ARVEN
OFFSHORE WIND FARM

Offshore HRA Screening Report

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Glossary

Term	Definition
Array Area(s)	The area(s) in which wind turbine generators (WTGs) and their associated floating foundations, inter-array cables, offshore substation platforms (OSPs) and their associated bottom-fixed foundations and interconnector cables will be located.
Arven Offshore Wind Farm	A floating offshore wind farm to be developed in the areas which are the subject of Option Agreements between Crown Estate Scotland and each of Arven Offshore Wind Farm Limited (ScotWind area 19) and Arven South Limited (ScotWind area 18).
Design Envelope	This comprises a description of the range of possible elements that make up the Project design options under consideration, as set out in detail in the project description when the exact and final engineering parameters

Term	Definition
	are not yet known. This is often referred to as a "Rochdale Envelope" approach.
Developer	Arven Offshore Wind Farm Limited and Arven South Limited.
Floating Foundations	The foundations that the WTGs will be installed upon, consisting of a floating platform with associated mooring and anchoring systems.
Foundations	The foundation and substructure or platform on which the WTGs or OSPs are installed. Within this Screening Report, reference is made to both Floating Foundations and Bottom-fixed Foundations.
Habitats Regulations	The Conservation (Natural Habitats, &c.) Regulations 1994, and the Conservation of Habitats and Species Regulations 2017.
Horizontal Directional Drilling (HDD)	A method of underground cable installation where the cable is drilled beneath a feature without the need for trenching.
Offshore Habitats Regulations	The Conservation of Offshore Marine Habitats and Species Regulations 2017
Inter-array Cables	Cables which link the WTGs to each other and to the OSPs.
Interconnector Cables	Cables which link OSPs to one another.
Landfall	The area where the offshore export cables will be brought ashore.
Offshore Export Cable Corridor (OfECC)	The area within which the Offshore Export Cables are planned to be installed.
Offshore Export Cables	The subsea electricity cables running from the OSPs to the Landfall and transmitting the electricity generated from the offshore wind farm to the onshore cable circuits for transmission onwards to the Onshore Converter Station or Onshore Substation.
Offshore Generation Infrastructure	The proposed generation infrastructure comprising WTGs and associated Floating Foundations, and the Inter-array Cables and Interconnector Cables (noting that the Interconnector Cables may be considered as either a generation or transmission asset).

Term	Definition
Offshore Proposed Development	Arven Offshore Wind Farm and Arven South Offshore Wind Farm project elements to which the Offshore Scoping Report and Environmental Impact Assessment Report relates, inclusive of the Offshore Transmission Infrastructure and Offshore Generation Infrastructure.
Offshore Substation Platform (OSP)	The offshore platform that facilitates the transfer of power from the WTGs and Inter-array Cables to the Offshore Export Cables. For a High Voltage Direct Current (HVDC) connection the offshore platform would house a converter station to convert High Voltage Alternating Current (HVAC) to HVDC.
Offshore Transmission Infrastructure	The offshore transmission infrastructure located below MHWS, comprising OSPs and associated foundations, and the Offshore Export Cables and Interconnector Cables (noting that the Interconnector Cables may be considered as either a generation or transmission asset).
Plan Option	A location identified in the Sectoral Marine Plan as a preferred area for commercial-scale offshore wind development.
Project	Arven Offshore Wind Farm and Arven South Offshore Wind Farm, collectively referred to as Arven. Comprising the Offshore Proposed Development and Onshore Proposed Development.
Sectoral Marine Plan	The Sectoral Marine Plan for Offshore Wind Energy, published by the Scottish Government in 2020.
Scour Protection	Protective material positioned around offshore infrastructure (for example, anchors and foundations) on the seabed to avoid sediment being eroded as a result of the flow of water.
Wind Turbine Generator	The wind turbines that generate electricity consisting of tubular towers and blades attached to a nacelle housing mechanical and electrical generating equipment.

List of Acronyms

Acronym / Abbreviation	Term
AA	Appropriate Assessment
ADD	Acoustic Deterrent Device

Acronym / Abbreviation	Term
BDMPS	Biologically Defined Minimum Population Scales
BGS	British Geological Society
CAA	Civil Aviation Authority
cSACs	Candidate SACs
DAS	Digital Aerial Survey
DDV	Drop Down Video
DEA	Drag Embedment Anchor
DECC	Department of Energy and Climate Change
DTA	David Tyldesley Associates
EIA	Environmental Impact Assessment
EMF	Electro Magnetic Field
EU	European Union
FCS	Favourable Conservation Status
HAT	Highest Astronomical Tide
HDD	Horizontal directional drilling
HNDFUE	Holistic Network Design Follow Up Exercise
HRA	Habitats Regulations Appraisal / Assessment
IAC	Inter-array cables
IAMMWG	Inter-Agency Marine Mammal Working Group
INNS	Invasive Non-native Species
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LSE	Likely significant effects
MCA	Maritime and Coastguard Agency
MD	Marine Directorate
MHWS	Mean High Water Springs
MLWS	Mean Low Water Spring
MMF+1SD	mean-maximum foraging range plus one standard deviation (MMF +1SD
MPA	Marine Protected Area
MW	MegaWatt
NETS	National Electricity Transmission System
NGESO	National Grid Electricity System Operator
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Service
OfECC	Offshore Export Cable Corridor
OREI	Offshore Renewable Energy Installation

Acronym / Abbreviation	Term
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
PDE	Project Design Envelope
PO	Planning Option
RIAA	Report to Inform Appropriate Assessment
SAC	Special Areas of Conservation
SCOS	Special Committee on Seals
SMP	Seabird Monitoring Programme
SMU	Seal Management Unit
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
s-p-r	source-pathway-receptor
SSSI	Site of Special Scientific Interest
TJB	Transition Joint Bay
UK	United Kingdom
UXO	Unexploded Ordnance
WTG	Wind Turbine Generator
ZoI	Zone of Influence

1 Introduction

1.1 Project Background

The Arven Offshore Wind Farm (OWF) will be situated approximately 30 km from the Shetland Mainland, covering an area of approximately 460 km^2 and will consist of a maximum of 161 Wind Turbine Generators (WTG). Electricity generated will be transported to the coastline via offshore export cables, which will be installed within the Offshore Export Cable Corridor (OfECC), to a landfall site(s) within the corridor. Multiple landfall locations are currently being considered along the east coast of mainland Shetland. For the purposes of this Screening Report, the offshore components of the Project are referred to as the Offshore Proposed Development.

GoBe Consultants Ltd have been appointed by Arven Offshore Wind Limited and Arven South Limited (the Developer) to prepare this Habitats Regulations Appraisal (HRA) Screening Report.

1.2 Purpose of this Report

This document has been produced to inform the HRA process for the Offshore Proposed Development. It provides information to enable the screening of the Offshore Proposed Development with respect to its potential to have no likely significant effects (LSE) on European and Ramsar sites of nature conservation importance. A significant effect should be considered likely if it cannot be excluded on the basis of objective information and it might undermine the integrity of a site or ecosystem or the conservation objectives for habitats or species populations within a given geographical area. This step in the process and associated reporting requirements are further described in the following sections.

This HRA Screening Report is based on the Offshore Proposed Development and site-specific information currently available. It should be noted, however, that further environmental survey and assessment work, consultee and advisor responses to this document, as well as refinements to the project design – including refinement of an OfECC - may change this assessment. These changes will be recorded and reflected in the full Report to Inform Appropriate Assessment (RIAA) to be submitted with the Marine Licence and Section 36 Consent applications for the Offshore Proposed Development. This report is assessing the Offshore Proposed Development, an onshore assessment will be provided separately for the Onshore Proposed Development.

1.3 Report Structure

This document is set out in a number of sections to present the process in a clear manner. The overall structure of the document is presented below:

- Section 1: Introduction. A background to the Offshore Proposed Development, including the purpose of the Project and where additional Project related information (including baseline environment and impact assessment) can be found;
- Section 2: Legislative Context. An overview of key legislation;
- Section 3: Description of the Offshore Proposed Development. Drawing on the information presented in the Project Description, providing the maximum adverse scenario for each receptor group including temporal and spatial aspects;

- Section 4: Methodology. A description of the methodology used to undertake the HRA Screening exercise;
- Section 5: Screening for No LSE Alone and In-Combination - HRA Screening – Project Alone and In-Combination. Findings of the screening exercise both alone and in-combination;
- Section 6: Test for No LSE; and
- Section 7: Summary of Screening for Appropriate Assessment. A summary of the screening conclusions.

2 Legislative Context

2.1 Introduction

This section provides background and context in terms of the legislative requirements and processes that are applicable for HRA within Scotland and to the Offshore Proposed Development. It sets out an overview of the establishment of the legislative framework and then provides explanation of the current legal requirements for development proposals.

2.1.1 Habitats Directive

European Union (EU) Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('Habitats Directive') and EU Council Directive 2009/147/EC on the conservation of wild birds ('Birds Directive') originally provided the EU legislative framework for the protection of the most valuable and threatened biodiversity. Within this framework European designated sites ('European sites') were defined as Special Areas of Conservation (SACs) and Candidate SACs (cSACs) under the Habitats Directive and Special Protection Areas (SPAs) under the Birds Directive. In accordance with these Directives, the UK set out its own regulatory framework through the application of a series of secondary legislation. This secondary legislation comprised the Conservation (Natural Habitats, &c.) Regulations 1994, the Conservation of Habitats and Species Regulations 2017 (Habitats Regulations) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (discussed further in Section 2.2) (Offshore Habitats Regulations).

2.1.2 Post-EU Exit Amendments

In January 2020, the UK withdrew from the EU and as such the UK is no longer bound by EU legislation unless forming part of domestic legislation. The importance of protecting biodiversity in the UK remained fully recognised following the UK's withdrawal and therefore the Scottish Parliament and the UK Government both passed EU-Exit legislation to ensure that biodiversity remained protected to at least the same standard as the original EU environmental standards.

Within Scotland, this was implemented through The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019, which ensured that at exit day Scotland continued to maintain the standards required by The Habitats and Birds Directives and that European Sites (and certain sites that were proposed to be so) continued to be protected. At this time The Scottish Government also indicated a longer-term ambition to exceed the requirements of the Directives.

Although the Habitats Regulations and Offshore Habitats Regulations remain in force, including the procedural requirements to undertake HRA to assess the implications of plans and projects for European sites, The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 made a number of changes to the Habitats Regulations and Offshore Habitats Regulations to ensure that these Regulations remained operable now that the UK had left the EU.

The amendments to the Habitats Regulations and Offshore Habitats Regulations are set out within 'EU Exit: The Habitats Regulations in Scotland' (Scottish Government, 2020) and include:

- The terms ‘European site’, ‘European marine site’ and ‘European offshore marine site’ have been retained, as have the terms ‘SAC’ and ‘SPA’;
- In the UK, European sites, European marine sites and European offshore marine sites (as defined by the Habitats Regulations and Offshore Habitats Regulations) are no longer part of the EU’s Natura 2000 network. Instead, they form a UK-wide network of protected sites, referred to in the Habitats Regulations and Offshore Habitats Regulations as the UK Site Network, and they retain the same protections;
- Management objectives are established for the UK Site Network (or alternatively referred to as ‘National Site Network’). For such sites in Scotland (including those in Scotland’s inshore and offshore waters), the Scottish Ministers must work in co-operation with the other UK administrations to manage, and where necessary, adapt the UK Site Network to contribute to the achievement of these objectives.
- The objectives in relation to the UK Site Network are to:
    - Maintain or restore certain habitats and species listed in the Habitats Directive to favourable conservation status (FCS);
    - Contribute to ensuring the survival and reproduction of certain species of wild bird in their area of distribution and to maintaining their populations at levels which correspond to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements.
- European marine sites and European offshore marine sites continue to contribute to Scotland’s Marine Protected Area (MPA) network. The network also includes Nature Conservation MPAs, Sites of Special Scientific Interest (SSSIs) and Ramsar sites.
- The European Commission no longer plays a role in the designation process, or provision of opinion in certain circumstances on whether there were Imperative Reasons of Overriding Public Interest (IROPI) for granting consent for a plan or project despite a competent authority being unable (following completion of an HRA) to ascertain no adverse effect on site integrity. This now all falls under the remit of the Scottish Ministers, with advice from NatureScot and the Joint Nature Conservation Committee (JNCC).

The Habitats Regulations and Offshore Habitats Regulations now include powers for the Scottish Ministers to amend the species schedules listed in the Habitats Regulations and Offshore Habitats Regulations where technology and scientific understanding and natural range in any area of Scotland suggests amendments might be required.

There are new powers for the Scottish Ministers and the Secretary of State (in relation to the Habitats Regulations and Offshore Habitats Regulations) to issue guidance on interpreting the requirements of the Nature Directives. In addition to the European sites designated under the Habitats Regulations, Offshore Habitats Regulations and other primary legislation such as the Wildlife and Countryside Act 1981 (as amended), Scottish Government policy (National Planning Framework 4 (NPF4) 2023) states that proposed and potential SPAs and SACs and internationally important wetlands designated under the Ramsar Convention (Ramsar sites) are afforded the same protection as SPAs and SACs, for the purpose of considering development proposals that may affect them (and so are referred to and considered in this report as ”European sites”).

2.2 Habitats Regulations

In Scotland, the protection of European sites is implemented through the Conservation (Natural Habitats &c.) Regulations 1994 and the Conservation of Habitats and Species Regulations 2017 (together referred to as the Habitats Regulations); and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (referred to as the Offshore Habitats Regulations). The Conservation (Natural Habitats &c.) Regulations 1994 are applicable from mean high water springs (MHWS) to the 12 nm limit, while The Offshore Habitats Regulations are applicable from the 12 nm limit to the Scottish offshore limit. Within Scotland, The Conservation of Habitats and Species Regulations 2017 only apply to specific reserved and devolved activities in Scottish inshore waters (MHWS to 12 nm limit).

The four-stage process of determining the absence of adverse effects on European sites under the Habitats Regulations and Offshore Habitats Regulations is known as an HRA.

Under Regulation 48(1) of The Conservation (Natural Habitats &c.) Regulations 1994 and under Regulation 28 of The Conservation of Offshore Marine Habitats and Species Regulations 2017, an Appropriate Assessment (AA) is required where a plan or project is likely to have a significant effect on a European site either alone or in combination with other reasonably foreseeable plans or projects and where the plan or project is not directly connected with or necessary to the management of the site.

Regulation 48(1) states:

> *A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which–*
>
> *(a) is likely to have a significant effect on a European site in Great Britain [F132or a European offshore marine site] (either alone or in combination with other plans or projects), and*
>
> *(b) is not directly connected with or necessary to the management of the site, 45 Document Generated: 2024-02-17 Changes to legislation: There are currently no known outstanding effects for the Conservation (Natural Habitats, &c.) Regulations 1994. (See end of Document for details) shall make an appropriate assessment of the implications for the site in view of that site's conservation objectives Regulation 28 states.*
>
> *Before deciding to undertake, or give any consent, permission or other authorisation for, a relevant plan or project, a competent authority must make an appropriate assessment of the implications of the plan or project for the site in view of that site's conservation objectives.*

It is therefore necessary, in the first instance, to determine whether it is possible to conclude that there is no LSE on the site. Only where it is not possible to conclude this, does an AA need to be carried out by the competent authority. The European Court of Justice ruling in the case of Waddenzee (Case C-127/02), which is referred to for context, set the position that an AA of a project is necessary *"if it cannot be excluded, on the*

basis of objective information, that it will have a significant effect on the site". It is therefore clear that if it cannot be objectively ruled out, then an effect is likely. The test is therefore negative and embeds precaution within it.

As identified above Regulation 48 of the 1994 Habitats Regulations and Regulation 28 of the Offshore Habitats Regulations states that a competent authority shall make an AA before any decision to give consent for any plan or project that is not directly connected with or necessary to the (conservation) management of a European site and which could likely have a significant effect on that site (either alone or in combination with other known plans or projects). An AA is therefore required for all plans or projects 'likely to have a significant effect' on a European site in view of the conservation objectives of the European site. The competent authority can only agree to the plan or project having ascertained that it will not adversely affect the integrity of the European site. In order to ascertain this, the competent authority must give regard to the manner in which the plan or project is proposed to be carried out or to any conditions or restrictions proposed for the consent or permission.

As the Offshore Proposed Development is not directly connected with or necessary to the management of a European site, an HRA is required.

2.2.1 HRA Process

As established, the Habitats Regulations and Offshore Habitats Regulations require that wherever a project that is not directly connected to, or necessary for, the management of a European site is likely to have a significant effect on the conservation objectives of the site (directly, indirectly, alone or in-combination with other plans or projects) then an 'Appropriate Assessment' (AA) must be undertaken by the Competent Authority. The AA must be carried out before consent or authorisation can be given for the project.

HRA is a four-stage process which determines LSE and (where appropriate) assesses adverse impact on the integrity of a European site, examines alternative solutions, and provides justification of Imperative Reason for Overriding Public Interest (IROPI). There are three key –stages involved in the process (Stage 1: Screening; Stage 2: AA; and Stage 3: Derogation and Compensation) which are achieved through a series of numerous steps as summarised below in Figure 2.1.

The integrity of a site is defined by guidance as the coherence of the site's ecological structure and function, across the whole of its area, which enables it to sustain the habitat, complex of habitats and/or populations of species for which the site has been designated (EC, 2001). An adverse effect on integrity is likely to be one which prevents the site from making the same contribution to favourable conservation status as it did at the time of designation.

The following guidance was reviewed and considered while undertaking this screening appraisal:

- Scottish Government (2012). Habitats Regulations Appraisal (HRA) Advice Sheet: Screening general policies and applying simple mitigation measures;
- Scottish Government (2013). Habitats Regulations Appraisal (HRA) Advice Sheet: HRA and Strategic Environmental Assessment;
- European Commission (EC) (2019). Managing Natura 2000 Sites – The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC;
- NatureScot (2023a). Habitats Regulations Appraisal (HRA) of Local Development Plans (LDPs) - Guidance for planning authorities in Scotland. November 2023;
- Tyldesley (2015). Habitats Regulations Appraisal of Plans. Guidance For Plan-Making Bodies In Scotland. Version 3. January 2015; and
- David Tyldesley and Associates (DTA). (2021a). The Habitat Regulations Assessment Handbook. Available online at: https://www.dtapublications.co.uk.

