Nature Conservation Marine Protected Area Assessment

MarramWind Offshore Wind Farm

December 2025

MarramWind

Document code:	MAR-GEN-ENV-REP-WSP-000023
Contractor document number:	852346-WEIS-IA-A2-RP-O7-101891
Version:	Final for Submission
Date:	08/12/2025
Prepared by:	WSP UK Limited
Checked by:	WSP UK Limited / APEM Ltd.
Approved by:	MarramWind Limited

Contents

1. Introduction

1.1 Background

1.1.1 MarramWind

1.1.1.1 MarramWind Offshore Wind Farm (hereafter referred to as 'the Project') is wholly owned by ScottishPower Renewables UK Limited (SPR). MarramWind Limited, a subsidiary of SPR, is the Applicant for the Project.

1.1.1.2 The Project is a proposed floating wind farm located in the North Sea, with a grid connection capacity of up to 3 gigawatts (GW). The location of the Project is determined by the Option Area Agreement (OAA), which is the spatial boundary of the Northeast 7 (NE7) Plan Option within which the electricity generating infrastructure will be located. The NE7 Plan Option is located north-east of Rattray Head on the Aberdeenshire coast in north-east Scotland, approximately 75 kilometres (km) at its nearest point to shore and 110km at its furthest point. An Option to Lease Agreement for the Project within the NE7 Plan Option was signed in April 2022.

1.1.1.3 A summary of the Project is provided in **Chapter 2** and a comprehensive description of the Project is provided in **Volume 1, Chapter 4: Project Description** of the **Environmental Impact Assessment (EIA) Report**.

1.1.2 Overview of the Project

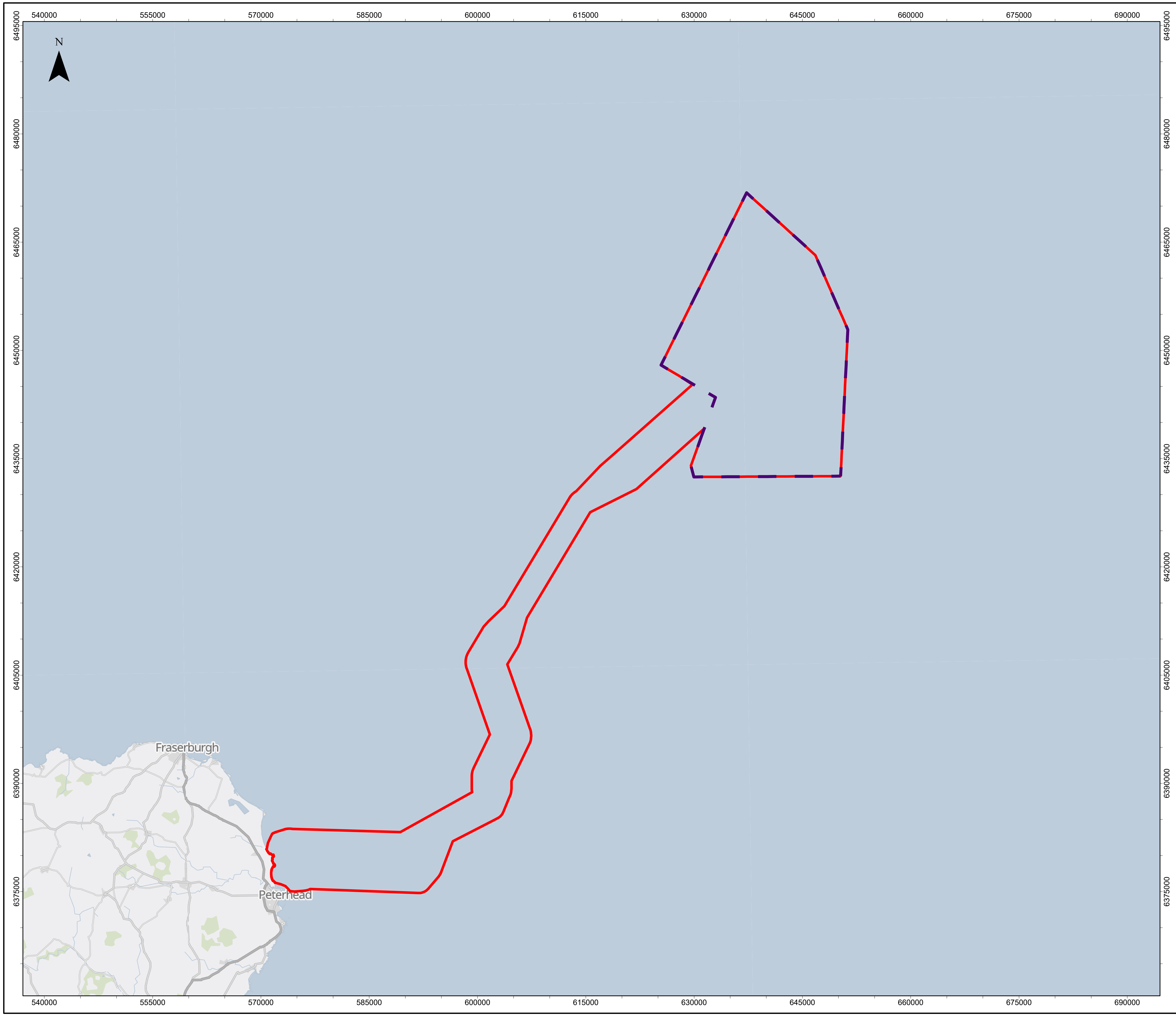
1.1.2.1 The Project's generating infrastructure will be located in the North Sea, within the 'Scottish Zone' (as defined in the Scotland Act 1998) of the United Kingdom (UK) Exclusive Economic Zone (EEZ). The generating infrastructure is specifically located within the spatial extent of the NE7 Plan Option, covered by the OAA, (see **paragraph 1.1.1.1**).

1.1.2.2 The Red Line Boundary is a geographical area within which the offshore wind farm; associated onshore and offshore infrastructure will be located. It represents the boundary identified for the relevant planning and consent applications. The Offshore Red Line Boundary is presented in **Figure 1** and described in **Chapter 2**.

1.1.2.3 The Project involves the installation and operation of infrastructure in the onshore and offshore environments. The Nature Conservation Marine Protected Area (NCMPA) Assessment relates only to activities within the marine environment, seaward of Mean High Water Springs (MHWS).

1.1.2.4 The Project's offshore infrastructure, located seaward of MHWS, includes the following:

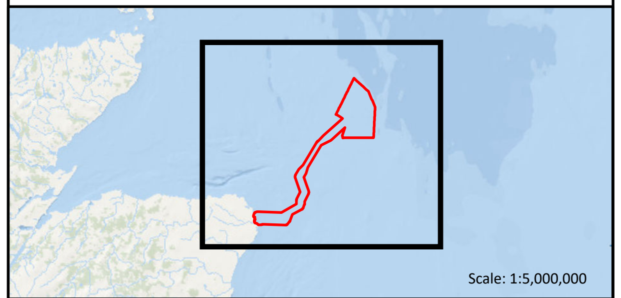
- wind turbine generators (WTGs), including floating units (platforms and station keeping system);
- array cables;
- subsea distribution centres and subsea substations;
- offshore substations;
- reactive compensation platform(s) (RCPs) (if required); and
- offshore export cables to connect the offshore infrastructure to the landfall(s).



Offshore Red Line Boundary

Option Agreement Area

0 10 20 Kilometres



	dd/mm/yyyy	--	--	--	--
	dd/mm/yyyy	--	--	--	--
1	25/09/2025	LT	AMc	MR	LG
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

WSP DRAWING NUMBER 808368-WEIS-IA-I8-FG-O7-52971

MarramWind DRAWING NUMBER MAR-GEN-ENV-MAP-WSP-000388

DATUM	ETRS 89	PROJECTION	UTM Zone 30N
SCALE	1:500,000	PAGE SIZE	A3

PROJECT TITLE

MarramWind Offshore Wind Farm

DRAWING TITLE

Figure 1 Offshore Red Line Boundary

Nature Conservation Marine Protected Areas Report

NOT TO BE USED FOR NAVIGATION

wsp MarramWind

1.2 Purpose of the Nature Conservation Marine Protected Area Assessment

1.2.1.1 The Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 introduced provisions to support the management of NCMPAs. Under Section 83 of the Marine (Scotland) Act 2010 and Section 126 of the Marine and Coastal Access Act 2009, the Scottish Ministers as the competent authority, is required to consider whether a licensable activity is capable of affecting (other than insignificantly) a protected feature in a NCMPA or any ecological or geomorphological process on which the conservation of any protected feature in an NCMPA is dependent.

1.2.1.2 The Scottish Ministers must not grant authorisation of an activity unless the Applicant seeking authorisation satisfies the Scottish Ministers that there is no significant risk of the activity hindering the achievement of the conservation objectives for the NCMPA. If Scottish Ministers believe that there is, or may be a significant risk of a proposal hindering the achievement of an NCMPA's conservation objectives, then they must notify the conservation bodies of this (NatureScot for NCMPAs within 12 nautical miles (nm) or the Joint Nature Conservation Committee (JNCC) for NCMPAs beyond 12nm).

1.2.1.3 If the Applicant is not able to satisfy the Scottish Ministers that there is no significant risk of the licensable activity hindering the achievement of the conservation objectives, then a licence will only be granted if:

- Scottish Minsters is satisfied that there is no other means of proceeding with the licensable activity that would create a substantially lower risk of hindering the achievement of those objectives (to include proceeding in another manner or at another location);
- Scottish Minsters is satisfied that the benefit to the public of proceeding with the licensable activity clearly outweighs the risk of damage to the environment that will be created by proceeding with it; and
- Scottish Minsters is satisfied that the Applicant will undertake, or make arrangements for the undertaking of, measures of environmental benefit equivalent to the damage that the activity will or is likely to have in or on the NCMPA concerned.

1.2.1.4 The purpose of this document is to assess potential impacts on NCMPAs by drawing on multiple sources such as the existing environmental baseline (established from desk studies and publicly available data; and site-specific surveys in the Offshore Red Line Boundary), as well as feedback from the Scoping Opinion from the NCMPA Screening Assessment. This NCMPA Assessment:

- presents the potential impacts to NCMPAs and conclusions on the potential for hindering achievement of conservation objectives for each relevant NCMPA; and
- details a cumulative effects assessment (CEA) to allow for the identification of any potential risk to hindering the achievement of the conservation objectives of each relevant NCMPA.

1.2.1.5 The necessary stages of an NCMPA Assessment are described in **Chapter 3**. This document presents the Stage 1 assessment/initial screening findings of designated NCMPAs, which are proposed to be carried forward for consideration in the NCMPA Assessment.

1.3 Study area

1.3.1.1 The NCMPA Assessment study area is defined as the Offshore Red Line Boundary for the Project and the maximum zone of influence (ZOI) relevant to the designated features of NCMPAs that could foreseeably be impacted by the Project. In line with the EIA Report, the maximum relevant ZOI is the Offshore Red Line Boundary for the Project plus a 60 km buffer for the assessment of marine mammals, which includes cetaceans (whales, dolphins and porpoises) and pinnipeds (seals), to account for underwater noise impacts. This has been derived from the basis of potential far-field effects of sound emissions associated with impact piling (specifically, the cumulative sound exposure range for temporary threshold shift (TTS) for low frequency cetaceans). Given the highly mobile nature of marine mammals, it is considered that this ZOI is sufficient to describe and assess the potential effects of the Project.

1.3.1.2 Within this wider ZOI, the maximum range for effects to benthic and geodiversity features associated with elevated suspended sediment concentrations (SSC) is 15km. This ZOI is established based on the tidal ellipse and coastal process dynamics, reflecting the area within which suspended sediment may disperse following Project-related seabed disturbance. The 15km buffer exceeds the local mean value of the tidal ellipse as identified by the atlas of UK marine renewable energy resources (approximately 7km), thereby accounting for potential variation and ensuring adequate spatial coverage of indirect ecology effects (ABPmer, 2008).

1.3.1.3 The study area can be summarised as:

- the Offshore Red Line Boundary of the Project plus 60km for NCMPAs with marine mammal features; and
- the Offshore Red Line Boundary for the Project plus 15km for NCMPAs with benthic habitat, geodiversity and fish features.

1.4 Relevant legislative and policy context and technical guidance

1.4.1 Legislative and policy context

1.4.1.1 This Section identifies the relevant legislation and policy context that has informed the NCMPA Assessment. Further information on policies relevant to the Project and their status is set out in the **Volume 1, Chapter 2: Legislative and Policy Context** of the **EIA Report**, which provides an overview of the relevant legislative and policy context for the Project. **Volume 1, Chapter 2: Legislative and Policy Context** of the **EIA Report** is supported by **Volume 3, Appendix 2.1: planning Policy Framework** of the **EIA Report**, which provides a detailed summary of international, national, marine and local planning policies of relevance to the Project. Individual policies of specific relevance to this assessment and associated appendices have been taken into account.

1.4.1.2 In order to recognise the legislative and policy basis for this NCMPA Assessment, this Section presents a summary of legislation and policies relevant for the benthic, epibenthic and intertidal ecology assessment. This summary provides a foundation for understanding the specific requirements that this NCMPA Assessment must address in terms of assessing and mitigating impacts on receptors and relevant environmental issues.

1.4.1.3 The legislation relevant to the NCMPA Assessment includes:

- The Southern Trench Nature Conservation Marine Protected Area Order 2020;

- Turbot Bank Marine Protected Area Order 2014;
- Marine (Scotland) Act 2010;
- Marine and Coastal Access Act 2009; and
- Energy Act 2004.

1.4.1.4 The policies relevant to the NCMPA Assessment includes:

- Draft Updated Sectoral Marine Plan (Scottish Government, 2025);
- National Policy Statements (NPS) 2024 (NPS EN-1, NPS-EN3 and NPS-EN5) (DESNZ, 2023a, 2023b and 2023c);
- Scotland's National Marine Plan 2015 (Scottish Government, 2015); and
- UK Marine Policy Statement 2011 (HM Government, 2011).

1.4.2 Relevant technical guidance

1.4.2.1 Other information and technical guidance relevant to the NCMPA Assessment includes:

- Draft Fisheries Assessment – Turbot Bank NCMPA: Fisheries management measures within Scottish Offshore Marine Protected Areas (Scottish Government, 2024);
- Nature Conservation Marine Protected Areas: Draft Management Handbook[1] (Scottish Government, 2013); and
- Marine Conservation Zones (MCZs) and marine licensing (MMO, 2013).

1.5 Holistic Network Design Follow Up Exercise

1.5.1.1 As part of its work on the Holistic Network Design Follow Up Exercise (see **Volume 1, Chapter 4: Project Description** of the **EIA Report**), the National Electricity System Operator (NESO) has developed an HND Implementation Plan with accompanying Environmental Appraisal Reports. At the time of writing, a confidential draft assessment report specific to the MarramWind Offshore Wind Farm was shared with the Project. It is expected that NESO's suite of reports, including project-specific and cumulative assessments, will be published for consultation in November 2025 prior to the submission of the consenting applications and associated assessments for the Project.

1.5.1.2 The draft report has identified potential impact pathways of relevance to the NCMPAs screened and assessed in this NCMPA Assessment. It also presents the NESO's view on whether the conservation objectives of these NCMPAs are likely to be hindered by the activities proposed by the Project.

1.5.1.3 Where relevant in **Section 5** and **Section 6**, the conclusions of the NESO's draft report have been compared with those made by the NCMPA Assessment.

1.6 Consultation and engagement

1.6.1.1 This Section describes the consultation and stakeholder engagement undertaken on the Project in relation to NCMPA Assessment. This includes early engagement, the outcome of and response to Scoping Opinions (Scottish Government, 2023) in relation the NCMPA

[1] Although the guidance document has been archived, it has been used in this NCMPA Assessment due to the relevance of its content and the lack of updated guidance. Its staged approach is also consistent with the methodology outlined in the MMO's 2013 guidance for potential MCZ assessments.

Assessment, non-statutory consultation and the findings of the Project's Statutory Consultation. An overview of engagement undertaken for the Project as a whole can be found in Section 5.5 of **Volume 1, Chapter 5: Approach to the EIA** of the **EIA Report**.

1.6.1.2 A summary of the key issues raised during statutory and non-statutory consultation, specific to the NCMPA Assessment, is outlined below in , together with how these issues have been considered in the production of this NCMPA Assessment Report.

Table 1.1 Stakeholder issues responses - Marine Protected Area Assessment

Stakeholder	Stakeholder issue ID	Date, document, forum	Stakeholder comment	How is this addressed in the NCMPA Assessment Report
NatureScot	519	12 May 2023, Marine Directorate Licensing Operations Team (MD-LOT) Scoping Opinion Appendix 1: Consultation Responses and Advice (Scottish Government, 2023).	"*Designated sites* *Table 5.8.14 should be updated to include the minke whale feature of the Southern Trench NCMPA (currently only burrowed mud is included). Minke whale prey on sandeel, herring and mackerel they are sensitive to prey depletion and this predator/ prey relationship should be explored for this development site*".	The minke whale feature of the Southern Trench NCMPA is described and assessed in **Chapter 5** of this NCMPA Assessment. This includes consideration of changes to prey availability and distribution.
NatureScot	526	12 May 2023, MD-LOT Scoping Opinion Appendix 1: Consultation Responses and Advice (Scottish Government, 2023).	"*Potential impacts on Southern Trench NCMPA* *There may be impacts on the minke whale protected feature of the Southern Trench NCMPA via impacts on prey fish species from the export cable route and we recommend this is scoped into assessment*".	The minke whale feature of the Southern Trench NCMPA is described and assessed in **Chapter 5** of this NCMPA Assessment' This includes consideration of changes to prey availability and distribution and the proposed routing for the offshore export cable, which intersects the Southern Trench NCMPA.
NatureScot	717	18 March 2024, Email.	*"The applicant proposes to screen the following sites into the NCMPA Assessment:* ● *Southern Trench NCMPA;* ● *Turbot Bank NCMPA; and* ● *East Caithness NCMPA* *We agree that the first two of these sites should be screened into the NCMPA Assessment. We do not consider that East Caithness*	The East Caithness NCMPA is not included within the NCMPA Assessment.

Stakeholder	Stakeholder issue ID	Date, document, forum	Stakeholder comment	How is this addressed in the NCMPA Assessment Report
			NCMPA requires to be assessed – this site is designated for black guillemot and this species does not venture far from the coast. We have no updates on the feature conditions of the sites, and no updates on publications relating to carrying out the NCMPA Assessment".	
Scottish Fishermen's Federation	619	12 May 2023, MD-LOT Scoping Opinion Appendix 1: Consultation Responses and Advice (Scottish Government, 2023).	*"On P 5.9.3 it should be mentioned that NCMPA are not fisheries management measures per se, although in some instances it is required".*	The comment is acknowledged. There are no fisheries management measures specified for the NCMPAs that are screened into this MPA Assessment.

2. Project description

2.1 Introduction

2.1.1.1 This Section describes the design details of the Project, comprising of all offshore infrastructure seaward of MHWS, including all activities associated with the Project stages from pre-construction, construction, operation and maintenance (O&M) and decommissioning. Key parameters are summarised along with activities and timescales for each stage of the Project.

2.2 Design envelope process

2.2.1.1 An iterative design process is a fundamental element for the Project and this NCMPA Assessment. It has been developed following feedback via the Scoping Opinion, Statutory Consultation and other engagement with key stakeholders. Statutory and non-statutory engagement are integral to the provision of opportunities for stakeholders to provide feedback and to understand and influence the design as it has progressed.

2.2.1.2 The iterative design process integrates the advice and experience of both the environmental subject matter experts and the Project's engineering team. Regular liaison between these groups ensures that design evolution is informed by a comprehensive understanding of both environmental sensitivities and engineering requirements. This collaborative approach ensure that the mitigation hierarchy is adhered to throughout the Project's development, while also considering practical engineering solutions and constraints.

2.2.1.3 From the outset, the environment has been central to the design of the Project. This is demonstrated through the development of embedded environmental measures presented in this NCMPA Assessment.

2.2.1.4 The findings presented in this NCMPA Assessment reflect the current stage in the design process and understanding of baseline conditions and have allowed for conclusions as to the likely significant effects to be drawn. Where the design is still evolving, a precautionary approach is applied to ensure a maximum design scenario relevant to each aspect is considered in this NCMPA Assessment. A precautionary approach is used where there is uncertainty on the potential significance of an effect. Where there is potential for an effect to be significant, a lack of certainty is not a plausible reason to not put protective measures in place. A maximum design scenario is therefore assessed to result in the most undesirable effect, with the likely effect being of a lesser extent. In using this precautionary approach to the assessment, the level of effect may be overstated and subsequently reduced at the time of development.

2.3 Project overview

2.3.1 Offshore Red Line Boundary and site information

2.3.1.1 The Offshore Red Line Boundary (illustrated in **Figure 1**) includes:

- the NE7 OAA where the wind farm array will be located; and
- the offshore export cable corridor up to MHWS.

2.3.1.2 **Table 2.1** provides the key characteristics of the area enclosed by the Offshore Red Line Boundary.

Table 2.1 Offshore Red Line Boundary characteristics

Parameters	Values
OAA surface area	684km^2
Water depth range in OAA	87.8 to 133.7 metre (m)[2]
Closest distance to shore of OAA	75km
Farthest distance to shore of OAA	110km
Export cable corridor surface area	575km^2
Total offshore development surface area (including OAA and offshore export cable corridor)	1,259km^2

2.3.2 Project design envelope

2.3.2.1 The description of the Project is indicative and a 'design envelope' approach, also known as the 'Rochdale Envelope', has been adopted. The provision of a design envelope is intended to identify key design assumptions to enable the environmental assessment to be carried out whilst retaining enough flexibility to accommodate further refinement during detailed design. The design envelope approach is widely used and accepted for major infrastructure projects in the UK, including for recent applications for offshore wind farms. The approach is recognised by MD-LOT and the Energy Consents Unit in their guidance on how the design envelope assessment approach may be applied in the context of applications received for generating stations under Section 36 (s.36) of the Electricity Act 1989 (Scottish Government, 2022). Further details are available within **Volume 1, Chapter 4: Project Description** of the **EIA Report**.

2.3.3 Key components of the offshore Project infrastructure

2.3.3.1 For the purpose of this NCMPA Assessment, the key components of the offshore Project are shown in **Plate 2.1** and a description of the function of each component is provided in **Table 2.2**.

Table 2.2 Offshore key components and functionality

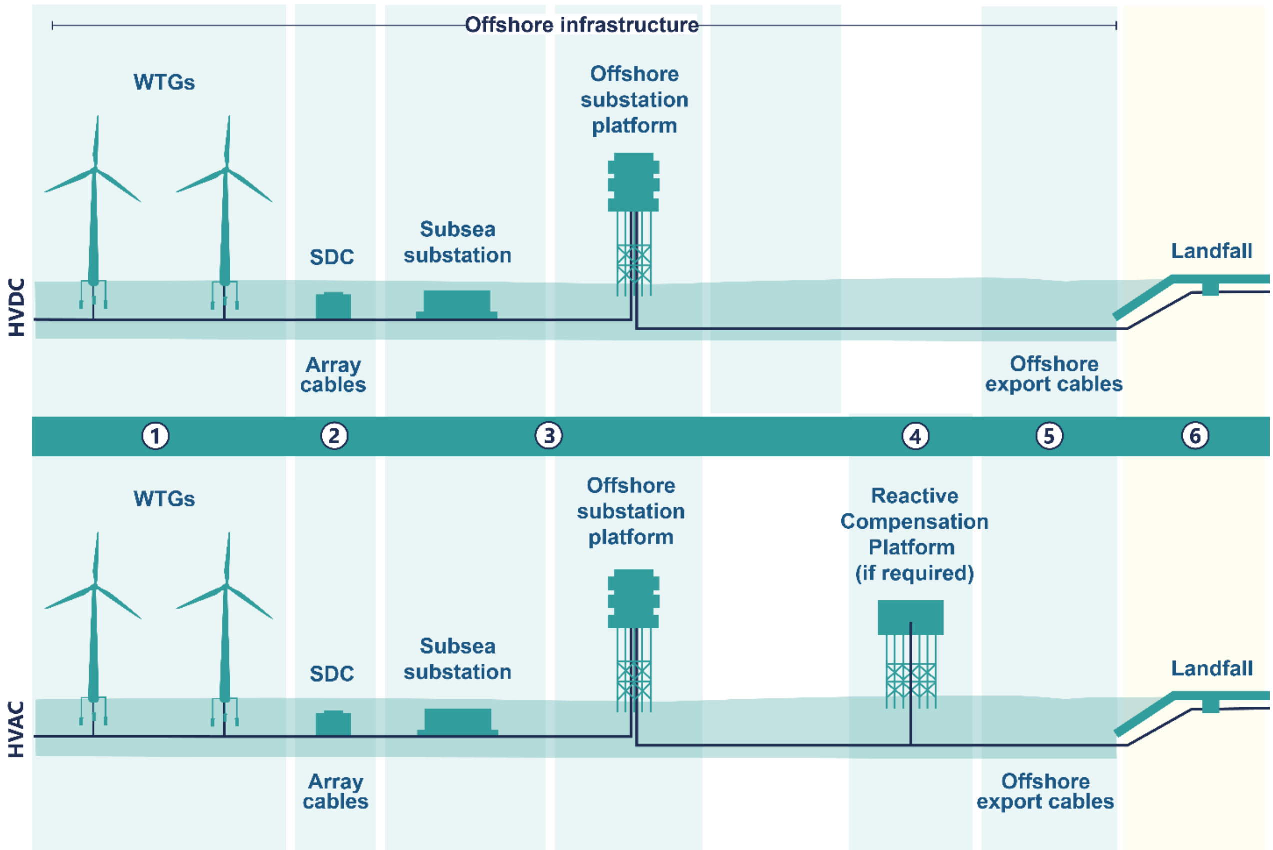
Plate 2.1 ID	Component	Purpose / function
1	**Floating WTGs**	WTGs convert wind energy to electricity. Each floating WTG will comprise a tower (assembled in sections), a rotor with three blades attached to a nacelle. The nacelle typically houses a gearbox, generator, converter, transformer, and control equipment.

[2] Further details on of the geophysical surveys; bathymetry and seabed composition at the OAA are presented in **Volume 1, Chapter 6: Marine Geology, Oceanography and Physical Processes** and **Chapter 7: Marine Water and Sediment Quality** of the **EIA Report**.

Plate 2.1 ID	Component	Purpose / function
	WTG floating unit	Each WTG is supported by a floating unit that is positively buoyant and moored in position on the seabed. A number of floating unit concepts are currently under consideration.
	WTG station keeping system	Each WTG on its floating unit will be secured in place using a station keeping or mooring system, involving anchors and mooring lines. Typically, multiple mooring lines will spread out radially from the floating structure, each ending in an anchor point on the seabed.
2	**Array cables**	Array cables will be used to connect the WTGs to the offshore substation. This will be via other WTGs if in a string or loop arrangement, or to a subsea distribution centre, and then onto the offshore substation if in a star configuration. The cables will have a requirement to withstand both dynamic conditions at the floating units as well as static lay and burial in or on the seabed.
	Subsea distribution centres (SDC)	The subsea distribution centres allow cables from multiple WTGs to connect, with a single array cable then going from the subsea distribution centre to the offshore substation. Subsea distribution centres comprise a foundation support structure and protection structure.
3	**Offshore substation(s)**	Offshore substations are installed to collect the energy generated by the WTGs and house transmission equipment. The latter is required to convert the wind farm electricity to higher voltages necessary for long distance transmission through subsea cables to the onshore grid. Offshore substations can be above the sea surface on a platform and/or subsea. Up to four platforms may be required for the Project.
	Subsea substations	Subsea substations comprise a foundation support structure and protection structure, which is secured subsea to support associated collection and transmission equipment. Given the access restrictions from being subsea, they will be designed for ease of access for operation and maintenance activities.
4	**Reactive compensation platform**	For HVAC transmission, there is an upper limit of offshore export cable route length, beyond which the electrical losses incurred during transmission become prohibitive. This limit can be increased using reactive power compensation equipment connected through a separate substation(s) along the offshore export cable route, typically close to the mid-point between the offshore substation and onshore substations.

Plate 2.1 ID	Component	Purpose / function
5	**Offshore export cables**	Subsea export cables connect the offshore substation(s) to the landfall(s) where a transition joint bay links the offshore subsea cables to the onshore underground cables. This cable system is necessary to export power from the offshore wind farm through the onshore substations to the existing grid network.
6	**Landfall(s)**	The landfall is the point at which the offshore export cables cross from the marine environment through the intertidal zone to the terrestrial environment and connect to the onshore export cables via transition joint bays. A trenchless solution is to be implemented to install ducts. Whilst other trenchless methods are available, Horizontal Directional Drilling (HDD) (or similar trenchless technique). In relation to trenchless cable burial techniques, HDD has been presented in the NCMPA Assessment. Whilst other trenchless methods are available, HDD is presented herein as it is likely to have the largest construction impact

Plate 2.1 Offshore key components of the Project



2.3.3.2 **Table 2.3** outlines a summary of the maximum design scenario for the offshore elements of the Project.

Table 2.3 Maximum design scenario

Project component	Parameters	Indicative design envelope	
WTGs	Maximum turbine power output.	14MW	25MW
	Maximum number of WTGs.	225	126
	WTG hub height (to centreline of hub) (mean sea level) (MSL).	142m	182m
	Maximum rotor diameter.	236m	326m
	Rotor blade width.	5.1m	10m
	Rotor blade length.	115m	155m
	Number of blades per WTG.	3	3
	Maximum rotor blade tip height (MSL).	274m	350m
	Minimum rotor blade tip height (above mean low water springs).	260m	340m
	Blade clearance above MHWS.	22m	22m
Floating units	Floating unit concepts considered.	Semi-submersible, barge, tension leg platform, or any other hybrid design to take into account emerging or future technologies.	
	Floating unit surface dimensions.	100m x 120m maximum size of floating unit (relates to semi-submersible as worst case).	
	Floating unit shape.	Rectangular, circular, triangular or hexagonal.	
	Floating unit minimum spacing from other structures.	800m from centre of WTG to centre of nearest adjacent WTG.	

Project component	**Parameters**	**Indicative design envelope**	
		Minimum of 500m from WTG blade tip to offshore substation topsides.	
	Elevation above waterline.	Minimum 15m to maximum 25m above MSL	
	Floating unit cable location.	Typically the base or one side of the floating unit.	
	Mooring line connection points.	Connection point is likely to be below the surface at the base of the floating unit. Alternatively, it might be connected above the waterline.	
	Number of mooring lines per floating unit.	Maximum of 8 (see below for further details on mooring lines).	
WTG station keeping system	Mooring concepts considered.	Catenary mooring, taut-line mooring, semi-taut mooring, vertical tendon mooring.	
	Number of mooring line connection points.	Semi-submersible floating unit.	Minimum 3, maximum 8 using catenary mooring or semi-taut moorings.
		Barge floating unit.	Minimum 3, maximum 8 using catenary mooring or semi-taut moorings.
		Tension leg platform floating unit.	Minimum 3, maximum 8 tendons.
	Mooring footprint (max).	800m radius per individually moored floating unit (all mooring lines and mooring footprint will be within the OAA boundary).	
	Drag embedment anchors		
	Maximum length.	12m	
	Width	12.5m	
	Height	7m	
	Height proud of seabed once fully installed.	0m	

Project component	Parameters	Indicative design envelope	
	Maximum seabed displacement.	3,750m^2	
	Driven pile anchors		
	Maximum pile length.	30m	
	Pile diameter.	3m	
	Maximum hammer energy.	3,500 kilojoules (kJ)	
	Number of piles per day.	Minimum of 1 and maximum of 2.	
	Length of pile proud of seabed once fully installed.	0.5m	
	Maximum seabed displacement.	7.07m^2	
	Suction anchors		
	Maximum pile length.	20m	
	Pile diameter.	6.5m	
	Length of pile proud of seabed once fully installed.	0.5m	
	Maximum seabed displacement.	33.18m^2	
Array cables	Proposed operating voltage.	Between 66kV and 132kV.	Between 66kV and 132kV.
	Number of cables.	225	126
	Secondary protection considered.	Rock placement. Localised: concrete mattresses and bags.	Rock placement. Localised: concrete mattresses and bags.
	Cable protection type, volume and location(s).	1,122,000m^3 of rock; or 22,666 mattresses; or	874,500m^3 of rock; or 17,667 mattresses; or

Project component	Parameters	Indicative design envelope	
		a combination of both.	a combination of both.
	Total array cable length.	680km	530km
	Permanent array cable corridor swathe width (m) and area.	3m permanent array cable corridor swathe width except for areas of rock placement where 15m is conservatively assumed. Area of 2.04km^2.	3m permanent array cable corridor swathe width except for areas of rock placement where 15m is conservatively assumed. Area of 1.59km^2.
	Maximum extent of burial.	680km (assuming 100% burial of total length of cable is possible).	530km (assuming 100% burial of total length of cable is possible).
	Trench / disturbance width.	30m per trench.	30m per trench.
	Length of unburied cable.	136km (assuming a worst case of 20% of cable length cannot be buried).	106km (assuming a worst case of 20% of cable length cannot be buried).
Subsea distribution centres	Maximum number of subsea distribution centres.	45 (between five to eight array cables can be connected into one subsea distribution centres).	
	Maximum dimensions of subsea distribution centres (length x width x height).	18m x 8m x 5m	
	Maximum dimensions of subsea distribution centre including cable protection (length x width).	38m x 28m	
	SDC construction footprint (length x width).	58m x 48m	
	Foundation type for subsea distribution centre.	Suction caisson / skirt and gravity base foundations.	
Subsea substations	Maximum number of subsea substations.	4	
	Maximum dimensions of subsea substation centres (length x width x height).	22m x 20m x 16m	

Project component	Parameters	Indicative design envelope
	Maximum dimensions of subsea substation including cable protection (length x width).	42m x 40m
	Foundation type for subsea substation.	Suction caisson / skirt and gravity base foundations.
Offshore substations	Number of offshore substations.	4
	Water depth at proposed locations.	Between 87.8m to 133.7m.
	Offshore substation foundation type.	Jacket foundations secured by driven piles or suction caisson.
	Offshore substation shape.	Rectangular or square topsides.
	Minimum spacing to other structures.	500m to other offshore substations. 500m from WTG blade tip to offshore substation topsides infrastructure.
	Offshore substation topsides above-surface dimensions (maximum).	80m above lowest astronomical tide (LAT) (not including mast and lightning conductor and cranes). 100m above LAT (including mast and lighting conductor and cranes). 106m length 70m width
	Offshore substation foundation above-surface dimensions.	20m above LAT 80m length 60m width
	Offshore substation foundation below-surface dimensions (maximum) (width x length).	80m x 60m
	Minimum height above water.	20m (height from LAT to main deck of topsides).
	Driven piles length.	95m
	Number of driven piles in total.	12 for each offshore substation.

