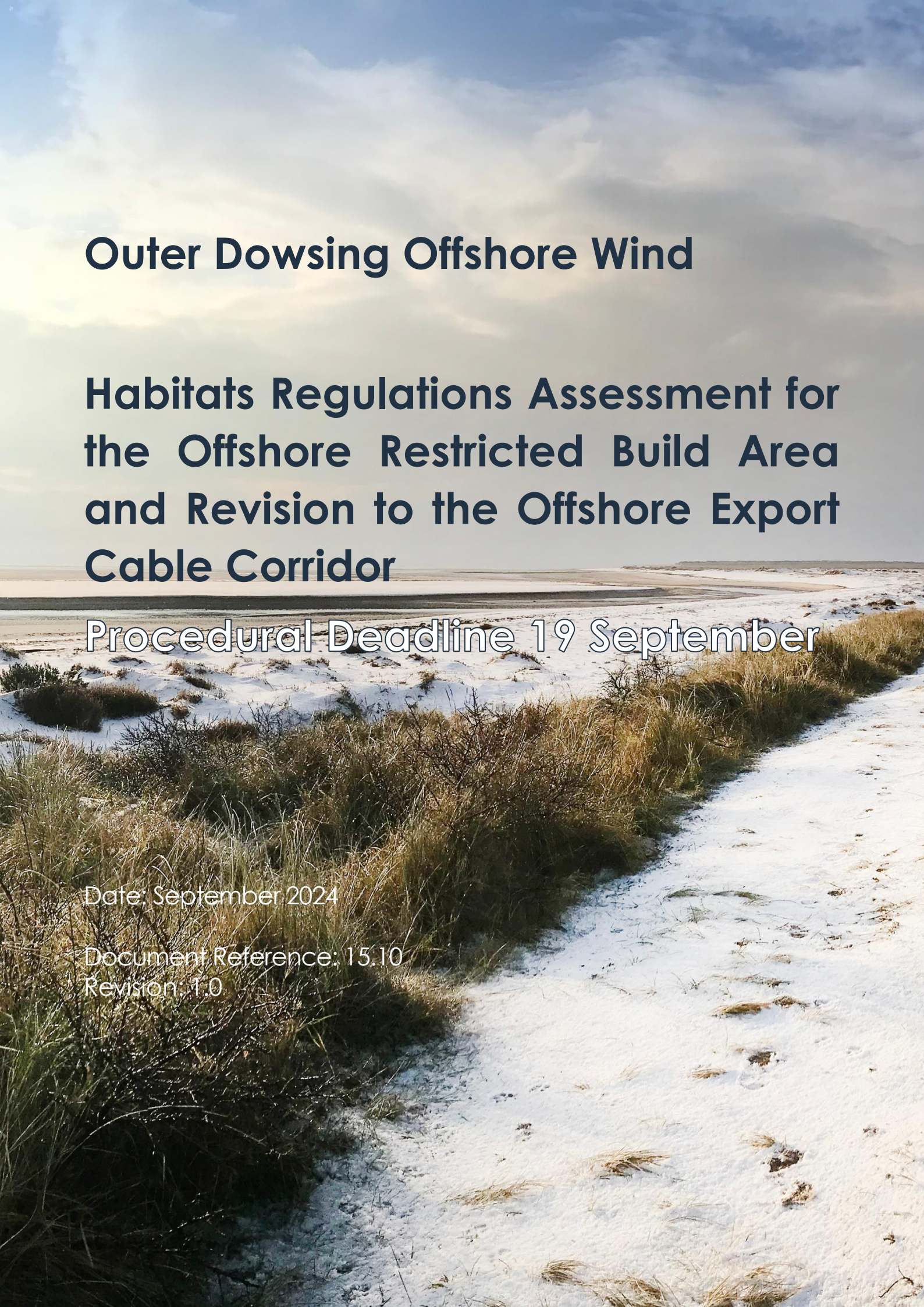

Outer Dowsing Offshore Wind

Habitats Regulations Assessment for the Offshore Restricted Build Area and Revision to the Offshore Export Cable Corridor

Procedural Deadline 19 September

Date: September 2024

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Abbreviations

Abbreviation / Acronym	Description
AEoI	Adverse Effect on Integrity
ANS	Artificial Nesting Structure
CI	Confidence Interval
CoS	Chamber of Shipping
CRM	Collision Risk Modelling
DAS	Digital Aerial Survey
DCO	Development Consent Order
ECC	Export Cable Corridor
ES	Environmental Statement
HRA	Habitats Regulations Assessment
INNS	Invasive Non-Native Species
JNCC	Joint Nature Conservation Committee
km	Kilometres
LSE	Likely Significant Effect
m	Meters
MCA	Maritime and Coastguard Agency
MMO	Marine Management Organisation
MU	Management Unit
MW	Mega Watt
NE	Natural England
ODOW	Outer Dowsing Offshore Wind
OP	Offshore Platform
ORBA	Offshore Restricted Build Area
ORCP	Offshore Reactive Compensation Platform
OSS	Offshore Substation
O&M	Operation and Maintenance
PTS	Permanent Threshold Shift
RIAA	Report to Inform Appropriate Assessment
RR	Relevant Representation
SAC	Special Area of Conservation
SCANS	Small Cetaceans in European Atlantic Waters and North Sea
SCI	Site of Community Importance
SELcum	Sound Exposure Level (Cumulative)

Abbreviation / Acronym	Description
SMP	Sectoral Marine Plan
SNS	Southern North Sea
SPA	Special Protection Area
TCE	The Crown Estate
THLS	Trinity House Lighthouse Service
TTS	Temporary Threshold Shift
WTG	Wind Turbine Generator

Definitions

Term	Definition
The Project	Outer Dowsing Offshore Wind Project
Apportioning	Defining the proportion of a project's impact felt by a colony.
Array area	The area offshore within which the generating station (including wind turbine generators (WTG) and inter array cables), offshore accommodation platforms, offshore transformer substations and associated cabling will be positioned.
Baseline	The status of the environment at the time of assessment without the development in place.
Bio-season	A period within the annual cycle of a species that can broadly be defined by the species behaviour and location.
Collision	Impact upon birds through collision with wind turbine generators.
Displacement	Mechanism by which birds are impacted through being denied access to, or passage through a given area.
Habitats Regulations Assessment (HRA)	Habitats Regulations Assessment. A process which helps determine likely significant effects and (where appropriate) assesses adverse effects on the integrity of European conservation sites and Ramsar sites. The process consists of up to four stages of assessment: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI) and compensatory measures.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Intertidal	Area where the ocean meets the land between high and low tides.
Wind turbine generator (WTG)	All the components of a wind turbine, including the tower, nacelle, and rotor.

1 Introduction

1.1 Project Background

1. GT R4 Limited (trading as Outer Dowsing Offshore Wind) hereafter referred to as the 'Applicant', is proposing to develop the Project. The Applicant submitted an application for a DCO ('the Application') for the Project to the Planning Inspectorate in March 2024, which was accepted for Examination in April 2024.
2. The Project array will be located approximately 54km from the Lincolnshire coastline in the southern North Sea. The Project will include both offshore and onshore infrastructure including an offshore generating station (windfarm), export cables to landfall, Offshore Reactive Compensation Platforms (ORCPs), onshore cables, connection to the electricity transmission network, ancillary and associated development and areas for the delivery of up to two Artificial Nesting Structures (ANS) and the creation of a biogenic reef (if these compensation measures are deemed to be required by the Secretary of State) (see Volume 1, Chapter 3: Project Description [APP-058] for full details).

1.2 Overview

3. This document is part of a suite of documents which introduces two changes which have been made by GT R4 Limited (trading as Outer Dowsing Offshore Wind, hereafter referred to as the 'Applicant') to the proposed Outer Dowsing Offshore Wind Farm (the Project):
   - the introduction of an Offshore Restricted Build Area (ORBA) over the northern section of the Project array area; and
   - the removal of the northern section of the offshore Export Cable Corridor (ECC).
4. These documents present the justification for these changes and confirm that the Project remains materially the same as described within the Development Consent Order (DCO) application. Accordingly, the environmental implications of the changes have been reviewed to fully understand whether the changes affect the conclusions of the Environmental Statement (ES) and the Report to Inform Appropriate Assessment (RIAA) (AS1-095). This document focuses on the changes in the Project alone impact as a result of the introduction of the ORBA. In presenting Natural England's position as part of this assessment the Applicant is fully taking into account feedback provided by Natural England post application (RR-045). A companion document (Environmental Report for the Offshore Restricted Build Area and Revision to the Offshore Export Cable Corridor (document reference 15.9) presents the full rationale for the changes and the consideration of the implications for the ES.

5. As a result of continuing engagement with stakeholders, and enabled by progress on engineering design, the area within which the Wind Turbine Generators (WTGs) and Offshore Platforms (OPs), up to four offshore substations and one accommodation platform, will be positioned has been refined. The proposed ORBA has been introduced to reduce the impact from the presence of the WTGs on auk species (specifically common guillemot and razorbill), informed by a consideration of geophysical and geotechnical data.
6. The proposed ORBA covers the northern section of the array area and would restrict the installation of WTGs and OPs. For the avoidance of doubt, this area may still be used for cable installation and ancillary operations during construction (and decommissioning) and repair and maintenance during operation. Additionally, Project parameters including number of structures, foundation types, and cable parameters will remain unchanged, As such, no change is being proposed to the extent of the array area, as defined within the draft Development Consent Order (DCO).
7. The location and size of the ORBA was decided using various factors. MRSea based analysis was used to generate estimates of distribution and abundance, underpinned by observations of guillemot recorded in the DAS imagery (Scott -Hayward et al., 2014). This produced month by month density distribution mapping for the period March 2021 to August 2023 that identified hotspots within the EA Array area plus 2 km buffer.
8. There was some commonality in the hotspots between the 2021 and 2022 surveys with denser concentrations of guillemots recorded in the north and east of the area of interest (Figures 3.1 - 3.4 Appendix 15.9G MRSea Modelling for Offshore Ornithology) particularly within the months of April and August both in 2021 and 2022.
9. The MRSea data (document 15.9G) strongly agreed with the design based density estimates, which also show a general pattern of higher densities of guillemot and razorbill to the north of the array area (see Figures 12.33 - 12.35 and 12.39 - 12.41 of the Offshore Restricted Build Area and Revision to the Offshore Export Cable Corridor Ornithology Baseline Summary (document 15.9D)).
10. The introduction and size of the ORBA has been made possible through continued engagement with the relevant oil and gas operators who have interests which overlap with the Project, i.e. due to the presence of oil and gas platforms within or adjacent to the array area. Since the Application, the Applicant has been able to agree the principles for co-existence between the Project and access arrangements to the Malory platform with Perenco, specifically for helicopter transfers to and from this platform. Confidence in the likely final protective provisions for this operator within the DCO for the Project has therefore allowed further engineering work to be undertaken to support additional mitigation of the impact to auk species through a reduction in the area within which WTGs and OPs may be placed

11. The introduction of the ORBA has resulted in a reduction in the summed mean seasonal peak abundance of guillemot from 27,653.3 birds in the array area plus 2 km buffer (Appendix 12.1 Offshore and Intertidal Ornithology Technical Baseline AS1-064) to a summed mean seasonal peak abundance of 23,586 guillemot in the array area minus the ORBA plus 2km buffer (Appendix 15.9D). The introduction of the ORBA equates to an approximately 12.5% reduction in the predicted guillemot mortalities using the Applicant's approach. A direct comparison cannot be made with the RIAA (AS1-095) for the Natural England Approach, as Natural England's approach was updated during the relevant representation process (RR-045).
12. Further engineering design and procurement work, informed by additional geophysical, geotechnical and environmental survey work, undertaken post-consent (if granted), will confirm the final layout of infrastructure. Final details will be set out in a design plan to be submitted to and approved by the MMO, following consultation with Trinity House, the MCA and UKHO prior to commencement of the licensed works, in line deemed Marine Licence condition 13 (see condition 13(1)(a), Part 2, Schedule 10 of the DCO [document 3.1].
13. The offshore ECC presented within the RIAA (AS1-095) that supported the DCO Application included two routeing options within the inshore area of the cable route, a northern and a southern route. The northern route was included as it is situated north of the Inner Dowsing sandbank and thus avoided impacts to this designated feature[1]. The southern route was also included as the northern route passes through aggregates Area 1805 which has an Exploration and Option area agreement with The Crown Estate, although this was due to expire on 31st August 2024. In the event that the option agreement was not taken up by the holder, this seabed area could have become available to the Project, thus allowing the Project to avoid crossing the Inner Dowsing sandbank.
14. It has now been confirmed that the option on this area has been extended by TCE until 2025 (pers. comms. Hansons via email 1st May 2024), with a Marine Licence Application (MLA/2024/00227) having been made by the agreement holder on 25th April 2024 to permit aggregates extraction within the site for a period of 15 years. As such, it is clear that the agreement holder intends to take up the option over this area of the seabed for aggregate extraction, and therefore it is no longer a viable option for the Project to pursue. Consequently, the Project has excluded the northern route option from the offshore ECC and is amending the Order Limits to exclude this section of the offshore ECC from the draft DCO.