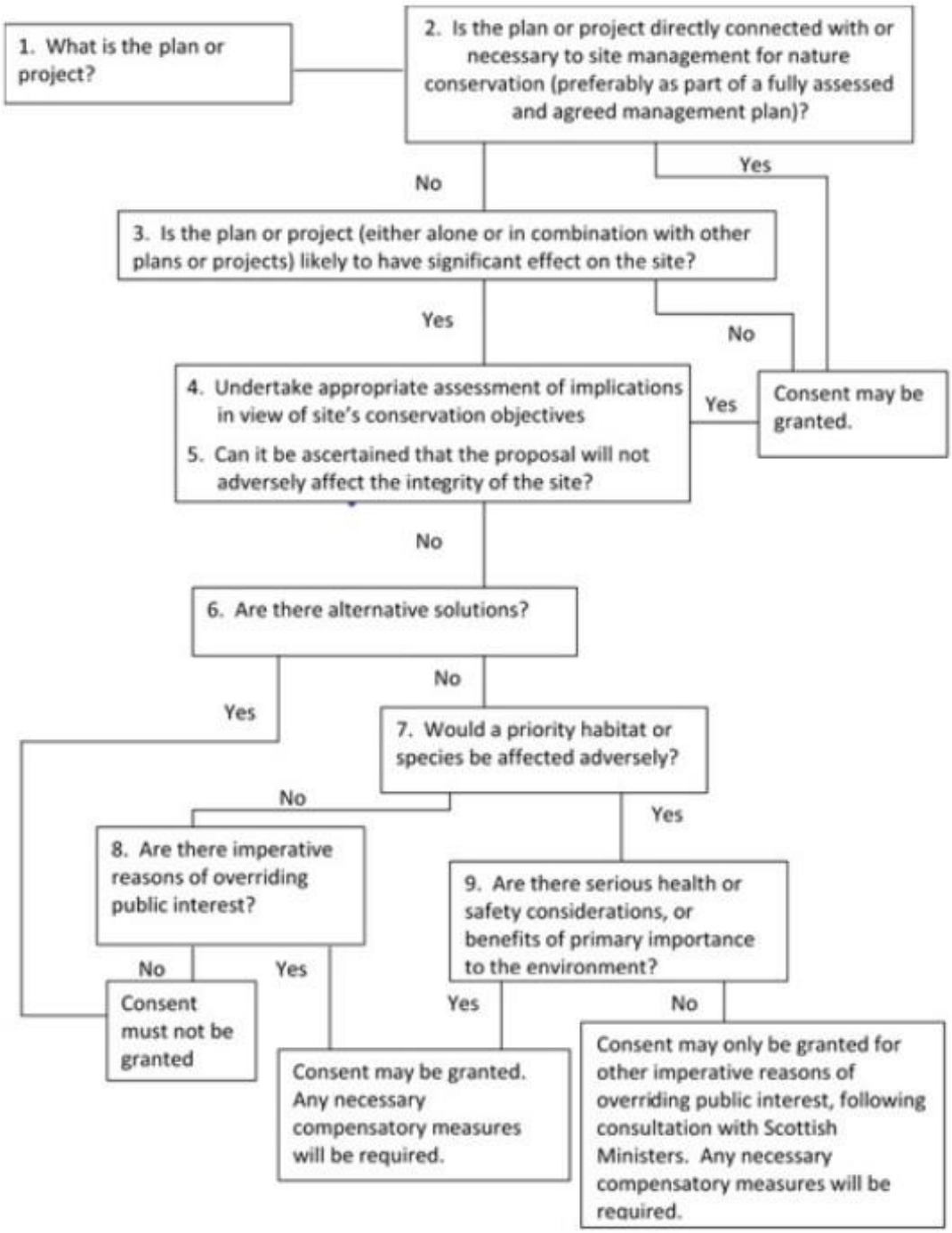


Figure 2.1: How to consider plans and projects that could affect European sites (SPAs and SACs). (NatureScot, 2024)

3 Description of the Offshore Proposed Development

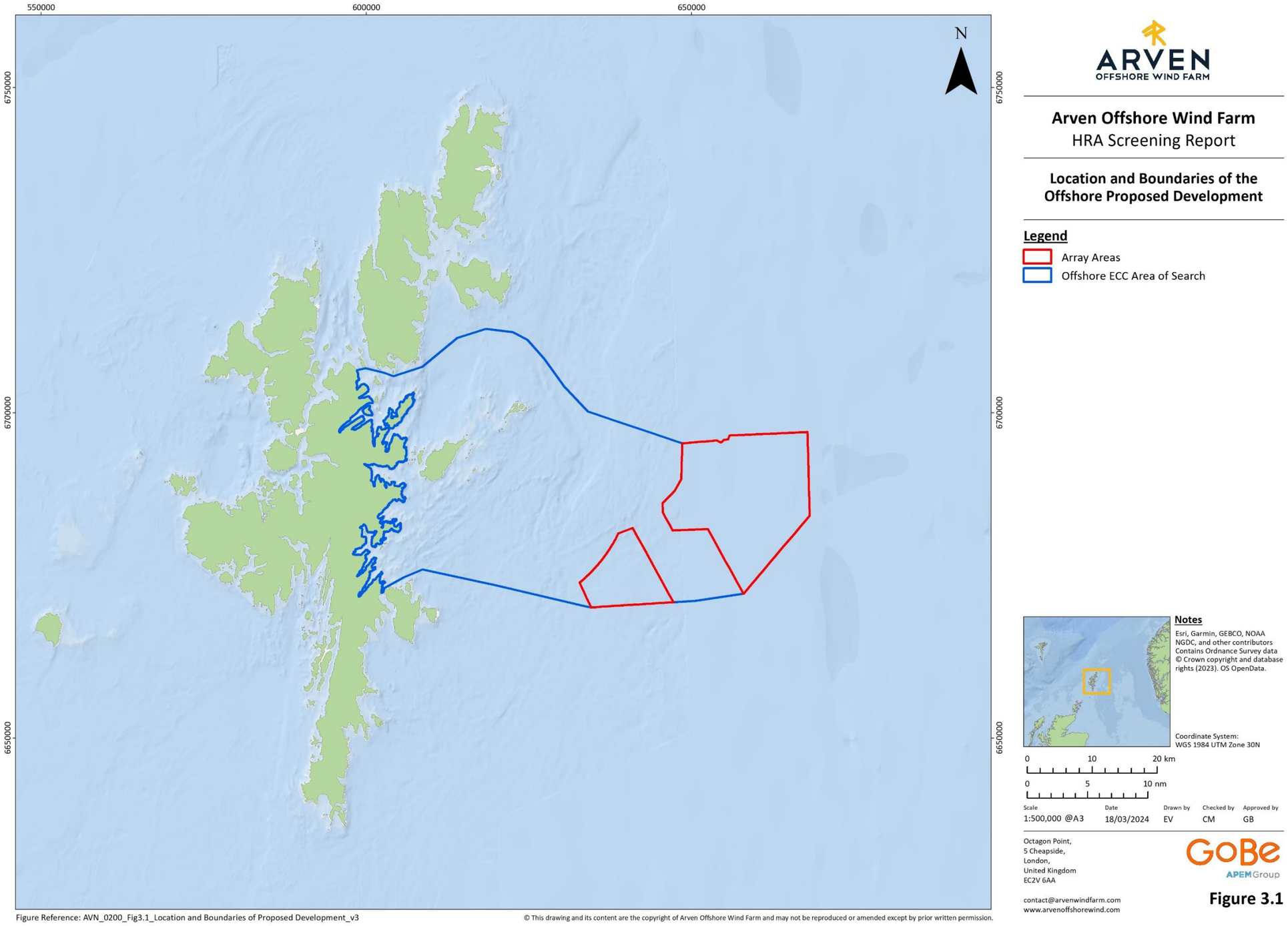
3.1 Introduction

This section of the HRA Screening Report provides an outline description of the Offshore Proposed Development, based on preliminary conceptual design information and as described in Chapter 3: Description of the Offshore Proposed Development of the Offshore Scoping Report. It sets out the Offshore Proposed Development design and components for the offshore infrastructure, as well as the activities associated with the construction, operation and maintenance, and decommissioning of the Offshore Proposed Development.

3.2 Project Site and Location

The Offshore Proposed Development is located within the NE1 Plan Option (PO) area (Crown Estate Scotland 2022). The Array Areas cover 460 km^2, which includes the Arven Array Area (360 km^2) and the Arven South Array Area (100 km^2). The Array Areas are located 30 km from the Shetland mainland at their closest point. At present it is anticipated that the Offshore Proposed Development will export generated electricity via a connection to the Shetland mainland.

The boundary within which all Offshore Proposed Development infrastructure will be located is displayed in Figure 3.1. The boundary encompasses the two Array Areas and a relatively wide area of search running into the east of Mainland Shetland within which an Offshore ECC(s) and landfall(s) will be located. The identification of and subsequent refinement of the Offshore ECC(s) and landfall(s) will be informed by a number of factors, and that identification and refinement process will commence upon confirmation of onshore connection location(s) following conclusion of the National Grid Electricity System Operator (NGESO) Holistic Network Design Follow Up Exercise (HNDFUE).



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Arven Offshore Wind Farm
HRA Screening Report

Location and Boundaries of the Offshore Proposed Development

Legend
- Array Areas
- Offshore ECC Area of Search

Notes
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors
Contains Ordnance Survey data © Crown copyright and database rights (2023). OS OpenData.

Coordinate System:
WGS 1984 UTM Zone 30N

0 10 20 km
0 5 10 nm

Scale	Date	Drawn by	Checked by	Approved by
1:500,000 @A3	18/03/2024	EV	CM	GB

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Figure 3.1

Figure Reference: AVN_0200_Fig3.1_Location and Boundaries of Proposed Development_v3

Figure 3.1: Location and boundaries of the Offshore Proposed Development

3.3 Design Envelope Approach

The Developer has adopted a Design Envelope approach to impact assessment in line with guidance from the Scottish Government (2022). The Design Envelope approach offers flexibility in the EIA process by enabling an impact assessment to be carried out against several potential design options. At this time in the early stages of development, it is not possible to define exact specifications for infrastructure for the Offshore Proposed Development. In the offshore wind sector, improvements in technology and construction methodologies occur frequently and information provided as part of the consent application could become rapidly outdated, resulting in an uneconomical and potentially unbuildable project. Furthermore, key contracts are not placed until later in the development phase closer to construction, and detailed site investigation works will be required to inform the final design. In addition, the Floating Foundation technology concept is yet to be developed at a commercial level and there are many innovative and novel floating designs becoming available to the market. As such, the design envelope approach being applied allows for flexibility in design options where the final details of the Offshore Proposed Development are not known.

The Design Envelope will therefore identify a range of parameters associated with each aspect of the Offshore Proposed Development, enabling a realistic assessment of the likely worst-case environmental effects upon a particular receptor. Initial details on the key components for the Offshore Proposed Development are provided in the sections below. These parameters are indicative and informed by the experience of the Developer and will be refined as the proposed development progresses through the planning and development phase. The design envelope provided in the EIAR will provide additional details on key components of the proposed development as a reflection of design decisions made in the intervening period between Screening and consent application submission. These design decisions will be informed by feedback from stakeholder engagement, environmental survey work, and technical and engineering studies, all of which support the EIA and HRA process.

3.4 Development Phases

3.4.1 Construction

It is anticipated that the construction of the Offshore Proposed Development will commence in the early 2030s and take approximately four years, although this is subject to change. Construction works would be undertaken 24 hours a day, 7 days a week offshore, dependent upon weather conditions.

An indicative construction series is outlined below showing the key stages associated with the installation of the Offshore Proposed Development, noting that stages may take place in a different order:

- Pre-construction surveys, such as geophysical, geotechnical and unexploded ordnance (UXO) surveys;
- Site preparation; if required as a result of the pre-construction surveys, boulder and UXO clearance activities may also be undertaken;
- Installation of Offshore substation platforms (OSPs) and associated foundations;
- Offshore Export Cable installation;
- Interconnector Cable installation;

- Pre-lay of anchors and moorings for Floating Foundations;
- Tow-out of pre-assembled WTGs and Floating Foundations and hook-up to moorings;
- Inter-array Cable installation;
- Testing and commissioning of OSPs, cables and WTGs.

Given the large maximum capacity of the Project and scope for multiple routes to market, there is potential for the Project to be built out in phases. Phasing scenarios will be further developed to inform detailed EIA. EIA scoping considers the entirety of the Offshore Proposed Development, observing that build out may follow various phasing scenarios as described in Table 3.1.

Table 3.1: Potential phasing scenarios for the construction of the Offshore Proposed Development

Potential phasing scenarios:	Single phase (Project constructed in single phase as single development).
	Sequential (with gap) (Project constructed in two or more phases, each occurring after the previous phase has completed).
	Sequential (overlapping) (Project constructed in two or more phases, construction overlapping but each component (e.g. WTGs) only occurring after works relating to that component in the previous phase is complete).
	Simultaneous (Project constructed in two or more phases, each constructed at the same time although not necessarily the same component being constructed at the same time).

3.4.2 Operation and Maintenance

It is anticipated that preventative, corrective, planned and unplanned maintenance activities will all be required. The O&M strategy for the Offshore Proposed Development is highly contingent upon the key infrastructure selected for the final Offshore Proposed Development design and will be confirmed post consent.

The O&M strategy will be finalised once the technical specifications of the Project are confirmed, including the WTG model, OSP approach, and final Project layout. The anticipated O&M requirements will be set out in the EIAR. Despite uncertainties, the HRA will assess a maximum likely effects scenario.

3.4.3 Decommissioning

OWF projects are required by the Energy Act 2004 and the Scotland Act 2016, to provide a Decommissioning Programme which covers the decommissioning of Offshore Renewable Energy Installations (OREIs). This programme needs to be supported by appropriate financial security.

The Decommissioning Programme will follow guidance from the Guidance Notes on Decommissioning of OREI under the Energy Act 2004 from the UK Department of Energy and Climate Change (DECC) (Department for Business Energy and Industrial Strategy, 2019) and the Guidance Note for the Decommissioning of OREI in Scottish Waters or in the Scottish part of the Renewable Energy Zone under the Energy Act 2004 published

by Marine Scotland (Marine Scotland, 2022). Decommissioning activities will comply with all relevant legislation at that time.

3.5 Project Infrastructure Overview

The following key infrastructure components of the Offshore Proposed Development are included within the Design Envelope:

- WTGs, including associated infrastructure (nacelle and blades) and Floating Foundations;
- OSPs and Bottom-fixed Foundations or subsea substations;
- Scour protection for WTG and OSP foundations;
- Inter-array Cables between WTGs and between WTGs and OSPs or subsea substations;
- Interconnector Cables between OSPs or subsea substations (if required);
- Offshore Export Cables connecting the OSP(s) or subsea substations to Landfall; and
- Cable protection where required.

3.5.1 Wind Turbine Generators (WTGs)

WTGs transform wind energy into electricity and consist of rotor blades, towers, nacelles, hubs, generators, transformers, power electronics and control equipment. WTG technology is constantly evolving and several design options are currently under consideration by the Developer. The selection of the final model of WTG will be made post consent as part of the detailed design process. Depending on the final WTG size selected, the Project is expected to have a maximum of 161 WTGs. The final number of WTGs will be dependent on the capacity of individual WTGs used, as well as the environmental and engineering survey results.

Each WTG (including colours, marking and lighting) and any required aids to navigation will be designed in accordance with relevant guidance from Northern Lighthouse Board (NLB), the Civil Aviation Authority (CAA) and the MCA. The methods and locations for the fabrication and assembly of the WTGs are reliant on the supply chain availability and therefore are not yet known. The required modes of transportation for the WTGs to site offshore, whether as components or assembled, is also not yet known as this will depend upon the fabrication and assembly locations and type of Floating Foundation selected.

The layout of the WTGs will be developed to effectively make use of the available wind resource and suitability of seabed conditions, as well as ensuring that the environmental effects and impacts on other marine users (e.g. fisheries and shipping routes) are kept to a minimum.

The Design Envelope for the WTGs is displayed in Table 3.2. These are indicative maximum parameters and may be subject to refinement ahead of EIA.

Table 3.2: WTG parameters described within the Design Envelope

Parameter	Design Component
Maximum number of WTGs	161
Maximum rotor blade diameter (m)	310
Maximum nacelle height (m) above lowest astronomical tide (LAT)	204.1

Parameter	Design Component
Maximum blade tip height (m) above LAT	359.1
Minimum Downwind Spacing (m)	6-7 Diameters of WTG rotor blade diameter
Minimum Crosswind Spacing (m)	3-4 Diameters of WTG rotor blade diameter
Maximum swept area of WTG (km^2)	7.32
Air Gap (m) above MHWS	22 - 35

3.5.2 Offshore Substation Platforms (OSPs)

The OSPs are the interface between Inter-array Cables and the Offshore Export Cables, and transform the electricity generated by the WTGs to a higher voltage to allow for transmission to shore in an efficient way by reducing electrical losses.

The Design Envelope includes two approaches to the deployment of OSPs which results in the installation of either several smaller platforms or fewer larger platforms. The Design Envelope also allows for the deployment of subsea substations. The subsea substation is a novel concept in the context of offshore wind and would see the substation equipment located on the seabed. The maximum design scenario is presented in Table 3.3 and the foundation types in Table 3.4.

Table 3.3: OSP parameters described within the Design Envelope

Design Area	Parameter	Design Component
OSP topside	Maximum number of platforms	Small OSP: 7 Large OSP: 3
	Length of topside (m)	35 - 115
	Width of topside (m)	20 - 90
	Height (LAT) (m)	30 - 80
Subsea substation	Maximum number of subsea units	9
	Maximum seabed footprint (m)	30 x 30

3.5.3 Foundations (WTGs and OSPs)

The WTGs and OSPs will be permanently attached to the seabed with Foundations.

The WTGs will be supported by a Floating Foundation which consists of a floating platform with associated mooring and anchoring systems to keep the foundation 'on station'. Analysis of the expected water depths and predicted geological conditions across the Array Areas, and consideration of the limitations of bottom-fixed foundations, has concluded that Floating Foundations are the most suitable and cost-effective solution for the Project. Water depths between 99 m and 137 m are expected across most of the Array Areas, with approximately 80% of the Array Areas between 115 m and 125 m, exceeding the limits of bottom-fixed foundations deployed to date. The hard and shallow bedrock expected across the Array Areas would also

present significant challenges for installation of bottom-fixed foundations. Figure 3.2 below represents the floating foundation types that are considered feasible for the Offshore Proposed Development and which are included in the Design Envelope. These are, from the left, barge, semi-submersible, spar and tension-leg platform. A more detailed description of each option and associated mooring systems is provided in Table 3.4. The associated mooring systems are attached to the seabed by an anchoring system. Figure 3.3 below represents the different anchoring solutions that could potentially be utilised. These include, from the left, drag embedment anchors, suction caissons, grouted piles and gravity-based anchors. Based on the ground conditions a single solution or a combination of the below could be implemented.

3.5.3.1 Scour Protection

Scour protection may be required around Foundations to prevent the movement of seabed sediment as a result of the flow of water around the Foundation during the lifetime of the Project. The types of scour protection considered for each foundation type are listed in Table 3.5 and Table 3.6. Rock berms are piles of placed rock material, typically deposited around the Foundation from a fallpipe vessel. Rock bags are comprised of rocks within mesh bags, placed in situ by an offshore construction vessel.