Project component	Parameters	Indicative design envelope
	Driven pile maximum diameter.	3m
	Driven pile maximum hammer energy.	3,500kJ
	Number of driven piles per day.	Minimum of 1 and maximum of 2.
	Length of pile proud of seabed once fully installed.	0.5m
	Offshore substations construction footprint.	130m x 110m
	Maximum seabed footprint (including scour protection).	110m x 90m
	Scour protection types.	Rock placement. Localised: concrete mattresses and bags.
	Scour protection quantity per foundation.	500m^3 per offshore substation.
Offshore export cables	Expected offshore export cable maximum voltage.	275kV for HVAC. $\pm$320kV or $\pm$525kV for HVDC (depending on what type of HVDC technology is deployed).
	Grid transmission route length offshore.	130km to 140km depending on the offshore substation and landfall(s) location(s)
	Number of offshore cable trenches (maximum).	5
	Cable trench width.	Up to 30m per trench.
	Percentage of offshore export cable corridor considered suitable for burial.	Target burial of 100% of offshore export cables.
	Number of infrastructure crossings (max).	16 known crossings and an additional 6 (to take account of other developers export cables) within the offshore export cable corridor and 6 assumed crossings within the OAA.
	Trench / disturbance width.	30m per trench.

Project component	Parameters	Indicative design envelope
		150m total.
	Burial depth.	The offshore export cables will be typically buried 1m to 2m below the seabed.
	Separation Distance Between Cable trenches.	Closest distance will be three times the water depth along the offshore export cable route.
	Cable protection type.	Rock placement. Localised: concrete mattresses, bags or steel split pipe.
	Cable protection locations.	Worst case assumes 20% of length requires rock placement.
	Cable protection berm dimension (height x width).	2m x 7m
	Cable protection volume.	1,155,000m^3
	Dredging volume.	35,000m^3
Cable crossings	Number of cable crossings.	28 (per cable trench).
	Permanent crossing dimensions (including rock placement) (length x width).	150m x 11m.
	Permanent crossings area (including rock placement).	1,650m^2
	Crossing construction footprint (length x width).	170m x 30m.
	Crossing protection volume.	850km^3 per crossing.
RCPs	Number of RCPs (maximum).	2
	Water depth range at proposed locations.	73.74m to 110.53m
	RCP foundation type.	Jackets foundations secured by driven piles or suction caisson.
	Offshore RCP shape.	Rectangular or square topsides.
	Spacing separation distance between RCPs.	50 to 150m

Project component	Parameters	Indicative design envelope
	RCP topsides above-surface dimensions.	80m above LAT (not including mast and lightning conductor and cranes). 100m above LAT (including mast and lighting conductor and cranes). 50m length 50m width
	RCP foundation above-surface dimensions (length x width).	35m x 35m.
	Minimum height above water.	20m LAT.
	Driven piles length.	95m
	Number of driven piles in total.	4 for each RCP.
	Driven pile maximum diameter.	3m
	Driven pile maximum hammer energy.	3,500kJ
	Number of driven piles per day.	Minimum of 1 and maximum of 2.
	RCP construction footprint.	55m x 55m.
	Maximum seabed footprint (including scour protection).	65m x 65m.
	Scour protection types and quantity per foundation.	Rock placement. Localised: concrete mattresses and bags.
	Scour protection quantity per foundation.	500m^3 per RCP.
	Closest distance to shore (MHWS) of RCP search area.	31.85km
Landfall(s)	Landfall(s) location.	Up to 3
	Number of HDD cable ducts.	Up to 8 (including 1 spare duct / bore).

2.4 Installation methodology

2.4.1.1 Construction of the offshore components of the Project will be completed in a number of stages. The stages are outlined below with a complete description of the offshore installation methodology can be found in Section 4.6 within **Volume 1, Chapter 4: Project Description** of the **EIA Report**. Given the scale of the Project, it is likely that some stages are undertaken in parallel in practice. The stages are as follows:

- pre-construction surveys and seabed preparation activities;
- anchor and mooring line installation;
- floating unit and wind turbine preparatory works;
- floating wind turbine towing to site;
- array cable and SDC installation;
- offshore platform foundation installation and piling;
- offshore platform topside installation;
- offshore export cable installation; and
- WTG commissioning.

2.4.1.2 Equipment and offshore installation activities will be designed to avoid the need for divers wherever possible. However, in some instances this may not be possible and diver operations may be undertaken subject to the appropriate procedures and risk assessment.

2.4.1.3 It is anticipated that approximately 10 vessels would be on site at any one time during the construction of the Project. The number of vessels will be confirmed with further input from construction contractors post-consent.

2.4.1.4 It is estimated that approximately 3,838 individual vessels transits (each representing a one-way journey between port and worksite) would be required during the construction of the Project. It is estimated that the installation of each floating unit will require up to three vessel transits of the installation vessel.

2.5 Project construction programme and construction timings

2.5.1 Construction programme

2.5.1.1 An indicative construction programme for the Project is presented in **Plate 2.2**. The programme illustrates the anticipated duration of the main construction / installation activities by infrastructure component.

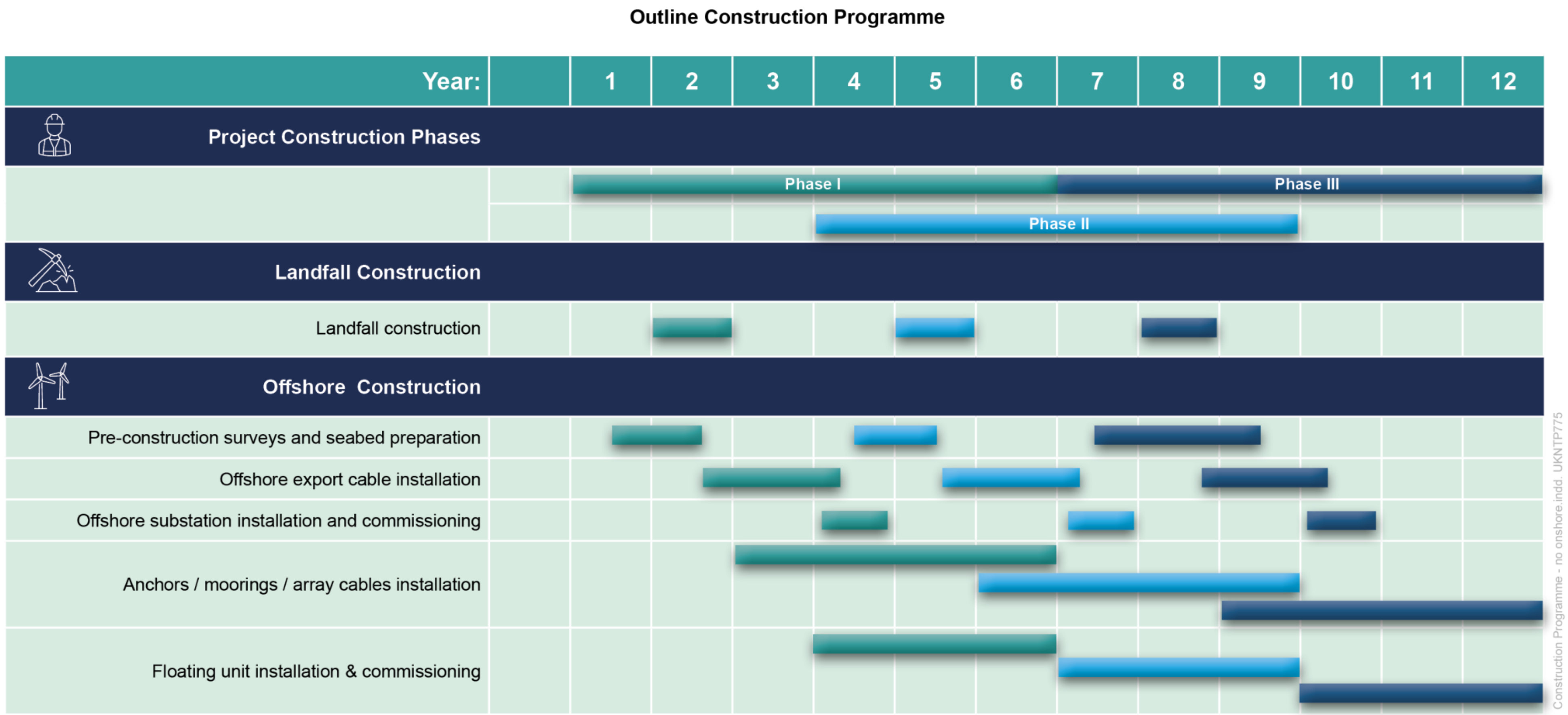
2.5.1.2 The overall duration of construction of the offshore infrastructure is anticipated to be up to 12 years. This will be subject to the final grid connection date, supply chain discussions and further site surveys (pre-consent).

2.5.1.3 The Project will be delivered in phases which are reflected in the indicative construction programme. It is anticipated that construction of the Project would commence in 2030.

2.5.2 Construction timing

2.5.2.1 As secured in **Volume 4: Outline Environmental Management Plan** of the **EIA Report** the worst-case expected working hours offshore would be 24 hours a day subject to relevant marine law and watch keeping.

Plate 2.2 Indicative construction programme



2.6 Operation and maintenance stage

2.6.1 Overview

2.6.1.1 A complete description of the O&M stage of the Project can be found within **Volume 1, Chapter 4: Project Description** of the **EIA Report**. In this NCMPA Assessment, only the offshore infrastructure seaward of MHWS, relevant to this assessment are considered.

2.6.1.2 It is anticipated that the first phase of the Project would become fully operational in 2037 following commissioning of the WTGs for phase 1. It is anticipated the second phase of the Project would become fully operational in 2040 and the third phase in 2043. The operational lifetime of the Project for each phase is expected to be around 35 years.

2.6.2 Key operation and maintenance requirements

2.6.2.1 Key O&M requirements include:

- **Remote monitoring:** The wind farm will be equipped with advanced monitoring systems that will provide real-time data on its performance and condition. This data will be analysed to identify trends, predict potential failures, and optimise maintenance schedules.
- **Preventive maintenance:** A proactive maintenance program will be established to prevent failures and minimise downtime. This will involve scheduled replacement of components, cleaning, lubrication, and calibration of equipment.
- **Corrective maintenance:** In the event of unexpected failures or malfunctions, prompt corrective maintenance will be performed to restore functionality. This may involve repairs, component replacements, or system adjustments.
- Where scour protection had been employed during the initial construction stage, this may be replenished during operation via the addition of fresh material on top of existing scour protection areas should it be required.

2.6.3 Frequency of operation and maintenance activities

2.6.3.1 The frequency of O&M activities will vary depending on the specific component or system. Some tasks may be performed daily (for example remote monitoring), while others may be scheduled annually or less frequently (for example component replacements).

2.6.4 Offshore surveys

2.6.4.1 Offshore surveys will be undertaken on an ongoing basis throughout the O&M stage, which may include geophysical surveys to monitor the condition of the seabed and subsea infrastructure, depth of burial surveys using acoustic or electromagnetic survey techniques to monitor the condition of buried cables, and visual inspections via ROV.

2.6.4.2 Seabed surveys of the OAA will also typically be performed. The timing of the inspection or monitoring of the infrastructure will be subject to further assessment during detailed design phase. However, as there is a up to 12 year construction stage, vessels will be in the vicinity to complete spot checks where necessary.

2.6.4.3 The survey schedule for the remaining lifetime of the wind farm will be determined after the first surveys. This schedule should include, as a minimum, two further surveys over the remaining lifetime of the wind farm. Depending on site conditions, additional or rescheduled monitoring following a major storm event..

2.6.5 Operation and maintenance activities for the Option Agreement Area

2.6.5.1 The following O&M activities are expected to occur in relation to the components within the OAA (including WTGs, floating units, station keeping systems, subsea distribution centres, array cables and subsea substations):

- replacement of consumable items (for example lubricants);
- routine inspections;
- geophysical surveys;
- blade repairs and / or replacements;
- gear box replacements;
- other minor repairs;
- application of paint or other protective coatings and corrosion protection measures;
- repairs or replacements of navigational equipment and other ancillary equipment including condition monitoring equipment;
- removal of marine debris (for example lost fishing gear);
- modification or replacement of ancillary structures such as access ladders and boat landings;
- replacement or repair of mooring line components and hardware such as rope, links, chain buoyancy aids and / or clump weights where necessary;
- replacement or repair of array cables;
- visual inspections;
- cable repair by recovering the cable from its trench or water column and making the necessary repairs;
- reburial of sections of cable that have become exposed;
- ancillary equipment repair or replacement; and
- replacement of cable protection over sections of the cable identified as in need of protection.

2.6.6 Operation and maintenance activities for offshore substations and reactive compensation platforms

2.6.6.1 As the offshore platforms will be sold to an offshore transmission owner (OFTO) after commissioning, the following O&M activities may be reasonably anticipated but will be confirmed by the OFTO that takes ownership of these assets.

2.6.6.2 The following O&M activities are expected to occur in relation to the offshore substation topsides:

- routine inspections;

- removal of avian guano;
- replacement of consumables and electrical transmission components; and
- painting and other coatings.

2.6.6.3 The following O&M activities are expected to occur in relation to the offshore substation and RCP jacket foundations:

- routine inspections;
- geophysical surveys;
- repairs and replacements of navigational equipment and other ancillary equipment including condition monitoring equipment;
- removal of marine growth;
- replacement of corrosion protection anodes;
- application of painting or other protective coatings;
- replacement of access ladders and boat landings;
- modifications to or replacement of J and I-tubes; and
- replacement of scour protection.

2.6.7 Operation and maintenance activities for the offshore export cables

2.6.7.1 The following O&M activities are expected to occur in relation to the offshore export cables:

- routine inspections;
- geophysical surveys;
- cable repair by recovering the cable from its trench / water column and making the necessary repairs;
- reburial of sections of cable that have become exposed;
- ancillary equipment repair; and
- replacement of cable protection over sections of the cable identified as in need of protection.

2.6.8 Offshore access and logistics for operation and maintenance

2.6.8.1 There will be a peak of up to 7 O&M vessels offshore with up to 364 round trips to port per year.

2.6.8.2 The offshore crew for the O&M of the wind farm will be transferred from port via dedicated vessels and / or helicopters as required. The frequency of these movements is yet to be determined and may constitute a regular pattern, with additional movements, when necessary, in response to maintenance needs offshore.

2.7 Decommissioning stage

2.7.1.1 A complete description of the decommissioning stage of the Project can be found within **Volume 1, Chapter 4: Project Description** of the **EIA Report**. In this report only the decommissioning activities of the offshore infrastructure seaward of MHWS, relevant to this assessment are considered.

2.7.1.2 The approach to decommissioning of the offshore infrastructure will be completed in line with any relevant guidance and legislation at the time of decommissioning. It is however expected that all infrastructure above the seabed will be removed. Any infrastructure below the seabed will be assessed to determine if less impactful (from an environmental perspective) to remove or leave in position. This is particularly relevant where new habitats have developed during the O&M stage of the Project.

2.7.1.3 A Decommissioning Programme will be developed post consent but prior to construction. It will be updated during the operational phase of the Project to account for any changes to industry best practice, relevant legislation, guidance and policy, or developments in technology.

2.7.1.4 The decommissioning stage of the Project will involve the safe and environmentally responsible removal of offshore infrastructure following the end of its operational life. Offshore decommissioning activities will include the disconnection and removal of WTGs, floating units, mooring systems, array and export cables, offshore substations, and RCPs if deployed.

2.7.1.5 WTGs and floating units will be towed from site to designated decommissioning ports, while mooring lines and anchors will be recovered where feasible, subject to environmental and technical constraints.

2.7.1.6 Subsea cables may be removed or left in situ following a case-by-case assessment, considering seabed conditions and potential environmental impacts. Offshore substations and RCPs will be dismantled and transported to shore for recycling or disposal.

2.7.1.7 Once decommissioned, all components will be reused or recycled where possible.

3. Marine Protected Area Assessment Methodology

3.1 Introduction

3.1.1.1 This NCMPA Assessment has been prepared in line with relevant guidance published in 2013 "*Nature Conservation Marine Protected Areas: Draft Management Handbook*" (Scottish Government, 2013).

3.1.1.2 In Scotland, an NCMPA Assessment is a statutory requirement when applying for a marine licence if the proposed activity is capable of affecting an NCMPA, even if the impact is assessed as not significant. Under Section 83 of the Marine (Scotland) Act 2010 and Section 126 of the Marine and Coastal Access Act 2009, Scottish Ministers must assess whether the activity could hinder the conservation objectives of designated NCMPAs

3.1.1.3 As the competent authority, Scottish Ministers will not grant a marine licence unless the applicant can demonstrate that there is no significant risk to the NCMPA, or that the public benefit clearly outweighs the environmental risk, with appropriate mitigation or compensatory measures in place.

3.1.1.4 Marine licences will be required to undertake prescribed licensable activities for the Project, including:

- deposition of cables and other objects on or within the seabed;
- installation of any necessary cable protection;
- installation of station keeping systems consisting primarily of mooring lines and seabed anchors; and
- the installation of any wider infrastructure or substructures required.

3.1.1.5 The assessment has two sequential stages:

- Stage one: initial screening; and
- Stage two: main assessment.

3.2 Stage one: initial screening

3.2.1.1 An initial screening stage is undertaken to establish what can reasonably be predicted as a consequence of the proposed Project and whether it is 'capable of affecting other than insignificantly', a protected feature of an NCMPA. The initial screening typically uses information available at the Project's stage of design evolution and considers the scale, timing and duration of the proposed activities. These considerations should include activities proposed to occur both withing and beyond the boundary of an NCMPA.

3.2.1.2 Firstly, consideration of 'capable of affecting' should result in removing from further consideration all proposals / functions that are not in any way connected to the NCMPA's protected feature(s). A capability that is both remote (in terms of likelihood of occurrence) and hypothetical should not be the basis of a conclusion that further assessment is required. This can be determined by considering whether the activity will exert pressures that the protected feature(s) are sensitive to.

3.2.1.3 Secondly, if it is concluded that the Project is 'capable of affecting' a protected feature, the focus should then be on considering whether the proposed development or activity will in fact affect the protected features of an NCMPA, other than insignificantly. Consideration of the degree of pressure that could be exerted by the activity on a spatial basis should help to establish what level of effect might occur.

3.2.1.4 In circumstances where the conclusion is that the activity is 'capable of affecting' (other than insignificantly) the protected features of an NCMPA, then the main assessment must be carried out considering the conservation objectives.

3.2.1.5 **Chapter 4** provides further detail on the NCMPA Screening Assessment.

3.3 Stage two: main assessment

3.3.1.1 If required following the initial screening stage one, the stage two main assessment will focus on determining whether the exercise of a function will or may significantly hinder (Section 82 of the Marine (Scotland) Act 2010 or Section 125 Marine and Coastal Access Act 2009), or there is or may be a significant risk of the act hindering (Section 83 of the Marine (Scotland) Act 2010 or Section 126 of the Marine and Coastal Access Act 2009), the achievement of the conservation objectives. The approach to this assessment is similar, therefore, to simplify the description this Section only refers to 'significant risk of hindering'.

3.3.1.2 Consideration must be carried out on a case-by-case basis of whether there may be a 'significant risk of hindering' the achievement of the conservation objectives of the protected features of an NCMPA. In carrying out the main assessment, it may be that further data needs to be collated or collected to provide sufficient evidence.

3.3.1.3 As with the initial screening, aspects such as scale, timing and duration of the proposed activities or developments should all be considered. However, whilst the initial screening focuses on the protected features, the main assessment focuses on the potential impact on the achievement the conservation objectives of the protected features. Therefore, the main assessment stage will also include consideration of the scale of the potential impact. Consideration of cumulative effects with other activities should also be undertaken in line with EIA requirements.

3.3.1.4 The assessment should build on the initial screening assessment described in **Section 3.2** that considers the pressures associated with the activity and the sensitivity of the protected features, and information on the likely spatial overlap. To determine whether there is a 'significant risk of hindering' the achievement of the conservation objectives of the protected features of an NCMPA, aspects such as the intensity, frequency, and duration of any activities associated with the activity should be considered.

3.3.2 Conservation objectives

3.3.2.1 The conservation objectives for NCMPA features are high-level criteria (Scottish Government, 2013) describing the desired condition of the NCMPA feature. There are two objectives for features within an NCMPA, which are that the protected features should:

- so far as already in favourable condition, remain in such condition; and
- so far as not already in favourable condition, be brought into such condition, and remain in such condition.

3.3.2.2 The NCMPA Assessment presented in **Chapter 5** and **Chapter 6** of this document will therefore consider whether the Project could potentially affect these objectives for each of the NCMPAs screened into the assessment in **Chapter 4**. An assessment will be made of whether the Project could potentially impact the site so that the feature(s) are no longer in favourable condition or prevent the feature(s) from recovering to a favourable condition.

3.3.3 Methodology for evaluating the potential to hinder conservation objectives

3.3.3.1 The criteria for determining the potential for Project activities to hinder the conservation objectives of an NCMPA comprises a two-stage process that involves defining the sensitivity of receptors and the magnitude of impacts from the Project. This Section describes the criteria applied in this NCMPA Assessment to assign values to the sensitivity of the receptors and the magnitude of potential impacts. The terms used to define sensitivity and magnitude are based on those described in further detail in **Volume 1, Chapter 5: Approach to the EIA** of the **EIA Report**.

3.3.3.2 Both sensitivity and magnitude are assessed on a four-level scale: **high**, **medium**, **low** and **very low**.

Sensitivity of receptor

3.3.3.3 Sensitivity refers to the likely response of a receptor to an anthropogenic pressure or effect. This is assessed by evaluating each receptor's adaptability or tolerance to the pressure, considering also the recoverability from the effect. The criteria for receptor sensitivity is defined for geodiversity features in **Volume 1, Chapter 6: Marine Geology, Oceanography and Physical Processes,** for benthic receptors (burrowed mud) in **Volume 1, Chapter 10: Benthic, Epibenthic and Intertidal Ecology**, for marine mammals in **Volume 1, Chapter 11: Marine Mammals**, and for marine and diadromous fish in **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**.

Magnitude of impact

3.3.3.4 In assigning magnitude, the duration, frequency and probability of the impact, as well as the consequences of the effect, which takes into account the scale of effect relative to the population, are considered. The magnitude criteria for the NCMPA receptors considered in this assessment are defined in Table 6.9 of **Volume 1, Chapter 6: Marine Geology, Oceanography and Physical Processes,** Table 10.15 of **Volume 1, Chapter 10: Benthic, Epibenthic and Intertidal Ecology,** Table 11.12 of **Volume 1, Chapter 11: Marine Mammals,** and Table 13.22 of **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**.

Significance evaluation (potential to hinder conservation objectives)

3.3.3.5 The significance of the effect on NCMPA designated features will be determined by correlating the sensitivity / value of the receptor and the magnitude of the impact. The method employed for this preliminary assessment is presented in **Table 3.1**, with the final assessment for each effect based upon expert judgement.

3.3.3.6 As a general rule, **Major** and **Moderate** effects are considered to be **Significant** and **Minor** and **Negligible** effects are considered to be **Not Significant**. However, professional judgement is applied, where appropriate, to determine significance of effect. Where effects are assessed, according to the matrix in **Table 3.1** to be **Potentially Significant** in EIA terms, professional judgement is applied to determine whether they are **Significant** or **Not Significant**.

Table 3.1 Significance assessment matrix for the significance of residual effect

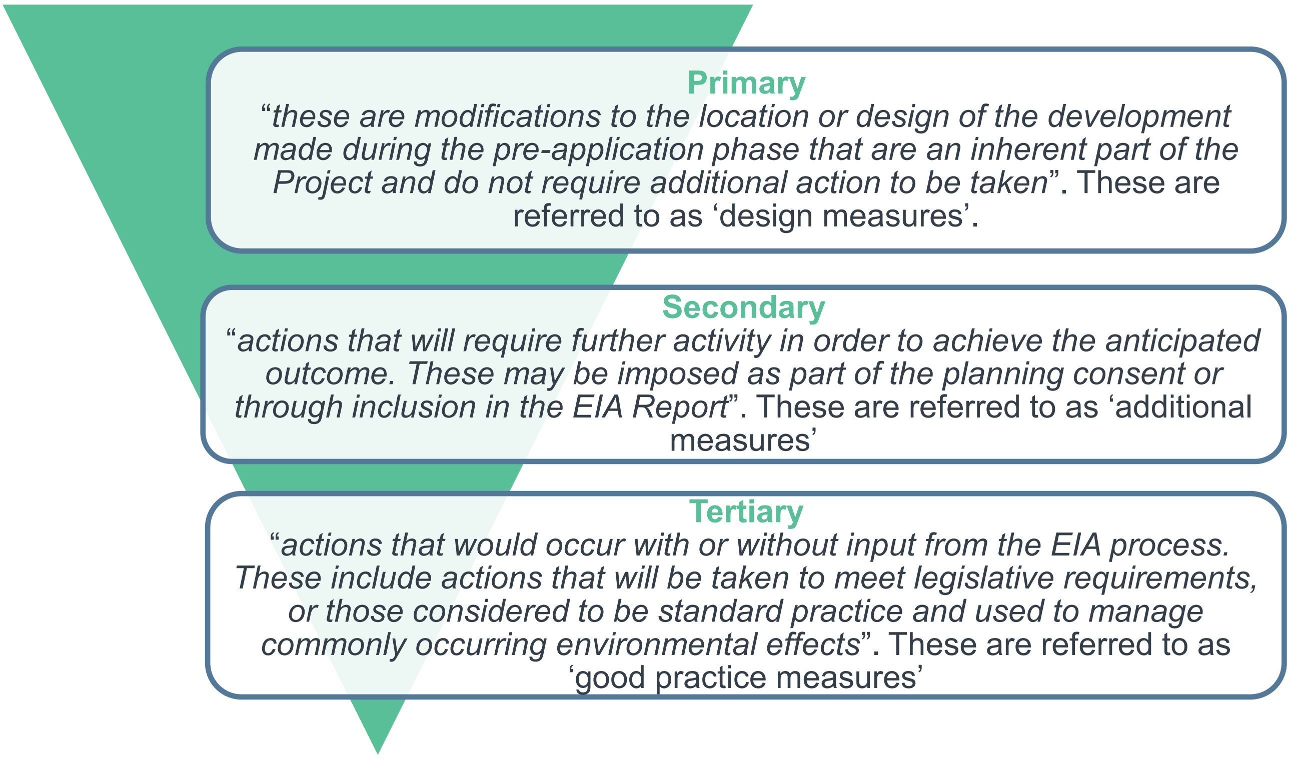
		Magnitude of change			
		High	**Medium**	**Low**	**Very low**
Value / Sensitivity	**High**	**Major (Significant).**	**Major (Significant).**	**Moderate (Potentially Significant).**	**Minor (Not Significant).**
	Medium	**Major (Significant).**	**Moderate (Potentially Significant).**	**Minor (Not Significant).**	**Minor (Not Significant).**
	Low	**Moderate (Potentially Significant).**	**Minor (Not Significant).**	**Minor (Not Significant).**	**Negligible (Not Significant).**
	Very low	**Minor (Not Significant).**	**Minor (Not Significant).**	**Negligible (Not Significant).**	**Negligible (Not Significant).**

3.4 Embedded environmental measures

3.4.1.1 Embedded environmental measures have been adopted to reduce the potential for significant effects on receptors, and are included within **Volume 3, Appendix 5.2: Commitments Register** of the **EIA Report**.

3.4.1.2 These embedded environmental measures include both avoidance, best practice and design commitments. The Institute of Environmental Management and Assessment (IEMA) Implementing the Mitigation Hierarchy from Concept to Construction (IEMA, 2024) provides guidance on three categories of environmental measures: primary, secondary or tertiary measures and set out in **Plate 3.1**. Best practice consideration and application of environmental measures involves a hierarchal approach, considering avoidance of negative effects as the primary objective.

Plate 3.1 Embedded environmental measures



3.4.1.3 In the context of this NCMPA Assessment, embedded environmental measures incorporate all types of measures as set out in **Plate 3.1**. The iterative design evolution process followed has been driven by collaborative working between the design, environment and landowner teams and in consultation with key stakeholders. This may have been through the consideration and adoption of alternatives or through measures incorporated within the design itself.

3.4.1.4 The embedded environmental measures relevant to the NCMPA Assessment are detailed in **Table 3.2**.

Table 3.2 Relevant NCMPA embedded environmental measures

ID	Environmental measure proposed	Project stage measure introduced	How the environmental measures will be secured
M-028	An **Outline Scour Protection Plan** has been submitted within this Application (**Volume 4**), and includes details of the need, type, quantity and installation methods for scour protection. A Final Scour Protection Plan will be completed prior to construction commencing and will include measures during the O&M phase such as periodic inspection and maintenance requirements and will be submitted to MD-LOT for approval.	Scoping Amended at EIA Report.	s.36 conditions and marine licences conditions.
M-029	An **Outline Cable Plan** has been submitted within this Application (**Volume 4**), and includes details of the need, type, quantity and installation methods for cabling. A Final Cable Plan will be completed prior to construction commencing and submitted to MD-LOT for approval. The Final Cable Plan will include: a) the vessel types, location, duration and cable laying techniques for export and array cables; b) the finalised location of the export cable route; c) the results of monitoring or data collection work (including geophysical, geotechnical and benthic surveys); d) technical specification of the cables, including a desk based assessment of attenuation of electromagnetic field strengths and shielding; e) a CBRA, to ascertain burial depths and where necessary alternative protection measures; f) methods to be used to mitigate the effects of EMF; g) methodologies and timetable for post-construction and operational surveys (including inspection, over trawl, post-lay) for the cables through its operational life; h) measures to address and report to the Licensing Authority any exposure of cables or risk to users of the sea from cables; and g) methodologies for cable inspection with measures to address and report to Scottish Ministers, any exposure of array cables.	Scoping Amended at EIA Report.	s.36 conditions and marine licences conditions.
M-032	An **Outline Marine Mammal Mitigation Protocol** (MMMP) has been submitted with this Application (**Volume 4**). The Final MMMP will be completed prior to construction and submitted to MD-LOT for approval. The MMMP will be adhered to and subsequently mitigate potential impacts from underwater noise on marine mammals and fish through good or standard practice actions in order to meet legislative requirements.	Scoping Amended at EIA Report.	s.36 conditions and marine licences conditions.

ID	Environmental measure proposed	Project stage measure introduced	How the environmental measures will be secured
M-033	An **Outline Marine Pollution Contingency Plan** (MPCP) (Appendix to the **Outline Environmental Management Plan** (EMP)) has been submitted with this Application (**Volume 4** of the **EIA Report**). This Outline MPCP outlines details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising from offshore operations relating to the Project. The Final MPCP will be completed prior to construction commencing and submitted to MD-LOT for approval and will include relevant key emergency contact details.	Scoping Amended at EIA Report.	s.36 conditions and marine licences conditions.
M-054	A detailed Cable Burial Risk Assessment (CBRA) will be undertaken to enable informed judgements about burial depth. This should reduce the risk of buried cables reemerging whilst also limiting the amount of sediment disturbance to that which is necessary. The array and export cables will typically be buried at a target burial depth between 1-2m below the seabed surface. The final depth of the cable will be dependent on the seabed mobility and CBRA. The CBRA will manage and mitigate risks from loading and sediment transport across the seabed. The CBRA will be included within the Final Cable Plan.	Scoping Amended at EIA Report.	s.36 conditions and marine licences conditions.
M-055	Key sensitive habitats will be avoided, where known, through pre-construction surveys and micro-siting of proposed offshore Project infrastructure.	Scoping	s.36 conditions and marine licences conditions.
M-057	Burial of the cables where possible and / or use of external cable protection such as rock placement and / or concrete mattressing. Concrete mattresses only used in isolation in non-fished areas to ensure no snagging issues for fisheries industry. Where appropriate, nature-inclusive design options will be considered in the selection and placement of cable protection measures.	Scoping Amended at EIA Report.	s.36 conditions and marine licences conditions.
M-059	Micro-siting will be applied to proposed offshore Project infrastructure such as cables (trenched or ploughed in), or WTG anchor structures, to minimise mobilisation of contaminants from any areas of significantly contaminated sediment detected during pre-construction surveys.	Scoping	s.36 conditions and marine licences conditions.
M-102	An **Outline Offshore Invasive Non-Native Species** (INNS) Management Plan has been submitted with this Application (**Volume 4** of the **EIA Report**). The Final INNS Management Plan will be completed prior to construction commencing and submitted to MD-LOT for	Scoping Amended at EIA Report.	s.36 conditions and marine licences conditions.

