62 (0.58 – 0.66)	No survey		2.16 (1.93 – 2.43)	No data		1.53 (1.25 – 2.16)	
October	0	No survey	-	0	No data	-	**0.03 (0.00 – 0.08)***	0.03
November	0	No survey		0	No data		0	
December	0	No survey		0	No data		0	
January	0	No survey		0	No data		0	
February	0	No survey		0	No data		0	
March	0	No survey		0	No data		0	

* Density estimated using mean of transect density

Table 6.8 Densities of kittiwakes on the water in the Moray West Site plus 4 km buffer density in the overlap with BOWL compared to BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI) and Moray West Site plus 4 km buffer density in the overlap with Moray East compared to Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI). Also shown is the Moray West Site plus 2 km buffer density (lower – upper 95% CI). Seasonal peak values for each data set is highlighted in bold. The selected peak density value used in displacement assessment is also shown. season = green, post-breeding season = yellow, pre-breeding season = blue.

<table>
<tr><th>Month</th><th>Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)</th><th>BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)</th><th>DST path</th><th>Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)</th><th>Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)</th><th>DST path</th><th>Moray West Site plus 2 km buffer density (lower – upper 95% CI)</th><th>Selected peak density</th></tr>
<tr><td>Survey platform</td><td>Digital aerial</td><td>Digital aerial</td><td></td><td>Digital aerial</td><td>Boat</td><td></td><td>Digital aerial</td><td></td></tr>
<tr><td>April</td><td>0</td><td>No survey</td><td rowspan="6">DST, N.2, N.6, N.7, Est.4 = 18.03</td><td>0</td><td>No data</td><td rowspan="6">DST. N.2, N.5, Est.3 = 17.95</td><td>0</td><td rowspan="6">18.30</td></tr>
<tr><td>May</td><td>0.03 (0.03 – 0.03)</td><td>0.39 (0.00 – 1.04)</td><td>0.39 (0.32 – 0.47)</td><td>9.49 (8.16 – 10.92)</td><td>1.68 (1.30 – 2.64)</td></tr>
<tr><td>June</td><td rowspan="2">0.62 (0.58 – 0.66)</td><td>23.57 (0.69 – 61.14)</td><td rowspan="2">3.59 (3.34 – 3.86)</td><td>No data</td><td rowspan="2">8.57 (6.10 – 16.37)</td></tr>
<tr><td>June</td><td>3.24 (0.69 – 6.90)</td><td>No data</td></tr>
<tr><td>July</td><td rowspan="2">1.54 (1.31 – 1.82)</td><td>5.4 (0.30 – 13.33)</td><td rowspan="2">0.11 (0.07 – 0.17)</td><td>No data</td><td rowspan="2">5.18 (3.84 – 9.55)</td></tr>
<tr><td>July</td><td>35.06 (16.70 – 57.17)</td><td>No data</td></tr>
</table>

Month	Moray West Site plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL pre-construction density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with Moray West Site plus 4 km buffer (lower – upper 95% CI)	DST path	Moray West Site plus 2 km buffer density (lower – upper 95% CI)	Selected peak density
Survey platform	**Digital aerial**	**Digital aerial**		**Digital aerial**	**Boat**		**Digital aerial**	
August	1.35 (1.17 – 1.57)	4.32 (0.50 – 9.16)		**17.95 (15.85 – 20.31)**	No data		**10.62 (7.71 – 16.93)**	
September	**3.50 (3.12 – 3.92)**	No survey	-	**3.09 (2.66 – 3.61)**	No data	-	**3.90 (2.63 – 28.81)**	3.90
October	0	No survey		0	No data		0.10 (0.00 – 0.22)*	
November	0.29 (0.26 – 0.32)	No survey		0.03 (0.02 – 0.03)	No data		0.56 (0.34 – 53.69)	
December	0.40 (0.34 – 0.46)	No survey		0.16 (0.14 – 0.18)	No data		0.97 (0.64 – 3.68)	
January	0	No survey	-	0	No data	-	0	2.85
February	0	No survey		0	No data		1.17 (0.00 – 3.07)*	
March	**0.88 (0.75 – 1.05)**	No survey		**3.04 (2.30 – 4.07)**	No data		**2.85 (2.10 – 4.44)**	

* Density estimated using mean of transect density

7 Annex B – seasonal density surface mapping

Annex B shows the figures shown above, but within each season the scale of densities are equal across all months. This can aid in understanding the importance in the variation of spatio-temporal densities.

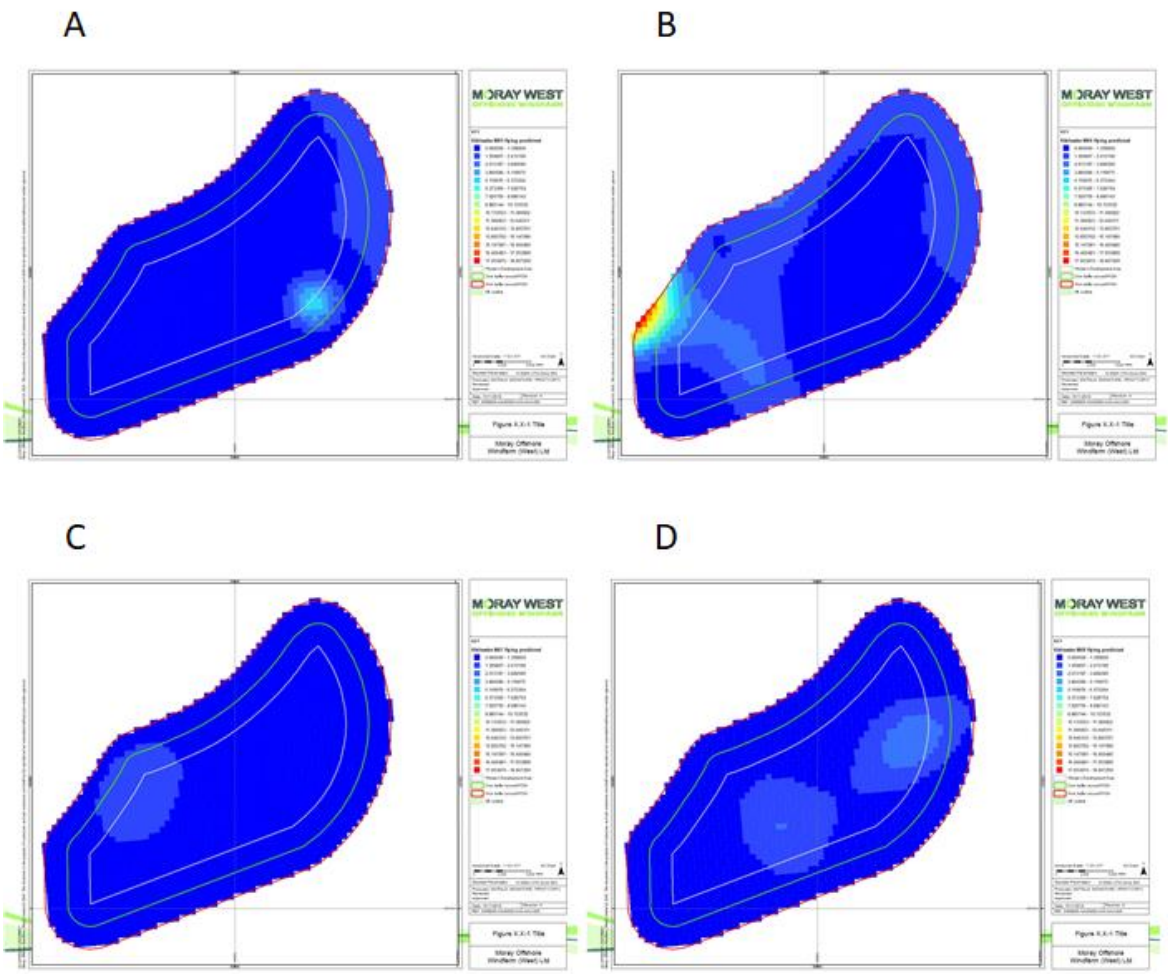

Figure 7.1 Relative aerial densities of kittiwake predicted by MRSea in: A = May, B = June, C = July, D = August. Densities use the same scale across all months.

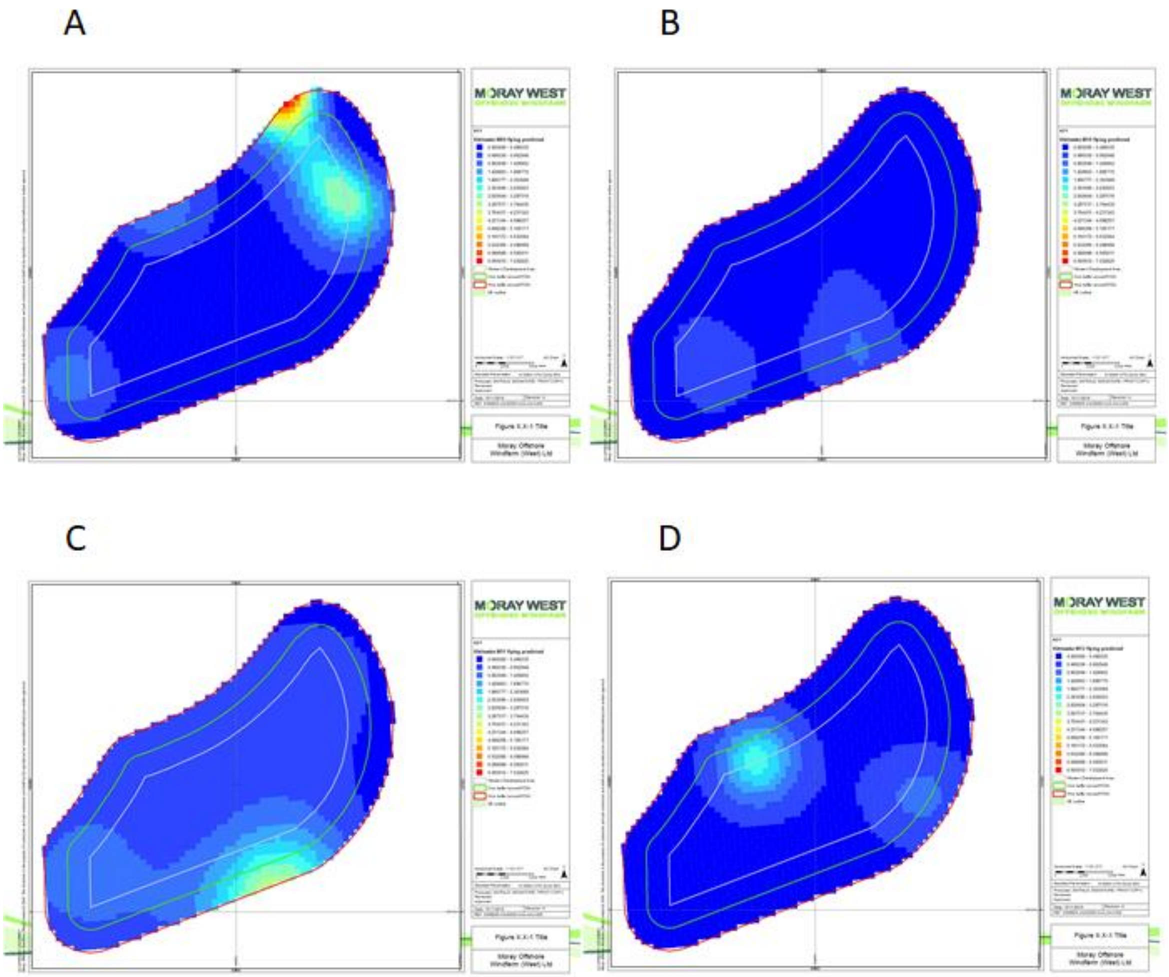

Figure 7.2 Relative aerial densities of kittiwake predicted by MRSea in: A = September, B = October, C = November, D = Decembe. Densities use the same scale across all months.

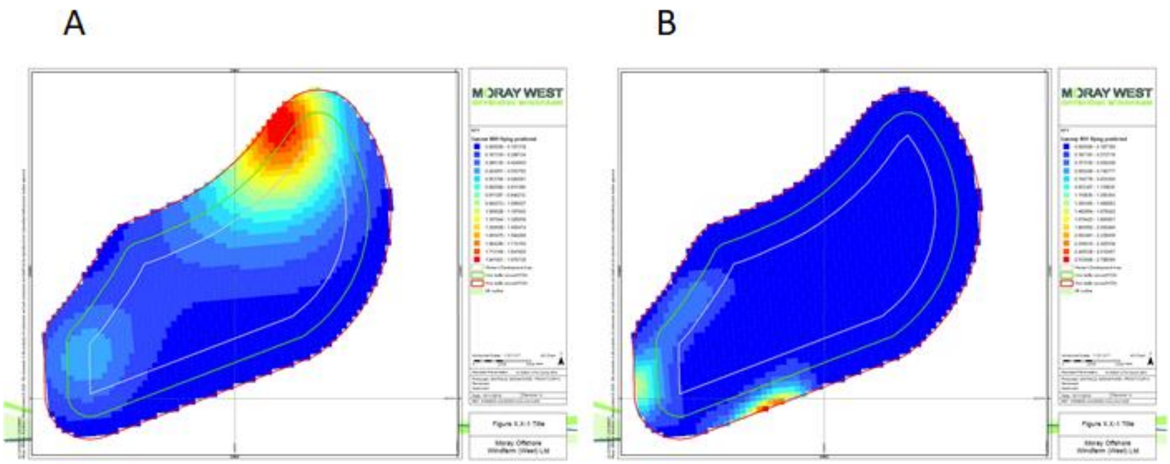

Figure 7.3 Relative aerial densities of gannet in the Moray West Site plus 4 km buffer predicted by MRSea in: A = October, B = November. Densities use the same scale across all months.

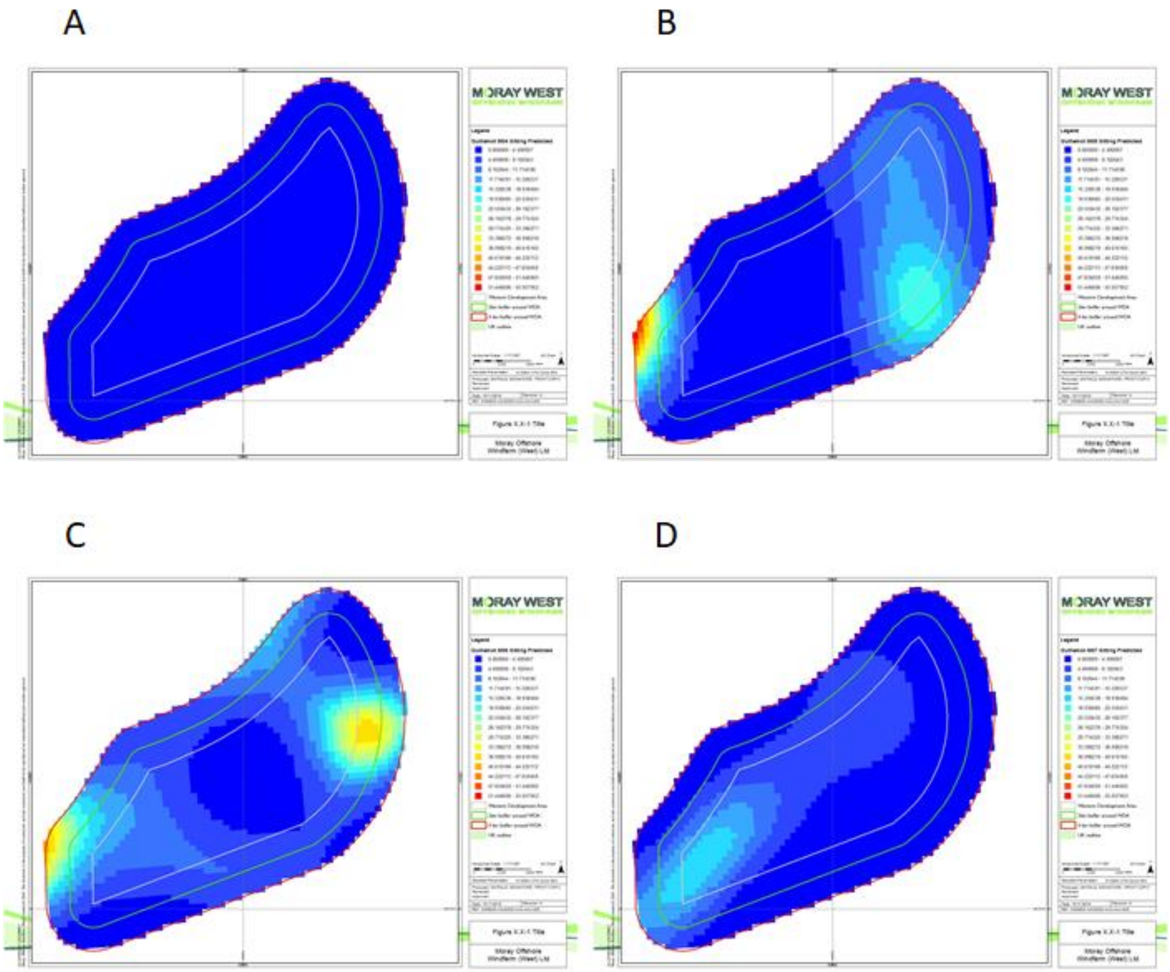

Figure 7.4 Relative densities of guillemots on the water predicted by MRSea in: A = April, B = May, C = June, D = July. Densities use the same scale across all months.

