DOGGER BANK D WIND FARM

Preliminary Environmental Information Report

Report to Inform Appropriate Assessment (Part 3 of 3)

Document Reference No: 5.3 **Date:** June 2025 **Revision:** V1

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DOGGER BANK D HRA SCREENING ADDENDUM

Document No: PC6250-RHD-XX-ZZ-RP-Z-0001
Date: July 2024
Revision: 01

DOGGER BANK D
WIND FARM

Document Title: **Dogger Bank D HRA Screening Report Addendum**	**Document No.** PC6250-RHD-XX-ZZ-RP-Z-0001
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1 Introduction

1.1 Project Overview

1. Four projects (Creyke Beck A, Creyke Beck B, and Teesside A (renamed as Dogger Bank C ((DBC)) consented in 2015 were restructured under new ownership arrangements. In 2021, an opportunity was identified by the Applicant to maximise the capacity of the third phase of the Dogger Bank Wind Farm, namely DBC, such that additional capacity of renewable energy could potentially be consented and constructed in the eastern part of the original DBC site. This new development phase is known as Dogger Bank D Offshore Wind Farm (hereafter 'DBD' or 'the Project').

2. The DBD Array Area covers an area of approximately 262km^2 and is located approximately 210km off the north-east coast of England, with its eastern boundary adjacent to the Dutch Exclusive Economic Zone (EEZ).

1.2 Background

3. DBD is proposed by SSE Renewables and Equinor (hereafter 'the Applicant'). In accordance with Regulation 10 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (hereafter 'the EIA Regulations'), the Applicant submitted a Habitats Regulations Assessment (HRA) Screening Report for consultation in December 2023.

4. Ongoing project refinement has resulted in the removal of the previously incorporated Hydrogen Production Facility (HPF) from the Project (which was assessed in the original Dogger Bank D HRA Screening Report (DBD, 2023)). Furthermore, the Applicant received confirmation in March 2024 of an updated grid connection location from the Electricity System Operator (ESO). The Project is therefore now being developed to connect into Birkhill Wood, a proposed new 400kV substation located in the East Riding of Yorkshire, in compliance with the National Grid Electricity Systems Operator (ESO) Transitional Centralised Strategic Network Plan (tCSNP2).

5. The HRA Screening Report submitted in December 2023 was based on the project description at the time of writing. Given the nature of the changes (the removal of the HPF and change of grid connection location) resulting in amendments to both the Onshore Project Boundary and Offshore Project Boundary, the HRA Screening has been updated through the provision of this Addendum.

6. The Project is also exploring the future possibility of the development of DBD to be coordinated with an Offshore Hybrid Asset (OHA) between the UK and another European country's electricity market to form a multi-purpose interconnector (MPI). This option would increase energy security for the UK.

1.3 Purpose of this Addendum

7. This HRA Screening Addendum identifies any changes in the assessments of effects upon designated sites and species between the 2023 HRA Screening Report and the 2024 Project as at the submission of the Environmental Impact Assessment (EIA) Scoping Report (24 June 2024) and as described in **Section 2**. This HRA Screening Addendum additionally identifies and addresses comments (where possible) raised by stakeholders in response to the 2023 HRA Screening Report, as seen in **Annex 1**.

8. These changes are presented clearly on a topic-by-topic basis, whether the change alters species assessed, the screening of effects or the alteration in designated sites considered, as presented in **Sections 4 to 9**.

2 Project Description and Changes

2.1 Introduction

9. This chapter provides an indicative description of the Project for the purpose of informing the re-consideration of the HRA Screening and subsequent comments received by Statutory Nature Conservation Bodies (SNCBs) and the Planning Inspectorate (PINS).

10. The NPS EN-3 (Department of Energy and Climate Change (DECC), 2011) recognises the design envelope approach which states in paragraph 2.6.42:

'Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application to the IPC [the Secretary of State], possibly including:

- *Precise location and configuration of turbines and associated development;*
- *Foundation type;*
- *Exact turbine tip height;*
- *Cable type and cable route; and*
- *Exact locations of offshore and/or onshore substations'*.

11. NPS EN-3 (paragraph 2.6.43) continues:

'*Where details are still to be finalised, applicants should explain in the application which elements of the proposal have yet to be finalised, and the reason why this is the case. Where flexibility is sought in the consent as a result, applicants should, to the best of their knowledge, assess the likely worst case environmental, social and economic effects of the proposed development to ensure that the impacts of the project as it may be constructed have been properly assessed*.

12. A design envelope approach will be progressed where maximum and minimum parameters, as appropriate, will be defined to ensure the worst-case scenario for each potential effect can be quantified and assessed allowing likely significant effects to be identified, and mitigated for wherever possible. This approach has been widely used in the consenting of offshore wind farms and is consistent with the Planning Inspectorate Advice Note Nine: Rochdale Envelope (Planning Inspectorate, 2018) which states that:

'The Rochdale Envelope assessment approach is an acknowledged way of assessing a Proposed Development comprising EIA development where uncertainty exists, and necessary flexibility is sought'.

13. The project description, including the project design envelope, will be further refined through the EIA process with the final design envelope set out in the Environmental Statement (ES) submitted as part of the Development Consent Order (DCO) application. Such refinement will take into account:

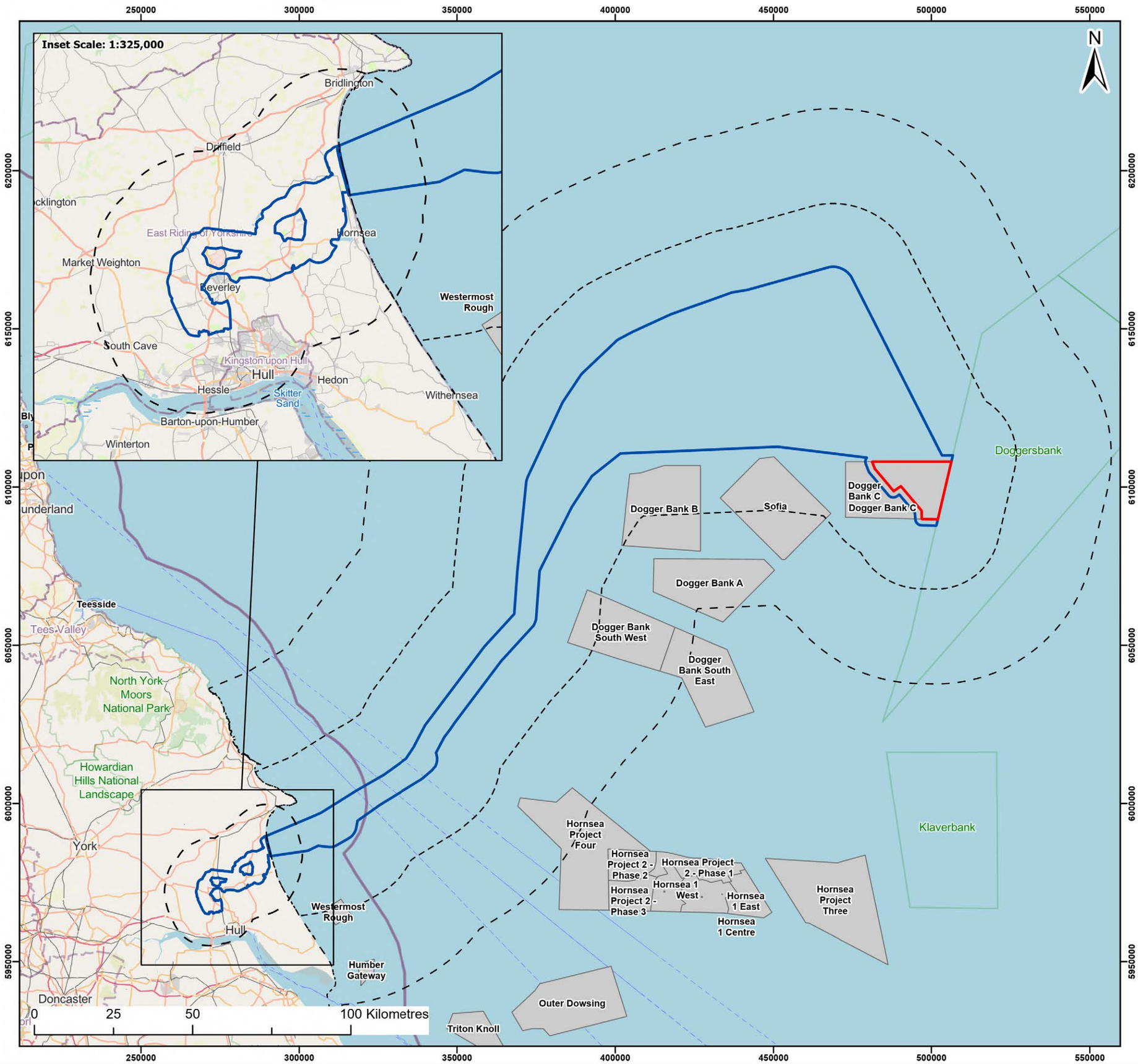
- The Scoping Opinion;
- Consultation with a wide range of stakeholders (including the local community);
- Formal stakeholder responses, agreements and recommendations from the Evidence Plan Process; and
- Further technical and engineering development along with environmental assessments.

2.2 Indicative Project Infrastructure

14. **Figure 2-1** identifies the Offshore and Onshore Project Areas. **Table 2-1** sets out which infrastructure components are located in which area.

15. The HRA Screening Addendum has been prepared using a realistic worst-case scenario approach for the Project (which includes an element of flexibility to allow for coordination with an OHA).

16. **Table 2-1** sets out key indicative parameters for the Project infrastructure. The parameters have been identified using the Applicant's knowledge of previous offshore wind developments and future changes in the market to elements such as wind turbine dimensions. These parameters will continue to be refined through the EIA process based on realistic worst-case scenarios, which will be fully justified in the ES.



Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Project Area and Zones of Influence (per topic)

Figure: 2-1

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0084

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	28/06/2024	JH	SS	A3	1:1,200,000
03	23/11/2023	AB	SS	A3	1:1,200,000

Co-ordinate system: WGS 1984 UTM Zone 31N

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Table 2-1 Key Indicative Parameters for the Realistic Worst-Case Scenario Assessed in the HRA Screening Report Addendum

Feature	Indicative Parameter
General Parameters	
Distance to shore from the Array Area (at its closest point)	210km
Array Area	262km^2
Array Area water depths	21 to 35m at Lowest Astronomical Tide (LAT)
Offshore Infrastructure Parameters	
Maximum number of wind turbines	122
Maximum wind turbine rotor diameter	337m
Minimum blade clearance	28m above LAT
Wind turbine foundation options under consideration	Potential foundation types include monopiles, piled jackets and suction bucket jackets.
Scour protection options for foundations	Potential options include protective aprons, mattresses or matting (concrete or rock filled bags), flow energy dissipation (frond) devices and rock and gravel placement.
Maximum number of offshore platforms	Maximum of three offshore platform structures
Offshore platform foundation options under consideration	Potential foundation types include monopiles, piled jackets, suction bucket jackets, elevator platform and gravity bases.
Scour protection options for foundations	Potential options include protective aprons, mattresses (concrete or rock filled bags), flow energy dissipation (frond) devices, and rock and gravel placement.
Maximum total inter-array cable length	Up to approximately 400km.
Offshore export cable electrical current	HVDC
Maximum number of offshore export cables	Maximum of four cables.
Maximum number of trenches	Three trenches
Maximum offshore export cable length	Up to approximately 400km
Landfall Infrastructure Parameters	
Proposed landfall installation method	Trenchless methodology or open cut trenching
Maximum number of exit pits	Up to an estimated four exit pits
Maximum number of Transition Joint Bays (TJB)	Estimated three Transition Joint Bays (TJBs)
Approximate transition pit permanent footprint (per pit)	Up to approximately 50m^2 (5m x 10m)
Approximate transition pit construction footprint (per pit)	Up to approximately 250m^2
Landfall trenchless compound (length x width)	Up to approximately 125m x 125m
Onshore Infrastructure Parameters	
Maximum number of onshore export cables	Maximum of four cables
Proposed onshore export cable installation methods	Open trenching methods, with trenchless techniques where required.
Maximum number of trenches	Four trenches
Maximum onshore export cable length	Up to approximately 60km for HVDC cables from the landfall to the Onshore Converter Station(s) (OCS(s)), with up to an additional 7km for HVAC cables from OCS(s) to the Birkhill Wood Substation.
Maximum permanent corridor width	30m
Maximum temporary construction corridor width (including for trenchless techniques)	80m
Estimated maximum OCS(s) area (construction and operation area)	27ha (subject to final design) - any energy storage and balancing equipment will be housed wholly within the footprint of the OCS(s). Note that estimated maximum OCS(s) area does not consider potential area required for delivery of on-site BNG proposals, which will be in addition to the area stated.

2.3 Infrastructure Description

2.3.1 Dogger Bank D Array Area

17. The wind turbines will be located within the DBD Array Area which is located approximately 210km off the north-east coast of England (at its closest point) in the North Sea, immediately to the east of the DBC Offshore Wind Farm, covering an area of approximately 262km^2 (**Figure 2-1**). Water depths in this area range from approximately 21m to 35m below LAT.

2.3.1.1 Wind Turbines

18. The final selection of wind turbines will be made once further surveys, technical development and engagement with the supply chain have been undertaken with the final decision made post-consent.

19. Based on the likely wind turbines available at the time DBD enters construction (with anticipated rated capacity of 14 to 27+MW per turbine), it has been assumed at this project stage that a maximum of 122 wind turbines would be deployed if wind turbines at the lower end of this power per turbine range are selected, with fewer required if the larger turbines are selected. The power rating of the wind turbines is not in itself a consenting parameter but presented indicatively in this Screening Report Addendum to assist the reader with understanding the Applicant's scope for the Project.

20. The final layout of the wind turbines within the Array Area will be confirmed post-consent, informed by site investigation works, impact assessment and wind resource modelling. The final layout will comply with relevant best practice for offshore wind farms in relation to shipping and navigation, fishing interests, offshore health and safety, and any relevant aviation interests. Note that the layout of turbines does not affect the realistic worst-case scenario for screening purposes – the key consideration is instead the maximum area over which development could occur.

21. Wind turbines typically incorporate tapered tubular towers and three blades attached to a nacelle housing mechanical and electrical generating equipment. The minimum clearance above the LAT of the turbine blades will be 28m, subject to further project design refinement. At present, the expected maximum rotor diameter is 337m. Indicative wind turbine parameters are set out in **Table 2-1** and shown in **Plate 2-1**.

2.3.1.2 Foundations

22. The wind turbines will be secured to the seabed using fixed foundations. Foundation designs will be informed by several factors including environmental characteristics such as ground conditions, water depths, metocean conditions, and techno-economic parameters including the size of wind turbines selected, and supply chain constraints.

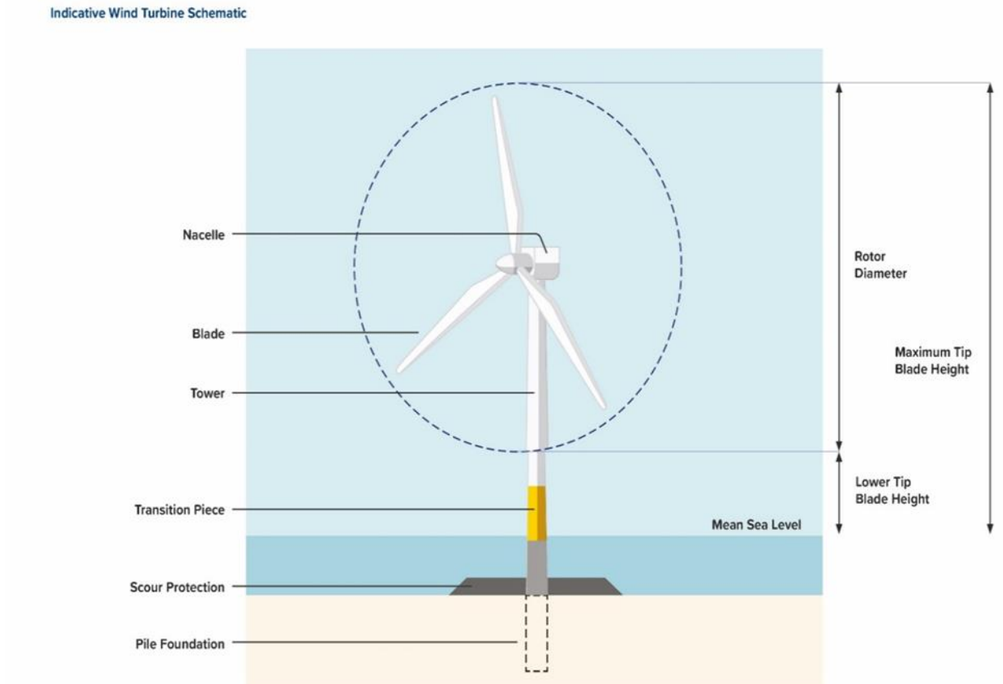


Plate 2-1 Indicative Wind Turbine Schematic

23. The final selection of the type(s) of foundations that will be utilised will be made following seabed surveys, engineering and environmental assessments and engagement with the supply chain, with a decision made post-consent on the finally selected foundation type(s). It is possible that more than one type of foundation could be used across the Array Area.

24. **Table 2-2** sets out high level details of the foundation types under consideration (noting additional options for the offshore platforms) with **Plate 2-2** providing an indicative example of what each wind turbine foundation type looks like.

Table 2-2 Offshore Infrastructure Foundation Types Under Consideration

Foundation Type	Description
Monopile	Monopiles are usually constructed from steel, with dimensions dependent on the size of the wind turbines, seabed / ground conditions, metocean conditions, and installation and transportation methods. The piles are installed vertically into the seabed using piling hammers and / or vibrational methods with the driving method determined by seabed conditions. In the most challenging seabed conditions such as stiff clays or rock, piles may be installed by a mix of driving and drilling.
Piled Jacket	The piled jacket foundation structure is initially positioned on the seabed, with piles then driven through 'skirts' and fixed into place by means of grouting. Pre-piling can also be used, whereby the piles are installed first in a different campaign, with installation of the jackets undertaken at a later stage. This way the installation of the piles can already be completed before the jackets are on location. 'Templates' are used to ensure that the jacket legs align with the piles and which also keeps the piles vertical during driving.
Suction Bucket Jacket	Suction installed foundations penetrate the seabed by self-weight with suction applied after so that pressure difference drives the bucket into the seabed to a target depth, which is normally less than 20m. This foundation type offers several advantages over conventional piled jacket structures due to its efficient installation with the jacket and bucket foundations installed in one go, and its suitability for sites with shallow bedrock, although seabed obstructions such as boulders need clearing in advance.
Elevator Platform	This foundation type is only under consideration for the offshore platforms (i.e. not the wind turbines). Elevator platforms combine the advantages of traditional fixed platforms with the versatility offered by a mobile unit. Elevator platforms can be fabricated at local yards without extensive equipment or specialist expertise. When complete they need only tugs and strand jacks for installation and relocation. The elevator platform concept is somewhat similar to a jack up vessel, the platform itself forming the hull for float out and "legs" penetrating this which can be extended into contact with the seabed which then raises the platform out of the water. These are then locked into place for the lifetime of the structure.
Gravity Base	This foundation type is only under consideration for the offshore platforms (i.e. not the wind turbines). Gravity base foundations sit on the seabed and are typically heavy ballasted structures made of steel and / or concrete. This foundation type primarily relies on its weight to maintain the stability of the platform(s). The gravity base is placed on a pre-prepared area of seabed which may include removal of soft, mobile sediments and other obstructions such as boulders, with the area levelled in preparation for the placement of the gravity base through the installation of a layer of rock / gravel.

25. Scour of the seabed may occur around the foundations, and scour protection measures may be required, with the following protection methods potentially being considered:

- Solid protective aprons made of preformed concrete or plastic;
- Concrete mattresses;
- Rock filled bags;
- Flow energy dissipation (frond) devices (e.g. frond mattresses); and
- Rock and gravel placement.

26. Installation of scour protection normally involves seabed preparation such as provision of a gravel bedding layer and / or seabed levelling.

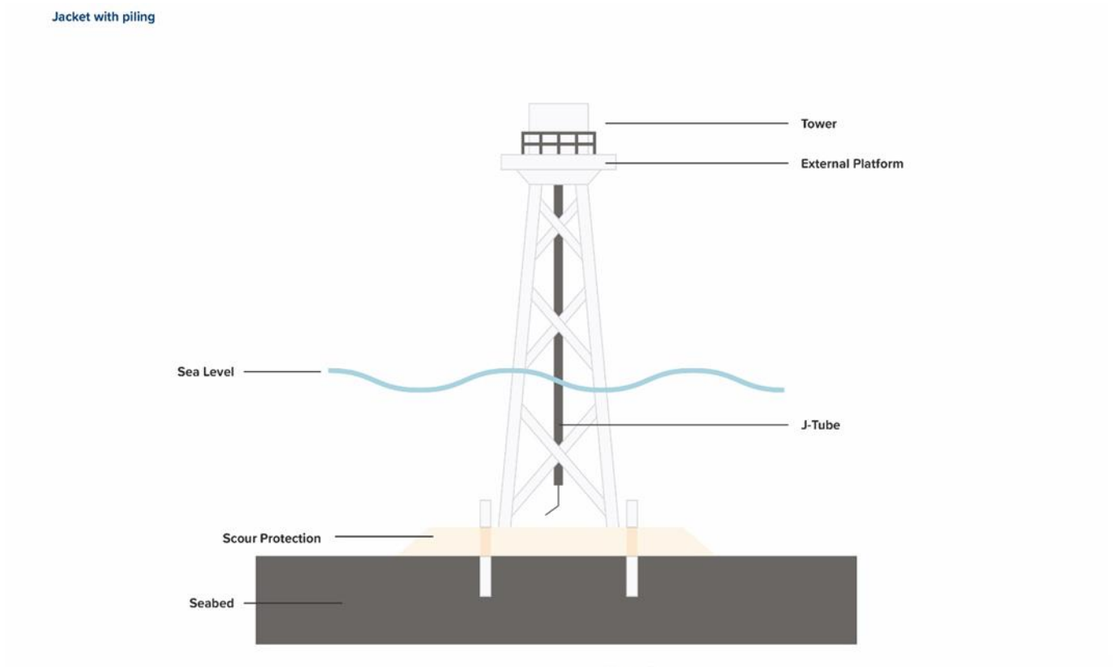


Plate 2-2 Potential Wind Turbine Foundation Types

2.3.1.3 Offshore Platforms

27. **Table 2-1** identifies the realistic worst-case scenario used in this HRA screening exercise with respect to the number of offshore platforms potentially required for the Project. Up to three offshore platforms will be potentially required.

28. The type of foundations being considered for these platforms are the same as those being considered for the wind turbines, with the addition of the elevator platform and gravity bases (as per **Table 2-2**). It should be noted that the final design may incorporate different foundations on the offshore platforms compared to the wind turbines. **Plate 2-3** providing an indicative example of what each offshore platform foundation type looks like.

2.3.1.4 Inter-Array Cables

29. Inter-array cables will connect the wind turbines to the Offshore Substation Platform(s) (OSP(s)). The length of each inter-array cable will be dependent on the final wind farm layout; however, the most realistic maximum length of the total inter-array cabling for DBD is likely to be up to approximately 400km. The final location and length of the inter-array cabling will be determined post-consent, subject to the final layout of the wind turbines.

30. The inter-array cables will be buried (where feasible) in the seabed, typically to a depth of 1m, but burial depth may range from 0.5m to 7.5m depending on ground conditions encountered and will be determined by a Burial Assessment Study (BAS) and a Cable Burial Risk Assessment (CBRA). Cables can be buried via several different techniques depending on the seabed conditions along the route. These include ploughing, jetting, trenching or post-lay burial. Decisions on the burial method will be made following further seabed characterisation and engineering design work, resulting in the identification of realistic worst-case scenarios during the EIA process to allow assessment, as well as consideration of the impacts on the designated features of the Dogger Bank Special Area of Conservation (SAC).

31. Where cable burial is not possible due to hard ground conditions or the presence of existing infrastructure on / under the seabed, alternative cable protection measures could be used, and this could include rock placement, grout / sandbags, concrete mattresses and / or polyethylene ducting. The appropriate level of protection will be determined based on an assessment of the risks posed to the Project in specific areas which will underpin the development of worst-case scenarios through the EIA process.

2.3.2 Offshore Export Cable Corridor

32. The export cables will be HVDC and there could be up to four export cables laid in the offshore Export Cable Corridor (ECC). Small fibre optic cables may also be installed alongside the export cables for cable monitoring and communication with the wind farm. Dependant on the export cable configuration, there may also be neutral metallic return cable(s) installed alongside the export cables.

33. Export cables will be installed in multiple trenches and protected in line with good industry practice. The export cables will be installed in separate installation campaigns per trench. The method of installation of offshore cables will depend on the seabed conditions along the cable route which, along with appropriate burial depths will be determined by a BAS and a CBRA. This will take account of risk to the cable across the seabed from damage by external factors.

34. Cable protection, where required, can take various forms with those methods under consideration described in **Table 2-3**.

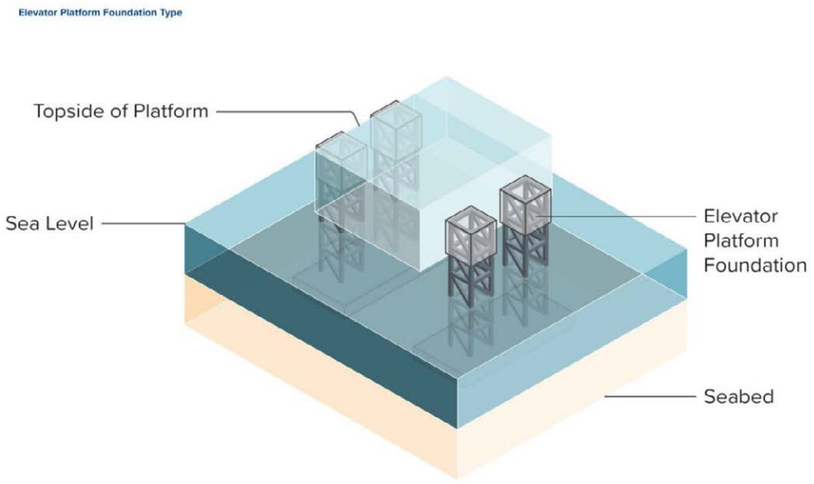


Plate 2-3 Potential Offshore Platform Foundation Types

Table 2-3 Offshore Cable Protection Methods Under Consideration

Cable Protection Method	Description
Rock Placement	In this technique, an engineered berm comprising differing sized rocks covers the cable. The rocks are normally delivered to the seabed using a fall pipe vessel with smaller rocks placed first to protect the cable from the larger rocks. The size and shape of the outer rocks can be engineered in a trapezium shape to specifically mitigate the risk from both anchor strike and dragging.
Grout / Sandbags	Grout / sand filled bags may be used in conjunction with other cable lay protection methods, primarily (but not limited to) at cable / pipeline crossings.
Rock Bags	Rocks contained in wire or rope netted bags can be deployed via crane on to the seabed. Accurate positioning can be achieved by this method.
Concrete Mattress	Interlocking concrete slabs can be lowered to the seabed on a frame. Once the position of the frame is correct, the release mechanism is triggered, and the mattress is deployed over the cable. Mattresses provide an alternative protection system where more irregularly shaped protection (e.g. rock placement) may increase the risk of snagging from trawling activity.
Frond Mattress	A frond mattress has the additional characteristic of having buoyant fronds which slow water velocity directly above the cable, increasing sediment deposition, and therefore assisting with the protection provided by the mattress itself.
Polyethylene Ducting	Polyethylene ducting or polymer shells are installed on the submarine cable before cable laying, typically in interlocking half shell sections. These ducts or shells have good wear resistance and can protect the cable from abrasion. They can provide bend restriction, impact protection, stability, abrasion resistance and are often used in combination with mattresses and rock placement.

35. It is likely that the offshore export cables will have to cross other cables and / or pipelines. Detailed methodology for the crossing of cables and pipelines by the export cables will be determined in collaboration with the owners of the infrastructure to be crossed. A number of techniques can be utilised, including:

- Pre-lay and post lay concrete mattresses;
- Pre-lay and post lay rock dumping;
- Pre-lay steel structures; and
- Other appropriate approaches.

36. All methods will be pre-agreed with the asset owner and subject to the most appropriate industry and technical standards.

2.3.3 Landfall

37. With regard to the Onshore and Offshore Project Areas, the electricity will be transmitted to shore from the Array Area by offshore export cables which will make landfall south east of Skipsea.

38. Dependant on the engineering constraints of the proposed landfall, different cable installation methodologies will be considered. It is assumed that suitable technologies will include trenchless solutions. Such techniques involve drilling pilot holes between the entry (onshore) and the exit (offshore) points. These are then enlarged by a larger cutting tool passing through the holes. Cable ducts are then installed through the openings created, providing a conduit for export cables to be pulled through at a later date.

39. Trenchless cable installation would be drilled from an onshore construction compound and will exit the seabed in an exit pit at a suitable site with a water depth of approximately 10m below LAT. The length of the trenchless cable installation would also depend upon factors such as seabed topography, shallow geology / soil conditions, selected cable installation methodology, coastal erosion and environmental constraints.

40. The offshore and onshore export cables will be jointed in an onshore TJB. It is assumed there will be a maximum of three TJBs overall. The TJB is an underground structure that houses the joints between the offshore and onshore export cables together with a separate fibre optic link box in the same excavation as the TJB.

2.3.4 Onshore Export Cable Corridor

41. The onshore export cables will be installed within the onshore ECC via open cut trenching methods and, where required, using trenchless crossings. A maximum temporary construction corridor of 52m is assumed for the onshore ECC, this is increased to up to 80m for trenchless crossings. This width accounts for the cable trenches, haul road, topsoil storage, drainage, etc.

42. Where Horizontal Directional Drilling (HDD) is used as one of the selected trenchless techniques, jointing bays will be used to pull the cables into the preinstalled ducts installed during the HDD process and to join the cable lengths to each other. Link boxes are used for earthing cables and will be installed inside a protective concrete chamber. The jointing bays are sub-surface structures, while the link boxes will require access (for inspections) from the surface during the operation phase and will therefore be located at or above ground level. At the jointing location, there will be one link box per joint.

2.3.5 Onshore Converter Station Zone

43. OCS(s) are required to connect DBD to the transmission grid. The OCS(s) will be located in the vicinity of the grid connection point at Birkhill Wood Substation. The OCS(s) will contain the necessary electrical and auxiliary equipment and components for transforming the power from the wind farm to 400kV to meet the UK Grid Code for connection to the transmission grid. Infrastructure within the OCS zone may incorporate energy storage and balancing infrastructure (ESBI), such as battery banks. Since ESBI is evolving technology, a range of technologies are under development and hence will be considered and assessed within the PEIR and ES. The system could be housed in single or multiple building(s), several containers, in an open yard or a combination of the above within the OCS zone. The realistic worst-case scenario will be set out in the PEIR and confirmed in the ES (e.g. maximum height, footprint, number and type of buildings). The key indicative construction parameters for the OCS(s) and EBSI known at this stage are set out in **Table 2-1**.

44. Construction of infrastructure within the OCS zone will include:

- Establishing access roads and construction site perimeter fencing;
- Site clearance and installation of environmental mitigation requirements;
- Site preparation / levelling for the temporary construction compounds and the permanent OCS(s) site including drainage;
- Installation of underground utility / drainage and foundations for buildings and equipment; Dependent upon the onsite ground conditions at the OCS(s) location, piling may be required to support the construction of buildings and heavy equipment;
- Construction of building(s) and installation of electrical equipment;
- Construction of permanent finishes e.g. internal roads and gravel areas;
- Installation of permanent perimeter fencing around entire OCS(s) area; and
- Landscaping to minimise visual impact.

45. The need, location and extent of landscaping and / or BNG at the OCS(s) will be identified and agreed with relevant stakeholders during DBD's design process.

2.4 Construction Programme

46. Construction of the Project is expected to begin no earlier than 2029 and based on this date, construction is expected to be completed no later than 2035.

2.5 Operation, Maintenance and Decommissioning

47. Throughout the operational life of the Project Operational and Maintenance (O&M) activities will be required. The overall O&M strategy will be finalised once the location of a suitable port / harbour is identified, and the technical specifications of the wind farm are known. The production of an O&M plan will be conditioned in the relevant DML(s) which will provide detail on anticipated maintenance activities.

48. Maintenance activities will include:

- Scheduled maintenance (preventative);
- Unscheduled maintenance (corrective); and
- Emergency / special maintenance (corrective).

49. It is anticipated that the Project's assets would have an operational life of 35 years. At the end of the operation phase, it is a condition of The Crown Estate lease, as well as a statutory requirement (through the provisions of the Energy Act 2004 (as amended)), that the Project is decommissioned.

50. It is anticipated that when decommissioning takes place, all offshore structures above the seabed (foundations and electrical infrastructure) will be removed, and the site of the onshore OCS(s) will be restored. The process of removing or leaving in situ the electrical cables, both offshore and onshore, on decommissioning will be agreed through the Decommissioning Programme post-consent in consultation with relevant stakeholders. The decommissioning sequence will be undertaken in reverse of the construction sequence, involving similar types and numbers of vessels and equipment.

51. A Decommissioning Programme and associated schedule will be developed during the Project's lifespan to take account of the latest best practice and new technologies. The approach and methodologies of the decommissioning activities will be compliant with the relevant legislation, guidance and policy requirements at the time of decommissioning.

2.6 Site Selection

52. Site selection is an iterative process with selection and refinement of the Project Area ongoing throughout the EIA and HRA process. For the purposes of HRA Screening (and this subsequent HRA Addendum to that HRA Screening), the Applicant has sought to develop a boundary which gives consideration to key constraints known at this time, particularly those related to designated sites. However, the Project Area has also been developed to provide sufficient flexibility to accommodate further refinement of onshore and offshore infrastructure.

53. Following outcomes of the Holistic Network Design (HND) process led by National Grid ESO, the onshore grid connection point for the Project has been identified at the proposed Birkhill Wood Substation. This substation will be developed and constructed by National Grid Electricity Transmission (NGET) as part of a separate planning application on land in the vicinity of the existing Creyke Beck substation north of Hull and does not form part of this Project.

54. The identification of the DBD Array Area and grid connection point has been explained in the preceding sections.

55. However, of key importance in relation to site selection is the routing for the Offshore ECC. This has the overarching aim of minimising impacts upon the seabed and has been subject to and influenced by the presence of the Dogger Bank SAC, and other SACs to a lesser extent. The selection of Offshore ECC has therefore been selected on the basis of minimising the length of export cables within the Dogger Bank SAC, avoiding cable crossings within the Dogger Bank SAC, and also providing flexibility to follow these objectives in the event that any further extension to the Dogger Bank SAC arises.

56. The selection of the landfall location at Skipsea was influenced by nearshore constraints, including existing and planned infrastructure, designated sites (Marine Conservation Zones), Annex I habitats and feasibility informed by seabed conditions, among other factors.

3 HRA Screening

3.1 Approach to the HRA Addendum

57. This Addendum is an addition to the DBD HRA Screening Report (Dogger Bank D, 2023) and clarifies where the changes to the Project (the removal of the HPF and change of grid connection location) influence the outcome of the previous screening report. It also considers whether new elements of the project relating to changes in the project boundaries and Project Infrastructure result in any additional effects being screened in.

58. Furthermore, given the feedback received on the HRA Screening Report (see **Annex 1**), any changes to the effects that will be considered and carried forward into the Report to Inform Appropriate Assessment (RIAA) at PEIR and ES will be identified. The Annex presents the comments received from various stakeholders and the responses to them from the Applicant.

3.2 Zone of Influence (ZOI)

59. As per the 2023 HRA Screening Report, European sites with qualifying features or species which are located within the ZOI associated with Onshore and Offshore Project Area activities will be taken forward for consideration of Likely Significant Effects (LSE). Receptors can be impacted by disturbances from activities far from their source, with this distance being considered the maximum worst-case ZOI.

60. For each topic, the ZOI considered Special Areas of Conservation (SACs), candidate SACs (cSACs), Sites of Community Importance (SCI), Special Protection Areas (SPAs) and as a matter of policy, possible SACs (pSACs), potential SPAs (pSPAs) and Ramsar Sites (listed under the Ramsar Convention on Wetlands of International Importance) where also designated as a European site that the Project could have the potential to have a LSE upon.

3.2.1 Onshore

61. Designated sites within a 10km buffer of the Onshore Project Area were considered within this HRA screening addendum (**Figure 3-1**). These sites were screened in for further assessment depending on the individual ZOI of designated features for each site.

62. An initial precautionary buffer of 30km from the Onshore Project Area was used to scope potential effects on mobile species such as bats or otters. There are no European Sites designated for bats or otters within this distance, therefore a smaller buffer of 10km has been used for this HRA.

63. The ZOI for water pollution and / or discharge of sediments risks is 10km for locations where there is a direct discharge into a watercourse within, or connected to a European Site.

64. The ZOI for onshore habitats and surface water flow is considered to be 1km.

65. The ZOI for qualifying terrestrial features, or features that may use the Onshore Project Area as functionally linked land (i.e. foraging or roosting habitat of SPA birds), is 1km. This is based on evidence from previous reporting on the disturbance of bird species throughout their life history, which concluded that disturbance of birds from onshore works is predominantly limited to within 1km of the impact sources (Ruddock and Whitfield, 2007).

