DBS Offshore Wind

RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Dogger Bank South Offshore Wind Farms

Effects on Prey Species Technical Note (Revision 2) (Clean)

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02	73 - 75	7.2	Herring spawning section updated with additional commentary and mapping.

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Glossary

Term	Definition
Array Areas	The DBS East and DBS West offshore Array Areas, where the wind turbines, offshore platforms and array cables would be located. The Array Areas do not include the Offshore Export Cable Corridor or the Inter-Platform Cable Corridor within which no wind turbines are proposed. Each area is referred to separately as an Array Area.
Dogger Bank South (DBS) Offshore Wind Farms	The collective name for the two Projects, DBS East and DBS West.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the value, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Electrical Switching Platform (ESP)	The Electrical Switching Platform (ESP), if required would be located either within one of the Array Areas (alongside an Offshore Converter Platform (OCP)) or the Export Cable Platform Search Area.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement (ES).
Environmental Statement (ES)	A document reporting the findings of the EIA and produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Fish and Shellfish Ecology Study Area	The Fish and Shellfish Ecology Study Area for the Projects is defined as ICES Rectangles 36E9; 36F0; 37E9; 37F0; 37F1; 37F2; 38F0; 38F1; and 38F2. It covers a total of 26,858km2, and includes the Offshore Development Area with a minimum buffer distance of 7km.
Habitats Regulations	Conservation of Habitats and Species Regulations 2017 and Conservation of Offshore Marine Habitats and Species Regulations 2017.
Habitats Regulations Assessment (HRA)	The process that determines whether or not a plan or project may have an adverse effect on the integrity of a European Site or European Offshore Marine Site.
Impact	Used to describe a change resulting from an activity via the Projects, i.e. increased suspended sediments / increased noise.

Term	Definition
Management Unit	Management units provide an indication of the spatial scales at which impacts of plans and projects alone, cumulatively and in-combination, need to be assessed for the key cetacean species in UK waters, with consistency across the UK.
Offshore Development Area	The Offshore Development Area for ES encompasses both the DBS East and West Array Areas, the Inter-Platform Cable Corridor, the Offshore Export Cable Corridor, plus the associated Construction Buffer Zones.
Offshore Export Cable Corridor	This is the area which will contain the offshore export cables between the Offshore Converter Platforms and Transition Joint Bays at the landfall.
Offshore Export Cables	The cables which would bring electricity from the offshore platforms to the Transition Joint Bays (TJBs).
Project Change Request 1	The changes to the DCO application for the Projects set out in **Project Change Request 1 - Offshore & Intertidal Works** [AS-141] which was accepted into Examination on 21st January 2025.
Projects Design (or Rochdale) Envelope	A concept that ensures the EIA is based on assessing the realistic worst-case scenario where flexibility or a range of options is sought as part of the consent application.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of Receptors include species (or groups) of animals, plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc.
Sand	Sediment particles, mainly of quartz with a diameter of between 0.063mm and 2mm. Sand is generally classified as fine, medium or coarse.
Sand wave	Bedforms with wavelengths of 10 to 100m, with amplitudes of 1 to 10m.
Scour protection	Protective materials to avoid sediment erosion from the base of the wind turbine foundations and offshore substation platform foundations due to water flow.
Special Area of Conservation (SAC)	Strictly protected sites designated pursuant to Article 3 of the Habitats Directive (via the Habitats Regulations) for habitats listed on Annex I and species listed on Annex II of the Directive
Suspended sediment	The sediment moving in suspension in a fluid kept up by the upward components of the turbulent currents or by the colloidal suspension.

Term	Definition
The Applicants	The Applicants for the Projects are RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited. The Applicants are themselves jointly owned by the RWE Group of companies (51% stake) and Masdar (49% stake).
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South Offshore Wind Farms).

Acronyms

Acronym	Definition
AEoI	Adverse Effect On Integrity
DBS	Dogger Bank South
EIA	Environmental Impact Assessment
EMF	Electromagnetic field
HRA	Habitat Regulations Assessment
JNCC	Joint Nature Conservation Committee
LWT	Lincolnshire Wildlife Trust
MU	Management Unit
RIAA	Report to Inform Appropriate Assessment
SAC	Special Area of Conservation
SSC	Suspended Sediment Concentration

1 Introduction

1. Throughout the pre-examination and examination stages of the Dogger Bank South Offshore Wind Farms ('the Projects'), RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited (hereafter referred to as 'the Applicants') have received comments (see section 1.2) on the topic of indirect effects on receptors (birds and marine mammals) via effects upon prey species (fish and shellfish. and benthos) from stakeholders. Following submission of the application, comments have been made by stakeholders regarding the adequacy of this element of the assessments.
2. The Applicants consider that a robust assessment of these indirect effects has been undertaken both for Environmental Impact Assessment (EIA) and Habitats Regulations Assessment (HRA) considerations and that these assessments have been completed in line with common industry working practices.
3. In line with common industry working practices **Chapter 10 Fish and Shellfish** [APP-091] assessed the potential impacts of the Projects upon fish and shellfish during the construction, operation and maintenance and decommissioning, whilst **Chapter 9 Benthic and Intertidal Ecology** [APP-085] assessed the potential impacts of the Projects upon the benthos. The impact conclusions from these chapters were then cross-referenced in the relevant assessments for ornithology (**Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] and **Report to Inform Appropriate Assessment (RIAA) HRA Part 4 of 4 – Marine Ornithological Features (Revision 5)** [document reference: 6.1]**)** and marine mammals **Chapter 11 Marine Mammals** [APP-095] and **RIAA HRA Part 3 of 4 – Annex II Marine Mammals (Revision 3)** [REP5-009] in the context of the supporting role of benthic habitats and fish and shellfish as prey. The Applicants therefore consider that the assessment is in line with best practice for offshore wind assessments.
4. In addition, **RIAA HRA - Appendix B – Sandeel Habitat Potential in the Dogger Bank Special Area of Conservation (SAC) and Southern North Sea SAC** [APP-050] presents the potential sandeel spawning habitat in the Southern North Sea in relation to the Southern North Sea SAC and the Dogger Bank SAC. This information is used in:
    - The **RIAA HRA Part 2 of 4 - Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014] to understand prey species populations supported by the Dogger Bank SAC; and
    - **RIAA HRA Part 3 of 4 – Annex II Marine Mammals (Revision 3)** [REP5-009] in relation to prey effects on harbour porpoise.

5. This document presents all information previously submitted by the Applicants regarding effects on prey species from the Environmental Statement and the RIAA, in addition to the Applicants' responses to comments received from stakeholders during the pre-examination / examination stages of the Projects. This report has been produced to provide a single source of information on the topic of effects on prey species for stakeholders / the Examining Authority to refer to, noting that information in the application originally appeared in many separate documents.
6. This document therefore sets out:
    - The key receptor species and their prey
    - A summary of the impact assessment conclusions relevant to prey (i.e. from **Chapter 10 Fish and Shellfish** [APP-091] and **Chapter 9 Benthic and Intertidal Ecology** [APP-085]
    - The EIA conclusions for birds and mammals (summarised from **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] and **Chapter 11 Marine Mammals** [APP-095]
    - The Round 4 Plan Level HRA conclusions relevant to prey
    - The HRA conclusions for birds and mammals (summarised from **RIAA HRA Part 4 of 4 – Marine Ornithological Features (Revision 4)** [document reference: 6.1]) and **RIAA HRA Part 3 of 4 – Annex II Marine Mammals (Revision 3)** [REP5-009], including consideration of the Plan level HRA.
7. The Applicants met with Natural England on 7th May 2025 to discuss this document and to determine if any further information could be included. Natural England requested mapping of seabird ranges and sandeel and herring spawning potential and therefore this has been included (see section 3.2.3 and sections 7.1 and 7.2). In addition, **Table 2-1** has been updated to include Natural England's Deadline 5 comments and the Applicants' responses.
8. Natural England maintain that the assessment is simplistic for both seabirds and marine mammals however, the Applicants maintain that:
    - Where individuals (predators) are subject to displacement effects, the mortality from this is assumed to result from a reduction in access to prey. So, in this case, consideration of any indirect effects via effects on prey is double counting to some degree (e.g. the predators are already displaced from the Array Areas so effects on prey within these locations have no additional effect).
    - Where predators are not displaced, there are two considerations. 1) The area which can no longer be used for foraging which is confined to the immediate footprint of the infrastructure (or disturbance footprint if following Natural England position) within the Array Areas (and within the Export Cable Corridor small sections of cable protection) which is permanently lost. 2) The direct effects on the prey themselves (disturbance, noise impacts etc).
    - Therefore, the assessment has covered all the potential pathways for impacts. These were assessed in line with standard practice in the Application, with the steps set out in this document.

9. The Applicants reiterate that a robust assessment has been undertaken both for EIA and HRA considerations and mitigation (in the form of reduced seabed footprint, via the exclusion of gravity base foundations and suction bucket jacket foundations, reduction in number of Offshore platforms and bundling of Offshore Export Cables and commitments to minimise the use of cable and scour protection and to minimise seabed disturbance through activities such as sand wave levelling) has been applied.

2 Stakeholder Responses on Prey Species

10. A complete list of stakeholder comments received post-submission on the assessment of effects upon prey, the Applicants' responses to each comment and where each comment is covered in this document is provided in **Table 2-1** below.

Table 2-1 Stakeholder comments received post-submission on the assessment of effects upon prey

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
RR-028: 3 (LWT)	Lincolnshire Wildlife Trust (LWT) disagree with the scoping out of direct damage and impacts to fish and shellfish, the limited consideration of potential cumulative impacts and the exclusion of appropriate consideration for disturbance from other noise sources and noise during operational/maintenance phases. The Dogger Bank is the largest sandbank in UK waters and a crucial ecosystem for the lesser sandeel, which serves as an essential prey source for various seabird and marine mammal species. Significant declines in sandeel populations have been shown to negatively impact these species, prompting concerns from the Joint Nature Conservation Committee (JNCC) about the health and status of the Dogger Bank Special Area of Conservation (SAC). The JNCC has stated that a full recovery of this ecosystem would be impossible if hindered by additional pressures. Currently, the Dogger Bank sandeel stock is in poor condition, which led to the recent closure of commercial sandeel fisheries. Although fishing has been a primary focus, management and regulatory bodies have also identified wind turbine development as a negative factor affecting the sandeel population in the area. Given the vulnerability and importance of the Dogger Bank sandeel stock, the LWT urges that appropriate management strategies be implemented before irreversible damage occurs. LWT strongly disagrees with the applicant's decision to lower the appraised sensitivity to habitat disturbance, arguing that this is based on inaccurate recovery times for sandeel. With the majority of the DBS West array located within areas of high spawning potential for sandeel, LWT advises that both the direct and cumulative impacts of this development on this ecologically and economically important fish species be carefully considered. Ongoing measures aimed at improving population health and resilience for sandeel should also be taken into account in any decisions, and LWT expects that all perceived and anticipated impacts to the Dogger Bank sandeel population will be meticulously evaluated within the mitigation hierarchy, with proper due diligence given at each level.	Direct damage and impacts to fish and shellfish has not been scoped out of the assessment and impacts to fish and shellfish are considered within the **Report to Inform Appropriate Assessment (RIAA) Habitats Regulations Assessment Part 2 of 4 (Revision 4)** [REP4-014]. • Damage and impacts to fish and shellfish is assessed in sections 6.4.2.1.1 (for Project Alone, which covers DBS East and DBS West together) and 6.4.2.1.2 (in-combination with other projects). • Impacts upon fish and shellfish are included within the above sections in terms of damage, and also included for consideration with regard to changes in suspended sediments (sections 6.4.2.2.1 (project alone) and 6.4.2.1.2 (in-combination)); electromagnetic field (EMF) changes (sections 6.4.2.3.1 (project alone) and 6.4.2.3.2 (in-combination)); Hydrocarbon etc contamination (section 6.4.2.4.1 (project alone)); and physical change (sections 6.4.2.6.1 (project alone) and 6.4.2.5.2 (in-combination). These sections refer to assessments undertaken upon fish and shellfish within the **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and **Chapter 10 Fish and Shellfish Ecology** [APP-091] which place impacts in the wider context of the southern North Sea and refer to **RIAA Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] which presents figures of the areas of modelled suitability for the presence of sandeel within the context of the Dogger Bank SAC boundary. Direct impacts on potential sandeel habitat within the Dogger Bank SAC will occur during all phases of the Projects' lifetimes, however the potential area of habitat affected within the site is a small fraction of that available (as shown in the figures within **RIAA Appendix B - Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050]). The habitat within the Dogger Bank SAC is not unique in its potential to support sandeel, with areas of similar potential surrounding the site and present across the Southern North Sea. In addition, the presence of sandeel is not relevant to the boundaries of the SAC which was designated on the basis of bathymetry and benthic communities. With regard to recovery times of the sandbank habitat, this is evidenced in section 6.4.2.1.1 of the **RIAA Habitats Regulations Assessment Part 2 of 4 (Revision 4)** [REP4-014] which includes a review of historic evidence from the offshore wind industry and Cefas studies as well as site specific information from within the Dogger Bank SAC (**Appendix 8-2 Met Mast Survey Analysis** [APP-083]). In addition, the Applicants intend to provide further evidence of habitat recovery (again from within the Dogger Bank SAC) at Deadline 1. The Applicants reiterate that a robust assessment has been undertaken both for Environmental Impact Assessment (EIA) and Habitats Regulation Assessment (HRA) considerations and mitigation (in the form of reduced seabed footprint, via the exclusion of gravity base foundations and suction bucket jacket foundations) has been applied.	Section 4.2 – Fish and Shellfish Section 7.2 - Annex I Offshore Habitats and Annex II Migratory Fish

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
RR-030: 5.5.22 (MMO)	5.5.22 In addition to this, sandeel spawn in the areas that they inhabit, and therefore loss and disturbance to their habitat arising from construction activities has the potential to cause significant impacts to sandeel at a population level. Consideration should also be given to the fact that sandeel represent a key prey source for many animals at various trophic levels (including birds, marine mammals and other fish), and that localised reductions in prey abundance due to decreased sandeel (and herring) populations in the vicinity of the DBS OWF sites during the construction programme will have potentially far-reaching effects.	The Applicants acknowledge this comment changes to prey resource, including sandeel, has been considered in **Chapter 11 Marine Mammals** [APP-095], **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] and **Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050].	Section 5 – Impacts upon Predators
RR-039: NE12 (NE)	Natural England disagrees that impacts on mobile designated site interest features (i.e. seabirds from FFC SPA and harbour porpoise in SNS SAC) can be ruled out based solely on no significant impacts being concluded at a regional population level in the EIA assessment for forage fish species. The RIAA assessment has also only considered direct construction impacts on prey availability rather than the operational impacts of spawning habitat loss. Assessments on herring and sandeel should be considered at a biologically relevant population level and should include loss and/or change of spawning habitat throughout the lifetime of the project. The implications on prey abundance and distribution within the foraging areas of Annex I and Annex II species from designated sites should be assessed.	Indirect effects to predators such as marine mammals due to changes to prey have been assessed in sections 11.6.1.7 and 11.6.2.6 of **Chapter 11 Marine Mammals** [APP-095]. Due to the wide foraging ranges of marine mammals the significance was assessed as negligible or minor adverse, therefore Not Significant in EIA terms. Impacts upon prey are considered in the Plan Level HRA (RIAA Appendix I Marine Mammal Array Assessment Part 2; The Crown Estate, 2022c) under the following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. The HRA concludes that: The effect of this habitat loss will be to reduce the area available for foraging and also the extent of habitat for species which form prey. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging habitat available. Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact. Damage to physical habitats could affect prey species, or benthic communities upon which these are dependent. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging habitat available. Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact. The Habitats Assessment (RIAA Appendix J – Annex I Habitats Assessment; The Crown Estate, 2022d) notes that indirect physical damage cannot be quantified at present but some effects are expected. Based on evidence presented in Appendix J which suggests that such effects will be relatively localised and generally accounted for within areas attributed to habitat loss it is considered that the scale of effects will not be significant in the context of possible impacts upon supporting habitats for marine mammals. Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact. Although the overall effect of habitat loss will be to reduce the area available for foraging and the extent of habitat for prey species, habitat loss effects will be negligible given the small proportion of habitat occupied by the structures compared to the large foraging ranges of the	Section 6 - Plan Level Habitats Regulations Assessment Section 7 - Report to Inform Appropriate Assessment

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
		protected features, as indicated by the distances used in relation to screening. Similarly, although offshore wind structures may provide new foraging opportunities for some species (e.g. Clausen *et al*, 2021; Russell *et al*, 2014) habitat gain effects are expected to be negligible in the context foraging ranges. Impacts upon prey are also considered in the Plan Level HRA (RIAA Appendix H – Ornithology Array Assessment Part 2; The Crown Estate, 2022b) under the following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. In all cases the HRA concludes that: *"All seabird species screened in forage widely within the marine environment and the predicted area of habitat damaged represents a very small proportion of the foraging habitat available. Any impact is, therefore, considered to be negligible and would not make an appreciable difference to any in-combination impact."* The Applicants consider there to be good evidence that seabird populations will be very little affected by any impacts on their prey, even during construction which is the period when there is the most risk of effects on prey species (and for which consideration was made in the assessment). For example, the impact of seabirds on their prey stock biomass is very small (estimated across five ecosystems to average about 1% of the primary forage fish being consumed by all seabird species (Saraux *et al.* 2020)). Furthermore, forage fish stock biomass varies enormously from year to year while seabird population sizes change much more slowly. Thus, two things are apparent from this: fish stock fluctuations are not caused by seabird population fluctuations and seabird populations are little affected by the inter-annual variations in their prey. Population fluctuations are typical of forage fish species because their survival is very low while recruitment varies very widely from year to year. These factors taken together therefore indicate that small changes in prey stock biomass, as assessed in the Fish and Shellfish assessment (**Chapter 10 - Fish and Shellfish Ecology** [APP-091]), will have undetectable effects on the seabird populations which prey on those stocks, and even if prey stocks are affected more widely than currently assessed, this would still not result in seabird population impacts.	
RR-039: C20 (NE)	Natural England disagrees with "Habitats or species that provide prey items for other species of conservation value" being considered of low value in the assessment. We note that large areas within the red line boundary act as spawning/nursery grounds for sandeel and herring, both of which are an important prey resource for Annex I bird species and Annex II marine mammal features of designated sites. See Appendix E for further comments on indirect effects.	The supporting role of benthic habitats for other features is considered within both the ornithology assessment (**Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] and **RIAA HRA Part 4 of 4 (Revision 4)** [document reference: 6.1]) and marine mammal assessment (**Chapter 11 Marine Mammals** [APP -095] and **RIAA HRA Part 3 of 4 (Revision 3)** [REP5-009]). The impacts are assessed within **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and then cross-referenced in the relevant assessments for all phases of the Projects (construction, operation and decommissioning). The Applicants consider that the assessment is line with best practice for offshore wind assessments. The Applicants note that Natural England have not referenced **RIAA Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] in their review. This document presents an overview of sandeel habitats across the two SACs (based upon modelling of the potential for habitat to be suitable for sandeel) considering impact	Section 6 - Plan Level Habitats Regulations Assessment Section 7 - Report to Inform Appropriate Assessment

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
		footprints of the Projects in the context of the SACs and also the wider Southern North Sea across which ornithological and marine mammal features forage. Updated sandeel heat mapping using the Reach *et al.* (2024) methodology is presented within the **Heat Mapping Report** [AS-105] to be submitted in late November 2024. This is overlaid with impacts ranges for "fish with a swim bladder not used in hearing", to provide further context around the sandeel potential within the region. It should be noted however that this updated sandeel heat mapping does not materially change the original mapping presented in **Chapter 10 Fish and Shellfish Ecology** [APP-091] or that used to inform the **RIAA Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] report. The presence of sandeel (or any other prey species) is not relevant to the boundary of the Dogger Bank SAC which was designated on the basis of bathymetry and benthic (invertebrate) communities (JNCC, 201126. Sandeel in particular were highlighted by the Applicants in the **RIAA Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] noting that in the SACO (JNCC, 2022). Sandeel are not named as 'key and influential species of the [sandbank] feature, although they are discussed in relation to 'Characteristic Communities' in the Supplementary Advice on Conservation Objectives (SACO) for Dogger Bank (JNCC, 2022)), sandeel are described as being more resident than other species and that mapping of potential herring spawning habitat shows the Dogger Bank SAC as being of limited suitability (see Figure 2-1 of **Heat Mapping Report** [AS-105]. Impacts upon prey for ornithology receptors are considered in the Plan Level HRA (RIAA Appendix H – Ornithology Array Assessment Part 2, The Crown Estate, 2022b) under the following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. In all cases the HRA concludes that "*All seabird species screened in forage widely within the marine environment and the predicted area of habitat damaged represents a very small proportion of the foraging habitat available. Any impact is, therefore, considered to be negligible and would not make an appreciable difference to any in-combination impact.*" Impacts upon prey for marine mammal receptors are considered in the Plan Level HRA (RIAA Appendix I Marine Mammal Array Assessment Part 2, The Crown Estate, 2022c) under the following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. The HRA concludes that (Applicants emphasis): *The effect of this habitat loss will be to reduce the area available for foraging and also the extent of habitat for species which form prey. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging habitat available.* ***Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.*** *Damage to physical habitats could affect prey species, or benthic communities upon which these are dependent. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging*	

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		habitat available. ***Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.*** *The Habitats Assessment (Appendix J) notes that indirect physical damage cannot be quantified at present but some effects are expected. Based on evidence presented in Appendix J which suggests that such effects will be relatively localised and generally accounted for within areas attributed to habitat loss it is considered that the scale of effects will not be significant in the context of possible impacts upon supporting habitats for marine mammals.* ***Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.*** Although the overall effect of habitat loss will be to reduce the area available for foraging and the extent of habitat for prey species, habitat loss effects will be negligible given the small proportion of habitat occupied by the structures compared to the large foraging ranges of the protected features, as indicated by the distances used in relation to screening. Similarly, although offshore wind structures may provide new foraging opportunities for some species (e.g. Clausen *et al.*, 20212; Russel *et al.*, 20142) habitat gain effects are expected to be negligible in the context foraging ranges.	
RR-039: E 3 (NE)	Spawning Habitat Loss for sandeel The full scale of potential spawning habitat loss and/or change for sandeel has not been assessed. A significant proportion (34.85%) of high potential sandeel spawning habitat within Dogger Bank SAC has been calculated to be within offshore wind farm (OWF) array areas in the in-combination assessment. Our understanding is that this does not include areas of the Export Cable Corridors (ECC) overlapping with the SAC, which also include additional high potential spawning habitat that could be subject to habitat loss/change through the introduction of cable protection. Impacts from UXO clearance have not been assessed. Whilst we agree that surveys to identify the locations and number of UXOs would not be conducted until post-consent, we consider that a nominal assessment should be included as has been done for other receptors, e.g. marine mammals and benthic. The Applicant has also not considered the likely cumulation of benthic 'ecological halo effect' which can be expected following the placement of structures on the seabed. This halo effect can lead to changes in benthic and epifaunal community composition, which could have implications for sandeel spawning habitat. We are particularly concerned that secondary 'ecological halo' effects will be combined and exacerbated in the array areas as a result of the network of potential parallel and perpendicular lengths of cable protection, which	Whilst it is acknowledged that 34.85% of high potential sandeel habitat within the Dogger Bank Special Area of Conservation (SAC) has been indicated to fall within offshore wind farm array areas (not limited to those associated with the Projects), it must be acknowledged that the present of these array areas is not equitable to a potential loss in habitat (**Appendix B - Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050]). Rather, the potential loss / change of sandeel potential habitat should be determined based only on values provided within the assessment of Permanent Loss of Habitat and / or Change in Habitat Type as a Result of Changes in Substrate Composition, presented in section 10.6.2.6. of the ES (**Chapter 10 Fish and Shellfish Ecology** [APP-091]). A worst case scenario associated with the development of the Projects determines a loss of habitat of 4.19km2, across the Offshore Development Area, comprising both the Array Areas (2.05km2) and the Offshore Export Cable Corridor (2.14km2). Assuming a worst case scenario in which all permanent habitat loss associated with the development falls within areas of high potential sandeel habitat, this will result in a loss of 0.0008% of the high sandeel potential habitat within the Dogger Bank SAC (5049.7km2). It should be noted that revised sandeel potential habitat will be presented within the **Heat Mapping Report** [AS-105] based on the MMO-approved Reach *et al.* (2024)33 methodology. This report will be submitted in late November 2024. A nominal assessment of Unexploded Ordnance (UXO) clearance impacts is included within the assessment of underwater noise impacts within section 10.6.1.4., with specific impact ranges relating to UXO presented in Table 10-23 of **Chapter 10 Fish and Shellfish Ecology** [APP-091]. Discussions regarding the "ecological halo effect" were not raised during previous rounds of comments, or at expert technical group meetings undertaken prior to Development Consent Order (DCO) submission. Potential impacts as a result of the developments as determined in	Section 7.1 - Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC Section 7.2 - Annex I Offshore Habitats and Annex II Migratory Fish