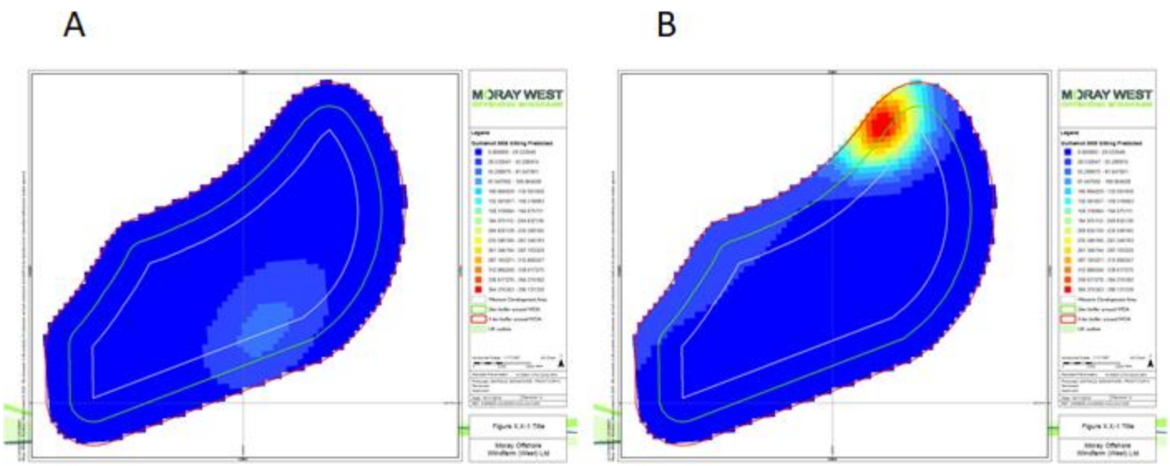

Figure 7.5 Relative densities of guillemots on the water predicted by MRSea in: A = August, B = September. Densities use the same scale across all months.

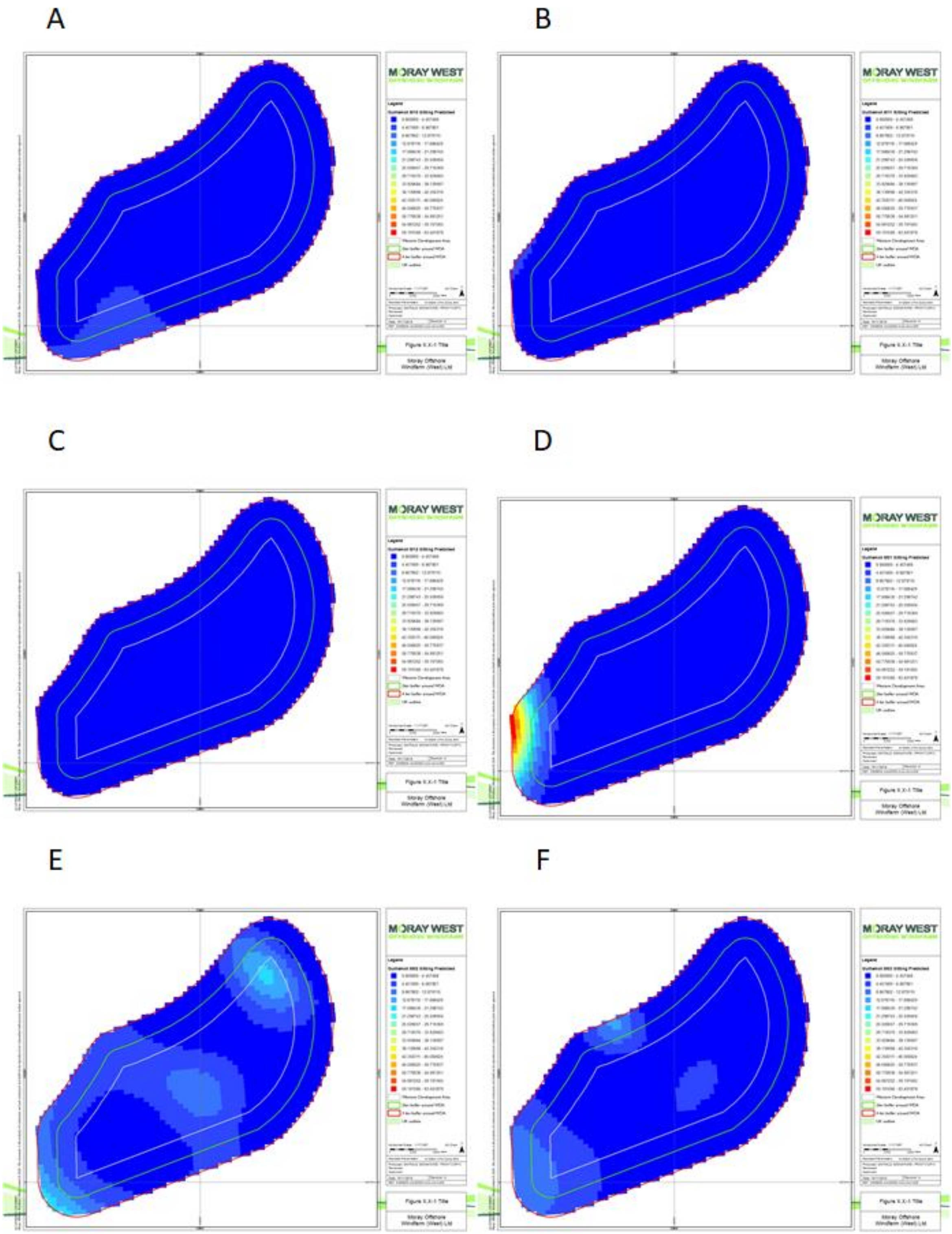

Figure 7.6 Relative densities of guillemots on the water predicted by MRSea in: A = October, B = November, C = December, D = January, E = February, F = March. Densities use the same scale across all months.

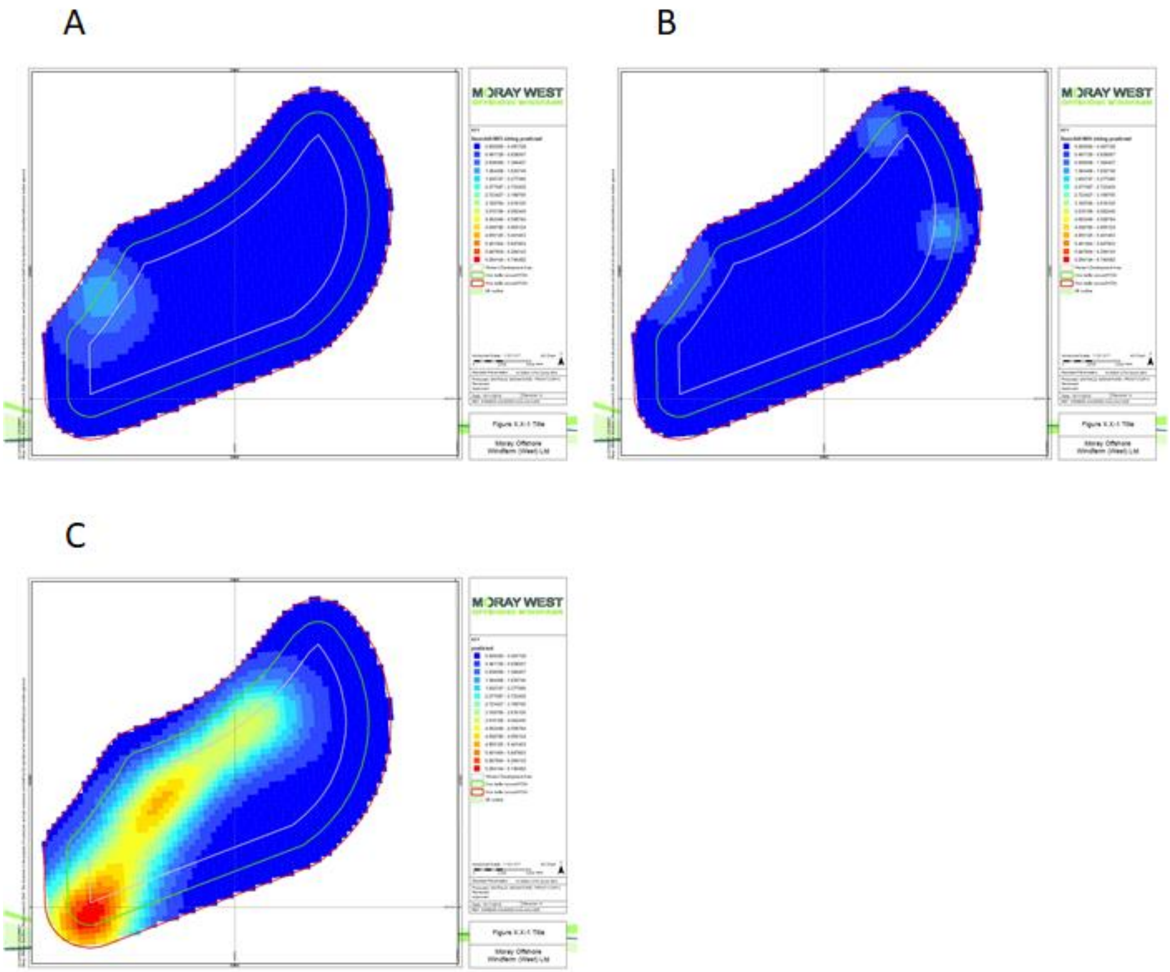

Figure 7.7 Relative densities of razorbills on the water predicted by MRSea in: A = May, B = June, C = July. Densities use the same scale across all months.

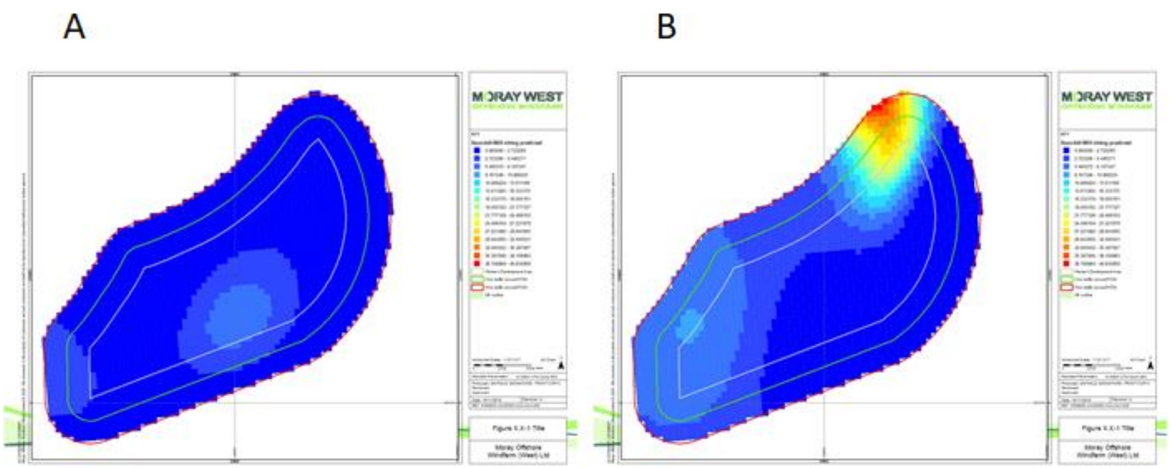

Figure 7.8 Relative densities of razorbills on the water predicted by MRSea in: A = August, B = September. Densities use the same scale across all months.

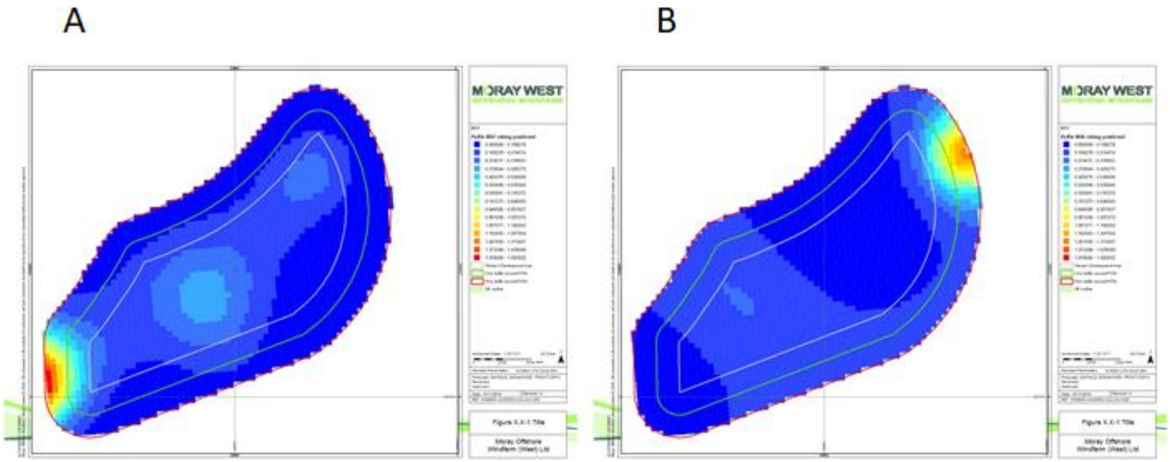

Figure 7.9 Relative densities of puffins on the water predicted by MRSea in: A = June, B = July. Densities use the same scale across all months.

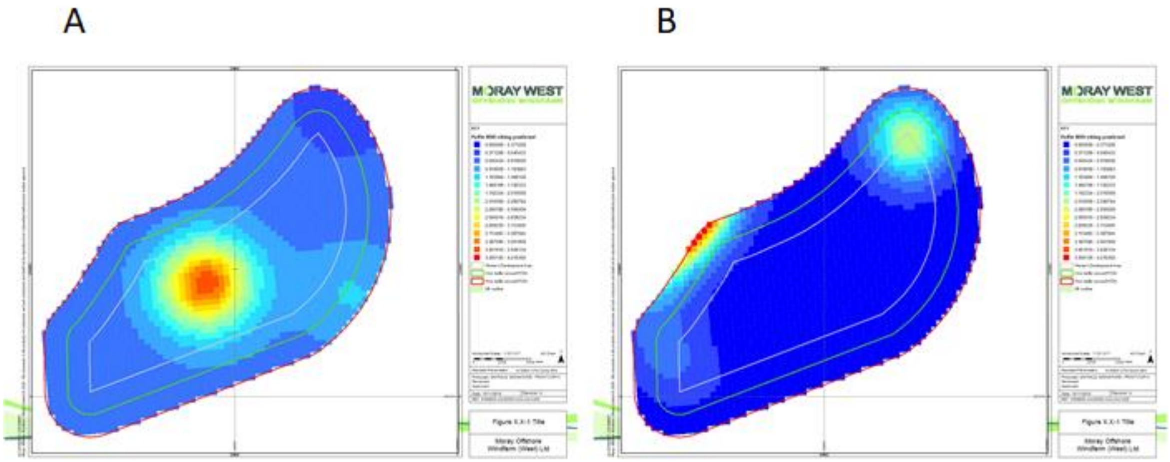

Figure 7.10 Relative densities of puffins on the water predicted by MRSea in: A = August, B = September. Densities use the same scale across all months.

