Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Appendix 1 - Habitats Regulations Assessment Screening Report

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Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

Preliminary Environmental Information Report

Habitats Regulations Assessment Screening Report

Appendix 5.1

HRA Screening

April 2021

N.B. This is a copy of the April 2021 Screening Report and has not been updated since that time. As such it should be read in conjunction with RIAA Appendix 2 Habitats Regulations Assessment Screening Matrices (document reference 5.4.2) as well as the RIAA itself (document reference 5.4), which together reflect the final screening outcomes.

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Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions – HRA Screening	
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Glossary of Acronyms

AC	Alternating Current
AoO	Advice on Operations
CIA	Cumulative Impact Assessment
cSAC	Candidate SAC
DCO	Development Consent Order
DEP	Dudgeon Extension Project
DOW	Dudgeon Offshore Wind Farm
EDR	Effective Deterrent Radius
EC	European Commission
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
EPS	European Protected Species
ETG	Expert Topic Group
EU	European Union
FCS	Favourable Conservation Status
GIS	Geographical Information System
HDD	Horizontal Directional Drilling
HRA	Habitats Regulations Assessment
HVAC	High-Voltage Alternating Current
HVDC	High-Voltage Direct Current
IROPI	Imperative Reasons of Overriding Public Interest
km	Kilometre
LSE	Likely Significant Effect
MMMP	Marine Mammal Mitigation Plan
MPA	Marine Protected Area
MU	Management Units
MW	Megawatts
NAS	Noise Abatement System
NSER	No Significant Effects Report
NSIP	Nationally Significant Infrastructure Project
Ofgem	Office of Gas and Electricity Markets
OFTO	Offshore Transmission Owner
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PTS	Permanent Threshold Shift
pSAC	Possible SAC
pSPA	Potential SPA
SAC	Special Area of Conservation
SEP	Sheringham Shoal Extension Project
SIP	Site Integrity Plan
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Body
SNS	Southern North Sea
SPA	Special Protection Area
SoCG	Statement of Common Ground

SSC	Suspended Sediment Concentration
TP	Transition Pieces
UK	United Kingdom
UXO	Unexploded Ordnance
ZOI	Zone of Influence

Glossary of Terms

Array cables	Cables which link the wind turbine generators to the offshore substation platforms.
Dudgeon Offshore Wind Farm Extension site	The Dudgeon Offshore Wind Farm Extension offshore wind farm boundary.
Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive. This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas, and is defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics.
Horizontal directional drilling (HDD) zones	The areas within the onshore cable route which would house HDD entry or exit points.
Sheringham Shoal Offshore Wind Farm Extension site	Sheringham Shoal Offshore Wind Farm Extension offshore wind farm boundary.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
The Applicant	Equinor ASA

HABITATS REGULATIONS ASSESSMENT SCREENING REPORT

N.B. This is a copy of the April 2021 Screening Report and has not been updated since that time. As a 'point in time' document it is only submitted for reference purposes as much of the supporting text remains valid. However a small number of screening outcomes have changed since April 2021, as the consultation on likely significant effects and associated assessments have developed through the pre-application period. As such it should be read in conjunction with RIAA **Appendix 2 Habitats Regulations Assessment Screening Matrices** (document reference 5.4.2), as well as the **RIAA** itself (document reference 5.4), which together reflect the final screening outcomes and provide a narrative explaining the changes.

1 Introduction

1.1 Purpose of this Document

1. This report documents Stage 1 of the four stage Habitats Regulations Assessment (HRA) process which is described in the Planning Inspectorate's Advice Note Ten (The Planning Inspectorate, 2017) (further details in **Section 2**). The aim of Stage 1 is to determine whether or not a plan or project is likely to have a significant effect ('Likely Significant Effect' or 'LSE') on a European site, either alone or in-combination with other plans and projects. Where it is considered that there is no potential for LSE, the site (or relevant interest feature) is 'screened out' from further consideration in the HRA process. Where the potential for LSE cannot be discounted, it remains screened in and further assessment will be undertaken. Agreement on whether sites and features should or should not be screened-out will be sought through feedback on this Screening Report and throughout the ongoing Evidence Plan Process (EPP) and associated Expert Topic Groups (ETGs).

2. The Screening Report considers both onshore and offshore elements of the proposed Development Consent Order (DCO) application for the Dudgeon Extension Project (DEP) and Sheringham Extension Project (SEP). It considers the following receptors:

- Onshore:
  - Terrestrial ecology; and
  - Onshore ornithology.
- Offshore:
  - Benthic ecology;
  - Fish ecology;
  - Marine mammals; and
  - Offshore ornithology.

3. The screening assessment is based on the understanding of the baseline environment and the scope and nature of the proposed project activities at the time of writing. Further environmental survey and assessment work, changes to designated sites, consultee responses and refinements to the Project design may change this assessment. Any such changes will be reflected in the draft HRA Report that will be consulted on as part of the pre-application consultation.

1.2 Project Description

4. This section provides further detail on the infrastructure parameters of the proposed Projects and the key activities that will be undertaken during construction, operation and decommissioning. Project design will be ongoing throughout the environmental impact assessment (EIA) and pre-construction phase. Therefore, the description of the Projects provided here is indicative at this stage, is based on the information available at the time of writing, and is designed to provide context for the screening assessment. The project design envelope will be developed in parallel with the EIA process and will be influenced by the results of environmental and technical studies and in some cases stakeholder consultation.

5. The Applicant has determined that the most appropriate consenting approach is a single application for development consent addressing both wind farm extensions and their associated transmission infrastructure. This strategy will allow for a consistent approach to assessments (including HRA screening), consultation and examination. Although there will be a combined EIA process and associated submissions, each project is assessed individually and in-combination. This covers the possibility that one or the other (but not both) of the Projects are developed, as well as both projects being developed, either concurrently or sequentially.

1.2.1 Wind Farm Sites

1.2.1.1 Lease area

6. The Projects consist of two extension assets and thus Agreement for Lease areas. The DEP area is divided into two parts – DEP north and DEP south. The key characteristics of each area are summarised in **Table 1-1**.

Table 1-1 Dudgeon and Sheringham Extensions Overview

Area	Parameters	Values
SEP	AfL area	92.6km^2
	Closest distance to shore	17.5km
	Water depth	14 – 25m
DEP	AfL area	103.5km^2
	Closest distance to shore	31km
	Water depth	11 – 23m

1.2.1.2 Wind Turbine Generators

7. The indicative wind turbine design envelope for DEP and SEP is outlined in **Table 1-2**.

Table 1-2 Wind Turbine Design Envelope

Parameters	Indicative range
Rotor Diameter	~220 – 300m
Number of wind turbines – DEP	Up to 32 turbines
Number of wind turbines – SEP	Up to 24 turbines
Max Tip Height (HAT)	Up to ~330m
Air Gap above Highest Astronomical Tide (HAT)	Lowest air gap ~26m
Indicative separation distance between turbines (inter-row), DEP and SEP	Shortest distance between turbines ~ 990m (4.5 rotor diameters)

1.2.1.3 Wind Turbine Foundations

8. The considered wind turbine foundation types are:
   - Monopile/transition piece;
   - Mono tower with suction bucket;
   - Jacket with pile;
   - Jacket with suction bucket; and
   - Gravity base structure[1] (GBS).
9. Key wind turbine foundation parameters are listed in **Table 1-3**.

Table 1-3 Wind turbine foundation design envelope

Foundation type	Parameter	Indicative size
Monopile/transition piece	Diameter	Up to 16m
	Hammer size	Up to 5,500kJ
Jacket with piling	Leg spacing	< 30m
	Hammer size	< 3,000kJ
Jacket with suction bucket	Leg spacing	< 30m
	Bucket diameter	< 20m

[1] GBS were included in the Scoping Report (Royal HaskoningDHV, 2019) and have been retained in the design envelope to provide flexibility across the range of turbine options that are under consideration. This is because other foundation types may be more limited in terms of the maximum size of wind turbine (and associated blade diameter) that they can support.

Foundation type	Parameter	Indicative size
Mono tower with suction bucket	Diameter	< 45m
GBS	Diameter	< 60m

1.2.2 Electrical System

10. The transmission system will be constructed by Equinor and the ownership will be transferred to an Offshore Transmission Owner (OFTO) in accordance with applicable rules and regulations in a transaction managed by the Office of Gas and Electricity Markets (Ofgem).

11. Array cables connect the turbines to each other and to the offshore substation. The current design includes three additional array cables on DEP and two additional array cables on SEP to be used as links between radials. The array cables are expected to be 66kV alternating current (AC). A realistic maximum distance of array cables will be defined for the purposes of the EIA and used as the basis for the assessments.

1.2.2.1 Offshore substation(s)

12. The cables from a string of turbines will be brought to an offshore substation, located appropriately to optimise the array cable and export cable lengths. At the substation, the generated power will be transformed to a higher AC voltage. This higher voltage will be determined by detailed studies, but is likely to be ~ 220kV.

13. There will be up to two offshore substations. In the case that two substations are constructed, there will be one substation located in each extension area.

14. The offshore substation foundation type will likely be a jacket, fixed to the seabed with suction caissons or piles. The jacket foundation will have four or six legs with up to three piles at each leg or one suction bucket at each leg. Leg spacing at the seabed will be up to 40m.

1.2.2.2 Array cables

15. Cable system design will be based on radial strings from the offshore substation(s) and connecting multiple turbines per string. The current design also includes three additional array cables on DEP and two additional array cables on SEP to be used as links between radials. The array cables will be 66kV AC.

16. Array cables will connect DEP to the offshore substation located in the SEP area (in case there is only one offshore substation). The current design accounts for up to six array cables linking DEP to the offshore substation at SEP. Each cable will require its own trench, totalling up to six trenches.

1.2.2.3 Interlink cables

17. Should the final design of DEP and SEP include two substations, up to two interlink cables may be installed to link the two substations. The interlink cables will improve the reliability of the transmission system. They will be 220kV AC cables and will be installed in separate trenches.

1.2.2.4 Offshore export cables

18. Two export cables (220kV AC) are likely to run from the offshore substation(s) to a transition joint bay at the landfall. The transition joint bay connects the offshore and onshore export cables. Each export cable will be installed in a separate trench and protected in line with good industry practice.

19. The export cables will be installed in separate installation campaigns as the installation vessel can only install one cable at a time. Installation of offshore cables typically takes place by ploughing or trenching depending on the soil conditions along the cable route. The purpose of cable burial is to ensure that the cables are protected from damage by external factors. Typical burial depth is between 0.5 to 1.5m, but no protection will also be considered. The appropriate level of protection will be determined based on an assessment of the risks posed to the Projects in specific areas. **Table 1-4** describes the main cable parameters.

20. It is likely that the export cables will have to cross other cables and/or pipelines. A number of techniques can be utilised, including (but not limited to):

- Pre-lay and post lay concrete mattresses;
- Pre-lay and post lay rock dumping; or
- Pre-lay steel structures.

21. There will be no separate cables for fibre optics. Fibre optics will be integrated with the export cables.

Table 1-4 Offshore cable parameters (based on an HVAC export cable system)

Item	Indicative parameters
DEP array cables	One per wind turbine plus potential cables for redundancy between strings
SEP array cables	One per wind turbine plus potential cables for redundancy between strings
Cables connecting DEP and SEP (array or interlink)	Up to 7
Export cables/trenches	Up to 2
Fibre optic cables	Bundled in export cable
Number of cable crossings	Up to 21
Length of cables	
Array cables	Dependent upon distance between turbines
DEP – SEP	Up to ~ 20km
Export cable SEP – Weybourne landfall	~18km
Export cable route scoping width	~500m – 1,000m (1,000m through the MCZ)

1.2.2.5 Landfall

22. Following consideration of two alternative landfall options (Weybourne and Bacton) a landfall at Weybourne has been selected. Cable installation at the landfall is proposed to be by horizontal directional drilling (HDD). The offshore and onshore cables will be jointed in one or two transition bays onshore. **Table 1-5** shows the main construction parameters for the landfall site.

23. Each export cable will require one HDD i.e. up to two in total. However, a spare HDD is accounted for in the scoping envelope. The HDD is drilled from an onshore construction compound and will exit the seabed in an exit pit at a suitable location with approximately 8 – 10m water depth. The exact length of the HDD will depend upon factors such as water depth, seabed topography, shallow geology/soil conditions and environmental constraints. The onshore construction compound will be temporary in nature and reinstated after completion of the Projects.

24. The exit pits offshore of the HDDs will be spaced some distance apart. However, environmental and technical constraints will determine the actual separation distance to be used. The exit pits are likely to be 3m wide at the bottom to allow collection of drilling fluids. The total length will be approximately 10m, while the depth of the exit pits will reflect the depth at which the export cable will continue further offshore. However, it is likely that depths will be less than 1m. The export cables are generally protected in the HDD exit pits and in the offshore export cable trench by burial. However, there is a section between the HDD exit pit and the cable trench of up to 50m which may require additional permanent protection measures in the form of rock protection. For the purposes of the EIA appropriate protective measures will be identified and discussed with key stakeholders prior to submission of the DCO application.

25. The onshore transition bay(s) will be located underground. A pit will be dug out and refilled once the transition bay(s) have been installed.

Table 1-5 Landfall construction parameters

Landfall	Indicative parameters
Number of HDD drills	Up to 4
Number of transition bays	Up to 2
Transition bay dimensions (length x width)	Up to 20 x 20m
Transition bay dimensions depth	Up to 2m
Landfall HDD compound (length x width)	Up to 75 x 60m
Length of HDD	Up to 1,500m

1.2.2.6 Onshore Export System

26. The width of the onshore cable corridor swathe will be up to 60m. This allows for additional separation of cables buried at depth and accounts for the required construction footprint, including trenches, haul road, spoil storage, drainage etc.

27. The onshore underground cable system will be installed in trenches, either a common trench for the two circuits or one circuit per trench. Each circuit consists of three high voltage cables and one fibre optical cable. A trench holding two circuits may be up to 5m wide. A trench holding a single circuit may be up to 2.5m wide (the width of the corridor allows for appropriate separation between trenches).

28. Jointing bays will be used to pull the cables into the ducts and/or 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 subsurface structures, while the link boxes will require access (for inspections) from the surface during operations and will therefore be located at or above ground level. At the jointing location there will be one link box per circuit. The number of jointing bays will be approximately 140 (every 500m).

Table 1-6: Onshore cable parameters

Onshore cable corridor	Indicative parameters
Cable corridor swathe width	Up to 60m
Cable corridor swathe at trenchless crossings	Up to 60m
No. cables	Up to 8
No. ducts	Up to 5
No. trenches	Up to 2
Depth to top of buried infrastructure (ducts)	>1m
Trenchless (HDD) crossings	To be identified
Trenchless (HDD) crossings compound (length x width)	Up to 75 x 60m
Typical jointing bay frequency	Up to every 500m
Jointing bay (length x width x height)	Up to 12 x 7 x 2m
Depth to top of jointing bay (m)	> 1m

1.2.2.7 Onshore Substation

29. One or two onshore substations will be constructed to accommodate the connection of both DEP and SEP to the transmission grid within the same footprint. The HVAC onshore substation will be located in proximity to National Grid's existing Norwich Main substation. It will contain the necessary electrical and auxiliary equipment and components for transforming the power from the wind farm to 400kV and required to meet the UK Grid Code for connection to the transmission grid.

30. The maximum design scenario will be set out in the PEIR (e.g. maximum height, footprint, number and type of buildings). **Table 1-7** describes the main onshore substation construction parameters.

31. The operational footprint up to 6.25ha does not necessarily take possible landscaping needs into account. The need and location of landscaping activities will be identified and agreed with relevant stakeholders at a later stage.

32. In the case that the DEP and SEP onshore substation is located adjacent to the existing Norwich Main substation, an overhead connection between the two substations will be considered. An underground cable connection will be used if the two substations are not adjacent to each other. The cable corridor between the two substations will be similar to the export cable corridor in design and width.

Table 1-7 Onshore substation construction parameters

Substation	Indicative parameters
Construction compound	Up to 1ha
Operational compound	Up to 6.25ha
Building height	Up to 15m
External equipment height	Up to 30m

1.2.2.8 Grid Connection

33. DEP and SEP will both connect to the existing transmission grid in National Grid's Norwich Main substation. The requirement for any NGET substation consents necessary to undertake works associated with DEP and SEP at Norwich Main is the responsibility of National Grid. The cumulative impacts will be considered as appropriate.

1.2.3 Offshore and Onshore Construction

1.2.3.1 Fabrication

34. All elements of the offshore wind farm including turbines, foundations, substations and electrical infrastructure will be fabricated offsite, stored at a suitable port facility and transported to site as needed. Fabrication contracts have not been placed and Equinor will run competitive tendering processes to identify the best suitable contractors to deliver the different elements of the development. Fabrication can take place in the UK, in Europe or elsewhere dependent upon the location of the chosen contractor.

1.2.3.2 Seabed preparation

35. Some form of seabed preparation may be required for each foundation type. Seabed preparation includes seabed levelling, ground reinforcement and removing surface and subsurface debris such as boulders, fishing nets, lost anchors etc. If debris are present below the seabed surface then excavation may be required for access and removal. Any unexploded ordnances found with live ammunition will be detonated and any remaining debris removed, where practicable.

36. Consent for UXO removal will be sought in a future Marine Licence application, when geophysical survey data of suitable spatial resolution is available to identify and quantify UXO risk.

1.2.3.3 Marine operations

37. Monopiles can be installed by using floating mono hull crane vessels or suitable jack-up vessels for these water depths and conditions. The contractor market has developed in recent years and there are several new installation vessels being planned or constructed which will be suitable for DEP and SEP.

38. It is expected that the maximum hammer size for pile driving will be 5,500kJ.

39. The vessels undertaking the piling of the monopiles will also be likely to install the transition pieces (TPs). There are currently initiatives looking into possible alternative solutions for construction, including the installation of a combined monopile and TP. The Applicant will follow this technology development closely and identify a construction philosophy which best takes all aspects into account.

40. Foundations and turbines are likely to be installed by using jack-up vessels. For the larger new turbines the market for installation vessels is limited, but it is expected that the availability of installation vessels will adapt to the increase in turbines sizes. Details of the anticipated jack-up operation footprints will be considered in the PEIR.

1.2.3.4 Onshore cable route

41. The onshore cable ducts will be installed using a trenching machine/open-cut trench techniques; and where necessary HDD or other trenchless methods to avoid surface disturbance at sensitive features. The cables will be direct laid or installed in ducts at the bottom of the trench(es).

42. The cable burial includes the removal of topsoil, excavating the trench, installing the ducts and backfilling the trench. The cables will be pulled through the ducts after the trench has been backfilled. Cables and ducts are likely to be covered by approximately 1m soil. The cable route width of 60m takes account of the need for storing soils during construction.

43. Haul roads will be constructed along the cable route to allow access to the cable route during the construction phase. In the case of a phased development the haul roads may be left in situ between construction periods and removed once construction of the phased development has finalised. The cable route width of 60m takes account of the need for haul roads.

44. There will be need for several temporary compounds along the onshore cable corridor for material and equipment.

45. **Table 1-6** details the main onshore cable construction parameters.

1.2.3.5 Trenchless crossings (including landfall)

46. Where an open trench approach is not possible due to significant obstructions (e.g. a major road or watercourse or at the landfall) non-trenching techniques will be employed. It is anticipated that HDD technique or similar will be used.

47. Use of any trenchless technique will also require temporary construction compounds at the entry and exit points.

1.2.3.6 Onshore substation

48. Construction of the onshore substation will include:

- Establishing access roads;

- Site preparation/levelling for the temporary construction compounds and the permanent substation site (depending on the project scenario up to two substation buildings will be built in the same footprint). Dependent upon the onsite ground conditions at the substation location, piling may be required to support the construction of buildings and heavy equipment;
- Installation of underground utility/drainage and foundations for buildings and equipment;
- Construction of building(s) and installation of electrical equipment;
- Installation of permanent perimeter fencing around entire substation; and
- Landscaping to minimise visual impact.

1.2.4 Construction Program

49. The indicative high-level construction programs shown in **Figure 1-1** and **Figure 1-2** provide an overview of installation durations of the main project elements under the integrated and separated grid options respectively. **Figure 1-2** shows construction activities undertaken as a single construction campaign for DEP and SEP, but also a program where construction activities are undertaken as two separate campaigns approximately 2 – 3 years apart.

Figure 1-1 Construction Program Integrated Grid Option

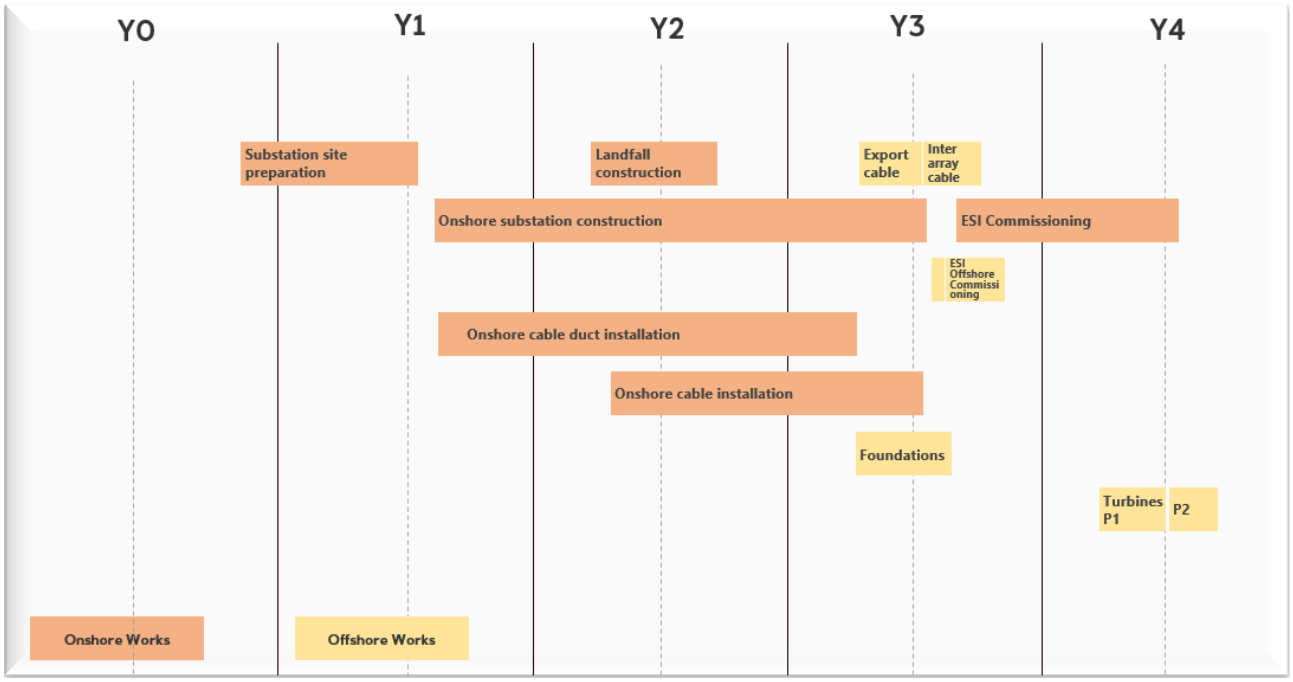
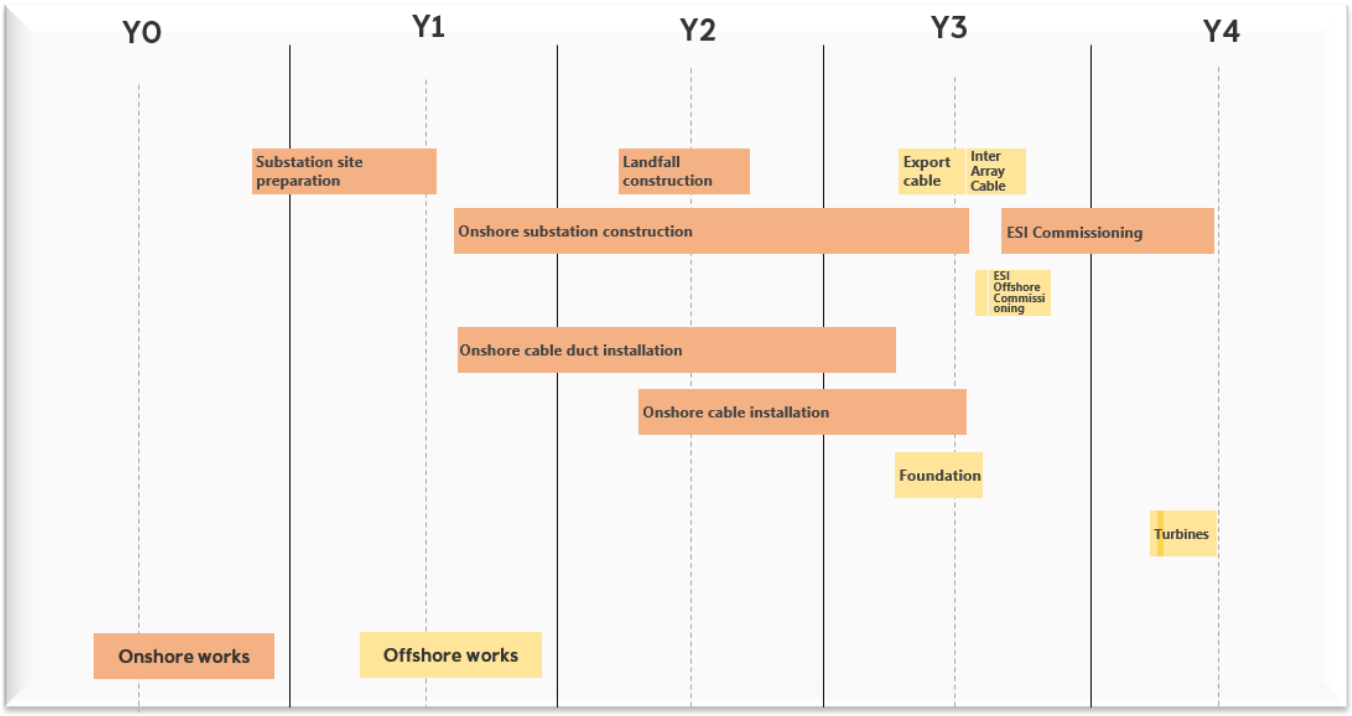
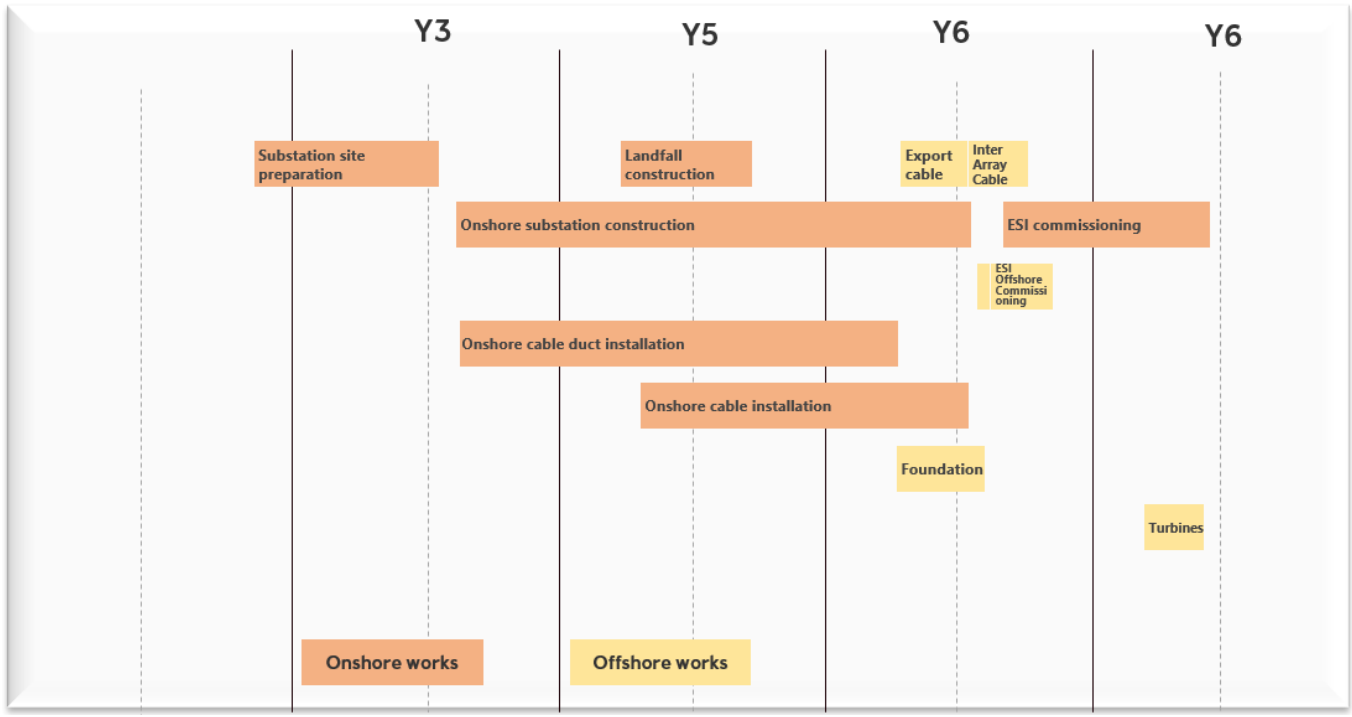


Figure 1-2 Construction Program Separated Grid Option

Project 1



Project 2



1.2.5 Operation, Maintenance and Decommissioning Phases

50. The general O&M strategy will rely primarily on crew vessels, supply vessels, and helicopters for the O&M services that will be performed at the wind farms.

51. Maintenance activities will be categorised into two levels: preventive and corrective maintenance. Preventive maintenance will be undertaken according to scheduled services whereas corrective maintenance would be needed to cover unexpected repairs, component replacements, retrofit campaigns and breakdowns.

52. At the end of the operational lifetime of the wind farm, assumed to be minimum 30 years, it is anticipated that all offshore structures above the seabed (foundations and electrical infrastructure) will be removed and the site of the onshore substation will be restored. All electrical cables will be left in-situ to minimise environmental impacts associated with their removal. The decommissioning sequence will take approximately three years and will be undertaken in reverse of the construction sequence, involving similar types and numbers of vessels and equipment. The decommissioning plan and program will be developed prior to construction and be updated during the Projects' lifespan to take account of changing best-practice and new technologies.

1.3 Legislation, Policy and Guidance

1.3.1 Overview

53. The HRA process covers those features designated under the European Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive') and Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive'). The UK also has to meet its obligations under relevant international agreements such as the Ramsar Convention.

54. The UK exited the EU on 31st January 2020. However, as described in **Section 1.3.3** below, the application of the HRA process currently remains largely unchanged due to the introduction of the EU Exit Regulations 2019.

1.3.2 European Legislation

1.3.2.1 The Birds Directive

55. The Birds Directive provides a framework for the conservation and management of wild birds in Europe. The relevant provisions of the Directive are the identification and classification of SPAs for rare or vulnerable species listed in Annex I of the Directive and for all regularly occurring migratory species (required by Article 4). The Directive requires national Governments to establish SPAs and to have in place mechanisms to protect and manage them. The SPA protection procedures originally set out in Article 4 of the Birds Directive have been replaced by the Article 6 provisions of the Habitats Directive.

1.3.2.2 The Habitats Directive

56. The Habitats Directive provides a framework for the conservation and management of natural habitats, wild fauna (except birds) and flora in Europe. Its aim is to maintain or restore natural habitats and wild species at a favourable conservation status. The relevant provisions of the Directive are the identification and classification of Special Areas of Conservation (SAC) (Article 4) and procedures for the protection of SACs and SPAs (Article 6). SACs are identified based on the presence of natural habitat types listed in Annex I and populations of the species listed in Annex II. The Directive requires national Governments to establish SACs and to have in place mechanisms to protect and manage them.

1.3.2.3 The Ramsar Convention

57. The Convention on Wetlands of International Importance especially as Waterfowl Habitat, as amended in 1982 and 1987 (the 'Ramsar Convention') is an international treaty for the conservation and sustainable use of wetlands of international importance. Ramsar site selection has had an emphasis on wetlands of importance to waterbirds, however non-bird features are increasingly taken into account, both in the selection of new sites and when reviewing existing sites. The UK government and the devolved administrations have issued policy statements relating to Ramsar sites which extend to them the same protection at a policy level as SACs and SPAs. Ramsar sites are therefore included in the HRA process.

1.3.3 UK National Legislation

1.3.3.1 The Conservation of Habitats and Species Regulations 2017, the Conservation of Offshore Marine Habitats and Species Regulations 2017, and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019

58. These regulations (hereafter the 'Habitats Regulations') together with the Wildlife and Countryside Act 1981 transpose the Habitats and Birds Directives into UK legislation covering terrestrial areas out to and including the UK Offshore Marine Area with the exception of within Scottish territorial waters, where The Conservation (Natural Habitats, &c.) Regulations 1994 continue to apply.

59. The Conservation of Habitats and Species Regulations 2019 make changes to the 2017 Habitats Regulations so that they continue to work (are operable) following the UK's exit from the EU on 31st January 2020. While the basic legal framework for HRA is maintained, the EU Exit Regulations transfer functions previously undertaken by the European Commission (EC) to UK Ministers. Furthermore, where the Habitats Regulations continue to use the term European sites, those sites now form part of a "national site network" and not the European "Natura 2000" site network.

60. The Habitats Regulations place an obligation on 'competent authorities' to carry out an appropriate assessment of any proposal likely to affect a designated site, to seek advice from Natural England and not to approve an application that would have an adverse effect on a designated site unless certain conditions are met (where there are no alternative solutions, the plan or project can only proceed if there are imperative reasons of over-riding public interest and if the necessary compensatory measures can be secured). The competent authority in the case of the proposed project is the Secretary of State (SoS) for Business Energy and Industrial Strategy (BEIS).

1.3.4 Policy and Guidance

61. In addition to the legislation outlined above, the HRA will give consideration to all relevant guidance and policies issued by a number of Governmental, statutory and industry bodies.

1.3.4.1 Government Guidance

62. In relation to guidance from Government bodies, this includes:

- European Commission: Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites.
- European Commission: EU Guidance on wind energy development in accordance with EU nature directives.
- The Planning Inspectorate Advice Note Nine: Rochdale Envelope.
- The Planning Inspectorate Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects.
- The Planning Inspectorate Advice Note Seventeen: Cumulative Effects Assessment.
- Department of Energy and Climate Change: Guidelines on the Assessment of Transboundary Impacts of Energy Developments on Natura 2000 Sites outside the UK.

1.3.4.2 Statutory Nature Conservation Bodies Guidance

63. In relation to guidance from Statutory Nature Conservation Bodies (SNCBs) this includes:

- English Nature: Habitats Regulations Guidance Note (HRGN 1): The Appropriate Assessment (Regulation 48) The Conservation (Natural Habitats &c) Regulations, 1994.
- English Nature: Habitats Regulations Guidance Note (HRGN 3): The Determination of Likely Significant Effect under the Conservation (Natural Habitats &c) Regulations, 1994.
- English Nature: Habitats Regulations Guidance Note (HRGN 4): Alone or in-combination.

