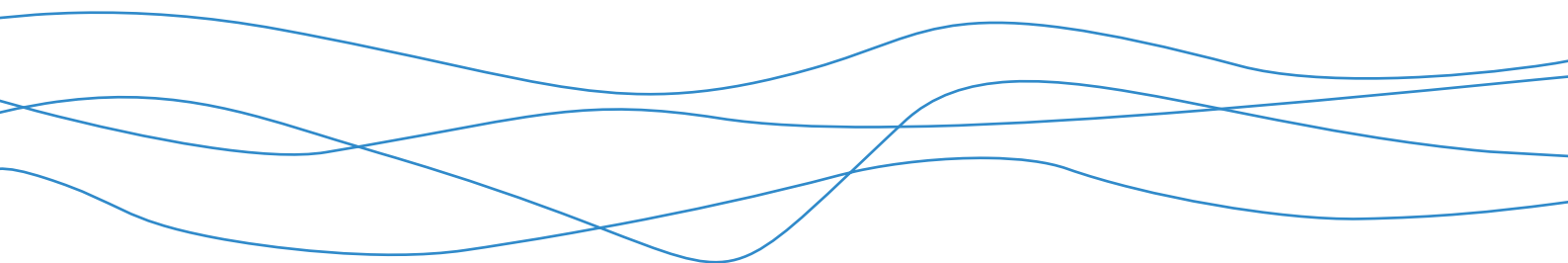




Bowdun Offshore Wind Farm, Report to Inform Appropriate Assessment

Part 2 – Special Areas of Conservation

TWP-BOW-RPS-ENV-RPT-00014 | April 2026



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Glossary

Defined term	Definition
Additional Mitigation	Also referred to as secondary mitigation which is defined by The Institute of Sustainability and Environmental Professionals (ISEP) (formerly Institute of Environmental Management and Assessment (IEMA)) as: Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the Environmental Impact Assessment (EIA) Report (sic).
Annex I	Habitats of community interest whose conservation requires the designation of Special Areas of Conservation (SACs), as identified in Annex I of the Habitats Directive (Council Directive 92/43/EEC).
Annex II	Species of community interest whose conservation requires the designation of Special Areas of Conservation (SACs) as identified in Annex II of Habitats Directive (Council Directive 92/43/EEC).
Applicant (the)	Bowdun Offshore Wind Farm Limited (BOWFL).
Appropriate Assessment (AA)	An assessment to determine the implications of a plan or project for a European site in view of that site's conservation objectives. An Appropriate Assessment forms part of the Habitats Regulations Appraisal (HRA) and is required when a plan or project (either alone or in combination with other plans or projects) is likely to have a significant adverse effect on a European site.
Array Area	The Array Area is the area in which the Offshore Generation Assets will be located.
Barrier Effects	The effect by which an animal or bird has to make longer transits between a breeding or roosting location to an area of foraging. An Offshore Wind Farm (OWF) could act as a barrier in which a species has to fly around to reach the other side, some species are unlikely to travel through or over.
Benthic	Living on or in the seabed.
Bowdun Offshore Wind Farm Limited (BOWFL)	A Special Purpose Vehicle (SPV) (legal entity) for the purpose of developing the Project. BOWFL are the Applicant for the Offshore Application.
Cetacean	Marine mammals that are entirely aquatic. These include whales, dolphins, and porpoises.
Competent Authority	The term derives from the Habitats Regulations and relates to the duties that the Regulations impose on public bodies and individuals. Regulation 6(1) defines Competent Authorities as 'any Minister, government department, public or statutory undertaker, public body of any description or person holding a public office'. In the case of the Proposed Development, the Competent Authority is the Marine Directorate-Licensing Operations Team (MD-LOT) acting on behalf of the Scottish Ministers.
Cumulative Effects	The effects of the Proposed Development assessed together with effects from the Onshore Infrastructure forming the Project as well as one or more different projects on the same receptor/resource.
Diadromous Fish	Fish which move between freshwater and seawater as part of their life cycle.
Digital Aerial Surveys (DAS)	A method for undertaking baseline ornithological and marine mammal data collection surveys. Usually undertaken over a period of 24 months.

Defined term	Definition
Displacement	An impact that occurs when an animal is forced away from an area of habitual usage. This can be temporary (i.e. a ship moving) or permanent (i.e. the placement of offshore infrastructure).
Effect	Term used to express the consequence of an impact (i.e. the result of change or changes on specific environmental resources or receptors). The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity of the receptor or resource in accordance with defined significance criteria.
Embedded Mitigation	Measures that are adopted as part of the Proposed Development and therefore assessed within the EIA. The proposed approach for the EIA for the Proposed Development is that Embedded Mitigation includes both primary mitigation and tertiary mitigation. These are defined by the ISEP as follows: Primary: Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken. Tertiary: Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
Environmental Impact Assessment (EIA)	Process for the assessment of likely significant environmental effects of a project on the physical, biological and human environment during construction, Operation and Maintenance (O&M) and decommissioning.
European Sites	This term recognises SACs, candidate SACs (cSACs), Sites of Community Importance (SCIs), Special Protection Areas (SPAs), possible SACs (pSACs), potential SPAs (pSPAs) and Ramsar sites (where also designated as another European Site), which protect species and habitats shared across Europe and were originally designated under European legislation.
Export Cable Corridor	The area seaward of MHWS which connects the Array Area with the Landfall within which the Offshore Export Cables will be installed.
Habitats Regulations	A term that refers to the collective legislation that translates the Habitats Directive into specific legal obligations in Scotland, namely: The Conservation (Natural Habitats, &c.) Regulations 1994; The Conservation of Habitats and Species Regulations 2017; and The Conservation of Offshore Marine Habitats and Species Regulations 2017 (in each case as amended).
Habitats Regulations Appraisal (HRA)	An assessment carried out under the Habitats Regulations to determine if a plan or project could adversely affect the integrity of a European Site.
Impact	A change caused by an action that occurs during a project's lifetime.
Impulsive Sound	Sound which is broadband, very brief with a high rise time and high peak level compared to the energy averaged sound level.

Defined term	Definition
In-Combination Effects	The combined effects of the Proposed Development assessed together with effects from one or more different projects on the same Qualifying Features/SAC.
Inter-Array Cables (IAC)	Cables which link the Wind Turbines to each other and with the OSPs.
Interconnector Cables	Cables which will connect individual OSPs to each other to provide redundancy against cable failure elsewhere.
Intertidal Area	The area between MHWS and Mean Low Water Springs (MLWS).
Landfall	The area in which the Offshore Export Cables make landfall and is also the transitional area between the Offshore Transmission Assets and the Onshore Transmission Assets. Located in the Intertidal Area at Benholm.
Likely Significant Effect (LSE)	A significant effect on a designated site that has the potential to occur as a result of the Proposed Development (as determined by the LSE Screening Report). Where a LSE cannot be ruled out, further assessment is needed as part of the AA.
Marine Directorate (MD)	The Marine Directorate of the Scottish Government, formerly known as Marine Scotland. The planning and licensing authority for Scotland's seas and custodian of Scotland's National Marine Plan (NMP). The Marine Directorate - Licensing Operations Team (MD-LOT) are specifically responsible for managing Section 36 Consent and Marine Licence Applications seaward of MHWS.
Marine Licence	A Marine Licence permits the undertaking of different activities in the marine environment, including construction, the deposition or removal of substances or objects, and dredging. The Marine (Scotland) Act 2010 requires Marine Licences to be obtained for licensable activities taking place within Scottish Territorial Seas (MHWS to 12 nm). The Marine and Coastal Access Act (MCAA) 2009 requires a Marine Licence to be obtained for licensable marine activities within the Scottish offshore region (12 nm – 200 nm).
Maximum Design Scenario (MDS)	The scenario within the design envelope likely to result in the greatest impact on a particular topic receptor, and therefore the one that should be assessed for that topic receptor.
Mean High Water Springs (MHWS)	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean Low Water Springs (MLWS)	The average tidal height throughout the year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Mitigation	Measures to avoid, prevent, reduce or control effects on the environment. See also definitions for Embedded Mitigation and Additional Mitigation.
Non-Impulsive (or Continuous) sound	Sound which is either continuous or intermittent but without the characteristics described above for impulsive sound.
Odontocete	An animal that belongs to the family of toothed whales, a sub-group of the order Cetacea.
Offshore Application	Term used to refer to the applications associated with the Proposed Development. The Applicant will apply for: • A Section 36 Consent under the Electricity Act 1989; and • Marine Licence(s) under Marine Scotland Act 2010 and Marine and Coastal Access Act 2009.

Defined term	Definition
Offshore Environmental Impact Assessment (EIA) Report (hereafter, ‘Offshore EIA Report’)	Document prepared to report the findings of the EIA for the Proposed Development and produced in accordance with the EIA Regulations. The Offshore EIA Report is submitted to support the Offshore Application for the Proposed Development, and to comply with EIA Regulations.
Offshore Export Cables	Subsea cables used to transmit electricity generated offshore by the Wind Turbines from the OSPs to shore. The Transition Joint Bay (TJB) is the location where the Offshore Export Cables terminate, and the onshore cabling begins.
Offshore Generation Assets	The infrastructure of the Proposed Development required to generate electricity comprising of the Wind Turbines, Wind Turbine foundations and associated infrastructure (e.g. IACs).
Offshore Infrastructure	All of the Offshore Infrastructure associated with the Proposed Development that is located seaward of MHWS, comprising the Offshore Generation Assets and the Offshore Transmission Assets.
Offshore Scoping Report	The report that presents the findings of the EIA scoping process undertaken for the Proposed Development with the purpose of obtaining a Scoping Opinion. The Offshore Scoping Report defines what is intended to be assessed and reported as part of the EIA.
Offshore Substation Platform(s) (OSP(s))	OSP(s) comprise the support structure, topside and electrical components used for collecting and/or converting electricity generated by the Wind Turbines for transmission by the Offshore Export Cables.
Offshore Transmission Assets	The infrastructure of the Proposed Development required to transmit the generated electricity comprising of the OSPs, Offshore Export Cables and associated infrastructure up to MHWS.
Operation and Maintenance (O&M)	The phase of the Proposed Development following completion of construction. This phase of development includes routine inspections, repairs and replacement of infrastructure and equipment (including Interconnector Cables and IACs), Scour Protection replenishment or replacement, major component replacement, painting and/or other coating works, removal of marine growth, and replacement of access ladders.
Option to Lease Agreement (OLA)	An agreement between CES and a developer, permitting the future development of offshore wind within an agreed area.
Oslo-Paris [Convention] (OSPAR)	Convention for the Protection of the Marine Environment of the North-East Atlantic.
Particle Motion	Component of the pressure wave comprising the movement of particles within the water or sediment relative to an equilibrium point.
Pathway	Describes the means or route by which a receptor (such as the seabed) can be affected by an identified impact source (such as Wind Turbine foundations).
Piling	The action of installing piles: installation can use various methodologies, the most common of which are impact piling (in which the piles are struck by a “hammer”) and drilling (during which a hole is drilled into the seafloor, the drilling tool is removed, and the pile is slotted into that hole).

Defined term	Definition
Project (the)	An overarching term for the Bowdun Offshore Wind Farm (Bowdun OWF) comprising the offshore and onshore infrastructure required to generate and transmit electricity from the Array Area to the onshore GCP. The Project includes the Offshore Generation Assets, the Offshore Transmission Assets and the Onshore Transmission Assets.
Proposed Development	Term used to define the Offshore Infrastructure associated with the Project seaward of MHWS for which consent is being sought. Further details of the parameters are included in Volume 1, Chapter 3: Project Description.
Qualifying Features	The features for which a European Site has been officially designated to protect.
Report to Inform Appropriate Assessment (RIAA)	The RIAA provides detailed information to support the process of AA (undertaken by the competent authority) as part of the HRA, which evaluates the potential impacts of a project or plan on European Sites.
Scoping Opinion	A document produced by MD-LOT which is issued in response to submission and review of the Offshore Scoping Report. The Scoping Opinion is supported with feedback and advice from consultees, which details what is expected to be included in the Offshore EIA Report and what can be scoped out of the EIA process.
Scoping Workshop	A series of sessions preceding the finalisation of the Offshore Scoping Report to provide an opportunity for the Applicant to consult on the draft scope and for stakeholders to request additional information on key issues.
Scottish Marine Area	The area of sea within the seaward limits of the territorial sea of the United Kingdom adjacent to Scotland as defined by the Marine (Scotland) Act 2010.
Scottish Ministers (the)	The decision makers with regard to Marine Licence(s) and Section 36 Consent applications in Scottish Offshore Waters and Scottish Marine Area.
Scottish Offshore Waters	The area of sea beyond 12 nm but within the Scottish Exclusive Economic Zone (EEZ) up to 200 nautical miles from the coast. .
Scour Protection	Protective materials installed to avoid sediment being eroded away from the base of the foundations and/or buried subsea cable due to the flow of water.
Section 36 Consent	Scottish Ministers' consent under Section 36 of the Electricity Act 1989 required to permit the generation and operation of an energy generation station.
Significance	Effect factor that is determined by the magnitude of impact along with the sensitivity of the receptor.
Site Boundary	The boundary within which all elements of the Proposed Development will be located. The Site Boundary comprises the Array Area and Export Cable Corridor which ends at MHWS.
Special Areas of Conservation (SACs)	SACs are areas designated for the conservation of certain plant and animal species listed in the Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

Defined term	Definition
Special Protection Areas (SPAs)	SPAs are sites that are designated to protect rare or vulnerable birds (as listed on Annex I of the Directive 2009/147/EC on the conservation of wild birds), as well as regularly occurring migratory species.
Spring Tidal Excursion	The distance suspended sediment is transported prior to being carried back on the returning tide.
Statutory Nature Conservation Body (SNCB)	A statutory adviser to the UK and Scottish Governments on Scottish, UK and international nature conservation.
Study Area	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific study area. Specific study areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of the Project may be experienced by the relevant receptors (i.e. Zone of Influence).
Subtidal	Areas of the coastal marine environment that lie below the level of MLWS and are continuously submerged by seawater.
Thistle Wind Partners (TWP)	Company established for the development of the Project.
Wind Turbines	Structures comprising of a tubular tower, rotor blades, and a nacelle which houses the Wind Turbine generator.

Acronyms

Acronym	Definition
AA	Appropriate Assessment
AC	Alternating Current
ADD	Acoustic Deterrent Device
AIS	Automatic Information System
AUD INJ	Auditory Injury
AUV	Autonomous Underwater Vehicles
BOWFL	Bowdun Offshore Wind Farm Limited
CaP	Cable Plan
CAP	Conservation Advice Package
CBA	Cable Burial Assessment
CBRA	Cable Burial Risk Assessment
CEA	Cumulative Effects Assessment
CMA	Conservation and Management Advice
CMS	Construction Method Statement
CoCP	Code of Construction Practice
CPT	Cone Penetration Test
CSIP	Cable Specification and Installation Plan
DAS	Digital Aerial Surveys
DC	Direct Current
DEFRA	Department for Environment Food and Rural Affairs
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMP	Environmental Management Plan
EPS	European Protected Species
FCS	Favourable Conservation Status
HDD	Horizontal Directional Drilling
HF	High Frequency
HRA	Habitats Regulations Appraisal
HVDC	High Voltage Direct Current
IAC	Inter-Array Cable
IAMMWG	Inter-Agency Marine Mammal Working Group
INNS	Invasive Non-Native Species
INNSMP	Invasive Non-Native Species Management Plan
iPCoD	Interim Population Consequences of Disturbance Model
JNCC	Joint Nature Conservation Committee
L _p	sound pressure level
LSE	Likely Significant Effects

Acronym	Definition
MBES	Multibeam Echosounder
MD	Marine Directorate
MDS	Maximum Design Scenario
MD-LOT	Marine Directorate-Licensing Operations Team
MHWS	Mean High Water Spring
MMO	Marine Mammal Observer
MMMP	Marine Mammal Mitigation Protocol
MU	Management Unit
NASCO	North Atlantic Salmon Conservation Organization
NEQ	Net Explosive Quantity
NMFS	National Marine Fisheries Service
NSVMP	Navigational Safety and Vessel Management Plan
ORJIP	Offshore Renewables Joint Industry Programme
OSP	Offshore Substation Platform
OSPAR	Oslo Paris [Convention]
OWF	Offshore Wind Farm
OWFL	Offshore Wind Farm Limited
O&M	Operation and Maintenance
PAM	Passive Acoustic Monitoring
PCW	Phocid carnivores in water
PEMP	Project Environmental Monitoring Plan
PTS	Permanent Threshold Shift
PW	Phocid pinnipeds (underwater)
RIAA	Report to Inform Appropriate Assessment
rms	Root Mean Square
SAC	Special Area of Conservation
SBES	Single Beam Echosounder
SBP	Sub-bottom Profiler
SCANS	Small Cetaceans in European Atlantic Waters in the North Sea
SCOS	Special Committee on Seals
SEL	Sound Exposure Level
SEL_{cum}	Cumulative Sound Exposure Level
SEL_{ss}	single-strike sound exposure levels
SMU	Seal Management Unit
SNCBs	Statutory Nature Conservation Bodies
SPA	Special Protection Area
SPL	Sound Pressure Level
SPL_{pk}	Peak Sound Pressure Level

Acronym	Definition
SSC	Suspended Sediment Concentration
SSE	Scottish and Southern Electricity
SSEN	Scottish and Southern Electricity Networks
SSS	Side Scan Sonar
TTS	Temporary Threshold Shift
TWP	Thistle Wind Partners Limited
UHRS	Ultra High-Resolution Seismic
UK	United Kingdom
USV	Unmanned Surface Vehicles
UXO	Unexploded Ordnance
WSDOT	Washington State Department of Transport
WWII	World War Two
Zol	Zone of Influence

Table of Units

Units	Definition
cm	Centimetre
dB	Decibel
Gauss	Gauss (magnetic induction)
GW	GigaWatt
Hz	Hertz
J	Joule
kg	Kilogram
kHz	Kilohertz
kJ	Kilojoule
km	Kilometre
km ²	Square kilometre
kts	Knots
kV	Kilovolt
m	Metre
m ²	Square Metre
mG	Milligauss
m/s	Metre per second
mT	MilliTesla
mV/m	Millivolt per metre
MW	MegaWatt
nm	Nautical mile
V/m	Volt per metre

Units	Definition
μPa	Micropascal
μT	MicroTesla (10^{-6} T)
μV/m	MicroVolt per metre
%	Percent

1 Introduction

1.1 The Purpose of this Report to Inform Appropriate Assessment

- 1.1.1 This Habitats Regulations Appraisal (HRA) Stage 2 Report to Inform Appropriate Assessment (RIAA) supports Bowdun Offshore Wind Farm Limited's (BOWFL; hereafter referred to as the 'Applicant') application submission to the Marine Directorate-Licensing and Operations Team (MD-LOT), acting on behalf of Scottish Ministers, for Section 36 Consent and Marine Licences for the offshore elements of the Bowdun Offshore Wind Farm (OWF) (hereafter referred to as the 'Proposed Development'). The regulations under which this HRA Stage 2 RIAA is being prepared are The Conservation (Natural Habitats, & C.) Regulations 1994 (as amended), The Conservation of Habitats and Species Regulations 2017 and The Conservation of Offshore Marine Habitats and Species Regulations 2017. These regulations are collectively referred to as the Habitats Regulations and require that an Appropriate Assessment (AA) is carried out by the Competent Authority of all plans and projects that are likely to have a significant effect on a European Site.
- 1.1.2 This RIAA has been prepared by Tetra Tech RPS Energy and Tetra Tech RPS Consulting on behalf of the Applicant to support the HRA of the Proposed Development in the determination of the implications upon European sites. This RIAA builds upon the Proposed Development HRA Stage 1 Likely Significant Effects (LSEs) Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report), completed and submitted to MD-LOT in August 2024, and incorporates the subsequent advice from stakeholders in the Proposed Development HRA Screening Response received in November 2024 (MD-LOT, 2024).
- 1.1.3 This RIAA assesses the LSEs of the Proposed Development as they relate to the Qualifying Features of the relevant European sites, assessing whether the Proposed Development could have an adverse effect on integrity on any European Site, either alone, or in-combination with other plans or projects. This RIAA will provide the Competent Authority with the information required to undertake the AA.
- 1.1.4 This document constitutes Part 2 of the RIAA, and presents the assessment of the implications of the Proposed Development on Special Areas of Conservation (SACs). This document is structured as follows:
- Section 1: Introduction (this section), which details the purpose and structure of the RIAA;
 - Section 2: Consultation, which provides a summary of relevant consultation undertaken to date, the responses provided, and how these have been addressed in this Part of the RIAA;
 - Section 3: Summary of the HRA Stage 1 LSE Screening conclusions for SACs;
 - Section 4: Information to inform the AA, which includes the Maximum Design Scenario (MDS), information on Embedded Mitigation, and an outline of the baseline data on the SACs;

- Section 5: Assessment of adverse effects on integrity of European sites for Annex II Diadromous Fish and shellfish both alone and in-combination with other projects;
- Section 6: Assessment of adverse effects on integrity on European sites for Annex II marine mammals both alone and in-combination with other projects;
- Section 7: Overall summary of this Part of the RIAA; and
- References.

1.2 Structure of the RIAA

1.2.1 As detailed in Section 1.5 of Part 1: Introduction, for clarity and ease of navigation, this RIAA has been structured and reported as follows:

- Part 1: Introduction;
- Part 2: SAC Assessments (this document); and
- Part 3: Special Protection Areas (SPAs) and Ramsar Sites.

2 Consultation

- 2.1.1 Consultation for the HRA has been undertaken alongside the EIA with statutory stakeholders, including MD-LOT, NatureScot and Natural England, with regards to Annex I habitats and the relevant Annex II Diadromous Fish and shellfish, and marine mammal features of SACs. The Scoping Opinion, received 25 November 2024, included the response to the HRA Stage 1 LSE Screening Report submitted for the Proposed Development (MD-LOT, 2024). A summary of all relevant consultation undertaken to date is presented in Table 2.1.

Table 2.1: Summary of Key Consultations on Relevant to Part 2 of the RIAA

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
Scoping Workshop						
25/04/2024	Annex II Marine Mammals	NatureScot	Environmental Impact Assessment (EIA) Scoping Workshop	Species to be scoped in or out of the HRA were discussed as well as aligning HRA with the Offshore EIA Report. NatureScot confirmed that European sites for grey seals and harbour seals that are located over 20 km and 50 km respectively from the Proposed Development can be screened out of the HRA unless connectivity is established using tracking data (e.g. telemetry).	No, the effects on grey seals and harbour seals remains screened into the assessment on the basis that the seal telemetry study (Annex A: Seal Telemetry Report of Volume 3, Technical Appendix 10.1: Marine Mammal Technical Report (TWP-BOW-RPS-OFE-RPT-00017) of the Offshore EIA Report (Marwood and Stevens, 2024)) indicated connectivity between the Proposed Development and the Firth of Tay and Eden Estuary SAC for harbour seal and the Isle of May SAC and Berwickshire and North Northumberland Coast SAC for grey seal.	Screening of relevant SACs is discussed in Section 3, while potential adverse effects on these seal species are discussed in Section 6.
25/04/2024	Annex I habitats	NatureScot	EIA Scoping Workshop	NatureScot is content with conclusion of no European sites designated for Annex I habitats.	No.	The exclusion of Annex I habitats from the AA is noted in Section 3.
25/04/2024	Annex II Diadromous Fish	NatureScot	EIA Scoping Workshop	The inclusion or exclusion of the River Spey SAC from the HRA was discussed, due to the SAC being located outside of the study area but there being potential connectivity with Diadromous Fish coming out of the Moray Firth.	Yes, on a precautionary basis, the River Spey SAC has been included in this assessment in the RIAA for Atlantic salmon and freshwater pearl mussel, on the basis of evidence of Atlantic salmon migrations across the North Sea region. The pathways to impact assessed for this SAC are the	The inclusion of the River Spey SAC in the AA is noted in Section 3 and has been added to Table 3.1.

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
					same as those considered for the other sites with Annex II Diadromous Fish features.	
04/07/2024	Annex II Diadromous Fish	NatureScot	EIA Scoping Workshop (written advice)	NatureScot advised that Diadromous Fish should be assessed through the EIA only and not the HRA.	No. The advice provided by NatureScot has been acknowledged by the Applicant. Given that Diadromous Fish are a listed Annex II feature, they have been retained for inclusion within this RIAA.	A high-level assessment is provided in Section 5, taking account of the uncertainty in relation to connectivity between Diadromous Fish and natal rivers.
04/07/2024	Onshore Annex II species	NatureScot	EIA Scoping Workshop (written advice)	NatureScot advise that bats and otter do not require further assessment under the offshore HRA.	No	The exclusion of Onshore Annex II habitats from the AA is noted in Section 3.
Scoping Opinion						
25/11/2024	Annex I habitats	MD-LOT	Scoping Response	MD-LOT is content with conclusion of no European sites designated for Annex I habitats.	No	The exclusion of Annex I habitats from the AA is noted in Section 3.
		NatureScot	Scoping Response	NatureScot are content that no sites with Annex I habitats have been screened in for further consideration.		
25/11/2024	Annex II Diadromous Fish	MD-LOT	Scoping Response	In line with NatureScot's representation (see row below), MD-LOT advises that Diadromous Fish should be screened out	No.	The advice provided by NatureScot and MD-LOT has been acknowledged by the Applicant. Given

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
				from the HRA and should be considered through the EIA report.		that Diadromous Fish are a listed Annex II feature, they have been retained for inclusion within this RIAA. A high-level assessment is provided in Section 5, taking account of the uncertainty in relation to connectivity between Diadromous Fish and natal rivers. It should also be noted that the latest available evidence, as highlighted in the Scoping Opinion, was considered within this RIAA.
		NatureScot	Scoping Response	NatureScot advises that Diadromous Fish are not to be assessed through HRA. This is because there is limited knowledge of distribution and behaviour of Diadromous Fish in the marine environment, and no population data for salmon or lamprey SACs on the data forms. This inability to understand connectivity to and within rivers prohibits an informed assessment of the impact on individual site integrity. NatureScot welcome the Scottish Marine Energy Research (ScotMER) project Diadromous Fish in the Context of Offshore Wind – Review of Current Knowledge & Future Research, which is part of the vehicle for helping to address the evidence gaps and uncertainties with respect to spatial and temporal distribution as well as uncertainty around migration routes, potential impact pathways and		To note, Diadromous Fish have also been assessed in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report.

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
				connectivity to protected sites. Whilst this research may change conclusions on how Diadromous Fish are treated in both EIA and HRA going forward, NatureScot currently advise that it is not possible for them to carry out an assessment of Diadromous Fish to the level required under HRA.		
25/11/2024	Annex II Marine mammals	MD-LOT	Scoping Response	MD-LOT are broadly content with the sites included in the assessment, but highlight that the Isle of May SAC and Berwickshire and Northumberland SAC can be scoped out of further assessment in the RIAA, which is supported by the NatureScot representation (see row below) on approach used to establish connectivity.	No, the seal telemetry study (Marwood and Stevens, 2024) indicated connectivity between the Proposed Development and the Isle of May SAC and Berwickshire and North Northumberland Coast SAC therefore these SACs remain screened into the RIAA.	The Isle of May SAC and Berwickshire and North Northumberland Coast SAC have been scoped into further assessment in the RIAA, following review of the seal telemetry study (Marwood and Stevens, 2024) and advice from Natural England (see response below.) These SACs are

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
						discussed in Sections 3 and 6.
				MD-LOT advise that the Berwickshire and North Northumberland Coast SAC is considered in the RIAA due to the designated seal population, which is supported by advice from Natural England.	No, there is no change required to the screening outcomes for the Berwickshire and North Northumberland Coast SAC, as this SAC was already screened into the RIAA.	The relevant SACs are discussed in Sections 3 and 6, including the Berwickshire and North Northumberland Coast SAC.
				MD-LOT highlight representation from NatureScot and Natural England on the approach used to establish connectivity to marine mammal SACs.	No, the Natural England approach to establishing connectivity has been followed for seal SACs. This is also in line with NatureScot's advice to consider SACs outside of the 20 km grey seal buffer and 50 km harbour seal buffer if connectivity has been demonstrated, as it has been by the seal telemetry study (Marwood and Stevens, 2024). NatureScot's approach (use of a 100 km buffer for cetaceans other than bottlenose dolphin) has been followed.	The relevant sites with marine mammal Qualifying Features are addressed in Sections 3 and 6.
				MD-LOT disagrees with screening out injury and disturbance from Subsea Noise generated during site investigation surveys. MD-LOT highlight this pathway should be screened in for the Firth of Tay and Eden Estuary	Yes, on the advice of MD-LOT, impact pathways (i.e. injury and disturbance) due to Subsea Noise generated during site investigation surveys during the construction and Operation and Maintenance (O&M) phases has been screened into the assessment.	The inclusion of impacts pathways due to Subsea Noise is addressed in Paragraph 3.1.17 and Table 3.1 and the impact pathways and potential adverse

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
				SAC and the Moray Firth SAC.		effects on site integrity are discussed in Section 6.
				MD-LOT disagrees with screening out injury and disturbance from Subsea Noise generated through vessel use and other activities. MD-LOT highlight this pathway should be screened in for the Moray Firth SAC.	Yes, on the advice of MD-LOT, impact pathways due to Subsea Noise generated through vessel use and other activities during the construction, O&M and decommissioning phases has been screened into the assessment	The inclusion of impacts pathways due to Subsea Noise is addressed in Paragraph 3.1.17 and Table 3.1 and the impact pathways and potential adverse effects on site integrity are discussed in Section 6.
				MD-LOT highlights advice from NatureScot on the potential for LSE on prey availability, noting that this should be considered for all phases of the Proposed Development.	Yes, the potential LSE from changes to prey during the O&M and decommissioning phases has been screened in, in addition to the construction phase (which was already screened in) and assessed for marine mammals.	The inclusion of the potential for LSE on prey availability during the O&M and decommissioning phases is addressed in Paragraph 3.1.18 and the associated potential adverse effects on site integrity during all phases is discussed in Section 6.
				MD-LOT advice that entanglement can be screened out of the RIAA as an impact pathway for all phases of the Proposed Development.	Yes, on the advice from MD-LOT, the impact pathway of entanglement has been screened out for all phases of the Proposed Development.	The exclusion of the impact pathway of entanglement from the assessment is addressed in Paragraph 3.1.19.

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
				MD-LOT refer the developer to the NatureScot representation regarding further recommended data sources omitted from the Scoping Report. The highest density estimates for each species should be used from Digital Aerial Surveys (DAS) and Small Cetaceans in European Atlantic Waters in the North Sea (SCANS), the advice from NatureScot in this regard must be fully addressed in the Offshore EIA Report. The Scottish Ministers draw attention to the advice provided by NatureScot on the absence of seal population estimates in Special Committee on Seals (SCOS) 2023. The Scottish Ministers recommends the Developer to review and incorporate the most recent SCOS report when undertaking the marine mammal assessment	No, the highest appropriate density estimates have been used. Density estimates used in this RIAA aligned with the density estimates used in Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) of the Offshore EIA Report.	Annex II marine mammal density estimates and sources are discussed in Section 6.2.

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
				within the Offshore EIA Report.		
		NatureScot	Scoping Response	NatureScot expected the buffer approach to be used for marine mammals instead of the 21 month DAS data, however, all expected sites were included regardless.	No.	The relevant SACs are discussed in Sections 3 and 6.
				NatureScot disagree that there is no potential for LSE on marine mammals due to Subsea Noise generated during site investigation surveys. It is advised that impact pathways due to Subsea Noise should be screened in for the Firth of Tay and Eden Estuary SAC and Moray Firth SAC.	Yes, on the advice from NatureScot impacts from Subsea Noise during geophysical surveys during the construction and O&M phases have been screened in and assessed for all SACs including the Firth of Tay and Eden Estuary SAC and Moray Firth SAC.	The inclusion of impacts pathways due to Subsea Noise generated during site investigation surveys during the construction and O&M phases is addressed in Paragraph 3.1.17 and Table 3.1 and the impact pathways and potential adverse effects on site integrity are discussed in Section 6.
				NatureScot advise any noisy activities associated with the Export Cable Corridor, including injury and disturbance from Subsea Noise generated during vessel use and other activities (e.g. dredging, trenching, rock	Yes, on the advice from NatureScot impacts from noise producing activities associated with the Export Cable Corridor, including injury and disturbance from Subsea Noise generated during vessel use and other activities, will be screened in and assessed	The inclusion of impacts pathways due from noise producing activities associated with the Export Cable Corridor is addressed in Paragraph 3.1.17 and

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
				placement, etc.) have the potential to cause injury and/or disturbance to the bottlenose dolphin feature of the Moray Firth SAC.	for the bottlenose dolphin feature of the Moray Firth SAC, as well as all other SACs.	Table 3.1 and the impact pathways and potential adverse effects on site integrity are discussed in Section 6.
				NatureScot agree that entanglement can be screened out of the assessment during all phases of the Development.	Yes, on the advice from MD-LOT and NatureScot, the impact pathway of entanglement has been screened out for all phases of the Proposed Development.	The exclusion of the impact pathway of entanglement from the assessment is addressed in Paragraph 3.1.19.
				NatureScot welcomes the inclusion of changes to prey availability as an impact pathway during the construction phase, but notes that there is also the potential for the same impact pathway during the decommissioning phase as impacts will be similar to construction and the O&M phase due to indirect impacts from EMF on prey species.	Yes, on the advice of NatureScot impacts from potential changes to prey during the O&M and decommissioning phases have been screened in and assessed for marine mammals.	The inclusion of the potential for LSE on prey availability during the O&M and decommissioning phases is addressed in Paragraph 3.1.18 and the associated potential adverse effects on site integrity during all phases is discussed in Section 6.
				NatureScot advise screening in SACs for grey seals for assessment if the Proposed Development or impact radius is within 20 km of the SAC.	No, the Isle of May SAC and Berwickshire and North Northumberland Coast SAC remain screened into the assessment of Annex II Marine Mammals despite being outside this impact radius as the seal telemetry study	Screening of relevant SACs is discussed in Section 3, while potential adverse effects are discussed in Section 6.