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	could result in broadscale changes in the benthic habitats and communities across the wider DCO area and a significant proportion of Dogger Bank SAC. It is unclear how impacts on high potential spawning habitat due to cable protection have been assessed (for sandeel and Atlantic herring). Cable protection requirements are currently based on high percentage estimates and could all potentially be placed within high potential spawning habitat. Natural England advises that a robust assessment is needed of the potential worst-case area of impact on spawning habitat along the ECC and within Dogger Bank SAC sandbank feature. This should include the nature and scale of impact as a result of changes to physical and biological processes following the placement of structures and cable/scour protection on the seabed, and implications at a localised population level.	collaboration with stakeholders and regulators are presented within the ES. See the Applicants' response to RR-039: C6 in **Table 2.4.1** for further details on this matter. Worst case scenarios have been used to determine the potential impact to potential habitat and spawning grounds of sandeel and herring respectively. This includes the use of the highest potential use of cable protection, as described within section 10.6.2.6. of **Chapter 10 Fish and Shellfish Ecology** [APP-091]. Additionally, the Applicants are in the process of preparing a change request relating to the relevant design parameters. The Examining Authority (ExA) was notified of the Applicants' intention to make this change request on the 8th October 2024 (**Change Notification Letter** [PDA-012]). It is expected that the change request will be submitted to the ExA in early January 2025 following targeted consultation. The change request relates to the removal of an intertidal Horizontal Directional Drill (HDD) exit from the Projects' Design Envelope, the removal of all platforms from the Offshore Export Cable Corridor, reductions in the number of platforms in the Array Areas and overall reductions in cable lengths within the Array Areas. The change request will be supported by the **Request for Design Change – Environmental Assessment Update** [document reference C1.1] which will describe any resultant changes to the assessment conclusions presented in the ES, thus informing a consultation with relevant stakeholders (as agreed by the ExA) as part of the change request process. All the changes are expected to be positive i.e. reducing or removing impacts. These factors, if the change request is accepted, may result in changes to the values discussed above. It should be noted that the Applicants' proposed changes to the Projects' Design Envelope, if accepted by the ExA, would reduce the footprint of habitat loss within the Offshore Development Area to approximately 3.78km² (1.7km² within the Array Areas and 2.08km² within the Offshore Export Cable Corridor). The changes will be summarised in the **Project Change Request 1 – Environmental Assessment Update** [document reference C1.1] which will be submitted with the change request in early January 2025.	
RR-039: E 4 (NE)	Indirect effects and impacts on relevant sub-populations For EIA and the RIAA, the Applicant suggests that if there were no significant impacts identified for potential prey species in their respective assessments then there would be no significant impacts on ornithology and marine mammal receptors. Natural England disagree with this. The assessments undertaken in the Fish and Shellfish chapter consider impacts at a regional population level and only consider fish and shellfish as receptors, rather than potential sources of impact. NE consider that an understanding of the relative importance of the site as a foraging area, and potential for any impacts on prey abundance and distribution, is critical in framing the predicted impacts that can be quantified. Further assessment is therefore needed to understand how more localised impacts on fish and shellfish might influence prey availability for seabirds and mammals. We suggest that any negative	Indirect effects to predators such as marine mammals due to changes to prey have been assessed in sections 11.6.1.7 and 11.6.2.6 of **Chapter 11 Marine Mammals** [APP-095]. Due to the wide foraging ranges of marine mammals the significance was assessed as negligible or minor adverse, therefore Not Significant in EIA terms. Impacts upon prey are considered in the Plan Level Habitat Regulations Assessment (HRA) (RIAA Appendix I Marine Mammal Array Assessment Part 2; The Crown Estate, 2022c) under the following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. The HRA concludes that: The effect of this habitat loss will be to reduce the area available for foraging and also the extent of habitat for species which form prey. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging habitat available. Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.	Section 6 - Plan Level Habitats Regulations Assessment Section 7 - Report to Inform Appropriate Assessment

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	impact on forage fish may have an impact on vulnerable seabirds – particularly kittiwake. These pathways should be considered in more detail and conclusions evidenced. Please see Annex E1 for further detail. Given the potential for indirect effects on designated predator features from impacts on forage fish prey species, Natural England advises that assessment of potential impacts on sub-populations of key fish species is necessary, e.g. potential localised depletion and/or reduced resilience of the wider stock. Natural England advises that the assessments should consider both direct and indirect impact pathways to sandeel and herring at a biologically relevant population scale, for both the construction and operation phases of the Projects. For herring this would be the Banks spawning component of the North Sea stock, and for sandeel the specific genetic population present in the Project area.	Damage to physical habitats could affect prey species, or benthic communities upon which these are dependent. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging habitat available. Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact. The Habitats Assessment (RIAA Appendix J – Annex I Habitats Assessment; The Crown Estate, 2022d) notes that indirect physical damage cannot be quantified at present, but some effects are expected. Based on evidence presented in Appendix J which suggests that such effects will be relatively localised and generally accounted for within areas attributed to habitat loss it is considered that the scale of effects will not be significant in the context of possible impacts upon supporting habitats for marine mammals. Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact. Although the overall effect of habitat loss will be to reduce the area available for foraging and the extent of habitat for prey species, habitat loss effects will be negligible given the small proportion of habitat occupied by the structures compared to the large foraging ranges of the protected features, as indicated by the distances used in relation to screening. Similarly, although offshore wind structures may provide new foraging opportunities for some species (e.g. Clausen *et al*, 2021; Russel *et al*, 2014) habitat gain effects are expected to be negligible in the context foraging ranges. Impacts upon prey are also considered in the Plan Level HRA (RIAA Appendix H – Ornithology Array Assessment Part 2; The Crown Estate, 2022b) under the following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. In all cases the HRA concludes that: *"All seabird species screened in forage widely within the marine environment and the predicted area of habitat damaged represents a very small proportion of the foraging habitat available.* *Any impact is, therefore, considered to be negligible and would not make an appreciable difference to any in-combination impact."* The Applicants consider there to be good evidence that seabird populations will be very little affected by any impacts on their prey, even during construction which is the period when there is the most risk of effects on prey species (and for which consideration was made in the assessment). For example, the impact of seabirds on their prey stock biomass is very small (estimated across five ecosystems to average about 1% of the primary forage fish being consumed by all seabird species (Saraux *et al.* 2020)). Furthermore, forage fish stock biomass varies enormously from year to year while seabird population sizes change much more slowly. Thus, two things are apparent from this: fish stock fluctuations are not caused by seabird population fluctuations and seabird populations are little affected by the inter-annual variations in their prey. Population fluctuations are typical of forage fish species because their survival is very low while recruitment varies very widely from year to year. These factors taken together therefore indicate that small changes in prey stock biomass, as assessed in the Fish and Shellfish assessment (**Chapter 10 Fish and Shellfish Ecology** [APP-091]), will have	

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		undetectable effects on the seabird populations which prey on those stocks, and even if prey stocks are affected more widely than currently assessed, this would still not result in seabird population impacts.	
RR-039: E 17 (NE)	Given the potential for indirect effects on designated predator features from impacts on forage fish prey species, Natural England advises that assessment of potential impacts on sub-populations of key fish species is necessary, e.g. potential localised depletion and/or reduced resilience of the wider stock. We advise that impacts on herring should be considered against the context of the Banks spawning component of the North Sea stock. We advise that sandeel should be considered against the context of the specific genetic population of sandeel present in the Project area. Natural England advises that assessments should consider the impact pathways at a biologically relevant population scale e.g., Banks herring population, sandeel genetic population. Further advice regarding the assessment of indirect effects can be found in Annex E1.	The assessment of potential effects upon Atlantic herring has been undertaken for the Banks spawning population specifically, however noting that the Banks spawning population contributes to the wider NSAS stock dynamics. This assessment will be further investigated within the Atlantic herring section of the **Heat Mapping Report** [AS-105], to be submitted in late November 2024. Potential effects on sandeel are considered in the context of the Dogger Bank SAC, which is expected to retain a level of genetic homogeneity. The application of the Reach *et al.* (2024) heat mapping methodology will introduce the additional Wright *et al.* (2019) defined areas of genetic similarity within the sandeel section of the **Heat Mapping Report** [AS-105].	Section 7.1 - Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC
RR-039: E 29 (NE)	Natural England notes that the Applicant has stated that mitigation is not applicable for impacts to fish species, as all impacts have been assessed as either negligible or minor adverse. However, Natural England do not agree with these conclusions at present (see E33). We also do not agree that mitigation is not applicable owing to the risks of indirect effects on designated predator species through impacts on fish prey species. We consider mitigation options are available to the Applicant, as detailed in the rows below. Further consideration of appropriate mitigation methods should be undertaken.	The Applicants acknowledge this comment, please see the Applicants responses to RR-039: E 5, RR-039: E6 and RR-039: E33 for further details. For indirect effects to marine mammals due to changes of prey, please see comment (RR-039: E 4). The Applicants acknowledge the requirement for effective and appropriate mitigation measures to minimise the risk to fish, however mitigation measures described in the Marine Mammal Mitigation Protocol (MMMP) (**Outline MMMP (Revision 4)** [REP4-054]) are also likely to mitigate effects of underwater noise to fish species as well, therefore reducing the indirect effects to marine mammals.	Section 5.1 – Marine Mammals
RR-039: E 38 (NE)	In the RIAA, the Applicant suggests that if there were no significant impacts identified for potential fish prey species in the EIA assessment then there would be no significant impacts on ornithology and marine mammal receptors. Natural England disagree with this. The assessments undertaken for EIA in the Fish and Shellfish chapter consider impacts at a regional population level and only consider fish and shellfish as receptors, rather than potential sources of impact. NE consider that an understanding of the relative importance of the Project site as a foraging area, and potential for any impacts on prey abundance and distribution is critical in framing the predicted impacts that can be quantified. Further assessment is therefore needed to understand how more localised impacts on fish and shellfish might	Please see the Applicants response to RR-039: E4 above.	Section 6 - Plan Level Habitats Regulations Assessment Section 7 - Report to Inform Appropriate Assessment

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	influence prey availability for seabirds and mammals. We suggest that any negative impact on forage fish may have an impact on vulnerable seabirds – particularly kittiwake. These pathways should be considered in more detail and conclusions evidenced. Please see Annex E1 for further detail. Given the potential for indirect effects on designated predator features from impacts on forage fish prey species, Natural England advise that assessment of potential impacts on sub-populations of key fish species is necessary, e.g. potential localised depletion and/or reduced resilience of the wider stock. Natural England advise that the assessments should consider both direct and indirect impact pathways to sandeel and herring at a biologically relevant population scale, for both the construction and operation phases of the Projects. For herring this would be the Banks spawning component of the North Sea stock, and for sandeel the specific genetic population present in the Project area.		
RR-039: Annex E1.1 (NE)	Annex E1: Natural England's Advice on the assessment of indirect effects. 1. Natural England welcomes that the Applicant has made efforts to address advice provided during the Evidence Plan Process to include an assessment of impacts on mobile designated features resulting from impacts to prey fish species, and that consideration has also been given to sandeel as a component of the Dogger Bank SAC [APP-050]. However, we consider that the current assessment is insufficient to advise that impacts on Annex I ornithology receptors at FFC SPA and Annex II harbour porpoise in SNS SAC, in relation to conservation objectives for the distribution, abundance and availability of key food and prey items to be restored (FFC SPA) or maintained (SNS SAC) can be excluded. We are also unable to advise that impacts on the characteristic community and ecological function which are key attributes of Dogger Bank SAC through impacts to sandeel can be excluded. **Therefore, we believe that the conservation objects for FCC SPA, SNS SAC and Dogger Bank SAC are likely to be hindered in relation to changes to ecological communities and impacts to prey availability.**	Please see the Applicants responses regarding potential effects on prey species in RR-039: E3 and RR-039: E4 above.	Section 6 - Plan Level Habitats Regulations Assessment Section 7 - Report to Inform Appropriate Assessment
RR-039: Annex E1.2 (NE)	2. The Applicant's assessment concludes that if no significant impacts are identified on fish and benthic receptors in their respective assessments, then there will be no significant impacts on ornithology and marine mammal receptors both in terms of EIA and the RIAA. Natural England disagrees with this assumption. The assessments undertaken in	Please see the Applicants responses regarding potential effects on prey species in RR-039: E3 and RR-039: E4 above.	Section 6 - Plan Level Habitats Regulations Assessment Section 7 - Report to Inform Appropriate Assessment

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	the Fish and Shellfish chapter consider impacts at a regional population level and only consider fish and shellfish as receptors, rather than potential sources of impact. Indirect effects of impacts on habitat and prey on birds and mammals may occur at different thresholds than for the receptors themselves. It is Natural England's view that while there may be no significant impacts on wider stocks of forage fish, this does not mean there may not be redistributions or local declines that could impact specific seabirds or mammals at certain times of the year, especially in areas known to be 'hot spots' for particular fish species. For example, we highlight that sandeel have high site fidelity and specific sediment constraints for spawning, and DBS is likely to impact on specific sub-populations of both sandeel and herring. The RIAA has also only considered direct impacts on fish during the construction period in terms of impacts to prey availability for birds and mammals. Consideration has not been given to the implications of permanent loss of spawning habitat on local forage fish population levels and what this could mean for prey availability.		
RR-039: Annex E1.3 (NE)	3. We highlight that should the project be consented that an estimated 30.45% of high potential spawning habitat in Dogger Bank SAC would be within offshore wind farm (OWF) array areas, with 11.71 km2 of predicted direct habitat loss. The Dogger Bank South (DBS) projects contribute 2.25 km2 of this loss (by the Applicant's assessment) and have not committed to removal of cable/scour protection at end of life so there will beno ability for populations to recover. Also, the estimated loss does not reflect the potential for indirect loss or deterioration of spawning habitat in the near vicinity. Broadscale habitat change could occur as introduced hard substrate is colonised, changing the community composition of the surrounding area (ecological halo effects). This is likely to be further exasperated by the presence of structures in the marine environment which will also affect sediment transport and water column movement with the potential for seascape scale changes in stratification mixing zones, particularly as there are now four OWFs along the Flamborough front and six on Dogger Bank. There is also no consideration of the 'reef effect' created by the presence of the wind turbines and the potential increase in more pelagic species which also forage on sandeels. Further assessment is needed to understand how all of these factors will affect sandeel populations in this area, and how those changes might influence prey availability for seabirds and mammals foraging in the area.	Please see the Applicants responses regarding potential effects on prey species in RR-039: E3 and RR-039: E4 above.	Section 6 - Plan Level Habitats Regulations Assessment Section 7 - Report to Inform Appropriate Assessment
RR-039: Annex E1.4	4. Natural England advises that APP-050 (6.1.2 Appendix B - Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC) is expanded to include FFC SPA receptors. Direct and indirect impact pathways from relevant thematic areas (Benthic, Marine	Please see the Applicants responses regarding potential effects on prey species in RR-039: E3 and RR-039: E4 above.	Section 6 - Plan Level Habitats Regulations Assessment

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(NE)	Physical Environment, Fish and Shellfish) on localised forage fish abundance and distribution in and around the project area should be included and discussed in relation to the implications for key seabird and marine mammal species. We advise the following aspects should be considered: • Evidence to determine the relative importance of the project area as a foraging area at different times of year, e.g. foraging ranges of FFC SPA species and overlap with the project area at different times of year. • Impact assessments focussed on the specific subpopulations of sandeel (and herring) found in the project area. • Broadscale habitat change as a result of ecological halo effects and implications for spawning habitat. • Implications of marine processes and changes to sediment transport, stratification, and frontal systems • Changes to the ecosystem functionality of the sandbank and the food web it supports.		Section 7 - Report to Inform Appropriate Assessment
RR-039: Annex E1.5 (NE)	5. We acknowledge that it will not be possible for a single project to address all of the evidence gaps in this area. However, whilst uncertainty around the potential impacts remain it will not be possible to advise beyond reasonable scientific doubt that impacts on sandeel as a contributing factor to the AEoI conclusions for FFC SPA, SNS SAC and Dogger Bank SAC can be excluded. We therefore advise that consideration should be given to ways that beneficial management for sandeel abundance and availability could be incorporated into proposals for compensatory measures and as such factored into the strategic compensation MPA designation considerations. We advise that this should be made a stipulation of benthic compensation requirements for this project that will need to be addressed/delivered at the project level or by Defra as part of the strategic benthic compensation	Please see the Applicants responses regarding potential effects on prey species in RR-039: E3 and RR-039: E4 above.	Section 6 - Plan Level Habitats Regulations Assessment Section 7 - Report to Inform Appropriate Assessment
REP1-074:1.9.1 (MMO)	1.9 Natural England (NE) (RR-039) 1.9.1 The MMO notes and supports Natural England's (NE) concerns regarding indirect effects on seabirds and marine mammals with regards to lack of assessments on prey abundance and distribution within the foraging areas of Annex I and Annex II species from designated sites.	Please see the Applicants response to NE stated in **Response to Natural England's Relevant Representations** [AS-048] (RR-039: NE12) below: *'Indirect effects to predators such as marine mammals due to changes to prey have been assessed in sections 11.6.1.7 and 11.6.2.6 of **Chapter 11 Marine Mammals** [APP-095]. Due to the wide foraging ranges of marine mammals the significance was assessed as negligible or minor adverse, therefore Not Significant in EIA terms.* *Impacts upon prey are considered in the Plan Level Habitat Regulations Assessment (HRA) (RIAA Appendix I Marine Mammal Array Assessment Part 2; The Crown Estate, 2022c) under the*	Section 6 - Plan Level Habitats Regulations Assessment Section 7 - Report to Inform Appropriate Assessment

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		following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. The HRA concludes that: *The effect of this habitat loss will be to reduce the area available for foraging and also the extent of habitat for species which form prey. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging habitat available. Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.* *Damage to physical habitats could affect prey species, or benthic communities upon which these are dependent. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging habitat available. Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.* *The Habitats Assessment (RIAA Appendix J – Annex I Habitats Assessment; The Crown Estate, 2022d) notes that indirect physical damage cannot be quantified at present, but some effects are expected. Based on evidence presented in Appendix J which suggests that such effects will be relatively localised and generally accounted for within areas attributed to habitat loss it is considered that the scale of effects will not be significant in the context of possible impacts upon supporting habitats for marine mammals. Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.* *Although the overall effect of habitat loss will be to reduce the area available for foraging and the extent of habitat for prey species, habitat loss effects will be negligible given the small proportion of habitat occupied by the structures compared to the large foraging ranges of the protected features, as indicated by the distances used in relation to screening. Similarly, although offshore wind structures may provide new foraging opportunities for some species (e.g. Clausen et al, 2021; Russel et al, 2014) habitat gain effects are expected to be negligible in the context foraging ranges.* *Impacts upon prey are also considered in the Plan Level HRA (RIAA Appendix H – Ornithology Array Assessment Part 2; The Crown Estate, 2022b) under the following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. In all cases the HRA concludes that:* *"All seabird species screened in forage widely within the marine environment and the predicted area of habitat damaged represents a very small proportion of the foraging habitat available. Any impact is, therefore, considered to be negligible and would not make an appreciable difference to any in-combination impact."* *The Applicants consider there to be good evidence that seabird populations will be very little affected by any impacts on their prey, even during construction which is the period when there is the most risk of effects on prey species (and for which consideration was made in the assessment). For example, the impact of seabirds on their prey stock biomass is very small (estimated across*	

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
		*five ecosystems to average about 1% of the primary forage fish being consumed by all seabird species (Saraux et al. 2020)). Furthermore, forage fish stock biomass varies enormously from year to year while seabird population sizes change much more slowly. Thus, two things are apparent from this: fish stock fluctuations are not caused by seabird population fluctuations and seabird populations are little affected by the inter-annual variations in their prey. Population fluctuations are typical of forage fish species because their survival is very low while recruitment varies very widely from year to year. These factors taken together therefore indicate that small changes in prey stock biomass, as assessed in the Fish and Shellfish assessment (**Chapter 10 Fish and Shellfish Ecology** [APP-091]), will have undetectable effects on the seabird populations which prey on those stocks, and even if prey stocks are affected more widely than currently assessed, this would still not result in seabird population impacts.'*	
REP2-069:C10 (NE)	*We disagree with "Habitats or species that provide prey items for other species of conservation value" being considered of low value in the assessment. Of note are spawning/nursery grounds for sandeel and herring, both of which are an important prey resource for Annex I bird species and Annex II marine mammal features of designated sites. Within the wider marine environment impacts to habitats that provide prey availability may be considered as low, however it should be recognised that some areas remain more important than others. The importance of the 'Dogger Bank' area for fish species is well documented. We advise that a generic low value can't be attributed to all areas within the red line boundary. We also advise that impacts to benthic habitats which reduce/remove their ability to support benthic communities which are integral to maintaining populations of Annex I and II designated site features, needs to be fully considered within the ES. (See Sheet E for further comments on indirect effects) (7.09)* No change. We note the Applicant has contested the importance of the Dogger Bank sandbank system for prey availability and foraging species. Natural England disagrees with the justification provided and therefore maintains the advice provided in our Relevant Representation on this issue.	Note that if the Applicants assigned prey species in the EIA as high value and high sensitivity, the significance of effect for the assessment of all impacts would be minor adverse, which is not significant in EIA terms. This is due to the negligible magnitude of impacts (e.g. 0.018% of the medium to high potential habitat for sandeel of the SAC for habitat loss and 0.23% of the medium to high potential habitat for sandeel of the SAC for disturbance). There would be no change to the assessment conclusions if the sensitivity was increased. The Applicants reiterate that the value of the Dogger Bank as an Annex 1 feature is considered within the **RIAA HRA Part 2 of 4 – Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014] whilst the value the biotopes found there-upon are considered in the ES. The Applicants do not contest that the Dogger Bank is *a* foraging area for mobile species, but seek to highlight that it is not the *only* foraging area for these species. Therefore, when considering effects on foraging for mobile species the SAC boundary is less relevant and foraging should be seen in the wider regional context of prey available to the wide ranging predators of interest to Natural England – all of whom have foraging ranges of many, many thousands of km2 across areas many times the size of the proposed Offshore Development Area, hence the approach taken. In terms of the EIA, the SAC boundary is used as a geographic reference only based on the pre-application advice of NE that there should be a clear separation between EIA and HRA assessment. The supporting role of benthic habitats and fish and shellfish for other features is considered within both the ornithology assessment (**Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] and **RIAA HRA Part 4 of 4 – Marine Ornithological Features (Revision 4)** [document reference: 6.1] and marine mammal assessment (**Chapter 11 Marine Mammals** [APP-095] and **RIAA HRA Part 3 of 4 (Revision 3)** [REP5-009]). The impacts are assessed within **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and **Chapter 10 - Fish and Shellfish Ecology** [APP-091]) and then cross-referenced in the relevant assessments for ornithology and marine mammals for all phases of the Projects (construction, operation and decommissioning). The Applicants therefore consider that the assessment is line with best practice for offshore wind assessments.	Section 7.1 - Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC Section 7.3 – Annex II Marine Mammals