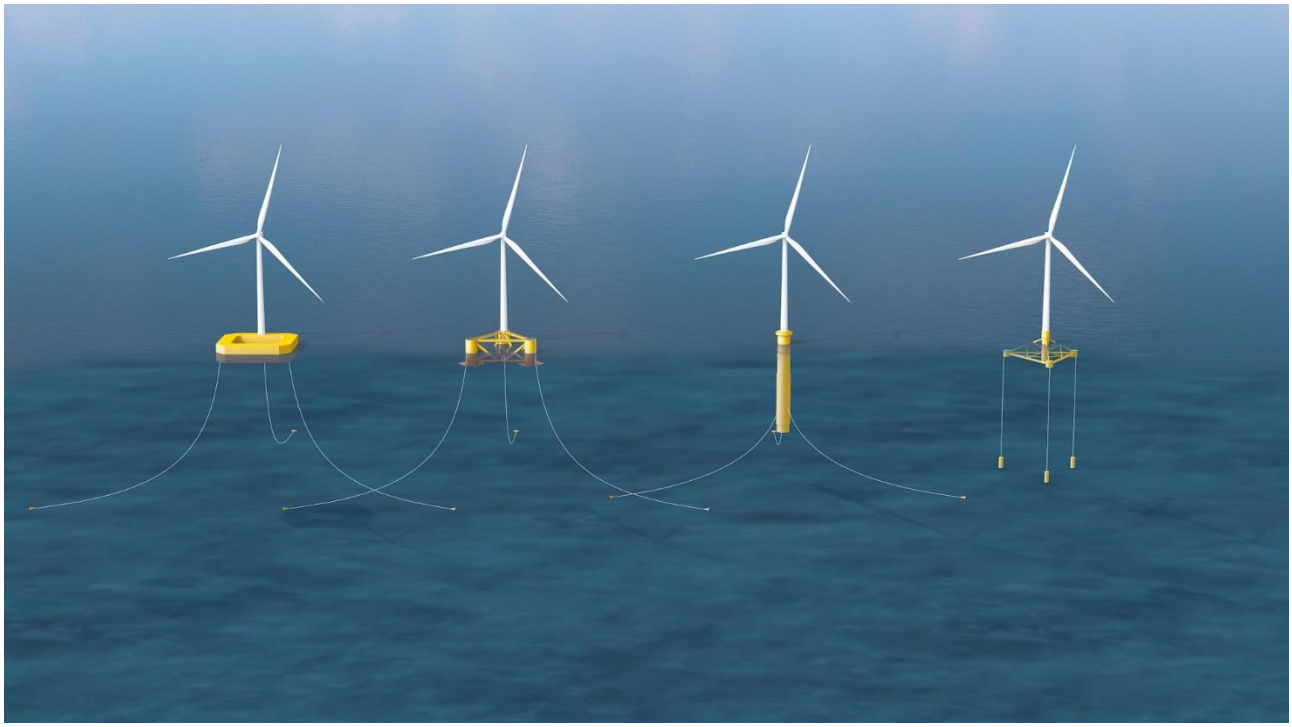


Figure 3.2: Potential Floating Foundation types considered for the Offshore Proposed Development (from the left, barge, semi-submersible, spar and tension-leg platform

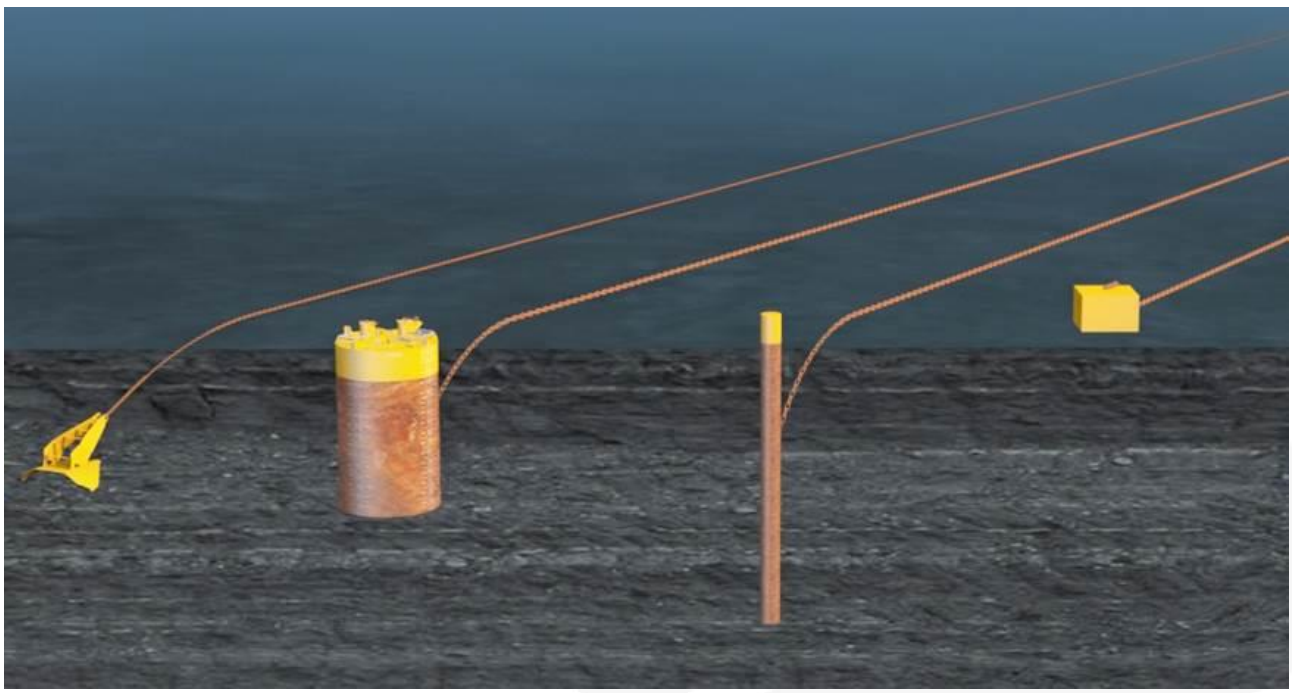


Figure 3.3: Potential anchoring solutions considered for the Offshore Proposed Development (from the left, drag embedment anchors, suction caissons, grouted piles and gravity-based anchors)

Table 3.4: Types of floating platforms considered for the Offshore Proposed Development

Floating Platform	Description	Mooring system
Barge	A square flat-bottomed platform with a large surface area constructed of either concrete, steel or combination of both. It provides stability through buoyancy and ballast systems.	Catenary mooring system consisting of steel chains and synthetic ropes. Extending to a radius of 1,000m.
Semi-Submersible	A triangular platform featuring multiple buoyant columns or pontoons that are partially submerged in the water, creating stability, and allowing the platform to move with the motion of the waves. It can be constructed of either steel or concrete.	
Spar	A concrete vertical cylindrical column extending deep beneath the waterline, offering stability by minimising movement in response to waves and wind.	
Tension-Leg Platform	A pyramid shaped platform constructed out of steel tubulars held in position by tendons. It achieves stability by minimising horizontal movement caused by waves and wind.	Tendons (steel pipes or wire ropes) anchored directly below the platform. Up to 6 tendons per platform are considered.

The design parameters of the floating foundation types being considered for the Offshore Proposed Development are described in Table 3.5.

Table 3.5: WTG Floating Foundation parameters described within the Design Envelope

Floating Foundation Type	Parameter	Design Component
Barge	Floating platform dimensions (m)	70 x 70
	Depth of floating platform within the water column (i.e. draught) (m)	20

Floating Foundation Type	Parameter	Design Component
	Max number of mooring lines	9
	Max mooring line radius (m)	1,000
	Installation method	tow-out of integrated WTG-platform unit to site
	Anchoring method	gravity-based anchors, piles, drag embedment anchors, suction caissons; anchors may be driven, drilled and/or grouted; shared anchors/moorings may be used
	Scour protection	protective rock berm or rock bags
Semi-Submersible	Floating platform dimensions (m)	120 x120
	Depth of floating platform within the water column (i.e. draught) (m)	20
	Max number of mooring lines	9
	Max mooring line radius (m)	1,000
	Installation method	tow-out of integrated WTG-platform unit to site
	Anchoring method	gravity based anchors, micropiles, shared anchors/moorings, drilled and grouted anchors, drag embedment anchor, suction caissons
	Scour protection	protective rock berm or rock bags
Spar Platform	Floating platform dimensions (m)	35 m diameter of main body
	Depth of floating platform within the water column (i.e. draught) (m)	100
	Max number of mooring lines	6
	Max mooring line radius (m)	1,000
	Installation method	tow-out of integrated WTG-platform unit to site
	Anchoring method	gravity based anchors, micropiles, shared anchors/moorings, drilled and grouted anchors, drag embedment anchor, suction caissons
	Scour protection	protective rock berm or rock bags

Floating Foundation Type	Parameter	Design Component
Tension Leg Platform	Floating platform dimensions (m)	100 x 100
	Depth of floating platform within the water column (i.e. draught) (m)	35m
	Number of tension legs	6
	Installation method	installation of floating foundation followed by WTG installation
	Anchoring method	gravity based anchors, micropiles, shared anchors/moorings, drilled and grouted anchors, drag embedment anchor, suction caissons
	Scour protection	protective rock berm or rock bags.

The OSPs are expected to be secured to the seabed with a Bottom-fixed Foundation. The Bottom-fixed Foundations are typically fabricated from steel and/or concrete. Two Bottom-fixed Foundation options are currently under consideration, suction caisson jacket and pin piled jacket concepts described in Table 3.6, noting these would not be applicable in the case of the subsea substation option. Current concepts use mudmats (foundational elements for subsea equipment, providing stability and security on the seabed) and / or suction piles as part of the structure detailed in Table 3.3 to secure the subsea substation to the seabed.

Table 3.6: OSP Bottom-Fixed Foundation parameters described within the Design Envelope

Foundation Type	Parameter	Design Component
Jacket with pin piles	Number of piled jacket platforms	Small OSP: 7 Large OSP: 3
	Maximum number of legs per jacket	4
	Leg diameter (m)	3.5 - 5
	Number of piles per jacket	8 - 16
	Pin pile diameter (m)	2 - 4
	Maximum hammer energy (kJ)	3000 - 3600
	Mudmat diameter (m)	8 - 10
	Scour protection	protective rock berm, rock bags, concrete mattresses, gabion mattresses, or frond mats
Jacket with suction caissons	Maximum number of jackets	Small OSP: 7 Large OSP: 3
	Number of suction caissons per jacket	4 - 6
	Suction caisson diameter (m)	10 - 12
	Suction caisson diameter with scour protection (m)	30 - 36

Foundation Type	Parameter	Design Component
	Maximum height of suction caisson above seabed (m)	3
	Maximum penetration depth (m)	15
	Scour protection	protective rock berm, rock bags, concrete mattresses, gabion mattresses, or frond mats

3.5.4 Inter-array Cables

Inter-array Cables (IACs) are used to connect WTGs to each other and to the OSP(s)/subsea substations. The layout of the IACs is highly dependent upon the WTG layout and as such will be defined at the final design stage post consent.

Where Floating Foundations are used, dynamic inter-array cables may be required. These are cables, or sections of cable, that are designed to accommodate the motions associated with the Floating Foundations to enable them to move with the foundation. Sections of the IACs where they are on the seabed will potentially be protected by burial, typically by ploughing, jetting or trenching, depending on the seabed conditions along the IAC routes. Cables for which optimal burial depths are not achievable may be subject to secondary protection measures such as rock placement or installation of concrete mattresses.

Subsea inter array cable collection units or junction boxes may be utilised within the Inter-array Cable configuration. These facilitate alternative Inter-array Cable configurations such as star or fishbone that may be required for effective floating arrays. The connectors themselves may be grouped into subsea modules that accommodate multiple WTG connections and a single connection to the OSP.

The IAC parameters included within the Design Envelope are described in Table 3.7.

Table 3.7: Inter-array cable parameters described within the Design Envelope

Parameter	Design Component
Maximum total cable length (km)	650 km
Maximum cable diameter (mm)	220
Cable burial method	Jet trencher, mechanical trencher, cable plough
Cable burial depth (m)	0 - 3
Maximum width of cable trench (m)	5
Maximum width of seabed affected by installation per cable (m)	20
Voltage (kV)	up to 132
Cable protection	Concrete mattresses, rock placement, cast iron shells or grout bags on the seabed. Bend stiffeners and cable protection systems where cables enter/exit WTGs.

3.5.5 Interconnector Cables

Interconnector Cables connect the OSPs/subsea substations to one another. As multiple OSPs/subsea substations are required, Interconnector Cables may be necessary in order to connect these to one another and improve the availability of the overall electrical system. The Interconnector parameters included within the Design Envelope are set out in Table 3.8.

Table 3.8: Interconnector cable parameters described within the Design Envelope

Parameters	**Design Component**
Number of cables	Up to 6
Total length of cabling (km)	80
Voltage (kV)	Up to 525
Cable type	3-Core, armoured, subsea cable
Cable burial depth (m)	0-3
Protection method where burial not achieved	Concrete mattresses, rock placement, cast iron shells or grout bags for seabed. Bend stiffeners and cable protection systems for enter/exit OSPs.

Offshore Export Cables

Offshore Export Cables will connect the OSPs/subsea substations to the Onshore Transmission Infrastructure allowing transfer of electricity from the wind farm either onwards through the NETS, or, to an alternative route to market.

Table 3.9: Offshore Export Cable parameters described within the Design Envelope

Parameter	**Design Component**
Number of cables	up to 8
Maximum total cable length (km)	750
Maximum cable diameter (mm)	300
Cable burial method – seaward of MLWS	Jet trencher, mechanical trencher, cable plough
Cable burial method – landward of MLWS	Trenching, jetting, ploughing, cutting, horizontal directional drill, direct pipe or other trenchless techniques
Target cable burial depth (m)	1
Maximum width of cable trench (m)	5

Parameter	Design Component
Maximum width of seabed disturbed by cable installation (per cable (m))	20
Voltage (kV)	up to 525
Cable protection and cable crossing material	Concrete mattresses, rock placement, cast iron shells or grout bags on the seabed. Bend stiffeners and cable protection systems where cables enter/exit OSPs.
Cable type	3-core or single core, armoured subsea cable.

3.6 Landfall Infrastructure

Multiple Landfall locations are currently being considered along the east coast of Mainland, Shetland. All locations considered fall within the scoping area boundaries (Figure 3.1). The Landfall area encompasses the interface where the Offshore Export Cables and onshore cable circuits meet. Offshore Export Cables making Landfall will cross the intertidal area and land between MHWS and a transition joint bay (TJB). Cables are installed at the Landfall via two techniques:

- Open cut trenching installation; and/or
- Trenchless techniques (e.g. horizontal directional drilling (HDD) or direct pipe).

All infrastructure located above MHWS falls outside the scope of this Offshore Screening Report. This infrastructure design will be detailed within the Onshore Screening Report and assessed within the Onshore EIAR.

Table 3.10: Landfall parameters described within the Design Envelope

Parameter	Design Component
Maximum cable spacing at landfall (m)	50
Maximum width of foreshore affected by installation per cable (m)	15
Installation method	Trenching, jetting, ploughing, cutting, horizontal directional drill, direct pipe
Number of trenches/HDD duct	Up to 8
Number of transition joint bays	Up to 8
Each transition joint bay dimensions (m)	3 x 20
Landfall- compound dimensions (m)	270 x 75

4 Methodology

4.1 Approach to Screening

The applicable test of the screening stage was documented within the decision for Waddenzee (C-127/02 – Paragraph 3a):

> *"In the light of the precautionary principle, a risk of significant effects exists if it cannot be excluded on the basis of objective information that the plan or project will have significant effects on the conservation objectives of the site concerned; in case of doubt as to the absence of significant effects an appropriate assessment must be carried out. All aspects of the plan or project which can, either individually or in-combination with other plans or projects, affect those objectives must be identified in the light of the best scientific knowledge in the field."*

The screening stage has been characterised by the European Commission (EC) (2019) as follows; 'Assessment of plans and projects significantly affecting European sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC' ("the European Commission Guidance")' as a four-step process. These steps are:

1. Determining whether the Offshore Proposed Development or plan is directly connected with or necessary to the management of any European site(s);
2. Description of the Offshore Proposed Development and the description and characterisation of other projects or plans that in-combination have the potential for having significant effects on a European site(s);
3. Identifying the potential LSEs on a European site(s); and
4. Assessing the significance of any LSEs on a European site(s).

When each of these steps has been worked through there are three potential outcomes:

- The Offshore Proposed Development is directly connected with or necessary to the management of a European site(s) and therefore does not require AA (Stage 2);
- One or more LSEs on designated features of European sites are identified and the Offshore Proposed Development requires an AA; and
- No LSEs on designated features of European sites are identified as there is no pathway by which such effects could occur, or they can be excluded on the basis of objective information and therefore there is no requirement for an AA.

In order to determine whether the Offshore Proposed Development is capable of resulting in one or more LSEs on a European site(s) it is necessary to understand the activities associated with the installation, operation and maintenance and decommissioning of the Offshore Proposed Development (e.g. the positioning of external cable protection), the potential changes that may occur in the environment as a result (e.g. the production of installation noise), and the effects that this may have on designated features of European sites (e.g. disturbance of marine mammals resulting in increased energy expenditure and reduced energy intake resulting in potential lower survival and productivity rates).

Through the use of this activity – change – effect concept, it is possible to identify European sites (and their qualifying features) that may be subject to LSEs through the determination of a series of search parameters. These search parameters can then be extended to identify the other plans and projects that require consideration within the assessment of in-combination effects.

4.2 Methodology used to Identify European Sites and Potential to be Affected by the Offshore Proposed Development

Screening is a relatively coarse and therefore precautionary filter to identify those European sites and qualifying features with connectivity to the Offshore Proposed Development for which an LSE cannot be discounted. In order to screen for LSE, it is necessary to consider three hierarchical aspects:

- Connectivity;
- Route to impact; and
- Non-trivial abundance.

Connectivity is defined as the presence of the qualifying feature of an SPA, SAC or Ramsar site in the Zone of Influence (ZoI) of a project. ZoI is defined by the guidance (DCCAE, 2017) as the potential geographic area that could be affected by the implementation of the project with the boundaries determined having regard to the source-pathway-target risk assessment concept. So, if a qualifying feature has no connectivity to the Offshore Proposed Development, it leads to the conclusion of no LSE. Where connectivity cannot be objectively ruled out for any one qualifying feature, it is necessary to conclude that LSE cannot be excluded on the grounds of connectivity.

The next stage of the LSE consideration process is to consider potential for a route to impact (be it direct or indirect). Where connectivity has been identified, but it is determined that there is no route to impact on the qualifying feature (source-pathway-receptor (s-p-r) approach), then it may still be possible to objectively conclude no LSE. If, however, a route to impact exists then a conclusion of LSE cannot be ruled out at this stage. Site-specific screening criteria are identified that assist with this part of the appraisal (Section 4.3).

Finally, if (following confirmation of potential for connectivity and route to impact) the abundance of a qualifying feature within the ZoI is deemed trivial, it may be argued that no LSE can be concluded, as the COs of the site will not be compromised. The classification of trivial abundance is considered on a case-by-case basis and will vary between features, based on their habitat extent or population size.

Following the above process, for each European site (and their qualifying features) considered within the test for LSE it will be concluded that either:

- There are no LSEs on the European site(s) and their qualifying features, so therefore no further assessment is required; or
- LSEs on the European site(s) and their qualifying features cannot be discounted alone or in-combination, and therefore an AA is necessary.

Given the comparatively high-level nature of screening a precautionary approach will be applied and so where any doubt as to the potential for LSE exists, then the feature will be screened into the subsequent stage of the HRA process.