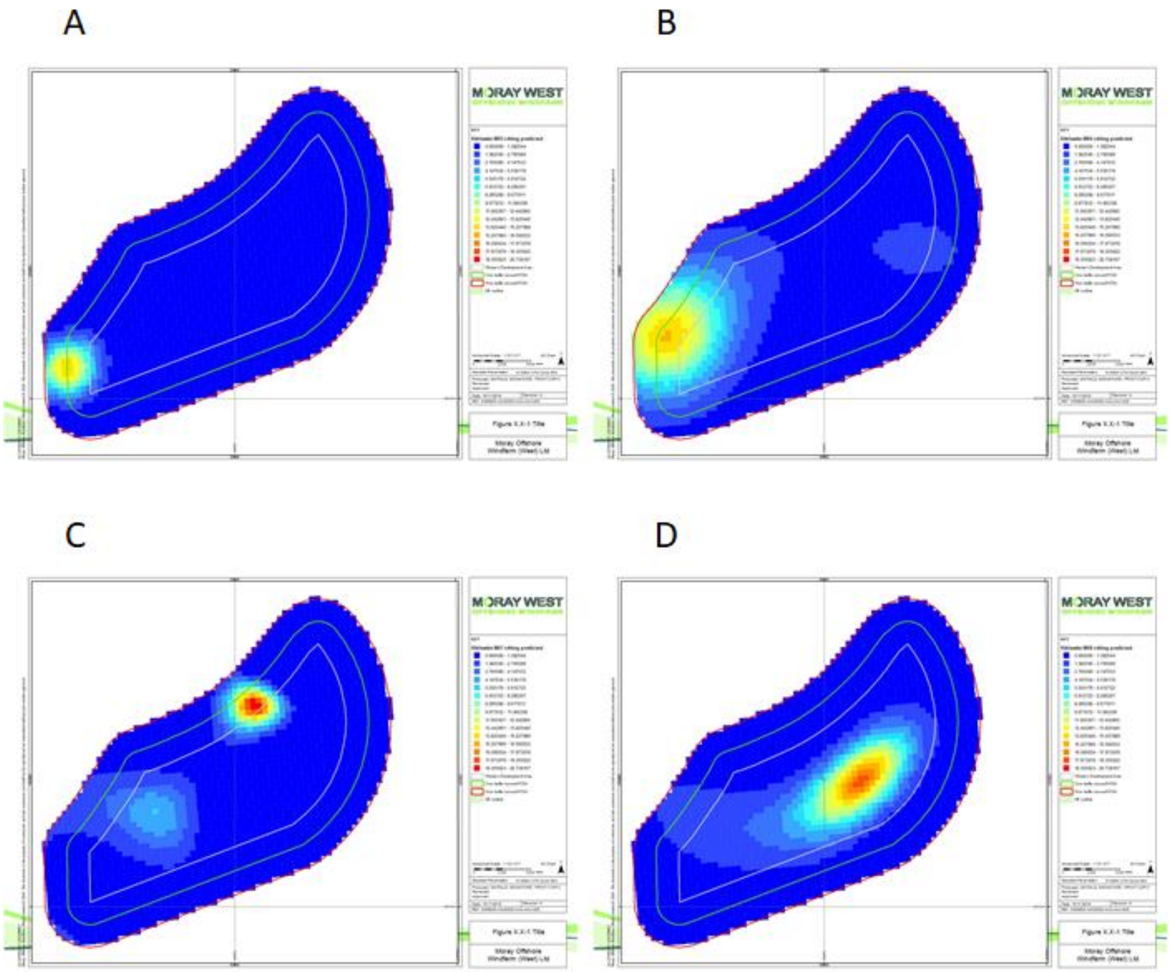

Figure 7.11 Relative densities of kittiwakes on the water predicted by MRSea in: A = May, B = June, C = July, D = August. Densities use the same scale across all months.

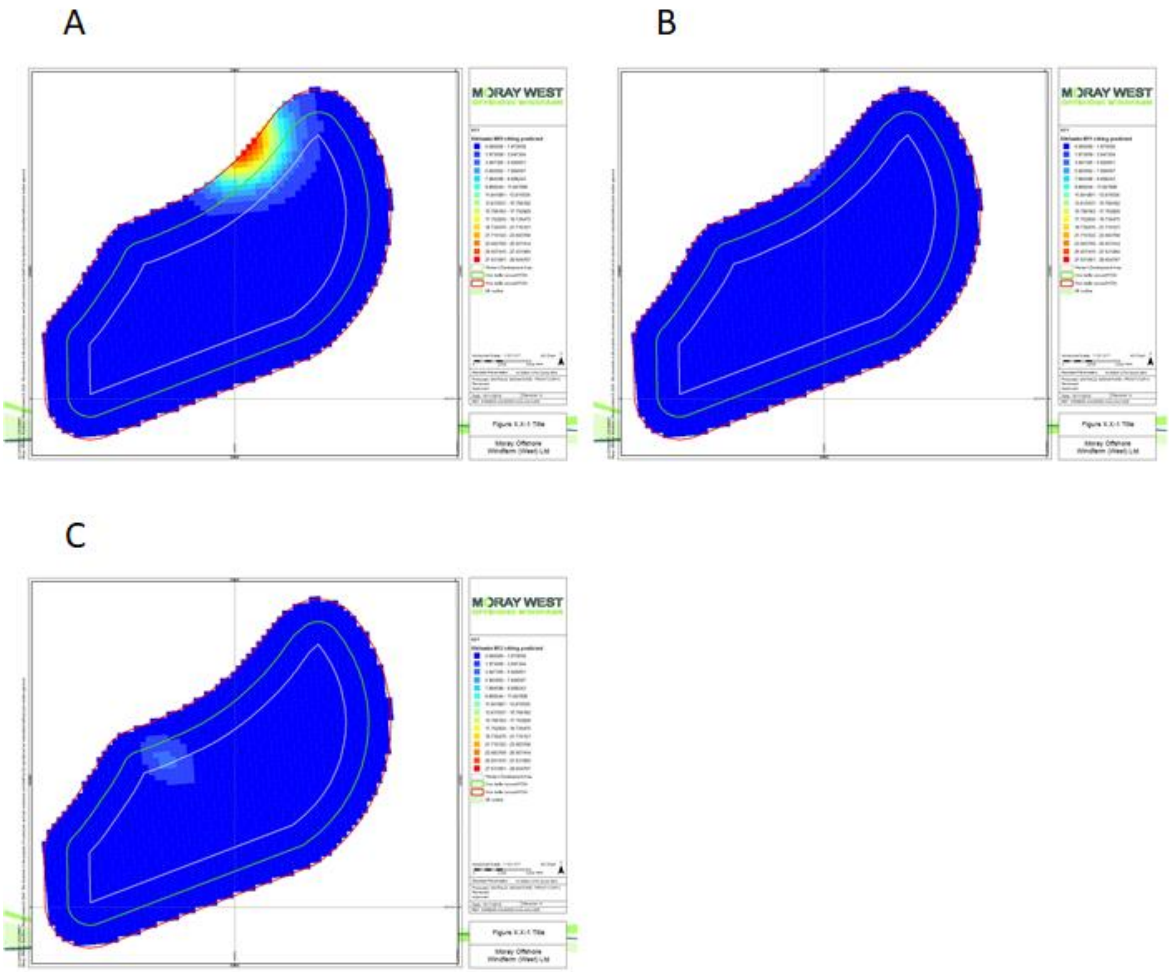

Figure 7.12 Relative densities of kittiwakes on the water predicted by MRSea in: A = September, B = November, C = December. Densities use the same scale across all months.

Annex C As Built Scenarios

MORAY WEST
OFFSHORE WINDFARM

Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI) Application Addendum

Annex C – As Built Scenarios

Moray Offshore Windfarm (West) Limited

1 As Built Scenarios

1.1 Introduction

Due to the extensive timescales across which offshore wind farm consenting and pre-planning activities occur, it is often the case that as-built turbine scenarios are different to those that were assessed. Often, due to advances in technology, as-built scenarios are composed fewer, higher capacity turbines which is likely to result in associated collision risk. Differences between assessed and as-built scenarios creates uncertainty associated with cumulative and in-combination assessments although attempts at capturing this (e.g. by tiering projects) have been applied in assessments for offshore wind farms.

The use of collision risk estimates calculated based on the assumptions applied by projects at the point of application or, at the latest, point of decision, that are subsequently used as part of cumulative or in-combination assessments for Moray West has the potential to significantly over-estimate the total collision impact in terms of both EIA and HRA assessments. This was considered as part Chapter 10: Offshore Ornithology and the RIAA using previously calculated correction factors as reported in MacArthur Green (2017). This report builds on the approach presented in Chapter 10: Offshore Ornithology and the RIAA considering the implications for collision risk estimates if the as-built scenarios for all projects were incorporated into the cumulative and in-combination assessments for Moray West, calculating correction factors for additional projects where relevant information exists to facilitate this process.

1.2 Background

The over-estimation of collision risk on cumulative and in-combination scales has previously been detailed in work commissioned by the Crown Estate (MacArthur Green, 2017). Cumulative totals calculated from collision risk estimates calculated using assessed turbine scenarios were compared to corrected collision risk estimates calculated using as-built turbine scenarios. Correction factors to facilitate the calculation of as-built cumulative totals were derived using ratios of consented and as-built turbine parameters.

MacArthur Green (2017) identified considerable reductions in the North Sea for kittiwake (15%) in relation to collision risk.

The differences between assessed and as-built turbine scenarios were considered in Chapter 10: Offshore Ornithology and the RIAA. The assessed, consented and as-built turbine scenarios were identified for all projects considered as part of cumulative/in-combination assessments with different approaches then applied based on the information obtained for each project.

Where differences arose between assessed turbine scenarios and as-built/planned turbine scenarios (i.e. those projects for which consideration in the assessment is qualitative) the correction factors calculated by MacArthur Green (2017), were used to calculate the likely change in collision risk estimates for a project with this then discussed qualitatively in the respective species sections. This approach was used for Galloper, Humber Gateway, Kentish Flats Extension, Lincs, Race Bank, Teesside and Westermost Rough and was only applied when the turbine parameters used in MacArthur Green (2017) matched those used to calculate collision risk estimates at each project. This approach is maintained in this report. The potential reductions to collision risk for relevant species in Chapter 10: Offshore Ornithology the RIAA (Document 5.2) when applying the correction factors from MacArthur Green (2017) are presented in Table 1.1.

Table 1.1: Reductions in cumulative/in-combination collision risk totals for kittiwake as a result of applying the correction factors presented in MacArthur Green (2017) to relevant projects			
Assessment	**Post-breeding season**	**Pre-breeding season**	**Annual**
EIA	2.0	1.7	1.7
HRA	2.0	1.7	1.0

1.3 Turbine scenarios

Table 1.2 identifies the turbine scenarios used by each project to calculate the collision risk estimates incorporated into the cumulative and in-combination assessments for relevant species in Chapter 10: Offshore Ornithology and the RIAA (i.e. the assessed turbine scenario). Also presented are the turbine scenarios that are either operational or planned for each project.

Table 1.2: Assessed and as-built/planned turbine scenarios for projects incorporated into the cumulative and in-combination assessments for Moray West

Project	Project status	Assessed turbine scenario	Consented scenario	As-built/planned scenario	Difference between number of turbines	Difference between turbine capacity
Aberdeen (European Offshore Wind Development Centre)	Partially operational	11 x 7 MW	Total capacity = 100 MW No. of turbines = 11	11 x 8.4 MW	No difference	Higher capacity
Beatrice	Under construction	142 x 7 MW	Total capacity = 750 MW No. of turbines = 125	84 x 7 MW	Decrease	No change
Blyth Offshore-Demonstration Extension	Operational	15 x 8 MW	Unavailable	5 x 8 MW	Decrease	No change
Dogger Bank Creyke Beck A & B	Consented without CfD	400 x 6 MW	Total capacity = 2400 MW No. of turbines = 400	400 x 6 MW / 176 turbines / 140 turbines	Potential decrease	Potential increase
Dogger Bank Teesside A and Sofia	Consented without CfD	400 x 6 MW	Total capacity = 2400 MW No. of turbines = 400	200 x 6 MW (Teesside A) 66 – 200 turbines of varying capacity (Sofia)	Potential decrease	Potential increase
East Anglia One	Under construction	325 x 3.6 MW	Total capacity = 750 MW No. of turbines = 150	102 x 7 MW	Decrease	Higher capacity
East Anglia Three	Consented	172 x 7 MW	Total capacity = 1200 MW No. of turbines = 172	Unknown	-	-
Seagreen Alpha	Consented	75 x 7 MW	Total capacity = 525 MW No. of turbines = unavailable	120 turbines	Decrease	Unknown
Seagreen Bravo	Consented	75 x 7 MW	Total capacity = 525 MW No. of turbines = unavailable			
Galloper Wind Farm	Operational	140 x 3.6 MW	Total capacity = 504 MW No. of turbines = 140	56 x 6.3 MW	Decrease	Higher capacity
Greater Gabbard Wind Farm	Operational	140 x 3.6 MW	Unavailable	140 x 3.6 MW	No difference	No change

Table 1.2: Assessed and as-built/planned turbine scenarios for projects incorporated into the cumulative and in-combination assessments for Moray West						
Hornsea 1	Under construction	240 x 5 MW	Total capacity = 1200 MW No. of turbines = 120	174 x 7 MW	Decrease	Higher capacity
Hornsea 2	Consented	300 x 5 MW	Total capacity = 1800 MW No. of turbines = 300	92-231 turbines	Decrease	Unknown
Humber Gateway	Operational	83 x 3.6 MW	Total capacity = 300 MW No. of turbines = 83	73 x 3 MW	Decrease	Lower capacity
Hywind	Operational	5 x 6 MW	Total capacity = 30 MW No. of turbines = unavailable	5 x 6 MW	No difference	No change
Inch Cape	Consented	213 turbines	Unavailable	72 turbines	Decrease	Unknown
Kentish Flats Extension	Operational	17 x 3 MW	Total capacity = 51 MW No. of turbines = unavailable	15 x 3.3 MW	Decrease	Higher capacity
Kincardine	Under construction	8 x 6 MW	Total capacity = 50 MW No. of turbines = unavailable	7 turbines	Decrease	Unknown
Lincs	Operational	83 x 3 MW	Total capacity = 250 MW No. of turbines = 83	75 x 3.6 MW	Decrease	Higher capacity
London Array	Operational	271 x 3 MW	Total capacity = 1000 MW No. of turbines = 341	175 x 3.6 MW	Decrease	Higher capacity
Methil	Consented	1 turbine	Unavailable	2 turbines	Increase	Unknown
Moray East	Consented	339 (139 x 3.6, 100 x 5 and 100 x 5 MW)	Total capacity = 1116 MW No. of turbines = 186	100 x 9.5 MW	Decrease	Higher capacity
Neart na Gaoithe	Consented	128 x 3.6 MW	Total capacity = 450 MW No. of turbines = 75	56 x 8 MW	Decrease	Higher capacity
Race Bank	Operational	206 x 3 MW	Total capacity = 580 MW No. of turbines = unavailable	91 x 6.3 MW	Decrease	Higher capacity
Teesside Offshore Wind Farm	Operational	30 turbines	Total capacity = 100 MW No. of turbines = 30	27 x 2.3 MW	Decrease	Unknown

Table 1.2: Assessed and as-built/planned turbine scenarios for projects incorporated into the cumulative and in-combination assessments for Moray West						
Thanet	Operational	60 x 5 MW	Total capacity = 300 MW No. of turbines = unavailable	100 x 3 MW	Increase	Lower capacity
Triton Knoll	Consented	288 x 3.6 MW	Total capacity = 900 MW No. of turbines = 90	90 x 9.5 MW	Decrease	Higher capacity
Westermost Rough	Operational	50 x 3.6 MW	Total capacity = 245 MW No. of turbines = 80	35 x 6 MW	Decrease	Higher capacity

For the majority of projects included in the cumulative/in-combination assessments, the as-built turbine scenario is composed, or is proposed to be composed, of fewer, higher capacity turbines. This is therefore likely to represent a significant decrease in the collision risk for relevant species and ultimately for cumulative and in-combination assessments predominantly due to reductions in the number of turbines but also due to changes to turbine parameters associated with higher capacity turbines (although note that these changes may actually increase collision risk although to a lesser extent than the reduction associated with a reduced number of turbines).

Based on the information presented in Table 1.2, a number of approaches can be taken in order to derive collision risk estimates that better reflect the turbine scenario operating/planned at each project considered cumulatively/in-combination. These are:

1. Use collision risk estimates from project-specific documents (e.g. updated applications, non-material amendments, etc.);
2. If the assessed and as-built turbine scenarios presented in Table 1.2 match those used to derive a correction factor in MacArthur Green (2017) then the correction factor presented in MacArthur Green (2017) is directly applied;
3. If the assessed and as-built turbine parameters presented in Table 1.2 do not match those used to derive a correction factor in MacArthur Green (2017) then the approach used in MacArthur Green (2017) to calculate correction factors is used alongside updated turbine parameters; or
4. No change applied.