66. Effects from air pollution resulting from Project activities are assessed under 'indirect effects' within the 2023 Screening Report on functionally linked land and prey species where applicable in the ornithology sections.

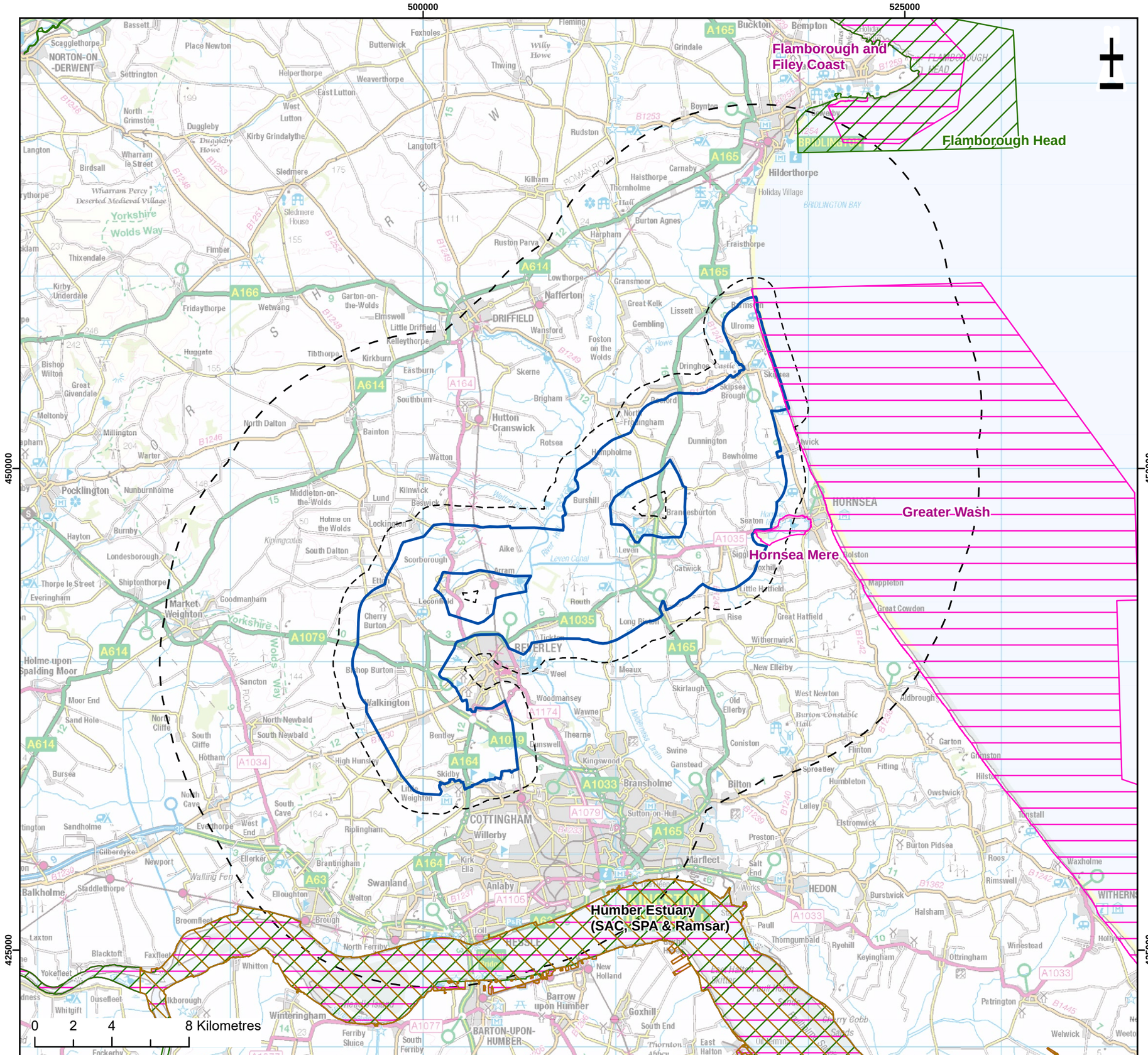
3.2.2 Offshore

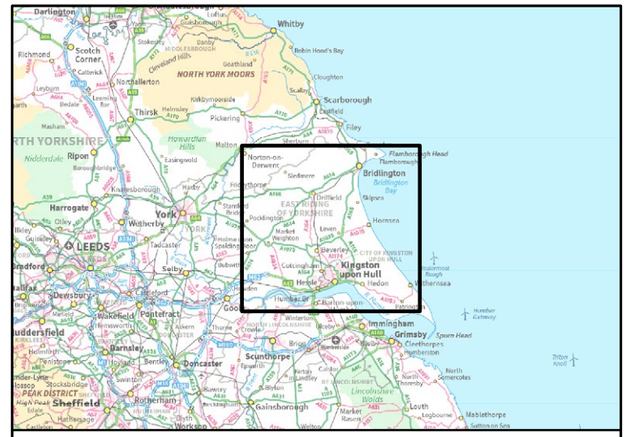
67. For the offshore Project Area, the following buffers were used for identification of LSE on designated sites (**Figure 3-2**):

- Annex I Offshore Sites: 20km (informed by tidal ellipse distance);
- Annex II Migratory Fish: 50km (maximum effect range from worst-case piling noise);
- Annex II Marine Mammals: All European Sites for certain species (wide-ranging, screening has been based on the potential connectivity for each species); and
- Marine Ornithology: Varies per species (mean maximum foraging range + 1 standard deviation during the breeding season and the Biologically Defined Minimum Population Size (BDMPS) region (Furness 2015) surrounding the Array area, during the non-breeding season).

3.3 Plan-level HRA

68. In addition to undertaking a project-level HRA, The Crown Estate announced that the Project has been included in a collective 'plan-level' HRA for seven offshore wind farms that were awarded seabed rights in The Crown Estate's Offshore Wind Leasing Round 3 or The Crown Estate's 2017 Offshore Wind Extensions Opportunity (The Crown Estate, 2023).





Legend:

- Onshore Scoping Area
- 1km Buffer (Surface Water Flow)
- 10km Buffer (Designated Sites)
- Ramsar
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Onshore Project Area and Designated Sites within a 10km ZOI

Figure: 3-1

Drawing No: PC6250-RHD-XX-ON-DR-GS-0019

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	01/08/2024	JH	SS	A3	1:200,000

Co-ordinate system: British National Grid

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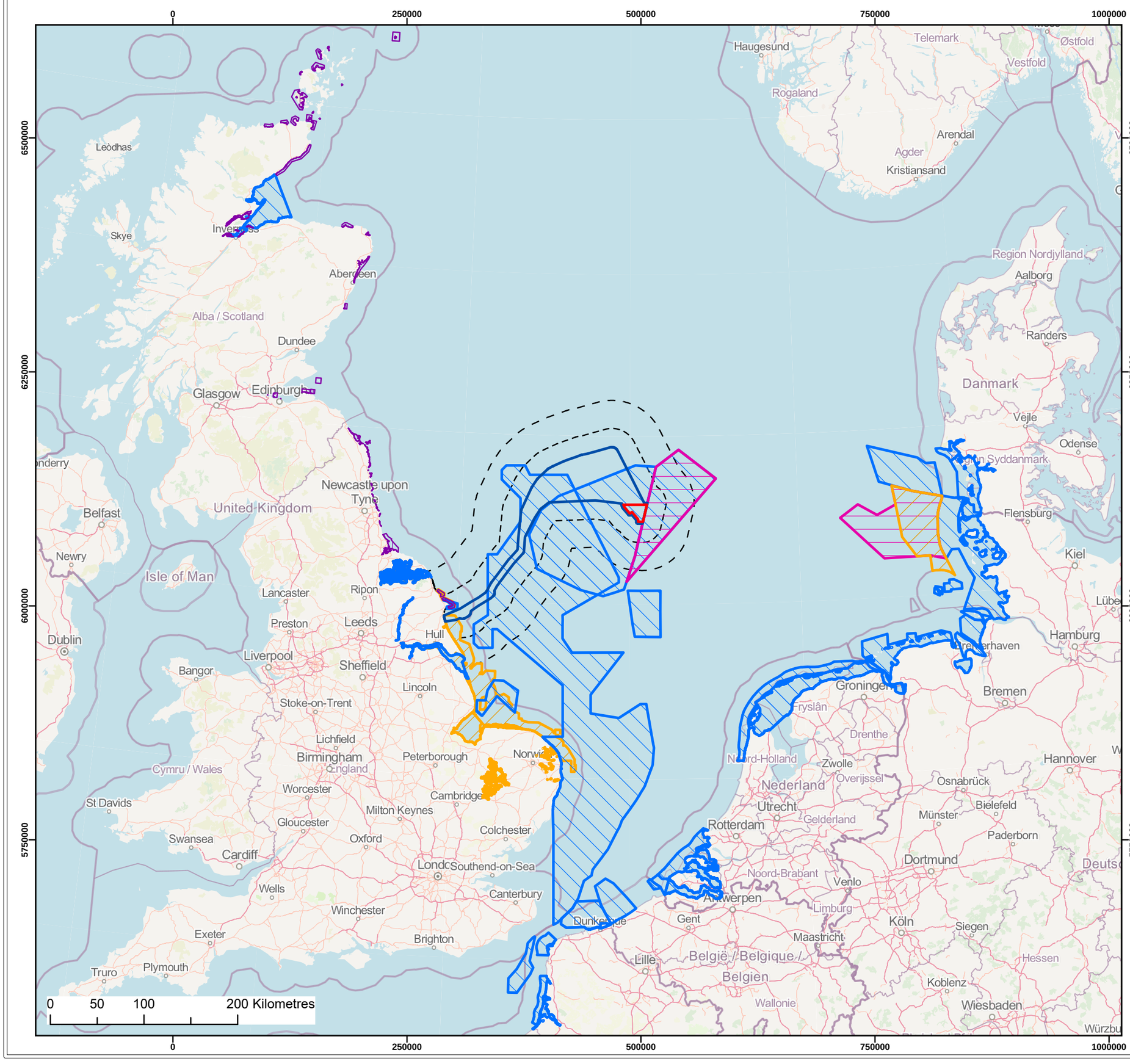

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Offshore Project Area and Designated Sites within ZOIs per topic

Figure:	Drawing No:				
3-2	PC6250-RHD-XX-OF-DR-GS-0020				
Revision:	**Date:**	**Drawn:**	**Checked:**	**Size:**	**Scale:**
01	01/08/2024	JH	SS	A3	1:4,000,000

Co-ordinate system: WGS 1984 UTM Zone 31N

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4 Annex I Terrestrial Habitats

4.1 Sites within the ZOI of the Project's Effects

4.1.1 HRA Screening Report (2023)

69. Section 4.1.1.1 in the 2023 HRA Screening Report presented the European sites located within the Onshore Project Area and the Project's ZOI.

70. There were no Annex I European Sites within the Onshore Project Area, therefore no sites were screened in for further consideration of direct impacts on this basis.

71. European sites with Annex I habitats which were located within the ZOI of impacts (as described in **Section 3.2**) were taken forward for consideration of LSE, which included the Humber Estuary SAC and Ramsar site within the 10km buffer.

4.1.2 HRA Addendum

72. Due to the removal of the HPF element from the Project and the new onshore grid connection, the Onshore Project Area is no longer adjacent to the Humber Estuary.

73. The potential for noise or airborne pollution from the proposed Onshore Project Area is limited and a ZOI of 2km would be considered conservative for those sources in relation to onshore and offshore Annex I habitats. Consequently, these sources and their potential effects are screened out from consideration as the nearest SACs are the Humber Estuary and the Flamborough Head SAC, which are both in excess of 10km from any onshore works. No potential for LSE is therefore identified alone or in-combination with these sites.

74. The ZOI for water pollution and / or discharge of sediments risks is greater than 10km for locations where there is a direct discharge into a watercourse within, or connected to a European Site.

75. As the 7.41km linear distance between the Onshore Project Area and the Humber Estuary has no direct route for discharges to water and is obstructed by a high concentration of infrastructure, including topographic elevations, the Humber Estuary is therefore beyond the 10km ZOI (13.94km pathway distance) in terms of direct water discharge pathways (as shown in **Figure 4-1**).

76. On this basis, **the Humber Estuary SAC and Ramsar Site are now screened out** for determination of LSE, due to the distance between the Onshore Project Area and the Humber Estuary now exceeding 10km for water discharge pathways, giving a low potential for connectivity and indirect effects on the marine environment.

4.2 Revised Determination of LSE for Annex I Terrestrial Habitats

77. The direct and indirect pathways for effects to occur on Annex I Terrestrial Habitats are presented in **Table 4-1**. The sites for which the potential effects were scoped in to the 2023 HRA Screening exercise have now been removed for LSE due to the changes to the Project.

78. Due to **all potential sites for effect now being screened out**, no overall effects are now screened in for Onshore Annex I Habitats, with changes highlighted in yellow in **Table 4-1**.

Table 4-1 Summary of Potential Effects Identified for Annex I Terrestrial Habitats

Potential Effect	Construction (C)	Operation and Maintenance (O&M)	Decommissioning (D)	Changes from the 2023 Screening Report?
Direct effects on European Sites	x	x	x	N/A
Changes in suspended solids (water clarity)	x	x	x	Removed for all designated sites.
Introduction of other substances (such as pollutants or sediments)	x	x	x	Removed for all designated sites.
Introduction or Spread of INNS	x	x	x	Removed for all designated sites.

4.2.1 Changes in Response to HRA Screening Report Comments

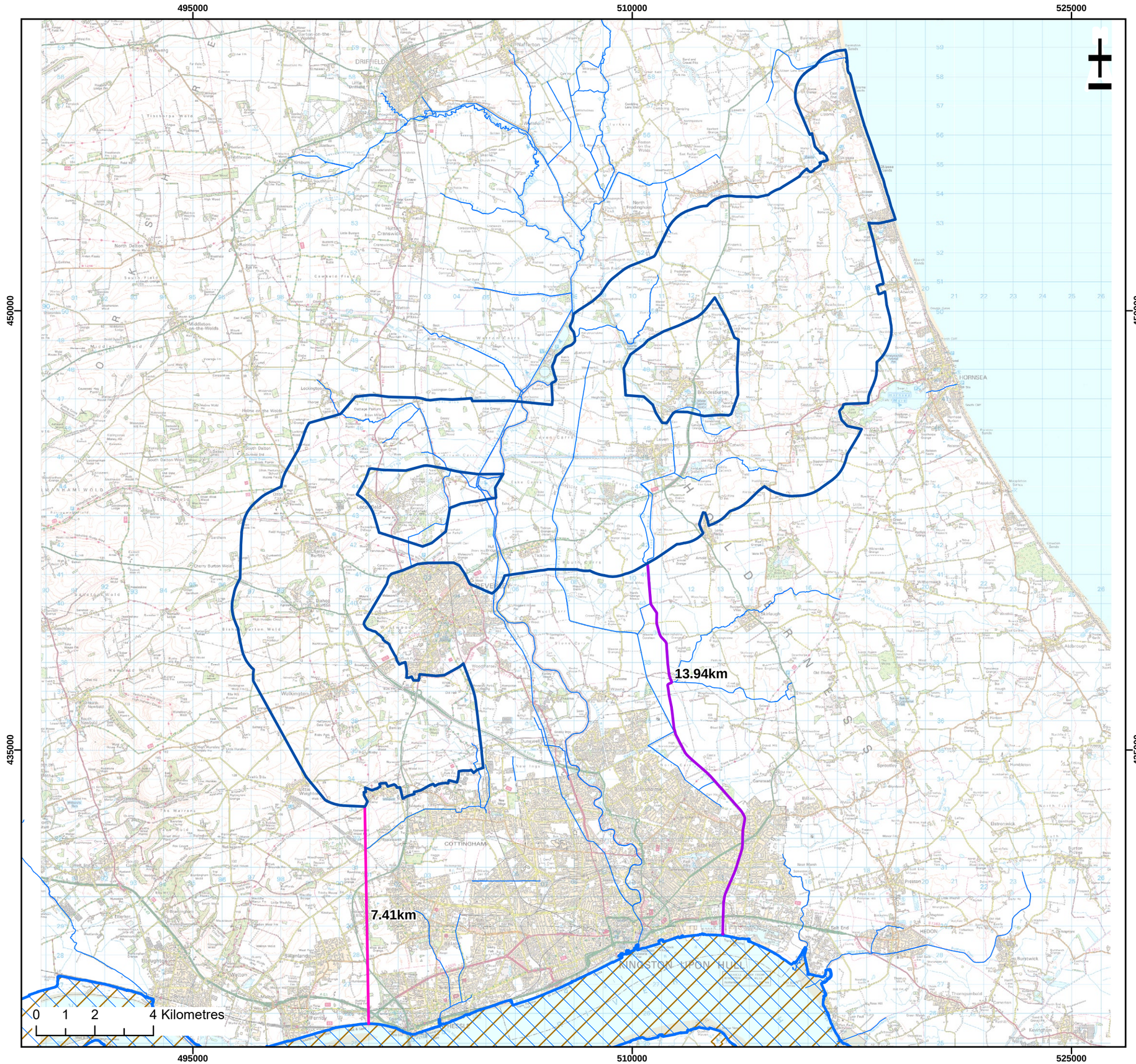
79. No stakeholder responses received in the 2023 HRA Screening Opinion have affected this assessment. Previous comments for Annex I terrestrial habitats related primarily to the HPF, which has now been removed from the Project envelope and are therefore no longer applicable to this HRA screening exercise.

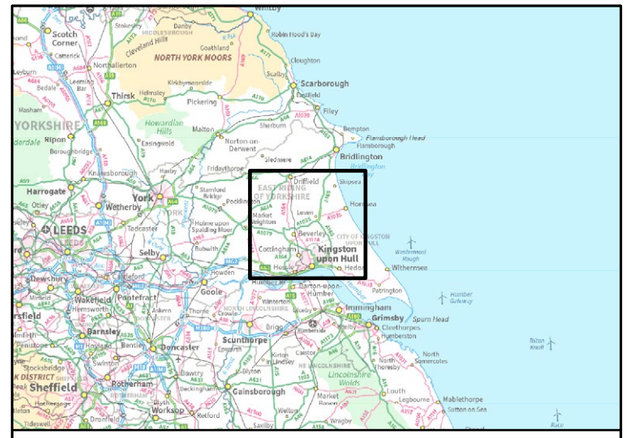
4.3 In-combination and Transboundary Effects

80. No potential for transboundary effects are present for the Onshore Project Area due to the Onshore area of the Project not being adjacent to or within proximity to any internationally designated terrestrial areas.

81. There is potential for in-combination effects to arise in which other projects or plans could act collectively with works undertaken in the Onshore Project Area to affect Annex I terrestrial habitats.

82. These will be further considered for the sites and features screened into the Stage 2 assessment.





Legend:

- Onshore Scoping Area
- Shortest linear distance between Indicative Onshore Boundary and Humber Estuary SAC
- Shortest watercourse pathway from Indicative Onshore Boundary to Humber Estuary SAC
- Special Area of Conservation (SAC)
- Ramsar
- Statutory Main Rivers

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Linear and Pathway Distance between the Onshore Project Area and Humber Estuary SAC/Ramsar

Figure: 4-1

Drawing No: PC6250-RHD-XX-ON-DR-GS-0021

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Co-ordinate system: British National Grid

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5 Annex I Marine Habitats

5.1 Sites within the ZOI of the Project's Effects

5.1.1 HRA Screening Report (2023)

83. Section 4.1.3.2 of the 2023 HRA Screening Report presented the European sites located within the Offshore Project Area and the Project's Zone of Influence (ZOI), which included direct effects to the Dogger Bank SAC and the Humber Estuary SAC and Ramsar Site.

5.1.2 HRA Addendum

84. Given that the Humber Estuary SAC and Ramsar Site are now located a significant distance away from the Offshore Project boundary (in excess of 40km pathway distance – **Figure 5-1**) and given the tidal ellipse is less than 20km at the coast, no effects are expected to extend beyond these distances. Therefore, with no remaining pathways for any effects as shown in **Table 5-1**, no LSE is therefore expected on Humber Estuary SAC and the Humber Estuary Ramsar site and they are scoped out from further consideration.

5.2 Revised Determination of LSE for Annex I Marine Habitats

85. The direct and indirect pathways for effects to occur on marine habitats and thus Annex I designated sites and features are presented in **Table 5-1**.

86. During operation there are fewer potential sources whereby substances could be introduced into the marine environment. Notably, there would not be any discharges from the previously considered desalination element of the HPF. Whilst this does not remove the potential effect of discharges (accidental or incidental) during construction, operation, and/or decommissioning, they reduce the potential scale. Furthermore, the offshore project boundary has moved much further north than previously considered and is now a minimum of 24.6km linear distance from the Humber Estuary SAC and Ramsar site. As such, due to the negligible scale of any potential accidental discharge, the distance and subsequent dilution and dispersal, and that the tidal ellipse is much smaller than this distance to the Humber Estuary SAC and Ramsar site, no likely significant effect is anticipated and **the Humber Estuary SAC and Ramsar Sites are now screened out**.

87. Three potential effects have been altered (screened out) by the removal of the HPF in comparison to the 2023 HRA Screening Report. Due to the removal of the HPF and its related desalination discharge, **the operation and maintenance phases for "Salinity increase (Hydrogen and hybrid opportunities only)", "Temperature increase (Hydrogen and hybrid opportunities only)", and "Changes to longshore sediment processes" are screened out**.

88. Consequently, as a result of the revised screening, only the Dogger Bank SAC is taken forward for appropriate assessment for revised effects on Annex I Marine Habitats.

5.2.1 Changes in Response to HRA Screening Report Comments

89. Natural England disagreed with the introduction or spread of Invasive Non-Native Species (INNS) being screened out for the construction and decommissioning phases, as this is when vessel traffic and material introduction will be at its highest. Natural England advised that INNS should be screened in for all phases of the project. The Project agrees to consider this in the RIAA and this potential effect has therefore been screened in.

Table 5-1 Summary of Potential Effects Identified for Annex I Marine Habitats

Potential Effect	Potential pressure as described in JNCC (JNCC, 2022b)	C	O&M	D	Changes from the 2023 Screening Report?
Temporary physical disturbance / Physical disturbance	Abrasion / disturbance of the substrate on the surface of the seabed Penetration and / or disturbance of the substrate below the surface of the seabed, including abrasion	✓	✓	✓	Removed for the Humber Estuary SAC and Ramsar Sites.
	Habitat structure changes – removal of substratum (extraction)	✓	✓	✓	Removed for the Humber Estuary SAC and Ramsar Sites.
Long term habitat loss	Physical change (to another seabed type) Physical change (to another sediment type)	x	✓	x	Removed for the Humber Estuary SAC and Ramsar Sites.
	Barrier to species movement	x	x	x	Removed for the Humber Estuary SAC and Ramsar Sites.
Increased suspended sediment concentrations (SSC)	Changes in suspended solids (water clarity) Smothering and siltation rate changes (heavy) Smothering and siltation rate changes (light)	✓	✓	✓	Removed for the Humber Estuary SAC and Ramsar Sites.
Remobilisation of contaminated sediments	Hydrocarbon & Polyaromatic Hydrocarbon (PAH) contamination	✓	✓	✓	Removed for the Humber Estuary SAC and Ramsar Sites.

Potential Effect	Potential pressure as described in JNCC (JNCC, 2022b)	C	O&M	D	Changes from the 2023 Screening Report?
	Transition elements & organo-metal (e.g. TBT) contamination	✓	x	✓	Removed for the Humber Estuary SAC and Ramsar Sites.
Pollution events resulting from the accidental release of pollutants	Hydrocarbon & PAH contamination	✓	x	✓	Removed for the Humber Estuary SAC and Ramsar Sites.
	Transition elements & organo-metal (e.g. TBT) contamination	✓	x	✓	Removed for the Humber Estuary SAC and Ramsar Sites.
	Synthetic compound contamination	x	✓	x	Removed for the Humber Estuary SAC and Ramsar Sites.
	Introduction of other substances (solid, liquid or gas)	x	x	x	Removed for the Humber Estuary SAC and Ramsar Sites.
Underwater noise and vibration	Underwater noise changes/Vibration	✓	✓	✓	Removed for the Humber Estuary SAC and Ramsar Sites.
Interactions of Electromagnetic Field (EMF) (including potential cumulative EMF effects)	Electromagnetic changes	x	✓	x	Removed for the Humber Estuary SAC and Ramsar Sites.
Introduction of marine INNS from vessel traffic	Introduction or spread of INNS	✓	✓	✓	Screened in for the Dogger Bank SAC for all phases of the project. Removed for the Humber Estuary SAC and Ramsar Sites.
Colonisation of introduced substrate	Introduction or spread of INNS	x	✓	x	Removed for the Humber Estuary SAC and Ramsar Sites.
Salinity increase (Hydrogen and hybrid opportunities only)	Salinity increase	x	x	x	Removed for the Humber Estuary SAC and Ramsar Sites. Screened out for O&M due to removal of the HPF.
Temperature increase (Hydrogen and hybrid opportunities only)	Temperature increase	x	x	x	Removed for the Humber Estuary SAC and Ramsar Sites. Screened out for O&M due to removal of the HPF.
Changes to longshore sediment processes	Water flow (tidal current) changes, including sediment transport considerations	x	x	x	Removed for the Humber Estuary SAC and Ramsar Sites. Screened out for O&M due to removal of the HPF.
In-combination effects	N / A	✓	✓	✓	Removed for the Humber Estuary SAC and Ramsar Sites.
Transboundary effects	N / A	✓	✓	✓	Removed for the Humber Estuary SAC and Ramsar Sites.

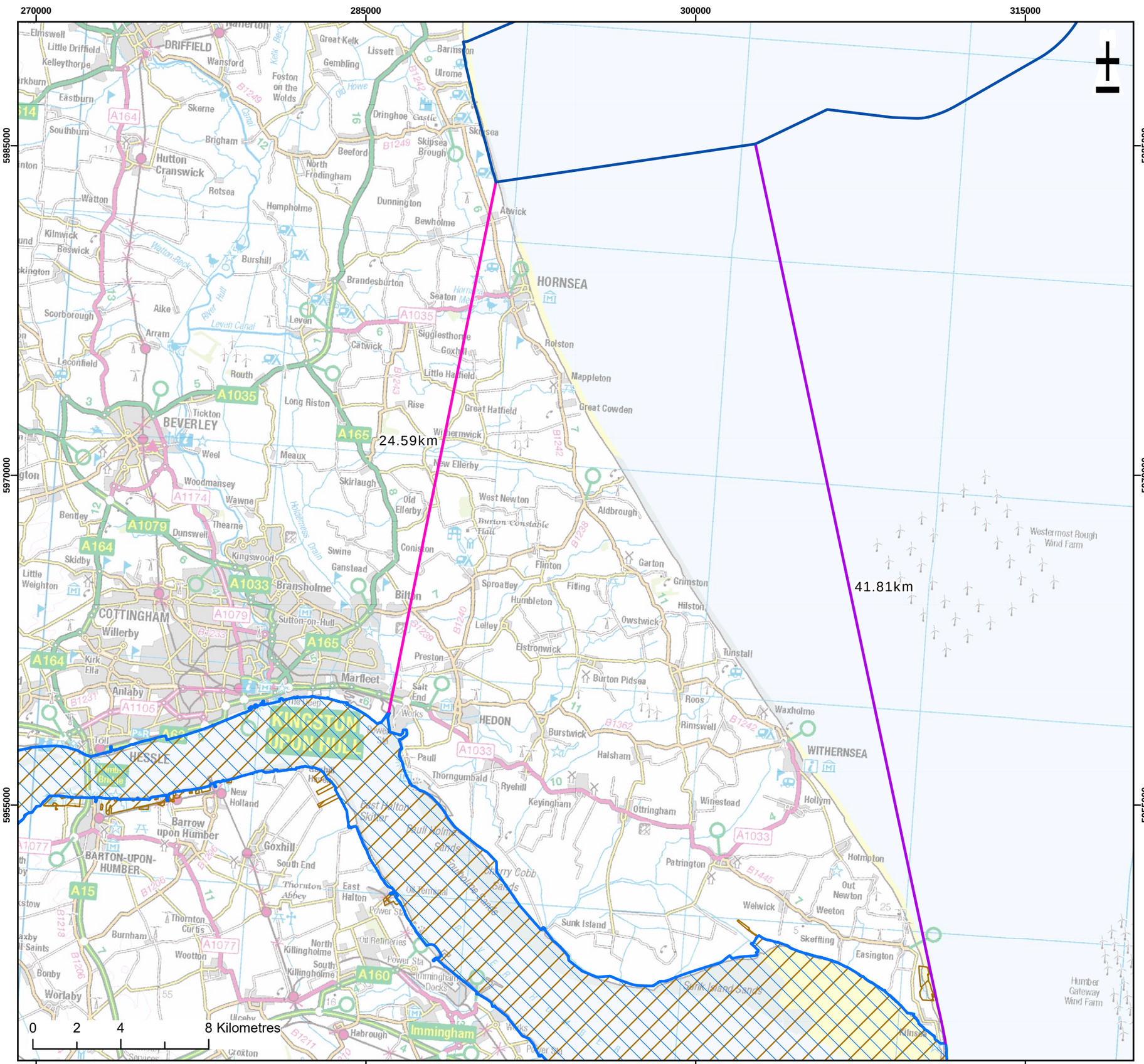
5.3 In-combination and Transboundary Effects

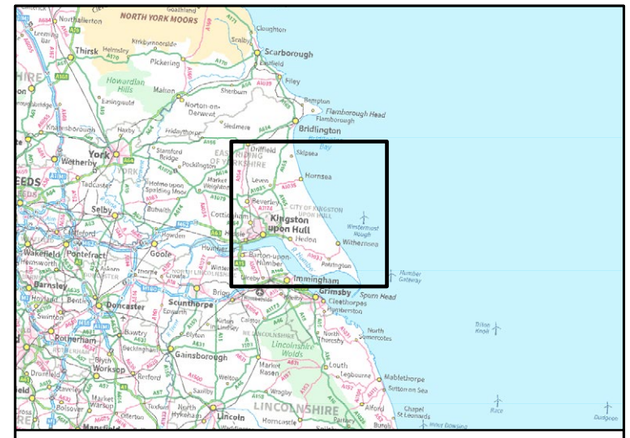
90. All offshore wind farms under planning or under construction within the Dogger Bank SAC (Dogger Bank A, B, C, Dogger Bank South and Sofia) will be considered in the in-combination assessment, due to the potential in-combination effects upon the Dogger Bank SAC.

91. Hornsea Project Four is located adjacent to the offshore export cable corridor, as such in-combination effects will be considered between the projects. As the Hornsea Project Two and Three offshore wind farms and Viking Link Interconnector are located over 20km from the Offshore Project Area, no in-combination effects are predicted to occur with these projects.

92. There is potential for transboundary effects upon Annex I benthic habitats due to the Project's construction, O&M and decommissioning activities. Potential transboundary effects, including those associated with underwater noise and sediment plumes, will be assessed by the Applicant, and where possible, they will liaise with developers in European Economic Area (EEA) Member States to obtain up-to-date project information to inform the assessment.

93. The North Sea Programme 2022-2027 (Noordzeeloket, 2022) outlines the management and use of the North Sea territorial waters within the Netherland's territory. The programme outlines a Natura 2000 designated site that lies adjacent to the Array Area. It is therefore proposed that transboundary impacts are screened in for further assessment in Stage 2.





Legend:

- Offshore Project Area
- Shortest linear distance between Offshore Boundary and Humber Estuary SAC/Ramsar
- Shortest watercourse pathway from Indicative Offshore Boundary to Humber Estuary SAC/ Ramsar
- Special Area of Conservation (SAC)
- Ramsar

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Linear and Pathway Distance between the Offshore Project Area and Humber Estuary SAC/Ramsar Site

Figure: 5-1
Drawing No: PC6250-RHD-XX-ON-DR-GS-0022

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Co-ordinate system: WGS 1984 UTM Zone 31N

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6 Annex II Terrestrial Ecology and Ornithology Species

6.1 Sites within the ZOI of the Project's Effects

6.1.1 HRA Screening (2023)

94. Section 4.2.3.2 in the 2023 HRA Screening Report presented the European sites located within the Onshore Project Area and the Project's Zone of Influence (ZOI). There were no European Sites within the Onshore Project Area, therefore no sites were screened in for further consideration of direct impacts on this basis.

95. European sites with Annex II Species which were located within the ZOI of impacts (as described in **Section 3.2**) were taken forward for consideration of LSE, which included:

- Greater Wash SPA; located adjacent to the Onshore Project Area within the intertidal zone;
- Hornsea Mere SPA; located adjacent of the Onshore Project Area; and
- Humber Estuary SAC/SPA/Ramsar; located 8km south of the Onshore Project Area.

6.1.2 HRA Addendum

96. Although the Humber Estuary SAC/SPA/Ramsar sites are now located a significant distance away from the Onshore Project Area (7.4km linear distance, see **Figure 4-1**), Natural England guidance for the Humber Estuary SPA states that project land within 10km of the SPA boundary that is suitable for use by waterbirds or other SPA birds during day or night periods can be considered as potential functionally linked land. Project land located within 10km of the Humber Estuary SPA/Ramsar includes:

- Arable farmland;
- Semi-natural grassland;
- Amenity and improved grassland;
- Permanent waterbodies; and
- Potential temporary waterbody sites.

97. All of these habitat types are suitable for use by one or more of the following waterbird qualifying features (or assemblage feature components) screened in in the 2023 HRA Screening Report:

- Avocet (SPA non-breeding);
- Bar-tailed godwit (SPA non-breeding, Ramsar wintering);
- Black-tailed godwit (SPA non-breeding, Ramsar passage and wintering);
- Dunlin (SPA non-breeding, Ramsar passage and wintering);
- Golden plover (SPA non-breeding, Ramsar passage and wintering);
- Hen harrier (SPA non-breeding);
- Knot (SPA non-breeding, Ramsar passage and wintering);
- Marsh harrier (SPA breeding);
- Redshank (SPA non-breeding, Ramsar passage and wintering);
- Ruff (SPA non-breeding);
- Shelduck (SPA non-breeding, Ramsar wintering); and
- Waterbird assemblage (SPA non-breeding, Ramsar wintering).

98. However, due to changes in the Onshore Project Area, the distance from the Onshore Project Area to habitat types comprising functionally linked land supporting certain qualifying features of the Humber Estuary SPA/Ramsar exceeds that of the 10km ZOI. Therefore, the Onshore Project Area has no potential to support the following qualifying features previously screened in in the 2023 HRA Screening Report:

- Avocet (SPA breeding); and
- Little tern (SPA breeding).

99. Therefore, **all effects previously screened in for breeding avocet and breeding little tern as part of the Humber Estuary SPA are screened out**. There are no other changes for effects in comparison to the 2023 HRA Screening Report.

6.2 Revised Determination of LSE for Terrestrial Ecology and Ornithology

100. The direct and indirect pathways for effects to occur on Annex II Terrestrial Ecology and Ornithology features are presented in **Table 6-1**.

Table 6-1 Summary of Potential Effects Identified for Annex II Terrestrial Ecology and Ornithology

Potential Effect	C	O&M	D	Changes from the 2023 Screening Report?
Direct effects on European Sites	x	x	x	No changes.
Long term and temporary loss of designated Annex I Habitats	x	x	x	No changes.
Disturbance / displacement	✓	✓	✓	Removed for breeding little tern and breeding avocet of Humber Estuary SPA.
Long term and temporary loss of functionally linked land	✓	✓	✓	Removed for breeding little tern and breeding avocet of Humber Estuary SPA.
Indirect impacts through effects on designated habitats and prey species	✓	✓	✓	Removed for breeding little tern and breeding avocet of Humber Estuary SPA.

6.2.1 Changes in Response to HRA Screening Report Comments

101. No comments from the HRA Screening Opinion have affected this assessment. Responses for Annex II Terrestrial Ecology and Ornithology related primarily to the HPF, which has now been removed from the Project envelope and are therefore no longer applicable to this HRA screening exercise.

6.3 In-combination and Transboundary Effects

102. No potential for transboundary effects is present for the Onshore Project Area due to the Onshore area of the Project not being adjacent to or within proximity to any internationally designated terrestrial areas.

103. There is potential for in-combination effects to arise in which other projects or plans could act collectively with works undertaken in the Onshore Project Area to affect Annex I terrestrial habitats.

104. These will be further considered for the sites and features screened into the Stage 2 assessment.

7 Annex II Species - Intertidal and Marine Ornithology

7.1 Sites within the ZOI of the Project's Effects

7.1.1 HRA Screening Report (2023)

105. European sites with Annex II Species which were located within the ZOI of impacts (as described in **Section 3.2**) were taken forward for consideration of LSE, which included:

- Greater Wash SPA;
- Humber Estuary SPA and Ramsar;
- Flamborough and Filey Coast SPA;
- Teesmouth and Cleveland Coast SPA;
- Northumbria Coast SPA;
- Coquet Island SPA;
- Farne Islands SPA;
- Lindisfarne SPA;
- Forth Islands SPA;
- Imperial Dock Lock, Leith SPA;
- Fowlsheugh SPA;
- Ythan Estuary, Sands of Forvie and Meikle Loch (extension) SPA and Ramsar;
- Loch of Strathbeg SPA;
- Troup, Pennan and Lion's Heads SPA;
- Inner Moray Firth SPA;
- Cromarty Firth SPA;
- East Caithness Cliffs SPA;
- North Caithness Cliffs SPA;
- Pentland Firth Islands SPA;
- Auskerry SPA;
- Hoy SPA;
- Fair Isle SPA;
- Rousay SPA;
- Marwick Head SPA;
- West Westray SPA;
- Sumburgh Head SPA;
- Papa Westray (North Hill and Holm) SPA;
- Mousa SPA;
- Noss SPA;
- Foula SPA;
- Papa Stour SPA;
- Fetlar SPA;
- Ronas Hill – North Roe and Tingon SPA; and
- Hermaness, Saxa Vord and Valla Field SPA.