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
REP2-069:E21 (NE)	*We disagree that if there were no significant impacts identified for potential fish prey species in the EIA assessment then there would be no significant impacts on ornithology and marine mammal receptors. NE consider that an understanding of the relative importance of the Project site as a foraging area, and potential for any impacts on localised prey abundance and distribution is critical in framing the predicted RIAA impacts that can be quantified. Further assessment is therefore needed to understand how more localised impacts (e.g localised depletion and/or reduced resilience of the wider stock) on fish and shellfish might influence prey availability for designated seabirds and mammals. The assessments should consider both direct and indirect impact pathways to sandeel and herring at a biologically relevant population scale, for both the construction and operation phases of the Projects. For herring this would be the Banks spawning component of the North Sea stock, and for sandeel the specific genetic population present in the Project area. See Annex E1 of REP-039 for futher guidance.* No change. We note the Applicant has contested the importance of the Dogger Bank sandbank system for prey availability and foraging species. Natural England disagrees with the justification provided and therefore maintains the advice provided in our Relevant Representation on this issue.	See the Applicants response to REP2-069: C10 above.	Section 7.1 - Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC Section 7.3 – Annex II Marine Mammals
REP2-069:F20 (NE)	*Indirect Effects - We disagree that it can be concluded that there is no risk of AEoI to marine mammal SAC features as a result of impacts on prey species, solely due to impacts being ruled out at EIA scale. Consideration has also only been given to temporary construction impacts on prey in the RIAA, rather than the indirect effects of permanent spawning habitat loss that will also occur. Please see Appendix E for our detailed comments on the indirect effects assessment.* No Change. We note the Applicant has contested the importance of the Dogger Bank sandbank system for prey availability and foraging species. Natural England disagrees with the justification provided and therefore maintains the advice provided in our Relevant Representation on this issue.	Note that if the Applicants assigned prey species in the EIA as high value and high sensitivity, the significance of effect for the assessment of all impacts would be minor adverse, which is not significant in EIA terms. This is due to the negligible magnitude of impacts (e.g. 0.018% of the medium to high potential habitat for sandeel of the SAC for habitat loss and 0.23% of the medium to high potential habitat for sandeel of the SAC for disturbance). There would be no change to the assessment conclusions if the sensitivity was increased. The Applicants reiterate that the value of the Dogger Bank as an Annex 1 feature rather than simply its biotopes is considered within the **RIAA HRA Part 2 of 4 – Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014]. The Applicants do not contest that the Dogger Bank is *a* foraging area for mobile species, but seek to highlight that it is not the *only* foraging area for these species. Therefore, when considering effects on foraging for mobile species the SAC boundary is less relevant and foraging should be seen in the wider regional context, hence the approach taken. The supporting role of benthic habitats and fish and shellfish for other features is considered within the **RIAA HRA Part 3 of 4 - Annex II Marine Mammals (Revision 3)** [REP5-009]. The impacts are assessed within **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and **Chapter 10 - Fish and Shellfish Ecology** [APP-091]) and then cross-referenced in the relevant assessments for marine mammals for all phases of the Projects (construction, operation and decommissioning). The Applicants therefore consider that the assessment is line with best practice for offshore wind assessments.	Section 7.1 - Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC Section 7.3 – Annex II Marine Mammals

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
		The Applicants note that an assessment of long term habitat loss with regards to changes to prey resources (i.e. the indirect effects of permanent spawning habitat loss) was assessed in section 8.3.5.3.9.1 of the **RIAA HRA Part 3 of 4 - Annex II Marine Mammals (Revision 3)** [REP5-009] for the SNS SAC, the only SAC designated for marine mammals where habitat loss associated with the Projects would occur. The assessment concluded that would be no adverse effect on site integrity of the SNS SAC due to minimal spatial extent any habitat loss associated with the Projects would have on the wider available spawning habitat for prey species within the SNS SAC.	
BE.1.3 (ExA)	**Benthic habitats as supporting habitats for bird and marine mammal features** NE states in its RR [RR-039] that appropriate consideration and assessment of potential impacts on the conservation objectives for Special Protection Areas (SPAs) and SACs where the benthic habitats serve as supporting habitats for bird and marine mammal features, including Flamborough and Filey Coast (FFC) SPA and the Southern North Sea SAC, has not been adequately undertaken. The ExA is aware of the Applicants response to this in its response to NE's RR [AS-048] but this issue remains unresolved in NE's Risk and Issues Log [REP2-069]. Can you explain the latest status of this issue and how the Applicants intend to resolve this disagreement with NE before the close of the Examination?	The Applicants have provided a response on this statement in REP2-069:C10 in the **Applicants' Responses to Deadline 2 Documents** [REP3-028], submitted at Deadline 3 and stated below for ease. *'Note that if the Applicants assigned prey species in the EIA as High Value and High sensitivity, the significance of effect for the assessment of all impacts would be Minor Adverse, which is not significant in EIA terms. This is due to the negligible magnitude of impacts (e.g. 0.018% of the medium to high potential habitat for sandeel of the SAC for habitat loss and 0.23% of the medium to high potential habitat for sandeel of the SAC for disturbance). There would be no change to the assessment conclusions if the sensitivity was increased.* *The Applicants reiterate that the value of the Dogger Bank as an Annex 1 feature is considered within the **RIAA HRA Part 2 of 4 – Annex I Offshore Habitats and Annex II Migratory Fish (Revision 3)** [AS-051] whilst the value the biotopes found there-upon are considered in the Environmental Statement.* *The Applicants do not contest that the Dogger Bank is a foraging area for mobile species, but seek to highlight that it is not the only foraging area for these species. Therefore, when considering effects on foraging for mobile species the SAC boundary is less relevant and foraging should be seen in the wider regional context of prey available to the wide-ranging predators of interest to Natural England – all of whom have foraging ranges of many, many thousands of km_2 across areas many times the size of the proposed Offshore Development Area, hence the approach taken. In terms of the EIA, the SAC boundary is used as a geographic reference only based on the pre-application advice of NE that there should be a clear separation between EIA and HRA assessment.* *The supporting role of benthic habitats and fish and shellfish for other features is considered within both the ornithology assessment (**Chapter 12 Offshore Ornithology** [APP- 103] and **RIAA HRA Part 4 of 4** [APP-048 and updated in AS-085]) and marine mammal assessment (**Chapter 11 Marine Mammals** [APP-095] and **RIAA HRA Part 3 of 4** [APP-047]). The impacts are assessed within **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and **Chapter 10 - Fish and Shellfish Ecology** [APP-091]) and then cross-referenced in the relevant assessments for ornithology and marine mammals for all phases of the Projects (construction, operation and decommissioning). The Applicants therefore consider that the assessment is line with best practice for offshore wind assessments.'*	Section 7.1 - Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC Section 7.3 – Annex II Marine Mammals Section 7.4 – Marine Ornithological Features
MM.1.10	**Indirect impacts through effects on prey species**	Natural England is incorrect in that consideration within the **Report to Inform Appropriate Assessment (RIAA) Habitats Regulations Assessment (HRA) Part 3 of 4 – Annex II Marine**	Section 7.3 – Annex II Marine Mammals

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
(ExA)	The ExA notes your response to ISH2 [AS-155] confirms there was nothing unusual in the assessment and in allocating prey species with a low value, and that this approach is consistent with other projects. The ExA also notes that at Deadline 2 NE has maintained its disagreement related to the risk of AEoI to marine mammal SAC features as a result of impacts on prey species [REP2-069]. It states this is due to the fact that consideration has only been given to temporary construction impacts on prey in the RIAA rather than the indirect effects of permanent spawning habitat loss that could also occur. Can you respond to this concern from NE, explaining how you intend to resolve this disagreement before the end of the Examination?	**Mammals (Revision 3)** [REP5-009]has only been given to temporary construction impacts on prey. Impacts to changes to prey resources, including permanent habitat loss, during both construction and operation and maintenance have been included. The Applicants direct Natural England and the Examining Authority to the following sections found within the **RIAA HRA Part 3 of 4 – Annex II Marine Mammals (Revision 3)** [REP5-009]: • For the SNS SAC, section 8.3.4.3 Potential Effects During Operation and Maintenance discusses the impacts of Changes to Prey Resources (section 8.3.5.3.9, page 111) including Long Term Habitat Loss (section 8.3.5.3.9.1). Section 8.3.5.5 discusses Potential In-combination Effects of Changes to Prey Availability (section 8.3.5.5.4, page 148). • For the Humber Estuary SAC, section 8.3.6.4 Potential Effects During Operation and Maintenance discusses the impacts of Changes to Prey Resources (section 8.3.6.4.9, page 205) including Long Term Habitat Loss. Section 8.3.6.6 discusses Potential In-combination Effects of Changes to Prey Availability (section 8.3.6.6.5, page 225). • For the Wash and North Norfolk Coast SAC, section 8.3.7.4 Potential Effects During Operation and Maintenance discusses the impacts of Changes to Prey Resources (section 8.3.7.4.9, page 270) including Permanent Habitat Loss. Section 8.3.7.6 discusses Potential In-combination Effects of Changes to Prey Availability (section 8.3.7.6.5, page 288). • For the Berwickshire and North Northumberland Coast SAC, section 8.3.8.4 Potential Effects During Operation and Maintenance discusses the impacts of Changes to Prey Resources (section 8.3.8.4.9, page 327) including Permanent Habitat Loss. Section 8.3.8.6 discusses Potential In-combination Effects of Changes to Prey Availability (section 8.3.8.6.5, page 343). • For the Moray Firth SAC, section 8.3.9.3 Potential Effects During Operation and Maintenance discusses the impacts of Changes to Prey Resources (section 8.3.9.3.7, page 369) including Permanent Habitat Loss. Section 8.3.9.5 discusses Potential In-combination Effects of Changes to Prey Availability (section 8.3.9.5.4, page 381). In summary, the Applicants reiterate that all impacts on prey species during all phases of the Projects have been assessed and maintain that the effects on the harbour porpoise of the SNS SAC are minimal. In section 4 of **Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and the SNS SAC** [APP-050] it is concluded that the potential area of habitat affected within the sites is a small fraction of the available habitat. The habitat within the designated sites is not unique in its potential to support sandeel, with areas of similar potential surrounding the sites. In addition, the presence of sandeel is not relevant to the boundaries of either SAC which were designated on the basis of bathymetry and benthic communities (Dogger Bank SAC) and the density of harbour porpoise (SNS SAC). To help resolve this disagreement, the Applicants intend to compile all the relevant information included in the Application documents and additional documents submitted into	

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
		Examination, into a single technical note (covering both marine mammals and ornithology) to provide the evidence in one place without the need for cross referencing. This document will be submitted at Deadline 4.	
REP5-056: E4	<u>Effects on Prey Species Technical Note</u> Whilst Natural England welcome the provision of [REP4-093], we disagree that indirect effects on predator species from prey impacts have been adequately assessed and can be ruled out. We note that the Applicant's arguments have centred around two key points: 1) that if there are no impacts on prey species at an EIA/population scale that there will be no impacts on predatory species at a HRA scale, and 2) that as predatory species such as birds and marine mammals are mobile animals, they will be able to find prey resources elsewhere. Natural England consider these arguments to oversimplify the case and advise that the current assessment is insufficient to advise that impacts on Annex I ornithology receptors at FFC SPA and Annex II harbour porpoise in SNS SAC, in relation to conservation objectives for the distribution, abundance and availability of key food and prey items to be restored (FFC SPA) or maintained (SNS SAC) can be excluded. Natural England recommend that further discussion and consideration occurs regarding the complex relationships between predators, prey and offshore industry. The following information, for example, should be taken into consideration when predicting the impacts of the project on prey species:	The Applicants do not argue that there are no effects on prey species in either the EIA or HRA. Direct effects on prey species have been assessed in the EIA and found to be non-significant and these effects have been carried through to assessments of the predators for both EIA and HRA. The Applicants highlight that with regard to the HRA it was not just the Applicants conclusion that prey effects did not lead to adverse effect on integrity. These effects were assessed in the Plan Level HRA and not considered beyond the primary assessment (this was detailed previously in section 6 of the **Effects on Prey Species Technical Note** [REP4-093]. The Applicants do not contest that birds and mammals are foraging within the Dogger Bank SAC and Southern North Sea SAC, but highlight that the areas of the SACs affected are small – even relative to the scale of the Offshore Development Area - and must be considered in the context of the wider prey resource available beyond the SAC boundaries.	The Applicants have updated the **Effects on Prey Species Technical Note (Revision 2)** [document reference 14.8] to provide additional information as requested by Natural England. As per the discussion at the meeting with Natural England on 7th May this additional information is provided for information only, the assessments have not been updated.
REP5-056: E4.1	<u>Harbour Porpoise</u> There are several studies which have evidenced the importance of sandeels and clupeids (for example, herring) for harbour porpoise. Gilles *et al.* (2016) found harbour porpoise density increases with decreasing distance to sandeel grounds, and recent research, by Ransijn *et al.* (2021) has shown that sandeel are a preferred prey for harbour porpoise. This preference is likely to be driven by the quality of prey; sandeels and clupeids are high in fat and therefore, a decrease in their population numbers could require porpoise to increase the amount of other prey they are consuming in order to meet energetic requirements (Ransijn *et al*, 2021). Leopold (2015) demonstrated that harbour porpoise in better body condition had higher amounts of fatty fish, such as sandeel, in their stomachs. Furthermore, recent publication from the PrePared project has identified that installation of wind turbines has resulted in a modified predator-prey interaction, with a weaker relationship between porpoises and sandeel density (Fernandez-Betelu *et al.* 2024).	The Applicants acknowledge the important link between harbour porpoise distribution, ranges, and feeding grounds with the main prey species being sandeels and clupeids. Distribution of harbour porpoises is thought to be prey driven and it is likely that the high densities of harbour porpoises that occur at the Dogger Bank are due to a particularly rich area for feeding (Ransijn *et al.* 20214). Important harbour porpoise prey also includes cod (Gadus morhua), whiting (Merlangius merlangus) and sprat (Sprattus sprattus). Sprats are also high in fat, therefore a good quality of prey. All of these prey species are present within the wider Dogger Bank area and southern North Sea. A southward shift in distribution of harbour porpoise is supported by data from smaller scale surveys in the southern North Sea which show increasing numbers of porpoises and aggregations in French, Belgian, Dutch and German waters (e.g., Gilles *et al.* 2011 , 2016; Haelters *et al.* 2011 ; Scheidat *et al.* 2012 ; Peschko *et al.* 2016 ; Laran *et al.* 2017 ; Nachtsheim *et al.* 2021). This shift in harbour porpoise distribution is probably related to changes in prey distribution and abundance (Hammond *et al.* 2013). Data from SCANS-III in 2016 and the recent SCANS-IV survey in 2022 confirm that the shift to the south has been maintained (Hammond *et al.* 2021 ; Gilles *et al.* 2023). There is already a documented shift in harbour porpoise distribution likely due to prey availability. As such, the Applicants maintain their position, from comprehensive	No update required. Note that **Figure 7-2** and **Figure 7-4** show the distribution of potential sandeel and herring spawning habitat in relation to the Southern North Sea SAC.

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
		Environmental Impact Assessment that has been undertaken, that the that the Projects' effects are not significant. The Applicants note that Natural England's comment does not include any further request to amend the assessment or advice on additional information required. No updates are therefore proposed to be made to the assessments.	
REP5-056: E4.2	Ornithology Whilst seabirds are mobile animals, their distributions during the breeding season are constrained as central-place foragers to areas within foraging range, and their distribution is also strongly affected by the availability of prey (Evans *et al* 2021 , de la Cruz *et al* 2022 , Legard *et al* 2025); seabirds are known to aggregate in areas where prey availability is high (Oppel *et al* 2018). The Projects are located within the Dogger Bank SAC, in an area that is important for sandeel (Dunn 2021 , Langton 2021) and therefore likely to attract seabirds breeding at FFC SPA (see also response to OR1.5 and OR 1.6 [REP3-057]). Furthermore, sandeel are a relatively sedentary species that show limited mobility and are strongly associated with discrete areas of particular sediment types (van der Kooij *et al* 2008 , Jensen *et al* 2011). Van der Kooij *et al*. (200811) demonstrated that, during their daily movements, sandeel in the Dogger Bank remained within a few kilometers of the substrate in which they burrow overnight. Areas within the Dogger Bank with high abundance of sandeels are therefore likely to represent a consistent source of food for foraging seabirds. However, this oversimplifies the case and overlooks the fact that whilst they could forage elsewhere, they are choosing to forage in this location.	The Applicants acknowledge the important link between seabirds and feeding grounds with the main prey species being sandeels and clupeids. Seabirds present within the Array Areas are primarily there for foraging, however, as previously stated the Array Areas do not represent the only available foraging grounds for seabirds. The mapping presented in this report clearly shows that sandeel are widespread across the Southern North Sea outwith the boundaries of the Dogger Bank SAC. In terms of herring, the Dogger Bank SAC is not particularly important for spawning with this mostly occurring more inshore and along the coast and south towards the Thames. Following discussion with Natural England on 7th May the Applicants have presented mapping in this updated report showing the foraging ranges of the key species of concern (i.e. kittiwake, guillemot and razorbill), the hotspot mapping from Cleaby *et al* (2020) and the above-mentioned mapping of potential spawning areas. Together these demonstrate the point made previously that whilst seabirds are foraging at the Array Areas, prey resource is widespread throughout their foraging range and hotspot modelling suggests that locations outwith the array Areas are of greater importance for these species. The Applicants note that Natural England consider that the assessment undertaken is simplistic however we point out that: • Where birds are subject to displacement effects (such as razorbill, guillemot and gannet), the mortality from this is assumed to result from a reduction in access to prey. So, in this case, consideration of any indirect effects via effects on prey is double counting to some degree (e.g. the birds are already displaced from the Array Areas so effects on prey within these locations have no additional effect). • For birds not displaced, such as kittiwake and the residual auks (under Natural England's preferred displacement rate 70% are displaced so only 30% remain), the area which can no longer be used for foraging is confined to the immediate footprint of the infrastructure within the Array Areas (and within the Export Cable Corridor small sections of cable protection) which is permanently lost. In addition to this there are direct effects on the prey themselves (disturbance, noise impacts etc) which is what has been assessed in **Chapter 10 Fish and Shellfish Ecology** [APP-091]) and cross referenced within the ornithology assessment (**Chapter 12 Offshore Ornithology (Revision 4)** [document reference: 7.12] and **RIAA HRA Part 4 of 4 (Revision 5)** [document reference: 6.1]) Therefore, the assessment has covered all the potential pathways for impacts. These were assessed in line with standard practice in the Application, with the steps set out in this document.	Additional mapping has been provided on foraging ranges and seabird distribution (see section 3.2.3) and potential spawning areas of herring and sandeel (see section 7.1)

I.D	Stakeholder Comment	Applicants' Response	Relevant Section Where Comment is Addressed in this Document
		The Applicants note that Natural England's comment does not include any further request to amend the assessment or advice on additional information required. No updates are therefore proposed to be made to the assessments.	

3 Diet of marine mammals and birds

11. Within the baseline sections presented within the application, information was provided on the diet of marine mammal and bird species.

3.1 Marine mammals

12. The information in the section below has been summarised from **Appendix 11-2 Marine Mammal Information Report** [APP-098] with the relevant sections signposted.

13. In summary, the marine mammals that have been assessed in **Chapter 11 Marine Mammals** [APP-095] and **RIAA HRA Part 3 of 4 – Annex II Marine Mammals (Revision 3)** [REP5-009]) are generally wide-ranging opportunistic foragers, and would be able to prey upon a range of fish species.

3.1.1 Receptors and Diet

3.1.1.1 Harbour porpoise (section 11.2.6.1.6)

Harbour porpoise are generalist feeders, and their diet reflects available prey in an area. Therefore, their diet varies geographically, seasonally and annually, reflecting changes in available food resources and differences in diet between sexes or age classes may also exist. The diet of the harbour porpoise consists of a wide variety of fish, including pelagic schooling fish, as well as demersal and benthic species, especially Gadoids, Clupeids and sandeels.

3.1.1.2 Bottlenose dolphin (section 11.2.6.2.6)

Bottlenose dolphin are opportunistic feeders and take a wide variety of fish and invertebrate species. Benthic and pelagic fish (both solitary and schooling species), including haddock, saithe, pollock, cod, whiting, hake, blue whiting, bass, mullet, mackerel, salmon, sea trout, flounder, sprat and sandeels, as well as octopus and other cephalopods have all been recorded in the diet of bottlenose dolphin.

3.1.1.3 Common dolphin (section 11.2.6.3.6)

Common dolphin are cooperative feeders, working within a pod to capture prey. They have a varied diet of fish including haddock, mackerel, Atlantic horse mackerel, blue whiting, anchovy., and sardine which are also exploited by fisheries. Other prey items recorded in common dolphins include cephalopods and crustaceans.

3.1.1.4 White-beaked dolphin (section 11.2.6.4.6)

Analysis of the stomach contents of white-beaked dolphin have shown that the species feed on a wide range of fish and squid species, including cod, whiting, and hake. White-beaked dolphin have also been observed to associate with herring and mackerel shoals.

3.1.1.5 Minke whale (section 11.2.6.5.6)

Minke whales feed on a variety of fish species, including herring, cod and haddock. In one study, sandeels and mackerel were found to be the most dominant prey species for minke whale in the northern North Sea (Windsland et al. 2007).

3.1.1.6 Grey seal (section 11.2.6.6.7)

Grey seals are generalist feeders, feeding on a wide variety of prey species. Diet varies seasonally and from region to region. In the North Sea, principal prey items are sandeel, whitefish (such as cod, haddock, whiting and ling) and flatfish (plaice, sole, flounder, and dab). Amongst these, sandeels are typically the predominant prey species.

3.1.1.7 Harbour seal (section 11.2.6.7.8)

Harbour seal take a wide variety of prey including sandeels, gadoids, herring and sprat, flatfish, and cephalopods.

3.1.2 Foraging range

14. **Appendix 11-2 Marine Mammal Information Report** [APP-098] provides details on the ranges of marine mammal species. The key points are summarised here.

15. In general cetaceans have wide ranges, as reflected in the large Management Units (MU) which are used for the reference populations in the assessments (which for example cover the whole of the North Sea). These MUs are designed to reflect population distribution, migratory patterns, and ecological needs rather than arbitrary boundaries. The mixing of waters from the English Channel and the northern North Sea, combined with changes in seafloor topography around shallow banks, creates an area of eddies that trap nutrients. The diverse and abundant benthic community across the North Sea forms a rich food base for the fish fauna and influences the wide-ranging foraging patterns for cetaceans. Pinnipeds (seals) are more geographically restricted as they are associated with haul out sites. Grey seal trips generally occur within 100km of their haul-out sites, although they can travel up to several hundred kilometres offshore to forage and the maximum range recorded is 448km (Carter *et al*, 2022). Harbour seals generally make smaller foraging trips than grey seal, typically travelling 40-50km from their haul-out sites to foraging areas, although the maximum range recorded is 273km (Carter *et al*, 2022).

16. In relation to the wider foraging habitat available within these species foraging ranges, the footprint of the Projects represent a negligible loss of foraging habitat.