[1] The Inner Dowsing sandbank is a designated feature of the Inner Dowsing, Race Bank and North Ridge Special Area of Conservation (SAC), with the feature "sandbanks covered with water at all times" a marine habitat of particular conservation importance and listed under Annex I of the Conservation of Offshore Marine Habitats Regulations (2017)

2 Description of the Proposed Changes

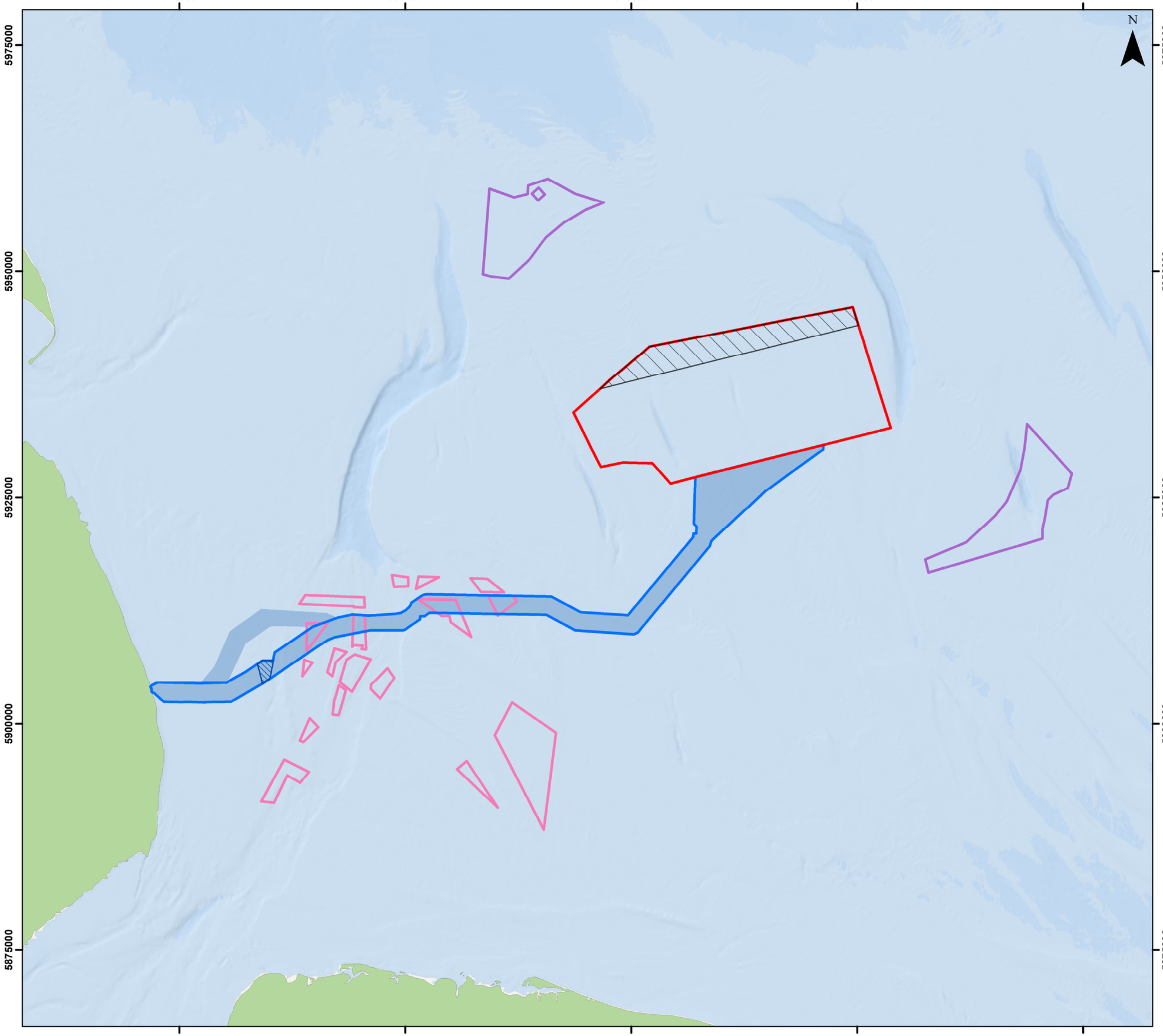
2.1 Offshore Restricted Build Area

15. The ORBA is proposed to cover the northern part of the array area, comprising an area that is approximately 2km wide at the north-east corner and approximately 3.5km at the north-west corner (Figure 2-1). In total, the ORBA covers an area of 71.3km^2, which represents 16.4% of the array area. No WTGs or OPs will be installed in the ORBA, however, the area may be used for cable installation and ancillary operations during construction (and decommissioning).
16. As outlined in section 0, the ORBA has been designed to reduce the impact of the Project on ornithology features, specifically guillemot, in response to concerns raised by stakeholders (Chapter 6 Appendix 1 Evidence Plan Process APP_149; APP-052) regarding the high numbers of birds to the north of the array area. The smaller area reduces the number of birds at risk of displacement, to all key species through a simple reduction of the footprint, and also targeted to guillemot by removing a portion of the array that held high densities of birds (the main driver for the introduction of the ORBA).
17. The limits of the ORBA have been defined based on environmental considerations to ensure that the Project minimises environmental impacts as far as practicable whilst also retaining the required flexibility to ensure deliverability and meeting the defined Project objectives, including making a large contribution to UK decarbonisation targets (7.5 Derogation Case APP-242).
18. There is no change to the previously defined minimum or maximum criteria for the WTGs or OSPs within the Project Description, with the maximum number of structures remaining at 100 WTGs, four offshore substations (OSSs) and one accommodation platform.

2.2 Offshore Export Cable Corridor

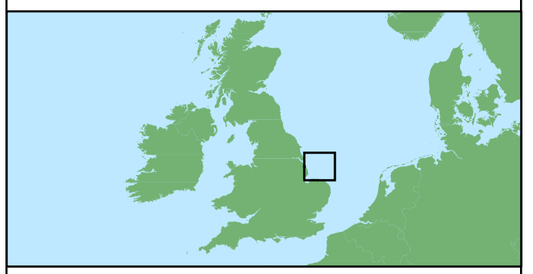
19. As described above, within the Order Limits for the DCO Application, optionality was retained along a section of the offshore ECC to potentially enable the Project to avoid crossing the Inner Dowsing sandbank, were the option on aggregates area 1805 not taken up by the agreement holder or were the option only taken up over part of the site. The aggregate option agreement has now been extended by The Crown Estate, and a Marine Licence Application to permit aggregates extraction over the whole site has been submitted to the Marine Management Organisation (MMO).
20. As the developer of Area 1805 has rights to the seabed and intends to exercise those rights in due course, the northern route, which passes through the aggregates area, is no longer viable; the leaseholder has priority with regard to seabed rights and has informed the Project that they intend to use the whole of the lease area for aggregates extraction which is not compatible with cable installation and ongoing operation and maintenance. Therefore, colocation is not possible, and the site covers the whole of the northern route so the aggregate area is unavoidable. As such, the Project is amending the Order Limits to exclude this section of the offshore ECC from the draft DCO. This includes the northern ORCP area which was positioned along this section of the offshore ECC.

21. The ORCP area within the southern route has also been refined to remove areas that were not technically feasible.
22. The total maximum offshore export cable lengths, number of cables, number of ORCPs and all other parameters remain, as provided within the DCO Application.



Legend

- Array Area
- Offshore Restricted Build Area
- Offshore Export Cable Corridor
- Offshore Export Cable Corridor (ES)
- ORCP Area
- Artificial Nesting Structure Area
- Biogenic Reef Restoration Area



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale: 1:400,000

A3 Page Size

Project Boundaries

Figure 2-1 Overview of the ORBA and Offshore ECC Modifications

OUTER DOWSING OFFSHORE WIND

Date: 09/08/2024
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3 Consultation

23. The Applicant has endeavoured to undertake early phase consultation on the proposed changes with selected stakeholders, specifically the Marine Management Organisation (MMO), Natural England (NE), the Maritime and Coastguard Agency (MCA), Trinity House (TH) and the Chamber of Shipping (CoS).
24. The consultation with all parties to date has been via meetings (held virtually), with the key elements of the proposed changes and implications for the relevant receptors presented by the Applicant. In general, the changes have been welcomed by stakeholders as positive for specific receptors, as detailed in Table 3-1 below.

Table 3-1: Consultation undertaken on the proposed design changes

Date and type of consultation	Stakeholder	Consultation comments	Applicant Response
13 August and 03 September 2024 – Meeting held on Teams and correspondence via e-mail 13 September 2024	MMO	MMO were presented with the ORBA and ECC refinement and confirmed that they will comment by Deadline One (24th October)	The Applicant welcomes feedback from the MMO once they have reviewed the suite of documents.
03 September 2024 – Meeting held on Teams	Natural England	Natural England asked what the drivers were for the site selection of the ORBA.	The Applicant confirmed that a reduction in environmental impacts, specifically displacement of auks, was the driver to identify areas for the ORBA. The Applicant identified hotspots and areas of high density to allow for the greatest impact reduction (as discussed in section 1.2 of this document).
	Natural England	Natural England queried how the densities of auks were calculated for the ORBA.	The Applicant confirmed that model and design based estimates were used to identify high density areas of auks and hotspots. A full description of the analyses and the results for the density and model-based estimate types is provided in appendices 15.9D and 15.9G respectively.

Date and type of consultation	Stakeholder	Consultation comments	Applicant Response
Correspondence via e-mail 13 September 2024	Natural England	Natural England confirmed that they will provide further comment by Deadline One (24th October)	The Applicant welcomes further comment once they have reviewed the suite of documents.

4 Consideration of the Potential for the Design Changes to Affect RIAA Conclusions

4.1 Benthic and Intertidal Ecology

4.1.1 Description of the Changes from the Assessment Scenarios in the RIAA

25. The proposed introduction of the ORBA changes the potential locations where foundations may be placed within the array area and the modification to the offshore ECC removes consideration of the northern ORCP route option (and cabling through the northern section of the ECC options). Therefore, the baseline presented within the RIAA (AS1-095) is considered to remain valid and unchanged.
26. Furthermore, as the activities associated with all phases of the Project remain unchanged, the same impacts are considered to arise. Therefore, the potential impact pathways screened in remain valid and unchanged.
27. The introduction of the ORBA does not change the overall array area, and the modification to the offshore ECC simply removes the northern ECC and ORCP from consideration. With respect to the identification of sites potentially impacted, the only distances that have changed from the RIAA (AS1-095) are in relation to the ORCP, with the distances to the Humber Estuary Ramsar and Humber Estuary SAC increasing from 15.3km to 18.7km, and from 19.7km to 23.8km respectively. All other sites and distances presented in the RIAA (AS1-095) are considered unchanged.
28. As the ORBA and modifications to the offshore ECC only affect the potential for impacts within the construction and decommissioning phase, no further consideration is given to operational effects, for which the conclusions drawn within the RIAA remain unchanged and valid.

4.1.2 Environmental Implications of the Change

29. When considering all the potential impact pathways within the RIAA (AS1-095), the modification of the ECC (including removal of the northern ORCP) will not result in any changes to impacts associated with the Project. The option with the greatest potential for impact to a designated site is the southern route which passes over the Inner Dowsing Annex I sandbank. Therefore, the removal of the northern route does not alter the maximum design scenario assessed in the RIAA and therefore the conclusions of the RIAA with regard to the offshore ECC remain unchanged and valid.

30. The introduction of the ORBA and the associated increase in density of turbine foundations has the potential to alter the risk of introduction or spread of marine INNS. The introduction of hard substrate into a sedimentary habitat can increase the risk of colonisation of the introduced substrate by invasive/non-indigenous species that might otherwise not have had a suitable habitat for colonisation, thereby enabling their spread. Furthermore, it should be noted that offshore structures can be vectors which facilitate the spread of INNS (De Mesel et al. 2015) as these structures may aid natural dispersal via ocean currents, acting as stepping stones between locations on which larvae can settle (Adams et al., 2013). Whilst the closer proximity of introduced structures within the array area as a result of the adoption of the ORBA may facilitate spread of INNS if any species become established, the increased distance between the northern boundary of the development and relevant designated sites means that the risk of subsequent spread of INNS to designated sites is reduced from that assessed in the RIAA (AS1-095).
31. The initial assessment in the RIAA (AS1-095) considered that, with appropriate mitigation measures, the risk of introduction or spread of marine INNS is negligible. As the number of structures introduced into the marine environment remains the same, the level of necessary maintenance activity will also remain the same in relation to the adoption of the ORBA (and remain outside of any relevant SAC). The previously identified mitigation measures will also remain in place, therefore the potential impact of the introduction of INNS will not change from that presented in the RIAA (AS1-095). Therefore, it is considered that the conclusions drawn in the RIAA (AS1-095) in relation to INNS impacts on any designated sites remain unchanged and valid.
32. For all other identified impact pathways, as there is only a reduction in impacts associated with the design changes it is considered that the worst case scenario has been assessed within the RIAA for all remaining potential impacts on designated sites. The design changes (both the introduction of the ORBA and the modification to the ECC) will not significantly alter any of the remaining potential impacts considered in the RIAA and all of the conclusions drawn remain unchanged and valid.
33. With respect to in-combination impacts, as the assessments presented for the inclusion of the ORBA alone determine that all conclusions within the RIAA (AS1-095) remain unchanged and valid, it is therefore considered that there will be no material change to the in-combination effects presented in the RIAA (AS1-095) and the in-combination conclusions also remain unchanged and valid.
34. Therefore, it is concluded that **there is no AEoI to the designated features associated with the North Norfolk Sandbanks and Saturn Reef SAC, Inner Dowsing Race Bank and North Ridge SAC, The Wash and North Norfolk Coast SAC, Humber Estuary Ramsar, Humber Estuary SAC, Gibraltar Point Ramsar, and The Wash Ramsar from the Project during construction and decommissioning and therefore, subject to natural change, the designated features will be maintained in the long-term.**

4.2 Migratory Fish

4.2.1 Description of the Changes from the Assessment Scenarios in the RIAA

35. As stated above, the only considerations in relation to the proposed introduction of the ORBA and the modification to the offshore ECC are changes to the potential locations where foundations may be placed within the array area, and removal of northern ORCP option and cabling through the northern route of the ECC.
36. As the activities associated with all phases of the Project remain unchanged, the same impacts are considered to arise. Therefore, the potential impact pathways screened in remain valid and unchanged.
37. The introduction of the ORBA does not change the overall array area, and the modification to the offshore ECC simply removes the northern ECC and ORCP from consideration. With respect to the identification of sites potentially impacted, the only distances that have changed from the RIAA (AS1-095) is in relation to the ORCP, with the distance to the Humber Estuary SAC increasing from 19.7km to 23.8km. All other distances are considered unchanged from the RIAA (AS1-095).
38. As the ORBA and modifications to the offshore ECC only affect the potential for impacts within the construction and decommissioning phase, no further consideration is given to operational effects, for which the conclusions drawn within the RIAA (AS1-095) remain unchanged and valid.