7.1.2 HRA Addendum

106. Due to the Humber Estuary SPA/Ramsar sites now being located a significant distance away from the Offshore Project Area (24.6km linear distance as shown in **Figure 3-2**), no effects are expected to extend to this distance. However, individual little terns from the breeding qualifying feature of the SPA may (when foraging and provisioning nests) range into the Greater Wash SPA, for which effects on its little tern qualifying feature are screened in. Therefore, **effects remain screened in for breeding little tern associated with the Humber Estuary SPA**. **Effects are screened out for any of the remaining qualifying features (or assemblage feature components) of the Humber Estuary SPA/Ramsar Site previously screened in in the 2023 HRA Screening Report**.

7.2 Revised Determination of LSE for Intertidal and Marine Ornithology

107. The direct and indirect pathways for effects to occur on Intertidal and Marine Ornithology are presented in **Table 7-1**.

7.2.1 Changes in Response to Scoping Opinion and HRA Screening Report Comments

108. In their EIA Scoping Opinion, the Planning Inspectorate (2023) did not agree with direct habitat loss being scoped or screened out for offshore ornithological receptors and considers that this impact could occur at the construction or decommissioning stage and potentially during maintenance in the operational phase. The Project accepts this position and **direct impacts on bird habitat and within the effect pathway 'indirect effects via habitat and prey availability' are now screened in**.

109. Natural England would not support the scoping or screening out of impacts based on conclusions made in the Teesside A & B project EIA. In the context of intertidal and offshore ornithology, the impacts covered by this response were barrier impacts on offshore receptors during the operational phase. The Project accepts this position and **barrier effects during the operational phase are now screened in**.

110. Natural England noted that disturbance impacts due to vessel movements and other works activities were originally screened out during the operation and maintenance phase. Natural England advised that these should be screened in, particularly for Greater Wash SPA. The Project accepts this recommendation and **disturbance impacts due to vessel movements and other works activities are now screened in** as a pathway to the RIAA for the O&M phase on a precautionary basis.

111. Natural England did not agree with Greater Wash SPA tern species being screened out for direct disturbance and displacement effects from work activity in the nearshore/ECC. While terns are indicated to have low sensitivity at sea to vessel activities and approach (Fliessbach *et al.*, 2019), the Project accepts this suggestion. Therefore, **foraging terns of the Greater Wash SPA as a breeding qualifying feature species are now screened in** for further consideration of potential LSE, on the basis of the Precautionary Principle.

112. Natural England agreed with the screening in of gannet, guillemot, razorbill, and puffin for displacement impacts during operation and maintenance. However, Natural England noted that these species have not been screened in for displacement impacts during construction and decommissioning. Natural England advised that displacement impacts on gannet, guillemot, razorbill, and puffin should be screened in for the construction and decommissioning phases of the project. The Project accepts this suggestion and **gannet, guillemot, razorbill and puffin are now screened in for potential LSE via displacement during construction and decommissioning, on the basis of the Precautionary Principle**. The specific seasons in which there is assessed to be potential effects will vary between species, based on variable connectivity due to seasonal species behaviour.

Table 7-1 Summary of Potential Effects Identified for Offshore and Intertidal Ornithology

Potential Effect	Type of Ornithology Receptor	C	O&M	D	Changes from the 2023 Screening Report?
Direct habitat loss	Offshore ornithology receptors	x	x	x	Now screened in under 'Indirect Effects via Habitat and Prey Availability'.
	Intertidal ornithology receptors	x	x	x	Now screened in under 'Indirect Effects via Habitat and Prey Availability'.
Direct disturbance and displacement due to work activity in the Array Area, offshore ECC or landfall.	Intertidal and Offshore	✓	✓	✓	All Disturbance and Displacement Due to Works now aggregated into this single LSE. Retained for breeding little tern of Humber Estuary SPA. Removed for all other features of Humber Estuary SAC/SPA/Ramsar Sites. Screened in for all features of the Greater Wash SPA. Screened in for foraging terns, gannet, guillemot, razorbill and puffin during construction and decommissioning.
Direct disturbance and displacement due to work activity in the offshore ECC	Offshore ornithology receptors only	✓	x	✓	Incorporated into single LSE 'Direct disturbance and displacement due to work activity in the Array Area, offshore ECC or landfall'. See row above.
Direct disturbance and displacement due to nearshore vessel movements	Intertidal ornithology receptors only (Offshore receptors considered within work activity in offshore areas above)	x	x	x	Incorporated into single LSE 'Direct disturbance and displacement due to work activity in the Array Area, offshore ECC or landfall'. See row above.
Direct disturbance and displacement due to work activity at landfall and within the intertidal area	Intertidal ornithology receptors and offshore ornithology receptors such as red-throated diver	✓	✓	✓	Incorporated into single LSE 'Direct disturbance and displacement due to work activity in the Array Area, offshore ECC or landfall'. See row above.

Potential Effect	Type of Ornithology Receptor	C	O&M	D	Changes from the 2023 Screening Report?
Displacement due to presence of wind turbines and other offshore infrastructure	Offshore ornithology receptors only (red-throated diver, gannet, auks)	✓	✓	✓	Now screened in during construction and decommissioning phases in line with NE screening opinion.
Barrier effect due to presence of wind turbines and other offshore infrastructure	Offshore and intertidal ornithology receptors (including migratory waterbirds)	x	✓	x	Now screened in during O&M phase for offshore receptors (including migratory non-seabirds).
Accidental pollution	Offshore and intertidal receptors	x	x	x	No change.
Indirect Effects via Habitats or Prey Availability	Offshore and intertidal receptors	✓	✓	✓	Effect name 'Indirect Effects via Habitats and Prey Availability'. This effect no longer includes entrapment and/or entrainment of prey at marine outfall / intake locations following removal of HPF from the Project envelope. Retained for breeding little tern of Humber Estuary SPA. Removed for all other features of the Humber Estuary SAC/SPA/Ramsar Sites.
Collision risk with wind turbine blades	Offshore ornithology receptors (gulls, skuas, gannet) and intertidal ornithology receptors (including migratory waterbirds)	x	✓	x	No change.

7.3 In-combination and Transboundary Effects

113. There is potential for in-combination effects to arise in which other projects or plans could act collectively with works undertaken in the Offshore Project Area to affect Annex II intertidal and offshore ornithological species.

114. These will be further considered for the sites and features screened into the Stage 2 assessment.

8 Annex II Migratory Fish

8.1 Sites within the ZOI of the Project's Effects

8.1.1 HRA Screening Report (2023)

115. Section 4.3.3.2 in the 2023 HRA Screening Report presented the European sites located within the Offshore Project Area and the Project's ZOI. There were no European Sites within the Offshore Project Area, therefore no sites were screened in for further consideration of direct impacts on this basis.

116. European sites with Annex II Migratory Fish Species which were located within the ZOI of impacts (as described in **Section 3.2**) were taken forward for consideration of LSE, which included:

- Humber Estuary SAC/SPA; located adjacent to the Onshore Project Area and within the 50km ZOI for Migratory Fish; and
- River Derwent SAC, 56km west of the Offshore Project Area (inland).

8.1.2 HRA Addendum

117. The Humber Estuary SAC is now located a significant distance away from the Onshore Project Area (7.4km linear distance and beyond 19.5km water discharge pathway distance) as shown in **Figure 4-1**. Previously the Onshore Project Area was immediately adjacent to the Humber Estuary, presenting a pathway for onshore activities to impact the estuary. This is no longer the case. The only pathway for effect arises from the Offshore Project Area, which is located over 40km north of the estuary mouth. A pathway for LSE still exists regarding underwater noise impacts from UXO clearance in the inshore section of the export cable corridor, and this remains screened in.

118. Given the evolution of the Project, with the removal of the opportunity to include a HPF as part of the design envelope for DBD, there is no pathway for direct effects on the Humber Estuary SAC, or these Annex II features in any other SAC. Therefore, there is no pathway for LSE from direct in-combination effects and **the Humber Estuary SAC is now screened out**. The distance of the Project's piling from sites designated for migratory species, means that species from these sites will be absent or low abundance in the piling noise ZOI. Combined with the low hearing sensitivity of lamprey species, this contributes to the lack of pathway for LSE due to indirect in-combination effects.

8.2 Revised Determination of LSE for Annex II Migratory Fish

119. The direct and indirect pathways for effects to occur on Annex II Migratory Fish are presented in **Table 8-1**.

8.2.1 Changes in Response to HRA Screening Report Comments

120. In response to a comment from Natural England on the 2023 HRA Screening Report, the Project has considered INNS and accidental pollution as sources for which potential effects could arise on relevant migratory Annex II fish species and their associated designated sites. Given that the Offshore Project Area is located over 40km north of the Humber Estuary mouth, there is no potential pathway for INNS, pollutants, or sediments to directly impact on the Humber Estuary SAC and these potential effects are screened out of further assessment.

Table 8-1 Summary of Potential Effects Identified for Annex II Migratory Fish

Potential Effect	C	O&M	D	Changes from the 2023 Screening Report?
Barrier to species movement (excl. EMF)	✓	x	✓	Removed for the Onshore Project Area.
Changes in suspended solids (water clarity)	✓	✓	✓	Removed for the Onshore Project Area.
Electromagnetic changes	x	✓	x	Removed for the Onshore Project Area.
Physical change (to another seabed or sediment type)	✓	✓	✓	Removed for the Onshore Project Area.
Smothering and siltation rate changes (Heavy)	✓	✓	✓	Removed for the Onshore Project Area.
Smothering and siltation rate changes (Light)	✓	✓	✓	Removed for the Onshore Project Area.
Underwater Noise	✓	x	x	Removed for the Onshore Project Area.
Introduction of other substances (such as pollutants or sediments)	✓	✓	✓	Now considered for all phases and screened out as no pathway for LSE. Removed for the Onshore Project Area.
Introduction or Spread of INNS	✓	✓	✓	Now considered for all phases and screened out as no pathway for LSE. Removed for the Onshore Project Area.

8.3 In-combination and Transboundary Effects

121. There is potential for in-combination effects to arise in which other projects or plans could act collectively with works undertaken in the Offshore Project Area to affect Annex II Migratory Fish.

122. These will be further considered for the sites and features screened into the Stage 2 assessment.

9 Annex II Marine Mammals

9.1 Sites within the ZOI of the Project's Effects

9.1.1 HRA Screening Report (2023)

123. Section 4.4.3 in the 2023 HRA Screening Report presented the European sites located within the Offshore Project Area and the Project's Zone of Influence (ZOI).

124. European sites with Annex II Marine Mammal Species which were located within the ZOI of impacts (as described in **Section 3.2**) were taken forward for consideration of LSE, which included:

- Southern North Sea SAC;
- Doggersbank SAC;
- Humber Estuary SAC;
- Klaverbank SAC;
- The Wash and North Norfolk Coast SAC;
- Doggerbank SCI;
- Berwickshire and North Northumberland Coast SAC;
- Isle of May SAC;
- European Sites for Grey Seal; and
- Moray Firth SAC.

9.1.2 HRA Addendum

125. Although the Offshore Project Area has changed (**Figure 3-2**), this has not resulted in any alterations to the designated sites for marine mammals originally assessed in 2023. The only change comes as a result of HPF removal, and therefore **any LSE on water quality during O&M are now screened out**.

9.2 Revised Determination of LSE for Annex II Marine Mammals

126. The direct and indirect pathways for effects to occur on Annex II Marine Mammals are presented in **Table 9-1**.

9.2.1 Changes in Response to HRA Screening Report Comments

127. Natural England noted that effects associated with increased suspended sediments have been screened out for direct and indirect impacts to harbour porpoise. It is important to consider the impacts of suspended sediment on harbour porpoise prey resource and habitat.

128. The Dogger Bank area is an important site for sand eels, a prey resource for harbour porpoise. It is vital that habitat and prey resource is protected to meet the Conservation Objective 3 of the Southern North Sea SAC. Natural England recommended the Project assesses the impacts of suspended sediment from construction, operation and decommissioning on harbour porpoise habitat and prey resource to understand the impact on harbour porpoise from the Southern North Sea SAC.

129. The potential for an indirect effect due to changes in water quality (through its effect to fish species) has been screened in. Assessments from other chapters (sediment and fish) will help to inform the marine mammal assessment regarding the effects on prey resources through all phases, including consideration of harbour porpoise key prey species (such as sandeel).

Table 9-1 Summary of Potential Effects Identified for Annex II Marine Mammals

Potential Effect	C	O&M	D	Changes from the 2023 Screening Report?
Underwater noise: physical and auditory injury resulting from impact piling during construction	✓	x	x	No changes.
Underwater noise: behavioural impacts resulting from impact piling during construction	✓	x	x	No changes.
Underwater noise: physical and auditory injury resulting from operational wind turbine noise	x	✓	x	No changes.
Underwater noise: behavioral impacts resulting from operational wind turbine noise	x	✓	x	No changes.
Underwater noise: physical and auditory injury resulting from noise associated with other construction and maintenance activities (such as dredging and rock placement) and vessel noise	✓	✓	✓	No changes.
Underwater noise: behavioral impacts resulting from other construction and maintenance activities (such as dredging and rock placement), and vessel noise (including disturbance to foraging areas)	✓	✓	✓	No changes.

Potential Effect	C	O&M	D	Changes from the 2023 Screening Report?
Underwater noise: barrier effects	✓	✓	✓	No changes.
Disturbance at seal haul-out sites	✓	✓	✓	No changes.
Vessel interaction (increase in risk of collision)	✓	✓	✓	No changes.
Changes to prey resource	✓	✓	✓	No changes.
Changes to water quality	✓	x	✓	Removed for HPF, and therefore removed fully during O&M.
Barrier effects from the physical presence of the wind farm during operation	x	✓	x	No changes.
Effects from EMF during operation	x	x	x	No changes.
In-combination effects	✓	✓	✓	No changes.
Transboundary effects	✓	✓	✓	No changes.

9.3 In-combination and Transboundary Effects

130. There is potential for in-combination effects to arise in which other projects or plans could act collectively with works undertaken in the Offshore Project Area to affect Annex II marine mammals.

131. These will be further considered for the sites and features screened into the Stage 2 assessment.

10 Summary and Conclusions

132. The sites and species screened out from the HRA following the Project changes are:

- **The Humber Estuary SAC and Ramsar Site are now screened out for determination of LSE in relation to onshore works and infrastructure (and related discharges)**, due to the distance between the Project Area and the Humber Estuary (7.4km linear and beyond 10km for water discharge pathways), removing a clear impact pathway and giving a low potential for connectivity and indirect effects on the marine environment (the Humber Estuary SAC and Ramsar Site remain screened in for marine mammal and ornithology features);
- **Offshore works and subsequent effects are screened out in relation to all features of the Humber Estuary SPA except for little tern** for which effects remain screened in;
- **The functionally linked land effects previously screened in for breeding avocet and breeding little tern of Humber Estuary SPA and Ramsar Site are screened out** on the basis that the Onshore Project Area does not include habitat of appropriate type or distance from the SPA to support these features of the SPA.
- **The onshore works and subsequent effects are screened out in relation to Annex II migratory fish for the River Derwent SAC** as there no longer exists a pathway for direct effects due to an increased distance between the SAC and the Onshore Project Area.

133. **Table 10-1** summarises the sites and species that remain screened into the HRA following the Project changes since the previous HRA Screening Report. Any new sites and species screened in are represented in bold. The effects for which species are screened in are presented in the earlier technical topic sections.

134. The Annex I Habitats (and the sites for which they are features) have been screened in due to:

- The array or ECC being located within the Annex I habitat; and
- The Annex I habitat being within the ZOI for pollution to habitats via water and air through connecting habitats and hydrological connectivity.

135. For Annex II Migratory Fish species (and the sites for which they are features) designated sites have been screened in due to:

- Individuals from sites may be disturbed/subject to mortality by potential UXO clearance in coastal waters.

136. For Annex II Marine Mammal species, designated sites have been screened in due to:

- The sites are within the grey seal foraging distance (of 448km) of DBD or they have been identified as having connectivity with DBD through the Carter *et al*. (2022) SAC relative density data;
- The sites are within the harbour seal foraging distance (of 273km) of DBD or they have been identified as having connectivity with DBD through the Carter *et al.* (2022) SAC relative density data;
- Harbour porpoise from the site (Southern North Sea SAC) are assumed to be utilising the DBD area;
- There is potential connectivity between construction activities at DBD and the coastal bottlenose dolphin population of the Moray Firth; and
- It is assumed that all harbour porpoise in the DBD project area, or areas of potential effect, are from the nearest European site for harbour porpoise.

137. Annex II bird species (and the sites for which they are features) have been screened in due to:

- Where onshore effects such as indirect impacts relating to water and air pollution which could affect prey species, or supporting and functionally linked habitats, disturbance from noise, visual and light, or the loss or degradation of supporting and functionally linked habitats;
- The Project Area (ECC, landfall) overlaps with the site boundary;
- Potential connectivity of relevant site's species during the breeding season;
- Potential connectivity of relevant site's species during the non-breeding / migration season;
- Potential connectivity of relevant site's species during wintering period; and
- Potential connectivity of relevant site's species during passage period.

138. For the Humber Estuary SPA, only little tern are screened in as there exists the potential for impacts relating to the offshore works to have subsequent effects on this qualifying feature.

Table 10-1 Summary of European Sites and Species Screened in for the Project as of 2024

European Site	Distance to Array (nearest km)	Distance to ECC (nearest km)	Designated Feature Screened In
Annex I Habitats			
Dogger Bank SAC (Site Code: UK0030352)	0	0	Sandbanks which are slightly covered by seawater all the time
Terrestrial Ecology and Ornithology			
Humber Estuary Ramsar (Site code: UK11031; RSIS code: 663)	233	7	Bar-tailed godwit, wintering Black-tailed godwit, passage Black-tailed godwit, wintering Dunlin, passage Dunlin, wintering Golden plover, passage Golden plover, wintering Knot, passage Knot, wintering Redshank, passage Redshank, wintering Shelduck, wintering Waterbird assemblage, wintering
Humber Estuary SPA (Site code: UK9006111)	235	7	Avocet, non-breeding Bar-tailed godwit, breeding Black-tailed godwit, non-breeding Dunlin, non-breeding Golden plover, non-breeding Hen harrier, non-breeding Knot, non-breeding Marsh harrier, breeding Redshank, non-breeding Ruff, non-breeding Shelduck, non-breeding Waterbird assemblage
The Greater Wash SPA (Site code: UK9020329)	215	0	Little tern, breeding Common tern, breeding Sandwich tern, breeding Little gull, breeding and non-breeding Common scoter, non-breeding Red-throated diver, non-breeding
Hornsea Mere SPA (Site code: UK9006171)	229	0	Gadwall Mute Swan
Marine Ornithological Features			
The Greater Wash SPA (Site code: UK9020329)	215	0	Little tern, breeding Common tern, breeding Sandwich tern, breeding Common scoter, non-breeding

European Site	Distance to Array (nearest km)	Distance to ECC (nearest km)	Designated Feature Screened In
			Red-throated diver, non-breeding
Humber Estuary SPA (Site codes: UK9006111)	235	25	Little tern, breeding
Flamborough and Filey Coast SPA (Site code: UK9006101)	209	7	Gannet, breeding Guillemot, breeding Kittiwake, breeding Razorbill, breeding Seabird assemblage, breeding Puffin Herring Gull Shag Cormorant
Teesmouth and Cleveland Coast SPA (Site codes: UK9006061)	245	84	Common tern, breeding
Northumbria Coast SPA (Site codes: UK9006131)	257	118	Arctic tern, breeding
Coquet Island SPA (Site code: UK9006031)	271	170	Arctic tern, breeding Common tern, breeding Roseate tern, breeding Sandwich tern, breeding Seabird assemblage, breeding Puffin Herring Gull Lesser black-backed gull Kittiwake
Farne Islands SPA (Site code: UK9006021)	279	182	Arctic tern, breeding Common tern, breeding Guillemot, breeding Roseate tern, breeding Sandwich tern, breeding Seabird assemblage, breeding Kittiwake Shag Cormorant Puffin
Lindisfarne SPA (Site codes: UK9006011)	287	190	Roseate tern, breeding
Forth Islands SPA (Site code: UK9004171)	348	259	Arctic tern, breeding Common tern, breeding Gannet, breeding Lesser black-backed gull, breeding Puffin, breeding Roseate tern, breeding Sandwich tern, breeding
Imperial Dock Lock, Leith SPA (Site codes: UK9004451)	383	289	Common tern, breeding
Fowlsheugh SPA (Site code: UK9002271)	362	283	Guillemot, breeding Kittiwake, breeding

European Site	Distance to Array (nearest km)	Distance to ECC (nearest km)	Designated Feature Screened In
Ythan Estuary, Sands of Forvie and Meikle Loch (extension) SPA and Ramsar (Site codes: UK9002221 and UK13061)	373	295	Common tern, breeding Sandwich tern, breeding
Loch of Strathbeg SPA (Site codes: UK9002211)	395	321	Sandwich tern, breeding
Troup, Pennan and Lion's Heads SPA (Site code: UK9002471)	414	340	Guillemot, breeding
Inner Moray Firth SPA (Site codes: UK9001624)	494	414	Common tern, breeding
Cromarty Firth SPA (Site codes: UK9001623)	504	426	Common tern, breeding
East Caithness Cliffs SPA (Site code: UK9001182)	505	431	Guillemot, breeding Herring gull, breeding Kittiwake, breeding Razorbill, breeding
North Caithness Cliffs SPA (Site code: UK9001181)	519	447	Guillemot, breeding
Pentland Firth Islands SPA (Site code: UK9001131)	524	453	Arctic tern, breeding
Auskerry SPA (Site code: UK9002381)	540	471	Arctic tern, breeding
Hoy SPA (Site code: UK9002141)	544	472	Great skua, breeding
Fair Isle SPA (Site code: UK9002091)	550	486	Arctic tern, breeding Guillemot, breeding
Rousay SPA (Site code: UK9002371)	565	496	Arctic tern, breeding
Marwick Head SPA (Site code: UK9002121)	574	504	Guillemot, breeding
West Westray SPA (Site code: UK9002101)	575	506	Arctic tern, breeding Guillemot, breeding
Sumburgh Head SPA (Site code: UK9002511)	575	512	Arctic tern, breeding
Papa Westray (North Hill and Holm) SPA (Site code: UK9002111)	578	510	Arctic skua, breeding Arctic tern, breeding
Mousa SPA (Site code: UK9002361)	590	527	Arctic tern, breeding
Noss SPA (Site code: UK9002081)	598	535	Gannet, breeding Great skua, breeding Guillemot, breeding

European Site	Distance to Array (nearest km)	Distance to ECC (nearest km)	Designated Feature Screened In
Foula SPA (Site code: UK9002061)	621	557	Arctic tern, breeding Great skua, breeding Guillemot, breeding Puffin, breeding
Papa Stour SPA (Site code: UK9002051)	636	573	Arctic tern, breeding
Fetlar SPA (Site code: UK9002031)	638	576	Arctic tern, breeding Great skua, breeding
Ronas Hill – North Roe and Tingon SPA (Site codes: UK9002041)	648	586	Great skua, breeding
Hermaness, Saxa Vord and Valla Field SPA (Site code: UK9002011)	660	598	Gannet, breeding Great skua, breeding Puffin, breeding
Annex II Migratory Fish			
River Derwent SAC (Site code: UK0030253)	246	38	Indirect effects on Annex II species that are a primary reason for selection of this site: • River lamprey Annex II species present as a qualifying feature, but not a primary reason for site selection: • Sea lamprey
Humber Estuary SAC (Site code: UK0030170)	235	25	Indirect effects on Annex II species present as a qualifying feature, but not a primary reason for site selection: • Sea lamprey
			• River lamprey
Humber Estuary Ramsar (Site code: UK11031; RSIS code: 663)	233	25	Indirect effects on River lamprey and Sea lamprey
Annex II Marine Mammals			
Vlaamse Banken SAC (Site code: BEMNZ0001)	383	320	Grey Seal
Vlakte van de Raan SCI (Site code: BEMNZ0005)	377	344	Grey Seal
Sydlige Nordsø SAC (Site code: DK00VA347)	243	242	Grey Seal
Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde SAC (Site code: DK00AY176)	314	313	Grey Seal
Baie de Canche et couloir des trois estuaires SAC (Site code: FR3102005)	495	392	Grey Seal
Bancs des Flandres SAC (Site code: FR3102002)	407	328	Grey Seal
Estuaires et littoral picards (baies de Somme et d'Authie) SAC (Site code: FR2200346)	517	414	Grey Seal
Falaises du Cran aux Oeufs et du Cap Gris-Nez, Dunes du Chatelet, Marais de Tardinghen et Dunes de Wissant SAC (Site code: FR3100478)	458	362	Grey Seal

European Site	Distance to Array (nearest km)	Distance to ECC (nearest km)	Designated Feature Screened In
Recifs Gris-Nez Blanc-Nez SAC (Site code: FR3102003)	450	350	Grey Seal
Ridens et dunes hydrauliques du 37etroit du Pas-de-Calais SAC (Site code : FR3102004)	457	65	Grey Seal
Doggerbank SCI (Site code: DE1003301)	67	332	Harbour Porpoise Harbour Seal
Dünenlandschaft Süd-Sylt SAC (Site code: DE1115391)	333	333	Grey Seal
Hamburgisches Wattenmeer SAC (Site code: DE2016301)	353	353	Grey Seal
Helgoland mit Helgolander Felssockel SAC (Site code: DE1813391)	320	320	Grey Seal
Küsten- und Dünenlandschaften Amrums SAC (Site code: DE1315391)	337	336	Grey Seal
National park Niedersachsisches Wattenmeer SAC (Site code: DE2306301)	267	266	Grey Seal
NTP S-H Wattenmeer und angrenzende Kustengebiete SAC (Site code: DE0916391)	311	310	Grey Seal

European Site	Distance to Array (nearest km)	Distance to ECC (nearest km)	Designated Feature Screened In
SPA Ostliche Deutsche Bucht SPA (Site code: DE1011401)	262	262	Grey Seal
Steingrund SAC (Site code: DE1714391)	328	328	Grey Seal
Sylter Außenriff SCI (Site code: DE1209301)	207	208	Grey Seal
Doggersbank SAC (Site code: NL2008001)	0	0	Harbour Seal Grey Seal Harbour Porpoise
Duinen Ameland SAC (Site code: NL3009005)	237	236	Grey Seal
Duinen en Lage Land Texel SAC (Site code: NL2003060)	231	229	Grey Seal
Duinen Goeree & Kwade Hoek SAC (Site code: NL9801079)	351	349	Grey Seal
Duinen Terschelling SAC (Site code: NL2003059)	224	223	Grey Seal
Duinen Vlieland SAC (Site code: NL2003061)	225	225	Grey Seal
Grevelingen SAC (Site code: NL4000021)	356	351	Grey Seal

European Site	Distance to Array (nearest km)	Distance to ECC (nearest km)	Designated Feature Screened In
Klaverbank SAC (Site code: NL2008002)	74	72	Grey Seal Harbour Seal Harbour Porpoise
Noordzeekustzone SAC (Site code: NL9802001)	218	216	Grey Seal
Oosterschelde SPA and SAC (Site code: NL3009016)	366	355	Grey Seal
Vlakte van de Raan SAC (Site code: NL2008003)	377	345	Grey Seal
Voordelta SAC and SPA (Site code: NL4000017)	334	332	Grey Seal
Waddenzee SAC (Site code: NL1000001)	225	224	Grey Seal
Westerschelde & Saeftinghe SAC (Site code: NL9803061)	382	356	Grey Seal
Berwickshire and North Northumberland Coast SAC (Site code: UK0017072)	267	167	Grey Seal
Humber Estuary SAC (Site code: UK0030170)	235	25	Grey Seal
Isle of May SAC (Site code: UK0030172)	350	260	Grey Seal
Moray Firth SAC (Site code: UK0019808)	469	392	Bottlenose dolphin
Southern North Sea SAC (Site code: UK0030395)	39	0	Harbour porpoise
The Wash and North Norfolk Coast SAC (Site code: UK0017075)	244	99	Harbour seal

Table 10-2 Summary of European Sites and Species Screened out for the Project in this HRA Addendum

European Site	Distance to Array (nearest km)	Distance to ECC (nearest km)	Designated Feature Screened Out
Annex I Habitats			
Humber Estuary Ramsar Site (Site code: UK11031; RSIS code: 663)	233	7	All Terrestrial and Marine Features
Humber Estuary SAC (Site code: UK0030170)	235	7	All Terrestrial and Marine Features
Annex II Terrestrial Ecology and Ornithology			
Humber Estuary SPA (Site code: UK9006111)	235	7	Avocet, breeding Little tern, breeding
Annex II Intertidal and Marine Ornithology			
Humber Estuary SPA (Site code: UK9006111)	235	25	Avocet, breeding Avocet, non-breeding Bar-tailed godwit, non-breeding Bittern, breeding Bittern, non-breeding Black-tailed godwit, non-breeding Dunlin, non-breeding Golden plover, non-breeding Hen harrier, non-breeding Knot, non-breeding Marsh harrier, breeding Redshank, non-breeding Ruff, non-breeding Shelduck, non-breeding Waterbird Assemblage (wintering)

11 References

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DOGGER BANK D HRA SCREENING ADDENDUM ANNEX I: STAKEHOLDER RESPONSES TO HRA SCREENING REPORT (2023)

DOGGER BANK D
WIND FARM

Date: 02 February 2024
Our ref: 463105
Your ref: N/A

Natural England
Lateral
8 City Walk
Leeds
LS11 9AT

BY EMAIL ONLY

Dear Rob,

Discretionary Advice Service (Charged Advice)
UDS A006626
Dogger Bank D Offshore Wind Farm Habitats Regulations Assessment Screening Report

Thank you for your consultation, dated 19 December 2023, on the below document:

- Habitat Regulations Assessment Screening Report. Dogger Bank D Offshore Wind Farm. Revision 01. Doc reference LF000016-CST-DOG-REP-0003

Natural England has reviewed the report and provide the following advice.

Summary
The Habitats Regulations Assessment (HRA) Screening Report is largely well considered and appropriate. However, we have provided detailed comments in Annex 1 at the end of this letter, which we advise should be addressed in the RIAA before inclusion within an application. For comments where the recommended action is 'clarification needed', we would welcome these clarifications in a written response or via the Expert Topic Groups.

For any queries relating to the content of this letter please contact me using the details provided below.

Yours sincerely,

Janie Latchford

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Yorkshire and North Lincolnshire Area Team
E-mail: janie.latchford@naturalengland.org.uk

The advice provided in this letter has been through Natural England's Quality Assurance process.

The advice provided within the Discretionary Advice Service is the professional advice of the Natural England adviser named below. It is the best advice that can be given based on the information provided so far. Its quality and detail is dependent upon the quality and depth of the information which has been provided. It does not constitute a statutory response or decision, which will be made by Natural England acting corporately in its role as statutory consultee to the competent authority after an application has been submitted. The advice given is therefore not binding in any way and is provided without prejudice to the consideration of any statutory consultation response or decision which may be made by Natural England in due course. The final judgement on any proposals by Natural England is reserved until an application is made and will be made on the information then available, including any modifications to the proposal made after receipt of discretionary advice. All pre-application advice is subject to review and revision in the light of changes in relevant considerations, including changes in relation to the facts, scientific knowledge/evidence, policy, guidance or law. Natural England will not accept any liability for the accuracy, adequacy or completeness of, nor will any express or implied warranty be given for, the advice. This exclusion does not extend to any fraudulent misrepresentation made by or on behalf of Natural England.

Annex 1: Detailed Comments

1. General comments

Section	Paragraph /Table	Comment	Recommendations
N/A	N/A	We find reference to 'landfall' throughout the document to be unclear as to whether the Aldborough or Saltend site is being referred to when discussing impact pathways.	Clearly specify which landfall site is being referred to when considering impact pathways.

2. Benthic Ecology

Section	Paragraph /Table	Comment	Recommendations
2.2.2	20	We welcome that gravity base foundations have not been included as an option for the wind turbines but note that they have been included as a platform foundation option. We highlight that no project in UK waters to date has required the use of gravity bases, and that their use would result in a greater area of habitat loss within Dogger Bank SAC than with any other foundation option.	We advise that gravity base foundations are removed from the project envelope, or that further information is provided to justify their inclusion.
2.2.3	23	We welcome that HVDC will be used for the export cable but question why up to six might be needed for a single array. Clarity is needed on whether this is for a single connection option or is the cabling requirements summed across all connection options. If this is for a single option, full justification should be provided in the ES.	Clarification required.
2.2.3	24	NE advise that cables should be bundled to reduce benthic impacts and the volume of cable protection needed. This is particularly the case where cable routes are intersecting designated sites.	To note.

2.3	27	It is stated that the HDD will “exit the seabed in an exit pit at a suitable site with a water depth of approximately 10m below Lowest Astronomical Tide (LAT)”. We understand this to mean that the exit pit will be at or beyond the 10m depth contour, thereby removing the need for cable protection within the 10m depth contour.	Please confirm if this is correct.
2.5	Table 2-2	NE notes that open cut trenching has been included as a proposed landfall installation method in Table 2-2, however this is not mentioned as an option in Section 2.3. NE would not support the use of open cut trenching along the Holderness Coastline and advise that the Project commit to using trenchless techniques.	To note.
4.1.2	Table 4-2	Natural England disagree with the introduction or spread of INNS being screened out for the construction and decommissioning phases, as this is when vessel traffic and material introduction will be at its highest.	We advise that INNS are screened in for all phases of the project.
4.1.5	141, Table 4-3	We note that the Humber Estuary SAC has been screened in but only for impacts resulting from the onshore works. NE considers that the Humber Estuary SAC should also be screened in for indirect effects from the landfall/nearshore works until project specific modelling is available to rule out impacts to sediment transport and/or the Project commits to no cable protection within the Holderness Inshore MCZ/10m depth contour.	We advise that the Humber Estuary SAC is screened in for indirect effects from the landfall/nearshore works. Please also see our comment on 2.3.

3. Comments on Terrestrial Ecology and Ornithology

Section	Paragraph /Table	Comment	Recommendations
2.4.2	32	We note this section of the screening details the infrastructure which will comprise the hydrogen production facility (HPF). It is unclear whether there is likely to be emissions of pollutants such as ammonia, NOx or SO2 associated with this facility.	Clarification required as to whether there is potential for air quality emissions to be produced by the HPF. If so, the potential for impacts to European sites within a 10km radius should be assessed within the HRA.
3.3	62	We welcome that disturbance impacts to birds from the Onshore Project Area will be taken to through to Appropriate Assessment (AA). In addition to the bird disturbance impacts in a 1km radius, the AA should also consider impacts on the 'openness' of the land immediately adjacent to the hydrogen facility and how construction of the hydrogen facility may affect habitat use by birds.	Consideration for the 'openness' of land adjacent to the hydrogen facility, when assessing disturbance impact pathways to birds during AA.
4.1.6	153, Table 4-4	We note and welcome that SAC habitats have been identified as within the ZOI for pollution to habitats via water and air. Designated sites within 200m of a road which will experience a significant increase in traffic movements should be assessed for impacts due to air pollution from traffic. When undertaking an assessment of the potential impacts during the construction or operation phase of the development there will need to be clarification provided on which roads will be used to access the development site, and the number of predicted vehicle movements. Natural England has produced guidance for assessing the impacts of air pollution due to traffic (Natural England's approach to advising competent authorities on	Refer to Natural England guidance on assessing impacts of air pollution due to traffic. Consider potential impacts from ammonia emissions and calculate if necessary. Consider potential impact that may arise due to dust.

		the assessment of road traffic emissions under the Habitats Regulations - NEA001). Ammonia emissions from road traffic could make a significant difference to nitrogen deposition close to roads and potential impacts of this pathway should be considered (https://www.aqconsultants.co.uk/news/february-2020-(1)/ammonia-emissions-from-roads-for-assessing-impacts). There are currently two models which can be used to calculate the ammonia concentration and contribution to total N deposition from road sources. One of these models is publicly available and called CREAM (Air Quality Consultants - News - Ammonia Emissions from Roads for Assessing Impacts on Nitrogen-Sensitive Habitats (aqconsultants.co.uk), and there is another produced by National Highways. Potential impacts which may arise due dust and other pollution sources during construction should also be considered. Designated sites within 200m of a dust source should be screened in for impacts. Suitable mitigation for these impacts could be outlined within a Construction Environmental Management Plan (CEMP).	
4.1.6	153, Table 4-4	The table states that European sites immediately adjacent to the onshore work area will not be subject to direct impacts as they are technically outside of the boundary, and therefore only subject to ZOI influences. The development boundary is directly adjacent to the Humber designated site. It must be ensured there is no encroachment into the designated site during construction as this could lead to direct damage to habitat.	To note.