ID	Environmental measure proposed	Project stage measure introduced	How the environmental measures will be secured
	approval. The Final INNS Management Plan will include management measures to limit the risk of INNS being introduced to the marine environment.		
M-105	An **Outline Piling Strategy** has been submitted with this Application (**Volume 4** of the **EIA Report**). The Final Piling Plan will be completed prior to construction commencing and submitted to MD-LOT for approval. It will detail the method of pile installation and associated underwater noise levels. It will describe any mitigation measures to be implemented (e.g. soft start and ramp up measures, or the use of acoustic deterrent devices) prior to and during pile installation to manage the effects of underwater noise.	Scoping Amended at EIA Report.	s.36 conditions and marine licences conditions.
M-106	The development of and adherence to a Decommissioning Programme. The Decommissioning Programme will outline measures for the decommissioning of the Project. The Decommissioning Programme would be submitted prior to construction commencing to MD-LOT and approved by Scottish Ministers prior to construction.	Scoping Amended at EIA Report.	s.36 conditions and marine licences conditions.
M-114	The Project will use 'low order' techniques such as deflagration for UXO disposal, where possible and required.	Scoping	s.36 conditions and marine licences conditions.
M-115	The UXO Management Plan will mitigate any potential for UXO within the offshore construction area and also disposal once encountered.	Scoping	s.36 conditions and marine licences conditions.
M-120	An **Outline Construction Method Statement** (CMS) has been submitted with this Application (**Volume 4** of the **EIA Report**). The Final CMS will be completed prior to construction commencing and submitted to Marine Directorate - Licensing Operations Team (MD-LOT) for approval. The Final CMS will include: a) details of the commence dates, duration and phasing of key elements of construction, working areas, the construction procedures and good working practices; b) details of the roles and responsibilities; and c) details of how the construction related mitigation step proposed are to be delivered.	EIA Report.	s.36 conditions and marine licences conditions.
M-121	An **Outline Environmental Management Pla**n (EMP) has been submitted with this Application (**Volume 4** of the **EIA Report**) and includes the following Appendix: - **Outline Marine Pollution Contingency Plan**.	EIA Report.	s.36 conditions and marine licences conditions.

ID	Environmental measure proposed	Project stage measure introduced	How the environmental measures will be secured
	The Final EMP will be completed prior to construction commencing and submitted to Marine Directorate - Licensing Operations Team (MD-LOT) for approval. The Final EMP will be implemented by the contractor(s). The contractor(s) will ensure that the relevant environmental measures within the EMP and health and safety procedures are implemented. The Final EMP will identify the project management structure roles and responsibilities with regard to managing and reporting on the environmental impact of the construction and O&M phases. Other measures that feed into the EMP include: - A Waste Management Plan (WMP) will be developed as an Appendix of the EMP post-submission to manage all waste generated during the construction and operation stages of the Project. The WMP will be appended to the Environmental Management Plan. The WMP will follow the principles of the waste hierarchy (Department for Environment, Food & Rural Affairs, 2001) which consists of: prevention, re-use, recycle, other recovery and disposal. - The Final Environmental Management Plan will include a Chemical Risk Assessment to identify, evaluate and mitigate potential environmental and health risks associated with the use, storage and disposal of hazardous substances during O&M and decommissioning stages of the Project. The EMP will be the securing mechanism for many measures.		
M-122	Development of and adherence to a Offshore Operations and Maintenance Plan, which will confirm the Project's operations and maintenance activities. This will be submitted to MD-LOT for approval post-consent.	EIA Report.	s.36 conditions and marine licences conditions.

3.5 Data sources

3.5.1 Publicly available data sources

3.5.1.1 The publicly available data sources that have been collected and used to inform this NCMPA Assessment are summarised in **Table 3.3**.

Table 3.3 Publicly available data sources used to inform the NCMPA Assessment

Source	Date	Summary	Coverage of study area
Publicly available data			
EMODnet Map Viewer (EMODnet European Commission, 2025)	Accessed 2025	EMODnet broad-scale seabed habitat map for Europe of physical habitats is a predictive habitat map that covers the seabed of a large area of European waters including the North Sea. Habitats are described in the European Nature Information System (EUNIS) and MSFD predominant habitat classifications and predicted based on a number of physical parameters. Associated confidence maps are also available which give a break down confidence in predicted habitats into high, medium, and low.	Full coverage of study area.
Southern Trench NCMPA Conservation and Management Advice (NatureScot, 2025)	2024	The Conservation and Management Advice document for the Southern Trench NCMPA provides a comprehensive overview of the purpose, conservation value, and management framework for the site.	Southern Trench NCMPA.
Salamander Offshore Wind Farm Offshore EIA Report Volume ER.A.4 Annex 9.4: Benthic Features Impact Assessment Southern Trench NCMPA	2024	The NCMPA Assessment document for Salamander Offshore Wind Farm.	Partial coverage of study area.
Cenos Offshore Wind Farm Offshore EIA Report	2023	The EIA Report for Cenos Offshore Wind Farm.	Partial coverage of study area.
MarESA Tool	Accessed 2025	The MarESA tool is a systematic approach developed to assess the sensitivity of marine species and habitats. It examines the biology or ecology of a feature, compiles	Full coverage of study area.

Source	Date	Summary	Coverage of study area
		evidence of the effect of a given pressure on the feature and assesses the likely sensitivity of the feature to the pressure against standard scales. The assessments are based on a detailed review of available evidence on the effects of pressures on biotopes, and a subsequent scoring or sensitivity against a standard list of pressures, and their benchmark levels of effect. This allows for a comprehensive understanding of the potential impacts of various pressures on the marine environment within an NCMPA. The following ecological considerations are incorporated within the MarESA tool: • the intolerance and / or resistance of receptors due to pressures associated with the Project; and • the recoverability and / or resilience of receptors – this I the time taken for receptors and / or habitat to return to its original state prior to the activities associated with the Project. The MarESA tool provides a robust and evidence-based approach to inform effective management and conservation strategies within NCMPAs. Therefore, in line with best practice, the NCMPA Assessment has used the MarESA tool to support the conclusions on the conservation objectives of the NCMPAs.	
Feature Activity Sensitivity tool (Scottish Government, 2025)	Accessed 2025	The FeAST tool is a web-based application that allows users to investigate the sensitivity of marine features, including habitats, species, geology, and landforms, in Scotland's seas to pressures arising from human activities. It provides a systematic method for understanding the potential impacts of various pressures on the marine environment. Therefore, the FeAST tool is considered to	Full study area

Source	Date	Summary	Coverage of study area
		adhere to the requirements under the Marine (Scotland) Act 2010 and as well as the MarESA tool, it is considered to be robust. The FeAST tool uses a 'feature' approach, focusing on specific habitats or species within the NCMPA (NatureScot, 2025b). The tool enables users to explore what is known about a given NCMPA designated feature's sensitivity to pressures and the marine activities that can cause them. Therefore, this tool is considered to be a crucial element in determining potential management requirements for NCMPAs.	

3.5.2 Project specific surveys

3.5.2.1 Site-specific surveys for the Project have been carried out to inform the baseline. Surveys relevant to this NCMPA Assessment are summarised within **Table 3.4**.

Table 3.4 Summary of site-specific survey data

Survey	Survey area	Overview
Volume 3, Appendix 10.3: Confidential Geophysical and Environmental Export Cable Corridor Survey – Benthic Survey Interpretative Report 2024 of the EIA Report	Offshore export cable corridor	For the nearshore section of the survey area, three camera transects and two grab sampling stations were proposed. Photographic data was successfully acquired at all stations and transects. A full suite of grab samples was successfully acquired at two proposed stations. For the offshore section of the survey area, 80 stations were proposed with sediment grab samples and photographic data to be collected at each station. Samples were successfully acquired from 74 of the 79 remaining proposed stations.
Volume 3, Appendix 10.4: Geophysical and Environmental Offshore Windfarm Survey Volume 2 of 11: Benthic Survey Interpretative Report of the EIA Report	OAA	80 grab sampling stations were proposed. A full suite of grab samples were successfully acquired from 79 stations. Video and stills photographs were successfully acquired along all eighty proposed camera stations and fifty-eight transects.

3.6 Marine Protected Area cumulative assessment

3.6.1.1 The potential for cumulative effects during the construction, O&M and decommissioning stages has been assessed with respect to the designated features within each NCMPA, as appropriate. The methodology for the CEA undertaken aligns with the process described for the EIA Report (see **Volume 1, Chapter 33: Cumulative Effects Assessment** of the **EIA Report**).

3.6.1.2 Impacts can occur cumulatively with ‘other developments’ in different ways:

- **Intensified cumulative impacts:** An environmental impact from the Project affecting a particular receptor could be intensified through its accumulation with impact(s) from another development occurring at the same time. For example, noise or air quality impacts resulting from construction traffic, along with increased traffic volumes on local roads generated from ‘other developments’.
- **Spatially cumulative impacts:** An environmental impact from the Project combined with impacts from ‘other developments’ in the same geographic area, resulting in a greater overall effect on a particular environmental receptor. For example, habitat loss

impacts from the Project could be exacerbated with habitat loss from 'other developments'.

- **Temporal cumulative impacts:** An environmental impact that is experienced over a given period can be exacerbated where it precedes or follows another similar impact. For example, prolonged noise impacts from construction of consecutive 'other developments' affecting the same community.

3.6.1.3 **Plate 3.2** illustrates the different ways impacts can occur cumulatively with 'other developments'.

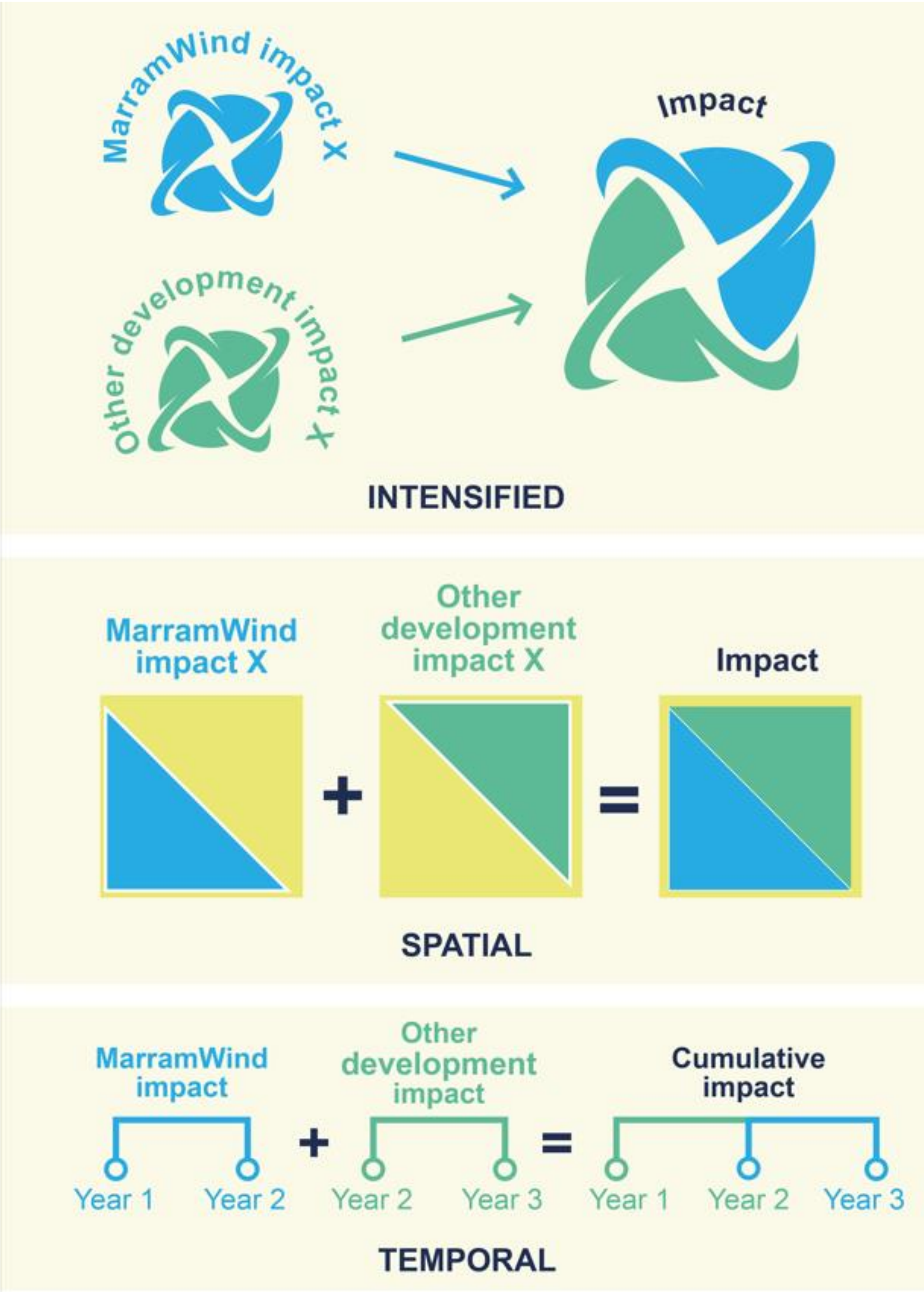
3.6.1.4 For the purposes of the CEA, the types of 'other developments' that are proposed for consideration include:

- operational wind farms;
- developments that are under construction;
- developments that have planning permission, s.36 consent or marine licences;
- developments for which planning, s.36 or marine licence applications have been submitted to the relevant authority; and
- developments that are 'reasonably foreseeable' (e.g. projects identified in development plans, projects in other plans and programmes as may be relevant, offshore renewable energy projects that have a CES Agreement for Lease (AfL) or the Crown Estate AfL.

3.6.1.5 The CEA methodology is divided into four stages and follows the Planning Inspectorate's Nationally Significant Infrastructure Projects: Advice on Cumulative Effects Assessment (Planning Inspectorate, 2024):

- Stage 1: establishing the long list of 'other developments';
- Stage 2: establishing the short list of 'other developments';
- Stage 3: information gathering; and
- Stage 4: assessment.

Plate 3.2 Cumulative impacts with 'other developments'



4. Marine Protected Area Screening

4.1 Introduction

4.1.1.1 In accordance with the relevant policies and legislation outlined in **Section 1.4.1**, the Project has assessed whether its activities could have more than an insignificant effect on the designated features or conservation objectives of NCMPAs. This initial screening stage considers what can reasonably be predicted as a result of the Project's activities and whether there is any potential for significant impact on NCMPA features or the objectives of an NCMPA. An NCMPA Screening Assessment was submitted to Scottish Ministers in 2024, following submission of the EIA Scoping Report (MarramWind Ltd., 2023). This was responded to by MD-LOT and NatureScot in March 2024. The NCMPA Screening Assessment has not been revised or edited since this time. This Chapter provides a summary of that screening assessment and identifies the NCMPAs carried forward for further consideration in this NCMPA Assessment, as agreed with stakeholders.

4.2 Identification of relevant Marine Protected Areas / study scope

4.2.1.1 A review of the Project information and impact pathways that was available in 2023 via the Scoping Report was completed to inform the NCMPA Screening, including the identification of the potential zones of ZOI that may arise from the construction, O&M, and decommissioning of the Project. These ZOI are as follows for the protected features of NCMPAs:

- **Benthic habitats/species and geodiversity features:** There is potential for indirect effects to sites designated for benthic and geodiversity features. As a result of increased SSC arising from construction activities, and changes to the hydrodynamic regime as a result of the presence of the offshore infrastructure associated with the Project. Physical processes modelling has been undertaken for the Project to inform the EIA Report in 2025. However, this information was not available at the time of writing the NCMPA Screening in 2023. Therefore, a buffer of one mean tidal excursion in the vicinity of the Project was derived from the Atlas of UK Marine Renewable Energy Resources (ABPmer, 2008), which equates to approximately 7km. For the purpose of NCMPA Screening, a precautionary approach has been adopted, and this buffer has been increased to 15km. This buffer is considered to be sufficiently precautionary to capture all sites likely to be in the ZOI from direct and indirect effects. This buffer has also been applied for geodiversity features of NCMPAs.
- **Fish species:** For the purposes of the NCMPA Assessment a precautionary buffer of 100km has been adopted to screen in NCMPA sites, on the basis that this is sufficiently precautionary to capture the ZOI from the Project from key impacts such as underwater noise. The ZOI for fish has been refined within the NCMPA Assessment in line with **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report** to a buffer zone extending 15km beyond the OAA and 15km around the offshore cable corridor, to account for potential impacts other than underwater noise.
- **Marine mammals:** The Habitats Regulations Appraisal (HRA) Screening Report submitted to MD-LOT in 2024 considers designated sites with cetaceans as qualifying interest features within a buffer that equates to the Marine Mammal Management Units. These were defined by the Inter Agency Marine Mammal Working Group (IAMMWG) and described in Section 5.6: Marine mammals of the Scoping Report (these are further described in **Volume 1, Chapter 11: Marine Mammals** of the **EIA Report**) and are

appropriate for analyses of population dynamics. These are larger however, than the likely ZOI for the specified Project activities. A reasonable but conservative study area for marine mammals (for the purposes of the NCMPA Assessment) has therefore been defined as the Offshore Red Line Boundary plus a 60km buffer zone. These buffers are considered to be sufficiently precautionary to capture all sites likely to be in the ZOI from indirect effects associated with construction activities.

4.3 Initial screening for the Project

4.3.1.1 The following NCMPAs were identified within Stage 1: Initial Screening for initial inclusion:

- Southern Trench NCMPA (overlaps the offshore export cable corridor part of the Scoping Boundary);
- Turbot Bank NCMPA (approximately 62km south of the OAA, and 14km south of the offshore export cable corridor part of the Scoping Boundary; and
- East Caithness Cliffs NCMPA (approximately 144km west of the windfarm OAA, 89km northwest of the offshore export cable corridor part of the Scoping Boundary.

4.4 Conclusion from Marine Protected Area Screening Assessment

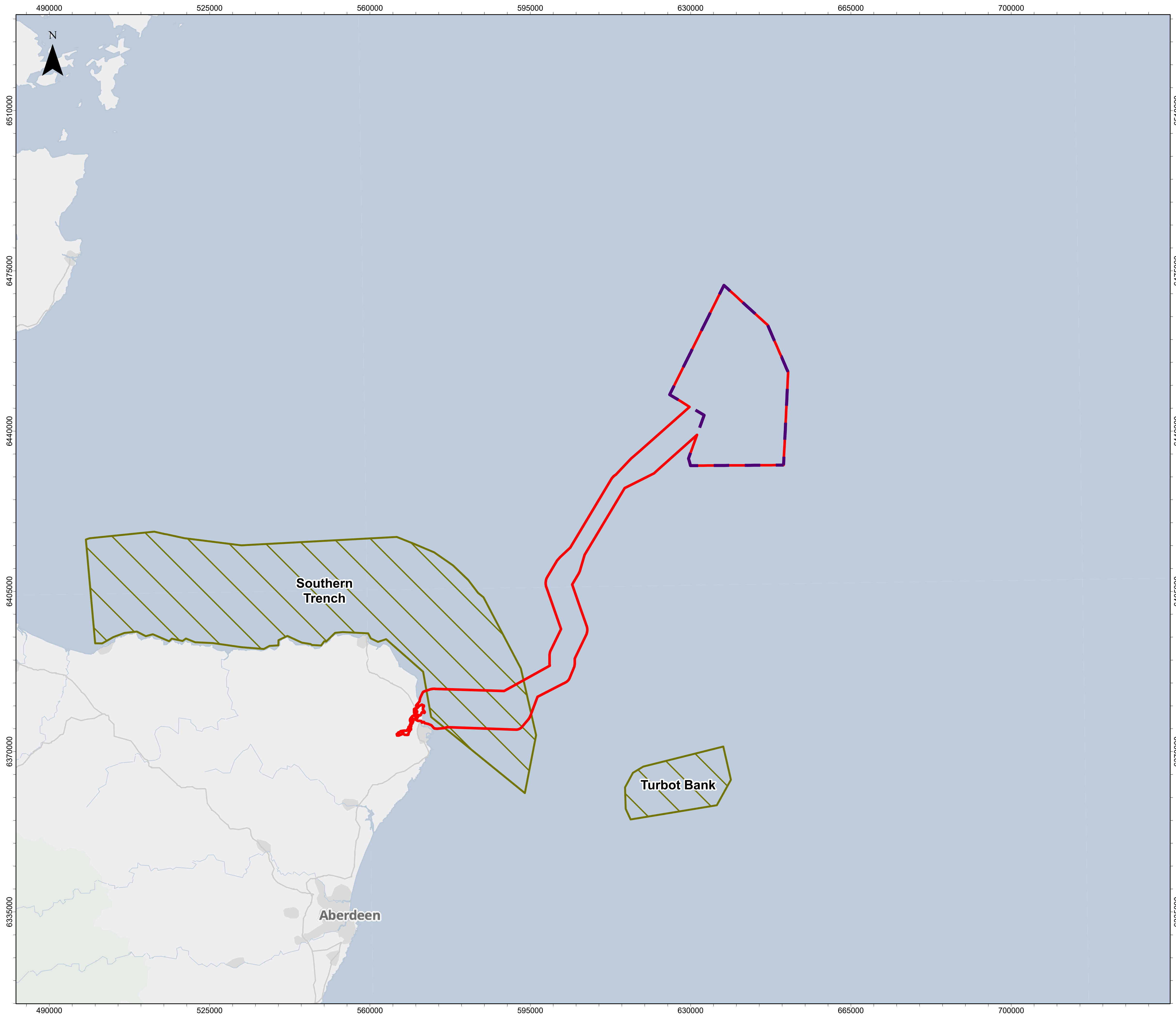
4.4.1.1 The following NCMPA sites and designated features have been taken forward to the main NCMPA Assessment stage:

- Southern Trench NCMPA; and
- Turbot Bank NCMPA

4.4.1.2 The locations of these are show in **Figure 2**.

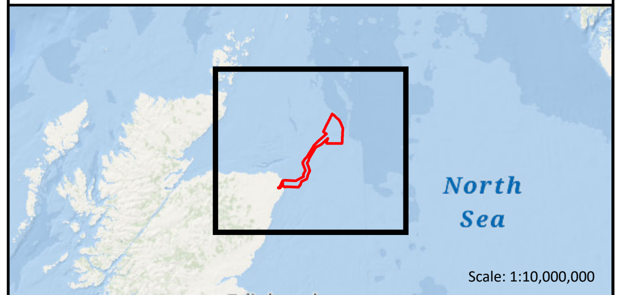
4.4.1.3 Following stakeholder feedback from NatureScot via the Scoping Opinion in 2024, it was confirmed that the East Caithness Cliff NCMPA does not require full NCMPA Assessment. As such, it has been excluded from further consideration in this document.

4.4.1.4 The following subsections present a summary of each NCMPA included within the initial NCMPA Screening process, the features for which they have been designated, and the general management approaches being implemented. The NCMPAs are presented in order of increasing distance from the Offshore Red Line Boundary. Information for each NCMPA has been obtained from the NCMPA's individual site summary, with full details provided in **Section 5.2** and **Section 6.2**.



Red Line Boundary
Option Agreement Area
Nature Conservation Marine Protected Area (NCMPA)

0 20 40 Kilometres



	dd/mm/yyyy	--	--	--	--
2	13/10/2025	EH	LT	MR	LG
1	25/09/2025	EH	LT	MR	LG
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

WSP DRAWING NUMBER	808368-WEIS-IA-I8-FG-O7-9791
MarramWind DRAWING NUMBER	MAR-GEN-ENV-MAP-WSP-000481

DATUM	ETRS 89	PROJECTION	UTM Zone 30N
SCALE	1:800,000	PAGE SIZE	A3

PROJECT TITLE
MarramWind Offshore Wind Farm

DRAWING TITLE
Figure 2 Southern Trench and Turbot Bank NCMPA locations

Marine Protected Areas Report

NOT TO BE USED FOR NAVIGATION

wsp MarramWind

5. Southern Trench Marine Protected Area Assessment

5.1 Introduction

5.1.1.1 This Chapter characterises the baseline environment of the Southern Trench NCMPA, which has been screened in for further assessment.

5.1.1.2 Southern Trench NCMPA is located off the Aberdeenshire coast and is designated to protect the following features:

- burrowed mud habitats;
- fronts;
- shelf deeps;
- minke whales (*Balaenoptera acutorostrata*);
- quaternary of Scotland; and
- submarine mass movement (slide scars).

5.1.1.3 The Project's Red Line Boundary intersects the NCMPA (see **Figure 2**), which was designated in 2020.

5.1.1.4 The Southern Trench NCMPA takes its name from the 58km long, 9km wide and 250m deep trench running parallel to the coast that was carved out by glaciers. This important geodiversity feature also contains rock features thought to be over 250 million years old. The trench functions as a nursery ground for juvenile fish and the thick, soft mud covering the trench floor provides habitat for an assortment of benthic and epibenthic species. These include the Norway lobster (*Nephrops norvegicus*) and crabs that build their burrows in the mud, elegant seapens (*Virgularia mirabilis*) and tube anemones (Ceriantharia) that rise out of the mud to filter food from the water column, and squat lobsters (*Galathea squamifera* and *Munidia rugosa*) that inhabit and forage the mud's surface.

5.1.1.5 The deep trench environment of the Southern Trench NCMPA creates a dynamic mixing zone of warm and cold waters that supports high numbers of plankton and attracts shoals of fish including species of commercial interest such as herring (*Clupea harengus*), mackerel (*Scomber scombrus*) and cod (*Gadus morhua*). The soft sands provide abundant habitat for sandeels (*Ammodytes* spp. and *Hyperoplus* spp.) (NatureScot, 2020). The presence of these prey species attracts predator species such as minke whale to the area.

5.1.1.6 **Figure 3** shows the distribution of protected biodiversity and geodiversity features of the Southern Trench NCMPA (excluding fronts).

5.2 Baseline characterisation

5.2.1 Burrowed mud

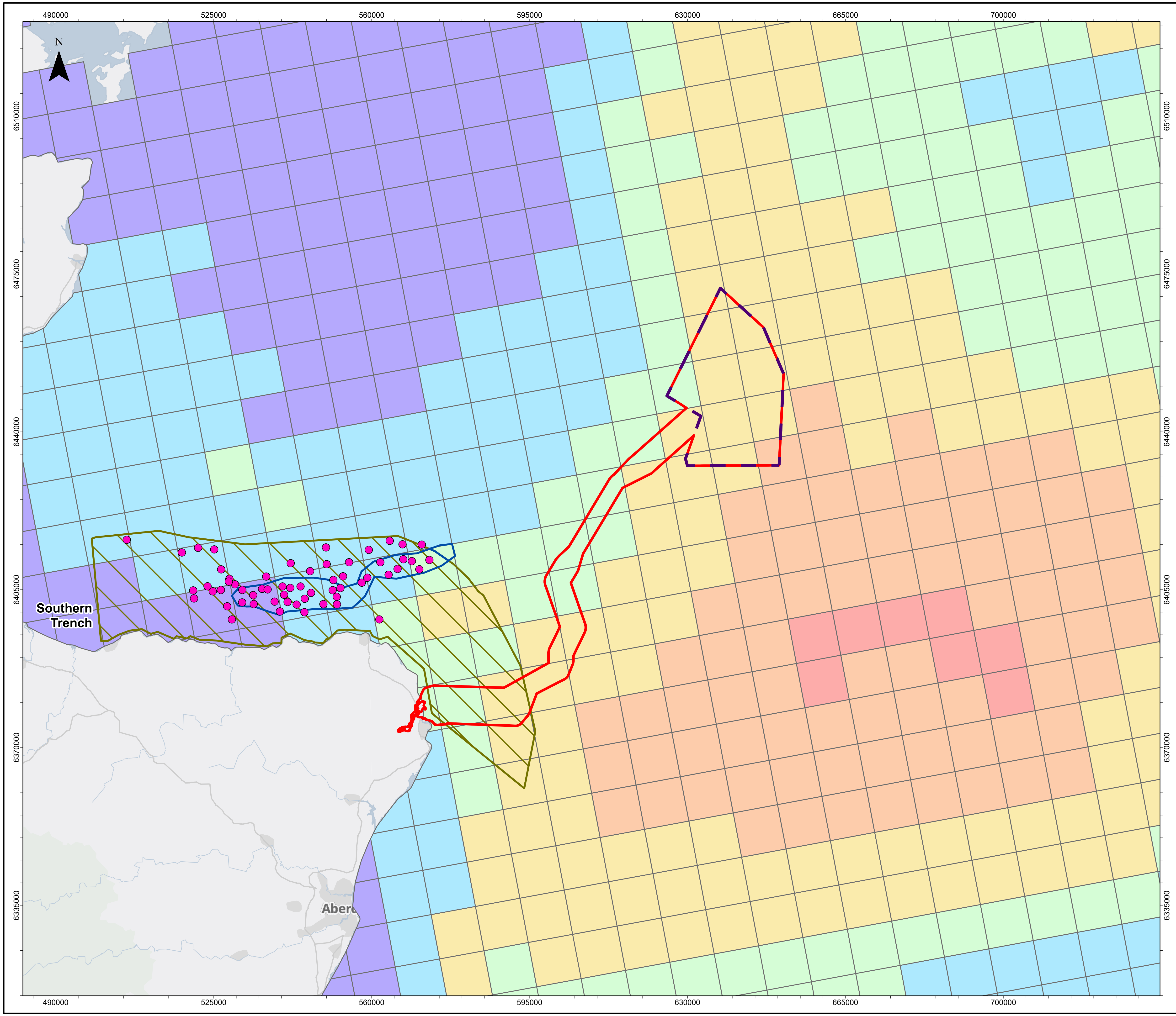
5.2.1.1 The 'Burrowed mud' benthic habitat is listed as a Scottish Priority Marine Feature (PMF) (Tyler-Walters *et al.*, 2016). In some areas of the NCMPA, burrowed mud may support conspicuous populations of seapens, including the biotope 'Seapens and burrowing megafauna communities' which is also listed as a Scottish PMF, and in the OSPAR List of Threatened / or Declining Species and Habitats'.

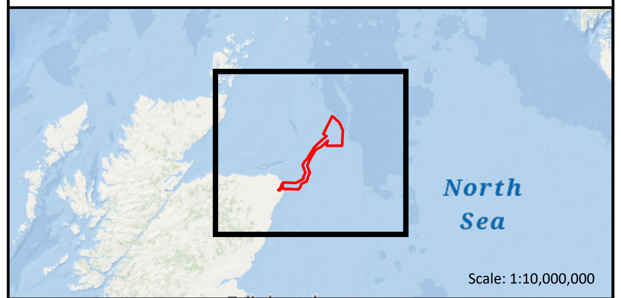
5.2.1.2 The burrowed mud of the Southern Trench NCMPA is covered by thick, soft mud inhabited by characteristic invertebrate fauna including Norway lobster, crabs, sea pens and tube anemones. The ocean quahog (*Arctica islandica*) is a PMF species that has also been recorded from burrowed mud habitat within the site. The distribution of burrowed mud within the NCMPA is predominantly confined to an area a minimum of 18km (and beyond) west of the Offshore Red Line Boundary (**Figure 3**).

5.2.1.3 The current feature condition of burrowed mud is "Favourable" (NatureScot, 2020c).

5.2.1.4 During Project-specific geophysical and environmental surveys within the OAA and the export cable corridor that were undertaken in 2022 and 2023, grab samples identified three benthic biotopes[3] within the survey area. These biotypes included 'Sea pens and burrowing megafauna in circalittoral fine mud (SS.SMu.CFiMu.SpnMeg), 'Circalittoral fine sand' (SS.SSa.CFiSa) and 'Sublittoral mixed sediment' (SS.SMx). Whilst the survey report identified the biotope 'Sea pens and burrowing megafauna in circalittoral fine mud' the biotope was recorded in sandy sediments, and therefore, it was assessed the 'Burrowed mud' is unlikely to be present within the export cable corridor. Please refer to **Volume 1, Chapter 10: Benthic, Epibenthic and Intertidal Ecology** of the **EIA Report** for further detail on the results from the geophysical and environmental surveys.

[3] A biotope is defined as the region of a habitat associated with, or characterised by, a particular ecological community.





REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER
	dd/mm/yyyy	--	--	--	--
2	13/10/2025	EH	LT	MR	NC
1	25/09/2025	EH	LT	MR	NC

WSP DRAWING NUMBER 808368-WEIS-IA-I8-FG-O7-75121

MarramWind DRAWING NUMBER MAR-GEN-ENV-MAP-WSP-000482

DATUM ETRS 89 | PROJECTION UTM Zone 30N

SCALE 1:800,000 | PAGE SIZE A3

PROJECT TITLE
MarramWind Offshore Wind Farm

DRAWING TITLE
Figure 3 Distribution of protected features within the Southern Trench NCMPA (NatureScot, 2025)

Nature Conservation Marine Protected Areas Report

NOT TO BE USED FOR NAVIGATION

wsp | MarramWind

5.2.2 Minke whale

5.2.2.1 Minke whale is a European Protected Species (EPS) under Annex IV of the Habitats Directive. The species was most recently assessed for the International Union for Conservation of Nature (IUCN) Red List of Threatened Species in 2018. The assessment considered the global populations of minke whale and concluded that the species was of Least Concern (Cooke, 2018). Within UK waters, minke whale is of unknown conservation status (JNCC, 2019).