4.2.1 Source-Pathway-Receptor (s-p-r) Approach

The s-p-r approach is the standard conceptual model that is used across the Habitats Regulations and Offshore Habitats Regulations to characterise the means (pathways) via which effect-sources (such as the works being proposed) could be experienced by receptors (sensitive designated features of a European site). Only where there is an identifiable source, a pathway and a sensitive receptor, is there likely to be a significant effect. The s-p-r framework refers to its three comprising elements that must all be present to identify a potential effect-pathway.

ZoI is defined in the David Tyldesley Associates (DTA) HRA Handbook as the area in which a proposed change has the potential to represent a risk of a significant effect on a European site or one or more of its qualifying features. The most obvious extent of the ZoI is within the 'footprint' of an effect where exposure might provide a direct pathway to a receptor. S-p-r relationships are not always linear, and effects might be transmitted beyond the 'footprint' e.g. via hydrological pathways or enabled by impacts on another receptor (indirect effects). Notwithstanding this, how an effect might progress from its source along pathways to a particular European site can easily be discerned with reference to the receiving environment. Consideration of supporting habitat (defined as areas that can be used by a species, in particular those which may be listed as a feature of a designated site, to support that species survival and/or reproduction) is also important here.

Mobile species are also of consideration, and the pathways will change between mobile receptor type. The primary mobile receptors of concern are marine mammals, migrating fish and ornithological receptors. Due to the large area/ range covered by some of these receptors and the large scale of the Offshore Proposed Development, there is a risk of mobile species moving into/ through the site or being excluded from the area. The nature of these receptors often leads to precautionarily large ZoIs and pathways to cover this potential risk.

4.2.2 Zone of Influence

For many types of development, it is relatively simple to define ZoI because the projects are geographically discrete, and the number of receptors and types of impact are low. Generally, a single search (typically distance) parameter can be applied to determine the extent of a project's effects.

For offshore wind developments, however, numerous effect-pathways can arise due to species mobility. These pathways are complex and potentially distributed across a vast spatial scale.

The method to identify the ZoI must be appropriate for offshore wind developments and the consideration of European sites for highly mobile species in this context. It is fundamental that the method is able to define all components of the ZoI, these being:

The area over which direct effects could occur (and direct, or indirect impacts could result) (also termed the direct ZoI);

- The area of indirect impact surrounding the Offshore Proposed Development; and
- The area that captures remote sites where species distribution / ranges provide connectivity.

Transboundary sites were reviewed and screened out apart from the ones found in Table 6.3 where there is connectivity with breeding seabirds mean-maximum foraging range plus one standard deviation (MMF +1SD) and non-breeding birds.

4.3 Screening Ranges Applied

Following the description above, different ranges have been identified for each receptor group and are present in Table 4.1. The sites identified to be included within the screening appraisal can be seen in Figure 4.1 and Figure 4.2.

Table 4.1: Zone of Influence applied to identify European sites for habitats and mobile species considered at screening

Receptor	Range applied	Source / reference
Benthic and intertidal habitat receptors	12 km	The tidal excursion distances surrounding the Array Areas and the Offshore ECC range from 4 to 8 km from the Offshore Proposed Development. Therefore, as a precautionary measure, the sedimentary ZoI has been defined as a 12 km buffer from the Offshore Proposed Development.
Harbour porpoise	North Sea Management Unit for harbour porpoise	Inter-Agency Marine Mammal Working Group (IAMMWG), 2022
Bottlenose dolphin	Greater North Sea Management Unit for Bottlenose dolphin	IAMMWG, 2022
Harbour seal	Average foraging range of 50 km	Carter *et al.* (2022) and based on guidance from NatureScot during the Pre-Scoping Workshop (28th November 2023).
Grey seal	Average foraging range of 100 km	Carter *et al.* (2022) which is conservative, based on guidance from NatureScot during the Pre-Scoping Workshop (28th November

Receptor	Range applied	Source / reference
		2023), where they recommended using 20 km.
Migratory fish species	100 km	Reasonable objective range for the identification of risks to migratory fish with reference to the location of designated estuaries. Following the standard approach adopted by other OWF developments, a highly precautionary range of 100 km from the Offshore Proposed Development has been considered for the site selection process. Underwater noise is considered to be the impact with the largest range affecting migratory fish and a screening distance of 100 km is considerably greater than the potential noise footprint of the Offshore Proposed Development.
Ornithological receptors		
Breeding seabirds	Breeding seabird connectivity is determined based on the MMF +1SD found in Woodward *et al*. (2019). Their colony distance is defined according to the distance of the designated site for which they are a designated feature. There are several site-specific exceptions to the standard foraging range found in Woodward *et al*. (2019) due to specific local food supply conditions. NatureScot (2023b) guidance suggests that these exceptions be used in any assessments. Breeding seabirds are subject to LSE based on their sensitivity to displacement and collision (i.e. connectivity does not necessarily automatically mean a particular receptor is subject to LSE) (Wade *et al*., 2016).	Wade *et al*., 2016; Woodward *et al*., 2019 Nature Scot 2023e

Receptor	Range applied	Source / reference
Non-breeding seabirds	Non-breeding seabirds that are designated features of key designated breeding colony sites may be sensitive to LSE during the non-breeding season when they disperse away from their breeding colonies (Wright *et al*., 2012). However, vulnerability to LSE during the non-breeding season is based on individual species' sensitivities and the species' presence around the Offshore Proposed Development during the non-breeding season. Population sizes and locations during the non-breeding season are assessed using species-specific Biologically Defined Minimum Population Scales (BDMPS). NatureScot Guidance Note 4 (2023c) suggests the use of Furness (2015) to determine appropriate population sizes during the non-breeding season. LSE will be described in more detail for each connected species in Table 6.3.	Wright *et al*., 2012; Furness, 2015
Breeding waterbirds	The potential connectivity of breeding waterbirds to the Offshore Proposed Development is species dependent. Intertidal birds may experience disturbance up to 0.7 km from their colonies, red-throated divers may experience disturbance at up to 2 km from the ECC and 10 km from the Array Areas from construction and maintenance works, and seaducks and other divers may experience disturbance at up to 2 km from the ECC (where works are being undertaken) and 4 km from the Array Areas during construction and maintenance works (SNCB, 2017; MacArthur Green & Royal HaskoningDHV, 2021; Bellebaum *et al*., 2006). Their colony distance is defined according to the distance of the designated site for which they are a designated feature. Breeding waterbirds are subject to LSE based on their sensitivity to displacement and collision (i.e. connectivity does	Wade *et al*., 2016; SNCB, 2017; Goodship and Furness, 2022; Wright *et al*., 2012.

Receptor	Range applied	Source / reference
	not necessarily automatically mean a particular receptor is subject to LSE) (Wade *et al*., 2016).	
Non-breeding waterbirds	Non-breeding waterbirds that are designated features of key designated sites are likely to be sensitive to LSE during migration when they disperse away from their breeding colonies (Wright *et al*., 2012). However, vulnerability to LSE during migration is based on individual species' sensitivities as well as their specific migratory routes. Red-throated divers may experience disturbance at up to 2 km from the ECC and 10 km from the Array Areas, and seaducks and other divers may experience disturbance at up to 2 km from the ECC (where works are being undertaken) and 4 km from the Array Areas (SNCB, 2017; MacArthur Green & Royal HaskoningDHV, 2021; Bellebaum *et al*., 2006). Therefore, LSE will be described in more detail for each connected species in Table 6.3. A review of migratory routes and species vulnerabilities is currently available on behalf of Marine Scotland and the Crown Estate (NatureScot, 2023d). This new guidance includes a stochastic mCRM tool that helps determine LSE for migratory species. NatureScot guidance states that this tool should be used.	Wade *et al*., 2016; SNCB, 2017; Goodship and Furness, 2022; Wright *et al*., 2012; WWT and MacArthur Green, 2014.

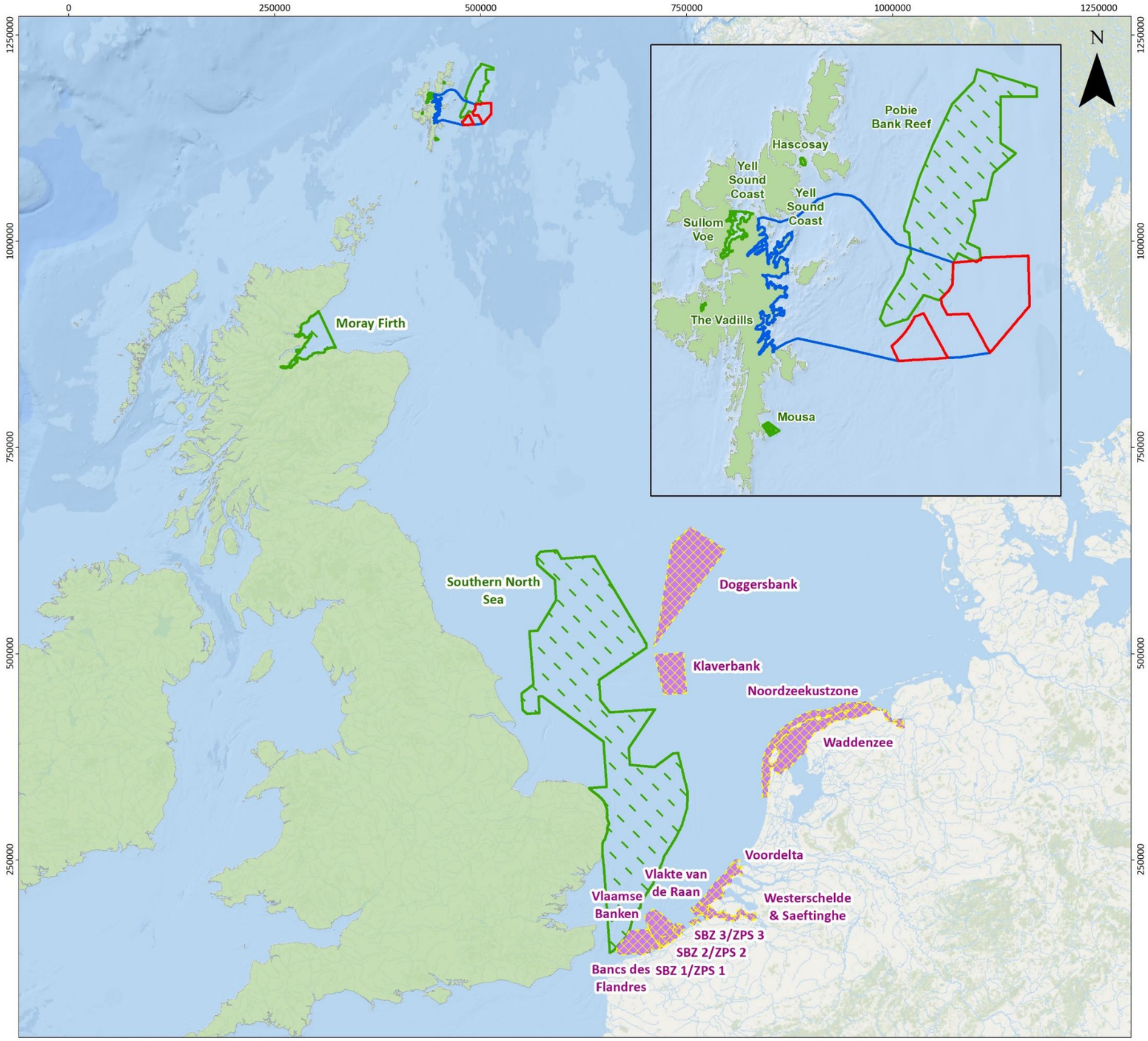
Table 4.2: Mean-maximum foraging range, SD, and mean-maximum foraging rage +1 SD of UK breeding seabird species (Woodward et al., 2019). Where no SD is available, the maximum foraging range is used instead of mean-maximum

Species	Mean-maximum foraging range (km)	Standard deviation (SD) (km)	Mean-max +1SD (km)
Black-legged kittiwake (*Rissa tridactyla*)	156.1	144.5	300.6
Black-headed gull (*Chroicocephalus ridibundus*)	18.5	-	18.5

Species	Mean-maximum foraging range (km)	Standard deviation (SD) (km)	Mean-max +1SD (km)
Mediterranean gull (*Larus melanocephalus*)	20	-	20
Common gull (*Larus canus*)	50	-	50
Great black-backed gull (*Larus marinus*)	73	-	73
Herring gull (*Larus argentatus*)	58.8	26.8	85.6
Lesser black-backed gull (*Larus fuscus*)	127	109	236
Sandwich tern (*Sterna sandvicensis*)	34.3	23.2	57.5
Little tern (*Sterna albifrons*)	5	-	5
Roseate tern (*Sterna dougallii*)	12.6	10.6	23.2
Common tern (*Sterna hirundo*)	18.0	8.9	26.9
Arctic tern (*Sterna paradisaea*)	25.7	14.8	40.5
Great skua (*Stercorarius skua*)	443.3	487.9	931.2
Common guillemot (*Uria aalge*) – excluding data from Fair Isle			95.2
Common guillemot – all Northern Isle SPAs			153.7
Razorbill (*Alca torda*)			122.2
Razorbill – all Northern Isle SPAs			164.6
Atlantic puffin (*Fratercula arctica*)	137.1	128.3	265.4

Species	Mean-maximum foraging range (km)	Standard deviation (SD) (km)	Mean-max +1SD (km)
European storm-petrel (*Hydrobates pelagicus*)	336	-	336
Northern fulmar (*Fulmarus glacialis*)	542.3	657.9	1200.2
Manx shearwater (*Puffinus puffinus*)	1346.8	1018.7	2365.5
Northern gannet (*Morus bassanus*)	315.2	194.2	509.4
Northern gannet – Forth Islands SPA	590		
Northern gannet – Grassholm SPA	516.7		
Northern gannet – St Kilda SPA	709		
Great Cormorant (*Phalacrocorax carbo*)	25.6	8.3	33.9
European shag (*Phalacrocorax aristotelis*)	13.2	10.5	23.7

The designated sites identified using the ZoIs detailed above can be seen in Figure 4.1 and Figure 4.2.



ARVEN
OFFSHORE WIND FARM

Arven Offshore Wind Farm
HRA Screening Report

SACs Identified for Inclusion within Screening

Legend

- Array Areas
- Offshore ECC Area of Search
- SACs
- Transboundary Site for Seals (SAC/SCI)
- Transboundary Site for Harbour Porpoise (SAC/SCI)

Notes

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Coordinate System: British National Grid

0 100 200 300 km

0 50 100 nm

Scale	Date	Drawn by	Checked by	Approved by
1:4,500,000@A3	18/03/2024	EV	CM	GB

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Figure 4.1

Figure Reference: AVN_0200_Fig4.1_SACs Screening Sites_v3

Figure 4.1: SACs identified for inclusion within Screening

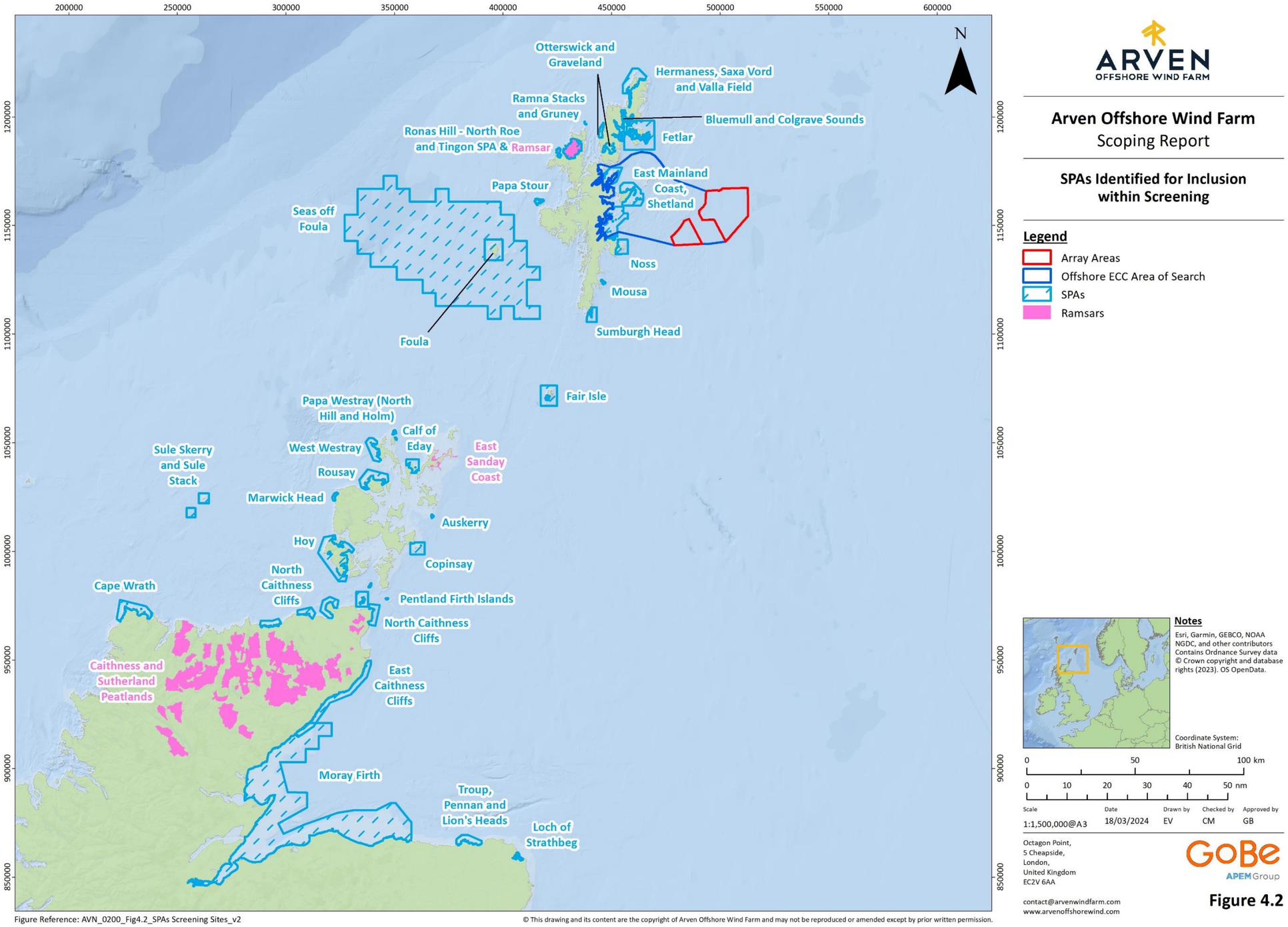

Figure Reference: AVN_0200_Fig4.2_SPAs Screening Sites_v2

ARVEN
OFFSHORE WIND FARM

Arven Offshore Wind Farm
Scoping Report

SPAs Identified for Inclusion within Screening

Legend

- Array Areas
- Offshore ECC Area of Search
- SPAs
- Ramsars

Notes

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Coordinate System: British National Grid

0 50 100 km
0 10 20 30 40 50 nm

Scale	Date	Drawn by	Checked by	Approved by
1:1,500,000@A3	18/03/2024	EV	CM	GB

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Figure 4.2

Figure 4.2: SPAs Identified for Inclusion within Screening

5 Screening for No LSE Alone and In-Combination

5.1 Introduction

Following the identification of Screening ranges (above), this section considers the potential for significant effects identified using the s-p-r model. Following the description of the receiving environment, sites and features with connectivity to the Offshore Proposed Development will be identified and assessed for LSE either alone or in-combination.