4.3.4.1	Paragraph 247	We welcome further reasoning as to why there is no potential for in-combination impacts to affect migratory fish, including lamprey.	Justification required.

4. Comments on Fish Ecology

Section	Paragraph /Table	Comment	Recommendations
4.3.4	4-9	We recommend that sandeels should also be considered for inclusion as they are a key prey species for several bird and cetacean species that have been scoped into the HRA and are known to use the vicinity of the OWF for spawning and nursey areas. Their benthic habits means that populations are sensitive to local impacts such as habitat loss, habitat change, and underwater noise. They should be considered for inclusion in the HRA during construction and when assessing in combination impacts.	Screen in sandeels for construction and in combination impact pathways.
4.3.2.1	216	We consider INNS and accidental pollution are potential pathways to impact fish ecology.	These potential effects should be included in the screening exercise.

5. Comments on Marine Mammals

Section	Paragraph /Table	Comment	Recommendations
4.4.1	253	In addition to the potential for connectivity between marine mammals and the offshore project area, it is not clear to what extent the potential offshore substation and Hydrogen Production Facility (HPF), both of which could be within, or very close to, the Southern North Sea SAC are considered in the HRA. There seems to be little consideration on potential construction of a substation and of the cable route within the SAC and potential disturbance during the operation of the HPF.	Clearly present the possible options for construction, including any offshore substations and Electrical Connection Opportunities which might impact the Southern North Sea SAC.

4.4.2.1	Table 4-12	We would welcome more detail and consideration on how the construction and operation & maintenance of offshore substations and Electrical Connection Opportunities might affect seal haul-out sites.	Provide detailed plans of the offshore substations and Electrical Connection Opportunities and assess how these will affect seal haul-out sites.
4.4.2.2.4	282	Effects associated with increased suspended sediments have been screened out for direct and indirect impacts to harbour porpoise. It is important to consider the impacts of suspended sediment on harbour porpoise prey resource and habitat. The Dogger Bank area is an important site for sand eels, a prey resource for harbour porpoise. It is vital that habitat and prey resource is protected to meet the Conservation Objective 3 of the Southern North Sea SAC.	Thoroughly assess the of impacts of suspended sediment from construction, operation and decommissioning on harbour porpoise habitat and prey resource to understand the impact on harbour porpoise from the Southern North Sea SAC.
4.4.3.2 and 4.4.3.3	325 and 333	We would welcome information on how the number of grey seals and harbour seals observed during the baseline surveys differ between the ECC and the offshore array area.	Present densities observed in the offshore project area and the ECC separately.
4.4.3.2 and 4.4.3.3	325 and 333	We note that the second year of marine mammal baseline survey is not yet available. We advise that the full baseline is included in the PEIR if possible, or provided for consultation post-PEIR.	N/A
4.4.3.2 & 4.4.3.3	Maps of grey and harbour seal relative densities	The densities of grey and harbour seal are higher closer to the coast, and therefore more information on potential locations of HPF and any offshore substations outside of the array area is vital to assess the impacts on grey seals.	Provide more information on locations of potential Electrical Connection Opportunities to accurately assess the impacts on grey seals from the Humber Estuary SAC, the Berwickshire and North Northumberland Coast SAC and the Isle of May SAC, and on harbour seals from the Wash and North Norfolk Coast SAC.
4.4.5	362	As commented above, more detail on the EEC and potential HPF and offshore substations is required to fully assess the	Provide more information on locations of potential Electrical Connection Opportunities

		impact on harbour porpoise from the Southern North Sea SAC.	to accurately assess the impacts on harbour porpoise from the Southern North Sea SAC.

6. Comments on Marine Ornithology

Section	Paragraph /Table	Comment	Recommendations
4.5	N/A	We note that a definitive list of sites and features to be screened in for assessment will depend on the results of the full two years of baseline surveys, and that the list of ornithological features presented here is therefore indicative only. We are therefore unable to definitively agree to the list of sites and features that should be screened in for HRA purposes at this stage.	We welcome provision of the data from the full two-years of baseline surveys for consideration, once available.
4.5	Table 4-17	We agree that the species-specific seasons presented are likely to be appropriate but note that until we have seen the baseline survey data, we are unable to agree definitively. Natural England note that, pending review of the baseline survey data, bespoke approaches to seasonality may be required.	Engage with NE on appropriate seasonal definitions once results of baseline surveys have been presented.
4.5	Table 4-18	We do not agree with the exclusion of Fair Isle tracking data from the foraging rages for guillemot and razorbill and advise the Applicant refer to Woodward et al. (2019) for foraging ranges. We note that Woodward et al. (2019) contains the most comprehensive and up-to-date review of seabird tracking studies and, as a general rule, recommend that the foraging ranges presented in Woodward et al (2019) + 1SD should be used for screening purposes. In the event that appropriate, recent, site-specific data is available, this should be presented and a decision on its appropriateness agreed with Natural England.	We advise using the mean max foraging ranges presented in Woodward et al. (2019) +1SD for screening purposes.

4.5.2.2.2	391	We note that disturbance impacts due to vessel movements have been screened out during the operation and maintenance phase. Natural England advise that these should be screened in, particularly for Greater Wash SPA. We acknowledge that a vessel management plan is going to be produced and would welcome discussion on additional mitigation that could be implemented to reduce impacts, however mitigation cannot be considered at LSE stage and we are unable to rule out impacts due to embedded mitigation prior to seeing the associated plans.	Screen in vessel disturbance during the operation and maintenance phase for the ECC/landfall.
4.5	Table 4-19	We require clarification on column heading 'sea distance to array area.' Natural England advise that the closest distance from an SPA to the project array, plus the buffer zone should be considered in HRA. It is unclear as to whether the buffer zone has been considered in this measurement.	Clarification required.
4.5	Table 4-21	We do not agree with Greater Wash SPA tern species being screened out for direct disturbance and displacement effects from work activity in the nearshore/ECC.	Screen in Little tern, Common tern and Sandwich tern for this impact pathway within the Greater Wash SPA.
4.5	Table 4-21	We agree with the screening in of gannet, guillemot, razorbill, and puffin for displacement impacts during operation and maintenance. However, Natural England note that these species have not been screened in for displacement impacts during construction and decommissioning. Natural England advise that displacement impacts on these species should be screened in for the construction and decommissioning phases of the project.	We advise that displacement impacts on gannet, guillemot, razorbill, and puffin should be screened in for the construction and decommissioning phases of the project.

Marine Management Organisation

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Robert Goodchild
Lead Consents Manager
SSE Renewables
Dogger Bank Wind Farm
robert.goodchild@sse.com

Our reference: DCO/2023/00001

By email only

26 January 2024

Dear Robert Goodchild,

Dogger Bank D Offshore Wind Farm (OWF)

Habitats Regulations Assessment (HRA) Screening Report

The Marine Management Organisation (MMO) received the HRA Screening Report on 19 December 2023. The MMO has reviewed the documents along with our advisors Centre for Environment, Fisheries and Aquaculture Science (Cefas).

After full review of the meeting minutes, agreement log and Compensatory Measures Long List, and advice received from Cefas, the MMO has the following comments to make:

Comments

1. Benthic Ecology

1.1. The MMO agree with the approach to the HRA within the screening report regarding Benthic Ecology matters.

1.2. The MMO agree with the Benthic Ecology impacts which have been screened in within the Likely Significant Effect (LSE) screening.

1.3. The MMO agree that the potential impacts from the proposed Electric Connection Opportunities are likely to be limited to within the Zone of Influence (ZOI) buffer around the Dogger Bank D array area and offshore export cable route.

2. Coastal and Sedimentary Processes

2.1. The MMO note that since the design phase is still incomplete, the exact format of the assessment intended by the applicant and hence the coverage implied by the topics screened in cannot be fully assessed at this time.

2.2. Section 4.1.2.2.4 of the report indicates that changes in water clarity (due to suspended solids) will be assessed, but the accompanying text only identifies sediment disturbed by cable reburial or maintenance as a cause. The HRA should also assess the effect of potential changes in water clarity due to changes in the vertical distribution of sediment in the water column on a (semi) permanent basis due

to hydrodynamic flow changes in the lee of turbines (turbine wakes from seabed to surface).

2.3. The MMO agree with the ZOI defined in the screening report. However, the screening should define the sediment transport cells and major pathways. Where impacts may occur on major pathways (supplying sediment for any geomorphic features contributing to maintenance or designation of designated areas), then this should be highlighted. If any significant risk to maintenance of the feature is noted, then it may be appropriate to extend the ZOI.

3. Fisheries

3.1. The MMO agree with the approach to the HRA within the screening report regarding Fisheries matters.

3.2. The MMO note that no project specific underwater noise modelling has been produced at this stage, and that the maximum distance of 19km for moderate avoidance behaviour occurring from piling activities, is based off Environmental Impact Assessments (EIAs) for other offshore windfarms. The MMO do not fully agree with this conclusion as the range of effect from underwater noise will vary greatly depending on project specific factors such as pile diameter, hammer energy, water depth, duration of piling, and whether simultaneous/concurrent piling is being undertaken.

Once project specific underwater modelling becomes available, this modelling would be discussed in the HRA report and the ZOI would be expanded if found to be appropriate.

3.3. The MMO agree with the screening in of the Humber Estuary SAC and Humber Estuary Ramsar sites (which list sea lamprey and river lamprey as qualifying features) for further assessment on the basis that these sites fall within the ZOI associated with the Onshore Project Area for indirect effects as a result of contamination of habitats from pollution via water and air.

3.4. The MMO agree with the Fisheries impacts which have been screened in within the LSE screening.

4. Underwater Noise

4.1. The MMO agree with the approach to the HRA within the screening report regarding Underwater Noise matters.

4.2. Section 4.3.2.2.4 states that the only sources of underwater noise at the operational and maintenance stage arise from vessel movements related to intermittent maintenance activities and operational turbines. The MMO agree that compared to the construction phase, it is expected that operational and maintenance activities will result in more localised effects, however the statement that 'previous underwater noise modelling suggests that impact ranges for these activities are highly localised (<50 m)' is unclear.

4.3. Barham and Mason (2021) assessed a range of activities, including cable laying, trenching, rock placement, drilling, suction dredging, vessels and operational turbines. The assessment concluded that there is a low to negligible risk (<50 m) of injury or Temporary Threshold Shift (TTS) in line with the Sound Pressure Level (SPLrms) noise exposure thresholds for fish and continuous sources as per Popper et al. (2014). Ultimately, the MMO defer to other relevant consultees on whether they

are content for noise during the operational and maintenance stage to be scoped out for Annex II migratory fish.

4.4. For marine mammals, the Screening Report concludes that underwater noise during operation and maintenance is considered unlikely to have the potential for a significant effect, however, this effect has been screened in for further site-specific assessment.

4.5. The MMO defer to Natural England for comments on the ZOI used for underwater noise.

4.6. The MMO note that no project specific underwater noise modelling has been produced at this stage, and that the maximum distance of 19km for moderate avoidance behaviour occurring from piling activities, is based off EIAs for other offshore windfarms. Please note that the behavioural predictions are largely dependent on the threshold that was applied in the assessment. The Barham and Mason (2021) assessment (which was undertaken for Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects) provide a range of predictions for behavioural effects (i.e., ranging from 11 km to 34 km, depending on the threshold).

5. General Comments

5.1. The MMO defer to Natural England for additional comments on the report.

5.2. The report discusses onshore and offshore elements relevant to the HRA somewhat interchangeably throughout. The MMO recommend clearer signposting between sections which discuss the different elements of the project.

Conclusion

The MMO welcomes the progress Dogger Bank D has made to date regarding Marine Mammal Ecology and Underwater Noise (EIA and HRA). However, the MMO requires the points raised in this response, to be addressed within the PEIR. In addition to this the MMO would welcome early engagement and review of any reports or modelling as part of the evidence plan process to ensure that only major topics of disagreement are discussed past the application stage.

Please note this letter comprises the MMO's initial comments in respect of the Dogger Bank D OWF and is without prejudice to any future representation the MMO may make about the proposed Project and associated documents.

Your feedback

We are committed to providing excellent customer service and continually improving our standards and we would be delighted to know what you thought of the service you have received from us. Please help us by taking a few minutes to complete the following short survey (https://www.surveymonkey.com/r/MMOMLcustomer).

If you require any further information please do not hesitate to contact me using the details provided below.

Yours Sincerely,

Marine Licensing Case Manager

D +44 (0)2030250460
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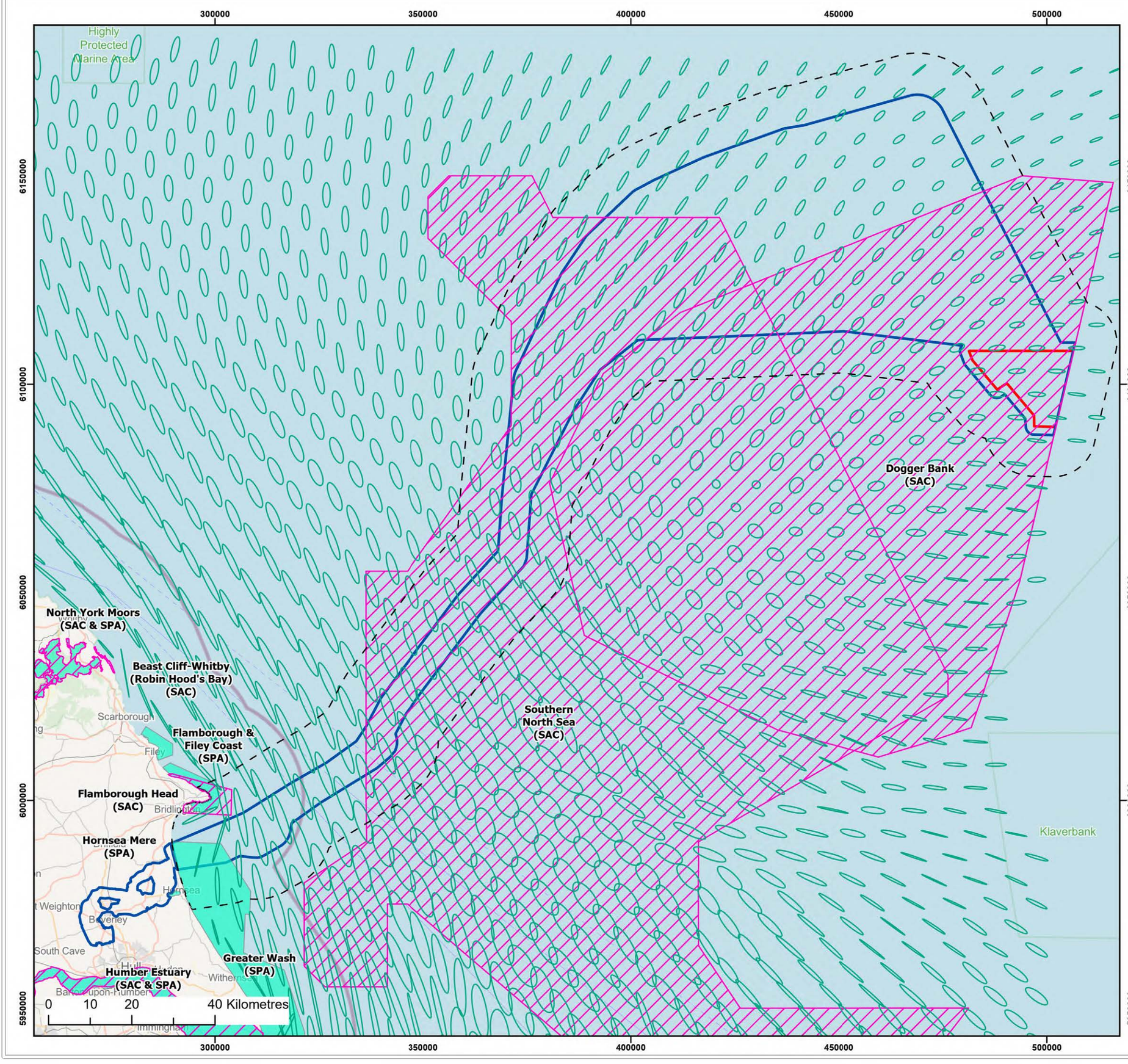
References

Barham, R. and Mason, T. (2021). Sheringham Extension Project and Dudgeon Extension Project: Underwater noise assessment. Subacoustech Environmental Report No. P272R0306.

Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D. A., Bartol, S., Carlson, T. J., Coombs, S., Ellison, W. T., Gentry, R. L., Halvorsen, M. B., Løkkeborg, S., Rogers, P. H., Southall, B. L., Zeddies, D. G., & Tavolga, W. N. (2014). ASA S3/SC1.4 TR-2014 Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. Springer International Publishing. https://doi.org/10.1007/978-3-319-06659-2.

DOGGER BANK D HRA SCREENING ADDENDUM ANNEX II: UPDATED HRA SCREENING FIGURES (2023)

DOGGER BANK D
WIND FARM



Legend:

- Dogger Bank D Array Area
- Project Area
- Zone Of Potential Influence of the Tidal Regime
- Spring Tidal Ellipses
- Special Area of Conservation (SAC)
- Special Protection Areas (SPA)

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Offshore ZoI Tidal Regime

Figure: 4-1

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0088

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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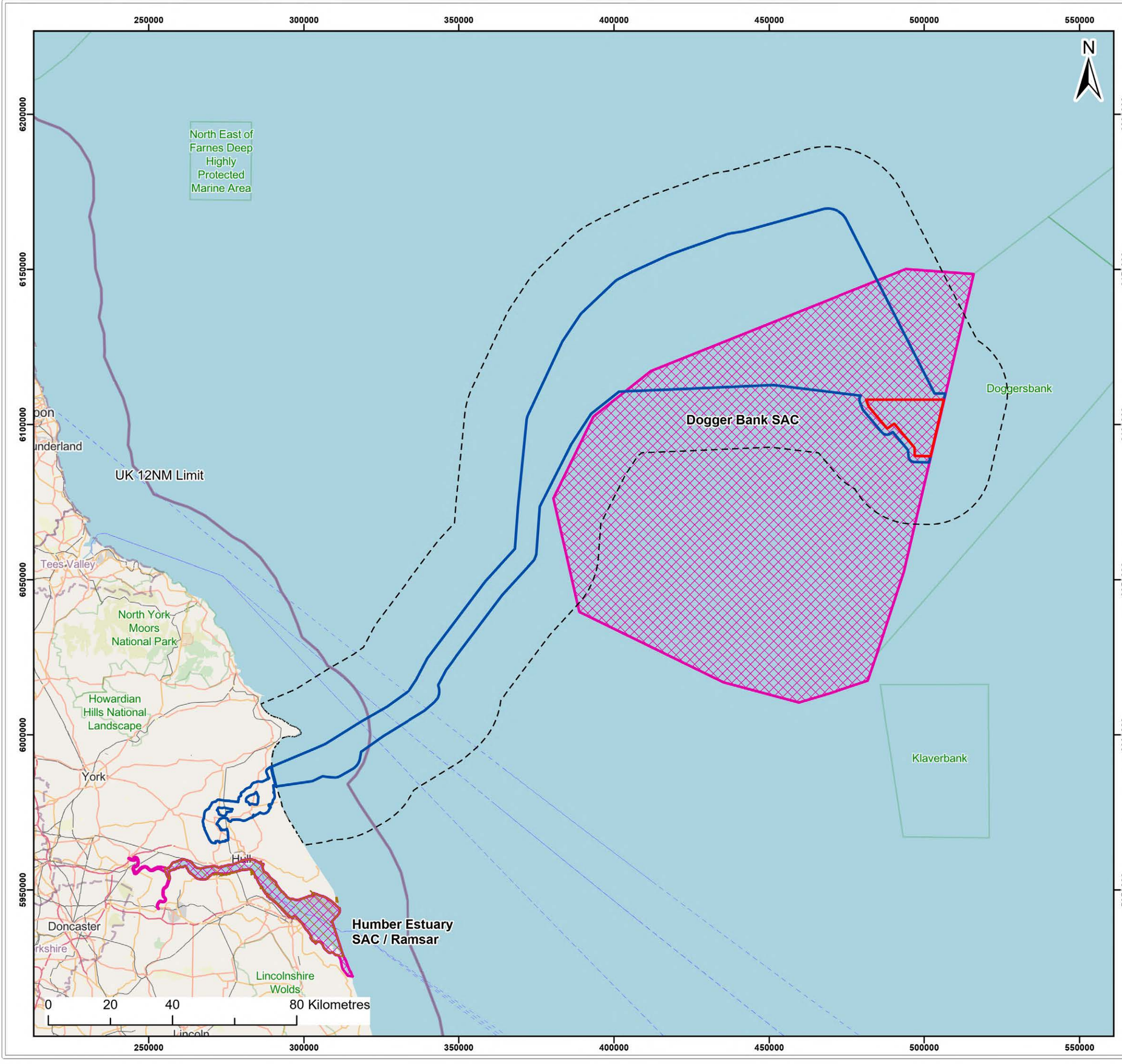
04	13/12/2023	AB	SS	A3	1:900,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor



Legend:

- Dogger Bank D Array Area
- Onshore Scoping Area
- Special Area of Conservation (SAC)
- Ramsar
- Annex I Offshore Sites ZoI (20km)

Source: © Haskoning DHV UK Ltd, 2024; © Natural England, 2024; © OpenStreetMap (and) contributors, CC-BY-SA

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Sites Designated for Annex I Habitats Taken Forward for Further Assessment

Figure: 4-2

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0083

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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02	29/11/2023	AB	SS	A3	1:1,200,000

Co-ordinate system: WGS 1984 UTM Zone 31N

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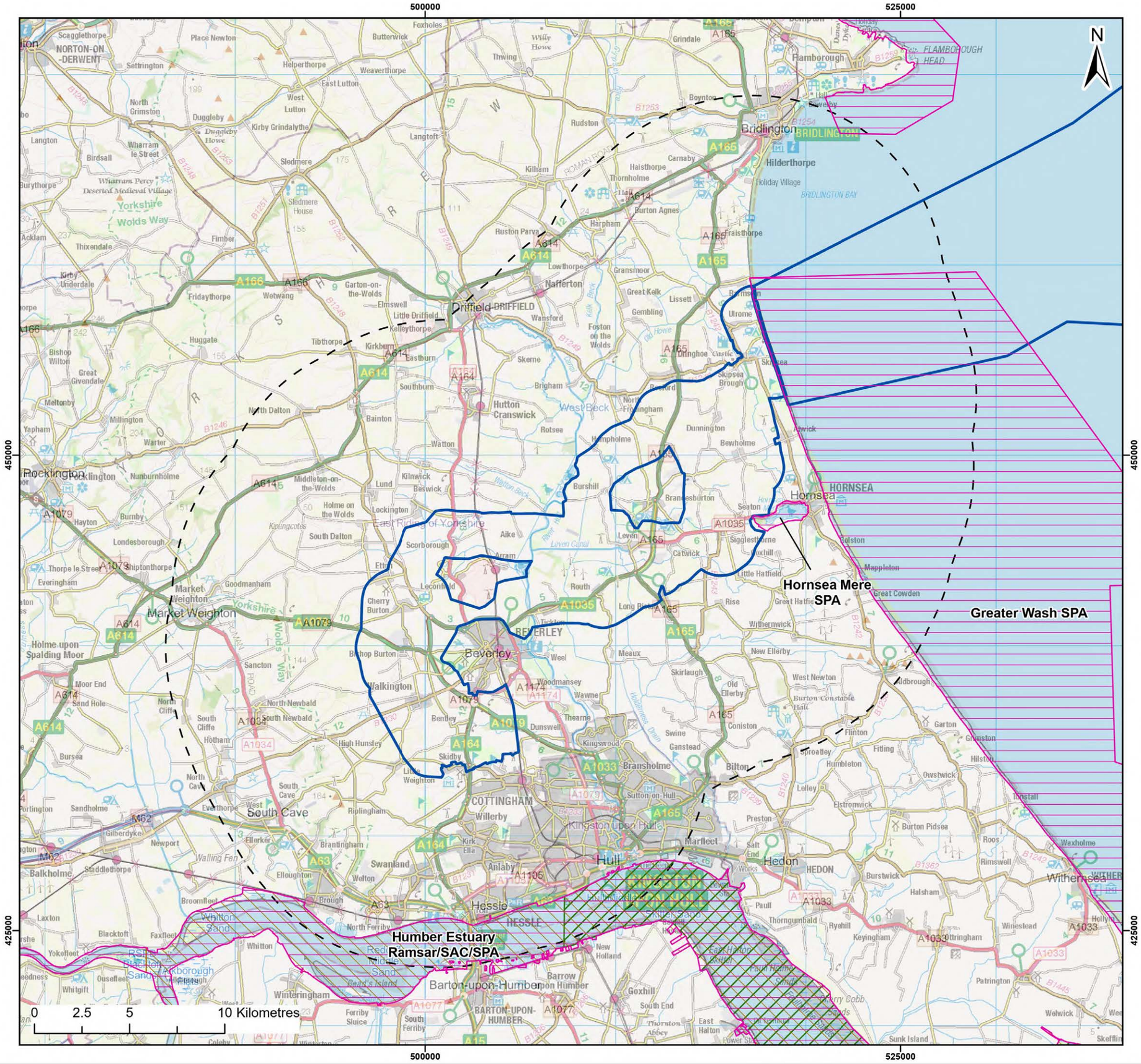

Legend:

- Project Area
- Onshore Project Area ZoI (10km)
- Ramsar
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: European Sites within 10km of the Onshore Project Area

Figure: 4-3

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0088

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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05	14/02/2023	AB	SS	A3	1:200,000

Co-ordinate system: British National Grid

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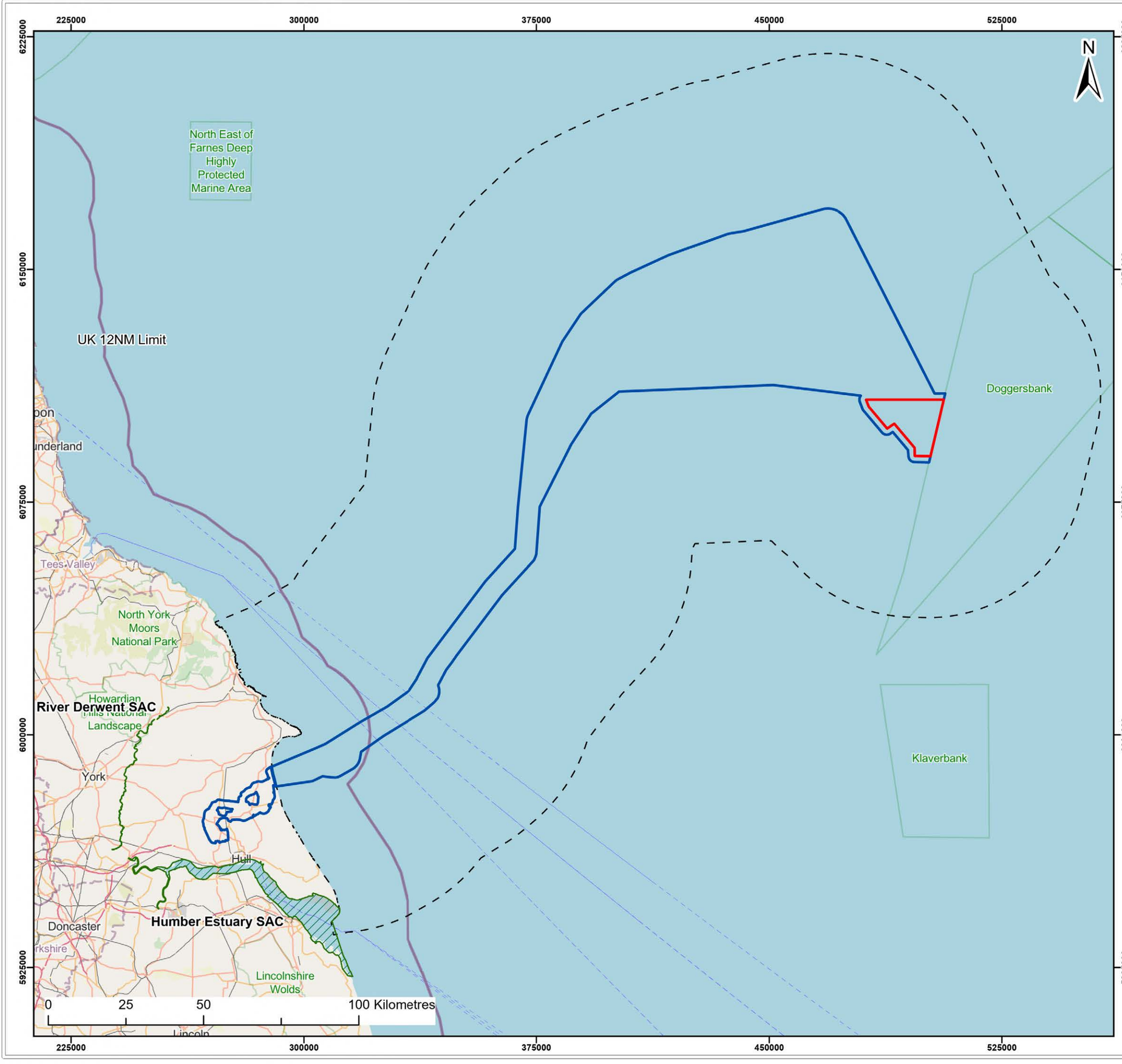

Legend:

- Dogger Bank D Array Area
- Project Area
- Special Area of Conservation (SAC)
- Annex II Migratory Fish ZoI (50km)

Project:

Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

SACs for Annex II Migratory Fish
Features Screened in for Further Assessment

Figure:	4-4	Drawing No:	PC3991-RHD-ZZ-ZZ-DR-Z-0077		
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02	02/10/2023	GC	EB	A3	1:1,200,000

Co-ordinate system: WGS 1984 UTM Zone 31N

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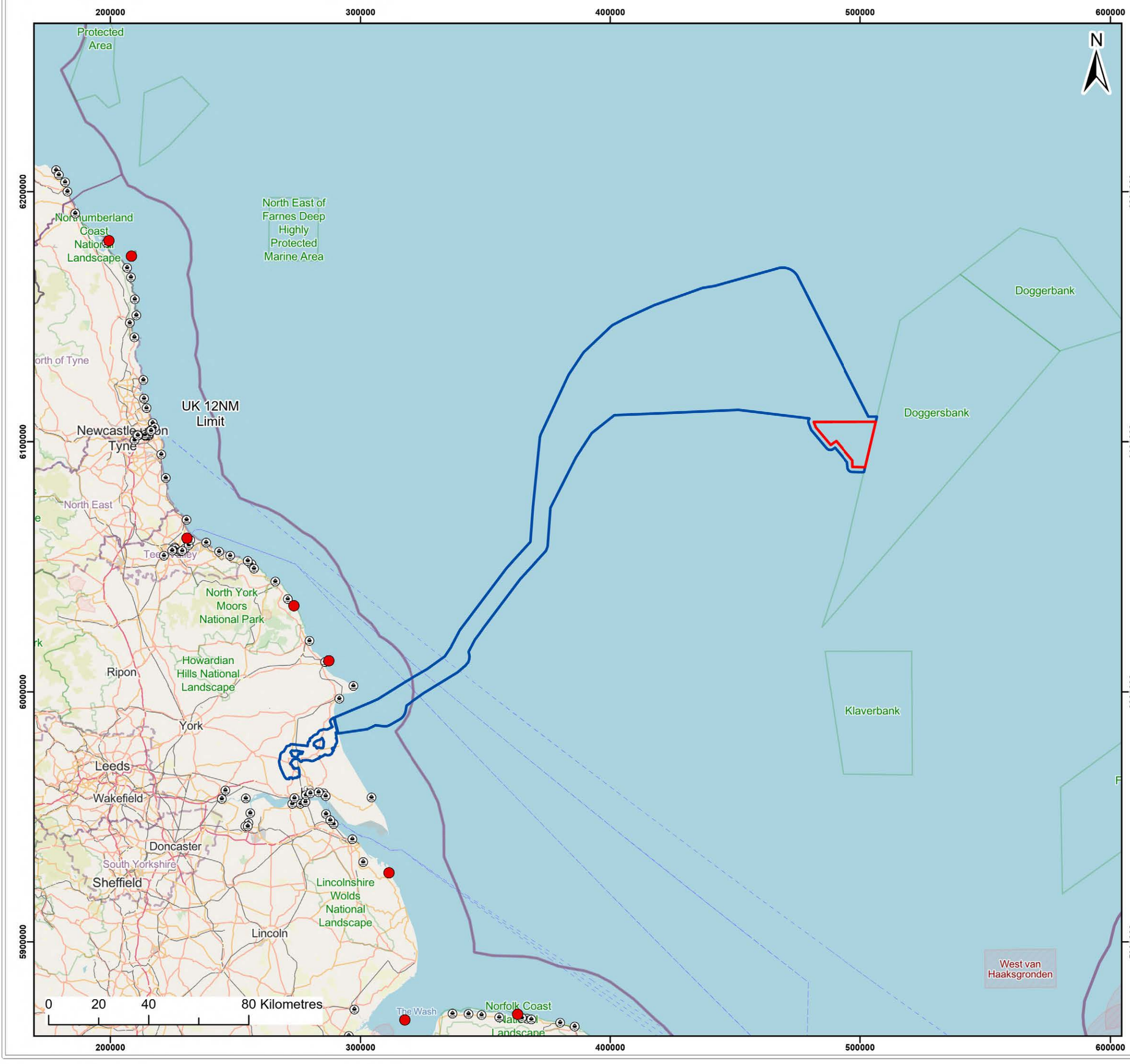

Legend:

- Dogger Bank D Array Area
- Project Area
- UK Ports
- Seal Haul-Out Sites

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Seal Haul-Out Sites and Port Locations in the Vicinity of the Project Location

Figure:	Drawing No:				
4-5	PC3991-RHD-ZZ-ZZ-DR-Z-0086				
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Co-ordinate system: WGS 1984 UTM Zone 31N

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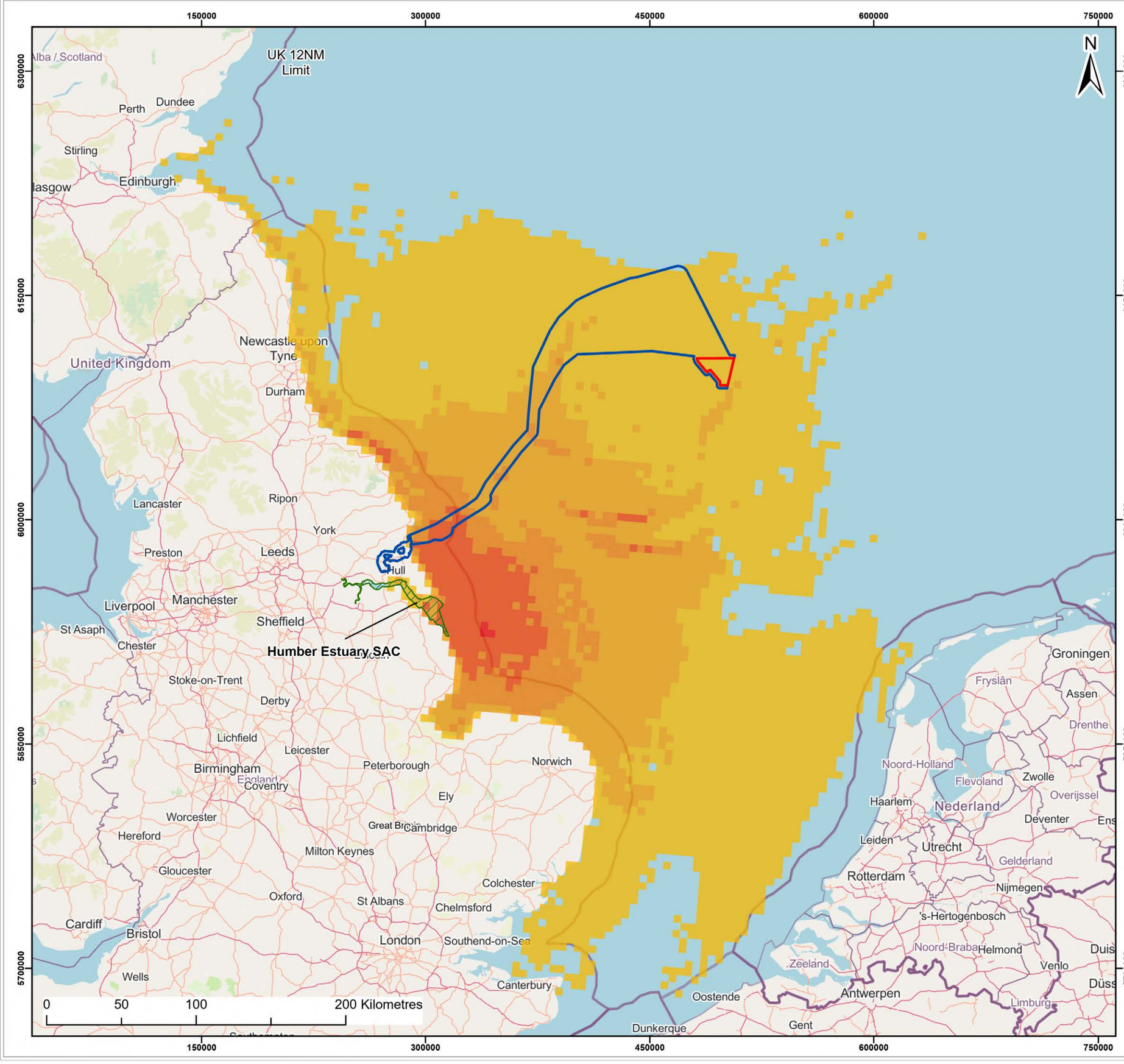