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
					(Marwood and Stevens, 2024) indicated connectivity between the Proposed Development and these SACs for grey seal. Therefore, both grey seal SACs remain screened in.	
				NatureScot advise screening in SACs for harbour seals for assessment if the Proposed Development or impact radius is within 50 km of the SAC. Ranges further should be considered if there is additional information (e.g. tagging data).	No, there is no change required to the screening outcomes for the Firth of Tay and Eden Estuary SAC, as the seal telemetry study (Marwood and Stevens, 2024) indicated connectivity between the Proposed Development and the Firth of Tay and Eden Estuary SAC.	The Firth of Tay and Eden Estuary SAC is discussed in Sections 3 and 6.
				NatureScot are content that the Firth of Tay and Eden Estuary SAC is included for harbour seal as screening in SACs for assessment is advised if the Proposed Development or impact radius is within 50 km of the SAC.		
				NatureScot advise that the Isle of May SAC and Berwickshire and North Northumberland Coast SAC can be screened out of further assessment in the RIAA, but highlight the cross-border nature of the	No, the seal telemetry study (Marwood and Stevens, 2024) indicated connectivity between the Proposed Development and the Isle of May SAC and Berwickshire and North Northumberland Coast SAC, while Natural England	The Isle of May SAC and Berwickshire and North Northumberland Coast SAC have been scoped into further assessment in the RIAA,

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
				Berwickshire and North Northumberland Coast SAC and defer to Natural England for the English portion of this SAC.	advised retaining the Berwickshire and North Northumberland Coast SAC. Therefore, both SACs remain screened in.	following review of the seal telemetry study (Marwood and Stevens, 2024) and advice from Natural England (see response below.) These SACs are discussed in Sections 3 and 6.
				NatureScot advise screening in SACs for cetaceans for assessment if the Proposed Development is within 100 km of the SAC, subject to species and impact-specific considerations, noting that Natural England should be consulted for sites in English waters.	Yes, on the advice of NatureScot for a 100 km buffer for cetaceans, the Southern North Sea SAC designated for harbour porpoise was screened out of the assessment, due to no representation from Natural England relating to harbour porpoise.	The screening out of the Southern North Sea SAC is discussed in Section 3.
				NatureScot agree that Moray Firth SAC should be screened in for further assessment for bottlenose dolphin.	No, Moray Firth SAC remains screened into the RIAA.	The inclusion of Moray Firth SAC is discussed in Sections 3 and 6.
		Natural England	Scoping Response	Natural England advise that the Berwickshire and North Northumberland Coast SAC is considered in the RIAA due to the designated seal population.	No.	The relevant SACs are discussed in Sections 3 and 6, including the Berwickshire and North Northumberland Coast SAC.

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
25/11/2024	General	Natural England	Scoping Response	Natural England highlight their publication of advice on the environmental considerations and use of data and evidence to support offshore wind and cable projects in English waters, noting this should be used for assessments considering English sites.	No.	It should be noted that the latest available evidence, as highlighted in the Scoping Opinion, was considered within this RIAA.
25/11/2024	Onshore Annex II species	NatureScot	Scoping Response	NatureScot are content with the conclusions drawn in the HRA Screening Report regarding onshore Annex II species (including bats and otter).	No.	The exclusion of onshore Annex II species from the AA is noted in Section 3.
25/11/2024	Transboundary impacts	NatureScot	Scoping Response	NatureScot are content that transboundary sites will not be assessed.	No.	The exclusion of transboundary sites as per the HRA Stage 1 LSE Screening Report is noted in Section 3.
25/11/2024	In-combination assessments	NatureScot	Scoping Response	NatureScot consider the approach to in-combination assessment appropriate, however cannot comment further due to the lack of detail provided.	No.	Full details of the in-combination assessments are presented in Section 5.4 for Diadromous Fish and Section 6.4 for marine mammals.
27/02/2026	MM Baseline TR, DAS Report TR and Outline MMMP	NatureScot	Email	NatureScot provided feedback on the baseline and DAS reports shared 28/01/2026. Advice	No.	N/A

Date	Receptor Group	Consultee	Type of Consultation	Summary of Consultation	Change Required to Screening Outcomes?	Where Addressed in this Document
				consisted of quantitative use of DAS wherever possible - with qualitative where it is not, using highest density model, bottlenose dolphin density, management units grey seals and the presentation on densities within the final application.		

3 Summary of HRA Screening Conclusions for Special Areas of Conservation

3.1.1 This section summarises all pathways for potential LSE on features of SACs (arising alone or in-combination with other projects).

3.1 Screening Outcomes for the Proposed Development

3.1.1 The potential for LSE as a result of the Proposed Development has been identified following the LSE screening presented in the Proposed Development HRA Stage 1 LSE Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report), and advice from Statutory Nature Conservation Bodies (SNCBs), with respect to ten SACs (Figure 3.1 and Table 3.1).

3.1.2 There were no SACs designated for Annex I habitats or Annex II Qualifying Features European otter *Lutra lutra* or bat (e.g. Nathusius' pipistrelle bat *Pipistrellus nathusii*) screened into the HRA Stage 1 LSE Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report). Therefore, no SACs designated for Annex I habitats or Annex II European otters and bats were screened in for further assessment in this RIAA.

3.1.3 No potential significant transboundary effects, either alone or in-combination, were screened into the HRA Stage 1 LSE Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report) and therefore were not screened in for further assessment in this RIAA.

Annex II Diadromous Fish and Shellfish

3.1.4 The LSE screening (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report) identified five SACs designated for Annex II Diadromous Fish and dependent features as having the potential for LSE which were therefore screened in for full assessment in the RIAA. These are as follows:

- River South Esk SAC;
- River Dee SAC;
- River Tay SAC;
- River Tweed SAC; and
- River Teith SAC.

3.1.5 However, following discussion in the Scoping Workshop (as outlined in Table 2.1), and based on evidence of Atlantic salmon *Salmo salar* migrations across the North Sea region (see Paragraphs 3.1.7 to 3.1.9), an additional SAC, the River Spey SAC has been screened in for full assessment in the RIAA, on a precautionary basis. Given the distance of this SAC from the Proposed Development (147.9 km at the closest point), only the Atlantic salmon feature and freshwater pearl mussel *Margaritifera margaritifera* feature of this SAC have been screened into

the assessment in the RIAA. This is based on the justification presented below in Paragraph 3.1.6.

- 3.1.6 Screening for Annex II Diadromous Fish and associated shellfish features used a 100 km buffer around the Proposed Development. Therefore, only the River Tay SAC was screened in for sea lamprey *Petromyzon marinus*. An exception was made for Atlantic salmon and freshwater pearl mussel where a refined area was considered based on likely migration routes and the anadromous fish region boundaries.
- 3.1.7 Current evidence suggests that Atlantic salmon smolts migrating from rivers in the Moray Firth, to the north of the Proposed Development, tend to head directly north and east across the North Sea rapidly, instead of travelling along the coast upon leaving their natal rivers (Marine Scotland Science, 2019; Newton *et al.*, 2017). Similarly, for adult Atlantic salmon, the latest evidence indicates that adult migration to natal rivers in the Moray Firth is most likely from the north (ABPmer, 2014; Malcolm *et al.*, 2010; The Crown Estate, 2019).
- 3.1.8 Based on this information and considering the location of the Proposed Development in relation to the predominant migration routes, the potential to create a barrier to Atlantic salmon migrating to and from SAC designated rivers which flow into the Moray Firth is considered to be very low. Therefore, most of these SACs (those in the northern part of the North-East anadromous fish region) were screened out from further assessment in this RIAA. This is with the exception of the River Spey SAC, which has been screened in for further assessment following consultation during the EIA Scoping Workshop (25 April 2024; see Table 2.1). This is due to its position on the southern shore of the Moray Firth and the potential for salmon smolts to swim directly east and into the vicinity of the Proposed Development.
- 3.1.9 Freshwater pearl mussel will not be directly affected by the Proposed Development as it is restricted to freshwater environments. However, there is the potential for the species to be indirectly impacted due to its symbiotic life cycle with Atlantic salmon. The freshwater pearl mussel relies on Atlantic salmon, the host species, during a critical parasitic phase of its life cycle where its larvae attach to the gills of Atlantic salmon in mid to late summer and drop off in spring (Taeubert and Geist, 2017). There is the potential for an indirect adverse effect upon the freshwater pearl mussel feature of European sites, should the Atlantic salmon population be adversely affected by the Proposed Development.
- 3.1.10 Therefore, a total of six SACs designated for Annex II Diadromous Fish and dependent features were taken forward for full assessment in the RIAA. These are as follows:
- River South Esk SAC (for Atlantic salmon and freshwater pearl mussel);
 - River Dee SAC (for Atlantic salmon and freshwater pearl mussel);
 - River Tay SAC (for Atlantic salmon and sea lamprey);
 - River Tweed SAC (for Atlantic salmon);

- River Spey SAC (for Atlantic salmon and freshwater pearl mussel); and
- River Teith SAC (for Atlantic salmon).

3.1.11 As per the Stage 1 LSE Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report) and lack of further comment from SNCBs during consultation, the following impacts remain screened out of further assessment of Annex II Diadromous Fish and shellfish in this Stage 2 assessment:

- temporary habitat loss and/or disturbance;
- long term habitat loss;
- increased Suspended Sediment Concentrations (SSCs) and associated deposition; and
- introduction of artificial habitats and subsequent colonisation of hard structures.

3.1.12 The most significant impacts on Annex II Diadromous Fish and associated shellfish features as Subsea Noise generated during piling and Unexploded Ordnance (UXO) clearance in the construction phase. These activities do not occur during O&M and decommissioning, therefore these phases remain screened out of this RIAA as per Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report.

3.1.13 A summary of the six SACs and relevant Annex II Diadromous Fish and shellfish features, for which LSE could not be ruled out and therefore were carried forward for full assessment in this RIAA, is presented in Table 3.1.

Annex II Marine Mammals

3.1.14 Five SACs designated for Annex II marine mammals were originally identified as having the potential for LSE following the LSE screening (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report). These were as follows:

- Firth of Tay and Eden Estuary SAC;
- Isle of May SAC;
- Berwickshire and North Northumberland Coast SAC;
- Moray Firth SAC; and
- Southern North Sea SAC.

3.1.15 However, on advice from NatureScot and Natural England (as outlined in Table 2.1), and based on telemetry data (Marwood and Stevens, 2024), only four of these SACs were screened in for full assessment in the RIAA. The Southern North Sea SAC designated for harbour porpoise *Phocoena phocoena* has been screened out of the Stage 2 assessment, as it is further than 100 km from the Proposed Development. The screening out of this SAC is in line with NatureScot's advice regarding harbour porpoise (Table 2.1).

- 3.1.16 The four SACs screened in for full assessment in this RIAA are as follows:
- Firth of Tay and Eden Estuary SAC (for harbour seal *Phoca vitulina*);
 - Isle of May SAC (for grey seal *Halichoerus grypus*);
 - Berwickshire and North Northumberland Coast SAC (for grey seal); and
 - Moray Firth SAC (for bottlenose dolphin *Tursiops truncatus*).
- 3.1.17 Based on MD-LOT, NatureScot and Natural England's advice (Table 2.1), impact pathways relating to Subsea Noise generated during site investigation surveys during the construction and O&M phase and pathways relating to Subsea Noise generated through vessel use and other activities noise have been screened into this Stage 2 assessment. The potential for LSE due to injury and disturbance relating to Subsea Noise due to activities across the construction, O&M and decommissioning phases have been assessed further in relation to adverse effects on site integrity in Section 6.
- 3.1.18 Effects on marine mammals due to altered prey availability during the construction phase were screened into the Stage 2 assessment in the Stage 1 LSE Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report). On the advice of NatureScot, effects due to altered prey availability have also been screened into the Stage 2 assessment during the O&M and decommissioning phases. Potential adverse effects on site integrity in relation to the potential LSEs for marine mammals from altered prey availability are assessed in Section 6.
- 3.1.19 Entanglement is screened out of further assessment as the Proposed Development is now only considering fixed Wind Turbines (see Section 4 of Part 1: Introduction), whereas the Stage 1 LSE Screening Report considered the potential for both fixed and floating Wind Turbines (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report).
- 3.1.20 As per the Stage 1 LSE Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report) and no further comment from SNCBs, the following impacts remain screened out of further assessment of Annex II marine mammals in this Stage 2 assessment:
- injury and disturbance from Subsea Noise generated by Wind Turbine operation;
 - impact from Electromagnetic Fields (EMF) from Inter-Array Cables (IAC)s and/or Offshore Export Cables; and
 - injury to marine mammals due to collision.
- 3.1.21 A summary of the four SACs and relevant Annex II marine mammal features for which LSE could not be ruled out and therefore were carried forward for full assessment in this RIAA is presented in Table 3.1.

3.2 Screening Outcomes for the Proposed Development In-Combination with Other Plans and Projects

- 3.2.1 There are no current plans with the potential for In-Combination Effects therefore in this RIAA only other projects have been considered.

Annex II Diadromous Fish and Shellfish

- 3.2.2 A precautionary approach to the selection of relevant European Sites for Annex II Diadromous Fish and shellfish was adopted in the Proposed Development HRA Stage 1 LSE Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report). This involved the use of a 100 km buffer and the screening in of all SACs designated for Atlantic salmon and freshwater pearl mussel within a refined area based on likely migration routes and the anadromous fish region boundaries as described in Paragraph 3.1.6 and Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report. Due to this approach, all SACs relevant for AA, including those where there is the potential for disruption to/from natal rivers, have been identified. Given this, there is unlikely to be potential for connectivity between the Site Boundary and Annex II Diadromous Fish and shellfish from any additional SACs beyond those identified as relevant in the HRA Stage 1 LSE Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report). As described in Paragraph 3.1.5, one additional SAC which was not identified in the HRA Stage 1 LSE Screening Report, the River Spey SAC, has been screened into the assessment following stakeholder consultation.
- 3.2.3 No potential impact pathways between the Proposed Development and any additional sites designated for Annex II Diadromous Fish Diadromous Fish and shellfish were identified. As such, there is no potential for In-Combination Effects at any SACs other than those which have been screened in for Stage 2 RIAA (i.e. those listed in Paragraph 3.1.4). The in-combination assessment in Section 5.4 therefore assesses the same impacts as the alone assessment for the same six SACs for Annex II Diadromous Fish and dependent features in-combination with other projects as per the methodology in Section 4.6.

Annex II Marine Mammals

- 3.2.4 A precautionary approach to the selection of relevant European sites for Annex II marine mammals was adopted in the Proposed Development HRA Stage 1 LSE Screening Report (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report). Marine mammals are highly mobile species, which can forage over wide areas. Therefore, all SACs with qualifying marine mammal features with a range that overlaps the Site Boundary were considered. The screening area extended to the relevant marine mammal Management Units (MU) and Seal Management Unit (SMU) for each species, as defined by the Inter-Agency Marine Mammal Working Group (IAMMWG) for cetaceans (IAMMWG, 2022, 2023), and by the SCOS for seals (SCOS, 2024). For harbour seal the Site Boundary falls within the East Scotland SMU, while for grey seal it falls within the East Scotland SMU and within the vicinity of the North Coast & Orkney SMU, Moray Firth SMU and Northeast England SMU. For

bottlenose dolphin the Site Boundary falls within the Coastal East Scotland MU and the Greater North Sea MU, whilst the Regional Marine Mammal Study Area (Figure 6.7) is informed by the Celtic and Greater North Sea MU. Thus, any European sites that are located within these MUs and SMUs were considered for potential for connectivity with the Proposed Development.

- 3.2.5 There were 19 transboundary sites identified within the screening areas outlined above. However, all relevant impact pathways were considered extremely weak, given the distance between the Site Boundary and the sites (from 322.1 km to 765.1 km depending on the site) (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report). As a result, only negligible effects would be apparent and could not contribute, in any material way, to an in-combination effect. As such, LSE associated with planned projects or other activities in the vicinity of the Site Boundary are also not anticipated for marine mammal features of any transboundary site.
- 3.2.6 No potential impact pathways between the Proposed Development and any additional sites designated for Annex II marine mammals were identified. As such, there is not potential for In-Combination Effects at any SACs apart from those which are screened in for the Stage 2 RIAA (i.e. those listed in Paragraph 3.1.14 and Table 3.1, as per Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report). This approach was agreed with relevant statutory stakeholders (Table 2.1). The in-combination assessment in Section 6.4 therefore assesses the same impacts as the alone assessment for the same four SACs for Annex II marine mammals in-combination with other projects as per the methodology in Section 4.6.

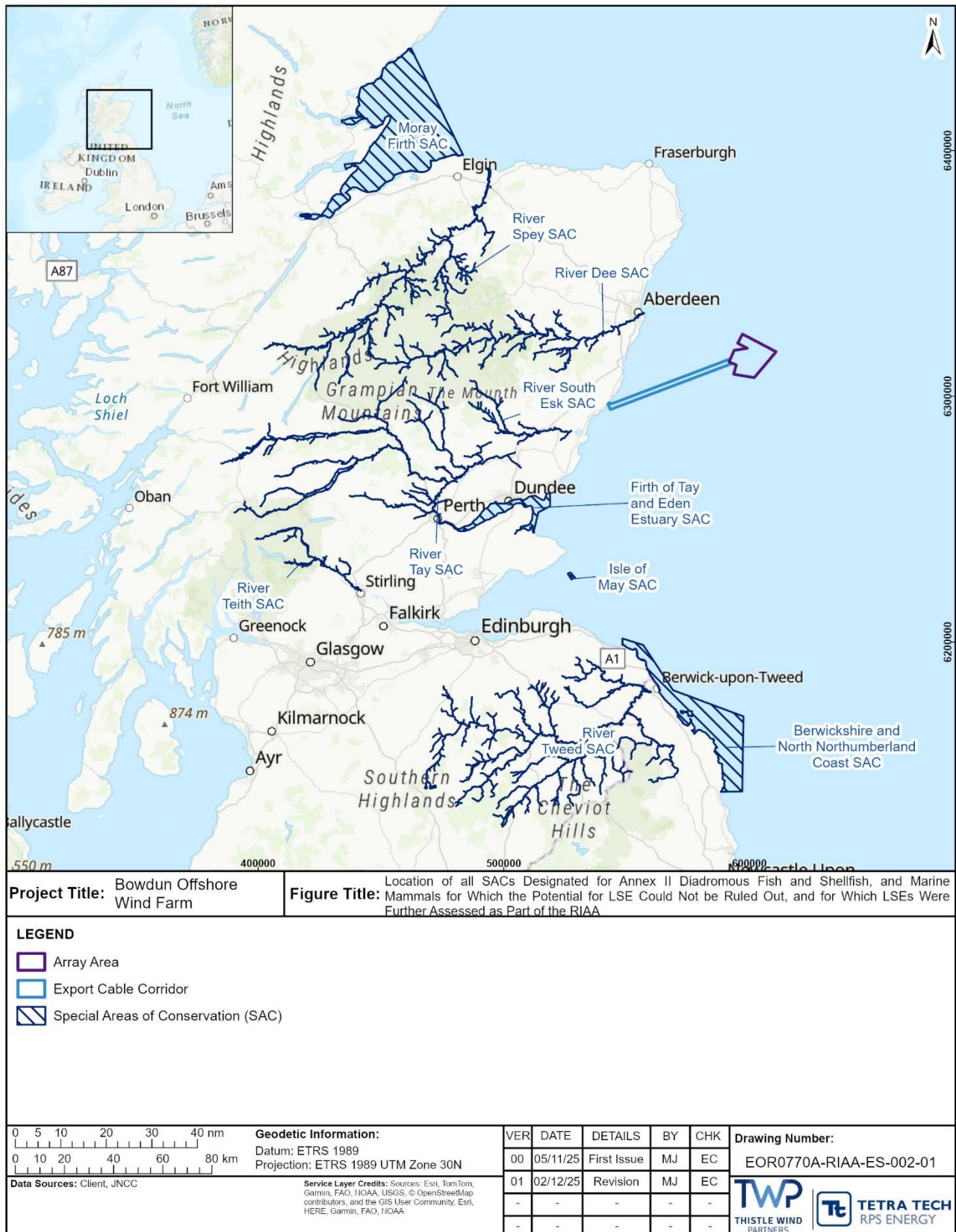


Figure 3.1: Location of all SACs Designated for Annex II Diadromous Fish and Shellfish, and Marine Mammals for Which the Potential for LSE Could Not be Ruled Out, and for Which LSEs Were Further Assessed as Part of the RIAA

Table 3.1: Summary of all SACs for Which the Potential for LSE Could Not be Ruled Out, and for Which an Assessment has been Undertaken in this Part of the RIAA

Site ID	Site Name	Distance to Array Area (km) ¹	Distance to Export Cable Corridor (km) ¹	Relevant Qualifying Features	Potential Impact	Proposed Development Phase*		
						C	O	D
Annex II Diadromous Fish and Shellfish								
UK0030262	River South Esk SAC	71.1	20.3	Atlantic salmon Freshwater pearl mussel	Subsea Noise impacting fish and shellfish (alone and in-combination)	✓	✗	✗
					Impacts to fish and shellfish due to EMF (alone and in-combination)	✗	✓	✗
UK0030251	River Dee SAC	39.6	29.9	Atlantic salmon and freshwater pearl mussel	Subsea Noise impacting fish and shellfish (alone and in-combination)	✓	✗	✗
					Impacts to fish and shellfish due to EMF (alone and in-combination)	✗	✓	✗
UK0030312	River Tay SAC	130.4	83.6	Atlantic salmon Sea lamprey	Subsea Noise impacting fish and shellfish (alone and in-combination)	✓	✗	✗
					Impacts to fish and shellfish due to EMF (alone and in-combination)	✗	✓	✗
UK0012691	River Tweed SAC	136.8	120.8	Atlantic salmon	Subsea Noise impacting fish and shellfish (alone and in-combination)	✓	✗	✗
					Impacts to fish and shellfish due to EMF (alone and in-combination)	✗	✓	✗

¹ Note: Unless stated otherwise, all distances are measured as the marine route “by-sea” to the site (i.e. not the straight line distance). Qualifying Features are predominantly aquatic when foraging and travelling so distances relate to the shortest routes of connectivity between SACs and potential impacts.

Site ID	Site Name	Distance to Array Area (km) ¹	Distance to Export Cable Corridor (km) ¹	Relevant Qualifying Features	Potential Impact	Proposed Development Phase*		
						C	O	D
UK0019811	River Spey SAC	147.9	155.4	Atlantic salmon Freshwater pearl mussel	Subsea Noise impacting fish and shellfish (alone and in-combination)	✓	✗	✗
					Impacts to fish and shellfish due to EMF (alone and in-combination)	✗	✓	✗
UK0030263	River Teith SAC	206.7	169.4	Atlantic salmon	Subsea Noise impacting fish and shellfish (alone and in-combination)	✓	✗	✗
					Impacts to fish and shellfish due to EMF (alone and in-combination)	✗	✓	✗
Annex II Marine Mammals								
UK0030311	Firth of Tay and Eden Estuary SAC	89.1	42.3	Harbour seal	Injury and disturbance from Subsea Noise generated during piling (alone and in-combination)	✓	✗	✗
					Injury and disturbance from Subsea Noise generated during UXO clearance (alone and in-combination)	✓	✗	✗
					Injury and disturbance from Subsea Noise generated during site investigation surveys (alone and in-combination)	✓	✓	✗
					Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities (alone and in-combination)	✓	✓	✓
					Effects on marine mammals due to altered prey availability (alone and in-combination)	✓	✓	✓

Site ID	Site Name	Distance to Array Area (km) ¹	Distance to Export Cable Corridor (km) ¹	Relevant Qualifying Features	Potential Impact	Proposed Development Phase*		
						C	O	D
UK0030172	Isle of May SAC	104.5	68.3	Grey seal	Injury and disturbance from Subsea Noise generated during piling (alone)	✓	✗	✗
					Injury and disturbance from Subsea Noise generated during UXO clearance (alone and in-combination)	✓	✗	✗
					Injury and disturbance from Subsea Noise generated during site investigation surveys (alone and in-combination)	✓	✓	✗
					Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities (alone and in-combination)	✓	✓	✓
					Effects on marine mammals due to altered prey availability (alone and in-combination)	✓	✓	✓
UK0017072	Berwickshire and North Northumberland Coast SAC	116.2	93.4	Grey seal	Injury and disturbance from Subsea Noise generated during piling (alone and in-combination)	✓	✗	✗
					Injury and disturbance from Subsea Noise generated during UXO clearance (alone and in-combination)	✓	✗	✗
					Injury and disturbance from Subsea Noise generated during site investigation surveys (alone and in-combination)	✓	✓	✗

Site ID	Site Name	Distance to Array Area (km) ¹	Distance to Export Cable Corridor (km) ¹	Relevant Qualifying Features	Potential Impact	Proposed Development Phase*		
						C	O	D
					Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities (alone and in-combination)	✓	✓	✓
					Effects on marine mammals due to altered prey availability (alone and in-combination)	✓	✓	✓
UK0019808	Moray Firth SAC	159.6	167.6	Bottlenose dolphin	Injury and disturbance from Subsea Noise generated during piling (alone and in-combination)	✓	✗	✗
					Injury and disturbance from Subsea Noise generated during UXO clearance (alone and in-combination)	✓	✗	✗
					Injury and disturbance from Subsea Noise generated during site investigation surveys (alone and in-combination)	✓	✓	✗
					Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities (alone and in-combination)	✓	✓	✓
					Effects on marine mammals due to altered prey availability (alone and in-combination)	✓	✓	✓

* Proposed Development Phase refers to construction (C), O&M (O) and decommissioning (D).

4 Information to Inform the Appropriate Assessment

4.1 Introduction

- 4.1.1 As described in the RIAA Part 1: Introduction, a European Site is progressed to the AA stage (Stage 2 of the HRA process) where it is not possible to exclude the potential for an LSE on one or more of its Qualifying Features. European sites and their features and potential impacts requiring an AA for the Proposed Development are therefore those for which LSE could not be ruled out during the HRA LSE screening exercise and following consultation.
- 4.1.2 Information to help inform the AA for SACs is provided in Sections 4.2 to 4.6. The information provided includes a description of the SACs under consideration, their Qualifying Features, and an assessment of the potential adverse effects on site integrity in light of the conservation objectives of each site. A cross-referencing approach has been adopted to aide readability and reduce repetition where relevant, but this has been carefully carried out to ensure that all information required for a robust HRA of each site is presented.

4.2 Baseline Information

- 4.2.1 Baseline information on the SACs identified for further assessment within the HRA Stage 2 RIAA has been collated through a comprehensive review of existing desktop studies and datasets. Key desktop data sources are presented in Sections 5.2 and 6.2 for Annex II Diadromous Fish and shellfish, and marine mammals, respectively. Where applicable, any additional data sources used in the HRA Stage 2 RIAA are also included in these sections. Further baseline information is presented within the respective topic chapters in the Offshore EIA Report and accompanying technical reports for fish and shellfish and marine mammals (Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) and Volume 3, Technical Appendix 9.1: Fish and Shellfish Ecology Technical Report (TWP-BOW-RPS-OFE-RPT-00073) and Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) and Volume 3, Technical Appendix 10.1: Marine Mammal Technical Report (TWP-BOW-RPS-OFE-RPT-00017) of the Offshore EIA Report).

4.3 Maximum Design Scenarios

- 4.3.1 The assessments of impacts on Qualifying Features and subsequent effect on site integrity presented in this Part of the RIAA have been based on a realistic MDS, which was derived from the Project Description presented in the RIAA Part 1: Introduction (see Section 4). The final design will be no greater than the parameters set out in the MDS, and in some instances, may be less. An overview of the MDS considered for the assessment of potential impacts on Annex II Diadromous Fish and shellfish and Annex II marine mammals is presented per impact (see Sections 5.3 and 6.3 respectively). This MDS is consistent with that used for the fish and shellfish and marine mammal assessments in the Offshore EIA Report (Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) and Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018)).

4.4 Embedded Mitigation

- 4.4.1 As part of the project design process, a number of Embedded Mitigation measures have been included and are committed to be delivered by the Applicant. These Embedded Mitigation measures are integrated into the Proposed Development through design and best practice and are not considered as mitigation measures intended to specifically avoid or reduce effects on European sites.
- 4.4.2 Measures intended specifically to avoid or reduce effects on European Sites were not considered during the HRA Stage 1 LSE Screening (Part 1, Appendix 1A: Habitats Regulations Appraisal Stage 1 Likely Significant Effects Screening Report) but are included within the HRA Stage 2 RIAA for determination of adverse effects on integrity. Where relevant, this Part of the RIAA indicates whether adverse effects on European sites are likely and if so, whether those effects can be avoided through the introduction of mitigation measures that avoid or reduce the effect on Qualifying Features. These measures are referred to as Additional Mitigation and may be the same as those Additional Mitigation measures in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) and Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) of the Offshore EIA Report or, where necessary, may have been developed specifically to comply with HRA requirements. Where the latter is the case, this has been made clear throughout.

4.5 Conservation Objectives and Conservation Advice

- 4.5.1 NatureScot has produced conservation advice for the European sites under their statutory remit. Other SNCBs have produced conservation advice for the European sites under their remit, such as the Joint Nature Conservation Committee (JNCC) and Natural England, which depends on site location.
- 4.5.2 The conservation advice from NatureScot provides supplementary information on European sites and their features in the form of a Conservation Advice Package (CAP) document for terrestrial SACs and a Conservation and Management Advice (CMA) document for marine SACs. The SACs screened in for Annex II Diadromous Fish are considered terrestrial sites as they have no marine component. The CAP and CMA documents both contain revised and updated conservation objectives for the individual Qualifying Features of the European Site, site-specific clarifications, advice for the conservation objectives to be achieved, and advice on management required to achieve said conservation objectives.
- 4.5.3 Two SACs have conservation advice that was developed jointly by NatureScot and Natural England as they cross the Scotland/England border. However, the CAP for the River Tweed SAC was produced by NatureScot and is hosted on the NatureScot SiteLink system, while the conservation advice for the Berwickshire and North Northumberland Coast SAC is hosted on Natural England's Designated Site System as an interactive CAP.

- 4.5.4 Conservation objectives of European sites set the framework for establishing appropriate conservation measures for each feature and provide a framework against which plans or projects can be assessed. The conservation objectives present the essential elements needed to ensure that the Favourable Conservation Status (FCS) of a qualifying habitat or species is maintained or restored at the site. The integrity of the site will be maintained if all the conservation objectives are met.
- 4.5.5 The conservation objectives within the NatureScot CAPs and CMAs comprise two overarching objectives (one and two) that apply to all the Qualifying Features of the site, and three to four additional objectives (2a to 2d) that have been written which are specific to each feature. Site-specific supplementary advice is provided for each objective.
- 4.5.6 It is recognised in the conservation advice that if any feature of the European Site is in unfavourable condition, the integrity of the site is deemed to be compromised, and the overarching objective is therefore to restore site integrity. NatureScot guidance, however, states that with the ‘new style’ conservation objectives it is not expected that plans or projects must include measures that lead to the restoration of features (where restore objectives are in place) in order to gain approval from a Competent Authority. Instead, a plan or project should not prevent the possibility of site integrity being restored where necessary. This means that a plan or project should not prevent a feature from being able to be restored. HRAs should, therefore, focus on and consider if the plan or project is likely to undermine the conservation objectives of the site (NatureScot, 2021).
- 4.5.7 The assessment of the Proposed Development alone and in-combination with other projects focuses on the species-specific conservation objectives. This allows a proportionate approach, as by demonstrating that potential impacts associated with the Proposed Development alone and in-combination with other projects will not have an adverse effect on the species-specific conservation objectives, the overarching conservation objectives will not be impaired.