3.2 Birds

3.2.1 Receptors

17. The key marine ornithological receptors assessed in **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] were as follows:

- Red throated diver;
- Fulmar;
- Gannet;
- Arctic skua;
- Great skua;
- Puffin;
- Razorbill;
- Common guillemot;
- Common tern;
- Arctic tern;
- Kittiwake;
- Lesser black-backed gull;
- Herring gull; and
- Great black-backed gull.

3.2.2 Diet

18. Information on the diet of birds is high level and provided in **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032], unlike for marine mammals this information is spread throughout the chapter within the assessments rather than being summarised within species specific accounts.

19. Sandeel, herring, and sprat are described as the main prey species for seabirds such as gannet, auk species (see paragraph 481 of **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] and kittiwake (Ruffino, 2023). In section 12.5.3 sandeel stocks in the North Sea are described as the most important prey fish stock for North Sea seabirds during the breeding season.

3.2.3 Foraging Range

20. The foraging ranges for each species assessed in **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032], as detailed in Woodward *et al.* 2019, are presented in **Table 3-1** below.

Table 3-1 Foraging ranges for all seabirds assessed in Chapter 12 Offshore Ornithology, based on Woodward *et al.* 2019

Species[1]	Max Foraging Range (km)	Mean Max Foraging Range (km)	Mean Foraging Range (km)	Confidence
Red Throated Diver	9	9	4.5	Low

[1] While the species little gull *Hydrocoloeus minutus* was assessed in **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032], foraging ranges for the species are not provided in Woodward *et al.* 2019.

Species[1]	Max Foraging Range (km)	Mean Max Foraging Range (km)	Mean Foraging Range (km)	Confidence
Fulmar	2,736	542.3 ± 657.9	134.6 ± 90.1	Good
Gannet	709	315.2 ± 194.2	120.4 ± 50	Highest
Arctic skua	N/A	N/A	2 ± 0.7	Poor
Great skua	1003	443.3 ± 487.9	67 ± 31.5	Uncertain
Puffin	383	137.1 ± 128.3	62.4 ± 34.4	Good
Razorbill	**313**	**88.7 ± 75.9**	**61.3 ± 33.4**	**Good**
Common guillemot	**338**	**73.2 ± 80.5**	**33.1 ± 36.5**	**Highest**
Common tern	30	18.0 ± 8.9	6.4 ± 4.5	Good
Arctic tern	46	25.7 ± 14.8	6.1 ± 4.4	Good
Kittiwake	**770**	**156.1 ± 144.5**	**54.7 ± 50.4**	**Good**
Lesser black-backed gull	553	127 ± 109	43.3 ± 18.4	Highest
Herring gull	92	58.8 ± 26.8	14.9 ± 7.5	Good
Great black-backed gull	73	73	16.7	Low

21. Given the DBS West and DBS East Array Areas are situated at a minimum of 100km and 122km from shore respectively, the maximum foraging ranges for the species assessed in **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] either:
    - Do not fall within the Array Areas and would not be affected by construction activities taking place there, or
    - They extend to a significant distance beyond the Array Areas such that these species could exploit alternative foraging areas if required.
22. In addition to the above the Applicants have provided mapping to illustrate a) the foraging ranges and b) density 'hotspots' for the kittiwake, guillemot and razorbill species based on Cleasby *et al.* (2020) These figures highlight that:
    - Guillemot (Figure 3-1 and Figure 3-2)

- The density 'hotspot' is close to the Flamborough and Filey Coast (FFC) SPA along the coast
- The Array Areas are beyond the mean max foraging range, but within the mean max +1sd from FFC SPA

- Razorbill (Figure 3-3 and Figure 3-4)
  - The density 'hotspot' is close to the FFC SPA along the coast
  - The Array Areas are beyond the mean max foraging range, but within the mean max +1sd from FFC SPA
- Kittiwake (Figure 3-5 and Figure 3-6)
  - The density 'hotspots' are inshore of the Array Areas or to the south at the Hornsea projects (per Cleasby *et al.* (2020)) based on tracking data from 93 individuals (tracking data from 2010 – 2014). Wischnewski *et al.* (2018) suggest the hot spot at the Array Areas although this is based on the data from just 18 individuals (tracking data from 2017)
  - The Array Areas are within the mean max foraging range from FFC SPA

23. Although guillemot and razorbill have not been tracked from FFC SPA, due to their inaccessibility for capture, the foraging distribution maps produced by Cleasby *et al.* (2020) used data collected from 12 and 14 sites, with 178 and 281 individuals of each species tracked respectively. These data were modelled against explanatory variables, including colony size, to generate foraging predictions for all colonies. It is apparent from Cleasby *et al.* (2020) that the auks have more coastal foraging distributions than kittiwake in the breeding season, and this also corresponds with the Project survey data which found the lowest abundances of these species in these months. Thus, while auks will use the Projects for foraging to some extent, the evidence indicates that the sites are no more important than many other areas, and due to distance from the colony are likely to be of lower importance during periods of central place foraging (e.g. chick provisioning).
24. Note that given the complexity of the ornithology mapping and the fish potential spawning habitat mapping, it is not practical to overlay these data on the same figures. However, the inclusion of the Offshore Development Area boundaries across both sets of figures readily allows comparison between the seabird and fish data.
25. In addition, RWE commissioned the RSPB to undertake tracking of kittiwake from the FFC SPA in 2022 (Wischnewski, *et al* 2022, unpublished). 35 birds were tagged (20 tags at Flamborough and 15 at Filey) and 311 complete foraging trips were recorded during the breeding season. The work was specifically tasked with recording foraging trips that overlapped with the Projects' Array Areas. The key findings are presented below.

Table 3-2 Trips metrics for all foraging trips collected within the Flamborough and Filey Coast SPA in 2022. *N=311 (Wischnewski, et al 2022).*

Trip metric	Mean (±SD)	Range
Trip duration (h)	7.51 (±6.39)	0.50 – 38.58
Foraging range (km)	61.65 (±52.91)	0.63 - 279.15
Travelled distance (km)	148.58 (±130.37)	1.26 – 724.29

Table 3-3 Number of individuals and trips overlapping with Array Areas, per site and in total. *Percentages of all tracked individuals (per site and in total) are given in parenthesis below. N=311 (Wischnewski, et al 2022).*

	Filey		Flamborough		Total	
	#Ind. (%)	#Trips	#Ind. (%)	#Trips	#Ind. (%)	#Trips
DBSW	11 (73%)	35 (31%)	4 (20%)	8 (4%)	19 (54%)	43 (14%)
DBS E	4 (27%)	8 (7%)	2 (10%)	3 (2%)	6 (17%)	11 (4%)
Total	12 (80%)	37 (32%)	5 (25%)	11 (6%)	17 (49%)	48 (15%)

26. **Table 3-3** shows that birds from both colonies made trips to the Array Areas and that this was a much more regular occurrence for the Filey birds compared to birds from Flamborough. However, although 49% of the individuals made trips to the Array Areas this only accounted for 15% of their trips overall, and this is reflected in the mean foraging range show in **Table 3-2**. **Plate 3-1** and **Plate 3-2** illustrate the difference in behaviour between the birds from the different colonies.

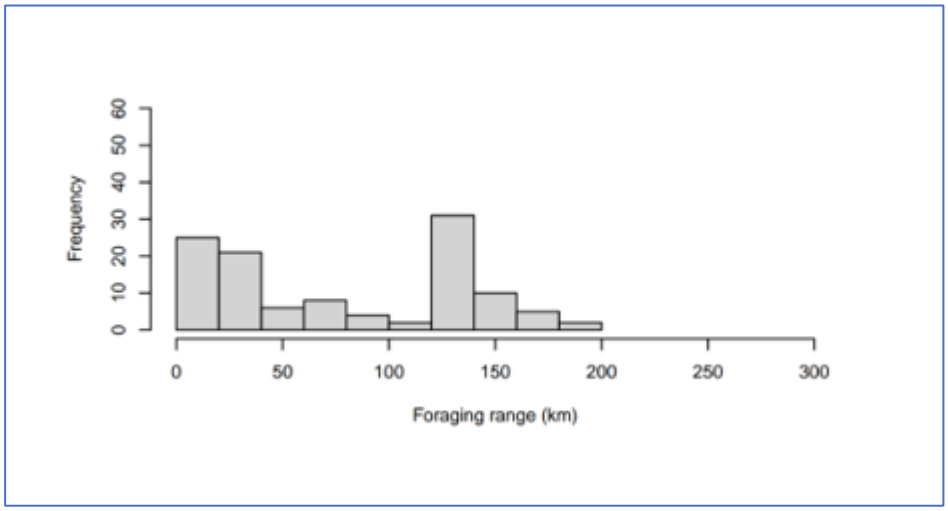


Plate 3-1 Frequency distributions foraging range collected for complete foraging trips from Kittiwakes tagged at Filey Brigg in 2022.

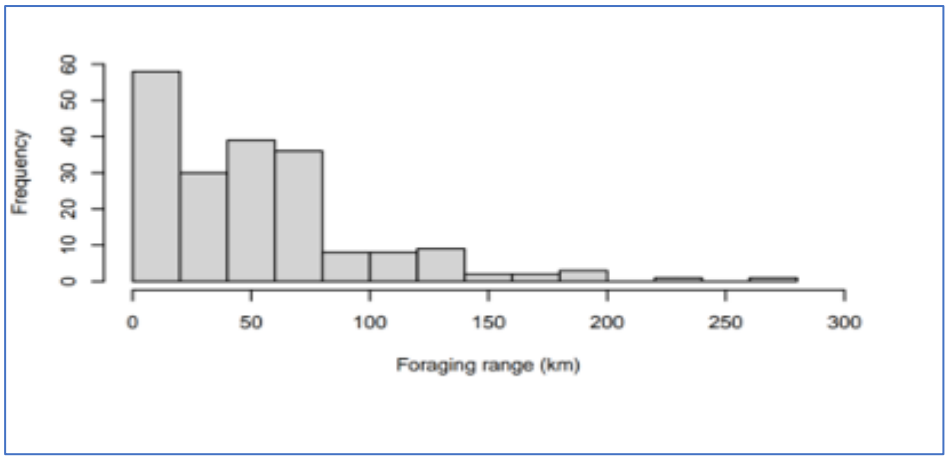
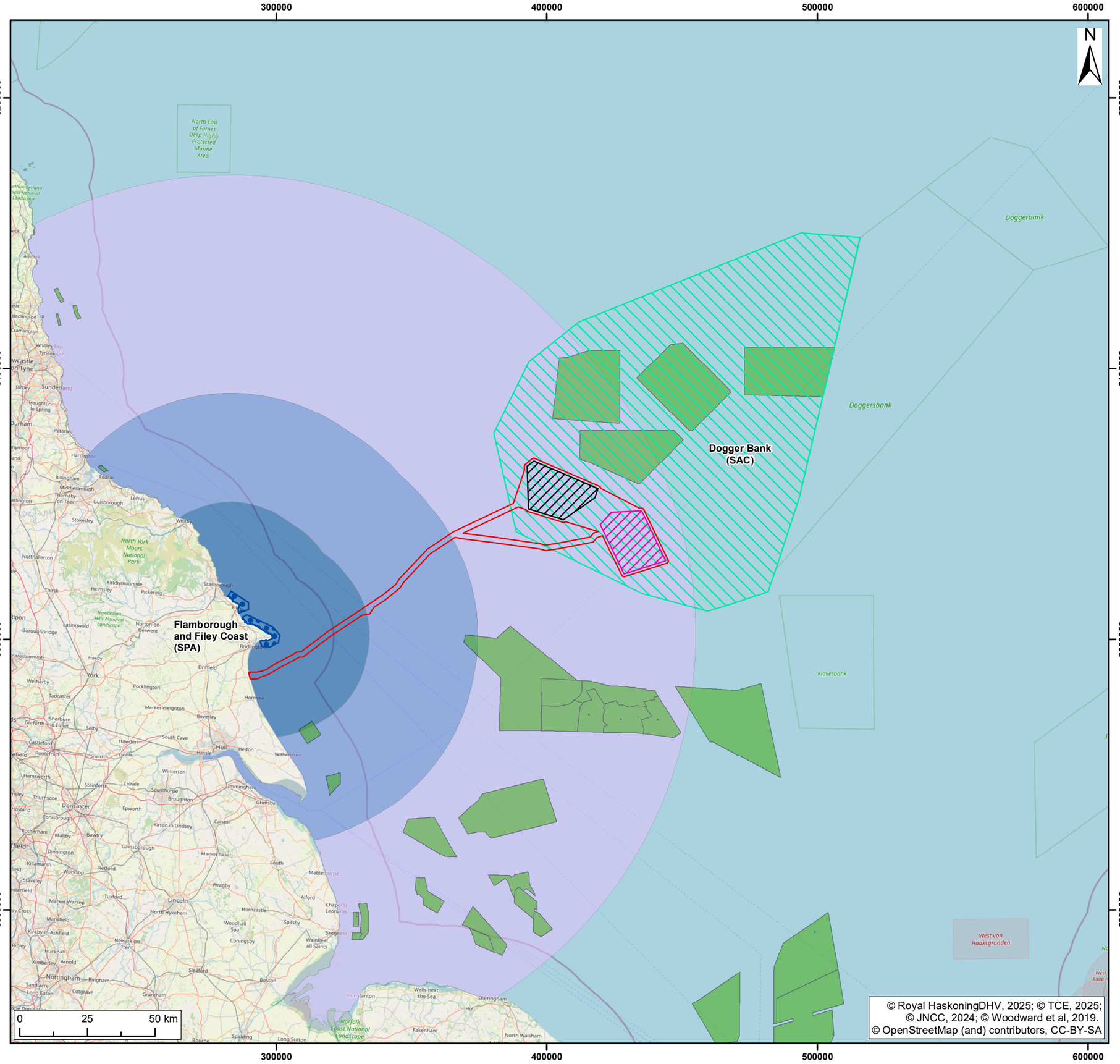


Plate 3-2 Frequency distributions of foraging range for complete foraging trips collected from Kittiwakes tagged at Flamborough Head in 2022.



Legend:

- Offshore Development Area
- DBS East Array Area
- DBS West Array Area
- Special Areas of Conservation (SAC)
- Special Protection Area (SPA)
- Offshore Wind Farm Site

Guillemot Foraging Ranges (Woodward *et al*. 2019)

- 33.1km Mean Foraging Range
- 73.2km Mean Max Foraging Range
- 153.7km Mean Max + 1sd Foraging Range

SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR
S2	P01	12/06/2025	Suitable for information	FC	SM	PP

Title:

Guillemot Foraging Ranges

Figure: 3-1

Drawing No: PC2340-RHD-OF-ZZ-DR-Z-1083

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:1,400,000

Project:

Dogger Bank South Offshore Wind Farms

Report:

Ornithology Foraging Ranges & Hotspots

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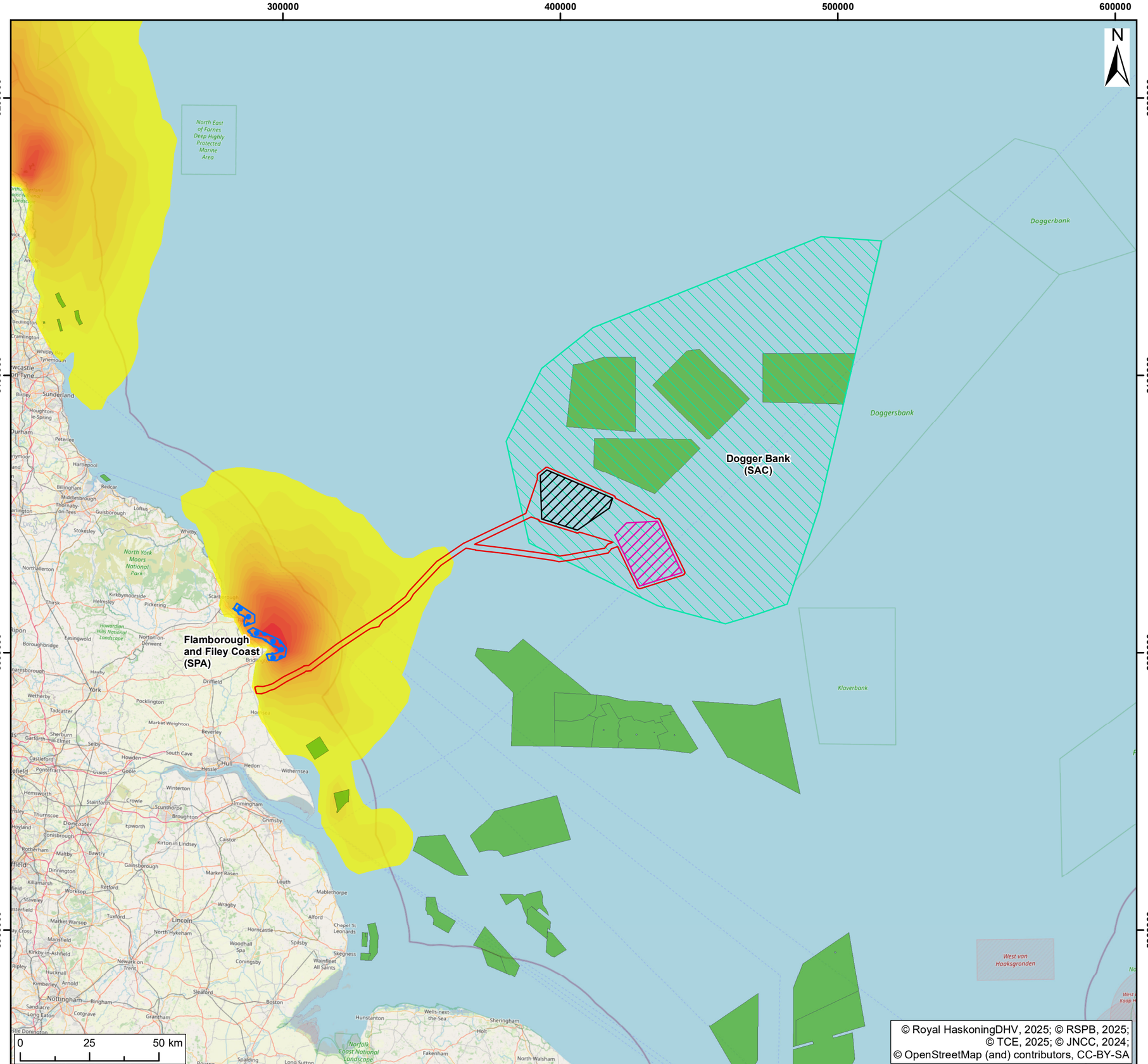

Legend:

- Offshore Development Area
- DBS West Array Area
- DBS East Array Area
- Special Areas of Conservation (SAC)
- Special Protection Area (SPA)
- Offshore Wind Farm Site

Guillemot Utilisation Distribution

- 0.05
- 0.06 - 0.10
- 0.11 - 0.15
- 0.16 - 0.20
- 0.21 - 0.25
- 0.26 - 0.30
- 0.31 - 0.35
- 0.36 - 0.40
- 0.41 - 0.45
- 0.46 - 0.50
- 0.51 - 0.55
- 0.56 - 0.60
- 0.61 - 0.65
- 0.66 - 0.70
- 0.71 - 0.75
- 0.76 - 0.80
- 0.81 - 0.85
- 0.86 - 0.90
- 0.91 - 0.95

S2	P01	12/06/2025	Suitable for information	FC	SM	PP
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Guillemot Hotspots at-sea Utilisation

Figure: 3-2

Drawing No: PC2340-RHD-OF-ZZ-DR-Z-1086

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:1,400,000

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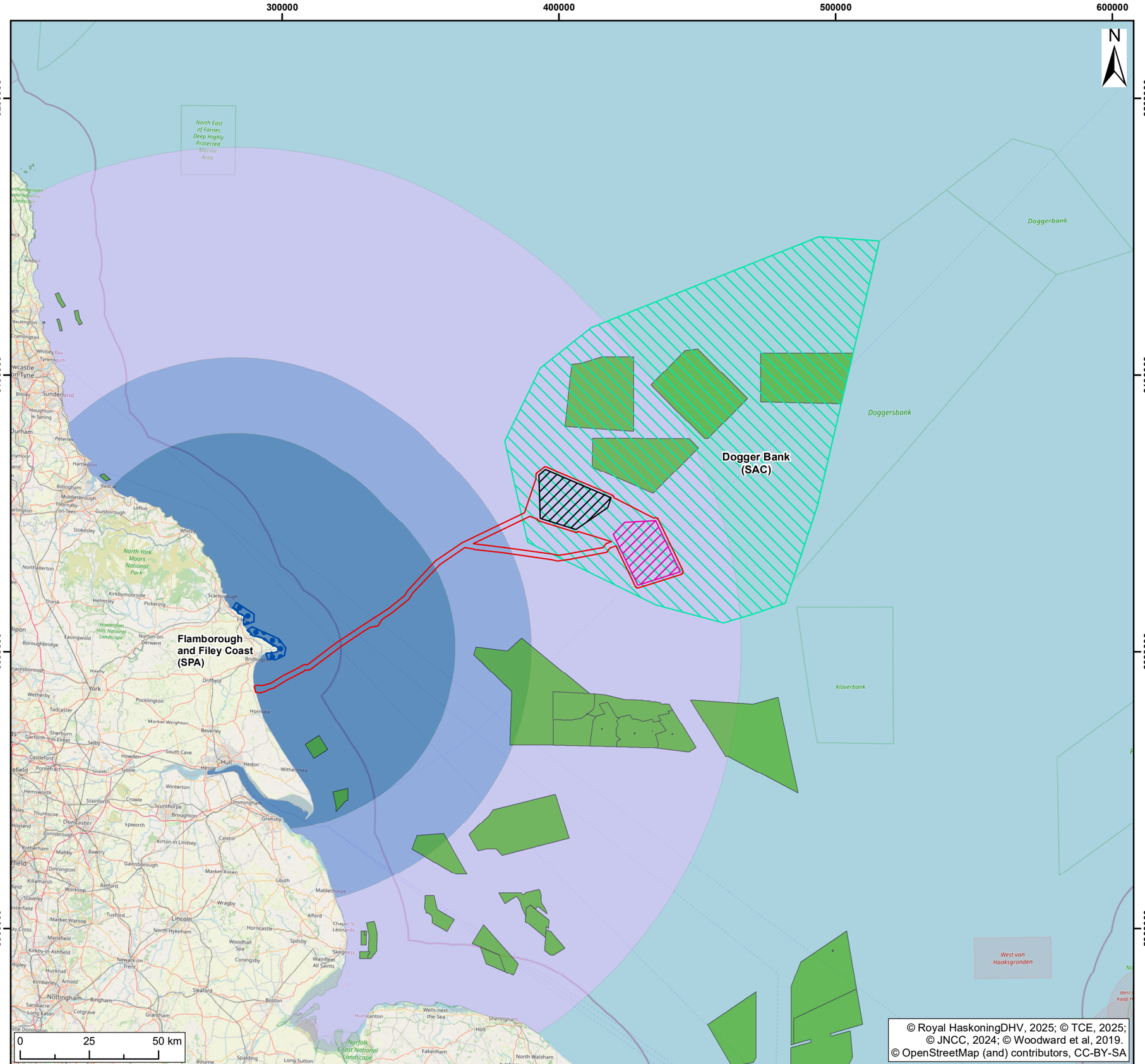

Legend:

- Offshore Development Area
- DBS East Array Area
- DBS West Array Area
- Special Areas of Conservation (SAC)
- Special Protection Area (SPA)
- Offshore Wind Farm Site

Razorbill Foraging Ranges (Woodward *et al*. 2019)

- 61.3km Mean Foraging Range
- 88.7km Mean Max Foraging Range
- 164.6km Mean Max + 1sd Foraging Range

S2	P01	12/06/2025	Suitable for information	FC	SM	PP
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Razorbill Foraging Ranges