5.2.2.2 An assessment of minke whale in UK waters concluded that the overall trend in conservation status was unknown (JNCC, 2019). The report stated that there were insufficient data to establish a trend for the population size or potential future prospects for the population. Minke whales are the most common baleen whale in UK waters and have a year-round distribution with peaks between April and October (Robinson *et al.,* 2007). Minke whales utilise the outer Moray Firth seasonally.

5.2.2.3 Information on the abundance and distribution of marine mammals (including minke whale) in the study area is available from site-specific digital aerial surveys (see **Volume 3, Appendix 11.1: Marine Mammal Baseline Technical Report** of the **EIA Report**) and regional level surveys from Small Cetaceans in European Atlantic waters and the North Sea (SCANS) surveys. The study area falls within SCANS-IV block NS-D, for which density and abundance estimates are provided within **Figure 3** and **Table 5.1**; Gilles *et al*., 2023). Abundance estimates are also available with management units (MUs) from the IAMMWG, where an MU typically refers to a geographical area in which the animals of a particular cetacean species are found, to which management of human activities is applied (IAMMWG, 2023) Please refer to **Volume 1, Chapter 11: Marine Mammals** of the **EIA Report**.

Table 5.1 Minke whale density and abundance estimates in study area (MU = Management Unit) including the confidence interval (CI) and coefficient of variance (CV); sources: Gilles *et al*., 2023, 2025; IAMMWG, 2023

Common name	Latin Name	Gilles *et al.*, 2025	Gilles *et al.*, 2023		IAMMWG 2023
		Surface density	Block NS-D density	Block NS-D abundance	
Minke whale	*Balaenoptera acutorostrata*	0.05	0.0419 (CV=0.594)	2,702 (95% CI=547-7,357; CV=0.594)	Celtic and Greater North Seas UK MU: 10,288

5.2.2.4 The spatio-temporal distribution of feeding and foraging minke whales within the Southern Trench NCMPA has been reported to be strongly correlated with high burrowed sandeel density (i.e, burrowed muds), particularly in May and June. Minke whale presence was also found to be highly correlated to the presence of offshore thermal fronts from June to September (MacDougal and Robinson, 2025).

5.2.3 Submarine mass movement

5.2.3.1 Submarine mass movement is the gravity-driven downslope movement of sediment and rock beneath the water, occurring as subaqueous landslides, debris flows, or turbidity currents. Areas where this has occurred are a geodiversity feature. Slide scars within the Southern Trench NCMPA delineate areas where large volumes of bedrock and sediment have moved downslope as part of submarine mass movement processes. They are found on or below the steep sided flanks of the subglacial tunnel valleys (NatureScot, 2025).

5.2.3.2 The current feature condition of Submarine Mass Movement is "Favourable" (NatureScot, 2020c). Refer to **Volume 1, Chapter 6: Marine Geology, Oceanography and Physical Processes** of the **EIA Report**.

5.2.4 Fronts

5.2.4.1 An ocean front is the boundary between two distinct water masses of differing salinity, temperature or other physico-chemical parameters. Certain front types can be important features for biodiversity, particularly where they mobilise or concentrate nutrients.

5.2.4.2 Fronts are formed by a combination of physical processes and small differences in these can lead to a wide range of front types and morphologies. Within the Southern Trench NCMPA, fronts are determined by a pronounced thermal gradient as well as tidal currents and salinity.

5.2.4.3 Fronts are expected to be present year-round within the Southern Trench NCMPA. The fronts associated with the Southern Trench NCMPA correspond to a pronounced tidal front (the Buchan front), which is found in the transitional zone off Buchan on the Aberdeenshire coast, where the shallow coastal water meets deeper, seasonally stratified North Sea water. Stratification is a term used to describe when two distinct layers occupy the vertical water column in the sea; the upper layer being less dense than the one beneath. This can be due to differences in temperature (warm layer overlying a cooler layer), salinity (freshwater overlying saltier water), or both.

5.2.4.4 Fronts tend to concentrate nutrients, supporting phytoplankton and zooplankton blooms that attract fish species including sandeel, thereby enhancing feeding opportunities for minke whales.

5.2.4.5 The current feature condition of Fronts in the NCMPA is "Favourable" (NatureScot, 2020c). Refer to **Volume 1, Chapter 6: Marine Geology, Oceanography and Physical Processes** of the **EIA Report**.

5.2.5 Shelf deeps

5.2.5.1 Shelf deeps are large areas of seabed that are notably deeper than surrounding areas. These deep areas were mostly created by glacial movement thousands of years ago.

5.2.5.2 The Southern Trench is a distinctive seabed feature of glacial origin, formed from at least two erosion events in different directions (Holmes *et al*., 2004; Brooks *et al*., 2013. It reaches depths of approximately 250m, making it one of the deepest parts of the Outer Moray Firth. Shelf deeps are found in the northern and northwestern parts of the Southern Trench NCMPA (NatureScot, 2025).

5.2.5.3 Shelf deeps are an important feature for biodiversity in the Southern Trench NCMPA as they create the conditions that support the formation of ecological features. The deep water allows the accumulation of burrowed mud, and the submarine topography influences water circulation contributing to the formation of fronts.

5.2.5.4 The current feature condition of Shelf deeps is “Favourable” (NatureScot, 2025). Refer to **Volume 1, Chapter 6: Marine Geology, Oceanography and Physical Processes** of the **EIA Report**.

5.2.6 Quaternary of Scotland

5.2.6.1 The geological structure of the underlying bedrock in this region is characterised by a complex pattern of down-faulted basins separated by platforms (relatively uplifted areas). The uplifted platforms formed approximately 420 million years ago and underlie the modern coastline and nearshore parts of the study area. The Mesozoic basins found further offshore formed more recently during faulting, approximately 142 to 250 million years ago (Holmes *et al.*, 2004). The modern-day seabed configuration reflects the combination of this large-scale geological structure and burial by younger sediments, in particular those deposited during the Quaternary period (within the last 2.5 million years) in response to the growth and decay of Pleistocene ice sheets and associated changes in relative sea level.

5.2.6.2 A lack of major river sediment input and the resistance of most of the shorelines to erosion has resulted in only minor amounts of clastic sediment (rock) input from the coastal areas to offshore areas over the last 10,000 years. This, coupled with strong tidal and non-tidal currents, has provided favourable environments for the proliferation of calcareous seabed biota meaning in places the biogenic carbonate content of the sand fraction in seabed sediments may comprise up to 50% (Holmes *et al*., 2004).

5.2.6.3 Within the Southern Trench NCMPA, the Quaternary of Scotland feature encompasses moraines and subglacial tunnel valleys. Moraines are a relict feature that are composed of glacial till (poorly sorted boulders, gravels, sand and clays of variable consolidation). Within the Southern Trench NCMPA, they are interspersed within the subglacial tunnel valley systems (erosional features formed by ice over millennia) (NatureScot, 2020c). They are present at shallower depths further east, to the north and east of Peterhead.

5.2.6.4 The current feature condition of Quaternary of Scotland is “Favourable” (NatureScot, 2020c). Refer to **Volume 1, Chapter 6: Marine Geology, Oceanography and Physical Processes** of the **EIA Report**.

5.3 Conservation objectives

5.3.1.1 Paragraph 5(1) of the *Southern Trench Nature Conservation Marine Protected Area Order 2020* regarding conservation objectives defines that the protected features:

a) so far as already in favourable condition, remain in such condition,

b) so far as not already in favourable condition, be brought into such condition, and remain in such condition.

5.3.1.2 Paragraph 5(2) states that “favourable condition”, with respect to marine habitats means that:

a) its extent is stable or increasing; and

b) its structures and functions, its quality, and the composition of its characteristics biological communities are such as to ensure that it is in a condition that is healthy and not deteriorating.

5.3.1.3 Paragraph 5(3) states that "favourable condition", with respect to a mobile species of marine fauna, means that:

a) the species is conserved or, where relevant, recovered to include the continued access by the species to resources provided by the NCMPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds,

b) the extent and distribution of any supporting feature upon which the species is dependent is conserved or, where relevant, recovered, and

c) the structure and function of any supporting feature, including any associated processes supporting the species within the NCMPA, is such as to ensure that the protected feature is in a condition that is healthy and not deteriorating.

5.3.1.4 Paragraph (6) states that "favourable condition", with respect to large scale features, means that

a) the extent, distribution and structure of that feature is maintained;

b) the function of the feature is maintained so as to ensure that it continues to support its characteristics biological communities and their use of the site including, but not restricted to, feeding, spawning, courtship or use as nursery grounds; and

c) the processes supporting the feature are maintained.

d) for the purpose of determining whether a protected feature is in favourable condition any alteration to that feature brought about entirely by natural processes is to be disregarded.

5.3.1.5 Paragraph (8) states that "favourable condition", with respect to features of geomorphological interest means that:

a) its extent, component elements and integrity are maintained;

b) Its structure and functioning are unimpaired; and

c) its surface remains sufficiently unobscured for the purposes of determining whether the criteria in paragraphs (a) and (b) are satisfied.

d) for the purpose of determining whether a feature of geomorphological interest is sufficiently unobscured under paragraph (3)(c), any obscuring of that feature entirely by natural processes is to be disregarded.

e) for the purpose of determining whether a protected feature is in a favourable condition, any alteration to that feature brought about entirely by natural processes is to be disregarded.

5.3.1.6 **Table 5.2** summarises the features of the Southern Trench NCMPA alongside its relevant conservation objectives.

Table 5.2 Summary of features designated under the Southern Trench NCMPA, their broad conservation objectives (CO), and the site-specific advice / objectives for each feature

Feature type	Protected feature	Conservation objectives and site-specific advice
Habitat features	Burrowed mud	CO1: Extent: Conserve the current extent and distribution of burrowed mud habitat within the site so that it is stable or increasing. CO2: Structures: Conserve the current physical structure of the burrowed mud; Conserve the three-dimensional structure created by fauna and flora (e.g. infaunal burrows created by *N.norvegicus*) that are associated with this habitat. CO3: Function and quality: Conserve the functions provided by burrowed mud and the environmental conditions that support them. CO4: Composition of its characteristic biological communities: Conserve the diversity, abundance and distribution of typical species associated within the burrowed mud (including *N.norvegicus*, *Pennatula phosphorea*, *V.mirabilis*, *Goneplax rhomboides*, *Munida* spp., *Calocaris macandreae* and *Calianassa.subterranea*).
Mobile species	Minke whales	CO1: Species is conserved: Minke whale in the Southern Trench NCMPA are not at significant risk from injury or killing; CO2: Continued access by the species to resources provided by the NCMPA for, but not restricted to, feeding, courtship, or use as nursery grounds: Conserve the access to resources (e.g. for feeding) provided by the NCMPA for various stages of the minke whale life cycle; Conserve the distribution of minke whale within the site by avoiding significant disturbance; CO3: Extent and distribution of any supporting feature and structure and function of any supporting feature, including any associated processes supporting the species: Conserve the extent and distribution of any supporting feature upon which minke whale is dependent; and

Feature type	Protected feature	Conservation objectives and site-specific advice
		Conserve the structure and function of supporting features; including processes to ensure minke whale are healthy and not deteriorating.
Large scale features	Fronts	CO1: Extent, distribution and structure: Conserve the extent, distribution and structure of fronts. CO2: Function of the features is maintained so as to ensure that it continues to support its characteristic communities and their use of the site including, but not restricted to, feeding, spawning, courtship or use of nursery grounds: Conserve the function of the fronts feature so as to ensure that it continues to support its characteristic biological communities and their use of the site including, but not restricted to, feeding, spawning, courtship or use as nursery grounds. CO3: Processes supporting the feature: Conserve the process which support the front features, in particular current patterns, freshwater input and local topography.
Large scale features	Shelf deeps	CO1: Extent, distribution and structure: Conserve the extent, distribution and structure of the shelf deeps feature. CO2: Function of the features is maintained so as to ensure that it continues to support its characteristic communities and their use of the site including, but not restricted to, feeding, spawning, courtship or use of nursery grounds: Conserve the function of the shelf banks and mounds feature so as to ensure that it continues to support its characteristic biological communities (in particular burrowed mud). CO3: Processes supporting the feature: Conserve the process which support the shelf deeps feature, particularly deep water currents.
Geomorphological features	Quaternary of Scotland (subglacial tunnel valleys and moraines)	CO1a: Extent, component elements, and integrity: Conserve the features extent, component elements and integrity of the Quaternary of Scotland' feature. CO1b: Its structure and functioning are unimpaired: Conserve the structure and functioning of the feature so that they are unimpaired.

Feature type	Protected feature	Conservation objectives and site-specific advice
		CO1c: Its surface remains sufficiently unobscured for the purposes of determining whether the criteria for CO1a and CO1b are satisfied: Conserve the surface of the feature so that it remains sufficiently unobscured for the purposes of determining whether the criteria in conservation objective (a) and (b) listed above are satisfied.
Geomorphological features	Submarine mass movement (slide scars)	CO1a: Extent, component elements and integrity: Conserve the feature’s extent, component elements and integrity of the submarine mass movement feature. CO1b: Its structure and functioning and unimpaired: Conserve the structure and functioning of the feature so that they are unimpaired; and CO1c: its surface remains sufficiently unobscured for the purposes of determining whether the criteria for CO1a and CO1b are satisfied: Conserve the surface of the feature so that it remains sufficiently unobscured for the purposes of determining whether the criteria in conservation objectives (a) and (b) are satisfied.

5.4 Impact assessment methodology

5.4.1 Screening of protected features

5.4.1.1 Following identification of the Southern Trench NCMPA to be considered, section 126 of the Marine and Coastal Access Act 2009 and section 83 of the Marine (Scotland) Act 2010 would apply if it is determined through the course of screening that *"the activity is capable of affecting (other than insignificantly) either (i) any protected feature of a Nature Conservation NCMPA; or (ii) any ecological or geomorphological process on which the conservation of any protected feature in a Nature Conservation NCMPA is (wholly or in part) dependent".*

5.4.1.2 The designated features of the Southern Trench NCMPA are not all identified as having the potential to be affected by the Project. The spatial extent of the Project activities and the nature of the direct and indirect potential effects have been considered in assessing which designated features are screened in the assessment.

5.4.2 Protected features screened in for assessment

Minke whale

5.4.2.1 Minke whale is screened in for assessment because it is known to occur within the study area and is particularly vulnerable to a range of potential impacts from offshore wind farm development. There are a number of potential impacts that could hinder that achievement of the conservation objectives outlined in **Table 5.2**. Underwater noise and habitat change associated with the Project may directly affect minke whales, with the potential for secondary effects through changes in prey availability and distribution during the duration of the Project.

5.4.2.2 Increased underwater noise during from pile driving during the construction stage could cause physical injury, including permanent and temporary threshold shifts (PTS and TTS), or behavioural changes resulting in displacement from breeding and foraging sites and reduced ability to communicate, forage, and navigate (Southall *et al.,* 2019; Thompson *et al.,* 2020). Indirect effects of underwater noise on marine mammal prey species during construction could alter prey availability and distribution.

5.4.2.3 Potential pressures on prey species during the O&M stage, including from habitat disturbance and loss both temporary and long term, due to the presence of infrastructure such as offshore substations, scour protection and cable protection may affect prey species, and prey availability (Ounanian *et al.,* 2020; Todd *et al.,* 2016). The severity and likelihood of these pressures vary depending on the species mobility, life stage and behavioural state at the time of exposure. These factors influence the ability of prey species to avoid or recover from disturbance. Pressures on prey species arising from the presence of the offshore export cable corridor could indirectly affect minke whale within the NCMPA through a reduction in prey availability, or changes in prey distribution.

5.4.2.4 Finally, unexploded ordnance (UXO) clearance during construction could result in direct trauma, auditory damage (TTS / PTS), or disturbance leading to behavioural change (Benda-Beckmann *et al.,* 2015). Given the scale and range of these potential impacts, and the conservation status of minke whale, this species is screened in for detailed assessment.

5.4.2.5 Potential impacts that could pose risk to the site-specific conservation objectives of the Southern Trench NCMPA minke whale feature include:

5.4.2.6 Potential risks to CO1:

- underwater noise from piling (construction); and
- underwater noise from UXO clearance (construction).

5.4.2.7 Potential risks to CO2:

- underwater noise from piling (construction);
- underwater noise from UXO clearance (construction); and
- changes to prey distribution and availability (construction, O&M and decommissioning).

5.4.2.8 Potential risks to CO3:

- underwater noise from piling (construction);
- underwater noise from UXO clearance (construction); and
- changes to prey distribution and availability (construction, O&M and decommissioning).

5.4.2.9 The NCMPA Assessment is site-led, and therefore effects screened out of the assessment are not anticipated to compromise site-specific conservation objectives. Impacts that are not included in the Southern Trench NCMPA Assessment for minke whales include:

- auditory injury and disturbance from non-impulsive noise sources (construction, O&M and decommissioning);
- vessel collisions and disturbance from increased vessel presence (construction, O&M and decommissioning);
- electromagnetic fields (EMF); and
- entanglement in moorings and cables.

Quaternary of Scotland

5.4.2.10 The Project may be capable of affecting the Quaternary of Scotland features, a geodiversity protected feature of the Southern Trench NCMPA, as the Offshore Red Line Boundary and the marine geology, oceanography and physical processes study area both directly overlap the NCMPA.

5.4.2.11 There is potential for impacts to seabed morphology within the Southern Trench NCMPA. Cable installation, as well as the installation (and subsequent presence) of cable protection within the NCMPA, all have the potential to impact upon seabed morphology, as in theory cables may be installed into moraines and tunnel valleys designated under Quaternary of Scotland. Within the offshore export cable corridor, some levelling may be necessary during the construction stage, and the levelling of moraines cannot be ruled out. The presence of cable protection during the O&M stage has the potential to cause changes to the local seabed level as a result of local flow interaction between the body and surface of the berm, and any near-bed current and wave action. As a result, impacts on seabed morphology within the NCMPA cannot be ruled out and are screened in for assessment in accordance with best practice guidance (see **Volume 1, Chapter 6, Marine Geology, Oceanography, and Physical Processes** of the **EIA Report**).

5.4.2.12 Potential impacts that could pose risk to the site-specific conservation objectives of the Southern Trench NCMPA Quaternary of Scotland feature:

- Potential risks to CO1a: Potential impacts to seabed morphology (construction, O&M and decommissioning).

- Potential risks to CO1b: Potential impacts to seabed morphology (construction, O&M and decommissioning).
- Potential risks to CO1c: Potential impacts to seabed morphology (construction, O&M and decommissioning).

Screened out

Submarine mass movement

5.4.2.13 Submarine mass movement formed in bedrock and sediments after the icesheets melted and are generally resistant to most pressures associated with human activities in the marine environment. However, as a relic of past processes, the feature has no resilience to change and therefore is considered to have medium sensitivity to physical removal and to any activities that could cause natural processes to be obscured. Potential impacts on seabed morphology on submarine mass movement were scoped in for designated areas of the seabed, in the marine geology oceanography and physical processes chapter of the Scoping Report. However, from observation of the locations of slide scars within the NCMPA using NatureScot NCMPA proposal document (NatureScot, 2014), in addition to the more recent Southern Trench NCMPA Conservation and Management Advice Report (NatureScot, 2025) the Offshore Red Line Boundary does not overlap with the location of the slide scars, therefore, they are not considered to be at risk from the Project (see **Figure 3**). On this basis, it is determined that overall, the offshore development of the Project is not capable of affecting (other than insignificantly) the protected feature submarine mass movement and therefore will not be assessed further.

Fronts

5.4.2.14 The thermal front within the NCMPA, could be sensitive to pressures such as changes in tidal flow or physical changes to the seabed. Furthermore, activities that have the potential to cause substantial changes to either water flow or to the seabed topography could have implications for the structure or distribution of the feature within the NCMPA and therefore, secondary effects on its functional role. Floating wind turbine generators within a large array have the potential to cause localised effects on stratification and mixing with potential downstream effects on biological processes such as plankton production. However, given the location of the OAA relative to the residual current directions (see **Volume 3, Appendix 6.1: Physical Processes Modelling** of the **EIA Report**), being effectively downstream of the NCMPA it is considered unlikely that Project activities could cause significant impact on the fronts feature within the NCMPA. Therefore, this feature is not considered further within this assessment.

Shelf deeps

5.4.2.15 Shelf deeps are considered to be robust features and are not considered to be at risk of significant damage from human activity. Shelf deeps are a broadscale geological feature and they occur in the far north of the NCMPA. The distribution of shelf deeps within the NCMPA is outside of the Offshore Red Line Boundary, and are located outside of the Marine geology, oceanography and physical processes study area (15km). On this basis, it is determined that overall, the offshore development of the Project is not capable of affecting (other than insignificantly) the protected feature shelf deeps and therefore will not be assessed further.

Burrowed mud

5.4.2.16 The Project may be capable of affecting the protected feature burrowed mud of the Southern Trench NCMPA as the export cable corridor directly overlaps with the NCMPA. There may be potential for the near field direct and far-field indirect impacts on burrowed mud via temporary / long term habitat loss and elevated suspended sediment levels respectively. The FeAST assesses that for sub-surface abrasion / penetration, physical removal (extraction of substratum), and removal of target and non-target species, that burrowed mud has a medium sensitivity to these pressures. It also assesses that this feature has a high sensitivity to physical change to another seabed type that may occur through placement of rock on the seabed for cable scour protection (Scottish Government, 2025). Burrowed mud has a low sensitivity to changes in water clarity caused by increases in suspended sediment and following deposition it has a low sensitivity to light siltation rate changes (< 5cm of sediment), and medium sensitivity to heavy deposition (> 5cm of sediment) (Scottish Government, 2025).

5.4.2.17 Geophysical and environmental surveys carried out along the export cable corridor in May and July 2023, collected sediment grab samples and photographic data (see full description in **Volume 1, Chapter 10: Benthic and Epibenthic Intertidal Ecology** of the **EIA Report**). Using the data, the macrofaunal and epifaunal community, and biotope complexes along the export cable corridor could be described. The epifaunal biotope 'Sea pens and burrowing megafauna in circalittoral fine mud' (SS.SMu.CFiMu.SpnMeg) was identified within sandy sediments within the export cable corridor. On this basis, it was determined in the Geophysical and Environmental Export Cable Corridor Survey Report (**Volume 3, Appendix 10.3** of the **EIA Report**), that 'Burrowed mud' broad habitat is unlikely to occur within the export cable corridor.

5.4.2.18 Data from Marine Scotland provides an understanding of the distribution of burrowed mud habitats within the Southern Trench NCMPA (Marine Scotland, 2025). Using this data, the extent of burrowed mud habitat is largely confined to the western portion of the NCMPA. When measuring the distance between the Offshore Red Line Boundary and the nearest burrowed mud habitat, the habitat is beyond the 15km study area defined for benthic habitats. **Figure 3**, displays the distribution of protected features within the Southern Trench NCMPA.

5.4.2.19 Given the precautionary approach to defining the benthic study area, based on an approximate range of twice the maximum tidal ellipse, it is not expected that activities causing resuspension of sediment will impact burrowed mud. Furthermore, given the absence of burrowed mud habitat from the Red Line Boundary, no impacts are expected with respect to temporary or permanent habitat loss. On this basis, it is determined that overall, the offshore development of the Project is not capable of affecting (other than insignificantly) the protected feature of burrowed mud and therefore will not be assessed further.

5.4.3 Basis of assessment

5.4.3.1 As detailed in **Section 2.2,** this assessment considers the maximum design scenario for the Project parameters that are predicted to result in the greatest environmental impact. The maximum design scenario represents, for any given receptor and potential impact on that receptor that would result in the greatest potential for change.

5.4.3.2 Given that the maximum design scenario is based on the design option (or combination of options) that represents the greatest potential for change, confidence can be held that development of any alternative options within the design parameters will give rise to no worse effects than assessed in this NCMPA Assessment. **Table 5.3** presents the maximum design scenario for potential impacts on the conservation objectives of the Southern Trench NCMPA during construction, O&M, and decommissioning.

Table 5.3 Maximum design scenario project design for Southern Trench NCMPA and Turbot Bank NCMPA assessment

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
Construction			
Southern Trench NCMPA Minke whale	Impact C1: Auditory injury from increased underwater noise during installation of driven piles.	Construction window of up to 12 years. **WTG anchor installation with driven piles:** • 8 driven pile anchors per floating unit, total 1,800 driven piles; • maximum pile length: 30m; • maximum pile diameter: 3m; • maximum hammer energy: 3,500kJ; • maximum number of driven piles per day per location is 2; • maximum number of concurrent piling locations is 2; • maximum hours pilling per driven pile is 2.35; and • maximum number of piling days is 1,800 (assuming one pile installed per day). **Offshore substation foundation installation with driven piles:** • 4 offshore substations with jacket foundations secured by driven piles; • 48 driven piles (12 per offshore substation); • maximum pile length: 95m; • maximum pile diameter: 3m; • maximum hammer energy: 3,500kJ; • maximum number of driven piles per day per location is 2; • maximum number of concurrent piling locations is 2; • maximum hours pilling per driven pile is 2.35; and • maximum number of piling days is 48 (assuming one pile installed per day. **RCP foundation installation with driven piles:** • 2 RCPs with jacket foundation secured by driven piles;	Impulsive noise created during piling for the installation of the offshore substations and RCP foundations, and WTG anchors, has the potential to cause auditory injury (PTS) of marine mammals. PTS can reduce individual's ability to communicate, forage, and navigate. The scenario with the maximum number of piling days represents the temporal worst case. The scenario with the maximum predicted impact range for UWN represents the spatial worst case. This is described in Section 11.8.3 of **Volume 1, Chapter 11: Marine Mammals** of the **EIA Report**.

Protected feature	**Activity / impact**	**Maximum design scenario parameters**	**Justification**
		• 8 driven piles (4 per RCP); • maximum pile length: 95m; • maximum pile diameter: 3m; • maximum hammer energy: 3,500kJ; • maximum number of driven piles per day per location is 2; • maximum number of concurrent piling locations is 2; • maximum hours pilling per driven pile is 2.35; and • maximum number of piling days is 8 (assuming one pile installed per day). **Maximum number of piling days: 1,800 (WTG anchors) + 48 (offshore substations) + 8 (RCPs) = 1,856 days.**	
	Impact C2: Auditory injury from unexploded ordnance (UXO) clearance.	The type, size and number of possible UXO that might require clearance is currently unknown. The primary method of clearance will be low-order, with high-order being assessed as the worst-case scenario. An illustrative assessment is presented using charge weights (Trinitrotoluene (TNT) equivalent) ranging from 25 to 750kg, with an additional donor weight of 0.5kg, for high order detonation. A charge weight of 0.25kg is used to provide an illustrative assessment of a low order (deflagration) detonation.	Detonation of UXO could result in direct trauma or auditory damage causing PTS. PTS can reduce individual's ability to communicate, forage, and navigate. UXO clearance will be licensed under a separate Marine Licence but is included in the EIA Report for illustrative purposes. The maximum UXO charge size and clearance method will determine the greatest noise impacts and the worst-case scenario.
	Impact C3: Indirect effects via changes in prey availability from:	The maximum design scenario for minke whale for this impact is also considered to represent the maximum design scenario for prey species, which are relevant to indirect prey-related impacts. The maximum design scenario for impacts relevant to minke whale prey species are discussed in detail in **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**.	

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
	- temporary habitat loss / disturbance.	**Wind turbine generators (WTGs): 6.75km^2** • up to 225 WTGs; • mooring concepts: catenary; • maximum seabed displacement: Anchor type: drag embedment[4] fully buried (breadth 12.5m). 300m drag length. Seabed impact of 3,750m^2 per anchor; and • total anchor disturbance (assuming 225 WTGs, each with 8 anchors) is 6.75km^2. **Array cables: 20.4km^2** • 225 array cables; • 680km total array cable length; • assumed jet trenching installation method as worst-case for sediment mobilisation with 30m disturbance width; • temporary construction disturbance assumed 100% of total array cable length is buried by jet trenching; 680km x 0.03km = 20.4km^2 **Subsea distribution centres (SDC): 125,280m^2** • up to 45 SDCs; • assumed worst-case is gravity base foundations; • SDC construction footprint: 58m x 48m, footprint is 2,784m^2 per SDC; and • total disturbance is 125,280m^2 for 45 SDCs. **Offshore substations: 57,200m^2** • 4 offshore substations with jacket foundations secured with suction caisson; • offshore substation construction footprint: 130m x 110m = 14,300m^2 per offshore substations; and • total disturbance is 57,200m^2 for four offshore substations;	Potential change to prey availability and distribution due to temporary habitat loss / disturbance; increases in SSC; direct and indirect seabed disturbances leading to the release of sediment contaminants; changes in water quality; increased noise; and increased risk of the introduction of INNS could negatively affect foraging of marine mammals. This is the maximum area of temporary disturbance required for the installation of WTG anchors; offshore substations and RCPs jacket foundations; SDCs; and offshore cables (array and export). Catenary mooring and drag-embedment anchors are considered the worst-case design options in terms of habitat disturbance, due to maximising the area of seabed swept by chains / cables, in addition to the direct footprint of the anchor. Offshore substations are considered the worst-case design scenario over subsea substations due to having the largest construction footprint. For offshore substation and RCP, jacket foundations secured by suction caissons have been considered as the wors t-case

[4] Should the drag embedment end point be out of tolerance then it would be required to lift the anchor and re-lay increasing the seabed displacement by the same amount. At the design stage, it is not possible to accurately determine the level of installation failure or damage when laying the anchors. There will remain a residual risk that some anchors may need to be re-laid as they are out of tolerance or moved during service. This will depend on seabed conditions and other factors associated with offshore operations of the install vessels.

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
		Offshore export cables: 21km^2 • 5 offshore export cable trenches; • 140km offshore grid transmission route length per trench; • assumed jet trenching installation method as worst-case for sediment mobilisation with 30m disturbance width, • temporary construction disturbance assumed 100% of total export cable length is buried by jet trenching of 140km x 0.03km = 4.2km^2 per cable; and • total disturbance is 21km^2 for five cables. **Cable crossings: 714,000m^2** • 6 cable crossings per trench within the OAA with construction footprint of 170m x 30m = 5,100m^2, total of 153,000m^2 for 6 cable crossings for 5 cable trenches; and • 22 cable crossings along the offshore export cable corridor with construction footprint of 170m x 30m =5,100m^2, total of 561,000m^2 for 22 cable crossings for 5 cable trenches. **Reactive compensation platforms (RCPs): 14,450m^2** • 2 RCPs with jacket foundations secured with suction caisson; construction footprint: 85m x 85m = 7,225m^2 (per RCP); and • total disturbance is 14,450m^2 for 2 RCP's. **Landfall(s): 80m^2** • Scotstown, Lunderton North and Lunderton South; • 8 HDD ducts; HDD exit pit dimensions: assumed 5m x 2m as worst-case, 10m^2 per exit pit; and • total disturbance is 80m^2 for 8 exit pits. **Total temporary habitat disturbance = 49,110,010m^2 (49.11km^2)**.	design scenario due to having the largest footprint of all the foundation types. Jet trenching is considered the worst-case cable installation method as it has to penetrate to achieve the same burial depth and disturbs a greater amount of sediment, therefore affecting a greater area of habitat. It also tends to resuspend a greater portion of sediment, increasing total suspended sediment and the area prone to redeposition.

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
	- temporary localised increases in suspended sediment concentrations (SSC) and smothering; - direct and indirect seabed disturbances leading to the release of sediment contaminants; and - changes in water quality.	**Seabed preparation for wind turbine anchors** • 225 WTGs each with 8 anchors, total of 1,800 anchors; • Anchor type: driven pile anchor; and • bedform clearance (for example sandwaves). **Seabed preparation for array cables** • Bedform clearance (or example sandwaves). **Installation activities for array cables** • Jet trenching up to 530km of array cables with trench dimensions of 30m wide, 2m deep. **SDCs** • 45 SDCs; and • bedform clearance (or example sandwaves). **Seabed preparation for subsea substation** • 4 subsea substations; and • bedform clearance (or example sandwaves). **Seabed preparation for offshore substations** • 4 offshore substations; and • bedform clearance (or example sandwaves). **Piling for substation foundation installation** • 56 drilled piles (12 driven piles per offshore substation and 4 driven piles per reactive compensation platform (RCP)) with 94.5m drill penetration depth and 3m drill diameter, creating 667.7m^3 of drill arisings per pile. **Seabed preparation for export cables** • bedform clearance (or example sandwaves); and • 35,000m^3 of sandwave clearance from the offshore export cable.	

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
		Installation activities for export cables • Jet trenching up to 5 offshore export cable trenches, with trench dimensions of 30m wide, 2m deep, along 140km offshore export cable corridor length. **Landfall installation activities** • 8 HDD cable bore exit pits and ducts with sub-tidal location for punch-out; and • 1,500m HDD duct length.	
	- mortality, injury and behavioural changes resulting from underwater noise, vibration and particle motion.	Refer to Impact C1 and C2.	