4.6 Approach to the In-Combination Assessment

- 4.6.1 The approach taken for the assessment of in-combination impacts has been partly informed by the Cumulative Effects Assessment (CEA) carried out for relevant topics in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) and Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) of the Offshore EIA Report. The methodology for the in-combination assessment is compliant with HRA guidance (NatureScot, 2023a) and is summarised in the following paragraphs.
- 4.6.2 In order to assess the potential for temporal overlap between other projects and the Proposed Development, the following temporal assumption has been applied. Seabed preparation activities for the Proposed Development are scheduled to begin in Q2 2031, with commissioning expected to be completed in Q1 2036. An operational period of 30 years from 2036 has been assumed for the Proposed Development. As a precautionary buffer of delays in construction

an additional year has been added on either side of the construction period of the Proposed Development when considering other projects for in-combination impacts. This has been implemented for all biological receptors (including Annex II Diadromous Fish and shellfish and marine mammals), and an additional year on either side of the construction period has been assessed as a result.

4.6.3 It is important to note that other projects under consideration will have differing potential for proceeding to construction (and therefore to an O&M stage) and hence a differing potential to ultimately contribute to In-Combination Effects alongside the Proposed Development. Therefore, a tiered approach has been adopted. This provides a framework for placing relative weight upon the potential for each project to be included in the in-combination assessment to ultimately be realised, based upon the project's current stage of maturity and certainty in the projects' parameters. The tiered approach employs the following tiers:

- Tier 1 – The onshore elements of the Project;
- Tier 2 – Projects that have an application submitted, are consented, under construction or operational to the extent not already captured with the baseline;
- Tier 3 – Projects which have submitted a scoping report and/or have received a scoping opinion; and
- Tier 4 – Reasonably foreseeable projects including those with Crown Estate Scotland option or lease agreements.

4.6.4 It should be noted that each Tier is not distinct from one another but that the approach is additive (i.e. once Tier 1 has been assessed, information is then added into the Tier 2 step of the assessment and so on). That way information on projects has been appropriately assessed in-combination.

5 Assessment of Potential Adverse Effects on Integrity: Annex II Diadromous Fish and Shellfish

5.1 Introduction

- 5.1.1 This section provides background information and an explanation for the approach taken to assess the potential impacts of the Proposed Development on European sites designated for Annex II Diadromous Fish and shellfish species.
- 5.1.2 As stated in Section 3.1, the potential for LSE was identified for the Annex II Diadromous Fish and shellfish features of six SACs, which are listed in Table 5.1 and Figure 5.1.

Table 5.1: European Sites Designated for Annex II Diadromous Fish and Shellfish Features for which an Appropriate Assessment is Required

Site	Relevant Qualifying Feature	Period of Potential Impact
River South Esk SAC	Atlantic salmon Freshwater pearl mussel	Construction and O&M phases
River Dee SAC	Atlantic salmon Freshwater pearl mussel	
River Tay SAC	Atlantic salmon Sea lamprey	
River Tweed SAC	Atlantic salmon	
River Spey SAC	Atlantic salmon Freshwater pearl mussel	
River Teith SAC	Atlantic salmon	

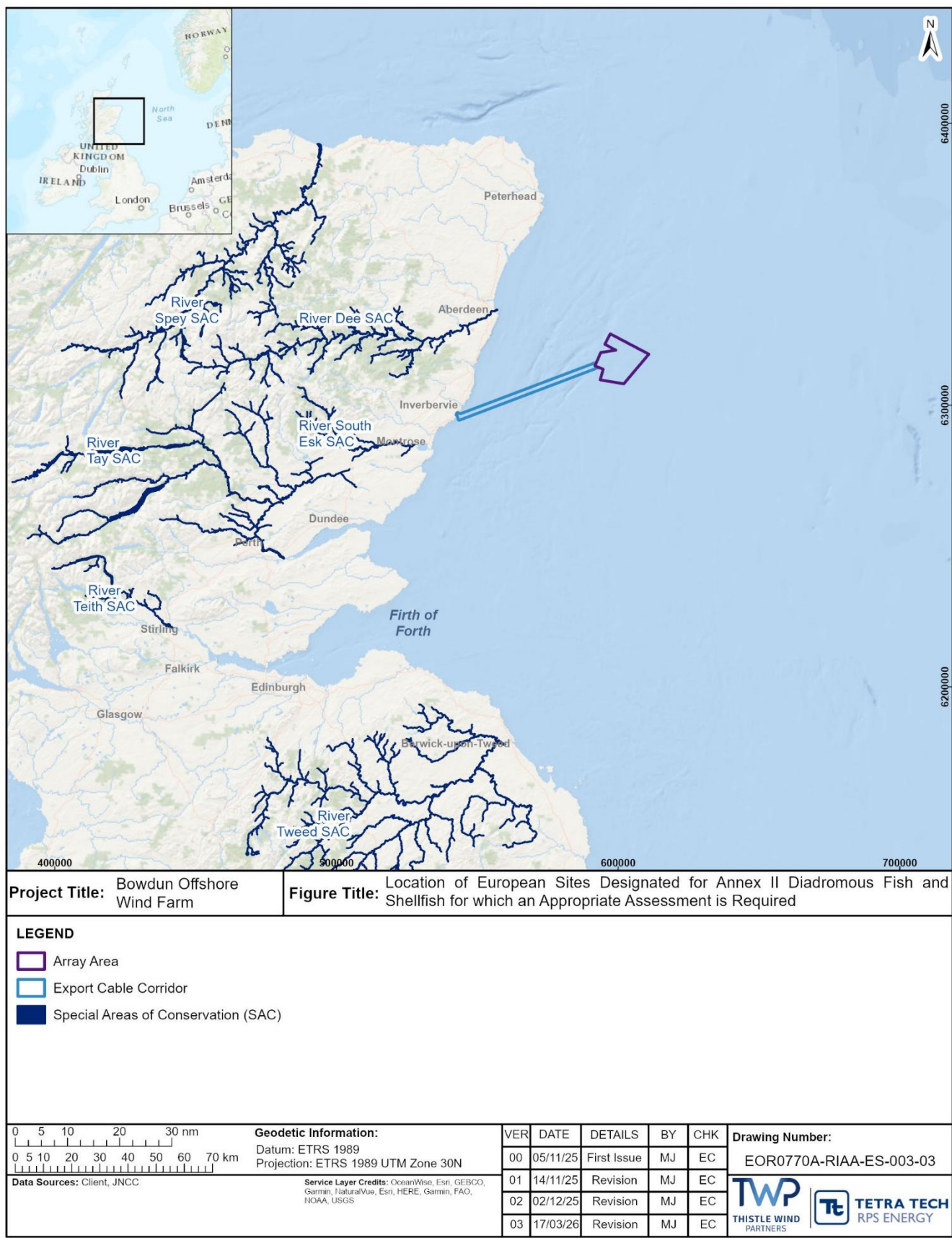


Figure 5.1: Location of European Sites Designated for Annex II Diadromous Fish and Shellfish for which an Appropriate Assessment is Required

- 5.1.3 Potential impact pathways for the SACs presented in Table 5.1 were identified for construction and O&M phases of the Proposed Development and are outlined below in Table 5.2. A range of Embedded Mitigation measures have been committed to as part of the Proposed Development, and these are presented, where relevant, in Section 5.3 per impact.

Table 5.2: Potential Impacts to Annex II Diadromous Fish and Shellfish of the European Sites Identified for Appropriate Assessment

Proposed Development Phase	Potential Impact
Construction	Subsea Noise impacting fish and shellfish (alone and in-combination)
O&M	Impacts to fish and shellfish due to EMF (alone and in-combination)

5.2 Baseline

- 5.2.1 Baseline information on the relevant screened in Annex II Diadromous Fish and freshwater pearl mussel features has been gathered through a comprehensive desktop study of existing datasets and materials. Full detail on the ecology of these features is provided in Volume 3, Technical Appendix 9.1: Fish and Shellfish Ecology Technical Report (TWP-BOW-RPS-OFE-RPT-00073) of the Offshore EIA Report.

Qualifying Feature Accounts

Atlantic Salmon

- 5.2.2 Atlantic salmon is a Diadromous Fish which lives in freshwater as a juvenile and in the marine environment as an adult. The adults return to their native rivers (i.e. the rivers in which they were born) to spawn. This usually occurs in November and December, although the spawning season may extend from October to late February (NatureScot, 2025a). Females lay their eggs in gravel depressions, known as ‘redds’, which are fertilised immediately by a male, and then covered with gravel by the female. The egg incubation time depends on water temperature, although eggs usually hatch in the spring, with ‘fry’ emerging from the redds at a length of about 3 cm (NatureScot, 2025a). They are known as ‘parr’ once they develop markings on their sides. Parr live in the rivers for up to three years, with time spent in rivers dependent on food availability and water temperature. At around 12 cm the fish transform physiologically into ‘smolts’, continuing to change colour to silver and becoming ‘post-smolts’, which migrate to sea. The downstream migration occurs between April and June (Malcolm *et al.*, 2010; NatureScot, 2025a) and has been recorded to predominantly occur during the night time. Recorded activity in the day time has been predominantly associated with prey detection and predator avoidance (Hedger *et al.*, 2008).

- 5.2.3 Little is known about the migration pathways of Atlantic salmon at sea, either as post-smolts or returning adults, although research suggests that upon reaching the North Sea post-smolts are transported by water currents towards Northern Norway and then into the Norwegian Sea (Jonsson *et al.*, 1993); North Atlantic Salmon Conservation Organization (NASCO) (NASCO, 2019). There is also evidence of Atlantic salmon from the east coast of Scotland being recaptured in waters around Greenland and the Faroe Islands, providing evidence to suggest that post-smolts may migrate west to feed and grow (Malcolm *et al.*, 2010). In addition, evidence from the Moray Firth suggests that post-smolts may migrate from their rivers in the Moray Firth and head directly across the North Sea (Gardiner *et al.*, 2018; Newton *et al.*, 2019; Newton *et al.*, 2017). Similar evidence of a rapid easterly migration out into the North Sea has also been shown for the River Dee in Aberdeenshire (Gardiner *et al.*, 2018). Therefore, it could be assumed that smolts from other east coast rivers (e.g. the River Tay, River Dee, River South Esk, River Tweed, and River Teith) would follow a similar pattern of movement.
- 5.2.4 After one to four years spent at sea, Atlantic salmon migrate back to their native rivers to spawn. Around 90% to 95% of Atlantic salmon will die after spawning, but those that survive may spawn again (NatureScot, 2025a). Atlantic salmon that return after only one year at sea are known as ‘grilse’ and may weigh up to 2 kg to 3 kg (Malcolm *et al.*, 2010; NatureScot, 2025a). Those individuals that return after spending two to three or four years are known as ‘multi-sea-winter salmon’ and are larger than grilse as they have spent more time feeding in the marine environment (Malcolm *et al.*, 2010; NatureScot, 2025a). Upstream migration is associated with the time of day and tidal phase; primarily observed as nocturnal and occurring during ebb tides (Smith and Smith, 1997). Olfactory cues are known to direct Atlantic salmon up river in the final phase of upstream migration (Hasler and Scholz, 1983). Upstream migration may occur at any time of year, although evidence shows a peak in late summer and autumn (NatureScot, 2023b, 2025a).
- 5.2.5 Atlantic salmon are of considerable cultural and economic importance, as well as conservation importance (NASCO, 2019). Numbers of Atlantic salmon have declined throughout their geographic range including population declines in Scotland (JNCC, 2025a; Scottish Government, 2024), although the population around the United Kingdom (UK) shows variable trends (Figure 5.2) (OSPAR Commission, 2022). The species is subject to many pressures in both marine and freshwater environments. These include pollution, the introduction of non-native salmon stocks, physical barriers to migration, exploitation from netting and angling, physical degradation of spawning and nursery habitat, disease and/or parasites and increased marine mortality (NASCO, 2019; OSPAR Commission, 2022).

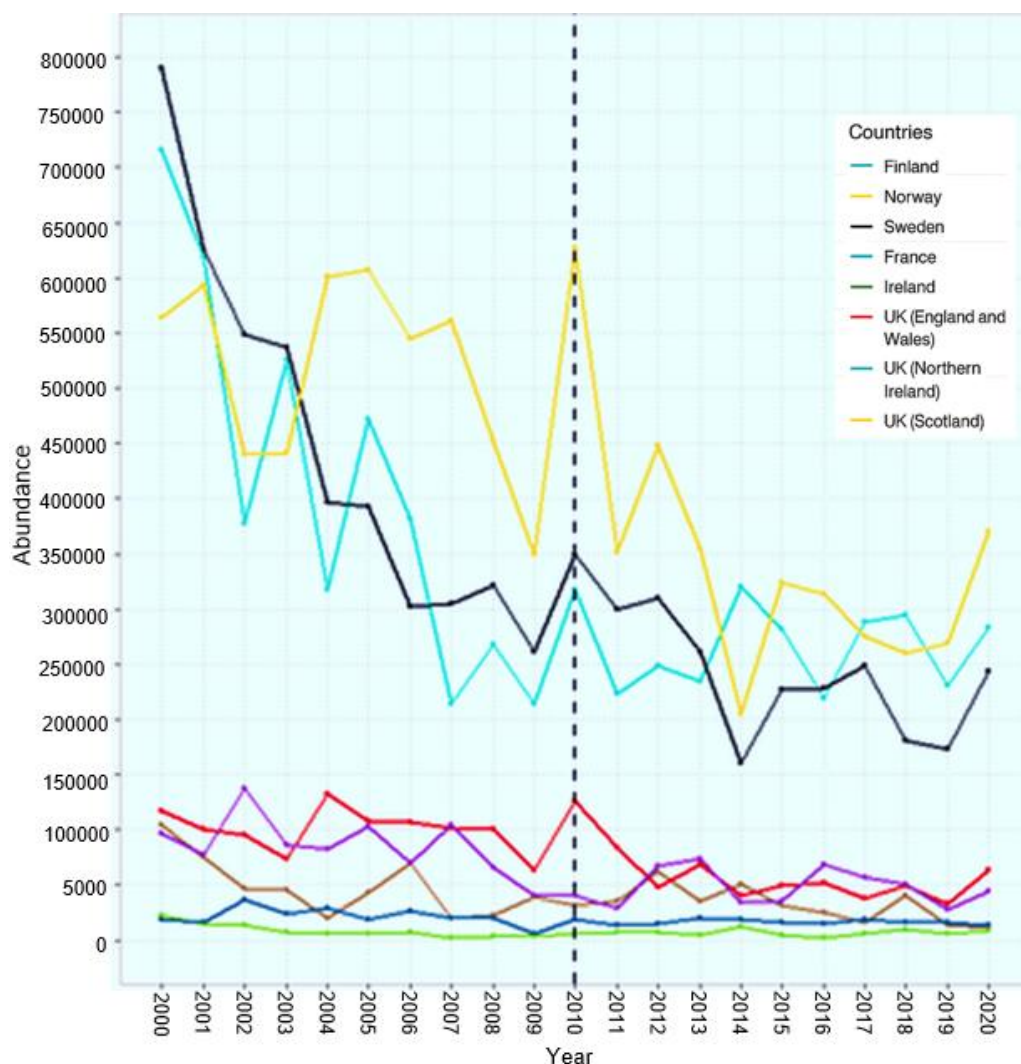


Figure 5.2: Pre-fishery Abundance of One-Sea-Winter Atlantic Salmon (Grilse) Between 2000 and 2020 Based on International Council for the Exploration of the Seas data (OSPAR Commission, 2022). Note: Black Dotted Line Indicates Date of Last OSPAR Assessment for Atlantic Salmon

- 5.2.6 The Conservation of Salmon (Scotland) Regulations 2016 was implemented to protect stocks that were in poor conservation status, therefore any Atlantic salmon caught in coastal waters or specified inland waters must be released to prevent the preserve the stocks of Atlantic salmon in coastal waters and estuaries. The most recent wild Atlantic salmon total rod catch data reported 32,477 individuals in 2023. This is the lowest record since the start of the statistics on salmon fisheries in Scotland by Marine Scotland in 1952 (Scottish Government, 2023). It was also a 24% decrease compared to 2022, where numbers showed an increase from 2021 (Scottish Government, 2023).
- 5.2.7 Alongside sea trout *Salmo trutta*, Atlantic salmon are host species for the parasitic larval phase of freshwater pearl mussel. Freshwater pearl mussel are strictly freshwater species and have seen population declines throughout their UK range. Further information on the ecology of freshwater pearl mussel is provided in Paragraphs 5.2.8 to 5.2.10. A decline in Atlantic salmon stocks is one of the factors contributing to this population decline. The potential impacts to Atlantic salmon can directly affect populations of Annex II freshwater pearl

mussel, which has been assessed alongside Atlantic salmon in this Part of the RIAA.

Freshwater Pearl Mussel

- 5.2.8 The freshwater pearl mussel is a long-lived freshwater mollusc that burrows into sandy substrates, often between boulders and pebbles (JNCC, 2025b). They live in clear, unpolluted, well-oxygenated, and fast-flowing rivers, many of which contain old mussels with no signs of reproduction (JNCC, 2025b; NatureScot, 2023c). The larvae of the mussel are parasitic and dependent upon a healthy population of salmonids (young Atlantic salmon or sea trout) which act as host species (Taeubert and Geist, 2017). Freshwater pearl mussel larvae attach to the gills of salmonid fish in mid to late summer and drop off the following spring. When they detach from their hosts they must land in sandy or gravelly substrates to settle and grow to adulthood (JNCC, 2025b). In suitable conditions they can live for over 100 years and grow up to 20 cm.
- 5.2.9 Freshwater pearl mussel is widely distributed in Europe and North-Eastern North America but has seen significant population decline throughout its range. The mussel is threatened with extinction and is considered as highly vulnerable in every part of its former range (JNCC, 2025b; NatureScot, 2023c). It is listed as ‘critically endangered’ in Europe by the International Union for the Conservation of Nature (Moorkens, 2024). Freshwater pearl mussels are filter feeders and are therefore vulnerable to water pollution and other changes in water quality, as well as hydrological alterations (including engineering and abstractions) in rivers (NatureScot, 2023c). Other threats include habitat degradation of river beds and banks, illegal fishing and availability of host salmonids (JNCC, 2025b; NatureScot, 2023c).
- 5.2.10 The species was formerly widespread throughout western and northern parts of the UK. However, many UK rivers now contain only scattered individuals, with no juvenile mussels recorded; such populations may become extinct due to lack of recruitment (JNCC, 2025b). Although Scotland has also seen large declines in both range and total population, it remains a stronghold for the freshwater pearl mussel. It supports functional populations in over 50 rivers, many of which are in the Highlands (JNCC, 2025b).

Sea Lamprey

- 5.2.11 Sea lamprey is a primitive, jawless fish resembling an eel. It is the largest of the three lamprey species found in the UK (the other two are the river lamprey *Lampetra fluviatilis* and the brook lamprey *L. planeri*) and can reach approximately 1 m in length (JNCC, 2025c; NatureScot, 2023d). The sea lamprey is a diadromous species that spawns in freshwater but feeds at sea (NatureScot, 2023d). Spawning occurs between May and July, with the sea lamprey preferring warmer waters upstream of estuaries and easily accessible rivers in areas of clean gravel substrates (JNCC, 2025c; NatureScot, 2023d). The larvae, known as ammocoetes, once hatched, drift downstream to nursery habitats which have fine, soft substrate in well-oxygenated, slow-flowing water (NatureScot, 2023d). The ammocoetes remain in the freshwater nurseries for

up to eight years, feeding on algae and bacteria, before metamorphosing into juvenile pre-adults and migrating to the marine environment from late autumn (Hume, 2017; NatureScot, 2023d).

- 5.2.12 At sea, the lamprey is a parasite (blood-feeding) of various prey species, including salmonids, sharks and cetaceans (Quintella *et al.*, 2021; Silva *et al.*, 2014). Their parasitic lifestyle may start during their downstream migration, as recently transformed juveniles, or they may not begin parasitism until they reach the sea (Hume, 2017; Quintella *et al.*, 2021). Sea lamprey remain at sea for 18 to 24 months, growing into adults that migrate back upstream to freshwater spawning habitats between April and May (NatureScot, 2023d; Scottish Government, 2019). There is no evidence of homing behaviour in sea lamprey (Scottish Government, 2019) in comparison to Atlantic salmon (see Paragraph 5.2.4).
- 5.2.13 The distribution of sea lamprey in the marine environment largely depends on the distribution of their host, due to their parasitic nature (Scottish Government, 2019). The sea lamprey has a wide range of vertical and horizontal distributions, with juveniles/smaller individuals tending to be encountered in estuarine and coastal regions, and larger individuals encountered in deeper water (up to 4,099 m) at greater distances from the coast (Quintella *et al.*, 2021; Scottish Government, 2019).
- 5.2.14 The sea lamprey occurs over much of the Atlantic coastal area of western and Northern Europe (from Northern Norway to the Western Mediterranean) and Eastern North America, and is reasonably widespread in UK rivers (JNCC, 2025c). However, sea lamprey has declined in parts of its UK range and has become extinct in a number of rivers. It appears to reach its northern limit of distribution in Scotland and does not occur north of the Great Glen (JNCC, 2025c). At the River Tay, the main issues that may affect sea lamprey are obstructions to passage (e.g. from hydro-schemes), diffuse pollution, and river engineering (NatureScot, 2020a).

River South Esk SAC

Site Description

- 5.2.15 River South Esk is 20.3 km and 71.1 km from the Export Cable Corridor and Array Area, respectively. The site is located in Angus in Eastern Scotland and covers approximately 4.7 km². The site is designated solely for Atlantic salmon and freshwater pearl mussel (NatureScot, 2020b).
- 5.2.16 The ecology of Atlantic salmon is as described above in Paragraphs 5.2.2 to 5.2.6 and for freshwater pearl mussel in Paragraphs 5.2.8 to 5.2.10. The SAC once supported a large, high-quality Atlantic salmon population but as noted in Paragraph 5.2.20, the population is currently considered to be in unfavourable condition. The river has a strong nutrient gradient along its length, rising in the nutrient-poor Grampians and flowing for half of its length through the rich agricultural lands of Strathmore. The high proportion of the River South Esk which is accessible to salmon and the range of ecological conditions in the river allows it to support the full range of life history types found in Scotland (JNCC,

2025d). The freshwater pearl mussel was abundant in the River South Esk and had a density of more than 20 m² at its highest (in the middle reaches of the river) (JNCC, 2025d). However, as noted in Paragraph 5.2.21 the population has declined due to low juvenile recruitment (NatureScot, 2020b).

Conservation Objectives

5.2.17 NatureScot developed the River South Esk SAC conservation objectives as part of a CAP (NatureScot, 2020b). The overarching conservation objectives for this SAC are:

- 1. to ensure that the qualifying features of the River South Esk SAC are in favourable condition and making an appropriate contribution to achieving FCS; and
- 2. to ensure that the integrity of the River South Esk SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature (and 2d for freshwater pearl mussel).

5.2.18 The specific conservation objectives for Atlantic salmon are to:

- 2a. restore the population of Atlantic salmon, including range of genetic types, as a viable component of the site;
- 2b. restore the distribution of the species throughout the site; and
- 2c. restore the habitats supporting Atlantic salmon within the site and availability of food.

5.2.19 The specific conservation objectives for freshwater pearl mussel are to:

- 2a. restore the population of freshwater pearl mussel as a viable component of the site;
- 2b. restore the distribution of freshwater pearl mussel throughout the site;
- 2c. restore the habitats supporting freshwater pearl mussel within the site and availability of food; and
- 2d. restore the distribution and viability of freshwater pearl mussel host species and their supporting habitats.

Condition Assessment

5.2.20 The condition of Atlantic salmon was last assessed in 2015 and for freshwater pearl mussel was last assessed in 2024 (NatureScot, 2025b) as:

- Atlantic salmon: unfavourable recovering; and
- freshwater pearl mussel: unfavourable declining.

5.2.21 Atlantic salmon was assessed as being in unfavourable condition due to a reduced spring salmon component, although the trend of this component indicates it is recovering (NatureScot, 2020b). Freshwater pearl mussel was assessed as being in unfavourable condition due to the low number and density of freshwater pearl mussels present. This is due to low levels of juvenile

recruitment, oxygen demand, and disturbance of mussel beds (NatureScot, 2020b).

River Dee SAC

Site Description

- 5.2.22 River Dee SAC is 29.9 km and 39.6 km from the Export Cable Corridor and Array Area, respectively. The River Dee originates in the Cairngorms and flows through Southern Aberdeenshire to reach the North Sea at Aberdeen. The site covers an area of approximately 23.3 km² and is designated for Atlantic salmon and freshwater pearl mussel (NatureScot, 2020c).
- 5.2.23 The ecology of Atlantic salmon is as described above in Paragraphs 5.2.2 to 5.2.6 and for freshwater pearl mussel in Paragraphs 5.2.8 to 5.2.10. Atlantic salmon show evidence of a rapid easterly migration out into the North Sea (Gardiner *et al.*, 2018; Newton *et al.*, 2019; Newton *et al.*, 2017). From 2018 to 2021, a tagging study was conducted on juvenile Atlantic salmon migrating from the River Dee (River Dee Trust and Marine Scotland Science, 2023). Atlantic salmon were found to travel at an average speed of 0.45 m/s from the river mouth to around 4 km offshore, before dropping to 0.24 m/s between 4 km to 20 km offshore (River Dee Trust and Marine Scotland Science, 2023). Individuals mostly swam within the top 3 m of the water column and swam in an easterly direction in the first 4 km, before following a south-easterly trajectory. This pattern was consistent over the three years of the study, suggesting that this is a regular migratory route and that Atlantic salmon must make a northerly course adjustment at some point in their migration to reach higher latitude feeding grounds in the Norwegian Sea (River Dee Trust and Marine Scotland Science, 2023).

Conservation Objectives

- 5.2.24 NatureScot developed the River Dee SAC conservation objectives as part of a CAP (NatureScot, 2020c). The overarching conservation objectives for this SAC are:
- 1. to ensure that the qualifying features of the River Dee SAC are in favourable condition and making an appropriate contribution to achieving FCS; and
 - 2. to ensure that the integrity of the River Dee SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature (and 2d for freshwater pearl mussel).
- 5.2.25 The specific conservation objectives for Atlantic salmon are to:
- 2a. maintain the population of Atlantic salmon, including range of genetic types, as a viable component of the site;
 - 2b. maintain the distribution of the species throughout the site; and
 - 2c. maintain the habitats supporting Atlantic salmon within the site and availability of food.

- 5.2.26 The specific conservation objectives for freshwater pearl mussel are to:
- 2a. restore the population of freshwater pearl mussel as a viable component of the site;
 - 2b. restore the distribution of freshwater pearl mussel throughout the site;
 - 2c. restore the habitats supporting freshwater pearl mussel within the site and availability of food; and
 - 2d. maintain the distribution and viability of freshwater pearl mussel host species and their supporting habitats.

Condition Assessment

- 5.2.27 The condition of Atlantic salmon was last assessed in 2015 and for freshwater pearl mussel was last assessed in 2024 (NatureScot, 2025b) as:
- Atlantic salmon: favourable maintained; and
 - freshwater pearl mussel: unfavourable declining.

- 5.2.28 Freshwater pearl mussel was assessed as being in unfavourable condition due to the low number and density of freshwater pearl mussels present. This is due to low levels of juvenile recruitment, water flow, river morphology and the presence of filamentous algae and water quality at the SAC (NatureScot, 2020c).

River Tay SAC

Site Description

- 5.2.29 River Tay SAC is 83.6 km and 130.4 km from the Export Cable Corridor and Array Area, respectively. The SAC covers an area of approximately 94.6 km² and comprises the longest river in Scotland. It originates in Western Scotland and flows easterly across the Highlands before becoming tidal at the Firth of Tay. The River Tay drains a very large catchment, and has the greatest flow of all UK rivers (JNCC, 2025e). The site is designated for Annex I habitats and Annex II Diadromous Fish; the qualifying features relevant to the assessment are Atlantic salmon and sea lamprey (NatureScot, 2020a).
- 5.2.30 The ecology of Atlantic salmon is as described above in Paragraphs 5.2.2 to 5.2.6 and for sea lamprey in Paragraphs 5.2.11 to 5.2.14. The River Tay supports a high-quality Atlantic salmon population with rod catch returns showing that it is consistently one of the top three salmon rivers in Scotland (JNCC, 2025e). In 1999 the catch was 7,230 fish, over 10% of the Scottish total (JNCC, 2025e). There is considerable ecological variety in the River Tay catchment resulting in the SAC supporting the full range of salmon life history types found in Scotland. Adult salmon enter the River Tay throughout the year to spawn in different parts of the catchment (JNCC, 2025e). At the River Tay, the proliferation of small scale hydro-schemes, Invasive Non-Native Species (INNS) such as the North American signal crayfish *Pacifastacus leniusculus*, and pollution from agriculture are having a notable impact upon the Atlantic salmon population which is declining throughout their geographic range including in Scottish rivers (NatureScot, 2020d). For sea lamprey, the main issues at this SAC are

obstructions to passage (e.g. from hydro-schemes), diffuse pollution, and river engineering (NatureScot, 2020a).

Conservation Objectives

5.2.31 NatureScot developed the River Tay SAC conservation objectives as part of a CAP (NatureScot, 2020a). The overarching conservation objectives for this SAC are:

- 1. to ensure that the qualifying features of the River Tay SAC are in favourable condition and making an appropriate contribution to achieving FCS; and
- 2. to ensure that the integrity of the River Tay SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature.

5.2.32 The specific conservation objectives for Atlantic salmon are to:

- 2a. maintain the population of Atlantic salmon, including range of genetic types, as a viable component of the site;
- 2b. maintain the distribution of the species throughout the site; and
- 2c. maintain the habitats supporting Atlantic salmon within the site and availability of food.

5.2.33 The specific conservation objectives for sea lamprey are to:

- 2a. maintain the population of the sea lamprey as viable components of the site;
- 2b. maintain the distribution of the sea lamprey throughout the site; and
- 2c. maintain the habitats supporting sea the lamprey within the site, and availability of food.

Condition Assessment

5.2.34 The condition of Atlantic salmon was last assessed in 2015 and for sea lamprey was last assessed in 2010 (NatureScot, 2025b) as:

- Atlantic salmon: favourable maintained; and
- sea lamprey: favourable maintained.

River Tweed SAC

Site Description

5.2.35 River Tweed SAC is 120.8 km and 136.8 km from the Export Cable Corridor and Array Area, respectively. The SAC is located in Eastern Scotland and Northumberland and covers an area of approximately 37.4 km² (NatureScot, 2020d). The site is designated for Annex I habitats and Annex II species, including Atlantic salmon which is the only Qualifying Feature relevant to this assessment.

5.2.36 The ecology of Atlantic salmon is as described above in Paragraphs 5.2.2 to 5.2.6. The River Tweed SAC supports a very large and high-quality population of Atlantic salmon. The river is the best example in the UK of a large river showing a strong nutrient gradient along its length, with oligotrophic conditions in its headwaters, and nutrient-rich lowland conditions just before it enters the sea at Berwick (JNCC, 2025f). The river supports the full range of salmon life history types, with sub-populations of spring, summer salmon and grilse all being present (JNCC, 2025f). Research by (Gauld, 2014) and (Gauld *et al.*, 2016) suggested that Atlantic salmon mainly spawn in the main lower stretches of the channel of the River Tweed. The salmon catch in the River Tweed is the highest in Scotland from data in recent years, with up to 15% of all salmon caught (JNCC, 2025f).

Conservation Objectives

5.2.37 The River Tweed SAC crosses the England/Scotland border and so, management of this site is shared by Natural England and NatureScot. Therefore, conservation objectives have been published by both Natural England and NatureScot, and both sets of conservation objectives have been used in the assessment as the Atlantic salmon feature may migrate to and from the English or Scottish parts of the SAC.

5.2.38 NatureScot developed the River Tweed SAC conservation objectives as part of a CAP (NatureScot, 2020d). The overarching conservation objectives for this SAC are:

- 1. to ensure that the qualifying features of the River Tweed SAC are in favourable condition and making an appropriate contribution to achieving FCS; and
- 2. to ensure that the integrity of the River Tweed SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature (noting only Atlantic salmon is relevant to this assessment).

5.2.39 The specific conservation objectives for Atlantic salmon are to:

- 2a. maintain the population of Atlantic salmon, including range of genetic types, as a viable component of the site;
- 2b. maintain the distribution of the species throughout the site; and
- 2c. maintain the habitats supporting Atlantic salmon within the site and availability of food.

5.2.40 Conservation objectives and related supplementary advice have been developed by Natural England (Natural England, 2022). The high-level conservation objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the FCS of its Qualifying Features, by maintaining or restoring:

- the extent and distribution of qualifying natural habitats and habitats of qualifying species;

- the structure and function (including typical species) of qualifying natural habitats;
- the structure and function of the habitats of qualifying species;
- the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- the populations of qualifying species; and
- the distribution of qualifying species within the site.