- Natural England and JNCC: Interim advice on HRA screening for seabirds in the non-breeding season.
- Natural England and JNCC: Advice on HRA screening for seabirds in the breeding season.
- Natural England and JNCC: Interim Advice Note – Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation to Offshore Windfarm Developments.

1.3.4.3 Industry Guidance

64. In relation to guidance from industry this includes:

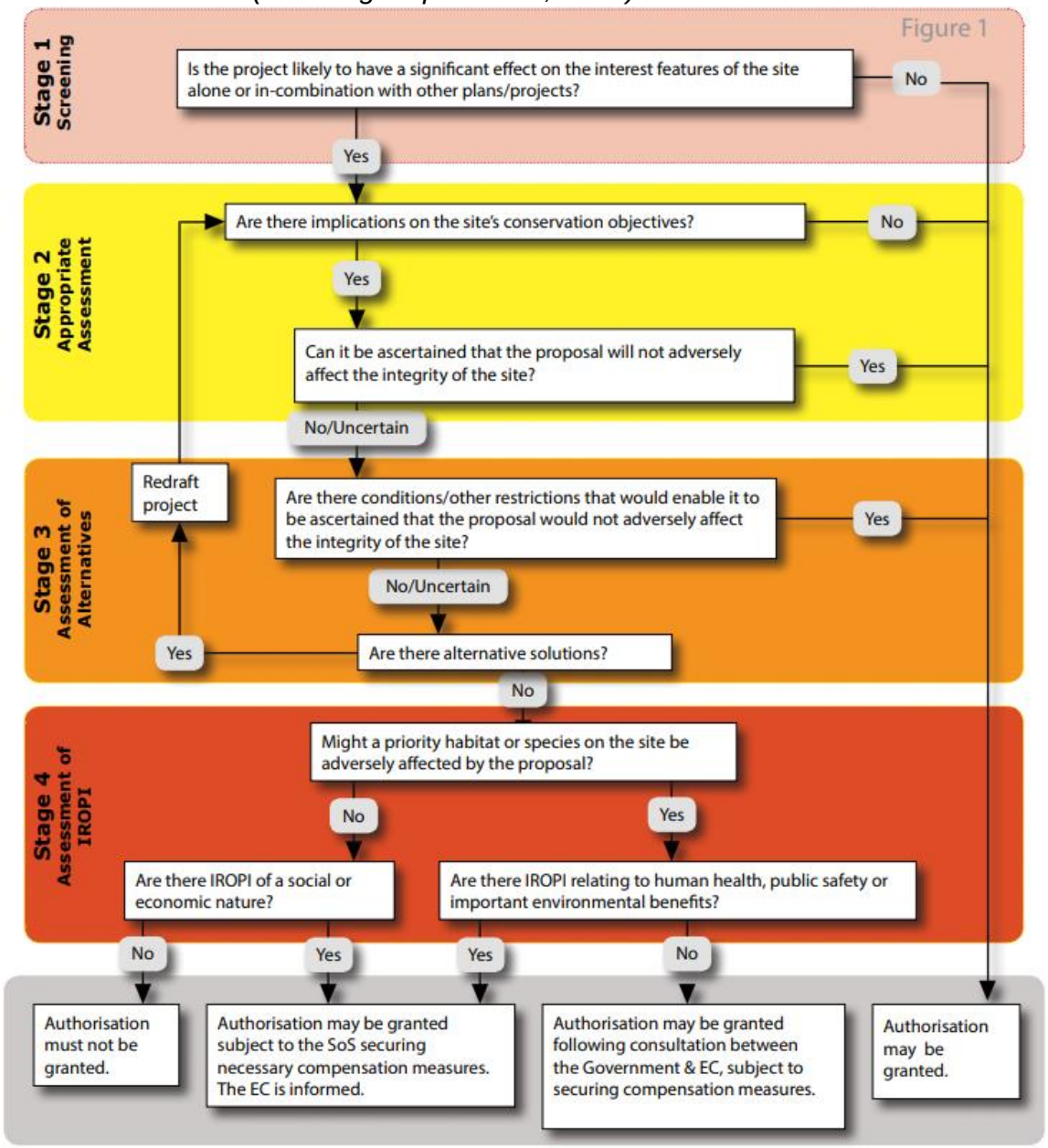
- Developing Guidance on Ornithological Cumulative Impact Assessment for Offshore Wind Farm Developers (King *et al*. 2009).
- Cumulative Impact Assessment Guidelines – Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms (RenewableUK, 2013).

2 HRA Methodology

2.1 Overview of HRA Process

65. The HRA process consists of up to four stages (**Figure 2-1**) that are described in more detail in Planning Inspectorate Advice Note 10 (Planning Inspectorate, 2017) and summarised below. For all plans and projects which are not wholly directly connected with, or necessary to the conservation management of a site's qualifying features, this will include formal screening for any LSE either alone or in-combination with other plans or projects. As already noted, the role of the European Commission is now taken by UK Ministers.

Figure 2-1: HRA Process (Planning Inspectorate, 2017)



2.1.1 Stage 1 – Screening (this report)

66. In Stage 1, designated sites are screened for LSE resulting from the 'project alone' scenario (i.e. either DEP or SEP in isolation, or DEP and SEP together) and in-combination with other projects. Where it can be determined that there is no potential for LSE to occur to interest features of a designated site, that site is sought to be 'screened out'.

67. Mitigation measures intended to avoid or reduce the harmful effects of a plan or project are not taken into account at Stage 1, but will be considered during the Stage 2 assessment, where this applies.

68. The Planning Inspectorate advises that for those projects where no LSE is predicted, this should be reported in the form of a No Significant Effects Report (NSER) and there is no requirement to undertake the Stage 2 assessment (Planning Inspectorate, 2017).

2.1.2 Stage 2 – Appropriate Assessment

69. The purpose of the HRA process is to identify where potential LSE may occur and to provide information to the competent authority so that they can determine whether LSE is expected to occur through an Appropriate Assessment.

70. For those sites where LSE cannot be excluded in Stage 1 screening, further information to inform the assessment is prepared. The assessment will determine whether the Projects, alone or in-combination, could adversely affect the integrity of the site in view of its conservation objectives. The assessment includes a description of any mitigation measures proposed which avoid or reduce each effect, and any remaining residual effects. The assessment and conclusions of this stage will be reported in the form of a HRA Report and the results of the assessment summarised in the form of a series of matrices.

71. In cases where the appropriate assessment identifies the potential for an adverse effect on the integrity of a designated site (or cannot rule one out), the assessment proceeds to Stage 3.

2.1.3 Stage 3 – Assessment of Alternatives

72. Stage 3 investigates alternatives that could be applied to reduce the potential for effects. The Planning Inspectorate advises that alternative solutions can include a proposal of a different scale, a different location and an option of not having the scheme at all – the 'do nothing' approach.

2.1.4 Stage 4 – Assessment of Imperative Reasons of Overriding Public Interest (IROPI)

73. If it is demonstrated that there are no alternative solutions to the proposal that would have a lesser effect or avoid an adverse effect on the integrity of the site(s), then a case will be prepared that the scheme should be carried out for IROPI. The IROPI justification must relate to either:

- human health, public safety or beneficial consequences of primary importance to the environment; or

- having due regard to any opinion from the appropriate authority, any other imperative reasons of overriding public interest.

74. If the conclusion of Stages 3 and 4 is that there is no alternative and that the project has demonstrated IROPI, then the project may proceed with a requirement that appropriate compensatory measures are delivered. The SoS has stated in the decision letter for Norfolk Vanguard and the 'minded to approve' letter for Hornsea Project Three (both dated 1 July 2020) that he expects applicants to put forward 'without prejudice' derogation cases and compensatory measures proposals, in appropriate cases, so that those issues are considered properly in the Examination.

2.1.5 Compensatory Measures

75. If HRA Stage 2 identifies an adverse effect on the integrity of a designated site, an assessment of compensatory measures must also be included in the HRA Report. Compensatory measures should be determined through consultation with the relevant SNCBs and landowners.

2.2 Consultation

76. Consultation of relevance to the HRA process has been undertaken with SNCBs and other stakeholders through scoping, and will continue as part of an ongoing Evidence Plan Process (EPP).

2.2.1 Scoping

77. Consultation has been undertaken with the appropriate authorities as part of the scoping stage of the EIA process. The scoping report for the Projects was submitted to PINS on 8th October 2019 and a Scoping Opinion received on 18th November 2019. Scoping established the potential effects of the Projects that will be assessed by the EIA and HRA.

2.2.2 Evidence Plan

78. The EPP is a non-statutory, voluntary process that aims to encourage upfront agreement on what information an applicant needs to supply to the PINS as part of a DCO application. It aims to ensure EIA and HRA requirements are met and to reduce the risk of major infrastructure projects being delayed at (or before) the examination phase.

79. The EPP aims to identify and agree the scope of the assessment, the baseline used, methodologies used to collect and analyse data, the interpretation of information, and the conclusions presented (including any LSE). The EPP also enables consultation on proposed mitigation and/or compensation measures. Agreements and areas where disputes remain between the Applicant and the relevant SNCB are documented in Statements of Common Ground (SoCG).

80. The Projects' EPP includes consultation through several ETGs for key EIA topics. Those which are relevant to the HRA process are summarised in **Table 2-1**.

Table 2-1: HRA-related Expert Topic Groups and members

ETG	Members
Terrestrial Ecology and Ornithology	Equinor, Royal HaskoningDHV, Norwich City Council Natural England, Norfolk Wildlife Trust, Environment Agency, Norfolk County Council
Seabed (including benthic and fish ecology, and marine physical processes)	Equinor, Royal HaskoningDHV, Natural England, MMO, Cefas, Eastern IFCA, the Wildlife Trusts
Marine Mammal Ecology	Equinor, Royal HaskoningDHV, Natural England, MMO, Cefas, the Wildlife Trusts
Offshore Ornithology	Equinor, Royal HaskoningDHV, Natural England, MMO, RSPB

2.3 Stage 1 Screening Process

81. The types of effects associated with wind farm development will vary in their magnitude and significance, depending on a range of factors including the type of technology and process involved and the location and timing of activity. In respect of designated habitats and species populations, these effects may be direct (e.g. habitat loss associated with infrastructure installation) or indirect (e.g. via changes in water quality).

82. Screening is based on a conceptual 'source-pathway-receptor' approach. This approach identifies likely environmental effects resulting from the proposed construction, operation and maintenance, and decommissioning of the proposed Projects. The parameters are defined as follows:

- Source – the origin of a potential effect (noting that one source may have several pathways and receptors).
  - Example: cable installation.
- Pathway – the means by which the effect of the activity could impact a receptor.
  - Example: noise from cable installation.
- Receptor – the element of the receiving environment that is impacted.
  - Example: presence of a receptor within the direct footprint physical effect or within range of disturbance (e.g. from noise or light).

83. Where there is no pathway, or the pathway has sufficient distance such that the effect from the source has dissipated to a negligible level before reaching the receptor, there may be justification for the screening out of that particular receptor (i.e. feature) for the site in question.

84. The HRA screening process is applied to DEP and SEP individually to identify if a LSE on a designated site might be screened in for one project but not the other.

85. Note that sites are screened in if, for any one of their qualifying features (i.e. a species or habitat), a source-pathway-receptor relationship and potential for LSE cannot be ruled out (including in-combination effects). However, each qualifying feature of that site will be considered separately and it may be that the screening process rules out LSE for some features at this stage.

86. As described above, mitigation is not taken into account at Stage 1, but will be considered where relevant in the Stage 2 assessment.

87. The approach to screening for each receptor is outlined in Sections 3-7 and is based on the known distribution, ecology and sensitivities of each receptor group and therefore the potential for being affected by the proposed Projects.

88. Where there is insufficient information available at this stage to screen out a site, the site is screened in for further consideration.

2.3.1 In-combination Screening Methodology

89. The Habitats Regulations require that the potential effects of a project on designated sites are considered both alone and in-combination with other plans or projects.

90. Whilst there is no legal definition of what constitutes a plan or project for the purposes of the Habitats Regulations, the Planning Inspectorate (Planning Inspectorate, 2016) advises that the following should be considered in the in-combination assessment:

- projects that are under construction;
- permitted application(s) not yet implemented;
- submitted application(s) not yet determined;
- all refusals subject to appeal procedures not yet determined;
- projects on the National Infrastructure's programme of projects; and
- projects identified in the relevant development plan (and emerging development plans – with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited and the degree of uncertainty which may be present.

91. Onshore plans or projects that may be considered include (but are not limited to):

- Other energy generation infrastructure;
- Building and / or housing developments;
- Installation or upgrade of roads;
- Installation or upgrade of cables and pipelines; and
- Coastal protection works.

92. Offshore plans or projects that may be considered include (but are not limited to):

- Other offshore wind farms;
- Marine renewables (wave and tidal);
- Port and harbour developments;
- Marine aggregate extraction and dredging;
- Licensed disposal sites;
- Oil and gas exploration and production;

- Mariculture;
- Subsea cables and pipelines; and
- Recreational sea fishing activity.

93. The assessment will present relevant in-combination effects of projects based on their stage of development using the tiered approach as devised by Natural England (JNCC and Natural England, 2013) and presented in **Table 2-2**.

Table 2-2: Tiers for Undertaking In-combination Assessment (based on JNCC and Natural England, 2013)

Tier	Consenting or Construction Phase	Data Availability
Tier 1	Built and operational projects should be included within the cumulative assessment where they have not been included within the environmental characterisation survey, i.e. they were not operational when baseline surveys were undertaken, and/or any residual impact may not have yet fed through to and been captured in estimates of "baseline" conditions e.g. background" distribution or mortality rate for birds.	Pre-construction (and possibly post-construction) survey data from the built project(s) and environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the Projects).
Tier 2	Tier 1, plus projects under construction	As Tier 1 but not including post construction survey data.
Tier 3	Tier 2, plus projects that have been consented (but construction has not yet commenced)	Environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the Projects) and possibly pre-construction.
Tier 4	Tier 3, plus projects that have an application submitted to the appropriate regulatory body that have not yet been determined	Environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the Projects).
Tier 5	Tier 4, plus projects that the regulatory body is expecting an application to be submitted for determination (e.g. projects listed under the Planning Inspectorate programme of projects)	Possibly environmental characterisation survey data (but strong likelihood that this data will not be publicly available at this stage).
Tier 6	Tier 5, plus projects that have been identified in relevant strategic plans or programmes (e.g. projects identified in Round 3 wind farm ZAP documents)	Historic survey data collected for other purposes/by other projects or industries or at a strategic level.

94. As for the 'project alone' scenario (i.e. either DEP or SEP in isolation or DEP and SEP together), screening of in-combination effects is based on a conceptual 'source-pathway-receptor' approach.

95. Projects classified under Tiers 1-4 are included in the HRA screening. Tier 5 (including for example projects that have submitted a detailed PEIR as part of their section 42 consultation) and 6 projects will be considered to the extent that the available data allows.

2.4 Types of Designated Sites included in HRA

96. The classes of designations considered within this HRA Screening are:

- Special Protection Areas (SPAs, some of which are also Ramsar sites);
- Potential SPAs (pSPAs) – SPAs that are approved by the UK Government but are still in the process of being classified;
- Special Areas of Conservation (SACs);
- Possible SACs (pSACs) – a site which has been identified and approved to go out to formal consultation; and
- Candidate SACs (cSACs) – following consultation on a pSAC, the site is submitted to the European Commission (EC) for designation and at this stage it becomes a cSAC.

97. Consideration is also given to potential effects on Ramsar sites. Ramsar sites protect wetland areas and extend only to areas of marine water the depth of which at low tide does not exceed six metres.

3 Terrestrial Ecology

3.1 Approach to Screening

3.1.1 Potential Effects (Source)

98. During construction of DEP and SEP, activities such as site preparation, cable installation and substation construction may result in direct or indirect (e.g. disturbance from light or noise) effects on terrestrial ecology receptors.

99. There is the potential for the loss of biodiversity through works such as excavation and piling. The impact upon biodiversity will be assessed, paying particular attention to species and habitats protected under the Habitats Directive and Birds Directive. Impacts upon sites, habitats and species protected through EU and UK law or through local policy that represent the elements of UK biodiversity most at risk of loss, isolation or degradation will be prioritised with impacts upon all habitats and species to be assessed, including demonstrating a net gain for biodiversity.

100. There is the potential for direct impacts where ecological receptors and the footprint of the proposed works overlap leading to potential loss or fragmentation of habitats and the risk of killing protected species, as well as indirect impacts where the proximity of the works may lead to a disturbance / displacement effect on protected species associated with noise, vibration, lighting, presence of workforce, disruption to groundwater, etc. In addition, invasive species present within the proposed application boundary will be considered along with the potential risk of spreading invasive species.

101. The potential effects on terrestrial ecology from the proposed projects have been identified within the Scoping Report (Royal HaskoningDHV, 2019) and the Scoping Opinion (The Planning Inspectorate, 2019). **Table 3-1** outlines which effects will be considered in relation to terrestrial ecology features within the HRA. These are therefore the potential effects which could affect a receptor (site or feature) if there is a pathway.

Table 3-1: Summary of Potential Effects - Terrestrial Ecology (scoped in (✓) and scoped out (x))

Potential Impacts	Construction	Operation	Decommissioning
Direct impacts to statutory and non-statutory designated nature conservation sites and associated qualifying features	✓	✓	✓
Indirect impacts (e.g. noise, dust, groundwater supply) to statutory and non-statutory designated nature conservation sites and associated qualifying features	✓	✓	✓
Direct impacts (permanent and temporary loss) to habitats due to the footprint of the onshore works	✓	✓	✓
Direct and indirect impacts (disturbance – noise, lighting etc /	✓	✓	✓

Potential Impacts	Construction	Operation	Decommissioning
potential killing) to adjacent habitats and protected species			
Spread of invasive non-native species as a result of construction activities	✓	x	✓
Cumulative impacts	✓	✓	✓
Transboundary impacts	✓	✓	✓

102. Following four types of potential effects upon each site have been considered:

- Direct effects within the site boundary (i.e. onshore infrastructure located within the site boundary).
- Direct effects on ex-situ habitats of site (i.e. onshore infrastructure located within habitats located outside the site boundary but which have the potential to support its interest features).
- Indirect effects within the site boundary (i.e. the site boundary falls within the zone of influence (ZOI) of an environmental parameter associated with the onshore infrastructure).
- Indirect effects on ex-situ habitats of site (i.e. habitats located outside the site boundary but which have the potential to support its interest features falls within the ZOI of an environmental parameter associated with the onshore infrastructure).

3.1.2 Identification of Sites and Features (Pathway and Receptor)

103. **Figure 3.1** presents sites designated for terrestrial ecology within 20km of the onshore cable corridor and which have been considered in the screening exercise. A 20km buffer for the screening exercise is considered to be conservative and it is not expected that there are any pathways of effect that could extend beyond this. **Table 3-2** presents ZOI for different environmental parameters considered for this assessment.

Table 3-2: The ZOI of potential effects definitions

Environmental parameter	Zone of influence of potential effect
Noise	1km buffer from the onshore cable corridor based on the sensitivity of ornithological receptors to noise disturbance (Whitfield, Ruddock & Bullman, 2008).
Air quality	50m buffer from the onshore cable corridor for construction dust and 1km from the cable corridor for project emissions based on the anticipated dispersion distances of emissions generated by the project.
Light	50m buffer from the onshore cable corridor, the zone of potential light spill based on the potentially effects of light upon sensitivity ecological features (e.g. bat commuting / foraging routes).
Visual disturbance	500m buffer from the onshore cable corridor based on the sensitivity of ornithological receptors to noise disturbance (Whitfield, Ruddock & Bullman, 2008).

Environmental parameter	Zone of influence of potential effect
Geology and land contamination	500m buffer from the cable corridor based on the potential extent of release of contaminated material caused by the project.
Groundwater and hydrology	1km buffer from the onshore cable corridor, although this could be larger where a hydraulic connectivity exists.

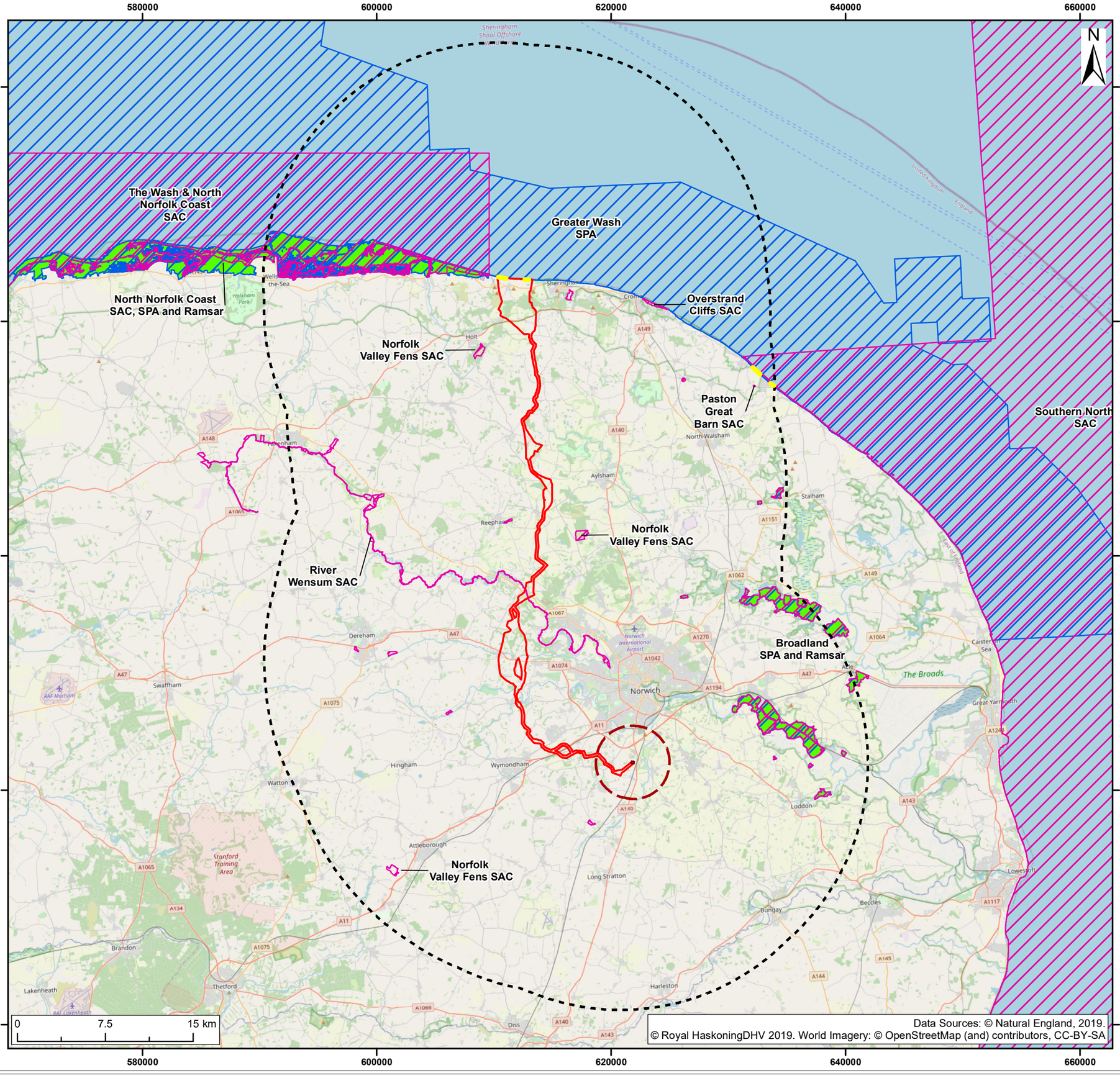
104. Direct or indirect effects on terrestrial habitats and species may be caused from permanent or temporary disturbance during the construction of the onshore infrastructure. There is also potential for direct or indirect effects on these receptors during the operational and decommissioning phases of DEP and SEP.

105. A site designated for an onshore habitat interest feature will be screened in through this high level process if:

- A component of the proposed project directly overlaps with the site.
- The distance between the proposed project and the onshore habitat interest feature is within the range for which there could be a likely significant effect e.g. the pathway is not too long for water pollution.

106. A site designated for an onshore species interest feature will be screened in through this high level process if:

- There is physical overlap between the proposed project and the site.
- The distance between the proposed project and the site is within the range for which there could be a likely significant effect e.g. noise, light or physical disturbances from the proposed project could be detected within a site and at a level which would have an effect on the species of interest.
- The distance between the proposed project and resources on which the species of interest depends (i.e. an indirect effect acting though prey or access to habitat) is within the range for which there could be a likely significant effect e.g. noise, light or physical disturbances from the proposed project could be detected at foraging grounds and at a level which would have an effect on the species of interest.



Legend:

- Cable Corridor Route Option
- Cable Corridor Route Option - 20km Buffer
- Landfall Sites
- Substation Study Area
- Norwich Main Substation
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ramsar

S1	P01	02/06/2020	Suitable for Information	AZ	RS	AP
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Nature Conservation Designations within 20km of the Cable Corridor Route Option

Figure: 3.1	Drawing No: PB8164-RHD-ZZ-ON-DR-Z-0029

Co-ordinate system:	Page Size:	Scale:
British National Grid	A3	1:325,000

Project:	Report:
Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions	HRA Screening Report

Royal HaskoningDHV
Enhancing Society Together

equinor

3.3 Screening

3.3.1 DEP or SEP in Isolation

107. At the time of writing this screening report, the landfall, cable corridor and substation site selection process is ongoing. A 20km buffer for the screening exercise is considered to be conservative and it is not expected that there are any pathways of effect that could extend beyond this (see section above).

108. Designated sites identified during the desk-based review are listed in **Table 3-3** and **Figure 3.1**

109. There are four European sites within 20km of the onshore cable corridor screened in for further assessment. These are:

- River Wensum SAC;
- North Norfolk Coast Ramsar site;
- North Norfolk Coast SPA; and
- Broadland Ramsar Site.

Table 3-3: Screening list of sites with terrestrial ecology interest features (screened out sites are shown in grey)

Name	Features	Proximity to onshore cable corridor area	Screening decision	Rationale
River Wensum SAC	Qualifying habitats and species: Annex I habitats that are a primary reason for selection of this site. • Watercourses of plain to montane levels with *R. fluitantis* Annex II species that are a primary reason for selection of this site. • Freshwater crayfish *Austropotamobius pallipes* Annex II species present as a qualifying feature, but not a primary reason for site selection • Desmoulin's whorl snail *Vertigo moulinsiana* • Brook lamprey *Lampetra planeri* • Bullhead *Cottus gobio*	Located within 200m cable corridor	In	The site is located within the cable corridor area and could be impacted by proposed projects.
North Norfolk Coast Ramsar	Qualifying Species/populations (as identified at designation: • Sandwich tern *Sterna (Thalasseus) sandvicensis* • Common tern *Sterna hirundo* • Little tern *Sterna albifrons* • Red knot *Calidris canutus islandica* • Pink-footed goose *Anser brachyrhynchus* • Dark-bellied brent goose *Branta bernicla bernicla* • Eurasian wigeon *Anas penelope* • Northern pintail *Anas acuta*	0.8km	In	No overlap therefore no direct effect, however, the qualifying features are likely to utilise a range of supporting habitats outside the boundary of the site.
North Norfolk Coast SAC	Qualifying habitats and species (interest features above MHWS): Annex I habitats that are a primary reason for selection of this site • Coastal lagoons • Perennial vegetation of stony banks	0.8km	Out	No overlap therefore no direct effect, and beyond the range of potential significant indirect effect (interest features above MHWS).

Name	Features	Proximity to onshore cable corridor area	Screening decision	Rationale
	• Mediterranean and thermo-Atlantic halophilous scrubs *Sarcocornetea fruticosi* • Embryonic shifting dunes • Shifting dunes along the shoreline with *Ammophila arenaria* ('White dunes') • Fixed dunes with herbaceous vegetation ('Grey dunes') • Humid dune slacks . Annex II species present as a qualifying feature, but not a primary reason for site selection. • Otter *Lutra lutra* • Petalwort *Petalophyllum ralfsii*			
North Norfolk Coast SPA	Qualifying species: Annex II • Avocet *Recurvirostra avosetta* • Bittern *Botaurus stellaris* • Common tern *Sterna hirundo* • Dark-bellied Brent goose *Branta bernicla* • Knot *Calidris canutus* • Little tern *Sterna albifrons* • Marsh harrier *Circus aeruginosus* • Montagu's harrier *Circus pygargus* • Pink-footed goose *Anser brachyrhynchus* • Sandwich tern *Sterna sandvicensis* • Wigeon *Anas penelope*	0.8km	In	No overlap therefore no direct effect, however, the qualifying features are likely to utilise a range of supporting habitats outside the boundary of the site.
The Wash and North Norfolk Coast SAC	Qualifying habitats and species: Annex I habitats that are a primary reason for selection of this site.	0.8km	Out	No overlap therefore no direct effect, and beyond the range of potential significant indirect effect.

Name	Features	Proximity to onshore cable corridor area	Screening decision	Rationale
	• Sandbanks which are slightly covered by sea water all the time • Mudflats and sandflats not covered by seawater at low tide • 1160 Large shallow inlets and bays • 1170 Reefs • 1310 Salicornia and other annuals colonizing mud and sand • 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae)* • 1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site • 1150 Coastal lagoons Annex II species that are a primary reason for selection of this site • 1365 Harbour seal *Phoca vitulina* Annex II species present as a qualifying feature, but not a primary reason for site selection • 1355 Otter *Lutra lutra*			
Norfolk Valley Fens SAC	Annex I habitats that are a primary reason for selection of this site: • 7230 Alkaline fens	2.2km	Out	No overlap therefore no direct effect, and beyond the range of potential significant indirect effect.
Broadland Ramsar	The site supports a number of rare species and habitats within the biogeographical zone context, including the following Habitats Directive Annex I feature	9.5km	In	No overlap therefore no direct effect, however, the qualifying features are likely to utilise a range of supporting habitats outside the boundary of the site.

Name	Features	Proximity to onshore cable corridor area	Screening decision	Rationale
	• H7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* Calcium-rich fen dominated by great fen sedge (saw sedge). • H7230 Alkaline fens Calcium-rich springwater-fed fens. • H91E0 Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (Alno-*Padion, Alnion incanae, Salicion albae*) Alder woodland on floodplains and the Annex II species: • S1016 *Vertigo moulinsiana* Desmoulin`s whorl snail • S1355 *Lutra lutra* Otter • S1903 *Liparis loeselii* Fen orchid Qualifying Species/populations (as identified at designation): • Tundra swan *Cygnus columbianus bewicki* • Eurasian wigeon *Anas penelope* • Gadwall *Anas strepera* • Northern shoveler *Anas clypeata*			
The Broads SAC/SPA	Annex I habitats that are a primary reason for selection of this site: • 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp*. • 3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation • 7140 Transition mires and quaking bogs • 7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* • 7230 Alkaline fens • 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	9.5km	Out	No overlap therefore no direct effect, and beyond the range of potential significant indirect effect.
Overstrand Cliffs SAC	Annex I habitats that is a primary reason for selection of this site is 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts	9.2km	Out	No overlap therefore no direct effect and beyond the range of potential significant indirect effect.
Paston Great Barn SAC	Designated as it supports the only known barbastelle maternity roost in Norfolk (1 of 3 in the UK).	18.2	Out	No overlap therefore no direct effect.

Name	Features	Proximity to onshore cable corridor area	Screening decision	Rationale
	Annex II species that are a primary reason for selection of this site. • 1308 Barbastelle *Barbastella barbastellus*			Females of barbastelle maternity colonies have been identified as typically foraging between 6-7km from the maternity roost (Zeale et al 2012), and the BCT's Core Sustenance Zone for barbastelles is set at 6km (BCT, 2016) and therefore indirect impacts are screened out.

3.3.1.1 River Wensum SAC

110. The River Wensum SAC covers approximately 307ha and includes the river and certain adjacent floodplain habitats from its source near Fakenham to its confluence with the River Tud at Norwich. The qualifying features of the River Wensum SAC are summarised below:

- Annex I habitats that are a primary reason for selection of this site
  - 3260 Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. The Wensum represents sub-type 1 in lowland eastern England. Although the river is extensively regulated by weirs, *Ranunculus* vegetation occurs sporadically throughout much of the river's length. Stream water-crowfoot *R. penicillatus* ssp. *pseudofluitans* is the dominant *Ranunculus* species but thread-leaved water-crowfoot *R. trichophyllus* and fan-leaved water-crowfoot *R. circinatus* also occur.
- Annex II species that are a primary reason for selection of this site
  - 1092 White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*. The Wensum is a chalk-fed river in eastern England, and is an eastern example of riverine white-clawed crayfish *A. pallipes* populations. As with most of the remaining crayfish populations in the south and east of England, the threats from non-native crayfish species and crayfish plague are severe. Designation of the river as a SAC provides as much protection as can be afforded to such vulnerable populations.
- Annex II species present as a qualifying feature, but not a primary reason for site selection
  - 1016 Desmoulin's whorl snail *Vertigo moulinsiana*;
  - 1096 Brook lamprey *Lampetra planeri*; and
  - 1163 Bullhead *Cottus gobio.*

3.3.1.1.1 Direct effects within SAC boundary

111. The cable corridor will cross the River Wensum near the village of Attlebridge. DEP and SEP propose to use a trenchless technique (e.g. HDD) to cross the river. This technique will ensure that there are no direct effects upon any of the qualifying features of the SAC within the site boundary, and therefore potential direct effects upon the SAC boundary are screened out from any further assessment.

3.3.1.1.2 Direct effects upon ex-situ habitats

112. *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and Desmoulin's whorl snail may also be present in habitats functionally connected to the River Wensum, including coastal floodplain and grazing marsh habitat.

113. Although the site selection process is still ongoing HDD activities required for the crossing will potentially involve activities located within coastal floodplain grazing marsh adjacent to the River Wensum. Therefore, there is the potential for direct effects upon these qualifying features to occur. These potential effects have been screened in for further assessment.

114. The ditches present within the coastal and floodplain grazing marsh habitats might provide optimal habitat for white-clawed crayfish and freshwater fish species.

115. As such, potential direct effects upon ex-situ habitats are screened in for further assessment.

3.3.1.1.3 Indirect effects within SAC boundary

116. The qualifying features of the River Wensum SAC are not sensitive to noise, visual, air quality or light disturbance, so indirect effects upon these qualifying features will not occur and these effects have been screened out of further assessment.

117. However, the HDD activities will involve construction activities within 500m of the River Wensum SAC. This will include HDD beneath the River Wensum SAC, excavation at HDD receptor sites and cable trenching within the River Wensum floodplain. As a consequence, potential indirect effects arising as a result of land contamination encountered during construction, bentonite mud break outs, as well as result of changes to the groundwater / hydrology regime have been screened in for further assessment.

3.3.1.1.4 Indirect effects on ex-situ habitats

118. **Table 3-2** presents ZOI for different environmental parameters considered for this assessment. As explained above the qualifying features of the River Wensum SAC are not sensitive to noise, visual, air quality or light disturbance, so indirect effects upon these qualifying features will not occur and these effects have been screened out of further assessment.