4.2.2 Environmental Implications of the Change

39. The only impact pathway screened into the RIAA (AS1-095) was underwater noise. As a result of the ORBA, the most northerly extent at which foundations could be installed has been moved south, thereby resulting in the north-east (NE) location modelled for the RIAA now being positioned outside the area within which foundations could be installed. Therefore, revised underwater noise modelling has been undertaken to predict the extent of underwater noise impacts for this location. Additionally, revised modelling of the simultaneous piling scenario was undertaken as the NE corner had been used as one the locations for this scenario. The logic for the modelled locations, the noise metrics considered and the modelling parameters (pile diameter, maximum hammer energy, number of blows, etc.) remain as per those modelled for the RIAA (AS1-095). Full details of the underwater noise modelling results, including impact parameters, are presented in Appendix 15.9C.

40. Considering the modelled results for the simultaneous piling of pin piles for jacket foundations at the NE and SW piling locations (the spatial maximum design scenario), a slight reduction in extent is predicted from that reported within the RIAA (AS1-095, Table 9.43). For example the largest impact range, the 186dB SELcum noise threshold (the threshold above which TTS is expected to occur within Group 1 species – including both species of lamprey (noting that the Popper *et al*. (2014) criteria specify that the actual value is expected to be much greater than this threshold for this hearing group but that there are insufficient studies to define a specific threshold)) during the simultaneous piling of pin piles, has reduced from 740km^2 to 680km^2 for fleeing receptors (Table 4-1). It is worth noting that given the nature of noise effects, and the transient nature of sea lamprey and river lamprey across the Project during migration, it is anticipated that sea lamprey and river lamprey would display a fleeing response and are therefore assessed as fleeing receptors.

Table 4-1: Noise modelling results for the in-combination impact areas for fleeing receptors from the simultaneous pilling of foundations within the array area, in the absence of the ORBA (as reported in the RIAA, AS1-095) and with the inclusion of the ORBA.

Criteria	Noise level	Monopile foundation impact in-combination area (simultaneous piling of two monopiles at the NE and SW locations in the array area)		Jacket foundation impact in-combination area (simultaneous piling of up to six pin piles at the NE and SW piling locations in the array area)		Sequential piling at all locations for both foundation types	
		Exclusion of the ORBA	Inclusion of ORBA	Exclusion of the ORBA	Inclusion of ORBA	Exclusion of the ORBA	Inclusion of ORBA
Mortality and potentially mortal injury							
SEL_{cum} (fleeing)	219	-[2]	-	-	-	<100m	<100m
Recoverable injury							
SEL_{cum} (fleeing)	216	-	-	-	-	<100m	<100m
TTS							
SEL_{cum} (fleeing)	186	740 km^2	680km^2	620km^2	570km^2	<100m	<100m

41. With respect to the modification of the ECC (including removal of the northern ORCP), noise modelling was assessed in the RIAA (AS1-095) for both ORCP locations with a conclusion of no AEoI on any receptors, and therefore the conclusions presented in the RIAA (AS1-095) on all considered designated sites remain unchanged and valid.

[2] Fields denoted with a dash "-" show where there is no combined effect when piling occurs at the two locations simultaneously.

42. With respect to in-combination impacts, as the assessments presented for the inclusion of the ORBA alone determine that all conclusions within the RIAA (AS1-095) remain unchanged and valid, it is therefore considered that there will be no material change to the in-combination effects presented in the RIAA (AS1-095) and the in-combination conclusions also remain unchanged and valid.

43. Overall, the proposed design changes result in slightly reduced impact ranges for underwater noise, which are not considered to result in any changes to the assessment conclusions within the RIAA (AS1-095). Therefore, it is concluded that **there is no AEoI to the sea lamprey or river lamprey for the Humber Estuary SAC from underwater noise in relation to the Project during construction and decommissioning and therefore, subject to natural change, the designated features will be maintained in the long-term.**

4.3 Marine Mammals

4.3.1 Description of the Changes from the Assessment Scenarios in the RIAA

44. The only considerations in relation to the proposed introduction of the ORBA and the modification to the offshore ECC are changes to the potential locations where foundations may be placed within the array area, and removal of northern ORCP option and cabling through the northern route of the ECC. Therefore, the baseline presented within the RIAA (AS1-095) is considered to remain valid and unchanged.

45. Furthermore, as the activities associated with all phases of the Project remain unchanged, the same impacts are considered to arise. Therefore, the potential impact pathways screened in remain valid and unchanged.

46. The introduction of the ORBA does not change the overall array area, and the modification to the offshore ECC simply removes the northern ECC and ORCP from consideration. With respect to the identification of sites potentially impacted, the only distances that have changed from the RIAA (AS1-095) is in relation to the ORCP, with the distances all increasing as follows:

- Southern North Sea SAC; 42.5km to 47.3km
- Humber Estuary SAC; 19.7km to 23.8km
- Humber Estuary Ramsar; 15.3km to 18.7km
- Berwickshire and North Northumberland Coast SAC; 262.1km to 267.0km
- Moray Firth SAC; 543.9km to 548.9km.

47. All other distances to designated sites are considered unchanged from the RIAA (AS1-095).

48. The introduction of the ORBA means that the underwater noise modelling location in the NE corner of the array area presented in the ES is now situated outside of the area in which WTGs will be installed. Therefore, re-modelling was conducted for a new NE modelling location outside of the ORBA. The piling parameters remain the same as those presented in the RIAA (AS1-095).

49. The removal of the northern portion of the offshore ECC means that the ORCP North modelling location presented in the ES is no longer applicable. However, both ORCP locations were assessed within the RIAA (AS1-095) and the south ORCP area was considered to be the MDS for marine mammals; as such, there is no change to the assessment within the RIAA in respect of this change. No further consideration is given to this aspect of the change for marine mammals.
50. The introduction of the ORBA and modification to the offshore ECC is not expected to result in any changes to the remainder of impacts considered for marine mammals, due to the general risk nature of those impacts (e.g. vessel collisions, etc.) not being affected by the ORBA (as vessel movement will still occur in that area) nor by the relatively small change in the offshore ECC and project parameters such as vessel numbers for construction and operation remaining as per the RIAA (AS1-095). There will be no change to the impacts on fish and shellfish presented within the Application (APP-065) and therefore no changes to the conclusion in relation to indirect impacts on prey on marine mammals..
51. Therefore, only the change to the locations where foundations may be installed within the array area and the associated changes to the underwater noise impact are considered herein for marine mammals.

4.3.2 Environmental Implications of the Change

52. Given the multitude of features considered for marine mammals which can be present at multiple sites and the singular effect of underwater noise being assessed, this section is presented on a feature-by-feature basis.
53. The noise modelling undertaken for the various SACs has been presented with respect to the number of individuals impacted within the relevant Management Unit (MU). As per the RIAA (AS1-095), given the wide range of marine mammal species and the connectivity with the wider MU populations, as a worst case scenario it has been considered in each assessment that all of the animals impacted are directly connected to the SAC.

4.3.2.1 Harbour porpoise

54. Table 4-2 illustrates the reduction in PTS impact ranges and number of individuals associated with the NE location compared to the modelling prior to the introduction of the ORBA. The reduction in ranges and impacts is not considered to not result in any material changes to the assessments presented within the RIAA (AS1-095), with the conclusions presented remaining unchanged and valid.
55. Table 4-3 illustrates the reduction in disturbance to harbour porpoise within the relevant MU for harbour porpoises. The design changes have reduced the area of overlap with the Southern North Sea (SNS) SAC (a 2.6% reduction from the RIAA (AS1-095)), reducing the overall disturbance to the SNS SAC population. However, despite this potential reduction in impact, appropriate mitigation (namely the SNS Site Integrity Plan (SIP)) will still be developed to ensure that there is no AEoI and therefore no change from the impacts considered in the RIAA (AS1-095).

56. Therefore, it is considered that the conclusions of no AEoI drawn on all SACs with harbour porpoise as a feature, as presented in the RIAA (AS1-095), remain unchanged and valid.

Table 4-2: PTS-onset impact ranges, number of harbour porpoise and percentage of the management unit (MU) predicted to experience PTS-onset during puling using the uniform DAS estimate (1.63/km^2)[3,4]

	DCO Application Results				ORBA Results			
	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket
Instantaneous PTS (SPL_{peak})								
Area (km^2)	1.1	No cumulative effect[5]	0.78	No cumulative effect	1	No cumulative effect	0.75	No cumulative effect
Max range (m)	580		500		580		490	
# (DAS)	2		1		2		1	
% MU	<0.001		<0.001		<0.001		<0.001	
Cumulative PTS (SEL_{cum}) monopile x1 or jacket x1								
Area (km^2)	24	No cumulative effect	11	No cumulative effect	22	No cumulative effect	9.7	No cumulative effect
Max range (m)	3,200		2,200		3,000		2,000	
# (DAS)	39		18		36		16	
% MU	0.011		0.005		0.010		0.005	
Cumulative PTS (SEL_{cum}) monopile x2 or jacket x6								

[3] Note: the site-specific DAS provided the highest impact estimates and thus the SCANS III surface and the SCANS IV estimate are not shown here.

[4] Note: the numbers presented here for the DCO Application Results differ from the numbers presented in the main RIAA (AS1-095) as the numbers assessed in the RIAA were incorrect at the time of submission. The Applicant notes the difference in these numbers, however the numbers presented within the ES and the Environmental Report for the Offshore Restricted Build Area and Revision to the Offshore Export Cable Corridor (document reference 15.9) and Habitats Regulations Assessment for the Offshore Restricted Build Area and Revision to the Offshore Export Cable Corridor (document reference 15.10) are reduced from those presented in the RIAA (AS1-095), and therefore based on the reduction in impacts, all presented conclusions are considered correct.

[5] There is no in-combination effect when piling occurs at the two locations simultaneously, generally where the individual ranges are small enough that the distant site does not produce an influencing additional exposure.

	DCO Application Results				ORBA Results			
	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket
Area (km^2)	24	300[6]	11	230	22	280	9.7	220
Max range (m)	3,200	-	2,200	-	3,000	-	2,000	-
# (DAS)	39	483	18	383	36	456	16	365
% MU	0.011	0.139	0.005	0.111	0.010	0.132	0.005	0.105

Table 4-3: Number of harbour porpoise and percentage of MU predicted to experience disturbance during piling using the SCANS III density surface (grid cell specific) (Lacey et al., 2022) and the SCANS IV density estimate (0.6027/km2) (Gilles et al., 2023).

	DCO Application Results				ORBA Results			
	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket
# Lacey et al 2022	2,012	24,95	1,799	2,220	1,903	2,387	1702	2,123
% MU	0.58	0.72	0.52	0.64	0.55	0.69	0.49	0.61
# SCANS IV	956	1,185	855	1,055	914	1,144	817	1,018
% MU	0.28	0.34	0.25	0.30	0.26	0.33	0.24	0.29

[6] Note: this impact area is much higher than for a single location. This is explained in the underwater noise report: "*piling from multiple sources has the ability to increase impact ranges and areas significantly as, in this case, it introduces noise from double the number of pile strikes to the water*".

4.3.2.2 Bottlenose dolphin

57. Table 4-4 illustrates the reduction in PTS impact ranges and number of individuals within the relevant MU associated with the NE location compared to the modelling prior to the introduction of the ORBA, whilst Table 4-5 illustrates the reduction in disturbance. The reduction in ranges and impacts are considered to not result in any material changes to the assessments presented within the RIAA (AS1-095), and therefore, it is considered that the conclusions of no AEoI drawn for all SACs with bottlenose dolphin as a feature, as presented in the RIAA (AS1-095), remain unchanged and valid.

4.3.2.3 Harbour seal

58. Table 4-6 illustrates the reduction in PTS impact ranges and number of individuals impacted within the relevant MU associated with the NE location compared to the modelling prior to the introduction of the ORBA, while Table 4-7 illustrates the reduction in disturbance. There are no material alterations in impacts from the RIAA (AS1-095), and therefore, it is considered that the conclusions of no AEoI drawn for all SACs with harbour seal as a feature, as presented in the RIAA (AS1-095), remain unchanged and valid.

4.3.2.4 Grey seal

59. Table 4-6 illustrates the reduction in PTS impact ranges and number of individuals associated with the NE location compared to the modelling prior to the introduction of the ORBA. Table 4-8 illustrates the changes in disturbance to grey seal, noting that the number is higher than initially modelled for the original NE location. Despite this minor increase, it is considered that there are no material alterations in impacts, and therefore, it is considered that the conclusions of no AEoI drawn for all SACs with grey seal as a feature, as presented in the RIAA (AS1-095), remain unchanged and valid.

Table 4-4: PTS-onset impact ranges for bottlenose dolphin

	Old NE location considered in the RIAA				Updated modelling from new NE location			
	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket
Instantaneous PTS (SPL_{peak})								
Area (km^2)	<0.01	No cumulative effect	<0.01	No cumulative effect	<0.01	No cumulative effect	<0.01	No cumulative effect
Max range (m)	<50		<50		<50		<50	
Cumulative PTS (SEL_{cum}) monopile x1 or jacket x1								
Area (km^2)	<0.1	No cumulative effect	<0.1	No cumulative effect	<0.1	No cumulative effect	<0.1	No cumulative effect
Max range (m)	<100		<100		<100		<100	
Cumulative PTS (SEL_{cum}) monopile x2 or jacket x6								
Area (km^2)	<0.1	No cumulative effect	<0.1	No cumulative effect	<0.1	No cumulative effect	<0.1	No cumulative effect
Max range (m)	<100		<100		<100		<100	

Table 4-5: Number of bottlenose dolphins and percentage of MU predicted to experience disturbance during piling using: the SCANS III density surface (grid cell specific) (Lacey et al., 2022) and the SCANS IV uniform density estimate (0.0419/km2) (Gilles et al., 2023)

	Old NE location considered in the RIAA				Updated modelling from new NE location			
	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket
Dose-response function								
# Lacey et al 2022	2	3	2	3	2	3	2	2
% MU	0.10	0.15	0.10	0.15	0.10	0.15	0.10	0.10

	Old NE location considered in the RIAA				Updated modelling from new NE location			
	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket
# SCANS IV	66	82	59	73	64	79	57	71
% MU	3.26	4.06	2.92	3.61	3.17	3.91	2.82	3.51
Level B harassment threshold								
# Lacey et al 2022	<1	1	<1	1	<1	1	<1	<1
% MU	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	<0.05
# SCANS IV	27	33	23	28	26	32	22	27
% MU	1.34	1.63	1.14	1.38	1.29	1.58	1.09	1.34

Table 4-6: PTS-onset impact ranges for seal species.