5.2.41 The second conservation objective: ‘the structure and function (including typical species) of qualifying natural habitats’ is only relevant to the Annex I habitat features of the River Tweed SAC and is therefore not included further in this assessment on Annex II Diadromous Fish.

Condition Assessment

5.2.42 There was no condition assessment of Atlantic salmon currently available on the Natural England Designated Sites Portal for the English section of the SAC (Natural England, 2022). However, the condition of Atlantic salmon was last assessed by NatureScot in 2015 (NatureScot, 2025b) as:

- Atlantic salmon: favourable maintained.

River Spey SAC

Site Description

5.2.43 River Spey SAC is 155.4 km and 147.9 km from the Export Cable Corridor and Array Area, respectively. The site covers an area of approximately 57.6 km² and is located in the Highlands, flowing into the Moray Firth (NatureScot, 2020e). The site is designated for Annex II species, including Diadromous Fish features. Relevant to this assessment are Atlantic salmon and freshwater pearl mussel.

5.2.44 The ecology of Atlantic salmon is as described above in Paragraphs 5.2.2 to 5.2.6 and for freshwater pearl mussel in Paragraphs 5.2.8 to 5.2.10. The River Spey supports one of Scotland’s largest Atlantic salmon populations, with little evidence of modification by non-native stocks. The population includes fish of all ages including migrating smolts and returning adults; adults spawn throughout the whole length of the river and good quality nursery habitat is found in abundance in the SAC (NatureScot, 2020e). However, the Atlantic salmon population within the River Spey has shown a decrease in the spring multi-sea winter fish since 1952 (NatureScot, 2020e). The River Spey also supports a freshwater pearl mussel population in the middle to lower reaches of the river, which was historically extremely dense in some sections (JNCC, 2025g).

Conservation Objectives

- 5.2.45 NatureScot developed the River Spey SAC conservation objectives as part of a CAP (NatureScot, 2020e). The overarching conservation objectives for this SAC are:
- 1. to ensure that the qualifying features of the River Spey SAC are in favourable condition and making an appropriate contribution to achieving FCS; and
 - 2. to ensure that the integrity of the River Spey SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature (and 2d for freshwater pearl mussel).
- 5.2.46 The specific conservation objectives for Atlantic salmon are to:
- 2a. restore the population of Atlantic salmon, including range of genetic types, as a viable component of the site;
 - 2b. restore the distribution of the species throughout the site; and
 - 2c. restore the habitats supporting Atlantic salmon within the site and availability of food.
- 5.2.47 The specific conservation objectives for freshwater pearl mussel are to:
- 2a. restore the population of freshwater pearl mussel as a viable component of the site;
 - 2b. restore the distribution of freshwater pearl mussel throughout the site;
 - 2c. restore the habitats supporting freshwater pearl mussel within the site and availability of food; and
 - 2d. restore the distribution and viability of freshwater pearl mussel host species and their supporting habitats.

Condition Assessment

- 5.2.48 The condition of Atlantic salmon and freshwater pearl mussel was last assessed in 2015 (NatureScot, 2025b) as:
- Atlantic salmon: unfavourable recovering; and
 - freshwater pearl mussel: unfavourable declining.
- 5.2.49 Atlantic salmon was assessed as being in unfavourable condition at this SAC due to a decline in the number of salmon in the river, especially the spring salmon component of the population. The main issues include marine survival, water abstraction, dams and weirs, predation, marine mortality and INNS (NatureScot, 2020e).
- 5.2.50 Freshwater pearl mussel monitoring in the River Spey SAC showed a significant apparent decrease in mussel density between 2000 and 2014. The lack of recruitment in the River Spey SAC may be due to fine sediment causing anoxic conditions in the river gravels of the upper Spey, poor water quality or the presence of the water crowfoot *Ranunculus fluitans* which has been found to

impact freshwater pearl mussels in the middle and lower Spey, through entanglement of mussels or smothering from roots (NatureScot, 2020e).

River Teith SAC

Site Description

- 5.2.51 River Teith SAC is 169.4 km and 206.7 km from the Export Cable Corridor and Array Area, respectively. The River Teith begins in Loch Lomond and the Trossachs National Park and flows through Stirling and into the Firth of Forth. The SAC covers an area of approximately 12.9 km² and is designated for Annex II Diadromous Fish species, including Atlantic salmon, which is the only Qualifying Feature relevant to this assessment (NatureScot, 2015). While Atlantic salmon are a Qualifying Feature, they are not a primary feature for site designation.
- 5.2.52 The ecology of Atlantic salmon is as described above in Paragraphs 5.2.2 to 5.2.6. There is also no CAP available for this site, which results in there being a lack of site-specific information and data for Atlantic salmon at this SAC. However, it is noted in JNCC Standard Data for this SAC that it is considered to support a significant presence of Atlantic salmon (JNCC, 2015).

Conservation Objectives

- 5.2.53 NatureScot have not yet developed a CAP for the River Teith; however, conservation objectives have been defined for the qualifying features of the site. The overarching conservation objectives are to (NatureScot, 2015):
- to avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving FCS for each of the qualifying features; and
 - to ensure for the qualifying species that the following are maintained in the long term:
 - population of the species, including range of genetic types for salmon, as a viable component of the site;
 - distribution of the species within site;
 - distribution and extent of habitats supporting the species;
 - structure, function and supporting processes of habitats supporting the species; and
 - no significant disturbance of the species.
- 5.2.54 There are no specific conservation objectives for the Atlantic salmon qualifying feature of this SAC.

Condition Assessment

- 5.2.55 The condition of Atlantic salmon was last assessed in 2015 as:
- Atlantic salmon: unfavourable recovering (NatureScot, 2025c).
- 5.2.56 NatureScot's SiteLink page for this SAC suggests that the negative pressures influencing the unfavourable condition of Atlantic salmon are climate change, forestry operations, INNS and water quality (NatureScot, 2025c).

5.3 Assessment of the Adverse Effects of the Proposed Development Alone

Subsea Noise Impacting Fish and Shellfish Receptors

- 5.3.1 The LSE assessment during the HRA screening process concluded that LSE could not be ruled out for Subsea Noise during the construction phase only for all six SACs screened in for Annex II Diadromous Fish and shellfish (see Table 3.1).
- 5.3.2 The MDS and Embedded Mitigation considered for the assessment of Subsea Noise are shown in Table 5.3 and Table 5.4, respectively.

Table 5.3: MDS Considered for the Assessment of Potential Impacts to Annex II Diadromous Fish and Shellfish due to Subsea Noise during the Construction Phase

Proposed Development Phase	MDS	Justification
Construction	<u>Piling</u> <i>Fixed foundation monopile – 25 MW:</i> • Number of fixed foundations: 40; • Maximum number of piles: 40; • Maximum pile diameter: 15 m; • Maximum pile length: 123 m, with final pile penetration of 45 m; • Maximum hammer energy: 6,250 kJ; and • Maximum duration of piling: 8.6 hours. <i>Jacket foundations 3-legged jacket – 25 MW:</i> • Number of fixed foundations: 40; • Maximum number of piles: 120; • Maximum pile diameter: 5 m; • Maximum pile length: 90 m, with final pile penetration of 85 m; • Maximum hammer energy: 4,500 kJ; and • Maximum duration of piling: 16.2 hours. <i>Realistic– Fixed Foundation monopile – 25 MW:</i> • Number of fixed foundations: 40; • Maximum number of piles: 40; • Maximum pile diameter: 15 m; • Maximum pile length: 123 m, with final pile penetration of 45 m; • Average hammer energy: 6,000 kJ; and • Average duration of piling: 4.3 hours.	<u>Piling</u> The impact assessment will consider the worst-case impact ranges from both single and concurrent piling scenarios. Noise modelling will estimate impact ranges for instantaneous auditory injury, accumulated auditory injury (over the duration of the installation period) and disturbance. Three scenarios have been chosen for modelling purposes that will encompass all potential foundation options. <i>Monopile foundations</i> The MDS for monopile foundations is based on 25 MW, monopile option. The parameters modelled for this option will encompass the Offshore Substation Platforms (OSPs). <i>Jacket foundations</i> The MDS for foundations is based on the 25 MW, 3-legged jacket option. The parameters modelled for this option will encompass the OSPs. <i>Realistic Scenario</i> This is based on the 25 MW monopile, using the average hammer energy and average piling duration (instead of maximums) in order to provide context to the maximum scenario. A key parameter in the estimation of accumulated injury, is the duration of impact piling. Concurrent piling will be modelled in addition to single pile events. In all cases concurrent piling would

Proposed Development Phase	MDS	Justification
	<i>Concurrent piling – all 3 scenarios:</i> - Up to 2 vessels piling concurrently; and - Minimum 1 km and maximum 20 km distance between concurrent piling events. <u>UXO clearance</u> - Maximum realistic charge weight of UXO – 227 kg (Net Explosive Quantity (NEQ)); - A maximum of 40 UXOs are anticipated to require clearance (based on most probable case for Array Area (30 UXOs) and Export Cable Corridor (10 UXOs) combined); - A maximum of 2 detonations during 24 hours; and - A maximum of 40 days – assuming one clearance events per day. <u>Site investigation surveys</u> Typical Geophysical equipment: - Multibeam Echosounder (MBES); - Frequency 400 kHz - Source level 225 dB re 1 µPa (rms) - Side scan sonar (SSS); - Low frequency 230 kHz - High frequency 550 kHz - Source level 210 dB re 1 µPa (rms) - Parametric Sub-bottom profiler (SBP); and 100 kHz (primary); 4, 5, 6, 8, 10, 12 kHz selectable secondary frequencies - Source level 248 dB re 1 µPa (rms) 2D Ultra High-Resolution Seismic (UHRS) - Frequency 0.05 to 4 kHz	lead to a larger spatial extent of ensonification in total, in comparison to a single piling event. Minimum spacing between concurrent piling represents the highest risk of auditory injury to animals as noise from adjacent foundations could combine to produce a greater radius of effect compared to a single piling event. This represents the MDS for concurrent piling injury impacts. Maximum spacing between concurrent piling represents a larger area of ensonification. This represents the MDS for concurrent piling disturbance impacts <u>UXO clearance</u> Maximum number used in the MDS (reflecting the most probable worst-case) and the maximum size of UXOs encountered within the Site Boundary is based on the UXO Hazard Assessment undertaken for the Array. The actual detail of any possible UXO that may need clearance is not known at this stage. Although not specific to fish and shellfish, the JNCC (2025h) guidelines for minimising the risk of injury to marine mammals from UXO clearance, states that the default method for clearance should be a low noise method, as required by the UK Government's Joint Position Statement (DEFRA, 2025; UK Government, 2025). The MDS represents the maximum charge weight likely to be present, noise modelling will estimate impact ranges for low order as the default, with high order impact ranges for context. <u>Site investigation surveys</u>

Proposed Development Phase	MDS	Justification
	- Source level 219 dB re 1 µPa (rms). Typical Geotechnical equipment: - Vibrocore; and - Boreholes. Geophysical and geotechnical surveys will take place during the pre-construction period, involving up to 14 vessels on site at any one time and up to 110 vessel movements (return trips) in total. <u>Vessel noise and other noise producing activities</u> During the construction phase, a total of 16 vessels will be on site in the Export Cable Corridor at any one time, with an estimated 449 return trips in total. A total of 25 vessels will be on site in the Array Area at any one time with an estimated 1,671 return trips in total. Vessel types include installation (jack-up/dynamic positioning), cargo barge/heavy transport, scour protection installation, grouting, drilling, support (dive /trenching, including Service Operation Vessel), tug/anchor, cable laying (and burial), guard, survey, crew transfer vessels, sandwave clearance, pre-lay grapnel run, rock dumping, boulder clearance, UXO clearance, and micro-tunnelling or Horizontal Directional Drilling (HDD) support vessels. Other noise producing activities, include drilling activities (if required): - drilling of up to a maximum of 32.5 hours per pile over a maximum realistic duration of 268 days (15 MW 4-leg piled jacket).	Site investigation surveys are conducted in the pre-construction phase. However, details of the specific equipment types are not yet known. The assessment has been based on literature/known acoustic characteristics associated with typical equipment used for site surveys. <u>Vessel noise and other noise producing activities</u> Maximum numbers of vessels on site at any one time and largest numbers of return trips during each phase will result in the greatest potential impact. Range of other activities producing underwater noise, including maximum timescales were also included.

Table 5.4: Embedded Mitigation Measures Considered for the Assessment of Potential Impacts to Annex II Diadromous Fish and Shellfish to Subsea Noise during the Construction Phase

Embedded Mitigation Measures	Justification
Development of, and adherence to, a Piling Strategy. This will detail use of Acoustic Deterrent Devices (ADDs), slow start, soft start, and ramp up procedures, as appropriate, as well as any Additional Mitigation measures, where determined to be required, in consultation with stakeholders including NatureScot and MD-LOT.	These measures will reduce the likelihood of injury from elevated Subsea Noise to sensitive fish and shellfish receptors in the immediate vicinity of piling operations as far as practicable, by possibly allowing individuals to move away from the area before sound levels reach a level at which injury may occur. Secured in the Section 36 Consent and Marine Licences via the requirement for a Piling Strategy, which will be submitted to MD-LOT for approval.
Where practicable, the use of low order disposal of UXOs will be implemented (i.e. deflagration).	Low order techniques will be adopted wherever practicable (e.g. deflagration and clearance shots) as mitigation to reduce noise levels and thereby injury and disturbance to sound-sensitive receptors during UXO clearance. There is a small risk that low order disposal could unintentionally arise in a high order detonation and therefore this scenario has also been considered in the assessment. Secured in the Section 36 Consent and Marine Licences via the requirement for an EMP, which will be submitted to MD-LOT for approval.
Low order clearance techniques are the default method for UXO clearance and would not require Additional Mitigation over and above the Embedded Mitigation measures within the outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report). However, should high order clearance be unavoidable Additional Mitigation may be required dependant on the results of the UXO Risk Assessment. Appropriate mitigation measures will be discussed and agreed with MD-LOT and NatureScot with the detail to be agreed for the finalised MMMP.	Low order clearance is the default method for the Proposed Development, consistent with the guidance set out in the SNCB joint position statement on UXO clearance (UK Government, 2025). Low noise alternatives to high order detonation are commercially available and cause less environmental harm. In line with this guidance high order clearance methods as a contingency will be considered once the results of the UXO geophysical survey are available. Should high order clearance be considered necessary, mitigation measures proportionate to the identified risk will be implemented for the Proposed Development in order to mitigate the impacts to diadromous fish. Secured in the Section 36 Consent and Marine Licences, via the requirement for a MMMP, which will be submitted to MD-LOT for approval.

Embedded Mitigation Measures	Justification
Development of, and adherence to, a Project Environmental Monitoring Plan (PEMP) to include details of any agreed surveys or monitoring requirements. The PEMP will provide the mechanism to validate the impact assessment, assess the effectiveness of mitigation measures, and inform adaptation of mitigation measures throughout the construction phase of the Proposed Development.	The PEMP will detail the methodology that will be used validate the impact assessment predictions made within the EIA. Subsea Noise levels will be measured and monitored during the construction phase (impact piling operation). The PEMP will also provide for the mechanism for any adaptation of diadromous fish and shellfish mitigation measures if required to reduce impacts from the Proposed Development. Secured in the Section 36 Consent and Marine Licences, via the requirement for a PEMP, which will be submitted to MD-LOT for approval.

Information to Inform the Assessment

Hearing Sensitivity of Annex II Diadromous Fish

- 5.3.3 Subsea Noise can potentially have an adverse impact on Diadromous Fish species ranging from physical injury and mortality to behavioural effects. Peer reviewed guidelines have been published by the Acoustical Society of America and provide directions and recommendations for setting criteria (including injury and behavioural criteria) for fish (Popper *et al.*, 2014). These are the most relevant and best available guidelines for assessing the impacts of Subsea Noise on fish species.
- 5.3.4 The Popper *et al.* (2014) guidelines broadly place fish species into the following groups according to the presence or absence of a swim bladder and on the potential for that swim bladder to improve the sound sensitivity and range of hearing:
- Group 1: fish species which lack swim bladders (e.g. lampreys, elasmobranchs and flatfish species). These species are only sensitive to particle motion, not sound pressure and show sensitivity to only a narrow band of frequencies (see Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report for further information on particle motion). These species are less susceptible to barotrauma.
 - Group 2: fish species which have a swim bladder, but the swim bladder does not play a role in hearing (e.g. salmonids such as Atlantic salmon). These species are susceptible to barotrauma, although hearing only involves particle motion, not sound pressure.
 - Group 3: fish species with swim bladders that are close, but not connected, to the ear (e.g. gadoid species such as cod *Gadus morhua*, and European eel *Anguilla anguilla*). These species are sensitive to both particle motion and sound pressure and have a more extended frequency range than Groups 1 and 2, extending to about 500 Hz.
 - Group 4: fish species that have special structures mechanically linking the swim bladder to the ear (e.g. clupeids such as herring *Clupea harengus*). These species are sensitive primarily to sound pressure, although they can also detect particle motion. These species have a wider frequency range, extending to several kHz and generally show higher sensitivity to sound pressure than Groups 1, 2 and 3.
 - Eggs and larvae: separated due to greater vulnerability and reduced mobility. Very few peer reviewed studies report on the response of eggs and larvae to anthropogenic Subsea Noise.
- 5.3.5 Sea lamprey are a Group 1 species, and therefore has relatively low sensitivity to Subsea Noise (Popper *et al.*, 2014). Lamprey species are known to have relatively simple ear structures (Popper and Hoxter, 1987) with very few responses to auditory stimuli noted overall (Popper, 2005) except a slight swimming speed increase and decrease in resting behaviour when exposed to

continuous low frequency noise of 50 Hz to 200 Hz (Mickle *et al.*, 2018). This suggests a low vulnerability to impacts of noise overall. In contrast, Group 4 hearing specialist fish, such as herring, possess an otic bulla. This is a gas filled sphere that is connected to the swim bladder, which enhances hearing ability. This anatomy is not present in sea lamprey, although the gas filled swim bladder in Atlantic salmon may be involved in their hearing capability (Popper *et al.*, 2014). Whilst there is no direct link to the inner ear, Atlantic salmon are able to detect lower noise frequencies and as such are considered to be a Group 2 species, and therefore have a higher hearing sensitivity to Subsea Noise than sea lamprey, but comparatively low with respect to Group 3 and Group 4 species (Popper *et al.*, 2014).

- 5.3.6 Subsea Noise associated with the Proposed Development will only occur offshore, therefore the effects of Subsea Noise upon freshwater pearl mussel are limited to indirect effects. Freshwater pearl mussel are a freshwater resident species and so will only be affected indirectly due to potential disruption to their host species (Atlantic salmon) migration.
- 5.3.7 The Popper *et al.* (2014) guidelines set out criteria for injury effects due to different sources of Subsea Noise. Those relevant to the Proposed Development are considered to be those for impulsive piling sources only, as non-impulsive sources were not considered to be a potential impact and therefore were screened out of the guidance (Popper *et al.*, 2014) and therefore this assessment. The criteria include a range of indices including Sound Exposure Level (SEL), Peak Sound Pressure Level (SPL_{pk}), and Sound Pressure Level root mean square (rms). Where insufficient data exist to determine a quantitative guideline value, the risk is categorised in relative terms as “*high*”, “*moderate*” or “*low*” at three distances from the source: “*near*” (i.e. in the tens of metres), “*intermediate*” (i.e. in the hundreds of metres) or “*far*” (i.e. in the thousands of metres). It should be noted that these qualitative criteria cannot differentiate between exposures to different Subsea Noise levels and therefore all sources of Subsea Noise, no matter how loud, would theoretically elicit the same assessment result. However, because the qualitative risks are generally qualified as “*low*”, with the exception of a moderate risk at “*near*” range (i.e. within tens of metres) for some types of hearing groups and impairment effects, this is not considered to be a significant issue with respect to determining the potential effect of Subsea Noise on Annex II Diadromous Fish. The assessment is therefore considered to present a precautionary margin as thresholds are based on best available data for the sensitive species.
- 5.3.8 An assessment of the potential for injury/mortality and behavioural effects on fish with reference to the Popper *et al.* (2014) fish hearing groups is presented in Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report, with the results summarised and used to inform the assessment of adverse effects in this Part of the RIAA.

Piling

5.3.9 The injury threshold criteria used in the Subsea Noise modelling for impulsive piling are presented in Table 5.5. This includes parameters for both SEL and SPL_{pk} , both of which are unweighted. Physiological effects relating to injury criteria are as follows (Popper *et al.*, 2014; Popper and Hawkins, 2016):

- Mortality and potential mortal injury: either immediate mortality or tissue and/or physiological damage that is sufficiently severe (e.g. a barotrauma) that death occurs sometime later due to decreased fitness. Mortality has a direct effect upon animal populations, especially if it affects individuals close to maturity.
- Recoverable injury: Tissue and other physical damage or physiological effects, that are recoverable, but which may place animals at lower levels of fitness, may render them more open to predation, impaired feeding and growth, or lack of breeding success, until recovery takes place.
- Temporary Threshold Shift (TTS): Short term changes in hearing sensitivity may, or may not, reduce fitness and survival. Temporary impairment of hearing may affect the ability of animals to capture prey and avoid predators, and also cause deterioration in communication between individuals affecting growth, survival, and reproductive success. After termination of a noise that causes TTS, normal hearing ability returns over a period that is variable, depending on many factors, including the intensity and duration of exposure.

Table 5.5: Criteria for the Onset of Injury and Disturbance to Fish from Impulsive Piling (Popper *et al.*, 2014)

Hearing Group	Parameter	Mortality and Potential Mortal Injury	Recoverable Injury	TTS
Group 1 Fish (sea lamprey): no swim bladder (particle motion detection)	SEL, dB re 1 μPa^2s	>219	>216	>186
	SPL_{pk} , dB re 1 μPa	>213	>213	-
Group 2 Fish (Atlantic salmon): where swim bladder is not involved in hearing (particle motion detection)	SEL, dB re 1 μPa^2s	210	203	>186
	SPL_{pk} , dB re 1 μPa	>207	>207	-

5.3.10 Behavioural reactions of fish to Subsea Noise have been found to vary between species based on their hearing sensitivity. Typically, fish sense sound via particle motion in the inner ear which is detected from sound-induced motions in the fish's body (see Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report for further details). The detection of sound pressure is restricted to those fish which have

air filled swim bladders; however, particle motion (induced by sound) can be detected by fish without swim bladders. The gas filled swim bladder in Atlantic salmon may be involved in their hearing capabilities, so although there is no direct link to the inner ear, these species are able to detect lower sound frequencies and as such are considered to be of medium sensitivity to sound.

- 5.3.11 Popper *et al.* (2014) sets out qualitative criteria for disturbance due to different sources of sound. The risk of behavioural effects is categorised in relative terms as “*high*”, “*moderate*” or “*low*” at three distances from the source: “*near*” (i.e. in the tens of metres), “*intermediate*” (i.e. in the hundreds of metres) or “*far*” (i.e. in the thousands of metres), as shown in Table 5.6. Since these criteria are qualitative not quantitative, a subsea noise source of a particular type (e.g. piling) would be predicted to result in the same potential impact, no matter the level of subsea noise produced or the propagation characteristics. The assessment is therefore considered to present a precautionary margin as thresholds are based on best available data for the sensitive species.
- 5.3.12 Criteria presented in the Washington State Department of Transport (WSDOT) Biological Assessment Preparation for Transport Projects Advanced Training Manual (WSDOT, 2011) have been used in this assessment for predicting the distances at which behavioural effects may occur due to Subsea Noise from impulsive piling (e.g. Ossian Offshore Windfarm Limited (Ossian OWFL, 2024a)). This manual suggests an unweighted SPL of 150 dB re 1 μ Pa (rms) as the criterion for onset of behavioural effects for all fish species, based on work by Hastings (2002). SPL in excess of 150 dB re 1 μ Pa (rms) are expected to cause temporary behavioural changes, such as elicitation of a startle response, disruption of feeding, or avoidance of an area. The document notes that levels exceeding this threshold are not expected to cause direct permanent injury but may indirectly affect the individual fish (such as by impairing predator detection). It is important to note that this sound level is used as a guide for onset of potential effects, and not necessarily an ‘adverse effect’ threshold.
- 5.3.13 In addition, a study by Harding *et al.* (2016) failed to produce physiological or behavioural responses in Atlantic salmon when subjected to noise similar to piling. However, the noise levels tested were estimated at <160 dB re 1 μ Pa (rms), below the level at which injury or behavioural disturbance would be expected for this species. Nedwell *et al.* (2006) compared behavioural responses to piling in Atlantic salmon and found no significant behavioural response. Physical impacts on migrating salmonids exposed to piling noise of 218 dB re 1 μ Pa²s (SEL) were recorded by Bagočius (2015), although at these high noise levels, avoidance reactions would be expected, in order to avoid injury. Following consultation with NatureScot during the Scoping Workshop (April 2024), it was agreed that the modelled sound contours at 160dB re 1 μ Pa (SPL_{pk}) would be used as a guide for the potential for behavioural disturbance across all fish species. This value was based on a number of literature sources (McCauley *et al.*, 2000; Mueller-Blenkle *et al.*, 2010) and was deemed appropriate and proportionate for this assessment. As such, the modelled SPL_{pk} 160dB re 1 μ Pa contours have been applied to the assessment of disturbance due to piling for Atlantic salmon. It should be noted that this is highly precautionary for Atlantic salmon, which are a Group 2 species, and therefore

less sensitive to subsea noise than Group 3 and 4 species (upon which most literature sources focus on).

Table 5.6: Criteria for the Onset of Behavioural Effects in Fish (Popper *et al.*, 2014)

Hearing Group	Relative Risk of Behavioural Effects		
	Impulsive piling	Explosives	Non-impulsive sound
Group 1 Fish (sea lamprey): no swim bladder (particle motion detection)	(Near) High (Intermediate) Moderate (Far) Low	(Near) High (Intermediate) Moderate (Far) Low	(Near) Moderate (Intermediate) Moderate (Far) Low
Group 2 Fish (Atlantic salmon): where swim bladder is not involved in hearing (particle motion detection)	(Near) High (Intermediate) Moderate (Far) Low	(Near) High (Intermediate) High (Far) Low	(Near) Moderate (Intermediate) Moderate (Far) Low

UXO Clearance

5.3.14 The injury criteria used in the Subsea Noise modelling assessment for explosives (i.e. UXO clearance activities) are given in Table 5.7.

Table 5.7: Criteria for the Onset of Injury to Fish due from Explosives (Popper *et al.*, 2014)

Hearing Group	Parameter	Mortality and Potential Mortal Injury	Recoverable Injury	TTS
Group 1 Fish (sea lamprey): no swim bladder (particle motion detection)	Peak, dB re 1 μ Pa	229 - 234	(Near) High (Intermediate) Low (Far) Low	(Near) High (Intermediate) Moderate (Far) Low
Group 2 Fish (Atlantic salmon): where swim bladder is not involved in hearing (particle motion detection)	Peak, dB re 1 μ Pa	229 - 234	(Near) High (Intermediate) High (Far) Low	(Near) High (Intermediate) Moderate (Far) Low

5.3.15 As detailed in Table 5.4, the use of low order disposal of UXOs (e.g. deflagration and clearance shots) where practicable is an Embedded Mitigation measure. There is a small risk that low order disposal could unintentionally result in a high order detonation and therefore this scenario has also been considered in the assessment. Details and assumptions of the different charge sizes involved in both low and high order disposal are detailed in Table 5.8.

Table 5.8: Details of High and Low Order UXO Disposal Assumptions and their Relevant Charge Sizes used in the Subsea Noise Modelling

Charge Size (kg NEQ)	Notes/Assumptions
Low Order and Low- Yield Donor Charge Configurations	
0.08 kg	Maximum size of donor charge used for low order technique.
0.5 kg	Maximum size of clearing shot to neutralise any residual explosive material.
Potential UXOs (High Order Disposal)	
227 kg	Realistic worst-case UXO charge weight, based on British World War Two (WWII) mine Mk XIV.
720 kg	Maximum estimated UXO size that is anticipated to be encountered, based on a 1,000 kg German WWII mine BM1000.

Other Subsea Noise Sources

5.3.16 Subsea Noise modelling was also undertaken for the following non-impulsive Subsea Noise sources:

- vessels;
- geotechnical surveys; and
- construction activities (see Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report).

5.3.17 However, the only numerical criteria for these sources are for recoverable injury and TTS for Groups 3 and 4 Fish, which do not include sea lamprey or Atlantic salmon (see Paragraph 5.3.4).

5.3.18 The modelling suggested that the threshold for recoverable injury in Groups 3 and 4 fish (170 dB re 1 μ Pa (rms) for 48 hours (Popper *et al.*, 2014)) was not exceeded for any of the non-impulsive noise sources associated with the Proposed Development, except for vibro coring (10 m). The TTS threshold of Groups 3 and 4 fish (158 dB re 1 μ Pa (rms) for 12 hours (Popper *et al.*, 2014)) was not exceeded for many non-impulsive noise sources (such as drilling, borehole drilling, and jack-up vessel use), and in the low tens of metres for others (such as vibro coring, cable laying, and use of construction vessels). As Group 3 and 4 fish are more sensitive to Subsea Noise than Group 1 (sea lamprey) and Group 2 (Atlantic salmon), it can reasonably be assumed that recoverable injury and TTS ranges for sea lamprey and Atlantic salmon would be minimal, and not represent a barrier to migration. Therefore, only Subsea Noise from piling and UXO clearance have been considered in this assessment of adverse effects.

Results of Subsea Noise Modelling Conducted for the Proposed Development

Piling

5.3.19 For the different piling scenarios, the modelling using the SEL metric considers fish as both moving and static receptors. To model moving receptors, a swim speed of 0.5 m/s was applied for all Annex II Diadromous Fish species (Popper *et al.*, 2014).

- 5.3.20 The MDS considers both single and concurrent piling of three different scenarios: fixed monopile, three-legged jacket and realistic (see Table 5.3). For the fixed monopile Wind Turbine foundations, the piling schedule modelled included a maximum hammer energy of 6,250 kJ and a total piling duration of 8.6 hours.
- 5.3.21 The potential injury and disturbance ranges for single piling of the monopile Wind Turbine foundation scenario are presented in Table 5.9 for fish modelled as moving receptors using the cumulative SEL metric. For Group 1 fish (sea lamprey) the modelling results indicate that the thresholds for mortality and recoverable injury will not be exceeded, with higher mortality and recoverable injury ranges modelled for Group 2 fish (Atlantic salmon; Table 5.9). Recoverable injury and TTS ranges were higher for both; however, these are considered reversible. Modelling results indicated that behavioural disturbance may occur out to 60,451 m (Table 5.9).
- 5.3.22 The potential injury and disturbance ranges for single piling of the monopile Wind Turbine foundation scenario are presented in Table 5.9 for fish modelled as static receptors using the cumulative SEL metric. The modelling results suggest that the thresholds for mortality will be exceeded for both sea lamprey and Atlantic salmon, with ranges of 1,436 m and 3,780 m, respectively (Table 5.9). Recoverable injury and TTS ranges were higher; however, these are reversible. Modelling results indicated that behavioural disturbance may occur out to 60,451 m (Table 5.9).

Table 5.9: Potential Injury and Disturbance Ranges for Single Monopile Installation, based on the Cumulative SEL Metric for Moving Fish (N/E = Threshold Not Exceeded)

Hearing Group	Response	Threshold (SEL: db re 1 μ Pa ² s)	Range (m) for Moving Fish	Range (m) for Static Fish
Group 1 (sea lamprey)	Mortality	219	N/E	1,436
	Recoverable injury	216	N/E	1,993
	TTS	186	22,266	25,000
Group 2 (Atlantic salmon)	Mortality	210	177	3,780
	Recoverable injury	203	3,926	10,430
	TTS	186	22,266	25,000
Both hearing groups	Disturbance	150 dB re 1 μ Pa (rms)	60,451	60,451

- 5.3.23 Finally, the potential injury and disturbance ranges for single piling of the monopile Wind Turbine foundation scenario are presented in Table 5.10 using the SPL_{pk} metric. For sea lamprey and Atlantic salmon, mortality and recoverable injury ranges were modelled as within the low hundreds of metres for the first hammer strike, and out to between 888 m to 1,389 m for the highest hammer energy (Table 5.10).