119. HDD activities will involve construction activities within 500m of the coastal floodplain grazing marsh ex-situ habitats of the River Wensum SAC. This will include excavation at HDD receptor sites and cable trenching within 500m of the River Wensum floodplain. As a consequence, potential indirect effects arising as a result of land contamination encountered during construction, as well as effects arising as a result of changes to the groundwater / hydrology regime have been screened in for further assessment.

3.3.1.2 North Norfolk Coast Ramsar site

120. North Norfolk Coast Ramsar compromises a low-lying barrier coast site extending for 40 km from Holme to Weybourne. The site is one of the largest expanses of undeveloped coastal habitat of its type in Europe. It is a particularly good example of a marshland coast with intertidal sand and mud, saltmarshes, shingle banks and sand dunes. There are a series of brackish-water lagoons and extensive areas of freshwater grazing marsh and reed beds.

121. The site supports internationally important numbers of wildfowl in winter and several nationally rare breeding birds.

122. Ramsar criterion 6 species/populations occurring at levels of international importance (as identified at designation):

- Sandwich tern Sterna *(Thalasseus) sandvicensis*;
- Common tern *Sterna hirundo*;
- Little tern *Sterna albifrons*;
- Red knot *Calidris canutus islandica*;
- Pink-footed goose *Anser brachyrhynchus*;
- Dark-bellied brent goose *Branta bernicla*;
- Eurasian wigeon *Anas penelope*; and
- Northern pintail *Anas acuta*.

123. Species/populations identified subsequent to designation for possible future consideration under criterion 6:

- Ringed plover *Charadrius hiaticula*;
- Sanderling *Calidris alba*; and
- Bar-tailed godwit *Limosa lapponica lapponica*.

3.3.1.2.1 Direct effects within the Ramsar site

124. All sites which comprise the North Norfolk Coast Ramsar site are located 1.2km or more from on onshore infrastructure. Therefore, direct effects upon the boundary are screened out from further assessment

3.3.1.2.2 Direct effects on ex-situ habitats

125. The wintering qualifying features of the North Norfolk Coast Ramsar site (for example pink-footed goose) are likely to utilise a range of supporting habitats outside the boundary of the Ramsar site over the winter. The qualifying species listed above are known reedbeds and rivers and lakes, although the qualifying geese species also rely on winter crop waste associated with arable agriculture.

126. The onshore infrastructure might cross the above habitats therefore, there is the potential for direct effects upon these qualifying features to occur. These potential effects have been screened in for further assessment.

3.3.1.2.3 Indirect effects within the Ramsar site boundary

127. The North Norfolk Coast Ramsar site is located 1.2km from onshore infrastructure. This is outside of the ZOI of any of the environmental parameters associated with the construction and operation of the project. Therefore, direct effects upon the boundary are screened out from further assessment (see **Table 3-2**).

3.3.1.2.4 Indirect effects on ex-situ habitats

128. The qualifying features of the North Norfolk Coast Ramsar are sensitive to noise, visual or air quality disturbance, so indirect effects upon these qualifying features might occur and these effects have been screened in for further assessment.

129. There is arable land, rivers located within the onshore cable corridor which might be utilised by wintering birds within the ZOI of the onshore infrastructure, therefore lighting has been screened in for further assessment.

130. Wintering birds are associated with arable land and watercourse habitats which will not be affected by changes to the geology or land contamination regime. Therefore, these effects have been screened out of further assessment.

131. Watercourses and arable land which might be supporting wintering birds identified as qualifying features of the Ramsar site could be subject to trenching works during the construction phase, and as such there may be effects upon this ex-situ habitat. These effects have been screened in for further assessment

3.3.1.3 North Norfolk Coast SPA

132. The qualifying species of the North Norfolk Coast SPA are

- Avocet *Recurvirostra avosetta*;
- Bittern *Botaurus stellaris*;
- Common tern *Sterna hirundo*;
- Dark-bellied *Brent goose Branta bernicla*;
- Knot *Calidris canutus*;
- Little tern *Sterna albifrons*;
- Marsh harrier *Circus aeruginosus*;
- Montagu's harrier *Circus pygargus*;
- Pink-footed goose *Anser brachyrhynchus*;
- Sandwich tern *Sterna sandvicensis*; and
- Wigeon *Anas penelope*.

3.3.1.3.1 Direct effects within the SPA

133. All sites which comprise the North Norfolk Coast SPA site are located 1.2km or more from on onshore infrastructure. Therefore, direct effects upon the boundary are screened out from further assessment

3.3.1.3.2 Direct effects on ex-situ habitats

134. The wintering qualifying features of the North Norfolk Coast SPA are likely to utilise a range of supporting habitats outside the boundary of the Ramsar site over the winter. The various qualifying species use predominantly reedbeds and rivers and lakes, although the qualifying geese species also rely on winter crop waste associated with arable agriculture.

135. The onshore infrastructure might cross the above habitats therefore, there is the potential for direct effects upon these qualifying features to occur. These potential effects have been screened in for further assessment.

3.3.1.3.3 Indirect effects within the SPA site boundary

136. The North Norfolk Coast SPA site is located 1.2km from onshore infrastructure. This is outside of the ZOI of any of the environmental parameters associated with the construction and operation of the project. Therefore, direct effects upon the boundary are screened out from further assessment

3.3.1.3.4 Indirect effects on ex-situ habitats

137. The qualifying features of the North Norfolk Coast SPA are sensitive to noise, visual or air quality disturbance, so indirect effects upon these qualifying features might occur and these effects have been screened in of further assessment.

138. There are arable land, rivers located within the onshore cable corridor which might be utilised by wintering birds within the ZOI of the onshore infrastructure, therefore lighting has been screened in for further assessment.

139. Wintering birds are associated with arable land and watercourse habitats which will not be affected by changes to the geology or land contamination regime. Therefore, these effects have been screened out of further assessment.

140. Watercourses and arable land which might be supporting wintering birds identified as qualifying features of the Ramsar site could be subject to trenching works during the construction phase, and as such there may be effects upon this ex-situ habitat. These effects have been screened in for further assessment.

3.3.1.4 Broadland Ramsar site

141. Broadland is a low-lying wetland complex straddling the boundaries between east Norfolk and northern Suffolk. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries.

142. The site supports a number of rare species and habitats within the biogeographical zone context, including the following Habitats Directive Annex I features:

- H7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* Calcium-rich fen dominated by great fen sedge (saw sedge);
- H7230 Alkaline fens Calcium-rich springwater-fed fens; and
- H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) Alder woodland on floodplains.

143. Annex II species:

- S1016 *Vertigo moulinsiana* Desmoulin`s whorl snail;
- S1355 *Lutra* Otter; and
- S1903 *Liparis loeselii* Fen orchid.

144. Ramsar criterion 6 species/populations occurring at levels of international importance (as identified at designation):

- Tundra swan *Cygnus columbianus bewickii*;

- Eurasian wigeon *Anas penelope*;
- Gadwall *Anas strepera*; and
- Northern shoveler *Anas clypeata*.

145. Species/populations identified subsequent to designation for possible future consideration under criterion 6:

- Pink-footed goose *Anser brachyrhynchus*; and
- Greylag goose *Anser anser*.

3.3.1.4.1 Direct effects within the Ramsar site

146. All sites which comprise the Broadland Ramsar site are located 4.1km or more from on onshore infrastructure. Therefore, direct effects upon the boundary are screened out from further assessment

3.3.1.4.2 Direct effects on ex-situ habitats

147. The wintering qualifying features of the Broadland Ramsar site are likely to utilise a range of supporting habitats outside the boundary of the Ramsar site over the winter. The various qualifying species use predominantly reedbeds and rivers and lakes, although the qualifying geese species also rely on winter crop waste associated with arable agriculture.

148. The onshore infrastructure might cross the above habitats therefore, there is the potential for direct effects upon these qualifying features to occur. These potential effects have been screened in for further assessment.

3.3.1.4.3 Indirect effects within the Ramsar site boundary

149. The Broadland Ramsar site is located 4.1km from onshore infrastructure. This is outside of the ZOI of any of the environmental parameters associated with the construction and operation of the project. Therefore, direct effects upon the boundary are screened out from further assessment

3.3.1.4.4 Indirect effects on ex-situ habitats

150. The qualifying features of the Broadland Ramsar are sensitive to noise, visual or air quality disturbance, therefore indirect effects upon these qualifying features might occur and these effects have been screened in of further assessment.

151. Arable land and rivers are located within the onshore cable corridor which might be utilised by wintering birds within the ZOI of the onshore infrastructure, therefore lighting has been screened in for further assessment.

152. Wintering birds are associated with arable land and watercourse habitats which will not be affected by changes to the geology or land contamination regime. Therefore, these effects have been screened out of further assessment.

153. Watercourses and arable land which might be supporting wintering birds identified as qualifying features of the Ramsar site could be subject to trenching works during the construction phase, and as such there may be effects upon this ex-situ habitat. These effects have been screened in for further assessment.

3.3.2 DEP and SEP Together

154. As detailed above, potential LSE has been identified on four European sites which are screened in for further assessment. These are:

- River Wensum SAC;
- North Norfolk Coast Ramsar site;
- North Norfolk Coast SPA; and
- Broadland Ramsar Site.

155. The same sites are also screened in under the DEP and SEP together scenario.

3.3.3 In-combination Effects

156. The Habitats Regulations require the consideration of the potential effects of a project on European sites (and on Ramsar sites as a matter of Government policy) both alone and in-combination with other plans or projects.

157. For the purpose of the screening assessment, the conclusions set out for the 'project alone' also apply with respect to consideration of in-combination effects with other plans and projects.

158. The projects identified for further in-combination assessment will be discussed during ETG meetings with stakeholders. It is likely that there will be a number of other projects to be considered as part of the in-combination assessment, and the full list of projects for consideration will be updated following consultation on the PEIR and agreed in consultation with local authorities. The main projects identified for in-combination assessment at this stage include:

- Norwich Western Link;
- A47 Duelling;
- Norfolk Vanguard;
- Norfolk Boreas; and
- Hornsea Project Three.

3.3.4 Terrestrial Ecology Screening Summary

159. Designated sites identified during the desk-based review and considered for the assessment are listed in **Table 3-3** and shown in **Figure 3.1**.

160. There are four European sites screened in for further assessment. These are:

- River Wensum SAC;
- North Norfolk Coast Ramsar site;
- North Norfolk Coast SPA; and
- Broadland Ramsar Site.

4 Benthic Ecology

4.1 Approach to Screening

161. Direct or indirect effects on benthic habitats may arise from permanent or temporary physical presence of components or plant and/or activities relating to the construction, operation or decommissioning of the wind farms and associated infrastructure.

162. This offshore HRA screening exercise considers sites which meet the following criteria:

- A component of the Projects (permanently or temporarily) directly interacts with the site whose interest features include a habitat listed in Annex I of the Habitats Directive; and
- The distance between the Projects and the interest feature is within a range for which there could be indirect interaction (i.e. within a ZOI for a physical process change resulting from DEP and/or SEP).

4.1.1 Potential Effects (Source)

163. The key factors that are applied during the HRA screening process are:

- Potential effects (source); and
- Proximity of source to the qualifying feature (distance between the proposed development and designated sites) (pathway and receptor).

164. During construction of the Projects, activities such as seabed preparation, foundation installation, cable installation and jack-up activities may result in direct or indirect effects on benthic habitats.

165. During the operational phase, the physical presence of turbine foundations and associated components (offshore platforms, export cables, inter-array cables) will result in the loss or replacement of existing habitats. Maintenance activities during the operational phase may also result in localised direct and in-direct effects during works.

166. Decommissioning may require the removal of foundation structures and either the cutting or removal of subsea cables, resulting in physical disturbance and the potential for indirect effects associated with suspended sediment. Effects caused during decommissioning are expected to be similar to those during the construction phase.

167. The potential effects on benthic habitats from the Projects have been identified within the Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions Scoping Report (Royal HaskoningDHV, 2019) and Scoping Opinion (The Planning Inspectorate, 2019). **Table 4-1** outlines which effects are considered in relation to benthic features within the HRA. These are therefore the potential effects which could affect a receptor (site or feature), if there is a pathway.

Table 4-1: Summary of potential effects - benthic ecology (scoped in (✓) and scoped out (✗))

Potential Effects	Construction	Operation	Decommissioning
Temporary physical disturbance	✓	✓	✓
Temporary habitat loss	✓	✓	✓
Permanent/long-term habitat loss	✗	✓	✓
Increased suspended sediment concentrations	✓	✓	✓
Re-mobilisation of contaminated sediments	✓	✓	✓
Effects on bedload sediment transport	✓	✓	✓
Underwater noise and vibration	✓	✓	✓
Colonisation of foundations and cable protection	✗	✓	✗
Invasive species	✓	✓	✓
Electromagnetic fields (EMF)	✗	✗	✗
Potential impacts on sites of marine conservation importance	✓	✓	✓
Cumulative impacts	✓	✓	✓
Transboundary impacts	✗	✗	✗

4.1.2 Identification of Sites and Features (Pathway and Receptor)

168. Designated sites with benthic habitats listed under Annex I of the Habitats Directive as interest features have been considered in this screening exercise (**Figure 4.1**).

169. This screening report reviews sites in the southern North Sea within 100km of the DEP and SEP scoping area (**Table 4-2**). Impacts to benthic habitats are expected to be restricted to direct and indirect physical effects at a relatively localised scale and it is considered that, based on expert judgement, there is no potential pathway for impacts to sites in the wider North Sea or beyond 100km from source. As it has been agreed through the scoping process that transboundary effects are scoped out for EIA (given the distance to sites in other Members States jurisdictions), these have also been screened out from consideration for HRA purposes.

170. Consideration of sites within the southern North Sea is based on the sensitivities of site specific interest features (receptors) and whether there is a potential pathway for habitats to receive direct or indirect effects (source). Potential impacts to benthic habitats from the Projects are generally considered small scale, and are mainly driven by localised physical disturbance to the seabed, or localised effects on physical processes.

171. The significance of effects on the habitats will be derived from their sensitivity to the received impact. This will include temporary and permanent change and the ability of the interest feature to withstand or recover from change. Screening decisions are informed with reference to Natural England's conservation advice packages which have been developed to assist environmental assessments to determine if activities, plans or projects will impact on habitats and species within Marine Protected Areas (MPAs); in particular the Advice on Operations (AoO) component which identifies pressures associated with offshore wind farm activities and assesses the sensitivity of habitat features to these pressures.

172. Annex I habitats, for which sites are designated, are:

- Sandbanks which are slightly covered by sea water all the time;
- Estuaries;
- Mudflats and sandflats not covered by seawater at low tide;
- Coastal lagoons;
- Reefs;
- Large shallow inlets and bays;
- Submarine structures made by leaking gases; and
- Submerged or partially submerged sea caves.

4.2 Screening

4.2.1 DEP and SEP in Isolation

173. This section screens the potential for LSE from DEP or SEP in isolation. Screening of LSE from the Projects together is addressed in **Section 4.2.2**.

174. There are no SACs designated for benthic features within the direct footprint of DEP or SEP, therefore there are no sites that will be directly impacted during construction, operation or decommissioning. Therefore, no sites are screened in for direct effects. These include temporary physical disturbance, temporary and permanent/long-term habitat loss, colonization of foundations and cable protection, invasive species and EMF effects.

175. The export cable corridor traverses the Greater Wash SPA, designated for breeding terns and non-breeding red-throated diver and little gull. Indirect impacts through effects on bird habitats and prey species are addressed in **Section 7**.

176. Indirect impacts to benthic features in sites outside the Projects' footprint could arise from seabed disturbance during construction, maintenance and decommissioning activities resulting in increased suspended sediment concentrations (SSC) and subsequent redeposition of suspended sediment on benthos. Effects from the presence of infrastructure on physical processes including bedload sediment transport may locally affect benthic communities as a result of changes in current velocities and wave action, and associated changes to sediment characteristics (including scour effects). Re-mobilisation of contaminated sediments also has potential to indirectly impact benthic habitats. To assess if there is potential for indirect effects upon any site it is necessary to determine whether there is a pathway for effect, and the potential ZOI, as described in **Sections 4.2.1.1**, **4.2.1.2** and **4.2.1.3** below.

177. It has been reported that some benthic species may react to episodic and high intensity noise, which may include the type of noise typically generated by piling activities (Carroll *et al*, 2017; Heinisch and Weise, 1987). However, Natural England AoO indicates that Annex I habitats for which sites are designated are not known to have any noise sensitivity; therefore, noise effects will not be considered criteria for screening-in effects on benthic habitats.

4.2.1.1 Physical processes (waves, currents, bedload sediment transport)

178. Waves will be modified in the immediate vicinity of turbines and their foundation structures. Research has shown that changes to waves become negligible within 200m from turbines (Ohl *et al*. 2001) based on the effects of cylinders of 20m diameter. Although the maximum diameters of some wind turbine foundation options are greater than 20m (**Section 1.2.1.3**), changes to wave conditions at sites designated for Annex I benthic habitats are not expected given that the shortest distances from the DEP and SEP array areas to the nearest SAC (Inner Dowsing, Race Bank and North Ridge SAC) are 2.2km and 10.3km, respectively.

179. Tidal current flows across the DEP and SEP extension areas are directed approximately northwest and southeast, and are parallel to the coastline nearshore. Mean spring tide current velocities of about 1m/s occur at the extension sites with lower velocities closer to the coast across the export cable corridors. There will be a flow separation zone and downstream turbulence around turbine foundation structures extending 6-10 cylinder diameters downstream (Whitehouse, 1998). Within this zone there is likely to be generation of turbulence that is greater than normal, especially during peak flood and ebb conditions. The largest wind turbine foundation diameter in the scoping envelope is <50m for a gravity base structure. Therefore the ZOI on tidal currents would be <500m.

180. Impacts on bedload sediment transport are likely to be localised to the areas immediately surrounding the individual foundations or cable protection in the form of seabed scour where the sediment is soft enough to be mobilised. The extent of these effects will be limited to the extent of changes to waves and currents as described above. A scour assessment undertaken for Sheringham Shoal concluded that the worst case export cable scour may extend up to 10m either side of the unburied cable (Scira Offshore Energy, 2006).

181. Where the export cables are buried there would be no effect on bedload sediment transport. However, if cable protection is required there is potential for it to create an obstacle that interrupts bedload sediment transport. Net alongshore sediment transport is directed to the west around the Weybourne landfall. Mobile sediment would first accumulate on one side or both sides of the obstacle (depending on the gross and net transport) to the height of the protrusion. With continued build-up, it would then form a 'ramp' over which sediment transport would eventually continue by bedload processes, thereby eventually bypassing the protection. Natural England's AoO does not rank 'Water flow (tidal current) changes, including sediment transport considerations' as a high risk pressure from power cable laying, burial and protection, but ranks it as a medium to high risk from offshore wind farm operation due to the physical presence of wind turbines. The gross patterns of bedload transport across the cable (and similarly around turbines) are therefore unlikely to be significantly affected, but relatively local effects cannot be ruled out at this stage.

4.2.1.2 Increased SSC and sediment redeposition

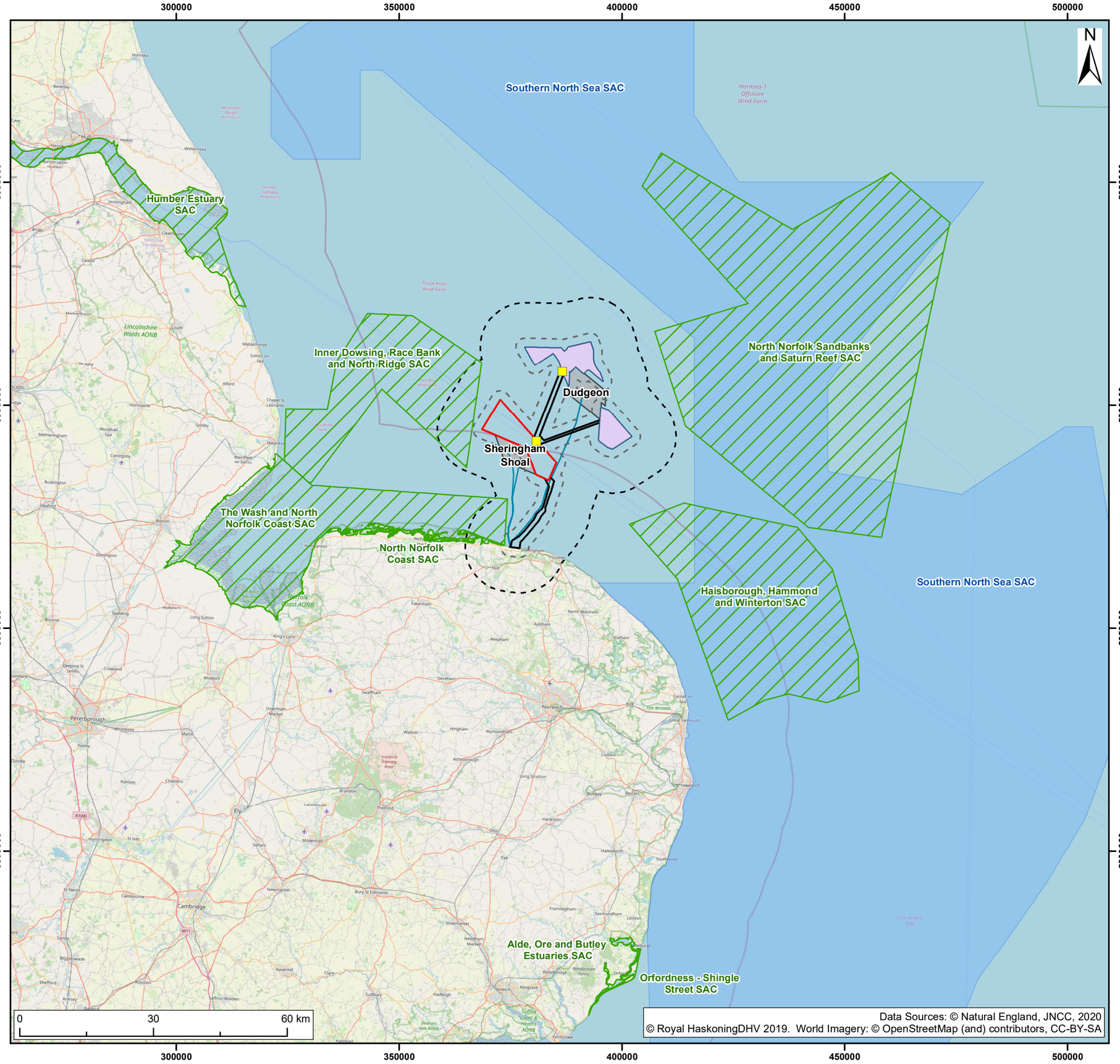
182. The dispersion and deposition of sediment arising from cable laying was modelled for the Dudgeon and Sheringham Shoal offshore wind farms. The worst case extent of suspended sediment dispersion was from ploughing in chalk seabed during a spring tide, where the dispersion footprint extended up to 10km to the west and less to the east, with concentrations dropping to less that 1mg/l above background within a single tidal excursion. However chalk fines are not expected to settle (DOW, 2009; Scira Offshore Energy, 2006).

183. For other seabed types (sediment with a high proportion of fines) the dispersion footprint was expected to extend less than 1km from Dudgeon (DOW, 2009) and less than 2km from Sheringham Shoal (Scira Offshore Energy, 2006). The footprint of silt deposition was over a wide area but at an undetectable rate. Even under slack water conditions, the maximum deposition over a six tide simulation was less than 0.5mm over a small area close to source. Coarser sediment such as sand will only be carried a few metres from the point of disturbance. Dispersion and deposition of seabed sediment from turbine installation is expected to be of lower magnitude than from cabling (DOW, 2009; Scira Offshore Energy, 2006).

184. Natural England's AoO describes the risk of smothering and siltation rate changes to designated features (including Annex I habitats) in terms of 'light' or 'heavy' deposition. Light deposition is defined as up to 5cm of fine material added to the habitat in a single, discrete event, and is assessed as a high-risk pressure from cable and offshore wind farm activities. Light deposition can be expected to occur within 2km of seabed disturbance, albeit at the bottom end of the 'light' deposition category (less than 0.5mm close to source). Heavy deposition may occur within a few metres of source, but is not ranked as a high risk pressure.

4.2.1.3 Re-mobilisation of contaminated sediments

185. Sediment analysis undertaken at the Dudgeon and Sheringham Shoal offshore wind farms indicates low levels of contamination (DOW, 2009; Scira Offshore Energy, 2006). The potential for historical contamination in the Project areas is limited given the prevailing sedimentary and hydrodynamic regime and the lack of fine material to which contaminants could bind. It is therefore considered that re-mobilisation of contaminated sediments could not have a LSE on designated benthic ecology receptors. However, this will be confirmed by analysis of sediment samples from a Projects benthic survey. Should this identify any contamination of concern, the ZOI of sediment-bound contaminants could as a worst case be the same as the footprint of disturbed sediment deposition. However, beyond the area close to source sediment deposition would be at an undetectable rate and it is therefore unlikely that any associated contamination would be sufficient the have a significant effect on designated benthic ecology receptors. Any contaminants that dissolve in the water column would rapidly dilute and disperse such that LSE on benthic receptors would be highly localised.



Legend:

- Dudgeon Extension Project AfL Area
- Sheringham Extension Project AfL Area
- Offshore Cable Corridor
- Indicative Offshore Substation Location
- Existing Offshore Wind Farm
- Existing Offshore Wind Farm Export Cable

Offshore Scoping Area Maximum ZOI Buffers

- 2km
- 10km

Special Area of Conservation (SAC) with Marine Component

- Seabed Habitat Protected Features
- Harbour Porpoise Protected Features

SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR
S1	P01	05/06/2020	Suitable for information	AZ	RS	AP

Title:

Location of Projects Scoping Area in Relation to SACs

Figure: 4.1

Drawing No: PB8164-RHD-ZZ-OF-DR-Z-0055

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:850,000

Project: Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

Report: HRA Screening Report

Royal HaskoningDHV
Enhancing Society Together

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4.2.1.4 Screening of sites for 'project alone' effects

186. The maximum potential ZOI on benthic features from indirect effects is 10km, as a result of dispersion of chalk fines. However, given that chalk fines will not redeposit in the area, potential effects from redeposition would extend to less than 2km from the source of seabed disturbance. Impacts on bedload sediment transport are likely to be local to the areas immediately surrounding the individual foundations or cable protection and limited to the extent of changes to waves and currents. However, where seabed infrastructure has potential to create an obstacle to bedload sediment transport, it is possible that the maximum ZOI on sediment transport could exceed 2km. Three sites are approximately 2km or less from the Projects (**Table 4-2**). These are:

- The Wash and North Norfolk Coast SAC (1.26km);
- North Norfolk Coast SAC and Ramsar (1.27km); and
- Inner Dowsing, Race Bank and North Ridge SAC (2.2km)

The next nearest site, the Haisborough, Hammond and Winterton SAC, is located over 17km from the Projects and is considered to be beyond the maximum ZOI.

187. The Wash and North Norfolk Coast SAC is designated for a variety of subtidal and intertidal habitats as summarised in **Table 4-2**. Of these, sandbanks which are slightly covered by sea water all the time may be located near the eastern boundary of the SAC (Natural England, 2017a) and within the Projects ZOI. Sediment dispersal and deposition modelling completed for Dudgeon and Sheringham Shoal offshore wind farms (DOW, 2009; Scira Offshore Energy, 2006) suggests deposition in the SAC would be at an undetectable rate and to a depth of much less than 0.5mm. Therefore, it is concluded that there is no LSE on the SAC or its protected features from smothering and siltation rate changes. Net alongshore sediment transport is directed to the west around the Weybourne landfall, meaning that any interruption to bedload transport of mobile sediments could have impact to the west of the obstacle. The eastern boundary of the Wash and North Norfolk Coast SAC is located approximately 1.26km to the west of the export cable corridor at its closest point (at landfall). Therefore, interruption of sediment supply to the sandbank features located near the eastern boundary of the SAC cannot be ruled out at this stage.

188. The North Norfolk Coast SAC is designated for a variety of terrestrial coastal habitats as summarised in **Table 4-2**. The only designated marine feature is coastal lagoons. In the case of the North Norfolk Coast SAC these are percolation lagoons separated from the sea by shingle banks, but allowing sea water to enter by percolating through the shingle or by over-topping the bank (e.g. in storms) (Natural England, 2017a). Therefore there is no pathway for a LSE on this feature. HDD will avoid the need for cable infrastructure on the seabed close to shore, with the exit pit located at a suitable location with approximately 8 – 10m water depth. Therefore no effects on longshore sediment transport are anticipated and LSE on coastal and intertidal habitats in the North Norfolk Coast SAC and Ramsar are screened out.

189. The Inner Dowsing, Race Bank and North Ridge SAC is designated for sandbanks which are slightly covered by sea water all the time, and subtidal biogenic reefs (*Sabellaria spinulosa*) as summarised in **Table 4-2**. Sandbank features extend to the eastern boundary of the SAC, although they are not thought to be present at the nearest point from the Projects (2.2km west of the SEP wind farm) and are therefore at a distance of more than 2.2km. Nevertheless, the interruption of sediment supply to the sandbank features located near the eastern boundary of the SAC cannot be ruled out at this stage.

190. **Table 4-2** provides the results of the HRA screening process for benthic ecology.

Table 4-2 Screening list of sites with benthic ecology features (screened out sites are shown in grey)

Site Code	Site name	Feature	Distance* (km)			Screening Decision	Rationale
			DEP	SEP	Export Cable Corridor		
UK0017075	The Wash and North Norfolk Coast SAC	H1110 Sandbanks which are slightly covered by sea water all the time H1140 Mudflats and sandflats not covered by seawater at low tide H1150 Coastal lagoons H1160 Large shallow inlets and bays H1170 Reefs	24.3	8.4	1.26	In	Natural England Conservation Advice for The Wash and North Norfolk Coast SAC suggests that the Annex I habitat feature 'Sandbanks which are slightly covered by sea water all the time' may be within the Projects' ZOI from increased SSC and sediment redeposition, and impacts on bedload sediment transport (<2km from the export cable corridor). Natural England's AoO states that smothering and siltation rate changes (Light) is a high-risk pressure from cable and offshore wind farm activities and that this Annex I habitat feature is potentially sensitive to this pressure. However, modelling suggests deposition in the SAC would be at an undetectable rate and to a depth of much less than 0.5mm. Therefore, it is concluded that there is no LSE on the SAC or its protected features from smothering and siltation rate changes. Natural England's AoO states that water flow (tidal current) changes including sediment transport is a low-risk pressure from cable laying, burial and protection activities. 'Sandbanks which are slightly covered by sea water all the time' are potentially sensitive to this pressure because one of its component habitats, subtidal mud, is sensitive to the pressure. However, subtidal sand is assessed as not sensitive (Natural England, 2017a). Evidence suggests that a LSE on the SAC is unlikely, but it cannot be entirely ruled out at this stage.

Site Code	Site name	Feature	Distance* (km)			Screening Decision	Rationale
			DEP	SEP	Export Cable Corridor		
UK0019838	North Norfolk Coast SAC	H1150 Coastal lagoons	31.6	17.3	1.27	Out	Within potential ZOI for increased SSC and sediment redeposition, and impacts on bedload sediment transport (<2km from the export cable corridor). However, these are percolation lagoons separated from the sea by shingle banks but allowing sea water to enter by percolating through the shingle or by over-topping the bank (e.g. in storms) (Natural England, 2017a). Therefore, there is no pathway for a LSE on this feature. No effects on longshore sediment transport are anticipated and therefore no LSE on coastal and intertidal habitats.
UK0030370	Inner Dowsing, Race Bank and North Ridge SAC	H1110 Sandbanks which are slightly covered by sea water all the time H1170 Reefs (Subtidal biogenic reefs: *Sabellaria* spp.)	10.3	2.2	17.7	In (SEP)	Smothering and siltation rate changes (Light) is a high-risk pressure from cable and offshore wind farm activities. However, the SAC is outside potential ZOI for increased SSC and sediment redeposition (2km). Natural England Conservation Advice for Inner Dowsing, Race Bank and North Ridge SAC suggests that the Annex I habitat feature 'Sandbanks which are slightly covered by sea water all the time' may be within the SEP ZOI from impacts on sediment transport, although the feature extent is further from SEP than the SAC boundary. Natural England's AoO states that Water flow (tidal current) changes, including sediment transport is a high risk pressure from offshore wind operation (presence of turbines). 'Sandbanks which are slightly covered by sea water all the time' are potentially sensitive to this

Site Code	Site name	Feature	Distance* (km)			Screening Decision	Rationale
			DEP	SEP	Export Cable Corridor		
							pressure because one of its component habitats, subtidal mud, is sensitive to the pressure. However subtidal sand is assessed as not sensitive (Natural England, 2017c). Sabellaria reefs are not sensitive to this pressure. Evidence suggests that a LSE on the SAC sandbanks feature is unlikely, but it cannot be entirely ruled out at this stage from SEP. A LSE on the site from DEP is screened out.
UK0030369	Haisborough, Hammond and Winterton SAC	H1110 Sandbanks which are slightly covered by sea water all the time H1170 Reefs (Subtidal biogenic reefs: *Sabellaria* spp.)	17.3	20.7	19.1	Out	Smothering and siltation rate changes (Light) is a high-risk pressure from cable and offshore wind farm activities. Annex I sandbank habitat features are potentially sensitive to this pressure. Sabellaria reefs are not sensitive to this pressure. However, outside potential ZOI for increased SSC and sediment redeposition (2km).
UK0030358	North Norfolk Sandbanks and Saturn Reef SAC	H1110 Sandbanks which are slightly covered by sea water all the time H1170 Reefs (Subtidal biogenic reefs: Sabellaria spp.)	14.5	30.1	32.0	Out	Smothering and siltation rate changes (Light) is a high-risk pressure from cable and offshore wind farm activities. Annex I sandbank habitat features are potentially sensitive to this pressure. Sabellaria reefs are not sensitive to this pressure. However, outside potential ZOI for increased SSC and sediment redeposition (2km).

Site Code	Site name	Feature	Distance* (km)			Screening Decision	Rationale
			DEP	SEP	Export Cable Corridor		
UK0030170	Humber Estuary SAC	H1150 Coastal lagoons H1130 Estuaries H1140 Mudflats and sandflats not covered by seawater at low tide H1110 Sandbanks which are slightly covered by sea water all the time	63.2	59.7	77.3	Out	Smothering and siltation rate changes (Light) is a high-risk pressure from cable and offshore wind farm activities. Annex I sandbank habitat features are potentially sensitive to this pressure. However, outside potential ZOI for increased SSC and sediment redeposition (2km)
UK0030076	Alde, Ore and Butley Estuaries SAC	H1130 Estuaries H1140 Mudflats and sandflats not covered by seawater at low tide	110	104	89.9	Out	Outside potential ZOI.
UK0014780	Orfordness – Shingle Street SAC	H1150 Coastal lagoons	128	108	94.9	Out	Outside potential ZOI.