Figure: 3-3	Drawing No: PC2340-RHD-OF-ZZ-DR-Z-1084

Co-ordinate system:	Page Size:	Scale:
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Project:	Report:
Dogger Bank South Offshore Wind Farms	Ornithology Foraging Ranges & Hotspots

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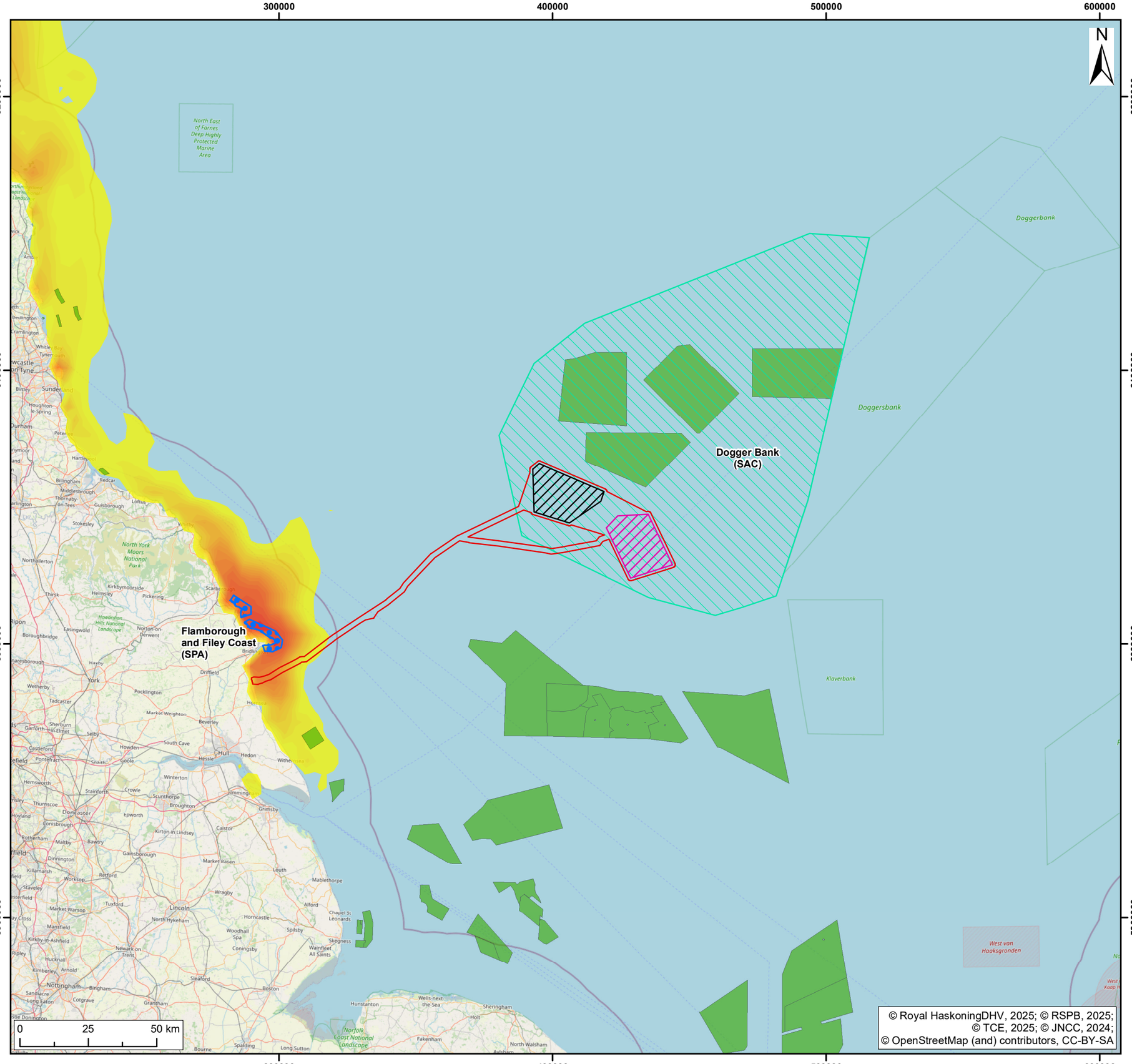

Legend:

- Offshore Development Area
- DBS West Array Area
- DBS East Array Area
- Special Areas of Conservation (SAC)
- Special Protection Area (SPA)
- Offshore Wind Farm Site

Razorbill Utilisation Distribution

- 0.05
- 0.06 - 0.10
- 0.11 - 0.15
- 0.16 - 0.20
- 0.21 - 0.25
- 0.26 - 0.30
- 0.31 - 0.35
- 0.36 - 0.40
- 0.41 - 0.45
- 0.46 - 0.50
- 0.51 - 0.55
- 0.56 - 0.60
- 0.61 - 0.65
- 0.66 - 0.70
- 0.71 - 0.75
- 0.76 - 0.80
- 0.81 - 0.85
- 0.86 - 0.90
- 0.91 - 0.95

S2	P01	12/06/2025	Suitable for information	FC	SM	PP
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Razorbill Hotspots at-sea Utilisation

Figure: 3-4

Drawing No: PC2340-RHD-OF-ZZ-DR-Z-1087

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:1,400,000

Project: Dogger Bank South Offshore Wind Farms

Report: Ornithology Foraging Ranges & Hotspots

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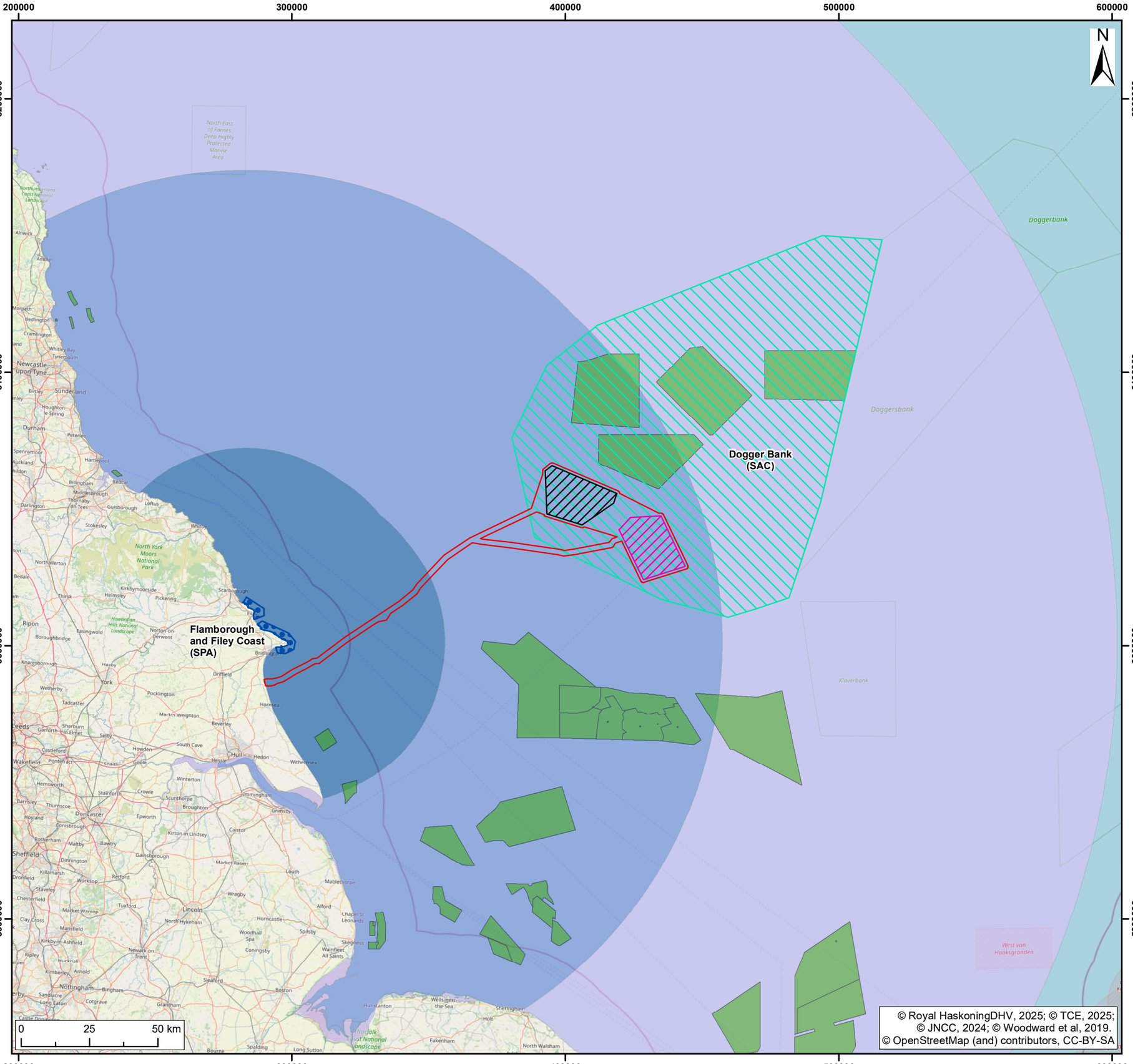

Legend:

- Offshore Development Area
- DBS East Array Area
- DBS West Array Area
- Special Areas of Conservation (SAC)
- Special Protection Area (SPA)
- Offshore Wind Farm Site

Kittiwake Foraging Ranges (Woodward *et al*. 2019)

- 54.7km Mean Foraging Range
- 156.1km Mean Max Foraging Range
- 300.6km Mean Max + 1sd Foraging Range

S2	P01	12/06/2025	Suitable for information	FC	SM	PP
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Kittiwake Foraging Ranges

Figure: 3-5	Drawing No: PC2340-RHD-OF-ZZ-DR-Z-1082	
Co-ordinate system: WGS 1984 UTM Zone 31N	Page Size: A3	Scale: 1:1,400,000

Project: Dogger Bank South Offshore Wind Farms	Report: Ornithology Foraging Ranges & Hotspots

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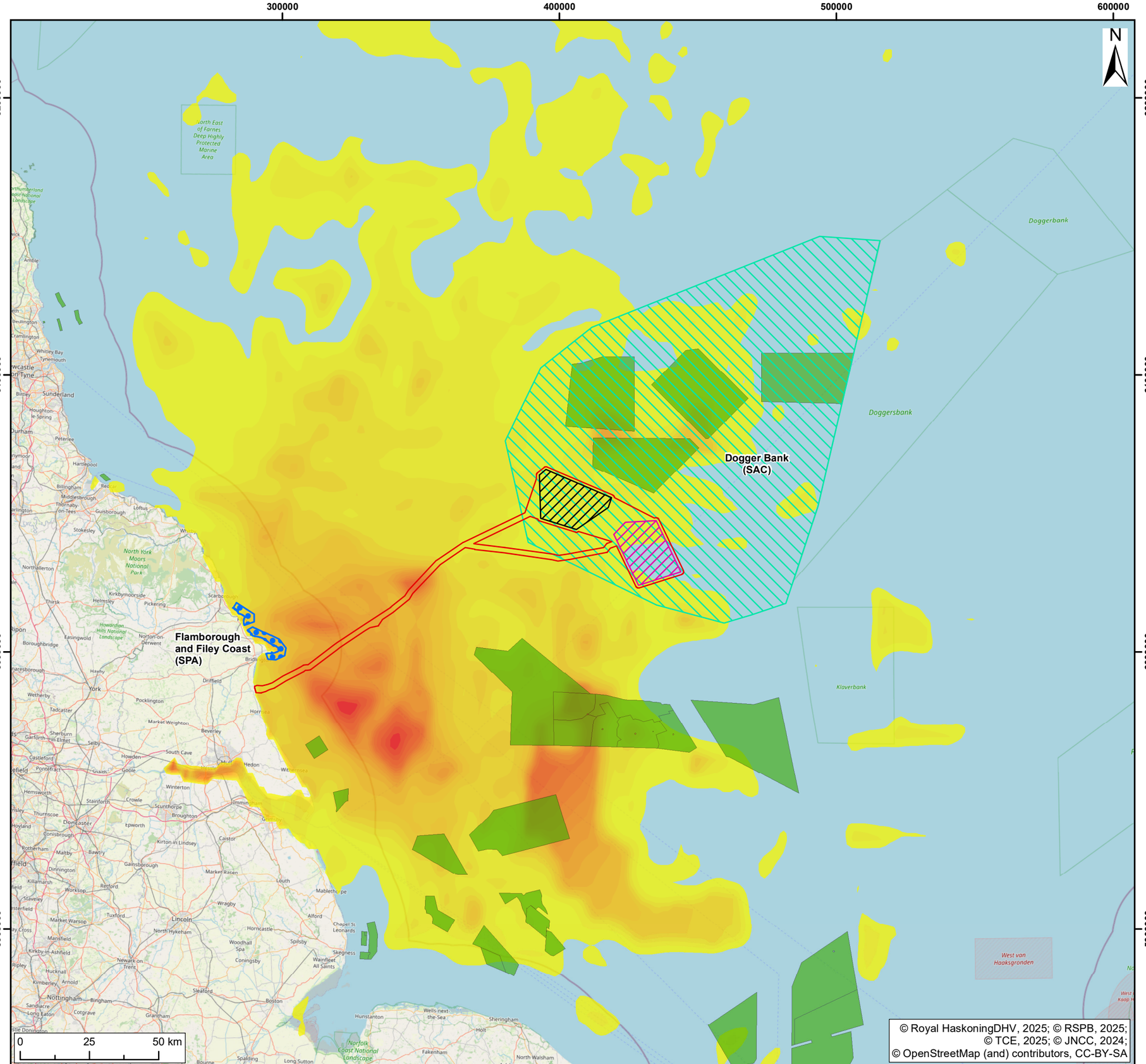

Legend:

- Offshore Development Area
- DBS East Array Area
- DBS West Array Area
- Special Areas of Conservation (SAC)
- Special Protection Area (SPA)
- Offshore Wind Farm Site

Kittiwake Utilisation Distribution

- 0.05
- 0.06 - 0.10
- 0.11 - 0.15
- 0.16 - 0.20
- 0.21 - 0.25
- 0.26 - 0.30
- 0.31 - 0.35
- 0.36 - 0.40
- 0.41 - 0.45
- 0.46 - 0.50
- 0.51 - 0.55
- 0.56 - 0.60
- 0.61 - 0.65
- 0.66 - 0.70
- 0.71 - 0.75
- 0.76 - 0.80
- 0.81 - 0.85
- 0.86 - 0.90
- 0.91 - 0.95

S2	P01	12/06/2025	Suitable for information	FC	SM	PP
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Kittiwake Hotspots at-sea Utilisation

Figure: 3-6

Drawing No: PC2340-RHD-OF-ZZ-DR-Z-1085

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:1,400,000

Project: Dogger Bank South Offshore Wind Farms

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27. To provide examples for the key species of concern we can make a rough estimate for the potential foraging areas of species based upon their mean max foraging range (+1 standard deviation) (calculated in GIS per the figures above)

    - Razorbill foraging area 52,477km²
    - Guillemot – foraging area 46,892km²
    - Kittiwake – foraging area 160,650km²

28. The approximate worst-case habitat loss within the Array Areas is 1.82km² (see **RIAA HRA Part 2 of 4 – Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014] for further information). In relation to the wider foraging habitat available within these species foraging ranges, this area of habitat loss represents a negligible loss of foraging habitat. Even if habitat loss is considered to include disturbance within the Array Areas (as per Natural England's advice) then this -is 25km², still negligible in relation to the wider foraging areas which cover 46,892-160,650km².

29. While the foraging ranges of these species would overlap with the Offshore Export Cable Corridor, as construction activities will be a transient activity occupying a minimal spatial extent at any one time, any disturbance within foraging areas would be spatially and temporally limited. Habitat loss associated with the cable protection measures for the Offshore Export Cables will be minimal (approximate worst-case of 0.89km²) in the context of the overall foraging habitat available in the wider North Sea to seabirds.

30. From these examples it can be seen that the potential habitat loss (even if entirely within the foraging areas for key species) is a small percentage of the available foraging area (notwithstanding that some discrete areas within the foraging range will be preferred to others).

31. Sections 4 - 7 present further information on the assessment undertaken, with information on the distribution of two key prey species, sandeel and herring, provided in sections 7.1 and 7.2 respectively.

4 Impact assessment of supporting features

32. **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and **Chapter 10 Fish and Shellfish** [APP-091] assess impacts on the benthos and fish and shellfish. Both of these chapters refer back to **Chapter 8 Marine Physical Environment** [APP-080] which provides the basis of understanding of physical disturbance (including sediment deposition and smothering), increased suspended sediment concentrations (SSCs) and changes to physical processes due to the presence of infrastructure.

4.1 Benthic and Intertidal Ecology

4.1.1 Existing Environment

33. Section 9-5 of **Chapter 9 Benthic and Intertidal Ecology** [APP-085] details the receptors identified within the Projects' study area. In summary, during subtidal site specific surveys, six biotopes and one habitat are identified within the Offshore Development Area. These biotopes include some species such as shellfish that may be prey for some birds.

4.1.2 Environmental Assessment

34. **Chapter 9 Benthic and Intertidal Ecology** [APP-085] assessed the potential impacts of the Projects during the construction, operation and maintenance, and decommissioning on benthic and intertidal ecology that could be directly / indirectly affected by the Projects. Section 4.2 of **Project Change Request 1 – Offshore and Intertidal Works** [AS-141] provides detail regarding the proposed changes to the Benthic and Intertidal Ecology assessment (noting that although footprints of impacts were reduced there were no changes to conclusions on significance of effect) following acceptance of Project Change Request 1 into Examination.

4.1.2.1 Summary of Potential Likely Significant Effects

35. **Table 3-2** summarises the impact assessment as presented in Table 9-27 of **Chapter 9 Benthic and Intertidal Ecology** [APP-085].

36. In terms of indirect impacts on predators the key impacts are temporary physical disturbance and permanent habitat loss which reduce the area available (temporarily or permanently) for foraging and also the extent of habitat for species which form prey. However, these footprints represent a very small proportion of the foraging habitat available. Therefore, the significance of effect is assessed as minor adverse, not significant in EIA terms.

Table 4-1 Summary of the Potential Likely Significant Effect of Permanent Habitat Loss from the Projects on Benthic and Intertidal Ecology.

Impact	Sensitivity	Magnitude	Residual Significant Effect
Construction			
Temporary physical disturbance	Low - High	Negligible	Minor Adverse
Increased suspended sediment concentrations (including sediment deposition and smothering)	Not Sensitive - Medium	Minor Adverse	Minor Adverse
Remobilisation of Contaminated Sediments	Low	Negligible	Negligible
Underwater noise and vibration	Negligible	Negligible	Negligible
Operation			
Temporary physical disturbance	Low - High	Negligible	Minor Adverse
Increased suspended sediment concentrations (including sediment deposition and smothering)	Not Sensitive - Medium	Negligible	Minor Adverse
Permanent habitat loss	High	Negligible	Minor Adverse
Interactions of Electromagnetic Field (EMF)	Negligible	Negligible	Negligible
Colonisation of introduced substrate, including non-native species	High	Negligible	Minor Adverse
Decommissioning			
Temporary physical disturbance	Low - High	Negligible	Minor Adverse
Increased suspended sediment concentrations (including sediment deposition and smothering)	Not Sensitive - Medium	Minor Adverse	Minor Adverse
Remobilisation of Contaminated Sediments	Low	Negligible	Negligible
Underwater noise and vibration	Negligible	Negligible	Negligible

4.2 Fish and Shellfish

4.2.1 Existing Environment

37. As in section 10.5.3 of **Chapter 10 Fish and Shellfish** [APP-091], the fish and shellfish species identified as having a likely presence within the Fish and Shellfish Ecology Study Area can be classified within one of five receptor groups. These receptor groups have been determined based on the similar biological and behavioural traits of the comprising species, resulting in similar or identical sensitivities to impacts identified within this assessment. The following receptor groups have therefore been utilised throughout the assessment of significance in section 10.6 of **Chapter 10 Fish and Shellfish** [APP-091]:

    - Elasmobranchs;
    - Demersal fish;
    - Pelagic fish;
    - Migratory fish; and
    - Shellfish.

38. The baseline information for each of these groups is presented in the following sections 10.5.3.1 to 10.5.3.5 of **Chapter 10 Fish and Shellfish** [APP-091]. Species considered within each of the receptor groups, alongside information on their biology and conservation status can be found in **Appendix 10-2 Fish and Shellfish Ecology Technical Appendix** [APP-094]. Figures 10-2 – 10-7 of **Chapter 10 Fish and Shellfish Ecology - Figure 10-1 to Figure 10-10** [APP-092] present the spawning and nursery areas in relation to the Offshore Development Area.

39. Due to the specificity of species and impacts associated with underwater noise, this impact is assessed using alternative receptor groups, as described within Popper *et al.* (2014):

    - Fish with a swim bladder used in hearing;
    - Fish with a swim bladder not used in hearing;
    - Fish without a swim bladder; and
    - Fish eggs and larvae.

40. The above receptor groups are listed in order of decreasing sensitivity to underwater noise. It is important to note that sandeel, which are considered an important prey item for many species, do not have a swim bladder and are therefore not considered sensitive to underwater noise effects. Further detail can be found in section 10.5.3 of **Chapter 10 Fish and Shellfish** [APP-091].

4.2.2 Environmental Assessment

41. **Chapter 10 Fish and Shellfish Ecology** [APP-091] assesses the potential environmental impacts that the Projects may have upon fish and shellfish. Section 4.3 of **Project Change Request 1 – Offshore and Intertidal Works** [AS-141] and **Appendix A – Fish and Shellfish Ecology Environmental Statement Update** [AS-142] provides detail regarding the proposed changes to the fish and shellfish ecology assessment (noting that although footprints of impacts were reduced, in particular from the removal of the Electrical Switching Platform (ESP) from the Projects' Design Envelope, there were no changes to conclusions on significance of effect) following the acceptance of Project Change Request 1 into Examination.

42. The sensitivity in the assessment for fish is largely based upon their biological / ecological sensitivity to an effect, with consideration of whether these are commercially or ecologically important species where relevant. Magnitude of effect is difficult to quantify given the lack of precise definition of what constitutes an important area of fish species (i.e. spawning and nursery grounds) and the fact that many species are mobile. However, it is clear from looking at the areas presented in Figures 10-2 – 10-7 of **Chapter 10 Fish and Shellfish Ecology - Figure 10-1 to Figure 10-10** [APP-092] that the impact of the spatial footprints of the Projects will be negligible or low.

43. Natural England has questioned whether prey species should be considered as high value and high sensitivity and therefore whether the EIA has underestimated the significance of effect. However, given the negligible or low magnitude of impacts there would be no change to the assessment conclusions if the sensitivity was increased.

44. It should also be noted that in the context of the EIA, the boundaries of designated sites are not relevant and if used are only there to provide a geographic reference. In addition, the presence of sandeel (or any other prey species) is not relevant to the boundaries of the SAC which was designated on the basis of bathymetry and benthic communities.

4.2.2.1 Summary of Potential Likely Significant Effects

45. **Table 2-1** summarises the summarises the impact assessment as presented in Table 10-35 of **Chapter 10 Fish and Shellfish Ecology** [APP-091] and Table 4-4 of **Project Change Request 1 – Offshore and Intertidal Works** [AS-141].