Table 5.10: Potential Injury Ranges for Single Monopile Installation, based on the SPL_{pk} Metric

Hearing Group	Response	Threshold (SPL _{pk} db re 1 µPa)	Range (m)	
			First Strike	Highest Energy
Group 1 (sea lamprey)	Mortality	213	180	888
	Recoverable injury	213	180	888
Group 2 (Atlantic salmon)	Mortality	207	282	1,389
	Recoverable injury	207	282	1,389

- 5.3.24 For the three-legged jacket Wind Turbine foundations, the piling schedule modelled included a maximum hammer energy of 4,500 kJ and a total piling duration of 16.2 hours.
- 5.3.25 The potential injury and disturbance ranges for single piling of the three-legged jacket Wind Turbine foundation scenario are presented in Table 5.11 for fish modelled as moving receptors using the cumulative SEL metric. For Group 1 (sea lamprey) the modelling results suggest that the thresholds for mortality will not be exceeded, a range of 13 m modelled for Group 2 (Atlantic salmon) fish (Table 5.11). Recoverable injury and TTS ranges were higher; however, these are reversible. Modelling results indicated that behavioural disturbance (for both hearing groups) may occur out to 55,359 m (Table 5.11).
- 5.3.26 The potential injury and disturbance ranges for single piling of the three-legged jacket Wind Turbine foundation scenario are presented in Table 5.11 for fish modelled as static receptors using the cumulative SEL metric. The modelling results suggest that the thresholds for mortality will be exceeded for both sea lamprey and Atlantic salmon, with ranges of 1,026 m and 2,931 m, respectively (Table 5.11). Recoverable injury and TTS ranges were higher; however, these are reversible. Modelling results indicated that behavioural disturbance (for both hearing groups) may occur out to 55,359 m (Table 5.11).

Table 5.11: Potential Injury and Disturbance Ranges for Jacket Pile Installation, based on the Cumulative SEL Metric for Moving and Static Fish (N/E = Threshold Not Exceeded)

Hearing Group	Response	Threshold (SEL: db re 1 µPa ² s)	Range (m) for Moving Fish	Range (m) for Static Fish
Group 1 (sea lamprey)	Mortality	219	N/E	1,026
	Recoverable injury	216	N/E	1,495
	TTS	186	20,977	25,000
Group 2 (Atlantic salmon)	Mortality	210	13	2,931
	Recoverable injury	203	1,173	7,384
	TTS	186	20,977	25,000
Both hearing groups	Disturbance	150 dB re 1µPa (rms)	55,359	55,359

- 5.3.27 Finally, the potential injury and disturbance ranges for single piling of the three-legged jacket Wind Turbine foundation scenario are presented in Table 5.12 using the SPL_{pk} metric. For both hearing groups, the mortality and recoverable injury ranges were modelled as within 211 m and 342 m for the first hammer strike, and out to between 544 m to 882 m for the highest hammer energy (Table 5.12).

Table 5.12: Potential Injury Ranges for Jacket Pile Installation, based on the SPL_{pk} Metric

Hearing Group	Response	Threshold (SPL_{pk} db re 1 μ Pa)	Range (m)	
			First Strike	Highest Energy
Group 1 (sea lamprey)	Mortality	213	211	544
	Recoverable injury	213	211	544
Group 2 (Atlantic salmon)	Mortality	207	342	882
	Recoverable injury	207	342	882

- 5.3.28 For the realistic piling schedule (based on the 25 MW monopile option, using the average hammer energy and average piling duration instead of maximums), the piling schedule modelled included a full power hammer energy of 6,000 kJ and a total piling duration of 4.3 hours.
- 5.3.29 The potential injury and disturbance ranges for single piling of the realistic piling scenario are presented in Table 5.13 for fish modelled as moving receptors using the cumulative SEL metric. For Group 1 (sea lamprey) the modelling results suggest that the thresholds for mortality will not be exceeded, with a range of 118 m modelled for Group 2 (Atlantic salmon) fish (Table 5.13). Recoverable injury and TTS ranges were higher; however, these are reversible. Modelling results indicated that behavioural disturbance (for both hearing groups) may occur out to 59,735 m (Table 5.13).
- 5.3.30 The potential injury and disturbance ranges for single piling of the realistic piling scenario are presented in Table 5.13 for fish modelled as static receptors using the cumulative SEL metric. The modelling results suggest that the thresholds for mortality will be exceeded for both sea lamprey and Atlantic salmon, with ranges of 909 m and 2,696 m, respectively (Table 5.13). Recoverable injury and TTS ranges were higher; however, these are reversible. Modelling results indicated that behavioural disturbance (for both hearing groups) may occur out to 59,735 m (Table 5.13).

Table 5.13: Potential Injury and Disturbance Ranges for the Realistic Scenario (Fixed Foundation Monopile), based on the Cumulative SEL Metric for Moving and Static Fish (N/E = Threshold Not Exceeded)

Hearing Group	Response	Threshold (SEL: db re 1 μ Pa ² s)	Range (m) for Moving Fish	Range (m) for Static Fish
Group 1 (sea lamprey)	Mortality	219	N/E	909
	Recoverable injury	216	N/E	1,349
	TTS	186	22,149	25,000
Group 2 (Atlantic salmon)	Mortality	210	118	2,696
	Recoverable injury	203	2,579	6,329
	TTS	186	22,149	25,000
Both hearing groups	Disturbance	150 dB re 1 μ Pa (rms)	59,735	59,735

5.3.31 Finally, the potential injury and disturbance ranges for single piling of the realistic piling scenario are presented in Table 5.14 using the SPL_{pk} metric. For both hearing groups, the mortality and recoverable injury ranges were modelled as within 180 m to 282 m for the first hammer strike, and out to between 872 m to 1,363 m for the highest hammer energy (Table 5.14).

Table 5.14: Potential Injury Ranges for the Realistic Scenario (Fixed Foundation Monopile), based on the SPL_{pk} Metric

Hearing Group	Response	Threshold (SPL _{pk} db re 1 μ Pa)	Range (m)	
			First Strike	Highest Energy
Group 1 (sea lamprey)	Mortality	213	180	872
	Recoverable injury	213	180	872
Group 2 (Atlantic salmon)	Mortality	207	282	1,363
	Recoverable injury	207	282	1,363

5.3.32 The Subsea Noise modelling also considered concurrent piling, using two pile installation vessels at once, with a minimum separation of 1 km between concurrent piling events. Potential injury and disturbance ranges for concurrent piling of the three different piling scenarios (monopile, three-legged jacket, and realistic) are presented in Table 5.15 to Table 5.17. These are all based on the cumulative SEL metric, as ranges calculated using the SPL_{pk} metric will remain the same as those detailed in Table 5.10, Table 5.12, and Table 5.14 for single piling.

5.3.33 The results of the concurrent piling modelling illustrate that mortality, recoverable injury, and TTS ranges are similar or slightly larger than the single piling scenarios for both hearing groups when modelled as moving fish, but considerably larger for fish modelled as static receptors (Table 5.15 to Table 5.17). The behavioural disturbance ranges are slightly higher for the

concurrent and single piling scenarios. It should be noted that, in reality, most fish are not likely to remain static for the duration of piling, and therefore being modelled as static receptors is highly precautionary.

- 5.3.34 As per Table 5.17, mortality may occur for Group 1 species (sea lamprey) at 1,261 m and 3,339 m for Group 2 species (Atlantic salmon). Recoverable injury and TTS ranges increase to the tens of thousands of metres, with TTS ranges of 25,000 m for all hearing groups (Table 5.17).

Table 5.15: Potential Injury and Disturbance Ranges for Concurrent Monopile Installation, with a separation of 1 km, Based on the Cumulative SEL Metric for Moving and Static Fish (N/E = Threshold Not Exceeded)

Hearing Group	Response	Threshold (SEL: db re 1 $\mu\text{Pa}^2\text{s}$)	Range (m) for Moving Fish	Range (m) for Static Fish
Group 1 (sea lamprey)	Mortality	219	5	1,993
	Recoverable injury	216	12	2,813
	TTS	186	23,086	25,000
Group 2 (Atlantic salmon)	Mortality	210	1,056	5,860
	Recoverable injury	203	7,969	15,235
	TTS	186	23,086	25,000
Both hearing groups	Disturbance	150 dB re 1 μPa (rms)	73,451	73,451

Table 5.16: Potential Injury and Disturbance Ranges for Concurrent Three-legged Jacket Foundation Installation, with a separation of 1 km, Based on the Cumulative SEL Metric for Moving and Static Fish (N/E = Threshold Not Exceeded)

Hearing Group	Response	Threshold (SEL: db re 1 $\mu\text{Pa}^2\text{s}$)	Range (m) for Moving Fish	Range (m) for Static Fish
Group 1 (sea lamprey)	Mortality	219	N/E	1,612
	Recoverable injury	216	N/E	2,286
	TTS	186	22,559	25,000
Group 2 (Atlantic salmon)	Mortality	210	206	4,337
	Recoverable injury	203	4,220	11,954
	TTS	186	22,559	25,000
Both hearing groups	Disturbance	150 dB re 1 μPa (rms)	70,356	70,356

Table 5.17: Potential Injury and Disturbance Ranges for Concurrent Piling of the Realistic Scenario, with a separation of 1 km, Based on the Cumulative SEL Metric for Moving and Static Fish (N/E = Threshold Not Exceeded)

Hearing Group	Response	Threshold (SEL: db re 1 μ Pa ² s)	Range (m) for Moving Fish	Range (m) for Static Fish
Group 1 (sea lamprey)	Mortality	219	N/E	1,261
	Recoverable injury	216	N/E	1,759
	TTS	186	22,852	25,000
Group 2 (Atlantic salmon)	Mortality	210	587	3,399
	Recoverable injury	203	4,923	8,907
	TTS	186	22,852	25,000
Both hearing groups	Disturbance	150 dB re 1 μ Pa (rms)	72,395	72,395

- 5.3.35 As detailed in the preceding tables, behavioural disturbance ranges extend to tens of kilometres for the different piling scenarios (between 55,359 m to 73,451 m). This was modelled using a threshold SPL of 150 dB re 1 μ Pa (rms) (from WSDOT (2011)). It should be noted that these ranges are for all hearing groups combined and will be highly conservative for the less sensitive fish hearing groups (e.g. sea lamprey and Atlantic salmon). Additional information is provided here to characterise the sensitivity of the receptor with regards to behavioural disturbance further.
- 5.3.36 In some cases (e.g. previous offshore wind projects including Ossian OWF), TTS has been used as a proxy for behavioural disturbance. The maximum TTS value of 25,000 m was the same for each of the groups in the three concurrent piling scenarios, with fish modelled as static receptors (Table 5.15, Table 5.16 and Table 5.17). It should be noted that, in reality, most fish species are not likely to remain static for the duration of piling, and therefore being modelled as static receptors is highly precautionary. This range is of a similar magnitude to the behavioural disturbance values between 55,359 m to 73,451 m modelled for the different piling scenarios using the threshold SPL of 150 dB re 1 μ Pa (rms). Therefore, values in the low tens of kilometres are likely representative of the maximum ranges of behavioural disturbance to all fish species. These results broadly align with qualitative thresholds for behavioural effects on fish as set out in Table 5.6, with moderate risk of behavioural effects in the range of hundreds of metres to thousands of metres from the piling activity, depending on the hearing groups. As previously discussed, these behavioural disturbance thresholds are likely to be highly precautionary for the less sensitive Group 1 and Group 2 fish species (sea lamprey and Atlantic salmon).
- 5.3.37 Behavioural disturbance due to piling can also be inferred from post construction monitoring studies of other OWFs. For example, a sandeel monitoring study at the Beatrice OWF found no evidence of adverse impacts on sandeel populations between pre and post construction levels over a six year period (Beatrice OWF Limited, 2021).

- 5.3.38 Behavioural responses to Subsea Noise have been found to vary between species, based on their hearing sensitivity (McCauley *et al.*, 2000; Mueller-Blenkle *et al.*, 2010; Pearson *et al.*, 1992). As there are no agreed thresholds for behavioural effects on fish from piling, a risk-based approach has been undertaken using published literature as summarised in Paragraph 5.3.13. Based on this, the 160 dB re 1 μ Pa (SEL) noise contour has been mapped to assess behavioural responses in fish species in general. It is unlikely that species will experience behavioural disturbance beyond this noise contour, based on the described studies which demonstrated responses (including avoidance) at levels above this threshold. It is likely that 160 dB re 1 μ Pa (SEL) contour is over conservative, given that Diadromous Fish (sea lamprey and Atlantic salmon) are at the lower end of the sensitivity spectrum (i.e. hearing Groups 1 and 2). The 160 dB re 1 μ Pa (SEL) contour is presented in Figure 5.3 for concurrent piling of the maximum piling scenario for monopile foundations (as this represents the worst-case scenario in the MDS).
- 5.3.39 Due to the extent of the modelled contours offshore, any potential behavioural impacts are unlikely to cause barrier effects to diadromous species as they migrate to and from the SACs included in this assessment, due to the relatively limited area around piling events where noise levels are high enough to cause behavioural responses in the context of the wider area. The modelled contours for the north piling location show the 150 dB re 1 μ Pa (SEL) contours extend near the Scottish coast in the vicinity of the River Dee SAC (Figure 5.3), which is designated for migrating salmon. However, salmonids are a Group 2 species sensitive to particle motion only, and it is therefore considered highly precautionary that they would be sensitive to sound levels at this threshold. For piling in the south of the Array Area the 160 dB re 1 μ Pa (SEL) the modelled contours do not extend as far as the Scottish coast (Figure 5.3). Furthermore, the research mentioned above suggests a behavioural response is not likely to be evoked in Atlantic salmon at the levels modelled at the mouth of the River Dee SAC (Harding *et al.*, 2016).

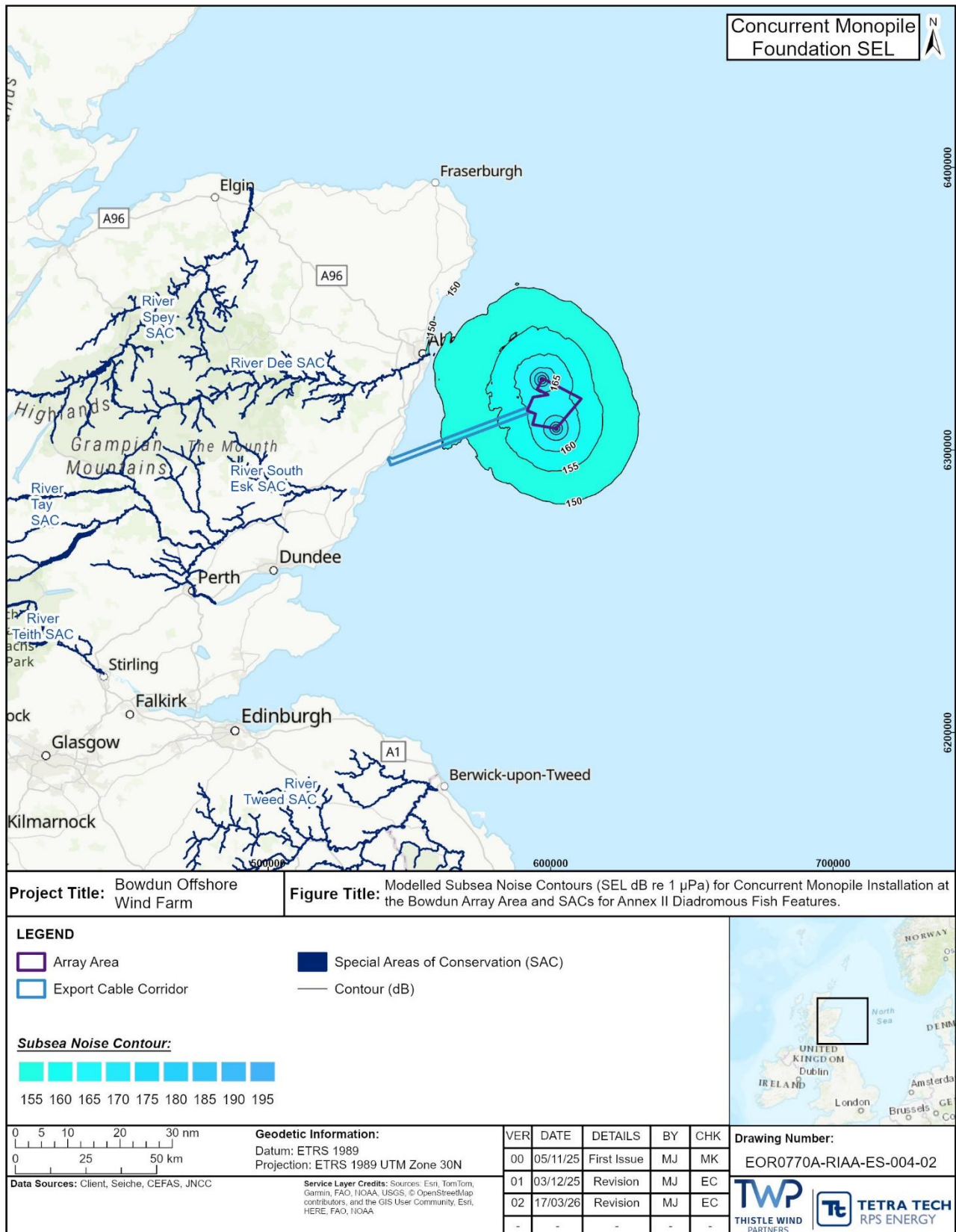


Figure 5.3: Modelled Subsea Noise Contours (SEL dB re 1 µPa) for Concurrent Monopile Installation at the Bowdun Array Area and SACs for Annex II Diadromous Fish Features

UXO Clearance

- 5.3.40 UXO clearance (including detonation) has the potential to cause injury and disturbance to Diadromous Fish. UXO clearance will be completed prior to the construction phase, as part of the site preparation activities. The MDS assumes clearance of up to 40 UXOs within the Site Boundary, with a maximum realistic charge weight of 227 kg NEQ (Table 5.3). The total duration of UXO clearance is estimated at up to 20 days, with up to two detonations within 24 hours. Compared to piling, UXO clearance will consist of single, isolated events of very short duration. The maximum duration of UXO clearance is 40 days, with one detonation within 24 hours.
- 5.3.41 As detailed in Table 5.4, the use of low order disposal of UXOs (e.g. deflagration and clearance shots) where practicable is an Embedded Mitigation measure. This will reduce Subsea Noise levels and thereby injury and disturbance to Diadromous Fish and shellfish features during UXO clearance. The low order UXO clearance campaign will involve subsonic combustion with a donor charge of up to 0.08 kg NEQ for each clearance event, and a clearing shot of up to 0.5 kg NEQ to neutralise residual explosive material at each location. There is a small risk that low order disposal could unintentionally result in a high order detonation and therefore this scenario has also been considered in the assessment.
- 5.3.42 The modelled mortality and potential mortal injury ranges (using the SPL_{pk} metric) for low order and high order are presented in Table 5.18. As detailed in Table 5.18, the mortality and potential mortal injury ranges for the low order clearance activities may occur out to tens of metres for all fish hearing groups, with these increasing to multiple hundreds of metres for high order clearance activities (Table 5.18).
- 5.3.43 It should be noted that, due to a combination of dispersion (i.e. where the waveform elongates), multiple reflections from the sea surface and seabed and molecular absorption of High Frequency (HF) energy, the Subsea Noise is unlikely to still be impulsive in character once it has propagated more than a few kilometres. Furthermore, the modelling assumes that the UXO acts like a charge suspended in open water whereas in reality it is likely to be partially buried in the sediment. In addition, it is possible that the explosive material will have deteriorated over time meaning that the predicted Subsea Noise levels will be less in reality, and the predictions (made on the basis of the material not being deteriorated) are likely to be overestimated. In-combination, these factors mean that the results of potential impact ranges should be treated as precautionary as the impact ranges are likely to be significantly lower than predicted in this assessment.

Table 5.18: Potential Impact Ranges for UXO Clearance Activities based on the SPL_{pk} Metric

UXO Clearance Parameter	Impact Range (m)
0.08 kg Low Order Donor Charge	
Fish (lower range: Potential Mortal Injury)	44
Fish (upper range: Mortality)	27
0.5 kg Clearing Shot	
Fish (lower range: Potential Mortal Injury)	81
Fish (upper range: Mortality)	49
227 kg UXO – High Order Explosion	
Fish (lower range: Potential Mortal Injury)	620
Fish (upper range: Mortality)	375
720 kg UXO – High Order Explosion	
Fish (lower range: Potential Mortal Injury)	910
Fish (upper range: Mortality)	550

Summary

- 5.3.44 As illustrated by the results of the Subsea Noise modelling, sea lamprey and Atlantic salmon close to piling operations may experience injury or mortality. However, Diadromous Fish species tend to be highly mobile and are unlikely to be particularly reliant on the marine environment within and around the Proposed Development other than to pass through during migration. Therefore, piling is unlikely to result in injury or mortality of Annex II diadromous species. The use of soft start piling procedures (see Embedded Mitigation; Table 5.4) will allow individuals in close proximity to piling to flee the ensonified area and will also reduce the overall acoustic energy entering the marine environment, therefore reducing the likelihood of injury and mortality.
- 5.3.45 Atlantic salmon and sea lamprey may experience behavioural effects in response to piling noise, including a startle response, disruption of feeding, or avoidance of an area. However, modelling for the concurrent monopile scenario at maximum hammer energy of 6,250 kJ suggested both fish species could experience TTS up to 23,086 m for moving fish and 25,000 m for static fish using the cumulative SEL metric. The injury and disturbance ranges therefore are not likely to extend to the SACs, as the closest SAC to the Bowdun Array Area where piling will occur is the River Dee SAC at 39.6 km at its closest point. Due to the distance of the Proposed Development Array Area from the Scottish coast (Figure 5.3), potential behavioural impacts are unlikely to cause barrier effects to diadromous species as they migrate along the coast of Scotland, due to the relatively limited area around piling events where noise levels will be high enough to cause behavioural responses. Furthermore, as mentioned in Paragraph 5.3.13, application of the modelled SPL_{pk} 160dB re 1 µPa contours to sea lamprey (Group 1) and Atlantic salmon (Group 2) is considered highly precautionary, as this behavioural guidance applies to all species including those in Groups 3 and 4, which are highly sensitive to Subsea Noise when compared with Group 1 and 2 species. It is therefore unlikely that piling

associated with the Proposed Development would cause a barrier to migration of Atlantic salmon and sea lamprey to and from their natal rivers.

- 5.3.46 The results of the Subsea Noise modelling with respect to UXO clearance activities suggest impact ranges in the tens of metres associated with low order techniques (Table 5.18) with these increasing to multiple hundreds of metres for high order clearance activities (Table 5.18). These impact ranges are highly localised to the location of individual UXO clearance activities (which themselves will be intermittent: up to 40) and are considered precautionary (see Paragraph 5.3.43). Thus, it is considered unlikely that UXO clearance associated with the Proposed Development could cause a barrier to migration of Atlantic salmon and sea lamprey to and from their natal rivers.

Effects on prey species

- 5.3.47 The Subsea Noise modelling for all fish hearing groups (i.e. Groups 1 to 4, as opposed to just the results of Groups 1 and 2 presented in Paragraphs 5.3.3 to 5.3.46 for the Annex II Diadromous Fish assessment) was summarised and assessed in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report. Effects on the prey species of marine mammals are summarised in Paragraph 6.3.224 et seq. and will be similar to effects on the prey species of Diadromous Fish.
- 5.3.48 Estimates of the maximum recoverable injury range, using the SPL_{pk} metric, from piling Subsea Noise are 180 m to 1,389 m for the monopile foundations and 211 m to 882 m for the jacket foundation. However, these are considered conservative as the implementation of soft starts during piling activities will allow fish to move away from the areas of highest noise levels. As such, the maximum injury ranges in the order of tens of metres are likely to be more realistic. The impacts ranges from UXO clearance activities are the same for all hearing groups of fish Table 5.18. Therefore, Subsea Noise generated by piling and from UXO clearance were both assessed as having a minor adverse effect on all fish and shellfish receptors in EIA terms, except herring.
- 5.3.49 Piling in the construction phase was concluded to have a moderate adverse effect on herring. A moderate adverse significance of impact was concluded for herring due to piling in the construction phase. However, herring is only a small component of Diadromous Fish species diet and so, no adverse effects on the availability of food will be experienced by Annex II Diadromous Fish due to the availability of other prey species.

Construction Phase

- 5.3.50 Potential effects from the Proposed Development on the relevant conservation objectives of the six SACs are presented in Table 5.19. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 5.19.

River South Esk SAC, River Dee SAC and River Spey SAC

- 5.3.51 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon and freshwater pearl mussel features of the River South Esk SAC (as presented in Paragraphs 5.2.18 and 5.2.19), River Dee SAC (as presented in Paragraphs 5.2.25 and 5.2.26) and River Spey SAC (as presented in Paragraphs 5.2.46 and 5.2.47) are presented in Table 5.19.

Atlantic Salmon

- 5.3.52 As summarised in Paragraphs 5.3.44 to 5.3.46, the highly mobile nature of Atlantic salmon together with the Embedded Mitigation measures presented in Table 5.4, will reduce the likelihood of injury and mortality for the Atlantic salmon feature of these three SACs. As outlined in Paragraphs 5.3.35 to 5.3.39, Subsea Noise resulting in behavioural responses is unlikely to represent a significant barrier to migration to and from these three SACs.

Freshwater Pearl Mussel

- 5.3.53 Adult freshwater pearl mussels are confined to freshwater environments, and so there is therefore no pathway for direct effects associated with Subsea Noise during construction. Indirect impacts on the larval stage of freshwater pearl mussel may, however, arise if Atlantic salmon (their host species) are impacted. As detailed in Paragraphs 5.3.45 and 5.3.46, Subsea Noise during the construction phase will not lead to significant mortality or injury to Atlantic salmon or result in barriers to migration. Therefore, it can also be concluded that there will be no indirect impact to freshwater pearl mussel.

River Tay SAC

- 5.3.54 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon and sea lamprey features of the River Tay SAC (as presented in Paragraphs 5.2.32 and 5.2.33) are presented in Table 5.19.

Atlantic Salmon

- 5.3.55 As summarised in Paragraphs 5.3.44 to 5.3.46, the highly mobile nature of Atlantic salmon together with the Embedded Mitigation measures presented in Table 5.4, will reduce the likelihood of injury and mortality for the Atlantic salmon feature of this SAC. As outlined in Paragraphs 5.3.35 to 5.3.39, Subsea Noise resulting in behavioural responses will not represent a significant barrier to migration to and from the SAC.

Sea Lamprey

- 5.3.56 As summarised in Paragraphs 5.3.44 to 5.3.46, sea lamprey are highly mobile and are only likely to pass through the area encompassing the Proposed Development during migration. This, together with the short term and intermittent nature of the impact during the construction phase and the Embedded Mitigation measures presented in Table 5.4, means that significant mortality or injury to sea lamprey is unlikely.
- 5.3.57 As outlined in Paragraphs 5.3.35 to 5.3.39, Subsea Noise resulting in behavioural responses will not represent a significant barrier to migration to and from the SAC.

River Tweed SAC and River Teith SAC

- 5.3.58 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon feature of the River Tweed SAC (as presented in Paragraph 5.2.39) and River Teith SAC (as presented in Paragraph 5.2.53) are presented in Table 5.19.

Atlantic Salmon

- 5.3.59 As summarised in Paragraphs 5.3.44 to 5.3.46, the highly mobile nature of Atlantic salmon together with the Embedded Mitigation measures presented in Table 5.4, will reduce the likelihood of injury and mortality for the Atlantic salmon feature of these two SACs. As outlined in Paragraphs 5.3.35 to 5.3.39, Subsea Noise resulting in behavioural responses will not represent a significant barrier to migration to and from the SACs.

Conclusion

- 5.3.60 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II Diadromous Fish and shellfish as a result of Subsea Noise with respect to the construction phase of the Proposed Development.

Table 5.19: Conclusions Against the Conservation Objectives of the SACs for Annex II Diadromous Fish and Shellfish Screened in for Assessment of Subsea Noise during the Construction Phase

SAC	Feature	Conservation Objectives	Conclusion
River South Esk SAC River Dee SAC River Tay SAC River Tweed SAC River Spey SAC River Teith SAC	Atlantic salmon	2a. maintain/restore the population of Atlantic salmon, including range of genetic types, as a viable component of the site.	As detailed by the results of the Subsea Noise modelling, Atlantic salmon within close proximity to piling and UXO clearance may experience injury or mortality. However, this species is highly mobile and may only use the marine environment encompassing the Proposed Development to pass through during migration. As such, and with additional consideration of the Embedded Mitigation of the use of soft start piling procedures and low order UXO detonation, significant mortality or injury to this species is not predicted. Therefore, this impact will not prevent the populations of Atlantic salmon from being maintained or restored as a viable component of these SACs or the distributions or genetic diversity of Atlantic salmon from being maintained or restored. Atlantic salmon may also experience behavioural effects in response to piling associated with the construction phase of the Proposed Development. However, the Subsea Noise modelling indicates these effects would not result in barriers to migration to and from the SACs (see Figure 5.3; from the Array Area where piling takes place River South Esk SAC is 71.1 km away; River Dee SAC is 39.6 km away; River Tay SAC is 130.4 km away; River Tweed SAC is 136.8 km away; and River Teith SAC is 206.7 km away). Further, Subsea Noise from piling will be short term and intermittent during the construction phase. As above for injury and mortality, there is therefore negligible risk of disruption to migration of Atlantic salmon due to behavioural disturbance. There are, therefore, no negative impacts predicted which could hinder these conservation objectives for the Atlantic salmon feature of each of these SACs.
		2b. maintain/restore the distribution of the species throughout the site.	
		2c. maintain/restore the habitats supporting the species within the site and availability of food.	

SAC	Feature	Conservation Objectives	Conclusion
			herring, which was concluded to be moderate adverse due to piling during the construction phase only. Although, there is evidence that adult Atlantic salmon may prey on herring, herring is predicted to form only a very small proportion of Atlantic salmon's diet and Atlantic salmon are predicted to be able to switch prey to other small fish species if required. There are, therefore, no negative impacts predicted which could hinder these conservation objectives for the Atlantic salmon feature of each of these SACs.
River South Esk SAC River Dee SAC River Spey SAC	Freshwater pearl mussel	2a. restore/maintain the population of species as a viable component of the site.	As a freshwater resident species, there is no direct pathway of potential impact associated with Subsea Noise and the population and distribution of freshwater pearl mussel within the SACs. As presented in the rows above for Atlantic salmon, Subsea Noise during the construction phase will not lead to significant mortality or injury to Atlantic salmon and will not result in barriers to migration. Therefore, it can also be concluded that Subsea Noise will not indirectly prevent the populations of freshwater pearl mussel from being restored or maintained as a viable component of the SACs or the distributions of this species from being restored or maintained throughout the SACs screened in. There are, therefore, no negative impacts predicted which could hinder these conservation objectives for the freshwater pearl mussel feature of each of these SACs.
		2b. restore/maintain the distribution of the species throughout the site.	
		2c. restore/maintain the habitats supporting the species within the site and availability of food.	As above for Atlantic salmon, there is no pathway of potential impact between Subsea Noise generated during the construction phase and the habitats and availability of food that support freshwater pearl mussel. There are, therefore, no negative impacts predicted which could hinder this conservation objective for the Freshwater pearl mussel feature of each of these SACs.
		2d. maintain/restore the distribution and viability of freshwater pearl mussel host species and their supporting habitats.	Atlantic salmon is highly mobile and may only use the marine environment encompassing the Proposed Development to pass through during migration. This, combined with the Embedded Mitigation of the use of soft start piling procedures and low order UXO detonation, results in no predicted significant mortality or injury to Atlantic salmon. There is also negligible risk of disruption to migration of Atlantic salmon due to

SAC	Feature	Conservation Objectives	Conclusion
			behavioural disturbance as described in the rows above. Therefore, this impact will not prevent the distribution and viability of freshwater pearl mussel host species (Atlantic salmon) and its supporting habitats from being maintained or restored within the SACs screened in. There are, therefore, no negative impacts predicted which could hinder these conservation objectives for the Freshwater pearl mussel feature of each of these SACs.
River Tay SAC	Sea lamprey	2a. maintain the population of sea lamprey as a viable component of the site.	As detailed by the results of the Subsea Noise modelling, sea lamprey within close proximity to piling and UXO clearance may experience injury or mortality. However, they are highly mobile and may only use the marine environment encompassing the Proposed Development to pass through during migration. As such, and with additional consideration of the Embedded Mitigation of the use of soft start piling procedures and low order UXO detonation, significant mortality or injury to this species is not predicted. Therefore, this impact will not prevent the populations of sea lamprey from being a viable component of this SAC or the distributions of sea lamprey from being maintained throughout the SAC. Sea lamprey may also experience behavioural effects in response to piling associated with the Array Area, but the Subsea Noise modelling indicates these effects would not result in barriers to migration to and from this SAC. Further, Subsea Noise from piling will be short term and intermittent during the construction phase. As above for injury and mortality, there is therefore negligible risk of disruption to migration of sea lamprey due to behavioural disturbance. There are, therefore, no negative impacts predicted which could hinder these conservation objectives for the sea lamprey feature of this SAC.
		2b. maintain the distribution of sea lamprey throughout the site.	
		2c. maintain the habitats supporting sea lamprey within the site and availability of food.	There is no pathway for impact between Subsea Noise generated during the construction phase and the habitats supporting sea lamprey within the SAC and availability of food. There are, therefore, no negative impacts predicted which could hinder this conservation objective for the sea lamprey feature of this SAC.