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
	- increased risk of introduction and / or spread of marine invasive non-native species (INNS).	Construction window of up to 12 years. It is anticipated that approximately 10 vessels would be on site at any one time during the construction of the Project. It is estimated that approximately 3,838 individual vessel transits would be required during the construction of the Project. **Total volume of introduced hard substrates: 2,399,000m^3** • 225 WTGs; • 1,122,000m^3 of rock for array cable protection; • 500m^3 scour protection per offshore substation platform, total 2,000m^3 for four offshore substations; • 500m^3 scour protection per RCP, total 1,000m^3 for two RCPs; • 140km offshore export cable with 1,155,000m^3 of cable protection; and • 28 cable crossings per cable trench (140 cable crossings total) total 850m^3 x 140 = 119,000m^3 of cable protection. **Total introduced hard substrate = 2,399,000m^3**.	Vessel movements associated with the construction of the Project can lead to an increased risk of introduction or spread of marine INNS. These parameters are considered the worst-case in terms of vessel movements. This scenario represents the maximum area of hard substrate introduced that could be introduced on the seabed. Hard substrates offer ideal settlement surfaces for species that are typically absent from soft sediment environment. The introduction of hard substrate can act as a stepping stone for the spread of INNS, particularly those that are opportunistic and thrive on artificial substrate. The maximum design scenario is used to ensure a precautionary approach in assessing risk of introduction or spread of INNS, capturing the worst-case extent of habitat alteration and associated biosecurity concerns.
Southern Trench NCMPA Quaternary of Scotland	Impact C4: Potential impacts to seabed morphology.	**Seabed preparation for wind turbine anchors** • 225 WTGs; • pre-lay grapnel run across entire length or all cables; • boulder clearance campaign; and • bedform clearance (e.g. sandwaves). **Seabed preparation for array cables** • pre-lay grapnel run across entire length or all cables; • boulder clearance campaign; and • bedform clearance (e.g. sandwaves).	The maximum design scenario corresponds to (a combination of) the greatest amount of material disturbed and the greatest geographical extent of the impact. **Seabed preparation** Sandwave clearance activities may be undertaken using a range of techniques – MFE and suction hopper dredging. Dredged spoil release creates disposal mounds through the active phase of the plume,

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
		Installation activities for array cables • jet trenching up to 680km of array cables with trench dimensions of 30m wide, 2m deep; and **Seabed preparation for SDCs:** • 45 SDCs; • boulder clearance campaign; and • bedform clearance (e.g. sandwaves). **Seabed preparation for subsea substation:** • 4 subsea substations; • boulder clearance campaign; and • bedform clearance (e.g. sandwaves). **Seabed preparation for offshore substations:** • 4 offshore substations; • boulder clearance campaign; and • bedform clearance (e.g. sandwaves) **Piling for substation foundation installation:** • Refer to Impact C1. **Seabed preparation for export cables** • pre-lay grapnel run across entire length or all cables; • boulder clearance campaign; and • bedform clearance (e.g. sandwaves). **Installation activities for export cables:** • jet trenching up to 5 export cable trenches, with trench dimensions of 30m wide, 2m deep, along 140km offshore export cable corridor length. 5 x (140km x 0.03km) = 21km^2); and • rock placement used for cable protection with dimensions of 2m high and 7m wide.	assumed to be 90% of the material released.

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
		Landfall installation activities • 8 horizontal directional drill (HDD) cable bore exit pits and ducts with sub-tidal location for punch-out; and • 1,500m HDD duct length. Installation duration will be: • up to 1 year for Phase 1; • up to 1 year for Phase 2; and • up to 1 year for Phase 3.	
Turbot Bank NCMPA Sandeels	Impact C5: Injury or disturbance from underwater noise and vibration.	Refer to Impact C1 and C2.	Impulsive noise created during pile driving for the installation of the WTG anchors; offshore substation and RCP jacket foundations; and UXO have the potential to result in has the potential to cause injury or disturbance in fish receptors. This can affect migratory routes spawning, eggs, foraging, and larvae. The scenario with the maximum number of piling days represents the temporal worst-case. The type of construction activity and duration of construction represents the maximum potential for UWN from other construction activities. UXO clearance will be licensed under a separate marine licence but is included in the EIA Report for illustrative purposes.

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
O&M			
Southern Trench NCMPA Minke whale	Impact O1: Changes to prey availability and distribution from long-term habitat loss	Each phase will be operational for 35 years. **WTGs: 270,000m^2** • 8 anchors per floating unit, total number of anchors 8 x 225 =1,800; • worst-case assumed: drag embedment anchor; and • maximum total area of seabed covered by 1 anchor: 12m x 12.5m = 150m^2, total 270,000m^2 for 1,800 anchors. **Array cables: 2.04km^2** • 225 array cables; • secondary protection rock placement, localised: concrete mattresses and bags; • 680km total array cable length; • 136km length of unburied cable; • conservative cable corridor swathe width of 15m assumed for areas of cable protection, and; • maximum total area of seabed covered by cable protection based on conservative 136km x 0.015km = 2.04km^2. **SDCs: 47,880m^2** • 45 SDCs; • assumed worst-case is gravity base foundations; and • dimensions of SDC including cable protection: 38m x 28m, footprint is 1,064m^2 and total 47,880m^2 for 45 SDCs. **Offshore substations: 39,600m^2** • 4 offshore substations with jacket foundations secured by suction caisson; • maximum seabed footprint (including scour protection): 110m x 90m, footprint is 9,900m^2 and total 39,600m^2 for 4 offshore substations.	The maximum design scenario is defined by the maximum area of seabed lost by the footprint of the anchors on the seabed, offshore substation and RCP jacket foundations, SDCs, scour and cable protection for offshore cables (array and export), and cable crossings. Offshore substations are considered the worst-case design scenario over subsea substations due to having the largest seabed footprint. Worst-case design scenario footprints for cable protection have been determined based on: • 20% of total cable length requiring cable protection for the array cables; and • 20% of total cable trench length requiring cable protection for the offshore export cables.

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
		Offshore export cables: 10.5km^2 • 5 offshore export cable trenches; • 140km offshore grid transmission rout length per trench; • conservative cable corridor swathe width of 15m assumed for areas of cable protection, and; • maximum seabed footprint (including cable protection): 140km x 0.015km = 2.1km^2 per cable trench and total 10.5km^2 for 5 cable trenches; **Cable crossings: 231,000m^2** • 6 cable crossings per trench within the OAA with construction footprint of 150m x 11m = 1,650m^2, total of 49,500m^2 for 6 cable crossings for 5 cable trenches; and • 22 cable crossings along the offshore export cable corridor with construction footprint of 150m x 11m = 1,650m^2, total of 181,500m^2 for 22 cable crossings for 5 cable trenches. **RCPs: 8,450m^2** • 2 RCPs with jacket foundations secured by suction caisson; • maximum seabed footprint (including scour protection): 65m x 65m = 4,225m^2 and total 8,450m^2. **Maximum long-term habitat loss = 13,136,930m^2 (13.137km^2).**	
Southern Trench NCMPA Quaternary of Scotland	Impact O2: Impacts to seabed morphology.	**Cable protection** • 1,122,000m^3 of array cable protection volume (rock placement); • 1,155,000m^3 of export cable protection volume for five trenches (rock placement); • 20% of export cable length requires protection; and • 2m high and 7m wide cable protection. **Cable crossings:** • Up to 28 cable crossings (per cable trench), total of 119,000m^3 cable protection.	Direct changes to seabed morphology through the presence of cable protection. Secondary scour will be highly localised and within the maximum design scenario assessed for primary scour.

Protected feature	Activity / impact	Maximum design scenario parameters	Justification
		Operation and maintenance of: • 45 SDCs with dimensions of 18m x 8m x 5m; and • 4 subsea substations with dimensions of 22m x 20m x 16m.	
Decommissioning			
Southern Trench NCMPA Minke whale	Impact D1: Changes to prey availability.	The worst-case design scenario will be equal to (or less than) that of the construction stage (Refer to Impact C3).	Refer to Impact C3.
Southern Trench NCMPA Quaternary of Scotland	Impact D2: Impacts to seabed morphology.	The approach for decommissioning is yet to be determined, however, for the purposes of this maximum design scenario total removal of all infrastructure including buried cables and cable protection has been assumed.	The coastal and seabed morphology could evolve to a new equilibrium state including the influence and presence of infrastructure. Removal of structures that have been in place for a long time could lead to changes in morphodynamics.

5.4.4 Feature sensitivity assessment

5.4.4.1 The key sensitivities of the designated features of the Southern Trench NCMPA screened into the assessment are summarised in the Conservation and Management Advice for the Southern Trench NCMPA (NatureScot, 2025).

Minke whale

5.4.4.2 Minke whales are considered to be sensitive to entanglement in static fishing gear and incidental bycatch (Leaper *et al.,* 2022). Entanglement represents the single most frequently documented cause of mortality for minke whales in Scottish waters (based on Scottish Marine Animal Stranding Scheme data 2012-2017). There is evidence of minke whales with lacerations/scars associated with entanglement (Northridge *et al*., 2010), and a number of dead stranded animals have been reported within the Moray Firth having physical scarring and lesions associated with entanglement (SMASS, 2025). Additionally, minke whales are known to be sensitive to underwater noise, particularly from pulse sources that overlap with minke whale hearing sensitivities, which is estimated to be 7 hertz (Hz) to 35kHz, with a peak sensitivity between 200–19 kHz (Southall *et al.,* 2019). There is potential for auditory injury, disturbance and displacement from foraging areas as a result of activities involving underwater noise at frequencies that overlap with the whales' hearing range.

5.4.4.3 Minke whales are also considered to be sensitive to collisions with vessels. There is evidence of minke whales with injuries that could have been caused by collision with boat propellers, and blunt trauma injuries associated with collision with the bows of vessels (Laist *et al*., 2001). Minke whales may be sensitive to water pollution through exposure to bioaccumulated contaminants. Whilst there is little information available regarding the recovery potential of minke whales to such pressures, the risk of exposure to these pressures can be minimised through the adoption of best practice and relevant mitigation (NatureScot, 2025).

Quaternary of Scotland

5.4.4.4 Subglacial tunnel valleys are highly resistant to human activities (having been formed in bedrock by erosion under ice sheets) and are either considered not sensitive or to have a low sensitivity to pressures arising from human activities. In the vast majority of instances, most pressures associated with human activity in the marine environment will not be sufficient to impact geological and geomorphological seabed features (Brooks, 2013). Moraines are relict features that are composed of glacial till. Their resistance to erosion is highly variable and depends upon the composition and level of consolidation of the till. Overall, moraines are considered to have a medium sensitivity to sub-surface abrasion and changes in tidal flow, and a high sensitivity to physical removal (NatureScot, 2025).

5.5 Main Assessment of potential effects – Project alone

5.5.1 Overview

5.5.1.1 This section presents the main assessment of the effects of the construction, O&M and decommissioning of the Project on the protected features of the Southern Trench NCMPA.

5.5.1.2 Each of the impacts identified in the NCMPA Screening of protected features are discussed individually in the following sections and within each assessment, the effects on attributes and targets of the relevant protected features, and subsequently on the conservation objectives, are considered, using the best available scientific evidence to support the conclusions made.

5.5.2 Construction stage – minke whale

5.5.2.1 Impacts from underwater noise generating activities have the potential to hinder the achievement of conservation objectives CO1 (species is conserved) and CO2 (continued access by the species to resources provided by the NCMPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds).

5.5.2.2 During the construction stage of the Project, several activities have the potential to generate underwater noise, which may result in acoustic impacts (including injury and/or disturbance to minke whale).

5.5.2.3 Underwater noise has the potential to hinder COs one and two (see **Table 5.2**) The following activities within the Offshore Red Line Boundary have been identified as having the potential to result in direct injury and/or disturbance to minke whales as a result of underwater noise:

- impact piling; and
- UXO.

5.5.2.4 The impact of human-made underwater noise on minke whales varies based on the noise frequency, intensity and duration, as well as the baseline environment and whale sensitivity. Sound can be categorised into impulsive and non-impulsive noise types. Non-impulsive noise can be defined as a steady-state noise that does not necessarily have a long duration (e.g. vibropiling, drilling). Impulsive noise can be defined as a sound with a high peak sound pressure, short duration, fast rise-time and a broad frequency content at the source (e.g. seismic airguns, explosives, impact piling). These differences are important to consider regarding the potential for auditory injury, as impulsive noise is more injurious than non-impulsive noise.

5.5.2.5 Categorisation of a noise as impulsive or non-impulsive can be challenging. This is particularly the case if a sound is travelling over long distances. For example, if an impulsive sound propagates through an environment, the energy within the sound wave will scatter and dissipate, and it becomes less impulsive with distance from the noise source. This is important to consider regarding auditory injury and impact range calculations, as noise will become less injurious if it becomes less impulsive.

5.5.2.6 Research to define the range-dependent transition from impulsive and non-impulsive noise (see Martin *et al.,* 2020) has been a significant field of study. Although the situation is complex, Hastie *et al.,* (2019) concluded that an impulsive sound can be considered effectively non-impulsive at 3.5km from the source on some metrics.

5.5.2.7 However, the recent study by Matei *et al.,* (2024) concludes that there is still insufficient evidence to clearly define a transition point suitable for an assessment such as this, although it is reasonable to presume there is a fully impulsive region close to the source, a fully non-impulsive region at some greater distance, and a transition region in between. The paper makes it clear that there is a substantial reduction in impulsiveness within the first 5km. Due to the uncertainty in identifying a transition point, no presumption of a change in impulsiveness has been made in the **Volume 3, Appendix 8.1: Underwater Noise Modelling Assessment** of the **EIA Report**, although the sound should be considered not fully impulsive where PTS ranges are calculated above 5km. Results in respect of both impulsive and non-impulsive criteria have been presented for piling noise sources.

5.5.2.8 The impact on minke whales depends on their hearing sensitivity. As low frequency cetaceans, minke whales have an estimated hearing range of 7Hz–35KHz, with greatest sensitivity between 200Hz and 19kHz (Southall *et al.,* 2019). The impact range for underwater noise can be assessed using different acoustic metrics, notably peak sound pressure level ($L_{p,pk}$) and sound exposure level ($L_{Ep,t}$). $L_{p,pk}$ represents the maximum instantaneous pressure of a sound wave and is primarily used to assess the risk of physical injury to marine mammals, such as auditory damage. In contrast, $L_{Ep,t}$ quantifies the total acoustic energy received over time and is more relevant for assessing cumulative effects, including behavioural disturbance and temporary hearing loss. Consequently, impact ranges based on $L_{Ep,t}$ are typically larger than those based on $L_{p,pk}$, reflecting the broader spatial extent over which non-injurious but ecologically significant effects may occur. PTS is irreversible hearing loss caused either by a single high amplitude peak sound (instantaneous PTS) or cumulative sound exposure (cumulative PTS), with thresholds defined for marine mammals per Southall *et al.,* (2019).

5.5.2.9 Underwater noise can lead to behavioural responses, which may differ depending on various factors such as species, individual characteristics, location, season, and construction activity. To evaluate the level of disturbance caused by underwater noise from construction activities, a range of methods has been used to assess injury, following the best available evidence and guidelines (e.g. PTS onset ranges using Southall *et al.,* (2019) for impact piling).

5.5.2.10 The assessment of potential effects from underwater noise on minke whale is supported by the outputs of **Volume 3, Appendix 8.1** of the **EIA Report**. The level of underwater noise from impact piling during construction was estimated using the INSPIRE semi-empirical underwater noise model. This approach considers a wide variety of input parameters including bathymetry, hammer blow energy, strike rate, and the flee speed of the receptor. See **Volume 3, Appendix 8.1** of the **EIA Report** for detailed methodology. The modelling results were analysed in terms of relevant noise metrics and criteria to assess the effects of impact piling noise on minke whale (Southall *et al.,* 2019).

Impact C1: Auditory injury from increased underwater noise during installation of driven piles

Sensitivity of the receptor

5.5.2.11 Of the underwater noise sources considered in **Volume 3, Appendix 8.1** of the **EIA Report**, the noise source of most importance is impact piling for driven piles for the offshore substations and reactive power compensation platform (RCP) foundations, and for driven pile anchors due to the potential noise levels and duration it will present (Bailey *et al.,* 2014). Minke whale is a low frequency cetacean, with a generalised hearing range of 7Hz to 35kHz (Southall *et al.,* (2019). Southall *et al.* (2019) considers the nature of the sound in the context of whether it is an impulsive or non-impulsive source. The impulsive and non-impulsive weighted criteria set out by Southall *et al.,* (2019) for PTS and TTS in low-frequency cetaceans (minke whale), is displayed in **Table 5.4** below.

Table 5.4 Weighted $L_{E,p,24h,wtd}$ and unweighted $L_{p,pk}$ criteria for PTS and TTS in low frequency cetaceans (Southall *et al.*, 2019)

$L_{E,p,24h,wtd}$ (dBre1μPa²s)				$L_{p,pk}$ (dBre1μPa)	
Impulsive		**Non-impulsive**		**Impulsive**	
PTS	TTS	PTS	TTS	PTS	TTS
183	168	199	179	219	213

5.5.2.12 Minke whales are particularly vulnerable to impulsive noise sources such as impact piling due to the overlap between their auditory sensitivity range (approximately 7 Hz to 35 kHz) and the dominant frequencies produced during piling activities. Southall *et al.*, (2019) identify impact piling as a high-risk source of acoustic exposure, capable of inducing both TTS and PTS depending on proximity and exposure duration. Behavioural responses to piling noise in minke whales include avoidance, increased swim speed, and directional movement, which can disrupt foraging, migration, and social behaviours. The sudden onset and high intensity of impulsive sounds make them more likely to elicit acute stress responses and displacement from critical habitats. Despite this, piling-related PTS is unlikely to significantly affect the survival or reproduction rates of minke whales, as piling noise only a small portion of piling noise overlaps with minke whale hearing frequencies. Minke whales are considered highly adaptable and have a reasonable tolerable to PTS and therefore have a sensitivity of **low** to PTS from underwater noise during pile driving.

Magnitude of impact

Impact piling modelling

5.5.2.13 Two impact piling scenarios have been considered in this study, both involving 3m diameter piles installed with a maximum blow energy of 3,500kJ. The offshore substation and RCP driven piles measure 95m in length and the driven pile anchors measure 30m in length, with all the other parameters for the piling scenarios (blow energies, strike rates) being the same[5].

5.5.2.14 It should also be noted that the results from the modelling should be considered conservative as maximum design parameters and maximum design assumptions have been selected for: piling hammer blow energies, soft start, hammer energy ramp up, and strike rate, total duration of piling, and receptor swim speeds. When combined with the maximum design assumptions in parameter selection, modelled results will remain precautionary.

5.5.2.15 Modelling for driven pile installation has been undertaken at six representative locations covering the OAA and export cable corridor, giving a spread of water depths, distances to shore and bathymetry stretching into deeper water. Four offshore substation locations have been selected at the corners of the OAA along with two RCP locations along the cable corridor. The northerly or the two RCP locations was subsequently discounted during the Project's design evolution process due to electrical engineering reasons, so the results of

[5] A summary of the soft start and ramp up input parameters for the impact piling are detailed in Table 3.2, source levels are described in Table 3.3, predicted noise levels in Table 3.4, found in **Volume 3, Appendix 8.1: Underwater Noise Modelling Assessment** of the **EIA Report**.

the modelling for the northerly RCP location are not considered in this NCMPA Assessment. Further explanation for why the northerly RCP location was discounted are provided in **Volume 3, Appendix 8.1** of the **EIA Report**.

5.5.2.16 Drive pile anchors have been considered at the deepest, and therefore maximum design scenario, offshore substation location at the north corner. In a 24-hour period, it is expected that a maximum of two piles can be sequentially installed from the same piling vessel. This has been taken into consideration for the modelling. Where multiple sequential piles are modelled, no break has been assumed between each one as a maximum design scenario.

5.5.2.17 Modelling was carried out using both weighted and unweighted criteria. Unweighted refers to raw acoustic measurements without species-specific adjustments. Weighted criteria are adjusted using auditory weighting functions that reflect the hearing sensitivity of different species. The weighted thresholds are used to model zones of impact and determine mitigation needs.

Single piles

5.5.2.18 Single location modelling was undertaken to determine the maximum weighted $L_{E,p,24h,wtd}$ impact ranges for a single pile. The largest impact ranges are predicted using the impulsive $L_{E,p,24h,wtd}$ criteria at the N and SE corners for offshore substation driven piles with maximum PTS range of 20 km (see **Table 5.5**). The PTS impact range from the RCP south location overlap with the Southern Trench NCMPA. The PTS impact ranges from single piles at the remaining driven piling and driven pile anchor locations do not overlap with the NCMPA.

Table 5.5 Summary of the weighted LE,p,24h,wtd and unweighted Lp.pk impulsive noise impact ranges for minke whale (Southall *et al.,* 2019) for single driven piles

<table>
<tr><th rowspan="2">Modelling locations</th><th>PTS</th><th>TTS</th><th>PTS</th><th>TTS</th></tr>
<tr><th colspan="4">Maximum range</th></tr>
<tr><td>Offshore substation southeast corner</td><td>20km</td><td>91km</td><td rowspan="2">50m</td><td rowspan="2">120m</td></tr>
<tr><td>Offshore substation southwest corner</td><td>19km</td><td>86km</td></tr>
<tr><td>Offshore substation / drive pile anchor north corner</td><td>20km / 18km</td><td>91km / 87km</td><td>50m / <50m</td><td>120m / 100m</td></tr>
<tr><td>Offshore substation west corner</td><td>19km</td><td>84km</td><td>50m</td><td>120m</td></tr>
<tr><td>RCP south location</td><td>17km</td><td>75km</td><td><50m</td><td>120m</td></tr>
</table>

Two sequentially installed piles

5.5.2.19 The modelled PTS impact ranges for two sequentially installed piles extend into the area of the Southern Trench NCMPA as detailed in **Volume 3, Appendix 8.1** of the **EIA Report**. The closest piling location modelled is the RCP south location (57.7363°N, 1.2687°W). The maximum weighted impact range from this location is 21km for PTS (**Table 5.6**), extending into the area of the Southern Trench NCMPA. Whilst the largest impact ranges are predicted using the impulsive $L_{E,p,24h,wtd}$ criteria at the north corner for offshore substation driven piles with maximum PTS range of 25 km. However, the northern corner is >80km from the Southern Trench NCMPA. The PTS impact ranges from two sequential piles at the remaining driven piling and driven pile anchor locations do not overlap with the Southern Trench NCMPA.

Table 5.6 Summary of the weighted $L_{E,p,24h,wtd}$ impulsive noise impact ranges for minke whale (Southall *et al.*, 2019) for two sequentially installed driven piles

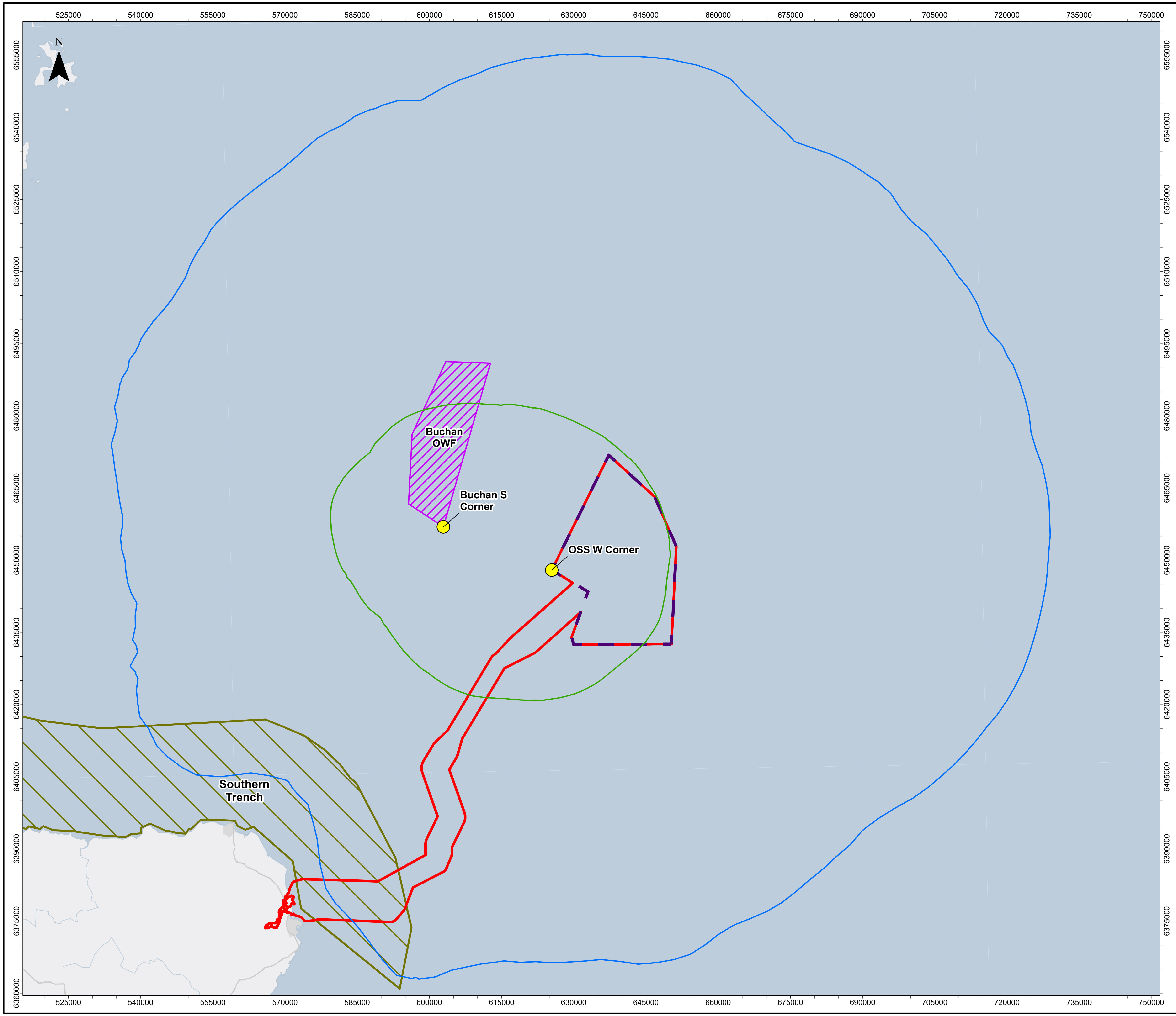
Modelling locations	PTS	TTS
	Maximum range	
Offshore substation southeast corner	24km	101km
Offshore substation southwest corner	22km	97km
Offshore substation / drive pile anchor north corner	25km / 22km	101km / 97km
Offshore substation west corner	22km	95km
RCP south location	21km	84km

Multiple location modelling

5.5.2.20 Piling from multiple sources can increase impact ranges significantly as it introduces additional noise energy into the water column; in this case double the energy from twice the number of pile strikes. This results in higher cumulative noise exposures. Multiple location modelling was undertaken to investigate the potential impacts of simultaneous piling at multiple separated locations. The modelled scenario was chosen as a maximum design scenario to provide the greatest geographical spread of noise sources that would lead to the greatest impact range contours. The two scenarios assessed each considered two sequentially installed piles. This scenario includes piling of the offshore substation foundations concurrently with installation of driven pile anchors in the north of the OAA.

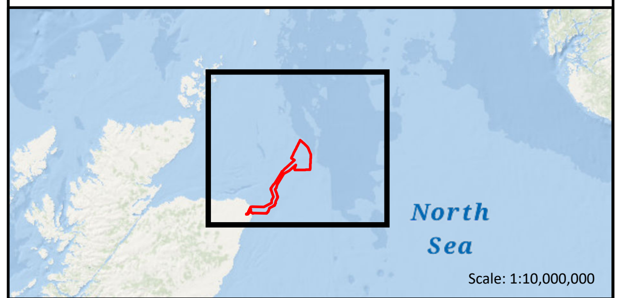
5.5.2.21 The results indicate that for fleeing animals the maximum impact areas, cover 31,000km^2 for TTS and 4,100km^2 for PTS based on the impulsive $L_{E,p,24h,wtd}$ criteria for minke whales (Southall *et al.* 2019). See **Figure 4** below for the visualised impact range from **Volume 3, Appendix 8.1** of the **EIA Report**. The PTS impact range does not overlap with the Southern Trench NCMPA.

5.5.2.22 For the second scenario, the modelling considered the potential for impact piling to occur for the MarramWind Offshore Wind Farm simultaneously with impact piling for the nearby Buchan Offshore Wind Farm. The array areas of the two projects are located approximately 24km apart at their nearest points and have potential for concurrent construction programmes. The modelling determined that the in-combination impacts of the concurrent installation of offshore substation foundations at the west corner of the Project and the south corner of the Buchan Offshore Wind Farm for minke whale using the impulsive Southall *et al.* (2019) $L_{E,p,24h,wtd}$ criteria, are up to 28,000km^2 for TTS from impulsive sound for minke whale, and up to 3,400km^2 for PTS for impulsive noise for minke whales. See **Figure 5** below for the visualised impact range from **Volume 3, Appendix 8.1** of the **EIA Report**. The PTS impact range does not overlap with the Southern Trench NCMPA.



Red Line Boundary
Option Agreement Area
Nature Conservation Marine Protected Area (NCMPA) - Southern Trench
Buchan array area
Marram OSS W x2 + Buchan S x2 LF 168dB SELcum (Flee 2,1)
Marram OSS W x2 + Buchan S x2 LF 183dB SELcum (Flee 2,1)
MarramWind+Buchan concurrent modelling locations

0 10 20 30 40 Kilometres



	dd/mm/yyyy	--	--	--	--
2	14/10/2025	EH	LT	MR	LG
1	25/09/2025	EH	LT	MR	LG
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

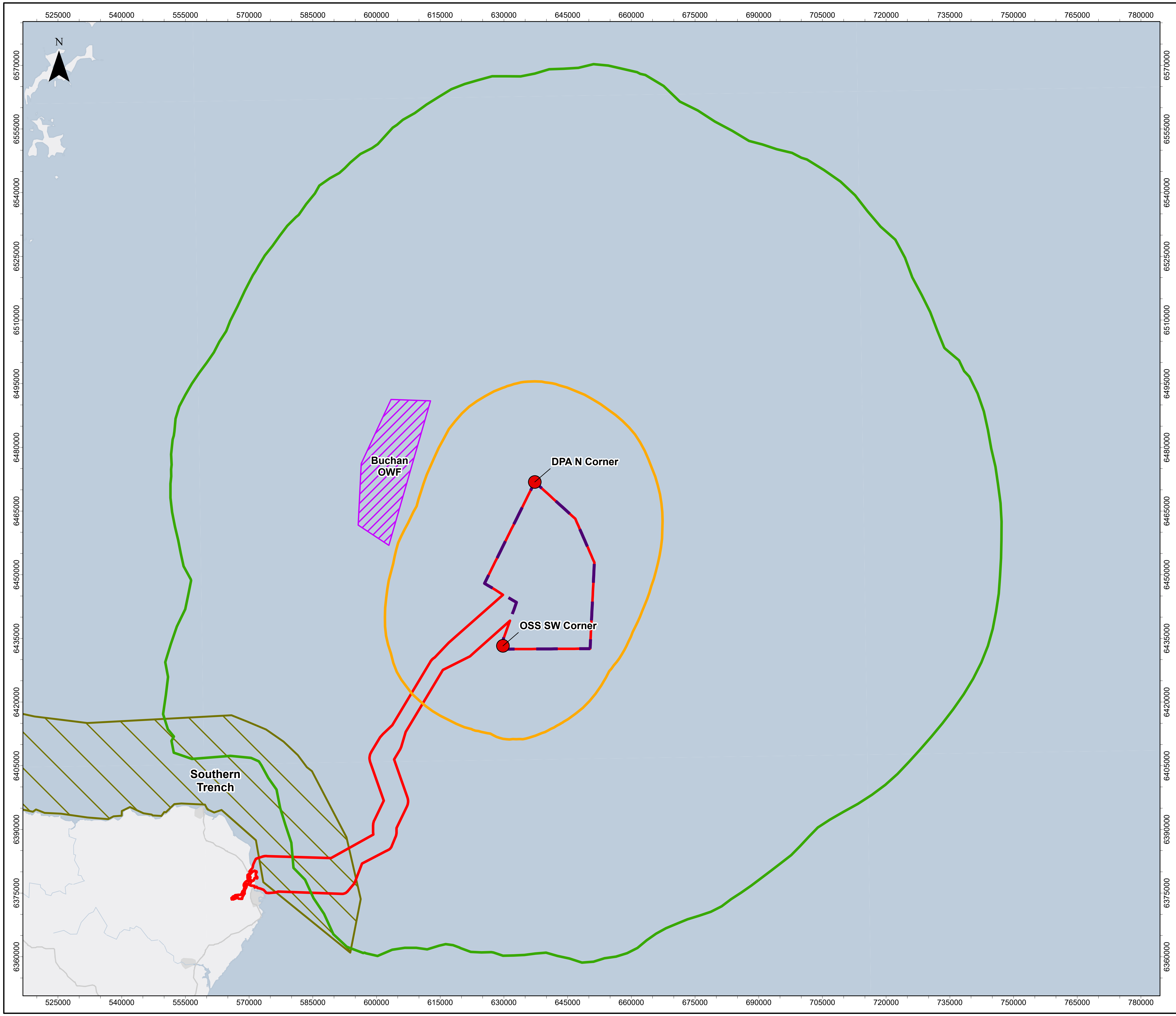
WSP DRAWING NUMBER	808368-WEIS-IA-I8-FG-O7-65733		
MarramWind DRAWING NUMBER	MAR-GEN-ENV-MAP-WSP-000483		
DATUM	ETRS 89	PROJECTION	UTM Zone 30N
SCALE	1:750,000	PAGE SIZE	A3

PROJECT TITLE
MarramWind Offshore Wind Farm

DRAWING TITLE
Figure 4 In-combination impact areas of concurrent piling of OSS foundations and driven pile anchors for fleeing LF cetaceans using the Southall et al., (2019) criteria
Nature Conservation Marine Protected Areas Report

NOT TO BE USED FOR NAVIGATION

wsp MarramWind



Red Line Boundary

Option Agreement Area

Nature Conservation Marine Protected Area (NCMPA) - Southern Trench

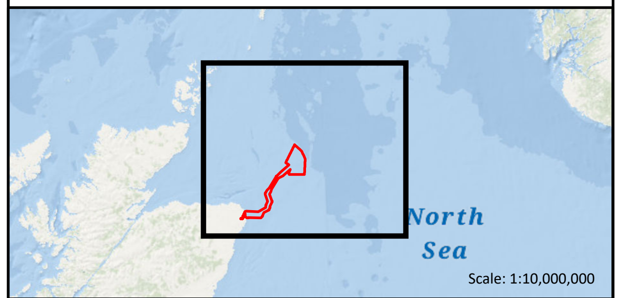
Buchan array area

Concurrent modelling locations

Marram OSS SW x2 + Marram DPA N x2 LF 183dB SELcum (Flee 2,1)

Marram OSS SW x2 + Marram DPA N x2 LF 168dB SELcum (Flee 2,1)

0 10 20 30 40 Kilometres



	dd/mm/yyyy	--	--	--	--
2	14/10/2025	EH	LT	MR	LG
1	25/09/2025	EH	LT	MR	LG
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

WSP DRAWING NUMBER 808368-WEIS-IA-I8-FG-O7-48182

MarramWind DRAWING NUMBER MAR-GEN-ENV-MAP-WSP-000484

DATUM	ETRS 89	PROJECTION	UTM Zone 30N
SCALE	1:850,000	PAGE SIZE	A3

PROJECT TITLE
MarramWind Offshore Wind Farm

DRAWING TITLE
Figure 5 Contour plot showing the in-combination impacts of concurrent installation of offshore substation foundations and piling Buchan for fleeing LF cetaceans using the Southall et al., (2019) criteria
Nature Conservation Marine Protected Areas Report

NOT TO BE USED FOR NAVIGATION

wsp MarramWind

Impact piling conclusion

5.5.2.23 Data on minke whales within the Offshore Red Line Boundary indicates the density ranges between 0.04-0.05 individuals per km^2 (see **Table 5.1**). The maximum modelled instantaneous PTS-onset impact range for driven piling is less than 50m for all modelled locations (<0.01 km²), equating to less than one individual experiencing PTS, which is <0.01% of the population within the Celtic and Greater North Sea MU. Taking the modelling into account and considering that it is likely to be highly conservative, as well as the potential effects of injury and disturbance to minke whale within the Southern Trench NCMPA from both potential PTS and TTS impacts, it is precautionary to assess the magnitude of impact on minke whales as **low** as a result of impact piling.