	Old NE location considered in the RIAA				Updated modelling from new NE location			
	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket
Instantaneous PTS (SPL_{peak})								
Area (km^2)	<0.01	No cumulative effect	<0.01	No cumulative effect	<0.01	No cumulative effect	<0.01	No cumulative effect
Max range (m)	<50		<50		<50		<50	
Cumulative PTS (SEL_{cum}) monopile x1 or jacket x1								
Area (km^2)	<0.1	No cumulative effect	<0.1	No cumulative effect	<0.1	No cumulative effect	<0.1	No cumulative effect
Max range (m)	<100		<100		<100		<100	
Cumulative PTS (SEL_{cum}) monopile x2 or jacket x6								
Area (km^2)	<0.1	No cumulative effect	<0.1	No cumulative effect	<0.1	No cumulative effect	<0.1	No cumulative effect
Max range (m)	<100		<100		<100		<100	

Table 4-7: Number of harbour seals and percentage of MU predicted to experience disturbance during piling using the Carter et al., (2020, 2022) grid cell specific density estimates.

	Old NE location considered in the RIAA				Updated modelling from new NE location			
	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket
# (95% CI)	11 (2-19)	28 (4-54)	10 (2-17)	24 (3-47)	11 (2-20)	28 (4-52)	10 (1-18)	24 (3-44)
% MU (95% CI)	0.23 (0.04-0.39)	0.58 (0.08-1.11)	0.21 (0.04-0.35)	0.49 (0.06-0.97)	0.23 (0.04-0.41)	0.58 (0.08 – 1.07)	0.21 (0.02-0.37)	0.49 (0.06-0.90)

Table 4-8: Number of grey seals and percentage of MU predicted to experience disturbance during piling using the Carter et al., (2020, 2022) grid cell specific density estimates.

	Old NE location considered in the RIAA				Updated modelling from new NE location			
	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket	NE monopile	Concurrent NE-SW monopile	NE jacket	Concurrent NE-SW jacket
# (95% CI)	342 (44-647)	502 (69-1059)	291 (37-571)	414 (57-919)	326 (41-602)	514 (62-954)	286 (35-529)	440 (51-821)
% MU (95% CI)	0.52 (0.07-0.99)	0.77 (0.11-1.62)	0.44 (0.06-0.87)	0.63 (0.09-1.40)	0.50 (0.06-0.92)	0.78 (0.09-1.46)	0.44 (0.05-0.81)	0.67 (0.08-1.25)

4.3.2.5 In-combination impacts

60. With respect to in-combination impacts, as the assessments presented for the inclusion of the ORBA alone determine that all conclusions within the RIAA (AS1-095) remain unchanged and valid, it is therefore considered that there will be no material change to the in-combination effects presented in the RIAA (AS1-095) and the in-combination conclusions also remain unchanged and valid.

4.3.2.6 Conclusion on AEoI for marine mammal receptors

61. Overall, the proposed design changes result in slightly reduced impacts from underwater noise for all marine mammals assessed and are not considered to result in any changes to the assessment conclusions within the RIAA (AS1-095). Therefore, it is concluded that **there is no AEoI to the harbour porpoise, bottlenose dolphin, harbour seal or grey seal features associated with the Southern North Sea SAC, Moray Firth SAC, Humber Estuary SAC, Humber Estuary Ramsar, Wash and North Norfolk Coast SAC, Berwickshire and North Northumberland Coast SAC, Bancs des Flandres SAC, Doggersbank (Netherlands) SAC, Klaverbank SCI, Noordzeekustone SCI, SBZ 1 SCI, SBZ 2 SCI, SBZ 3 SCI, Vlaamse Banked SCI, Vlakte van de Raan SCI, Voordelta SCI, Waddenzee SCI, and Westerschelde & Saeftinghe SCI from the Project during construction and decommissioning and therefore, subject to natural change, the designated features will be maintained in the long-term.**

4.4 Intertidal and Offshore Ornithology

4.4.1 Description of the Changes from the Assessment Scenarios in the ES

62. The introduction of the ORBA results in a reduction of the array area, and as a consequence, the density of WTGs within this area has increased. Therefore, re-modelling of both collision risk modelling (CRM), displacement, and the assessment of impacts from these combined (i.e. for gannet) is required.
63. The proposed introduction of the ORBA reduces the area in which WTGs and OPs will be placed. The modification to the offshore ECC removes consideration of the northern ORCP option (and cabling through the northern route of the ECC). Although there is no change to the species identified within the baseline, the densities and abundances of species within the area subject to the impacts of displacement and collision risk during the operational phase has changed. An updated Offshore and Intertidal Ornithology Technical Baseline has therefore been provided (document ref 15.9D).
64. The densities and abundances within the array area, minus the ORBA, have been calculated and used within the accompanying modelling, which includes:
    - Displacement modelling (technical reporting and results in full presented in Appendix 15.9F); and
    - CRM (technical reporting, input parameters, and results in full presented in Appendix 15.9E).
65. The approach to apportioning of impacts for the Applicant's approach remains the same as was presented at application (AS1-040). However, the Applicant has received a Relevant Representation (RR-045) from Natural England which provides clarifications regarding the methodology to be used to set out "Natural England's Approach" to the impacts within the RIAA. Where the Natural England Approach differs from the Applicant's, the updates requested by Natural England have been included within this report, with the values also presented in Appendix 15.10A and Appendix 15.9D. For the majority of species, the differences in approach are relevant to the breeding season only; this is clearly labelled in the tables within this report where this is the case. The approach to non-breeding season apportioning is identical with the exception of guillemot. A full comparison of the Applicant's approach and Natural England's approach to assessment methodology is presented in the ORBA and Revision to the Offshore Export Cable Corridor Ornithology Baseline Summary (document reference 15.9D) and the HRA for the ORBA and Revision to the Offshore Export Cable Corridor Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).
66. Additionally, the modelling used at the point of application has been updated to incorporate the new Natural England guidance on Demographic rates issued to Round 4 Projects and Interim Collision Riks Modelling guidance issued by the Joint Nature Conservation Committee (JNCC) and Natural England on 15th August 2024.

67. The introduction of the ORBA and the modifications to the offshore ECC do not change those sites previously considered as screened out of the assessment. As both changes are effectively a reduction in area, there is no requirement to consider new sites or features within the assessment. Furthermore, no additional impact pathways require consideration as a result of the ORBA.

4.4.2 Environmental Implications of the Change

68. The increase in WTG density (through reducing the array area but maintaining the same number of turbines) may lead to slight differences in modelled collisions. This can be an increase or decrease depending on the relative densities of birds within the ORBA compared with the larger array area. The smaller area also reduces the number of birds at risk of displacement, both through a simple reduction of the footprint and also through the removal of a portion of the array that held high densities of key species such as guillemot. Other key auk species, including razorbill and puffin, saw a reduction in density from this smaller area. As such the impact pathways remain the same as presented in the RIAA (AS1-095), but act at slightly different scales.
69. As the ORBA and modifications to the offshore ECC only affect the potential for impacts within the O&M phase, no further consideration is given to construction and decommissioning effects, for which the conclusions drawn within the RIAA (AS1-095) remain unchanged and valid.
70. The following sections consider the change in predicted impacts to seabird features of the assessed SPAs from the full array area as presented within the RIAA (AS1-095) compared to the predicted impact from the Project with the introduction of the ORBA, as informed by the updated modelling (for both displacement and CRM). Each section considers whether the conclusions of the RIAA (AS1-095) require to be updated. Reference populations and background mortality rates against which impacts are assessed are presented for each assessment.

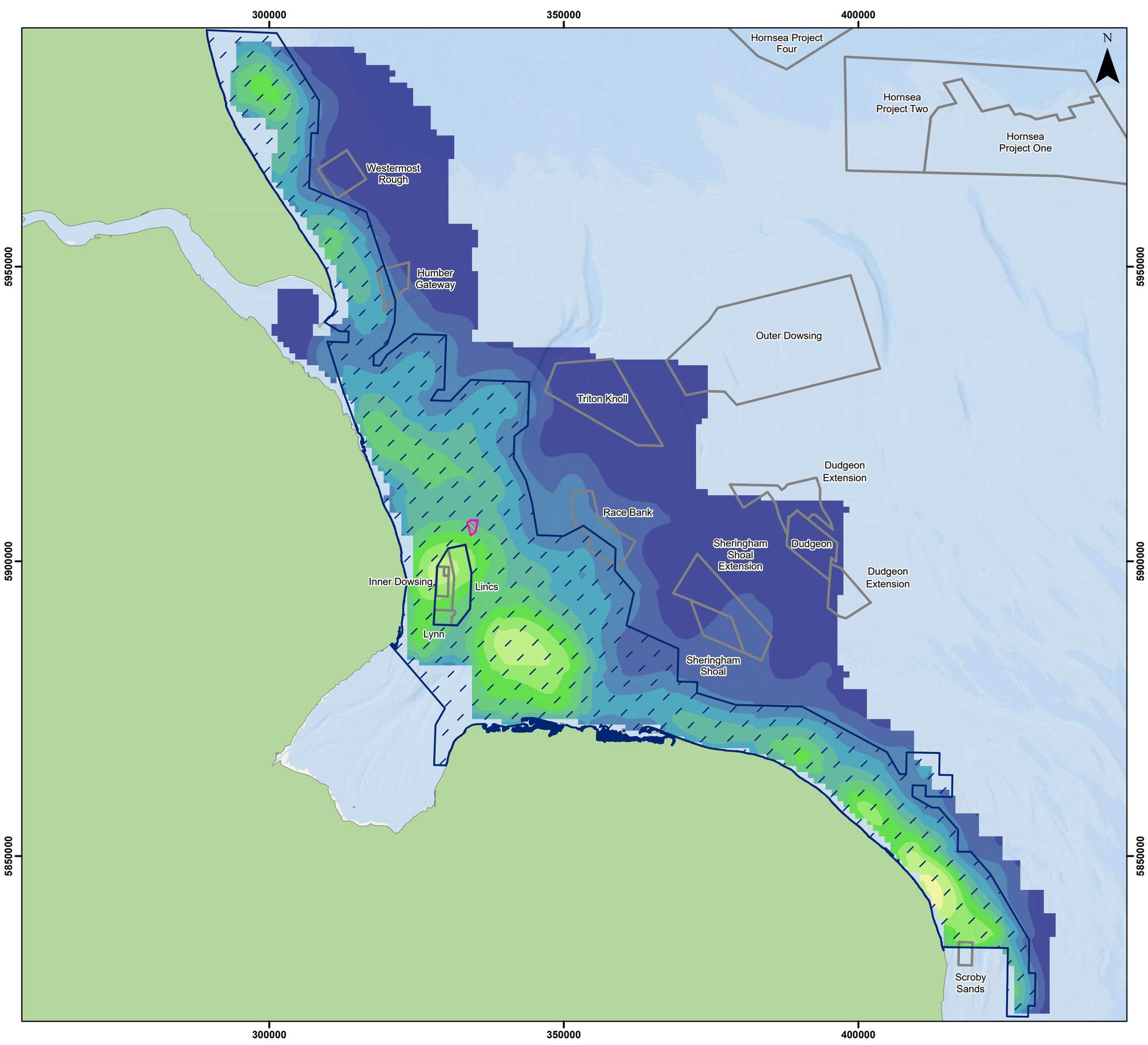
4.4.2.1 Species at risk of displacement

Greater Wash SPA – Red-throated diver

71. The presence of the ORCP and operational vessel traffic associated with the Project have the potential to affect red-throated diver associated with the Greater Wash Special Protection Area (SPA). The RIAA (AS1-095) considered a worst-case scenario of impacts during construction and decommissioning due to the ORCPs. The Applicant maintains that the assessment presented in the RIAA (AS1-095) is robust and is proportional to the risks both from installation and operation of the ORCPs. The removal of the northern ORCP area will not change the conclusions of the RIAA (AS1-095).

72. Within their relevant representations, Natural England has requested a more detailed assessment of the impacts of the ORCP on red-throated diver, specifically during the O&M phase (RR-045 – F6). Therefore, an additional assessment has been undertaken to address these concerns, specifically the uncertainty surrounding the effects of static structures on red-throated diver.

73. The ORCP area overlaps with the Greater Wash SPA, the offshore ECC, and consequently the ORCP area was sited to avoid high density areas of red-throated diver based on data by Lawson (2016). Figure 4-1 shows the distribution of red-throated diver within the Greater Wash SPA and the low level of overlap with the proposed ORCP area. Based on data by Lawson et al. (2016), an average density of 0.409 and a maximum density of 0.467 red-throated diver per km^2 are estimated to be present within the ORCP area.

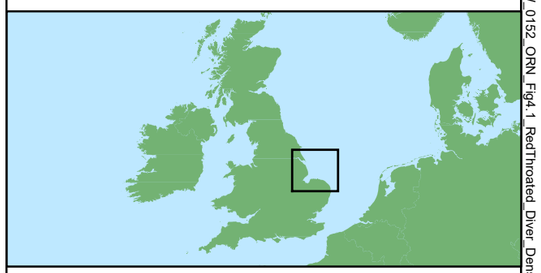


Legend

- ORCP Area
- Greater Wash SPA
- Offshore Wind Farm Boundaries

Red-throated Diver Densities within the Greater Wash SPA (Lawson *et al.*, 2016) (birds per km^2)

- 0 - 0.05
- 0.05 - 0.11
- 0.11 - 0.19
- 0.19 - 0.28
- 0.28 - 0.39
- 0.39 - 0.51
- 0.51 - 0.67
- 0.67 - 0.87
- 0.87 - 1.35
- 1.35- 3.38



Coordinate System: WGS 1984 UTM Zone 31N

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ODOW ORBA HRA Technical Note

Red-throated Diver Densities within the Greater Wash SPA

Figure 4-1

OUTER DOWSING OFFSHORE WIND

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74. Much evidence has been gathered as to the behaviour of red-throated diver in response to OWFs, with the majority of disturbance/displacement from OWFs attributed to the presence of WTG structures which are rotating. However, there is a relative paucity of peer reviewed studies and analysis of the potential for displacement of red-throated diver from static structures.