Impacts to Fish and Shellfish Receptors due to Electromagnetic Field

- 5.3.61 The LSE assessment during the HRA screening process identified that during the O&M phase, LSE could not be ruled out for impacts due to EMF for all six SACs screened in for Annex II Diadromous Fish and shellfish (see Table 3.1).
- 5.3.62 The MDS and Embedded Mitigation considered for the assessment of impacts due to EMF are shown in Table 5.20 and Table 5.21, respectively.

Table 5.20: MDS Considered for the Assessment of Potential Impacts to Annex II Diadromous Fish and Shellfish from Impacts due to EMF during the O&M Phase

Proposed Development Phase	MDS	Justification
O&M	EMFs may be emitted to the marine environment from IAC, Interconnector Cables, and Offshore Export Cables. Where burial is required, a minimum burial depth of 0.5 m applies to all cables, however there will be a target burial depth of 1.5 m. Where burial is not practicable, cable protection will be used. There will be a total of 397 km of cables, comprised of: • up to 151 km of 132 kV IACs are on the seabed; • up to 36 km of 275 kV Interconnector Cables; and • up to 210 km of 275 kV Offshore Export Cables (up to 3 Export Cables, with a maximum length of 70 km each). The O&M phase will last for 30 years	The MDS for this impact is based on the greatest cable lengths proposed buried in the seabed, and protected where burial is not practicable.

Table 5.21: Embedded Mitigation Measures Considered for the Assessment of Potential Impacts to Annex II Diadromous Fish and Shellfish from Impacts due to EMF during the O&M Phase

Embedded Mitigation Measures	Justification
Development and adherence to a Cable Specification and Installation Plan (CSIP) post consent.	It is standard industry practice to bury cables and use cable protection where burial is not practicable. The CSIP will outline the technical specifications of the cables in the Proposed Development and describe the relevant cable installation methodology, and identify risks of cable burial, and any measures required to address these risks to limit the disturbance of the seabed as far as practicable. Secured in the Section 36 Consent and Marine Licences via the requirement for a CSIP, which will be submitted to MD-LOT for approval.
Development of, and adherence to, a Cable Burial Risk Assessment (CBRA) and the Cable Burial Assessment (CBA). Implementation, management and monitoring of cable protection, via burial or external protection where adequate burial depth is not feasible, will be undertaken as informed by these assessments. Results of these assessments, and commitments to post construction monitoring, will be provided in the Cable Plan (CaP).	The potential impacts of cable installation can be mitigated through burying cables to a target cable burial depth, as detailed in the CBRA and CBA. This, alongside the cable installation strategy, should provide sufficient depth to avoid most exposure through metocean processes. Details of any required cable protection will be included in the CaP. Secured in the Section 36 Consent and Marine Licences, via the CBRA, CBA and CaP, which will be submitted to MD-LOT for approval.

Information to Inform the Assessment

Background Information on EMFs

- 5.3.63 The conduction of electricity through subsea power cables will result in emission of localised EMFs. The MDS for this impact assessment also considers the impacts of EMFs from the IACs and Interconnector Cables; the MDS assumes that there are up to 151 km of IACs on the seabed, and up to 36 km of Interconnector Cables.
- 5.3.64 EMFs comprise both the electrical fields, measured in volts per metre (V/m), and the magnetic fields, measured in microtesla (μ T), millitesla (mT), milligauss (mG) or gauss. Within the North Sea, background magnetic field levels are approximately 50 μ T, and background electric field measurements are approximately 25 μ V/m (Tasker *et al.*, 2010). Subsea power cables are constructed using magnetic outer sheathing materials, which can partially block the direct electrical field, meaning that only the magnetic field and the resultant induced electrical field are emitted into the marine environment. By design, Direct Current (DC) and Alternating Current (AC) cables typically contain two and three conductor bundles, respectively, which are superimposed and twisted around each other. This design feature creates partial self-cancellation of the total magnetic field emitted (Hervé, 2021; Snyder *et al.*, 2019).
- 5.3.65 The strength of the magnetic field (and consequently, induced electrical fields) decreases rapidly horizontally and vertically with distance from source. On the seabed, it is standard industry practice to bury cables and where burial is not feasible, to use cable protection (which is accounted for in the MDS, see Table 5.20). This can reduce EMF levels at the seabed surface as a result of field decay with distance of the seabed from the cable (Chapman *et al.*, 2023; Gill *et al.*, 2005; Gill *et al.*, 2009; Snyder *et al.*, 2019). For example, a recent study by Snyder *et al.* (2019) demonstrated that IACs and Offshore Export Cables buried between depths of 1 m to 2 m reduced the magnetic field at the seabed surface four-fold. For unburied cables protected by thick concrete mattresses or rock berms, the field levels were found to be similar to those of the buried cables (Snyder *et al.*, 2019). This study also demonstrated that magnetic field levels directly over live AC IACs associated with offshore wind projects ranged between 65 mG at the seabed and 5 mG at 1 m above the seabed (Snyder *et al.*, 2019). At horizontal distances from the cables, magnetic fields greatly reduced at the sea floor to between 10 mG and <0.1 mG (Snyder *et al.*, 2019).
- 5.3.66 Clear differences in the EMFs emitted between AC and DC systems are also apparent. The flow of electricity associated with an AC cable changes direction (as per the frequency of the AC transmission) and creates a constantly varying electrical field in the surrounding marine environment (ElectroMagneticWorks Inc, 2022; Huang, 2005). Conversely, DC cables transmit energy in one direction creating a static electrical field and magnetic field. Average magnetic field levels of DC cables are also higher than those of equivalent AC cables (ElectroMagneticWorks Inc, 2022; Huang, 2005). All the subsea cables associated with the Proposed Development will be AC cables (Table 5.20).

- 5.3.67 Overall, EMF levels in the vicinity of subsea cables are influenced by a variety of design and installation factors. These include distance between cables, cable sheathing material, number of conductors, and internal cable configuration.
- 5.3.68 A large proportion of the cables will be buried beneath surface sediments to a minimum burial depth of 0.5 m (noting that the target burial depth is 1.5 m) (Table 5.21). The intensity of EMF from subsea cables decreases at approximately the inverse square/power of the distance away from the cable (Hutchison *et al.*, 2021). This attenuation level is the same for buried and unburied cables (Hutchison *et al.*, 2021). So, whilst EMFs emitted from unburied cables will be considerably higher than compared to buried cables (i.e. due to the lack of surface sediments/protection upon these), EMF levels are expected to return to the baseline level within a few metres distance from the cable, to a maximum of a few tens of metres (Bochert and Zettler, 2006; Hutchison *et al.*, 2021; Snyder *et al.*, 2019). Therefore, as for the buried cables at the seabed, the area of effect is limited in extent, and barrier effects on fish movement are not anticipated to occur.
- 5.3.69 The Export Cable Corridor will be comprised of up to three Offshore Export Cables (buried or subject to cable protection). Given that EMF levels are expected to return to baseline levels within metres to tens of metres from cables, barrier effects are also not predicted to occur over the length of the Export Cable Corridor.

Sensitivity of Annex II Diadromous Fish to EMFs

- 5.3.70 Many animals are able to detect the Earth's natural electric and magnetic fields (referred to as 'magnetoreception'; Nordmann *et al.* (2017)) and used them as cues to guide their migration patterns. Given their life histories, accurate migration is essential for Diadromous Fish species. Magnetoreception and/or the possession of magneto-receptive material has been demonstrated in salmonid species (Lohmann and Lohmann, 2019; Moore *et al.*, 1990; Naisbett-Jones *et al.*, 2020; Putman *et al.*, 2014). EMFs within the marine environment may therefore interfere with the navigational ability of diadromous species. For example, Putman *et al.* (2014) reported that drifts in the Earth's magnetic field accounted for 23% and 44% of variation in migratory routes taken by two salmonid species in British Columbia, Canada. There is evidence of a response to electric and/or magnetic fields in Atlantic salmon and sea lamprey (Gill and Bartlett, 2010; Gill *et al.*, 2005; Snyder *et al.*, 2019).
- 5.3.71 During the marine phase of their life cycles, Diadromous Fish species may be exposed to EMFs from the cables on the seafloor. EMFs emitted from these cables are likely to only be detected within a matter of metres (see Paragraph 5.3.68); beyond which, baseline levels will be established. As such, potential impacts associated with EMFs from the cables will be highly localised. Lamprey species possess specialised ampullary electroreceptors that are sensitive to weak, low frequency electric fields (Bodznick and Northcutt, 1981; Bodznick and Preston, 1983). These are hypothesised to be used for detecting prey, although further research is required (Tricas and Carlson, 2012). Chung-Davidson *et al.* (2008) demonstrated that weak electric fields may play a role in the reproduction of sea lamprey and suggested that electrical stimuli may

mediate different behaviours in feeding and spawning individuals. This study demonstrated that sea lamprey migratory behaviour was affected (i.e. adults did not move) when stimulated with electrical fields of intensities of between 2.5 mV/m and 100 mV/m, with normal behaviour observed at electrical field intensities higher and lower than this range (Chung-Davidson *et al.*, 2008). It should be noted, however, that these levels are considerably higher than modelled induced electrical fields expected from AC subsea cables. There is currently no evidence of lamprey responses to magnetic fields (Gill and Bartlett, 2010).

- 5.3.72 Research on the effects of a High Voltage Direct Current (HVDC) cable on the migration patterns of a range of fish species, including salmonids, failed to demonstrate any effect in two studies from Sweden (Westerberg *et al.*, 2007; Wilhelmsson *et al.*, 2010). Research conducted at a DC undersea cable near San Francisco, California, found that migration success and survival of chinook salmon *Oncorhynchus tshawytscha* was not impacted by the cable (Kavet *et al.*, 2016). However, behavioural changes were noted when near the cable, with individual chinook salmon appearing to remain around it for longer periods (Kavet *et al.*, 2016). Yano *et al.* (1997) studied magnetic compass orientation in oceanic migrating chum salmon *Oncorhynchus keta*, off the coast of Japan. Four chum salmon were fitted with a tag which generated an artificial magnetic field which produced an alternating intensity of around 6 gauss, with polarity which reversed every 11.25 minutes. The authors did not observe any effects on horizontal or vertical movements of the chum salmon when the magnetic field was modified (Yano *et al.*, 1997).
- 5.3.73 Further, Armstrong *et al.* (2015) investigated the effects of mains frequency (50 Hz) magnetic fields on behaviour of captive Atlantic salmon. This study found that large Atlantic salmon (62 cm to 85 cm long) demonstrated no statistically significant differences in approach, traverse or departure times associated with coils emitting a magnetic field of 95 μ T. Post-smolts (24 cm to 41 cm in length) were exposed to three 30 minute periods of magnetic fields of 1.3 μ T, 11.4 μ T, and 95 μ T with 30 minutes of control conditions before each treatment. There was no evidence that the numbers of post-smolts passing through the coils was related to the sequence of intensity of the magnetic fields. There were also no observations of unusual behaviours in association with magnetic fields up to 95 μ T (Armstrong *et al.*, 2015). Salmonids are thought to use chemical and olfactory signals in coastal waters to locate their natal rivers (Ueda, 2014) and EMFs during offshore migrations (Gill and Bartlett, 2010; Lohmann *et al.*, 2008). As Atlantic salmon are a pelagic species during their marine phase, any potential effects of EMF would only be perceived in shallower waters (Snyder *et al.*, 2019).
- 5.3.74 This reviewed literature demonstrates that whilst EMFs can result in altered patterns of fish behaviour, these changes are temporary and highly localised to within metres of the cable and are therefore not likely to represent large scale barriers to migration, impede population health, or cause trophic level effects. It should be noted that although there is limited information available in the literature on the impacts and sensitivities of shellfish species to EMFs, freshwater pearl mussel would not be directly impacted by EMFs produced by

subsea cables associated with the Proposed Development given that they are a freshwater resident species. There will be no subsea cables associated with the Proposed Development in any freshwater habitats for this Annex II species, as the closest SAC to any cable is the River South Esk SAC at approximately 20.3 km from the Export Cable. Indirect impacts on the larval stage of freshwater pearl mussel may, however, arise if Atlantic salmon (their host species) are impacted.

Operation and Maintenance Phase

- 5.3.75 Potential effects from the Proposed Development on the relevant conservation objectives of the six SACs screened in for Annex II Diadromous Fish and shellfish are presented in Table 5.22. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 5.22.

River South Esk SAC, River Dee SAC and River Spey SAC

- 5.3.76 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon and freshwater pearl mussel features of the River South Esk SAC (as presented in Paragraphs 5.2.18 and 5.2.19), River Dee SAC (as presented in Paragraphs 5.2.25 and 5.2.26) and River Spey SAC (as presented in Paragraphs 5.2.46 and 5.2.47) are presented in Table 5.22.

Atlantic Salmon

- 5.3.77 As outlined in Paragraphs 5.3.70 to 5.3.74, EMFs from subsea cables may influence the behaviour of Atlantic salmon. Altered behaviour could be detrimental if it results in the creation of a barrier to migration routes to and from natal rivers. However, Atlantic salmon are highly mobile and are considered to be capable of changing course during migration between natal rivers and the open sea.
- 5.3.78 As detailed in Paragraphs 5.3.63 to 5.3.69, EMFs produced from buried cables are expected to attenuate to baseline levels within a few metres to few tens of metres (both horizontally and vertically) from the cable (Hutchison *et al.*, 2021). Therefore, should impacts from EMF occur (either within the Array Area or along the Export Cable Corridor), they would be limited to within a few metres to few tens of metres of the cable and unlikely to represent any barrier to migration for this highly mobile, pelagic species.

Freshwater Pearl Mussel

- 5.3.79 Adult freshwater pearl mussel are confined to freshwater environments, and there is therefore no pathway for direct effects associated with potential impacts from EMF during the O&M phase. Indirect impacts on the larval stage of freshwater pearl mussel may, however, arise if Atlantic salmon (their host species) are impacted. As detailed in Paragraphs 5.3.77 and 5.3.78, EMFs from subsea electrical cabling in the O&M phase are unlikely to result in barriers to migration for Atlantic salmon and there is, therefore, unlikely to be any indirect impact to freshwater pearl mussel.

River Tay SAC

- 5.3.80 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon and sea lamprey features of the River Tay SAC (as presented in Paragraphs 5.2.32 and 5.2.33) are presented in Table 5.22.

Atlantic Salmon

- 5.3.81 As outlined in Paragraphs 5.3.70 to 5.3.74, EMFs from subsea cables may influence the behaviour of Atlantic salmon. Altered behaviour could be detrimental if it results in the creation of a barrier to migration routes to and from natal rivers. However, Atlantic salmon are highly mobile and considered to be capable of changing course during migration between natal rivers and the open sea.
- 5.3.82 Further, as detailed in Paragraphs 5.3.63 to 5.3.69, EMFs produced from buried cables are expected to attenuate to baseline levels within a few metres to few tens of metres (both horizontally and vertically) from the cable (Hutchison *et al.*, 2021). Therefore, should impacts from EMF occur (either within the Array Area or along the Export Cable Corridor), they would be limited to within a few metres to few tens of metres of the cable and unlikely to represent any barrier to migration for this highly mobile, pelagic species.

Sea Lamprey

- 5.3.83 As outlined in Paragraphs 5.3.70 to 5.3.74, EMF may influence the behaviour of sea lamprey and other Diadromous Fish. These effects may be detrimental if they result in the creation of a barrier to migration routes to and from natal rivers. However, sea lamprey and other Diadromous Fish are highly mobile and considered to be capable of changing course during migration between natal rivers and the open sea.
- 5.3.84 Sea lamprey are considered to have reduced sensitivity to EMFs in comparison with other fish species, such as elasmobranchs (Gill *et al.*, 2005; Hutchison *et al.*, 2018). Further, as detailed in Paragraphs 5.3.63 to 5.3.69, EMFs produced from buried cables will attenuate to baseline levels within a few metres to few tens of metres (both horizontally and vertically) from the cable (Hutchison *et al.*, 2021). Therefore, should impacts from EMF occur (either within the Array Area or along the Export Cable Corridor), they would be limited to within a few metres to few tens of metres of the cable and unlikely to present any barrier to migration for this highly mobile species.

River Tweed SAC and River Teith SAC

- 5.3.85 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon feature of the River Tweed SAC (as presented in Paragraph 5.2.39) and River Teith SAC (as presented in Paragraph 5.2.53) are presented in turn below in Table 5.22.

Atlantic Salmon

- 5.3.86 As outlined in Paragraphs 5.3.70 to 5.3.74, EMFs from subsea cables may influence the behaviour of Atlantic salmon. Altered behaviour could be detrimental if it results in the creation of a barrier to migration routes to and from natal rivers. However, Atlantic salmon are highly mobile and are considered to be capable of changing course during migration between natal rivers and the open sea.
- 5.3.87 Further, as detailed in Paragraphs 5.3.63 to 5.3.69, EMFs produced from buried cables are expected to attenuate to baseline levels within a few metres to few tens of metres (both horizontally and vertically) from the cable (Hutchison *et al.*, 2021). Therefore, should impacts from EMF occur (either within the Array Area or along the Export Cable Corridor), they would be limited to within a few metres to few tens of metres of the cable and not represent a barrier to migration for this species.

Conclusion

- 5.3.88 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II Diadromous Fish and shellfish as a result of impacts due to EMF with respect to the O&M phase of the Proposed Development.

Table 5.22: Conclusions Against the Conservation Objectives of the SACs for Annex II Diadromous Fish and Shellfish Screened in for Assessment of Impacts due to EMF during the O&M Phase

SAC	Feature	Conservation Objectives	Conclusion
River South Esk SAC River Dee SAC River Tay SAC River Tweed SAC River Spey SAC River Teith SAC	Atlantic salmon	2a. maintain/restore the population of Atlantic salmon, including range of genetic types, as a viable component of the site.	Any effects of EMF from subsea electrical cabling will be highly localised (i.e. metres to a maximum of tens of metres around cables). There will be no barrier to migration and, therefore, a negligible risk of disruption to Atlantic salmon population and distribution. There are no negative impacts predicted which could hinder the maintenance/restoration of the population of Atlantic salmon as a viable component of these SACs or the distribution of the Atlantic salmon feature throughout each of these SACs.
		2b. maintain/restore the distribution of the species throughout the site.	
		2c. maintain/restore the habitats supporting the species within the site and availability of food.	There is no pathway of potential impact between EMFs from subsea electrical cables and the habitats that support Atlantic salmon and its availability of food within these SACs. There are no negative impacts predicted which could hinder the maintenance/restoration of the habitats supporting the Atlantic salmon feature or availability of food of each of these SACs.
River South Esk SAC River Dee SAC River Spey SAC	Freshwater pearl mussel	2a. restore/maintain the population of species as a viable component of the site.	As a freshwater resident species there is no direct pathway of potential impact between EMFs from subsea electrical cables and freshwater pearl mussel within these SACs. There is no indirect impact on freshwater pearl mussel predicted as EMF is considered not to present any barrier to Atlantic salmon migration. There are, therefore, no negative impacts predicted which could hinder the maintenance/restoration of the population of Atlantic salmon as a viable component of these SACs or the distribution of the freshwater pearl mussel feature throughout each of these SACs.
		2b. restore/maintain the distribution of the species throughout the site.	
		2c. restore/maintain the habitats supporting the species within the site and availability of food.	As above for Atlantic salmon, there is no pathway of potential impact between EMFs from subsea electrical cabling and the habitats that support freshwater pearl mussel and its availability of food within these SACs. There are, therefore, no negative impacts predicted which could hinder the maintenance/restoration of the habitats supporting the freshwater pearl mussel feature or availability of food of each of these SACs.

SAC	Feature	Conservation Objectives	Conclusion
		2d. maintain/restore the distribution and viability of freshwater pearl mussel host species and their supporting habitats.	Any potential effects of EMF from subsea electrical cabling will be highly localised (i.e. metres to a maximum of tens of metres around cables). There will be no barrier to migration and, therefore, a negligible risk of disruption to Atlantic salmon population and distribution. There is no pathway of potential impact between EMFs from subsea electrical cables and the habitats that support Atlantic salmon and its availability of food within these SACs. There are, therefore, no negative impacts predicted which could hinder the maintenance/restoration of the distribution and viability of freshwater pearl mussel host species and their supporting habitats for each of these SACs.
River Tay SAC	Sea lamprey	2a. maintain the population of sea lamprey as a viable component of the site.	Any potential effects of EMF from subsea electrical cabling will be highly localised to metres or a maximum of tens of metres around cables. There will be no barrier to migration and, therefore, a negligible risk of disruption to sea lamprey population viability and distribution. There are no negative impacts predicted which could hinder the maintenance of the population of sea lamprey as a viable component of the SAC or the distribution of the sea lamprey feature throughout this SAC.
		2b. maintain the distribution of sea lamprey throughout the site.	
		2c. maintain the habitats supporting sea lamprey within the site and availability of food.	There is no pathway of potential impact between EMFs from subsea electrical cables and the habitats that support sea lamprey and its availability of food within these SACs. There are no negative impacts predicted which could hinder the maintenance of the habitats supporting the sea lamprey feature or availability of food of each of this SAC.

5.4 Assessment of Adverse Effects of the Proposed Development In-Combination with Other Projects

Projects Screened into the In-combination Assessment for Annex II Diadromous Fish and Shellfish

- 5.4.1 The specific projects scoped into the in-combination assessment for Annex II Diadromous Fish and shellfish are outlined in Table 5.23 and illustrated in Figure 5.4. Tier 1 encompasses the onshore elements of the Project. There are not anticipated to be any receptor impact pathways for Annex II Diadromous Fish and shellfish between the onshore elements of the Project and the Proposed Development, as the onshore elements do not interact with rivers or riverbanks. Therefore there is no Tier 1 assessment included in the in-combination assessment for this topic.
- 5.4.2 For the impact of Subsea Noise, a buffer of 100 km (with an area of 32,557.73 km²) has been applied to identify relevant projects and activities. This buffer has been accepted by the SNCBs in HRAs for other OWFs and is sufficiently large to account for the wider ranging Zone of Influence (Zoi) for Subsea Noise, in comparison to other potential impacts to Annex II Diadromous Fish and shellfish. For the impact of EMFs, a buffer of 50 km (with an area of 12,121.60 km²) has been applied, which is considered to be suitably precautionary given the localised nature of this impact. These buffers were presented during Scoping and agreed upon through the Scoping Opinion (MD-LOT, 2024) process. These buffers were applied to both the Array Area and the Export Cable Corridor, so there were some projects screened into the in-combination assessment that were within these buffers from one but not the other. As a precaution, any projects that were within these buffers from either the Array Area or Export Cable Corridor were included for consideration, even if they were outside the buffer of the other.

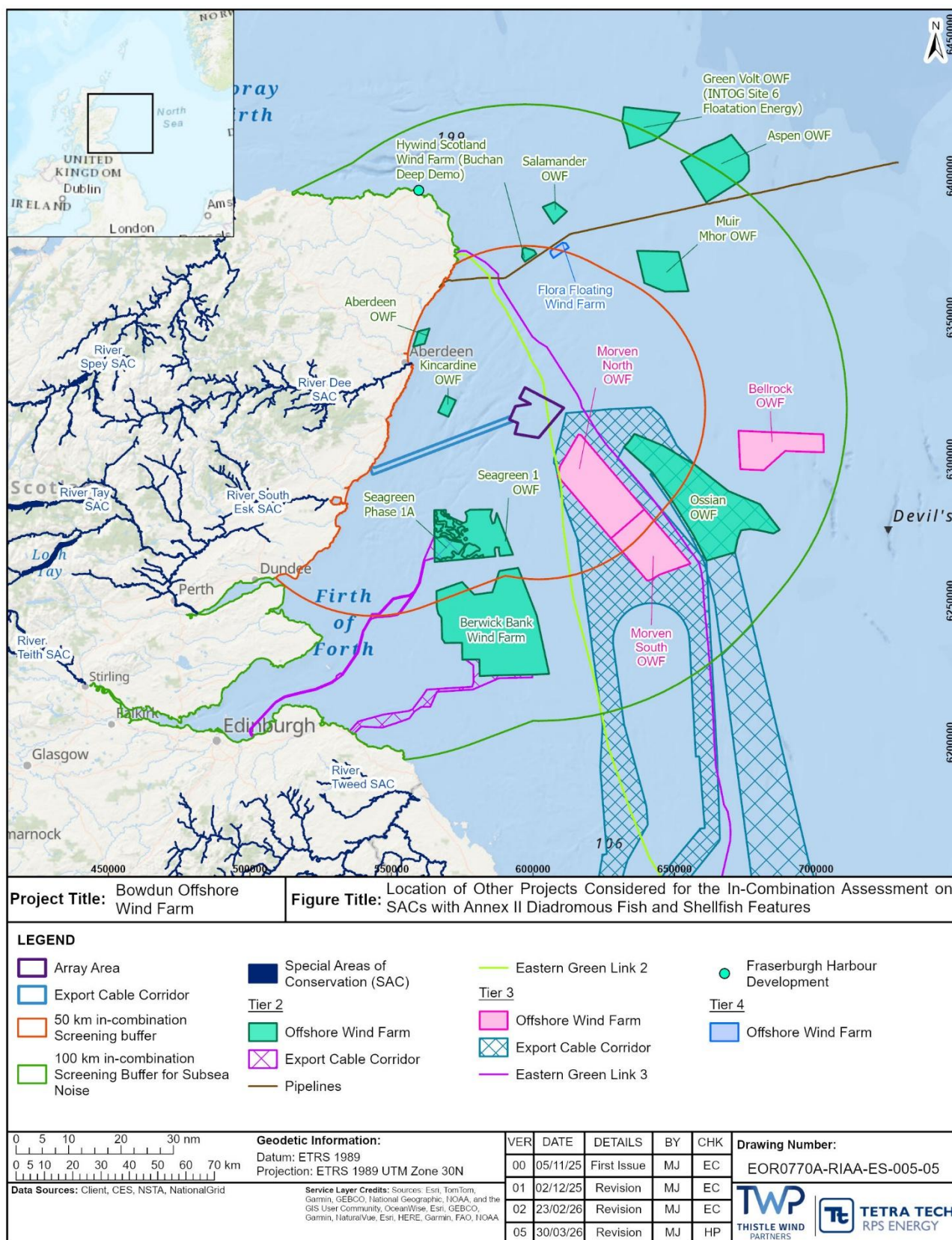


Figure 5.4: Location of Other Projects Considered for the In-Combination Assessment on SACs with Annex II Diadromous Fish and Shellfish Features

Table 5.23: List of Other Projects with Potential for In-Combination Effects on Annex II Diadromous Fish and Shellfish Features²

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
Tier 1							
There were no Tier 1 projects brought forward for in-combination assessment.							
Tier 2							
Offshore Wind Projects and Associated Cables							
Kincardine OWF	Operational	20.14	7.63	Kincardine OWF consists of up to 7 wind turbines with 6 currently operational. Capacity of 50 MW. .	N/A	2021-2045	The O&M and decommissioning phases of this project has the potential to overlap with the construction and O&M phases of the Proposed Development.
Seagreen 1A Project	Consented	36.30	19.47	Seagreen 1A is made up of the 36 remaining Wind Turbines consented as part of the Seagreen 1 OWF.	2029-2032	2033-2057	The construction, O&M and decommissioning phases of this project has the potential to overlap with the construction and O&M phases of the Proposed Development.
Seagreen 1 OWF	Operational	27.87	19.88	Seagreen 1 OWF consists of up to 114 Wind Turbines at a capacity of 1,075 MW.	N/A	2023-2047	The O&M and decommissioning phases of this project has the potential to overlap with the construction and

² Ordered by distance to the Export Cable Corridor.

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
							O&M phases of the Proposed Development.
Seagreen Phase 1A OFTO	Consented	42.87	28.05	Consent includes an export cable approximately 110 km in length to a landfall location at Cockenzie.	2029-2032	2033-unknown	The construction and O&M phases of this project has the potential to overlap all phases of the Proposed Development.
Seagreen Phase 1 OFTO	Operational	40.48	32.37	Consented up to 6 export cables with no maximum capacity.	N/A	2023-unknown	The O&M and decommissioning phases of this project has the potential to overlap with the construction and O&M phases of the Proposed Development.
Aberdeen OWF	Operational	38.60	34.71	Aberdeen OWF consists of up to 11 Wind Turbines at a capacity of 96.8 MW.	N/A	2018-2042	The O&M and decommissioning phases of this project has the potential to overlap with the construction and O&M phases of the Proposed Development.
Ossian OWF	Application submitted but not yet determined	25.36	40.14	The Ossian Floating Wind project is proposed for up to 265 floating Wind Turbines with a capacity of 3,600 MW. Operational lifetime 35 years.	2031-2038	2039-2073	The construction and O&M phases of Ossian OWF have the potential to overlap with all phases of the Proposed Development.

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
Berwick Bank Wind Farm	Consented	46.53	47.70	Berwick Bank OWF is proposed for up to 307 Wind Turbines with a capacity of up to 4,100 MW. O&M up to 35 years.	2027-2032	2032-2067	The construction, O&M and decommissioning phases of Berwick Bank OWF has the potential to overlap with the construction and O&M phases of the Proposed Development.
Berwick Bank OFTO (Cambois Connection)	Consented	46.53	47.70	Berwick Bank transmission is proposed for up to 4 cables with an operational lifetime of 35 years.	2026-2029	2030-2064	The O&M and decommissioning phases of Berwick Bank OFTO (Cambois Connection) has the potential to overlap with the construction and O&M phases of the Proposed Development.
Hywind Scotland Wind Farm (Buchan Deep Demo)	Operational	44.43	54.73	Floating OWF with 5 Wind Turbines and 30 MW installed capacity. The wind farm started operating in 2017 with a design life of 20 years. Decommissioning is planned to be undertaken during Q2/Q3 2038.	N/A	2017-2037	The O&M and decommissioning phases of this project has the potential to overlap with the construction and O&M phases of the Proposed Development.
Muir Mhòr OWF	Application submitted but not yet determined	52.50	66.47	Muir Mhòr OWF is proposed for up to 67 Wind Turbines at a capacity of 798 MW.	2027-2030	2031-2055	The O&M and decommissioning phases of Muir Mhòr OWF has the potential to overlap

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
							with the construction and O&M phases of the Proposed Development. As outwith the 50 km EMF screening buffer but within the 100 km Subsea Noise screening buffer, this project is only included in the CEA for the impact of Subsea Noise.
Salamander OWF	Consented	58.68	69.52	Salamander OWF is proposed for up to 100 MW.	2027-2029	2030-2054	The O&M and decommissioning phases of Salamander OWF have the potential to overlap with the construction and O&M phases of the Proposed Development. As outwith the 50 km EMF screening buffer but within the 100 km Subsea Noise screening buffer, this project is only included in the CEA for the impact of Subsea Noise.
Aspen OWF	Application submitted but not yet determined	88.37	102.23	Floating OWF proposed for up to 1,000 MW and up to 72 Wind Turbines.	2027-2031	2032-2056	The O&M and decommissioning phases of Aspen OWF has the potential to overlap with the construction and

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
							O&M phases of the Proposed Development. As outwith the 50 km EMF screening buffer but within the 100 km Subsea Noise screening buffer, this project is only included in the CEA for the impact of Subsea Noise.
Green Volt OWF (INTOG Site 6 Flotation Energy)	Consented	92.16	103.35	Green Volt OWF is proposed for up to 35 Wind Turbines at a capacity of 560 MW.	2027-2029	2030-2054	The O&M and decommissioning phase of Green Volt OWF overlap with the construction and O&M phases of the Proposed Development. As outwith the 50 km EMF screening buffer but within the 100 km Subsea Noise screening buffer, this project is only included in the CEA for the impact of Subsea Noise.
Cables and Pipelines							
Eastern Green Link 2	Under construction	0.00	12.33	2 GW subsea cable connecting Peterhead in Aberdeenshire and Drax in North Yorkshire. Onshore construction commenced in 2025.	2024-2028	2029-Unknown	The O&M and decommissioning phases of this project has the potential to overlap with the construction, O&M and decommissioning

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
				Offshore construction begins in 2027.			phases of the Proposed Development.
Forties to Cruden Bay (PL721)	Operational	39.31	48.70	170 km oil pipeline from the forties C platform to Cruden bay.	N/A	Ongoing	The O&M and decommissioning phases of this project have the potential to overlap with the construction, O&M and decommissioning phases of the Proposed Development.
Tier 3							
Offshore Wind Projects and Associated Cables							
Morven Hawthorn Pit Grid Connection Project	Pre-Application	1.81	17.41	Consists of the onshore and offshore infrastructure associated with the Morven OWFs. Up to 6 export cables with a capacity of 525 kV.	2029-2032	2033-unknown	The construction, O&M and decommissioning phases of this project has the potential to overlap with the construction, O&M and decommissioning phases of the Proposed Development.
Morven North OWF	Pre-Application	10.03	22.20	Morven North OWF is proposed for up to 96 Wind Turbines at a capacity of 1,500 MW.	2030-2036	2037-2061	The construction, O&M and decommissioning phases of Morven North OWF have the potential to overlap with the construction and O&M phases of the Proposed Development.