For some projects no change is necessary (i.e. because turbine parameters have not changed) whereas for others updated turbine parameters are not available. These projects are therefore considered qualitatively and assigned to approach 4 in Table 1.3.

The approach to be applied to the collision risk estimates for each project considered in-combination is outlined in Table 1.3.

Table 1.3: Approach used for each project considered cumulatively/in-combination with Moray West		
Project	**Approach used**	**Justification**
Aberdeen (European Offshore Wind Development Centre)	3	The project is now operational and uses higher capacity turbines than those assessed. The turbine parameters presented in MacArthur Green (2017) are different to those actually assessed and therefore a revised correction factor has been calculated
Beatrice	1	Collision risk estimates calculated for Beatrice use the as-built turbine scenario.
Blyth Offshore- Demonstration Extension	4	No information available
Dogger Bank Creyke Beck A & B	1	The project has recently submitted a non-material amendment which would alter the design envelope and potentially lead to a project with fewer, higher capacity turbines. This amendment does not remove the original turbine scenario and has not yet been authorised and therefore no quantitative change is considered in this report.
Dogger Bank Teesside A and Sofia	1	The Sofia project has recently submitted a non-material amendment which would alter the design envelope and potentially lead to a project with fewer, higher capacity turbines. This amendment does not remove the original turbine scenario and has not yet been authorised and therefore no quantitative change is considered in this report. No updated information is available for the Dogger Bank Teesside A project.
East Anglia One	3	The project is currently under construction and is deploying fewer, higher capacity turbines than those assessed. The turbine parameters presented in MacArthur Green (2017) are different to those actually assessed and therefore a revised correction factor has been calculated
East Anglia Three	4	Project recently consented, no further information, no change made.
Seagreen Alpha	1	Project submitted a revised application in 2018 proposing the use of fewer, higher capacity turbines. However, the original consent is still valid and therefore any changes are discussed qualitatively
Seagreen Bravo	1	Project submitted a revised application in 2018 proposing the use of fewer, higher capacity turbines. However, the original consent is still valid and therefore any changes are discussed qualitatively
Galloper Wind Farm	2	The project is now operational and uses fewer, higher capacity turbines than those assessed. The turbine parameters for these scenarios match those used in MacArthur Green (2017) to calculate a correction factor.
Greater Gabbard Wind Farm	3	The project is now operational, with the as-built turbine scenario having different turbine parameters to those originally assessed. The turbine parameters presented in MacArthur Green (2017) are different to those actually assessed and therefore a revised correction factor has been calculated
Hornsea Project One	3	The project is currently under construction and is deploying fewer, higher capacity turbines than those assessed. The turbine parameters presented in MacArthur Green (2017) are different to those actually assessed and therefore a revised correction factor has been calculated

Table 1.3: Approach used for each project considered cumulatively/in-combination with Moray West

Hornsea Project Two	4	No change. Although the project is expected to construct fewer, higher capacity turbines, no information is available in relation to updated collision risk estimates or potential turbine parameters for the planned turbine scenario
Humber Gateway	2	The project is now operational and uses fewer, lower capacity turbines than those assessed. The turbine parameters for these scenarios match those used in MacArthur Green (2017) to calculate a correction factor.
Hywind	4	No difference between assessed and as-built turbine scenarios
Inch Cape	1	A Section 36 consent variation was authorised in 2015 with the project committing to reduce the number of turbines from 213 to 110 whilst also reducing the total generating capacity of the wind farm. In addition, the project submitted a revised application in 2018 proposing the use of fewer, higher capacity turbines. However, the original consent is still valid and therefore any changes are discussed qualitatively
Kentish Flats Extension	2	The project is now operational and uses fewer, higher capacity turbines than those assessed. The turbine parameters for these scenarios match those used in MacArthur Green (2017) to calculate a correction factor.
Kincardine	4	Although the proposed number of turbines has reduced, the turbine parameters for the as-built turbine scenario are unknown. No change is therefore made.
Lincs	2	The project is now operational and uses fewer, higher capacity turbines than those assessed. The turbine parameters for these scenarios match those used in MacArthur Green (2017) to calculate a correction factor.
London Array	3	The project is operational and has deployed fewer, higher capacity turbines than those assessed. The turbine parameters presented in MacArthur Green (2017) are different to those actually assessed and therefore a revised correction factor has been calculated
Methil	4	No difference between assessed and as-built turbine scenarios identified
Moray East	1	Project submitted an application for a revised project design incorporating fewer, higher capacity turbines. This was supported by collision risk modelling incorporating four turbine scenarios. The collision risk estimates associated with the worst case scenario have been used in this report.
Neart na Gaoithe	1/3	The project submitted a revised application in 2018. Collision risk estimates are presented for kittiwake and these have therefore been used in this report (Approach 1). However, the original consent is still valid and therefore any changes are discussed qualitatively
Race Bank	2	The project is now operational and uses fewer, higher capacity turbines than those assessed. The turbine parameters for these scenarios match those used in MacArthur Green (2017) to calculate a correction factor.
Teesside Offshore Wind Farm	2	The project is now operational and uses fewer turbines than those assessed. The turbine parameters for these scenarios match those used in MacArthur Green (2017) to calculate a correction factor.
Thanet	1	Collision risk estimates for the as-built turbine scenario are available in project-specific documentation. These were used in the original assessments for Moray West and are also used in this report.

Table 1.3: Approach used for each project considered cumulatively/in-combination with Moray West		
Triton Knoll	3	The project is consented and has committed to constructing fewer, higher capacity turbines than those originally assessed. The turbine parameters presented in MacArthur Green (2017) are different to those actually assessed and therefore a revised correction factor has been calculated
Westermost Rough	2	The project is now operational and uses fewer, higher capacity turbines than those assessed. The turbine parameters for these scenarios match those used in MacArthur Green (2017) to calculate a correction factor.

1.4 Approach 1 - Updated project-specific collision risk estimates

For a number of projects listed in Table 1.3, revised collision risk estimates calculated using updated turbine parameters are included in project-specific documentation. This includes:

- Beatrice;
- Dogger Bank Creyke Beck A&B;
- Dogger Bank Teesside A&B (now Dogger Bank Teesside A and Sofia);
- Seagreen Alpha;
- Seagreen Bravo;
- Inch Cape;
- Moray East
- Neart na Gaoithe; and
- Thanet.

Each of these projects is considered as part of the Discussion section below in relation to the revised collision risk estimates and the associated confidence that can be placed in updated collision risk modelling.

1.4.1 Beatrice and Moray East

The collision risk modelling for Beatrice and Moray East has been updated using the parameters associated with the as-built or planned turbine scenarios as part of the assessments presented in Chapter10: Offshore Ornithology and the RIAA.

1.4.2 Dogger Bank projects

Collision risk modelling for the Dogger Bank projects (Dogger Bank Creyke Beck A&B, Dogger Bank Teesside A and Sofia) used a 200 x 6 MW turbine scenario for each project. In June 2018, the Dogger Bank Creyke Beck A&B and Sofia projects issued non-material amendment applications to the Secretary of State (BEIS) outlining a number of proposed changes. Of relevance to collision risk modelling, it was proposed that the Development Consent Order (DCO) for each project be amended to allow for the construction of turbines with larger rotor diameters. Changes to other turbine parameters (e.g. rotor swept area) were not proposed and therefore the use of turbines with a larger rotor diameter would reduce the number of turbines that could be constructed. However, crucially these non-material amendments do not exclude the previously consented turbine scenario from the project design envelopes.

Collision risk modelling incorporating the updated turbine parameters was conducted and showed that, if the revised turbine parameters (i.e. those using the largest rotor diameter) were to be constructed, collision risk estimates would reduce. The likely reduction is discussed in the sections below however, it is not incorporated into the quantitative appraisal for each species as the originally assessed turbine scenario has not been removed from the design envelope for each project.

1.4.3 Firth of Forth projects (Seagreen Alpha and Bravo, Inch Cape and Neart na Gaoithe)

The Seagreen Alpha, Seagreen Bravo, Inch Cape and Neart na Gaoithe projects all received planning consent in 2014, with Neart na Gaoithe being awarded a CfD in 2015.

The assessment presented for Neart na Gaoithe in 2012 from which collision risk estimates were sourced for the assessments presented in Volume 2, Chapter 5: Offshore Ornithology (Document 6.2.5) and the RIAA (Document 5.2), was conducted on the basis of a 128 x 3.6 MW turbine scenario. However, the consent issued in 2014 was for a 75 x 6 MW turbine scenario for which collision risk estimates were not presented. In 2015, a Section 36 variation was submitted for the Neart na Gaoithe offshore wind farm which committed the project to a reduced number of higher capacity turbines (up to 75 turbines and a rated turbine capacity of up to 7 MW). The documentation supporting this variation contains collision risk estimates calculated for the consented turbine scenario (75 x 6 MW turbines). The assessments presented in Chapter 10:Offshore Ornithology and the RIAA for kittiwake have therefore been updated using the collision risk estimates associated with the varied consent.

A similar Section 36 variation had previously been submitted for the Inch Cape offshore wind farm (in October 2014) with commitments to reduce the number of turbines from 213 to 110 and to reduce the total generating capacity of the project from 1050 MW to 784 MW. However, updated collision risk estimates do not appear to be available and therefore likely changes are discussed qualitatively in the Discussion section.

Revised applications for all of these projects are expected in 2018 (the application for Neart na Gaoithe has been submitted and is publically available) incorporating different project designs to those consented in 2014. Although collision risk estimates reflecting the revised turbine scenarios are available for each project, it is possible that each project could choose to construct the previously consented turbine scenario. As such, the changes to collision risk that may occur if the revised designs are awarded consent is only considered qualitatively in the Discussion section.

1.4.4 Thanet

Collision risk modelling undertaken for the Thanet offshore wind farm incorporated two turbine scenarios (60 x 5 MW and 100 x 3 MW). The assessments undertaken for the application were based on the worst case scenario (60 x 5 MW) however, the as-built scenario is 100 x 3 MW turbines. Chapter 10: Offshore Ornithology and the RIAA utilised the collision risk estimates calculated using the 100 x 3 MW turbine scenario and these collision risk estimates are therefore used in the following sections.

1.5 Approach 2 – Corrected collision risk estimates using correction factors in MacArthur Green (2017)

There are a number of projects considered cumulatively/in-combination for which the turbine parameters used in MacArthur Green (2017) correspond with those used to calculate collision risk estimates used in the cumulative and in-combination assessments for Moray West. This includes:

- Galloper;
- Humber Gateway;
- Kentish Flats Extension;
- Lincs;
- Race Bank;
- Teesside; and
- Westermost Rough.

For these projects, the correction factors presented in MacArthur Green (2017) have been applied to the collision risk estimates obtained for each project (Table 1.4). This approach was conducted in Chapter 10: Offshore Ornithology and the RIAA.

Table 1.4: Correction factors from MacArthur Green (2017) applied in Approach 2

Project	Correction factor

Table 1.4: Correction factors from MacArthur Green (2017) applied in Approach 2	
Galloper	0.42
Humber Gateway	0.39
Kentish Flats Extension	0.72
Lincs	1.04
Race Bank	0.59
Teesside Offshore Wind Farm	0.67
Westermost Rough	0.82

1.6 Approach 3 – Corrected collision risk estimates using corrected factors derived using the MacArthur Green (2017) with updated turbine parameters

There are a number of projects considered cumulatively/in-combination for which the assessed turbine parameters used to calculate collision risk estimates do not match those used in MacArthur Green (2017) to derive a correction factor. This includes:

- Aberdeen (European Offshore Wind Development Centre);
- East Anglia One;
- Greater Gabbard;
- Hornsea Project One;
- London Array;
- Triton Knoll.

The approach used to derive these correction factors has therefore been updated with the turbine parameters used to calculate the collision risk estimates used in the cumulative and in-combination assessments for Moray West. The resulting correction factors (Table 1.5) are then applied to the collision risk estimates used in Chapter 10: Offshore Ornithology and the RIAA.

The turbine parameters and relevant sources used to derive correction factors are presented in Appendix A. Where a range of values was presented for a parameter, the worst case value was applied to derive a correction factor.

Table 1.5: Correction factors derived for projects for which Approach 3 was applied	
Project	**Correction factor**
Aberdeen	1.11
East Anglia One	0.40
Greater Gabbard	1.06

Table 1.5: Correction factors derived for projects for which Approach 3 was applied	
Hornsea Project One	0.78
London Array	0.49
Triton Knoll	0.35

1.7 Approach 4 - no change/information unavailable

The as-built/planned turbine scenario deployed for some projects considered cumulatively/in-combination has not changed since assessments were conducted (Hywind, Methil). Some projects have only recently been consented and therefore no changes have been made to the assessed turbine scenario, although as changes have been made to the as-built/planned turbine scenario for the majority of projects in Table 1.3, it is considered likely that this may also occur at more recently consented projects (e.g. East Anglia Three).

For remaining projects, information is not available to allow the calculation of a correction factor to account for differences between assessed and as-built/planned turbine scenarios (Blyth, Hornsea Project Two and Kincardine).

1.8 Updated collision risk estimates

1.8.1 Methodology

The original collision risk estimates presented in Table 1.6 are consistent with those presented in Chapter 10: Offshore Ornithology and the RIAA for kittiwake. The apportioning applied to these estimates is consistent with that used for each relevant project in the original Moray West assessments.

1.8.2 Results

Table 1.6 presents the updated cumulative and in-combination collision risk estimates for kittiwake The cumulative and in-combination collision risk totals have reduced on seasonal and annual bases.

Table 1.6: Comparison of assessed and as-built predicted cumulative and in-combination collision risk for kittiwake using the Extended Band model where available

Approach	Project	Collision risk estimates as used in Moray West assessments						Updated collision risk estimates					
		Breeding		Post-breeding		Pre-breeding		Breeding		Post-breeding		Pre-breeding	
		EIA	ECC SPA	EIA	ECC SPA	EIA	ECC SPA	EIA	ECC SPA	EIA	ECC SPA	EIA	ECC SPA
Breeding and non-breeding seasons													
N/A	Moray Wes	79	56	24	1	7	1	79	56	24	1	7	1
1	Moray East	73	69	2	0	12	1	73	69	2	0	12	1
	Beatrice	30	28	4	0	10	1	30	28	4	0	10	1
Non-breeding season													
1	Dogger Bank Creyke Beck A&B			107	6	295	23			107	6	295	23
	Dogger Bank Teesside A and Sofia			79	5	217	17			79	5	217	17
	Inch Cape			224	13	63	5			224	13	63	5
	Neart na Gaoithe			26	2	2	0			26	2	2	0
	Seagreen Alpha			148	9	112	9			148	9	112	9
	Seagreen Bravo			113	7	85	7			113	7	85	7
	Thanet			0	0	0	0			0	0	0	0

Table 1.6: Comparison of assessed and as-built predicted cumulative and in-combination collision risk for kittiwake using the Extended Band model where available													
2	Galloper			27	2	27	2			11	1	11	1
	Humber Gateway			2	0	2	0			0	0	0	0
	Kentish Flats Extension			1	0	1	0			1	0	0	0
	Lincs			1	0	1	0			1	0	1	0
	Race Bank			17	1	6	0			10	1	3	0
	Teesside			13	1	3	0			9	1	2	0
	Westermost Rough			0	0	0	0			0	0	0	0
3	Aberdeen			3	0	0	0			4	0	1	0
	East Anglia One			396	23	142	11			158	9	56	4
	Greater Gabbard			6	0	17	1			7	0	18	1
	Hornsea Project One			43	3	23	2			34	2	18	1
	London Array			2	0	3	0			1	0	1	0
	Triton Knoll			99	6	67	5			32	2	22	2
4	Blyth			2	0	1	0			2	0	1	0
	East Anglia Three			64	4	31	2			64	4	31	2

Table 1.6: Comparison of assessed and as-built predicted cumulative and in-combination collision risk for kittiwake using the Extended Band model where available

	Hornsea Project Two			7	0	3	0			7	0	3	0
	Hywind			1	0	1	0			1	0	1	0
	Kincardine			6	0	1	0			6	0	1	0
	Methil			0	0	0	0			0	0	0	0
Total		181	153	1,419	83	1,131	87	181	153	1,074	63	973	75

There are considerable differences between the collision risk estimates for kittiwake calculated using assessed turbine scenarios and those corrected to reflect the as-built turbine scenarios for relevant projects. Table 1.7 presents the approximate percentage reductions that occur between the assessed and as-built totals.