*Distance measured from the closest point of DEP, SEP and export cable corridor to the closest point of the designated site rounded to the nearest kilometre.

4.2.2 DEP and SEP Together

191. As detailed above, potential LSEs from SEP in isolation have been assessed and screened out for all SACs except The Wash and North Norfolk Coast SAC and Inner Dowsing, Race Bank and North Ridge SAC. Potential LSEs from DEP in isolation have been assessed and screened out for all SACs except The Wash and North Norfolk Coast SAC.

192. Any effects from the Projects together would be indirect and associated with increased SSC and deposition, and potential release sediment-bound contaminants, as a consequence of seabed disturbance during construction, maintenance and decommissioning of the export cable; or as a result of changes to bedload sediment transport. Should both DEP and SEP proceed, the intention is to install integrated transmission infrastructure which serves both extension projects. This would mean installing parallel offshore export cables offshore, reducing the total footprint of the Projects and therefore the overall environmental impact. However, each export cable would be installed in a separate trench in separate installation campaigns because the installation vessel can only install one cable at the time. Therefore DEP and SEP have the potential for combined effects on the Wash and North Norfolk Coast SAC. However, deposition in the SAC would be at an undetectable rate and to a depth of much less than 0.5mm. Therefore, it is concluded that there is no LSE on the SAC or its protected features from increased SSC and deposition, or potential release sediment-bound contaminants from DEP and SEP together (even if the effect is repeated) due to the negligible magnitude of the effects.

193. In terms of bedload sediment transport-related effects, net sediment transport is from east to west, meaning that impacts on ‘upstream’ SACs to the east can be ruled out. Both protected sites in relatively close proximity to the west of the Projects (The Wash and North Norfolk Coast SAC and Inner Dowsing, Race Bank and North Ridge SAC) are screened in for possible LSE from one or both of DEP and SEP in isolation. Therefore, no additional sites are screened in for possible LSE from DEP and SEP together. If both DEP and SEP are constructed, the sharing of cable infrastructure would minimise the need for cables and cable protection on the seabed, thereby minimising obstacles to bedload sediment transport. Therefore the magnitude of effect from a projects together scenario would be the same or only marginally greater that each project in isolation.

4.2.3 In-combination Effects

194. There are no direct effects on any SAC from the Project; therefore there is no pathway for LSE from direct in-combination effects.

195. Indirect in-combination effects from increased SSC and deposition, and potential release sediment-bound contaminants, are possible if other project activities that disturb the seabed occur at the same time as similar DEP and SEP activities.

196. Indirect in-combination effects from changes to bedload sediment transport are possible if other projects introduce obstacles to sediment transport within the ZOI of DEP and SEP.

197. The projects identified for potential in-combination assessment will be discussed during ETG meetings with stakeholders. The full list of projects for consideration will be updated following PEIR and agreed in consultation with the Seabed ETG. An initial review of the other currently planned projects in the vicinity shows five projects that have the potential to interact with the proposed DEP and SEP activities. These are:

- Dudgeon Offshore Wind Farm (maintenance and decommissioning);
- Sheringham Shoal Offshore Wind Farm (maintenance and decommissioning);
- Hornsea Project Three Offshore Wind Farm (export cables); and
- Nearshore Seaweed Cultivation of Native Species.

4.2.3.1 Dudgeon and Sheringham Shoal Offshore Wind Farms

198. The Dudgeon and Sheringham Shoal offshore wind farms and export cables are located in close proximity to DEP and SEP. Both are operational, so any in-combination effects would be associated with operation and maintenance, or decommissioning activities. There is currently no specific information about planned operation and maintenance activities associated with the Dudgeon or Sheringham Shoal offshore wind farms. However as part of marine licence applications maintenance activities, MCZAs have been prepared for both wind farms (Royal HaskoningDHV, 2020a, 2020b). These assessed the impacts from cable repair and replacement, and cable remedial burial. The ZOI of increased SSC and deposition from Dudgeon and Sheringham Shoal offshore wind farm activities (up to 2km) can be expected to overlap with the Projects and therefore there is potential for in-combination effects on The Wash and North Norfolk Coast SAC.

199. Similarly, the introduction of cable protection or associated seabed infrastructure would have the potential to interrupt bedload sediment transport, and have in-combination effects on The Wash and North Norfolk Coast SAC. This would be most likely close to landfall where the Dudgeon and Sheringham Shoal export cables and DEP and SEP export cables are closest to the protected site. However, given the absence of cable protection on the existing Dudgeon and Sheringham Shoal export cables, there is no potential for in combination effects on bedload sediment transport in this area. There is also no potential for in combination effects from the existing wind farm arrays on account of their distance from the SAC.

4.2.3.2 Hornsea Project Three Offshore Wind Farm

200. At the time of writing a DCO application has been submitted for Hornsea Project Three but has not yet been determined. The proposed Hornsea Project Three offshore export cable corridor is located approximately 325m to the west of the offshore export cable corridor. Therefore, based on the ZOI of increased SSC and deposition, in-combination effects are possible. However, there is no in-combination LSE on The Wash and North Norfolk Coast SAC given the rate and depth of sediment deposition associated with the Projects in the SAC, as described in **Section 4.2.2.4**. Similarly, there is no pathway for a LSE on the North Norfolk Coast SAC or its marine features.

201. As is the case with the Dudgeon and Sheringham Shoal export cables, the introduction of Hornsea Project Three offshore export cable protection or associated seabed infrastructure would have potential to interrupt bedload sediment transport, and have in-combination effects with DEP and SEP offshore export cable protection on The Wash and North Norfolk Coast SAC. Again, this would be most likely close to landfall where the export cables are closest to the protected site.

4.2.3.3 Nearshore Seaweed Cultivation of Native Species

202. Sustainable Seaweed Limited submitted a marine licence application (MLA/2018/00437) proposing the development of a seaweed farm off the north Norfolk Coast with the aim of establishing a commercial farming operation. The proposed scheme includes an initial construction phase with an expansion phase extending the site limits. The initial application was to install fabric mats (on which seaweed would grow) suspended horizontally under the surface of the sea and fixed to the seabed by a dedicated mooring system. The scoping process identified that Sustainable Seaweed Limited intends to resubmit the application with amended plans and details. The proposed seaweed farm is located approximately 1.6km south of the SEP extension array area at its nearest point, and to the west of the Sheringham Shoal Offshore Wind Farm. It is approximately 1.6km east of the Inner Dowsing, Race Bank and North Ridge SAC.

203. SEP is sufficiently far from the Inner Dowsing, Race Bank and North Ridge SAC (2.2km) such that there could be no in-combination effects on the site as a result of increased SSC and deposition. However, given the proximity of the seaweed farm to SEP and to the Inner Dowsing, Race Bank and North Ridge SAC, potential for in-combination sediment transport effects between projects cannot be ruled out at this stage.

4.2.4 Benthic Ecology Screening Summary

204. There is no potential for direct effects which could result in LSE on any site because no SACs designated for benthic features are within the footprint of DEP or SEP.

205. There is potential for indirect effects on one site, The Wash and North Norfolk Coast SAC, as a result of increased SSC and sediment redeposition associated with export cable activities. However, a LSE on this site is screened out due to the negligible magnitude of any effects. Similarly there is no potential LSE from increased SSC and deposition associated with DEP and SEP together due to the negligible magnitude of any impacts.

206. There is potential for indirect effects on The Wash and North Norfolk Coast SAC from effects on bedload sediment transport. Although considered unlikely, interruption of sediment transport cannot be ruled out from DEP and/or SEP offshore export cable protection. Indirect effects on the Inner Dowsing, Race Bank and North Ridge SAC as a result of changes to bedload sediment transport also cannot be ruled out. The source of these effects could be interruption of sediment transport by SEP turbines and other infrastructure in the offshore wind farm area. Similar effects on the site from DEP are screened out.

207. In-combination effects on The Wash and North Norfolk Coast SAC are possible from activities that disturb the seabed as related to maintenance or decommissioning activities at the Dudgeon and Sheringham Shoal offshore wind farms, and due to Hornsea Project Three Offshore Wind Farm export cable activities. A LSE on the SAC from the Hornsea Project Three Offshore Wind Farm alone is possible due in part to its proximity to the site (including overlap between site and the Hornsea Project Three offshore export cable route corridor) (Ørsted, 2018). However, given the negligible magnitude of any increased SSC and deposition effects from DEP and SEP, no LSE from in-combination effects are predicted.

208. Dudgeon, Sheringham Shoal, and Hornsea Project Three offshore wind farm export cable protection, in-combination with DEP and SEP export cable protection, has the potential to have an in combination effect on bedload sediment transport, resulting in an impact on the protected features of The Wash and North Norfolk Coast SAC and a potential LSE.

5 Fish Ecology

5.1 Approach to Screening

209. Direct or indirect effects on Annex II migratory fish species may arise from the permanent or temporary physical presence or activities relating to the construction, operation or decommissioning of the wind farms and associated infrastructure. Potential effects include loss of habitat, disturbance and displacement.

210. This HRA screening exercise considers sites which meet the following criteria:

- The Projects' scoping area directly overlaps a site whose interest features include an Annex II migratory fish species;
- The distance between the Projects' scoping area and a site with a fish interest feature is within the range for which there could be an interaction e.g. the distance of the site from the source of suspended sediment is within the range at which sediment deposition could occur;
- The distance between the Projects' scoping area and resources on which the interest feature depends (i.e. an indirect effect acting through prey or access to habitat) is within the range for which there could be an interaction; and
- The likelihood that a foraging area or a migratory route occurs within the Projects' scoping area.

5.1.1 Potential Effects (Source)

211. The key factors that are considered in the HRA screening process are:

- Potential effects (source); and
- Proximity of source to feature (distance between the proposed development and SACs, migration routes) (pathway and receptor).

212. During construction of DEP and SEP, activities which result in disturbance to the seabed and the generation of suspended sediment have the potential to disturb and displace fish from supporting habitats or migratory routes. Underwater noise generated by construction activities, such as piling, also has the potential to displace fish from supporting habitats or migratory routes by acting as a barrier.

213. During the operational period, the physical presence of turbine foundations and associated components (offshore platforms, export cables, inter-array cables) will result in the loss or replacement of existing habitats. Maintenance activities during the operational phase may also result in localised disturbance or displacement.

214. Decommissioning may require the removal of foundation structures and either the cutting or removal of subsea cables resulting in physical disturbance, potential disturbance and displacement of impacts associated with suspended sediment and underwater noise. Effects caused during decommissioning are expected to be similar to those during the construction phase.

215. The potential effects on fish and associated important habitats from the Projects have been identified within the Scoping Report (Royal HaskoningDHV, 2019) and Scoping Opinion (The Planning Inspectorate, 2019). **Table 5-1** outlines which effects will be considered in relation to Annex II fish species within the HRA. These are therefore the potential effects which could affect a receptor (site or feature), in the event that there is a pathway.

Table 5-1: Summary of potential effects - fish ecology (scoped in (✓) and scoped out (✗))

Potential Impacts	Construction	Operation	Decommissioning
Temporary physical disturbance (of seabed habitat, spawning or nursery grounds during intrusive works)	✓	✗	✓
Temporary habitat loss	✓	✓	✓
Permanent/long-term habitat loss	✗	✓	✓
Increased suspended sediments and sediment re-deposition	✓	✓	✓
Re-mobilisation of contaminated sediment during intrusive works	✓	✓	✓
Underwater noise impacts to acoustically sensitive species during foundation piling	✓	✗	✗
Underwater noise impacts to acoustically sensitive species due to other activities (vessels, seabed preparation, cable installation, turbine operational noise etc.)	✓	✓	✓
Impacts from electromagnetic fields	✗	✓	✗
Impacts on commercially exploited species associated with their displacement from the area of activity / works	✓	✓	✓
Cumulative impacts	✓	✓	✓
Transboundary impacts	✓	✓	✓

5.1.2 Identification of Sites and Features (Pathway and Receptor)

216. Based on a review of available information the following Annex II species are known to either migrate through or spend part of their lifecycle in the North Sea: Atlantic salmon *Salmo salar*, allis shad *Alosa alosa*, twaite shad *Alosa fallax*, sea lamprey *Petromyzon marinus* and river lamprey *Lampetra fluviatilis* (the latter being restricted to coastal waters). Therefore, there is the potential for these species of migratory fish to be present in the vicinity of DEP and SEP and they are therefore considered in the screening.

217. On this basis, the screening considers all designated sites within the Southern North Sea (and within 250km of the Projects) which have migratory fish species listed in Annex II of the Habitats Directive as an interest feature.

5.2 Screening

5.2.1 DEP or SEP in Isolation

218. There are no UK sites designated for Atlantic salmon, allis shad or twaite shad in the Southern North Sea. The nearest transboundary sites for these species are Voordelta SAC (allis shad, twaite shad), Haringvliet SAC (Atlantic salmon, allis shad, twaite shad) on the coast of the Netherlands, located approximately 209km and 230km from the export cable corridor respectively. The nearest UK sites for these species are the Plymouth Sound and Estuaries SAC (allis shad), the Severn Estuary SAC (twaite shad) and the River Avon SAC (Atlantic salmon). Disturbance to supporting habitats due to permanent installation of infrastructure or due to temporary works will be localised within the Projects area. Sediment plumes and changes to seabed characteristics are expected to be restricted to the local vicinity of the project areas. Underwater noise, particularly from piling activity may have behavioural effects on fish. Worst case underwater noise modelling undertaken for Dudgeon Offshore Wind Farm predicted behavioural effects on fish up to a maximum of 38km from piling (DOW, 2009), thus potential effects would be limited to approximately that range.

219. Therefore, given the distance of these designated sites from the Projects scoping area there is no pathway for direct effects upon the sites themselves. There is theoretical potential for individuals from these sites to be in the vicinity of the Projects. Fish surveys conducted at the Dudgeon or Sheringham Shoal wind farm sites did not record Atlantic salmon, allis shad and twaite shad (Scira, 2006; Brown & May Marine Ltd, 2008a, 2008b). Of these species, there is a single record of shad (species not identified) being landed by UK vessels in the region between 2014 and 2018 (in ICES rectangle 34F1 overlapping the export cable route) (MMO, 2019). However, it is considered that there is no potential for significant effects upon them as the absence of designated sites for these species on the UK coast of the Southern North Sea and paucity of records reflects the lower importance of the area to these species. Therefore, it is considered that there is no potential for LSE on Atlantic salmon, allis shad and twaite shad.

220. There are two UK designated sites within the Southern North Sea region which have Annex II fish species as primary reasons for designation or as qualifying features. These are the Humber Estuary SAC and the River Derwent SAC in North Yorkshire (which flows into the Humber), for which the relevant features are the sea lamprey and the river lamprey. The closest designated site for lamprey species is the Humber Estuary SAC, located 60km from the SEP array and 63km from the DEP array (see **Table 5-2**). The nearest transboundary site for these species is Voordelta SAC in the Netherlands. Given the distances involved, there would be no pathway for effects, either directly or indirectly, with the SACs themselves.

221. Relatively little is known about the precise habitats occupied by adult sea lamprey and although adults are sometimes caught at sea, the precise conditions in which they occur have not been described. Most adults are found in freshwater, and spawning and larval life history stages occur in rivers. Sea lamprey habitat seems only to be important in relation to their ability to get to the spawning beds. Similarly, river lamprey are restricted to estuaries of major rivers when not in upstream river systems (Maitland, 2003). No lamprey were recorded by fish surveys conducted at the Dudgeon or Sheringham Shoal wind farm sites (Scira, 2006; Brown & May Marine Ltd, 2008a, 2008b).

222. Given the distance from the Humber Estuary SAC and the River Derwent SAC, the evidence that the most important life history stages of these species take place in freshwater and estuaries, it is considered unlikely that there would be any effects from the Projects on sea lamprey or river lamprey.

Table 5-2: Screening list of sites with fish ecology features (screened out sites are shown in grey)

Site Code	Country	Site name	Feature	Distance (km)			Screening Decision	Rational
				DEP	SEP	Export Cable Corridor		
UK0030170	UK	Humber Estuary SAC	1095 Sea Lamprey** 1099 River lamprey**	63	60	77	Out	The distance between the Projects and the site precludes direct impact upon the site and its supporting habitats. River lamprey are restricted to estuaries of major rivers. Given the distance from the Projects to any such estuaries, e.g. the Humber, there can be no direct or indirect interaction with the Projects. Sea lamprey could in theory be present in the vicinity of DEP and SEP but given their life history interaction would be limited.
UK0030253	UK	River Derwent SAC	1099 River lamprey* 1095 Sea Lamprey**	147	146	157	Out	The River Derwent SAC has no marine components. The distance between the Projects and the site precludes direct impact upon the site and its supporting habitats. River lamprey are restricted to estuaries of major rivers. Given the distance from the Projects to any such estuaries, e.g. the Humber, there can be no direct or indirect interaction with the Projects. Sea lamprey could in theory be present in the vicinity of DEP and SEP but given their life history interaction would be limited.
NL4000017	Netherlands	Voordelta SAC	1095 Sea Lamprey* 1099 River lamprey* 1102 Allis shad*	209	214	209	Out	The distance between the Projects and the site precludes direct impact upon the site and its supporting habitats. Fish associated with the SAC could in theory be present in the vicinity of DEP and SEP but given the distance of the Projects they would be present in low numbers. The absence

Site Code	Country	Site name	Feature	Distance (km)			Screening Decision	Rational
				DEP	SEP	Export Cable Corridor		
			1102 Twaite shad*					of designated sites for these species on the UK Southern North Sea coast reflects the lower importance of the area to this species.
NL1000015	Netherlands	Haringvliet SAC	1095 Sea Lamprey* 1099 River lamprey* 1106 Atlantic salmon* 1102 Allis shad* 1102 Twaite shad*	225	233	230	Out	The distance between the Projects and the site precludes direct impact upon the site and its supporting habitats. Fish associated with the SAC could in theory be present in the vicinity of DEP and SEP but given the distance of the Projects they would be present in low numbers. The absence of designated sites for these species on the UK Southern North Sea coast reflects the lower importance of the area to this species.

*Primary feature | **Qualifying feature

5.2.2 DEP and SEP Together

223. As detailed above, there are no LSE for DEP or SEP in isolation. Although there is potential for combined effects between DEP and SEP, particularly if project activities occur at the same time, there remain no pathways for LSE on designated sites which have migratory fish species as an interest feature, even under a Projects together scenario.

5.2.3 In combination Effects

224. There are no direct effects on any SAC from the Project; therefore there is no pathway for LSE from direct in-combination effects.

225. Indirect in-combination effects from increased SSC and deposition, potential release sediment-bound contaminants, or from the generation of underwater noise are possible if associated project activities occur at the same time as similar DEP and SEP activities. However, as for DEP and SEP 'together effects', there remain no pathways for LSE on designated sites which have migratory fish species as an interest feature, primarily due to their distance from the Projects and the absence or low abundance of migratory fish from these sites in Project areas.

5.2.4 Fish Ecology Screening Summary

226. On the basis that there is no potential for direct or indirect effects which could result in LSE on any site, for the proposed DEP and SEP (either in isolation or together), it is proposed that all SACs with Annex II fish species interest features are screened out from further consideration in the HRA.

6 Marine Mammals

6.1 Approach to Screening

227. For marine mammals, the approach to HRA screening primarily focuses on the potential for connectivity between individual marine mammals from designated populations and the offshore project area (i.e. demonstration of a clear source-pathway-receptor relationship). This is based on the distance of the offshore project area from the designated site, the range of each effect and the potential for animals from a site to be within range of an effect.

228. The HRA screening exercise therefore considers designated sites which meet the following criteria:

- The distance between the potential effect of the proposed project and a designated site with marine mammals as a qualifying feature is within the range for which there could be an interaction (for example, the pathway is not too long for significant noise propagation and therefore the site is within the ZOI for underwater noise effects).
- The distance between the proposed project and resources on which the qualifying marine mammal feature depends (i.e. an indirect effect acting though prey or access to habitat) is within the potential ZOI (for example the pathway is not too long).
- The likelihood that a foraging area or a migratory route occurs within the ZOI of the proposed project (applies to mobile interest features when outside the designated site).

6.1.1 Potential Effects (Source)

229. The key factors that will be considered during the HRA screening process are:

- Potential effects (source); and
- Proximity of source to feature (distance between the proposed development and SACs, migration routes) (pathway and receptor).

230. The potential effects on marine mammals from the Projects have been identified within the Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions Scoping Report (Royal HaskoningDHV, 2019) and Scoping Opinion (The Planning Inspectorate, 2019). **Table 6-1** presents potential effects during construction, operation and maintenance (O&M) and decommissioning considered in the HRA process.

Table 6-1 Summary of potential effects – marine mammal (scoped in (✓) and scoped out (✗))

Potential Impacts	Construction	Operation	Decommissioning
Underwater noise (including, piling and other construction activities,	✓	✓	✓

Potential Impacts	Construction	Operation	Decommissioning
vessels, O&M activities, operational turbines and decommissioning activities)			
Unexploded ordnance (UXO) clearance (separate marine license)	✓	✓	✓
Any barrier effects from underwater noise	✓	✓	✓
Vessel interaction (increased collision risk)	✓	✓	✓
Disturbance at seal haul-out sites	✓	✓	✓
Disturbance of foraging seals at sea	✓	✓	✓
Changes to water quality	✓	✓	✓
Changes to prey resources	✓	✓	×
Any barrier effects from physical presence	×	×	×
Direct effects electromagnetic fields (EMF)	×	×	×
Cumulative impacts	✓	✓	✓
Transboundary impacts	✓	✓	✓

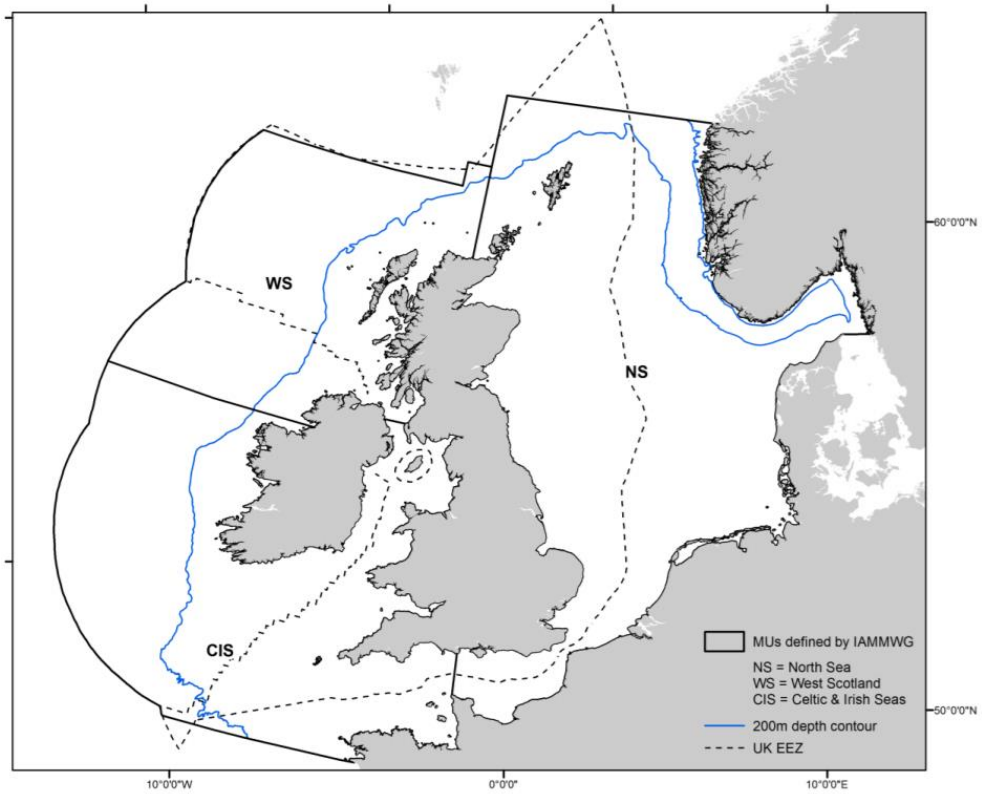
6.1.2 Identification of Sites and Features (Pathway and Receptor)

231. The following sections describe the process used to define the list of sites for which there is theoretical connectivity and therefore potential for a source – pathway – receptor relationship for harbour porpoise *Phocoena phocoena*, grey seal *Halichoerus grypus* and harbour seal *Phoca vitulina*. There are no bottlenose dolphin *Tursiops truncatus* designated sites with potential for connectivity with the Projects, and therefore bottlenose dolphin are not considered further.

6.1.2.1 Harbour porpoise

232. For harbour porpoise, connectivity is considered potentially possible between DEP and SEP and any European designated sites within the North Sea Management Unit (MU) (IAMMWG, 2015) where harbour porpoise are listed as a qualifying feature. The extent of the North Sea MU has been agreed during consultation with the Marine Mammal ETG (December 2019 meeting; as outlined in the SoCG), as the most appropriate population which any harbour porpoise occurring within DEP and SEP may be a part of. Therefore, all European designated sites out with the North Sea MU have been screened out from further consideration.

Figure 6-1: Harbour porpoise management units (IAMMWG, 2015).



233. This HRA screening considers any European designated sites within the harbour porpoise North Sea MU, where the species is considered as a grade A, B or C feature. Grade D indicates a non-significant population (JNCC, 2009) and have therefore not been considered further. All European designated sites out with the harbour porpoise North Sea MU area have been screened out from further consideration.

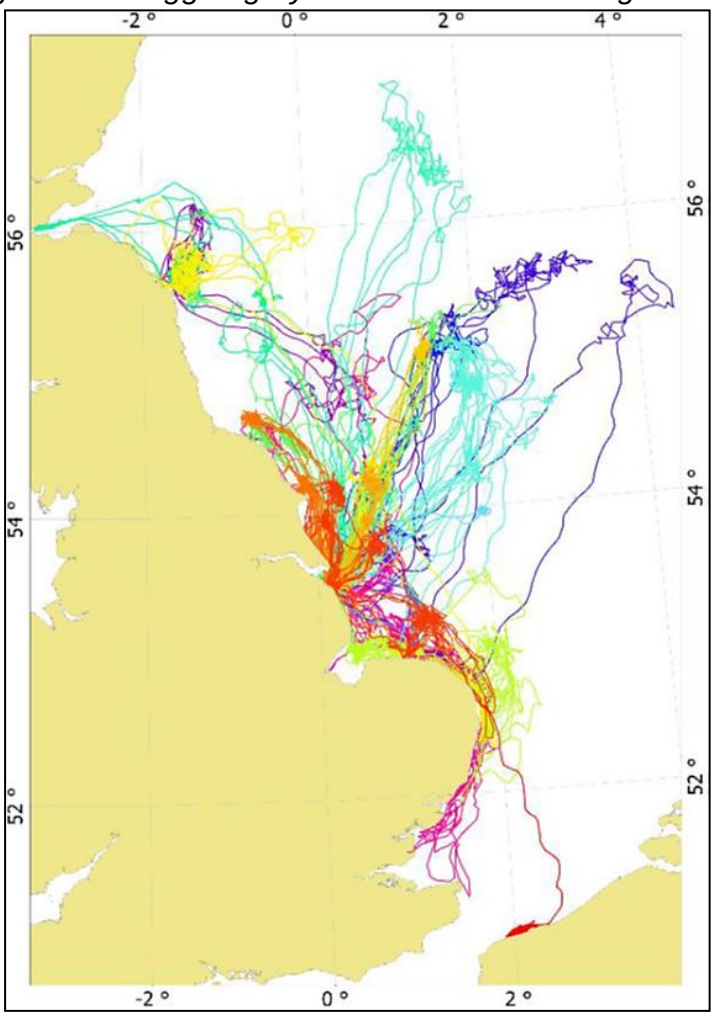
234. **Table 6-3** provides the list of sites with harbour porpoise interest features considered in the HRA screening. This list has been further refined and screened, in relation to the potential effects assessed in **Section 6.2.1**.

6.1.2.2 Grey seal

235. Grey seals are wide ranging and can breed and forage in different areas (Russell *et al.,* 2013). Grey seal generally travel between known foraging areas and back to the same haul-out site, but will occasionally move to a new site. For example, movements have been recorded between haul-out sites on the east coast of England and the Outer Hebrides (SCOS, 2018), and tags deployed on grey seals at Donna Nook and Blakeney Point in May 2015 indicated that they used multiple haul-outs sites; with one hauling out in the Netherlands and one in Northern France (Russell, 2016). **Figure 6-2** shows the tagged seal movements along the east coast of England and indicates that grey seal travel between haul-out sites along the east coast of England, as well as to the north of France, Firth of Forth and Dogger Bank (Russell, 2016).

236. Grey seals will typically forage in the open sea and return regularly to land to haul-out, although they may frequently travel up to 100km between haul-out sites. Foraging trips generally occur within 100km of their haul-out sites, although grey seal can travel up to several hundred kilometres offshore to forage (SCOS, 2018).

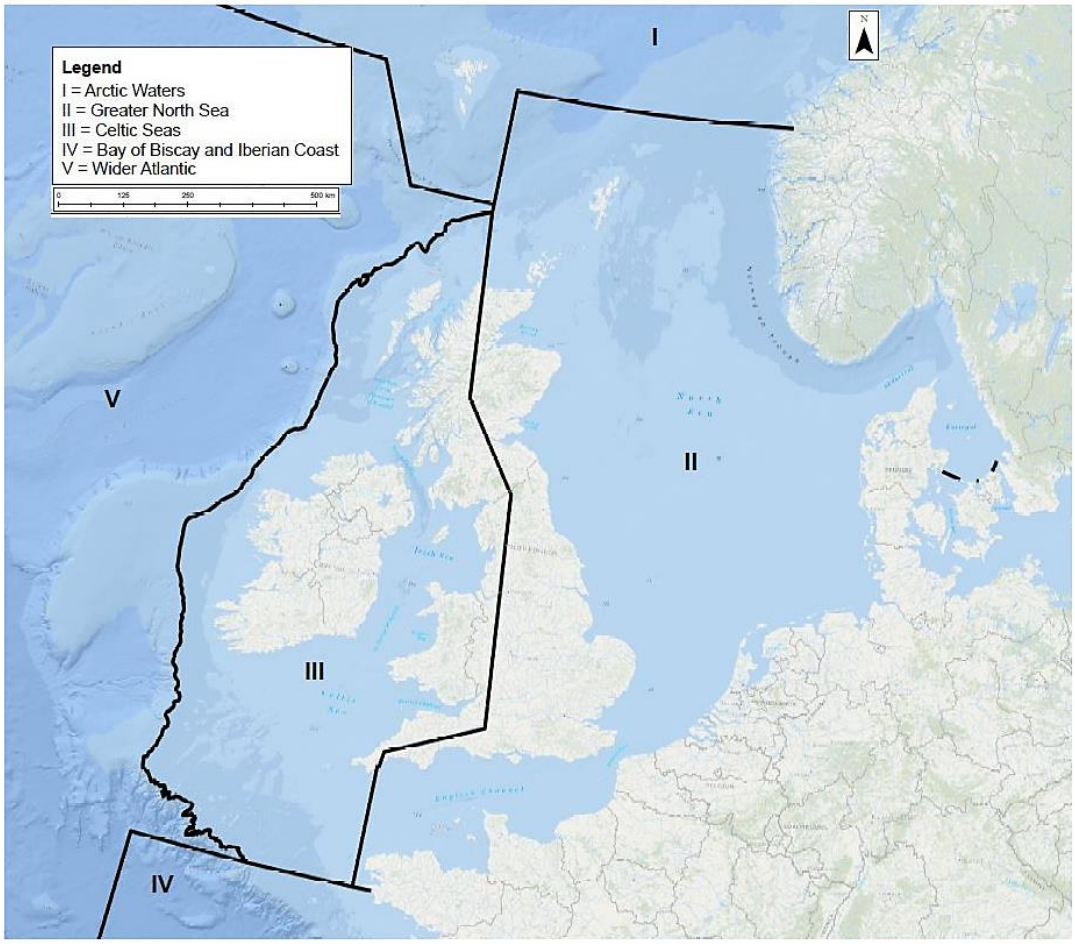
Figure 6-2: Tagged grey seal movements along the East coast of England (Russell, 2016).



237. To take the wide range and movements of grey seal into account, all designated sites where grey seal are a qualifying feature in the Greater North Sea OSPAR region II (**Figure 6-3**) were considered. All designated sites out with this region were screened out from further consideration. For grey seal, the screening process includes any designated site where the species is a grade A, B or C feature.

238. **Table 6-3** provides the list of sites with grey seal interest features considered in the HRA screening. This list has been further refined and screened, in relation to the potential effects assessed in **Section 6.2**.

Figure 6-3: Greater North Sea OSPAR region II.

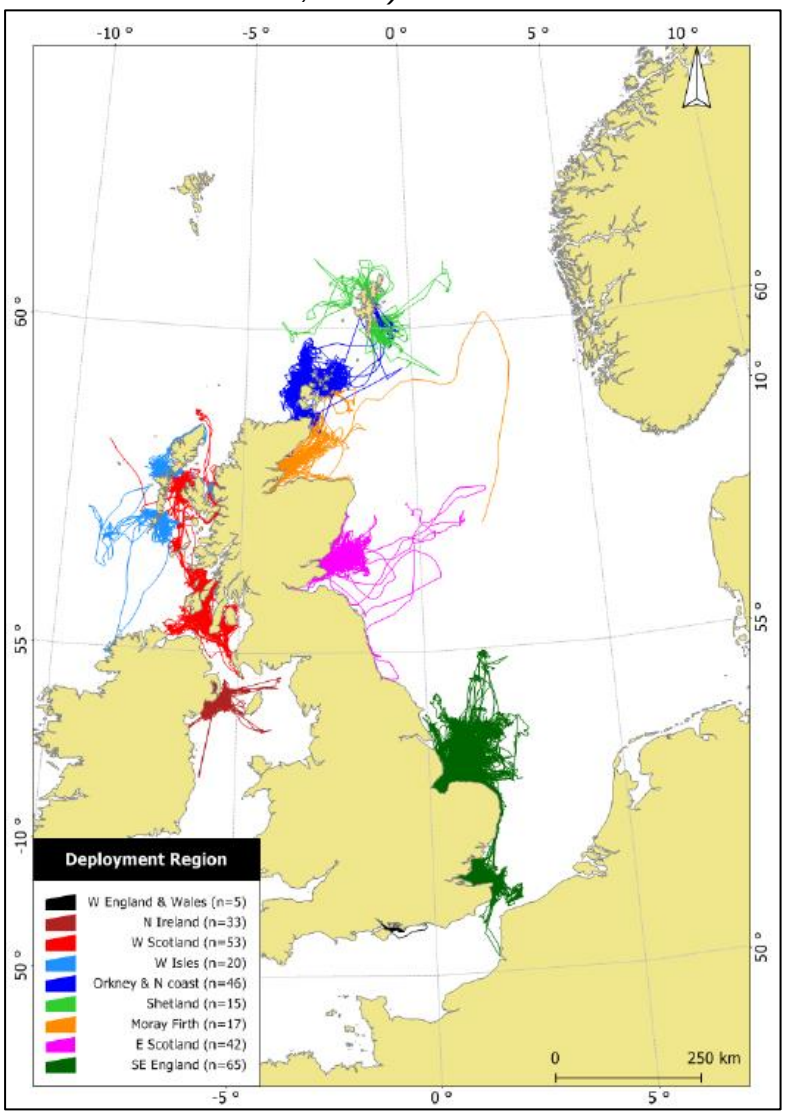


6.1.2.3 Harbour seal

239. The Sea Mammal Research Unit (SMRU), in collaboration with others, has deployed around 344 telemetry tags on harbour seals around the UK between 2001 and 2012. The spatial distributions indicate harbour seals persist in discrete regional populations, display heterogeneous usage, and generally stay within 50km of the coast (Russell and McConnell, 2014). Tagged harbour seals were observed to have a more coastal distribution than grey seals and do not travel as far from haul-outs (**Figure 6-4**; Russell and McConnell, 2014).