Legend:

- Dogger Bank D Array Area
- Project Area
- Humber Estuary Special Area of Conservation (SAC)

Grey seal at-sea mean density (% per 25km²)

- 0.0 - 0.001
- 0.0011 - 0.01
- 0.011 - 0.05
- 0.051 - 0.1
- 0.11 - 0.5
- >0.5

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Grey Seal At-Sea Mean Densities for Those Individuals Associated with the Humber Estuary SAC

Figure:	Drawing No:				
4-6	PC3991-RHD-ZZ-ZZ-DR-Z-0079				
Revision:	**Date:**	**Drawn:**	**Checked:**	**Size:**	**Scale:**
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01	18/05/2023	JR	GS	A3	1:2,500,000

Co-ordinate system: WGS 1984 UTM Zone 31N

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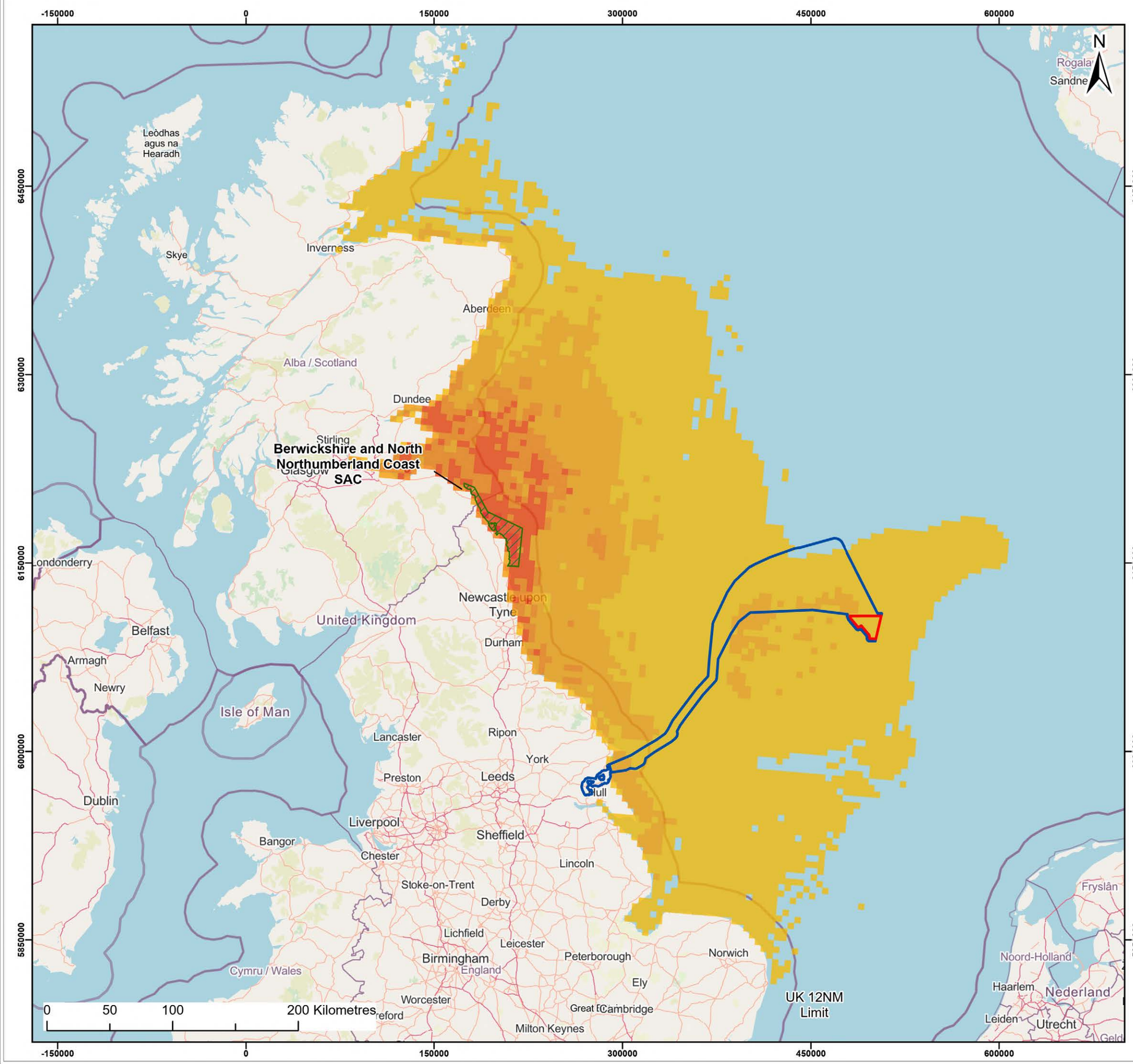

Legend:

- Dogger Bank D Array Area
- Project Area
- Berwickshire and North Northumberland Coast Special Area of Conservation (SAC)

Grey seal at-sea mean density (% per 25km²)

- <0.001
- 0.0011 - 0.01
- 0.011 - 0.05
- 0.051 - 0.1
- 0.11 - 0.5
- 0.51 - 1.0
- >1.0

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Grey Seal At-Sea Mean Densities for Those Individuals Associated with the Berwickshire and North Northumberland Coast SAC

Figure: 4-7

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0080

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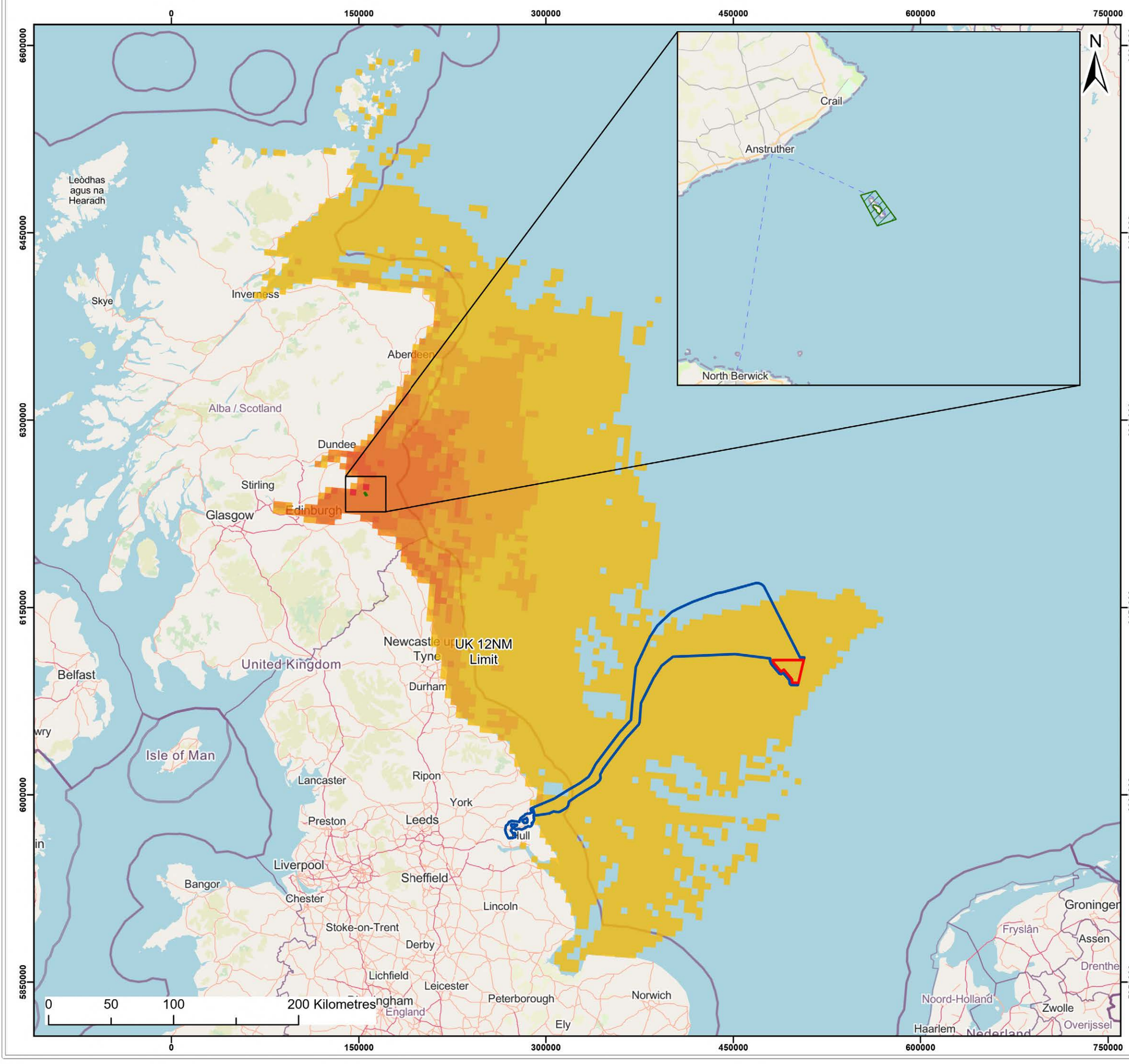
01	18/05/2023	JR	GS	A3	1:3,000,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor



Legend:

- Dogger Bank D Array Area
- Project Area
- Isle of May Special Area of Conservation (SAC)

Grey seal at-sea mean density (% per 25km²)

- <0.001
- 0.0011 - 0.010
- 0.011 - 0.050
- 0.051 - 0.1
- 0.11 - 0.5
- 0.51 - 1
- >1

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Grey Seal At-Sea Mean Densities for Those Individuals Associated with the Isle of May SAC

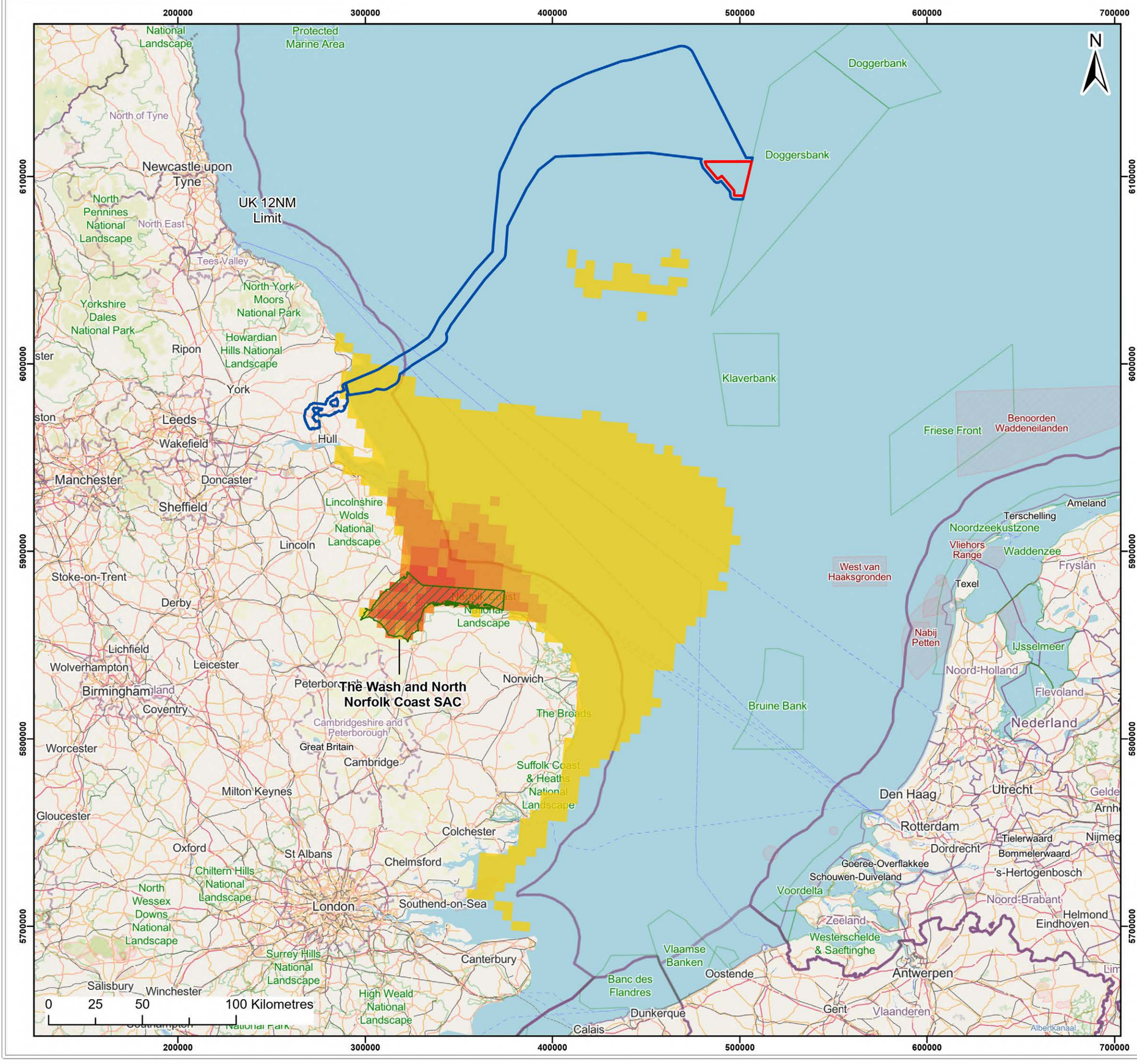
Figure: 4-8

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0081

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	01/07/2024	JH	AB	A3	1:3,000,000
01	19/05/2023	JR	GS	A3	1:3,000,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor



Legend:

- Dogger Bank D Array Area
- Project Area
- The Wash and North Norfolk Coast Special Area of Conservation (SAC)

Harbour seal at-sea mean density (% per 25km²)

- 0.0 - 0.0010
- 0.0011 - 0.1
- 0.11 - 0.2
- 0.21 - 0.5
- 0.51 - 1.0
- 1.1 - 1.5
- >1.5

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Harbour Seal At-Sea Mean Densities for Those Individuals Associated with The Wash and North Norfolk Coast SAC

Figure: 4-9
Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0082

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: WGS 1984 UTM Zone 31N

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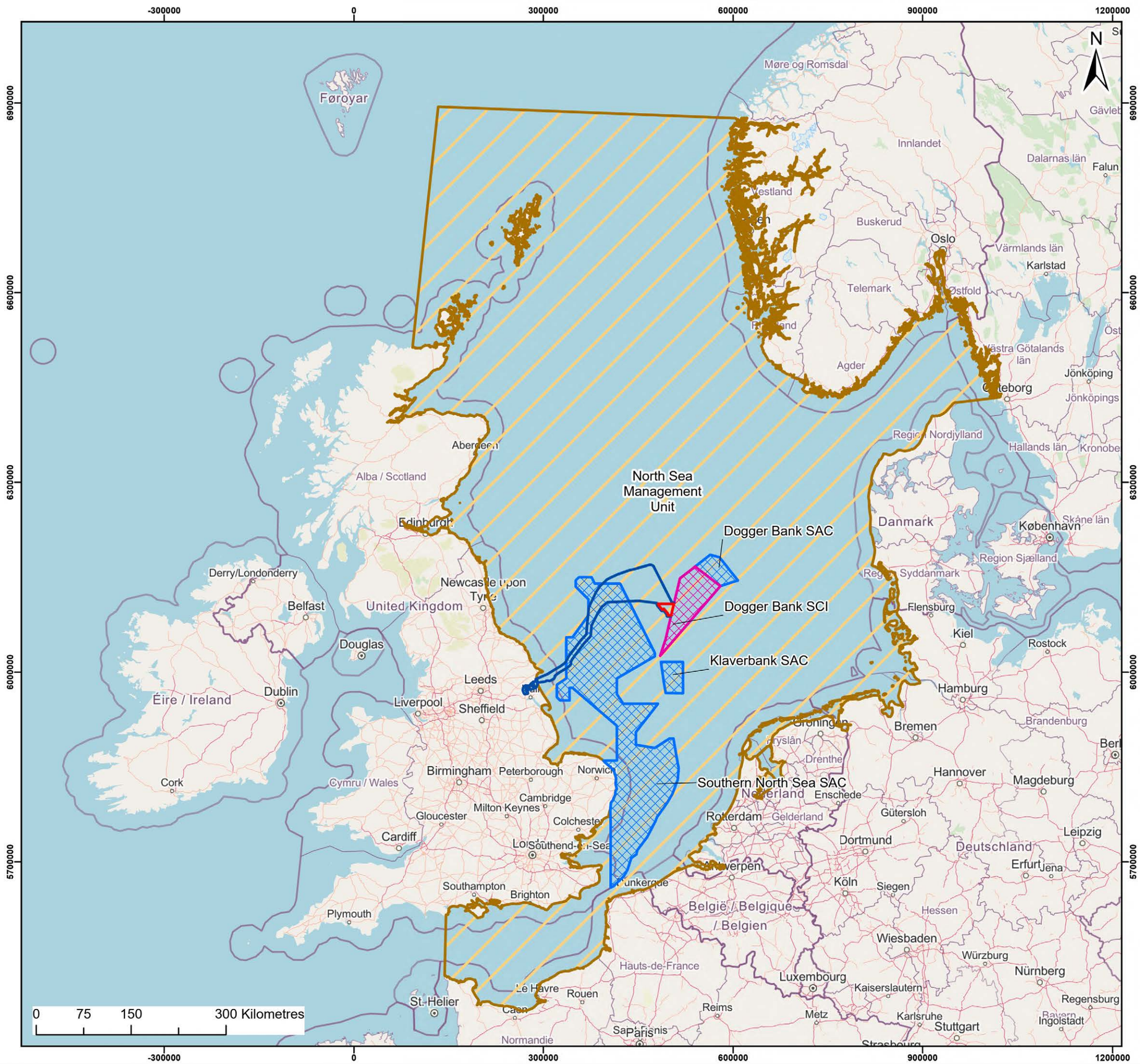


Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Harbour Porpoise Management Units and SACs Screened In

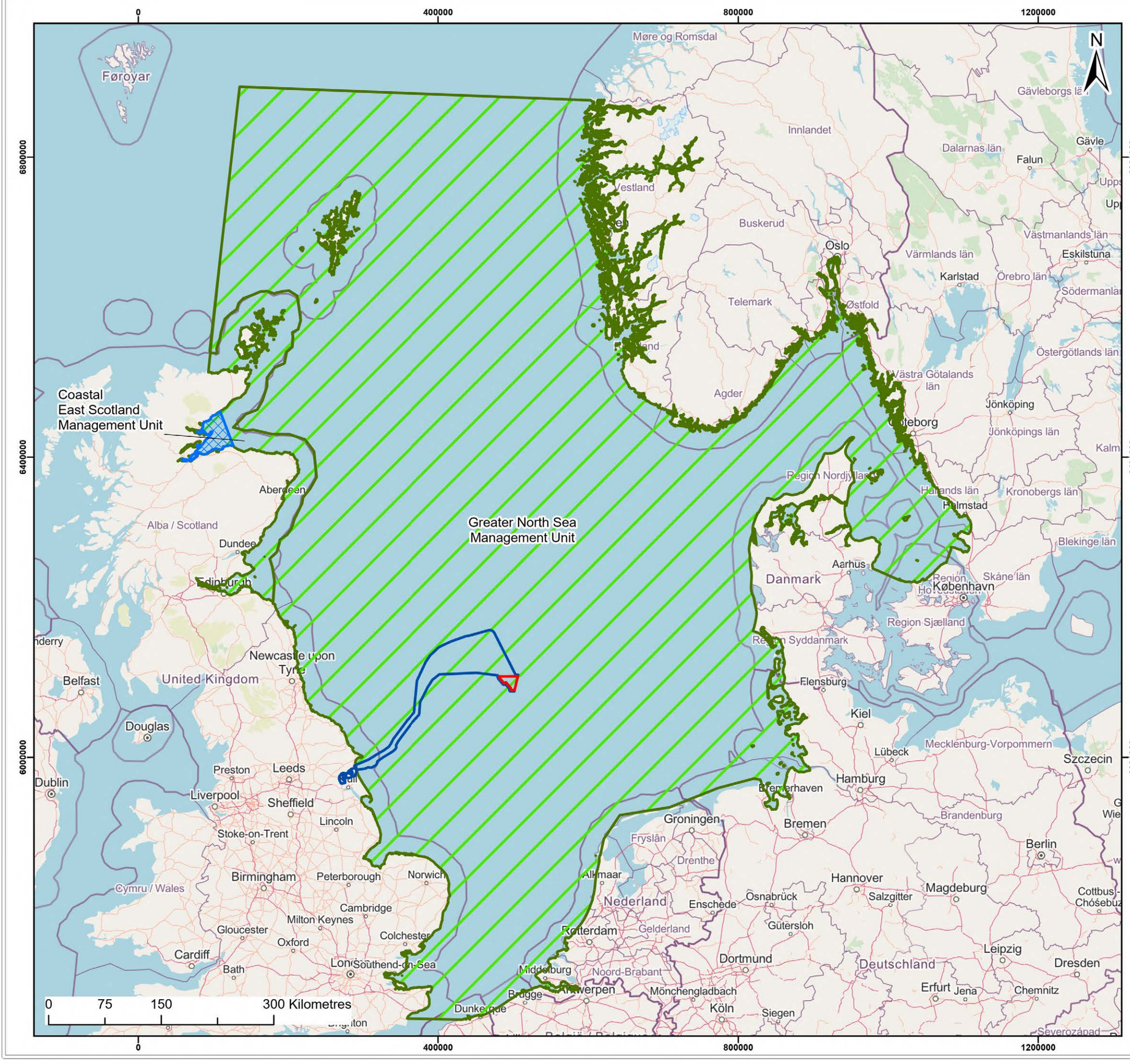
Figure: 4-10

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0001

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	01/07/2024	JH	AB	A3	1:6,000,000
01	02/10/2023	GC	SS	A3	1:6,000,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor



Legend:

- Dogger Bank D Array Area
- Project Area
- Moray Firth Special Area of Conservation (SAC)
- Bottlenose dolphin Management Units

Project:

Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Bottlenose Dolphin Management Units and SACs Screened In

Figure:	Drawing No:				
4-11	PC3991-RHD-ZZ-ZZ-DR-Z-0086				
Revision:	**Date:**	**Drawn:**	**Checked:**	**Size:**	**Scale:**
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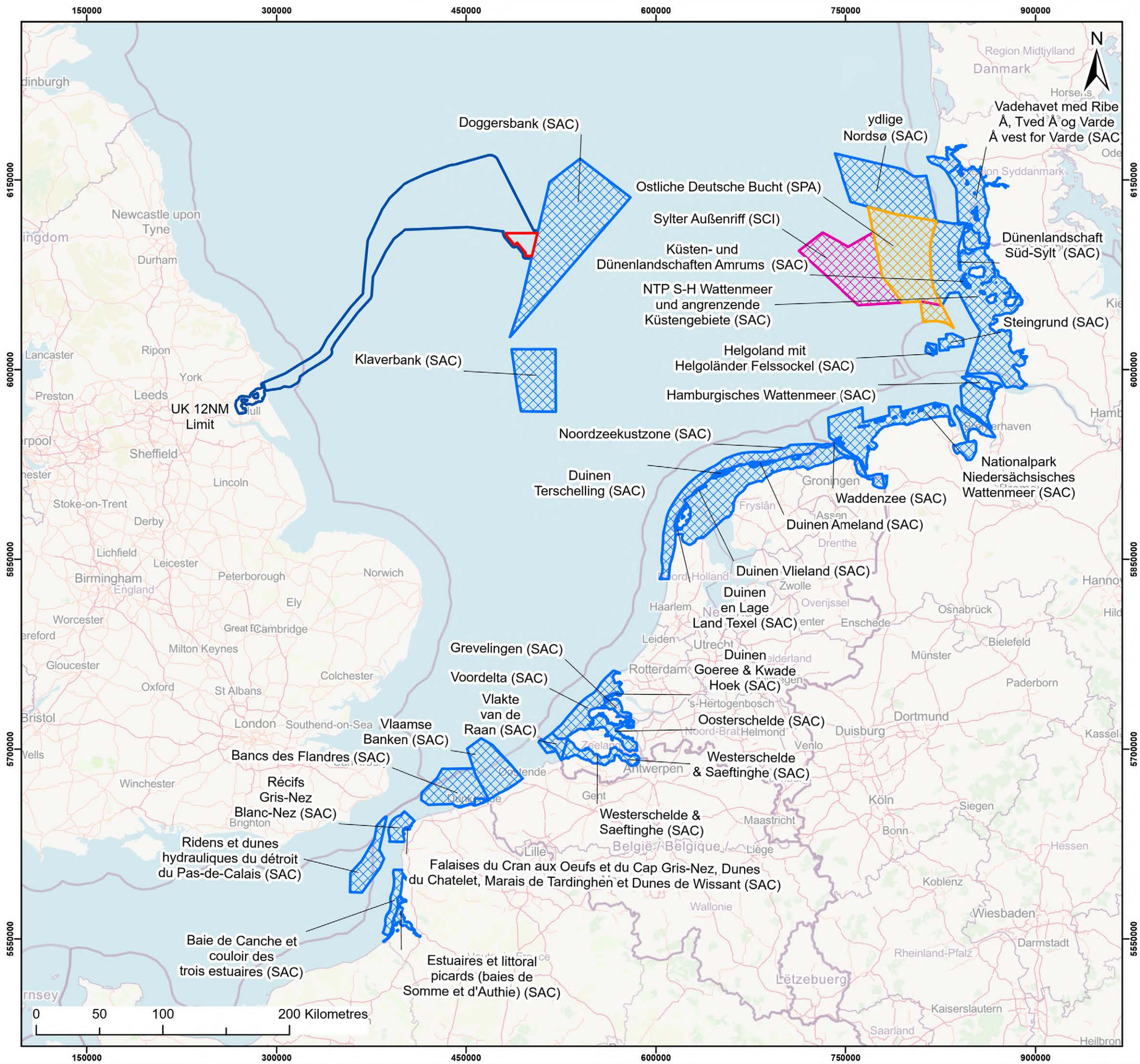
02	02/10/2023	GC	SS	A3	1:5,000,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor



Legend:

- Dogger Bank D Array Area
- Project Area
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Site of Community Importance (SCI)

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Grey Seal European SACs Screened In

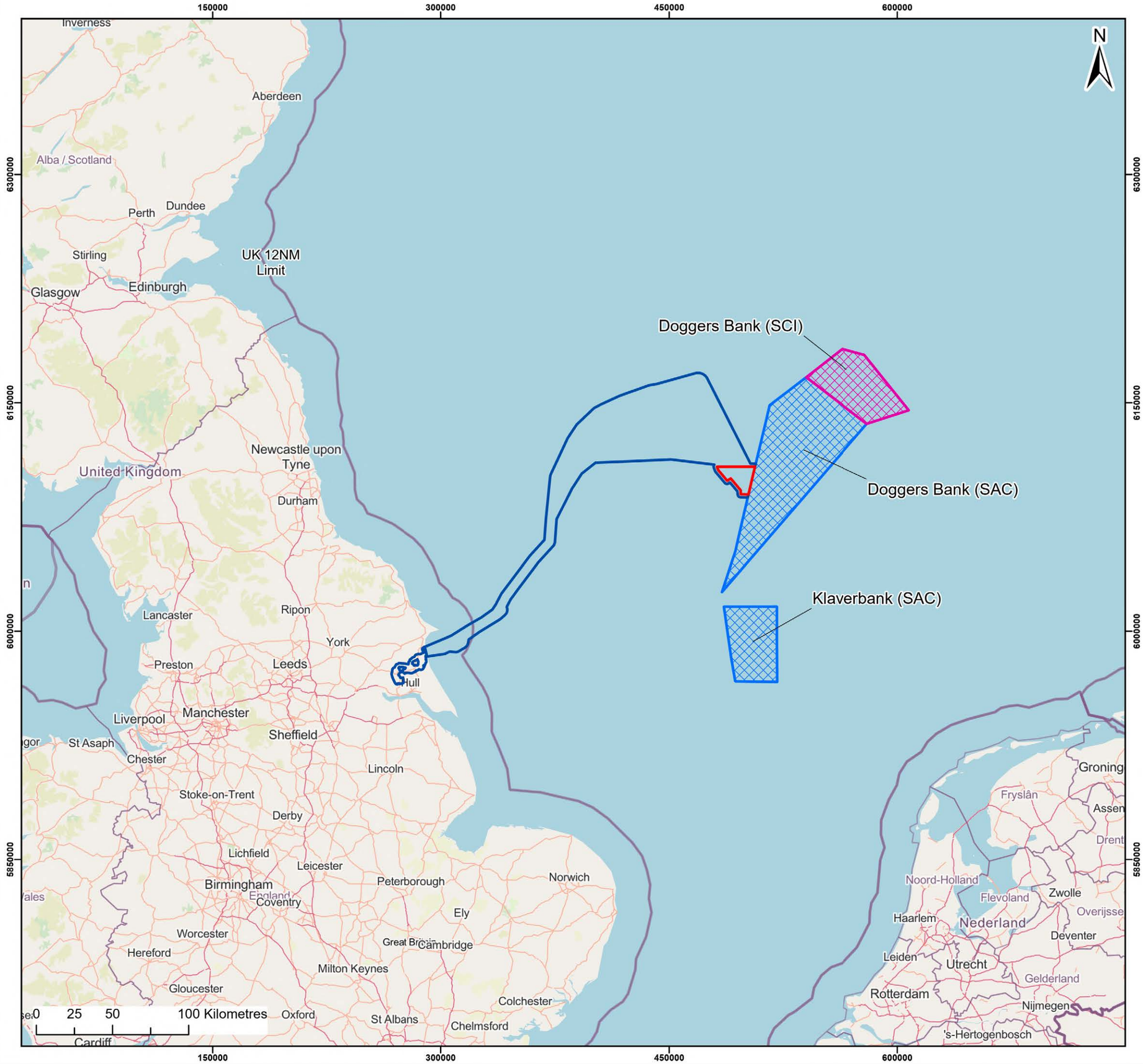
Figure: 4-12

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0006

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	01/07/2024	JH	AB	A3	1:3,000,000
01	02/10/2023	GC	SM	A3	1:3,000,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor



Legend:

- Dogger Bank D Array Area
- Project Area
- Special Area of Conservation (SAC)
- Site of Community Importance (SCI)

Source: © Haskoning DHV UK Ltd, 2024; © Natura 2000, 2024; ; © OpenStreetMap (and) contributors, CC-BY-SA

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Harbour Seal European SACs Screened In

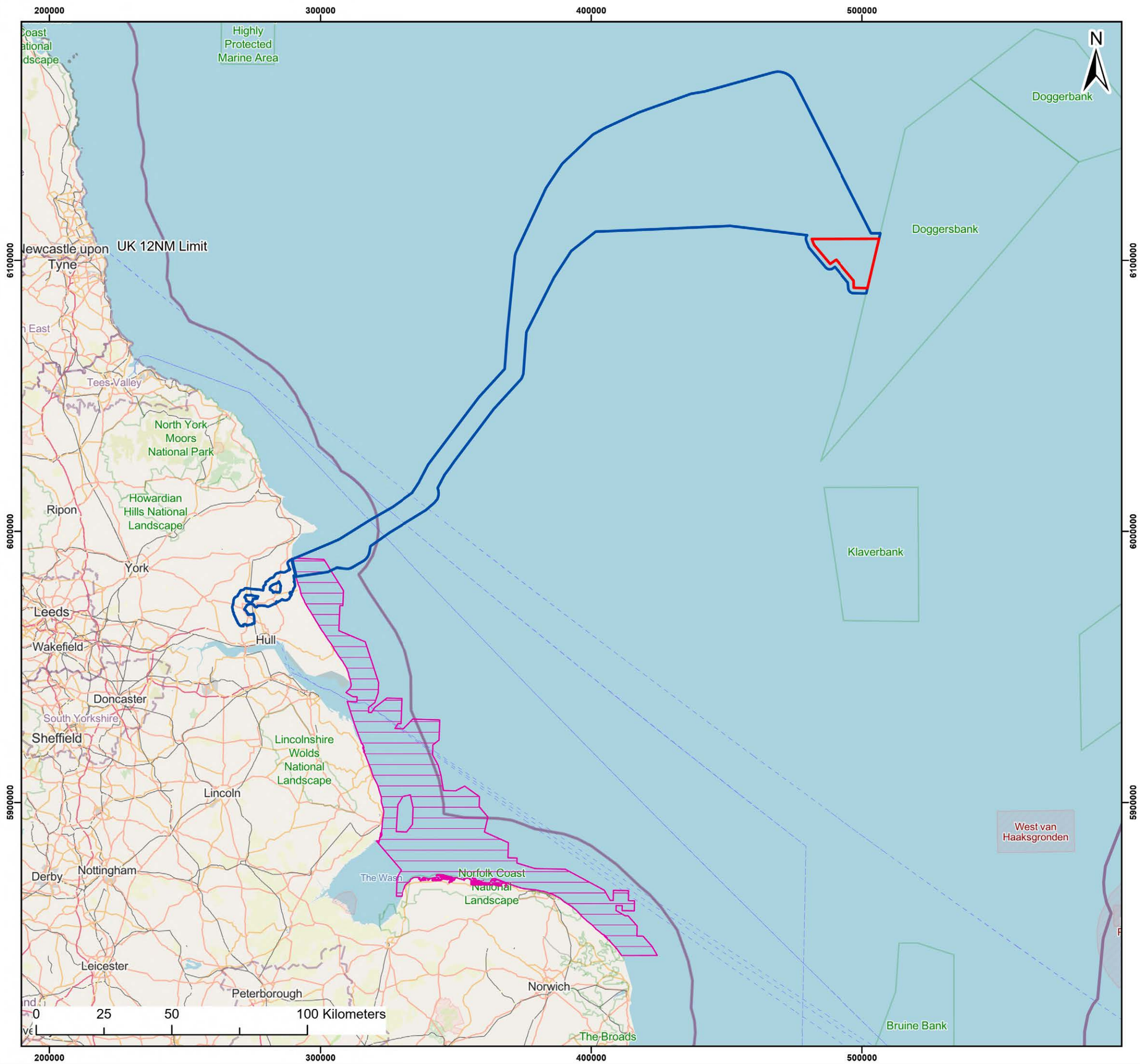
Figure: 4-13

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0086

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	01/07/2024	JH	AB	A3	1:2,500,000
01	02/10/2023	GC	SM	A3	1:2,500,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor



Legend:

- Dogger Bank D Array Area
- Project Area
- Greater Wash Special Protection Area (SPA)

Source: © Haskoning DHV UK Ltd, 2024; © Natural England, 2024; © OpenStreetMap (and) contributors, CC-BY-SA

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Overlap between the worst-case Project Area and the Greater Wash SPA

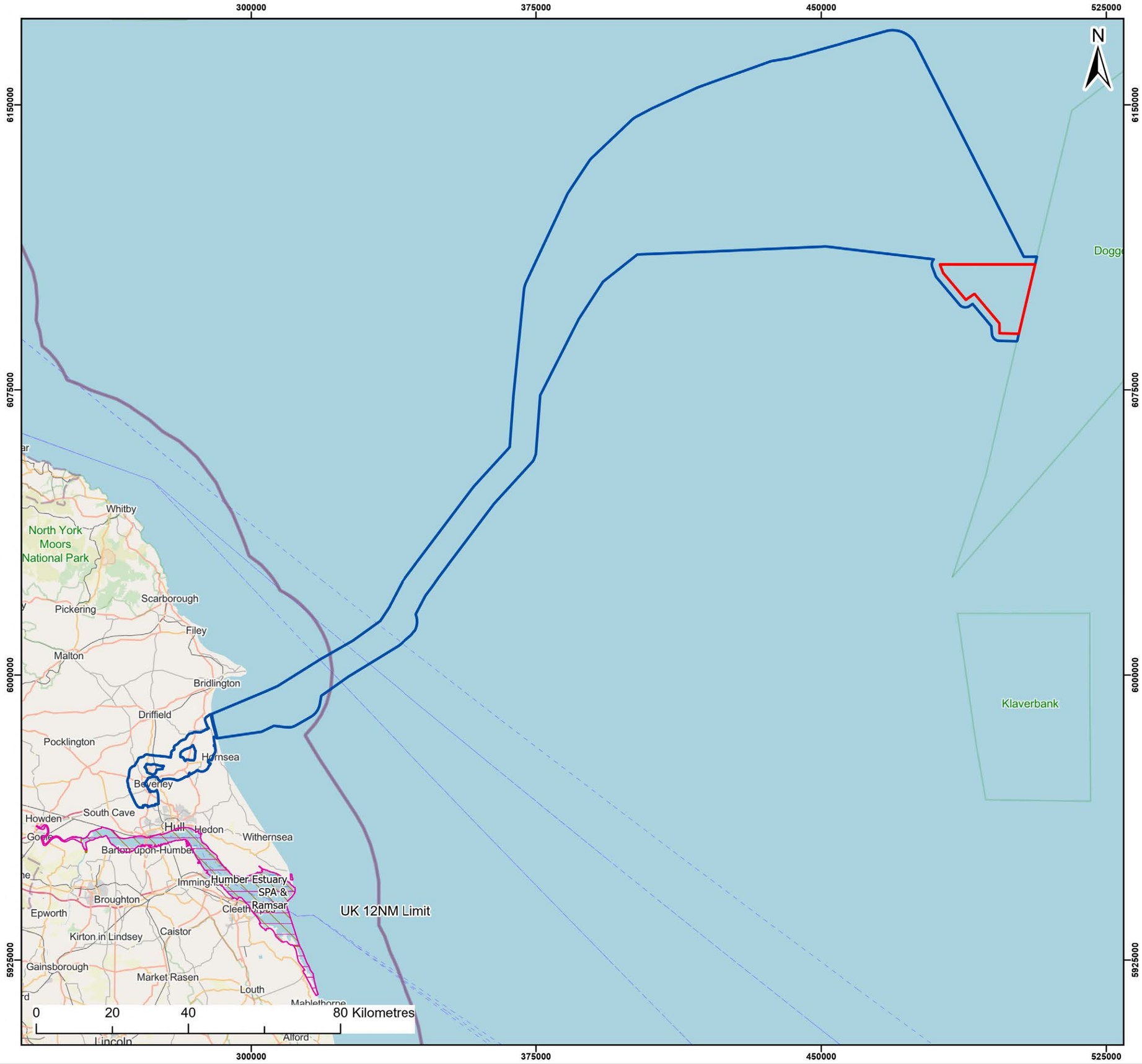
Figure: 4-14

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0095

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	01/07/2024	JH	AB	A3	1:1,400,000
01	03/11/2023	GC	EB	A3	1:1,400,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor



Legend:

- Dogger Bank D Array Area
- Project Area
- Humber Estuary Ramsar
- Humber Estuary Special Protection Area (SPA)

Source: © Haskoning DHV UK Ltd, 2024; © Natural England, 2024; © OpenStreetMap (and) contributors, CC-BY-SA

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Distance between the worst-case Project Area and the Humber Estuary SPA/Ramsar site

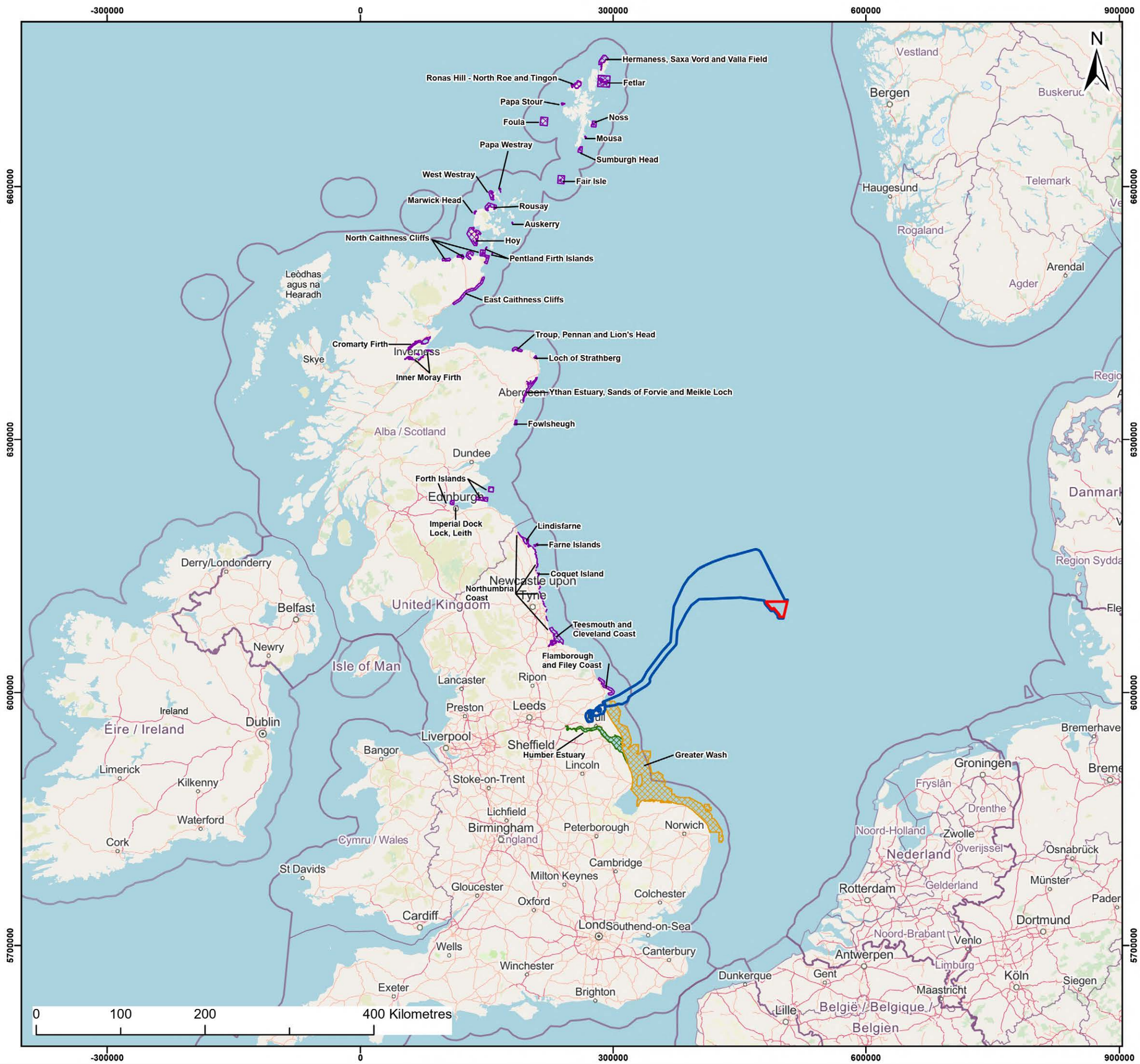
Figure: 4-15

Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0096

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	01/07/2024	JH	AB	A3	1:1,000,000
01	03/11/2023	GC	EB	A3	1:1,000,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor



Legend:

- Dogger Bank D Array Area
- Project Area
- Marine SPA
- Migratory Non-Seabird SPAs
- Seabird Colony SPA

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
SPAs for Ornithological Features
(Seabirds and Migratory Non-seabirds)
Screened In for Further Assessment

Figure: 4-16
Drawing No: PC3991-RHD-ZZ-ZZ-DR-Z-0091

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	01/07/2024	JH	AB	A3	1:4,500,000
02	03/11/2023	GC	LMF	A3	1:4,500,000

Co-ordinate system: WGS 1984 UTM Zone 31N

sse Renewables equinor

Appendix A.3 Apportionment Report

Royal HaskoningDHV

Dogger Bank D – Offshore Ornithology; Appendix A.3 Apportionment Report

Ursula Scuderi, Dr Amie Wheeldon, Jalal Khan & Matthew Boa

APEM

Client: Royal Haskoning DHV

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Project reference: P00011568

Date of issue: April 2025

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Revision and Amendment Register

Version Number	Date	Section(s)	Page(s)	Summary of Changes	Approved by
1.0	18/02/2025	All	All	Draft	MB
1.1	19/03/2025	All	All	Draft	MB
1.2	2/04/2025	All	All	Draft	MB
1.3	10/04/2025	All	All	Final clean version	MB
1.4	12/05/2025	All	All	Gannet apportionment updates	MB

Contents

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1. Introduction

SSE Renewables and Equinor (hereafter referred to as 'the Applicant') is proposing to develop the Dogger Bank D (DBD) Offshore Wind Farm (OWF) (hereafter referred to as 'the Project') as a proposed optimisation to the Dogger Bank C (DBC) OWF that is currently in construction. DBD is located approximately 210km offshore from the north-east coast of England at its closest point, with the array covering an area of approximately 262km^2. DBD will comprise both offshore and onshore infrastructure, including an offshore generating station (wind farm array area), export cables to landfall, onshore export cables to an onshore converter station zone for connection to the electricity transmission network (please see **Volume 1, Chapter 4 Project Description** for full details on the Project Design).

APEM Ltd (hereafter APEM) was commissioned by the Applicant to undertake a study of offshore ornithology features that characterise the area that may be influenced by DBD. A separate report (**Volume 2, Appendix 13.2 Offshore Ornithology Baseline Characterisation Report**) provides the findings from offshore ornithology survey data to determine the receptors that characterise the baseline and are relevant to assessing potential impacts from DBD. Moreover, appropriate modelling has been undertaken to characterise the potential impacts of the Project as detailed within **Volume 2, Appendix 13.3 Offshore Collision Risk Modelling** for collision risk and **Volume 2, Appendix 13.4 Offshore Displacement Analysis Report** for displacement. This technical annex has been produced to support the **Report to Inform Appropriate Assessment** (**RIAA**) (document reference 5.3).

To determine how potential impacts from the Project may affect seabird features of designated sites, predicted impacts are apportioned to individual colonies. The level of potential connectivity between the Project and the qualifying features of designated sites may vary seasonally, therefore apportionment has been undertaken on a seasonal basis.

The following sections details the apportionment process undertaken for the Project and the resulting seasonal apportionment rates for offshore ornithological qualifying features of designated sites screened in for assessment, as detailed within the **RIAA** (document reference 5.3).

2. Methodology

Following HRA screening and further refinement within the Draft RIAA (see **Section 9.3** of the **RIAA** (document reference 5.3) for further details), six species were identified as requiring HRA apportionment to allow for quantitative impact assessments for qualifying features of designated sites within the Draft RIAA (**Table 2-1**). Connectivity to designated sites varies seasonally, therefore apportionment is undertaken on a seasonal basis. Further details on seasonal approaches are provided in **Section 2.1** and **Section 2.2** for the breeding and non-breeding bio-seasons, respectively. A summary of the qualifying features requiring HRA apportionment and their seasonal connectivity is provided in **Table 2-1**.

Table 2-1 Designated sites and features screened in for assessment and the relative connectivity to bio-seasons (green highlighting indicates bio-season and relevant months included within breeding season apportionment, orange highlighting indicates bio-seasons and relevant months included within non-breeding season apportionment)

Feature	Site	Connectivity	Bio-season				
			Return migration	Breeding	Post-breeding migration	Migration-free winter	Non-breeding
Kittiwake	Flamborough and Filey Coast SPA	Breeding and non-breeding	January - February	March - August	September - December	N/A	N/A
	Farne Islands SPA	Breeding and non-breeding					
	Fowlsheugh SPA	Non-breeding					
	East Caithness Cliffs SPA	Non-breeding					
Herring gull	Flamborough and Filey Coast SPA	Non-breeding	N/A	N/A	N/A	N/A	September – February
	East Caithness Cliffs SPA	Non-breeding					
Guillemot	Flamborough and Filey Coast SPA	Non-breeding	N/A	N/A	N/A	N/A	August – February
	Farne Islands SPA	Non-breeding					
Razorbill	Flamborough and Filey Coast SPA	Non-breeding	January - March	N/A	August - October	November – December	N/A

Feature	Site	Connectivity	Bio-season				
			Return migration	Breeding	Post-breeding migration	Migration-free winter	Non-breeding
Puffin	Flamborough and Filey Coast SPA	Breeding and non-breeding	N/A	April - July	N/A	N/A	August - March
	Farne Islands SPA	Non-breeding					
	Coquet Island SPA	Non-breeding					
	Forth Islands SPA	Non-breeding					
Gannet	Flamborough and Filey Coast SPA	Breeding and non-breeding	December - February	March - September	October - November	N/A	N/A
	Forth Islands SPA	Breeding and non-breeding					
	Noss SPA	Non-breeding					
	Hermaness, Saxa Vord and Valla Field SPA	Non-breeding					

2.1 Breeding bio-season

2.1.1 Apportionment to individual colonies

During the breeding bio-season, only colonies within Mean Maximum Foraging Range (MMFR) plus one Standard Deviation (SD) as defined by Woodward *et al.,* (2019) are considered to have connectivity to the Project. These included both designated and non-designated sites, with a full overview of sites included provided in **Appendix 1**. As concluded within the HRA screening report, with further refinement provided in **Section 9.3** of the **RIAA** (document reference 5.3), a number of qualifying features of designated sites were identified as having connectivity to the Project and potential for a Likely Significant Effect (LSE) could not be ruled out:

- Kittiwake qualifying feature of:
    - Flamborough and Filey Coast SPA;
    - Farne Islands SPA;
- Puffin qualifying feature of:
    - Flamborough and Filey Coast SPA;
- Gannet qualifying feature of:
    - Flamborough and Filey Coast SPA; and
    - Forth Islands SPA.

Further information relating to the Project's approach to identification of SPA connectivity and potential effect pathways is detailed within **Section 9.3** of the **RIAA** (document reference 5.3).

Given that multiple colonies are within foraging range of the Project, the Scottish Natural Heritage (now NatureScot) apportionment methodology (SNH, 2018) was utilised to attribute the correct proportion of impact to different colonies. This methodology was agreed during ETG meetings with Natural England, see **Section 9.2** of the **RIAA** (document reference 5.3)).

The SNH (2018) apportionment methodology is based on considering a species' foraging range in addition to three colony-specific weighting factors:

- Colony size (in individuals);
- Distance of colony from the development site; and
- Sea area (the real extent of the open sea within the foraging range of the relevant species).

All colonies (designated and non-designated) within the MMFR plus 1 SD (Woodward *et al*., 2019) are included.

Foraging ranges are based on at-sea distances taking into account land barriers to movements for species which are known to avoid commuting over land. The colony sizes of designated sites within foraging range were derived from the most contemporary dataset, aligning with the Project's baseline survey data available from the SMP database, except for:

- Flamborough and Filey Coast (FFC) SPA the kittiwake and gannet counts are taken from Clarkson *et al*. (2022); and
- Forth Islands SPA the gannet count is taken from Harris *et al*. (2023).

Distance of colony from the development site area and sea area were calculated in QGIS. Distance to colony was calculated from the geometric centre of the SPA to the geometric centre of the Array Area as recommended within the SNH (2018) apportionment methodology. Sea area was calculated by buffering the SPA centroid by the seabirds MMFR plus 1 SD then removing all area over land and areas where seabirds are unlikely to forage such as estuaries.

The three weighting factors noted above were incorporated within the following equations, conducted in Microsoft Excel, for each colony:

Colony Sea Proportion:

$$\frac{\text{Sea Area}}{\text{Theoretical foraging area}}$$

Where Theoretical Foraging Area is the area of a circle with radius equal to the MMFR plus 1 SD. For a hypothetical colony on the edge of a large land mass with a perfectly straight coastline, the sea proportion would equal 0.5 (i.e., half the theoretical foraging area is sea; the other half is land).

A colony-specific weighting is calculated as follows:

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

The proportion apportioned to each colony is calculated as:

$$\frac{\text{Colony weight}}{\text{Sum of colony weights}}$$

The SNH (2018) apportionment input values and resulting apportionment to all colonies within MMFR plus 1 SD for all three species is presented in **Appendix 1**. As noted by Natural England during ETG meeting 2 on the topic of apportionment (see **Section 9.2** in the **RIAA** (document reference 5.3) for details), there is the potential for the SNH (2018) apportionment method to overestimate apportioning to larger distant colonies. To ensure appropriateness of the results, comparison of the results against tracking data and the Project's baseline information is provided in **Section 3**.

2.1.2 Consideration of immature birds

During the breeding bio-season there is potential for not only breeding adult birds within foraging range of the Project to have connectivity but also juvenile, immature and sabbatical birds which are not associated with any specific colony. Because of this, these free-roaming, non-breeding birds need to be accounted for when apportioning impacts.

The proportion of juvenile and immature birds relative to the number of breeding adults which may be connected to the Project can typically be calculated using age ratios determined from plumage characteristics in the Digital Aerial Surveys (DAS) or by using stable age structure estimates from population models (SNCBs, 2022). Natural England has stated, within ETG meetings for the Project (**Section 9.2** of the **RIAA** (document reference 5.3)), that they do not advocate the use of stable age structure estimates for this purpose and that only site-specific data derived from DAS should be used when assigning age classes. Therefore, the apportioning process outlined here has followed Natural England advice in this regard. The implications of using only DAS data to derive an age ratio for birds within the Project (and associated potential for producing highly overly precautionary assessments) is provided below.

For the purposes of deriving an adult / immature ratio, only the core breeding months (the migration-free breeding bio-season) have been considered. Using the entire breeding bio-season months has the potential to bias the overall ratio as it may include a possible influx of juvenile birds immediately post-fledging or additional adult birds migrating through the site in pre-breeding months.

2.1.2.1 Kittiwake age ratio

For kittiwakes, only first winter juvenile birds are readily distinguishable from other age categories, due to the distinct 'W pattern' across the wings and black tail-band (Svensson *et al.* 2023). This pattern, however, is lost by the time a kittiwake reaches its second winter moult, whereby the bird is indistinguishable from an adult bird. As presented in Coulson (2011), the modal age of kittiwakes first breeding is four years old, although the age of first breeding has been documented as late as 10 years old. This clearly shows that applying the assumption that all adult plumage birds are breeding adults, as is the case when using site-specific survey data, it is highly likely to overestimate the proportion of breeding adult birds within the project area.

Kittiwake age classes were determined from DAS imagery for the Array Area plus a 4km buffer. From this information the proportion of age classes observed in each bio-season was calculated. The initial age class assignment categorised individuals into 'adult' (2nd year or older) plumage, 'juvenile' (1st winter / summer) plumage or 'unknown'. For the migration-free bio-season, the percentage of kittiwakes recorded in the DAS data which could not be aged was 36%. Amongst the kittiwake records that could be aged, the majority were in 'adult' plumage (61%), with few individuals categorised as 'juvenile' plumage (3%) (**Table 2-2**).

Table 2-2 Kittiwake plumage proportions from raw counts

Bio-season	Sample size of age class (individuals) and the relative proportions (%)		
	Adult	Juvenile	Unknown
Migration-free breeding	540 (61%)	28 (3%)	322 (36%)

The 'unknown' age category has been apportioned using an adult / sub-adult ratio of 88.5% / 11.5%, based on all identified kittiwakes within the DAS data (using all months and the Array Area plus a 4km buffer due to the small sample size of kittiwakes identified to species level). This approach, agreed upon in ETG meetings (**Section 9.2** of the **RIAA** (document reference 5.3)), was used to provide a final apportioned age class for all kittiwakes recorded during the migration-free breeding bio-season (**Table 2-3**). Considering the apportioned age classes for kittiwake, the majority are adult birds (93%) with the remainder being sub-adult birds (7%).

Table 2-3 Kittiwake age class proportions apportioned using DAS data

Bio-season	Sampled size of age class (individuals) and the relative proportions (%)	
	Adult	Sub-adult
Migration-free breeding	825 (93%)	65 (7%)

As described above identification of immature kittiwakes older than second winter is not feasible from any conventional survey method. The assumption that all kittiwake recorded in 'adult plumage' are breeding birds will almost certainly overestimate the proportion of adult kittiwakes within the Project Array Area.

To provide context around the final age class proportions presented in **Table 2-3**, the UK kittiwake stable age population ratio calculated for Furness (2015) is provided in **Table 2-4**. The results of population modelling undertaken by Furness (2015) suggests a significantly different age class proportion to those calculated from DAS. However, the use of a stable age population ratio based on such a large geographic scale to define an OWF Array Area is not without limitations, as noted in Furness (2015):

"…at sea distribution of seabirds differs between age classes, with youngest birds tending to spend their time in the winter quarters even during summer, breeding adults tending to stay closest to their breeding area, and immature birds probably at sea in areas that have good food supplies, but are away from large colonies. Therefore, it is not clear that any at sea data on proportions of different age classes would provide a secure test of the estimated proportions based on demographic data…"

The Project Array Area is located approximately 210km from the coast at its nearest point. For kittiwake, this area is known to sit outside of the key foraging habitats identified by Wakefield *et al.,* (2017) and Cleasby *et al.,* (2018) during the breeding season. Taking this into consideration with the above caveat from Furness (2015), it would therefore be expected that there is a greater likelihood of juvenile and immature birds being within the Project Array Area than breeding adult birds during the breeding season. Even when considering the limitations of such as dataset, the stable age structure values predicted by Furness (2015) supports the Project's conclusion that the use of DAS only to derive age classes potentially overestimates the proportion of adult birds within the Project Array Area.

Table 2-4 Kittiwake age class proportions based on Furness (2015) population modelling

Age class proportions (%)		
Adult	**Immature**	**Juvenile**
53%	29%	18%

2.1.2.2 Gannet age ratio

Gannet juvenile (first calendar year birds) plumage is primarily grey/brown in colour with a lack of a distinct yellow head (Svensson *et al.* 2023), making them distinct from adult birds. For second calendar year birds, the grey-brown plumage on the head, underparts, uppertail-coverts and, usually, some of the lesser wing uppertail-coverts becomes white (Svensson *et al.* 2023), also making this age category readily distinguishable from adult birds. For third calendar year birds most tail-feathers and secondaries are usually black intermixed with white feathers, whilst the remaining body and head largely resemble the plumage of an adult bird, these birds are still readily identifiable from adult birds, depending on the quality of the DAS data and behaviour of the bird recorded. For example, the distinguishing features of a bird banking (bird rolling to one side whilst flying to change direction) might be difficult to observe, making identification to a specific age class difficult. For fourth calendar year birds, only the central tail-feathers and the odd scattered secondaries remain black, the rest of the bird's plumage resembles that of an adult bird, similar to third calendar year birds depending on the quality of the DAS data and behaviour of the bird recorded, this age category may be less regularly distinguished from adult birds. From fourth calendar year onwards the plumage of gannets remains indistinguishable, with the average age of first breeding at five years old. There is therefore potential to overestimate the proportion of breeding adult birds with the Project when using site-specific survey data.

Gannet age classes were determined from the DAS imagery for the Array Area plus a 4km buffer. The initial age class assessment categorised individuals into 'adult' plumage (over fourth year), 'juvenile' plumage (first year), and second through to fourth calendar year plumage. For the migration-free breeding bio-season, the percentage of gannets recorded in the DAS data which could not be aged was 16%. Amongst the gannet records that could be aged, the majority were in 'adult' plumage (77%), with few individuals categorised as second year (2%), third year (3%), fourth year (2%) or juvenile (first year) birds (>1%) (**Table 2-5**).

Table 2-5 Gannet age class proportions from raw counts

Bio-season	Sample size of age class (individuals) and the relative proportions (%)					
	Adult	Fourth calendar year	Third calendar year	Second calendar year	Juvenile	Unknown
Migration-free breeding	244 (77%)	5 (2%)	8 (3%)	7 (2%)	1 (>1%)	51 (16%)

The 'unknown' age category has been apportioned using an adult / sub-adult ratio of 95.4% / 4.6%, based on all identified gannets within the DAS data (using all months and the Array Area plus a 4km buffer due to the small sample size of gannets identified to species level). This approach, agreed upon in ETG meetings (**Section 9.2** of the **RIAA** (document reference 5.3)), was used to provide a final apportioned age class for all gannets recorded during the migration-free breeding bio-season (**Table 2-6**). Considering the apportioned age classes for gannet, the majority are adult plumage birds (93%) with the remainder being split between second year (3%), third year (3%), and fourth year birds (2%).

Table 2-6 Gannet age class proportions with apportionment of 'unknown' age class using DAS data

Bio-season	Sample size of age class (individuals) and the relative proportions (%)				
	Adult	Fourth calendar year	Third calendar year	Second calendar year	Juvenile
Migration-free breeding	293 (93%)	5 (2%)	9 (3%)	8 (3%)	1 (>1%)

As previously noted, gannet age classes from juvenile to fourth calendar year can be readily identified from high quality DAS, which has been collected for this Project. There is the potential for overestimation of the number of breeding adults due to bird behaviour and lack of distinguishable features beyond fourth calendar year.

To provide context around the final age class proportions presented in **Table 2-6**, the UK gannet stable age population ratio calculated for Furness (2015) is provided in **Table 2-7**. The results of population modelling undertaken by Furness (2015) suggests a significantly different age class proportion to those calculated from DAS.

Even when considering the limitations of such as dataset as noted previously, the stable age structure values predicted by Furness (2015) supports the Project's conclusion that the use of DAS only to derive age classes potentially overestimates the proportion of adult birds within the Project Array Area.

Table 2-7 Gannet age class proportions based on Furness (2015) population modelling

Age class proportions (%)		
Adult	**Juvenile**	**Immature**
55%	19%	26%

2.1.2.3 Puffin age ratio

Only first winter juvenile puffin are visually distinguishable from other age categories, with the distinguishing feature of juveniles being their size in comparison to the adult males in attendance of the chicks post breeding. Deriving breeding season age classes is therefore not possible from DAS or any other conventional survey method. After their first winter, immature birds are indistinguishable from breeding adult birds. The average breeding age for puffin is five years old (Horswill and Robinson, 2015), therefore the treatment that all 'adult type' appearance birds are breeding adults, as would be the case when using site-specific survey data, is highly likely to overestimate the proportion of breeding adult birds with the Project area.

For all records of puffin recorded in DAS, the age class was allocated as 'unknown', due to there being no readily identifiable features between different age classes within the available survey data. Therefore, for the apportionment process, all identified puffins are considered to be adult birds, as recommended by Natural England. This assumption will undoubtedly lead to an overestimate of the proportion of adult puffins within the Project, especially when considering that the Project is located at the limit of the species MMFR plus one SD from any potential colony (**Appendix 1**).

To provide context around the assignment of 100% of puffins within the Project Array Area as adult, the UK puffin stable age population ratio calculated for Furness (2015) is provided in **Table 2-8**. The results of population modelling undertaken by Furness (2015) suggests a significantly different age class proportion to those calculated from DAS.

Table 2-8 Puffin age class proportions based on Furness (2015) population modelling

Age class proportions (%)		
Adult	**Juvenile**	**Immature**
55%	18%	27%

Even when considering the limitations of such as dataset as noted previously, the stable age structure values predicted by Furness (2015) supports the Project's conclusion that the use of DAS only to derive age classes potentially overestimates the proportion of adult birds within the Project Array Area.

2.1.3 Consideration of sabbatical birds

Not all adult birds present in the Project Array Area will be breeding birds. This is evidenced from adult sabbatical birds free roaming the UK waters whilst taking a break from breeding activities (Marine Scotland, 2017a and b). As discussed within the ETG meeting 2 (see **Section 9.2** of the **RIAA** (document reference 5.3) for details), despite the likelihood of sabbatical birds within the Project area, Natural England are not in agreement with the 'sabbatical' definition and thus the inclusion of such a rate is not included within the apportioning process. Commentary is provided within Natural England's Relevant Representation for Five Estuaries OWF (Natural England, 2024) in relation to their rationale for excluding a sabbatical rate within the apportionment process. Natural England's concerns primarily relate to temporal and spatial variation of sabbatical rates and uncertainty relating to behaviour of sabbatical birds.

Instances of long-lived seabirds, such as gannet, kittiwake and puffin, taking 'sabbaticals' from breeding is relatively common (Horswill and Robinson, 2015) and is generally influenced by a bird's physiological condition prior to the breeding season (McNamara and Houston, 1996). As presented within Horswill and Robinson (2015), sabbatical rates are cited as 18 – 20.8% for kittiwake and 7.8% for puffin (no information is available for gannet), though such rates are based on small sample sizes and relatively old datasets. Due to a lack of robust evidence to be used as exact quantification of sabbatical rates, based on expert judgement a rate of 10% for kittiwake, 10% for gannet and 7% for puffin are recommended for OWF assessments in Scotland (Marine Scotland, 2017a and b).

Sabbatical birds may spend the duration of the breeding season at their breeding colony to hold territory, initially attend the colony then leave early during the breeding season or remain in their wintering grounds instead. Due to the potential for sabbatical birds to be at the colony, Natural England have raised concerns that these birds may be incorporated within the population count for which assessments are made against and so shouldn't be excluded from apportionment (Natural England, 2024). For guillemot and razorbill, the recommended census unit is individuals due to the high density for which such species nest, making identification between breeding and sabbatical breeding individuals unfeasible if they remain at the colony. Similarly for small puffin colonies, counts of individuals on land or rafting at sea surrounding the colony (as is the case for Flamborough and Filey Coast SPA) are used to determine population size with identification between breeding and sabbatical breeding individuals unfeasible (Walsh *et al.,* 1995). For such census methods, there is the potential for sabbatical birds to be included within the overall population count if birds remain at the colony. For gannet and kittiwake however, the recommended census method is to record apparently occupied nests or sites (AON / AOS) where behavioural cues can reduce the inclusion of sabbatical breeders within the population count (Walsh *et al.,* 1995).

In light of the above information, a sabbatical rate has not been included within the apportionment process to inform assessments for the **RIAA** (document reference 5.3). As previously acknowledged by Natural England (2024), the most appropriate way to treat sabbatical birds in impact assessments is currently a knowledge gap. Not accounting for sabbatical breeders within the apportionment process is considered a highly precautionary approach, and this should be taken into account when reviewing assessment conclusions for the Project.

2.1.4 Final breeding bio-season apportionment

The final breeding bio-season apportionment values for each SPA are provided in **Table 3-1**, accounting for the apportionment results in **Appendix 1** and also the assumed overall percentage of breeding adults, as outlined in each species age ratio section above.

2.2 Non-breeding bio-season(s)

As concluded within the HRA screening report, with further refinement provided in **Section 9.3** of the **RIAA** (document reference 5.3), a number of qualifying features of designated sites were identified as having the potential for a LSE during the non-breeding season(s). These include:

- Kittiwake feature of:
  - Flamborough and Filey Coast SPA;
  - Farne Islands SPA;
  - Fowlsheugh SPA;
  - East Caithness Cliffs SPA;
- Herring gull feature of:
  - Flamborough and Filey Coast SPA;
  - East Caithness Cliffs SPA;
- Guillemot feature of:
  - Flamborough and Filey Coast SPA;
  - Farne Islands SPA;
- Razorbill feature of:
  - Flamborough and Filey Coast SPA;
- Puffin feature of:
  - Flamborough and Filey Coast SPA;
  - Farne Islands SPA;
  - Coquet Island SPA;
- Gannet feature of:
  - Flamborough and Filey Coast SPA;
  - Forth Islands SPA;
  - Noss SPA; and
  - Hermaness, Saxa Vord and Valla Field SPA.

Outside of the breeding bio-season, wider mixing of seabird populations is expected to occur within the North Sea (and therefore the Project Array Area), containing a mix of birds from UK breeding colonies and continental Europe (Furness, 2015). Due to this wider mixing, then a much lower percentage of birds can be attributed to any individual breeding SPA population.

This apportionment is based on calculating the proportion of the breeding adults within the UK North Sea and Channel BDMPS population that can be attributed to the various SPAs as defined by Furness (2015), based on the data within that report. This follows Natural England's best practice guidance (Parker *et al.* 2022). It must be noted that the colony counts in Furness (2015) may differ from the SPA citation populations for some species, but in order to provide a level of consistency within the non-breeding bio-season apportionment process the same source is used for both the colony counts and the wider UK North Sea and Channel population estimates. Following this approach to apportionment the proportion of the BDMPS populations for all features and designated sites screened in for assessment are provided in **Table 3-1**.

3. Apportionment Result

The seasonal apportionment values for all SPA qualifying features screened in for assessment (see **Section 9.3** of the **RIAA** (document reference 5.3)) are provided in **Table 3-1** below. In addition, the 95% Confidence limits (CL) of the impacts apportioned to each SPA and the relevant qualifying features are provided in **Appendix 2** and **Appendix 3**, to allow for contextualisation of the confidence around the mean impact value used for assessment within the **RIAA** (document reference 5.3). The mean apportioned impacts are presented in the **RIAA** (document reference 5.3) and form the basis of assessments.

Table 3-1 Seasonal apportioning rates of predicted impacts from the Project to designated sites and qualifying features

Site	Feature	Bio-season					
		SNH Apportionment result (%; Appendix 1)	Breeding adult ratio (%)	Overall Breeding rate (%)	Post-breeding migration rate (%)	Migration-free winter / Non-breeding rate (%)	Return migration rate (%)
FFC SPA	Kittiwake	76.72%	93.00%	71.35%	5.44%	N/A	7.19%
	Gannet	100.00%*	93.00%	93.00%*	4.85%	N/A	6.23%
	Puffin	100.00%	100.00%	100.00%	N/A	0.41%	N/A
	Razorbill	N/A	N/A	N/A	3.38%	2.74%	3.38%
	Guillemot	N/A	N/A	N/A	N/A	4.41%	N/A
	Herring gull	N/A	N/A	N/A	N/A	0.21%	N/A
Farne Island SPA	Kittiwake	3.24%	93.00%	3.01%	0.50%	N/A	0.66%
	Puffin	N/A	N/A	N/A	N/A	17.32%	N/A
	Guillemot	N/A	N/A	N/A	N/A	3.73%	N/A
Coquet Island SPA	Puffin	N/A	N/A	N/A	N/A	5.32%	N/A

Site	Feature	Bio-season					
		SNH Apportionment result (%; Appendix 1)	Breeding adult ratio (%)	Overall Breeding rate (%)	Post-breeding migration rate (%)	Migration-free winter / Non-breeding rate (%)	Return migration rate (%)
Forth Island SPA	Gannet	0%*	93.00%	0%*	24.32%	N/A	31.27%
	Puffin	N/A	N/A	N/A	N/A	26.83%	N/A
Fowlsheugh SPA	Kittiwake	N/A	N/A	N/A	1.35%	N/A	1.78%
East Caithness Cliffs SPA	Kittiwake	N/A	N/A	N/A	5.84%	N/A	1.72%
	Herring gull	N/A	N/A	N/A	N/A	1.44%	N/A
Noss SPA	Gannet	N/A	N/A	N/A	3.42%	N/A	5.51%
Hermaness, Saxa Vord and Vala Field SPA	Gannet	N/A	N/A	N/A	8.54%	N/A	13.73%

Table Note: *In relation to gannet, guidance on apportionment using the SNH tool was followed, however outputs produced were unlikely to be realistic (see **Appendix 1**). Therefore, an alternative approach of apportioning 100% to the FFC is suggested by the Applicant as detailed within **Section 4.2**.

4. Discussion

4.1 Kittiwake

Using kittiwake's MMFR plus one SD resulted in FFC SPA and Farne Islands SPA being identified as potential designated sites within foraging range of the Project Array Area during the breeding bio-season. The SNH apportionment method concluded the majority of impact should be apportioned to the FFC SPA (76.72%; **Appendix 1**), with minimal apportionment to the Farne Islands SPA (3.24%; **Appendix 1**).

In relation to the FFC SPA, as part of post consent monitoring requirement for Hornsea Project One, a total of 20 adult kittiwakes were fitted with GPS-accelerometer tracking devices during the 2017 breeding season, with data obtained successfully from a total of 18 of the 20 devices (Wischnewski *et al.,* 2017). The devices recorded a total of 168 tracked trips from the colony during the chick rearing stage, with the results visualised in **Figure 4–1** as taken from Aitken *et al.* (2017). Although kittiwakes were recorded to enter the Dogger Bank Zone, no specific overlap was recorded with the Project Array Area. Further tracking work was planned at the colony though is noted to have been postponed by COVID-19 (Lloyd *et al.,* 2020).

Tracking data was also collected at the FFC SPA as part of the Seabird Tracking and Research (STAR) project between 2010 to 2015. Data from a total of 86 tags were collected between 2010 to 2014 at Flamborough head, with a further 32 individuals from Filey during 2013 and 2014 (Babcock *et al*., 2015) (**Figure 4–2**). Although kittiwakes were recorded to enter the Dogger Bank Zone, little to no overlap was recorded with the Project Array Area. In 2015, 29 GPS tags (15 at Flamborough Head and 14 at Filey) were fitted to previously tagged birds to understand foraging fidelity (Babcock *et al.,* 2015). Across the six years of tagging a similar foraging distribution was recorded to the 2017 tagging study, with birds recorded entering the Dogger Bank Zone, though no direct overlap with the Project Array Area recorded (Babcock *et al.,* 2015) (**Figure 4–3**). Again, although birds entered the Dogger Bank Zone, there was no direct overlap with the Project Array Area. The maximum recorded foraging range across the 2010 to 2014 tracking studies ranged from 123.6km to 219.4km, suggesting that kittiwakes from the FFC SPA could forage within the Project Array Area, though is unlikely to be part of their core foraging range (Aitken *et al.,* 2014), and might only be an area used when prey abundance is poor given the significant difference in maximum ranges recorded between years. This assumption is corroborated by the lack of overlap with kittiwake's core (50%) and 95% Utilisation Distribution (UD) bands produced by Wakefield *et al.,* (2017) (**Figure 4–4**) and Maximum Curvature and Getis-Ord analyses undertaken by Cleasby *et al.,* (2018) (**Figure 4–5**) during the breeding season.