Table 1.7: Percentage reductions in cumulative and in-combination collision risk calculated for kittiwake

Season	% reduction	
	EIA	ECC SPA
Breeding	0	0
Post-breeding	24	24
Pre-breeding	14	14

1.9 Discussion

1.9.1 Validity of correction factor approach

The application of the correction factors in this report is to highlight a substantial area of over-estimation in cumulative and in-combination assessments. The approach presented in MacArthur Green (2017), using ratios of assessed and as-built turbine scenarios calculated using the Band (2012) CRM, is considered to provide a suitable methodology for which such over-estimation can be quantified. It is however, important to highlight that the application of correction factors does not provide exact estimates of collision risk with the actual number potentially higher or lower although this margin of error is considered to be negligible, especially in assessment terms likely representing less than one bird in most cases. The level of uncertainty associated with collision risk estimates calculated using these factors is considered to be significantly less than the differences associated with cumulative/in-combination totals calculated using assessed turbine scenarios.

For collision risk estimates calculated using the Basic Band model (Options 1 and 2) no correction has been applied to account for differences in turbine height which would affect the proportion of birds at collision height (PCH). This would potentially result in considerable reductions in collision risk estimates, where the lower rotor tip height has been raised. Many projects will have conducted collision risk modelling based on the minimum level of clearance required (i.e. 22 m above Highest Astronomical Tide) with this representing the worst case scenario and most likely the most economic design option. However, there are a number of projects where an increase in lower rotor height has been used to reduce collision risk estimates both as part of the application process and post-consent (e.g. Hornsea Project One).

Turbine parameters for both assessed and as-built turbine scenarios are often not reported as part of project-specific literature. Other sources of information (e.g. 4coffshore.com and turbine specifications from manufacturers) have been consulted where required, however some parameters have had to be estimated based on information provided at other projects that use the same turbine or expert judgement. The sources from which turbine parameters were obtained are clearly identified in Appendix A.

1.9.2 Approach 1 projects

Those projects for which Approach 1 (updated project-specific collision risk estimates) was considered applicable were:

- Beatrice;
- Dogger Bank Creyke Beck A&B;
- Dogger Bank Teesside A&B (now Dogger Bank Teesside A and Sofia);
- Seagreen Alpha;
- Seagreen Bravo;
- Inch Cape;
- Moray East;
- Neart na Gaoithe; and
- Thanet.

For a number of these projects, although updated collision risk estimates, representing the as-built/planned turbine scenario exist it was not considered appropriate to utilise these in assessment for Moray West. This is applicable to all projects included in Approach 1 with the exception of Thanet which is an operational project which was built out to consented capacity.

The submission of a non-material amendment or an updated application indicates that a developer is giving serious consideration to a different turbine scenario, with these scenarios generally representing fewer, more powerful turbines that are likely to reduce installation costs. The projects identified for Approach 1 were consented in 2014 or 2015. Offshore wind farm technology has developed considerably since these projects were consented. The most recently constructed projects (e.g. Burbo Bank Extension and Walney Extension) have deployed 8 MW and 8.25 MW turbines respectively.

1.9.2.1 Dogger Bank projects

As discussed in Section 1.4.2 the Dogger Bank Creyke Beck A&B and Sofia projects issued non-material amendments to the Secretary of State (BEIS) in June 2018 outlining a number of proposed changes. It is considered appropriate to consider the change to collision risk estimates that would occur if the proposed turbine scenarios included in the non-material amendments are ultimately constructed.

Collision risk modelling undertaken for kittiwake at Dogger Bank Creyke Beck A&B indicates that collision risk estimates will reduce by approximately 32-48% when using the Basic model. For the Sofia project, reductions of approximately 26-47% were calculated for kittiwake.

The contribution of the Dogger Bank projects to total in-combination collision risk estimates are considerable for some species , representing up to 25% (using the Basic model) of the total for kittiwake. As such reductions of the magnitude described above would have a material effect on the conclusions drawn as part of the cumulative and in-combination assessments undertaken for Hornsea Three. Assessments should therefore include consideration of these reductions which are likely to occur as developers deploy fewer, larger turbine scenarios.

1.9.2.2 Firth of Forth projects

The collision risk estimates incorporated into the original assessments for Moray West for Neart na Gaoithe, Inch Cape and Seagreen Alpha and Bravo represented the predicted collision risk for the consented turbine scenarios at each project. A correction factor was applied to the collision risk estimates for Neart na Gaoithe with this representing the difference in the number of turbines for the consented and planned turbine scenarios. Collision risk estimates calculated reflecting the revised design for each of the three projects are presented in the recently submitted consent applications.

For collision risk estimates incorporated into the cumulative assessment for kittiwake in Chapter 10: Offshore Ornithology, those for Neart na Gaoithe, Inch Cape and Seagreen reduce by approximately 73%, 74% and 52% respectively. The contribution of the Firth of Forth projects to total in-combination collision risk estimates can be significant, representing approximately 29% of the total for kittiwake. As such reductions of the magnitude described above would have a material effect on the conclusions drawn as part of the cumulative and in-combination assessments undertaken for Hornsea Three.

1.9.3 Further development

For some projects presented in Table 1.3, the as-built or planned turbine scenarios represent turbine scenarios that do not reflect the maximum consented capacity or turbine number included in the relevant Marine Licences/consent decisions, that is to say less than the permitted capacity/number of turbines have been or will be deployed. It therefore remains legally possible even if unlikely practically for further development at projects where the as-built or planned turbine scenarios do not represent the maximum limits for the number of turbines or total capacity included in the relevant Marine Licence/consent decision. The potential for future development at relevant projects is investigated in Table 1.8.

Table 1.8: Consideration of the potential for further development at projects considered cumulatively/in-combination with Moray West					
Project	**Project status**	**As-built/planned turbine scenario**	**Permitted wind farm design**		**Potential for further development**
			Number of turbines	Total capacity (MW)	
Aberdeen (European Offshore Wind Development Centre)	Partially operational	11 x 8.4 MW	11	100	No – permitted maximum number of turbines reached
East Anglia One[a]	Under construction	102 x 7 MW	150 (HVAC option)	750 (HVAC option)	Yes – however the CfD award for East Anglia One was for 714 MW, equivalent to the as-built scenario
Galloper Wind Farm	Operational	56 x 6.3 MW	140	504	Yes – permitted number of turbines and total capacity higher than as-built scenario
Greater Gabbard Wind Farm	Operational	140 x 3.6 MW	140	500	No – total consented capacity and number of turbines reached
Hornsea Project One	Under construction	174 x 7 MW	240	1200	No – total consented capacity reached
Humber Gateway	Operational	73 x 3 MW	83	300	Yes – permitted number of turbines and total capacity higher than as-built scenario
Kentish Flats Extension	Operational	15 x 3.3 MW	-	51	No – with the turbine used, no further development would be possible (i.e. current toal capacity is 49.5 MW and therefore another 3.3 MW turbine could not be constructed within consent limits
Lincs	Operational	75 x 3.6 MW[b]	83	250	No – permitted total capacity reached
London Array	Operational	175 x 3.6 MW	341	1000	No - Marine Licence allows to 341 turbines and a total capacity of 1000 MW however, this is for a project in two phases. The first phases comprises 175 turbines with the second phase (London Array Phase 2) having been withdrawn
Race Bank	Operational	91 x 6.3 MW	Not defined	580	Highly unlikely – As-built total capacity equals 573.3 MW with total permitted capacity of 580 MW
Teesside Offshore Wind Farm	Operational	88 x 3.6 MW	108	316.8	No – maximum permitted capacity reached

a The Marine Licence for East Anglia One included two design scenarios, one using HVAC technology and the other using HVDC technology. The wind farm has been built using HVAC technology and as such the wind farm scenario using this scenario has been presented here
b Includes capacity and turbines at Lynn and Inner Dowsing

There is no capacity for further development at the following projects based on the information presented in Table 1.8:

- Aberdeen;
- Greater Gabbard;
- Hornsea Project One;
- Kentish Flats Extension;
- Lincs;
- London Array; and
- Triton Knoll.

The corrected collision risk estimates calculated in this report should therefore be used as part of cumulative and in-combination assessments for Moray West.

In addition to these projects, if further development were to occur at the remaining projects, there is unlikely to be any material increases in collision risk at the following projects as the as-built capacity is close to the consented capacity: East Anglia One (where only five additional turbines could potentially be installed), Race Bank (where only one additional turbine could be installed) and Westermost Rough (where only five additional turbines could be installed). This means that there are only three projects (Galloper, Humber Gateway and Teesside) at which future development could occur with the potential for material increases in collision risk.

However, there are a number of reasons why it is considered unlikely that further development would occur:

- Construction cost; and
- Contracts for Difference and economic viability;

The construction of an offshore wind farm requires the deployment of multiple resources including vessels, helicopters and personnel in addition to the production of wind farm components and the establishment of construction compounds to enable the transfer of materials to site. This is a costly process and one that is highly unlikely to be restarted when the economics of such an exercise are taken into account (i.e. the value of energy production from a few additional turbines may not outweigh the construction of these turbines). This is considered applicable to East Anglia One, Race Bank and potentially Westermost Rough.

Contracts for Difference (CfDs) are the subsidy scheme used to support investment in low-carbon electricity generation. Projects awarded a CfD are paid a fixed 'strike price' for each unit of electricity produced. If wholesale electricity prices fall below the strike price, contracted schemes receive the difference as a top-up payment. This provides a project with stable revenue generation that ensures the project is financially viable. It is therefore unlikely that a project would exceed the capacity awarded as part of the CfD as this may not be economically viable. This is considered applicable to East Anglia One.

1.10 Use of updated estimates in Moray West assessments

1.10.1 Summary of approaches taken for projects considered cumulatively/in-combination

Table 1.9 presents a summary of the approaches applied for those projects considered cumulatively/in-combination with Moray West for which updated collision risk estimates are available. In addition, a summary of the potential for further development at relevant projects (i.e. those for which Approaches 2 and 3 were applied) is also included. This information is then used to identify those projects for which the updated collision risk estimates represent the worst case scenario and should therefore be incorporated into assessments for Hornsea Three taking into account the differences between assessed and as-built scenarios and the potential for further development at each project.

Following the summary presented in Table 1.9, the updated collision risk estimates considered to represent the worst case scenario, using both the Basic model and Extended model, where available are presented in Table 1.10 in order to identify the precaution incorporated into the cumulative and in-combination assessments presented for Moray West. The final column in each table ('Change applied') indicates where either updated collision risk estimates are available or a correction factor has been applied for the relevant project. This therefore represents those projects for which collision risk estimates are different to those used in Chapter 10: Offshore Ornithology and the RIAA.

Table 1.9: Summary of approaches applied for projects considered cumulatively/in-combination with Hornsea Three and the worst case scenario for each project.

Project	Summary of refinements to collision risk estimates in this report	Is future development possible (Approach 2 and 3)?	Do updated collision risk estimates represent the worst case scenario?
Aberdeen (European Offshore Wind Development Centre)	Approach 3 - Correction factor derived using as-built turbine scenario	No	Yes. Project is operational. No further development is possible.
Beatrice	Approach 1 - Updated collision risk estimates for the as-built scenario available	-	Collision risk estimates used for Moray West assessments represent the as-built scenario
Blyth Offshore-Demonstration Extension	As built turbine scenario uses fewer turbines	-	N/A
Dogger Bank Creyke Beck A & B	Approach 4 - No updated information available	-	No. Current collision risk estimates are considered to reflect the worst case scenario at the project. The developer is however, considering different turbine scenarios that would reduce collision risk
Dogger Bank Teesside A and Sofia	Approach 1 - Non-material amendment under consideration, consented scenario could still be constructed	-	No. Current collision risk estimates are considered to reflect the worst case scenario at the project. The developer is however, considering different turbine scenarios that would reduce collision risk
East Anglia One	Approach 3 - Correction factor derived using as-built turbine scenario As built turbine scenario uses fewer, higher capacity turbines	Yes, however future development considered unlikely as operational capacity equals CfD award	Yes. Project is operational and updated collision risk estimates represent the as-built scenario and therefore provide an accurate representation of the likely collision risk associated with the project. Further development is considered to be unlikely.
East Anglia Three	Approach 4 - No change to consented turbine scenario	-	N/A
Seagreen Alpha	Approach 1 - None	-	New application submitted in 2018, however original consent still valid and therefore any changes in the new application should only be considered qualitatively
Seagreen Bravo	Approach 1 - None	-	New application submitted in 2018, however original consent still valid and therefore any changes in the new application should only be considered qualitatively

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Table 1.9: Summary of approaches applied for projects considered cumulatively/in-combination with Hornsea Three and the worst case scenario for each project.

Galloper Wind Farm	Approach 2 - Correction factor from MacArthur Green (2017) applied As built turbine scenario uses fewer, higher capacity turbines	Yes	No. Updated collision risk estimates derived using the correction factor are considered to provide an accurate representation of the as-built scenario however, further development is possible
Greater Gabbard Wind Farm	Approach 3 - Correction factor derived using as-built turbine scenario As-built turbine scenario has different parameters	No	Yes. Project is operational. No further development is possible.
Hornsea 1	Approach 3 - Correction factor derived using as-built turbine scenario As built turbine scenario uses fewer, higher capacity turbines	-	N/A
Hornsea 2	Approach 4 - No updated information available	-	N/A
Humber Gateway	Approach 2 - Correction factor from MacArthur Green (2017) applied As built turbine scenario uses fewer, lower capacity turbines	Yes	No. Updated collision risk estimates derived using the correction factor are considered to provide an accurate representation of the as-built scenario however, further development is possible
Hywind	Approach 4 - None	-	N/A
Inch Cape	Approach 1 - None	-	New application submitted in 2018, however original consent still valid and therefore any changes in the new application should only be considered qualitatively
Kentish Flats Extension	Approach 2 - Correction factor from MacArthur Green (2017) applied As built turbine scenario uses fewer, higher capacity turbines	No	Yes. Project is operational. No further development is possible.
Kincardine	Approach 4 - None	-	N/A
Lincs	Approach 2 - Correction factor from MacArthur Green (2017) applied As built turbine scenario uses fewer, higher capacity turbines	No	Yes. Project is operational. No further development is possible.

Table 1.9: Summary of approaches applied for projects considered cumulatively/in-combination with Hornsea Three and the worst case scenario for each project.

London Array	Approach 3 - Correction factor derived using as-built turbine scenario As built turbine scenario uses fewer, higher capacity turbines	No	Yes. Project is operational. No further development is possible.
Methil	Approach 4 - None	-	N/A
Moray East	Approach 1 - Updated collision risk estimates for the as-built scenario available	-	Yes. Collision risk estimates from (Marine Scotland, 2017) represent the as-built scenario and therefore provide an accurate representation of the likely collision risk associated with the project. Further development is considered to be unlikely.
Neart na Gaoithe	Approach 1 - Updated collision risk estimates for the as-built scenario available	No	Yes. Collision risk estimates from (Mainstream Renewable Power, 2015) represent the proposed as-built scenario and therefore provide an accurate representation of the likely collision risk associated with the project.
Race Bank	Approach 2 - Correction factor from MacArthur Green (2017) applied As built turbine scenario uses fewer, higher capacity turbines	Considered to be highly unlikely as operational capacity (573.3 MW) is close to consented capacity (580 MW)	Yes. Project is operational. No further development is possible.
Teesside Offshore Wind Farm	Approach 2 - Correction factor from MacArthur Green (2017) applied As built turbine scenario uses fewer turbines	Yes	No. Updated collision risk estimates derived using the correction factor are considered to provide an accurate representation of the as-built scenario however, further development is possible
Thanet	Approach 1 - None	--	N/A
Triton Knoll	Approach 3 - Correction factor derived using as-built turbine scenario As built turbine scenario uses fewer, higher capacity turbines	No	Yes. Collision risk estimates derived using the correction factor are considered to provide an accurate representation of the likely collision risk associated with the project. No further development is possible with proposed as-built scenario
Westermost Rough	Approach 2 - Correction factor from MacArthur Green (2017) applied As built turbine scenario uses fewer, higher capacity turbines	Yes	No. Updated collision risk estimates derived using the correction factor are considered to provide an accurate representation of the as-built scenario however, further development is possible

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Table 1.10: Predicted in-combination collision mortality for kittiwake from the East Caithness Cliffs SPA[1]							
Project	**Seasonal unapportioned collision risk estimates (EIA)**			**Seasonal collision risk apportioned to ECC SPA**			**Change applied**
	Breeding	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**	
Breeding and non-breeding season							
Moray West	79	24	7	56	1	1	None
Moray East	73	2	12	69	0	1	None
Beatrice	30	4	10	28	0	1	None
Non-breeding season							
Aberdeen European Offshore Wind Deployment Centre		4	1		0	0	Yes
Blyth Demonstration Project		2	1		0	0	None
Dogger Bank Creyke Beck Projects A and B		107	295		6	23	None
Dogger Bank Teesside Projects A and B		79	217		5	17	None
East Anglia One		158	56		9	4	Yes
East Anglia Three		64	31		4	2	None
Galloper		27	27		2	2	None
Greater Gabbard		7	18		0	1	Yes
Hornsea Project One		34	18		2	1	Yes
Hornsea Project Two		7	3		0	0	None
Humber Gateway		2	2		0	0	None
Hywind		1	1		0	0	None