240. Harbour seals generally make smaller foraging trips than grey seal, typically travelling 40-50km from their haul-out sites to foraging areas (SCOS, 2017). Tracking studies have shown that harbour seals travel 50-100km offshore and can travel 200km between haul-out sites (Lowry *et al.,* 2001; Sharples *et al.,* 2012). The range of these trips varies depending on the location and surrounding marine habitat. Tagging studies undertaken on harbour seal at The Wash (2003-2005) have shown that this population travels larger distances for their foraging trips than for other harbour seal populations and repeatedly forage between 75km and 120km offshore (average was 80km), with one seal travelling 220km (Sharples *et al.,* 2012). The typical and average foraging range for harbour seal is 50-80km (SCOS, 2017).

Figure 6-4: Telemetry tracks by deployment region for harbour seals aged one year or over (Russell and McConnell, 2014).



241. To take the wide range and movements of harbour seal into account, all designated sites in the Greater North Sea OSPAR region II (**Figure 6-3**) were considered. All designated sites out with this region were screened out from further consideration. For harbour seal, the screening process considers designated sites where the species is a grade A, B or C feature.

242. **Table 6-3** provides the list of sites with harbour seal as a qualifying feature considered in the HRA screening. This list has been further refined and screened, in relation to the potential effects assessed in **Section 6.1**.

6.1.3 Summary of Baseline Information from the Projects

243. Digital aerial surveys for marine mammals (and seabirds) occurred between May 2018 and April 2020 across the DEP and SEP sites (plus a 4km buffer), with one survey being completed at each project site each month during that period. At the time of writing, survey reports were available for the period May 2018 to March 2020. Note that for some of the months within this survey period, more than one survey was undertaken.

244. The most commonly sighted species within these aerial surveys was harbour porpoise (total of 401 sightings; 57.2% of the total), followed by grey seal (total of 52 sightings; 7.4% of the total), harbour seal (with a total of 21 sightings; 3.0% of the total), and minke whale (1 sighting; 0.1% of the total). The remainder of the marine mammal sightings could not be identified to species level, and are reported as seal species (total of 190 sightings; 27.1% of the total), or seal or small cetacean species (with 36 sightings; 5.1% of the total). **Table 6-2** shows the raw data count of marine mammals from these aerial surveys.

Table 6-2 Marine mammal species recorded in site specific aerial surveys for the period May 2018 to March 2020

Survey	Harbour porpoise	Grey seal	Harbor seal	Seal sp.	Seal/small cetacean	Minke whale
May 2018	16	2		3	4	
June 2018	12			6	4	
July 2018	16			3	4	1
August 2018	29	1	5	7	2	
September 2018	14	2			1	
October 2018	18	2	6	2		
November 2018	8	1		2	1	
December 2018	2			2	2	
January 2019	2	2	2	5		
February 2019	18	1		4	5	
March 2019	8			7	1	
April 2019 [Survey 1 / Survey 2]	4 / 34	0 / 1	0 / 2	3 / 9		
May 2019 [Survey 1 / Survey 2]	31 / 26			3 / 9		
June 2019 [Survey 1 / Survey 2]	25 / 20	1 / 5	2 / 0	9 / 14	1 / 1	
July 2019 [Survey 1 / Survey 2]	34 / 33	1 / 3	3 /	21 / 41	2 / 0	

Survey	Harbour porpoise	Grey seal	Harbor seal	Seal sp.	Seal/small cetacean	Minke whale
August 2019 [Survey 1 / Survey 2]	0 / 20	21 / 1		12 / 4		
September 2019	6			4	1	
October 2019	10	1	1	5		
November 2019	7	1		3	1	
December 2019	1	3		1		
January 2020	2			1	5	
February 2020	2	1		4	1	
March 2020	3	2		6		
TOTAL	**401**	**52**	**21**	**190**	**36**	**1**

6.2 Screening

6.2.1 DEP or SEP in Isolation

6.2.1.1 Underwater noise

245. The current Statutory Nature Conservation Bodies (SNCB) advice is that an effective deterrent radius (EDR) of 26km from an individual percussive piling of monopiles or UXO clearance location should be used to assess the area of the SNS SAC for harbour porpoise that could be disturbed during piling and UXO clearance (JNCC *et al.,* 2020).

246. This advice is relevant for all harbour porpoise SAC sites. Therefore, all designated sites with the exception of the Southern North Sea (SNS) SAC are screened out with regard to direct underwater noise effects on harbour porpoise as all sites are greater than 26km from the DEP and SEP sites (**Table 6-4**).

247. The offshore export cable route is located 19.2km from the SNS SAC winter area (**Figure 6-5**), therefore the proposed cable routes will be assessed for any potential direct or indirect effects in relation to the SNS SAC.

248. The DEP extension site is located approximately 14.1 from the SNS SAC summer area and will be assessed for any potential direct or indirect effects on harbour porpoise in the SNS SAC.

249. The SEP extension site is located approximately 25.6km from the SNS SAC summer area and will be assessed for any potential direct or indirect effects on harbour porpoise in the SNS SAC.

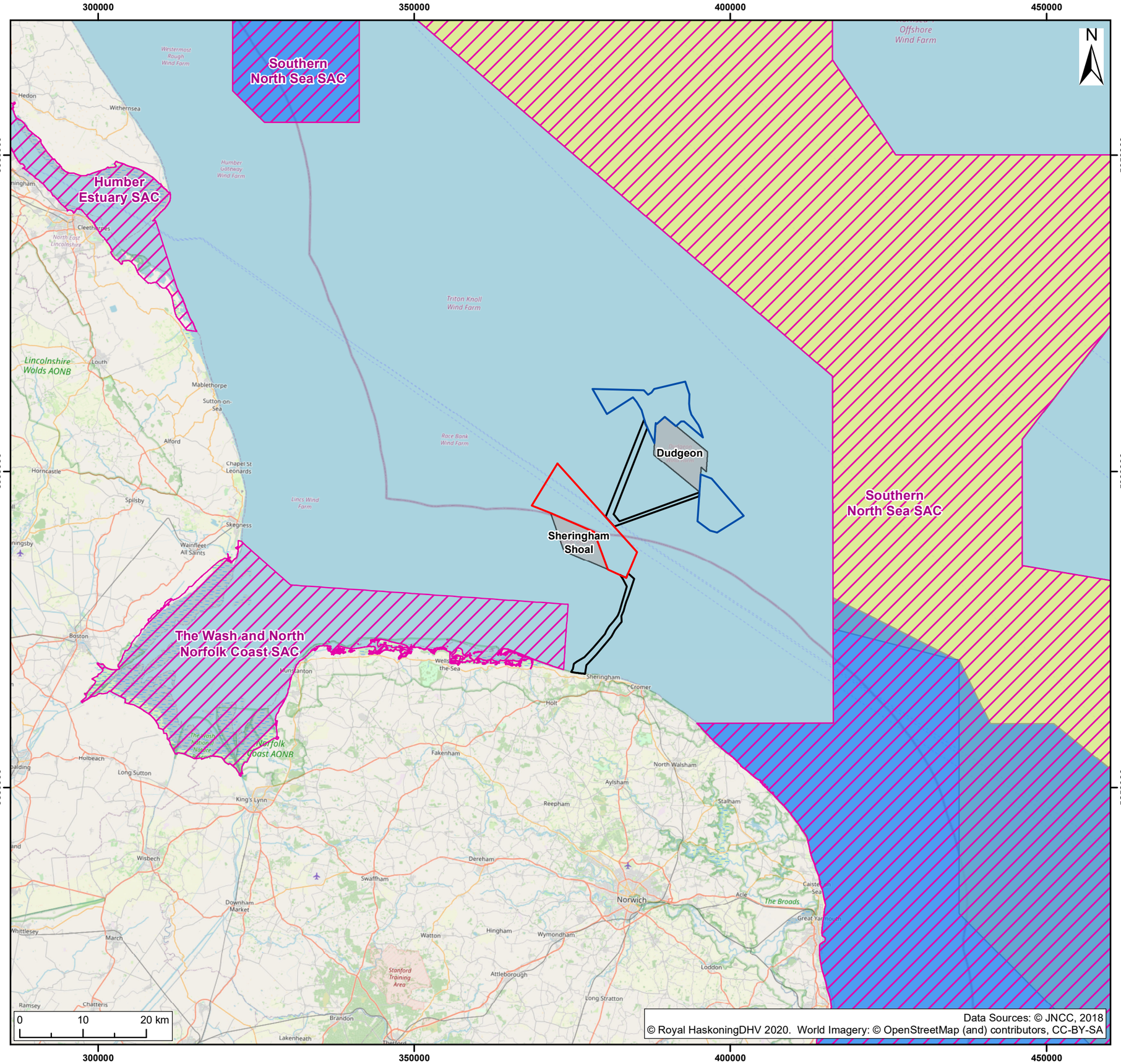
250. As harbour porpoise are wide-ranging within the North Sea MU, no discrete population can be assigned to an individual designated site. It is, therefore, assumed that at any one time, harbour porpoise within or in the vicinity of the offshore project area are associated with the Southern North Sea SAC (as they cannot simultaneously be part of the population of multiple designated sites, although all are part of the larger MU population). Therefore, with regard to the potential effects of underwater noise within the DEP and SEP sites and cable route, connectivity of harbour porpoise from other designated sites, other than the Southern North Sea SAC is screened out (**Table 6-4**).

251. Studies on the interactions between seals and offshore windfarms, have shown avoidance of pile driving activity out to ranges of 25km, but did not show avoidance of general construction activity or of operational windfarms (Russell *et al.,* 2016). Therefore, with regard to direct underwater noise effects on designated sites or individual grey seals and harbour seals within them, all designated sites for grey seal and harbour seal are screened out as they are all located more than 25km from DEP and SEP sites and cable route (**Table 6-4**).

252. Grey seals and harbour seals could come from any of the designated sites considered to have potential connectivity, even if those sites are at a distance of more than 25km (the potential disturbance range of 25km), due to their large foraging ranges. As a result, it will be assumed within the assessments that any grey or harbour seal within the DEP or SEP area, or within the potential disturbance ranges of the projects, could be from a designated site, but foraging within the vicinity of the site. Therefore, any potential effects to these species will be assessed based on them being from the nearest designated site for each species, and they have travelled away from the site in order to forage.

253. The Humber Estuary SAC (the nearest designated site for grey seal) and The Wash and North Norfolk Coast SAC (the nearest designated site for harbour seal) will be screened in for further assessment, as are within the foraging ranges of each species (100km for grey seal, and 80km for harbour seal). In addition, European sites that are within the identified foraging ranges for either grey seal or harbour seal have been screened in for assessment for the potential for disturbance from underwater noise.

254. There is the potential for LSE from underwater noise for harbour porpoise from the Southern North Sea SAC, grey seal from the Humber Estuary SAC and harbour seal from The Wash and North Norfolk Coast SAC, therefore these sites have been screened in for further assessment (**Table 6-3**).



Legend:

- Dudgeon Extension Project AfL Area
- Sheringham Extension Project AfL Area
- Offshore Cable Corridor
- Existing Offshore Wind Farm
- Special Area of Conservation (SAC)
- Southern North Sea SAC Summer Area
- Southern North Sea SAC Winter Area

S1	P01	02/06/2020	Suitable for Information	AZ	RS	AP
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Location of Dudgeon Extension and Sheringham Extension Projects and Marine Mammal Special Areas of Conservation (SAC)

Figure: 6.5	Drawing No: PB8164-RHD-ZZ-OF-DR-Z-0042

Co-ordinate system:	Page Size:	Scale:
WGS 1984 UTM Zone 31N	A3	1:600,000

Project:	Report:
Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions	HRA Screening Report

Royal HaskoningDHV
Enhancing Society Together

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6.2.1.2 Vessel interactions

256. Vessel activity will be concentrated in the vicinity of the DEP and SEP sites and cable route, beyond this, vessel activity will be dispersed and becomes part of the background vessel traffic, using already established vessel routes. It is likely that during construction, vessels will use regular routes between ports and the DEP and SEP sites and cable route which will allow marine mammals to become accustomed to vessels, in order to reduce any increased collision risk. Additionally, vessel operators will use good practice and common sense to reduce any risk of collisions with marine mammals.

257. For harbour porpoise, it is predicted that due to the proximity to the SNS SAC, all individuals that be at increased collision risk with vessels would be from the SNS SAC.

258. There is little information on collision rates or avoidance behaviour in seals, however it should be noted that the majority of vessels within the DEP and SEP sites and cable route will be slow moving or stationary. It is also highly unlikely that every seal in the offshore project area will be at risk of vessel collision.

259. In addition to the potential for any collision risk, the potential effects of underwater noise and disturbance from vessels will be assessed during construction, operation and decommissioning, including any potential in-combination effects.

260. The potential effects of vessel movements out with the DEP and SEP sites and cable route in the vicinity of any designated sites as they move between the port and the DEP and SEP sites will be assessed. The port location is not confirmed at this stage, however if a port to the north (e.g. Hull) is selected there is potential for impact on the Humber Estuary SAC and The Wash and North Norfolk Coast SAC, due to the proximity of this site to the potential port locations. The number of vessel movements between the port and DEP and SEP sites in relation to the existing vessel traffic will be assessed for any potential effects on seal species.

261. As outlined above, to take into account the movement of grey seal and harbour seal along the east coast of England, the Humber Estuary SAC and The Wash and North Norfolk Coast SAC was screened in with regard to any potential vessel interactions.

262. There is the potential for LSE from vessel interactions for harbour porpoise from the Southern North Sea SAC, grey seal from the Humber Estuary SAC and harbour seal from The Wash and North Norfolk Coast SAC, therefore these sites have been screened in for further assessment (**Table 6-3**).

6.2.1.3 Changes to prey species

263. Potential effects on prey species can result from physical disturbance and loss of seabed habitat; increased suspended sediment concentrations and sediment re-deposition; and underwater noise. The widest ranging potential effect on marine mammal prey species is likely to be underwater noise.

264. There is the potential for LSE as a result of any changes to prey availability for harbour porpoise from the Southern North Sea SAC, foraging grey seal from the Humber Estuary SAC and foraging harbour seal from The Wash and North Norfolk Coast SAC, therefore these sites have been screened in for further assessment (**Table 6-3**).

6.2.1.4 Changes to water quality

265. Changes to water quality can result from increased suspended sediments and disturbance of seabed sediments which has the potential to release any sediment-bound contaminants, such as heavy metals and hydrocarbons that may be present within them into the water column. The accidental release of contaminants (e.g. through spillage) also has the potential to effect water quality. Changes in water quality could have the potential to affect marine mammals in the area of impact either directly or in-directly via prey.

266. Any potential changes to water quality in the DEP and SEP sites could have the potential to directly or in-directly affect harbour porpoise from the SNS SAC. There is the potential for LSE as a result of any changes to water quality for harbour porpoise from the Southern North Sea SAC, therefore, this has been screened in for further assessment (**Table 6-3**).

267. Any potential changes to water quality in the DEP and SEP sites are unlikely to have a significant effect on foraging grey or harbour seal from the Humber Estuary SAC and from The Wash and North Norfolk Coast SAC, respectively, given the distance from the DEP and SEP sites. Therefore, these sites have been screened out for further assessment.

6.2.1.5 Disturbance at seal haul-out sites

268. The response of seals to disturbance at haul-out sites can range from increased alertness to moving into the water (Wilson, 2014). The potential impact of disturbance at seal breeding sites can include temporary or permanent pup separation, disruption of suckling, energetic costs and energetic deficit to pups, physiological stress and sometimes enforced move to distant or suboptimal habitat (Wilson, 2014). Potential impacts on moulting seals can include energy loss and stress, while impacts on other haul-out groups can cause loss of resting and digestion time and stress (Wilson, 2014). The potential impacts will be determined by the response of the seals, the duration and proximity of the disturbance to the seals.

269. Studies on the distance of disturbance, on land or in the water, from hauled-out seals have found that the closer the disturbance, the more likely seals are to move into the water. For the grey seal, mothers responded by moving into the water more due to boat speed rather than as a result of the distance, although movement into the water was generally observed to occur at distances of between 20m and 70m, with no detectable disturbance at 150m (Wilson, 2014; Strong and Morris, 2010). However, grey seals have also been reported to move into the water when vessels are at a distance of approximately 200m to 300m (Wilson, 2014).

270. During construction, O&M and decommissioning vessels moving to and from the offshore DEP and SEP sites and export cable corridor would not be moving within 500m of the coast. There is therefore no potential for any direct disturbance to hauled out seals as a result of vessel presence. Vessels will use the most direct routes to and from the site and ports and would be located a safe distance from the shore to avoid the risk of collision and grounding.

271. There is unlikely be any potential for disturbance of grey seal or harbour seal hauled out in the Humber Estuary SAC or The Wash and North Norfolk Coast SAC, respectively, as a result of vessels moving to and from the offshore DEP and SEP sites and export cable corridor. However, as a precautionary approach, any disturbance at seal haul-out sites from vessels has been screened in for further assessment.

272. The proposed landfall site for the cable route is located outwith the boundary for the Humber Estuary SAC and The Wash and North Norfolk Coast SAC (**Figure 6-5**), and therefore there is unlikely to be any potential for disturbance of grey seal or harbour seal hauled out in the Humber Estuary SAC or The Wash and North Norfolk Coast SAC, respectively, as a result of activities at the landfall site. However, as a precautionary approach, any disturbance at seal haul-out sites has been screened in for further assessment.

6.2.1.6 Disturbance of foraging seals at sea

273. Grey seal and harbour seal both exhibit alternate periods of foraging and resting at haul out sites (during which limited, or no feeding occurs). Although adult seals may be relatively robust to short term changes in prey availability, young and small individuals have a more sensitive energy balance; this is exhibited through effects of mass dependant survival (Harding *et al.,* 2005).

274. Tagged harbour seals in the Wash indicated that seals were not excluded from the vicinity of the Lincs windfarm during the overall construction phase, but that there was clear evidence of avoidance during pile driving, with significantly reduced levels of seal activity at ranges up to 25km from piling sites (Russell *et al.,* 2016). However, within two hours of piling cessation, the harbour seal distribution returned to normal pre-piling levels (Russell *et al.,* 2016).

275. To take into account the movement of both grey seal and harbour seal along the east coast of England, the Humber Estuary SAC and The Wash and North Norfolk Coast SAC were screened in. The potential for disturbance of foraging grey and harbour seal from the Humber Estuary SAC and The Wash and North Norfolk Coast SAC, respectively, as a result of activities in the DEP and SEP sites or cable route has been screened in for further assessment (**Table 6-3**).

6.2.2 DEP and SEP Together

276. All of the potential effects screened in for harbour porpoise from the Southern North Sea SAC, grey seal from the Humber Estuary SAC and harbour seal from The Wash and North Norfolk Coast SAC for DEP or SEP alone (**Section 6.2.1**) will also be assessed for potential effects for DEP and SEP together (**Table 6-3**).

6.2.3 In-combination Effects

277. The Stage 2 in-combination assessment will consider plans or projects where the predicted effects have the potential to interact with effects from the proposed construction, operation and maintenance or decommissioning of the DEP and SEP projects.

278. The in-combination assessment considers potential effects from all stages of any plan or project where there is the potential for any in-combination effects with the proposed DEP and SEP projects.

279. For harbour porpoise, the plans and projects assessed for potential in-combination effects are located within (i) the agreed reference population boundary of the North Sea MU for harbour porpoise; and (ii) the SNS SAC or within 26km of the SNS SAC boundary.

280. For grey and harbour seal, the plans and projects assessed for potential in-combination effects are located within (i) the agreed reference population boundary; and (ii) have the potential to affect foraging seals.

281. The projects identified for potential in-combination assessment will be discussed during ETG meetings with stakeholders. The full list of activities and projects for consideration will be updated following PEIR and agreed in consultation with the Marine Mammal ETG. An initial review of the other currently planned projects identified seven possible projects that have the potential to have in-combination effects with the proposed DEP and SEP activities. This could include, but will not be limited to:

- Dudgeon Offshore Wind Farm (maintenance and decommissioning);
- Sheringham Shoal Offshore Wind Farm (maintenance and decommissioning);
- Hornsea Project Three Offshore Wind Farm;
- Hornsea Project Four Offshore Wind Farm;
- Norfolk Vanguard Offshore Wind Farm;
- Norfolk Boreas Offshore Wind Farm; and
- Nearshore Seaweed Cultivation of Native Species.

6.2.4 Marine Mammals Screening Summary

282. Of all the designated sites initially considered in the HRA screening for marine mammals (**Table 6-4**), three sites, the SNS SAC for harbour porpoise, Humber Estuary SAC for grey seal and The Wash and North Norfolk Coast SAC for harbour seal, have been screened in for further assessment to determine the potential for any adverse effects on the integrity of the sites in relation to the conservation objectives as result of DEP and SEP alone, DEP and SEP together and in-combination with other projects and activities (**Table 6-3**).

Table 6-3: Designated sites where marine mammals are a qualifying feature (or feature of interest) screened into the HRA for further assessment

Designated site	Species	Reason for screening in
Southern North Sea SAC	Harbour porpoise	Potential effects from: ○ underwater noise; ○ vessel interactions; ○ changes to prey resources; ○ changes to water quality; and ○ any in-combination effects.
Humber Estuary SAC [UK0030170]	Grey seal	Potential effects from: ○ underwater noise; ○ vessel interactions; ○ changes to prey resources; ○ disturbance at seal haul-out sites; ○ disturbance of foraging seals at sea; and ○ any in-combination effects.
The Wash and North Norfolk Coast SAC [UK0017075]	Harbour seal	Potential effects from: ○ underwater noise; ○ vessel interactions; ○ changes to prey resources; ○ disturbance at seal haul-out sites; ○ disturbance of foraging seals at sea; and ○ any in-combination effects.

Table 6-4: Screening list of SACs and SCIs for harbour porpoise, grey seal and harbour seal (screened out sites are shown in grey).

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
UK0017075	The Wash and North Norfolk Coast	Harbour seal	B	-	Y	24.3	8.3	1.3	In	Potential effects from underwater noise; vessel interactions; changes to water quality; changes to prey resources; and disturbance at seal haul-out sites for grey and harbour seal.
UK0030395	Southern North Sea	Harbour porpoise	A	Y	Y	14.1	25.6	19.2	In	DEP and SEP offshore project area is outwith the Southern North Sea SAC. The proposed cable landfall is within the SNS SAC winter area. Assumed that all harbour porpoise in the DEP and SEP area are associated with the SNS SAC. Potential effects from underwater noise; vessel interactions; changes to water quality; changes to prey resources; and any in-combination effects.

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
UK0030170	Humber Estuary	Grey seal	C	-	Y	62.2	59.7	77.1	In	Potential effects from underwater noise; vessel interactions; changes to water quality; changes to prey resources; and disturbance at seal haul-out sites.
NL2008002	Klaverbank	Harbour porpoise	B	Y	Y	114	134	137	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	C							
		Harbour seal	C							
NL2008001	Doggersbank	Harbour porpoise	B	Y	Y	144	167	174	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	C							
		Harbour seal	C							
BEMNZ0001	Vlaamse Banken	Harbour porpoise	A	Y	Y	192	192	181	Out	The distance between the potential impact range of the

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
		Grey seal	A							proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	A							
FR3102002	Bancs des Flandres	Harbour porpoise	B	Y	Y	209	204	191	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	C							
		Harbour seal	C							
NL9802001	Noordzeekustzone	Harbour porpoise	C	Y	Y	205	221	221	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	A							
		Harbour seal	A							
NL4000017	Voordelta	Harbour porpoise	C	Y	Y	209	215	209	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are
		Grey seal	B							
		Harbour seal	B							

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
		Harbour seal	C							negligible and would result in no potential for LSE.
NL2008003	Vlakte van de Raan	Harbour porpoise	C	Y	Y	214	217	209	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	B							
		Harbour seal	B							
NL2003060	Duinen en Lage Land Texel	Grey seal	C	Y	Y	213	230	230	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
BEMNZ0002	SBZ 1 / ZPS 1	Harbour seal	C	-	Y	228	226	214	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
NL1000001	Waddenzee	Harbour porpoise	C	Y	Y	214	230	231	Out	The distance between the potential impact range of the

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
		Grey seal	A							proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	A							
BEMNZ0005	Vlakte van de Raan	Harbour porpoise	C	Y	Y	223	225	217	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	C							
		Harbour seal	B							
FR3102003	Récifs Gris-Nez Blanc-Nez	Harbour porpoise	C	Y	Y	240	233	219	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	C							
		Harbour seal	C							
NL3009016	Oosterschelde	Harbour porpoise	C	Y	Y	224	229	224	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	C							
		Harbour seal	C							

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
NL9801079	Duinen Goeree & Kwade Hoek	Grey seal	C	-	Y	219	226	224	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	C							
NL4000021	Grevelingen	Grey seal	C	-	Y	222	229	225	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	C							
FR3100474	Dunes de la plaine maritime flamande	Harbour seal	C	-	Y	237	234	222	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR3102004	Ridens et dunes hydrauliques du détroit du Pas-de-Calais	Harbour porpoise	C	Y	Y	244	237	222	Out	The distance between the potential impact range of the proposed project and the extent of any impact on
		Grey seal	C							

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
		Harbour seal	C							individuals from this site are negligible and would result in no potential for LSE.
NL2003061	Duinen Vlieland	Grey seal	C	Y	Y	227	244	245	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR3100478	Falaises du Cran aux Oeufs et du Cap Gris-Nez, Dunes du Chatelet, Marais de Tardinghen et Dunes de Wissant	Harbour porpoise	C	Y	Y	250	244	230	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	B							
		Harbour seal	C							
NL2003059	Duinen Terschelling	Grey seal	C	Y	Y	243	260	261	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
FR3100480	Estuaire de la Canche, dunes picardes plaquées sur l'ancienne falaise, forêt d'Hardelot et falaise d'Equihen	Harbour seal	C	-	Y	273	266	251	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR3102005	Baie de Canche et couloir des trois estuaires	Harbour porpoise	C	Y	Y	286	279	264	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	B							
		Harbour seal	A							
NL3009005	Duinen Ameland	Grey seal	C	Y	Y	273	291	292	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
UK0017072	Berwickshire and North Northumberland Coast	Grey seal	B	-	Y	284	291	311	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
										negligible and would result in no potential for LSE.
FR3100482	Dunes de l'Authie et Mollières de Berck	Harbour seal	C	Y	Y	306	299	285	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR2200346	Estuaires et littoral picards (baies de Somme et d'Authie)	Grey seal	B	-	Y	307	300	285	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	A							
DE1003301	Doggerbank	Harbour porpoise	B	Y	Y	290	313	319	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	C							
DE2104301	Borkum-Riffgrund	Harbour porpoise	C	Y	Y	316	334	335	Out	The distance between the potential impact range of the

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
		Grey seal	C							proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	B							
DE2306301	Nationalpark Niedersächsisches Wattenmeer	Harbour porpoise	B	Y	Y	339	357	358	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	A							
		Harbour seal	A							
DE2507301	Hund und Paapsand	Harbour seal	C	-	Y	359	376	377	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DE2507331	Unterems und Außenems	Harbour seal	C	-	Y	360	377	378	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
DE1209301	Sylter Außenriff	Harbour porpoise	A	Y	Y	367	388	390	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	A							
		Harbour seal	A							
FR2300121	Estuaire de la Seine	Harbour seal	C	-	Y	413	404	387	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR2500085	Récifs et marais arrière-littoraux du Cap Lévi à la Pointe de Saire	Grey seal	C	-	Y	422	409	392	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	C							
FR2502021	Baie de Seine orientale	Harbour porpoise	C	Y	Y	423	413	396	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are
		Harbour seal	C							

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
										negligible and would result in no potential for LSE.
UK0030172	Isle of May	Grey seal	B	-	Y	395	401	422	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR2502020	Baie de Seine occidentale	Harbour porpoise	C	Y	Y	432	420	402	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	A							
FR2500088	Marais du Cotentin et du Bessin - Baie des Veys	Grey seal	C	-	Y	445	432	415	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	A							
DE1011401	SPA Östliche Deutsche Bucht	Harbour porpoise	A	Y	Y	418	436	438	Out	The distance between the potential impact range of the

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
		Grey seal	A							proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	A							
UK0030311	Firth of Tay and Eden Estuary	Harbour seal	B	-	Y	420	426	447	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00VA347	Sydlige Nordsø	Harbour porpoise	B	Y	Y	422	443	446	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	B							
		Harbour seal	B							
DE1813391	Helgoland mit Helgoländer Felssockel	Harbour porpoise	C	Y	Y	429	447	448	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	A							
		Harbour seal	C							

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
DE1714391	Steingrund	Harbour porpoise	C	Y	Y	440	458	459	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	A							
		Harbour seal	C							
DE0916391	NTP S-H Wattenmeer und angrenzende Küstengebiete	Harbour porpoise	A	Y	Y	451	469	471	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	A							
		Harbour seal	A							
DE2016301	Hamburgisches Wattenmeer	Harbour porpoise	C	Y	Y	451	469	470	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	C							
		Harbour seal	B							
DE1315391	Küsten- und Dünenlandschaften Amrums	Grey seal	B	-	Y	474	491	493	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are

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				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
										negligible and would result in no potential for LSE.
DE1115391	Dünenlandschaft Süd-Sylt	Grey seal	C	-	Y	476	494	496	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR2500079	Chausey	Grey seal	C	N	Y	509	496	479	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00AY176	Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde	Harbour porpoise	C	Y	Y	489	508	510	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Grey seal	A							
		Harbour seal	A							
FR2500077	Baie du Mont Saint-Michel	Grey seal	B	N	Y	527	514	497	Out	The distance between the potential impact range of the

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				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
		Harbour seal	A							proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR5300010	Tregor Goëlo	Grey seal	C	N	Y	560	546	529	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR5300009	Côte de Granit rose-Sept-Iles	Grey seal	A	N	Y	567	552	536	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00EY133	Agger Tange, Nissum Bredning, Skibsted Fjord og Agerø	Harbour seal	C	-	Y	568	592	596	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
										negligible and would result in no potential for LSE.
FR5300015	Baie de Morlaix	Grey seal	C	N	Y	606	591	575	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00CY040	Venø, Venø Sund	Harbour seal	B	N	Y	579	602	605	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site would result in no potential for LSE.
UK0019806	Dornoch Firth and Morrich More	Harbour seal	C	-	Y	590	598	618	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00VA259	Gule Rev	Harbour porpoise	C	Y	-	598	621	626	Out	The distance between the potential impact range of the

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				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
										proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00EX026	Dråby Vig	Harbour seal	C	N	Y	613	636	639	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00EY134	Lovns Bredning, Hjarbæk Fjord og Skals, Simested og Nørre Ådal, Skravad Bæk	Harbour seal	C	N	Y	615	638	641	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR5300017	Abers - Côtes des légendes	Grey seal	C	N	Y	647	631	616	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
DK00EY124	Løgstør Bredning, Vejlerne og Bulbjerg	Harbour seal	B	-	Y	619	643	646	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR5300018	Ouessant-Molène	Grey seal	A	N	Y	677	661	646	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00FX123	Nibe Bredning, Halkær Ådal og Sønderup Ådal	Harbour seal	C	N	Y	646	669	672	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR5300019	Presqu'Ile de Crozon	Grey seal	C	N	Y	682	667	651	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are

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				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
										negligible and would result in no potential for LSE.
FR5302006	Côtes de Crozon	Grey seal	C	N	Y	689	674	658	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00FX122	Ålborg Bugt, Randers Fjord og Mariager Fjord	Harbour seal	C	N	Y	663	684	687	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR5300020	Cap Sizun	Grey seal	C	N	Y	696	681	665	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR5300023	Archipel des Glénan	Grey seal	C	N	Y	702	687	671	Out	The distance between the potential impact range of the

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
										proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR5302008	Roches de Penmarch	Grey seal	C	N	Y	709	694	678	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
FR5302007	Chaussée de Sein	Grey seal	C	N	Y	716	701	685	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00VA258	Store Rev	Harbour porpoise	C	Y	-	685	708	713	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
UK0030069	Sanday	Harbour seal	B	-	Y	690	700	720	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
UK0017096	Faray and Holm of Faray	Grey seal	B	-	Y	696	705	725	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK006X233	Havet og kysten mellem Præstø Fjord og Grønsund	Harbour seal	C	N	Y	712	730	732	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
DK00FX112	Skagens Gren og Skagerak	Harbour porpoise	B	Y	-	718	741	745	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
										negligible and would result in no potential for LSE.
DK00FX010	Strandenge på Læsø og havet syd herfor	Grey seal	C	N	Y	728	750	753	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	B							
DK00FX113	Hirsholmene, havet vest herfor og Ellinge Å's udløb	Grey seal	B	N	Y	729	752	755	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	C							
DK003X202	Hesselø med omliggende stenrev	Grey seal	B	N	Y	730	750	752	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	B							

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
DK00DX146	Anholt og havet nord for	Grey seal	A	N	Y	740	762	764	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	B							
DK00FX257	Havet omkring Nordre Rønner	Grey seal	C	N	Y	745	768	771	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
		Harbour seal	B							
UK0012711	Mousa	Harbour seal	B	-	Y	753	764	782	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0420360	Nordvästra Skånes havsområde	Grey seal	C	N	Y	761	781	783	Out	The distance between the potential impact range of the

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
		Harbour seal	C							proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0420002	Hallands Väderö	Harbour seal	B	N	Y	792	812	814	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0510050	Balgö	Harbour seal	C	N	Y	794	816	818	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
UK0012687	Yell Sound Coast	Harbour seal	C	-	Y	796	807	826	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
SE0510084	Nidingen	Harbour seal	C	N	Y	796	818	821	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
SE0520001	Vrångöskärgården	Harbour seal	B	N	Y	798	821	824	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0510058	Kungsbackafjorden	Harbour seal	C	N	Y	801	824	826	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0520036	Sälöfjorden	Harbour seal	C	Y	Y	808	831	834	Out	The distance between the potential impact range of the proposed project and the extent of any impact on

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
										individuals from this site are negligible and would result in no potential for LSE.
SE0520176	Pater Noster-skärgården	Harbour seal	C	-	Y	808	832	835	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0520043	Nordre älvs estuarium	Harbour seal	C	-	Y	811	835	838	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0520058	Måseskär	Harbour seal	C	-	Y	814	837	841	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
SE0520171	Gullmarsfjorden	Harbour seal	C	-	Y	821	844	848	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0520057	Malmöfjord	Harbour seal	C	-	Y	827	850	854	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0520188	Soteskär	Harbour seal	C	-	Y	830	853	858	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site are negligible and would result in no potential for LSE.
SE0520170	Kosterfjorden-Väderöfjorden	Harbour porpoise	C	Y	Y	832	855	860	Out	The distance between the potential impact range of the proposed project and the

Site code	Site Name	Species	Population Grade	Reason for Inclusion in Screening		Distance to the Project			Screening Decision	
				Within NS MU	Within OSPAR region	DEP site (km)	SEP site (km)	Export cable corridor (km)	Screened in or out	Reason
		Harbour seal	C							extent of any impact on individuals from this site are negligible and would result in no potential for LSE.