Table 4-2 Summary of Potential Likely Significant Effects on Fish and Shellfish Ecology (see Table 10-35 of Chapter 10 Fish and Shellfish Ecology [APP-091])

Impact	Sensitivity	Magnitude	Residual Significant Effect
Construction			
Temporary Habitat Disturbance to Fish and Shellfish Species and Spawning and / or Nursery Grounds	Low – Medium	Negligible	Negligible – Minor Adverse
Increase in local suspended sediment concentrations and sediment settlement.	Negligible – Medium	Low	Negligible – Minor Adverse
Release of sequestered contaminants following sediment disturbance.	Low	Negligible	Negligible
Impacts on fish and shellfish species as a result of noise and vibration.	Low – Medium	Low	Minor Adverse
Effect on Fish Stocks of Reduced Fishing Pressure Within the Array Areas and Increased Fishing Pressure Outside of the Array Area	Low	Low	Minor Adverse
Operation			
Temporary Habitat Disturbance to Fish and Shellfish Species and Spawning and / or Nursery Grounds	Low – Medium	Negligible	Negligible – Minor Adverse
Increase in local suspended sediment concentrations and sediment settlement.	Negligible – Medium	Low	Negligible – Minor Adverse
Release of sequestered contaminants following sediment disturbance.	Low	Negligible	Negligible
Impacts on fish and shellfish species as a result of noise and vibration.	Low – Medium	Low	Minor Adverse
Effect on Fish Stocks of Reduced Fishing Pressure Within the Array Areas and Increased Fishing Pressure Outside of the Array Area	Low	Low	Minor Adverse
Permanent loss of habitat and / or change in habitat type as a result of changes in substrate composition	Negligible – Medium	Low	Negligible – Minor Adverse

Impact	Sensitivity	Magnitude	Residual Significant Effect
EMF effects arising from cables.	Negligible – Medium	Negligible	Negligible – Minor Adverse
Decommissioning			
Temporary Habitat Disturbance to Fish and Shellfish Species and Spawning and / or Nursery Grounds	Low – Medium	Negligible	Negligible – Minor Adverse
Increase in local suspended sediment concentrations and sediment settlement.	Negligible – Medium	Low	Negligible – Minor Adverse
Release of sequestered contaminants following sediment disturbance	Low	Negligible	Negligible
Impacts on fish and shellfish species as a result of noise and vibration.	Medium	Negligible	Minor Adverse

5 Impacts upon Predators

5.1 Marine Mammals

5.1.1 Environmental Assessment

46. **Chapter 11 Marine Mammals** [APP-095] assesses the potential environmental impacts that the Projects may have upon marine mammals. Section 4.4 of **Project Change Request 1 – Offshore and Intertidal Works** [AS-141] and **Appendix B – Marine Mammal Environmental Statement Update** [AS-143] provides detail regarding the proposed changes to the marine mammal assessment as a result of Project Change Request 1.

47. The methodology for the consideration of changes to prey (during construction, operation, and decommissioning) is to identify which impact pathways affect prey, and use the assessed impacts from **Chapter 10 Fish and Shellfish** [APP-091] to determine the magnitude of effect. The significance of impact is then determined on a species by species basis for marine mammals based upon their sensitivity.

5.1.1.1 Magnitude of impact

48. Section 11.6.1.7 and section 11.6.2 **Chapter 11 Marine Mammals** [APP-095] identify the relevant impacts upon prey for construction and operation respectively. Section 11.6.3 of Chapter 11 Marine Mammals [APP-095] details the potential effects during decommissioning. However, the potential effects during decommissioning would be expected to be the same or less than those assessed for construction.

49. The magnitude of impact on marine mammal species is based on the magnitude of impact to prey species, although it should be noted that this is a precautionary approach as marine mammals are generally opportunistic foragers, and would be able to prey upon a range of other species. Each impact is discussed in turn in section 11.6.1.7 and section 11.6.2 of **Chapter 11 Marine Mammals** [APP-095] and conclusion made on the magnitude with respect to marine mammals. **Table 4-1** summarises the magnitude of impact for construction and **Table 4-3** summarises the magnitude of impact for operation. These tables originally appear in **Chapter 11 Marine Mammals** [APP-095] as Table 11-87 and Table 11-106 respectively.

Table 5-1 Magnitude of Potential Changes to Prey Resources During Construction, Based on Assessments in Chapter 10 Fish and Shellfish Ecology [APP-091] as presented in Table 11-87 of in Chapter 11 Marine Mammals [APP-095].

Potential effect to prey resources		Magnitude as assessed in Chapter 10
Physical disturbance and temporary habitat loss		Low (overall significance of effect of minor to negligible)
Increased suspended sediment concentrations and sediment deposition		Low (overall significance of effect of minor to negligible).
Re-mobilisation of contaminated sediment		Negligible (overall significance of effect of negligible).
Underwater noise	Piling noise	Negligible to low (overall significance of negligible), or for fish and shellfish with a swim bladder used in hearing, an overall significance of effect of minor (with an increased sensitivity).
	Other construction activities	Low (overall significance of effect of negligible).
	UXO clearance	Low (overall significance of effect of minor).
Changes in fishing activity		Low (overall significance of effect of negligible).

Table 5-2 Magnitude of Potential Changes to Prey Resources During Operation, Based on Assessments in Chapter 10 Fish and Shellfish Ecology [APP-091] as presented in Table 11-106 in Chapter 11 Marine Mammals [APP-095].

Potential effect to prey changes	Magnitude as assessed in Chapter 10 Fish and Shellfish
Long-term habitat loss	Low (effect significance of negligible to minor adverse)
Temporary habitat disturbance	Low (effect significance of n negligible to minor adverse)
Increased suspended sediment concentrations and sediment deposition	Low (effect significance of negligible to minor adverse)
Re-mobilisation of contaminated sediment	Negligible (effect significance of negligible)
Underwater noise and vibration	Low (effect significance of minor adverse)
Electromagnetic fields	Negligible (effect significance of negligible)

Potential effect to prey changes	Magnitude as assessed in Chapter 10 Fish and Shellfish
Changes in fishing activity	Low (effect significance of negligible)

5.1.1.2 Sensitivity of Receptor

50. Following the determination of magnitude, each impact is assessed on a species by species basis for marine mammals, using the sensitivity of each species. The text below is reproduced from section 11.6.1.7.7 of **Chapter 11 Marine Mammals** [APP-095] and this provides the basis of the sensitivity assessment for construction and operation (and decommissioning).

> *As outlined in **Appendix 11-2 Marine Mammal Information Report** [APP-098], the diet of harbour porpoise consists of a wide variety of prey species and varies geographically and seasonally, reflecting changes in available food resources. Harbour porpoise have relatively high daily energy demands and need to capture enough prey to meet daily energy requirements. It has been estimated that, depending on the environmental conditions, harbour porpoise can rely on stored energy (primarily blubber) for three to five days, depending on body condition (Kastelein et al. 1997). Harbour porpoise are therefore considered to have low to medium sensitivity to changes on prey resources.*
>
> *Dolphin species, including bottlenose dolphin, common dolphin and white-beaked dolphin have a broad diet, feeding on a wide range of prey species. All dolphin species are considered to have large foraging ranges, and a broad range of prey species, and are therefore considered to have low sensitivity to changes in prey resources.*
>
> *Minke whale feed on a variety of prey species, but in some areas, they have been found to prey upon specific species. Therefore, minke whale are considered to have a low to medium sensitivity to changes in prey resource.*
>
> *Grey seal are opportunistic feeders, preying on a variety of species, dominated by sandeel. Within the southern North Sea, diet is more varied in composition where grey seals also prey on flat fish, sandy benthic, large gadid prey and scorpion fish (the latter mainly during autumn/winter) (Wilson and Hammond 2019).*
>
> *Harbour seals are considered generalist feeders, and feed on a variety of species, e.g. large gadid prey (Wilson and Hammond 2019).*
>
> *Both grey and harbour seals are able to forage in other areas and have relatively large foraging ranges. Grey seal and harbour seal are therefore considered to have low sensitivity to changes in prey resources.*
>
> *Further information on the diet of marine mammal species is provided in **Appendix 11-2 Marine Mammal Information Report** [APP-098].*

5.1.1.3 Significance of Effect

51. Taking into account the low to medium marine mammal sensitivity, and the potential magnitude of impact of negligible to low (**Table 4-2**) for all fish species, the significance for any effect of the changes of prey for marine mammals has been assessed as **negligible** to **minor adverse** for harbour porpoise, minke whale, grey seal and harbour seal and **negligible adverse** (not significant in EIA terms) for bottlenose dolphin, common dolphin and white-beaked dolphin (**Table 4-2**).

Table 5-3 Assessment of Significance of Effect for the Potential of an Indirect Effect to Marine Mammals Through Changes to Prey Resources During Construction

Potential effect	Marine mammal species	Sensitivity	Magnitude of impact	Significance of effect
Physical disturbance and temporary habitat loss	Harbour porpoise and minke whale	Low to medium	Low	Negligible to Minor adverse
	Bottlenose dolphin, common dolphin, white-beaked dolphin, grey seal and harbour seal	Low		Negligible adverse
Increased suspended sediments and sediment deposition	Harbour porpoise and minke whale	Low to medium	Low	Negligible to Minor adverse
	Bottlenose dolphin, common dolphin, white-beaked dolphin, grey seal and harbour seal	Low		Negligible adverse
Re-mobilisation of contaminated sediment	Harbour porpoise and minke whale	Low to medium	Negligible	Negligible to Minor adverse
	Bottlenose dolphin, common dolphin, white-beaked dolphin, grey seal and harbour seal	Low		Negligible adverse
Underwater noise	Harbour porpoise and minke whale	Low to medium	Negligible to low	Negligible to Minor adverse
	Bottlenose dolphin, common dolphin, white-beaked dolphin, grey seal and harbour seal	Low		Negligible to Minor adverse

Potential effect	Marine mammal species	Sensitivity	Magnitude of impact	Significance of effect
Change in fishing activity	Harbour porpoise and minke whale	Low to medium	Low	Negligible to Minor adverse
	Bottlenose dolphin, common dolphin, white-beaked dolphin, grey seal and harbour seal	Low		Negligible adverse

Table 5-4 Assessment of Significance of Effect for the Potential of an Indirect Effect to Marine Mammals Through Changes to Prey Resources During Operation and Maintenance

Potential effect	Marine mammal species	Sensitivity	Magnitude of impact	Significance of effect
Long-term habitat loss Temporary habitat disturbance	Harbour porpoise, minke whale, grey seal and harbour seal	Low to medium	Low	Minor adverse
	Bottlenose dolphin, common dolphin and white-beaked dolphin	Low		Minor adverse
Increased suspended sediment concentrations and sediment deposition	Harbour porpoise, minke whale, grey seal and harbour seal	Low to medium	Low	Minor adverse
	Bottlenose dolphin, common dolphin and white-beaked dolphin	Low		Minor adverse
Re-mobilisation of contaminated sediment	Harbour porpoise, minke whale, grey seal and harbour seal	Low to medium	Negligible	Negligible to Minor adverse
	Bottlenose dolphin, common dolphin and white-beaked dolphin	Low		Negligible adverse
Underwater noise and vibration	Harbour porpoise, minke whale, grey seal and harbour seal	Low to medium	Low	Minor adverse

Potential effect	Marine mammal species	Sensitivity	Magnitude of impact	Significance of effect
	Bottlenose dolphin, common dolphin and white-beaked dolphin	Low		Minor adverse
Electromagnetic fields	Harbour porpoise, minke whale, grey seal and harbour seal	Low to medium	Negligible	Negligible to Minor adverse
	Bottlenose dolphin, common dolphin and white-beaked dolphin	Low		Negligible adverse
Changes in fishing activity	Harbour porpoise, minke whale, grey seal and harbour seal	Low to medium	Low	Minor adverse
	Bottlenose dolphin, common dolphin and white-beaked dolphin	Low		Minor adverse

5.1.2 Summary of Potential Likely Significant Effect of Impact

52. Indirect effects to predators such as marine mammals due to changes to prey have been assessed in sections 11.6.1.7 and 11.6.2.6 of **Chapter 11 Marine Mammals** [APP-095] and presented in section 5.1.1 of this document. Due to the wide foraging ranges and varied diets of marine mammals, and the small footprint of effect on prey the significance was assessed as negligible or minor adverse, therefore Not Significant in EIA terms.

53. **Table 4-5** summarises the effect of changes to prey resources from the Projects during different phases of the Projects. The full list of all impacts assessed (i.e. not just indirect effects) is presented in Table 11-142 of **Chapter 11 Marine Mammals** [APP-095] and Table 4-5 of **Project Change Request 1 – Offshore and Intertidal Works** [AS-141].

Table 5-5 Summary of the Potential Likely Significant Effect of Changes to Prey Resource from the Projects on Marine Mammals.

Changes to prey resources during:	Receptor	Sensitivity	Magnitude	Residual Significant Effect
Construction	Bottlenose dolphin, common dolphin and white-beaked dolphin, harbour seal and grey seal	Low	Negligible to low	Negligible to minor adverse
	Harbour porpoise and minke whale	Low to medium		
Operation	Bottlenose dolphin, common dolphin and white-beaked dolphin	Low		
	Harbour porpoise minke whale, harbour seal and grey seal	Low to Medium		
Decommissioning	All marine mammal species	Low to Medium		To be determined prior to decommissioning

5.2 Offshore Ornithology

5.2.1 Environmental Assessment

5.2.1.1 Impacts

54. The following impacts with regards to indirect effects were assessed in **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032]:

- Underwater noise;
- Changes to the seabed;
- Changes to suspended sediment levels;
- Colonisation of introduced substrate;
- Changes to fishing activity; and
- EMF.

55. The original assessment text as detailed in sections 12.7.2, 12.8.2 and 12.9.2 of **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] is presented in the following sections.

56. It should be noted that where birds are subject to displacement effects (such as razorbill, guillemot and potentially gannet), the mortality from this is assumed to result from a reduction in access to prey. So, in this case, consideration of any indirect effects via effects on prey is double counting to some degree (e.g. the birds are already displaced from the Array Areas so effects on prey within these locations have no additional effect).

5.2.1.1.1 Indirect Impacts Through Effects on Habitats and Prey Species During Construction

57. *Indirect disturbance and displacement of birds may occur during the construction phase if there are impacts on prey species and the habitats of prey species. These indirect effects include those resulting from the production of underwater noise (e.g. during piling) and the generation of suspended sediments (e.g. during preparation of the seabed for foundations) that may alter the behaviour or availability of bird prey species. Underwater noise may cause fish and mobile invertebrates to avoid the construction area and also affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the construction area and may smother and hide immobile benthic prey. These mechanisms may result in less prey being available within the construction area to foraging seabirds. Such potential effects on benthic invertebrates and fish have been assessed in* ***Chapter 9 Benthic and Intertidal Ecology*** *[APP-085] and* ***Chapter 10 Fish and Shellfish Ecology*** *[APP-091] and the conclusions of those assessments inform this assessment of indirect effects on birds.*

*With regard to noise impacts on fish, **Chapter 10 Fish and Shellfish Ecology** [APP-091] discusses the potential impacts upon fish relevant to ornithology as prey species. For species such as herring, sprat and sandeel, which are the main prey items of seabirds such as gannet and auks, unmitigated underwater noise effects (physical injury or behavioural changes) during construction are considered to be minor adverse for herring (group 3, most sensitive species), sandeel and sprat (group 1, least sensitive species). With a minor effect on fish, it is concluded that the magnitude of effect on seabirds, for which the DBS Array Areas represent only a small part of their possible foraging range, will be negligible. Therefore, the indirect significance, even for high sensitivity seabirds, of impacts on fish during the construction phase is, at most, **minor adverse**. This conclusion applies irrespective of the alternative construction scenarios (one or two projects, constructed concurrently or sequentially).*

5.2.1.1.2 Indirect Impacts Through Effects on Habitats and Prey Species During Operation

Indirect disturbance and displacement of birds may occur during the operational phase of the Projects if there are impacts on prey species and the habitats of prey species. These indirect effects include those resulting from the production of underwater noise (e.g. the turning of the wind turbines), electro-magnetic fields (EMF) and the generation of suspended sediments (e.g. due to scour or maintenance activities) that may alter the behaviour or availability of bird prey species.

Underwater noise and EMF may cause fish and mobile invertebrates to avoid the operational area and also affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the operational area and may smother and hide immobile benthic prey. These mechanisms could result in less prey being available within the operational area to foraging seabirds. Changes in fish and invertebrate communities due to changes in presence of hard substrate (resulting in colonisation by epifauna) may also occur, and changes in fishing activity could influence the communities present.

*With regard to noise impacts on fish, **Chapter 10 Fish and Shellfish Ecology** [APP-091] discusses the potential impacts upon fish relevant to ornithology as prey species. With regard to behavioural changes related to underwater noise impacts on fish during the operation of the Projects, **Chapter 10 Fish and Shellfish Ecology** [APP-091] concludes that the effects on fish and shellfish species to operational noise is considered to be of minor adverse significance. With a non-significant effect on fish that are bird prey species, it is concluded that the indirect effects on seabirds occurring in or around the Array Areas and Offshore Export Cable Corridor during the operational phase would result in no more than low magnitude effects for species of no more than medium sensitivity and would thus result in effects of **minor adverse** significance. This would be the case irrespective of whether just one of DBS East or DBS West is built, or both.*

With regard to changes to the seabed and to suspended sediment levels, ***Chapter 9 Benthic and Intertidal Ecology*** *[APP-085] discusses the nature of any change and impact. It identifies that changes in physical processes and temporary habitat disturbance would be of negligible significance. With negligible effects on benthic habitats and species, it is concluded that the indirect impact on seabirds occurring in or around the Array Areas and Offshore Export Cable Corridor during the operational phase would result in no more than negligible magnitude effects for species of no more than medium sensitivity and would thus result in a* ***negligible*** *to* ***minor adverse*** *effect. This would be the case irrespective of whether just one of DBS East or DBS West is built, or both.*

With regard to EMF effects, these are identified as very localised (<10m; Gill et al. 2005) with the majority of cables being buried to up to 1m depth, further reducing the effect of EMF. The magnitude of impact is considered negligible on benthic communities, and so it is concluded that the indirect effect on seabirds occurring in or around the Array Areas and Offshore Export Cable Corridor during the operational phase would result in no more than negligible magnitude effects for species of no more than medium sensitivity and would thus result in a ***negligible*** *effect.*

Very little is known about potential long-term changes in invertebrate and fish communities due to colonisation of hard substrate and changes in fishing pressures associated with offshore wind farms. Whilst the impact of the colonisation of introduced hard substrate is seen as a minor adverse effect in terms of benthic ecology (as it is a change from the baseline conditions), the consequences for seabirds may be positive or negative locally (i.e. this may increase or decrease local prey abundance and availability) but are predicted to be of negligible magnitude and ***negligible*** *significance (either beneficially or adversely) in EIA terms.*

With regard to changes to the seabed and to suspended sediment levels, ***Chapter 8 Marine Physical Environment*** *[APP-080] and* ***Chapter 9 Benthic and Intertidal Ecology*** *[APP-085] discusses the nature of any likely significant effects on the seabed and benthic habitats. The impact on benthic habitats is predicted to be of local spatial extent (i.e. restricted to discrete areas within the Array Areas in the vicinity of the construction location), short-term duration (as it is limited to the duration of construction activities), intermittent and with high reversibility. The consequent indirect effect on benthic habitats is considered to be minor. With a minor effect on benthic habitats which support fish that are bird prey species, it is concluded that the magnitude of effect on seabirds, for which the DBS Array Areas represent only a small part of their possible foraging range, will be negligible. Therefore, the indirect significance, even for high sensitivity seabirds, of impacts on benthic habitats during the construction phase is, at most, minor adverse. This conclusion applies irrespective of the alternative construction scenarios (one or two Projects, constructed concurrently or sequentially).*

In addition to the above it should also be noted that where birds are subject to displacement effects, the mortality from this is assumed to result from a reduction in access to prey. So, in this case, consideration of any indirect effects via effects on prey is double counting to some degree (e.g. the birds are already displaced from the Array Areas so effects on prey within these locations have no additional effect).

5.2.1.1.3 Indirect Impacts Through Effects on Habitats and Prey Species During Decommissioning

Indirect impacts such as displacement of seabird prey species are likely to occur as structures are removed. Such activities have already been assessed for relevant bird species in the construction section above and have been found to be of negligible magnitude.

Any impacts generated during the decommissioning phase of the Projects are expected to be similar, but likely of reduced magnitude compared to those generated during the construction phase; therefore, the magnitude of impact is predicted to be negligible. The resultant effect on a range of species of low to high sensitivity to disturbance is of ***negligible*** *to* ***minor adverse*** *significance.*

5.2.1.2 Summary of Potential Likely Significant Effect of Impact

58. **Table 5-6** summarises the effect of indirect impacts through effects on habitats and prey species during different phases of the Projects. Due to the wide foraging ranges of birds and the small footprint of effect on prey the significance was assessed as negligible or minor adverse, therefore Not Significant in EIA terms. No mitigation measures were proposed. The full list of all impacts assessed (i.e. not just indirect effects) is presented in Table 12-97 of **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032].

Table 5-6 Summary of the Potential Likely Significant Effect of Indirect impacts through effects on habitats and prey species from the Projects on Seabirds.

Indirect impacts through effects on habitats and prey species during:	Sensitivity	Magnitude	Residual Significant Effect
Construction and Operation	Low	Negligible	Negligible
Decommissioning	Low-High	Negligible	Negligible – Minor Adverse

6 Plan Level Habitats Regulations Assessment

59. The Crown Estate undertook a Habitats Regulations Assessment of the Round 4 plan (The Crown Estate, 2022a). This followed a process of screening and then a two stage assessment process comprised of:

- Step 1: The 'Primary Assessment' "uses available evidence to establish which feature / pressure combinations can be assessed using a reasoned evaluation, and to identify those that require further consideration, including quantitative assessment where this is feasible."
- Step 2: The 'Secondary Assessment' "provides further evidence (qualitative and quantitative) required for the assessment of those feature/pressure combinations which the Primary Assessment identified as requiring further consideration."

6.1 Annex II Marine Mammals

60. Impacts upon prey are considered in the Plan Level HRA within the primary assessment (RIAA Appendix I Marine Mammal Array Assessment Part 2; The Crown Estate, 2022c) under the following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. The HRA states:

> *P1. Habitat loss/gain*
>
> *The effect of this habitat loss will be to reduce the area available for foraging and also the extent of habitat for species which form prey. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging habitat available.*
>
> *Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.*
>
> *Similar logic underpins the conclusion that habitat gain effects will be negligible. There could be some attraction of marine mammals to structures where these provide foraging opportunities, e.g. Russell et al. (2014) presented evidence of seal species foraging around offshore structures including wind turbines and Clausen et al. (2021) reported that despite the underwater noise associated with oil and gas platforms harbour porpoise are attracted to these structures due to the higher prey abundance in their vicinity. Although potentially beneficial, this is considered to be negligible in the context of the overall foraging ranges for species which range for tens to hundreds of kilometres.*

P2 Direct Physical Damage

Direct physical damage will not be significant in the context of the Protected Sites. Only one Protected Site, Southern North Sea SAC, overlaps with any Preferred Project. Direct physical damage to habitats will primarily be caused by cable installation in areas not subsequently covered by rock armour. An area of up to 10m around each export cable has been assumed to be subject to temporary disturbance but recovery of habitats and associated communities is expected.

Damage to physical habitats could affect prey species, or benthic communities upon which these are dependent. However, all marine mammal species forage widely within the marine environment and the predicted loss of habitat represents a very small proportion of the foraging habitat available.

Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.

P3 Indirect Physical Damage

The Habitats Assessment (Appendix J) notes that indirect physical damage cannot be quantified at present but some effects are expected. Based on evidence presented in Appendix J which suggests that such effects will be relatively localised and generally accounted for within areas attributed to habitat loss it is considered that the scale of effects will not be significant in the context of possible impacts upon supporting habitats for marine mammals.

Any impact on marine mammal features is, therefore, considered to be negligible at any meaningful population scale and would not make an appreciable difference to any in-combination impact.