[1] [1] The collision risk estimates presented in this table have not been corrected for either differences between assessed and as-built turbine scenarios or updated nocturnal activity factors

Table 1.10: Predicted in-combination collision mortality for kittiwake from the East Caithness Cliffs SPA[1]							
Project	**Seasonal unapportioned collision risk estimates (EIA)**			**Seasonal collision risk apportioned to ECC SPA**			**Change applied**
	Breeding	**Post-breeding**	**Pre-breeding**	**Breeding**	**Post-breeding**	**Pre-breeding**	
Inch Cape		224	63		13	5	None
Kentish Flats Extension		1	0		0	0	Yes
Kincardine		6	1		0	0	None
Lincs		1	1		0	0	Yes
London Array		1	1		0	0	Yes
Methil		0	0		0	0	None
Neart na Gaoithe		26	2		2	0	Yes
Race Bank		10	3		1	0	Yes
Seagreen Alpha		149	112		9	9	None
Seagreen Bravo		113	85		7	7	None
Teesside		13	3		1	0	None
Thanet		0	0		0	0	None
Triton Knoll		32	22		2	2	Yes
Westermost Rough		0	0		0	0	None
Total	181	1,096	992	153	65	77	

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3 Appendix A - Turbine parameters for projects considered cumulatively/in-combination

Table 3.1: Predicted in-combination collision mortality for kittiwake from the East Caithness Cliffs SPA[2]

Project	Assessed turbine scenario						As-built turbine scenario					
	No. of turbines	Rotor radius	Rotor speed (rpm)	Max blade width (m)	Pitch (°)	Source	No. of turbines	Rotor radius	Rotor speed (rpm)	Max blade width (m)	Pitch (°)	Source
Aberdeen	11	83.5	6.05	5.4	15	Genesis (2012)	11	82	10.5	5.4	4.3[a]	Vestas (2011)
East Anglia One	325	60	9.72	4.2	10	ERM et al. (2012)	102	77	13	4.98[b]	6	Siemens (2016)
Greater Gabbard	140	75	97	14	2	Banks et al. (2006)	140	53.5	13	4.2	6	Siemens (2015a)
Hornsea Project One	240	58	16.3	4.1	15	SmartWind (2013)	174	77	13	4.98	7	Siemens (2016)
London Array	271	75	18.4	5	15	RPS (2005)	175	60	13	4.2	6	Siemens (2015b)
Neart na Gaoithe	128	60	13	4.2	15	Fijn et al. (2012)	75	77	8	5	15	Mainstream Renewable Power (2015)
Triton Knoll	288	62.5	9.47	5.45	6	RWE npower renewables (2011)	90	82	9.2	5.4	4	Vestas (2011)[c]

a Based on similar turbine proposed for other projects
b Using the same turbine as other projects and therefore same max blade width assumed
c In the absence of parameters for the 9.5 MW turbine, the parameters for the 8.0 MW turbine are used

[2] [2] The collision risk estimates presented in this table have not been corrected for either differences between assessed and as-built turbine scenarios or updated nocturnal activity factors

Annex D Reassessment of Densities for Key Bird Species using the DSS

MORAY WEST
OFFSHORE WINDFARM

Offshore Wind Farm and Offshore Transmission Infrastructure Application Addendum

Annex D – DSS Reassessment for Ornithology

Moray Offshore Windfarm (West) Limited

1 Annex D – Reassessment of Density Estimates for Key Seabirds through the Decision Support System

1.1 Introduction

The following section presents the results from the re-assessment of densities for kittiwake, guillemot and razorbill with respect to the Alternative Moray West Site using the DSS process.

1.2 Background

Moray West have undertaken High Definition Digital Video Aerial Surveys (DVAS) across the Moray West Site plus a 4 km buffer. This survey was undertaken across one year (April 2016 to March 2017), rather than across two years, which is often recommended by stakeholders. However, since there were extensive existing data available from surveys of both Moray East and Beatrice Offshore Wind Ltd. (BOWL), Moray West proposed a new approach to better characterise inter-annual variability within the site than from two years of survey alone.

The existing one year of DVAS survey data was compared to existing, publicly available, survey data in the Moray Firth. Suitable data was selected for comparing densities of birds sitting on the water, or in flight, in the Moray West Site plus 4 km buffer with similar data in the same months, but in other calendar years.

In order to select suitable densities for use in the impact assessment for the proposed Moray West Offshore Wind Farm, a decision support system (DSS) was created. The DSS compared the point density estimate from the Moray West DVAS data with the corresponding upper and lower confidence interval from other sources in other years. The DSS then provided a recommended density value to use, which was then extrapolated to the Moray West Site plus 2 km buffer, for displacement assessment, or to the Moray West Site only, for collision risk modelling. All of the density values recommended from the DSS were compared with existing densities estimated from the Moray West DVAS data analysed using MRSea (Scott-Hayward et al. 2013), and other data sources from the Moray Firth (e.g. Moray East boat surveys, Beatrice Offshore Wind Ltd. (BOWL) DVAS surveys analysed using MRSea. When bird numbers were too low to enable use of MRSea, density was calculated using the mean of density in each transect with bootstrapped confidence limits (Buckland *et al.* 2001).

1.3 Data Sources

All of the density values recommended from the DSS were compared with existing densities estimated from the Moray West DVAS data analysed using MRSea (Scott-Hayward et al. 2013), and other data sources from the Moray Firth (Figure 1.1):

- Moray East boat-based surveys;
- Beatrice Offshore Wind Ltd. (BOWL) DVAS surveys; and
- BOWL boat-based surveys

Moray East boat-based survey data were obtained from the published Environmental Statements (ESs) submitted as part of the previous Telford, Stevenson and MacColl wind farm applications (now referred to as Moray East). Data from birds observed in flight were analysed to estimate the 'aerial density' by extrapolating from the area surveyed to the whole survey area. Data from birds sitting on the water were analysed using model based Distance analyses (Thomas et al. 2010).

BOWL DVAS survey data were analysed in different ways depending on the area of interest. In the overlap between the Moray West Site plus 4 km buffer and the BOWL survey area, data were analysed using Kernel Density Estimation to produce both 'aerial densities' and densities of sitting birds. At the scale of the BOWL survey area, and the wind farm boundary within this, data were analysed by Trinder (2016) using MRSea.

To aid with comparisons, all of the monthly densities for each species from each overlap area are summarised in Annex A.

To avoid confusion with densities estimated from aerial survey techniques, throughout 'aerial densities' refers to the densities of birds in flight.

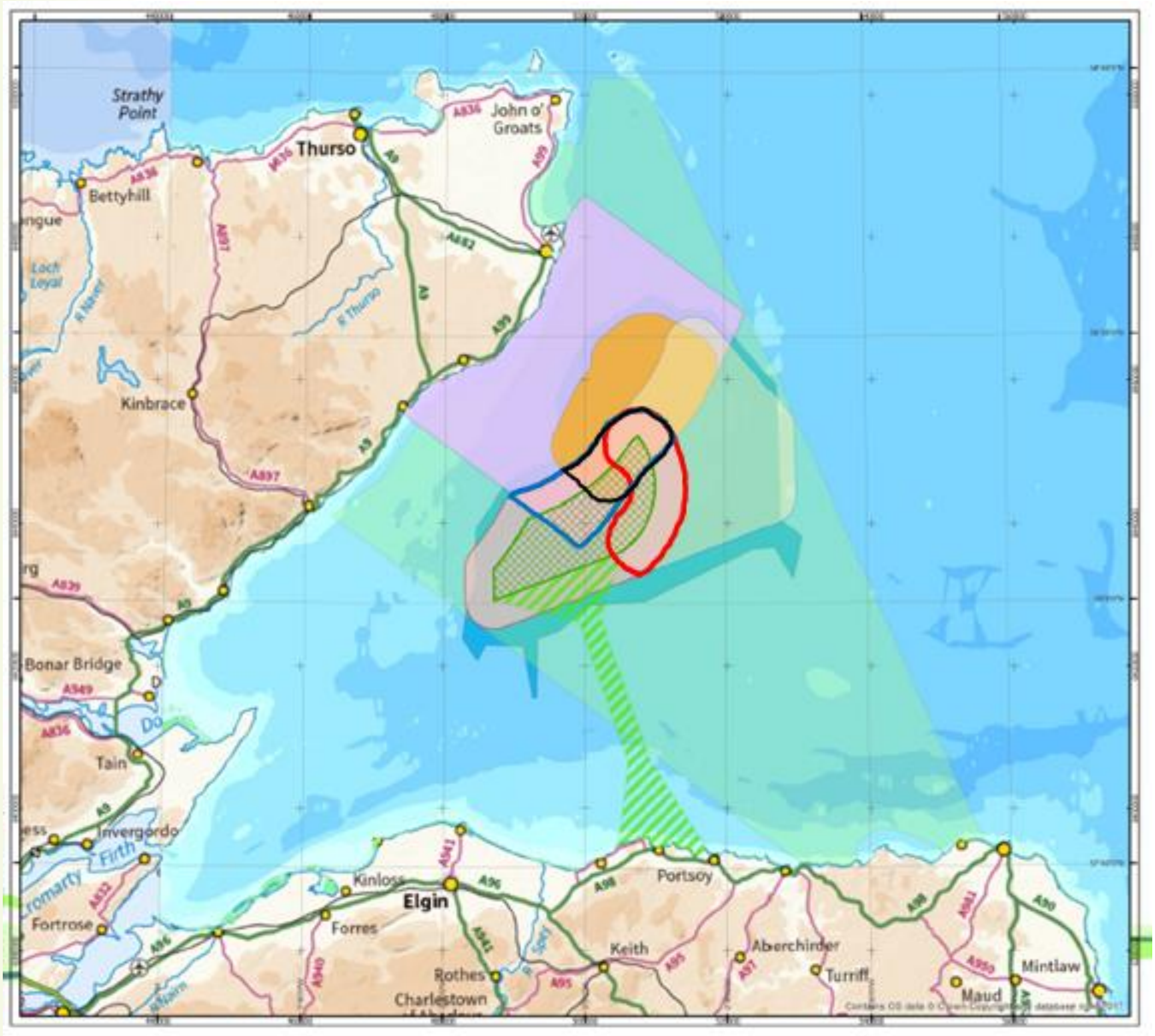

Figure 1.1 Map of the Moray Firth showing available data sources and the areas of sea where overlapping data were used as inputs to the DSS. The red line shows the overlap between the Moray West digital area survey area and the Moray East boat-based survey area. The blue line shows the overlap between the Moray West digital area survey area and the BOWL digital aerial survey area. The black line shows the overlap between the Moray West digital area survey area and BOWL boat-based survey area.

1.4 Kittiwake

1.4.1 Kittiwake aerial densities in the breeding season

The aerial densities of kittiwakes, as used as input values for collision risk modelling, were compared between the overlap of the Moray West and BOWL survey area and between the current Moray West Site area only (with no buffers) and the Alternative Moray West Site area only (with no buffers). These are summarised in Table 1.1. These show that in April to July the predicted aerial densities of kittiwakes in the Alternative Moray West Site area were lower than the current Moray West Site area. These differences were generally small (<1.0 birds km^{-2}). Only in August were the predicted aerial densities higher in the Alternative Moray West Site area than the current Moray West Site area. Again, this difference was small (0.34 birds km^{-2}).

Table 1.1 Comparison of aerial densities (birds.km^{-2}) of kittiwakes between the overlap between the Moray West survey area and BOWL survey area and between the current Moray West site area with no buffers and the Alternative Moray West Site area with no buffers (and upper and lower 95% confidence intervals).

Month	Moray West Site and 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with Moray West Site and 4 km buffer (lower – upper 95% CI)	current Moray West Site area only (no buffers) density (lower – upper 95% CI)	Alternative Moray West Site area only (no buffers) density (lower – upper 95% CI)
April	0.00	No survey	0.21 (0.00 – 0.54)*	0.21 (0.00 – 0.54)*
May	0.64 (0.62 – 0.66)	2.49 (1.2 – 4.07)	1.43 (1.04 – 2.30)	1.22 (1.07 - 1.39)
June	5.05 (4.91 – 5.21)	10.52 (1.13 – 24.23)	4.76 (3.72 – 6.74)	4.00 (3.83 - 4.17)
June +	N/a	21.64 (4.62 – 45.83)	N/a	N/a
July	3.17 (3.10 – 3.24)	9.08 (4.92 – 14.28)	3.35 (2.70 – 4.61)	2.89 (2.81 - 2.97)
July +	N/a	30.25 (15.19 – 48.8)	N/a	N/a
August	2.92 (2.79 – 3.06)	4.03 (0.93 – 8.42)	5.38 (3.78 – 8.98)	5.72 (5.54 - 5.90)
* Density estimated using mean of transect density + BOWL surveys were undertaken twice in each month				

The predicted aerial densities for the Alternative Moray West Site area were applied to the DSS process. The results of these new aerial densities are described in Table 1.2. This comparison shows that the recommended aerial densities for kittiwake in the breeding season did not change. This was due to the DSS process selecting data from the overlap between the Moray West survey area data and BOWL survey area data for all months.

Table 1.2 Node path through the DSS flow chart to select suitable densities for collision risk assessment. Blue = Current Moray West Site area, Green = Alternative Moray West Site area.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Estimate no.	Density estimate
April							n/a	0.21
							n/a	0.21
May		X				X	4	2.49
		X				X	4	2.49

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Estimate no.	Density estimate
June	X			X			2	12.40
	X			X			2	12.40
July		X				X	4	19.67
		X				X	4	19.67
August	X			X			2	3.47
	X			X			2	3.47

However, as previously noted in Technical Appendix 10.1A, the DSS selected aerial densities in June and July that included very high densities from the mean of transect densities from the aerial surveys of BOWL where they overlapped with the aerial surveys of Moray West. These densities estimates were high as the spatial scale of the overlap area was small relative to the spatial scale of hotspots of flying kittiwakes across the surveyed areas. While these densities are believable in relation to an individual hotspot, they are being extrapolated across a much larger spatial area and a much longer period than the lifespan of the hotspots. The Band (2012) Collision Risk Model (CRM), which calculates the collision risk for a single turbine and then multiplies this by the total number of turbines, creates an artificially high result by extrapolating the high hotspot density both spatially and temporally. The input density estimates for the Band (2012) CRM is intended to be a mean value that in some way represents the entire wind farm, and not just the turbines that may occur within a relatively small spatial scale. The Band (2012) CRM also extrapolated this mean density estimate across a much longer temporal scale then hotspots are likely to exist. The pattern of density estimates shown in EIA Report, Volume 4, Technical Appendix 10.1A (Figure 2.3) demonstrated that the location and densities of hotspots vary at least from month to month, and in reality, the temporal scales of hotpots likely vary from a few hours to a single day. The Band (2012) CRM extrapolates the input density estimate across the daylight hours in the month being modelled, and, where appropriate, a proportion of the hours of darkness too. Thus, the high aerial densities selected using the DSS are likely unsuitable for the Band (2012) CRM to make a meaningful prediction.

In this situation, any process-based DSS requires the application of expert judgment to adjust the recommended value. Here, it is apparent that in June and July some expert judgement is required to select a suitable aerial density of kittiwake for CRM. Since it is clear that spatial scale can be important, the aerial densities of kittiwakes from similar spatial scales were compared. Results of modelling observed kittiwakes in flight from digital aerial surveys of the current Moray West Site area and 4 km buffer and the BOWL digital aerial surveys of the wind farm and an approximately 10 km buffer showed the densities averaged across a broader spatial scale varied between 4.00 birds.km^{-2} and 7.53 birds.km^{-2} in June (Table 1.3) and between 3.15 birds.km^{-2} and 7.63 birds.km^{-2} in July (Table 1.4). This comparison has other advantages. Surveys of both wind farms were conducted using high definition digital video surveys. Data from these surveys were both analysed using MRSea (Scott-Hayward *et al*. 2013). Thus, there were no differences due to survey platform, technology type or analysis. It is also useful to show the level of intra-monthly densities within the Moray Firth, as the BOWL surveys were undertaken twice in each month. BOWL data were obtained from Trinder (2016).