5.2 Description of Receiving Environment

This section presents a brief summary of the baseline environment in respect to each receptor group. The areas described are defined following the screening ranges presented in Table 4.1 and Table 4.2 within Section 4.3.

5.2.1 Subtidal and Intertidal Benthic Ecology

The following datasets provide in Table 5.1 the existing baseline for benthic subtidal and intertidal ecology.

Table 5.1: Data sourced used to inform benthic subtidal and intertidal ecology screening.

Title	Summary	Source	Author and Year
Publicly Available Datasets			
EMODnet Broad-Scale Seabed Habitat Map for Europe (EUSeaMap) (2021) European Nature Information System (EUNIS) 2022 habitat types	Broadscale seabed habitat map for Europe	https://emodnet.ec.europa.eu/geoviewer/	EMODnet, 2021
OneBenthic faunal data points and habitat mapping	National broadscale data	https://rconnect.cefas.co.uk/onebenthic_portal/	Cefas, 2019
Pobie Bank Reef Special Area of Conservation (SAC) 2020 Cruise Report (1220S)	A benthic survey report outlining the findings of geophysical, Drop Down Video (DDV) and sediment grabs to characterise and monitor the conditions of the SAC	https://hub.jncc.gov.uk/assets/f207f461-207e-417b-8d54-d91d9c04d52c	Albrecht & Stirling 2021

Title	Summary	Source	Author and Year
Pobie Bank 2013 Biodiversity and 2009 Site Interpretation Data	Biodiversity analysis from surveying at Pobie Bank in 2013 and site data used as an input to SAC habitat maps	Provided by JNCC	JNCC, 2009 & 2013
Marine Protected Area (MPA) Network	A definition and overview of the Scottish MPA network	https://marine.gov.scot/node/12790	Marine Scotland, 2024 (now Marine Directorate (MD))
Kelp bed data	Scottish kelp bed habitat data layers	https://marine.gov.scot/node/14689	Marine Scotland, 2024 (now MD)
Burrowed mud data	Scottish burrowed mud habitat data layers	https://marine.gov.scot/node/14626	Marine Scotland, 2024 (now MD)
Ocean Quahog data	Records of ocean quahog in Scottish waters data layers	https://marine.gov.scot/node/12704	Marine Scotland, 2024 (now MD)
Shetland Islands Marine Region State of the Environment Assessment	The assessment aims to provide a baseline assessment of the Shetland marine and coastal environment out to 12 nm, using the most up-to date data available as of December 2016.	https://www.shetland.uhi.ac.uk/research/marine-spatial-planning/shetland-islands-regional-marine-plan/shetland-state-of-the-environment-assessment/	University of the Highlands and Islands, 2017
Sullom Voe			

Title	Summary	Source	Author and Year
Chemical and Macrobenthic Monitoring in Sullom Voe Sediments 2018 Report	Biannual macrobenthic survey report of the Sullom Voe area, to monitor environmental characteristic and changes over time	https://soteag.org.uk/wp-content/uploads/2019/07/2018-SOTEAG-Macrobenthic-Monitoring.pdf	SGS United Kingdom Limited and Eco Marine Consultants Limited, 2018
Site Specific Data			
Benthic Subtidal and Intertidal Ecology Survey Campaign	Site specific data collected across the Array Areas and adjacent seabed. Included DDV, sediment grabs and contaminant analysis	Held by Developer	Ocean Ecology, 2023

5.2.1.1 Sediment Type

In the study area between 100 m and 120 m depth, sands are the primary sediment (British Geological Society (BGS), 2023; Department of Energy Climate Change (DECC), 2004). From 120 m to 160 m, mud content increases, notably in the West Unst Basin (DECC, 2004). Near Shetland's shore, strong water movement leads to the prevalence of coarser sediments like gravels, as outlined in Chapter 6: Marine Geology, Oceanography and Physical Processes of the Offshore Scoping Report (DECC, 2004).

The Offshore Array Areas is comprised of mostly sand with components of sandy gravel and gravelly sand (BGS, 2023). Mud fractions are typically low, well below 10% of the samples (BGS, 2023).

Generally, for those sections of the Offshore ECC between 100 m and 120 m, sands are the predominant surficial sediment type (BGS, 2023; DECC, 2004). Below the depths of 120 to 160 m, the proportion of mud within the sediment increases, for example in the West Unst Basin (DECC, 2004). Closer to the shore of Shetland, the influence of an energetic hydrodynamic regime results in the absence of finer sediments such that coarser sediments, such as gravels, dominate the sediment regime (DECC, 2004).

5.2.1.2 Benthic Ecology

The characterisation of the species and habitats found within the benthic subtidal and intertidal ecology study area has drawn upon publicly available datasets and monitoring reports from nearby development surveys. These key sources include benthic and geophysical surveys undertaken as part of the Sullom Voe oil terminal biannual macrobenthic monitoring.

5.2.1.2.1 Offshore Array Areas and Offshore Export Cable Corridor

A total of two broadscale sediment habitats have been identified within the Array Areas through a review of the EUSeaMap (2021) data. The data confirms that the Array Areas are dominated by deep circalittoral sand throughout the Array Areas, with patches of faunal communities on deep moderate energy circalittoral rock located towards the west and south of the Array Areas. Habitat survey point data (EMODnet, 2021) corresponds to the EUSeaMap (2021) data, as there is indications of faunal communities on deep moderate energy circalittoral rock within the north of the Arven South Array Area. Offshore portions of the ECC and wider study area were characterised by the following macrofaunal assemblages:

- D2a – represented a faunal assemblage that was characterised by the polychaetes *Spionidae, Glyceridae, Terebellidae, Capitellidae, Phyllodocidae* and the nematode family Nemertea. This group is likely to be located on a variety of sandy substrates;
- D2c – represented a faunal assemblage that was characterised by polychaetes including *Nephtyidae*, *Spionidae* and *Opheliidae*. All of which are typically found in sands and muddy sands; and
- D2b – was characterised by *Spionidae, Amphiuridae, Nephtyidae, Lumbrineridae, Oweniidae*, *Cirratulidae, Capitellidae, Nemertea, Semelidae, Ampharetidae*. D2b is widely found across the northern North Sea and Celtic Shelf, is typically associated with deep water, low bottom temperature, muddy habitats with low bottom current flows, high salinity and low chlorophyll.

PMFs kelp beds, northern sea fan and sponge communities and kelp and seaweed communities on sublittoral sediment have been identified as likely to be present within the Offshore ECC.

Site-specific monitoring surveys conducted for the Sullom Voe oil terminal included chemical, particle size and hydrocarbon content analysis (SGS United Kingdom Ltd, 2018). The Sullom Voe survey collected samples from 32 stations throughout the Sullom Voe area, approximately 1.4 km from its nearest point to the Offshore ECC. The sediment samples were collected using a 0.1m^2 Day grab, the samples and sub samples were taken for the analysis of: sediment grain size, organic matter and total aliphatic hydrocarbons and aromatic hydrocarbons (SGS United Kingdom Ltd, 2018).

The survey found that the sediment characteristics were consistent with findings from the previous survey conducted in 2016, with the majority of sediments being categorised as gravelly muddy sand (Gravel 6.3%, Sand 38.5%, Mud 55.2%) to muddy sandy gravel (Gravel 54.7%, Sand 29.8%, Mud 15.5%; SGS United Kingdom Ltd, 2018).

5.2.1.2.2 Intertidal and Landfall

At the point of writing, a landfall site has not yet been confirmed, but several landfall sites fall within the Offshore ECC along the eastern coast of the Shetland Islands. The intertidal zone along this stretch is characterised by predominantly rock platforms with boulders/ loose rock, with a mixture of sandy and gravelly sediments, where there are bays with a backdrop of cliffs. Magic Map also highlights that there are rock platforms, rock platforms with banks of gravel and sand inlets and bays across this stretch of coastline (Magic Map, 2023).

PMFs kelp beds, horse mussel beds, seagrass beds, maerl beds, kelp and seaweed communities on sublittoral sediments and burrowed mud have been identified as likely to be present within the intertidal areas.

The intertidal zones of the Offshore ECC were characterised by the following macrofaunal assemblages:

- B1b - was characterised by the polychaetes *Spionidae, Serpulidae, Syllidae, Glyceridae, Galatheidae, Phyllodocidae, Terebellidae, Polynoidae, Capitellidae, Scalibregmatidae, Eunicidae, Cirratulidae* and the nematode family Nemertea.
- D1 - was characterised by *Spionidae, Montacutidae, Semelidae, Nephtyidae, Capitellidae, Cirratulidae, Amphiuridae, Oweniidae*, nematode family *Nemertea*, *Pholoidae* and *Nuculidae*.
- D2a – represented a faunal assemblage that was characterised by the polychaetes *Spionidae, Glyceridae, Terebellidae, Capitellidae, Phyllodocidae* and the nematode family Nemertea. This group is likely to be located on a variety of sandy substrates;
- D2b – was characterised by *Spionidae*, *Amphiuridae, Nephtyidae, Lumbrineridae, Oweniidae, Cirratulidae, Capitellidae, Nemertea, Semelidae, Ampharetidae*. D2b is widely found across the northern North Sea and Celtic Shelf, is typically associated with deep water, low bottom temperature, muddy habitats with low bottom current flows, high salinity, and low chlorophyll;
- D2d – was characterised by *Spionidae, Bathyporeiidae, Nephtyidae, Magelonidae* and *Tellinidae.*

5.2.2 Marine Mammals

The following datasets presented in Table 5.2 provide the existing baseline for marine mammals.

Table 5.2: Data sourced used to inform marine mammal screening.

Title	Summary	Source	Author and Year
Site-specific DAS for the Array Areas	Site-specific baseline characterisation digital video aerial surveys (24 surveys between April 2023 and March 2025). Only a certain proportion of the data (April 2023 – November 2023) was made available to inform this Offshore Screening Report.	Arven	HiDef, 2023a, HiDef 2023b, HiDef 2023c
Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys (September 2023)	Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. Aerial and boat-based surveys were conducted in 2022 to provide large-scale estimates of small cetacean abundance in European Atlantic waters.	https://www.tiho-hannover.de/en/clinics-institutes/institutes/institute-of-terrestrial-and-aquatic-wildlife-research-itaw/scans-iv-survey	Gilles *et al.* 2023
Review of Management Unit boundaries for cetaceans in UK waters (2023)	Marine Mammal MUs in UK waters. This report details abundance estimates for species and their MUs	https://data.jncc.gov.uk/data/b48b8332-349f-4358-b080-b4506384f4f7/jncc-report-734.pdf	IAMMWG, 2023

Title	Summary	Source	Author and Year
	for the seven most common cetacean species in UK waters.		
Scientific Advice on Matters Related to the Management of Seal Populations: 2022	The Special Committee on Seals (SCOS) provides scientific advice to the government on matters relating to the management of UK seal populations. There have been numerous reports collated that identify any conservation and management issues, including ecology, behaviour, population trends and estimates, important areas and the status of both grey and harbour seals in the UK.	http://www.smru.st-andrews.ac.uk/files/2023/09/SCOS-2022.pdf	SCOS, 2023
Whale and Dolphin Sightings	Sightings records made by ORCA's citizen scientists over ca. 30 years. The data gives insights into cetacean hotspots and regional species diversity, although it is not effort-based data.	https://orca.org.uk/whale-dolphin-sightings	ORCA, 2023
Sea Watch Foundation sightings	Sightings records made by Sea Watch Foundation citizen scientists. The map gives insights into cetacean hotspots and regional species diversity, although it is not effort-based data.	https://www.seawatchfoundation.org.uk/recentsightings/	Sea Watch Foundation, 2023
Modelled density surfaces of cetaceans in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys	The report describes the density surface modelling for those cetacean species for which sufficient data were obtained during SCANS-III surveys across the North-East Atlantic.	https://scans3.wp.st-andrews.ac.uk/files/2022/08/SCANS-III_density_surface_modelling_report_final_20220815.pdf	Lacey *et al.* 2022
Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the	Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Aerial and boat-based surveys were conducted in	https://scans3.wp.st-andrews.ac.uk/files/2021/06/SCANS-III_design-based_estimates_final_r	Hammond *et al.* 2021

Title	Summary	Source	Author and Year
SCANS-III aerial and shipboard surveys	2016 to provide large-scale estimates of small cetacean abundance in European Atlantic waters.	eport_revised_June_2021.pdf	
Sympatric Seals, Satellite Tracking and Protected Areas: Habitat-Based Distribution Estimates for Conservation and Management	These reports provide estimates of at-sea distribution for both grey and harbour seals from haul-outs in the British Isles. The predictions are based on regional models of habitat preference.	https://www.frontiersin.org/articles/10.3389/fmars.2022.875869/full	Carter *et al.* 2022
Scottish Killer Whale Photo ID Catalogue 2021	ID catalogue which identifies all the known individual killer whales that frequent Scottish waters as of January 2021	https://www.researchgate.net/profile/Andrew-Scullion-5/publication/354418921_Scottish_Killer_Whale_Photo_Identification_Catalogue_2021/links/613776a72b40ec7d8bf0c522/Scottish-Killer-Whale-Photo-Identification-Catalogue-2021.pdf	Scullion *et al.* 2021
Shetland Tidal Array Monitoring Report: Vantage point surveys	This report presents the results from analyses of Nova Innovation's nine-year programme of land-based marine wildlife observation surveys in Bluemull Sound, carried out as part of the environmental monitoring programme for the Shetland Tidal Array. Marine mammal sightings were recorded during vantage point surveys which were carried out over a nine-year period.	https://marine.gov.scot/sites/default/files/enfait-0347_sta_vp_report_final.pdf	Smith *et al.* 2021
Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters	This report collates and provides information on the abundance and distribution of marine mammal species in the Scottish Northern North Sea region and Scottish Atlantic waters, with a focus on what were the draft plan option (DPO) sites identified	https://data.marine.gov.scot/sites/default/files/Scottish%20Marine%20and%20Freshwater%20Science%20%28SMFS%29%20Vol%2011%20No%2012%20Regional%20baselines%20for%20marine%20mammal%20knowledge%20across%20the%20North%20Sea%20and%20Atlantic%20areas%20of	Hague *et al.* 2020

Title	Summary	Source	Author and Year
	in the Draft Sectoral Marine Plan for Offshore Wind Energy for Scotland.	%20Scottish%20waters.pdf	
Distribution maps of cetacean and seabird populations in the northeast Atlantic	Collation and standardization of survey data for cetaceans and seabirds, with distribution maps in the northeast Atlantic. Survey data (aerial and vessel) from 1980-2018. Distribution maps for 12 cetacean species at 10 km resolution.	https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.13525	Waggit *et al.* 2020
North Atlantic Killer Whales (*Orcinus orca*) Migrating between Iceland and Scotland. A short identification catalogue	ID catalogue of individual killer whales that migrate between Iceland and Scotland. Images were taken from Scottish mainland, Orkney, Shetland and the Hebrides and compared with images taken in West Iceland along the Snædellsnes Peninsula 2014-2018.	https://orcaguardians.org/wp-content/uploads/2019/05/Killer-Whales-Migrating-between-Iceland-and-Scotland.pdf	Mrusczok and Scullion, 2019
Revised Phase III data analysis of joint cetacean protocol data resources	This report collates and provides information on the abundance and distribution of cetacean species in the UK.	https://data.jncc.gov.uk/data/01adfabd-e75f-48ba-9643-2d594983201e/JNCC-Report-517-FINAL-WEB.pdf	Paxton *et al.* 2016
Atlas of cetacean distribution in northwest European waters	This Atlas provides an account of the distribution of all 28 cetacean species that are known to have occurred in the waters off northwest Europe, at the time of publication.	https://data.jncc.gov.uk/data/a5a51895-50a1-4cd8-8f9d-8e2512345adf/atlas-cetacean-distribution-web.pdf	Reid *et al.* 2003
UHI sightings data	Shore based sightings data, data layers, density maps and density records.	N/A	University of Highlands and Islands Shetland, n.d.
Whale and Dolphin Conservation surveys	Three years of effort weighted surveys around Shetland	N/A	Whale and Dolphin Conservation, n.d.
Shetland Biological Records Centre	Marine mammal density mapping	N/A	Shetland Biological Records Centre, n.d.

The Arven Digital Ariel Surveys (DAS) have sighted harbour porpoise (*Phocoena phocoena*), white-beaked dolphin (*Lagenorhynchus albirostris*), minke whale (*Balaenoptera acutorostrata*) and grey seals (*Halichoerus grypus*). Of these, harbour porpoise and grey seal are Annex II marine mammal species. Additionally, bottlenose dolphin (*Tursiops truncatus*) and harbour seals (*Phoca vitulina*) are also Annex II species that, although not recorded during DAS to-date, could be present in the Array Areas and Offshore ECC.

5.2.2.1 Harbour porpoise

The Array Areas and Offshore ECC overlap with SCANS-IV Block NS-E which has an estimated harbour porpoise density of 0.5156 (CV=0.208) animals/km² and an abundance of 33,735 (95% CI=21,757-50,324) (*Gilles et al.,* 2023). This is an increase from the Block T[1] density and abundance estimate from the 2016 SCANS III survey of 0.402 (CV=0.295) animals/km² and 26,309 individuals (95% CI = 14,219-45,280) (Hammond *et al.,* 2021). The Array Areas and Offshore ECC overlaps with the North Sea MU for harbour porpoise which has an estimated abundance of 159,632 (95% CI=127,442-199,954; CV=0.12) animals in the UK portion of the MU (IAMMWG, 2023). The overall trend in conservation status of harbour porpoise within UK waters is unknown due to insufficient data to establish a population trend (JNCC, 2019a).

The North Sea MU contains the Southern North Sea (SNS) SAC which is designated for harbour porpoise. The SNS SAC has been identified as being a discrete and persistent area of high porpoise density (Heinänen & Skov 2015). The year-round high density in this area has also been demonstrated by the analyses presented in Waggitt *et al.* (2020), with peak breeding season between May and August. The Arven Array Areas do not overlap with this SAC (525 km from the array area).

5.2.2.2 Bottlenose dolphin

The Array Area and Offshore ECC falls within the Greater North Sea MU which has an estimated abundance of 1,885 (95% CI=476-7,461; CV=0.8) animals in the UK portion of the MU (IAMMWG, 2023). The overall trend in conservation status of bottlenose dolphin within UK waters is unknown due to insufficient data to establish a population trend (JNCC, 2019d). The Array Areas and ECC overlap with SCANS-IV Block NS-E, no individuals were sighted in this block and therefore there is no density estimate (Gilles *et al.,* 2023). Additionally, there were no sightings in Block T[2] from the 2016 SCANS III survey (Hammond *et al.,* 2021).