75. Based on evidence gathered from the Outer Thames Estuary SPA (also designated for red-throated diver), red-throated divers do not appear to be disturbed or displaced at a consistent distance by anthropogenic structures (Figure 4-2 and Figure 4-3). Figure 4-2 displays the locations of the Sizewell Nuclear Power Station which is along a transect surveyed during the Outer Thames Estuary SPA surveys (Irwin *et al*., 2019). A number of offshore structures associated with Sizewell Nuclear Power Station (Sizewell Rigs, assumed to be located at the end of the outfall/ intake pipe) are located off the coast of the power plant. As shown in Figure 4-2, red-throated diver were recorded in proximity to these locations, despite the close proximity to the power plant and associated structures. Further evidence is provided from vantage point surveys undertaken to inform the assessment of disturbance and displacement of red-throated diver from Sizewell C Nuclear Power Station which identified red-throated diver within 500m of the structures. Additionally, the Gunfleet lighthouse is also located within the Outer Thames Estuary SPA (Figure 4-3). Despite this structure being over 20m in height, a medium to high density of red-throated diver was recorded within a 2km buffer of the structure.

375000
400000
425000
450000
5825000
5800000
5775000
N

Legend

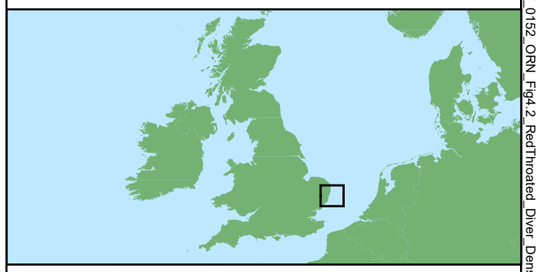
- Outer Thames SPA
- Offshore Wind Farm Boundaries
- Sizewell Nuclear Power Station
- Lighthouse

Red-throated Divers Count (2018) (Jenks)
(Irwin *et al.*, 2019)

- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 15
- 16 - 20

Bird Densities (birds per km^2)

- 0.01 - 0.1
- 0.11 - 0.2
- 0.21 - 0.5
- 0.51 - 1
- 1.01 - 2
- 2.01 - 5
- 5.01 - 10
- 10.01 - 20
- 20.01 - 50



Coordinate System: WGS 1984 UTM Zone 31N

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ODOW ORBA HRA Technical Note

Density of Red-throated Diver in the Northern Section of the Outer Thames Estuary SPA in comparison to Anthropogenic Structures

Figure 4-2

OUTER DOWSING OFFSHORE WIND

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350000
375000
400000
5750000
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5700000
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Legend

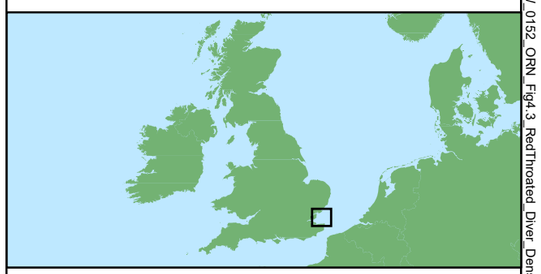
- Outer Thames SPA
- Offshore Wind Farm Boundaries
- Offshore Military Fort
- 2km Buffer from Offshore Military Fort
- Lighthouse
- 2km Buffer from Lighthouse

Red-throated Divers Count (2018) (Jenks)
(Irwin *et al.*, 2019)

- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 84

Bird Densities (birds per km^2)

- 0
- 0.01 - 0.1
- 0.11 - 0.2
- 0.21 - 0.5
- 0.51 - 1
- 1.01 - 2
- 2.01 - 5
- 5.01 - 10
- 10.01 - 20
- 20.01 - 50
- > 50



Coordinate System: WGS 1984 UTM Zone 31N

0 5 10 km

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ODOW ORBA HRA Technical Note

Density of Red-throated Diver in the Southern Section of the Outer Thames Estuary SPA in comparison to Anthropogenic Structures

Figure 4-3

OUTER DOWSING OFFSHORE WIND

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76. Moreover, three offshore military forts (or groups of forts) are located within the Outer Thames Estuary SPA (Figure 4-3). The middle fort is located within the busy Thames shipping lane (marked by buoys and leading out of the Thames Estuary). The low density of red-throated diver in the area is likely to be due to the shipping lane rather than the fort itself. Figure 4-3 shows a reduction of birds around the most westerly fort where it overlaps the shipping corridor in the north. However, to the south of the fort, medium densities of red-throated divers are recorded along the transect line and well within a 2km buffer from the structure. Close to the most easterly fort shown on Figure 4-3 there is a medium density of red-throated diver, despite also being in close proximity to a shipping lane (marked by buoys).
77. Based on the evidence presented above, it is concluded that the presence of the ORCP is unlikely to negatively impact the distribution of red-throated diver during all stages of the Project. It is also important to note that, with the removal of the northern ORCP area, the ORCPs will be positioned within the southern ORCP area which is closer to the Lincs offshore wind farm. As such, whilst no measurable displacement effect is predicted from the presence of the ORCPs, were a small-scale effect to occur then it is considered that any displacement from the ORCPs would fall wholly within the existing displacement effects from the Lincs offshore wind farm and would not be additional to ongoing impacts. Therefore, it is considered that the conclusions made within the RIAA (AS1-095) remain unchanged and valid.
78. At application, displacement impacts within the ECC were assessed based on the densities of red-throated divers presented in Lawson *et al. (*2016). The changes to the ECC constitute a reduction in the overall area affected through the removal of the northern section of the ECC and associated ORCP area. As there is no change to the predicted magnitude of effect, the conclusions of the RIAA (AS1-095) remain valid and unchanged. The Environmental Report for the Offshore Restricted Build Area and Revision to the Offshore Export Cable Corridor (document reference 15.9) provides an assessment of displacement effects of red-throated diver from the array area.

Greater Wash SPA – Common scoter

79. The presence of the ORCP and operational vessel traffic associated with the Project have the potential to affect common scoter associated with the Greater Wash SPA. The RIAA (AS1-095) considered a worst-case scenario of impacts during construction and decommissioning due to the ORCPs. The Applicant maintains that the assessment presented in the RIAA (AS1-095) is robust and is proportional to the risks both from installation and operation of the ORCPs. The removal of the northern ORCP area will not change the conclusions of the impacts on the Common scoter feature of the Greater Wash SPA.
80. Within their RR, Natural England has requested a more detailed assessment of the effects of the ORCP on common scoter, specifically during the O&M phase. Therefore, an additional confirmatory analysis has been undertaken to address these concerns, specifically the uncertainty surrounding the effects of static structures on common scoter.
81. This section considers the magnitude of impact on common scoter from the presence of the ORCP and relevant operational vessel traffic.
82. The location of the ORCP is not identified as a highly utilized location for common scoter (Lawson *et al.*, 2016; Figure 4-4 indicates a hotspot of common scoter on the edge of the Wash (near the coast), not in close proximity to the ORCP. Based on data by Lawson *et al*. (2016), an average density of 0.011 and a maximum density of 0.013 common scoters per km^2 are estimated to be present within the ORCP. Due to the lack of spatial overlap between the common scoter feature and the ORCP, any potential impact from the presence of the ORCP will not adversely affect the integrity of The Greater Wash SPA in relation to its conservation objectives.

300000
350000
400000
5950000
5900000
5850000
N

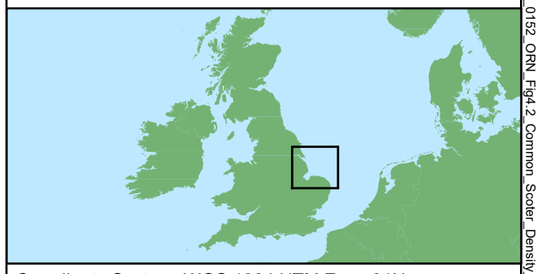
Legend

ORCP Area

Greater Wash SPA

Common Scoter Densities within the Greater Wash SPA (Lawson *et al.*, 2016) (birds per km^2)

- 0 - 0.7
- 0.7 - 2.34
- 2.34- 4.51
- 4.51- 7.22
- 7.22 - 10.51
- 10.51 - 14.83
- 14.83 - 21.34
- 21.34 - 31.05
- 31.05 - 40.72
- 40.72 - 56.58



Coordinate System: WGS 1984 UTM Zone 31N

0 20 40 km

Scale: 1:600,000

A3 Page Size

ODOW ORBA HRA Technical Note

Common Scoter Densities within the Greater Wash SPA

Figure 4-4

OUTER DOWSING OFFSHORE WIND

Date: 12/09/2024
Produced By: BPHB
Revision: 0.1

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Document Path: Z:\GIS\GIS_Projects\0152 Outer Dowsing EIA\GIS\Figures\Examination\OFZ and ECC Environmental Report\ORBA HRA Technical Note\ODOW_0152_ORN_Fig4-2_Common_Scoter_Density_v1.mxd

Flamborough and Filey Coast (FFC) SPA - Guillemot

83. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-9. Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A) provides detail on the differences between the Applicant's Approach and Natural England's Approach. In summary, the main difference between the approaches is that the Applicant uses bioseasons defined by Furness (2015), apportions 50% of birds to FFC SPA, uses the demographic rates to determine the proportion of adults in the array area and uses displacement and mortality rates of 50% and 1% respectively.

84. Impacts predicted within the RIAA (AS1-065) and calculated for the array with the inclusion of the ORBA using the Applicant's preferred approach are presented in Table 4-9. Impacts predicted within the RIAA and calculated for the array with the ORBA using Natural England's preferred approach to apportioning (Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A)) are also presented in Table 4-10. The introduction of the ORBA equates to an approximately 12.5% reduction in the predicted mortalities using the Applicant's approach. A direct comparison cannot be made with the RIAA (AS1-095) for the Natural England approach, as Natural England's approach was updated during the relevant representation process (RR-045). However, Table 4-10 presents the impacts from each of the approaches.

85. The predicted mortality of adult guillemot from the Flamborough and Filey Coast SPA per annum across all bio-seasons for project alone impacts using either the Applicant's Approach or the Natural England's Approach would be indistinguishable from natural fluctuations in the population. As the impact predicted with the ORBA is lower, this conclusion is considered valid here.

86. **Therefore, the potential for an AEoI to the conservation objectives of guillemot as a feature of the Flamborough and Filey Coast SPA in relation to disturbance and displacement effects in the O&M phase from the Project alone can be ruled out as, subject to natural change, guillemot will be maintained as a feature in the long-term.**

Table 4-9. Reference populations and background mortality for guillemot at FFC SPA

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Flamborough & Filey	83,214	5,076	2008 - 2011	149,980	9,149	2022	

Table 4-10. Design based impacts presented within the RIAA and with the inclusion of the ORBA, for guillemot at FFC SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
RIAA assessment	50.0	4,686.9	23.4	65.6	14.1 - 328.1	0.462	1.293	0.277 - 6.463	0.256	0.717	0.154 - 3.586
ORBA assessment	50.0	4,095.7	20.5	57.3	12.3 - 286.7	0.403	1.130	0.242 - 5.648	0.224	0.627	0.134 - 3.134
Difference between ORBA and RIAA			-2.9	-8.3	-1.8 – -41.4	-0.059	-0.263	-0.035 – -0.815	-0.032	-0.090	-0.02 – -0.452
Non-breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**
RIAA assessment	4.4	494.5	2.5	6.9	1.5 - 34.6	0.049	0.136	0.029 - 0.682	0.027	0.076	0.016 - 0.378
ORBA assessment	4.4	406.6	2.0	5.7	1.2 - 28.5	0.040	0.112	0.024 - 0.561	0.022	0.062	0.013 - 0.311
Difference between ORBA and RIAA			-0.5	-1.2	-0.3 - -6.1	-0.009	-0.024	-0.005 – -0.121	-0.005	-0.014	-0.003 – -0.067
Annual Total		**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**
RIAA assessment		5,181.4	25.9	72.5	15.5-362.6	0.511	1.429	0.306 – 7.154	0.280	0.793	0.168 – 3.920

ORBA assessment	4,502.3	22.5	63.0	13.5 – 315.2	0.443	1.242	0.266 – 6.209	0.246	0.689	0.147 – 3.445
Difference between ORBA and RIAA		-3.4	-9.5	-2.0 – -47.4	-0.068	-0.187	-0.04 – 5.903	-0.034	-0.104	-0.021 – -0.475

Table 4-11 Model based impacts presented with the inclusion of the ORBA for guillemot at FFC SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
ORBA assessment (Applicant)	50	3238.8	16.2	45.3	9.7 - 226.7	0.319	0.893	0.191 - 4.466	0.177	0.496	0.106 - 2.478
ORBA Assessment (NE)	100	11,364.2	56.8	159.1	34.1 - 795.5	1.119	3.134	0.672 - 15.671	0.621	1.739	0.373 - 8.695
Post-breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**
ORBA Assessment (NE)	68.5	6210.3	31.1	86.9	18.6 - 434.7	0.612	1.713	0.367 - 8.564	0.339	0.95	0.204 - 4.752
Non-breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**

ORBA assessment (Applicant)	4.4	400	2	5.6	1.2 - 28	0.039	0.11	0.024 - 0.552	0.022	0.061	0.013 - 0.306
ORBA Assessment (NE)	4.4	188.8	0.9	2.6	0.6 - 13.2	0.019	0.052	0.011 - 0.26	0.01	0.029	0.006 - 0.144

Annual Total	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
		50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
ORBA assessment (Applicant)	3,638.8	18.2	50.9	10.9 – 254.7	0.358	1.004	0.215 – 5.018	0.199	0.557	0.119 – 2.784
ORBA Assessment (NE)	17,763.3	88.8	248.7	53.3 – 1,243.4	1.750	4.899	1.050 – 24.495	0.971	2.718	0.583 – 13.591

87. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-12.
88. The predicted mortality of adult razorbill from the Flamborough and Filey Coast SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. Considering that the introduction of the ORBA has reduced the annual impact on this species substantially the same conclusion remains valid with this update.
89. **Therefore, the potential for an AEoI to the conservation objectives of the razorbill as a feature of the Flamborough and Filey Coast SPA in relation to disturbance and displacement effects in the O&M phase from the Project alone can be ruled out as, subject to natural change, razorbill will be maintained as a feature in the long-term.**

Table 4-12. Reference populations and background mortality for razorbill at Flamborough and Filey Coast SPA

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Flamborough & Filey	21,140	2,220		61,346	6,441.33		