7 Offshore Ornithology

7.1 Approach to Screening

283. Birds present in offshore waters and potentially affected by DEP and SEP will be predominantly seabirds (defined for this report as auks, gulls, terns, gannets, skuas, shearwaters, petrels and divers). These species have the potential to be present during the breeding season, non-breeding season and the spring/autumn migration/passage periods. Other bird species that may be affected by the Projects include waterfowl (swans, geese, ducks and waders) and other bird species which may fly through the Project areas during spring and/or autumn migration/passage periods.

284. For offshore ornithology receptors during the breeding season, the HRA screening focuses primarily on the potential for connectivity between seabirds breeding at colonies which are classified as SPAs, and the Projects.

285. Outside the breeding season, seabirds breeding at SPAs located beyond the breeding season foraging range of the Projects may spend part or all of the non-breeding season in the vicinity of the Projects, either wintering or migrating through on spring and/or autumn passage to wintering areas. During this time the number of SPAs with potential connectivity to the Projects will increase.

286. The HRA screening exercise considers sites which meet the following criteria:

- A component part of the Project(s) overlaps directly with a European Site (i.e. an SPA or Ramsar site) with bird species as qualifying features;
- The distance between the Projects and a European site with a bird interest feature is within the range for which there could be an interaction (i.e. the pathway is not too long). For seabirds during the breeding season this element of the screening process is informed by published information on foraging ranges (Woodward *et al.*, 2019). For seabirds during the non-breeding season, screening is informed by reference to the Furness (2015) report on non-breeding population sizes of birds in the UK, whilst for non-breeding birds, populations within 100km of the Projects have been considered; and
- The distance between the Project(s) and resources on which the interest feature depends (i.e. an indirect effect acting through prey or access to habitat) is within the range for which there could be an interaction (i.e. the pathway is not too long), applying professional judgment.

287. Assessment of species-specific risk to potential effects of OWFs is informed by industry standard advice and guidance and relevant scientific papers as well as assessments for recently proposed OWFs in the Southern North Sea, and representations from stakeholders during DCO examinations.

288. Information on SPAs, Ramsar sites and their qualifying features is taken from SPA citations/Natura 2000 forms, conservation objectives, departmental briefs and Ramsar site lists and Information Sheets as published by the SNCBs (e.g. Natural England's designated sites view [redacted] Scottish Natural Heritage's SiteLink [redacted] , and JNCC's list of Ramsar sites https://jncc.gov.uk/our-work/ramsar-sites/). Distances between sites and DEP / SEP were measured in GIS using SPA and Ramsar shapefiles also downloaded from SNCB websites.

289. It should be noted that whilst the screening has been undertaken with regard to both DEP and SEP, any differences between the screening outcome for each project have been identified where relevant. This is only the case for the red-throated diver interest feature of the Greater Wash SPA.

7.1.1 Potential Effects (Source)

290. The potential effects on offshore ornithology receptors from the Projects have been identified within the Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions Scoping Report (Royal HaskoningDHV, 2019) and Scoping Opinion (The Planning Inspectorate, 2019). Direct or indirect effects to offshore ornithology receptors in offshore waters may arise from temporary and permanent infrastructure and activities associated with the construction, operation and decommissioning of the Projects (**Table 7-1**).

Table 7-1: Summary of potential effects of the Projects for offshore ornithology receptors: scoped in (✓) and scoped out (x).

Potential Effects	Construction	Operation	Decommissioning
Direct disturbance and displacement due to work activity, presence of turbines and other infrastructure, vessel movements and lighting	✓	✓	✓
Collision risk due to the presence of turbines	x	✓	x
Barrier effects due to the presence of turbines and other infrastructure	✓ (from erection of first turbine)	✓	✓ (until final turbine is removed)
Indirect impacts through effects on habitats and prey species	✓	✓	✓

7.1.2 Identification of Sites and Features (Pathway and Receptor)

291. Screening was carried out for all UK coastal, wetland and marine SPAs and Ramsar sites within approximately 100km of the Projects. It was considered that 100km represents a reasonable cut off point, based on expert opinion. The probability that a large enough number of waders, wildfowl or other migrants, from a particular SPA located in excess of 100km from DEP and SEP could be present at DEP or SEP to result in an LSE is considered to be highly remote.

292. Beyond this distance, only SPAs on the east coast of Britain which are classified for breeding seabirds were considered. This is because seabirds are the key species which may be subject to effects from OWFs. The breeding season is the time when breeding seabirds are most constrained in their foraging ranges and most likely to be susceptible to effects as a result of the construction, operation and decommissioning of the Projects. For these SPAs, published evidence of the foraging behaviour of seabirds during the breeding season (Woodward *et al.*, 2019) and migratory behaviour of seabirds during the non-breeding season (Furness, 2015) was used to identify the area of search for SPAs and Ramsar sites considered the most likely to have connectivity with the Projects.

293. This approach was informed by the HRA screening reports for OWFs most recently submitted to PINS for DCO (e.g. East Anglia ONE North (Royal HaskoningDHV, 2019)).

294. There is potential for connectivity between the Projects and transboundary sites. OWFs recently submitted for DCO (e.g. East Anglia ONE North, Royal HaskoningDHV (2019)), have considered a number of non-UK SPAs in the North Sea during HRA screening. However, no transboundary SPAs were screened in for LSE for this project either for the project alone or in-combination effects.

295. Given this finding and the relatively close proximity (about 100km) of the Projects to East Anglia ONE North, a similar situation is anticipated for the Projects. No transboundary sites have been considered for non-breeding birds in the current HRA screening exercise, as there are none within 100km of the Projects. However, several SPAs for breeding seabirds are considered.

7.1.3 Summary of Baseline Information from the Projects

296. Digital aerial surveys for offshore ornithology occurred from May 2018 to April 2020. The bird species recorded within the survey area (which covered DEP, SEP and a minimum 4km buffer), and their season occurrence (i.e. presence) during this period by month are listed in **Table 7-2**. Table 7-2: Bird species recorded in the Projects survey area by baseline surveys between May 2018 and October 2019, and their seasonal occurrence.

Species	J	F	M	A	M	J	J	A	S	O	N	D
Arctic skua *Stercorarius parasiticus*										✓		
Arctic tern *Sterna paradisaea*				✓	✓	✓						
Black-headed gull					✓		✓	✓		✓		

Species	J	F	M	A	M	J	J	A	S	O	N	D
Chroicocephalus ridibundus												
Common gull *Larus canus*	✓	✓	✓	✓	✓			✓	✓	✓	✓	
Common scoter *Melanitta nigra*										✓		✓
Common tern *Sterna hirundo*				✓	✓	✓						
Cormorant *Phalacrocorax carbo*					✓		✓	✓				
Fulmar *Fulmarus glacialis*		✓	✓	✓	✓	✓	✓	✓	✓			✓
Gannet *Morus bassanus*		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Golden plover *Pluvialis apricaria*								✓				
Great black-backed gull *Larus marinus*	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Great crested grebe *Podiceps cristatus*										✓		
Great skua *Stercorarius skua*										✓	✓	
Guillemot *Uria aalge*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Herring gull *Larus argentatus*	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Kestrel *Falco tinnunculus*				✓								
Kittiwake *Rissa tridactyla*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Knot *Calidris canutus*					✓							
Lapwing *Vanellus vanellus*		✓										
Lesser black-backed gull *Larus fuscus*				✓	✓	✓	✓	✓	✓	✓		✓
Little gull *Hydrocoloeus minutus*								✓	✓	✓	✓	✓
Long-tailed skua *Stercorarius longicaudus*					✓							
Manx shearwater *Puffinus puffinus*					✓				✓	✓		
Oystercatcher *Haematopus ostralegus*								✓				
Pomarine skua *Stercorarius pomarinus*												✓

Species	J	F	M	A	M	J	J	A	S	O	N	D
Puffin *Fratercula arctica*		✓		✓	✓		✓		✓	✓	✓	
Razorbill *Alca torda*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Red-throated diver *Gavia stellata*	✓	✓	✓	✓	✓				✓	✓	✓	✓
Sandwich tern *Thalasseus sandvicensis*				✓	✓	✓	✓	✓	✓			
Tufted duck *Aythya fuligula*												✓
Woodpigeon *Columba palumbus*										✓		

7.1.4 Biologically Relevant Seasons for Seabirds Recorded During Baseline Surveys

297. Biologically relevant seasons for each seabird species included in **Table 7-2** are presented in **Table 7-3**.

Table 7-3. Biologically relevant seasons for seabird species recorded during proposed project baseline surveys between May 2018 and October 2019. Prefix "e" = early, "m" = mid and "l" = late.

Species	Breeding	Migration-free Breeding	Autumn Migration (UK Waters)	Winter	Spring Migration (UK Waters)	Non-breeding	Source
Arctic skua	May - Jul	Jun - Jul	Aug - Oct	Nov - Mar	Apr - May	Aug - Apr	Furness (2015)
Arctic tern	May - e.Aug	Jun	Jul - e.Sept	Oct - Mar	Apr - May	m.Aug - Apr	Furness (2015)
Common gull	-	May - Jul	-	-	-	Aug - Apr	Cramp and Simmons (1983)
Common tern	May - Aug	Jun - m.Jul	l.Jul - e.Sept	Oct - Mar	Apr - May	Sept - Apr	Furness (2015)
Cormorant	Apr - Aug	May - Jul	Aug - Oct	Nov - Jan	Feb - Apr	Sept - Mar	Furness (2015)
Fulmar	Jan - Aug	Apr - Aug	Sept - Oct	Nov	Dec - Mar	Sept - Dec	Furness (2015)
Gannet	Mar - Sept	Apr - Aug	Sept - Nov	None	Dec - Mar	Oct - Feb	Furness (2015)
Great black-backed gull	l.Mar - Aug	May - Jul	Aug - Nov	Dec	Jan - Apr	Sept - Mar	Furness (2015)
Great skua	May - Aug	May - Jul	Aug - Oct	Nov - Feb	Mar - Apr	Sept - Apr	Furness (2015)
Guillemot	Mar - Jul	Mar - Jun	Jul - Oct	Nov	Dec - Feb	Aug - Feb	Furness (2015)
Herring gull	Mar - Aug	May - Jul	Aug - Nov	Dec	Jan - Apr	Sept - Feb	Furness (2015)
Kittiwake	Mar - Aug	May - Jul	Aug - Dec	None	Jan - Apr	Sept - Feb	Furness (2015)
Lesser black-backed gull	Apr - Aug	May - Jul	Aug - Oct	Nov - Feb	Mar - Apr	Sept - Mar	Furness (2015)
Little gull	Apr - Jul	May - Jul	-	-	-	Aug - Apr	Cramp and Simmons (1983)
Pomarine skua	-	-	Apr - May	-	Sept - Oct	-	Cramp and Simmons (1983)
Puffin	Apr - e.Aug	May - Jun	l.Jul - Aug	Sept - Feb	Mar - Apr	m.Aug - Mar	Furness (2015)
Razorbill	Apr - Jul	Apr - Jun	Aug - Oct	Nov - Dec	Jan - Mar	Aug - Mar	Furness (2015)
Red-throated diver	Mar - Aug	May - Aug	Sept - Nov	Dec - Jan	Feb - Apr	-	Furness (2015)
Sandwich tern	Apr - Aug	Jun	Jul - Sept	-	Mar - May	Sept - Mar	Furness (2015)

298. Based on the species listed in **Table 7-2** and their seasonal occurrence (seasons being defined in **Table 7-3**), mean maximum and maximum foraging distances for breeding adults of relevant species from the latest source of this information (Woodward *et al.*, 2019) are presented in **Table 7-4**, along with other species not recorded during the baseline surveys of May 2018 to October 2019 that are considered relevant due to known breeding colonies within the vicinity of the Projects. These are used in the screening to assess potential breeding season connectivity for seabirds breeding at SPAs and Ramsar sites and the Projects.

Table 7-4: Relevant mean maximum and maximum seabird foraging distances from breeding colonies (Woodward et al. 2019).

Species	Mean Maximum Foraging Range (km ± Standard Deviation)[1]	Maximum Foraging Range (km)
Arctic skua	No data	No data
Arctic tern	25.7 (± 14.8)	46
Common gull	50 (no S.D.)	50
Common tern	18.0 (± 8.9)	30
European storm petrel *Hydrobates pelagicus*	336 (no S.D.)	336
Fulmar	542.3 (± 657.9)	2,736
Gannet	315.2 (± 194.2)	709
Great black-backed gull	73 (no S.D.)	73
Great skua	443.3 (± 487.9)	1,003
Guillemot[2]	55.5 (± 39.7)	135
Herring gull	58.8 (± 26.8)	92
Kittiwake	156.1 (± 144.5)	770
Lesser black-backed gull	127.0 (± 109)	533
Little tern	5.0 (no S.D.)	5
Manx shearwater	1,346.8 (± 1,018.7)	2,890
Puffin	137.1 (± 128.3)	383
Razorbill[3]	73.8 (± 48.4)	191
Red-throated diver	9 (no S.D.)	9
Sandwich tern	34.3 (± 23.2)	80

1. The mean maximum foraging range for a species is the mean of the maximum foraging range recorded from each colony for which foraging range data were available.
2. Data from Fair Isle excluded due to reduced prey availability causing increased foraging range (including Fair Isle increases maximum to 338km, mean maximum 73.2 (± 80.5).
3. Data from Fair Isle excluded due to reduced prey availability causing increased foraging range (including Fair Isle increases maximum to 313km, mean maximum 88.7 (±75.9).

299. The mean maximum foraging range for a species is generally considered to be the most appropriate measure in identifying spatial overlap between an OWF and the probable foraging grounds of a breeding seabird colony, and therefore connectivity between the colony and the foraging habitat where the OWF is located. Breeding qualifying features of SPAs and Ramsar sites within the mean maximum foraging range of the Projects are screened in, unless there is a justifiable biological reason for them being screened out. This mostly concerns the observation of parapatric competition between kittiwake, guillemot and gannet colonies during the breeding season (Wakefield *et al.*, 2017, 2013), which means that the foraging areas of birds from different colonies do not tend to overlap. Therefore, in some cases, utilisation distributions of key species (Cleasby *et al.*, 2020, 2018; Wakefield *et al.*, 2017) have been consulted to assess the likely origin of particular species recorded within the baseline survey area for the Projects.

300. Outside the breeding season seabirds no longer conform to central place foraging theory and disperse over greater distances than breeding season foraging ranges from their colonies. During this time, breeding adults from SPA colonies may encounter OWFs from which they are at risk of displacement or collision, which would not have presented such a risk during the breeding season. These breeding adults are assumed to mix evenly with non-breeding birds which may be immature or sub-adults; most seabirds take several years to reach breeding age so that large proportions of the populations are sub-adult. In turn, this population is then assumed to mix evenly with seabirds from other colonies. Biologically Defined Minimum Population Scales (BDMPS) and total population estimates for UK seabirds outside the breeding season are described by Furness (2015), along with approximate seasonal movement patterns. BDMPS areas are extensive and overall population sizes for individual species are generally large, consisting of the combined populations of many seabird colonies from both the UK and further afield, so the proportion of birds from a given SPA population that might be at risk of displacement or collision with the Projects outside the breeding season is usually considered to be very small due to the effect of dilution. The screening process uses the relevant BDMPS presented in Furness (2015) to estimate the proportion of the population recorded at DEP and SEP that originate from a particular SPA. This information is used to judge whether a particular qualifying feature should be screened into or out of further assessment based on whether LSE can be ruled out.

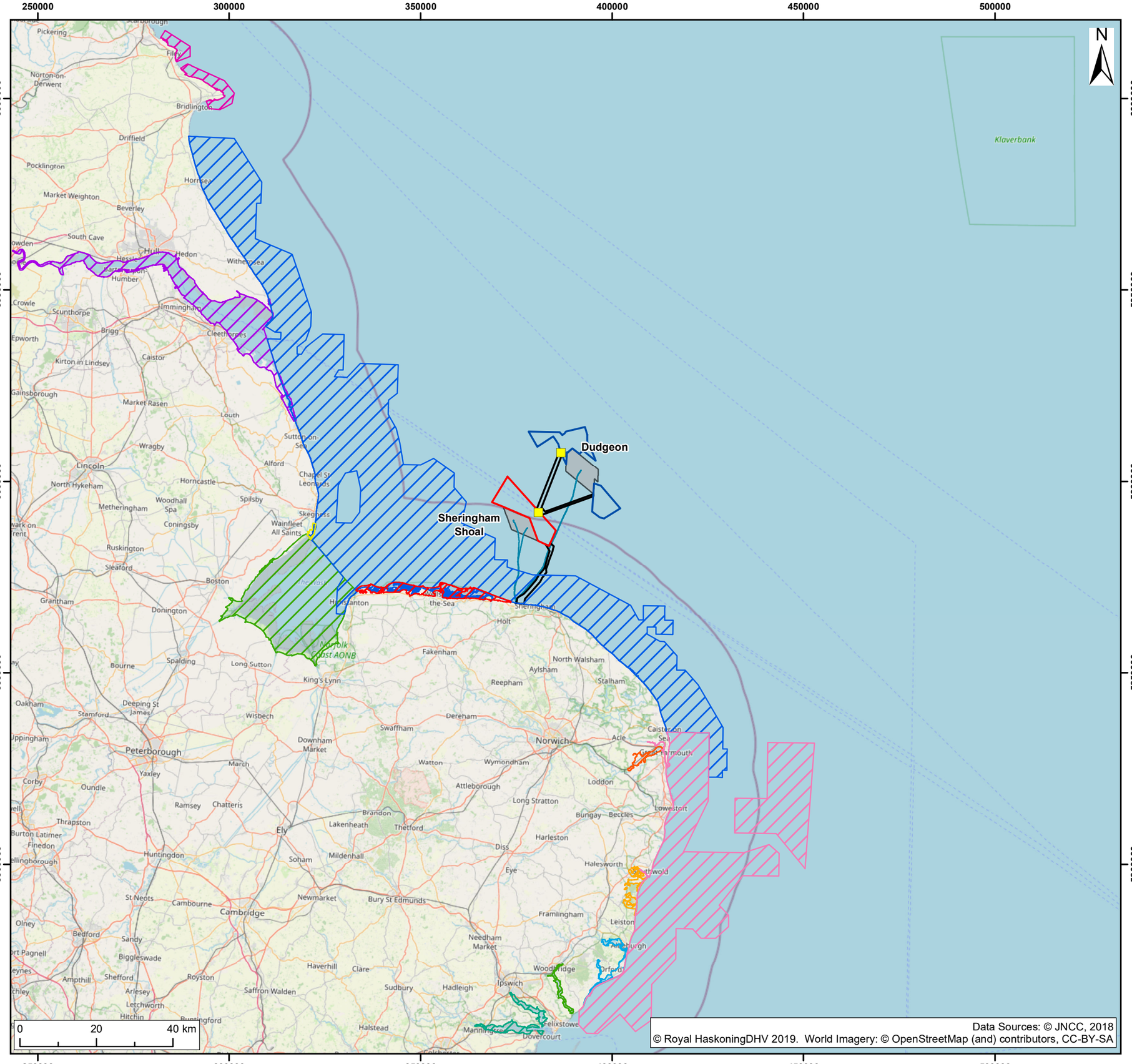
301. In addition to seabirds, other bird species that migrate across areas of open sea may encounter OWFs and be at risk of collision if they fly through a turbine array, or displacement and barrier effects if they avoid turbine arrays. Some of these species have been detected during the baseline surveys (**Table 7-2**). SPAs supporting these species either during the breeding or non-breeding season have also been considered in the screening.

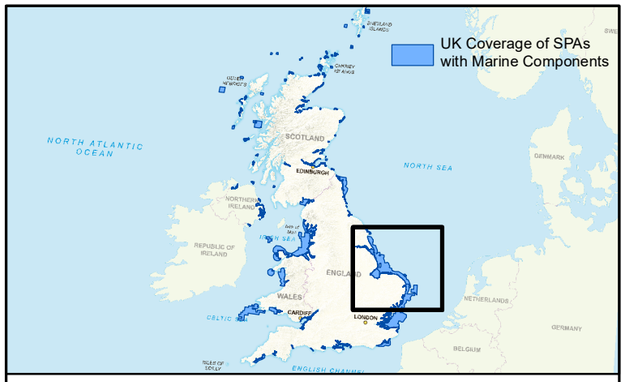
7.2 Screening

7.2.1 DEP or SEP in Isolation and Together

302. The list of SPAs and Ramsar sites considered in screening for LSE is included in **Table 7-5** for UK sites and **Table 7-6** for non-UK sites, and shown in **Figure 7.1**. These SPAs and Ramsar sites are listed in order of increasing distance from the Projects. SPAs and Ramsar sites are screened in where LSE cannot be ruled out for one or more qualifying features and proposed to be screened out where LSE can be ruled out for all qualifying features. A rationale is given for each SPA or Ramsar site to explain the screening decision. It should be noted that for indirect effects (within DEP, SEP, or export cable corridors), no instances of LSE have been identified due to the construction, operation and decommissioning of the Projects. This is mainly due to the distance between DEP, SEP and SPAs. In addition, the relatively small area occupied by DEP and SEP, when considered alongside the foraging ranges of the marine ornithology features under consideration (**Table 7-4**), suggest that LSE due to indirect effects within the wind farms or export cable corridors on these features is highly unlikely for foraging birds. These are therefore not included in **Table 7-5** and **Table 7-6**, though they have been considered.

303. All of the features screened in as set out in **Table 7-5** will also be subject to DEP and SEP together assessment for those effects.





Legend:

- Dudgeon Extension Project AfL Area
- Sheringham Extension Project AfL Area
- Offshore Cable Corridor
- Indicative Offshore Substation Location
- Existing Offshore Wind Farm
- Existing Offshore Wind Farm Export Cable

Special Protection Areas (SPA) with Marine Components

- Alde-Ore Estuary
- Breydon Water
- Deben Estuary
- Flamborough and Filey Coast
- Gibraltar Point
- Greater Wash
- Humber Estuary
- Minsmere-Walberswick
- North Norfolk Coast
- Outer Thames Estuary
- Stour and Orwell Estuaries
- The Wash

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Title:

Location of Dudgeon Extension and Sheringham Extension Projects and SPAs with Marine Components

Figure: 7.1 | Drawing No: PB8164-RHD-ZZ-OF-DR-Z-0056

Co-ordinate system: WGS 1984 UTM Zone 31N | Page Size: A3 | Scale: 1:1,000,000

Project: Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

Report: HRA Screening Report

Royal HaskoningDHV
Enhancing Society Together

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Table 7-5. Screening list of SPA and Ramsar sites in the UK with offshore ornithology features.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
UK902039	Greater Wash	• Breeding Sandwich tern • Breeding common tern • Breeding little tern • Non-breeding red-throated diver • Non-breeding little gull	16.6	7.0	In	The SPA includes core foraging areas for three breeding tern species at coastal colonies. Birds from the SPA can occur in habitat outside the SPA, and common tern and Sandwich tern have been recorded at DEP and SEP. During the breeding season these qualifying features may be at risk of collision and potentially displacement in the case of Sandwich tern, and are therefore both screened in. Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Sandwich tern: Approximately 20% of birds present during the autumn and spring migration seasons. Common tern: Approximately 0.7% of birds present during the autumn and spring migration seasons. These proportions are all considered sufficiently large for LSE to be possible for Sandwich tern at these times of year; therefore this qualifying feature is screened in. The proportion of common terns present at DEP and SEP during autumn and spring migration is not considered sufficiently high for LSE to occur, therefore it is screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						SEP is within 10km of the SPA and therefore an impact pathway exists due to potential displacement of red-throated diver within the SPA. This qualifying feature is therefore screened in. There is possible operational collision risk to non-breeding little gull, which have been recorded at DEP and SEP and are expected to be associated with this SPA. This qualifying feature is therefore screened in. It is not present outside the non-breeding season, therefore it is screened out during this time of year.
UK9009031 UK11048	North Norfolk Coast	• Breeding Sandwich tern • Breeding common tern • Breeding little tern • Non-breeding waterfowl including pink-footed goose and dark-bellied brent goose	33.3	17.7	In	DEP and SEP are within the mean maximum foraging range of breeding Sandwich tern, and the maximum foraging range of common tern from this SPA (**Table 7-4**). These species are at risk of collision. Sandwich tern may also be at risk of operational displacement. An impact pathway exists and these qualifying features are therefore screened in during the breeding season. During spring and autumn migration periods approximately 31% of Sandwich terns, and 0.3% of common terns present within the DEP and SEP survey area may originate from this SPA (Furness, 2015). Sandwich tern are screened in for migration season impacts. For common tern potential migration season impacts on such a small number of birds would not affect enough birds to represent LSE, so they are screened out. Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
UK9020309	Outer Thames Estuary	• Breeding common tern • Breeding little tern • Non-breeding red-throated diver	58.0	58.3	Out	DEP and SEP are beyond the likely disturbance distance for red-throated diver within the SPA boundary. There is no impact pathway and this qualifying feature is therefore screened out. DEP and SEP are beyond the maximum foraging range of common tern from this SPA (**Table 7-4**), and therefore no impact pathway exists for this population. It is therefore screened out during the breeding season. The presence of common tern at DEP and SEP from this SPA during passage periods in large numbers is considered unlikely as the SPA is located south of DEP and SEP (Furness, 2015). Whilst not listed in Furness (2015), the common tern population of this SPA would represent approximately 0.4% of birds recorded at DEP and SEP during migration seasons. This qualifying feature is therefore screened out as potential impacts on such a small number of birds would not be sufficient to represent LSE. Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out.
UK9009181 UK11008	Breydon Water	• Breeding common tern • Non-breeding waterfowl	61.4	59.2	In	DEP and SEP are beyond the maximum foraging range of breeding common tern from this SPA (**Table 7-4**), and therefore no impact pathway exists for this population. The presence of common tern at DEP and SEP from this SPA during passage periods in large numbers is considered unlikely as the SPA is located south of DEP and SEP (Furness, 2015). The common

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						tern population of this SPA would represent approximately 0.1% of birds recorded at DEP and SEP during migration seasons. This qualifying feature is therefore screened out as despite an impact pathway being identified, potential impacts on such a small number of birds would not be sufficiently large to represent LSE. Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
UK9008021 UK11072	The Wash	• Breeding common tern • Breeding little tern • Non-breeding waterfowl including Bewick's swan, pink-footed goose and dark-bellied brent goose	61.6	43.3	In	DEP and SEP are beyond the maximum foraging range of common tern breeding at this SPA (**Table 7-4**), and therefore no impact pathway exists for this population. The population is therefore screened out. The common tern population of this SPA would represent approximately 0.3% of birds recorded at DEP and SEP during migration seasons. This qualifying feature is therefore screened out as despite an impact pathway being identified, potential impacts on such a small number of birds would not be sufficiently large to represent LSE. Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
UK9008022 UK11027	Gibraltar Point	• Breeding little tern • Non-breeding waders	61.2	46.4	In	Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
UK9006111 UK11031	Humber Estuary	• Breeding little tern • Breeding bittern, marsh harrier and avocet • Non-breeding waterfowl	61.2	55.3	In	Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Other breeding birds named as qualifying features of this SPA are unlikely to utilise DEP or SEP due to their habitat preferences. There is no impact pathway for these species and they are therefore screened out. Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
UK9009253 UK11010	Broadland	• Breeding bittern and marsh harrier • Non-breeding waterfowl including Bewick's Swan and whooper swan	41.7	37.3	In	Breeding birds named as qualifying features of this SPA are unlikely to utilise DEP or SEP due to their habitat preferences. The same applies to non-breeding hen harrier. This means that no impact pathway has been identified and these qualifying features are therefore screened out. Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE,

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
		• Non-breeding hen harrier				due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
UK9009271	Great Yarmouth North Denes	• Breeding little tern	44.9	44.9	Out	Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out.
UK9009291	Benacre to Easton Bavents	• Breeding little tern • Breeding bittern and marsh harrier	82.7	80.0	Out	Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Other breeding birds named as qualifying features of this SPA are unlikely to utilise DEP or SEP due to their habitat preferences. There is no impact pathway for these species and they are therefore screened out.
UK9008041	Ouse Washes	• Breeding ducks and waders • Non-breeding waterfowl including Bewick's and Whooper swan	101	85.4	In	Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
UK9009101 UK11044	Minsmere-Walberswick	• Breeding little tern • Breeding bittern, marsh harrier, avocet, nightjar, and ducks • Non-breeding waterfowl • Non-breeding hen harrier	91.2	86.9	In	Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						The presence of other qualifying species from this SPA at the Projects will be sporadic at most during passage periods, and would result in negligible numbers passing through DEP and SEP. They are not anticipated at DEP and SEP during the breeding season due to their habitat preferences, and are therefore screened out.
UK9008031 UK11046	Nene Washes	• Breeding ducks • Non-breeding waterfowl including Bewick's swan	92.2	112	In	Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
UK9009112 UK11002	Alde-Ore Estuary	• Breeding Sandwich tern • Breeding little tern • Breeding lesser black-backed gull • Breeding avocet and marsh harrier • Non-breeding waders	110	104	In	SEP and DEP are within the mean maximum foraging range of breeding lesser black-backed gull from this SPA (**Table 7-4**), meaning that there is a potential impact pathway for this population. Whilst tracking data indicate that individuals of this species breeding at the SPA have not been recorded travelling as far as DEP or SEP (Thaxter *et al.*, 2015), this qualifying feature is screened in. Outside the breeding season, the lesser black-backed gull population of this SPA would represent approximately 0.9%, 1.7% and 1.0% of birds recorded at DEP and SEP during autumn migration, winter and spring migration respectively. Impacts on birds outside the breeding season are therefore screened in. DEP and SEP are beyond maximum foraging range of breeding Sandwich tern from this SPA (**Table 7-4**), there is no impact pathway for this population. Whilst birds from the SPA will be present at DEP and SEP on migration, meaning an impact pathway does exist, the proportion of the population present is expected to be small (<0.1% of Sandwich terns present)

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						compared with the wider BDMPS (Furness, 2015). This qualifying feature is therefore screened out. Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. The presence of other qualifying species from this SPA at the Projects will be sporadic at most during passage periods, and would result in negligible numbers passing through DEP and SEP. They are not anticipated at DEP and SEP during the breeding season due to their habitat preferences, and are therefore screened out.
UK9006171	Hornsea Mere	• Non-breeding mute swan and gadwall	110	112	Out	Due to the distance at which this SPA is situated from DEP and SEP, migrations of qualifying bird species to and from the SPA are likely to result in negligible numbers passing through DEP and SEP. This means that whilst a collision impact pathway exists, it is anticipated that numbers present would not be sufficient to result in impacts substantial enough to result in LSE. These qualifying features are therefore screened out.
UK9009121	Stour and Orwell Estuaries	• Breeding avocet • Non-breeding waterfowl	115	125	Out	Due to the distance at which this SPA is situated from DEP and SEP, migrations of qualifying bird species to and from the SPA are likely to result in negligible numbers passing through DEP and SEP. This means that whilst a collision impact pathway exists, it is anticipated that numbers present would not be sufficient to result in impacts substantial enough to result in LSE. These qualifying features are therefore screened out.
UK9006101	Flamborough and Filey Coast	• Breeding gannet • Breeding guillemot	116	122	In	Mean maximum and/or maximum foraging ranges indicate that breeding gannet, guillemot, kittiwake and razorbill may forage at DEP and SEP (**Table 7-4**) and be at risk of collision during

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
		• Breeding kittiwake • Breeding razorbill • Breeding seabird assemblage (fulmar, puffin, herring gull, shag and cormorant)				operation, and/or displacement. There is therefore an impact pathway and these qualifying features are screened in. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Gannet: Approximately 8.4% of birds present during autumn migration, and 9.1% of birds during spring migration. Guillemot: Approximately 7.3%.of birds present during the non-breeding season. Kittiwake: Approximately 8.6% of birds present during autumn migration, and 3.4% of birds during spring migration. Razorbill: Approximately 5.7% of birds present during autumn and spring migrations, and 3.4% of birds during winter. Fulmar: Approximately 0.3% of birds present during autumn and spring migration seasons. Puffin: Approximately 0.4%.of birds present during the non-breeding season. Herring gull: Approximately 0.4%.of birds present during the non-breeding season. Shag: Not present during non-breeding season.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Cormorant: Not present during non-breeding season. These proportions for gannet, guillemot, kittiwake and razorbill are all considered sufficiently large for these qualifying features to be screened in at these times of year. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur based on the proportions presented above. Therefore, they are screened out.
UK9006061	Teesmouth and Cleveland Coast[6]	• Non-breeding Sandwich tern • Breeding little tern • Non-breeding ruff • Non-breeding knot • Non-breeding redshank • Non-breeding waterfowl	202	204	Out	Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Sandwich terns from the SPA will be present at DEP and SEP on migration, meaning an impact pathway does exist due to collision risk, and possibly displacement. The proportion of the population present is predicted to be sufficiently large (5.0%) compared with the wider BDMPS (Furness, 2015) to screen this qualifying feature in. However, as this species was recorded in such small numbers at DEP and SEP outside the breeding season, LSE is not considered possible, and this species can therefore be screened out. Due to the distance at which this SPA is situated from DEP and SEP, migrations of qualifying bird species to and from the SPA are likely to result in negligible numbers passing through DEP