The Greater North Sea MU contains the Moray Firth SAC which is designated for bottlenose dolphin. The resident population protected by this SAC have a range extending beyond the SAC boundary, along the east coast of Scotland including the Tay Estuary and Firth of Forth. In more recent years, photo-identification studies have also found matches with the east coast of England and in the North Sea (Arso Civil *et al.,* 2021; Arso Civil *et al.,* 2022).

[1] Block T in SCANS III survey is the equivalent to Block NS-E in the SCANS IV survey, overlapping with Shetland and the Array Area and ECC
[2] Block T in SCANS III survey is the equivalent to Block NS-E in the SCANS IV survey, overlapping with Shetland and the Array Area and ECC

Harbour seal

The Arven Array Areas are within the Shetland Seal Management Unit (SMU) and falls within subunits four and five, which were last surveyed in 2019 (SCOS, 2023). The latest August count of harbour seals within the Shetland SMU is 3,180 individuals from surveys 2016-2019 (SCOS, 2023). Within sub-units 4 and 5, there were 216 and 285 individuals counted, respectively (SCOS, 2023). The latest population estimate for harbour seals in the Shetland SMU is 4,416 (95% CI=3,613-5,888) (SCOS, 2023). The trend for harbour seal within the Shetland SMU is depleted. Harbour seals have been assessed as having an unfavourable inadequate conservation status (JNCC, 2019b). Harbour seals are known to forage up to ca. 100 km from their nearest haul-out site, although typically they remain within 30-50 km of haul-out sites (Carter *et al.,* 2022; Hague *et al.,* 2020; SCOS, 2022).

The closest harbour seal SACs to the Arven Array Areas are the Yell Sound Coast SAC (0 km) and Mousa SAC (17.5 km) both within the Shetland SMU, and Sanday SAC (139 km) within the Orkney SMU. The latest counts for Yell Sound Coast SAC estimate that although the abundance is depleted it is stable; however, for Mousa SAC there are ongoing declines in abundance and the same trend is recorded at Sanday SAC (SCOS, 2022).

Grey seal

Grey seals in the UK have been assessed as having a favourable conservation status with an improving conservation status trend (JNCC, 2019c). Grey seals in Shetland have experienced fluctuations in population, with recent decreases in August count numbers and reduced pup production (SCOS, 2023). The latest August count of grey seals in 2019 within the Shetland SMU is 1,009 individuals. Within sub-units 4 and 5 there were 344 and 49 individual grey seals counted, respectively (SCOS, 2023). There is no estimated trend for grey seals within the Shetland SMU (SCOS, 2023). Grey seals do forage offshore, and typically remain within100 km of haul-out sites (Carter *et al*., 2022; Hague *et al*., 2020; SCOS, 2019).

The closest grey seal SACs to the Arven Array Areas is the Faray and Holm of Faray SAC located 163 km from the Arven Array Area and within the Orkney SMU. The latest haul out trends for Faray and Holm of Faray SAC are stable however pup production is declining (SCOS, 2022).

5.2.3 Migratory Fish

Migratory fish species have the potential to occur within the Offshore Proposed Development area and surrounding areas, including Atlantic salmon (*Salmo salmar*). Several species of fish living in Scottish rivers migrate between the sea and the upper reaches of rivers during their life cycle. Atlantic salmon, sea trout (Salmo trutta) and lampreys (*Lampetra fluviatilis*, *Petromyzon marinus* and *Lampetra planeri*), spend most of their adult lives in the oceans but return to freshwater to reproduce. European eel (*Anguilla anguilla*) are also diadromous fish, whereby adult eels migrate out to sea to spawn, and their larvae make the return journey back to the freshwater environments of rivers (termed catadromous).

Salmon have been identified as being either present or likely to be present within rivers throughout the Shetland and Orkney islands (Marine Scotland, 2023). However, there is little data which details the specific migratory routes, if any, used by salmon from Scottish rivers to deeper ocean waters (Malcome *et al*., 2010;

Shearer, 1992). However, it has been theorised that salmon may use ocean currents to assist their migrations (McCurdy and Knox, 2004; Furey *et al*., 2015; Malcome *et al*., 2010; Shearer, 1992). Studies on the migratory routes of salmon which exit rivers and enter the sea within and around the Moray Firth identified that the salmon predominantly moved in a northerly direction, which corresponds with the direction of the currents (Malcome *et al*., 2010).

The rivers Thurso, Naver and Berriedale and Langwell Waters (approximately 250 km, 280 km, and 285 km from the Offshore Proposed Development, respectively), are the closest SACs with a qualifying interest in diadromous species (all Atlantic salmon) – therefore none within the 100 km ZoI. This also applies to sea trout and lamprey species where there are no designated sites (SAC's) within 100 km of the Offshore Proposed Development. Therefore, migratory fish are not assessed any further within this assessment.

5.2.4 Offshore and Intertidal Ornithology

The Shetland Isles are an important seabird area, as they contain colonies supporting around one tenth of the UK's breeding seabirds, along with important breeding sites for waders and other ground nesting birds (Shetland Islands Council, 2017). The waters in which the Offshore Proposed Development is situated are therefore likely to be used by a range of ornithology receptors throughout the year.

5.2.4.1 Data Sources

Site-specific digital aerial surveys (DAS) are currently being conducted for the Offshore Proposed Development; the report for first six months of data (April 2023 to September 2023) is available to inform this Screening Report. The ornithological baseline for this Screening Report will also draw on geographically relevant data from literature, surveys, and key designated sites in the absence of a full complement of 24 months of site-specific DAS.

The ornithological baseline environment is made up of both offshore and intertidal habitats and their respective ornithological receptors. This Screening Report also accounts for the highly mobile nature of bird species. Birds may travel to the Offshore Proposed Development for feeding, overwintering, commuting and migration.

The ecological differences between ornithology receptors means that various species will interact with the area differently and could face different potential impacts from the Offshore Proposed Development. Furthermore, these impacts could affect each type of ornithological feature (breeding seabird, non-breeding seabird, breeding waterbird, or non-breeding waterbird) differently.

These classification of different types of ornithological features help categorise the differences in the way various species reproduce, feed, migrate, and use different habitats. Therefore, these categories are essential, as they will help the report account for each part of the ornithological baseline that could be affected by the Offshore Proposed Development.

In addition to the available DAS data, the following data sources have been used to inform the environmental baseline for the various offshore and intertidal ornithological features:

- Seabird Monitoring Programme (SMP) database and Burnell *et al*. (2023) provides the most recent national colony census data for seabirds.
- Project Arven – Seabird Colony Surveying 2023 – Report (HiDef, 2023) provides colony counts for Noss SPA and Hermaness, Saxa Vord and Valla Field SPA for the 2023 breeding season.
- Stone *et al*. (1995), Brown and Grice (2005), Kober *et al*. (2010), Wade *et al*. (2016), HiDef Ltd. (2015), Waggitt *et al*. (2019), Cleasby *et al*. (2020), and Davies *et al*. (2021) provide publicly available reports of bird distribution in the UK.
- Woodward *et al.* (2019) defines the mean-maximum foraging range + one standard deviation (+1SD) of breeding seabirds and waterbirds that can help determine their presence within the area of the Offshore Proposed Development (Table 4.2). NatureScot Guidance Note 3: Guidance to support Offshore Wind applications: Marine Birds – Identifying theoretical connectivity with breeding site Special Protection Areas using breeding season foraging ranges sets out the recommended foraging ranges derived from Woodward *et al*. (2019).
- Furness (2015) provides population sizes for BDMPS for non-breeding populations of seabirds in UK waters.
- Wernham *et al*. (2002), Thaxter *et al*. (2012), Wright *et al*. (2012), Wakefield *et al*. (2013; 2017), Furness *et al*. (2018), and Woodward *et al*. (2019) provide publicly available reports of bird movements during both breeding season foraging trips and migration.

5.3 Identification of Potential Effects

Considerable experience and knowledge exists from previous OWF projects, with regard to the potential effects that may result from the construction, operation and maintenance and decommissioning of an OWF. This provides a wealth of knowledge which can be drawn upon by the Offshore Proposed Development. The list of potential impacts has been compiled using the experience and knowledge gained from previous offshore wind farm projects in Scottish waters, the pressures data available on Scotland's environment web for individual features of sites, and NatureScot's guidance for plan-making bodies in Scotland (NatureScot, 2015; SEPA, 2024). In addition, for a number of the designated sites identified through the screening criteria, Natural England has prepared site advice packages and supporting documents, which are intended to help with site assessments and the impact of marine activity in sensitive areas. Specifically, the 'advice on operations' documents are relevant here, as these identify the type of effect that specific features are sensitive to. Whilst Natural England is a SNCB for England, the advice can be applied to any designated sites with similar features, therefore this guidance has been applied to Scottish designated sites for this report. The information is summarised in Table 5.3 to Table 5.4 below. For the purposes of HRA Screening, and given the limited information available, the potential for effect during decommissioning is assumed, as a worst-case scenario, to be the same as for construction (but is realistically likely to be less).

It should be noted that the effects identified in Table 5.3 do not correlate to LSE; these are effects that may arise as a result of the construction, operation & maintenance and decommissioning of the Offshore Proposed Development. The potential for LSE is explored subsequently, in relation to relevant sites and feature(s) in Section 6.

Table 5.3: Potential effects and pathways associated with Subtidal and intertidal benthic ecology receptor group

Potential Effects	Pathway	Activities potentially resulting in effects		
		Construction	**Operation and Maintenance**	**Decommissioning**
Physical habitat loss/ disturbance (temporary or permanent)	Direct physical interaction between the development and the Offshore Proposed Development (direct)	Installation of structures; Seabed preparation; Sediment disposal; Vessel movement/ anchoring; and All in-combination effects	Physical presence of structures; Maintenance of structures; and All in-combination effects	Anticipated to be less than during construction
Suspended sediment / deposition (temporary)	Effect travelling through the water column to reach the site/ feature (direct)	Installation of structures; Seabed preparation; Seabed dredging and seabed preparation; Sediment disposal; and All in-combination effects	Maintenance of structures; and All in-combination effects	Anticipated to be less than during construction

Potential Effects	Pathway	Activities potentially resulting in effects		
		Construction	**Operation and Maintenance**	**Decommissioning**
Accidental pollution (temporary)	Effect travelling through the water column to reach the site/ feature (direct)	Release of contaminants; Release of sediment (via all activities listed for suspended sediment/ deposition above); and All in-combination effects	Release of contaminants; Release of sediment (via all activities listed for suspended sediment/ deposition above); and All in-combination effects	Anticipated to be less than during construction
Introduction of Invasive Non-Native Species (Temporary or Permanent)	Presence of the works/ structures allowing non-native species to travel between sites and features (indirect)	Vessel movements on and off site; Installation of solid structures; and All in-combination effect	Vessel movements on and off site; Maintenance Activities; Physical presence of structures; and All in-combination effects	Anticipated to be less than during construction

Potential Effects	Pathway	Activities potentially resulting in effects		
		Construction	Operation and Maintenance	Decommissioning
Changes to physical processes (Permanent)	Effects on sites and features from changes to water movements and transitional rates (indirect)	Installation of Structures	Physical presence of structures	Anticipated to be less than during construction

Table 5.4: Potential effects and pathways associated with marine mammal receptors.

Potential Effects	Pathway	Activities potentially resulting in effects		
		Construction	Operation and Maintenance	Decommissioning
Underwater Noise (Temporary)	Effect travelling through the water column to reach the site/ feature (direct)	Piling; Unexploded Ordnance (UXO); Construction vessel noise; Other construction activities; Geophysical surveys; and All in-combination effects	Geophysical surveys; Vessel noise; Operational noise; and All in-combination effects	Anticipated to be less than during construction

Potential Effects	Pathway	Activities potentially resulting in effects		
		Construction	Operation and Maintenance	Decommissioning
Vessel Disturbance (Temporary)	Effect is a result of vessel movement within the area and can potentially impact connected sites and features (direct)	Construction vessel movements; Survey vessel movements; and All in-combination effects	Maintenance vessel movements; Survey vessel movements; and All in-combination effects	Anticipated to be less than during construction
Collision Risk (Temporary)	Effect is a result of vessel movement within the area and can potentially impact connected sites and features (direct)	Vessel collision risk; and All in-combination effects	Vessel collision risk; and All in-combination effects	Anticipated to be less than during construction
Accidental pollution (Temporary)	Effect travelling through the water column to reach the site/ feature (direct)	Release of contaminants; Release of sediment (via all activities listed for suspended sediment/ deposition); and All in-combination effects	Release of contaminants; Release of sediment (via all activities listed for suspended sediment/ deposition); and All in-combination effects	Anticipated to be less than during construction
Changes to prey (Temporary or permanent)	Effects site/ feature by impacting lower trophic level organisms (indirect)	Generation of underwater noise from construction activities; Loss of supporting habitats (via all activities listed for	Generation of underwater noise from maintenance activities; Loss of supporting habitats (via all activities listed for	Anticipated to be less than during construction

Potential Effects	Pathway	Activities potentially resulting in effects		
		Construction	Operation and Maintenance	Decommissioning
		physical habitat loss/ disturbance in Subtidal and Intertidal Benthic Ecology); Vessel movements; and All in-combination effects	physical habitat loss/ disturbance in Subtidal and Intertidal Benthic Ecology); Vessel movements; and All in-combination effects	
Habitat loss (temporary or permanent)	Effects impacting habitat caused by development works (direct and indirect)	Removal of supporting habitat during installation of structures; and All in-combination effects	Prey habitat loss in footprint of structures/cable protection; and All in-combination effects	Anticipated to be less than during construction
Disturbance at haul out sites (non-physical disturbance) (Temporary)	Effect is a result of vessel movement within the area and can potentially impact connected sites and features (direct)	Construction activity; Vessel movements; and All in-combination effects	Maintenance activity; Physical presence of turbines; Vessel movements; and All in-combination effects	Anticipated to be less than during construction

Table 5.4: Potential effects and pathways associated with offshore and intertidal ornithology receptors

Potential Effects	Pathway	Activities potentially resulting in effects		
		Construction	**Operation and Maintenance**	**Decommissioning**
Distributional responses (Permanent)	Effect is a result of physical structures present within the movement/ migratory zones for features (direct)	N/A	Maintenance activity; Physical presence of turbines; Vessel movements; and All in-combination effects	N/A
Collision risk and entanglement (Permanent)	Effect is a result of physical structures present within the movement/ migratory zones for features (direct)	N/A	Physical presence of turbines and moorings; and All in-combination effects	N/A
Barrier effects (Permanent)	Effect is a result of physical structures present within the movement/ migratory zones for features (direct)	N/A	Physical presence of turbines and moorings; and All in-combination effects	N/A
Impacts resulting from artificial light	Effect is a result of artificial lighting used during all phases of the Offshore Proposed Development	Construction activities; and All in-combination effects	Maintenance activity; Physical presence of turbines; Vessel movements; and	Decommissioning activities; and All in-combination effects

Potential Effects	Pathway	Activities potentially resulting in effects		
		Construction	**Operation and Maintenance**	**Decommissioning**
			All in-combination effects	
Indirect effects (temporary or permanent) from habitat loss	Effect on prey species availability and behaviour	Construction activities (installation of infrastructure); and All in-combination effects	Maintenance activity; Physical presence of turbines; Vessel movements; and All in-combination effects	Changes in prey species availability and behaviour; and All in-combination effects

5.3.1 Determination of LSE for Designated Sites

5.3.1.1 Offshore Windfarm LSE for SACs

The screening for coastal ecology, subtidal and intertidal benthic ecology, marine mammals and migratory fish first identified all European Sites with the respective designated features located within the ZoI outlined in Table 4.1. All sites identified within this first stage are then included within the test for LSE.

5.3.1.2 Offshore Windfarm LSE for SPAs and RAMSARs

Offshore windfarms can affect ornithological features in a variety of ways. These effects can occur during the construction, operation and maintenance, and decommissioning phases of the Offshore Proposed Development. This report will firstly outline the various ways that the Offshore Proposed Development can cause effects on designated ornithological features before identifying which designated sties will exhibit connectivity with the Offshore Proposed Development (and therefore vulnerability to LSE).

5.3.1.3 Determining Designated Site Connectivity

A list of all Scottish and transboundary SAC, SPA and Ramsar sites was compiled using publicly available datasets (JNCC, n.d.; National Parks and Wildlife Service (NPWS), n.d.; Ramsar, n.d.). The distances between each of these sites and the Offshore Proposed Development were then determined. This data provided a baseline with which connectivity between key designated sites and the Offshore Proposed Development could be determined.

Transboundary sites will be considered if there is connectivity of their designated features with the Offshore Proposed Development.

5.3.1.3.1 Pathways to LSE: Scoped In

Qualifying ornithological features of the designated sites listed above will be scoped in for LSE if they are sensitive to the effects of the Offshore Proposed Development and the site for which they are designated displays theoretical connectivity to the Offshore Proposed Development during any biologically relevant season.

Designated sites will be considered to be subject to LSE if the Offshore Proposed Development overlaps with the designated site boundary. Even if a species is not highly sensitive to the effects of a windfarm, the proximity of the Offshore Proposed Development increases the likelihood of disturbance.

5.3.1.3.1.1 Seabirds

Breeding seabird connectivity is determined based on the MMF +1SD found in Woodward *et al*. (2019). Their colony distance is defined according to the distance of the designated site for which they are a designated feature. There are several site-specific exceptions to the standard foraging range found in Woodward *et al*. (2019) due to specific local food supply conditions. NatureScot (2023b) guidance suggests that these exceptions be used in any assessments. Breeding seabirds are subject to LSE based on their sensitivity to displacement and collision (i.e. connectivity does not necessarily automatically mean a particular receptor is subject to LSE) (Wade *et al*., 2016). Non-breeding seabirds that are designated features of key designated breeding colony sites may be sensitive to LSE during the non-breeding season when they disperse away from

their breeding colonies (Wright *et al.*, 2012). However, vulnerability to LSE during the non-breeding season is based on individual species' sensitivities and the species' presence around the Offshore Proposed Development during the non-breeding season. Population sizes and locations during the non-breeding season are assessed using species-specific Biologically Defined Minimum Population Scales (BDMPS). NatureScot Guidance Note 4 (2023c) suggests the use of Furness (2015) to determine appropriate population sizes during the non-breeding season. LSE will be described in more detail for each connected species in Table 6.3.

5.3.1.3.1.2 Migratory waterbirds

In order to screen-in relevant SPAs supporting migratory ornithological features, a quantifiable approach was used that captured the percentage of bird migration pathways that could intersect with the project array boundary. All geometry and data manipulation functions utilised within this method were carried out within the software QGIS 3.34.

United Kingdom (UK) and Republic of Ireland (ROI) SPA boundary data was obtained from relevant sources (JNCC and NPWS). A centroid value was then calculated for each SPA, by using the geometry tool "Centroids". This algorithm creates a new point layer that represents the centroid of the geometrics of an input layer. The coastlines of Continental Europe and Iceland were split into 1 km points, with each point being labelled with a unique ID, to capture representative southern and northern bird migratory endpoints.