Table 4-13. Impacts presented within the RIAA and with the inclusion of the ORBA for razorbill at Flamborough and Filey Coast SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)			
			50:1		70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
RIAA assessment	100.0	2,049.8	10.2	28.70	6.1 – 143.5	0.462	1.293	0.277 – 6.464	0.159	0.446	0.095 – 2.228	

ORBA assessment (Applicant)	100.0	1,800.6	9.00	25.21	5.4 – 126.0	0.406	1.136	0.243 - 5.678	0.140	0.391	0.084 - 1.957
Difference between ORBA and RIAA			-1.20	-3.49	-0.7 – -17.5	-0.056	-0.157	-0.034 – -0.786	-0.019	-0.055	-0.011 – -0.271
ORBA assessment (NE)	100.0	3,159.0	15.80	44.23	9.5 - 221.1	0.712	1.992	0.427 - 9.962	0.245	0.687	0.147 - 3.433
Post-breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**
RIAA assessment	3.4	80.8	0.40	1.13	0.2 – 5.7	0.018	0.051	0.011- 0.255	0.006	0.018	0.004 – 0.088
ORBA assessment	3.4	73.8	0.37	1.03	0.2 - 5.2	0.017	0.047	0.01 - 0.233	0.000	0.016	0.003 - 0.08
Difference between ORBA and RIAA			-0.4	-0.10	-0.0 - -0.5	-0.001	-0.004	-0.001 – -0.022	-0.006	-0.002	-0.001 – -0.008
Non-breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**
RIAA assessment	0.9	17.9	0.1	0.25	0.0 – 1.25	0.004	0.011	0.002 – 0.056	0.001	0.004	0.001 – 0.019
ORBA assessment	2.7	48.8	0.24	0.68	0.1 - 3.4	0.011	0.031	0.007 - 0.154	0.004	0.011	0.002 - 0.053
Difference between ORBA and RIAA			0.14	0.43	0.1 – 2.15	0.007	0.02	0.005 – 0.098	0.003	0.007	0.001 – 0.034

Pre-breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
RIAA assessment	3.4	209.9	1.0	2.94	0.6 – 14.7	0.047	0.132	0.028 – 0.662	0.016	0.046	0.010 – 0.228
ORBA assessment	3.4	173.5	0.87	2.43	0.5 - 12.1	0.039	0.109	0.023 - 0.547	0.013	0.038	0.008 - 0.189
Difference between ORBA and RIAA			-0.13	-0.51	-0.1 - -2.6	-0.008	-0.023	-0.005 – -0.115	-0.003	-0.008	-0.002 – -0.039

Annual Total	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
		50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
RIAA assessment	2,358.4	11.8	33.0	7.1 – 165.1	0.531	1.487	0.319 – 7.437	0.183	0.513	0.110 – 2.563
ORBA assessment (Applicant)	2,096.8	10.5	29.4	6.2 – 146.7	0.472	1.322	0.283 – 6.612	0.163	0.456	0.097 – 2.279
Difference between ORBA and RIAA		-1.3	-3.6	-0.9 – -18.4	-0.059	-0.165	-0.036 – -0.825	-0.02	-0.057	-0.013 – -0.284
ORBA assessment (NE)	3,455.2	17.28	48.37	10.4 - 241.9	0.778	2.179	0.243 - 5.678	0.268	0.751	0.084 - 1.957

Flamborough and Filey Coast SPA – Gannet displacement

90. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-14.

91. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-15.

92. The predicted displacement mortality of adult gannet from the FFC SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. Considering that the introduction of the ORBA has reduced the annual impact on this species the same conclusion remains valid with this update.

93. **Therefore, the potential for an AEoI to the conservation objectives of the gannet as a feature of the FFC SPA in relation to disturbance and displacement effects in the O&M phase from the Project alone can be ruled out as, subject to natural change, gannet will be maintained as a feature in the long-term.**

Table 4-14. Reference populations and background mortality for gannet at FFC SPA

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Flamborough & Filey	16,938	1,372.0	1993	30,466	2,467.7	2023	

Table 4-15. Displacement impacts presented within the RIAA and with the inclusion of the ORBA for gannet at FFC SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality		% increase in baseline mortality (Citation population)		% increase in baseline mortality (Recent count)	
			70:1	60:1 - 80:1	70:1	60:1 - 80:1	70:1	60:1 - 80:1
RIAA assessment	100.0	588.8	4.1	3.5 – 4.7	0.300	0.257 - 0.343	0.167	0.143 - 0.191
ORBA assessment	100.0	554.2	3.9	3.3 - 4.4	0.283	0.242 - 0.323	0.157	0.135 - 0.180
Difference between ORBA and RIAA			-0.2	-0.2 - -0.3	-0.017	-0.015 - -0.020	-0.010	-0.008 - -0.011
Post-breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**		**% increase in baseline mortality (Citation population)**		**% increase in baseline mortality (Recent count)**	
			70:1	**60:1 - 80:1**	**70:1**	**60:1 - 80:1**	**70:1**	**60:1 - 80:1**
RIAA assessment	4.8	24.0	0.2	0.2 – 2.3	0.008	0.005 - 0.112	0.007	0.042 – 0.098
ORBA assessment	4.85	24.0	0.2	0.1 - 0.2	0.012	0.011 - 0.014	0.007	0.006 - 0.008
Difference between ORBA and RIAA			0.0	-0.1 - -2.1	0.004	0.006 - -0.098	0.000	-0.036 - -0.090
Pre-breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**		**% increase in baseline mortality (Citation population)**		**% increase in baseline mortality (Recent count)**	

Breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality		% increase in baseline mortality (Citation population)		% increase in baseline mortality (Recent count)	
			70:1	60:1 - 80:1	70:1	60:1 - 80:1	70:1	60:1 - 80:1
RIAA assessment	6.2	5.6	0.0	0.0 – 0.4	0.001	0.001 - 0.014	0.001	0.001 - 0.014
ORBA assessment	6.2	4.3	0.0	0.0 – 0.0	0.002	0.002 - 0.003	0.001	0.001 - 0.001
Difference between ORBA and RIAA			0.0	0.0 - -0.4	0.001	0.001 - -0.011	0.000	0.000 - -0.013

Annual total	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality		% increase in baseline mortality (Citation population)		% increase in baseline mortality (Recent count)	
		70:1	60:1 - 80:1	70:1	60:1 - 80:1	70:1	60:1 - 80:1
RIAA assessment	618.4	4.3	3.7 - 4.9	0.316	0.270 - 0.361	0.175	0.150 - 0.200
ORBA assessment	582.5	4.1	3.5 - 4.7	0.297	0.255 - 0.340	0.165	0.142 - 0.189
Difference between ORBA and RIAA		-0.2	-0.2 - -0.2	-0.019	-0.015 - - 0.021	-0.010	-0.008 - - 0.011

Flamborough and Filey Coast SPA – Puffin

94. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-16.

95. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-17.

96. The predicted mortality of adult puffin from the Flamborough and Filey Coast SPA per annum across all bio-seasons at RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. Considering that the introduction of the ORBA has reduced the annual impact on this species the same conclusion remains valid with this update.

97. **Therefore, the potential for an AEoI to the conservation objectives of the puffin as a feature of the Flamborough and Filey Coast SPA in relation to disturbance and displacement effects in the O&M phase from the Project alone can be ruled out as, subject to natural change, puffin will be maintained as a feature in the long-term.**

Table 4-16 Reference populations and background mortality for puffin at Flamborough and Filey Coast SPA

SPA	Population size and background mortality					
	Citation count			Recent/SMP count		
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year
Flamborough and Filey Coast SPA	-	-	-	3,080	290	2022

Table 4-17 Impacts presented within the RIAA and with the inclusion of the ORBA for puffin at Flamborough and Filey Coast SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
RIAA assessment	21.2	78.9	0.4	1.1	0.2 – 5.5	-	-	-	0.136	0.381	0.082 – 1.909
ORBA assessment (Applicant)	21.2	77.7	0.4	1.1	0.2 – 5.4	-	-	-	0.134	0.376	0.080 – 1.878
Difference between ORBA and RIAA			0.0	0.0	0.0 - -0.1	-	-	-	-0.002	-0.005	-0.002 – -0.031
ORBA assessment (NE)	21.2	141.2	0.7	2.0	0.4 - 9.9	-	-	-	0.244	0.683	0.146 - 3.414
Post-breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**
RIAA assessment											
ORBA assessment											
Difference between ORBA and RIAA											

Non-breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
RIAA assessment	0.82	5.2	0.0	0.1	0.0 – 0.0	-	-	-	0.009	0.025	0.005 - 0.126
ORBA assessment	0.4	1.7	0.0	0.0	0.0 – 0.1	-	-	-	0.003	0.008	0.002 – 0.041
Difference between ORBA and RIAA			0.0	-0.1	0.0 – 0.1	-	-	-	-0.006	-0.017	-0.003 – -0.085

Annual Total	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
		50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
RIAA assessment	84.1	0.4	1.2	0.2 – 5.5	-	-	-	0.145	0.406	0.087 - 2.035
ORBA assessment	79.4	0.4	1.1	0.2 – 5.5	-	-	-	0.137	0.384	0.082 - 1.919
Difference between ORBA and RIAA		0.0	0.1	0.0 – 0.0	-	-	-	-0.008	-0.022	-0.005 - -0.116
ORBA assessment (NE)	142.9	0.7	2.0	0.4 – 10.0	-	-	-	0.247	0.691	0.148 - 3.455

Flamborough and Filey Coast SPA – Assemblage features

98. The SPA also supports a wide variety of seabird species that form a large breeding assemblage, in addition to those assessed above. The seabird assemblage in the SPA includes; herring gull (*Larus argentatus*); shag (*Phalacrocorax aristotelis*); fulmar (*Fulmarus glacialis*), and great cormorant (*Phalacrocorax carbo*). The only species with connectivity and screened in as sensitive to the impacts of this development is herring gull for which collision impacts were estimated at less than 0.1 breeding adults. **Therefore, it is concluded that the proposed project alone will not have an adverse effect on the integrity of the seabird assemblage of the Flamborough and Filey Coast SPA.**

Coquet Island SPA – Puffin

99. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-18.

100. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-19.

101. The introduction of the ORBA reduces the impacts from those predicted within the RIAA. Therefore, the conclusion is that, as the predicted mortality of adults from Coquet Island SPA per annum across all bio-seasons would be indistinguishable from natural fluctuations in the population, **the potential for an AEoI to puffin as an assemblage feature of Coquet Island SPA can be ruled out as, subject to natural change, puffin will be maintained as a feature in the long-term, remains unchanged and valid.**

Table 4-18. Reference populations and background mortality for Puffin at Coquet Island SPA

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	Recent count source (if not SMP)
Coquet Island	31,686	2,978	2013-2018	50,058	4,705	2019	**N/A**

Table 4-19. Impacts presented within the RIAA and with the inclusion of the ORBA for Puffin at Coquet Island SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**
RIAA assessment	78.8	329.4	1.6	4.6	1.0 - 23.1	0.055	0.155	0.033 - 0.774	0.035	0.098	0.021 - 0.490
ORBA assessment (Applicant)	78.8	288.6	1.4	4.0	0.9 - 20.2	0.048	0.136	0.029 - 0.678	0.031	0.086	0.018 - 0.429
Difference between ORBA and RIAA			-0.2	-0.6	-0.1 – -2.9	-0.007	-0.019	-0.004 – -0.096	-0.004	-0.012	-0.003 – -0.061

ORBA assessment (NE)	78.8	524.8	2.6	7.3	1.6 - 36.7	0.088	0.247	0.053 - 1.233	0.056	0.156	0.033 - 0.781
Non-breeding	**SPA weighting (%)**	**Adults apportioned to SPA (array area plus 2km buffer)**	**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**
RIAA assessment	5.3	33.9	0.2	0.5	0.1 - 2.4	0.006	0.016	0.003 - 0.08	0.004	0.010	0.002 - 0.050
ORBA assessment	5.3	22.0	0.1	0.3	0.1 - 1.5	0.004	0.010	0.002 - 0.052	0.002	0.007	0.001 - 0.033
Difference between ORBA and RIAA			-0.1	-0.2	0.0 - -0.9	-0.002	-0.006	-0.001 - -0.028	-0.002	-0.003	-0.001 - -0.017
Annual total	**Adults apportioned to SPA (array area plus 2km buffer)**		**Estimated Mortality**			**% increase in baseline mortality (Citation population)**			**% increase in baseline mortality (Recent count)**		
			50:1	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**	**50:1**	**70:2**	**30:1 - 70:10**
RIAA assessment	363.3		1.8	5.1	1.1 - 25.4	0.061	0.171	0.037 - 0.854	0.039	0.108	0.023 - 0.540
ORBA assessment (Applicant)	310.6		1.6	4.3	0.9 - 21.7	0.052	0.146	0.031 - 0.730	0.033	0.092	0.020 - 0.462
Difference between ORBA and RIAA			-0.2	-0.8	-0.2 – -3.7	-0.009	-0.025	-0.006 – -0.124	-0.006	-0.016	-0.003 – -0.078
ORBA assessment (NE)	546.8		2.7	7.7	1.6 - 38.3	0.092	0.257	0.055 - 1.285	0.058	0.163	0.035 - 0.813

Farne Islands SPA – Guillemot

102. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-20.

103. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-21.

104. The predicted mortality of adult guillemot from the Farne Islands SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. Considering that the introduction of the ORBA has reduced the annual impact for the design based impacts on this species the same conclusion remains valid with this update. The model based impacts (which were not previously considered within the RIAA) are less than the design based impacts so the conclusions remain valid.