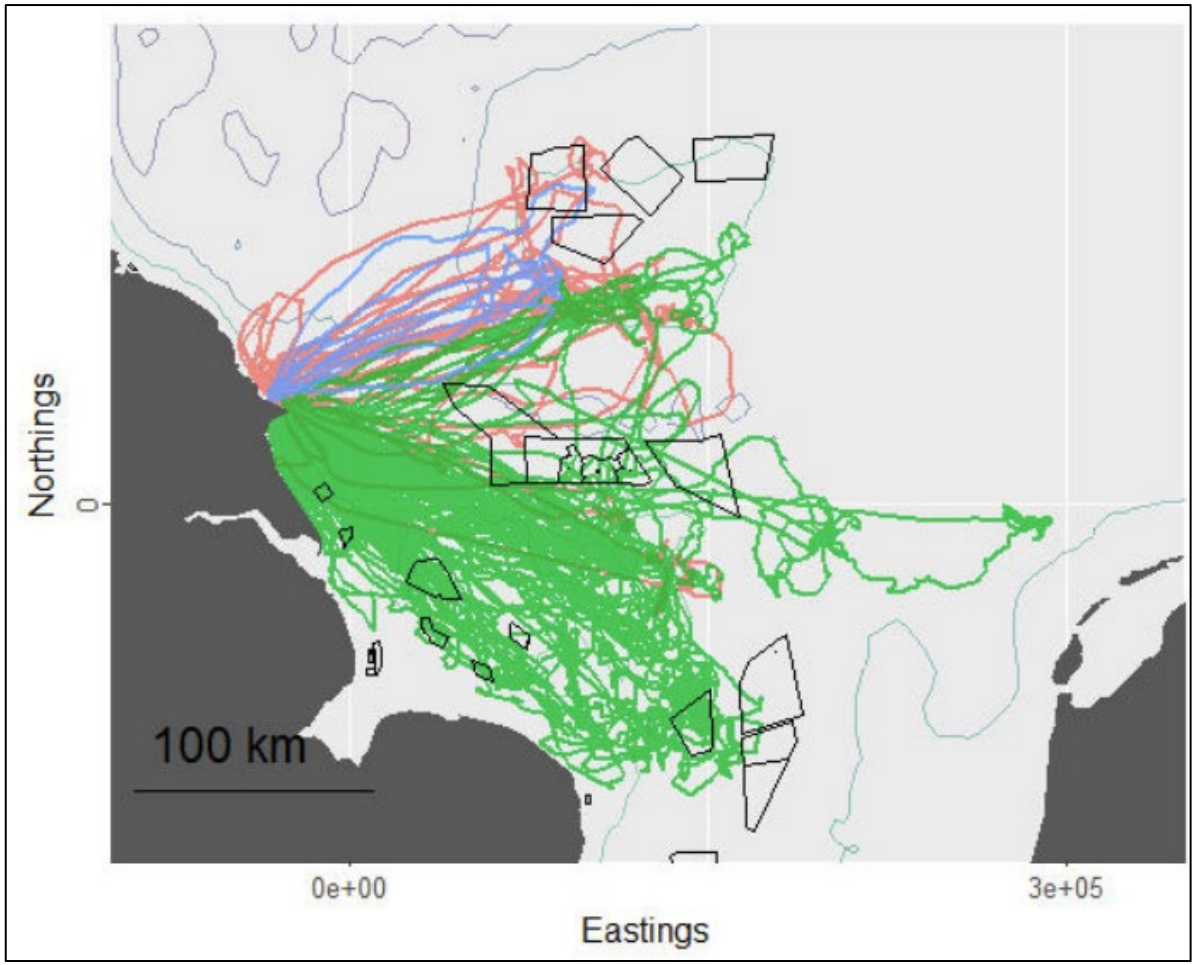

Figure 4–1 Kittiwake GPS foraging trips collected during the 2017 breeding season at the Flamborough and Filey Coast SPA. All trips are shown from Flamborough (Green, N=133 trips from 13 birds), Filey (Red, N=29 trips from 4 birds) and Speeton (Blue, N=6 trips from 1 bird) figure extracted from Aitken *et al.*, (2017)

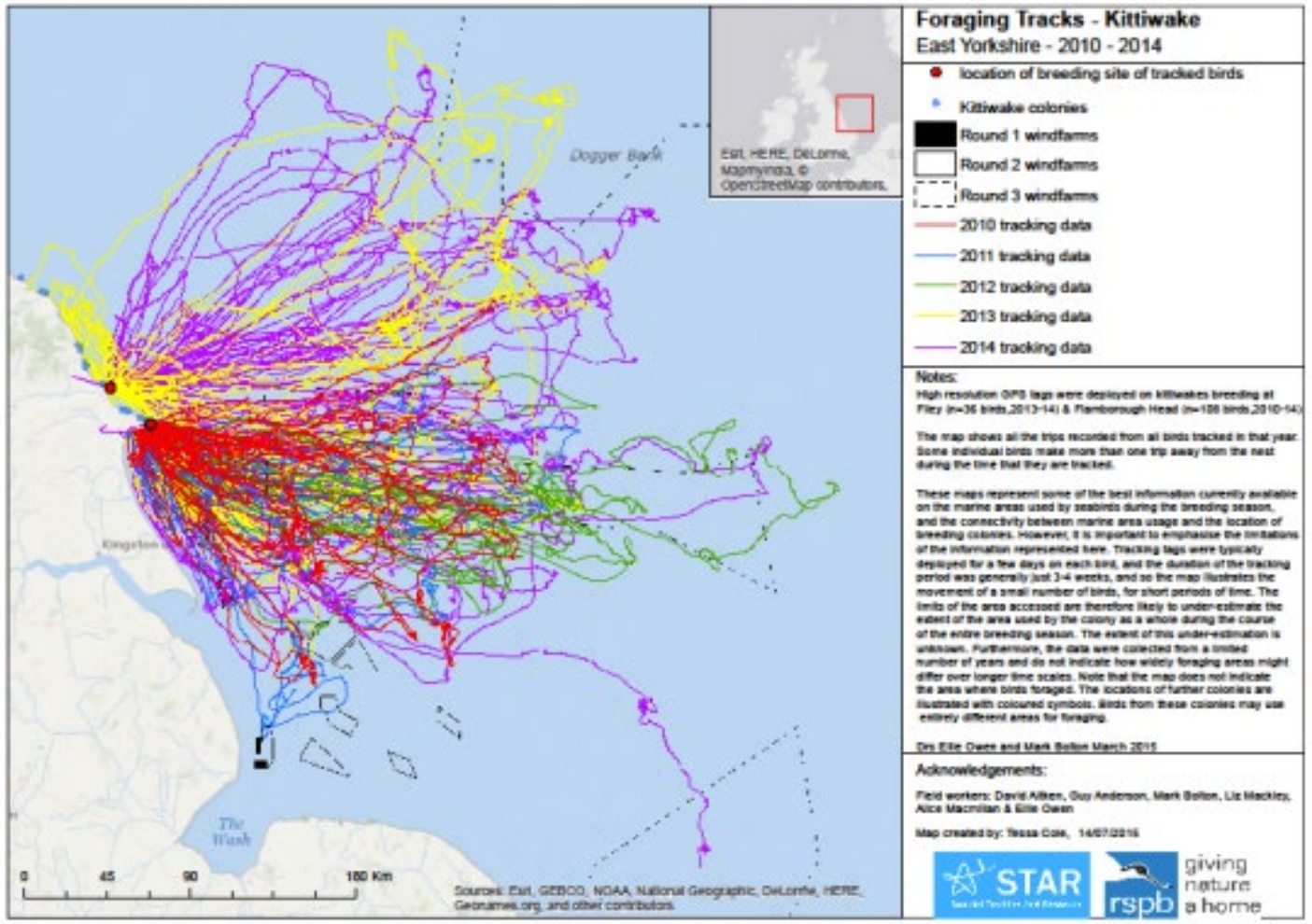

Figure 4–2 2010 to 2014 FFC SPA kittiwake STAR tagging project foraging tracks, figure extracted from Babcock *et al.,* (2015)

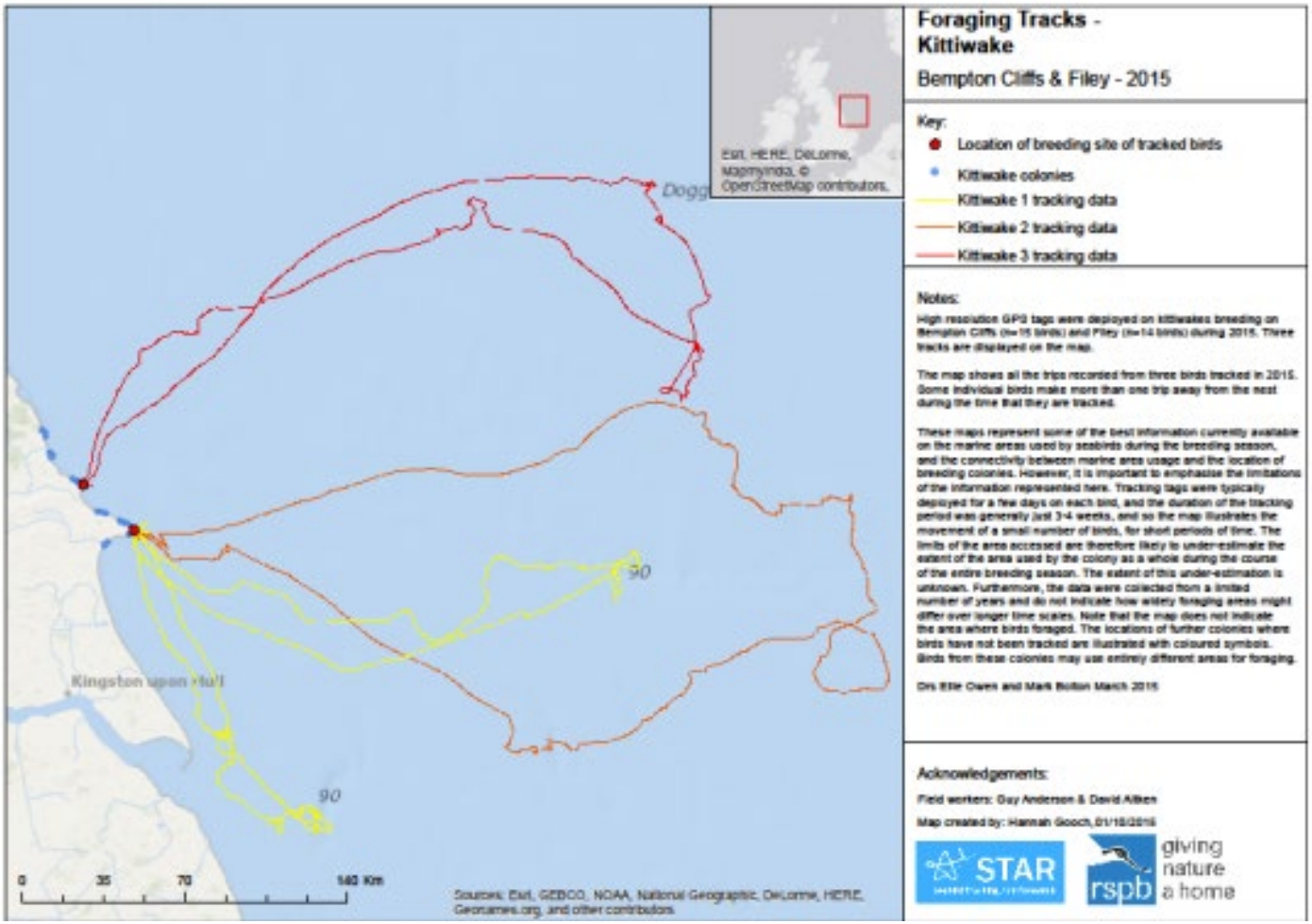

Figure 4–3 2015 FFC SPA kittiwake STAR tagging project foraging tracks, figure extracted from Babcock *et al.*, (2015)

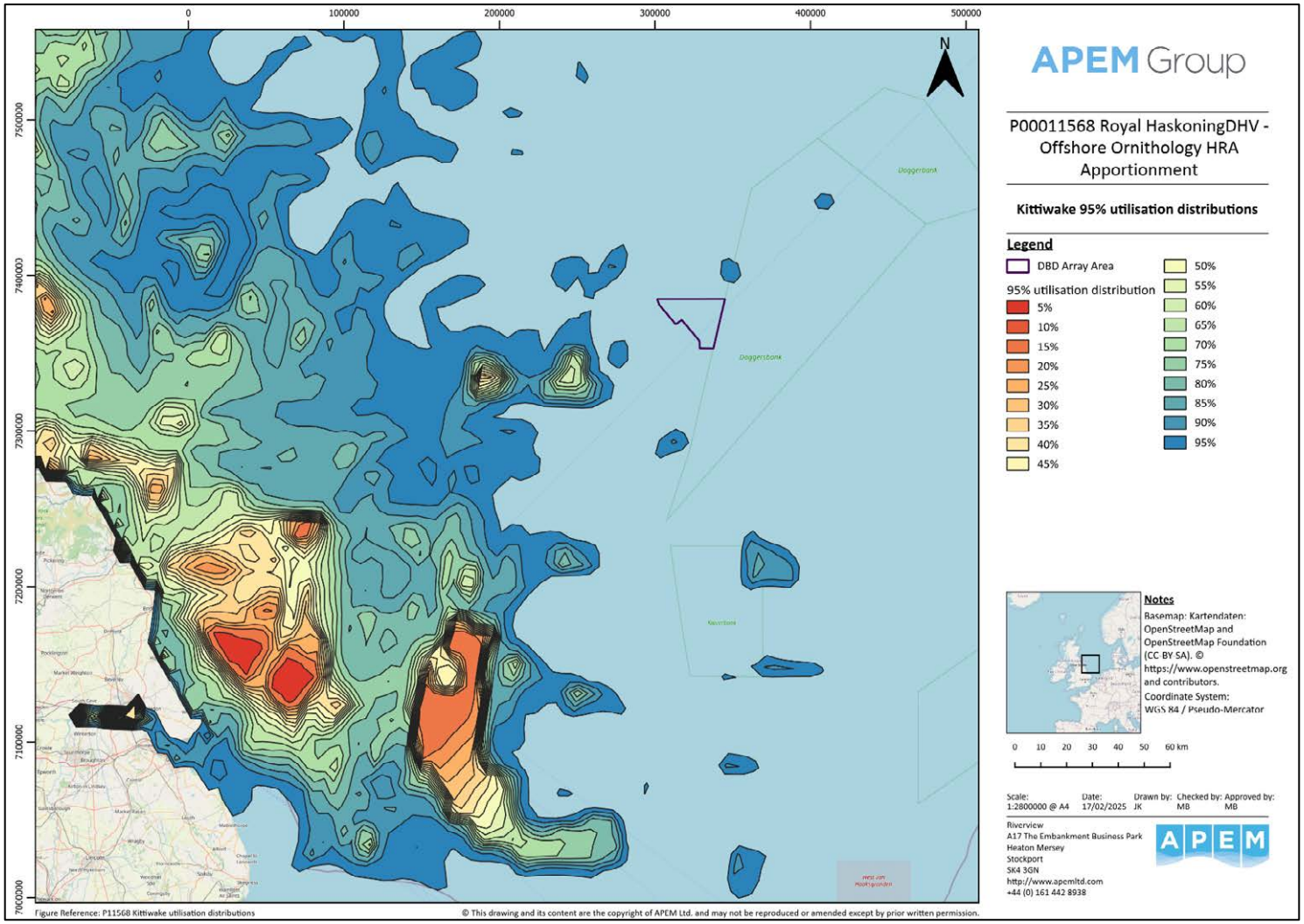

Figure 4–4 Kittiwake UK wide 95% UD bands overlap with DBD based on Wakefield *et al.*, (2017) dataset

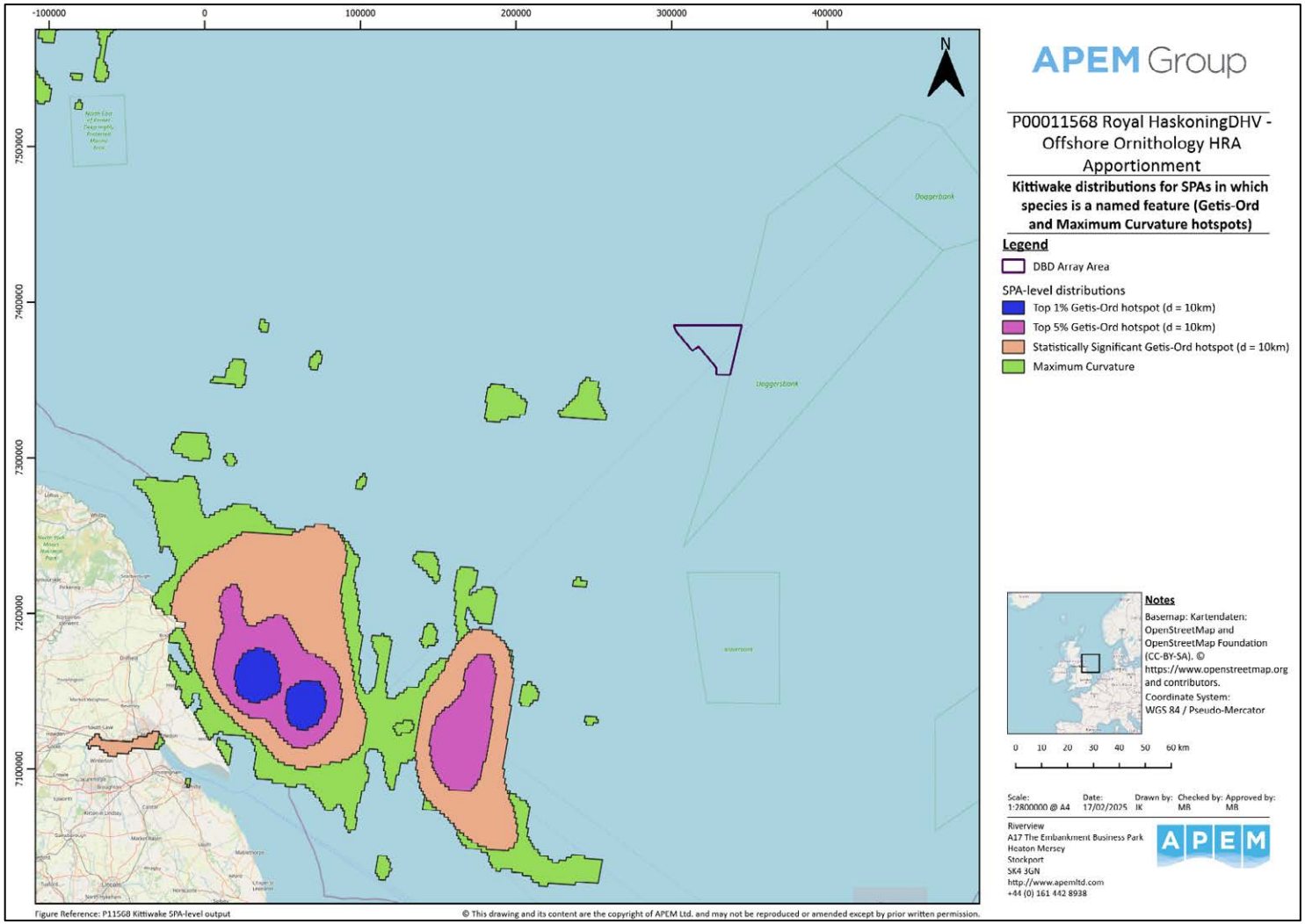

Figure 4–5 UK Kittiwake Getis-Ord and maximum curvature hotspots overlap with DBD based on Cleasby *et al.,* (2018) dataset

No kittiwake tracking data was available for the Farne Islands SPA, though considering the even greater distance to the Project Array Area and significantly smaller population size (resulting in less density dependant competition for prey availability and subsequent need to forage greater distances from the colony), connectivity is even less likely than for the FFC SPA population.

Monthly flight directions from across the DBD survey area during the breeding bio-season show no distinct flight orientations (**Volume 2, Appendix 13.2 Offshore Ornithology Baseline Characterisation Report**), suggesting no strong connectivity to any individual colony.

Based on the available evidence it is concluded that the SNH (2018) method derived apportioning rate of 76.72% of all impacts to the FFC SPA is likely to be an overestimate primarily biased by the size of the colony. The risk of overestimation is further exacerbated by the approach taken to age classification as detailed in **Section 2.1.2.1**. The impact predictions drawn for the FFC SPA kittiwake feature for the breeding bio-season should therefore be treated with caution, as it likely represents a significant overestimation of the level of impact.

A breeding bio-season apportionment rate concluded by the SNH (2018) method of 3.24% to the Farne Islands SPA is considered appropriate whilst maintaining a precautionary approach to assessment, given no available evidence suggesting strong connectivity between the designated site and the Project. However, there is potential for an overestimation of the overall breeding bio-season apportioning rate due to the approach taken to age classification as detailed in **Section 2.1.2.1.**

Another factor currently not considered within the apportionment process presented is the connectivity between kittiwakes breeding in the offshore environment and the Project Array Area. There is now well documented evidence of kittiwakes breeding on offshore structures collected by staff manning offshore platforms, as part of academic studies, oil and gas platform decommissioning surveys or surveys contracted by OWF developers to validate the use of ANSs as viable compensation (NIRAS, 2020 & 2021). There are currently 242 offshore platforms within kittiwakes MMFR plus one SD from the Project Array Area suggesting there is potential for a significant number of kittiwakes in the offshore environment to have theoretical connectivity to the Project, which is currently not accounted for.

After submission of the PEIR, the Project plans to further refine the apportionment process for kittiwake by including offshore breeders within the process and refining age classification due to the issues noted in **Section 2.1**, which will improve the robustness of the assessment conclusions for the Final RIAA submission.

4.2 Gannet

Using gannet's MMFR plus one SD resulted in Forth Islands SPA and FFC SPA being identified as designated sites for which breeding gannet is a qualifying feature within potential foraging range of the Project Array Area during the breeding bio-season. The SNH apportionment method concluded a roughly even split of impacts apportioned between the Forth Islands SPA (55.31%; **Appendix 1**) and the FFC SPA (41.58%; **Appendix 1**), providing uncertainty as to which SPA may have greater utilisation of the Project area if foraging segregation occurs over the Project (Wakefield *et al*., 2013).

For the FFC SPA, tracking data was collected from breeding adult gannet at Bempton Cliffs between 2010 to 2012, with a total of 42 gannets tagged across the breeding season. The tracking data shows that gannets from the FFC SPA may forage as far as the Dogger Bank Zone, including within the Project Array Area and beyond, though the Project appears to be beyond FFC SPA gannets core foraging area based on the small number of track points comparatively to other areas of the Southern North Sea (**Figure 4–6**).

In 2018, a further 10 gannets were tagged as part of Hornsea Project One's monitoring. However, the results of this monitoring do not appear to be publicly available online (Babcock *et al.,* 2018).

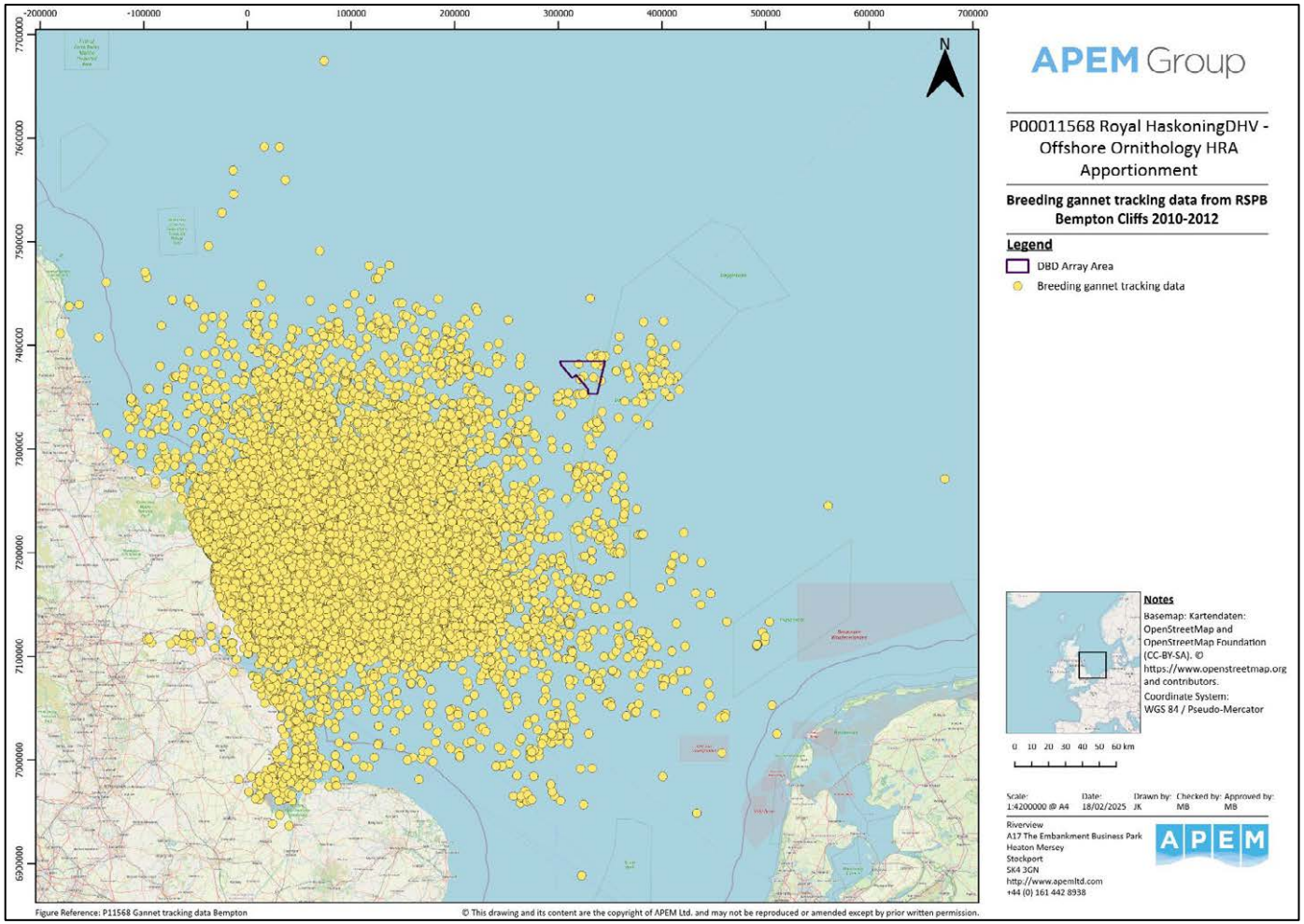

Figure 4–6 Bempton Cliffs gannet tracking points from 2010 to 2012 breeding season studies. Data derived from RSPB Open Data Portal (2025)

For the Forth islands SPA, tracking data for the Bass Rock gannetry between 2015 and 2019 is summarised within Lane *et al.,* (2020). For the five years of tagging, a total of 148 birds were fitted with GPS loggers prior to egg-laying (n=48) or during the chick provisioning stage (n=140) of the breeding season. UD bands were calculated based on the tracking data from 2015 to 2019 as presented in (**Figure 4–7**). Pre-egg laying, gannets from the Forth Islands SPA were recorded within the Project Array area, though the Project does not reside within Forth Islands SPA gannets' core (50% UD Band) foraging area. Once gannets from the Forth Islands SPA are provisioning for chicks their foraging range retracts, with the Project Array Area no longer within the Forth Islands SPA gannets' 95% UD band. However, the 95% UD band encompasses the area of sea surrounding the Project Array Area and therefore connectivity is still suggested during the breeding season (Lane *et al.,* 2020).

As detailed in Jeglinski *et al.,* (2024), prior to the Highly Pathogenic Avian Influenza, 10 breeding gannets at Bass Rock in April 2022 were fitted with GPS devices and a further 10 breeding gannets were fitted with GPS tags post outbreak in August 2022. Of the 10 gannets fitted with tags pre outbreak, data from five tags was attained, with three of the birds undertaking long distance flights away from Bass Rock outside of gannets regular foraging areas from the colony and even recorded prospecting other gannetries, which has never previously been recorded within breeding adult tracking data from the colony. This change in foraging area appeared to be only a short-term behavioural response due to the effect of HPAI at the colony, as tagged gannets which survived the outbreak returned to their usual foraging ranges aligning with the 2015 to 2019 foraging tracks, later in the breeding season in 2022 (**Figure 4–8**). The 2015 to 2019 foraging area is therefore still considered appropriate for informing the colonies typical foraging area post HPAI.

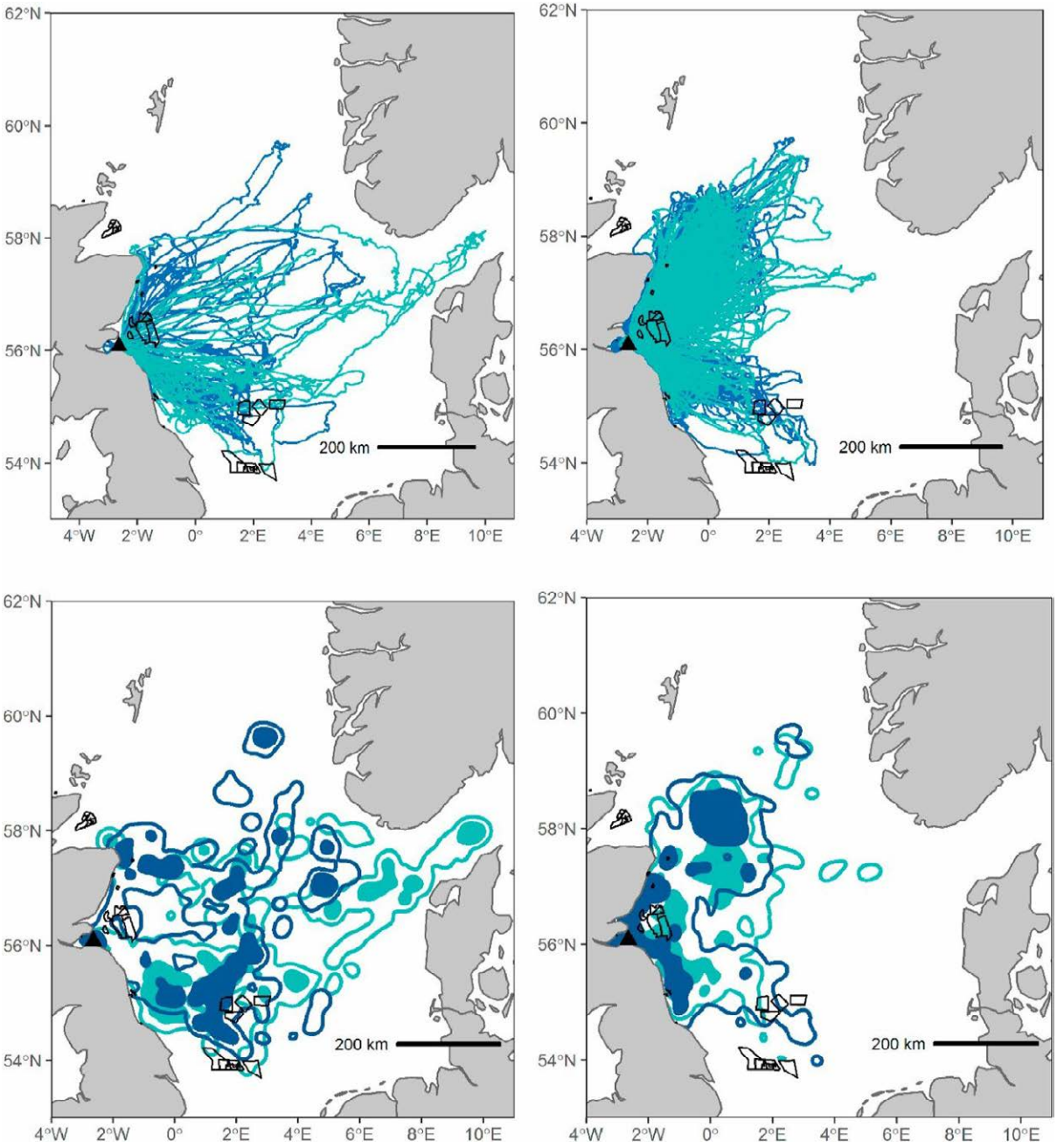

Figure 4–7 (Top) foraging tracks and (bottom) UDs of female (green) and male (blue) gannets tracked from Bass Rock (black triangle) (left) prior to chick hatching (pooled data for 2017–2019) and (right) during chick-rearing (pooled data for 2015–2019). UDs are based on active foraging locations and shading denotes UD contours (filled, 50%; unfilled, 95%). Figure extracted from Lane et al., (2020)

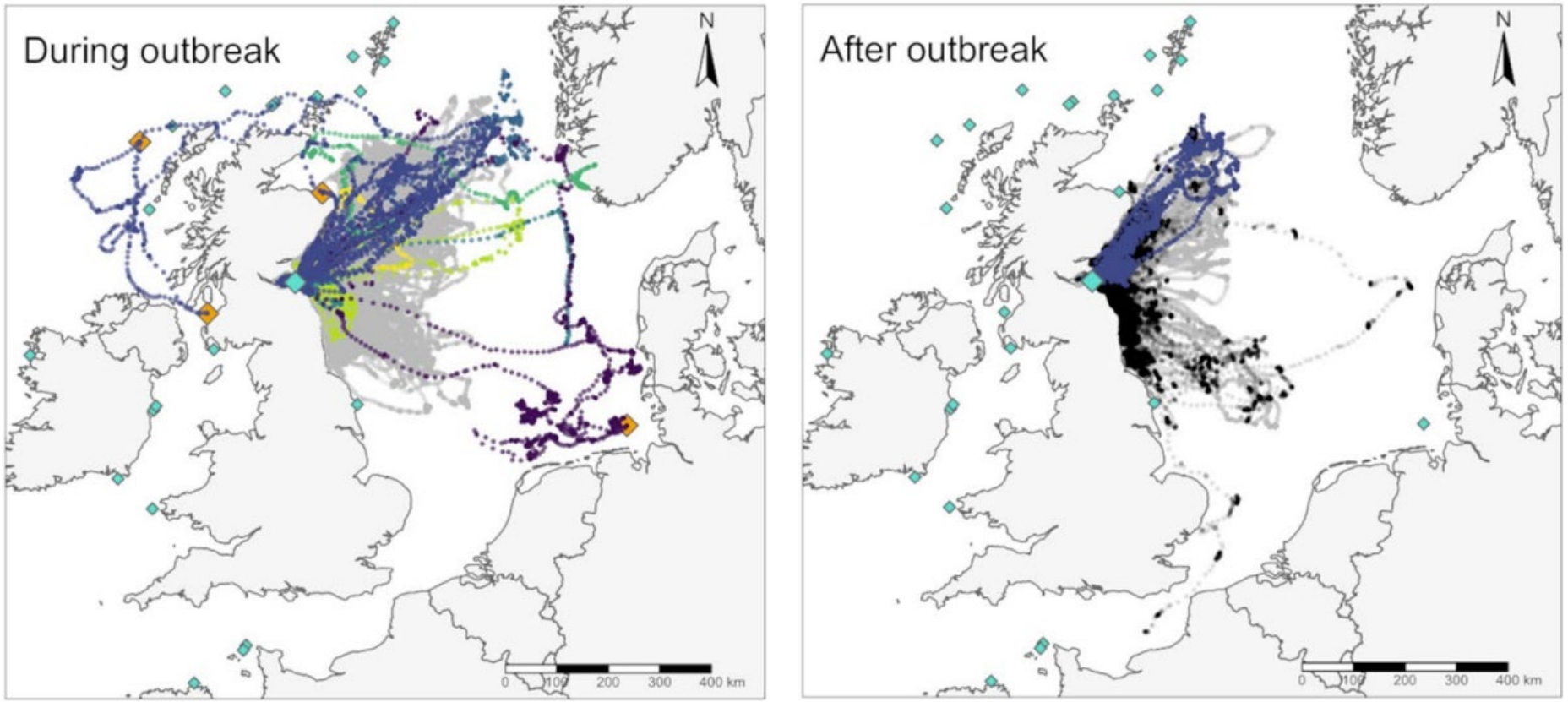

Figure 4–8 Movements of Bass Rock adult gannets during and after the HPAI outbreak in 2022, figure extracted from Jeglinski *et al.*, (2024)

Monthly flight directions from across the DBD survey area during the breeding bio-season show no distinct flight orientations (**Volume 2, Appendix 13.2 Offshore Ornithology Baseline Characterisation Report**). It is likely monthly flight directions have captured gannets foraging over the Project rather than commuting based on previous tracking evidence summarised above. Therefore, there maybe strong connectivity to a particular SPA but this cannot be determined from monthly flight directions.

Gannets are known to exhibit space partitioning between colonies, meaning gannets from different colonies tend to forage in mutually exclusive areas with only minor overlap of foraging ranges between different colonies (Wakefield *et al.,* 2013). This would typically mean predicted breeding bio-season impacts for gannet would be apportioned to only a single colony. However, the Project's Array Area appears to be located on the periphery of both the Forth Islands SPA and FFC SPA core foraging areas. This therefore suggests connectivity to either SPA is possible (Wakefield *et al.,* 2013), however available tracking data suggests that the Project is not located within either colonies core foraging range during the breeding bio-season.

The available evidence, would suggest connectivity to both FFC SPA and Forth Islands SPA is evident, as predicted by the SNH method (2018). Although, the tracking data suggests low utilisation by both the Forth Islands and FFC SPA colonies, there is uncertainty as to which SPA may realistically dominate the use of the area, as the SNH method takes no account of potential space partitioning between colonies. Given that the FFC SPA is significantly closer (by ~150km) to the Project, there is potential that the larger colony size of the Forth Islands SPA has had a disproportionate effect on the apportionment process. Due to the uncertainty of how distant colonies may exhibit segregation over foraging areas over the Project area, the Applicant has taken a precautionary approach to apportion 100% of the predicted impacts to the FFC SPA due to the closer proximity of the SPA.