Using the "MMQGIS Hub Lines tool", each point along these coastlines were joined to the centre of each SPA. For each SPA this created a unique vector layer of lines from the SPA to each individual endpoint that represented all possible theoretical migratory pathways.Using the geoprocessing tool "Intersection" the number of lines, from each SPA to the north and south endpoints, that directly passed through the project array area could be counted. The "Intersection" algorithm extracts the overlapping proportions of features in an input layer (SPA lines shapefile) that overlap with an overlay layer (project array boundary). This process was done for each individual SPA.

Each individual SPA intersection was then combined into a single output by utilising the processing toolbox function "Merge vector layers". The "Statistics by categories" function was then used to create an exportable attributes table containing a list of all SPAs that intersected with the array area, and the number of lines to do so. SPAs that had no lines intersecting with the project array area were removed at this point.

Utilising the number of northern (7311) and southern (7110) migratory endpoints, a percentage of lines intersecting, for each relevant SPA, with the project array area could then be calculated from the exported attributes table. In order for relevant SPAs to be included within following assessments, only those with migratory features with at least 10% of lines intersecting with the project array were carried forward. SPAs with a lower percentage of intersections passing through the project array area were screened out because bird migrations from these SPAs/ Ramsars are likely to result in negligible numbers passing through the site, and any associated collisions would be minimal[3]. Figure presents the flowchart of the methodology used.

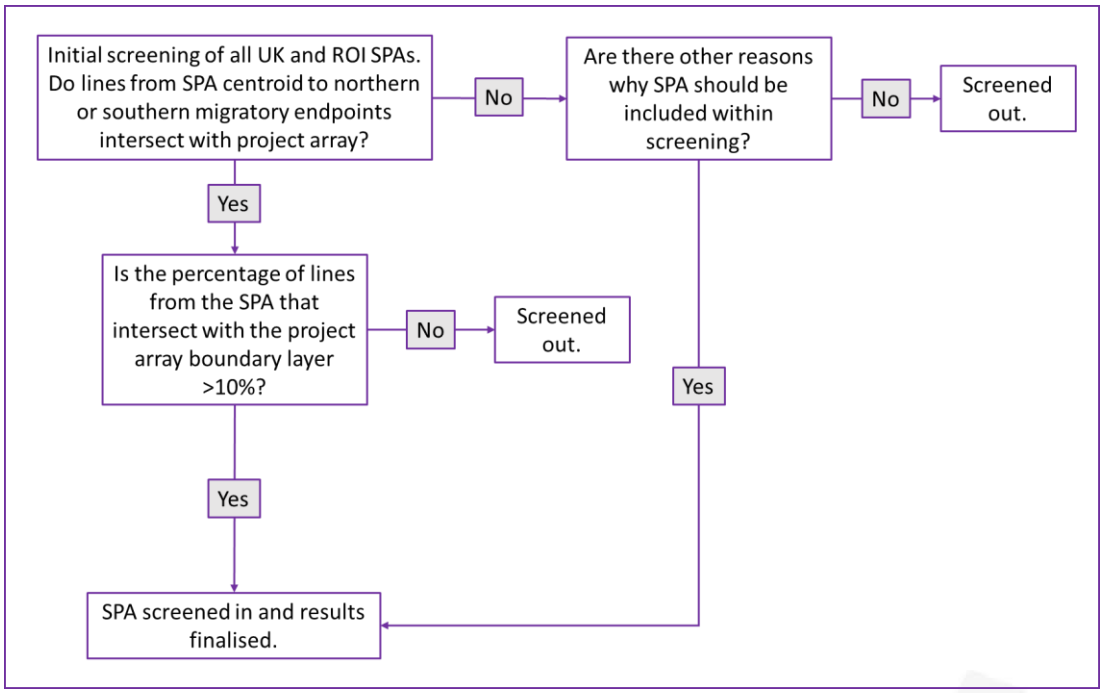

Figure 5.1: Flowchart detailing a high-level summary of the methodology used for SPA screening.

5.3.1.3.2 Pathways to LSE: Scoped Out

There are also several instances where sites will always be scoped out, as the likelihood of interaction with the Offshore Proposed Development is insignificant.

Firstly, any non-breeding migratory waterbirds that are features of designated sites with low connectivity (as quantified by the MIgropath tool) from the Offshore Proposed Development have been screened out. Due to the location of the Offshore Proposed Development, most of these bird species are unlikely to pass through the Array Areas in sufficient numbers for the threshold of LSE to be reached. The negligible numbers that do migrate through the Array Areas would only do so on a maximum of two occasions per year. Furthermore, migratory species are less at risk from adverse impacts caused by the Offshore Proposed Development during

[3] This is a novel approach that GoBe have been using on ScotWind projects. Generally, SPAs within 100 km are screened in but this has meant that some SPAs with connectivity beyond that are missed and others a lot closer but with no connectivity are included. Therefore, it is not an ideal method despite more SPAs being screened in. We believe this method is the most efficient an effective way of identifying connectivity.

migration. The costs of one-off avoidances during migration are trivial, accounting for less than 2% of available fat reserves (Masden *et al*., 2010; 2012; Speakman *et al*., 2009). Lastly, the vast majority of the predicted impacts on migratory features will be apportioned to SPAs in proximity to the Array Areas, leaving a negligible contribution to distant SPAs. Therefore, there are no chances for any LSE to manifest for these species with low connectivity with the Offshore Proposed Development, and they have been screened out.

Secondly, seabirds have been screened out for designated sites over the species MMF + 1SD from the Offshore Proposed Development, following the advice in NatureScots Guidance Note 3 (NatureScot, 2023)

Therefore it is determined that there is no chance for any LSE to manifest for these species beyond the MMF +1SD from the Offshore Proposed Development, and they have been screened out and excluded from Table 6.3.

5.3.2 Determination of LSE In-Combination

Regulation 48 of the 1994 Habitats Regulations (as similarly covered in the 2017 Habitats Regulations and Offshore Habitats Regulations) includes a requirement for the Competent Authority to make the AA alone and in-combination with other reasonably foreseeable plans or projects, where these are not directly connected with or necessary to the management of the site.

In-combination effects from the Offshore Proposed Development will be assessed to identify where there could be an accumulation of effects on each designated site. These impacts consider other (proposed) developments within the context of the site and any other reasonably foreseeable plans or projects in the vicinity including:

- Projects under construction;
- Consented projects, but not yet implemented;
- Submitted application(s) in the planning system but not yet determined (from scoping onwards);
- Plans or 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
- Plans or projects identified in other plans and programmes (as appropriate) which set the framework for the future development is reasonably likely to come forward.

It is proposed that projects that are built and operational at the time the site was designated have been classified as part of the baseline conditions. For those projects that were/are only partially constructed or have only recently been completed, the full extent of the impacts arising from the development(s) may not be known and will therefore be included within the in-combination assessment.

An in-combination assessment has not been completed at this stage but deferred to the Stage 2 AA. Therefore, all sites screened out alone (where connectivity exists) will be screened through to Stage 2 AA in-combination assessment.

6 Test for No LSE

Following the ZoIs identified (see Section 4.2.2) and the above information describing the screening process, various sites and features were identified for consideration in the Screening assessment.

Note - no sites were identified within the ZoI with fish receptors as designated features.

Table 6.1: Table of sites and features identified for Subtidal and Intertidal Ecological Receptors

European site and relevant qualifying interest	Distance to closest point of project area (km)	Physical habitat loss/disturbance			Suspended sediment/ deposition			Accidental pollution			INNS			Changes in physical processes		
		C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
The Vadills SAC (UK0017068																
Coastal lagoons	14.0	✓a	N/A	✓a	✓a	N/A	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✓a	N/A	✓a
Blanket bogs		✓a	N/A	✓a	✓a	N/A	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✓a	N/A	✓a
Hascosay SAC (UK0019793)																
Blanket bogs	9.4	✓a	N/A	✓a	✓a	N/A	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✓a	N/A	✓a
Sullom Voe SAC (UK0030273)																
Large shallow inlets and bays	1.4	✓a	N/A	✓a	✓a	N/A	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✓a	N/A	✓a
Coastal lagoons		✓a	N/A	✓a	✓a	N/A	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✓a	N/A	✓a
Reefs		✓a	N/A	✓a	✓a	N/A	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✓a	N/A	✓a
Pobie Bank Reef SAC (UK0030385)																
Reefs	0	✓a	N/A	✓a	✓a	N/A	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✓a	N/A	✓a

The text below explains whether LSE can be ruled out for a given impact. The impacts are categorised by letter which correspond to a letter within the table. Where LSE cannot be ruled out for the impact a ✓ symbol is included. Where an LSE has been ruled out a ✗ symbol is included. Where effects are not applicable as there is no pathway, they have N/A and are lightly greyed out.

a. Given the proximity to the site, evidence of connectivity and nature of effects, there is potential for LSE and therefore screened in alone and in-combination.

Table 6.2: Table of sites and features identified for Marine Mammals

European site and relevant qualifying interest	Distance to closest point of project area (km)	Underwater Noise			Vessel disturbance			Collision risk			Accidental pollution			Changes to prey			Habitat loss			Disturbance at haul-out sites.		
		C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Yell Sound Coast SAC (UK0012687)																						
Harbour seal	0	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✗b	N/A	N/A	✓a	N/A	✓a
Mousa SAC (UK0012711)																						
Harbour seal	17.5	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✗b	N/A	N/A	✓a	N/A	✓a
Sanday SAC (UK0030069)																						
Harbour seal	139	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Faray and Holm of Faray SAC (UK0017096)																						
Harbour porpoise	163	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Moray Firth SAC (UK0019808)																						
Bottlenose Dolphin	267.6	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✗b	N/A	N/A	N/A	N/A	N/A
Southern North Sea SAC (UK0030395)																						
Harbour porpoise	523.8	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	✓a	N/A	✓a	✗b	N/A	N/A	N/A	N/A	N/A
Doggersbank SAC (NL2008001)																						
Harbour porpoise	550.5	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Klaverbank SAC (NL2008002)																						
Harbour porpoise	813.9	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A

European site and relevant qualifying interest	Distance to closest point of project area (km)	Underwater Noise			Vessel disturbance			Collision risk			Accidental pollution			Changes to prey			Habitat loss			Disturbance at haul-out sites.		
		C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey Seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Noordzeekustzone SAC (NL9802001)																						
Harbour porpoise	813.9	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Waddenzee SAC (NL1000001)																						
Harbour porpoise	825.6	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Voordelta SAC (NL4000017)																						
Harbour porpoise	943.5	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Vlaamse Banken SAC (BEMNZ0001)																						
Harbour porpoise	974.9	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Vlakte van de Raan SAC (NL2008003)																						
Harbour porpoise	980.3	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A

European site and relevant qualifying interest	Distance to closest point of project area (km)	Underwater Noise			Vessel disturbance			Collision risk			Accidental pollution			Changes to prey			Habitat loss			Disturbance at haul-out sites.		
		C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Westerschelde and Saeftinghe SAC (NL9803061)																						
Harbour porpoise	987.3	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
SBZ 3/ZPS 3																						
Harbour porpoise	997.6	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Bancs des Flandres SAC (FR3102002)																						
Harbour porpoise	997.5	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	N/A	N/A	N/A
Harbour seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b
Grey seal		✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	✗b	N/A	✗b	✗b	N/A	✗b	✗b	N/A	✗b

The text below explains whether LSE can be ruled out for a given impact. The impacts are categorised by letter which correspond to a letter within the table. Where LSE cannot be ruled out for the impact a ✓ symbol is included. Where an LSE has been ruled out a ✗ symbol is included. Where effects are not applicable as there is no pathway, they have N/A and are lightly greyed out.

a. Given the proximity to the site, evidence of connectivity and nature of effects, effects cannot be screened out at this stage and therefore there is a potential for LSE.
b. Due to the distance between the site and the Offshore Proposed Development it has been determined that there is a lack of connectivity and therefore there is no potential for LSE.

Table 6.3: Table of sites and features identified for Intertidal and Offshore Ornithology Receptors

European site and relevant qualifying interest	Distance to closest point of project area (km)	Collision Risk		Disturbance and Displacement		
		C & D	O	C	O	D
Noss SPA (UK9002081)						
Gannet	14.0	N/A	✓a	✓c	✓c	✓c
Kittiwake		N/A	✓a	N/A	✓h	N/A
Fulmar		N/A	N/A	N/A	✓b	N/A
Great skua		N/A	✓a	N/A	N/A	N/A
Guillemot		N/A	N/A	✓c	✓c	✓c
Puffin		N/A	N/A	✓c	✓c	✓c
East Mainland Coast, Shetland SPA (UK9020311)						
Red-throated diver	19.7	N/A	N/A	✓e	✓e	✓e
Great northern diver		N/A	N/A	✓e	✓e	✓e
Slavonian grebe		N/A	N/A	✓c	✓c	✓c
Fetlar SPA (UK9002031)						
Fulmar	30.38	N/A	N/A	N/A	✓b	N/A
Arctic tern		N/A	✓b	N/A	N/A	N/A
Arctic skua		N/A	✓b	N/A	N/A	N/A
Great skua		N/A	✓a	N/A	N/A	N/A
Whimbrel		N/A	✓d	N/A	N/A	N/A
Red-necked phalarope		N/A	✓d	N/A	N/A	N/A
Dunlin		N/A	✓d	N/A	N/A	N/A
Mousa SPA (UK9002361)						
Storm petrel	17.5	N/A	✓j	N/A	N/A	N/A

European site and relevant qualifying interest	Distance to closest point of project area (km)	Collision Risk	Disturbance and Displacement			
		C & D	O	C	O	D
Arctic tern		N/A	✓b	N/A	N/A	N/A
Bluemull and Colgrave Sounds SPA (UK9020312)						
Red-throated diver	7.57	N/A	N/A	✓e	✓e	✓e
Otterswick and Graveland SPA (UK9002941)						
Red-throated diver	5.6	N/A	N/A	✓e	✓e	✓e
Sumburgh Head SPA (UK9002511)						
Fulmar	30.74	N/A	N/A	N/A	✓b	N/A
Kittiwake		N/A	✓a	N/A	✓h	N/A
Arctic tern		N/A	✓b	N/A	N/A	N/A
Guillemot		N/A	N/A	✓c	✓c	✓c
Hermaness, Saxa Vord and Valla Field SPA (UK9002011)						
Red-throated diver	21.08	N/A	N/A	✗f	✗f	✗f
Fulmar		N/A	N/A	N/A	✓b	N/A
Gannet		N/A	✓a	✓c	✓c	✓c
Kittiwake		N/A	✓a	N/A	✓h	N/A
Shag		N/A	✗g	✗g	✗g	✗g
Guillemot		N/A	N/A	✓c	✓c	✓c
Puffin		N/A	N/A	✓c	✓c	✓c
Ronas Hill - North Roe and Tingon SPA (UK13054)						
Red-throated diver	10.10	N/A	N/A	✗f	✗f	✗f
Great skua		N/A	✓a	N/A	N/A	N/A
Black guillemot		N/A	N/A	✗g	✗g	✗g
Arctic skua		N/A	✗g	N/A	N/A	N/A

European site and relevant qualifying interest	Distance to closest point of project area (km)	Collision Risk		Disturbance and Displacement		
		C & D	O	C	O	D
Fulmar		N/A	N/A	N/A	✓b	N/A
Whimbrel		N/A	✓b	N/A	N/A	N/A
Papa Stour SPA (UK9002051)						
Ringed plover	23.16	N/A	✓b	N/A	N/A	N/A
Arctic tern		N/A	Xg	N/A	N/A	N/A
Seas off Foula SPA (UK9020331)						
Fulmar	29.12	N/A	N/A	N/A	✓b	N/A
Arctic skua		N/A	Xg	N/A	N/A	N/A
Great skua		N/A	✓a	N/A	N/A	N/A
Guillemot		N/A	N/A	✓c	✓c	✓c
Puffin		N/A	N/A	✓c	✓c	✓c
Ramna Stacks and Gruney SPA (UK9002021)						
Leach's petrel	19.40	N/A	✓j	N/A	N/A	N/A
Foula SPA (UK9002061)						
Red-throated diver	43.22	N/A	N/A	Xf	Xf	Xf
Fulmar		N/A	N/A	N/A	✓b	N/A
Shag		N/A	Xg	Xg	Xg	Xg
Arctic tern		N/A	Xg	N/A	N/A	N/A
Kittiwake		N/A	✓a	N/A	✓h	N/A
Arctic skua		N/A	Xg	N/A	N/A	N/A
Great skua		N/A	✓a	N/A	N/A	N/A
Leach's petrel		N/A	✓j	N/A	N/A	N/A
Guillemot		N/A	N/A	✓c	✓c	✓c

European site and relevant qualifying interest	Distance to closest point of project area (km)	Collision Risk		Disturbance and Displacement		
		C & D	O	C	O	D
Razorbill		N/A	N/A	✓c	✓c	✓c
Puffin		N/A	N/A	✓c	✓c	✓c
Fair Isle SPA (UK9002091)						
Fulmar	69.32	N/A	N/A	N/A	✓b	N/A
Gannet		N/A	✓a	✓c	✓c	✓c
Kittiwake		N/A	✓a	N/A	✓h	N/A
Arctic skua		N/A	✗g	N/A	N/A	N/A
Great skua		N/A	✓a	N/A	N/A	N/A
Shag		N/A	✗g	✗g	✗g	✗g
Arctic tern		N/A	✗g	N/A	N/A	N/A
Guillemot		N/A	N/A	✓c	✓c	✓c
Razorbill		N/A	N/A	✓c	✓c	✓c
Puffin		N/A	N/A	✓c	✓c	✓c
Fair Isle wren		N/A	N/A	N/A	N/A	N/A
East Sanday Coast Ramsar (UK13013)						
Great black-backed gull	116.96	N/A	✗g	✗g	✗g	✗g
Calf of Eday SPA (UK9002431)						
Fulmar	130.11	N/A	N/A	N/A	✓b	N/A
Cormorant		N/A	✗g	✗g	✗g	✗g
Great black-backed gull		N/A	✗g	✗g	✗g	✗g
Kittiwake		N/A	✓a	N/A	✓h	N/A
Guillemot		N/A	N/A	✓c	✓c	✓c

European site and relevant qualifying interest	Distance to closest point of project area (km)	Collision Risk		Disturbance and Displacement		
		C & D	O	C	O	D
Papa Westray (North Hill and Holm) SPA (UK9002111)						
Arctic tern	127.77	N/A	✗g	N/A	N/A	N/A
Arctic skua		N/A	✗g	N/A	N/A	N/A
West Westray SPA (UK9002101)						
Fulmar	137.33	N/A	N/A	N/A	✓b	N/A
Arctic skua		N/A	✗g	N/A	N/A	N/A
Arctic tern		N/A	✗g	N/A	N/A	N/A
Kittiwake		N/A	✓a	N/A	✓h	N/A
Guillemot		N/A	N/A	✓c	✓c	✓c
Razorbill		N/A	N/A	✓c	✓c	✓c
Auskerry SPA (UK9002381)						
Storm petrel	147.41	N/A	✓j	N/A	N/A	N/A
Arctic tern		N/A	✗g	N/A	N/A	N/A
Rousay SPA (UK9002371)						
Fulmar	144.72	N/A	N/A	N/A	✓b	N/A
Arctic tern		N/A	✗g	N/A	N/A	N/A
Kittiwake		N/A	✓a	N/A	✓h	N/A
Arctic skua		N/A	✗g	N/A	N/A	N/A
Guillemot		N/A	N/A	✓c	✓c	✓c
Copinsay SPA (UK9002151)						
Fulmar	160.17	N/A	N/A	N/A	✓b	N/A
Great black-backed gull		N/A	✗g	✗g	✗g	✗g
Guillemot		N/A	N/A	✗g	✗g	✗g