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						and SEP. This means that whilst a collision impact pathway exists, it is anticipated that numbers present would not be sufficient to result in LSE. These qualifying features are therefore screened out.
UK9006131 UK11049	Northumbria Coast	• Breeding Arctic tern[7] • Breeding little tern • Non-breeding turnstone *Arenaria interpres* and purple sandpiper *Calidris maritima*	260	268	Out	DEP and SEP are beyond the maximum foraging range of breeding Arctic tern from this SPA (**Table 7-4**), and therefore no impact pathway exists for this population. Whilst this SPA is not included in Furness (2015), the Arctic tern population of this SPA would represent approximately 3% of birds recorded at DEP and SEP during migration seasons (Furness, 2015). This qualifying feature is therefore screened in as an impact pathway has been identified due to potential collision risk, and the proportion of birds from the SPA predicted to be at DEP and SEP is sufficient to potentially represent LSE. However, as this species was recorded in such small numbers at DEP and SEP outside the breeding season, LSE is not considered possible, and this species can therefore be screened out. Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Due to the distance at which this SPA is situated from DEP and SEP, migrations of qualifying bird species to and from the SPA are likely to result in negligible numbers passing through DEP and SEP. This means that whilst a collision impact pathway exists, it is anticipated that numbers present would not be sufficient to result in LSE. These qualifying features are therefore screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
UK9020325	Northumberland Marine	• Breeding Arctic tern • Breeding common tern • Breeding guillemot • Breeding little tern • Breeding puffin • Breeding roseate tern • Breeding Sandwich tern • Breeding seabird assemblage (Arctic tern, common tern, roseate tern, Sandwich tern, little tern, puffin, guillemot, cormorant, shag, black-headed gull kittiwake fulmar, great black-backed gull, lesser black-backed gull, herring gull and razorbill)	260.4	266.1	Out	Little tern and roseate tern have not been recorded at DEP and SEP. There is consequently no impact pathway for these qualifying features, which are therefore screened out. With the exception of puffin and guillemot, DEP and SEP are beyond the maximum foraging range of the species named as qualifying features at this SPA (**Table 7-4**). No impact pathway therefore exists, and these qualifying features are screened out during the breeding season. Due to the distance between DEP and SEP and this SPA, and parapatric competition between guillemot from the Flamborough and Filey Coast SPA (Wakefield *et al.*, 2017) it is considered unlikely that substantial numbers of breeding guillemots from this SPA would regularly forage at DEP or SEP during the breeding season. On that basis, the impact pathway is not considered to have the potential to represent LSE, and the qualifying feature is screened out. This SPA is not included in Furness (2015). However, the following proportions of birds present at DEP and SEP outside the breeding season are estimated to be from this SPA, and as a result are screened in as an impact pathway is present, and proportions of birds are sufficiently large to potentially represent LSE: Arctic tern: Approximately 6% of birds present during autumn and spring migrations. Common tern: Approximately 2% of birds present during autumn and spring migrations.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Guillemot: Approximately 4% of birds present during the non-breeding season. Puffin: Approximately 47% of birds present during the non-breeding season. Sandwich tern: Approximately 11% of birds present during autumn and spring migrations. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, this SPA protects the foraging habitat of several breeding seabird SPAs (Farne Islands SPA, Coquet Island SPA, and Northumbria Coast SPA). During the non-breeding season, potential impacts on these birds are considered within their respective breeding colony SPAs. Therefore, this SPA is screened out.
UK9006031	Coquet Island	• Breeding Sandwich tern • Breeding roseate tern • Breeding common tern • Breeding Arctic tern	282	289	In	Roseate tern has not been recorded at DEP and SEP, meaning that there is no impact pathway for this species. It is therefore screened out. DEP and SEP are beyond the maximum foraging range of breeding Sandwich tern, common tern and Arctic tern (**Table 7-4**). There is therefore no impact pathway for these qualifying features during the breeding season, and they are screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately 2.1% of birds present during autumn and spring migrations. Common tern: Approximately 1.5% of birds present during autumn and spring migrations. Sandwich tern: Approximately 5.1% of birds present during autumn and spring migrations. These proportions are all considered sufficiently large for these qualifying features to be screened in at these times of year.
UK9006021	Farne Islands	• Breeding Sandwich tern • Breeding roseate tern • Breeding common tern • Breeding Arctic tern • Breeding guillemot • Breeding seabird assemblage (puffin, kittiwake)	310	318	In	Roseate tern has not been recorded at DEP and SEP, meaning that there is no impact pathway for this species. It is therefore screened out. DEP and SEP are beyond the maximum foraging range of breeding Sandwich tern, common tern and Arctic tern (**Table 7-4**). There is therefore no impact pathway for these qualifying features during the breeding season, and they are screened out. DEP and SEP are beyond the mean maximum foraging range of guillemot, but just within the maximum published foraging range. Due to the distance between DEP and SEP and this SPA, and parapatric competition between guillemot from the Flamborough and Filey Coast SPA (Wakefield *et al.*, 2017) it is highly unlikely that substantial numbers of breeding birds from this SPA would regularly forage at DEP or SEP during the breeding season. On that basis, the impact pathway is not considered to have the

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						potential to represent LSE, and the qualifying feature is screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately 3.3% of birds present during autumn and spring migrations. Common tern: Approximately 0.1% of birds present during autumn and spring migrations. Sandwich tern: Approximately 6.2% of birds present during autumn and spring migrations. Guillemot: Approximately 6.2% of birds present during the non-breeding season. These proportions are all considered sufficiently large for these qualifying features to be screened in at these times of year, except for common tern. Predicted proportions of birds present at DEP and SEP originating from this SPA are very low, so LSE can be ruled out and this qualifying feature screened out during migration periods. Regarding assemblage features, the proportions of birds present at DEP and SEP that are from this SPA are predicted by Furness. (2015) to be as follows:

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Kittiwake: Approximately 0.7% of birds present during the autumn migration, and 1.0% during the spring migration. Puffin: Approximately 17.9% of birds present during the non-breeding season. The proportion of birds predicted to be present during the non-breeding season that are sufficiently high for the assemblage to be screened in.
UK0030281	St Abb's Head to Fast Castle	• Breeding seabird assemblage (razorbill, guillemot, kittiwake, herring gull, shag)	360	360	In	DEP and SEP are beyond the maximum foraging range of razorbill, guillemot, herring gull and shag from this SPA (**Table 7-4**). There is consequently no impact pathway for these qualifying features during the breeding season and they are screened out. DEP and SEP are also beyond the mean maximum but within the maximum foraging range of kittiwake from this SPA (**Table 7-4**). Due to the distance between DEP and SEP and this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA and Farne Islands SPA (Wakefield *et al.*, 2017), it is considered highly unlikely that breeding birds from this SPA would regularly forage at DEP or SEP during the breeding season in sufficient numbers to result in LSE. Therefore, this qualifying feature is also screened out during the breeding season despite an impact pathway being identified. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows:

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Razorbill: Approximately 0.7% of birds present during the migration seasons, and 0.4% during the winter. Guillemot: Approximately 4.1% of birds present during the non-breeding season. Kittiwake: Approximately 0.8% of birds present during the autumn migration season and 0.9% of birds present during the spring migration. Herring gull: Approximately 0.2% of birds present during the non-breeding season. Shag: Not present during the non-breeding season. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, except for guillemot, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore they are screened out, except for guillemot, which is screened in.
IK9020316	Outer Firth of Forth and St Andrews Bay complex pSPA	• Breeding common tern • Breeding Arctic tern • Breeding seabird assemblage (puffin, kittiwake, Manx shearwater, guillemot, herring gull)	358	365	Out	This is a marine pSPA designated for offshore aggregations of seabirds during the breeding and non-breeding seasons. The SPA boundary encompasses core areas for the qualifying species and given the extensive distance between the SPA and DEP and SEP, it is considered that there is no connectivity with DEP or SEP. All qualifying features are therefore screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
		• Non-breeding red-throated diver • Non-breeding Slavonian grebe • Non-breeding little gull • Non-breeding seabird assemblage (black-headed gull, common gull, herring gull, guillemot, shag, kittiwake and razorbill) • Non-breeding eider and waterfowl assemblage				
UK9004171	Forth Islands	• Breeding Arctic tern • Breeding roseate tern • Breeding common tern • Breeding Sandwich tern • Breeding gannet • Breeding shag • Breeding lesser black-backed gull • Breeding puffin	390	390	In	Roseate tern has not been recorded at DEP and SEP, meaning that there is no impact pathway for this species. It is therefore screened out. Except for gannet and kittiwake, DEP and SEP are beyond the maximum foraging range of all other breeding seabird species at this SPA (**Table 7-4**). There is no impact pathway for these qualifying features during the breeding season, and they are therefore screened out. Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA and Farne Islands SPA (Wakefield *et al.*, 2017, 2013), it is considered highly unlikely that breeding gannet

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
		• Breeding seabird assemblage (razorbill, kittiwake, herring gull, cormorant)				and kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, these qualifying features are screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately 0.5% of birds present during autumn and spring migration seasons. Common tern: Approximately <0.1% of birds present during autumn and spring migration seasons. Sandwich tern: Approximately 0% of birds present during autumn and spring migration seasons. Gannet: Approximately 42.0% of birds present during autumn migration, and 45.8% of birds present during spring migration. Shag: Not present during the non-breeding season. Lesser black-backed gull: Approximately 2.3% of birds present during autumn migration, 4.4% during winter and 2.4% during spring migration. Puffin: Approximately 27.9% of birds present during the non-breeding season.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Razorbill: Approximately 1.5% of birds present during the migration seasons, and 0.9% during the winter. Kittiwake: Approximately 0.7% of birds present during the autumn migration season and 0.9% of birds present during the spring migration. Herring gull: Approximately 2.2% of birds present during the non-breeding season. Cormorant: Not present during the non-breeding season. These proportions are all considered sufficiently small for Arctic tern, common tern, Sandwich tern and shag to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of these qualifying features birds present at DEP and SEP originating from this SPA are very low, so LSE can be ruled out and these qualifying features screened out. Gannet, lesser black-backed gull and puffin from this SPA are screened in outside the breeding season as proportions predicted to be present at DEP and SEP that are from this SPA are considered sufficiently large for LSE to be possible. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
UK9004451	Imperial Dock Lock, Leith	• Breeding common tern	410	410	In	DEP and SEP are beyond the maximum foraging range of breeding common terns from this SPA (**Table 7-4**). There is no impact pathway and therefore this qualifying feature can be screened out. Outside the breeding season, approximately 1.2% of birds present at DEP and SEP are estimated by Furness. (2015) to be from this SPA. An impact pathway therefore exists, and this proportion is considered sufficiently large for LSE to be possible, so this qualifying feature is screened in.
UK9004121 UK13018	Firth of Tay and Eden Estuary	• Breeding little tern • Breeding marsh harrier • Non-breeding waterfowl assemblage	420	430	Out	Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Marsh harrier was not recorded during the baseline surveys of DEP and SEP. The presence of marsh harrier will be highly sporadic at most during passage periods, and would result in negligible numbers of birds from this passing through DEP and SEP. Marsh harrier is not anticipated at DEP and SEP during the breeding season due to their habitat preferences, and is therefore screened out. Due to the distance at which this SPA is situated from DEP and SEP, migrations of qualifying waterfowl species to and from the SPA are likely to result in negligible numbers passing through DEP and SEP. This means that whilst a collision impact pathway exists, it is anticipated that numbers present would not be sufficient to result in LSE. These qualifying features are therefore screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
UK9002271	Fowlsheugh	• Breeding guillemot • Breeding kittiwake • Breeding seabird assemblage (razorbill, fulmar, herring gull)	450	460	In	DEP and SEP are beyond the maximum foraging ranges of guillemot, razorbill and herring gull from this SPA and beyond the mean maximum but within the maximum foraging range of kittiwake and fulmar (**Table 7-4**). There is no impact pathway for guillemot, razorbill and herring gull from this SPA during the breeding season, which are therefore screened out. Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore whilst an impact pathway exists, these qualifying features are screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP, particularly since this is an assemblage species. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows:

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Guillemot: Approximately 4.9% of birds present during the non-breeding season. Kittiwake: Approximately 2.1% of birds present during the autumn migration season and 2.6% of birds present during the spring migration. Razorbill: Approximately 2.0% of birds present during the autumn and spring migration seasons, and 1.2% during the winter. Fulmar: Approximately 0.1% of birds present during the autumn and spring migration seasons. Herring gull: Approximately 0.2% of birds present during the non-breeding season. These proportions are considered sufficiently small for Arctic tern to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of these qualifying features birds present at DEP and SEP originating from this SPA are very low, so LSE can be ruled out. Guillemot and kittiwake from this SPA are screened in outside the breeding season as proportions predicted to be present at DEP and SEP that are from this SPA are considered sufficiently large for LSE to be possible. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore they are screened out.
UK9002221 UK13061	Ythan Estuary, Sands of Forvie and Meikle Loch (extension)	• Breeding Sandwich tern • Breeding common tern • Breeding little tern • Non-breeding waterfowl assemblage	480	480	In	DEP and SEP are beyond the maximum foraging range of Sandwich tern and common tern breeding at this SPA and Ramsar site (**Table 7-4**). There is no impact pathway for these qualifying features during the breeding season, and they are therefore screened out. Little tern has not been recorded at DEP and SEP and has a very coastal distribution. There is consequently no impact pathway for this population, and this qualifying feature is screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA and Ramsar site (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Common tern: Approximately <0.1% of birds present during autumn and spring migration seasons. Sandwich tern: Approximately 4.3% of birds present during autumn and spring migration seasons. These proportions are considered sufficiently small for common tern to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of birds present at DEP and SEP originating from this SPA and Ramsar site are very low, so LSE can be ruled out and this qualifying feature screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Sandwich tern from this SPA and Ramsar site are screened in outside the breeding season as proportions predicted to be present at DEP and SEP are considered sufficiently large for LSE to be possible due to collision risk, and potentially displacement. Due to the distance at which this SPA and Ramsar site is situated from DEP and SEP, migrations of qualifying waterfowl species to and from the SPA and Ramsar site are likely to result in negligible numbers passing through DEP and SEP. This means that whilst a collision impact pathway exists, it is anticipated that numbers present would not be sufficient to result in LSE. These qualifying features are therefore screened out.
UK9002491	Buchan Ness to Collieston Coast	• Breeding seabird assemblage (kittiwake, guillemot, herring gull, shag, fulmar)	480	490	Out	DEP and SEP are beyond the maximum foraging range of breeding guillemot, herring gull and shag (**Table 7-4**). There is no impact pathway for these qualifying features during the breeding season, which are therefore screened out. DEP and SEP are within the mean maximum foraging range of fulmar and the maximum foraging range of kittiwake from this SPA (**Table 7-4**). Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						possibility. Therefore whilst an impact pathway exists, this qualifying feature is screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Kittiwake: Approximately 2.9% of birds present during autumn migration and 3.5% during spring migration. Guillemot: Approximately 2.1% of birds present during non-breeding season. Herring gull: Approximately 2.4% of birds present during non-breeding season. Shag: Not present during non-breeding season. Fulmar: Approximately 0.4% of birds present during autumn and spring migration seasons.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
UK9002211	Loch of Strathbeg	• Breeding Sandwich tern • Non-breeding waterfowl assemblage	510	520	Out	DEP and SEP are beyond the maximum foraging range of breeding Sandwich tern from this SPA (**Table 7-4**). There is therefore no impact pathway for this species during the breeding season and it is screened out. The proportion of the population migrating through DEP and SEP is 0% compared with the wider BDMPS (Furness, 2015), meaning that this species is screened out. Due to the distance at which this SPA is situated from DEP and SEP, migrations of qualifying waterfowl species to and from the SPA are likely to result in negligible numbers passing through DEP and SEP. This means that whilst a collision impact pathway exists, it is anticipated that numbers present would not be sufficient to result in LSE. These qualifying features are therefore screened out.
UK9002471	Troup, Pennan and Lion's Heads	• Breeding kittiwake • Breeding guillemot • Breeding seabird assemblage (fulmar, herring gull, razorbill)	530	540	In	DEP and SEP are beyond the maximum foraging range of breeding guillemot, herring gull and razorbill. There is therefore no impact pathway for these qualifying features during this season and they are screened out. DEP and SEP are within the mean maximum foraging range of fulmar, and the maximum foraging range of kittiwake (**Table 7-4**). Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Kittiwake: Approximately 3.4% of birds present during autumn migration and 4.1% during spring migration. Guillemot: Approximately 1.6% of birds present during non-breeding season. Fulmar: Approximately 0.6% of birds present during autumn and spring migration seasons.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Herring gull: Approximately 1.2% of birds present during non-breeding season. Razorbill: Approximately 1.0% of birds present during autumn and spring migration seasons and 0.6% of birds present during the winter season. The proportions of kittiwake and guillemot predicted to be present in the DEP and SEP survey area outside the breeding season that are from this SPA are sufficiently large for LSE to be considered a possibility; therefore these qualifying features are screened in. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore they are screened out.
UK9001182	East Caithness Cliffs	• Breeding guillemot • Breeding razorbill • Breeding herring gull • Breeding kittiwake • Breeding shag • Breeding seabird assemblage (great black-backed gull, cormorant, fulmar)	610	620	In	DEP and SEP are beyond the maximum foraging ranges of breeding seabirds except fulmar and kittiwake (**Table 7-4**). Other than fulmar and kittiwake, no impact pathway exists for the qualifying features of this SPA during the breeding season. They are therefore screened out. Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Guillemot: Approximately 15.1% of birds present during non-breeding season. Razorbill: Approximately 7.1% of birds present during autumn and spring migrations, and 4.3% of birds present during winter. Herring gull: Approximately 2.9% of birds present during non-breeding season. Kittiwake: Approximately 9.3% of birds present during autumn migration and 11.1% during spring migration. Shag: Not present during non-breeding season.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Great black-backed gull: Approximately 0.9% of birds present during non-breeding season. Cormorant: Not present during the non-breeding season. Fulmar: Approximately 4.4% of birds present during autumn and spring migration seasons. The proportions of kittiwake, guillemot and razorbill predicted to be present in the DEP and SEP survey area outside the breeding season are sufficiently large for LSE to be considered a possibility; therefore these qualifying features are screened in. Herring gull is screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
UK9001131 UK9020317	Pentland Firth pSPA[9]	• Breeding Arctic tern • Breeding guillemot • Breeding Arctic skua	620	630	In	DEP and SEP are beyond the maximum foraging range of the breeding seabirds named as qualifying features at this SPA (**Table 7-4**). During the breeding season there is no impact pathway and all qualifying features are therefore screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately 0.6% of birds present during autumn and spring migration seasons. Guillemot: Approximately 2.1% of birds present during non-breeding season. Arctic skua: Approximately 1.2% of birds present during autumn migration; no birds present during spring migration. The proportions of guillemot and Arctic skua (autumn migration) predicted to be present in the DEP and SEP survey area outside the breeding season are sufficiently large for LSE to be considered a possibility; therefore these qualifying features are screened in. Arctic tern and Arctic skua (spring migration) from this SPA do not occur in sufficiently large proportions at DEP and SEP for LSE to be considered feasible. They are therefore screened out.
UK9001181	North Caithness Cliffs	• Breeding guillemot • Breeding seabird assemblage (fulmar, kittiwake, razorbill, puffin)	640	650	In	DEP and SEP are beyond the maximum foraging ranges of the breeding seabirds named as qualifying features except fulmar and kittiwake (**Table 7-4**). Other than fulmar and kittiwake, no impact pathway exists for these qualifying features during the breeding season. They are therefore screened out. Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Guillemot: Approximately 6.7% of birds present during non-breeding season. Fulmar: Approximately 4.2% of birds present during autumn and spring migration seasons. Kittiwake: Approximately 2.3% of birds present during autumn migration and 2.8% during spring migration. Razorbill: Approximately 0.9% of birds present during autumn and spring migrations, and 0.6% of birds present during winter.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Puffin: Approximately 0.1% of birds present during non-breeding season. The proportion of guillemot predicted to be present in the DEP and SEP survey area outside the breeding season are sufficiently large for LSE to be considered a possibility; therefore this qualifying feature is screened in. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
UK9020321	Scapa Flow pSPA	• Breeding red-throated diver • Non-breeding great northern diver • Non-breeding black-throated diver • Non-breeding Slavonian grebe • Non-breeding shag • Non-breeding waterfowl assemblage	650	660	Out	DEP and SEP are beyond the maximum foraging range of breeding red-throated diver (**Table 7-4**), meaning that no impact pathway exists during the breeding season. Great northern diver, black-throated diver and Slavonian grebe were not recorded within the DEP and SEP survey area. There is therefore no impact pathway and these qualifying features can be screened out. It is not considered likely that the non-breeding shag of this SPA will occur at DEP and SEP. Therefore, there is no impact pathway and this qualifying feature is screened out. Due to the distance at which this SPA is situated from DEP and SEP, migrations of qualifying waterfowl species to and from the SPA are likely to result in negligible numbers passing through DEP and SEP. This means that whilst a collision impact pathway

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						exists, it is anticipated that numbers present would not be sufficient to result in LSE. These qualifying features are therefore screened out.
UK9002151	Copinsay	• Breeding seabird assemblage (guillemot, kittiwake, great black-backed gull, fulmar)	660	670	Out	DEP and SEP are beyond the maximum foraging range of the breeding seabirds named as qualifying features of this SPA except fulmar and kittiwake (**Table 7-4**). There is no impact pathway for the other qualifying features during the breeding season; they are therefore screened out. Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Guillemot: Approximately 0.8% of birds present during non-breeding season. Kittiwake: Approximately 0.2% of birds present during autumn migration and 0.2% during spring migration. Great black-backed gull: Approximately 1.1% of birds present during non-breeding season. Fulmar: Approximately 0.5% of birds present during autumn and spring migration seasons. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore they are screened out.
UK9002141	Hoy	• Breeding red-throated diver • Breeding great skua • Breeding seabird assemblage (puffin, kittiwake, great black-backed gull, guillemot)	660	670	In	DEP and SEP are beyond the maximum foraging range of all breeding seabirds included as qualifying features of this SPA except kittiwake and great skua (**Table 7-4**). As there is no impact pathway for red-throated diver, puffin, great black-backed gull or guillemot during the breeding season, these qualifying features are screened out. Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Great skua was not recorded within the DEP and SEP survey area during the breeding season. Therefore, there is no impact pathway and it is screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Red-throated diver: Approximately 0.4% of birds present during autumn and spring migrations, and 1.4% of birds present during winter. Great skua: Approximately 0% of birds present during autumn and spring migrations, and during winter. Puffin: Approximately 0.5% of birds present during non-breeding season. Kittiwake: Approximately 0.1% of birds present during autumn and spring migration.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Great black-backed gull: Approximately 0.3% of birds present during non-breeding season. Guillemot: Approximately 0.9% of birds present during non-breeding season. These proportions are considered sufficiently small for great skua to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of birds present at DEP and SEP originating from this SPA are very low, so LSE can be ruled out and these qualifying features are screened out. The proportion of red-throated diver predicted to be present in the DEP and SEP survey area during winter is sufficiently large for LSE to be considered a possibility; therefore this qualifying feature is screened in for this time of year. Impacts during the migration seasons are screened out as the proportion of birds predicted to be present is considered sufficiently low to rule out LSE. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
UK9002381	Auskerry	• Breeding European storm petrel • Breeding Arctic tern	670	680	In	European storm petrel was not recorded at DEP and SEP during the baseline surveys. There is no impact pathway for this qualifying feature, and it is therefore screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						DEP and SEP are beyond the maximum foraging range of breeding Arctic tern from this SPA **(Table 7-4**). There is therefore no impact pathway and this qualifying feature is screened out. Outside the breeding season, the proportion of Arctic tern present at DEP and SEP that are estimated by Furness (2015) to be from this SPA is approximately 1.1%. This is considered sufficiently large for LSE to be a possibility; therefore this qualifying feature is screened in.
UK9002371	Rousay	• Breeding Arctic tern • Breeding seabird assemblage (Arctic skua, kittiwake, guillemot, fulmar)			Out	DEP and SEP are beyond the maximum foraging range of all breeding seabirds included as qualifying features of this SPA except fulmar and kittiwake (**Table 7-4**). For Arctic tern, Arctic skua and guillemot, no impact pathway exists during the breeding season; these qualifying features are therefore screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						gannet and kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, these qualifying features are screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately 0.1% of birds present during autumn and spring migrations. Arctic skua: Approximately 0.3% of birds present during autumn migration and 0% during spring migration. Kittiwake: Approximately 0.4% of birds present during autumn migration and 0.5% during spring migration. Guillemot: Approximately 0.9% of birds present during non-breeding season. Fulmar): Approximately 0.3% of birds present during autumn and spring migration seasons. These proportions are considered sufficiently small for all qualifying features to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of birds present at DEP and SEP originating from this SPA are very low, so LSE can be ruled out and these qualifying features are screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
UK9002431	Calf of Eday	• Breeding seabird assemblage (cormorant, great black-backed gull, guillemot, fulmar, kittiwake)	700	710	Out	DEP and SEP are beyond the maximum foraging range of all breeding seabirds included as qualifying features of this SPA except fulmar and kittiwake (**Table 7-4**). For cormorant, great black-backed gull and guillemot, no impact pathway exists during the breeding season; these qualifying features are therefore screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows:

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Cormorant: Not present during the non-breeding season. Great black-backed gull: Approximately 1.4% of birds present during non-breeding season. Guillemot: Approximately 0.9% of birds present during non-breeding season. Fulmar: Approximately 0.5% of birds present during autumn and spring migration seasons. Kittiwake: Approximately 0.2% of birds present during autumn and spring migration seasons. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore they are screened out.
UK9002121	Marwick Head	• Breeding guillemot • Breeding seabird assemblage (kittiwake)	700	710	In	DEP and SEP are beyond the maximum foraging range of guillemot (**Table 7-4**). There is therefore no impact pathway for this species during the breeding season and it is screened out. DEP and SEP are within the maximum foraging range of kittiwake, so a potential impact pathway exists. However, due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Guillemot: 1.6%.of birds present during the non-breeding season. Kittiwake: Approximately 0.1% of birds present during autumn and spring migration seasons. These proportions are considered sufficiently small for kittiwake to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of birds present at DEP and SEP originating from this SPA are very low, so LSE can be ruled out and these qualifying features are screened out. The proportion of guillemot predicted to be present in the DEP and SEP survey area during the non-breeding season is sufficiently large for LSE to be considered a possibility; therefore this qualifying feature is screened in.
UK9002111	Papa Westray (North Hill and Holm)	• Breeding Arctic tern • Breeding Arctic skua	710	720	Out	DEP and SEP are beyond the maximum foraging ranges of Arctic tern and Arctic skua (**Table 7-4**). In addition, the latter was not recorded at DEP and SEP during the breeding season. There is therefore no impact pathway for either qualifying feature during the breeding season and they are screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately 0.3% of birds present during autumn and spring migration seasons. Arctic skua: Approximately 0.2% of birds present during autumn migration season and 0% of birds present during spring migration season. These proportions are considered sufficiently small for both qualifying features to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of birds present at DEP and SEP originating from this SPA are very low, so LSE can be ruled out and these qualifying features are screened out.
UK9002101	West Westray	• Breeding Arctic tern • Breeding guillemot • Breeding seabird assemblage (razorbill, kittiwake, Arctic skua, fulmar)	710	720	In	DEP and SEP are beyond the maximum foraging range of all breeding seabirds included as qualifying features of this SPA except fulmar and kittiwake (**Table 7-4**). For all other qualifying features no impact pathway exists during the breeding season; therefore they are screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately 0.8% of birds present during autumn and spring migration seasons. Guillemot: Approximately 4.8% of birds present during non-breeding season. Razorbill: Approximately 0.3% of birds present during autumn and spring migration seasons, and 0.2% of birds present during winter season. Kittiwake: Approximately 2.8% of birds present during autumn migration and 3.3% during spring migration.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Arctic skua: Approximately 0.2% of birds present during autumn migration season and 0% of birds present during spring migration season. Fulmar: Approximately 0.2% of birds present during autumn and spring migration seasons. These proportions are considered sufficiently small for Arctic tern to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of birds present at DEP and SEP originating from this SPA are very low, so LSE can be ruled out and these qualifying features are screened out. The proportion of guillemot predicted to be present in the DEP and SEP survey area that are from this SPA outside the breeding season is sufficiently large for LSE to be considered a possibility; therefore this qualifying feature is screened in. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
UK9002091	Fair Isle	• Breeding Arctic tern • Breeding guillemot • Breeding seabird assemblage (puffin, razorbill, kittiwake,	710	720	In	DEP and SEP are beyond the maximum foraging range of all breeding seabirds included as qualifying features of this SPA except fulmar and kittiwake (**Table 7-4**). For all other qualifying features, no impact pathway exists during the breeding season; therefore, they are screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
		great skua, Arctic skua, shag, gannet, fulmar)				Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately <0.1% of birds present during autumn and spring migration seasons. Guillemot: Approximately 1.9% of birds present during non-breeding season.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Puffin: Approximately 1.6% of birds present during non-breeding season. Razorbill: Approximately 0.5% of birds present during autumn and spring migration seasons, and 0.3% of birds present during winter season. Kittiwake: Approximately 0.2% of birds present during autumn and spring migration seasons. Great skua: Approximately 2.6% of birds present during autumn migration season and 0% of birds present during spring migration season. Arctic skua: Approximately 0.2% of birds present during autumn migration season and 0% of birds present during spring migration season. Shag: Not present during non-breeding season. Gannet: Approximately 2.5% of birds present during autumn migration season and 3.2% of birds present during spring migration season. Fulmar: Approximately 8.6% of birds present during autumn and spring migration seasons. These proportions are considered sufficiently small for Arctic tern to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of birds present at DEP and SEP originating from this SPA are very low,

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						so LSE can be ruled out and these qualifying features are screened out. The proportion of guillemot predicted to be present in the DEP and SEP survey area at particular times of year is sufficiently large for LSE to be considered a possibility; therefore these qualifying features are screened in. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
UK9002511	Sumburgh Head	• Breeding Arctic tern • Breeding seabird assemblage (guillemot, kittiwake, fulmar)	740	750	Out	DEP and SEP are beyond the maximum foraging range of all breeding seabirds included as qualifying features of this SPA except fulmar and kittiwake (**Table 7-4**). Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from (amongst others) the Flamborough and Filey Coast SPA, Forth Islands SPA and Farne Islands SPA (Wakefield *et al.*, 2017), and the distance between the SPA and DEP and SEP, it is considered highly unlikely that breeding kittiwake from this SPA would regularly forage at DEP or SEP during the breeding season in numbers sufficient for LSE to be a possibility. Therefore, whilst an impact pathway exists, this qualifying feature is screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists,

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately <0.3% of birds present during autumn and spring migration seasons. Guillemot: Approximately 0.7% of birds present during non-breeding season. Kittiwake: Approximately 0.1% of birds present during autumn and spring migration seasons. Fulmar: Approximately 0.1% of birds present during autumn and spring migration seasons. These proportions are considered sufficiently small for Arctic tern to be screened out at these times of year. Whilst an impact pathway has been identified, predicted proportions of birds present at DEP and SEP originating from this SPA are very low, so LSE can be ruled out and these qualifying features are screened out. The proportion of guillemot predicted to be present in the DEP and SEP survey area at particular times of year is sufficiently large for LSE to be considered a possibility; therefore this qualifying feature is screened in.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
N/A	Seas off Foula pSPA	• Breeding great skua • Breeding seabird assemblage (fulmar, Arctic skua, guillemot, puffin) • Non-breeding seabird assemblage (fulmar, great skua, guillemot)	750	760	Out	This is a marine pSPA designated for offshore aggregations of seabirds during the breeding and non-breeding season. Great skua and Arctic skua were not recorded within the DEP and SEP survey area during the breeding season. Therefore, there is no impact pathway and both qualifying features are screened out. DEP and SEP are beyond the maximum foraging range of all other breeding seabirds included as qualifying features of this SPA except fulmar (**Table 7-4**). Therefore, no impact pathway exists for guillemot and puffin and they are screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Features of the non-breeding seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Fulmar: Approximately 0.9% of birds present during autumn and spring migration seasons. Arctic skua: Approximately 3.4% of birds present during autumn migration season and 0% of birds present during spring migration season. Guillemot: Approximately 0.7% of birds present during the non-breeding season. Puffin: Approximately 6.4% of birds present during the non-breeding season. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out. It is considered unlikely that birds associated with the non-breeding seabird assemblage would be present at DEP and

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						SEP outside the non-breeding season, based on the fact that birds present at DEP and SEP during the breeding season are likely to originate from colonies closer to the Projects. The qualifying features of this assemblage are therefore screened out.
UK9002361	Mousa	• Breeding European storm petrel • Breeding Arctic tern	755	765	Out	European storm petrel was not recorded at DEP and SEP during the baseline surveys. There is no impact pathway for this qualifying feature, and it is therefore screened out. DEP and SEP are beyond the maximum foraging range of breeding Arctic tern from this SPA **(Table 7-4**). There is therefore no impact pathway and this qualifying feature is screened out. Outside the breeding season, the proportion of Arctic tern present at DEP and SEP that are estimated by Furness (2015) to be from this SPA is approximately 0%. This qualifying feature is therefore screened out.
UK9002081	Noss	• Breeding gannet • Breeding great skua • Breeding guillemot • Breeding seabird assemblage (fulmar, kittiwake, puffin)	765	780	In	Great skua was not recorded within the DEP and SEP survey area during the breeding season. Therefore, there is no impact pathway and it is screened out. DEP and SEP are beyond the mean maximum foraging ranges of SPA breeding gannet, guillemot, kittiwake and puffin. There is no impact pathway for these qualifying features during the breeding season and they are screened out. DEP and SEP are within the maximum foraging range of fulmar from this SPA (**Table 7-4**). Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds presumed to be present at DEP and SEP that are from this SPA (according to the wider relevant BDMPS of Furness (2015)) are as follows: Gannet: Approximately 6.2% of birds present during autumn migration and 8.0% during spring migration. Guillemot: Approximately 2.1% of birds present during the non-breeding season. Fulmar: Approximately 1.5% of birds present during autumn and spring migration seasons. Kittiwake: Approximately 0.1% of birds present during autumn and spring migration seasons. Puffin: Approximately 0.1% of birds present during the non-breeding season. The proportions of gannet and guillemot predicted to be present in the DEP and SEP survey area at particular times of year is sufficiently large for LSE to be considered a possibility; therefore, these qualifying features are screened in. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
UK9020311	East Mainland Coast, Shetland pSPA	• Breeding red-throated diver • Non-breeding great northern diver • Non-breeding Slavonian grebe • Non-breeding waterfowl assemblage	770	780	In	DEP and SEP are beyond the maximum foraging range of breeding red-throated diver at this SPA (**Table 7-4**). There is no impact pathway for these species during the breeding season and it is screened out. Great northern diver and Slavonian grebe were not recorded within the DEP and SEP survey area. There is therefore no impact pathway and these qualifying features can be screened out. Outside the breeding season, the proportions of red-throated divers presumed to be present at DEP and SEP that are from this SPA (according to the wider relevant BDMPS of Furness (2015) are large enough (7.8% during the winter, and 3.1% during autumn and spring migration seasons) for LSE to be possible. This qualifying feature is therefore screened in. Due to the distance at which this SPA is situated from DEP and SEP, migrations of qualifying waterfowl species to and from the SPA are likely to result in negligible numbers passing through DEP and SEP. This means that whilst a collision impact pathway exists, it is anticipated that numbers present would not be sufficient to result in LSE. These qualifying features are therefore screened out.
UK9002061	Foula	• Breeding Arctic tern	775	785	In	Great skua and Arctic skua were not recorded within the DEP and SEP survey area during the breeding season. Therefore,