Potential to hinder conservation objectives

5.5.2.24 Based on the underwater noise modelling and the assessment of impact ranges as a result of impact piling, impact piling has the potential to cause **Negligible** (**Not Significant**) effects and therefore is unlikely to hinder the achievement of the conservation objectives (other than insignificantly).

Impact C2: Auditory injury from unexploded ordnance clearance

5.5.2.25 There is a possibility that UXO may exist within the Offshore Redline Boundary, which would need to be cleared before construction can begin.

5.5.2.26 A maximum design scenario assessment of the effects of UXO clearance has been undertaken using conservative parameters and a range of explosive sizes. Low-order clearance techniques (deflagration) are the preferred and most likely option, though high-order (explosive) clearance is considered as an eventuality. The full methodology and input parameters are described in **Volume 3, Appendix 8.1** of the **EIA Report**.

Sensitivity of the receptor

5.5.2.27 As a low-frequency cetacean, minke whale are vulnerable to noise, particularly that associated with high-order detonations. UXO clearance can produce intense acoustic pulses capable of causing auditory injury or behavioural disturbance. Modelling assessments indicate that high-order detonations may result in PTS at distances up to 12km, although this is considered precautionary and based on maximum design scenario assumptions. Low-order techniques such as deflagration are preferred and significantly reduce the risk of injury. Based on current evidence and guidance from JNCC and Southall *et al.,* (2019), minke whales are assessed as having **medium** sensitivity to UXO clearance, reflecting their limited tolerance to noise, prey disturbance, and vessel movements.

Magnitude of impact

5.5.2.28 The ranges of impacts for UXO detonation on low frequency cetaceans are presented in **Table 5.7**, considering various charge weights and impact criteria. A UXO detonation source is defined as a single pulse, and as such the $L_{E,p}$ criteria from Southall *et al.,* (2019) have been given as a single pulse value, and fleeing animal assumptions do not apply. Although the impact ranges are large, the duration the noise is present must also be considered. For the detonation of a UXO, each explosion is a single noise event, compared to the multiple pulse nature and longer durations of impact piling.

5.5.2.29 The maximum PTS ranges calculated for the largest high-order UXO clearance is 2.7km for minke whale when considering the $L_{p,pk}$ criteria. For $L_{E,p}$ criteria, the largest PTS range is calculated for minke whale with a predicted impact range of 12 km using the impulsive noise criteria. This assumes no degradation of the UXO and no smoothing of the pulse over distance, which is very precautionary. Although an assumption of non-pulse could underestimate the potential impact (Martin *et al.,* 2020) (the equivalent range based on low-frequency (LF) cetacean non-pulse criteria is 750 m), it is likely that the long-range smoothing of the pulse peak would reduce its potential harm and the maximum 'impulsive' range for all species is precautionary. Given the conservative nature of the modelling, and duration the of the noise (a single noise event), the magnitude of impact as a result of UXO clearance on minke whales, is assessed as **low**.

Table 5.7 Summary of PTS and TTS impact ranges for UXO detonation using the impulsive $L_{p,pk}$, and $L_{E,p}$ (single pulse), and non-impulsive $L_{E,p}$ (single pulse) noise criteria from Southall *et al*., (2019) for low frequency cetaceans (minke whale)

Southall *et al*., (2019)	**PTS (impulsive)** $L_{p,pk}$	**TTS (impulsive)** $L_{p,pk}$	**PTS (impulsive)** $L_{E,p}$ (single pulse)	**TSS (impulsive)** $L_{E,p}$ (single pulse)	**PTS (non-impulsive)** $L_{E,p}$ (single pulse)	**TTS (non-impulsive)** $L_{E,p}$ (single pulse)
	LF 219dB	**LF 213dB**	**183dB**	**168dB**	**199dB**	**179dB**
Low-order (0.25kg)	170m	320m	230m	3.2km	< 50m	460m
25kg (+donor)	820m	1.5km	2.2km	29km	130m	4.4km
55kg (+donor)	1.0km	1.9km	3.2km	41km	190m	6.4km
120kg (+donor)	1.3km	2.5km	4.7km	57km	280m	9.4km
240kg (+donor)	1.7km	3.2km	6.5km	76km	390m	13km
525kg (+donor)	2.2km	4.1km	9.5km	100km	570m	18km
698kg (+donor)	2.4km	4.5km	10km	110km	660m	21km
750kg (+donor)	2.5km	4.6km	11km	110km	680m	22km
907kg (+donor)[6]	2.7km	4.9km	12km	120km	750m	24km

Potential to hinder conservation objectives

5.5.2.30 Based on the underwater noise modelling and the assessment of impact ranges as a result UXO clearance, UXO clearance has the potential to cause **Minor** (**Not Significant**) effects and therefore is unlikely to hinder the achievement of the conservation objectives (other than insignificantly).

[6] This measurement refers to the mass of explosive material used in a high-order detonation scenario, with an additional donor charge included to ensure full detonation. The donor charge is a secondary explosive charge used to initiate or support the detonation of the primary charge.

Impact C3: Indirect effects via changes in prey availability

5.5.2.31 Indirect effects via changes in prey availability have the potential to impact upon CO2 and CO2. (CO3: extent and distribution of any supporting feature and structure and function of any supporting feature, including any associated processes supporting the species. CO2: continued access by the species to resources provided by the NCMPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds, see **Table 5.2**).

5.5.2.32 A key reason for the seasonal aggregation of minke whale within the Southern Trench NCMPA, and therefore their designation under the NCMPA, is the presence of productive foraging grounds, with an abundance of minke whale prey species including herring and sandeel. The oceanographic conditions at the Buchan Front support enhanced biological productivity and are likely to be important for both sandeels (Engelhard *et al.,* 2008) and herring, that minke whale feed on. Herring distributions are also correlated with zooplankton rich waters associated with frontal zones in the northern North Sea. Studies in the southern outer Moray Firth found that minke whale distribution was positively correlated with areas of sandy gravel sediments, which represent suitable sandeel habitat (Robinson *et al.,* 2009). Activities with the potential to cause degradation of the seabed habitat supporting these species, or direct impacts to these prey species, may result in the local depletion of these species, ultimately affecting the minke whale using the site (NatureScot, 2025).

5.5.2.33 During construction, there is the potential for changes to prey on typical minke whale prey species. Construction impacts with the potential to affect prey species include increased underwater noise, habitat loss or disturbance, localised increases in suspended sediment concentration and smothering, changes in water quality, changes to commercial fishing pressures, and colonisation of hard structures by invasive species (see **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report** for the assessment of impacts on fish).

5.5.2.34 Should the distribution and availability of minke whale prey species change as a result of these impacts, there could be secondary effects on the foraging of minke whales within the NCMPA. Typical prey species that could be impacted by the construction activities include, sandeel, herring, sprat, whiting and cod.

Sensitivity of the receptor

5.5.2.35 Minke whales show seasonal site fidelity to different feeding grounds, and therefore, their distribution and prey preference is seasonally dependent. Studies have shown that in springtime, minke whales are predominantly found over gravel/sand seabed sediments, aligning with the distribution of sandeels, whilst in July/August they shift the location to pre-spawning herring habitat. The shifts in prey distribution and abundance, therefore, govern the distribution of minke whale (Macleod *et al*., 2004).

5.5.2.36 The low energetic costs of swimming in minke whales and their ability to switch between different prey according to their seasonal availability, indicates that they can readily respond to temporal and spatial changes in pelagic prey concentrations at different scales (Anderwald *et al*., 2012).

5.5.2.37 Given the low energetic cost of swimming in minke whales, and the heterogeneity of their diet, it can be inferred that minke whales are likely to be resilient to short term changes in prey availability and distribution. Despite this resilience, the importance of the Southern Trench NCMPA as a foraging ground for minke whales, means that changes in prey availability and distribution in this location could have greater impacts on minke whales than impacts in other locations. Therefore, minke whales in the Southern Trench NCMPA are assessed as having **low** sensitivity to changes in prey availability and distribution.

Magnitude of impact

5.5.2.38 During the construction of the Project, temporary disturbance and loss of seabed habitats, increased suspended sediment concentrations, and underwater noise may cause localised and short-term impacts on key minke whale prey species, particularly sandeel and herring. These activities may temporarily reduce the availability or accessibility of prey within the Offshore Red Line Boundary. However, this is expected to be concentrated in the southwestern part of the OAA, and outside of the Southern Trench NCMPA. Furthermore, the spatial extent of these impacts is expected to be limited, and the majority of suitable habitat for sandeel and herring will remain unaffected. Both sandeel and herring are expected to recover rapidly following cessation of construction activities, supported by evidence from other offshore wind developments (see **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**). As a result, the magnitude of impact due to changes in prey availability and distribution during construction is **low**. The effects are predicted to be temporary, reversible, and unlikely to result in population-level consequences for minke whales in the Southern Trench NCMPA, therefore assessed as **Negligible** (**Not Significant**).

Potential to hinder conservation objectives

5.5.2.39 The construction of the Project is predicted to result in temporary, localised effects on the distribution and availability of key minke whale prey species, particularly sandeel and herring, through pathways such as seabed disturbance, increased suspended sediment concentrations, and underwater noise. While these activities may coincide with sensitive periods for sandeel and herring in areas of suitable habitat, the overall spatial and temporal overlap is limited, and the majority of suitable habitats for these species remain unaffected. Evidence from other offshore wind developments indicates that both sandeel and herring populations are capable of rapid recovery following cessation of disturbance, provided suitable habitat conditions are restored. Most other prey species are less sensitive due to their mobility and broader habitat use. As a result, although short-term reductions in prey availability and localised displacement may occur, these are not expected to be of a magnitude or duration that would hinder the achievement of CO2 (continued access by minke whales to resources provided by the NCMPA for feeding and other life history functions) or CO3 (maintenance of the extent, distribution, structure, and function of supporting features and processes). The construction stage effects are therefore assessed as **Minor** (**Not Significant**) in the context of the Southern Trench NCMPA's conservation objectives for minke whales.

5.5.3 Construction stage – Quaternary of Scotland

Impact C4: Potential impacts to seabed morphology

5.5.3.1 Subsurface abrasion and removal during construction of the Project could directly disturb or remove Quaternary deposits that underpin the Quaternary of Scotland geodiversity feature of the NCMPA.

5.5.3.2 Cable installation, as well as the installation (and subsequent presence) of cable protection measures, have the potential to impact seabed morphology. This impact will commence when offshore construction begins, increasing incrementally up to the maximum design scenario, which is represented by the fully operational Project. Morphological change arising from the presence of these structures will be no greater than that identified for the O&M stage and, therefore, not considered further here.

5.5.3.3 In addition to the above, some levelling of sandwaves may be necessary during the construction stage, which has the potential to alter the local seabed morphology within the offshore export cable corridor. The levelling of moraines within the Southern Trench NCMPA cannot be ruled out; however, the potential location, footprint and volume of any dredging activity is unknown at this stage.

5.5.3.4 Finally, where dredging is required, material will be disposed of nearby on the seabed. These disposal events may leave mounds which locally change the morphology of the seabed and (depending on the nature of the material and local hydrodynamic setting) may persist in time.

Sensitivity of the receptor

5.5.3.5 The Quaternary deposits within the NCMPA are considered **high** sensitivity due to their scientific importance in reconstructing past glacial and sea-level processes. These features are largely irreplaceable and have limited spatial distribution, making them vulnerable to irreversible damage. The Southern Trench, a key geodiversity feature formed by glacial erosion and meltwater release, exemplifies this sensitivity. Its sub-trenches and associated formations provide critical evidence of past climatic events and geomorphological evolution. Any physical alteration or removal of these deposits could compromise the ability to interpret these processes, particularly if the disturbance affects stratified layers or relict features such as pockmarks, ploughmarks, or tunnel valleys.

Magnitude of impact

Installation of cables

5.5.3.6 Cables may be buried into superficial sediments or more consolidated Quaternary material. Once buried, the cables will not have any potential to impact seabed morphology unless exposed. Should this occur, the maximum depth of scour will be between one and three times the cable diameter (i.e. up to ~1m) and the maximum horizontal extent of any scour effect will be up to 50 times the cable diameter i.e. up to ~15m).

5.5.3.7 In theory, cables may be installed into moraines and tunnel valleys, which are protected geodiversity features within the Southern Trench NCMPA. Based on existing mapping of geodiversity features within the Southern Trench NCMPA (NatureScot, 2025), a moraine feature is understood to be present, located around 10 km to 12 km offshore of the Scotstown landfall, whilst a north to south trending tunnel valley is present around 16km offshore (see Figure 5 in **Volume 3, Appendix 6.3: Marine Geology, Oceanography and Physical Processes Baseline Report** of the **EIA Report**).

5.5.3.8 The designated moraine feature is not covered by the Project-specific survey and is not clearly apparent in the available UKHO 8m bathymetry data. This may relate to the comparatively low-resolution nature of the UKHO bathymetry or, more likely, the low resolution of the feature mapping presented in NatureScot (2025). The tunnel valley is also not resolved in available bathymetric survey data: this may be because the feature is infilled, or it may be due data resolution/ feature mapping accuracy. Regardless, even if moraines and tunnel valleys are found to be present, the localised nature of any works will be small relative to the size and extent of features and overall favourable condition should be maintained, according to the criteria set out in **Volume 1, Chapter 6: Marine Geology, Oceanography, and Physical Processes** of the **EIA Report**.

5.5.3.9 The magnitude of impact to the designated seabed features (moraines and tunnel valleys) resulting from cable trenching activities would be **very low**. This is because although it is recognised that impacts would be permanent, they would be extremely localised and impact only a small proportion of the total footprint of the feature.

Sandwave levelling

5.5.3.10 The magnitude of impact to moraines and tunnel valleys within the Southern Trench NCMPA as a result of any sandwave levelling is also considered to be **very low**. This is because partial removal of sandwaves would not disturb the underlying designated features upon which they would be located. As such, the impact does not threaten the long-term viability of the Southern Trench NCMPA. Please refer to **Volume 1, Chapter 6: Marine Geology, Oceanography, and Physical Processes** of the **EIA Report** for a description of sand wave levelling.

Disposal mounds

5.5.3.11 The magnitude of impact to moraines and tunnel valleys within the Southern Trench NCMPA as a result of any disposal activities is considered to be **very low**. This is because although it is recognised that the presence of a disposal mound on the designated features may be permanent, it would be an extremely localised impact covering a small proportion of the total footprint of the feature.

Potential to hinder conservation objectives

5.5.3.12 The conservation objectives for the Quaternary of Scotland feature include maintaining the integrity and visibility of key geological and geomorphological features that contribute to our understanding of Quaternary processes. Subsurface abrasion or removal could hinder these objectives by degrading or eliminating features that are central to the site's designation. However, effect significance is expected to be **Minor** (**Not Significant**), and there is no potential to hinder the conservation objectives (other than insignificantly).

5.5.4 Operation and maintenance stage – minke whale

Impact O1: Changes to prey availability and distribution from long-term habitat loss

5.5.4.1 Changes to prey availability and distribution from long-term habitat loss have the potential to affect CO2 (continued access by the species to resources provided by the NCMPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds) and CO3 (extent and distribution of any supporting feature and structure and function of any supporting feature, including any associated processes supporting the species (see **Table 5.2**). During the O&M stage of the Project, habitat change will occur primarily through the development of hard substrate communities associated with fixed structures which could affect foraging opportunities for minke whale (Ounanian *et al.,* 2020; Todd *et al.,* 2016). Permanent loss and alteration of seabed habitats due to the placement of seabed structures, scour protection, and cable protection may locally reduce the availability of suitable spawning and foraging grounds for some prey species, particularly sandeel and herring. However, changes to fish abundance and distribution are expected to be minor and highly localised (**Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**).

Sensitivity of the receptor

5.5.4.2 As described in **Section 5.5.2**, minke whales can switch between different prey species in response to availability and distribution. However, this adaptability is in response to natural, seasonal cycles of prey abundance and distribution, and not in response to human induced changes in prey distribution and abundance. A persistent reduction in prey resource could lead to changes in habitat use or displacement from preferred feeding area. The importance of the Southern Trench NCMPA as a seasonal foraging ground for minke whales, means that persistent changes in prey resource would reflect a change in the extent and distribution of the supporting processes of the NCMPA upon which minkes using the site rely, and therefore would represent a conflict with the COs, in particular CO3. However, given the low energetic cost of swimming in minke whales, and the heterogeneity of their diet, it can be inferred that minke whales are likely to be resilient to short term changes in prey availability and distribution. Therefore, minke whales in the Southern Trench NCMPA are assessed as having **very low** sensitivity to changes in prey availability and distribution.

Magnitude of impact

5.5.4.3 During the O&M stage, the permanent loss or alteration of benthic habitats due to the presence of wind turbines and foundations, scour protection, and cable protection may result in a small, localised reduction in suitable spawning and foraging grounds for sandeel and herring. Whilst these changes in habitat may lead to localised reductions in prey abundance, the overall area affected is small relative to the wider region, and most fish species are capable of utilising alternative habitats. In addition, the introduction of artificial hard substrates may alter local fish assemblages, potentially benefit some species while disadvantaging others, but is not expected to significantly reduce the overall availability of minke whale prey. As a result, any changes in fish abundance and distribution are expected to be spatially limited and reversible, with no evidence to suggest that these changes would significantly constrain minke whale access to prey or hinder their ability to meet their energetic requirements within the NCMPA. Consequently, the magnitude of impact on minke whales as a result of changes in prey availability and distribution during the operation of the wind farm is assessed as **low,** with no anticipated long-term or population-level effects on minke whales in the Southern Trench NCMPA

Potential to hinder conservation objectives

5.5.4.4 While there may be minor, localised reductions in prey availability and subtle shifts in distribution, these changes are not expected to hinder the achievement of the conservation objectives of concern (CO3: maintaining the extent, distribution, structure, and function of supporting features and associated processes and CO2: ensuring continued access by minke whales to resources provided by the NCMPA for feeding and other life history functions). The O&M effects on minke whale as a result of changes in prey availability and distribution are therefore assessed as **Negligible** (**Not Significant**) in the context of the Southern Trench NCMPA's conservation objectives for minke whales.

5.5.5 Operation and maintenance stage – Quaternary of Scotland

Impact O2: Potential impacts to seabed morphology

5.5.5.1 Subsurface abrasion and removal during operation of the Project could directly disturb or remove Quaternary deposits that underpin the geodiversity feature of the NCMPA Quaternary of Scotland feature. These deposits, formed during the Pleistocene and Holocene periods, include glacially derived formations such as the Witch Ground, Coal Pit, and Aberdeen Ground, which are present beneath the thin Holocene veneer across the offshore export cable corridor. Given that these formations are often erosion-resistant and structurally complex, disturbance could alter their integrity, stratigraphy, and geomorphological expression.

Sensitivity of the receptor

5.5.5.2 The Quaternary deposits within the NCMPA are considered to be of **high** sensitivity due to their scientific importance in reconstructing past glacial and sea-level processes. These features are largely irreplaceable and have limited spatial distribution, making them vulnerable to irreversible damage. Any physical alteration or removal of these deposits could compromise the ability to interpret these processes, particularly if the disturbance affects stratified layers or relict features such as pockmarks, ploughmarks, or tunnel valleys.

Magnitude of impact

Cable protection

5.5.5.3 The presence of cable protection during the O&M stage has the potential to cause changes to the local seabed level as a result of local flow interaction between the body and surface of the berm, and any near-bed current and wave action. The potential for cable protection to cause larger scale changes to the tidal, wave or sediment transport regimes is very limited, far less than the effects of the floating units and offshore platforms.

5.5.5.4 The purpose of cable protection is to maintain stable cover over the lifetime of the Project. By design, it aims to minimise the risk of scour associated with both the offshore export cables and the protection itself. The maximum berm dimensions (7m base width x 2 m height) result in relatively low angle slopes and a low overall height relative to the water depth, which limits the potential for form-related flow disturbance and scour, even when flows are perpendicular to the berm.

5.5.5.5 Turbulence may become locally elevated in water flowing close to the surface of the berm, which may result in a limited depth and extent of secondary scour (order of a few tens of centimetres deep and up a few metres from the berm). The seabed surface in the scoured area will generally be similar to the surrounding seabed but the texture may coarsen due to preferential winnowing of finer sediment grains.

5.5.5.6 Based on the restricted spatial extent and degree of change to the seabed, the magnitude of impact to designated seabed areas is predicted to be **very low**.

Presence of floating units and offshore platforms

5.5.5.7 On the basis of the discussion of potential changes to tides (set out in Section 6.10.2, of **Volume 1, Chapter 6: Marine geology, Oceanography and Physical Processes**), waves (set out in Section 6.10.3 and Plate 6.1, of **Volume 1, Chapter 6: Marine Geology, Oceanography, and Physical Processes**) and sediment transport (set out in Section 6.10.4 of **Volume 1, Chapter 6: Marine Geology, Oceanography, and Physical Processes** of the **EIA Report**), there are not expected to be any detectable changes to any of these parameters within the Southern Trench NCMPA. Indeed, changes to tidal currents will be highly localised to the OAA and immediate surroundings, whilst the reduction in wave height (Hs) is <5% at the locations of designated sites for all scenarios tested. Accordingly, the rate (and direction) of sediment transport at these sites will remain unaltered from baseline conditions and therefore there will be no associated morphological change to the seabed in these areas.

5.5.5.8 Based on the above, the magnitude of impact to designated seabed areas is predicted to be **very low**.

Potential to hinder conservation objectives

5.5.5.9 The O&M stage of the Project is unlikely to hinder the conservation objectives of the Quaternary of Scotland under the Southern Trench NCMPA, with **Minor** (**Not Significant**) effect.

5.5.6 Decommissioning stage – minke whale

Impact D1: Changes to prey availability

5.5.6.1 Minke whale are dependent on prey for survival. After decommissioning, the artificial hard substrate (scour protection) will no longer be present in the water column or will remain partially present. Therefore, the epifauna community, which will colonize the substrate in its 35-year lifespan (per Project phase), will also be (partially) removed. Additionally, the function of the artificial hard substrate as foraging, hiding or spawning habitat for associated species like certain fish and mobile macrobenthos will be removed. As a result, there is the potential for indirect effects on minke whale to occur as a result of impacts on their prey species or the habitats that support them.

5.5.6.2 During the decommissioning stage, potential pressures on prey species have been assessed in detail with the EIA Report, specifically in **Volume 1, Chapter 10: Benthic, Epibenthic and Intertidal Ecology** and **Chapter 13: Fish and Shellfish Ecology** of the **EIA Report**.

Sensitivity of receptor

5.5.6.3 The sensitivity of minke whale sensitivity to changes in prey availability is described in **paragraph** . The sensitivity of the receptor is **low.**

Magnitude of impact

5.5.6.4 Indirect effects on marine mammal prey species during the decommissioning stage is anticipated to be similar in nature, but of lower magnitude, to the construction stage.

5.5.6.5 Given the absence of significant impacts on minke whale prey species (see **Volume 1, Chapter 10: Benthic, Epibenthic and Intertidal Ecology,** and **Chapter 13: Fish Ecology** of the **EIA Report**), and the high likelihood that any effects on prey availability would lead to only minimal or imperceptible changes for minke whale, the potential magnitude of indirect impacts on marine mammal prey is assessed as **very low**.

Potential to hinder conservation objectives

5.5.6.6 The magnitude of impact is deemed to be **very low**, and the sensitivity of the receptor is deemed to be **low** for changes to prey. The effect will, therefore, be of **Negligible** (**Not Significant**), with no potential to hinder the conservation objectives.

5.5.7 Decommissioning stage – Quaternary of Scotland

Impact D2: Potential impacts to seabed morphology

5.5.7.1 Decommissioning activities, such as removal of infrastructure, could also potentially give rise to localised changes to morphology within the offshore export cable corridor. However, the potential for wider morphological change to designated seabed areas arising from these activities would be very limited and no greater than that identified for the construction stage.

Sensitivity of receptor

5.5.7.2 Due to the inability of the geodiversity features to recover from impact, the feature is assessed to be of **high** sensitivity.

Magnitude of impact

5.5.7.3 Where some or all cable protection is left in situ during or following the decommissioning process, the potential for changes to local seabed morphology, within designated areas of seabed is the same as described and assessed for the presence of cable protection during the O&M stage. Overall, the magnitude of the impact that decommissioning activities relating to the Project will have on the Quaternary of Scotland is considered to be **very low**.

Potential to hinder conservation objectives

5.5.7.4 Overall, it is predicted that the sensitivity of the receptor is **high**, and the magnitude is **very low**. The resulting effect is of **Minor** (**Not Significant**), with no potential to hinder the conservation objectives.

5.5.8 Conclusion

5.5.8.1 Based on the available information, the Project is not expected to hinder (other than insignificantly) the conservation objectives for Quaternary of Scotland at the Southern Trench NCMPA during construction, O&M, or decommissioning. Therefore, no additional feature specific mitigation is required in this instance.

5.5.9 NESO Environmental Appraisal conclusions for Southern Trench NCMPA

5.5.9.1 The NESO Environmental Appraisal for the Project described in **Section 1.5** identified a likely interaction between the Project and the Southern Trench NCMPA in relation to the impact pathways specified in this NCMPA Assessment. It recommended that the Southern Trench NCMPA is carried forward to the Stage 1 Assessment, which has been undertaken via the reporting in this document.

5.5.9.2 The NESO Environmental Appraisal for the Project concluded that the conservation objectives are highly unlikely to be hindered by the activities proposed by in the OAA. It also concluded that the offshore export cable corridor is not considered to pose a significant risk of hindering the conservation objectives of the Southern Trench NCMPA. This supports the conclusions drawn in **Section 5.5.8** above.

5.6 Cumulative assessment

5.6.1.1 Potential impacts from the Project have the potential to interact with those from other projects (developments) plans and activities, resulting in cumulative effects on designated features within the NCMPA. The general approach to the Cumulative Effects Assessment (CEA) is described in **Volume 1, Chapter 33: Cumulative Effects Assessment** of the **EIA Report** and summarised in **Section 3.6**.

5.6.1.2 Dependent on the designated features being assessed, variable ZOIs apply. Justification for the ZOI for Quaternary of Scotland, and minke whales is provided below.

5.6.2 Minke whale

5.6.2.1 The ZOI for assessment of cumulative effects within **Volume 1, Chapter 11; Marine Mammals** of the **EIA Report** is defined by the sampling surveys for cetaceans (Small Cetaceans in European Atlantic Waters and the North Sea, known as SCANS) (Gilles *et al.,* 2023), and the underwater noise modelling outputs (**Volume 3, Appendix 8.1** of the **EIA Report**). The ZOI includes all developments within SCANS-IV blocks, CS-K, NS-D, and

NS-E (see Gilles *et al.,* (2023) for a map of SCANS-IV blocks). Following this process, a number of development/activities with ZOIs overlapping the Projects are located. The development/ activities in **Table 5.8** are considered within the CEA for the Southern Trench NCMPA.

5.6.2.2 **Table 5.8** lists the developments considered within the CEA based on the approach outlined within **Volume 3, Appendix 33.3: Marine Mammal CEA** in the **EIA Report**.

Table 5.8 List of developments considered for the assessment of cumulative effects on minke whale in the Southern Trench NCMPA

‘Other development’ type	Name of ‘other development’	Distance from offshore export cable corridor	Tier	Overlap in temporal scope
Offshore wind farm	2B Energy Methil Demonstration	191 km southwest of the offshore export cable corridor.	1a	Operational during Project's construction and O&M stage.
Offshore wind farm	Aberdeen (EOWDC)	32.8km southwest of the offshore export cable corridor.	1a	Operational during Project's construction stage, enters decommissioning in the later quarter of the Project's decommissioning stage.
Offshore wind farm	Aspen (Innovation and Targeted Oil and Gas (INTOG) 7)	27.3km south east of the offshore export cable corridor.	3a	Operational during Project's construction and O&M stage.
Offshore wind farm	Avalon	31.4km east of the offshore export cable corridor.	Dormant	N/A.
Offshore wind farm	Beatrice Offshore Wind Farm	99.8km northwest of the offshore export cable corridor.	1a	Operational during Project's construction and O&M stage. Decommissioning begins during the Project's O&M stage.
Offshore wind farm	Bellrock (ScotWind Plan Option Area (PO) E1)	70.7km southeast of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Berwick Bank Offshore Wind Farm	114km south of the offshore export cable corridor.	1c	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Blyth Demo Phase 1	262.9km south of the offshore export cable corridor.	1a	Operational during the Projects construction stage.

'Other development' type	Name of 'other development'	Distance from offshore export cable corridor	Tier	Overlap in temporal scope
Offshore wind farm	Blyth Demo Phase 2	253.3km south of the offshore export cable corridor.	1a	Operational during the Projects construction stage.
Offshore wind farm	Broadshore (PO NE6)	37.8km southeast of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Buchan Offshore Wind Floating Energy Allyance (PO NE8)	Overlaps the offshore export cable corridor.	1d	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Caledonia Offshore Wind Farm (ScotWind Plan Option Area NE4)	61.9km northwest of the offshore export cable corridor.	1d	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	CampionWind (ScotWind Plan Option Area E2)	62.3km southeast of the offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.
Offshore wind farm	Cenos Offshore Wind Farm (INTOG 11)	Offshore cable route crossed the offshore export cable corridor.	1d	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Bowdun (PO E3)	50.2km south of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Ayre Offshore Wind Farm (PO NE2)	93.7km southeast of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Green Volt Offshore Wind Farm (INTOG 6)	The Project's offshore cable route crosses Green Volt's offshore cable route.	1c	Operational during the Project's construction stage.
Offshore wind farm	Hywind Scotland Pilot Park	The Project's offshore cable route crosses Hywind's offshore cable route.	1a	Operation and decommissioning activities during the Project's construction stage.

‘Other development’ type	Name of ‘other development’	Distance from offshore export cable corridor	Tier	Overlap in temporal scope
Offshore wind farm	Inch Cape Offshore Wind Farm	107.6km southwest of the offshore export cable corridor.	1b	Operational during the Project's construction stage.
Offshore wind farm	Kincardine – Phase 1 & Phase 2	54.5km south of the offshore export cable corridor.	1a	Operational during the Project's construction stage.
Offshore wind farm	Moray East	22.7km west of the offshore export cable corridor.	1a	Operational during the Project's construction stage.
Offshore wind farm	Moray West	87.9km west of the offshore export cable corridor.	1a / 1b	Operational during the Project's construction stage.
Offshore wind farm	Morven (PO E1)	71km southeast of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction stage.
Offshore wind farm	Muir Mhòr Offshore Wind Farm (PO E2)	Crosses the offshore export cable corridor.	1d	Operational during the Project's construction stage.
Offshore wind farm	Neart na Gaoithe Offshore Wind Farm	139.3km southwest of the offshore export cable corridor.	1a / 1b	Operational during the Project's construction stage.
Offshore wind farm	Ossian Floating Offshore Wind Farm (PO E1)	79.5km southeast of the offshore export cable corridor.	1d	Construction and O&M activities during the Project's construction stage.
Offshore wind farm	Salamander Offshore Wind Farm (INTOG 3)	The Project's offshore cable corridor overlaps Salamander (INTOG 3) cable corridor.	1c	Operational during the Project's construction stage.
Offshore wind farm	Scaraben (INTOG 2)	42.4km west of the offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.