Table 1.3 Aerial densities (birds.km^{-2}) of kittiwake from Moray West digital aerial surveys and BOWL digital aerial surveys in June. All results from MRSea models. Selected density shown in bold.

Area	Density	Lower 95% CI	Upper 95% CI
Current Moray West Site area + 4 km	6.05	5.20	7.69
Alternative Moray West Site area + 4 km	5.21	5.09	5.35
Current Moray West Site area + 2 km	5.16	4.23	6.94
Alternative Moray West Site area + 2 km	4.68	4.53	4.82
Current Moray West Site area	4.76	3.72	6.74
Alternative Moray West Site area	4.00	3.83	4.17
BOWL survey area (First survey)	4.97	-	-
BOWL survey area (Second survey)	4.96	-	-
BOWL wind farm (First survey)	5.17	-	-
BOWL wind farm (Second survey)	**7.53**	-	-

Table 1.4 Aerial densities (birds.km^{-2}) of kittiwake from Moray West digital aerial surveys and BOWL digital aerial surveys in July. All results from MRSea models. Selected density shown in bold.

Area	Density	Lower 95% CI	Upper 95% CI
Current Moray West Site area + 4 km	3.15	2.69	4.00
Alternative Moray West Site area + 4 km	3.08	3.02	3.15
Current Moray West Site area + 2 km	3.27	2.77	4.26
Alternative Moray West Site area + 2 km	3.02	2.95	3.09
Current Moray West Site area	3.35	2.70	4.61
Alternative Moray West Site area	2.89	2.81	2.97
BOWL survey area (First survey)	4.77	-	-
BOWL survey area (Second survey)	5.93	-	-
BOWL wind farm (First survey)	7.05	-	-
BOWL wind farm (Second survey)	**7.63**	-	-

The much narrower range of aerial densities of kittiwake in the Moray Firth in June and July that are apparent from the comparisons in Table 1.3 and table 1.4 indicated that the selected densities using the DSS were not representative of the likely real baseline conditions in the current Moray West Site area or the Alternative Moray West Site area. The densities within the Alternative Moray West Site area and both a 2 km and 4 km buffer from 2016 are within the range of densities of the four surveys from BOWL in 2015. However, since the aerial densities in BOWL could be higher than the single year of data from Moray West, and the absence of a second year of surveys in Moray West, a suitable, precautionary density to select was the highest value across the two surveys. This was 7.53 birds.km^{-2} in June, from the second June survey of the BOWL wind farm area and 7.63 birds.km^{-2}, from the second July survey of the BOWL wind farm area. Both values are similar to the upper 95% confidence intervals for the predicted aerial densities of kittiwakes in the Moray West surveys in June.

1.4.2 Kittiwake aerial densities in the post-breeding season

The aerial densities of kittiwakes were compared between the overlap of the Moray West and BOWL survey area and between the current Moray West Site area only (with no buffers) and the Alternative Moray West Site area only (with no buffers). Additionally, the boat-based survey date from Moray East were provided for context. These are summarised in Table 1.5. Note, that there were no aerial surveys of the BOWL wind farm and buffer in the post-breeding season. These comparisons show that in September and December the predicted aerial densities of kittiwakes in the Alternative Moray West Site area were lower than the current Moray West Site area. These differences were small (<1.0 bird km^{-2}). In October and November the predicted aerial densities were higher in the Alternative Moray West Site area than the current Moray West Site area. Again, this difference was small (<1 bird km^{-2}).

Table 1.5 Comparison of aerial densities (birds.km^{-2}) of kittiwakes between the overlap between the Moray West survey area and BOWL survey area and between the current Moray West site area with no buffers and the Alternative Moray West Site area with no buffers (and upper and lower 95% confidence intervals).

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area density with no buffer (lower – upper 95% CI)	Alternative Moray West Site area density with no buffer (lower – upper 95% CI)	Moray East survey area (boat-based)
September	4.17 (3.90 – 4.50)	No survey	2.21 (1.65 – 3.45)	1.97 (1.79 - 2.17)	0.111
October	1.17 (1.15 – 1.19)	No survey	1.61 (1.28 – 2.17)	1.66 (1.60 - 1.71)	0.134
November	2.84 (2.80 – 2.87)	No survey	3.49 (2.92 – 4.34)	4.14 (4.01 - 4.30)	0.078
December	2.25 (2.09 – 2.43)	No survey	2.15 (1.62 – 3.10)	2.09 (1.98 - 2.21)	0.078

In the absence of comparable data from the BOWL digital aerial surveys, and no confidence intervals around the Moray East boat-based survey data, it was not possible to use the DSS to select suitable aerial densities. As can be seen from the densities obtained from boat-based surveys of the Moray East survey area, densities predicted by MRSea across the both the current Moray West Site area and Alternative Moray West Site area were much larger. It would therefore be precautionary to apply the Alternative Moray West Site area MRSea predictions for the post-breeding season. These density predictions were between 1.66 birds.km^{-2} (in October) and 4.14 birds.km^{-2} (in November).

1.4.3 Kittiwake aerial densities in the pre-breeding season

The aerial densities of kittiwakes were compared between the overlap of the Moray West and BOWL survey area and between the current Moray West Site area only (with no buffers) and the Alternative Moray West Site area only (with no buffers). Additionally, the boat-based survey data from Moray East were provided for context. These are summarised in Table 1.6. Note, that there were no aerial surveys of the BOWL wind farm and buffer in the pre-breeding season. These comparisons show that in January and February the predicted aerial densities of kittiwakes in the Alternative Moray West Site area were the same as the current Moray West Site area. In March the predicted aerial densities were lower in the Alternative Moray West Site area than the current Moray West Site area. This difference was very small (0.01 birds km^{-2}).

Table 1.6 Comparison of aerial densities (birds.km^{-2}) of kittiwakes between the overlap between the Moray West survey area and BOWL survey area and between the current Moray West site area with no buffers and the Alternative Moray West Site area with no buffers (and upper and lower 95% confidence intervals).

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area density with no buffer (lower – upper 95% CI)	Alternative Moray West Site area density with no buffer (lower – upper 95% CI)	Moray East survey area (boat-based)
January	n/a	No survey	0.36 (0.13 – 0.67)*	0.36 (0.13 – 0.67)*	0.178
February	n/a	No survey	0.67 (0.27 – 1.26)*	0.67 (0.27 – 1.26)*	0.111
March	3.15 (3.03 – 3.28)	No survey	1.48 (1.12 – 2.10)	1.47 (1.39 - 1.56)	0.457
* Density estimated mean of transect density					

In the absence of comparable data from the BOWL digital aerial surveys, and no confidence intervals around the Moray East boat-based survey data, it was not possible to use the DSS to select suitable aerial densities. As can be seen from the densities obtained from boat-based surveys of the Moray East survey area, densities predicted by MRSea across the both the current Moray West Site area and Alternative Moray West Site area were larger. It would therefore be precautionary to apply the Alternative Moray West Site area predictions for the pre-breeding season. These density predictions were between 0.36 birds.km^{-2} (in January) and 1.47 birds.km^{-2} (in March).

1.4.4 Kittiwake sitting densities in the breeding season

Initial comparison of the densities of kittiwakes in the current Moray West Site area and Alternative Moray West Site area plus 4 km buffers was made with the monthly densities of kittiwakes from boat-based surveys of Moray East (Table 1.7). These showed that estimated densities were variable across the year, but the Moray West data were largely similar to the range of densities estimated in Moray East.

Table 1.7 Comparison of current Moray West Site area and Alternative Moray West Site area plus 4 km buffer MRSea predicted densities (birds.km^{-2}) of kittiwakes on the water with calculated densities of kittiwakes from boat-based surveys of Moray East in Year 1 and Year 2.

Survey platform/Model	DVAS/MRSea		Boat-based/Design-based	
Month	**Current Moray West Site area plus 2 km buffer**	**Alternative Moray West Site area plus 2 km buffer density**	**Moray East (Year 1)**	**Moray East (Year 2)**
April	0	0	3.68 (1.10 – 12.33)	12.49 (4.74 – 32.88)
May	1.68 (1.30 – 2.64)	0.33 (0.30 - 0.37)	37.61 (15.81 – 89.45)	19.55 (2.48 – 154.00)

Survey platform/Model	DVAS/MRSea		Boat-based/Design-based	
Month	**Current Moray West Site area plus 2 km buffer**	**Alternative Moray West Site area plus 2 km buffer density**	**Moray East (Year 1)**	**Moray East (Year 2)**
June	8.57 (6.10 – 16.37)	4.48 (4.24 - 4.75)	1.00 (0.13 – 7.97)	0.89 (0.16 – 4.85)
July	5.18 (3.84 – 9.55)	4.93 (4.43 - 5.53)	0.13 (0.05 – 0.35)	1.73 (0.79 – 3.81)
August	10.62 (7.71 – 16.93)	10.74 (10.01 - 11.52)	0.05 (0.02 – 0.16)	1.85 (0.70 – 4.90)
September	3.90 (2.63 – 28.81)	3.94 (3.61 - 4.36)	0.03 (0.00 – 0.16)	0.08 (0.02 – 0.32)
October	0.10 (0.00 – 0.22)*	0	0.03 (0.00 – 0.15)	0.21 (0.05 – 0.84)
November	0.56 (0.34 – 53.69)	0.55 (0.50 - 0.60)	0	0
December	0.97 (0.65 – 3.68)	1.05 (0.92 - 1.20)	0.03 (0.00 – 0.15)	0.07 (0.01 – 0.41)
January	0	0	0.24 (0.07 – 0.84)	0.03 (0.00 – 0.15)
February	1.17 (0.00 – 3.07)*	0	1.59 (0.76 – 3.32)	0
March	2.85 (2.10 – 4.44)	3.01 (2.62 - 3.49)	6.90 (2.96 – 16.08)	1.81 (0.79 – 4.11)
* Density estimated using mean of transect density				

Kittiwake sitting density data were also available for the overlap between Moray West and Moray East, unlike the situation with bird aerial density data. Thus, comparisons were possible between the overlap between Moray West and BOWL digital aerial surveys, and between Moray West digital aerial surveys and Moray East boat-based surveys. The boat-based survey data from Moray East was analysed using a simpler Density Surface Model (DSM) using Generalised Additive Models (GAMs) as the analyses pre-dated the introduction of MRSea. Only the most abundant month in the breeding season was analysed using GAMs to map spatial densities. Thus, these were the only data from Moray East that could be analysed to determine densities in the overlap with the Moray West survey area, since they were the only data with spatial predictions. It was therefore possible to apply the DSS flow chart (Section 7.7 in PART 2 Chapter 7) to both overlaps separately. This added the need for an additional decision-making level of which density value should be applied to displacement assessment. To provide a suitably precautionary approach, the density estimate selected by the DSS flow chart for each pair of data sets (Moray West and BOWL overlap, and Moray West and Moray East overlap) whichever was the largest was selected as the input to the displacement matrix.

Comparison of the densities in the Current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer (Table 1.8) show that in all months of the breeding season densities were lower in the Alternative Moray West Site area plus 2 km buffer. There was some variation in these differences, with a small (< 1 bird.km^{-2}) difference in August, but the difference in other months was larger (e.g. a change in density of 4.09 birds.km^{-2} in June).

Table 1.8 Densities (birds.km^{-2}) of kittiwakes on the water in the current Moray West Site area plus 4 km buffer in the overlap with both BOWL and Moray east (and upper and lower 95% confidence intervals). In addition, the sitting densities for the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer. Seasonal peak values for each data set is highlighted in grey.

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
April	0	No survey	0	No data	0	0
May	0.03 (0.03 – 0.03)	0.39 (0.00 – 1.04)	0.39 (0.32 – 0.47)	9.49 (8.16 – 10.92)	1.68 (1.30 – 2.64)	0.33 (0.30 - 0.37)
June	0.62 (0.58 – 0.66)	23.57 (0.69 – 61.14)	3.59 (3.34 – 3.86)	No data	8.57 (6.10 – 16.37)	4.48 (4.24 - 4.75)
June +	N/a	3.24 (0.69 – 6.90)	N/a	N/a	N/a	N/a
July	1.54 (1.31 – 1.82)	5.40 (0.30 – 13.33)	0.11 (0.07 – 0.17)	No data	5.18 (3.84 – 9.55)	4.93 (4.43 - 5.53)
July +	N/a	35.06 (16.70 – 57.17)	N/a	N/a	N/a	N/a
August	1.35 (1.17 – 1.57)	4.32 (0.50 – 9.16)	17.95 (15.85 – 20.31)	No data	10.62 (7.71 – 16.93)	10.74 (10.01 - 11.52)
+ BOWL surveys were undertaken twice in each month						

Since the change of the area from the current Moray West Site area to the Alternative Moray West Site area did not change the data available in the overlaps with BOWL or Moray East, the DSS did not recommend any changes to the densities used (Table 1.9). It is important to note that these selected densities were higher than the peak density in the Alternative Moray West Site area (Table 1.8.)

Table 1.9 Node path through the DSS flow chart to select suitable densities for displacement assessment. Blue = Current Moray West Site area, Green = Alternative Moray West Site area.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
Current MW & BOWL		X				X	X		4	18.30
Proposed MW & BOWL		X					X		4	18.30

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
Current MW & ME		X			X				3	17.95
Proposed MW & ME		X			X				3	17.95

1.5 Guillemot

1.5.1 Guillemot sitting densities in the breeding season

Initial comparison of the densities of guillemots in the current Moray West Site area and Alternative Moray West Site area plus 4 km buffers was made with the monthly densities of guillemots from boat-based surveys of Moray East (Table 1.10). These showed that estimated densities were similar in most months, but much higher in August and September in both the Current Moray West Site area plus 2 km buffer and Alternative Moray West site area plus 2 km buffer than either year of data from Moray East.

Table 1.10 Comparison of current Moray West Site area and Alternative Moray West Site area plus 4 km buffer MRSea predicted densities (birds.km^{-2}) of guillemots on the water with calculated densities of guillemots from boat-based surveys of Moray East in Year 1 and Year 2.

Survey platform/Model	DVAS/MRSea		Boat-based/Design-based	
Month	**Current Moray West Site area plus 2 km buffer**	**Alternative Moray West Site area plus 2 km buffer density**	**Moray East (Year 1)**	**Moray East (Year 2)**
April	0.50 (0.19 – 0.88)*	0.51 (0.49 - 0.53)*	27.45 (20.08 – 37.53)	20.48 (16.37 – 25.63)
May	27.11 (23.33 – 33.17)	26.79 (25.63 - 27.96)	88.67 (55.83 – 140.82)	34.94 (22.82 – 53.51)
June	34.71 (30.13 – 43.03)	32.66 (31.33 - 34.11)	24.58 (16.56 – 36.49)	4.95 (3.71 – 6.61)
July	23.14 (20.28 – 27.86)	18.07 (17.48 - 18.73)	0.16 (0.06 – 0.48)	3.32 (2.04 – 5.40)
August	73.33 (64.81 – 88.14)	80.89 (77.90 - 84.16)	0.51 (0.21 – 1.26)	7.40 (5.09 – 10.76)
September	101.21 (90.76 – 115.09)	101.41 (91.92 - 112.24)	1.01 (0.57 – 1.81)	7.28 (4.14 – 12.79)
October	8.58 (7.49 – 10.41)	8.60 (8.38 - 8.83)	0.10 (0.03 – 0.37)	0.80 (0.29 – 2.20)
November	2.81 (2.33 – 3.71)	2.90 (2.79 - 3.01)	0.03 (0.01 – 0.20)	0.80 (0.32 – 2.01)
December	1.02 (0.80 – 1.60)	1.01 (0.96 - 1.06)	0.93 (0.32 – 2.68)	0.98 (0.57 – 1.66)
January	7.14 (6.04 – 9.07)	5.13 (4.93 - 5.34)	2.64 (1.53 – 4.56)	1.08 (0.59 – 1.97)
February	21.79 (19.40 – 25.47)	21.39 (20.72 - 22.10)	7.74 (5.79 – 10.33)	1.38 (0.79 – 2.41)
March	12.08 (10.39 – 15.27)	9.58 (9.32 - 9.87)	7.24 (4.48 – 11.69)	5.59 (3.40 – 9.19)
* Density estimated using mean of transect density				

The data selection process using the DSS followed the same approach as the breeding season kittiwake process.

Comparison of the densities in the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer (Table 1.11) show that in most months of the breeding season densities were lower in the Alternative Moray West Site area plus 2 km buffer. In April the densities in the Alternative Moray West Site area plus 2 km buffer were slightly higher (0.1 birds.km^{-2}), but in all other months of the breeding season the densities were lower, though this difference was small (0.32 – 5.07 birds.km^{-2}).