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
		• Breeding Leach's storm-petrel • Breeding red-throated diver • Breeding great skua • Breeding guillemot • Breeding puffin • Breeding shag • Breeding seabird assemblage (kittiwake, razorbill, Arctic skua, fulmar, puffin)				there is no impact pathway and both qualifying features are screened out. Leach's storm petrel was not recorded at DEP and SEP during the baseline surveys. There is no impact pathway for this qualifying feature, and it is therefore screened out. DEP and SEP are beyond the mean maximum foraging range of all breeding seabirds that are qualifying features of this SPA, and beyond the maximum foraging range of all species except fulmar (**Table 7-4**). Except for fulmar, there is no impact pathway for these qualifying features (i.e. red-throated diver, guillemot, puffin and shag) during the breeding season, and they can therefore be screened out. Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately <0.1% of birds present during the autumn and spring migration seasons.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Red-throated diver: Approximately 0.1% of the birds present during the winter, and 3.7% of birds present during spring and autumn migrations. Guillemot: Approximately 2.4% of birds present during the non-breeding season. Puffin: Approximately 3.3% of birds present during the non-breeding season. Shag: No birds predicated to be present in any season. Kittiwake: Approximately 0.1% of birds present during the autumn and spring migration seasons. Razorbill: Approximately 0.2% of birds present during the autumn and spring migration seasons, and 0.13% during the winter season. Arctic skua: Approximately 0.3% of birds present during the autumn migration and 0% of birds present during the spring migration. Fulmar: Approximately 5.8% of birds present during the autumn and spring migration seasons. The proportions of guillemot and puffin during the non-breeding season and red-throated diver in the migration seasons are considered sufficiently large for this species to be screened in. For all other qualifying species and times of year, whilst an impact pathway may exist, the number of birds realistically

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						anticipated to be present at DEP and SEP means that LSE can be ruled out. They are therefore screened out. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
UK9002051	Papa Stour	• Breeding Arctic tern • Non-breeding ringed plover *Charadrius hiaticula*	795	810	In	DEP and SEP are far beyond maximum foraging range of breeding Arctic tern from this SPA (**Table 7-4**), meaning that there is no impact pathway and this qualifying feature can be screened out during the breeding season. During the migration season, the proportion of the population migrating through DEP and SEP is estimated to be 2.0% of the total number of birds (Furness, 2015). This qualifying feature is therefore screened in, as there is clearly an impact pathway present and the proportion of birds present at DEP and SEP may be sufficient for LSE to occur. Migrations of non-breeding ringed plover to and from the site are likely to result in negligible numbers passing through DEP and SEP due to the distance between the SPA and DEP and SEP. Whilst there is a small risk of collision and therefore an impact pathway exists, the number of birds realistically anticipated to be present means that LSE can be ruled out. This qualifying feature is therefore screened out.
UK9002041	Ronas Hill – North Roe and Tingon	• Breeding red-throated diver	810	825	In	DEP and SEP are beyond the maximum foraging range of breeding red-throated diver from this SPA (**Table 7-4**). Great skua was not recorded at DEP and SEP during the breeding

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
		• Breeding great skua				season. There is no impact pathway for either qualifying feature during the breeding season and they can therefore be screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Red-throated diver: 0.3% of the birds present during the winter, and 15.6% of birds present during spring and autumn migrations. Great skua: 2.0% of birds present during autumn migration, and 0% of birds present during winter. The proportions of great skua are considered sufficiently large for this species to be screened in during autumn migration. This also applies to red-throated diver in the migration seasons.
UK9002031	Fetlar	• Breeding Arctic tern • Breeding red-necked phalarope *Phalaropus lobatus* • Breeding great skua • Breeding whimbrel *Numenius phaeopus* • Breeding dunlin *Calidris alpina*	810	820	In	DEP and SEP are beyond the mean maximum foraging range of breeding Arctic tern (**Table 7-4**), and great skua and Arctic skua were not recorded at DEP and SEP during the breeding season. There is no impact pathway for these qualifying features and they can therefore be screened out. Other breeding birds named as qualifying features of this SPA are unlikely to utilise DEP or SEP due to their habitat preferences. There is no impact pathway for these species and they are therefore screened out. During the migration seasons, birds from this SPA will be present at DEP and SEP in very

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
		• Breeding seabird assemblage (Arctic skua, fulmar)				small numbers which will be insufficient to result in LSE. They are therefore screened out. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Arctic tern: Approximately <0.1% of the birds present during the spring and autumn migrations. Great skua: Approximately 6.1% of birds present during autumn migration, and 0% of birds present during winter. Arctic skua: Approximately 0.7% of birds present during autumn migration, and 0% during spring migration. Fulmar: Approximately 2.6% of birds present during autumn and spring migration seasons. The proportions of great skua are considered sufficiently large for this species to be screened in during autumn migration. With respect to Arctic tern, proportions of birds predicted to occur at DEP and SEP outside the breeding season are very small. Therefore, whilst an impact pathway exists, it is not considered that sufficient numbers of birds could be impacted to result in LSE. This qualifying feature is screened out. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.
UK9002011	Hermaness, Saxa Vord and Valla Field	• Breeding gannet • Breeding great skua • Breeding puffin • Breeding seabird assemblage (fulmar, shag, guillemot, kittiwake)	830	840	In	Great skua was not recorded at DEP and SEP during the breeding season; there is therefore no impact pathway, and this qualifying feature can therefore be screened out. DEP and SEP are beyond the mean maximum foraging range of all breeding seabirds that are qualifying features of this SPA, and beyond the maximum foraging range of all species except fulmar (**Table 7-4**). With the exception of fulmar, all other qualifying features can be screened out during the breeding season as there is no impact pathway. DEP and SEP are within the maximum foraging range of fulmar. However, breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015). Therefore, whilst an impact pathway exists, these qualifying features are screened out on the basis that sufficient numbers to result in LSE are considered unlikely to be present at DEP and SEP. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are as follows: Gannet: Approximately 15.5% of birds present during autumn migration, and 20.1% of birds during spring migration.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						Great skua: Approximately 4.9% of birds present during autumn migration, and 0% of birds present during winter. Puffin: Approximately 0.1% of birds present during the non-breeding season. Fulmar: Approximately 2.0% of birds present during the autumn and spring migration seasons. Shag: Not present during non-breeding season. Guillemot: Approximately 0.7% of birds present during the non-breeding season. Kittiwake: Approximately 0.1% of birds present during the autumn and spring migration seasons. The proportions of gannet and great skua are considered sufficiently large for this species to be screened in at these times of year. With respect to puffin, proportions of birds predicted to occur at DEP and SEP outside the breeding season are very small. Therefore, whilst an impact pathway exists, it is not considered that sufficient numbers of birds could be impacted to result in LSE. This qualifying feature is screened out. Features of the seabird assemblage of this SPA could be present at DEP and SEP during the non-breeding season. They could therefore be susceptible to a range of impact pathways. However, it is not considered likely that sufficient numbers of the seabird assemblage would be present at DEP and SEP for LSE to occur. Therefore, they are screened out.

Site Code[1]	Site Name	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		

1. Site codes: SPA codes have nine characters (e.g. UK9004411) and Ramsar site codes have seven (e.g. UK11049). All sites are SPAs but not all are also Ramsar sites (i.e. a site with one code is SPA only and two codes indicates both designations). Occasionally the Ramsar code is not included for a site which designated as Ramsar as well as SPA, because relevant (usually breeding seabird) qualifying features are not part of the Ramsar qualifying interest.
2. Species listed in parentheses are components of an assemblage rather than qualifying features in their own right. All seabird qualifying features are listed individually, others may be referred to as species groups (e.g. wintering waterfowl, breeding ducks) or sometimes not listed where they are not relevant (e.g. species that do not forage or migrate through marine areas).
3. The shortest straight-line distance between the Project site and the SPA boundary measured in GIS. Figures in normal text are wholly or largely across sea, those in italics indicate distances largely or wholly across land.
4. Sites are screened in where LSE cannot be ruled out for one or more qualifying features and out where LSE can be ruled out for all qualifying features.
5. References to mean maximum and maximum foraging ranges relate to those given in Woodward *et al.* (2019).
6. List of species based on extended site classified 16/01/20.
7. Arctic tern listed on SPA citation but not conservation objectives.
8. Distances are to the boundary of the proposed marine extension to the SPA, not yet formally classified.
9. Qualifying features and distance based on the proposed Pentland Firth (marine) SPA, not yet formally classified, which adds seabird breeding assemblage (Arctic skua, guillemot) to the qualifying interest and extends the Pentland Firth Islands SPA (classified for Arctic tern only) to include marine foraging areas for Arctic tern, Arctic skua and guillemot.

Table 7-6. Screening list of SPA and Ramsar sites outside the UK with offshore ornithology features.

Site Code[1]	Site Name and Country	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
FR2310045	Littoral SeinoMarin SPA, France	• Breeding seabirds • Non-breeding seabirds	*342*	*334*	Out	DEP and SEP are beyond the maximum foraging range of all breeding seabird species at this SPA except for gannet (**Table 7-4**). Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from the Flamborough and Filey Coast SPA (Wakefield *et al.*, 2013), it is considered highly unlikely that

Site Code[1]	Site Name and Country	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						breeding birds from this SPA would regularly forage at DEP or SEP during the breeding season. Proportions of SPA seabird populations migrating through DEP and SEP outside the breeding season are expected to be small compared with the wider BDMPS (Furness, 2015). On this basis, all qualifying features are screened out.
FR2502020	Baie de Seine Occidentale SPA, France	• Breeding seabirds • Non-breeding seabirds	*422*	*416*	Out	DEP and SEP are beyond the maximum foraging range of all breeding seabird species at this SPA except for gannet (**Table 7-4**). Due to utilisation distribution data indicating that the Project sites will not be used by birds from this SPA, and parapatric competition with birds from the Flamborough and Filey Coast SPA (Wakefield *et al.*, 2013), it is considered highly unlikely that breeding birds from this SPA would regularly forage at DEP or SEP during the breeding season. Proportions of SPA seabird populations migrating through DEP and SEP outside the breeding season are expected to be small compared with the wider BDMPS (Furness, 2015). On this basis, all qualifying features are screened out.
FR2510099	Falaise du Bessin Occidentale SPA, France	• Breeding seabirds	*450*	*441*	Out	DEP and SEP are beyond the maximum foraging range of all breeding seabirds that are qualifying features of this SPA, and beyond the maximum foraging range of all species except fulmar (**Table 7-4**). Breeding fulmars from this SPA are highly unlikely to regularly occur at DEP and SEP due to the distance between the SPA and DEP and SEP, and the habitat preferences of this species (Edwards, 2015).

Site Code[1]	Site Name and Country	Qualifying Feature[2]	Distance (km)[3]		Screening Decision[4]	Rationale[5]
			DEP	SEP		
						The proportions of the SPA population migrating through DEP and SEP outside the breeding season are expected to be small compared with the wider BDMPS (Furness, 2015). On this basis, all qualifying features are screened out.
DE1813491	Seevogelschutzge biet Helgoland SPA, Germany	• Breeding seabirds	432	450	Out	DEP and SEP are beyond the maximum foraging range of all breeding seabird species at this SPA except for gannet (**Table 7-4**). Due to the distance between this SPA and DEP and SEP, and parapatric competition with birds from the Flamborough and Filey Coast SPA (Wakefield *et al.*, 2013), it is considered highly unlikely that breeding birds from this SPA would regularly forage at DEP or SEP during the breeding season. Proportions of SPA seabird populations migrating through DEP and SEP outside the breeding season are expected to be small compared with the wider BDMPS (Furness, 2015). On this basis, all qualifying features are screened out.

1. Site codes: SPA codes have nine characters (e.g. UK9004411).
2. Unlike UK SPAs, qualifying features are not listed individually, largely because the SPAs considered have large numbers of qualifying features.
3. The shortest straight-line distance between the Project site and the SPA boundary measured in GIS. Figures in normal text are wholly or largely across sea, those in italics indicate distances largely or wholly across land.
4. Sites are screened in where LSE cannot be ruled out for one or more qualifying features and out where LSE can be ruled out for all qualifying features.
5. References to mean maximum and maximum foraging ranges relate to those given in Woodward *et al.* (2019).

7.2.2 In-combination Effects

304. It is not considered likely that any protected sites or species that have not been screened in for DEP and SEP would be subject to in-combination effects, such that an additional LSE would arise. As such, for the purpose of the screening assessment, the conclusions set out for the 'project alone' also apply with respect to consideration of in-combination effects with other plans and projects.

305. All of the features screened in as set out in **Section 7.2.1** (**Table 7-5**) will also be subject to in-combination assessment for those effects. For example, for an SPA breeding seabird species screened in for LSE in relation to collision risk during the breeding season, in-combination assessment will be carried out considering combined collision risk for all OWFs and other projects and plans that may contribute to the effect under consideration at any time of the year.. The effects of combined collision mortality will be considered in terms of the status of the SPA population, using population modelling (Searle *et al.*, 2019), if appropriate to inform the assessment. Based on previous and recent assessments undertaken for OWFs in the Greater Wash area, this is likely to be the case for Sandwich tern at the North Norfolk SPA, and potentially gannet and kittiwake from the Flamborough and Filey Coast SPA, though in the case of the latter two species, use may be made of existing models.

7.2.3 Ornithology Screening Summary

306. Of the European sites considered in the screening (**Table 7-5** and **Table 7-6**), the sites in Error! Reference source not found. (and shown in **Figure 7-1**) have been identified for further consideration in the Stage 2 Appropriate Assessment for both DEP and SEP. These are sites for which LSE could not be ruled out for impacts arising from DEP and SEP. Error! Reference source not found. also indicates which potential effects are likely to be relevant for each species, based on the available information; this will be refined and updated as further information becomes available. Specifically, fully processed data from baseline surveys on the abundance and distribution of bird species within SEP and DEP which can be used to identify the potential magnitude of effects; and through further discussions with stakeholders during the Expert Topic Group consultation process.

307. As mentioned above, some SPAs for migratory waterbirds have been screened in for LSE on a precautionary basis. The intention is to carry out further investigation for potential collision risk using the migratory CRM tool (Wright *et al.*, 2012) and assess potential for displacement/barrier effects in more detail. Expert judgement and liaison with ETG Stakeholders will be undertaken to consider which qualifying waterfowl species are subject to migratory CRM.

Table 7-7: Sites and qualifying features screened into Appropriate Assessment of shadow HRA for DEP and SEP for offshore ornithology.

SPA / Ramsar Site	Project	Species and Season on Citation	Seasons Screened In	Construction/ Decommissioning			Operation				In comb.[2]
				Dist. / disp.[1]	Barrier	Indirect effects	Dist. / disp.[1]	Barrier	Collision risk	Indirect effects	
Greater Wash	DEP	Non-breeding red-throated diver	Non-breeding season	✓							✓
	SEP			✓			✓				✓
	DEP and SEP	Breeding Sandwich tern	Breeding season, autumn migration and spring migration	✓	✓		✓	✓	✓		✓
	DEP and SEP	Breeding common tern	Breeding season						✓		✓
	DEP and SEP	Non-breeding little gull	Non-breeding season		✓			✓	✓		✓
North Norfolk Coast	DEP and SEP	Breeding Sandwich tern	Breeding season, autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Breeding common tern	Breeding season, autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Non-breeding waterfowl species	Autumn migration and spring migration		✓			✓	✓		✓
Breydon Water	DEP and SEP	Non-breeding waterfowl species	Autumn migration and spring migration		✓			✓	✓		✓

SPA / Ramsar Site	Project	Species and Season on Citation	Seasons Screened In	Construction/ Decommissioning			Operation				In comb.[2]
				Dist. / disp.[1]	Barrier	Indirect effects	Dist. / disp.[1]	Barrier	Collision risk	Indirect effects	
The Wash	DEP and SEP	Non-breeding waterfowl species	Autumn migration and spring migration		✓			✓	✓		✓
Gibraltar Point	DEP and SEP	Non-breeding waterfowl species	Autumn migration and spring migration		✓			✓	✓		✓
Humber Estuary	DEP and SEP	Non-breeding waterfowl species	Autumn migration and spring migration		✓			✓	✓		✓
Broadland	DEP and SEP	Non-breeding waterfowl species	Autumn migration and spring migration		✓			✓	✓		✓
Ouse Washes	DEP and SEP	Non-breeding waterfowl species	Autumn migration and spring migration		✓			✓	✓		✓
Minsmere-Walberswick	DEP and SEP	Non-breeding waterfowl species	Autumn migration and spring migration		✓			✓	✓		✓
Nene Washes	DEP and SEP	Non-breeding waterfowl species	Autumn migration and spring migration		✓			✓	✓		✓

SPA / Ramsar Site	Project	Species and Season on Citation	Seasons Screened In	Construction/ Decommissioning			Operation				In comb.[2]
				Dist. / disp.[1]	Barrier	Indirect effects	Dist. / disp.[1]	Barrier	Collision risk	Indirect effects	
Alde-Ore Estuary	DEP and SEP	Breeding lesser black-backed gull	Breeding season, autumn migration, winter and spring migration						✓		✓
Flamborough and Filey Coast	DEP and SEP	Breeding gannet	Breeding season, autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Breeding kittiwake	Breeding season, autumn migration and spring migration						✓		✓
		Breeding guillemot	Breeding and non-breeding seasons	✓	✓		✓	✓			✓
		Breeding razorbill	Breeding season, autumn migration, winter and spring migration	✓	✓		✓	✓			✓
Coquet Island	DEP and SEP	Breeding Arctic tern	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Breeding common tern	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Breeding Sandwich tern	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
Farne Islands	DEP and SEP	Breeding Arctic tern	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
		Breeding Sandwich tern	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓

SPA / Ramsar Site	Project	Species and Season on Citation	Seasons Screened In	Construction/ Decommissioning			Operation				In comb.[2]
				Dist. / disp.[1]	Barrier	Indirect effects	Dist. / disp.[1]	Barrier	Collision risk	Indirect effects	
		Breeding seabird assemblage	Non-breeding season	✓	✓		✓	✓	✓		✓
St Abbs Head to Fast Castle	DEP and SEP	Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
Forth Islands	DEP and SEP	Breeding gannet	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Breeding lesser black-backed gull	Autumn migration, winter and spring migration						✓		✓
		Breeding puffin	Non-breeding season	✓	✓		✓	✓			✓
Imperial Dock Lock, Leith	DEP and SEP	Breeding common tern	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
Fowlsheugh	DEP and SEP	Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
		Breeding kittiwake	Autumn migration and spring migration						✓		✓
Ythan Estuary, Sands of Forvie and Meikle Loch (extension)	DEP and SEP	Breeding Sandwich tern	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓

SPA / Ramsar Site	Project	Species and Season on Citation	Seasons Screened In	Construction/ Decommissioning			Operation				In comb.[2]
				Dist. / disp.[1]	Barrier	Indirect effects	Dist. / disp.[1]	Barrier	Collision risk	Indirect effects	
Troup, Pennan and Lion's Heads	DEP and SEP	Breeding kittiwake	Autumn migration and spring migration						✓		✓
East Caithness Cliffs	DEP and SEP	Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
		Breeding kittiwake	Autumn migration and spring migration						✓		✓
		Breeding herring gull	Non-breeding season						✓		✓
		Breeding razorbill	Autumn migration, winter and spring migration	✓	✓		✓	✓			✓
Pentland Firth	DEP and SEP	Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
		Breeding Arctic skua	Autumn migration						✓		✓
North Caithness Cliffs	DEP and SEP	Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
Hoy	DEP and SEP	Breeding red-throated diver	Winter	✓							✓
Auskerry	DEP and SEP	Breeding Arctic tern	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓

SPA / Ramsar Site	Project	Species and Season on Citation	Seasons Screened In	Construction/ Decommissioning			Operation				In comb.[2]
				Dist. / disp.[1]	Barrier	Indirect effects	Dist. / disp.[1]	Barrier	Collision risk	Indirect effects	
Marwick Head	DEP and SEP	Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
West Westray	DEP and SEP	Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
Fair Isle	DEP and SEP	Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
Noss	DEP and SEP	Breeding gannet	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
East Mainland Coast, Shetland pSPA	DEP and SEP	Breeding red-throated diver	Autumn migration, winter and spring migration	✓							✓
Foula	DEP and SEP	Breeding guillemot	Non-breeding season	✓	✓		✓	✓			✓
		Breeding puffin	Non-breeding season	✓	✓		✓	✓			✓
		Breeding red-throated diver	Autumn migration and spring migration	✓							✓

SPA / Ramsar Site	Project	Species and Season on Citation	Seasons Screened In	Construction/ Decommissioning			Operation				In comb.[2]
				Dist. / disp.[1]	Barrier	Indirect effects	Dist. / disp.[1]	Barrier	Collision risk	Indirect effects	
Papa Stour	DEP and SEP	Breeding Arctic tern	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
Ronas Hill – North Roe and Tingon	DEP and SEP	Breeding red-throated diver	Autumn migration and spring migration	✓							✓
Fetlar	DEP and SEP	Breeding great skua	Autumn migration						✓		✓
Hermaness, Saxa Vord and Valla Field	DEP and SEP	Breeding gannet	Autumn migration and spring migration	✓	✓		✓	✓	✓		✓
		Breeding great skua	Autumn migration						✓		✓

1. Disturbance and displacement.
2. In-combination.

8 Summary

308. Sites and features where the potential for LSE cannot be discounted and which are therefore proposed to be screened in to the appropriate assessment stage are summarised in **Table 8-1**.

Table 8-1: Summary of designated sites and features screened in

Site	Features	Rationale
Onshore and Coastal Sites		
River Wensum SAC	• H3260 Watercourses of plain to montane levels with *R. fluitantis* • S1016 Desmoulin's whorl snail • S1092 Freshwater crayfish • S1096 Brook lamprey • S1163 Bullhead	There is potential for both direct and indirect effects upon both the features of the sites and the supporting habitats.
North Norfolk Coast Ramsar	• Sandwich tern • Common tern • Little tern • Red knot • Pink-footed goose • Dark-bellied brent goose • Eurasian wigeon • Northern pintail	No overlap therefore no direct effect, however, the qualifying features are likely to utilise a range of supporting habitats outside the boundary of the site.
North Norfolk Coast SPA	• Avocet • Bittern • Common tern • Dark-bellied brent goose • Knot • Little tern • Marsh harrier	No overlap therefore no direct effect, however, the qualifying features are likely to utilise a range of supporting habitats outside the boundary of the site (interest features above MHWS).

Site	Features	Rationale
	• Montagu's harrier • Pink-footed goose • Sandwich tern • Wigeon	

Broadland Ramsar	• H7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* Calcium-rich fen dominated by great fen sedge (saw sedge).
	• H7230 Alkaline fens Calcium-rich springwater-fed fens.
	• H91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*).
	• Alder woodland on floodplains and the Annex II species:
	  • S1016 Desmoulin`s whorl snail
	  • S1355 Otter
	  • S1903 Fen orchid
	  • Tundra swan
	  • Eurasian wigeon
	  • Gadwall
	  • Northern shoveler
		No overlap therefore no direct effect, however, the qualifying features are likely to utilise a range of supporting habitats outside the boundary of the site.

Offshore Sites		
Inner Dowsing, Race Bank and North Ridge SAC	• Sandbanks which are slightly covered by sea water all the time	Potential effects from: ○ increased SSC and deposition ○ changes to bedload sediment transport from SEP wind farm infrastructure

Site	Features	Rationale
Southern North Sea SAC	Harbour porpoise	DEP and SEP offshore project area is within the Southern North Sea SAC. Assumed that all harbour porpoise in the DEP and SEP area are associated with this SAC. Potential effects from: o underwater noise; o vessel interactions; o changes to water quality; o changes to prey resources; and o any in-combination effects.
Humber Estuary SAC	Grey seal	Potential effects from: o underwater noise; o vessel interactions; o changes to prey resources; o disturbance at seal haul-out sites; o disturbance of foraging seals at sea; and o disturbance at seal haul-out sites.
The Wash and North Norfolk Coast SAC	• Sandbanks which are slightly covered by sea water all the time • Harbour seal	Potential effects on sandbanks from: o changes to bedload sediment transport from cable protection Potential effects on harbour seal from: o underwater noise; o vessel interactions; o changes to prey resources; o disturbance at seal haul-out sites; o disturbance of foraging seals at sea; and o disturbance at seal haul-out sites for grey and harbour seal.

Site	Features	Rationale
Greater Wash SPA	• Breeding Sandwich tern • Breeding common tern • Non-breeding red-throated diver • Non-breeding little gull	SEP is within 10km of the SPA and therefore an impact pathway exists due to potential displacement of red-throated diver within the SPA This qualifying feature is therefore screened in. There is possible operational collision risk to non-breeding little gull, which have been recorded at DEP and SEP and are expected to be associated with this SPA. This qualifying feature is therefore screened in. It is not present outside the non-breeding season, therefore it is screened out during this time of year. The SPA includes core foraging areas for three breeding tern species at coastal colonies Sandwich tern, common tern and little tern. Birds from the SPA can occur in habitat outside the SPA, and common tern and Sandwich tern have been recorded at DEP and SEP. During the breeding season these qualifying features may be at risk of collision and potentially displacement in the case of Sandwich tern, and are therefore both screened in. Sandwich tern is also screened in for during the non-breeding season due to sufficiently large proportions of Sandwich tern present at these times of year.
North Norfolk Coast SPA and Ramsar site	• Breeding Sandwich tern • Breeding common tern • Non-breeding waterfowl including pink-footed goose and dark-bellied brent goose	DEP and SEP are within the mean maximum foraging range of breeding Sandwich tern, and the maximum foraging range of common tern from this SPA and Ramsar site (**Table 7-4**). These species are at risk of collision. Sandwich tern may also be at risk of operational displacement. An impact pathway exists and these qualifying features are therefore screened in during the breeding season. During spring and autumn migration periods approximately 31% of Sandwich terns, and 0.3% of common terns present within the DEP and SEP survey area may originate from this SPA (Furness, 2015). Sandwich tern are screened in for migration season impacts. For common tern potential migration season impacts on such a small number of birds would not affect enough birds to represent LSE, so they are screened out. Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.

Site	Features	Rationale
Breydon Water SPA and Ramsar site	• Non-breeding waterfowl	Potential collision risk of migrations of waterfowl to and from the SPA and Ramsar site represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
The Wash SPA and Ramsar site	• Non-breeding waterfowl including Bewick's swan, pink-footed goose and dark-bellied brent goose	Potential collision risk of migrations of waterfowl to and from the SPA represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
Gibraltar Point SPA and Ramsar site	• Non-breeding waders	Potential collision risk of migrations of waterfowl to and from the SPA and Ramsar site represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
Humber Estuary SPA and Ramsar site	• Non-breeding waterfowl	Potential collision risk of migrations of waterfowl to and from the SPA and Ramsar site represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
Broadland SPA and Ramsar site	• Non-breeding waterfowl including Bewick's Swan and whooper swan	Potential collision risk of migrations of waterfowl to and from the SPA and Ramsar site represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
Ouse Washes SPA and Ramsar site	• Breeding ducks and waders • Non-breeding waterfowl including Bewick's and Whooper swan	Potential collision risk of migrations of waterfowl to and from the SPA and Ramsar site represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
Minsmere-Walberswick SPA and Ramsar site	• Non-breeding waterfowl	Potential collision risk of migrations of waterfowl to and from the SPA and Ramsar site represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.
Nene Washes SPA and Ramsar site	• Breeding ducks • Non-breeding waterfowl Bewick's Swan	Potential collision risk of migrations of waterfowl to and from the SPA and Ramsar site represents an impact pathway which could result in LSE, due to the relatively close proximity of the SPA to DEP and SEP. These qualifying features are therefore screened in.

Site	Features	Rationale
Alde-Ore Estuary SPA and Ramsar site	• Breeding lesser black backed gull	SEP and DEP are within the mean maximum foraging range of breeding lesser black-backed gull from this SPA and Ramsar site (**Table 7-4**), meaning that there is a potential impact pathway for this population. Whilst tracking data indicate that individuals of this species breeding at the SPA have not been recorded travelling as far as DEP or SEP (Thaxter *et al.*, 2015), this qualifying feature is screened in. Outside the breeding season, the lesser black-backed gull population of this SPA would represent approximately 0.9%, 1.7% and 1.0% of birds recorded at DEP and SEP during autumn migration, winter and spring migration respectively. Impacts on birds outside the breeding season are therefore screened in.
Flamborough and Filey Coast SPA	• Breeding gannet • Breeding guillemot • Breeding kittiwake • Breeding razorbill	Mean maximum and/or maximum foraging ranges indicate that breeding gannet, guillemot, kittiwake and razorbill may forage at DEP and SEP and be at risk of collision during operation, and/or displacement. There is therefore an impact pathway and these qualifying features are screened in. Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are all considered sufficiently large for these qualifying features to be screened in at these times of year.
Coquet Island SPA	• Breeding Sandwich tern • Breeding common tern • Breeding Arctic tern	Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are all considered sufficiently large for these qualifying features to be screened in at these times of year.
Farne Islands SPA	• Breeding Sandwich tern • Breeding Arctic tern • Breeding guillemot • Breeding seabird assemblage (puffin, kittiwake)	Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are all considered sufficiently large for these qualifying features (Arctic tern, Sandwich tern and guillemot) to be screened in at these times of year, except for common tern which is screened out due to lower proportions. The proportion of birds predicted to be present for kittiwake and puffin during the non-breeding season are sufficiently high for the assemblage to be screened in.

Site	Features	Rationale
St Abb's Head to Fast Castle SPA	• Breeding guillemot	Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are all considered sufficiently large for guillemot to be screened in at these times of year.
Forth Islands SPA	• Breeding gannet • Breeding lesser black-backed gull • Breeding puffin	Gannet, lesser black-backed gull and puffin from this SPA are screened in outside the breeding season as proportions predicted to be present at DEP and SEP that are from this SPA are considered sufficiently large for LSE to be possible.
Imperial Dock Lock, Leith SPA	• Breeding common tern	Outside the breeding season, approximately 1.2% of common tern present at DEP and SEP are estimated by Furness. (2015) to be from this SPA. An impact pathway therefore exists, and this proportion is considered sufficiently large for LSE to be possible, so this qualifying feature is screened in.
Fowlsheugh SPA	• Breeding guillemot • Breeding kittiwake	Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) have been considered. Guillemot and kittiwake from this SPA are screened in outside the breeding season as proportions predicted to be present at DEP and SEP that are from this SPA are considered sufficiently large for LSE to be possible.
Ythan Estuary, Sands of Forvie and Meikle Loch (extension) SPA and Ramsar site	• Breeding Sandwich tern	Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA and Ramsar site (according to the composition of the wider relevant BDMPS of Furness (2015)) have been considered. Sandwich tern from this SPA and Ramsar site are screened in outside the breeding season as proportions predicted to be present at DEP and SEP are considered sufficiently large for LSE to be possible due to collision risk, and potentially displacement.
Troup, Pennan and Lion's Heads SPA	• Breeding kittiwake • Breeding guillemot	The proportions of kittiwake and guillemot predicted to be present in the DEP and SEP survey area outside the breeding season that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are sufficiently large for LSE to be considered a possibility; therefore these qualifying features are screened in.
East Caithness Cliffs SPA	• Breeding guillemot • Breeding razorbill	The numbers and proportions of kittiwake, guillemot, razorbill predicted to be present in the DEP and SEP survey area that are from this SPA (according to the composition of the wider

Site	Features	Rationale
	• Breeding kittiwake	relevant BDMPS of Furness (2015)) outside the breeding season are sufficiently large for LSE to be considered a possibility; therefore these qualifying features are screened in.
Pentland Firth pSPA[9]	• Breeding guillemot • Breeding Arctic skua	Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) have been considered. The proportions of guillemot and Arctic skua (autumn migration) predicted to be present in the DEP and SEP survey area outside the breeding season are sufficiently large for LSE to be considered a possibility; therefore, these qualifying features are screened in.
North Caithness Cliffs SPA	• Breeding guillemot	The proportion of guillemot predicted to be present in the DEP and SEP survey area that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) outside the breeding season are sufficiently large for LSE to be considered a possibility; therefore this qualifying feature is screened in.
Hoy SPA	• Breeding red-throated diver	The proportion of red-throated diver predicted to be present in the DEP and SEP survey area during winter is sufficiently large for LSE to be considered a possibility; therefore, this qualifying feature is screened in for this time of year.
Auskerry SPA	• Breeding Arctic tern	Outside the breeding season, the proportion of Arctic tern present at DEP and SEP that are estimated by Furness (2015) to be from this SPA is approximately 1.1%. This is considered sufficiently large for LSE to be a possibility; therefore, this qualifying feature is screened in.
Marwick Head SPA	• Breeding guillemot	Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) have been considered. The proportion of guillemot predicted to be present in the DEP and SEP survey area during the non-breeding season is sufficiently large for LSE to be considered a possibility; therefore, this qualifying feature is screened in.
West Westray SPA	• Breeding guillemot	Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) have been considered. The proportion of guillemot predicted to be present in the DEP and SEP survey area that are from this SPA outside the breeding season is

Site	Features	Rationale
		sufficiently large for LSE to be considered a possibility; therefore, this qualifying feature is screened in.
Fair Isle SPA	• Breeding guillemot	Outside the breeding season, the proportions of birds estimated to be present at DEP and SEP that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) have been considered. The proportion of guillemot predicted to be present in the DEP and SEP survey area at particular times of year is sufficiently large for LSE to be considered a possibility; therefore, these qualifying features are screened in.
Noss SPA	• Breeding gannet • Breeding guillemot	The proportions of gannet and guillemot predicted to be present in the DEP and SEP survey area that are from this SPA (according to the wider relevant BDMPS of Furness (2015)) at particular times of year is sufficiently large for LSE to be considered a possibility; therefore these qualifying features are screened in.
East Mainland Coast, Shetland pSPA	• Breeding red-throated diver	Outside the breeding season, the proportions of red-throated divers presumed to be present at DEP and SEP that are from this SPA (according to the wider relevant BDMPS of Furness (2015) are large enough (7.8% during the winter, and 3.1% during autumn and spring migration seasons) for LSE to be possible. This qualifying feature is therefore screened in.
Foula SPA	• Breeding red-throated diver • Breeding guillemot • Breeding puffin	The proportions of guillemot and puffin during the non-breeding season and red-throated diver in the migration seasons that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are considered sufficiently large for this species to be screened in.
Papa Stour SPA	• Breeding Arctic tern	During the migration season, the proportion of the Artic tern population migrating through DEP and SEP is estimated to be 2.0% of the total number of birds (Furness, 2015). This qualifying feature is therefore screened in, as there is clearly an impact pathway present and the proportion of birds present at DEP and SEP may be sufficient for LSE to occur.
Ronas Hill – North Roe and Tingon SPA	• Breeding red-throated diver • Breeding great skua	The proportions of great skua that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are considered sufficiently large for this species to be screened in during autumn migration. This also applies to red-throated diver in the migration seasons.

Site	Features	Rationale
Fetlar SPA	• Breeding great skua	The proportions of great skua that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are considered sufficiently large for this species to be screened in during autumn migration.
Hermaness, Saxa Vord and Valla Field SPA	• Breeding gannet • Breeding great skua	The proportions of gannet and great skua that are from this SPA (according to the composition of the wider relevant BDMPS of Furness (2015)) are considered sufficiently large for this species to be screened in at these times of year.

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