105. **Therefore, the potential for an AEoI to the conservation objectives of the guillemot as a feature of the Farne Islands SPA in relation to disturbance and displacement effects in the O&M phase from the Project alone can be ruled out as, subject to natural change, guillemot will be maintained as a feature in the long-term.**

Table 4-20. Reference populations and background mortality for guillemot at Farne Islands SPA

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Farne Islands	65,751	4,010.8	2010-2014	46,332	2,826.3	2019	

Table 4-21. Design based impacts presented within the RIAA and with the inclusion of the ORBA for guillemot at Farne Islands SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
RIAA assessment	3.7	418.3	2.1	5.9	1.3 - 29.3	0.052	0.146	0.031 - 0.73	0.074	0.207	0.044 - 1.036
ORBA assessment	3.7	343.9	1.7	4.8	1.0 - 24.1	0.043	0.12	0.026 - 0.6	0.061	0.17	0.037 - 0.852
Difference between ORBA and RIAA			-0.4	-1.1	-0.3 - -5.2	0.0	0.0	-0.005 - -0.13	0.0	0.0	-0.007 - -0.184

Table 4-22. Model based impacts presented with the inclusion of the ORBA for guillemot at Farne Islands SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
ORBA assessment	3.73	338.4	1.7	4.7	1 - 23.7	0.042	0.118	0.025 - 0.591	0.060	0.168	0.036 - 0.838
NE Assessment (ORBA)	3.73	159.7	0.8	2.2	0.5 - 11.2	0.02	0.056	0.012 - 0.279	0.028	0.079	0.017 - 0.395

Farne Islands SPA – Puffin

106. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-23.

107. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-24.

108. The predicted mortality of adult puffin from the Farne Islands SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. Considering that the introduction of the ORBA has reduced the annual impact on this species the same conclusion remains valid with this update.

109. **Therefore, the potential for an AEoI to the conservation objectives of the puffin as a feature of the Farne Islands SPA in relation to disturbance and displacement effects in the O&M phase from the Project alone can be ruled out as, subject to natural change, puffin will be maintained as a feature in the long-term.**

Table 4-23. Reference populations and background mortality for puffin at Farne Islands SPA

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Farne Islands	76,798	7,219	2013-2018	87,504	8,225	2019	

Table 4-24. Impacts presented within the RIAA and with the inclusion of the ORBA for puffin at Farne Islands SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
RIAA assessment	17.2	109.7	0.5	1.5	0.3 - 7.7	0.008	0.021	0.005 - 0.106	0.007	0.019	0.004 - 0.093
ORBA assessment	17.2	71.3	0.4	1.0	0.2 – 5.0	0.005	0.014	0.003 - 0.069	0.004	0.012	0.003 - 0.061
Difference between ORBA and RIAA			-0.1	-0.5	-0.1 - -2.7	-0.003	-0.007	-0.002 - -0.037	-0.003	-0.007	-0.001 - -0.032

4.4.2.2 Collision Risk Assessment

Alde-Ore Estuary SPA – lesser black-backed gull

110. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-25.

111. Impacts predicted within theRIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-26.

112. The predicted collision mortality of adult lesser black-backed gull from the Alde-Ore Estuary SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. As the impact predicted with the ORBA is almost identical, this conclusion is considered valid here.

113. **Therefore, the potential for an AEoI to the conservation objectives of the lesser black-backed gull as a feature of the Alde-Ore Estuary SPA in relation to collisions in the O&M phase from the Project alone can be ruled out as, subject to natural change, lesser black-backed gull will be maintained as a feature in the long-term.**

Table 4-25. Reference populations and background mortality for lesser black-backed gull at Alde-Ore Estuary SPA

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Alde-Ore Estuary	28,140	3,236.1		3,498	402.27	2023	

Table 4-26. Collision impacts presented within the RIAA and with the inclusion of the ORBA, for lesser black-backed gull at Alde-Ore Estuary SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Impacted birds apportioned to SPA	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
RIAA assessment	15.7	0.2	0.2	0.007	0.060
ORBA assessment	15.7	0.32	0.16	0.005	0.039
Difference between ORBA and RIAA		0.12	-0.04	-0.002	-0.021
Post-breeding	**SPA weighting (%)**	**Impacted birds apportioned to SPA**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment	0.6	-	0.0	0.000	0.000
ORBA assessment	0.6	-	0.0	0.000	0.000
Difference between ORBA and RIAA		-	0.0	0.000	0.000

Non-breeding	SPA weighting (%)	Impacted birds apportioned to SPA	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
RIAA assessment	1.6	-	0.0	0.000	0.000
ORBA assessment	1.6	-	0.0	0.000	0.001
Difference between ORBA and RIAA		-	0.0	0.000	0.001
Pre-breeding	**SPA weighting (%)**	**Impacted birds apportioned to SPA**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment	0.6	-	0.0	0.000	0.000
ORBA assessment	0.6	-	0.0	0.000	0.000
Difference between ORBA and RIAA		-	0.0	0.000	0.000
Annual total		**Impacted birds apportioned to SPA**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment		0.2	0.2	0.007	0.060
ORBA assessment		0.32	0.16	0.010	0.002
Difference between ORBA and RIAA		0.12	-0.04	-0.002	-0.021

Coquet Island SPA – Sandwich tern

114. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-27.

115. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-28.

116. The predicted collision mortality of adult Sandwich tern from the Coquet Island SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. As the impact predicted with the ORBA is almost identical, this conclusion is considered valid here.

117. Impacts at Coquet Island SPA were predicted to be 0.001 birds with an increase of baseline mortality of 0.001% against a population at Coquest Island SPA of 1,161 AON. Sandwich tern populations at Farne Islands SPA have reduced from 862 AON at citation to 173 AON in 2023. As such, given the scale of the impacts at Coquet Island SPA, any impacts at Farne Islands SPA are expected to be negligible.

118. **Therefore, the potential for an AEoI to the conservation objectives of the Sandwich tern as a feature of the Coquet Island SPA in relation to collisions in the O&M phase from the Project alone can be ruled out as, subject to natural change, Sandwich tern will be maintained as a feature in the long-term.**

Table 4-27. Reference populations and background mortality for Sandwich tern at Coquet Island SPA.

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Coquet Island	2600	265.2	2010-2014	4428	451.656	2022	

Table 4-28. Collision impacts presented within the RIAA and with the inclusion of the ORBA, for Sandwich tern at Coquet Island SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-breeding	SPA weighting (%)	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
RIAA assessment	3.5	0.0	0.000	0.000
ORBA assessment	3.5	0.0	0.000	0.000
Difference between ORBA and RIAA		0.0	0.0	0.0

Farne Islands SPA – Kittiwake

119. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-29.

120. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-30.

121. The predicted collision mortality of adult kittiwake from Farne Islands SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. As the impact predicted with the ORBA is almost identical, this conclusion is considered valid here.

122. Therefore, the potential for an AEoI to the conservation objectives of the kittiwake as a feature of the Farne Islands SPA in relation to collisions in the O&M phase from the Project alone can be ruled out as, subject to natural change, kittiwake will be maintained as a feature in the long-term.

Table 4-29. Reference populations and background mortality for kittiwake at Farne Islands SPA

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Farne Islands	8,241	1,203	2010-2014	8,804	1,285	2019	

Table 4-30. Collision impacts presented within the RIAA and with the inclusion of the ORBA, for kittiwake at Farne Islands SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
RIAA assessment	1.3	0.3	0.028	0.026
ORBA assessment	1.3	0.3	0.027	0.025
Difference between ORBA and RIAA		0.0	0.001	0.001
Post-breeding	**SPA weighting (%)**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment	0.5	0.0	0.001	0.001
ORBA assessment	0.5	0.0	0.001	0.001
Difference between ORBA and RIAA		0.0	0.000	0.000
Pre-breeding	**SPA weighting (%)**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment	0.7	0.0	0.001	0.001
ORBA assessment	0.7	0.0	0.002	0.001
Difference between ORBA and RIAA		0.0	0.001	0.000
Pre-breeding	**SPA weighting (%)**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment		0.4	0.030	0.029
ORBA assessment		0.4	0.030	0.028
Difference between ORBA and RIAA		0.0	0.000	0.001

Flamborough and Filey Coast SPA - kittiwake

123. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-31.

124. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-32.

125. The predicted collision mortality of adult kittiwake from Flamborough and Filey Coast SPA per annum across all bio-seasons within the RIAA (AS1-095) (14.2 mortalities) would be indistinguishable from natural fluctuations in the baseline mortality of the population (13,015.8 mortalities using the most recent population estimate). The impact predicted with the ORBA (15 mortalities) is almost identical to that presented within the RIAA (AS1-095) (an increase in baseline mortality of 0.116 compared to an increase of 0.111 within the RIAA (AS1-095)), and given the extremely low increase in baseline mortality (<1%) this conclusion is considered valid here.

126. **Therefore, the potential for an AEoI to the conservation objectives of the kittiwake as a feature of the Flamborough and Filey Coast SPA in relation to collisions in the O&M phase from the Project alone can be ruled out as, subject to natural change, kittiwake will be maintained as a feature in the long-term.**

Table 4-31. Reference populations and background mortality for kittiwake at Flamborough and Filey Coast SPA.

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Flamborough & Filey	89040	12,999.8	2008-2011	89,148	13,015.8	2022	

Table 4-32. Collision impacts presented within the RIAA and with the inclusion of the ORBA for kittiwake at Flamborough and Filey Coast SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
RIAA assessment	61.3	14.2	0.110	0.109
ORBA assessment	61.3	15.0	0.115	0.115
Difference between ORBA and RIAA		0.8	0.005	0.006
Post-breeding	**SPA weighting (%)**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment	5.4	0.2	0.001	0.001
ORBA assessment	5.4	0.2	0.001	0.001
Difference between ORBA and RIAA		0.0	0.000	0.000
Pre-breeding	**SPA weighting (%)**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**

RIAA assessment	7.2	0.2	0.001	0.001
ORBA assessment	7.2	0.2	0.002	0.002
Difference between ORBA and RIAA		0.0	0.001	0.001

Annual total	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
RIAA assessment	14.6	0.112	0.112
ORBA assessment	15.3	0.118	0.118
Difference between ORBA and RIAA	0.7	0.006	0.006

127. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-33.

128. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-34.

129. The predicted collision mortality of adult Sandwich tern from North Norfolk Coast SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. As the impact predicted with the ORBA is almost identical, this conclusion is considered valid here.

130. Therefore, the potential for an AEoI to the conservation objectives of the Sandwich tern as a feature of the North Norfolk Coast SPA in relation to collisions in the O&M phase from the Project alone can be ruled out as, subject to natural change, Sandwich tern will be maintained as a feature in the long-term.

Table 4-33. Reference populations and background mortality for Sandwich tern at North Norfolk Coast SPA.

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
North Norfolk Coast	7,400	754.8	2020-2022	14,588	1,488.0	2020-2022	

Table 4-34. Collision impacts presented within the RIAA and with the inclusion of the ORBA for Sandwich tern at North Norfolk Coast SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Impacted INDS apportioned to SPA	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
RIAA assessment	100.0	0.4	0.2	0.029	0.015
ORBA assessment	100.0	0.4	0.2	0.031	0.016
Difference between ORBA and RIAA		0.0	0.0	0.002	0.001
Non-breeding	**SPA weighting (%)**	**Impacted INDS apportioned to SPA**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment	21.7	-	0.0	0.000	0.000
ORBA assessment	21.7	-	0.0	0.001	0.000
Difference between ORBA and RIAA		-	0.0	0.001	0.000
Non-breeding		**Impacted INDS apportioned to SPA**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment		0.4	0.2	0.030	0.015
ORBA assessment		0.4	0.2	0.031	0.016
Difference between ORBA and RIAA		0.0	0.0	0.001	0.001

Flamborough and Filey Coast SPA – Herring gull

131. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-35.

132. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-36.

133. The predicted collision mortality of adult Herring gull from Flamborough and Filey Coast SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. As the impact predicted with the ORBA is almost identical, this conclusion is considered valid here.

134. **Therefore, the potential for an AEoI to the conservation objectives of the herring gull as a feature of the Flamborough and Filey Coast SPA in relation to collisions in the O&M phase from the Project alone can be ruled out as, subject to natural change, herring gull will be maintained as a feature in the long-term.**

Table 4-35. Reference populations and background mortality for herring gull at Flamborough and Filey Coast SPA.

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Flamborough & Filey	-	-	-	283	46.98		

Table 4-36. Collision impacts presented within the RIAA and with the inclusion of the ORBA, for herring gull at Flamborough and Filey Coast SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Impacted INDS apportioned to SPA	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
RIAA assessment	8.4	0.1	0.1	-	0.275
ORBA assessment	8.4	0.2	0.1	-	0.403
Difference between ORBA and RIAA		0.1	0.0	-	0.122
Non-breeding	**SPA weighting (%)**	**Impacted adults apportioned to SPA (Furness)**		**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment	0.2	0.0	-	-	0.003
ORBA assessment	0.2	0.0	-	-	0.003
Difference between ORBA and RIAA		0.0	-	-	0.000

Flamborough and Filey Coast SPA – gannet collisions

135. Reference populations and background mortality rates against which impacts are assessed are presented in Table 4-37.

136. Impacts predicted within the RIAA (AS1-095) and calculated for the array with the inclusion of the ORBA are presented in Table 4-38.

137. The predicted collision mortality of adult gannet from Flamborough and Filey Coast SPA per annum across all bio-seasons within the RIAA (AS1-095) would be indistinguishable from natural fluctuations in the population. As the impact predicted with the ORBA is almost identical, this conclusion is considered valid here.

138. **Therefore, the potential for an AEoI to the conservation objectives of the gannet as a feature of the Flamborough and Filey Coast SPA in relation to collisions in the O&M phase from the Project alone can be ruled out as, subject to natural change, gannet will be maintained as a feature in the long-term.**

Table 4-37. Reference populations and background mortality for gannet at Flamborough and Filey Coast SPA.