European site and relevant qualifying interest	Distance to closest point of project area (km)	Collision Risk		Disturbance and Displacement		
		C & D	O	C	O	D
Kittiwake		N/A	✓a	N/A	✓h	N/A
Marwick Head SPA (UK9002121)						
Kittiwake	166.88	N/A	✓a	N/A	✓h	N/A
Guillemot		N/A	N/A	✗g	✗g	✗g
Hoy SPA (UK9002141)						
Fulmar	180.83	N/A	N/A	N/A	✓b	N/A
Arctic skua		N/A	✗g	N/A	N/A	N/A
Great black-backed gull		N/A	✗g	✗g	✗g	✗g
Guillemot		N/A	N/A	✗g	✗g	✗g
Kittiwake		N/A	✓a	N/A	✓h	N/A
Puffin		N/A	N/A	✓c	✓c	✓c
Pentland Firth Islands SPA (UK9001131)						
Arctic tern	189.07	N/A	✗g	N/A	N/A	N/A
North Caithness Cliffs SPA (UK9001181)						
Fulmar	193.31	N/A	N/A	N/A	✓b	N/A
Kittiwake		N/A	✓a	N/A	✓h	N/A
Guillemot		N/A	N/A	✗g	✗g	✗g
Razorbill		N/A	N/A	✗g	✗g	✗g
Puffin		N/A	N/A	✓c	✓c	✓c
Caithness and Sutherland Peatlands Ramsar (UK13003)						
Arctic skua	203.52	N/A	✗g	N/A	N/A	N/A
East Caithness Cliffs SPA (UK9001182)						
Fulmar	219.90	N/A	N/A	N/A	✓b	N/A

European site and relevant qualifying interest	Distance to closest point of project area (km)	Collision Risk		Disturbance and Displacement		
		C & D	O	C	O	D
Cormorant		N/A	✗g	✗g	✗g	✗g
Shag		N/A	✗g	✗g	✗g	✗g
Peregrine falcon		N/A	✗g	✗g	✗g	✗g
Herring gull		N/A	✗g	✗g	✗g	✗g
Great black-backed gull		N/A	✗g	✗g	✗g	✗g
Guillemot		N/A	N/A	✗g	✗g	✗g
Razorbill		N/A	N/A	✗g	✗g	✗g
Kittiwake		N/A	✓a	N/A	✓h	N/A
Sule Skerry and Sule Stack SPA (UK9002181)						
Storm petrel	213.55	N/A	✓j	N/A	N/A	N/A
Shag		N/A	✗g	✗g	✗g	✗g
Guillemot		N/A	N/A	✗g	✗g	✗g
Gannet		N/A	✓a	✓c	✓c	✓c
Leach's petrel		N/A	✓j	N/A	N/A	N/A
Puffin		N/A	N/A	✓c	✓c	✓c
Moray Firth SPA (UK9020313)						
Shag	267.6	N/A	✗g	✗g	✗g	✗g
Troup, Pennan and Lion's Heads SPA (UK9002471)						
Fulmar	280.22	N/A	N/A	N/A	✓b	N/A
Herring gull		N/A	✗g	✗g	✗g	✗g
Guillemot		N/A	N/A	✗g	✗g	✗g
Razorbill		N/A	N/A	✗g	✗g	✗g
Kittiwake		N/A	✓a	N/A	✓h	N/A

European site and relevant qualifying interest	Distance to closest point of project area (km)	Collision Risk		Disturbance and Displacement		
		C & D	O	C	O	D
Loch of Strathbeg SPA (UK9002211)						
Sandwich tern	284.22	N/A	✗g	✗g	✗g	✗g
Cape Wrath SPA (UK9001231)						
Fulmar	267.58	N/A	N/A	N/A	✓b	N/A
Kittiwake		N/A	✓a	N/A	✓h	N/A
Guillemot		N/A	N/A	✗g	✗g	✗g
Razorbill		N/A	N/A	✗g	✗g	✗g
Puffin		N/A	N/A	✗g	✗g	✗g
Buchan Ness to Collistone Coast SPA (UK9002491)						
Kittiwake	300.64	N/A	✓a	N/A	✓h	N/A
Rott-Hastein-Kjor (Norway, Ramsar Site no: 1952)						
Fulmar	335.76	N/A	N/A	N/A	✓b	N/A
Gannet		N/A	✓a	✓c	✓c	✓c
Runde (Norway, Ramsar Site no: 2164)						
Fulmar	371.99	N/A	N/A	N/A	✓b	N/A
Gannet		N/A	✓a	✓c	✓c	✓c
Great skua		N/A	✓a	N/A	N/A	N/A
Skuvoy Ramsar (Faroe Islands, Ramsar Site no: 2053)						
Fulmar	377.21	N/A	N/A	N/A	✓b	N/A
Manx shearwater		N/A	N/A	N/A	✓j	N/A
Great skua		N/A	✓a	N/A	N/A	N/A
Nolsoy Ramsar (Faroe Islands, Ramsar Site no: 2052)						
Fulmar	379.14	N/A	N/A	N/A	✓b	N/A

European site and relevant qualifying interest	Distance to closest point of project area (km)	Collision Risk		Disturbance and Displacement		
		C & D	O	C	O	D
Mykines Ramsar (Faroe Islands, Ramsar Site no: 2051)						
Gannet	428.79	N/A	✓a	✓c	✓c	✓c
Fulmar		N/A	N/A	N/A	✓b	N/A
Rum SPA (UK9001341)						
Manx shearwater	446.93	N/A	N/A	N/A	✓j	N/A
Forth Islands SPA (UK9004171)						
Gannet	447.38	N/A	✓a	✓c	✓c	✓c
St Kilda SPA (UK9001031)						
Gannet	484.21	N/A	✓a	✓c	✓c	✓c
Manx shearwater		N/A	N/A	N/A	✓j	N/A
Skomer, Skokholm and the seas off Pembrokeshire SPA (UK9014051)						
Manx shearwater	974.1	N/A	N/A	N/A	✓j	N/A
Glannau Aberdaron & Ynys Enlli/Aberdaron Coast & Bardsey Island SPA (UK9013121)						
Manx shearwater	851.31	N/A	N/A	N/A	✓j	N/A
Copeland Islands SPA (UK9020291)						
Manx shearwater	674.45	N/A	N/A	N/A	✓j	N/A

The text below explains whether LSE can be ruled out for a given impact. The impacts are categorised by letter which correspond to a letter within the table. Where LSE cannot be ruled out for the impact a ✓ symbol is included. Where an LSE has been ruled out a ✗ symbol is included. Where effects are not applicable as there is no pathway, they have N/A and are lightly greyed out.

a. The proposed development is within the mean-maximum +1SD foraging ranges (Woodward *et al*., 2019) for these designated seabird species which are considered vulnerable to collision risk. Therefore there is potential for LSE and is screened alone and in-combination.
b. The proposed development is within the mean-maximum +1SD foraging ranges (Woodward *et al*., 2019) for these designated seabird species which are considered low vulnerability to both collision risk and/or disturbance and displacement effects, however, are at risk due to proximity to the array area. Therefore there is potential for LSE and is screened alone and in-combination.
c. The proposed development is within the mean-maximum +1SD foraging ranges (Woodward *et al*., 2019) for these designated seabird species which are susceptible to disturbance and displacement due to vessel traffic and/or the offshore wind farm. Therefore there is potential for LSE and is screened in alone and in-combination.
d. This breeding feature is unlikely to pass through the Array Areas during migration; however due to proximity to the site it is considered there is potential for LSE and is screened alone and in-combination.
e. The Offshore Proposed Development ECC lies inside the 2 km buffer for assessing disturbance on divers as recommended by SNCB (2017). Therefore there is potential for LSE and is screened alone and in-combination.
f. This site and qualifying feature lie outside of the 2 km buffer for assessing disturbance on divers from the ECC and the 10 km buffer for assessing disturbance from the Array Areas as recommended by SNCB (2017). Furthermore, breeding features from this species are highly unlikely to migrate through the Array Area and have a very low collision risk. Therefore, we conclude no potential for LSE.
g. This site has no connectivity with this feature based on mean-maximum +1SD foraging range (Woodward *et al*., 2019). Therefore, we conclude no potential for LSE.

h. The proposed development is within the mean-maximum +1SD foraging ranges (Woodward *et al*., 2019) for these designated seabird species which are considered to have some vulnerability to collision risk from offshore wind farms and vessel traffic (Wade *et al*., 2016). Disturbance and displacement effects have also been screened in following NatureScot guidance. Therefore there is potential for LSE and is screened alone and in-combination.
i. The proposed development is within the mean-maximum +1SD foraging ranges (Woodward *et al*., 2019) for these designated seabird species. However, these species are not vulnerable to either collision or displacement / disturbance effects from offshore wind farms and vessel traffic (Wade *et al*., 2016). Therefore, we conclude no potential for LSE.
j. The proposed development is within the mean-maximum +1SD foraging ranges (Woodward *et al*., 2019) for these designated seabird species. These species have been screened in for collision risk due to the sensitivity being largely unknown.

6.1 Assessment of Non-trivial Abundances and Determination of LSE

For each designated site screened in within Section 5.3.1.3, the potential for LSE is considered, taking into account non-trivial abundance and recent research or studies that would lead to the conclusion of no LSE. Each possible LSE that has been identified is discussed and appraised to determine whether:

- There is no LSE upon the European Site or qualifying feature (and so screening out of any future AA can take place); or
- There is likely to be an LSE and hence further consideration within an AA is required to assess effects upon the integrity of the European site.

6.2 Transboundary Effects

Several transboundary sites have been identified with respect to ornithological receptors. These sites are all included within Table 6.3 and include the designated species harbour porpoise, harbour seal, and grey seal. The effects considered for these sites include wide-reaching effects such as underwater noise and disturbance.

As seen in Table 6.3 it was determined that no transboundary sites were screened in for LSE and no further assessment for these sites is required.

7 Summary of Screening for Appropriate Assessment

Table 7.1 below lists the sites and features that have been screened in for further assessment and have been determined to have potential LSE as a result of the Offshore Proposed Development.

Table 7.1: Summary of sites screened in for further assessment

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
Subtidal and Intertidal Benthic Habitats				
The Vadills SAC (UK0017068)	1150 Coastal lagoons 7130 Blanket Bogs	Physical habitat loss/ disturbance (construction, and decommissioning); Suspended sediment / deposition (construction and decommissioning);	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
		Accidental pollution (construction, O&M and decommissioning); INNS (construction and decommissioning); and Changes to physical processes (construction and decommissioning).		
Hascosay SAC (UK0019793)	7130 Blanket Bogs	Physical habitat loss/ disturbance (construction, and decommissioning); Suspended sediment / deposition (construction and decommissioning); Accidental pollution (construction, O&M and decommissioning); INNS (construction and decommissioning); and Changes to physical processes (construction and decommissioning).	Yes	Yes
Sullom Voe SAC (UK0030273)	1160 Large shallow inlets and bays 1150 Coastal lagoons	Physical habitat loss/ disturbance (construction, and decommissioning); Suspended sediment / deposition (construction and decommissioning);	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
	1170 Reefs	Accidental pollution (construction, O&M and decommissioning); INNS (construction and decommissioning); and Changes to physical processes (construction and decommissioning).		
Pobie Bank Reef SAC (UK0030385)	1170 Reefs	Physical habitat loss/ disturbance (construction, and decommissioning); Suspended sediment / deposition (construction and decommissioning); Accidental pollution (construction, O&M and decommissioning); INNS (construction and decommissioning); and Changes to physical processes (construction and decommissioning).	Yes	Yes
Marine Mammals				
Yell Sound Coast SAC (UK0012687)	1365 Harbour seal (*Phoca vitulina*)	Underwater noise (construction, O&M and decommissioning);	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
		Vessel disturbance (construction, O&M and decommissioning); Collision risk (construction, O&M and decommissioning); Accidental pollution (construction, O&M and decommissioning); Changes to prey (construction, and decommissioning); and Disturbance at haul out sites (construction, O&M and decommissioning).		
Mousa SAC (UK0012711)	1365 Harbour seal (*Phoca vitulina*)	Underwater noise (construction, O&M and decommissioning); Vessel disturbance (construction, O&M and decommissioning); Collision risk (construction, O&M and decommissioning); Accidental pollution (construction, O&M and decommissioning);	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
		Changes to prey (construction, and decommissioning); and Disturbance at haul out sites (construction, O&M and decommissioning).		
Moray Firth SAC (UK0019808)	1349 Bottlenose dolphin (*Tursiops truncatus*)	Underwater noise (construction, O&M and decommissioning); Vessel disturbance (construction, O&M and decommissioning); Collision risk (construction, O&M and decommissioning); Accidental pollution (construction, O&M and decommissioning); and Changes to prey (construction, and decommissioning).	Yes	Yes
Intertidal and Offshore Ornithology				
Noss SPA	Gannet; Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Great skua	Collision risk (Operation & Maintenance)	Yes	Yes
	Guillemot; Puffin	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
East Mainland Coast, Shetland SPA	Red-throated diver; great northern diver	Disturbance & displacement (construction, and decommissioning)	Yes	Yes
	Slavonian grebe	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
Mousa SPA	Storm petrel; Arctic tern	Collision risk (Operation & Maintenance)	Yes	Yes
Fetlar SPA	Arctic tern; Arctic skua, great skua, whimbrel, red-necked phalarope, dunlin	Collision risk (Operation & Maintenance)	Yes	Yes
	Fulmar	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
Bluemull and	Red-throated diver	Disturbance & displacement	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
Colgrave Sounds SPA		(construction, and decommissioning)		
Otterswick and Graveland SPA	Red-throated diver	Disturbance & displacement (construction, and decommissioning)	Yes	Yes
Sumburgh Head SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Guillemot	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Arctic tern	Collision risk (O&M)	Yes	Yes
Hermaness, Saxa Vord and Valla Field SPA	Gannet; Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Guillemot; Puffin	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
Seas off Foula SPA	Guillemot; Puffin	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Arctic skua	Collision risk (Operation & Maintenance)	No	No
	Great skua	Collision risk (Operation & Maintenance)	Yes	Yes
Foula SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Guillemot; Razorbill; Puffin	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Red-throated diver	Disturbance & displacement (construction, O&M and decommissioning)	No	No
	Shag; Arctic tern	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No	No

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Arctic skua	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No (Collision risk) Yes (D&D)	No (Collision risk) Yes (D&D)
	Great skua, Leach's petrel	Collision risk (Operation & Maintenance)	Yes	Yes
	Gannet; Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Guillemot; Razorbill; Puffin	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Shag; Arctic tern	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No	No
Fair Isle SPA	Arctic skua	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No (Collision risk) Yes (D&D)	No (Collision risk) Yes (D&D)

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
	Great skua	Collision risk (Operation & Maintenance)	Yes	Yes
East Sanday Coast Ramsar	Great black-backed gull	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No	No
Calf of Eday SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Guillemot	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Great black-backed gull; cormorant	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No	No
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
Papa Westray SPA	Arctic tern	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No	No
	Arctic skua	Collision risk (Operation & Maintenance)	No	No

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
West Westray SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Guillemot; razorbill	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Arctic tern	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No	No
	Arctic skua	Collision risk (Operation & Maintenance)	No	No
Auskerry SPA	Storm petrel	Collision risk (Operation & Maintenance)	Yes	Yes
	Arctic tern	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No	No
Rousay SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
	Arctic skua	Collision risk (Operation & Maintenance)	No	No
	Arctic tern	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No	No
	Guillemot	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Guillemot	Disturbance & displacement (construction, O&M and decommissioning)	No	No
	Great black-backed gull	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	No	No
Copinsay SPA	Fulmar	Disturbance & displacement (O&M)	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
Marwick Head SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Guillemot	Disturbance & displacement (construction, O&M and decommissioning)	No	No
Hoy SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Puffin	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Guillemot	Disturbance & displacement (construction, O&M and decommissioning)	No	No
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Great black-backed gull	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	No	No

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
	Arctic skua	Collision risk (Operation & Maintenance)	No	No
Pentland Firth Islands SPA	Arctic tern	Disturbance & displacement (construction, O&M and decommissioning); Collision Risk (O&M)	No	No
North Caithness Cliffs SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Puffin	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Guillemot; razorbill	Disturbance & displacement (construction, O&M and decommissioning)	No	No
Caithness and Sutherland Peatlands Ramsar	Arctic skua	Collision risk (Operation & Maintenance)	No	No
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
East Caithness Cliffs SPA	Cormorant; shag; peregrine; herring gull; great black-backed gull	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	No	No
	Guillemot; razorbill	Disturbance & displacement (construction, O&M and decommissioning)	No	No
	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
Sule Skerry and Sule Stack SPA	Gannet	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Puffin	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Storm petrel; Leach's petrel	Collision risk (Operation & Maintenance)	Yes	Yes
	Shag	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	No	No

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
	Guillemot	Disturbance & displacement (construction, O&M and decommissioning)	No	No
Moray Firth SPA	Shag	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	No	No
	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Herring gull	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	No	No
Troup, Pennan and Lion's Heads SPA	Guillemot; razorbill	Disturbance & displacement (construction, O&M and decommissioning)	No	No
Loch of Strathbeg SPA	Sandwich tern	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	No	No

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
Cape Wrath SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (O&M)	Yes	Yes
	Guillemot; razorbill; puffin	Disturbance & displacement (construction, O&M and decommissioning)	No	No
Buchan Ness to Colliston Coast SPA	Kittiwake	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
Rott-Hastein-Kjor Ramsar	Gannet	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Fulmar	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
Runde Ramsar	Gannet, Great skua	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
	Fulmar	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
Skuvoy Ramsar	Fulmar; Manx shearwater	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Great skua	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
Mykines Ramsar	Fulmar	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
	Gannet	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
Nolsoy Ramsar	Fulmar	Disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
Rum SPA	Manx shearwater	Collision risk (Operation & Maintenance)	Yes	Yes
Forth Islands SPA	Gannet	Collision risk & disturbance &	Yes	Yes

Site	Features screened in for further assessment	Effects Screened in for further assessment	Screened in alone	Screened in combination
		displacement (construction, O&M and decommissioning)		
	Gannet	Collision risk & disturbance & displacement (construction, O&M and decommissioning)	Yes	Yes
St Kilda SPA	Manx shearwater	Collision risk (Operation & Maintenance)	Yes	Yes
Skomer, Skokholm and the seas off Pembrokeshire SPA	Manx shearwater	Collision risk (Operation & Maintenance)	Yes	Yes
Glannau Aberdaron & Ynys Enlli/Aberdaron Coast & Bardsey Island SPA	Manx shearwater	Collision risk (Operation & Maintenance)	Yes	Yes
Copeland Islands SPA	Manx shearwater	Collision risk (Operation & Maintenance)	Yes	Yes

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