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
Ossian Transmission Infrastructure	Pre-Application	25.28	40.03	Up to 6 export cables with a maximum total length of offshore cable route of 509 km. Anticipated application submission in the latter half of 2026. Operational lifetime 35 years.	2030-2033	2034-2068	The construction and O&M phases of this project has the potential to overlap with the construction, O&M and decommissioning phases of the Proposed Development.
Morven South OWF	Pre-Application	43.61	53.83	Morven South OWF Array is proposed for up to 95 Wind Turbines at a capacity of 1,500 MW.	2030-2036	2037-2061	The construction, O&M and decommissioning phases of Morven South OWF Array have the potential to overlap with the construction and O&M phases of the Proposed Development.

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
Bellrock OWF	Pre-Application	62.23	79.55	Bellrock OWF is proposed for a capacity of 1,200 MW with between 42 and 80 Wind Turbines.	2027-2030	2031-2055	The O&M and decommissioning phases of Bellrock OWF has the potential to overlap with the construction and O&M phases of the Proposed Development. As outwith the 50 km EMF screening buffer but within the 100 km Subsea Noise screening buffer, this project is only included in the CEA for the impact of subsea noise.
Cables and Pipelines							
Eastern Green Link 3	Pre-Application	6.28	23.76	The project comprises a 2 GW system linking Aberdeenshire in Scotland and Lincolnshire in England. Approximately 575 km of subsea HVDC cable from Lincolnshire to a proposed landfall at Sandford Bay, Peterhead.	2028-2030	2031-unknown	The O&M and decommissioning phases of Eastern Green Link 3 has the potential to overlap with all phases of the Proposed Development.
Central North Sea Electrification (CNSE) Project	Pre-Application	36.00	46.20	Electrification of existing oil and gas infrastructure in the central North Sea. The infrastructure	2027-2028	2029-unknown	The O&M and decommissioning phases of this project has the potential to overlap with

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
				includes an onshore convertor station, an offshore convertor station, 66 kV offshore cabling connecting CNSE assets, 80 kV cabling to landfall, and 80 kV cabling from landfall to the onshore convertor station.			the construction and O&M phases of the Proposed Development.
Coastal Construction							
Fraserburgh Harbour Development	Pre-Application	79.16	86.17	Proposed works to existing harbour improvement and construction of New South Harbour. Proposed works include relocation of existing south breakwater box berth, dredging and widening of the entrance of 2 harbours, a jetty and a pier, installation of pontoons and dredging the existing channel, extension of breakwater, installation of new breakwater, dredging and installation of new dry dock.	2028–2032	N/A	The construction phase of this project has the potential to overlap with the construction phase of the Proposed Development. As outwith the 50 km EMF screening buffer but within the 100 km Subsea Noise screening buffer, this project is only included in the CEA for the impact of subsea noise.

Project	Status	Distance to the Array Area (km)	Distance to the Export Cable Corridor (km)	Description of Project	Dates of Construction (If Applicable) Proposed Development: 2031-2036	Dates of Operation (If Applicable) Proposed Development: 2036/2037-2067	Temporal Overlap with the Proposed Development
Tier 4							
Offshore Wind Projects and Associated Cables							
Flora Floating Wind Farm	Pre-Planning	46.83	57.79	Innovation and Targeted Oil and Gas site 4 is proposed for up to 50 MW.	Unknown	Unknown	There may be temporal overlap between all phases of this OWF project and those of the Proposed Development.

Subsea Noise Impacting Fish and Shellfish Receptors (In-Combination)

- 5.4.3 The LSE assessment during the HRA screening process identified that LSE could not be ruled out for Subsea Noise impacting fish and shellfish receptors in the construction phase of the Proposed Development in-combination with other projects for all six SACs screened in for Annex II Diadromous Fish and shellfish species (see Table 3.1).
- 5.4.4 The MDS considered for this in-combination assessment is shown in Table 5.24. The Embedded Mitigation measures are presented in Table 5.4 for the alone assessment of the Proposed Development.

Table 5.24: MDS Considered for the Assessment of Potential Impacts to Annex II Diadromous Fish and Shellfish due to Subsea Noise during the Construction Phase

Proposed Development Phase	Tier	MDS
Construction	1	No projects identified with in-combination impact pathways.
	2	The MDS is as detailed for the Proposed Development alone in Table 5.3, in-combination with the following projects as per Table 5.25: - Offshore Wind Projects and Associated Cables: - Kincardine OWF (O&M phase); - Seagreen 1 OWF (O&M phase); - Seagreen 1A Project (O&M phase); - Aberdeen OWF (O&M phases); - Ossian OWF (construction and O&M phases); - Berwick Bank OWF (construction and O&M phases); - Berwick Bank OFTO (Cambois Connection) (O&M phase); - Hywind Scotland Wind Farm (O&M phase); - Muir Mhòr OWF (O&M phase); - Salamander OWF (O&M phase); - Aspen OWF (O&M phase); and - Green Volt OWF (INTOG Site 6 Flotation Energy) (O&M phase).
	3	The MDS is as detailed for the Proposed Development alone in Table 5.3, in-combination with the following projects as per Table 5.25: - Tier 2 Projects; - Offshore Wind Projects and Associated Cables: - Morven Hawthorn Pit Grid Connection Project (construction and O&M phases); - Morven North OWF (construction phase); - Ossian Transmission Infrastructure (construction and O&M phases); - Morven South OWF (construction phase); - Bellrock OWF (construction and O&M phase); and - CNSE Project (O&M phase). - Coastal Construction:

Proposed Development Phase	Tier	MDS
		Fraserburgh Harbour Development (construction phase).
	4	The MDS is as detailed for the Proposed Development alone in Table 5.3, in-combination with the following projects as per Table 5.25: - Tier 2 Projects; - Tier 3 Projects; and - Offshore Wind Projects and Associated Cables: - Flora Floating Wind Farm (construction phase).

In-Combination Assessment

- 5.4.5 There is potential for In-Combination Effects from Subsea Noise generated during the construction phase of the Proposed Development and other projects.
- Tier 2*
- 5.4.6 There were 12 Tier 2 projects with the potential for in-combination impacts associated with Subsea Noise in the construction phase of the Proposed Development. The results of Subsea Noise modelling assessments for these projects are summarised in Table 5.25. Injury and disturbance associated with Subsea Noise in the various phases of the Tier 2 projects overlapping with the construction phase of the Proposed Development were not concluded to be significant for the fish and shellfish species (including Atlantic salmon and sea lamprey) assessed in their individual EIAs (Table 5.25). Where Annex II Diadromous Fish and shellfish were included in the RIAAs for the Tier 2 projects, no adverse effect on the integrity of the SACs assessed (some of which were the same as those assessed for the Proposed Development alone) was predicted (Table 5.25). Subsea Noise modelling results (where available) of the Tier 2 projects were of a similar scale to those associated with the Proposed Development.
- 5.4.7 It should be noted that the majority of Tier 2 projects will already be constructed by the time construction of the Proposed Development commences. This greatly reduces the potential for In-Combination Effects as the highest potential for impact is associated with piling noise in the construction phase of an OWF. Of the 12 Tier 2 projects assessed, only the construction phases of the Berwick Bank OWF (up to six years; 2027 to 2032) and Ossian OWF (up to eight years; 2031 to 2038) overlap with that of the Proposed Development (2031 to 2036).

Table 5.25: Subsea Noise Modelling Results for the Tier 2 Projects Overlapping with the Construction Phase of the Proposed Development

Project	MDS for Phase which Overlaps with the Construction of the Proposed Development	Subsea Noise Modelling Results	Reference
Offshore Wind Projects and Associated Cables			
Kincardine OWF	O&M: Operational noise from 5 Wind Turbines, mooring lines, cable repair, and maintenance vessel visit 5 days per week.	Diadromous Fish features were not considered in the project's RIAA as consultation confirmed that the distance of the Kincardine OWF from the relevant SACs, together with there being no piling associated with the project, would result in there being no pathway of potential impact. There were therefore no Subsea Noise impacts to consider in relation to the in-combination assessment for fish and shellfish. In the EIA for this project there was no Subsea Noise modelling undertaken, with Wind Turbines predicted to have a noise output of no greater than 110dB(A) at hub height measured according to the IEC 61400-11 standard.	(Kincardine OWF Limited, 2016a, b)
Seagreen 1 OWF	O&M: Operational noise from 150 Wind Turbines.	Diadromous Fish features were not considered in the RIAA for this project, based on stakeholder advice, therefore results from the EIA have been considered. There was no Subsea Noise modelling undertaken for the O&M phase of this project (which corresponds with the construction and O&M phases of the Proposed Development). Operational noise was assessed via a literature review in the EIA, with no significant effects predicted for any fish and shellfish species.	(Seagreen Wind Energy Limited, 2012, 2018a, b)
Seagreen 1A Project	O&M: Operational noise from 36 Wind Turbines.	There was no Subsea Noise modelling undertaken for the O&M phase of this project (which corresponds with the construction and operational phases of the Proposed Development). Operational noise was originally assessed in the Seagreen 1 OWF EIA via a literature review in the EIA, with no significant effects	(Seagreen 1A, 2021)

Project	MDS for Phase which Overlaps with the Construction of the Proposed Development	Subsea Noise Modelling Results	Reference
		predicted for any fish and shellfish species, however diadromous fish were not considered in the RIAA.	
Aberdeen OWF	O&M: Operational noise from 11 Wind Turbines.	There was no Subsea Noise modelling undertaken for the O&M or decommissioning phases of this project (which corresponds with the operational phases of the Proposed Development). Operational noise was predicted to have no significant effects for any fish and shellfish species.	(European Offshore Wind Deployment Centre, 2011a, b, c)
Ossian OWF	Construction: up to 265 semi-submersible Floating Wind Turbine Foundations (6 anchors per foundation) at a maximum hammer energy of 3,300 kJ. Up to 3 large OSP jacket foundations and 12 and small jacket foundations, with up to 12 and six legs per foundation at a maximum hammer energy of 4,400 kJ. UXO clearance of 15 UXOs. O&M: Operational noise from 265 semi-submersible floating Wind Turbines. Up to 1,590 catenary anchor mooring lines.	Diadromous Fish features were considered in the RIAA for Ossian OWF. Subsea Noise modelling for concurrent OSP Jacket pile installation at 4,400 kJ and Wind Turbine Foundation Pile at 3,000 kJ. The greatest TTS impact area was modelled at 45,100 m for static fish and 31,200 m for moving fish receptors (based on the cumulative SEL metric). Ranges were lower for the less sensitive hearing groups and for injurious effects. This was not assessed as having population-level effects on Diadromous Fish. The Subsea Noise contours for disturbance modelled for the Ossian OWF are likely to overlap with those modelled for the Proposed Development alone (Figure 5.3). Both Ossian OWF and the Proposed Development are scheduled to be constructed from 2031 onwards,	(Ossian OWFL, 2024a, b)

Project	MDS for Phase which Overlaps with the Construction of the Proposed Development	Subsea Noise Modelling Results	Reference
		with Ossian's Floating Wind Turbine anchors set to be installed over a period of 7 years (with no piling assumed during Q1). The total piling phase of the large OSP foundations is scheduled to take 72 months over a period of 8 years. For the Proposed Development boulder clearance/UXO detonation will occur between Q2 and Q3 of 2031, with piling commencing in Q4 of 2031 and likely being completed in Q1 of 2033. Therefore, there is potential for overlap between the construction activities of Ossian OWF and the Proposed Development. The potential impact ranges for UXO clearance activities for a 698 kg UXO in Ossian OWF's sound modelling was 930 m (upper range) to 558 m (lower range). All other modelled UXO, clearing shot and donor charge ranges were of a smaller distance than this. The modelled distances of these charges are far outwith the Proposed Development and there is, therefore, little risk of overlap with UXO activities. There was no Subsea Noise modelling undertaken for the O&M phase of this project (which corresponds with the O&M phase of the Proposed Development). The RIAA of Ossian OWF concluded no effects of Subsea Noise on the integrity of SACs for Atlantic Salmon, freshwater pearl mussel or sea lamprey. Therefore, no In-Combination Effects are predicted.	
Berwick Bank OWF	Construction: piling of up to 179 Wind Turbines with jacket foundations (up to 4 legs per foundation and up to 2 x 5.5 m diameter piles) using a maximum hammer energy of up to 4,000 kJ. Up to 8 OSP jacket foundations (6 legs per	The mortality and recoverable injury for both single piling of Wind Turbines and OSPs were modelled to not be exceeded for Group 1 Fish species, with mortality occurring up to 19 m for Group 2 Fish. Recoverable injury from piling for Wind Turbine and	(Berwick Bank Wind Farm Ltd., 2022; SSE Renewables, 2022)

Project	MDS for Phase which Overlaps with the Construction of the Proposed Development	Subsea Noise Modelling Results	Reference
	foundation) at a maximum hammer energy of 4,000 kJ. Pre-Construction clearance of up to 14 UXOs with 300kg UXO. O&M: The MDS for this project did not assess Subsea Noise during the O&M phase.	OSPs was 67m for Group 2 Fish, 6 m for Group 3 and 4 Fish. The maximum TTS range for all Fish Groups from Wind Turbine piling was 4,161 m, and from piling OSPs foundations was 3,900 m for Group 1 Fish and 3,943 m for Group 2 Fish. Taking into consideration the distance of the Berwick Bank OWF and the SACs assessed in the project's RIAA, there were no anticipated effects from Subsea Noise on the Atlantic salmon and sea lamprey features. In addition, soft start procedures will be implemented to allow fleeing fish receptors to move outside of the impact range before sounds levels reach a level likely to cause mortality. The Subsea Noise contours for disturbance modelled for the Berwick Bank OWF extended across the south of the marine environment encompassing the Proposed Development, so would likely overlap with those modelled for the Proposed Development alone (Figure 5.3). The piling phase of construction extends over a maximum of 372 days, with all construction scheduled to complete in 2032. However, should piling activities overlap temporally with those of the Proposed Development, any possible overlap will be of a very short duration. For the Proposed Development boulder clearance/UXO detonation will occur between quarter (Q) 2 and Q3 of 2031, with piling commencing in Q4 of 2031. The potential for concurrent piling to occur with the Proposed Development and Berwick Bank OWF is highly unlikely. Furthermore, the pre-construction UXO clearance of Berwick Bank OWF presents no risk of In-	

Project	MDS for Phase which Overlaps with the Construction of the Proposed Development	Subsea Noise Modelling Results	Reference
		Combination Effects associated with noise from the Proposed Development as this is scheduled to be completed before the Proposed Development's UXO clearance and piling activities.	
Berwick Bank OFTO (Cambois Connection)	O&M: The MDS for this project did not assess Subsea Noise during the O&M phase.	N/A	(SSE Renewables, 2023a, b)
Hywind Scotland OWF	O&M: Operational noise for 5 Wind Turbines, mooring lines and vessel maintenance.	The Habitats Regulation Appraisal concluded no LSE on Annex II Diadromous Fish and shellfish receptors were anticipated. In the EIA for this project there was no Subsea Noise modelling undertaken for the O&M phase of this project (which corresponds with the construction and O&M phases of the Proposed Development). Operational noise was assessed via a literature review in the EIA, with no significant effects predicted for any fish and shellfish species.	Statoil (2015a); (Statoil, 2015b)
Muir Mhòr OWF	O&M: Up to 67 direct drive/geared Wind Turbines and 12 mooring lines per Wind Turbine.	There was no Subsea Noise modelling undertaken for the O&M phase of the Muir Mhòr OWF project (which is scheduled to overlap with the construction and O&M phases of the Proposed Development). Operational noise was assessed via a literature review in the EIA, which considered research carried out at operational wind farms, with no significant effects predicted for any fish and shellfish species. Taking into consideration the distance of the Muir Mhòr OWF from the SACs assessed in the project's RIAA, there were no anticipated effects from Subsea Noise on the Atlantic salmon and sea lamprey features of these SACs.	(Muir Mhòr Offshore Wind Farm, 2024a, b)

Project	MDS for Phase which Overlaps with the Construction of the Proposed Development	Subsea Noise Modelling Results	Reference
Salamander OWF	O&M: Up To 210 vessel trips per year.	There was no Subsea Noise modelling undertaken for the O&M phase of this project (which corresponds with the construction and O&M phase of the Proposed Development). Operational noise was assessed via a literature review in the EIA, with no significant effects predicted for any fish and shellfish species.	Salamander OWF (2024a)
Aspen OWF	O&M: Operational noise from 72 Wind Turbines, 432 mooring lines and 3 OSPs.	There was no Subsea Noise modelling undertaken for the O&M phase of this project (which corresponds with the O&M phase of the Proposed Development). The RIAA for this project predicted no adverse effects on integrity of any SACs designated for Annex II Diadromous Fish.	(Cerulean Winds Aspen Project Limited, 2025a)
Green Volt OWF (INTOG Site 6 Flotation Energy)	O&M: Impacts are assessed relating to the loudest operational vessel type (offshore support vessel used as proxy), with a source SPL of 179 RMS (dB re 1µPa) and SEL (24h) of 228 (dB re 1µPa2s).	The RIAA for Green Volt did not assess the O&M phase of the project but concluded no adverse effect of Subsea Noise to Atlantic Salmon or Sea lamprey. In the EIA there was no Subsea Noise modelling undertaken for the O&M phase of this project (which is scheduled to overlap with the construction phase of the Proposed Development). Operational noise was assessed via a literature review in the Green Volt OWF EIA, which considered research carried out at operational wind farms and information and feedback obtained through consultation, with no significant effects predicted for any fish and shellfish species (including Atlantic salmon and sea lamprey).	(Green Volt, 2023a, b)

Tier 3

- 5.4.8 In addition to the Tier 2 projects, there were six Tier 3 projects with the potential for In-Combination Effects associated with Subsea Noise during the construction phase of the Proposed Development:
- Morven Hawthorn Pit Grid Connection Project (likely in its construction phase);
 - Morven North OWF (likely in its construction phase);
 - Ossian Transmission Infrastructure (likely in its construction and O&M phases);
 - Morven South OWF (construction phase);
 - Bellrock OWF (likely in its construction and O&M phases);
 - CNSE Project (likely in its O&M phase); and
 - Fraserburgh Harbour Development (likely in its construction phase) (Table 5.24).
- 5.4.9 It is possible that the construction phases of these Tier 3 projects may overlap with the construction phase of the Proposed Development, however there are no details on the construction programmes currently available in the public domain. In-Combination Effects would be reduced with lower overlap between the construction phases of the Tier 3 projects and the Proposed Development, as Subsea Noise levels will return to baseline conditions upon completion of individual construction activities (such as piling) for each project.
- 5.4.10 As Tier 3 projects, there are no RIAAs or EIAs available in the public domain and therefore no specific Subsea Noise modelling results to draw upon. However, the following indicative Wind Turbine parameters are provided from the relevant project Scoping Reports (noting that these are not final and may be subject to change as the projects progress):
- Bellrock OWF: total of up to 80 Wind Turbines (Bellrock Offshore Wind Farm, 2024a);
 - Morven North OWF: total of up to 96 Wind Turbines and associated OSPs (MvOWL, 2023a); and
 - Morven South OWF: total of up to 95 Wind Turbines and associated OSPs (MvOWL, 2023a).
- 5.4.11 In addition to piling of Wind Turbine and OSP foundations, UXO clearance is likely to be required, alongside other noise producing activities such as site investigation surveys, vessel use, and cable installation. No specific details are currently available for these projects regarding noise producing parameters, such as maximum piling durations, maximum or realistic hammer energies, however these are likely to be of a similar scale to that of the Proposed Development alone, given the similar scales between the Proposed Development and the Tier 3 OWFs.

- 5.4.12 The Fraserburgh Harbour Development includes upgrades to existing harbour infrastructure and the creation of an additional harbour to expand capacity and improve accessibility (Fraserburgh Harbour Development, 2025a). The development is likely to involve dredging, breakwater extensions, new pontoons and a dry dock. Construction methods will likely include demolition, rock cutting, underwater blasting which will generate Subsea Noise. However, the Fraserburgh Harbour Development is 79.0 km from the Proposed Development and noise contours are not expected to overlap. Construction is due to complete in 2032, therefore most of the piling is likely to be complete when the construction of the Proposed Development is underway. Therefore, In-Combination Effects are not predicted to be significant.

Tier 4

- 5.4.13 In addition to the Tier 2 and 3 projects, the only Tier 4 project identified with a potential for In-Combination Effects was Flora Floating Wind Farm (in the construction and O&M phases). As the Flora Floating Wind Farm is currently in the pre-application stage there is little known about the potential impacts associated with the project. It is, however, likely the In-Combination Effects will be similar to that of Ossian OWF which is also a floating project but on a smaller scale as Ossian OWF has a capacity of 3.6 GW and the Flora Floating Wind Farm has a maximum capacity of 50 MW (North Sea Transmission Authority, 2025).
- 5.4.14 The risk of injury or behavioural effects on fish from Wind Turbine noise, whether structure borne or mooring-related is considered very low. Given the distance between the Proposed Development and the Tier 3 projects (Table 5.23), it is unlikely that wide-ranging In-Combination Effects would occur, given the limited nature of operational noise disturbance to fish and shellfish receptors.

Construction Phase

- 5.4.15 Potential effects from the Proposed Development on the relevant conservation objectives of the six SACs screened in for Annex II Diadromous Fish and shellfish are presented in Table 5.26. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 5.26.

River South Esk SAC, River Dee SAC and River Spey SAC

- 5.4.16 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon and freshwater pearl mussel features of the River South Esk SAC (as presented in Paragraphs 5.2.18 and 5.2.19) and River Dee SAC (as presented in Paragraphs 5.2.25 and 5.2.26) and River Spey SAC (as presented in Paragraphs 5.2.46 and 5.2.47) are presented in Table 5.26.

Atlantic Salmon

- 5.4.17 As presented for the assessment of the Proposed Development alone (Section 5.3), this potential impact was not predicted to cause an adverse effect on integrity to the Atlantic salmon feature of these three SACs. Based on the Tier 2, 3 and 4 assessments presented in Paragraph 5.4.6 to 5.4.14 this conclusion is also applicable to the in-combination assessment. There were no Tier 1 projects identified for in-combination assessment for this impact (see Table 5.24). Any In-Combination Effects are predicted to be of short to medium term duration (such as short term UXO clearance, and more medium term piling schedules) and intermittent in nature. Further, the construction phase of the Proposed Development and those of the Tier 2 and 3 projects, in reality, may have limited temporal overlap. This is because the Tier 2 and 3 projects are large scale offshore developments, whose construction programmes will likely be refined in the future, and the indicative programmes available in the public domain at the time of writing this assessment may not reflect the reality of temporal overlap. This further reduces the potential for In-Combination Effects (as the highest levels of Subsea Noise are produced during the construction of OWF projects). Finally, it is likely that the Tier 2 and 3 projects will also include similar Embedded Mitigation measures as those proposed for the Proposed Development (Table 5.4), which will further reduce the total amount of acoustic energy emitted into the marine environment and the likelihood of injury, disturbance, and barrier effects to Atlantic salmon. Therefore, the in-combination assessment for this impact is considered to be suitably precautionary.

Freshwater Pearl Mussel

- 5.4.18 As discussed for the assessment of the Proposed Development alone (Section 5.3), adult freshwater pearl mussel are confined to freshwater environments, and so there is no pathway for potential direct effects associated with in-combination Subsea Noise during construction. Indirect impacts on the larval stage of freshwater pearl mussel may, however, arise if Atlantic salmon (their host species) are impacted. As detailed in Paragraph 5.4.17, injury, disturbance, and barriers to migration of Atlantic salmon are unlikely to occur from the Proposed Development in-combination with other projects. Therefore, it can also be concluded that there will be no indirect impact to freshwater pearl mussel.

River Tay SAC

- 5.4.19 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon and sea lamprey features of the River Tay SAC (as presented in Paragraphs 5.2.32 and 5.2.33) are presented in Table 5.26.

Atlantic Salmon

- 5.4.20 As presented for the assessment of the Proposed Development alone (Section 5.3), this potential impact was not predicted to cause an adverse effect on integrity to the Atlantic salmon feature of this SAC. Based on the Tier 2 and 3 assessments presented in Paragraph 5.4.6 to 5.4.11, this conclusion is also applicable to the in-combination assessment. There were no Tier 1 or 4 projects

identified for in-combination assessment for this impact (see Table 5.24). Any In-Combination Effects are predicted to be of short to medium term duration (such as short term UXO clearance, and more medium term piling schedules) and intermittent in nature. Further, the construction phase of the Proposed Development and those of the Tier 2 and 3 projects, in reality, may have limited temporal overlap. This is because the Tier 2 and 3 projects are large scale offshore developments, whose construction programmes will likely be refined in the future, and the indicative programmes available in the public domain at the time of writing this assessment may not reflect the reality of temporal overlap. This further reduces the potential for In-Combination Effects (as the highest levels of Subsea Noise are produced during the construction of OWF projects). Finally, it is likely that the Tier 2 and 3 projects will also include similar Embedded Mitigation measures as those proposed for the Proposed Development (Table 5.4), which will further reduce the total amount of acoustic energy emitted into the marine environment and the likelihood of injury, disturbance, and barrier effects to Atlantic salmon. Therefore, the in-combination assessment for this impact is considered to be suitably precautionary.

Sea Lamprey

- 5.4.21 As presented for the assessment of the Proposed Development alone (Paragraph 5.2.55), this potential impact was not predicted to cause an adverse effect on integrity to the sea lamprey feature of this SAC. Based on the Tier 2 and 3 assessments presented in Paragraph 5.4.6 to 5.4.11, this conclusion is also applicable to the in-combination assessment. There were no Tier 1 or 4 projects identified for in-combination assessment for this impact (see Table 5.24).

River Tweed SAC and River Teith SAC

- 5.4.22 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon feature of the River Tweed SAC (as presented in Paragraph 5.2.39) and River Teith SAC (as presented in Paragraph 5.2.53) are presented in Table 5.26.

Atlantic Salmon

- 5.4.23 As presented for the assessment of the Proposed Development alone (Section 5.3), this potential impact was not predicted to cause an adverse effect on integrity to the Atlantic salmon feature of these two SACs. Based on the Tier 2, 3 and 4 assessments presented in Paragraph 5.4.6 to 5.4.14 this conclusion is also applicable to the in-combination assessment. There were no Tier 1 projects identified for in-combination assessment for this impact (see Table 5.24). Any In-Combination Effects are predicted to be of short to medium term duration (such as short term UXO clearance, and more medium term piling schedules) and intermittent in nature. Further, the construction phase of the Proposed Development and those of the Tier 2 and 3 projects, in reality, may have limited temporal overlap. This is because the Tier 2 and 3 projects are large scale offshore developments, whose construction programmes will likely be refined in the future, and the indicative programmes available in the public domain at the time of writing this assessment may not reflect the reality of temporal overlap. This further reduces the potential for In-Combination Effects

(as the highest levels of Subsea Noise are produced during the construction of OWF projects). Finally, it is likely that the Tier 2 and 3 projects will also include similar Embedded Mitigation measures as those proposed for the Proposed Development (Table 5.4), which will further reduce the total amount of acoustic energy emitted into the marine environment and the likelihood of injury, disturbance, and barrier effects to Atlantic salmon. Therefore, the in-combination assessment for this impact is considered to be suitably precautionary.

Conclusion

- 5.4.24 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II Diadromous Fish and shellfish as a result of Subsea Noise with respect to the construction phase of the Proposed Development in-combination with other projects.

Table 5.26: Conclusions Against the Conservation Objectives of the SACs Screened in for In-Combination Assessment of Subsea Noise during the Construction Phase

SAC	Feature	Conservation Objectives	Conclusion
River South Esk SAC River Dee SAC River Tay SAC River Tweed SAC River Spey SAC River Teith SAC	Atlantic salmon	2a. maintain/restore the population of Atlantic salmon, including range of genetic types, as a viable component of the site.	Atlantic salmon within close proximity to piling and UXO clearance of the Proposed Development and Tier 2 and 3 projects may experience injury or mortality (see Table 5.25). As Atlantic salmon are highly mobile and may only use the marine environment encompassing the Proposed Development to pass through during migration to and from their natal rivers, for the Proposed Development alone, it was concluded there would be no adverse effects on site integrity. As such significant mortality or injury to this species is not predicted. The Embedded Mitigation measures (as outlined in Table 5.4) are based on stakeholder advice and considered standard practice across the offshore wind industry. Therefore, it is considered likely that they would be adopted as standard across the Tier 2, 3 and 4 projects. Therefore, this potential in-combination effect will not prevent the populations of this species from being restored or maintained as a viable component of the SACs or the distributions or genetic diversity of this species from being maintained or restored throughout the SACs. Atlantic salmon may also experience behavioural effects in response to piling associated with the Proposed Development in-combination with other projects. However, Subsea Noise modelling for the Proposed Development alone and that detailed in Table 5.25 for the Tier 2 projects indicates these effects would not result in barriers to migration to and from the SACs. Further, Subsea Noise from piling will be short term and intermittent during the construction phase of the different Tier 2 and 3 projects, with many not overlapping temporally with the construction phase of the Proposed Development. As above for injury and mortality, there is therefore negligible risk of disruption to migration of Atlantic salmon due to behavioural disturbance. Therefore, this potential impact will not prevent the populations of this species from being restored or maintained as a viable component of the SACs or the distributions or genetic diversity of this species from being maintained or restored throughout the SACs.
		2b. maintain/restore the distribution of the species throughout the site.	

SAC	Feature	Conservation Objectives	Conclusion
		2c. maintain/restore the habitats supporting the species within the site and availability of food.	There is no pathway for In-Combination Effects between Subsea Noise generated during the construction phase of the Proposed Development and by the Tier 2 and 3 projects, and the habitats that support Atlantic salmon within the SAC and the availability of food. With respect to availability of food, Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report concluded that for prey species of Atlantic salmon potential impacts from in-combination Subsea Noise would be of minor adverse significance, which is not significant in EIA terms, with the exception of herring, which was concluded to be of moderate adverse significance. Although, there is evidence that adult Atlantic salmon may prey on herring, herring is predicted to form only a very small proportion of Atlantic salmon's diet and Atlantic salmon are predicted to be able to switch prey to other small fish species if required. Therefore, this in-combination impact will not prevent the habitats within the SACs and the availability of food from being maintained or restored.
River South Esk SAC River Dee SAC River Spey SAC	Freshwater pearl mussel	2a. restore/maintain the population of species as a viable component of the site.	As a freshwater resident species, there is no direct pathway for In-Combination Effects associated with Subsea Noise and the population and distribution of freshwater pearl mussel within the SACs. As presented in the rows above for Atlantic salmon, Subsea Noise during the construction phase will not lead to significant mortality or injury to Atlantic salmon and is unlikely to result in barriers to migration. Therefore, it can also be concluded that in-combination Subsea Noise will not indirectly prevent the populations of this species from being restored as a viable component of the SACs or the distributions of this species from being restored or maintained throughout the SACs screened in.
		2b. restore/maintain the distribution of the species throughout the site.	
		2c. restore/maintain the habitats supporting the species within the site and availability of food.	As above for Atlantic salmon, there is no in-combination pathway for impact between Subsea Noise generated during the construction phase of the Proposed Development and the habitats that support freshwater pearl mussel and availability of food. Therefore, this in-combination effect will not prevent the habitats within the SACs and availability of food from being restored or maintained.

SAC	Feature	Conservation Objectives	Conclusion
		2d. maintain/restore the distribution and viability of freshwater pearl mussel host species and their supporting habitats.	As presented in the rows above for Atlantic salmon, this in-combination effect will not prevent the distribution and viability of freshwater pearl mussel host species (Atlantic salmon) and its supporting habitats from being maintained or restored.
River Tay SAC	Sea lamprey	2a. maintain the population of sea lamprey as a viable component of the site.	As detailed by the results of the Subsea Noise modelling for the Proposed Development alone, Sea lamprey within close proximity to piling and UXO clearance of the Tier 2, 3 and 4 projects may experience injury or mortality (see Table 5.25). Sea lamprey are highly mobile and may only use the marine environment encompassing the Proposed Development to pass through during migration to and from their natal rivers. As such, and with additional consideration of the Embedded Mitigation measures, including the use of soft start piling procedures and low order UXO detonation (Table 5.4), significant mortality or injury to this species is not predicted. These Embedded Mitigation measures are based on stakeholder advice and considered standard practice across the offshore wind industry. Therefore, it is considered likely that they would be adopted as standard across the Tier 2, 3 and 4 projects. Therefore, this potential in-combination impact will not prevent the populations of this species from being maintained as a viable component of this SAC or the distributions or genetic diversity of this species from being maintained throughout the SAC. Sea lamprey may also experience behavioural effects in response to piling associated with the Proposed Development in-combination with other projects. However, Subsea Noise modelling for the Proposed Development alone and that detailed in Table 5.25 for the Tier 2 projects indicates these effects would not result in barriers to migration to and from this SAC. Further, Subsea Noise from piling will be short term and intermittent during the construction phase of the different Tier 2, 3 and 4 projects, with many not overlapping temporally with the construction phase of the Proposed Development. As above for injury and mortality, there is therefore negligible risk of disruption to migration of Sea lamprey due to behavioural disturbance. Therefore, this in-combination effect will
		2b. maintain the distribution of sea lamprey throughout the site.	