SPA	Population size and background mortality						
	Citation count			Recent/SMP count			Recent count source (if not SMP)
	Count (individuals)	Background mortality	Count year	Count (individuals)	Background mortality	Count year	
Flamborough & Filey	16,938	1,372	1993	30,466	2,468	2023	

Table 4-38 Collision impacts presented within the RIAA and with the inclusion of the ORBA, for gannet at Flamborough and Filey Coast SPA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Breeding	SPA weighting (%)	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
RIAA assessment	100.0	1.0	0.071	0.039
ORBA assessment	100.0	1.0	0.073	0.041
Difference between the ORBA and RIAA		0.0	0.002	0.002
Post-breeding	**SPA weighting (%)**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment	4.8	0.0	0.001	0.000
ORBA assessment	4.8	0.0	0.001	0.000
Difference between the ORBA and RIAA		0.0	0.000	0.000
Pre-breeding	**SPA weighting (%)**	**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment	6.2	0.0	0.000	0.000

Breeding	SPA weighting (%)	Impacted adults apportioned to SPA	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
ORBA assessment	6.2	0.0	0.000	0.000
Difference between the ORBA and RIAA		0.0	0.000	0.000
Annual total		**Impacted adults apportioned to SPA**	**% increase in baseline mortality (Citation population)**	**% increase in baseline mortality (Recent count)**
RIAA assessment		1.0	0.072	0.040
ORBA assessment		1.0	0.075	0.042
Difference between the ORBA and RIAA		0.0	0.003	0.002

Table 4-39. Summary of annual total impacts on gannet from collision and displacement combined. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Annual total	Impacted adults apportioned to SPA		% increase in baseline mortality (Citation population)		% increase in baseline mortality (Recent count)	
	70:1	60:1 - 80:1	70:1	60:1 - 80:1	70:1	60:1 - 80:1
RIAA assessment	5.4	-	0.391	-	0.217	-
ORBA assessment	5.3	4.7 - 5.8	0.383	0.341 - 0.426	0.213	0.144 - 0.343
Difference between ORBA and RIAA	0.1	-	0.008	-	0.004	-

Impacts on Scottish sites

139. The following tables present the impacts on Scottish sites for key species, predicted with the inclusion of the ORBA. For all Scottish sites assessed, changes in impact resulting from the introduction of the ORBA either comprise a reduction or a very minor increase, and as such will not have any meaningful effect on the levels of baseline mortality. The conclusions presented in the RIAA (AS1-095) are therefore still valid. As impacts on Scottish sites presented within this document and the RIAA (AS1-095) are extremely small across all species and all sites, with increases in baseline mortalities of <0.05% in almost all cases. To avoid repetition the impacts provided in the RIAA (AS1-095) (and the differences between them and the impacts following introduction of the ORBA) are not represented here.

140. Therefore, the potential for an AEoI to the conservation objectives of the following features at all these Scottish SPAs in relation to collision and displacement consequent mortalities during the O&M phase from the project alone can be ruled out and therefore, subject to natural change, these features will be maintained in the long-term.

Guillemot

141. Impacts on Scottish sites predicted with the inclusion of the ORBA using the Applicant's approach are presented in Table 4-40.

Table 4-40. Impacts on guillemot at Scottish sites predicted with the inclusion of the ORBA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-Breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
Buchan Ness to Collieston	1.3	119.2	0.6	1.7	0.4 - 8.3	0.057	0.158	0.034 - 1.081	0.033	0.094	0.020 - 0.469
Calf of Eday	0.5	50.8	0.3	0.7	0.2 - 3.6	0.033	0.092	0.020 - 0.198	0.076	0.212	0.045 - 1.059
Copinsay	0.5	45.2	0.2	0.6	0.1 - 3.2	0.013	0.035	0.008 - 0.049	0.045	0.127	0.027 - 0.637
East Caithness Cliffs	9.2	859.0	4.3	12.0	2.6 - 60.1	0.066	0.185	0.040 - 3.052	0.047	0.132	0.028 - 0.661
Fair Isle	1.1	105.4	0.5	1.5	0.3 - 7.4	0.027	0.075	0.016 - 0.378	0.058	0.162	0.035 - 0.811
Forth Islands	1.6	152.2	0.8	2.1	0.5 - 10.7	0.039	0.109	0.023 - 0.466	0.049	0.138	0.030 - 0.689
Foula	1.4	134.0	0.7	1.9	0.4 - 9.4	0.029	0.082	0.018 - 0.272	0.191	0.534	0.114 - 2.668
Fowlsheugh	3.0	277.4	1.4	3.9	0.8 - 19.4	0.040	0.113	0.024 - 1.274	0.033	0.093	0.020 - 0.463
Hermaness, Saxavord	0.4	37.3	0.2	0.5	0.1 - 2.6	0.012	0.034	0.007 - 0.160	0.133	0.373	0.080 - 1.865
Hoy	0.5	50.8	0.3	0.7	0.2 - 3.6	0.016	0.044	0.009 - 0.155	0.033	0.092	0.020 - 0.462
Marwick Head	1.0	89.5	0.4	1.3	0.3 - 6.3	0.019	0.054	0.012 - 0.268	0.077	0.215	0.046 - 1.075
North Caithness Cliffs	4.1	379.1	1.9	5.3	1.1 - 26.5	0.081	0.227	0.049 - 1.116	0.172	0.483	0.103 - 2.414
Noss	1.3	119.2	0.6	1.7	0.4 - 8.3	0.025	0.070	0.015 - 0.487	0.041	0.115	0.025 - 0.576
Rousay	0.5	50.0	0.3	0.7	0.2 - 3.5	0.039	0.108	0.023 - 0.181	0.062	0.174	0.037 - 0.868
St Abbs Head to Fast Castle	2.5	229.2	1.1	3.2	0.7 – 16.0	0.059	0.166	0.036 - 1.644			
Sumburgh Head	0.4	38.4	0.2	0.5	0.1 - 2.7	0.020	0.055	0.012 - 0.099	0.034	0.094	0.020 - 0.470

Non-Breeding	SPA weighting (%)	Adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
Troup, Pennan & Lions	0.9	88.2	0.4	1.2	0.3 - 6.2	0.016	0.045	0.010 - 0.240	0.030	0.085	0.018 - 0.425
West Westray	2.9	273.4	1.4	3.8	0.8 - 19.1	0.053	0.149		0.091	0.255	0.055 - 1.276

Razorbill

142. Impacts on Scottish sites predicted with the inclusion of the ORBA are presented in Table 4-41.

Table 4-41. Impacts on razorbill at Scottish sites predicted with ORBA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-Breeding	Bioseason	SPA weighting (%)	Abundance of adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
				50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
Forth Islands	Autumn	0.9	28.2	0.1	0.4	0.1 – 2.0	0.096	0.269	0.058 - 1.344	0.023	0.064	0.014 - 0.322
Forth Islands	Winter	0.7	13.3	0.1	0.2	0.0 - 0.9	0.045	0.127	0.027 - 0.635	0.011	0.030	0.007 - 0.152
Forth Islands	Spring	0.9	28.2	0.1	0.4	0.1 – 2.0	0.096	0.269	0.058 - 1.344	0.023	0.064	0.014 - 0.322
East Caithness Cliffs	Autumn	4.2	134.4	0.7	1.9	0.4 - 9.4	0.041	0.113	0.024 - 0.567	0.021	0.060	0.013 - 0.298
East Caithness Cliffs	Winter	3.4	63.5	0.3	0.9	0.2 - 4.4	0.019	0.054	0.011 - 0.268	0.010	0.028	0.006 - 0.141
East Caithness Cliffs	Spring	4.2	134.4	0.7	1.9	0.4 - 9.4	0.041	0.113	0.024 - 0.567	0.021	0.060	0.013 - 0.298

Puffin

143. Impacts on Scottish sites predicted with the inclusion of the ORBA are presented in Table 4-42.

Table 4-42. Impacts on puffin at Scottish sites predicted with ORBA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-Breeding	SPA weighting (%)	Abundance of adults apportioned to SPA (array area plus 2km buffer)	Estimated Mortality			% increase in baseline mortality (Citation population)			% increase in baseline mortality (Recent count)		
			50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10	50:1	70:2	30:1 - 70:10
Fair Isle	1.4	6.7	0.0	0.1	0.0 - 0.5	0.002	0.004	0.001 - 0.022	0.005	0.015	0.003 - 0.075
Forth Islands	26.8	129.5	0.6	1.8	0.4 - 9.1	0.025	0.069	0.015 - 0.344	0.006	0.015	0.003 - 0.077
Foula	2.9	14.0	0.1	0.2	0.0 – 1.0	0.002	0.004	0.001 - 0.022	0.012	0.033	0.007 - 0.165
Hermaness, Saxavord	3.1	14.8	0.1	0.2	0.0 – 1.0	0.001	0.004	0.001 - 0.020	0.031	0.088	0.019 - 0.440
Hoy	0.5	2.2	0.0	0.0	0.0 - 0.2	0.002	0.005	0.001 - 0.023			
North Caithness Cliffs	0.1	0.6	0.0	0.0	0.0 – 0.0	0.001	0.002	0.000 - 0.011	0.001	0.003	0.001 - 0.015
Noss	0.1	0.5	0.0	0.0	0.0 – 0.0	0.001	0.003	0.001 - 0.016	0.002	0.006	0.001 - 0.032

Gannet

144. Impacts on Scottish sites predicted from with the inclusion of the ORBA are presented in Table 4-43. For collisions, impacts onto Scottish sites with the inclusion of the ORBA are presented in Table 4-44.

Table 4-43. Displacement impacts on gannet at Scottish sites predicted with ORBA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-breeding	Bioseason	SPA weighting (%)	Impacted adults apportioned to SPA (Furness)	Estimated Mortality		% increase in baseline mortality (Citation population)		% increase in baseline mortality (Recent count)	
				70:1	60:1 - 80:1	70:1	60:1 - 80:1	70:1	60:1 - 80:1
Forth Islands	Autumn	24.3	186.5	1.3	1.1 - 1.5	0.037	0.032 - 0.043	0.011	0.009 - 0.012
Forth Islands	Spring	31.3	32.1	0.2	0.2 - 0.3	0.006	0.005 - 0.007	0.002	0.002 - 0.002
Forth Islands	NB total		218.6	1.5	1.3 - 1.7	0.044	0.037 - 0.050	0.013	0.011 - 0.014
Hermaness, Saxavord	Autumn	8.5	65.5	0.5	0.4 - 0.5	0.035	0.030 - 0.039	0.011	0.009 - 0.013
Hermaness, Saxavord	Spring	13.7	14.1	0.1	0.1 - 0.1	0.007	0.006 - 0.008	0.002	0.002 - 0.003
Hermaness, Saxavord	NB total		79.6	0.6	0.5 - 0.6	0.042	0.036 - 0.048	0.013	0.012 - 0.015
Noss	Autumn	3.4	26.3	0.2	0.2 - 0.2	0.017	0.014 - 0.019	0.010	0.008 - 0.011
Noss	Spring	5.5	5.6	0.0	0.0 – 0.0	0.004	0.003 - 0.004	0.002	0.002 - 0.002
Noss	NB total		31.9	0.2	0.2 - 0.3	0.020	0.017 - 0.023	0.012	0.010 - 0.014
Fair Isle	Autumn	1.38	6.82	0.0	0.0 – 0.1	0.025	0.022 – 0.029	0.006	0.005 – 0.007
Fair Isle	Spring	2.21	1.53	0.0	0.0 – 0.0	0.006	0.005 – 0.006	0.001	0.001 – 0.002
Fair Isle	NB Total		8.34	0.1	0.1 – 0.1	0.031	0.027 – 0.035	0.007	0.006 – 0.008

Table 4-44. Collision impacts on gannet at Scottish sites predicted with ORBA. For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-breeding	Bioseason	SPA weighting (%)	Impacted adults apportioned to SPA (Furness)	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
Forth Islands	Autumn	24.32	0.10	0.003	0.000
Forth Islands	Spring	31.27	0.03	0.001	0.000
Forth Islands	NB total		0.13	0.004	0.000
Hermaness, Saxavord	Autumn	8.54	0.04	0.003	0.000
Hermaness, Saxavord	Spring	13.73	0.01	0.001	0.000
Hermaness, Saxavord	NB total		0.05	0.004	0.000
Noss	Autumn	3.42	0.01	0.001	0.000
Noss	Spring	5.51	0.00	0.000	0.000
Noss	NB total		0.02	0.002	0.000
Fair Isle	Autumn	1.38	0.01	0.003	0.000
Fair Isle	Spring	2.21	0.00	0.001	0.000
Fair Isle	NB total		0.01	0.004	0.000

Kittiwake

145. Collision impacts on Scottish sites predicted for kittiwake with the inclusion of the ORBA are presented in Table 4-45.

Table 4-45. Collision impacts on kittiwake at Scottish sites predicted with ORBA, For more details on the applicant and Natural England's approaches to apportioning (including adult apportioning), please see Appendix A Offshore and Intertidal Ornithology Apportioning (document reference 15.10A).

Non-breeding	Bioseason	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
Buchan Ness to Collieston	non-breeding	0.003	0.009
Calf of Eday	non-breeding	0.004	0.044
Copinsay	non-breeding	0.001	0.006
East Caithness Cliffs	non-breeding	0.010	0.014
Fair Isle	non-breeding	0.000	0.014
Forth Islands	non-breeding	0.003	0.018
Foula	non-breeding	0.001	0.005
Fowlsheugh	non-breeding	0.002	0.004
Hermaness, Saxavord	non-breeding	0.004	0.046
Hoy	non-breeding	0.001	0.012
Marwick Head	non-breeding	0.001	0.003
North Caithness Cliffs	non-breeding	0.007	0.015
Noss	non-breeding	0.001	0.036
Rousay	non-breeding	0.003	0.031
St Abbs Head to Fast Castle	non-breeding	0.001	0.006
Sumburgh Head	non-breeding	0.001	0.014

Non-breeding	Bioseason	% increase in baseline mortality (Citation population)	% increase in baseline mortality (Recent count)
Troup, Pennan & Lions	non-breeding	0.004	0.013
West Westray	non-breeding	0.004	0.137

Migratory waterbirds and seabirds

146. The introduction of the ORBA has reduced the footprint of the ODOW site, which will also reduce the associated risk of collision risk for migratory seabird and waterbird species due to a reduction in migratory pathways through the Array area. The impacts of collision risk to migratory species have been reduced compared to those presented within the RIAA (AS1-095) and therefore the conclusions presented within the RIAA remain valid and unchanged.

Conclusions

147. The information presented within this report concludes that the introduction of the ORBA and modification of the ECC (including the removal of the northern ORCP option) will have no effect on the overall conclusions drawn within the already submitted RIAA (AS1-095) in relation to benthic and intertidal ecology, migratory fish, marine mammals, and ornithological receptors. All potential impacts associated with the Project following the design changes are either reduced, or unchanged (with the exception of some slight increases in impact numbers for a few species) for all designated sites and features for these receptor groups, and therefore the conclusions drawn in the RIAA (AS1-095) remain unchanged and valid.

148. In addition, the impacts estimated for some of key species, such as guillemot have reduced substantially (by approximately 12.5%) compared with those precited in the RIAA (AS1-095).

5 Reference

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