After submission of the PEIR, the Project plans to further refine the apportionment process for gannet such as refining age classification and sabbatical rates due to the issues noted in **Section 2.1**, which will improve the robustness of the assessment conclusions for the Final RIAA submission.

4.3 Puffin

Using puffin's MMFR plus one SD resulted in the FFC SPA being identified as the only designated site for puffin within potential foraging range of the Project Array Area during the breeding bio-season. All impacts have therefore been apportioned to this single site using the SNH (2018) method. There is no available tracking data for puffin from the FFC SPA, nor were any flying puffins recorded within the Project Array Area to contextualise the SNH apportionment conclusions. The Project is located at the limit of puffin's MMFR plus one SD from the FFC SPA. It is therefore considered unlikely puffins from the FFC SPA are regularly travelling out to the Project Array Area during the breeding bio-season. When considering the location of the Project, it is far more likely to be non-breeding birds utilising the Project Array Area, rather than breeding birds associated with a designated site. As noted in **Section 2.1.2.3**,

Natural England's recommended approach to age class identification for puffin assumes all birds recorded are adult birds. This means no due consideration is incorporated within the current apportionment approach to account for the very high likelihood of non-breeding birds interacting with the Project Array Area during the breeding bio-season. The impact predictions drawn for the FFC SPA puffin feature for the breeding bio-season should therefore be treated with caution, as they are likely to represent a significant overestimation of the level of impact predicted.

After submission of the PEIR, the Project plans to further refine the apportionment process for puffin by including offshore breeders within the process and refining age classification due to the issues noted in **Section 2.1**, which will improve the robustness of the assessment conclusions for the Final RIAA submission.

5. References

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Appendix 1 SNH (2018) apportionment results

Kittiwake apportionment results following the SNH apportionment guidance (SNH, 2018)

Main Site	Sub sites	Count of adult birds at colony (individuals)	Year of count	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion
Farne Islands	Farne Islands	5,790	2024	296.39	87,847.03	138,070.97	0.49	2.06	0.04	3.24%
Seahouses 1	Seahouses 1	412	2019	296.6	87,971.56	135,095.26	0.48	2.10	<0.01	0.24%
Howick-Cullernose Point – Dunstanburgh Castle Point	Dunstanburgh Castle	628	2024	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Cullernose Point	184	2019							
	Howick	1,280	2019							
	Total for Howick- Cullernose Point – Dustanburgh Castle Point	2,092	/	291.38	84,902.30	133,427.14	0.47	2.13	0.01	1.25%
Coquet Island RSPB	Coquet Island RSPB	694	2024	286.49	82,076.52	132,716.15	0.47	2.14	<0.01	0.43%
Tynemouth and South Shields	Tynemouth	492	2015	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North Shields Warehouse	24	2015							
	Marsden Cliffs	4,776	2016							
	McNulty's, Tyne Dock	104	2014							
	Total for Tynemouth and South Shields	5,396	/	278.87	77,768.48	127,635.86	0.45	2.22	0.04	3.69%
Newcastle and Gateshead	Baltic Flour Mill	164	2015	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Tyne Bridge North Tower	780	2015							
	Quayside Buildings	258	2015							
	Tyne Bridge South Tower	310	2015							
	Gateshead Kittiwake Tower	180	2015							
	International Coatings	306	2015							
	Total for Newcastle and Gateshead	1,998	/	289.38	83,740.78	121,106.45	0.43	2.34	0.02	1.34%
Hartlepool	Steetley Pier	48	2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Hartlepool Fish Quay	322	2018							
	Total for Hartlepool	370	/	268.06	71,856.16	127,691.52	0.45	2.22	0.01	0.27%
Phillips Jetty	Phillips Jetty	754	2018	268.02	71,834.72	122,797.30	0.43	2.31	0.01	0.58%
Saltburn Cliffs (Huntcliff)	Saltburn Cliffs (Huntcliff)	2,220	2020	254.26	64,648.14	133,640.23	0.47	2.12	0.02	1.74%
Boulby Cliffs	Boulby Cliffs	2,880	2020	249	62,001	136,208.67	0.48	2.08	0.03	2.32%
Staithes to Sandsend	Staithes 2	652	2023	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Kettleness 1	172	2019							
	Kettleness 2	1,366	2019							
	Total for Staithes to Sandsend	2,190	/	243.93	59,501.84	138,635.48	0.49	2.05	0.02	1.80%

Main Site	Sub sites	Count of adult birds at colony (individuals)	Year of count	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion
Whitby to Robin Hood's Bay	Saltwick Nab 2	424	2024	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Hawsker Bottoms 2	410	2023							
	Total for Whitby to Robin Hood's Bay	834	/	235.19	55,275.77	143,180.62	0.50	1.98	0.01	0.72%
Long Nab	Long Nab	90	2015	231.13	53,421.08	144,486.52	0.51	1.96	<0.01	0.08%
Scarborough to Osgodby Point	Castle Headland	2,770	2024	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Old Britannia Inn/Eastborough	90	2024							
	Harbourside Houses	104	2024							
	Huntress Row	344	2024							
	Town Hall	20	2024							
	Royal Hotel	182	2024							
	Grand Hotel	1,326	2024							
	Sulman's (urban)	38	2011							
	Spa Bridge	374	2024							
	Total for Scarborough to Osgodby Point	5,248	/	231.74	53,703.43	144,089.81	0.51	1.97	0.05	4.61%
Flamborough and Filey Coast SPA	Filey Cliffs	9,842	2022	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Flamborough Head and Bempton Cliffs	79,306	2022							
	Total for Flamborough and Filey Coast SPA	89,148	/	224.4	50,355.36	156,700.04	0.55	1.81	0.88	76.72%
Bridlington	Flamborough 8 (incl. harbour but not buildings)	202	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Bridlington Town	310	2021							
	Total for Bridlington	512	/	229.1	52,486.81	144,874.17	0.51	1.96	0.01	0.46%
Lowestoft	Lowestoft	892	/2018	298.88	89,329.25	131,613.07	0.46	2.16	0.01	0.52%
TOTALS		**121,520**	**/**	**/**	**1,188,720.3**	**/**	**0**	**35.63**	**1.15**	**100%**
	Foraging range and foraging area									
Mean-max + one SD foraging range (km)			300.6 km							
Potential Foraging Range (km2)			283,875.44							

Gannet apportionment results following the SNH apportionment guidance (SNH, 2018)

Colony Name	Count of adult birds at colony (individuals)	Year of count	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion
Troup & Lion's Head RSPB	8,752	2023	439.7	193,336.09	359,935.83	0.44	2.26	0.037	2.99%
Bass Rock	103,688	2023	377.8	142,732.84	312,372.58	0.38	2.61	0.69	55.31%
St Abb's Head NNR	190	2023	337.6	113,973.76	342,632.69	0.42	2.38	<0.01	0.12%
Flamborough Head and Bempton Cliffs	31,588	2024	224.4	50,355.36	358,806.86	0.44	2.27	0.52	41.58%
TOTALS	**144,218**	**/**	**/**	**500,398.05**	**/**	**0**	**9.53**	**1.25**	**100%**

	Foraging range and foraging area	
	Mean-max + one SD foraging range (km)	509.4
	Potential Foraging Range (km^2)	815,206.76

Puffin apportionment results following the SNH apportionment guidance (SNH, 2018)

Colony Name	Count of adult birds at colony (individuals)	Year of count	Distance to Project Site (km)	Distance^2	Area of foraging range as sea (km^2)	Proportion of Foraging Range as Sea	1/P(Sea)	Weight	Proportion
Filey Cliffs	94	2022	N/A	N/A	N/A	N/A	N/A	N/A	0%
Flamborough Head and Bempton Cliffs	2,986	2022	N/A	N/A	N/A	N/A	N/A	N/A	0%
Flamborough and Filey Coast SPA	3,080	/	224.4	50,355.36	103,056.32	0.52	1.92	1	100%
TOTALS	**3,080**	**/**	**/**	**50,355.36**	**/**	**0**	**1.92**	**1**	**100%**

	Foraging range and foraging area	
	Mean-max + one SD foraging range (km)	250.8
	Potential Foraging Range (km^2)	197,608.19

Appendix 2 Confidence Limits for the apportioned collision impact values presented within the RIAA for designated sites

Kittiwake predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the FFC SPA

Bio-seasons	Collision risk impact Breeding adults per annum
Breeding (March - August)	2.37 - 159.83
Return migration (January - February)	0.64 – 4.55
Post-breeding migration (September - December)	0.41 – 5.38
Annual total	3.42 – 169.75

Kittiwake predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the Farne Islands SPA

Bio-seasons	Collision risk impact Breeding adults per annum
Breeding (March - August)	0.09 – 6.25
Return migration (January - February)	0.06 – 0.42
Post-breeding migration (September - December)	0.04 – 0.49
Annual total	0.19 – 7.16

Kittiwake predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the Fowlsheugh SPA

Bio-seasons	Collision risk impact Breeding adults per annum
Breeding (March - August)	0.00
Return migration (January - February)	0.16 – 1.13
Post-breeding migration (September - December)	0.10 – 1.34
Annual total	0.26 – 2.46

Kittiwake predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the East Caithness Cliffs SPA

Bio-seasons	Collision risk impact
	Breeding adults per annum
Breeding (March - August)	0.00
Return migration (January - February)	0.16 – 4.88
Post-breeding migration (September - December)	0.10 – 5.78
Annual total	0.26 – 10.66

Herring gull predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the FFC SPA

Bio-seasons	Collision risk impact
	Breeding adults per annum
Breeding (March - August)	0.00
Non-breeding (September - February)	<0.01
Annual total	<0.01

Herring gull predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the East Caithness Cliffs SPA

Bio-seasons	Collision risk impact
	Breeding adults per annum
Breeding (March - August)	0.00
Non-breeding (September - February)	0.00 – 0.03
Annual total	0.00 – 0.03

Gannet predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the FFC SPA

Bio-seasons	Collision risk impact
	Breeding adults per annum
Breeding (March - September)	0.00 – 7.68
Return migration (December - February)	0.00 – 0.13
Post-breeding migration (October - November)	0.02 – 0.54
Annual total	0.02 – 8.35

Gannet predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the Forth Islands SPA

Bio-seasons	Collision risk impact Breeding adults per annum
Breeding (March - September)	0.00
Return migration (December - February)	0.00 – 0.65
Post-breeding migration (October - November)	0.10 – 2.71
Annual total	0.10 – 3.36

Gannet predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the Noss SPA

Bio-seasons	Collision risk impact Breeding adults per annum
Breeding (March - September)	0.00
Return migration (December - February)	0.00 – 0.11
Post-breeding migration (October - November)	0.01 – 0.38
Annual total	0.01 – 0.50

Gannet predicted collision risk mortalities (lower and upper 95% CLs) during the operation and maintenance phase apportioned to the Hermaness, Saxa Vord and Valla Field SPA

Bio-seasons	Collision risk impact Breeding adults per annum
Breeding (March - September)	0.00
Return migration (December - February)	0.00 – 0.29
Post-breeding migration (October - November)	0.03 – 0.95
Annual total	0.03 – 1.24

Appendix 3 Confidence Limits for the apportioned abundance values presented within the RIAA for designated sites

Gannet abundance by bio-season (lower and upper 95% CLs) apportioned to the FFC SPA

Bio-seasons	Abundance
Breeding (March - September)	58 – 378
Return migration (December - February)	2 – 10
Post-breeding migration (October - November)	17 – 66
Annual total	77 – 453

Gannet abundance by bio-season (lower and upper 95% CLs) apportioned to the Forth Islands SPA

Bio-seasons	Abundance
Breeding (March - September)	0
Return migration (December - February)	10 – 48
Post-breeding migration (October - November)	84 – 330
Annual total	94 – 379

Gannet abundance by bio-season (lower and upper 95% CLs) apportioned to the Noss SPA

Bio-seasons	Abundance
Breeding (March - September)	0
Return migration (December - February)	2 - 9
Post-breeding migration (October - November)	12 - 46
Annual total	14 - 55

Gannet abundance by bio-season (lower and upper 95% CLs) apportioned to the Hermaness, Saxa Vord and Valla Field SPA

Bio-seasons	Abundance
Breeding (March - September)	0
Return migration (December - February)	4 – 21
Post-breeding migration (October - November)	29 – 116
Annual total	34 - 137

Guillemot abundance by bio-season (lower and upper 95% CLs) apportioned to the FFC SPA

Bio-seasons	Abundance
Breeding (March - August)	0
Non-breeding (September - March)	215 – 448
Annual total	215 – 448

Guillemot abundance by bio-season (lower and upper 95% CLs) apportioned to the Farne Islands SPA

Bio-seasons	Abundance
Breeding (March - August)	0
Non-breeding (September - March)	182 – 379
Annual total	182 – 379

Razorbill abundance by bio-season (lower and upper 95% CLs) apportioned to the FFC SPA

Bio-seasons	Abundance
Breeding (April – July)	0
Return migration (January – March)	17 - 92
Post-breeding migration (August – October)	4 - 17
Migration-free winter (November – December)	9 - 25
Annual	30 - 133

Puffin abundance by bio-season (lower and upper 95% CLs) apportioned to the FFC SPA

Bio-seasons	Abundance
Breeding (April – July)	46 - 194
Non-breeding (August - March)	0
Annual total	46 - 194

Puffin abundance by bio-season (lower and upper 95% CLs) apportioned to the Farne Islands SPA

Bio-seasons	Abundance
Breeding (April – July)	0
Non-breeding (August - March)	1 - 8
Annual total	1 - 8

Puffin abundance by bio-season (lower and upper 95% CLs) apportioned to the Forth Islands SPA

Bio-seasons	Abundance
Breeding (April – July)	0
Non-breeding (August - March)	1 - 13
Annual total	1 - 13

Puffin abundance by bio-season (lower and upper 95% CLs) apportioned to the Coquet Island SPA

Bio-seasons	Abundance
Breeding (April – July)	0
Non-breeding (August - March)	0 - 3
Annual total	0 - 3

Appendix A.4 Scottish SPAs Presentation of Quantitative Results

Royal HaskoningDHV

Appendix A.4 Scottish SPAs – Presentation of Quantitative Results

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Revision and Amendment Register

Version Number	Date	Section(s)	Page(s)	Summary of Changes	Approved by
R0.1	12/05/2025	All	All	Draft	AW
R0.2	15/05/2025	All	All	Internal Review	MB

Contents

List of Tables

1. Introduction

SSE Renewables and Equinor (hereafter referred to as 'the Applicant') are proposing to develop the Dogger Bank D (DBD) Offshore Wind Farm (OWF) (hereafter referred to as 'the Project') as a proposed optimisation to the Dogger Bank C (DBC) OWF that is currently in construction. DBD is located approximately 210km offshore from the north-east coast of England at its closest point, with the array covering an area of approximately 262km^2. DBD will comprise both offshore and onshore infrastructure, including an offshore generating station (wind farm array area), export cables to landfall, onshore export cables to an onshore converter station zone for connection to the electricity transmission network (see **PEIR Volume 1, Chapter 4 Project Description** for full details on the Project Design).

APEM Ltd (hereafter APEM) was commissioned by the Applicant to undertake a study of offshore ornithology features that characterise the area that may be influenced by DBD. A separate report (**PEIR Volume 2, Appendix 13.2 Offshore Ornithology Baseline Characterisation Report**) provides the findings from offshore ornithology survey data to determine the receptors that characterise the baseline and are relevant to assessing potential impacts from DBD. Moreover, appropriate modelling has been undertaken to characterise the potential impacts of the Project as detailed within **PEIR Volume 2, Appendix 13.3 Offshore Collision Risk Modelling** for collision risk and **PEIR Volume 2, Appendix 13.4 Offshore Displacement Analysis Report** for displacement. This technical annex has been produced to support the **Report to Inform Appropriate Assessment** (**RIAA**) (Document Reference 5.3).

Apportionment was undertaken for the Project to allow seasonal apportionment of impacts to offshore ornithological qualifying features of designated sites screened in for assessment. This is detailed within the **RIAA** (document reference 5.3) and **Appendix A.3 Apportionment Report**.

The following sections present the level of predicted impact apportioned to qualifying features of Scottish Special Protection Areas (SPAs), in relation to collision risk and disturbance and displacement from the Project alone.

2. Scottish SPAs Screened in for Appropriate Assessment

A Habitats Regulations Assessment Screening Report was submitted in December 2023 and in July 2024 an addendum to the HRA screening was drafted based on consultation responses received from Natural England (DAS UDS.A006626 02/02/2024). A summary of the changes made within the HRA Screening Addendum relevant to offshore ornithological qualifying features is provided in **Table 9-2** of the **RIAA** (document reference 5.3). Further updates specific to screening of Scottish SPA qualifying features was undertaken post submission of the addendum, based on consultation discussion with NatureScot held on 14th of October 2024. A summary of these further updates is provided within **Section 9.3** of the **RIAA** (document reference 5.3). This resulted in the Scottish SPAs and qualifying features presented in **Table 1** being screened in and subsequently assessed within the **RIAA** (document reference 5.3).

Table 1 Summary of HRA screening conclusions in relation to Scottish SPAs

SPA	Qualifying feature	Effect Pathway		
		Construction	Operation and Maintenance	Decommissioning
Forth islands SPA	Gannet *Morus bassanus*	• Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability (• In-combination impacts	• Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • Collision risk • Barrier Effects • In-combination impacts	• Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • In-combination impacts
	Puffin *Fratercula arctica*	• Disturbance and displacement due to work activity in the DBD Array Area, offshore ECC or landfall • Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • In-combination impacts	• Disturbance and displacement due to work activity in the DBD Array Area, offshore ECC or landfall • Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • Barrier Effects • In-combination impacts	• Disturbance and displacement due to work activity in the DBD Array Area, offshore ECC or landfall • Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • In-combination impacts
Fowlsheugh SPA	Kittiwake *Rissa tridactyla*	• Indirect effects via habitats or prey availability	• Collision risk • Indirect effects via habitats or prey availability • Barrier Effects • In-combination impacts	• Indirect effects via habitats or prey availability

SPA	Qualifying feature	Effect Pathway		
		Construction	Operation and Maintenance	Decommissioning
East Caithness Cliffs SPA	Herring gull *Larus argentatus*	• Indirect effects via habitats or prey availability	• Collision risk • Indirect effects via habitats or prey availability • Barrier Effects • In-combination impacts	• Indirect effects via habitats or prey availability
	Kittiwake	• Indirect effects via habitats or prey availability	• Collision risk • Indirect effects via habitats or prey availability • Barrier Effects • In-combination impacts	• Indirect effects via habitats or prey availability
Noss SPA	Gannet	• Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • In-combination impacts	• Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • Collision risk • Barrier Effects • In-combination impacts	• Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • In-combination impacts
Hermaness, Saxa Vord and Valla Field SPA	Gannet	• Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • In-combination impacts	• Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • Collision risk • Barrier Effects • In-combination impacts	• Direct disturbance and displacement due to presence of wind turbines and other offshore infrastructure • Indirect effects via habitats or prey availability • In-combination impacts

3. Assessment Methodology

The approach taken to assessment of potential impacts on ornithological qualifying features of designated sites is outlined within **Section 9.4** of the **RIAA** (document reference 5.3). This includes information on the following:

- Current embedded mitigation proposed by the Project (**Section 9.4.1**);
- Details of the worst-case scenario design considered and subsequently assessed for the Project (**Section 9.4.2**);
- Relevant biological seasons, populations and demographics for assessment (**Section 9.4.3**);
- Approach to apportionment of impacts (**Section 9.4.4**), with further detailed provided in **Appendix A.3 Apportionment Report**;
- Approach to assessment of disturbance and displacement (**Section 9.4.5**), with further detailed provided in **PEIR Volume 2, Appendix 13.4 Offshore Displacement Analysis Report**;
- Approach to assessment of collision risk (**Section 9.4.6**), with further detailed provided in **PEIR Volume 2, Appendix 13.3 Offshore Collision Risk Modelling**;
- Approach to combined effects (**Section 9.4.7**); and
- Approach to in-combination assessment (**Section 9.4.8**).

The Project has actively engaged with key stakeholders including NatureScot, in relation to the approach taken for assessments presented within the **RIAA** (document reference 5.3). Details on points of discussion are provided within **Appendix A.1 Consultation Responses for Habitats Regulations Assessment**.

As previously noted, this Appendix focuses on assessment summaries in relation to collision risk and disturbance and displacement only for the Project alone. In relation to indirect effects via habitat or prey availability and barrier effects, to avoid repetition details of these assessments are presented in **Section 9.11** and **9.12** of the **RIAA** (document reference 5.3). Similarly in-combination assessments are not repeated within this Appendix, though are provided within **Section 9.9** and **9.13** of the **RIAA** (document reference 5.3). For all sites and features the potential for an Adverse Effect on Integrity (AEoI) was confidently ruled out for the Project alone and in-combination for all effect pathways assessed for Scottish SPAs.

The Project is aware that there are differences in recommended approaches to assessment between England and Scotland for offshore ornithology Environmental Impact Assessment (EIA) and HRA, in particular relating to the recommended displacement and mortality rates for assessment. Within the **RIAA** (document reference 5.3), assessment of qualifying features of Scottish SPAs for disturbance and displacement is based on the recommended displacement and mortality rates recommended by Natural England (SNCBs, 2022) as previously agreed upon with NatureScot. For clarity however, disturbance and displacement impact predictions presented within this Appendix are based on the rates recommended within NatureScot Guidance Note 8 (NatureScot, 2023). A summary of the displacement and mortality rates recommended by NatureScot are as follows for receptors of relevance:

- Puffin: 60% displacement rate and a mortality rate of 3% to 5% during the breeding season and 1% to 3% in non-breeding bio-season); and
- Gannet: 70% displacement rate and a mortality rate of 1% to 3% for all seasons.

Additionally, disturbance and displacement assessment summaries presented in **Section 4** are based on potential operational and maintenance phase impacts only. This is due to disturbance and displacement in response to the presence of wind turbines and other offshore infrastructure during the construction and decommissioning phase not typically being an effect pathway assessed for Scottish OWF developments.

The assessment summaries presented in **Section 4** are based on the mean impact predictions apportioned to Scottish SPA qualifying features. Impact predictions based on the lower and upper 95% confidence limits apportioned to Scottish SPAs are provided in **Appendix 2** and **3** of **Appendix A.3 Apportionment Report** for reference.

4. Summary of Predicted Impacts Apportioned to Scottish SPAs

4.1 Conservation Objectives

Scottish SPAs have been assessed against the following conservation objectives:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
    - Population of the species as a viable component of the site;
    - Distribution of the species within the site;
    - Distribution and extent of habitat supporting the species;
    - Structure, function and supporting processes of habitats supporting the species; and
    - No significant disturbance of the species.

The conservation objectives of relevance to the assessments presented are highlighted in bold, based on the proximity of the designated sites, functional linkages and potential impact pathways identified.

4.2 Kittiwake

The kittiwake feature of a number of Scottish SPAs has been screened in for the assessment of operation and maintenance phase collision risk for the following SPAs:

- Fowlsheugh SPA (non-breeding); and
- East Caithness Cliffs SPA (non-breeding).

As detailed within **Appendix A.3 Apportionment Report**, the apportionment process concluded the potential for an effect pathway for kittiwake features of Scottish SPAs to be limited to non-breeding seasons of post-breeding migration (September to December) and return migration (January to February) only.

Due to there being multiple colonies identified as having potential connectivity to the Project, an apportionment process was completed in order to attribute and assess the level of potential effect to individual SPAs. For the non-breeding seasons, the Furness (2015) BDMPS apportioning rates were applied as agreed in consultation. A summary of the seasonal apportioning rates for each SPA is presented in **Table 2**. Further detail on the apportionment process applied for the Project is provided within **Appendix A.3 Apportionment Report**.

Table 2 **Summary of kittiwake seasonal apportionment to Scottish SPAs screened in for assessment**

SPA	Return migration (%)	Post-breeding migration (%)
Fowlsheugh SPA	1.78	1.35
East Caithness Cliffs SPA	7.72	5.84

4.2.1 Operation and Maintenance Phase Collision Risk

The apportioned predicted consequent mortality as a result of collision for each SPA considered is presented in **Table 3** based on EIA level predicted collision impacts of 31.22 individuals in the return migration season and 36.80 individuals in the post-breeding migration season, and accounting for the apportioning rate provided within **Table 2**.

Table 3 **Kittiwake predicted collision mortalities during the operation and maintenance phase attributed to Scottish SPAs using the breeding adult apportioning rates within Table 2**

SPA	Season	Apportioned predicted collision risk mortalities for each Scottish SPA (breeding adults per annum)	SPA population (breeding adults)	Increase in baseline mortality (%)
Fowlsheugh SPA	Return migration	0.56	30,966	0.012
	Post-breeding migration	0.50		0.011
	Annual	1.05		0.023
East Caithness Cliffs SPA	Return migration	2.41	48,958	0.034
	Post-breeding migration	2.15		0.030
	Annual	4.56		0.064

For all SPAs considered in **Table 3**, the level of predicted annual additional mortality due to collision is at most five (4.56) breeding adults. Additionally, for all assessments the increase in baseline mortality does not exceed an increase of 1% annually. Therefore, for all SPAs it can be confidently concluded that the potential for an **AEoI can confidently be ruled out** in relation to potential collision risk from the Project alone during the operation and maintenance phase. Therefore, subject to natural change, the population of the kittiwake feature will be maintained in the long term for all SPAs.

4.3 Herring gull

The herring gull feature of East Caithness Cliffs SPA has been screened in for the assessment of operation and maintenance phase collision risk. Due to the Project being outside of herring gulls mean max plus one SD foraging range from the East Caithness Cliffs SPA, potential for effect is limited to the non-breeding season only (August - March).

Due to there being multiple colonies identified as having potential connectivity to the Project, an apportionment process was completed in order to attribute and assess the level of potential effect to individual SPA qualifying features. For the non-breeding season, the Furness (2015) BDMPS apportioning rates were applied as agreed in consultation (as detailed within **Appendix A.1 Consultation Responses for Habitats Regulations Assessment**). A summary of the seasonal apportioning rates for East Caithness Cliffs SPA is presented in **Table 4**. Further detail on the apportionment process applied for the Project is provided within **Appendix A.3 Apportionment Report**.

Table 4 Summary of herring gull seasonal apportionment to Scottish SPAs screened in for assessment

SPA	Non-breeding (%)
Forth Islands SPA	1.44

4.3.1 Operation and Maintenance Phase Collision Risk

The apportioned predicted consequent mortality as a result of collision to East Caithness Cliffs SPA is presented in **Table 3** based on EIA level predicted collision impacts of 31.22 individuals in the return migration season and 36.80 individuals in the post-breeding migration season, and accounting for the apportioning rate provided within **Table 4**.

The level of predicted annual additional mortality due to collision is significantly less than a single (0.02) breeding adult apportioned to East Caithness Cliffs SPA. Additionally, for all assessments the increase in baseline mortality does not exceed an increase of 1% annually. Therefore, it can be confidently concluded that the potential for an **AEoI can confidently be ruled out** in relation to potential collision risk from the Project alone during the operation and maintenance phase. Therefore, subject to natural change, the population of the East Caithness Cliffs SPA herring gull feature will be maintained in the long term.

Table 5 Herring gull predicted collision mortality during the operation and maintenance phase attributed to East Caithness Cliffs SPAs using the breeding adult apportioning rates within Table 4

SPA	Season	Apportioned predicted collision risk mortalities (breeding adults per annum)	SPA population (breeding adults)	Increase in baseline mortality (%)
East Caithness Cliffs SPA	Non-breeding	0.02	2,226	0.005
	Annual	0.02		0.005

4.4 Puffin

The puffin feature of Forth Islands SPA has been screened in for the assessment of operation and maintenance phase disturbance and displacement. Due to the Project being outside of puffins mean max plus one SD foraging range from the Forth Islands SPA, potential for effect is limited to the non-breeding season only (August - March).

Due to there being multiple colonies identified as having potential connectivity to the Project, an apportionment process was completed in order to attribute and assess the level of potential effect to individual SPA qualifying features. For the non-breeding season, the Furness (2015) BDMPS apportioning rates were applied as agreed in consultation (as detailed within **Appendix A.1 Consultation Responses for Habitats Regulations Assessment**). A summary of the seasonal apportioning rates for the Forth Islands SPA is presented in **Table 6**. Further detail on the apportionment process applied for the Project is provided within **Appendix A.3 Apportionment Report**.

Table 6 Summary of puffin seasonal apportionment to Scottish SPAs screened in for assessment

SPA	Non-breeding (%)
Forth Islands SPA	26.83

4.4.1 Operation and Maintenance Phase Disturbance and Displacement

The apportioned predicted consequent mortality as a result of displacement for Forth Islands SPA puffin is presented in **Table 7**. The level of predicted impact presented within **Table 7** is based on a non-breeding season mean peak of 24 individuals recorded within the DBD Array Area plus 2km asymmetrical buffer at an EIA level, and accounting for the apportioning rate provided within **Table 6**.

The level of predicted annual additional mortality due to displacement is less than a single (0.04 – 0.12) breeding adult annually. Additionally, the increase in baseline mortality does not exceed an increase of 1% annually. Therefore, it can be confidently concluded that the potential for an **AEoI can confidently be ruled out** in relation to potential displacement from the Project alone during the operation and maintenance phase. Therefore, subject to natural change, the population of the puffin feature will be maintained in the long term.

Table 7 **Puffin predicted displacement mortalities during the operation and maintenance phase attributed to Forth Islands SPA using the breeding adult apportioning rates within Table 6**

SPA	Season	SPA population (breeding adults)	Apportioned abundance (breeding adults)	NatureScot recommended rates (60% Displacement and 1 – 3% Mortality)	
				Apportioned predicted displacement mortality (breeding adults per annum)	Increase from baseline mortality (%)
Forth Islands SPA	Non-breeding	121,524	6	0.04 – 0.12	<0.000 – 0.001
	Annual		6	0.04 – 0.12	<0.000 – 0.001

4.5 Gannet

The gannet feature of a number of Scottish SPAs has been screened in for the assessment of operation and maintenance phase collision risk, disturbance and displacement and combined effects for the following SPAs:

- Forth Islands SPA (non-breeding);
- Hermaness, Saxa Vord and Valla Field SPA (non-breeding); and
- Noss SPA (non-breeding).

As detailed within **Appendix A.3 Apportionment Report**, the apportionment process concluded the potential for impacts to gannet features of Scottish SPAs to be limited to non-breeding seasons of post-breeding migration (October to November) and return migration (December to February) only.

Due to there being multiple colonies identified as having potential connectivity to the Project, an apportionment process was completed in order to attribute and assess the level of potential effect at an individual SPA. For the non-breeding seasons, the Furness (2015) BDMPS apportioning rates were applied as agreed in consultation. A summary of the seasonal apportioning rates for each SPA is presented in **Table 8**. Further detail on the apportionment process applied for the Project is provided within **Appendix A.3 Apportionment Report**.

Table 8 Summary of gannet seasonal apportionment to Scottish SPAs screened in for assessment

SPA	Return migration (%)	Post-breeding migration (%)
Forth Islands SPA	31.27	24.32
Hermaness, Saxa Vord and Valla Field SPA	13.73	8.54
Noss SPA	5.51	3.42

4.5.1 Operation and Maintenance Phase Collision Risk

The apportioned predicted consequent mortality as a result of collision for each SPA considered is presented in **Table 9** based on EIA level predicted collision impacts of 0.53 individuals in the return migration season and 3.46 individuals in the post-breeding migration season, and accounting for the apportioning rate provided within **Table 8**.

Table 9 Gannet predicted collision mortalities during the operation and maintenance phase attributed to Scottish SPAs using the breeding adult apportioning rates within Table 8

SPA	Season	Apportioned predicted collision risk mortalities for each Scottish SPA (breeding adults per annum)	SPA population (breeding adults)	Increase in baseline mortality (%)
Forth Islands SPA	Return-migration	0.16	103,688	0.002
	Post-breeding migration	0.84		0.010
	Annual	1.01		0.012
Hermaness, Saxa Vord and Valla Field SPA	Return-migration	0.07	37,478	0.002
	Post-breeding migration	0.30		0.010
	Annual	0.37		0.012
Noss SPA	Return-migration	0.03	24,670	0.001
	Post-breeding migration	0.12		0.006
	Annual	0.15		0.007

For all SPAs considered in **Table 9**, the level of predicted annual additional mortality due to collision is at most one (1.01) breeding adult. Additionally, for all assessments the increase in baseline mortality does not exceed an increase of 1% annually. Therefore, for all SPAs it can be confidently concluded that the potential for an **AEoI can confidently be ruled out** in relation to potential collision risk from the Project alone during the operation and maintenance phase. Therefore, subject to natural change, the population of the gannet feature will be maintained in the long term for all SPAs.

4.5.2 Operation and Maintenance Phase Disturbance and Displacement

The level of predicted impact presented within **Table 10** is based on a return migration mean peak of 85 individuals and post-breeding migration mean peak of 813 individuals recorded within the DBD Array Area plus 2km asymmetrical buffer at an EIA level, and accounting for the apportioning rate provided within **Table 8**.

Table 10 **Gannet predicted displacement mortalities during the operation and maintenance phase attributed to Scottish SPAs using the breeding adult apportioning rates within Table 8**

SPA	Bio-seasons	SPA population (breeding adults)	Apportioned abundance (breeding adults)	NatureScot recommended rates (70% Displacement and 1 – 3% Mortality)	
				Apportioned predicted displacement mortality (breeding adults per annum)	Increase from baseline mortality (%)
Forth Islands SPA	Return-migration	103,688	27	0.19 – 0.56	0.002 – 0.007
	Post-breeding migration		198	1.38 – 4.15	0.016 – 0.049
	Annual		224	1.57 – 4.71	0.028 – 0.084
Hermaness, Saxa Vord and Valla Field SPA	Return-migration	37,478	12	0.08 – 0.25	0.003 – 0.008
	Post-breeding migration		69	0.49 – 1.46	0.016 – 0.048
	Annual		81	0.57 – 1.71	0.019 – 0.056
Noss SPA	Return-migration	24,670	5	0.03 – 0.10	0.002 – 0.005
	Post-breeding migration		28	0.19 – 0.58	0.010 – 0.029
	Annual		33	0.22 – 0.68	0.011 – 0.034

For all SPAs considered in **Table 10**, the level of predicted annual additional mortality due to displacement is at most five (4.71) breeding adults. Additionally, for all assessments the increase in baseline mortality does not exceed an increase of 1% annually. Therefore, for all SPAs it can be confidently concluded that the potential for an **AEoI can confidently be ruled out** in relation to potential displacement from the Project alone during the operation and maintenance phase. Therefore, subject to natural change, the population of the gannet feature will be maintained in the long term for all SPAs.

4.5.3 Operation and Maintenance Phase Combined Collision and Displacement

The apportioned predicted consequent mortality as a result of combined collision and displacement for each SPA considered is presented in **Table 11** based on the impact predictions presented within **Table 9** and **Table 10**.

Table 11 Gannet predicted combined collision and displacement mortalities during the operation and maintenance phase attributed to Scottish SPAs using the breeding adult apportioning rates within Table 8

SPA	Bio-seasons	SPA population (breeding adults)	NatureScot recommended rates (70% Displacement and 1 – 3% Mortality)	
			Apportioned predicted displacement mortality (breeding adults per annum)	Increase from baseline mortality (%)
Forth Islands SPA	Return-migration	103,688	0.35 – 0.72	0.004 – 0.009
	Post-breeding migration		2.22 – 4.99	0.026 – 0.059
	Annual		2.57 – 5.71	0.031 – 0.068
Hermaness, Saxa Vord and Valla Field SPA	Return-migration	37,478	0.15 – 0.32	0.005 – 0.010
	Post-breeding migration		0.79 – 1.76	0.026 – 0.058
	Annual		0.94 – 2.07	0.031 – 0.068

SPA	Bio-seasons	SPA population (breeding adults)	NatureScot recommended rates (70% Displacement and 1 – 3% Mortality)	
			Apportioned predicted displacement mortality (breeding adults per annum)	Increase from baseline mortality (%)
Noss SPA	Return-migration	24,670	0.06 – 0.13	0.003 – 0.006
	Post-breeding migration		0.31 – 0.70	0.016 – 0.035
	Annual		0.38 – 0.83	0.019 – 0.042

For all SPAs considered in **Table 11**, the level of predicted annual additional mortality due to displacement is at most six (5.71) breeding adults. Additionally, for all assessments the increase in baseline mortality does not exceed an increase of 1% annually. Therefore, for all SPAs it can be confidently concluded that the potential for an **AEoI can confidently be ruled out** in relation to potential collision risk from the Project alone during the operation and maintenance phase. Therefore, subject to natural change, the population of the gannet feature will be maintained in the long term for all SPAs.

5. References

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SNCB (2022). Joint SNCB Interim Displacement Advice Note: Advice on how to present assessment information on the extent and potential consequences of seabird displacement from Offshore Wind Farm (OWF) developments (updated January 2022 to include reference to the Joint SNCB Interim Advice on the Treatment of Displacement for Red-Throated Diver).