61. None of these pressures was considered beyond the Primary Assessment.

6.2 Marine Ornithological Features

62. Impacts upon prey are also considered in the Plan Level HRA (RIAA Appendix H – Ornithology Array Assessment Part 2; The Crown Estate, 2022b) under the following pressures P1 Habitat Loss / Gain, P2 Direct Physical Damage and P3 Indirect Physical Damage. The HRA states:

P1. Habitat loss/gain / P2 Direct Physical Damage

Potential habitat directly damaged due to the construction of turbines and inter array cables is predicted to comprise no more than 0.14-0.21% of the proposed array area in each of the Preferred Projects.

The effect of this direct habitat damage is to potentially reduce the area available for foraging and also the extent of habitat for species which form prey.

All seabird species screened in forage widely within the marine environment and the predicted area of habitat damaged represents a very small proportion of the foraging habitat available.

Any impact is, therefore, considered to be negligible and would not make an appreciable difference to any in-combination impact."

P3 Indirect Physical Damage

Potential habitat indirectly damaged due to the construction of turbines and inter- array cables is predicted to comprise no more than 0.14-0.21% of the proposed array area in each of the Preferred Projects.

The effect of this indirect habitat damage is to potentially reduce the area available for foraging and also the extent of habitat for species which form prey. Whilst indirect effects have been screened using a 15 km buffer, marked change to seabed habitats from scour or suspended sediment deposition are expected to occur over a much smaller area. For example, post-construction monitoring was undertaken at Scroby Sands offshore wind farm and Cefas (2006) commented that the likely significant effects on sediment transport were probably limited to the order of 100m around each monopile (i.e. well within the buffer zone) and unlikely to combine cumulatively between monopiles.

All seabird species screened in forage widely within the marine environment and the predicted area of habitat damaged represents a very small proportion of the foraging habitat available.

Any impact is, therefore, considered to be negligible and would not make an appreciable difference to any in-combination impact.

63. None of these pressures were considered beyond the Primary Assessment.

6.3 Annex I Habitats

64. Annex I habitats are considered in the Plan Level HRA (RIAA Appendix J – Annex I Habitats Assessment; The Crown Estate, 2022d). Sandeel and prey are only mentioned once in relation to '*Ecological Function & Supporting Processes'* but not in detail and are not highlighted specifically within the assessment.

6.4 Conclusions of the Plan Level HRA

65. The Plan Level HRA was very clear in its consideration of indirect effects on birds and marine mammals from impact upon prey. These effects were only considered in the primary assessment at a high level and principally ruled out from further consideration (and therefore not result in adverse effect on integrity) on the basis of the scale of the effect in comparison to the foraging habitat available.

7 Report to Inform Appropriate Assessment

66. Notwithstanding the fact that the Plan Level HRA effectively screened out indirect effects on prey for birds and marine mammals, these effects were considered by the Applicants throughout the Report to Inform Appropriate Assessment (RIAA), in, **RIAA HRA Part 3 of 4 – Annex II Marine Mammals (Revision 3)** [REP5-009] and **RIAA HRA Part 4 of 4 – Marine Ornithological Features (Revision 4)** [document reference 6.1].

67. In addition, whilst the Plan Level HRA had not considered prey species within the assessment of Annex I habitat this was included by the Applicants in **RIAA Habitats Regulations Assessment (HRA) Part 2 of 4 Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014].

68. Consideration of prey within the project level assessment included the mapping of potential sandeel spawning areas (as a key prey species) in relation to the Dogger Bank SAC and the Southern North Sea SAC. This is presented in **Appendix B – Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050].

69. Sections 6.1- 6.3 below present the relevant text from each part of the RIAA with regards to potential indirect effects on prey species.

7.1 Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC

70. **Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] presents an overview of sandeel habitats across the two SACs (based upon modelling of the potential for habitat to be suitable for sandeel) considering impact footprints of the Projects in the context of the SACs and also the wider Southern North Sea across which ornithological and marine mammal features forage.

71. Section 1.2 of **Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] considers the importance of sandeel in the context of the designated sites.

72. In relation to Dogger Bank SAC:

> *Sandeel are not a Habitats Directive Annex II species and are not a qualifying feature of the Dogger Bank SAC, which is designated for the Annex I habitat Sandbanks which are slightly covered by sea water all the time. However, sandeel are listed as a characteristic species of the sandbank community, and the site has been identified as an important location for sandeel, which are a vital food source for seabirds and marine mammals (MMO, 2022). The presence of sandeel has been highlighted as indicating that Dogger Bank supports species of wider importance across the North Sea. Sandeel presence is, therefore, an important component of connectivity across the MPA network (JNCC, 2022).*
>
> *Sandeel could therefore be considered as indicators of the conservation objective of "maintaining or restoring, subject to natural change…the structure and function of the qualifying habitat of the site". However, it should be noted that the boundary of the SAC was defined based primarily on bathymetry, supported by infaunal/epifaunal community data (JNCC, 2011). Sandeel are reported within the site assessment document as being localised to the edges of the Dogger Bank (JNCC, 2011), but neither their distribution or habitat requirements were a consideration in the determination of the site boundary.*

73. In relation to the Southern North Sea SAC:

> *Sandeel are not a Habitats Directive Annex II species and are not a qualifying feature of the Southern North Sea SAC. However, the species has been identified, among a variety of other fish species, as prey for the qualifying feature of the SAC, harbour porpoise Phocoena phocoena (JNCC and Natural England, 2019). The ability of the site to support sandeel therefore could be considered as contributing to the conservation objectives of the site "…ensuring that…the condition of supporting habitat and processes, and the availability of prey is maintained".*
>
> *It should be noted however, that the site selection assessment based the boundary of the SAC on harbour porpoise density. The assessment acknowledged that the assumed habitat preference of harbour porpoise is based on good feeding opportunities and prey aggregations. However, it also stated that the features of the habitat that are the most important drivers of the association with prey are unknown, as are the main prey species of porpoise within the site (JNCC, 2017).*

74. Section 3.1 of **Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] provides the estimated footprints for the project alone

- Dogger Bank SAC[2]
  - Temporary disturbance to habitat equates to 0.23% of the medium and high potential sandeel habitat within the SAC

[2] Note that the figures presented in [APP-060] do not take into account the reduction in footprint as a result of the project change request and export cable bundling (now presented in the **RIAA HRA Part 2 of 4 Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014].

- Permanent loss of habitat equates to 0.018% of the medium and high potential sandeel habitat within the SAC.

- Southern North Sea SAC
  - Temporary disturbance to habitat equates to 0.08% of the medium and high potential sandeel habitat within the SAC
  - Permanent loss of habitat equates to 0.006% of the medium and high potential sandeel habitat within the SAC.

75. Section 3.2 provides the in-combination footprints:

- Dogger Bank SAC
  - Permanent loss of habitat equates to 0.16% of the medium and high potential sandeel habitat within the SAC (only permanent loss has been estimated as temporary effects during construction will not overlap in most cases)
- Southern North Sea SAC
  - The proportion of medium and high potential sandeel habitat in the SAC encompassed by offshore wind farm array areas are 12.43% and 16.54% respectively. Given the number of windfarms considered and the age/availability of information it is not possible to calculate precise footprints for habitat loss, however as per the Projects, the infrastructure footprint will be a small percentage of the total array area.

76. In the assessment, it is assumed that potential for sandeel equals presence, which is not necessarily the case. The worst-case footprint of impact (both for disturbance and habitat loss) is equated to the effect on habitat for sandeel (which may not actually be present) and therefore the estimates of impact footprint are considered to be adequately precautionary.

77. Updated sandeel heat mapping using the Reach *et al.* (2024) methodology is presented within the **Heat Mapping Report** [AS-105]. In addition, the Heat Mapping Report [AS-105] also presented updated heat mapping for herring using the Kyle-Henney *et al.* (2024) methodology. This mapping is presented below and in the case of sandeel the footprints presented above have been expressed using the Reach *et al.* (2024) methodology.

78. With regards to sandeel it is evident that both the Dogger Bank SAC (**Figure 7-1**) and the Southern North Sea SAC (**Figure 7-2**) are almost entirely composed of habitat with potential for sandeel spawning (trending to the 'higher' end of the Reach *et al.* (2024) scale. However, it is also evident that the more favourable habitat is not restricted to within either SAC, covering areas well beyond their boundaries.

79. With regard to Dogger Bank SAC there is some extent of the highest potential spawning habitat within the DBS West Array Area, but this is not as extensive as within Dogger Bank B (**Figure 7-1**). Note that given the updated methodology (see **Heat Mapping Report** [AS-105]) there are differences in the relative 'importance' of the different wind farms for sandeel compared with **Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050], which illustrates the difficulties with using models in this way to quantify effect (even when based on best available evidence).

Table 7-1 Total area in km² of potential habitat for sandeel within the Dogger Bank SAC and respective OWF array areas. Percentage of habitat type from within the SAC shown in brackets

	Area	Spawning Potential Area (km²) by category			
Site	(km²)	<0.05	0.05 - <0.1	0.1 – <0.25	>0.25
Dogger Bank SAC	**12331**	**979 (8%)**	**690 (56%)**	**3193 (26%)**	**1264 (10%)**
Dogger Bank South	704 (5.71%)	11 (1%)	596 (9%)	96 (3%)	0 (0%)
Dogger Bank A	515 (4.18%)	0 (0%)	512 (7%)	0 (0%)	3 (0.2%)
Dogger Bank B	599 ((4.86%)	219 (22%)	204 (3%)	145 (5%)	32 (2%)
Dogger Bank C & D	561 (4.55%)	47(5%)	239 (3%)	274 (9%)	0 (0%)
Sofia	593 (4.81%)	0 (0%)	530 (8%)	63 (2%)	0 0 (0%)

80. However, the sandeel potential mapping is undertaken, it remains the case that:

- The Array Areas account for about 5.7% of the Dogger Bank SAC area
- Within this there are varying degrees of suitability of the substrate for sandeel
- However, even assuming that the entirety of the Offshore Development Area is sandeel habitat only a small percentage of that will either be subject to permanent habitat loss (1.82km² / 0.015% of the SAC) or disturbance (25km² / 0.2%)
- Assuming that species subject to displacement (such as guillemot and razorbill) are already excluded, this means that the effects on other species (such as kittiwake or marine mammals) from impacted area for prey / spawning habitat is minimal.

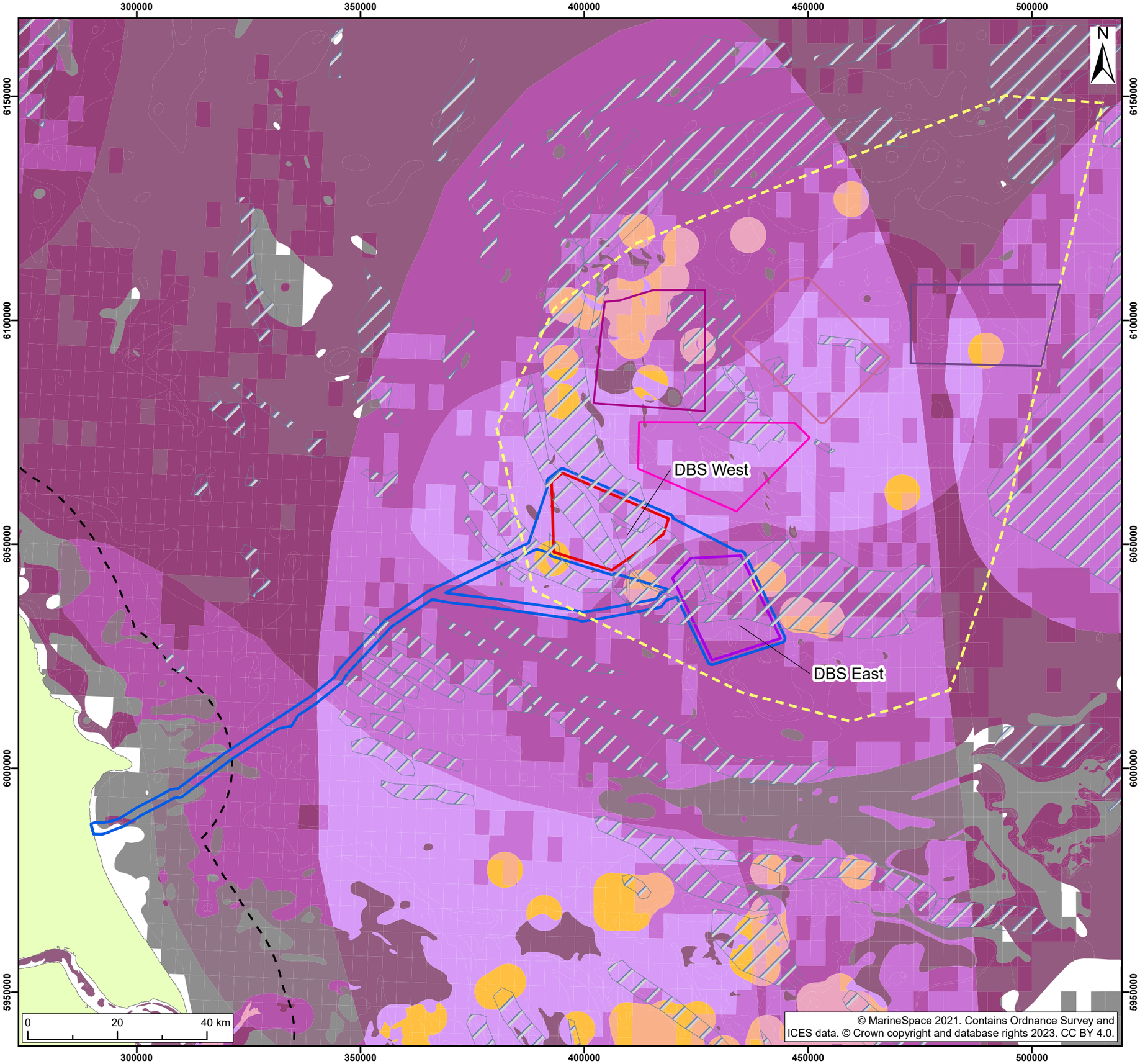
With regard to the Southern North Sea SAC a similar exercise can be undertaken:

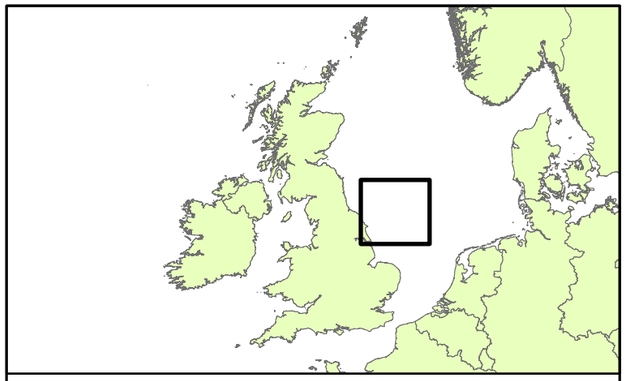
Table 7-2 Total area in km² of potential habitat for sandeel within the SNS SAC and respective OWF array areas. Percentage of habitat type from within the SAC shown in brackets

	Area	Spawning Potential Area (km²) by category			
Site	(km²)	<0.05	0.05 - <0.1	0.1 – <0.25	>0.25
SNS SAC	**36928**	3979 (11%)	13358 (36%)	15504 (42%)	3921 (11%)
Dogger Bank South	704 (1.9%)	11 (0.3%)	596 (4.5%)	96 (0.6%)	0 (0%)
All Other OWF	5292 (14.3%)	498 (12.5%)	2051 (15%)	2281 (15%)	462 (12%)

81. It remains the case that:

- The Array Areas account for about 1.9% of the Southern North Sea SAC area
- Within this there are varying degrees of suitability of the substrate for sandeel
- However, even assuming that the entirety of the Offshore Development Area is sandeel habitat, only a small percentage of that will either be subject to permanent habitat loss (1.82km² / 0.17% of the Offshore Development Area) or disturbance (40.3km² / 3.7% of the Offshore Development Area)
- Assuming that species subject to displacement (such as guillemot and razorbill) are already excluded, this means that the effects on other species (such as kittiwake or marine mammals) from impacted area for prey / spawning habitat is minimal.





Legend:

- DBS East Array Area
- DBS West Array Area
- Offshore Development Area

Windfarms within SAC

- Dogger Bank A
- Dogger Bank B
- Dogger Bank C & D
- Sofia
- Dogger Bank SAC
- Fishing grounds (DTU / ICES, 2022)
- UK 12nm limit

Confidence potential supporting habitat

- 0.01 - 0.02 - HIGHER
- 0.02 - 0.03
- 0.03 - 0.05
- 0.05 - 0.08
- 0.08 - 0.1
- 0.1 - 0.15
- 0.15 - 0.2
- 0.2 - 0.3
- 0.3 - 0.5
- 0.5 - 0.75 - LOWER

S2	P02	04/06/25	PB2340-MAR-OF-ZZ-DR-Z-XXXX	IW	OW	RM
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Sandeel Habitat Potential Across the Dogger Bank SAC

Figure: 7-1

Drawing No: PC2340-MAR-OF-ZZ-DR-Z-1091

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:850,000

Project: Dogger Bank South Offshore Wind Farms

Report: Dogger Bank South Offshore Wind Farms EIA

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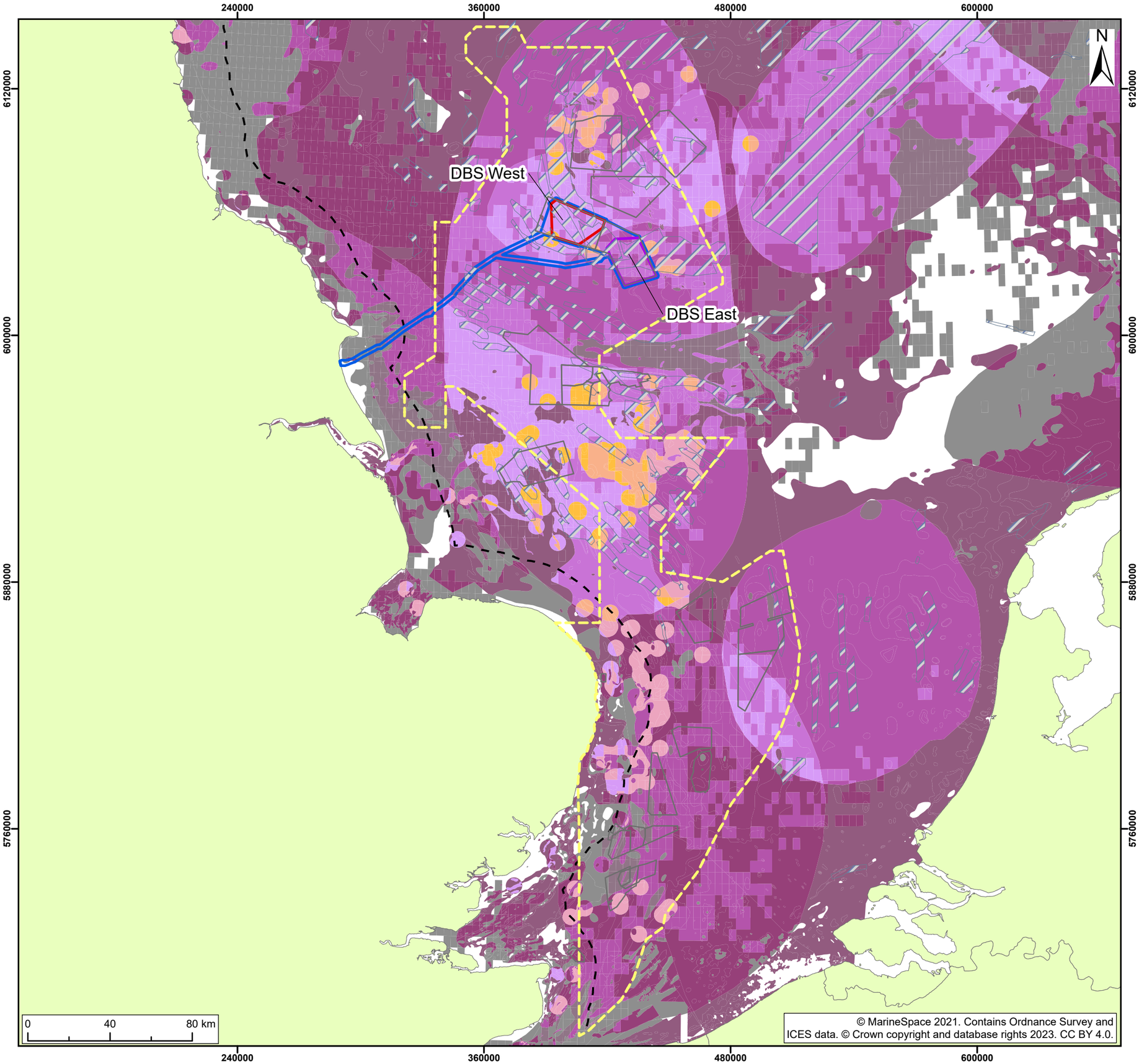

Legend:

- DBS East Array Area
- DBS West Array Area
- Offshore Development Area
- Southern North Sea SAC
- Fishing grounds (DTU / ICES, 2022)
- Windfarms within SAC
- UK 12nm limit

0.05 - 0.08
0.08 - 0.1
0.1 - 0.15
0.15 - 0.2
0.2 - 0.3
0.3 - 0.5
0.5 - 0.75 - LOWER

Confidence potential supporting habitat

0.01 - 0.02 - HIGHER
0.02 - 0.03
0.03 - 0.05

S2	P02	21/04/22	PB2340-MAR-OF-ZZ-DR-Z-XXXX	IW	OW	RM
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Sandeel Habitat Potential Across the Southern North Sea SAC

Figure: 7-2

Drawing No: PC2340-MAR-OF-ZZ-DR-Z-1092

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:1,850,000

Project: Dogger Bank South Offshore Wind Farms

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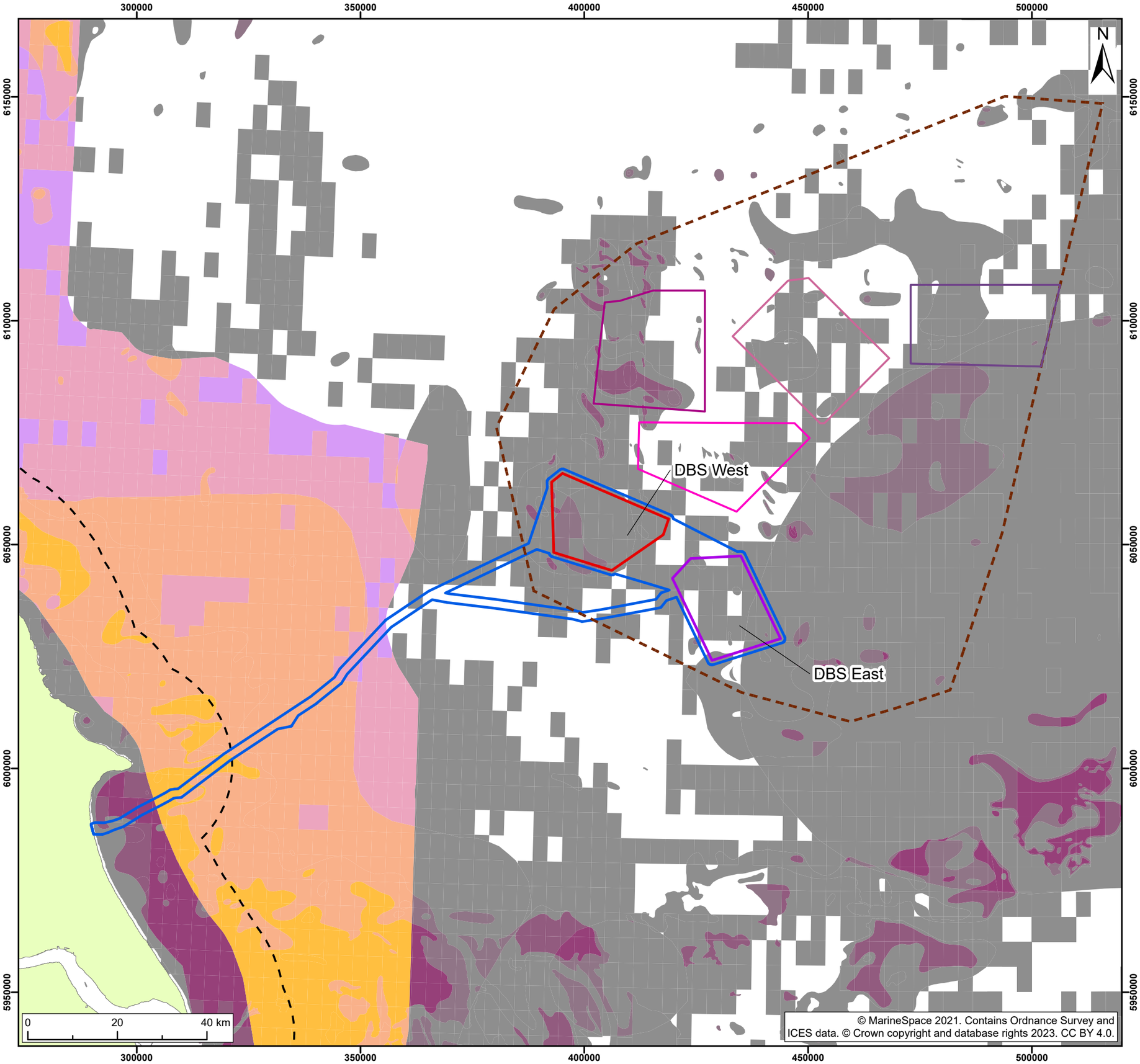
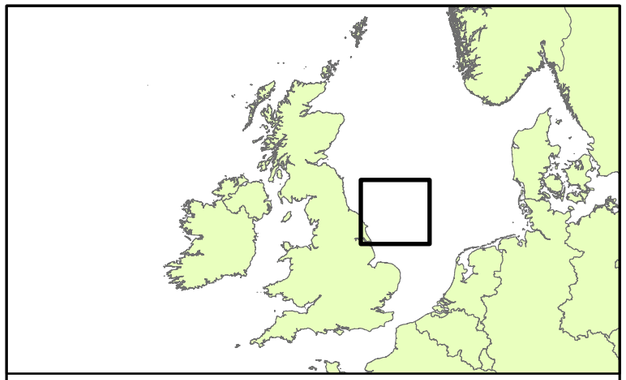
7.2 Herring Spawning

82. **Figure 7-3** and **Figure 7-4** present the herring spawning areas in relation to the two SACs using the Kyle-Henney *et al.* (2024) methodology recommended by Cefas. It can be seen that in contrast to the case of sandeel, the Array Areas and Dogger Bank SAC are not of high importance for herring spawning (**Figure 7-3**) whilst spawning areas are covered by the Southern North Sea SAC inshore of the Array Areas and in the Outer Thames region. The distribution pattern is the reason that the **RIAA Part 2 of 4 - Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014] and **Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] focus on sandeel when considering the Dogger Bank SAC as providing supporting functions for other non-Dogger Bank SAC features.