'Other development' type	Name of 'other development'	Distance from offshore export cable corridor	Tier	Overlap in temporal scope
Offshore wind farm	Seagreen Offshore Wind Farm	94.3km southwest of the offshore export cable corridor.	1a	Construction and O&M activities during the Project's construction stage.
Offshore wind farm	Sinclair (INTOG 1)	42.4km west of the offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.
Offshore wind farm	West of Orkney Offshore Wind Farm (PO N1)	181km northwest of the offshore export cable corridor.	1c	Construction and O&M activities during the Project's construction stage.
Offshore wind farm	Pentland Floating Offshore Wind Farm	186.7km northwest of the offshore export cable corridor.	1c	Operational during the Project's construction stage.
Offshore wind farm	Arven Offshore Wind Farm (PO NE1)	198.4km north of offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.
Offshore wind farm	Stoura (PO NE1)	321,1km north of offshore export cable corridor.	3a	Operational target mid 2030s. No information on construction timescales at the time of writing. Worst-case has been assumed.
Offshore wind farm	Dolphyn Project - pre-commercial	61.2km southwest of offshore export cable corridor.	3a	Operational during the Project's construction stage.
Offshore wind farm	Pentland Floating Offshore Wind Demonstration	186.7km northwest of the offshore export cable corridor.	1c	Operational during the Project's construction stage.
Offshore wind farm	Berwick Bank Offshore Wind Farm (Cambois Connection)	112.8km southwest of the offshore export cable corridor.	1c	Operational during the Project's construction stage.
Offshore wind farm	Seagreen 1A Offshore Wind Farm	103.7km southwest of the offshore export cable corridor.	1c	Construction and O&M activities during the Project's construction stage.

'Other development' type	Name of 'other development'	Distance from offshore export cable corridor	Tier	Overlap in temporal scope
Offshore wind farm	Levenmouth Demonstration	170km northwest of the offshore export cable corridor.	1a	Decommissioning activities during the Project's construction stage.
Wave and tidal	MeyGen Pentland Firth Phase 2	143.5km northwest of the offshore export cable corridor	1c	Operational during the Project's construction stage.
Wave and tidal	MeyGen Pentland Firth Phase 3	143.5km northwest of the offshore export cable corridor	1c	Operational during the Project's construction stage.
Wave and tidal	MeyGen Pentland Firth Phase 4	143.5km northwest of the offshore export cable corridor	3a	Operational during the Project's construction stage.
Wave and tidal	MeyGen Pentland Firth Phase 5	143.5km northwest of the offshore export cable corridor	3b	Operational during the Project's construction stage.
Wave and tidal	Orbital O2.2 at EMEC Berth	163.3km northeast of the offshore export cable corridor.	3b	O&M and decommissioning activities during the Project's construction stage.
Wave and tidal	Shetland Tidal Array	276.6km northwest of the offshore export cable corridor.	1a	O&M and decommissioning activities during the Project's construction stage.
Wave and tidal	Yell Sound	262.3km north of the offshore export cable corridor.	3b	Operational during the Project's construction stage.
Wave and tidal	CorPack wave cluster	189.2kn northwest of the offshore export cable corridor.	1c	O&M and decommissioning activities during the Project's construction stage.
Wave and tidal	EMEC Billia Croo	189.4km northwest of the offshore export cable corridor.	1a	O&M and decommissioning activities during the Project's construction stage.
Wave and tidal	EMEC Orbital O2	154.7km northwest of the offshore export cable corridor.	1a	O&M and decommissioning activities during the Project's construction stage.

‘Other development’ type	Name of ‘other development’	Distance from offshore export cable corridor	Tier	Overlap in temporal scope
Wave and tidal	EMEC Scapa Flow	166.6km northwest of the offshore export cable corridor.	1a	O&M and decommissioning activities during the Project's construction stage.
Wave and tidal	EMEC Magallanes 2 Extension	154.5km northwest of the offshore export cable corridor.	1c	Operational during the Project's construction stage.
Wave and tidal	EMEC Magallanes 2	155.4km northwest of the offshore export cable corridor.	1a	Operational during the Project's construction stage.
Wave and tidal	Orbital Marine Eday 1	268.5km northwest of the offshore export cable corridor.	1c	Operational during the Project's construction stage.
Wave and tidal	Orbital Eday 4	154.2km southeast of the offshore export cable corridor.	1c	O&M and decommissioning activities during the Project's construction stage.
Wave and tidal	EMEC Fall of Warness	153.3km northwest of the offshore export cable corridor.	1a	O&M and decommissioning activities during the Project's construction stage.
Wave and tidal	Westray Tidal Array	153.9km northwest of the offshore export cable corridor.	3a	Operational during the Project's construction stage.
Wave and tidal	OCEANSTAR	154.1km southeast of the offshore export cable corridor.	1c	Operational during the Project's construction stage.
Wave and tidal	SEASTAR	154.2km southeast of the offshore export cable corridor.	1c	Operational during the Project's construction stage.
Wave and tidal	Orbital Eday 3	154.1km southeast of the offshore export cable corridor.	1c	O&M and decommissioning activities during the Project's construction stage.
Wave and tidal	EMEC Orbital O2 - Phase 2	153.2km southwest of the offshore export cable corridor.	1c	O&M and decommissioning activities during the Project's construction stage.

‘Other development’ type	Name of ‘other development’	Distance from offshore export cable corridor	Tier	Overlap in temporal scope
Wave and tidal	MeyGen Pentland Firth Phase 1a	146.8km northwest of the offshore export cable corridor.	1a	O&M and decommissioning activities during the Project's construction stage.
Carbon capture	Viking CCS (Viking Cluster)	433.5km south east of the offshore export cable corridor..	1c	Operational during the Project's construction stage.
Carbon capture	Acorn Carbon Capture and Storage Site	The site crosses the offshore export cable corridor.	1d	Operational during the Project's construction stage.
Cables and pipelines	Eastern Green Link 2 HVDC Cable and Cable Protection	Landfall is approximately 4.64km south of the offshore export cable corridor.	1c	No planned construction activities during the Project's construction stage. O&M activities planned during the Project's construction stage.
Cables and pipelines	Eastern Green Link 3	1.55km south of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction stage.
Cables and pipelines	Spittal to Peterhead Subsea Cable link	Approximately 0.5km north of the offshore export cable corridor.	1d	No planned construction activities during the Project's construction stage. O&M activities planned during the Project's construction stage.
Cables and pipelines	Buchan Oil Field Electrification	14.1km southeast of the offshore export cable corridor.	3a	No planned construction activities during the Project's construction stage. O&M activities planned during the Project's construction stage.
Aggregate, dredging and disposal	North Buchan Ness	Project's offshore cable corridor overlaps disposal site. Within export cable survey corridor zone.	Open	Open disposal site.
Aggregate, dredging and disposal	Peterhead Harbour Disposal site	3.01km southeast of the offshore export cable corridor.	Open	Open disposal site.

‘Other development’ type	Name of ‘other development’	Distance from offshore export cable corridor	Tier	Overlap in temporal scope
Aggregate, dredging and disposal	MacDuff Disposal Site	49.7km northwest of the offshore export cable corridor.	Open	Open disposal site.
Aggregate, dredging and disposal	Aberdeen Disposal Site	47.8km southwest of the offshore export cable corridor.	Open	Open disposal site.

5.6.2.3 The following impacts have been taken forward for the CEA:

- construction and decommissioning:
  - injury and disturbance from underwater noise generating activities; and
  - changes to prey distribution and availability.
- O&M:
  - changes to prey distribution and availability.

5.6.3 Construction stage

Injury and disturbance from underwater noise generating activities

Sensitivity of receptor

5.6.3.1 Minke whale is potentially sensitive to auditory injury, and disturbance affecting various ecological and behavioural functions, the sensitivity of minke whale has been assessed as **medium**.

Magnitude of impact

5.6.3.2 Proportionate embedded environmental measures are required to be implemented during activities that generate high amplitude underwater noise, including impact piling, and UXO clearance, and therefore, these measures can be considered to be embedded into Project design through the implementation of and adherence to the Marine Mammal Mitigation Protocol (**Volume 4: Outline Marine Mammal Mitigation Protocol** of the **EIA Report**). As a result of strict adherence to the measures within the JNCC guidelines, which is assumed to be in place for all developments screened into the cumulative assessment, the auditory impacts on minke whales will be reduced to as low as reasonably practicable. Therefore, the magnitude of cumulative effects on minke whale will be **very low**.

Potential to hinder conservation objectives

5.6.3.3 Given the **high** sensitivity and the **very low** magnitude of the cumulative impact, injury and disturbance to minke whales from underwater noise generating activities during construction is expected to be of **Minor** (**Not Significant**) effect for minke whale and will not lower population densities in the Southern Trench NCMPA.

5.6.3.4 Cumulatively, auditory injury, or disturbance from underwater noise generating activities would not have the potential to hinder the achievement (other than insignificantly) of the conservation objectives to conserve the minke whale population in favourable condition and is of **Minor** (**Not Significant**).

Changes to prey availability and distribution

5.6.3.5 With regards to prey distribution, this CEA and the assessment for the Project alone are largely based on the outcomes of the assessment within **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**. Changes to prey distribution and availability in minke whales will be dependent on potential effects to fish distributions. Therefore, the developments considered cumulatively herein are within 100km of the Project (the cumulative ZOI used within **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**), see **Table 5.8**.

Sensitivity of the receptor

5.6.3.6 Minke whales are mobile and widely distributed. Given the importance of the Southern Trench NCMPA, the abundance of prey, and the ability of minke whales to exploit foraging opportunities across wide ranges, but considering the spatio-temporal distribution of feeding and foraging minke whales in areas characterised by burrowed muds (see **Section 5.2.2**), the construction of the Project and other ongoing developments are unlikely to impede their foraging or cause significant long-term changes to prey habitats. Due to their flexible diet, minke whales are considered to have **low** sensitivity to shifts in prey distribution.

Magnitude of impact

5.6.3.7 The assessment of the Project on fish in **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**, found that potential impacts on fish ranged from negligible to moderate (potentially significant). From this assessment, it is considered that the construction of the Project, will not significantly impact upon the distribution and availability of habitat for all fish species known to occur in the Project area. As a result, changes to the distribution and availability of prey species is likely to be temporary, and minimal, and not uniform across all species. Consequently, impacts upon minke whales are likely to be of **low** magnitude, given their adaptability to different prey species, and their ability to move to exploit different foraging opportunities.

Potential to hinder the conservation objectives

5.6.3.8 Given the low sensitivity and magnitude, the overall cumulative effect from changes to prey availability and distribution on the construction stage is considered to be **Minor** (**Not Significant**) for minke whale and will not reduce population densities within the Southern Trench NCMPA. Therefore, it is considered that cumulatively, changes to prey availability and distribution would not have the potential to hinder the achievement (other than insignificantly) of the conservation objectives to conserve the minke whale population in favourable condition.

5.6.4 Operation and maintenance stage

Changes to prey availability and distribution

5.6.4.1 As with changes to prey availability and distribution during construction, operational changes to prey availability and distribution are aligned to the assessment undertaken in **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**. Therefore, only developments within 100km of the Project are considered cumulatively for this impact.

Sensitivity of the receptor

5.6.4.2 As described in the assessment of cumulative effects in the construction stage, minke whales are highly mobile and wide ranging in their distribution. Whilst the Southern Trench NCMPA is a key seasonal feeding ground for minke whales, the heterogeneity of their diets, means that potential prey extends outside the spatial footprint of the NCMPA. Minke whales are therefore resilient to changes in prey availability and are therefore considered to have a **low** sensitivity to changes to prey resources during the operation and maintenance phase in combination with other developments.

Magnitude of impact

5.6.4.3 There is the potential for other developments to have a long-term footprint within the Southern Trench NCMPA, which will act cumulatively with the Project. It is uncertain what the long-term physical footprints associated with other nearby developments will be. Temporary disturbance to fish habitats may occur during maintenance work on cables throughout their operational lifetime, however, any habitat loss during maintenance will be significantly less than during construction. Additionally, it is unlikely that maintenance will occur simultaneously. As a result, it is unlikely that temporary habitat disturbance from cumulative projects will increase the impact associated with the Project during O&M.

5.6.4.4 In conclusion, the impacts from other developments will be highly localised and are not likely to enhance or increase the impact of the Project alone, therefore the impact is expected to be of **low** magnitude.

Potential to hinder the conservation objectives

5.6.4.5 Considering the above assessment, the low sensitivity and magnitude of impacts, the cumulative effect from operational changes to prey availability and distribution is considered to be **Minor** (**Not Significant**). Cumulative effects on prey availability and distribution during O&M will not hinder the achievement (other than insignificantly) of the conservation objectives to conserve the minke whale population in favourable condition.

5.6.5 Decommissioning stage

5.6.5.1 The potential cumulative effects during the decommissioning stage are expected to be analogous with or less than those assessed as part of the construction stage. Assuming that decommissioning works of other projects considered above occur at the same time as those of the Project, (as the other developments that may occur at the same time as the Project decommissioning are unknown at this time) the sensitivity of the receptors and the magnitude of effects concluded as part of the cumulative assessment of potential effects during the construction stage are also applicable to the decommissioning stage. Therefore, it is concluded that there is no potential for cumulative effects resulting from decommissioning activities and those of other relevant developments and activities to hinder achievement (other than significantly) of the conservation objectives for minke whales as a designated feature of the Southern Trench NCMPA.

5.6.6 Quaternary of Scotland

5.6.6.1 For assessment of cumulative effects on the geomorphological quaternary of Scotland feature of the Southern Trench NCMPA, it is most appropriate to use the ZOI as defined for **Volume 1, Chapter 6: Marine Geology, Oceanography, and Physical Processes** of the **EIA Report**. The ZOI was defined by the extent of spring tidal ellipses along the Project area. The developments/activities within this ZOI are listed in **Table 5.9**.

Table 5.9 List of developments considered for the assessment of cumulative effects on Quaternary of Scotland in the Southern Trench NCMPA

Other development' type	Name of 'other development'	Distance from offshore export cable corridor	Status	Stage 2 Overlap in temporal scope
Offshore wind farm	Aberdeen (EOWDC)	32.8km southwest of the offshore export cable corridor.	1a	Operational during Project's construction stage, enters decommissioning in the later quarter of the Project's decommissioning stage.
Offshore wind farm	Aspen (INTOG 7)	27.3km south east of the offshore export cable corridor.	3a	Operational during Project's construction and O&M stage
Offshore wind farm	Avalon	31.4km east of the offshore export cable corridor.	Dormant	Operational during Project's construction and O&M stage
Offshore wind farm	Broadshore (PO NE6)	37.8km southeast of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Buchan Offshore Wind Floating Energy Allyance (PO NE8)	Overlaps the offshore export cable corridor.	1d	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Caledonia Offshore Wind Farm (PO NE4)	61.9km northwest of the offshore export cable corridor.	1d	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	CampionWind (PO E2)	62.3km southeast of the offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.
Offshore wind farm	Cenos Offshore Wind Farm (INTOG 11)	Offshore cable route crossed the offshore export cable corridor.	1d	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Green Volt Offshore Wind Farm (INTOG 6)	The Project's offshore cable route crosses Green Volt's offshore cable route.	1c	Operational during the Project's construction stage.

Other development' type	Name of 'other development'	Distance from offshore export cable corridor	Status	Stage 2 Overlap in temporal scope
Offshore wind farm	Hywind Scotland Pilot Park	The Project's offshore cable route crosses Hywind's offshore cable route.	1a	Operation and decommissioning activities during the Project's construction stage.
Offshore wind farm	Moray East	22.7km west of the offshore export cable corridor.	1a	Operational during the Project's construction stage.
Offshore wind farm	Muir Mhòr Offshore Wind Farm (PO E2)	Crosses the offshore export cable corridor.	1d	Operational during the Project's construction stage.
Offshore wind farm	Salamander Offshore Wind Farm (INTOG 3)	The Project's offshore cable corridor overlaps Salamander (INTOG 3) cable corridor.	1c	Operational during the Project's construction stage.
Offshore wind farm	Scaraben (INTOG 2)	42.4km west of the offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.
Offshore wind farm	Sinclair (INTOG 1)	42.4km west of the offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.
Offshore wind farm	Stromar (PO NE3)	74.2km west of the offshore export cable corridor.	2	Operational during the Project's construction stage.
Carbon capture	Acorn Carbon Capture and Storage Site	The site crosses the offshore export cable corridor.	1d	Operational during the Project's construction stage.
Cables and pipelines	Eastern Green Link 2 HVDC Cable and Cable Protection	Landfall is approximately 4.64km south of the offshore export cable corridor.	1c	No planned construction activities during the Project's construction stage. O&M activities planned during the Project's construction stage.
Cables and pipelines	Eastern Green Link 3	1.55km south of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction stage.

Other development' type	Name of 'other development'	Distance from offshore export cable corridor	Status	Stage 2 Overlap in temporal scope
Cables and pipelines	Spittal to Peterhead Subsea Cable link	Approximately 0.5km north of the offshore export cable corridor.	1d	No planned construction activities during the Project's construction stage. O&M activities planned during the Project's construction stage.
Cables and pipelines	Buchan Oil Field Electrification	14.1km southeast of the offshore export cable corridor.	3a	No planned construction activities during the Project's construction stage. O&M activities planned during the Project's construction stage.
Aggregate, dredging and disposal	North Buchan Ness	Project's offshore cable corridor overlaps disposal site. Within export cable survey corridor zone.	Open	Open disposal site.
Aggregate, dredging and disposal	Peterhead Harbour Disposal site	3.01km southeast of the offshore export cable corridor.	Open	Open disposal site.

5.6.6.2 It is possible that the offshore export cables from both the Project and 'other developments' listed in **Table 5.9** could be installed within the Southern Trench NCMPA. Therefore, there is potential for cumulative pressures on Quaternary of Scotland (subglacial tunnel valleys and moraines). However, in the absence of high-resolution mapping of protected geodiversity features within the Southern Trench NCMPA, it is not possible to accurately determine the potential for cumulative effects to any features of geomorphological interest. Therefore, this has not been considered further within the assessment.

5.6.7 Conclusion

5.6.7.1 It is concluded that Project activities will not give rise to cumulative effects with other plans, developments, or activities that could hinder the conservation objectives for minke whale or Quaternary of Scotland within the Southern Trench NCMPA.

6. Turbot Bank Marine Protected Area Assessment

6.1 Introduction

6.1.1.1 Turbot Bank NCMPA is located in the northern North Sea, 44km east of Peterhead off the east coast of Scotland (**Figure 2**). The NCMPA lies within an area of sandy sediment and includes the shelf bank and mound feature known as 'Turbot Bank'. The site covers an area of 251km^2 and was designated by Marine Scotland as an NCMPA in 2014. The designated features of the Turbot Bank NCMPA; their overarching objectives; and the feature conditions are outlined in **Table 6.1**.

6.2 Baseline characterisation

6.2.1 Sandeels

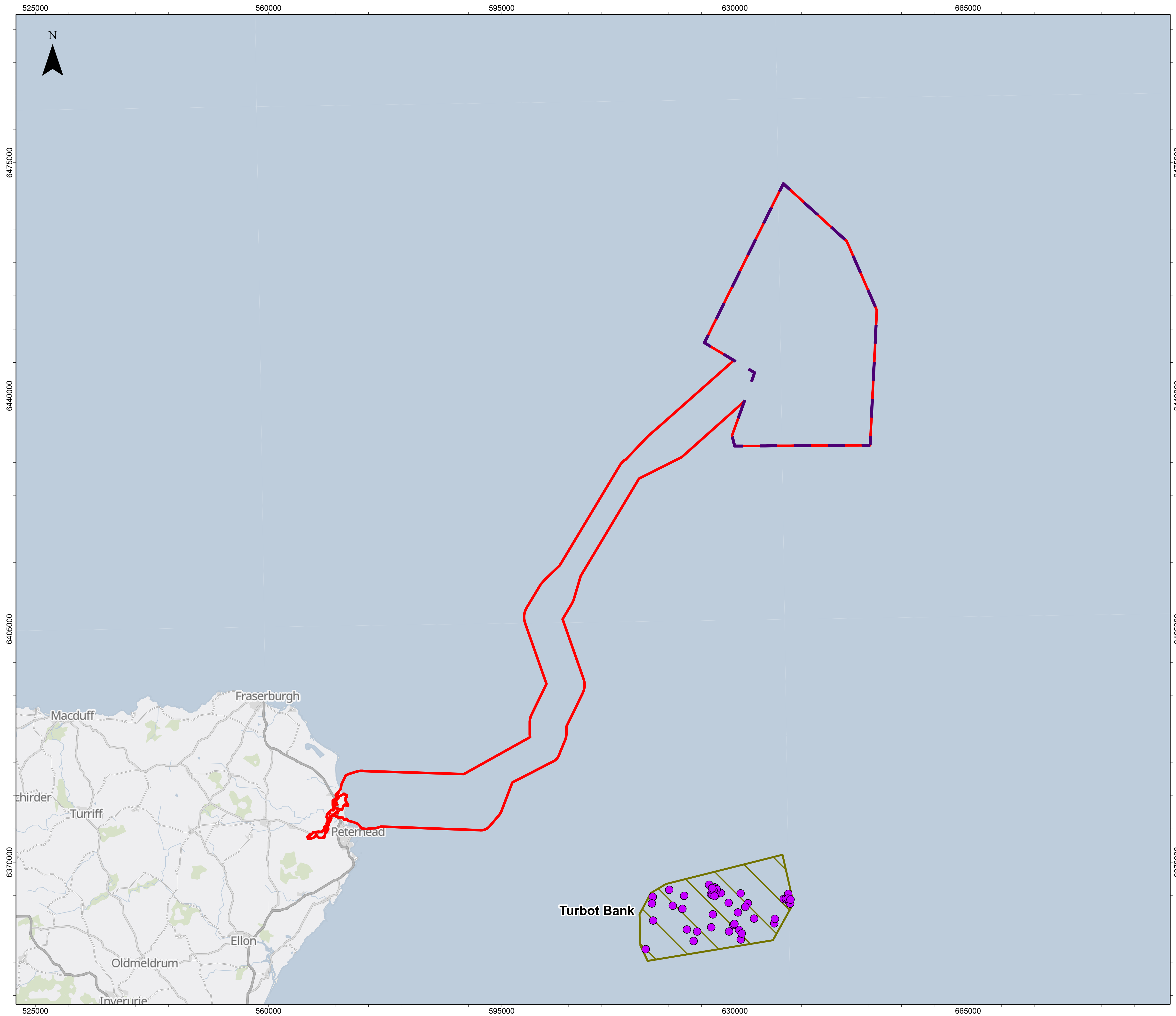
6.2.1.1 Turbot Bank is important for sandeels, particularly Raitt's sandeel (*Ammodytes marinus),* which are closely associated with sand habitats, living buried in the sand for months at a time. Sandeels are an important source of food for many types of marine predators, including seabirds such as Atlantic puffin (*Fratercula arctica*) and black-legged kittiwake (*Rissa tridactyla*), fish such as cod (*Gadus morhua*)*,* plaice (*Pleuronectes platessa*) and marine mammals such as dolphins (Engelhard *et al.,* 2013).

6.2.1.2 Sandeels play a key role in the North Sea food web and many species rely on them as a source of food. Sandeels are particularly vulnerable as they require a specific substratum (mainly consisting of medium to coarse sand and low silt) for their habitat requirements (Holland *et al.,* 2005). Sandeels spend autumn and winter months lying dormant in the sediment, apart from a brief emergence to spawn. During the spring and summer months they are more active, moving between the seabed and water column diurnally. Sandeels that have settled are rarely found at depths greater than 30m (Jensen *et al.,* 2011, Greenstreet *et al.,* 2010, Rowley, 2008). Due to sandeel's ecological importance and habitat preferences, they are vulnerable to disturbance through direct habitat loss or indirect changes to the seabed (Coull *et al.,* 1998).

6.2.1.3 The NCMPA contains the type of sandy sediment with low silt and clay components that sandeels prefer. Their life strategy means sandeel aggregations are potentially vulnerable to localised depletion, and, in the past, this part of Turbot Bank has been subject to occasional intensive sandeel fisheries. Additionally, data on sandeel larvae and models of larval transport indicate that the larvae hatching from Turbot Bank may be widely dispersed throughout the north-west North Sea. The sandeels present at Turbot Bank are one of the two key components of the International Council for the Exploration of the Sea (ICES) sandeel assessment 4 area (ICES, 2023). Sandeels are also a commercially important stock for EU member states.

6.2.1.4 Low intensity spawning grounds for sandeel overlap with the study area. Nursery grounds for sandeel also overlap with the study area (Coull *et al.,* 1998; Ellis *et al.,* 2012).

6.2.1.5 The distribution of potential sandeel features in the Turbot Bank NCMPA is shown in **Figure 6**.

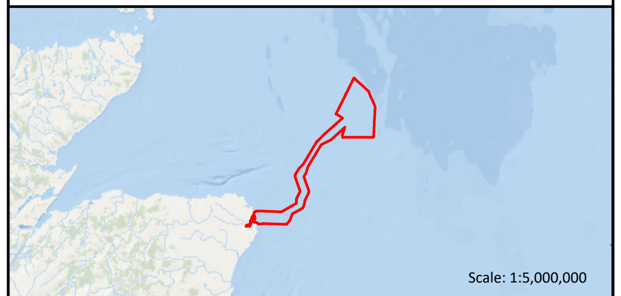


Red Line Boundary
Option Agreement Area
Nature Conservation Marine Protected Area (MPA)

Protected Features - Biodiversity

Sandeels

0 10 20 Kilometres



REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER
	dd/mm/yyyy	--	--	--	--
	dd/mm/yyyy	--	--	--	--
1	24/09/2025	EH	LT	MR	LG

WSP DRAWING NUMBER	808368-WEIS-IA-I8-FG-O7-86795		
MarramWind DRAWING NUMBER	MAR-GEN-ENV-MAP-WSP-000446		
DATUM	ETRS 89	PROJECTION	UTM Zone 30N
SCALE	1:550,000	PAGE SIZE	A3

PROJECT TITLE

MarramWind Offshore Wind Farm

DRAWING TITLE

Figure 6 Distribution of potential features of Turbot Bank NCMPA

Nature Conservation Marine Protected Areas Report

NOT TO BE USED FOR NAVIGATION

wsp

MarramWind

6.3 Conservation objectives

6.3.1.1 Paragraph 5(1) of the *Turbot Bank Nature Conservation Marine Protected Area Order* 2014 regarding conservation objectives defines that the protected features:

a) So far as already in favourable condition, remain in such condition; and

b) So far as not already in favourable condition, be brought into such condition, and remain in such condition.

6.3.1.2 Paragraph 5(2) states that "favourable condition", with respect to a mobile species of marine fauna, means that:

(a) the species is conserved or, where relevant, recovered to include the continued access by the species to resources provided by the NCMPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds;

(b) the extent and distribution of any supporting features upon which the species is dependent is conserved or, where relevant, recovered; and

(c) the structure and function of any supporting features, including any associated processes supporting the species within the NCMPA, is such as to ensure that the protected feature is in a condition which is healthy and not deteriorating.

Table 6.1 Designated features of the Turbot Bank NCMPA (JNCC, 2020)

Feature type	Protected feature	Conservation objectives and site species advice	Feature condition
Mobile feature	Sandeels	CO1: so far as already in favourable condition, remain in such condition; and CO2: so far as not already in favourable condition, be brought into such condition, and remain in such condition.	Favourable (JNCC, 2020)

6.4 Impact assessment methodology

6.4.1 Screening of Protected Features

6.4.1.1 The method for identification of protected features of NCMPAs follows the same approach as outlined in **paragraph 5.4.1.1**.

6.4.1.2 The spatial extent of the Project activities and the nature of the direct and indirect potential effects have been considered in assessing whether sandeels are screened in the assessment.

6.4.2 Protected features screened in for assessment

Sandeel

6.4.2.1 The spatial extent of the Project activities and the nature of the direct and indirect potential effects have been considered in assessing which potential impact pathways on designated features are screened in for this assessment. The Scoping Report scoped in a series of impacts on demersal fish, not specific to the Turbot Bank NCMPA, but applicable to other species of fish within the fish ZOI (**Volume 1, Chapter 13: Fish Ecology** of the **EIA Report**). Specific impacts related to the Turbot Bank NCMPA were not screened in in the scoping report (MarramWind Ltd, 2024). Given that there is no direct overlap between the Project and the NCMPA, impacts scoped in from the 2023 Scoping Report within the fish ecology ZOI have been revised for sandeel.

6.4.2.2 Turbot Bank NCMPA is more than 25km southeast from the study area and is therefore well beyond the ZOI for impacts from the Project. Given that no direct disturbance will occur within the NCMPA, potential impacts on sandeel due to temporary or long-term habitat loss and disturbance, have been screened out. Furthermore, given the distance from the ZOI, temporary increases in suspended sediment concentrations, associated smothering effects, and changes in water quality have also been screened out.

6.4.2.3 EMF and heat emissions from transmission cables have been excluded from this assessment. These effects are most pronounced near the cable source and diminish with distance (Hutchison *et al*., 2020). Additionally, recent research found no evidence that magnetic fields from subsea cables affect lesser sandeel larvae (Cresci et al., 2022). Given that the Turbot Bank NCMPA is located over 25 km southwest of the Offshore Red Line Boundary, sandeels within the NCMPA will not be impacted by EMF from the Project. The potential EMF produced by the Project has been modelled and is reported in **Volume 1, Chapter 9: Electromagnetic Fields** of the **EIA Report**. Modelling shows that the horizontal range of impact is limited to ~ 0.8m around the 66 kV array cables, and approximately 1.1m around a monopole HVDC cable and approximately 11m around any single pole of a bipole cable.

6.4.2.4 The potential for changes in regional fish abundance due to reduced fishing pressure during construction has also been screened out. As the Turbot Bank NCMPA lies outside the Offshore Red Line Boundary, it is unlikely to be affected. Moreover, reduced fishing pressure may benefit sandeel populations, which have historically been overexploited in the North Sea (Dunn, 2021). However, despite the location of Turbot Bank NCMPA outside of the study area, the impacts from underwater noise and vibration have been assessed for impact piling and UXO clearance during the construction stage of the Project, due to the potential for long range disturbance effects on sandeel in the NCMPA.

6.4.2.5 While underwater noise and vibration applies to both construction and decommissioning, the impact is considered here as part of construction. While the specific activities that will be employed during decommissioning are not yet known, it is anticipated that disturbance from decommissioning activities will be similar or less than during construction, as underwater noise during decommissioning will be non-impulsive and therefore different in quality and magnitude.

6.4.2.6 Impulsive underwater noise will be generated during construction from impact piling and UXO clearance. The primary noise considered as part of the underwater noise assessment was modelling of underwater noise generated by impact piling[7] (see **Volume 3, Appendix 8.1** of the **EIA Report**). UXO may also exist within the Offshore Red Line Boundary and would need to be cleared before construction can begin. Underwater noise sources other than impact piling, and UXO clearance were all predicted to be much lower than those predicted for impact piling. The risk of any potentially injurious effects to fish from these sources are expected to be minimal as the noise emissions from these are close to, or below, the appropriate injury criteria, even when very close to the source of the noise. As a result, further assessment of operational noise, and these noise sources are not considered further in this assessment. Underwater noise from impact piling and UXO

[7] Impact piling of driven piles for offshore substation and RCP foundations; and for driven pile anchors.

clearance has the potential to hinder the achievement of the conservation objectives for sandeel and are therefore taken through for further assessment.

6.4.2.7 Potential impacts that could pose risk to the conservation objectives of the Turbot Bank NCMPA sandeel feature:

- Potential risk to CO1 & CO2: Underwater noise and vibration.

6.4.3 Basis of assessment

6.4.3.1 As detailed in **Section 2.2**, this assessment considers the maximum design scenario which is predicted to result in the greatest potential environmental impact.

6.4.3.2 **Table 5.3** presents the assessed scenario for potential underwater noise impacts (refer to Impact C1 and C2).

6.4.4 Feature sensitivity assessment

6.4.4.1 FeAST identifies pressures associated with the most commonly occurring marine activities and provides a detailed assessment of feature sensitivity to these pressures. The key pressure of concern in this NCMPA Assessment is from underwater noise and vibration on sandeels within the Turbot Bank NCMPA. It is noted that a programme of updates to FeAST commenced during Summer 2025. At the time of writing, many of the sensitivity assessments are not available, including the sensitivity, tolerance and recoverability of sandeel to pressures form underwater noise and vibration.

6.5 Main Assessment of potential effects – Project alone

6.5.1 Construction stage – sandeel

Impact C5: Injury or disturbance from underwater noise and vibration

Sensitivity of the receptor

6.5.1.1 Popper *et al.* (2014) provides sound exposure guidelines for fish, eggs and larvae, which are defined by the way different species detect sound. Sandeel have no swim bladder and experience noise through particle motion detection, they therefore have the least sensitivity to sound pressure, compared to species with a swim bladder.

6.5.1.2 Qualitative risk levels for recoverable injury, TTS[8] and behavioural impacts from pile driving are expected to be moderate in the near field (metres), low in the intermediate field (hundreds of metres), low in the far field (thousands of metres) for masking and high in the near field, moderate in the intermediate field, and low in the far field for behaviour.

6.5.1.3 Quantitative risk levels from pile driving are:

- > 216dB $L_{E,p,24h,}$ > 213dB $L_{p,pk}$ for recoverable injury;
- >> 186dB $L_{E,p,24h}$ for TTS;

6.5.1.4 Qualitative risk levels for recoverable injury, TTS and behavioural impacts from explosions are expected to be:

[8] Temporary Threshold Shift is a temporary reduction in hearing sensitivity caused by exposure to intense sound.