Table 1.11 Densities (birds.km^{-2}) of guillemots on the water in the current Moray West Site area plus 4 km buffer in the overlap with both BOWL and Moray east (and upper and lower 95% confidence intervals). In addition, the sitting densities for the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer. Seasonal peak values for each data set is highlighted in grey.

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
April	0.07 (0.06 – 0.07)*	No survey	0.54 (0.49 – 0.59)	No data	0.50 (0.19 – 0.88)	0.51 (0.49 - 0.53)
May	6.35 (6.09 – 6.62)	104.99 (60.09 – 151.68)	54.51 (53.03 – 56.03)	23.88 (22.39 – 25.38)	27.11 (23.33 – 33.17)	26.79 (25.63 - 27.96)
June	6.48 (6.22 – 6.73)	68.74 (13.77 – 138.11)	48.13 (44.32 – 52.36)	No data	34.71 (30.13 – 43.03)	32.66 (31.33 - 34.11)
June +	N/a	78.01 (8.68 – 182.72)	N/a	N/a	N/a	N/a
July	4.39 (4.29 – 4.48)	18.75 (8.03 – 35.33)	14.63 (14.27 – 15.01)	No data	23.14 (20.28 – 27.86)	18.07 (17.48 - 18.73)
July +	N/a	123.04 (67.93 – 180.22)	N/a	N/a	N/a	N/a

* Density estimated using mean of transect density
\+ BOWL surveys were undertaken twice in each month

Since the change of the area from the current Moray West Site area to the Alternative Moray West Site area did not change the data available in the overlaps with BOWL or Moray East, the DSS did not recommend any changes to the densities used (Table 1.12). It is important to note that these selected densities were much higher than the peak density in the Alternative Moray West Site area Table 1.11.

Table 1.12 Node path through the DSS flow chart to select suitable densities for displacement assessment. Blue = Current Moray West Site area, Green = Alternative Moray West Site area.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
Current MW & BOWL		X				X	X		4	64.76
Proposed MW & BOWL		X				X	X		4	64.76
Current MW & ME		X			X				3	54.51
Proposed MW & ME		X			X				3	54.51

The higher of the selected densities was from the comparison between the Moray West and BOWL data within the overlap of the two surveys. This value (64.76 birds.km^{-2}) was also higher than the density across the Alternative Moray West Site area plus 2 km buffer (32.66 birds.km^{-2}), so this was selected as the preferred, precautionary, input.

1.5.2 Guillemot sitting densities in the post-breeding season

Comparison of the densities in the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer (Table 1.13) show that in August densities in the Alternative Moray West Site area plus 2 km buffer were slightly higher (increase of 7.56 birds.km^{-2}), while in September they were very slightly lower (decrease of 0.2 birds.km^{-2}).

Table 1.13 Densities (birds.km^{-2}) of guillemots on the water in the current Moray West Site area plus 4 km buffer in the overlap with both BOWL and Moray east (and upper and lower 95% confidence intervals). In addition, the sitting densities for the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer. Seasonal peak values for each data set is highlighted in grey.

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
August	12.51 (12.14 – 12.93)	30.96 (19.17 – 46.30)	83.30 (76.48 – 90.65)	No data	73.33 (64.81 – 88.14)	80.89 (77.90 - 84.16)
September	74.86 (68.36 – 82.24)	No survey	95.68 (78.81 – 115.52)	No data	101.21 (90.76 – 115.09)	101.41 (91.92 - 112.24)

Since the change of the area from the current Moray West Site area to the Alternative Moray West Site area did not change the data available in the overlaps with BOWL or Moray East, the DSS did not recommend any changes to the densities used (Table 1.14). However, in the absence of a DSM from Moray East from which a density could be calculated, the only valid comparison was between Moray West and BOWL, in the overlap between the two surveys. This value (74.86 birds.km^{-2}) was lower than the density across the Alternative Moray West Site area plus 2 km buffer (101.41 birds.km^{-2}). Consequently, the estimate for the Alternative Moray West Site area plus 2 km buffer was selected as the preferred, precautionary, input.

Table 1.14 Node path through the DSS flow chart to select suitable densities for displacement assessment. Blue = Current Moray West Site area, Green = Alternative Moray West Site area.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
Current MW & BOWL		X			X				3	74.86
Proposed MW & BOWL		X				X	X		4	74.86
Current MW & ME									n/a	n/a
Proposed MW & ME									n/a	n/a

1.5.3 Guillemot sitting densities in the non-breeding season

Comparison of the densities in the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer (Table 1.15) show that in October and November densities in the Alternative Moray West Site area plus 2 km buffer were slightly higher (<1 bird.km^{-2}), while in December to March they were very slightly lower (decrease of 0.01 – 2.01 birds.km^{-2}).

Table 1.15 Densities (birds.km^{-2}) of guillemots on the water in the current Moray West Site area plus 4 km buffer in the overlap with both BOWL and Moray East (and upper and lower 95% confidence intervals). In addition, the sitting densities for the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer. Seasonal peak values for each data set is highlighted in grey.

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
October	1.70 (1.66 – 1.75)	No survey	6.06 (5.80 – 6.33)	No data	8.58 (7.49 – 10.41)	8.60 (8.38 - 8.83)

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
November	0.49 (0.46 – 0.51)	No survey	1.38 (1.31 – 1.45)	No data	2.81 (2.33 – 3.71)	2.90 (2.79 - 3.01)
December	0.32 (0.30 – 0.34)	No survey	0.43 (0.40 – 0.45)	No data	1.02 (0.80 – 1.60)	1.01 (0.96 - 1.06)
January	1.37 (1.30 – 1.44)	No survey	9.25 (8.69 – 9.83)	No data	7.14 (6.04 – 9.07)	5.13 (4.93 - 5.34)
February	6.01 (5.72 – 6.33)	No survey	25.78 (23.63 – 28.18)	No data	21.79 (19.40 – 25.47)	21.39 (20.72 - 22.10)
March	2.82 (2.67 – 3.00)	No survey	8.83 (8.38 – 9.37)	No data	12.08 (10.39 – 15.27)	9.58 (9.32 - 9.87)

As there were no suitable comparison data in either the overlap with BOWL or Moray East, the only suitable data were from Moray West. Therefore, the most suitable data to use were the data from Alternative Moray West Site area plus 2 km buffer and the suitable density selected was 21.39 birds.km^{-2}. As can be seen from the data comparison with Moray East (Table 1.16), this density appears reasonable, even though it's higher than other non-breeding season data. This is a slightly smaller seasonal peak value from the current Moray West Site area plus 2 km buffer (21.79 birds.km^{-2}).

1.6 Razorbill

1.6.1 Razorbill sitting densities in the breeding season

Initial comparison of the densities of razorbills in the current Moray West Site area and Alternative Moray West Site area plus 4 km buffers was made with the monthly densities of razorbills from boat-based surveys of Moray East (**Error! Reference source not found.** 1.16). These showed that estimated densities were lower in all months for the Alternative Moray West Site area plus 4 km buffer.

Table 1.16 Comparison of current Moray West Site area and Alternative Moray West Site area plus 4 km buffer MRSea predicted densities (birds.km^{-2}) of razorbills on the water with calculated densities of razorbills from boat-based surveys of Moray East in Year 1 and Year 2.

Survey platform/Model	DVAS/MRSea		Boat-based/Design-based	
Month	**Current Moray West Site area plus 2 km buffer**	**Alternative Moray West Site area plus 2 km buffer density**	**Moray East (Year 1)**	**Moray East (Year 2)**
April	0.00	0.00	1.30 (0.66 – 2.59)	7.44 (5.46 – 10.14)
May	1.04 (0.81 – 1.81)	0.73 (0.69 - 0.77)	29.91 (19.22 – 46.55)	4.59 (2.28 – 9.24)
June	0.79 (0.62 – 1.54)	0.77 (0.73 - 0.82)	1.14 (0.54 – 2.39)	1.40 (0.70 – 2.83)
July	7.44 (6.21 – 10.50)	5.84 (5.55 - 6.15)	0.13 (0.05 – 0.32)	2.28 (1.52 – 3.43)
August	8.87 (7.55 – 11.45)	8.70 (8.38 - 9.04)	0.08 (0.02 – 0.26)	26.97 (19.08 – 38.12)
September	20.59 (18.13 – 24.80)	16.75 (15.63 - 18.03)	1.40 (0.78 – 2.50)	6.70 (3.58 – 12.53)
October	0.49 (0.37 – 1.00)	0.46 (0.42 - 0.49)	0.06 (0.02 – 0.25)	0.12 (0.02 – 0.63)
November	0.06 (0.00 – 0.13)*	0.00	0.06 (0.01 – 0.38)	0.16 (0.07 – 0.39)
December	0.00	0.00	0.13 (0.02 – 0.74)	0.52 (0.11 – 2.42)
January	0.49 (0.19 – 0.83)*	0.00	0.71 (0.24 – 2.12)	1.00 (0.40 – 2.50)
February	1.49 (0.16 – 3.98)*	0.00	0.56 (0.24 – 1.33)	0.59 (0.29 – 1.20)
March	9.51 (7.70 – 45.18)	4.82 (4.56 - 5.09)	1.63 (0.98 – 2.71)	1.50 (0.78 – 2.89)
* Density estimated using mean of transect density				

The data selection process using the DSS followed the same approach as the breeding season kittiwake process

Comparison of the densities in the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer (Table 1.17) show that in all months of the breeding season densities were lower in the Alternative Moray West Site area plus 2 km buffer (decrease of <1 bird.km^{-2}).

Table 1.17 Densities (birds.km^{-2}) of razorbills on the water in the current Moray West Site area plus 4 km buffer in the overlap with both BOWL and Moray east (and upper and lower 95% confidence intervals). In addition, the sitting densities for the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer. Seasonal peak values for each data set are highlighted in grey.

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
April	0.00	No survey	0.00	No data	0.00	0.00

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
May	0.11 (0.10 – 0.12)	1.29 (0.64 – 1.93)	0.91 (0.86 – 0.96)	No data	1.04 (0.81 – 1.81)	0.73 (0.69 - 0.77)
June	0.17 (0.15 – 0.19)	2.38 (0.27 - 4.95)	0.97 (0.88 – 1.07)	No data	0.79 (0.62 – 1.54)	0.77 (0.73 - 0.82)
June +	N/a	3.70 (0.39 – 7.91)	N/a	N/a	N/a	N/a
July	1.48 (1.39 – 1.58)	0.70 (0.00 – 1.78)	2.16 (1.99 – 2.34)	No data	7.44 (6.21 – 10.50)	5.84 (5.55 - 6.15)
July +	N/a	0.74 (0.26 – 1.33)	N/a	N/a	N/a	N/a
+ BOWL surveys were undertaken twice in each month						

Since the change of the area from the current Moray West Site area to the Alternative Moray West Site area did not change the data available in the overlaps with BOWL, the DSS did not recommend any changes to the densities used (Table 1.18). However, in the absence of a DSM from Moray East from which a density could be calculated, the only valid comparison was between Moray West and BOWL, in the overlap between the two surveys. This value (2.59 birds.km^{-2}) was lower than the density across the Alternative Moray West Site area plus 2 km buffer (5.84 birds.km^{-2}), so the latter value (5.84 birds.km^{-2}) was selected as the preferred, precautionary, input.

Table 1.18 Node path through the DSS flow chart to select suitable densities for displacement assessment. Blue = Current Moray West Site area, Green = Alternative Moray West Site area.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
Current MW & BOWL	X			X					2	2.59
Proposed MW & BOWL	X			X					2	2.59

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
Current MW & ME									n/a	2.16
Proposed MW & ME									n/a	2.16

1.6.2 Razorbill sitting densities in the post-breeding season

Comparison of the densities in the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer (Table 1.19) show that densities were lower in the Alternative Moray West Site area plus 2 km buffer in both months (decrease of 0.17 birds.km^{-2} in August and 3.84 birds.km^{-2} in September).

Table 1.19 Densities (birds.km^{-2}) of razorbills on the water in the current Moray West Site area plus 4 km buffer in the overlap with both BOWL and Moray east (and upper and lower 95% confidence intervals). In addition, the sitting densities for the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer. Seasonal peak values for each data set is highlighted in grey.

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
August	5.58 (5.27 – 5.92)	0.00	8.03 (7.62 – 8.50)	7.07 (6.81 – 7.30)	8.87 (7.55 – 11.45)	8.70 (8.38 - 9.04)
September	37.59 (35.02 – 40.40)	No survey	18.03 (14.99 – 21.54)	No data	20.59 (18.13 – 24.80)	16.75 (15.63 - 18.03)

Since the change of the area from the current Moray West Site area to the Alternative Moray West Site area did not change the data available in the overlaps with BOWL or Moray East, the DSS did not recommend any changes to the densities used (Table 1.20). Since the density from the overlap between Moray West and BOWL was higher than the overlap between Moray West and Moray East, the higher value (37.59 birds.km^{-2}) was chosen. In addition, this was higher than the density across the Alternative Moray West Site area plus 2 km buffer (16.75 birds.km^{-2}). Consequently, the estimate from Moray West in the overlap with the BOWL survey area was selected as the preferred, precautionary, input.

Table 1.20 Node path through the DSS flow chart to select suitable densities for displacement assessment. Blue = Current Moray West Site area, Green = Alternative Moray West Site area.

Month	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8	Estimate no.	Density estimate
Current MW & BOWL		X			X				3	37.59
Proposed MW & BOWL		X			X				3	37.59
Current MW & ME		X			X				3	18.03
Proposed MW & ME		X			X				3	18.03

1.6.3 Razorbill sitting densities in the non-breeding season

Comparison of the densities in the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer (Table 1.21) show that in October to December densities in the Alternative Moray West Site area plus 2 km buffer were slightly lower (<1 bird.km^{-2}).

Table 1.21 Densities (birds.km^{-2}) of razorbills on the water in the current Moray West Site area plus 4 km buffer in the overlap with both BOWL and Moray east (and upper and lower 95% confidence intervals). In addition, the sitting densities for the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer. Seasonal peak values for each data set is highlighted in grey.

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
October	0.05 (0.05 – 0.05))	No survey	0.19 (0.17 – 0.20)	No data	0.49 (0.37 – 1.00)	0.46 (0.42 - 0.49)
November	0	No survey	0	No data	0.06 (0.00 – 0.13)*	0.00
December	0	No survey	0	No data	0	0.00
* Density estimated using mean of transect density						

In the absence of data from the other data sources (BOWL and Moray East), the only suitable data to select was the peak density of 0.46 birds.km^{-2} from the Alternative Moray West Site area plus 2 km buffer.

1.6.4 Razorbill sitting densities in the pre-breeding season

Comparison of the densities in the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer (**Error! Reference source not found.** 1.22) show that in January to March densities in the Alternative Moray West Site area plus 2 km buffer were lower (0.49 – 4.69 birds.km^{-2}).

Table 1.22 Densities (birds.km^{-2}) of razorbills on the water in the current Moray West Site area plus 4 km buffer in the overlap with both BOWL and Moray east (and upper and lower 95% confidence intervals). In addition, the sitting densities for the current Moray West Site area plus 2 km buffer and Alternative Moray West Site area plus 2 km buffer. Seasonal peak values for each data set is highlighted in grey.

Month	Current Moray West Site area plus 4 km buffer density in the overlap with BOWL (lower – upper 95% CI)	BOWL density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 4 km buffer density in the overlap with Moray East (lower – upper 95% CI)	Moray East density in the overlap with current Moray West Site area plus 4 km buffer (lower – upper 95% CI)	Current Moray West Site area plus 2 km buffer density (lower – upper 95% CI)	Alternative Moray West Site area plus 2 km buffer density (lower – upper 95% CI)
Survey platform	**Digital aerial**	**Digital aerial**	**Digital aerial**	**Boat**	**Digital aerial**	**Digital aerial**
January	0	No survey	0	No data	0.49 (0.19 – 0.83)*	0.00
February	0	No survey	0	No data	1.49 (0.16 – 3.98)*	0.00
March	1.99 (1.90 – 2.09)	No survey	6.68 (6.31 – 7.05)	No data	9.51 (7.70 – 45.18)	4.82 (4.56 - 5.09)
* Density estimated using mean of transect density						

In the absence of data from the other data sources (BOWL and Moray East), the only suitable data to select was the peak density of 4.82 birds.km^{-2} from the Alternative Moray West Site area plus 2 km buffer.

Contact

Moray Offshore Windfarm (West) Limited
5th Floor, Atria One
144 Morrison Street
Edinburgh EH3 8EX
Tel: +44 (0)131 556 7602