83. For herring the Applicants have not determined the footprint of the impacts within the Offshore Development Area that overlaps with herring spawning, given that this area will be a small subset of that area (and largely temporary during cable installation, with permanent effect restricted to areas of cable protection).

84. It should be noted, however, that the updated mapping does not materially change the original assessments presented in **RIAA Part 2 of 4 - Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014]. Whilst methods have been updated the conclusions remain valid, the footprint of the Projects in relation to available spawning habitat for both sandeel and herring across the wider North Sea is minimal.





Legend:

- DBS East Array Area
- DBS West Array Area
- Offshore Development Area
- UK 12nm limit
- Dogger Bank A
- Dogger Bank B
- Dogger Bank C & D
- Sofia
- Dogger Bank SAC

Confidence potential supporting habitat

- 0.03 - 0.04 - HIGHER
- 0.04 - 0.06
- 0.06 - 0.08
- 0.08 - 0.1
- 0.1 - 0.15
- 0.15 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.
- 0.5 - 0.75 - LOWER

S2	P02	04/06/25	PB2340-MAR-OF-ZZ-DR-Z-XXXX	IW	OW	RM
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Herring Habitat Potential Across the Dogger Bank SAC

Figure: 7-3

Drawing No: PC2340-MAR-OF-ZZ-DR-Z-1093

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:850,000

Project: Dogger Bank South Offshore Wind Farms

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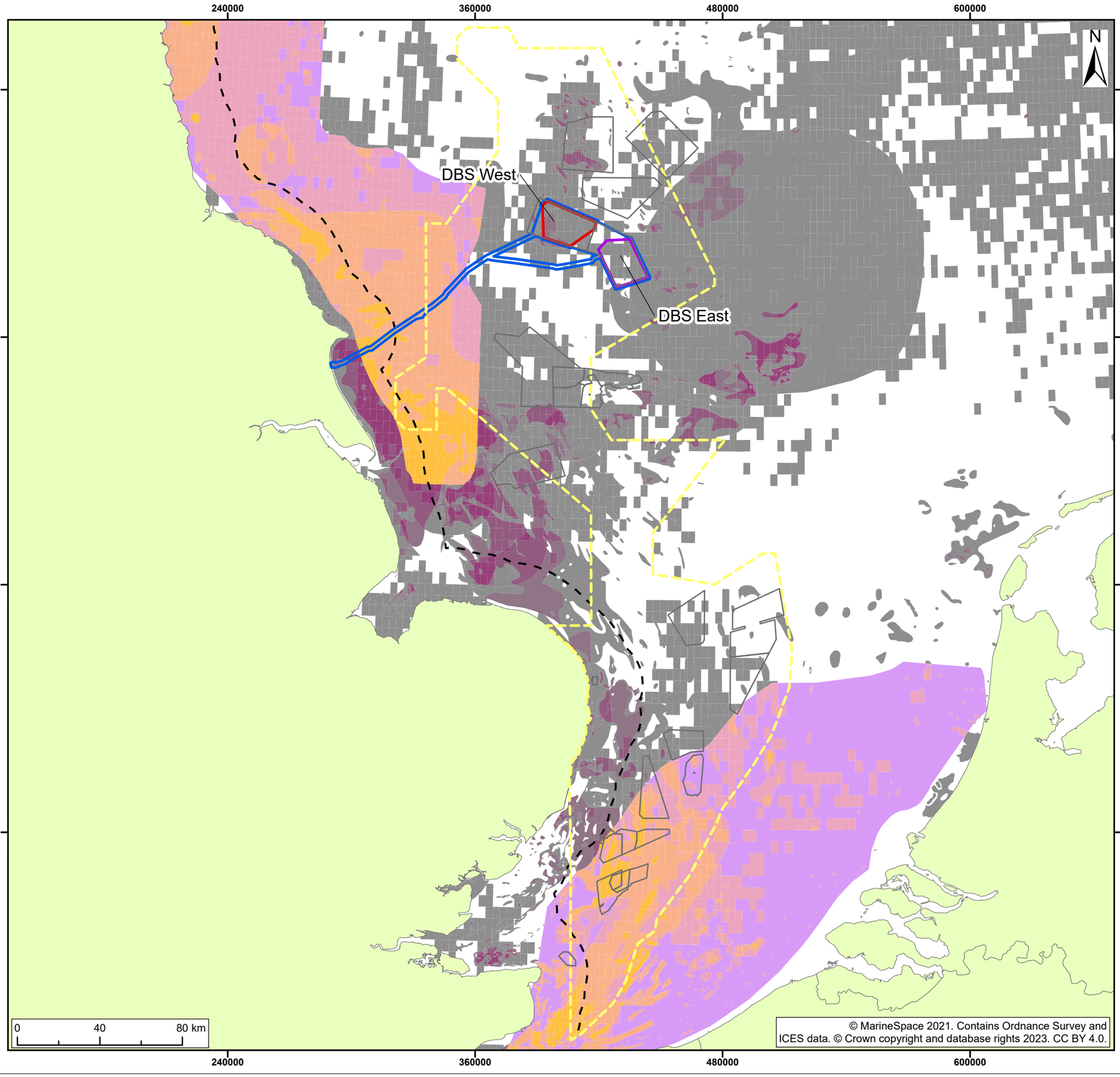

Legend:

- DBS East Array Area
- DBS West Array Area
- Offshore Development Area
- Southern North Sea SAC
- Windfarms within SAC
- UK 12nm limit

Confidence potential supporting habitat

- 0.03 - 0.04 - HIGHER
- 0.04 - 0.06
- 0.06 - 0.08
- 0.08 - 0.1
- 0.1 - 0.15
- 0.15 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.
- 0.5 - 0.75 - LOWER

SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR
S2	P02	21/04/22	PB2340-MAR-OF-ZZ-DR-Z-XXXX	IW	OW	RM

Title:

Herring Habitat Potential Across the Southern North Sea SAC

Figure: 7-4

Drawing No: PC2340-MAR-OF-ZZ-DR-Z-1094

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:1,850,000

Project: Dogger Bank South Offshore Wind Farms

Report: Dogger Bank South Offshore Wind Farms EIA

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85. It should be noted however that this updated sandeel heat mapping does not materially change the original mapping presented in **Chapter 10 Fish and Shellfish Ecology** [APP-091] or that used to inform the **RIAA Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] and **RIAA HRA Part 2 of 4 – Annex I Offshore Habitats and Annex II Migratory Fish** [REP4-014].

7.2.1 Dogger Bank SAC

86. Impacts to fish and shellfish are considered within **RIAA Habitats Regulations Assessment Part 2 of 4 - Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014]. Damage and impacts to fish and shellfish is assessed in sections 6.4.2.1.1 (for Project Alone, which covers DBS East and DBS West together) and 6.4.2.1.2 (in-combination with other projects).

87. Impacts upon fish and shellfish are included within the above sections in terms of damage, and also included for consideration with regard to changes in suspended sediments (sections 6.4.2.2.1 (project alone) and 6.4.2.1.2 (in-combination)); electromagnetic field (EMF) changes (sections 6.4.2.3.1 (project alone) and 6.4.2.3.2 (in-combination)); Hydrocarbon etc contamination (section 6.4.2.4.1 (project alone)); and physical change (sections 6.4.2.6.1 (project alone) and 6.4.2.5.2 (in-combination)).

88. These sections refer to assessments undertaken upon fish and shellfish within the **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and **Chapter 10 Fish and Shellfish Ecology** [APP-091] which place impacts in the wider context of the southern North Sea and refer to **RIAA Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] which presents figures of the areas of modelled suitability for the presence of sandeel within the context of the Dogger Bank SAC boundary.

89. In terms of footprints for the key impacts (i.e. abrasion / disturbance of the seabed and permanent habitat loss), the **RIAA HRA Part 2 of 4 – Annex I Offshore Habitats and Annex II Migratory Fish (Revision 4)** [REP4-014] states the following:

90. Paragraph 42:

> *The worst case for footprint activities that may result in abrasion / disturbance of the seabed will be during construction and are estimated to impact approximately 25km² within DBS East and DBS West combined, representing 0.2% of the area of the Dogger Bank SAC and 0.2% of the medium to high potential habitat for sandeel of the SAC. This disturbance would be episodic, associated with discrete locations across the Offshore Development Area at any one time and occur over the five-year duration of construction (assuming a worst case of concurrent construction), not as a single event.*

91. Paragraph 81:

> *The worst case area of habitat loss within the SAC from the presence of the Projects is estimated to be 1.82km² (see section 6.3.2). This area represents 0.015% of the Dogger Bank SAC's overall extent of 12,331km², and 0.015% of the medium to high potential habitat for sandeel of the SAC. As noted in section 6.3, the Applicants are committed to minimising the use of scour protection and external cable protection measures where possible. As such the final area of permanent habitat loss within the SAC is likely to be lower than that estimated as a worst case in this assessment.*

7.2.2 Summary

92. Section 7.2.1 signposts each of the impacts where prey species have been considered within the assessment of the effects upon the Dogger Bank SAC.

93. The assessment builds upon the assessments presented in **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and **Chapter 10 Fish and Shellfish Ecology** [APP-091] which place impacts in the wider context of the Southern North Sea and refer to **RIAA Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050]. All relevant impacts (changes in suspended sediments; EMF changes; Hydrocarbon etc contamination; and physical change) are considered for both Project alone and in-combination cases.

94. Fundamentally, the key factor in determining whether effects on prey could be a factor in the conclusion of Adverse Effect on Integrity (AEoI) rest on the footprints of those effects. Nonetheless, permanent habitat loss (physical change) is considered to give rise to Adverse Effect on Integrity of the Dogger Bank SAC.

7.3 Annex II Marine Mammals

7.3.1 Southern North Sea SAC

95. Impacts to fish and shellfish are considered within **RIAA HRA Part 3 of 4 Annex II Marine Mammals (Revision 3)** [REP5-009]. Impacts to fish and shellfish are assessed under the impact of 'Changes to Prey Resources' in section 8.3.5.2.9 and section 8.3.5.3.9 for the Projects alone (construction and operation & maintenance effects respectively) and in section 8.3.5.5.4 for the Projects in-combination with other plans and projects.

96. The following potential effects are assessed for the Projects alone:

- Construction effects:
  - Physical seabed disturbance - section 8.3.5.2.9.1;
  - Increased SSC and sediment re-deposition - section 8.3.5.2.9.2;
  - Remobilisation of contaminated sediments - section 8.3.5.2.9.3;
  - Underwater noise and vibration - section 8.3.5.2.9.4; and
  - Changes in fishing activity - section 8.3.5.2.9.5.
- Operation and maintenance effects:

- Permanent Habitat Loss - section 8.3.5.3.9.1;
- Temporary Habitat Loss, Physical Disturbance of The Seabed - section 8.3.5.3.9.2;
- Increased Suspended Sediment and Sediment Deposition - section 8.3.5.3.9.3;
- Underwater Noise - section 8.3.5.3.9.4;
- EMF - section 8.3.5.3.9.5; and
- Changes in Fishing Activity - section 8.3.5.3.9.6.

97. Potential in-combination impacts upon fish and shellfish are included wholly within section 8.3.5.5.4.

98. These assessments for harbour porpoise of the Southern North Sea SAC refer to assessments undertaken upon fish and shellfish within the **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and **Chapter 10 Fish and Shellfish Ecology** [APP-091] which place impacts in the wider context of the southern North Sea and refer to **RIAA Appendix B Sandeel Habitat Potential in the Dogger Bank SAC and Southern North Sea SAC** [APP-050] which presents figures of the areas of modelled suitability for the presence of sandeel within the context of the Southern North Sea SAC boundary. The worst-case footprints physical seabed disturbance and permanent habitat loss (for both the benthos and sandeel) are detailed in section 7.1.

99. The assessment is comprehensive and detailed and far exceeds the consideration of these effects within the primary assessment Plan Level HRA. Due to the wide foraging ranges of marine mammals and the small footprint of effect on prey it is concluded that 'Changes to Prey Resources' do not lead to an AEoI of the Southern North Sea SAC.

7.3.2 Other Annex II Marine Mammal Sites

100. Impacts to fish and shellfish are also considered in the assessments of the other sites Annex II Marine Mammal sites screened in for assessment in **RIAA HRA Part 3 of 4 Annex II Marine Mammals (Revision 3)** [REP5-009]:

- Humber Estuary SAC (grey seal):
  - Construction effects (Projects alone) – section 8.3.6.3.9;
  - Operation and maintenance effects (Projects alone) – section 8.3.6.4.9; and
  - In-combination effects – section 8.3.6.6.5.
- The Wash and North Norfolk Coast SAC (harbour seal):
  - Construction effects (Projects alone) – section 8.3.7.3.9;
  - Operation and maintenance effects (Projects alone) – section 8.3.7.4.9; and
  - In-combination effects – section 8.3.7.6.5.
- Berwickshire & North Northumberland Coast SAC (grey seal):
  - Construction effects (Projects alone) – section 8.3.8.3.9;
  - Operation and maintenance effects (Projects alone) – section 8.3.8.4.9; and
  - In-combination effects – section 8.3.8.6.5.
- Moray Firth SAC (bottlenose dolphin):

- Construction effects (Projects alone) – section 8.3.9.3.9;
- Operation and maintenance effects (Projects alone) – section 8.3.9.4.9; and
- In-combination effects – section 8.3.9.6.5.

101. These assessments are undertaken as per harbour porpoise described in section 7.3.1. These assessments considered the same list of potential effects as detailed in paragraph 72 above.

102. The assessment is comprehensive and detailed and far exceeds the consideration of these effects within the primary assessment Plan Level HRA. Due to the wide foraging ranges of marine mammals and the small footprint of effect on prey it is concluded that 'Changes to Prey Resources' do not lead to an AEoI of any of these SACs.

7.3.3 Summary

103. In summary, as detailed in sections 7.3.1 and 7.3.2 it was concluded that there would be no adverse effect on the integrity of any SAC assessed in **RIAA HRA Part 3 of 4 – Annex II Marine Mammals (Revision 3)** [REP5-009] in relation to the conservation objectives for Annex II marine mammals arising due to changes in prey resource, either on a Projects-alone or in-combination basis. All relevant impacts (physical seabed disturbance, permanent habitat loss, increased SSC and sediment re-deposition, remobilisation of contaminated sediments, underwater noise and vibration) changes, changes in fishing activity and EMF) are considered either on a Projects-alone or in-combination basis.

104. Fundamentally, the key factor in determining whether effects on prey could be a factor in the conclusion of adverse effect on integrity rest on the footprints of those effects in relation to the wider resource available. As per the ES conclusion for all fish receptors, the area of habitat affected is minimal when considered in the context of the amount of similar available habitat in the wider area (see Figures 10-2 – 10-7 of **Chapter 10 – Fish and Shellfish Ecology - Figure 10-1 to Figure 10-10** [APP-092).

105. The Applicants reiterate that all impacts on prey species during all phases of the Projects have been comprehensively assessed, in line with common industry best practice, and maintain that the effects on the marine mammals from all assessed SACs are minimal and do not lead to a conclusion AEoI for any site.

7.4 Marine Ornithological Features

106. Potential effects on prey species in relation are considered in the **RIAA HRA Part 4 of 4 – Marine Ornithological Features (Revision 4)** [document reference: 6.1].

107. The assessment is covered in section 9.2.30f **RIAA HRA Part 4 of 4 – Marine Ornithological Features (Revision 4)** [document reference: 6.1] and effects on prey considered are as per the EIA **Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032]:

- Underwater noise;
- Changes to the seabed;
- Changes to suspended sediment levels;

- Colonisation of introduced substrate;
- Changes to fishing activity; and
- EMF.

108. The assessment is brief and considered proportionate given that there is no way to quantify effects on a site by site basis and that the conclusions are the same for all sites and features. Given the length the assessment is reproduced from section 9.1.3 in full below:

> *Indirect disturbance and displacement of birds may occur during the construction stage if there are impacts on prey species and the habitats of prey species. These indirect effects include those resulting from the production of underwater noise (e.g. during piling), temporary habitat loss and disturbance (e.g. during preparation of the seabed for foundations and cable installation) that may alter the behaviour or availability of bird prey species.*
>
> *With regard to changes to the seabed and to suspended sediment levels,* ***Chapter 8 Marine Physical Environment*** *[APP-080] and* ***Chapter 9 Benthic and Intertidal Ecology*** *[APP-085] of the Environmental Statement discuss the nature of any change and impacts on the seabed and benthic habitats. The impact on benthic habitats was predicted to be minor adverse due to the limited spatial extent (i.e. restricted to discrete areas within the Projects), the relatively short-term duration (as it is limited to the duration of construction activities), intermittent and with high reversibility nature of the effect. The consequent indirect impact is considered to be minor, and this is also likely to be the case for species such as herring, sprat and sandeel which are the main prey items of seabirds such as gannet and auks. As outlined in* ***Chapter 10 Fish and Shellfish Ecology*** *[APP-091], sandeel and herring are potentially vulnerable to seabed disturbance and increases in local suspended sediments as these species are demersal spawners with specific habitat requirements. However, considering the temporary, intermittent, and localised nature of this impact, it is considered to be a minor adverse effect.*
>
> *Therefore, since these effects were ruled out as sources of potential impacts on seabirds at the EIA scale the same conclusion has been reached for designated sites and it is concluded there are no risks of AEoI for any SPA.*

109. The Applicants consider there to be good evidence that seabird populations will be very little affected by any impacts on their prey, even during construction which is the period when there is the most risk of effects on prey species (and for which consideration was made in the assessment). For example, the impact of seabirds on their prey stock biomass is very small (estimated across five ecosystems to average about 1% of the primary forage fish being consumed by all seabird species (Saraux *et al.* 2020)).

110. Furthermore, forage fish stock biomass varies enormously from year to year while seabird population sizes change much more slowly. Thus, two things are apparent from this: fish stock fluctuations are not caused by seabird population fluctuations and seabird populations are little affected by the inter-annual variations in their prey. Population fluctuations are typical of forage fish species because their survival is very low while recruitment varies very widely from year to year. These factors taken together therefore indicate that small changes in prey stock biomass, as assessed in **Chapter 10 Fish and Shellfish Ecology** [APP-091], will have undetectable effects on the seabird populations which prey on those stocks, and even if prey stocks are affected more widely than currently assessed, this would still not result in seabird population impacts.

8 Conclusion

111. Fish and shellfish species are the prey of other marine features such as birds and marine mammals, therefore it is important that potential effects on these predators through effects on their prey are assessed as part of both the EIA and HRA process.

112. The Applicants have undertaken a comprehensive assessment in both the EIA and HRA of these effects. This was a step-wise process whereby effects on prey were first assessed in their own right in **Chapter 9 Benthic and Intertidal Ecology** [APP-085] and **Chapter 10 Fish and Shellfish Ecology** [APP-091]. The conclusions from these chapters are then cross-referenced in the relevant assessments for ornithology (**Chapter 12 Offshore Ornithology (Revision 3)** [REP4-032] and **RIAA HRA Part 4 of 4 – Marine Ornithological Features (Revision 4)** [document reference: 6.1]) and marine mammals **Chapter 11 Marine Mammals** [APP-095] and **RIAA HRA Part 3 of 4 – Annex II Marine Mammals (Revision 3)** [REP5-009] in the context of the supporting role of benthic habitats and fish and shellfish as prey.

113. The assessment is based on the following

- Where individuals (predators) are subject to displacement effects, the mortality from this is assumed to result from a reduction in access to prey. So, in this case, consideration of any indirect effects via effects on prey is double counting to some degree (e.g. the predators are already displaced from the Array Areas so effects on prey within these locations have no additional effect).
- Where predators are not displaced, there are two considerations. 1) The area which can no longer be used for foraging which is confined to the immediate footprint of the infrastructure (or disturbance footprint if following Natural England position) within the Array Areas (and within the Offshore Export Cable Corridor small sections of cable protection) which is permanently lost. 2) The direct effects on the prey themselves (disturbance, noise impacts etc).
- Therefore, the assessment has covered all the potential pathways for impacts.

114. It is understood that the information on effects on prey is contained in multiple assessment chapters and appendices. Hence the reader may have missed some of the comprehensive information and evidence that has been diligently prepared by the Applicants in line with industry best practice in relation to these issues. This document therefore provides signposting to where the information can be found and collates much of the key information into a single location. In addition, this document also provides the assessment of these effects that was provided in the Round 4 Plan Level HRA as additional context.

115. The Applicants consider that the assessment is line with best practice for offshore wind assessments, is robust and comprehensive and clearly demonstrates the limited effects that the Projects would have upon bird and mammal receptors within and beyond relevant protected sites.

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