- high in the near field, moderate in the intermediate field, and low in the far field (TTS); and
- high in the near field, moderate in the intermediate field and low in the far field (behaviour).

6.5.1.5 The risk levels for recoverable injury for eggs and larvae in response to explosions are, high in the near field, and low in both the intermediate and far field, for all impacts. For pile driving the threshold for mortality and potential mortal injury for eggs and larvae is > 210 dB $L_{E,p,24h}$, > 207 dB $L_{p,\ pk}$. The qualitative risk levels for recoverable injury are moderate in the near field, and low in the intermediate and far field.

6.5.1.6 Sandeel are high value receptors, however because of their relative insensitivity to underwater sound, sandeel are considered of **very low** sensitivity.

Magnitude of impact

6.5.1.7 From the underwater noise modelling results (see **Volume 3, Appendix 8.1** of the **EIA Report**), for fish, the largest recoverable injury ranges (203 dB $L_{E,p,24h}$) were predicted to be 4.9km for a stationary receptor, reducing to less than 100m when a fleeing receptor was considered. Whether a fish flees or remains stationary in response to a loud noise differs between species, and there is limited evidence for fish fleeing from high level noise sources in the wild. As sandeel does not have a swim bladder, and has reduced hearing capabilities, it is considered more likely to remain stationary in response to high level noise (Goertner *et al*., 1994; Goertner *et al*., 1978; Stephenson *et al*., 2010; Halvorsen *et al*., 2012). Therefore, on a precautionary basis 4.9km is considered to be the appropriate range for sandeel in this NCMPA Assessment.

6.5.1.8 The maximum mortality and potential mortal injury thresholds of 234 dB, and 229 dB $L_{p,pk}$, from Popper *et al.,* (2014), were 580m and 970m respectively for low order UXO clearance (0.25 kg + donor charge). If high order UXO clearance is required (as a last resort), the maximum PTS ranges calculated for the largest high-order UXO clearance is 15 km for the VHF cetacean category (202 dB) when considering the $L_{p,pk}$ criteria (fish were not assessed for high order UXO clearance) (see **Volume 3, Appendix 8.1** of the **EIA Report**).

6.5.1.9 Popper *et al.* (2014) set the mortality/potential mortal injury threshold for fish exposed to explosions and pile driving at 229 – 234 dB $L_{p,pk}$, and > 219 dB $L_{E,p,24h}$ > 213 dB $L_{p,pk}$ respectively. Project noise modelling (as described in **Volume 3, Appendix 8.1** of the **EIA Report**) shows that the largest recoverable impact ranges (203 dB $L_{E,p,24h}$) were predicted to be 4.9km for a stationary receptor; beyond this, only temporary and behavioural effects occur.

6.5.1.10 Given that Turbot Bank NCMPA is approximately 25km from the nearest pile driving activity, or potential UXO clearance, the potential for underwater noise emitted during pile driving / UXO clearance causing temporary behavioural shifts in sandeel within the NCMPA is very low, and no mortality of sandeel within the NCMPA is expected to occur at this distance. Therefore, the magnitude of impact from underwater noise for sandeel is assessed as being of **low** magnitude.

Potential to hinder conservation objectives

6.5.1.11 The available information indicates that the impacts from underwater noise and vibration will have **Minor** (**Not Significant**) effect and are not expected to affect (other than insignificantly) the sandeel conservation objectives for Turbot Bank NCMPA.

6.5.2 Conclusion

6.5.2.1 Based on the available information, the Project is not expected to hinder (other than insignificantly) the conservation objectives for sandeel at the Turbot Bank NCMPA during construction, O&M, or decommissioning. Therefore, no additional feature-specific mitigation is required in this instance.

6.5.3 NESO Environmental Appraisal conclusion for Turbot Bank NCMPA

6.5.3.1 The NESO Environmental Appraisal for the Project described in **Section 1.5** identified that there is a highly a unlikely interaction between the Project and the Turbot Bank NCMPA in relation to the impact pathways specified in this NCMPA Assessment. This is because the Project is located beyond the ZOI for potential impact pathways, as defined by NESO. It therefore did not recommend that the Turbot Bank NCMPA should be carried forward to the Stage 1 Assessment.

6.5.3.2 It can therefore be inferred that the NESO Environmental Appraisal supports the conclusions drawn in **Section 6.5.2** above.

6.6 Cumulative assessment

6.6.1.1 Potential impacts from the Project have the potential to interact with those from other projects (developments) plans and activities, resulting in cumulative effects on designated features within the NCMPA. The general approach to the cumulative effects assessment (CEA) is described in **Volume 1, Chapter 33: Cumulative Effects Assessment** of the **EIA Report** and summarised in **Section 3.6**.

6.6.2 Sandeel

6.6.2.1 The ZOI for assessment of cumulative effects within **Volume 1, Chapter 13: Fish Ecology** of the **EIA Report** is 50km, a highly conservative buffer distance based on underwater noise modelling output (**Volume 3, Appendix 8.1** of the **EIA Report**). Following this process, a number of developments are located within 100km of the Project whose construction timelines may coincide with that of the Project. The developments in **Table 6.2** are considered within the CEA for the Turbot Bank NCMPA.

Table 6.2 List of developments considered for the assessment of cumulative effects on sandeel in the Turbot Bank NCMPA

'Other development' type	Name of 'other development'	Distance from offshore export cable corridor	Status	Overlap in temporal scope
Offshore wind farm	Broadshore (PO NE6)	37.8km southeast of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Buchan Offshore Wind Floating Energy Allyance NE8 (PO NE8)	23.8km southeast of the offshore export cable corridor.	1d	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Caledonia Offshore Wind Farm (PO NE4)	61.9km northwest of the offshore export cable corridor.	1d	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	CampionWind (PO E2)	62.3km southeast of the offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.
Offshore wind farm	Ayre Offshore Wind Farm (PO NE2)	93.7km southeast of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction and O&M stage.
Offshore wind farm	Scaraben (INTOG 2)	42.4km west of the offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.
Offshore wind farm	Sinclair (INTOG 1)	42.4km west of the offshore export cable corridor.	2	No information on construction, O&M and decommissioning timescales at the time of writing. Worst-case has been assumed.
Cables and pipelines	Eastern Green Link 3	1.55km south of the offshore export cable corridor.	2	Construction and O&M activities during the Project's construction stage.

6.6.2.2 Impulsive underwater noise and vibration (UXO clearance and impact piling) associated with the construction stage is assessed for the Project alone, therefore only other plans, projects (developments) and activities potentially generating underwater noise require further assessment. Further, developments are within 100km of the Project, many are located further from the Turbot Bank NCMPA.

6.6.3 Construction stage

Injury and disturbance from underwater noise

Sensitivity of the receptor

6.6.3.1 As for the Project alone, sandeel are judged to be high value receptors (as a designated feature in the Turbot Bank NCMPA). However, because of their relative insensitivity to underwater sound, sandeel are considered of **very low** sensitivity.

Magnitude of impact

6.6.3.2 The magnitude of impact as a result of UXO detonation and impact piling in the construction stage for the Project alone was assessed as negligible, with noise modelling showing that the largest recoverable impact ranges (203 dB $L_{E,p,24h}$) were predicted to be 4.9km for a stationary receptor and beyond this, only temporary and behavioural effects would occur. However, the likelihood of this occurring is very low considering that the Project is >25km away from the NCMPA. Therefore, the potential for cumulative underwater noise impacts as a result of impact piling and UXO detonation is very low. Considering the low likelihood of occurrence, the localised range of injurious impact associated with the noise sources, and the distance from the Project to the Turbot Bank NCMPA, the magnitude of the effect is **low**.

Potential to hinder the conservation objectives

6.6.3.3 Overall, it is predicted that the sensitivity of the receptor is **very low**, and the magnitude is **low**. The resulting effect is of **Negligible** (**Not Significant**), with no potential to hinder the conservation objectives.

6.6.3.4 Based on the information presented, it is concluded that cumulative effects from underwater noise and vibration are not likely to occur. Therefore, they would not be the potential to hinder achievement (other than insignificantly) of the conservation objectives for sandeel.

6.6.4 Operation and maintenance stage

6.6.4.1 The cumulative effects within the Turbot Bank NCMPA from O&M activities have not been assessed as there are no pathways of impact associated with this phase for the Project alone.

6.6.5 Decommissioning stage

6.6.5.1 The cumulative effects from decommissioning activities within the Turbot Bank NCMPA have not been assessed as there are no impacts associated with this stage of the Project alone.

6.6.6 Conclusion

6.6.6.1 It is concluded that there is no potential for the Project to have a cumulative effect with other plans, developments to hinder achievement (other than insignificantly) of the conservation objectives for the designated feature (sandeel) of the Turbot Bank NCMPA.

7. Summary of Conclusions

7.1.1.1 It is concluded that based on the information within this NCMPA Assessment there is no potential for the Project activities to hinder the achievement (other than insignificantly) of the conservation objectives for the Southern Trench NCMPA (in accordance with Section 126 of the Marine and Coastal Access Act 2009 and Section 83 of the Marine (Scotland) Act 2010) and Turbot Bank NCMPA (in accordance with Section 83 of the Marine (Scotland) Act 2010).

7.1.1.2 It is also concluded that, based on the information contained within this NCMPA Assessment there is no potential for the Project activities to have a cumulative effect with other plans, developments and activities to hinder the achievement (other than insignificantly) the conservation objectives for the Southern Trench NCMPA, and the Turbot Bank NCMPA (in accordance with Section 126 of the Marine and Coastal Access Act 2009 and Section 83 of the Marine (Scotland) Act 2010).

8. References

ABP Marine Environmental Research Ltd (ABPmer), (2008). *Atlas of UK Marine Renewable Energy Resources*. [online] Available at: https://www.renewables-atlas.info/. [Accessed: 23 September 2025].

Anderwald, P., Evans, P.G., Dyer, R., Dale, A., Wright, P.J. and Hoelzel, A.R., (2012). *Spatial scale and environmental determinants in minke whale habitat use and foraging*. Marine Ecology Progress Series, 450, pp.259-274.

Bailey, H., Brookes, L.K. and Thompson, M.P., (2014). *Assessing environmental impacts of offshore wind farms: lessons learned and recommendations for the future*. Aquatic Biosystems, 10(1), 8.

Benda-Beckmann, A.M., Aarts, G., Sertlek, H.Ö., Lucke, K., Verboom, W.C., Kastelein, R.A., Ketten, D.R., van Bemmelen, R., Lamm, F-P.A., Kirkwood, R.J. and Ainslie, M.A., (2015). *Assessing the impact of underwater clearance of unexploded ordnance on harbour porpoises (Phocoena phocoena) in the southern North Sea. Aquatic Mammals*, 41(4), pp.503-523.[online] Available at: https://doi.org/10.1578/AM.41.4.2015.503 [Accessed: 10 September 2025].

Brooks, A.J. Kenyon, N.H. Leslie, A., Long, D. and Gordon, J.E., (2013). *Characterising Scotland's marine environment to define search locations for new Marine Protected Areas. Part 2: The identification of key geodiversity areas in Scottish waters.* Scottish Natural Heritage Commissioned Report No. 432. [online] Available at: https://www.nature.scot/doc/naturescot-commissioned-report-432-characterising-scotlands-marine-environment-define-search [Accessed: 13 August 2025]

Cooke, J.G., (2018). *Balaenoptera acutorostrata*. *The IUCN Red List of Threatened Species 2018*. [online] Available at: https://www.iucnredlist.org/species/2474/50348265. [Accessed: 23 September 2025].

Coull, K.A., Johnstone, R. and Rogers, S.I., (1998). *Fisheries sensitivity maps in British waters*. [online] Available at: https://www.cefas.co.uk/media/o0fgfobd/sensi_maps.pdf [Accessed: 28 August 2025].

Cresci, A., Perrichon, P., Durif, C.M., Sørhus, E., Johnsen, E., Bjelland, R., Larsen, T., Skiftesvik, A.B. and Browman, H.I., (2022). *Magnetic fields generated by the DC cables of offshore wind farms have no effect on spatial distribution or swimming behaviour of lesser sandeel larvae (Ammodytes marinus). Marine Environmental Research*, *176*, p.105609.

Department for Energy Security & Net Zero (DESNZ), (2023a). *Overarching National Policy Statement for Energy (EN-1).* [online] Available at: https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1 [Accessed: 1 October 2025].

Department for Energy Security & Net Zero (DESNZ), (2023b). *National Policy Statement for Renewable Energy Infrastructure (EN-3).* [online] Available at: https://www.gov.uk/government/publications/national-policy-statement-for-renewable-energy-infrastructure-en-3 [Accessed: 1 October 2025].

Department for Energy Security & Net Zero (DESNZ), (2023c). *National Policy Statement for Electricity Networks Infrastructure (EN-5).* [online] Available at: https://www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5 [Accessed: 1 October 2025].

Dunn., E., (2021). *Revive our Seas: The case for stronger regulation of sandeel fisheries in UK waters.* RSPB. Available online: https://files.pca-cpa.org/pcadocs/2024-45/2.%20The%20United%20Kingdom's%20Written%20Submission%20-%20Exhibits/Exhibit%20R-0029.pdf [Accessed: 28 July 2025].

Ellis, C., Milligan, S., Readdy, L., Taylor, N. and Brown, M., (2012). *Spawning and nursery grounds of selected fish species in UK waters. Technical Report No. 147*. [online] Available at: https://tethys.pnnl.gov/sites/default/files/publications/Ellisetal2012.pdf [Accessed: 28 August 2025].

Engelhard, G.H., Blanchard, J.L., Pinnegar, J.K., van der Kooij, J., Bell, E.D., Mackinson, S. and Righton, D.A., (2013). *Body condition of predatory fishes linked to the availability of sandeels*. Marine Biology, 160(2), pp.299-308.

Engelhard, G.H., van der Kooij, J., Bell, E.D., Pinnegar, J.K., Blanchard, J.L., Mackinson, S. and Righton, D.A., (2008). *Fishing mortality versus natural predation on diurnally migrating sandeels Ammodytes marinus*. Marine Ecology Progress Series, 369, pp. 213–227.

Gilles, A, Authier, M, Ramirez-Martinez, NC, Araújo, H, Blanchard, A, Carlström, J, Eira, C, Dorémus, G, Fernández, Maldonado, C, Geelhoed, SCV, Kyhn, L, Laran, S, Nachtsheim, D, Panigada, S, Pigeault, R, Sequeira, M, Sveegaard, S,Taylor, NL, Owen, K, Saavedra, C, Vázquez-Bonales, JA, Unger, B, Hammond, PS (2023*). Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys*. Final report published 29 September 2023. 64 pp. [online] Available at: https://tinyurl.com/3ynt6swa [Accessed: 28 July 2025].

Goertner, J.F., (1978). *Dynamical model for explosion injury to fish*. Naval Surface Weapons Center, White Oak Lab, Silver Spring, MD. Report No. NSWC/WOL.TR-76-155.

Goertner, J.F., Wiley, M.L., Young, G.A. and McDonald, W.W., (1994). *Effects of underwater explosions on fish without swim bladders*. Naval Surface Warfare Center. Report No. NSWC/TR-76-155.

Greenstreet, S. P., Holland, G. J., Guirey, E. J. and Armstrong, E., (2010). *Combining hydroacoustic and grab sampling to assess the potential impact of a marine aggregate extraction operation on a sandeel (Ammodytidae) population*. ICES Journal of Marine Science, 67(5), pp. 993-1003.

Halvorsen, M.B., Zeddies, D.G., Ellison, W.T., Chicoine, D.R. and Popper, A.N., (2012). *Effects of mid-frequency active sonar on hearing in fish*. *The Journal of the Acoustical Society of America*, 131(1), pp. 599-607.

Hastie, G., Merchant, N. D., Götz, T., Russell, D. J. F., Thompson, P. and Janik, V. M. (2019). *Effects of impulsive noise on marine mammals: investigating range-dependent ris*k. Ecological Applications. 29(5), e01906.

Holland, G.J., Greenstreet, S.P.R., Gibb, I.M., Fraser, H.M., and Robertson, M.R., (2005). *Identifying sandeel Ammodytes marinus sediment habitat preferences in the marine environment.* Marine Ecology Progress Series, 303: pp. 269-282.

Holmes, R., Bulat, J., Henni, P., Holt, J., James, C., Kenyon, N., Leslie, A., Long, D., Musson, R., Pearson, S. and Stewart, H., (2004). *DTI Strategic Environmental Assessment Area 5 (SEA5): Seabed and superficial geology and processes*. British Geological Survey Report CR/04/064N.

Hutchison, Z.L., Secor, D.H. and Gill, A.B., (2020). *The interaction between resource species and electromagnetic fields associated with electricity production by offshore wind farms*. *Oceanography*, *33*(4), pp.96-107.

Institute of Environmental Management and Assessment (IEMA), (2024). *Guidelines: Implementing the Mitigation Hierarchy from Concept to Construction*.

International Council for the Exploration of the Seas (ICES), (2023). *Benchmark Workshop on Sandeel (Ammodytes spp.)* (Outputs from 2022 and 2023 meetings) (WKSANDEEL). [online] Available at: https://ices-library.figshare.com/articles/report/Benchmark_Workshop_on_Sandeel_Ammodytes_spp_Outputs_from_2022_and_2023_meetings_/21581151?file=44621995 [Accessed: 24 September 2025].

Jensen, H., Rindorf, A., Wright, P. J. and Mosegaard, H., (2011). *Inferring the location and scale of mixing between habitat areas of lesser sandeel (Ammodytes marinus) from patterns in otolith chemistry*. Canadian journal of fisheries and aquatic sciences, 68(1), pp. 49-61.

Joint Nature Conservation Committee (JNCC), (2019). *European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S2618 - Minke whale (Balaenoptera acutorostrata). United Kingdom*. [online] Available at: https://jncc.gov.uk/jncc-assets/Art17/S2618-UK-Habitats-Directive-Art17-2019.pdf [Accessed: 10 September 2025].

Joint Nature Conservation Committee (JNCC), (2025). *JNCC guidelines for minimising the risk of injury to marine mammals from unexploded ordnance (UXO) clearance in the marine environment.* JNCC, Aberdeen. [online] Available at: https://hub.jncc.gov.uk/assets/cbd480f1-47ea-4d78-b94c-04e0f9389daa [Accessed: 24 September 2025].

Joint Nature of Conservation Committee (JNCC), (2020). *Statements on conservation benefits, condition & conservation measures for Turbot Bank Nature Conservation Marine Protected Area.* [online] Available at: https://data.jncc.gov.uk/data/63f05a50-a78b-4a58-9bde-d78261780729/TurbotBank4-ConservationStatements-V1.0.pdf [Accessed: 28 August 2025].

Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M. (2001*). Collisions between ships and whales. Marine Mammal Science,* 17, 3-75.

Leaper, R., MacLennan, E., Brownlow, A., Calderan, S.V., Dyke, K., Evans, P.G.H., Hartny-Mills, L., Jarvis, D., McWhinnie, L., Philip, A., Read, F.L., Robinson, K.P., and Ryan, C. (2022). *Estimates of humpback and minke whale entanglements in the Scottish static pot (creel) fishery*. Endangered Species Research. 49, pp. 217-232.

MacDougal, D. A. I., and Robinson, K. P. (2025). Following the food: Dynamic, seasonal changes in the fine-scale distribution of foraging minke whales within a Scottish Marine Protected Area (MPA). *Oceans* 2025, 6, 18. [online] https://doi.org/10.3390/oceans6010018 [Accessed 15 October 2025].

Macleod, K., Fairbairns, R., Gill, A., Fairbairns, B., Gordon, J., Blair-Myers, C. and Parsons, E.C. (2004). *Seasonal distribution of minke whales Balaenoptera acutorostrata in relation to physiography and prey off the Isle of Mull, Scotland*. Marine Ecology Progress Series, 277, pp.263-274.

Marine (Scotland) Act 2010. (asp. 5). [online] Available at: https://www.legislation.gov.uk/asp/2010/5/contents [Accessed: 28 August 2025].

Marine and Coastal Access Act 2009. (c. 23). [online] Available at: https://www.legislation.gov.uk/ukpga/2009/23/contents [Accessed: 28 August 2025].

Marine Management Organisation (MMO), (2013). Marine conservation zones and marine licensing. [online] https://www.gov.uk/guidance/marine-licensing-impact-assessments#marine-conservation-zone-assessment [Accessed 15 October 2025].

MarramWind Limited, (2023). *MarramWind Offshore Wind Farm Environmental Impact Assessment – Scoping Report.* [online] Available at: https://marramwind.co.uk/scoping-report [Accessed: 28 August 2025].

Martin, S.B., Lucke, K. and Barclay, D.R., (2020). *Techniques for distinguishing between impulsive and non-impulsive sound in the context of regulating sound exposure for marine mammals*. The Journal of the Acoustical Society of America 147, 2159

Matei, M., Chudzińska, M., Remmers, P., Bellman, M., Darias-O'Hara, A.K., Verfuss, U., Wood, J., Hardy, N., Wilder, F. and Booth, C., (2024). *Range dependent nature of impulsive noise (RaDIN). Report on behalf of the Carbon Trust and Offshore Renewables Joint Industry Programme (ORJIP) for Offshore Wind.*

Maxwell, S.M., Baird, R.W., Hazen, E.L., Bograd, S.J., Halpin, P.N., Castelao, R.M., Dutton, P.H., Bailey, H., Mate, B.R., Shaffer, S.A., Palacios, D.M., Robinson, P.W., Tremblay, Y., Block, B.A. and Costa, D.P. (2022). *Cumulative human impacts on marine predators*. *Science*, 377(6611), pp. 979-983. https://doi.org/10.1126/science.abn7278

NatureScot, (2014). *Scottish MPA Project – Southern Trench MPA Proposal*. [online] Available at: https://www.nature.scot/sites/default/files/2017-11/Marine%20Protected%20Area%20-%20Data%20confidence%20assessment%20-%20Southern%20Trench%20MPA%20proposal.pdf [Accessed: 24 September 2025].

NatureScot, (2020). *Conservation and Management Advice: Southern Trench NCMPA*. [online] Available at: https://sitelink.nature.scot/site/10477 [Accessed: 28 August 2025].

NatureScot, (2025). *Conservation and Management Advice: Southern Trench NCMPA*. [online] Available at: https://www.nature.scot/sites/default/files/nature-conservationmpa/10477/conservation-and-management-advice.pdf [Accessed: 28 August 2025].

Ounanian, K., van Tatenhove, J.P.M., Ramírez-Monsalve, P., van Leeuwen, J., van Hoof, L., and Linke, S., (2020). *Governing marine ecosystem restoration: The role of discourses and actor coalitions in the North Sea*. *Marine Policy*, 112, 103778. [online] Available at: https://doi.org/10.1016/j.marpol.2019.103778 [Accessed: 24 September 2025].

Pirotta, E., Laesser, B.E., Hardaker, A., Riddoch, N., Marcoux, M. and Lusseau, D., (2015). *Dredging displaces bottlenose dolphins from an urbanised foraging patch. Marine Pollution Bulletin*, 97(1-2), pp. 402-408. https://doi.org/10.1016/j.marpolbul.2015.05.060

Popper, A.N., Hawkins, A.D., Fay, R.R., Mann, D.A., Bartol, S., Carlson, T.J., Coombs, S., Ellison, W.T., Gentry, R.L., Halvorsen, M.B., Løkkeborg, S., Rogers, P.H., Southall, B.L., Zeddies, D.G. and Tavolga, W.N., (2014). *Sound Exposure Guidelines for Fishes and Sea Turtles*. Berlin: Springer.

Robinson, K.P., Tetley, M., and Mitchelson-Jacob, E.G., (2009). *The distribution and habitat preference of coastally occurring Minke whales (Balaenoptera acutorostrata) in the outer southern Moray firth, Northeast Scotland*. Journal of Coastal Conservation. 13(1). 39-48.

Rowley, S.J., (2008). *Lesser sandeel (Ammodytes marinus) and sand goby (Pomatoschistus minutus) information from The Marine Life Information Network*.

Scottish Government (2024). *Draft Fisheries Assessment – Turbot Bank NCMPA: Fisheries management measures within Scottish Offshore Marine Protected Areas (MPAs)*. [online]. Available at: https://www.gov.scot/publications/draft-fisheries-assessment-turbot-bank-NCMPA-fisheries-management-measures-within-scottish-offshore-marine-protected-areas-mpas/documents/. [Accessed: 24 September 2025].

Scottish Government, (2013). *Nature Conservation Marine Protected Areas: Draft Management Handbook*. [online] Available at: https://www.webarchive.org.uk/wayback/archive/3000/https://www.gov.scot/resource/0042/00428637.pdf [Accessed: 28 August 2025].

Scottish Government, (2022). *Decommissioning of Offshore Renewable Energy Installations in Scottish waters or in the Scottish part of the Renewable Energy Zone under The Energy Act 2004*. [online]. Available at: https://www.gov.scot/publications/offshore-renewable-energydecommissioning-guidance-scottish-waters/pages/10/. [Accessed: 27 September 2025].

Scottish Government, (2023*). MarramWind Offshore Wind Farm Environmental Impact Assessment – Scoping Opinion*. [online] Available at: https://marine.gov.scot/node/23928 [Accessed: 22 June 2023].

Scottish Government, (2025). *Sitelink*. [online] Available at: https://feature-activity-sensitivity-tool.scot/ [Accessed 10 September 2025].

Scottish Marine Animal Stranding Scheme (SMASS), (2025). *Sitelink.* [online]. Available at: https://strandings.org/map/ [Accessed: 24 September 2025].

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P. and Tyack, P.L., (2019). *Marine mammal noise exposure criteria: updated scientific recommendations for residual hearing effects*. Aquatic Mammals, *45*(2), pp.125-232.

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P. and Tyack, P.L., (2019). *Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects. Aquatic Mammals*, 45(2), pp.125-232. https://doi.org/10.1578/AM.45.2.2019.125

Stephenson, J.R., Gingerich, A.J., Brown, R.S., Pflugrath, B.D., Deng, Z., Carlson, T.J., Langeslay, M.J., Ahmann, M.L., Johnson, R.L. and Seaburg, A.G., (2010). *Assessing barotrauma in neutrally and negatively buoyant juvenile salmonids exposed to simulated hydro-turbine passage using a mobile aquatic barotrauma laboratory*. Fisheries Research Volume 106, Issue 3, pp 271-278, December 2010.

Thompson, P.M., Brookes, K.L., Graham, I.M., Barton, T.R., Needham, K., Bradbury, G. and Merchant, N.D. (2020). *Short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises*. *Proceedings of the Royal Society B*, 287(1926), 20201517. [online] Available at: https://doi.org/10.1098/rspb.2020.1517 [Accessed: 24 September 2025].

Todd, V.L.G., Todd, I.B., Gardiner, J.C., Morrin, E.C.N., MacPherson, N.A., DiMarzio, N.A. and Thomsen, F., (2016). *A review of impacts of marine dredging activities on marine mammals. ICES Journal of Marine Science*, 72(2), pp.328-340.[online] Available at: https://doi.org/10.1093/icesjms/fsu187 [Accessed: 24 September 2025].

Tyler-Walters, H., James, B., Carruthers, M., Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P.D., Wilkes, P.T.V., Seeley, R., Neilly, M., Dargie, J. and Crawford-Avis, O.T., (2016). *Descriptions of Scottish Priority Marine Features (PMFs).* Scottish Natural Heritage Commissioned Report No. 406.

9. Glossary of Terms and Abbreviations

9.1 Abbreviations

Abbreviation	Definition
AfL	Agreement for Lease
CEA	Cumulative Effects Assessment
CES	Crown Estate Scotland
CI	Confidence Interval
CO	Conservation Objective
CV	Coefficient of Variance
dB	decibels
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
GW	gigawatts
HRA	Habitats Regulation Appraisal
Hz	Hertz
IAMMWG	Inter-Agency Marine Mammal Working Group
ICES	International Council for the Exploration of the Seas
IEMA	Institute of Environmental Management and Assessment
INTOG	Innovation and Targeted Oil and Gas
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
kJ	kiloJoules
km	kilometres
LEp,t	Sound Exposure Level over time
LF	Low Frequency
Lp,pk	Peak Sound Pressure Level
m	metre

Abbreviation	Definition
MarESA	Marine Evidence-based Sensitivity Assessment
MCZ	Marine Conservation Zone
MD-LOT	Marine Directorate Licensing and Operations Team
MHWS	Mean High Water Springs
MSL	Mean Sea Level
MU	Management Unit
NCMPA	Nature Conservation Marine Protected Area
NE7	North East 7
nm	Nautical mile
NPS	National Policy Statement
O&M	Operation & Maintenance
OAA	Option Agreement Area
OFTO	Offshore Transmission Owner
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic
PMF	Priority Marine Feature
PO	Plan Option
PTS	Permanent Threshold Shift
RCP	Reactive Compensation Platform
s.36	Section 36
SCANS	Small Cetaceans in European Atlantic waters and the North Sea survey
SPR	ScottishPower Renewables
SSC	Suspended Sediment Concentration
TTS	Temporary Threshold Shift
UK	United Kingdom
UXO	Unexploded Ordnance
WTG	Wind Turbine Generator
ZOI	Zone of Influence

9.2 Glossary of terms

Term	Definition
Background sound level	The underlying level of sound over a period, T, and is represented by LA90, T, the level exceeded for 90% of the measurement interval T.
Baseline conditions	The environment as it appears (or would appear) immediately prior to the implementation of a project, together with any known or foreseeable future changes that will take place before its completion.
Bathymetry	Topography of sea or estuary bed as measured from a fixed vertical datum.
Benthic ecology	The study of the organisms living in and on the sea floor, the interactions between them and their impacts on the surrounding environment.
Cetaceans	Marine mammals including whales, dolphins and porpoises.
Decibels	A unit used to measure the intensity of a sound or the power level of an electrical signal by comparing it with a given level on a logarithmic scale.
Echolocation	The location of objects by reflected sound.
European Protected Species	Species of plants and animals (other than birds) protected by law throughout the European Union.
European site	European sites are those that are designated through the Habitats Directive and Birds Directive (via national legislation as appropriate). Within Scotland, additional sites designated through international convention are given the same protection through policy – overall all of these are referred to as European sites. European sites in Scotland are considered to be SPAs, SACs, candidate SACs and Sites of Community Importance (SCI). Potential SPAs (pSPA), possible SACs (pSACs), Ramsar sites (designated under international convention) and proposed Ramsar sites.
FeAST tool	A tool created by NatureScot that assesses the sensitivity of marine features to pressures arising from human activities.
Geodiversity	The variety of geological environments, phenomena and processes that make up the surface and sub-surface environment of an area.
Hertz	The unit of measurement for frequency of a sound wave, measured as the number of sound waves oscillating per second.
Long-term habitat loss	Substantive change to a habitat such that it loses the integrity of its defining features for a period of time that bears significance to the species supported by the habitat (i.e. this may vary between habitats depending on the lifecycle of the dependent species in question) and their ability to successfully recolonise.
Marine licence	Licence required for certain activities in the marine environment and granted under either the Marine and Coastal Access Act 2009 or the Marine (Scotland) Act 2010.

Term	Definition
Marine Mammal Mitigation Protocol	A programme of measures to minimise the risk of injury (in the form of a permanent change in hearing referred to as a permanent threshold shift, or PTS) in marine mammals.
Marine Policy Statement	The framework for preparing Marine Plans and taking decisions affecting the marine environment in the UK.
Marine Protected Area Assessment	A three-step process for determining whether there is a significant risk that a proposed development could hinder the achievement of the conservation objective(s) of an NCMPA.
MarramWind Limited ('the Applicant')	MarramWind Offshore Wind Farm (hereafter referred to as 'the Project') is wholly owned by ScottishPower Renewables UK Limited (SPR). MarramWind Limited, a subsidiary of SPR, is the Applicant for the Project.
Mean High Water Springs	The average throughout a year of the heights of two successive high waters during those periods of 24 hours (approximately once a fortnight) when the tidal range is greatest.
Mean Low Water Springs	The average throughout a year of the heights of two successive low waters during those periods of 24-hours (approximately once a fortnight) when the tidal range is greatest.
MarESA Tool	A systematic approach to assess the sensitivity of marine species and habitats to various pressures.
Nature Conservation Marine Protected Area	A specific type of NCMPA designated under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 to protect habitats and species of national importance.
Permanent Threshold Shift	Irreversible and permanent change in hearing sensitivity.
Priority Marine Feature	Habitats and species that are considered to be marine nature conservation priorities in Scotland.
Scottish Government Marine Directorate (formerly Marine Scotland)	Civil service directorate for Scotland, which is responsible for the integrated management of Scotland's seas.
ScottishPower Renewables UK Limited	Part of the Iberdrola group and 100% owner of MarramWind Limited.
Small cetaceans in European Atlantic Waters and the North Sea	The name of a scientific research endeavour that involved large-scale ship and aerial surveys of the distribution and abundance of cetaceans in European Atlantic waters. The survey was first undertaken in 1994, with similar surveys also conducted in 2005, 2007, 2016 and 2022.
Temporary Threshold Shift	Reversible and temporary change in hearing sensitivity.
Unexploded Ordnance	Explosive weapons (for example bombs, shells, grenades, land mines, naval mines) that did not explode when they were employed or discarded and still pose a risk of detonation, potentially many decades later.

Term	Definition
Vessel Monitoring System	A system used in commercial fishing to allow environmental and fisheries regulatory organisations to monitor, minimally, the position, time at a position, and course and speed of fishing vessels.
Wind Turbine Generators	Devices that convert wind energy into electrical power, typically consisting of a rotor, generator, and tower.

MarramWind