SAC	Feature	Conservation Objectives	Conclusion
			not prevent the populations of this species from being maintained as a viable component of this SAC or the distributions or genetic diversity of this species from being maintained throughout the SAC.
		2c. maintain the habitats supporting sea lamprey within the site and availability of food.	There is no pathway for In-Combination Effects between Subsea Noise generated during the construction phase of the Proposed Development and by the Tier 2, 3 and 4 projects, and the habitats that support sea lamprey within the SAC and the availability of food. Therefore, this in-combination impact will not prevent the habitats within the SAC and the availability of food from being maintained.

Impacts to Fish and Shellfish Receptors due to EMF (in-combination)

- 5.4.25 The LSE assessment during the HRA Stage One screening process identified that, LSE could not be ruled out for impacts to fish and shellfish receptors due to EMF in the O&M phase of the Proposed Development in-combination with other projects for all six SACs screened in for Annex II Diadromous Fish and shellfish (see Table 3.1).
- 5.4.26 The MDS considered for in-combination assessment is shown in Table 5.27. There are no Embedded Mitigation measures available for this impact.

Table 5.27: MDS Considered for the Assessment of Potential Impacts to Annex II Diadromous Fish and Shellfish due to EMFs in the O&M Phase of the Proposed Development In-Combination with Other Projects

Proposed Development Phase	Tier	MDS
O&M	1	No projects identified with in-combination impact pathways.
	2	The MDS is as detailed for the Proposed Development alone in Table 5.20 in-combination with the following projects as per Table 5.28: - Offshore Wind Projects and Associated Cables: - Kincardine OWF (O&M phase); - Seagreen 1 OWF (O&M phase); - Seagreen Phase 1A OFTO (O&M phase); - Aberdeen OWF (O&M phase); - Ossian OWF (O&M phase); - Berwick Bank OWF (O&M phase); - Berwick Bank OFTO (Cambois Connection) (O&M phase); and - Hywind Scotland OWF (O&M phase). - Cables and Pipelines: - Eastern Green Link 2 (O&M phase).
	3	The MDS is as detailed for the Proposed Development alone in Table 5.20 in-combination with the following projects as per Table 5.28: - Tier 2 Projects. - Offshore Wind Projects and Associated Cables: - Morven Hawthorn Pit Grid Connection Project (O&M phase); - Morven North OWF (O&M phase); - Ossian Transmission Infrastructure (O&M phase); and - Morven South OWF (O&M phase). - Cables and Pipelines: - Eastern Green Link 3 (O&M phase); and - CNSE Project (O&M phase).

Proposed Development Phase	Tier	MDS
	4	The MDS is as detailed for the Proposed Development alone in Table 5.20 in-combination with the following projects as per Table 5.28: • Tier 2 and 3 Projects. • Offshore Wind Projects and Associated Cables: • Flora Floating Wind Farm (O&M phase).

In-combination Assessment

- 5.4.27 There is potential for EMFs to be produced by subsea electrical cables associated with the Proposed Development and the other projects during their O&M phases.

Tier 2

- 5.4.28 There were ten Tier 2 projects with the potential for EMF In-Combination Effects during the O&M phase of the Proposed Development (Table 5.27). As for the Proposed Development alone, subsea cables associated with these Tier 2 projects could release EMFs into the marine environment. The maximum cumulative length of subsea cables of the Tier 2 projects together with the Proposed Development is estimated at up to 6,964 km (Table 5.27).
- 5.4.29 Other cable parameters, such as voltage and burial depth, vary between the Proposed Development and the Tier 2 projects and are not possible to combine into one in-combination value, unlike maximum cable lengths. However, cable burial and/or cable protection measures are outlined within the RIAAs and EIAs for the Tier 2 projects.
- 5.4.30 EMFs emitted by subsea cables are influenced by a variety of design and installation factors, including distance between cables, cable sheathing, number of conductors, and internal cable configuration. The intensity of EMF from subsea cables decreases at approximately the inverse square/power of the distance away from the cable (Hutchison *et al.*, 2021). This attenuation is applicable to buried, unburied, and Dynamic Cables (Hutchison *et al.*, 2021). Therefore, EMFs produced by the Tier 2 projects are likely to be highly localised to within metres to tens of metres from cables, and no barriers to migration are likely to occur.

Table 5.28: Potential Sources of EMFs for the Tier 2 Projects within the O&M Phase of the Proposed Development

Project	MDS	Source of EMF	Reference
Proposed Development	397 km of cable: 151 km IACs (75.5 km buried), 36 km Interconnector Cables, and 210 km Export Cables (105 km buried).	See Table 5.20	N/A
Offshore Wind Projects and Associated Cables			
Kincardine OWF	O&M: 60 km In the AA, MS-LOT (now MD-LOT) concluded that this project overall, in-combination or alone, will not adversely affect site integrity of SACs assessed with respect to Atlantic salmon and freshwater pearl mussel.	IACs and Export Cables.	(Kincardine OWF Limited, 2016a, 2017; SSE Renewables, 2022)
Seagreen 1 OWF	O&M: 1,200 km No Annex II diadromous fish and shellfish qualifying features were assessed in the Seagreen 1 OWF HRA.	IACs cables and offshore Export Cable.	(Seagreen Wind Energy Limited, 2012, 2018a, b)
Seagreen Phase 1A OFTO	O&M: 110 km	Export Cable.	(Seagreen 1A, 2021)
Aberdeen OWF	O&M: 39 km The Information to Inform a HRA for this project predicted no adverse effects on the Annex II Diadromous Fish and shellfish features of the SACs assessed (some of which overlap with those assessed for the Proposed Development).	IACs and offshore Export Cable.	(European Offshore Wind Deployment Centre, 2011a, d)

Project	MDS	Source of EMF	Reference
Ossian OWF	O&M: 1,524 km The RIAA for this project predicted no adverse effects on the Annex II Diadromous Fish and shellfish features of the SACs assessed (some of which overlap with those assessed for the Proposed Development).	IACs and Interconnector Cables.	(Ossian OWFL, 2024b)
Berwick Bank OWF	O&M: 2,097 km The RIAA for this project predicted no adverse effects on the Annex II Diadromous Fish and shellfish features of the SACs assessed (some of which overlap with those assessed for the Proposed Development).	IACs and Offshore Export Cables.	(Berwick Bank Wind Farm Ltd., 2022; SSE Renewables, 2022)
Berwick Bank OFTO (Cambois Connection)	O&M: 160 km (in Scottish waters) The RIAA for this project predicted no adverse effects on the Annex II Diadromous Fish and shellfish features of the SACs assessed (some of which overlap with those assessed for the Proposed Development).	Four 40 km HVDC cables (symmetrical monopole) or two 40 km HVDC cables (bipole).	(European Offshore Wind Deployment Centre, 2011a, d; SSE Renewables, 2023a, b)
Hywind Scotland OWF	O&M: 50 km The HRA adverse effects on the Annex II Diadromous Fish and shellfish features of the SACs assessed (some of which overlap with those assessed for the Proposed Development).	IACs and offshore Export Cable.	Statoil (2015a)

Project	MDS	Source of EMF	Reference
Cables and Pipelines			
Eastern Green Link 2	O&M: 436 km The HRA for this project predicted no adverse effects on the Annex II Diadromous Fish and shellfish features of the SACs assessed (some of which overlap with those assessed for the Proposed Development).	Interconnector Cable.	(National Grid, 2022a, b)
Total cable length (Proposed Development and Tier 2 projects)	6,073 km		

Tier 3

5.4.31 In addition to the Tier 2 projects, there were six Tier 3 projects identified with a potential for In-Combination Effects during the O&M phase of the Proposed Development:

- Morven Hawthorn Pit Grid Connection Project (O&M phase);
- Morven North OWF (O&M phase);
- Ossian Transmission Infrastructure (O&M phase);
- Morven South OWF (O&M phase);
- Eastern Green Link 3 (O&M phase); and
- CNSE Project (Table 5.27).

5.4.32 As Tier 3 projects, there were no specific cable parameters publicly available to inform the assessment of In-Combination Effects (e.g. lengths of cables, burial depths, cable protection). However, cable burial and/or cable protection measures are likely to be included within these projects as industry standard.

5.4.33 As discussed in Paragraph 5.4.30 EMFs emitted by subsea cables attenuate with distances away from the cable (Hutchison *et al.*, 2021). EMFs produced are likely to be highly localised to within metres to tens of metres from cables, and no barriers to migration are likely to occur.

Tier 4

5.4.34 In addition to the Tier 2 and 3 projects, the only Tier 4 project identified with a potential for In-Combination Effects was Flora Floating Wind Farm (in the construction and O&M phases). As the Flora Floating Wind Farm is currently in the pre-application stage there is little known about the potential impacts associated with the project. It is, however, likely the In-Combination Effects will be similar to that of Ossian OWF which is also a floating project but on a smaller scale as Ossian OWF has a capacity of 3.6 GW and the Flora Floating Wind Farm has a maximum capacity of 50 MW (North Sea Transmission Authority, 2025).

5.4.35 As discussed in Paragraph 5.4.30 EMFs emitted by subsea cables attenuate with distances away from the cable (Hutchison *et al.*, 2021). EMFs produced are likely to be highly localised to within metres to tens of metres from cables, and no barriers to migration are likely to occur.

Operation and Maintenance Phase

5.4.36 Potential effects from the Proposed Development on the relevant conservation objectives of the six SACs screened in for Annex II Diadromous Fish and shellfish are presented in Table 5.22. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 5.22.

River South Esk SAC, River Dee SAC and River Spey SAC

- 5.4.37 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon and freshwater pearl mussel features of the River South Esk SAC (as presented in Paragraphs 5.2.18 and 5.2.19), River Dee SAC (as presented in Paragraphs 5.2.25 and 5.2.26) and River Spey SAC (as presented in Paragraphs 5.2.46 and 5.2.47) are presented in Table 5.29.

Atlantic Salmon

- 5.4.38 As presented for the assessment of the Proposed Development alone (Section 5.3), this potential impact was not predicted to cause an adverse effect on integrity of the Atlantic salmon feature of these SACs. Based on the Tier 2, 3, and 4 assessments presented in Paragraphs 5.4.28 to 5.4.35, this conclusion is also applicable to the In-Combination assessment. Whilst any In-Combination Effects will be continuous and persist over the life cycles of each project, they are likely to be highly localised in extent (i.e. within metres to a maximum of tens of metres from cables). Therefore, any In-Combination Effects associated with EMFs will be confined to the immediate vicinity of cables associated with the Tiers 2, 3 and 4 projects. For projects with only seabed cables and no dynamic (suspended) cables, the In-combination Effect will be further reduced because Diadromous Fish are pelagic in offshore waters and therefore unlikely to come into contact with cables. Finally, it is likely that all the Tier 2, 3, and 4 projects will include cable burial and protection, where relevant (i.e. dynamic cables will not be buried), which will further reduce the distance between cables and migrating Diadromous Fish species.

Freshwater Pearl Mussel

- 5.4.39 As discussed for the assessment of the Proposed Development alone (Section 5.3), adult freshwater pearl mussel are confined to freshwater environments, and so there is therefore no pathway for direct effects associated with In-Combination Effects from EMF during the O&M phase. Indirect impacts on the larval stage of freshwater pearl mussel may, however, arise if Atlantic salmon (their host species) are impacted. As detailed in Paragraph 5.4.38, injury, disturbance, and barriers to migration of Atlantic salmon are unlikely to occur from the Proposed Development in-combination with other projects. Therefore, it can also be concluded that there will be no indirect impact to freshwater pearl mussel.

River Tay SAC

- 5.4.40 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon and sea lamprey features of the River Tay SAC (as presented in Paragraphs 5.2.32 and 5.2.33) are presented in Table 5.29.

Atlantic Salmon

- 5.4.41 As presented for the assessment of the Proposed Development alone (Section 5.3), this potential impact was not predicted to cause an adverse effect on integrity of the Atlantic salmon feature of this SAC. Based on the Tier 2, 3, and 4 assessments presented in Paragraphs 5.4.28 to 5.4.35, this conclusion is also applicable to the In-Combination assessment. Whilst any In-Combination

Effects will be continuous and persist over the life cycles of each project, they are likely to be highly localised in extent (i.e. within metres to a maximum of tens of metres from cables). Therefore, any In-Combination Effects associated with EMFs will be confined to the immediate vicinity of cables associated with the Tiers 2, 3 and 4 projects. For projects with only seabed cables and no dynamic (suspended) cables, the In-combination effect will be further reduced because Diadromous Fish are pelagic in offshore waters and therefore unlikely to come into contact with cables. Finally, it is likely that all the Tier 2, 3, and 4 projects will include cable burial and protection, where relevant (i.e. dynamic cables will not be buried), which will further reduce the distance between cables and migrating Diadromous Fish.

Sea Lamprey

- 5.4.42 As presented for the assessment of the Proposed Development alone (Section 5.3), this potential impact was not predicted to cause an adverse effect on integrity to the sea lamprey feature of this SAC. Based on the Tier 2, 3 and 4 assessments presented in Paragraphs 5.4.6 to 5.4.14, this conclusion is also applicable to the In-Combination assessment. There were no Tier 1 projects identified for in-combination assessment for this impact (see Table 5.29). Whilst any In-Combination Effects will be continuous and persist over the life cycles of each project, they are likely to be highly localised in extent (i.e. within metres to a maximum of tens of metres from cables). Therefore, any In-Combination Effects associated with EMFs will be confined to the immediate vicinity of cables associated with the Tiers 2, 3 and 4 projects. For projects with only seabed cables and no dynamic (suspended) cables, the In-combination effect will be further reduced because Diadromous Fish are pelagic in offshore waters and therefore unlikely to come into contact with cables. Finally, it is likely that all the Tier 2, 3, and 4 projects will include cable burial and protection, where relevant (i.e. dynamic cables will not be buried), which will further reduce the distance between cables and migrating Diadromous Fish.

River Tweed SAC and River Teith SAC

- 5.4.43 Potential effects from the Proposed Development on the relevant conservation objectives of the Atlantic salmon feature of the River Tweed SAC (as presented in Paragraph 5.2.39) and River Teith SAC (as presented in Paragraph 5.2.53) are presented in Table 5.29.

Atlantic Salmon

- 5.4.44 As presented for the assessment of the Proposed Development alone (Section 5.3), this potential impact was not predicted to cause an adverse effect on integrity of the Atlantic salmon feature of these two SACs. Based on the Tier 2, 3, and 4 assessments presented in Paragraphs 5.4.28 to 5.4.35, this conclusion is also applicable to the in-combination assessment. Whilst any In-Combination Effects will be continuous and persist over the life cycles of each project, they are likely to be highly localised in extent (i.e. within metres to a maximum of tens of metres from cables). Therefore, any In-Combination Effects associated with EMFs will be confined to the immediate vicinity of cables associated with the Tiers 2, 3 and 4 projects. For projects with only seabed cables and no dynamic (suspended) cables, the In-combination effect will be

further reduced because Diadromous Fish are pelagic in offshore waters and therefore unlikely to come into contact with cables. Finally, it is likely that all the Tier 2, 3, and 4 projects will include cable burial and protection, where p relevant (i.e. dynamic cables will not be buried), which will further reduce the distance between cables and migrating Diadromous Fish.

Conclusion

- 5.4.45 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II Diadromous Fish and shellfish as a result of impacts due to EMF with respect to the O&M phase of the Proposed Development in-combination with other projects.

Table 5.29: Conclusions Against the Conservation Objectives of the SACs Screened in for In-Combination Assessment of Impacts due to EMF during the O&M Phase

SAC	Feature	Conservation Objectives	Conclusion
River South Esk SAC River Dee SAC River Tay SAC River Tweed SAC River Spey SAC River Teith SAC	Atlantic salmon	2a. maintain/restore the population of Atlantic salmon, including range of genetic types, as a viable component of the site.	For the Proposed Development and the Tier 2, 3 and 4 projects, any effects of EMF from subsea cables will be highly localised. In addition, for Tier 2 projects, no adverse effects on the integrity of Annex II Diadromous Fish and shellfish features were concluded (see Table 5.28). Therefore no barrier to migration for Atlantic salmon when considered in-combination with the other identified plans and projects is anticipated, and this potential In-combination Effect will not prevent the population of this species from being restored as a viable component of the SACs or the distributions or genetic diversity of this species from being maintained or restored throughout the SACs.
		2b. maintain/restore the distribution of the species throughout the site.	
		2c. maintain/restore the habitats supporting the species within the site and availability of food.	
River South Esk SAC River Dee SAC River Spey SAC	Freshwater pearl mussel	2a. restore/maintain the population of species as a viable component of the site.	As a freshwater resident species, there is no direct pathway of impact associated with EMF and the population and distribution of freshwater pearl mussel within these SACs. As presented in the rows above for Atlantic salmon, EMF in the O&M phase of the Proposed Development will not lead to significant mortality or injury to Atlantic salmon and is unlikely to result in barriers to migration. Therefore, it can be concluded that there will be no In-Combination
		2b. restore/maintain the distribution of the species throughout the site.	

SAC	Feature	Conservation Objectives	Conclusion
			Effects associated with EMF which could hinder these conservation objectives for these SACs.
		2c. restore/maintain the habitats supporting the species within the site and availability of food.	As presented previously for Atlantic salmon, there is no pathway of impact between EMF generated during the O&M phase of the Proposed Development and the habitats that support freshwater pearl mussel and its availability of food. Therefore, it can be concluded that there will be no In-Combination Effects associated with EMF which could hinder the conservation objectives for these SACs.
		2d. maintain/restore the distribution and viability of freshwater pearl mussel host species and their supporting habitats.	As presented previously for Atlantic salmon, this impact, in-combination with other projects identified, will not prevent the distribution and viability of freshwater pearl mussel host species (Atlantic salmon) and its supporting habitats from being maintained or restored.
River Tay SAC	Sea lamprey	2a. maintain the population of sea lamprey as a viable component of the site.	Any effects of EMF from subsea electrical cabling will be highly localised within the marine environment encompassing the Proposed Development. There is therefore no barrier to migration for sea lamprey, and this impact, in-combination with other projects identified, will not prevent the population of sea lamprey from being maintained as a viable component of this SAC or the distributions of this species from being maintained throughout the SAC.
		2b. maintain the distribution of sea lamprey throughout the site.	
		2c. maintain the habitats supporting sea lamprey within the site and availability of food.	There is no pathway for impact between EMFs from subsea electrical cables and the habitats that support sea lamprey within the SACs and availability of food. Therefore, this potential impact, in-combination with the other projects identified, will not prevent the habitats within the SAC and availability of food from being maintained.

6 Assessment of Potential Adverse Effects on Integrity: Annex II Marine Mammals

6.1 Introduction

- 6.1.1 This section provides background information and explanation for the approach taken to assess the potential impacts of the Proposed Development on European sites designated for Annex II marine mammals.
- 6.1.2 As stated in Section 3.1, the potential for LSE was identified for the Annex II marine mammal features of four SACs, which are listed in Table 6.1 and Figure 6.1.

Table 6.1: European Sites Designated for Annex II Marine Mammal Features for which an Appropriate Assessment is Required

Site	Feature of Potential Impact	Period of Potential Impact
Firth of Tay and Eden Estuary SAC	Harbour seal	Construction, O&M and decommissioning phases
Isle of May SAC	Grey seal	
Berwickshire and North Northumberland Coast SAC	Grey seal	
Moray Firth SAC	Bottlenose dolphin	

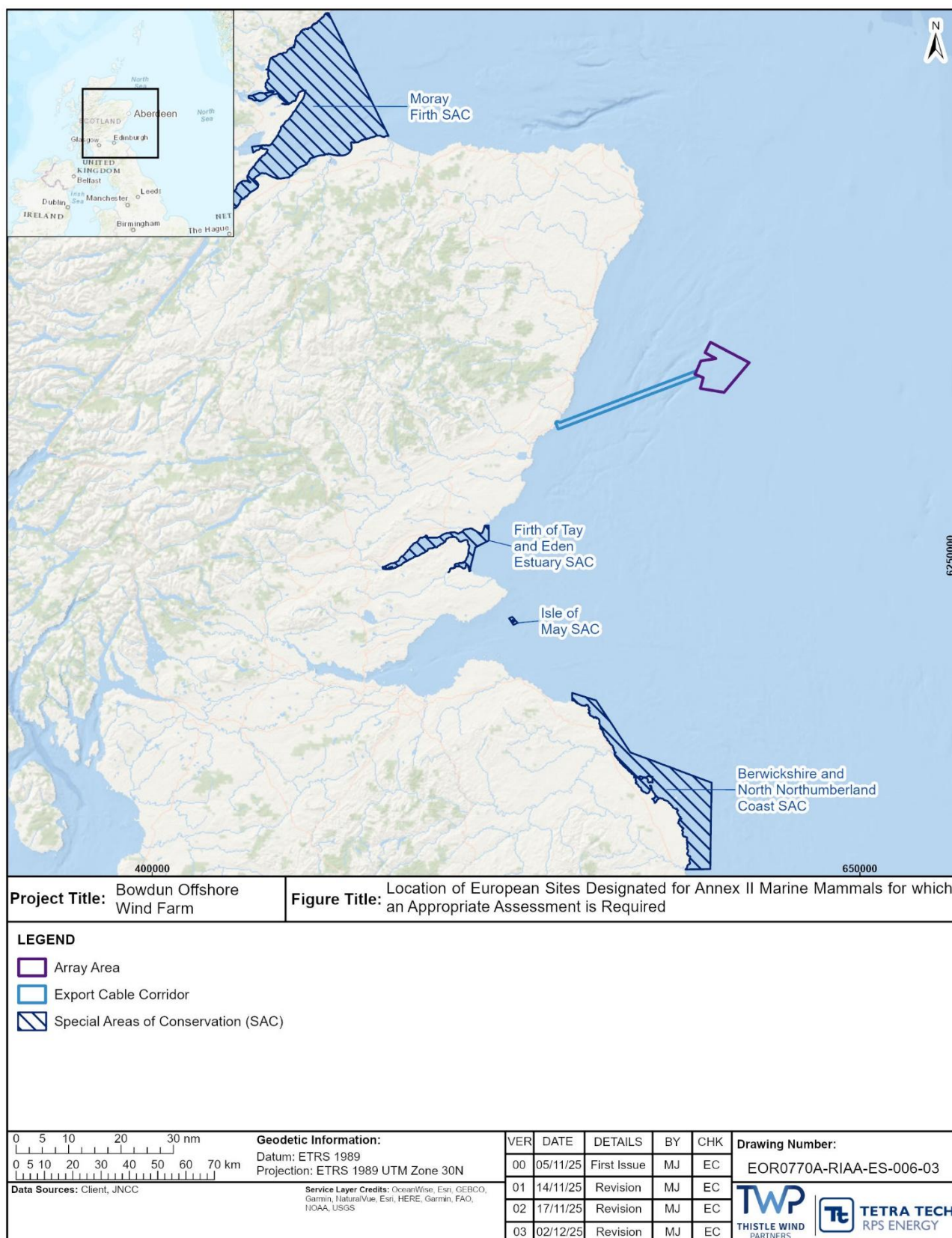


Figure 6.1: Location of European Sites Designated for Annex II Marine Mammals for which an Appropriate Assessment is Required

6.1.3 Potential impact pathways for the SACs presented in Table 6.1 were identified for construction, O&M and decommissioning phases of the Proposed Development and outlined below in Table 6.2.

Table 6.2: Potential Impacts to Annex II Marine Mammals of the European Sites Identified for Appropriate Assessment

Proposed Development Phase	Potential Impact
Construction	• injury and disturbance from Subsea Noise generated during piling (alone and in-combination); • injury and disturbance from Subsea Noise generated during UXO clearance (alone and in-combination); • injury and disturbance from Subsea Noise generated during site investigation surveys (alone and in-combination); • injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities (alone and in-combination); and • effects on marine mammals due to altered prey availability (alone and in-combination).
O&M	• injury and disturbance from Subsea Noise generated during site investigation surveys (alone and in-combination); • injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities (alone and in-combination); and • effects on marine mammals due to altered prey availability (alone and in-combination).
Decommissioning	• injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities (alone and in-combination); and • effects on marine mammals due to altered prey availability (alone and in-combination).

6.2 Baseline

6.2.1 Baseline information on the relevant screened in Annex II marine mammals has been gathered through a comprehensive desktop study of existing datasets and materials and site-specific DAS. Full detail on the ecology of these features is provided in Volume 3, Technical Appendix 10.1: Marine Mammal Technical Report (TWP-BOW-RPS-OFE-RPT-00017) of the Offshore EIA Report.

Qualifying Feature Accounts

Harbour Seal

6.2.2 Harbour seals typically weigh between 80 kg and 100 kg, with adults approximately 1.5 m in length (NatureScot, 2024a) and are the smaller of the two species of pinniped that breed in the UK (SCOS, 2021). Harbour seals become sexually mature at four to six years old for males and three to five years of age for females (Lowry, 2016). Harbour seals are long-lived animals with individuals estimated to live to between 20 and 30 years (NatureScot, 2024a; SCOS, 2022).

- 6.2.3 Harbour seals are central place foragers and come ashore in sheltered waters, often on sandbanks and in estuaries as well as rocky areas (NatureScot, 2024a; SCOS, 2021). This species requires haul-out sites on land for resting, moulting, and breeding, and they forage at sea. Harbour seals persist in discrete metapopulations and tend to stay within 50 km of the coast (Carter *et al.*, 2022), and within 40 km to 50 km of haul-out sites (NatureScot, 2024a), although most foraging trips are over shorter ranges (Russell and McConnell, 2014). As a result, their presence in the offshore waters is limited. To reduce time and energy searching for prey, animals are likely to travel directly to areas of previously or predictably high foraging success (Bailey *et al.*, 2014). Harbour seals are generalist feeders, and their diet varies seasonally and regionally (Hammond *et al.*, 2005).
- 6.2.4 Harbour seals breed in small groups scattered along the coastline, often returning to natal haul-out sites (NatureScot, 2024a). Breeding occurs in June and July and pups can swim almost immediately, having moulted their white coats prior to birth (NatureScot, 2024a). Although females will forage during lactation, the distances travelled at this time are more restricted than during other periods (NatureScot, 2024a; Thompson *et al.*, 1994). No recent harbour seal breeding surveys have been conducted in East Scotland. Moulting, another sensitive period for harbour seal, occurs between July and mid-September.
- 6.2.5 Harbour seals are found around the North Atlantic and north Pacific coasts from the subtropics to the Arctic (JNCC, 2025h; SCOS, 2021). There are approximately 100,000 harbour seals in Europe, with the largest population of harbour seals in Europe in the Wadden Sea (NatureScot, 2024a). Currently, approximately 30% of the eastern Atlantic harbour seal population are found in the UK (SCOS, 2024), with 85% of the UK harbour seal population present in Scottish waters (NatureScot, 2024a). Harbour seals are widespread around the west coast of Scotland and throughout the Hebrides and Northern Isles. On the east coast, their distribution is more restricted (NatureScot, 2024a), with concentrations in the major estuaries of the Thames, the Wash, the Firths of Forth and Tay, and the Moray Firth.
- 6.2.6 Major declines have been documented in several harbour seal populations along the east coast of England and around Scotland. Only three harbour seals were recorded during the site-specific DAS surveys (Volume 3, Technical Appendix 10.2: Marine Mammal Digital Aerial Survey Report (TWP-BOW-RPS-OFE-RPT-00016) of the Offshore EIA Report). Density estimates reported by Carter *et al.* (2025) are considered the most appropriate to use to reflect densities of harbour seal in the offshore waters where the Site Boundary is located and a density of 0.009 animals per km² has been used in this Stage 2 assessment (see Paragraph 6.4.45 in Volume 3, Technical Appendix 10.1: Marine Mammal Technical Report (TWP-BOW-RPS-OFE-RPT-00017) of the Offshore EIA Report for more details regarding the most appropriate density value to be taken forward to the assessment).

Grey Seal

- 6.2.7 Grey seal is the larger of the two pinniped species that occur around UK. Males can weigh up to 300 kg (NatureScot, 2024a), and females weigh up to 200 kg. The average lifespan for this species is between 20 and 30 years, however, females tend to live longer than males. Females mature between three and five years old, and males around six years, although they are probably not socially mature until eight years old (Hall and Thompson, 2009).
- 6.2.8 Grey seal breed, rest, moult and engage in social activity at haul-out sites, which are usually on land but may occur at sea on exposed sandbanks. The east coast of Scotland provides important breeding and haul-out habitats for grey seal (SCOS, 2022). Female grey seals tend to return to the same breeding site at which they were born to give birth. Preferred breeding locations in the UK include remote, uninhabited islands or coasts and a small number in caves (SCOS, 2021). These sites allow females with young pups to move away from busy beaches and storm surges inland. Grey seals may also breed on exposed, cliff-backed beaches, but these locations limit the opportunity to avoid storm surges, and it may result in higher levels of pup mortality (SCOS, 2021). In the UK, grey seal breed in the autumn, but there is a clockwise cline in the mean birth date around the UK (SCOS, 2021). In East Scotland pupping occurs between August and December, and in Eastern England, pupping occurs mainly between early November to mid-December. Grey seals give birth to a single, white-coated pup, which is weaned over a period of 17 to 23 days (SCOS, 2021). Pups shed their white natal coat (lanugo) and develop their first adult coat, with moult occurring when weaning, after which pups remain on the breeding colony for up to two to three weeks before going to sea. Following this, the female comes into oestrus and mating occurs, after which adult females return to sea to forage and build up fat reserves.
- 6.2.9 Along the Scottish coast, grey seal exhibit offshore foraging behaviour (Damseaux *et al.*, 2021), foraging in the open sea, returning to land regularly to haul-out. Foraging trips can be wide-ranging. However, tracking studies have shown that most foraging is likely to occur within 100 km of a haul-out site (SCOS, 2021). Movement of grey seals have been observed between haul-out sites in the North Sea and haul-out sites in the Western Isles SMU (SCOS, 2024). Grey seal therefore does not have the same site fidelity as seen in harbour seal. However, during breeding season, grey seals tend to exhibit restricted foraging, to within 20 km from the breeding site (pers. comm. with NatureScot). Grey seals have a selective diet. A study on the diet of grey seals in Scottish waters found that 50% of prey items were plaice *Pleuronectes platessa* and sole *Solea solea* and 46% of prey items were sandeels *Ammodytidae* (Damseaux *et al.*, 2021). Hammond *et al.* (2005) also highlighted that the grey seal diet comprises primarily sandeels, gadoids and flatfish (in order of importance) but varying seasonally and from region to region.

- 6.2.10 Globally, grey seals concentrate in three regions: Eastern Canada and the North-East USA, around the coast of the UK, especially in Scottish coastal waters, and the Baltic Sea. All populations are known to be increasing, with the most recent estimates of pup production approximately 75,950 pups, with over 95% produced in Scotland and the east coast of England (SCOS, 2024). Grey seals were observed in high numbers during the DAS with no clear temporal trends visible in monthly surveys (Volume 3, Technical Appendix 10.2: Marine Mammal Digital Aerial Survey Report (TWP-BOW-RPS-OFE-RPT-00016) of the Offshore EIA Report). The DAS Area the design-based approach gave a mean absolute density estimate of as 0.120 animals per km², while the overall model-based mean density estimate was 0.056 animals per km². For the Extended DAS Area (DAS area extended to the coast from April to August), the mean design-based absolute density was 0.332 animals per km². The density estimate derived from Carter *et al.* (2022) for the Local Marine Mammal Study Area³ of 0.56 animals per km² is more precautionary than both the equivalent density estimate derived from Carter *et al.* (2025) and the design-based (absolute) density estimate from the site-specific DAS data. Therefore, a density of 0.056 animals per km² has been used in this Stage 2 assessment (see Paragraph 6.4.29 in Volume 3, Technical Appendix 10.1: Marine Mammal Technical Report (TWP-BOW-RPS-OFE-RPT-00017) of the Offshore EIA Report for more details regarding the most appropriate density value to be taken forward to the assessment).

Bottlenose Dolphin

- 6.2.11 Bottlenose dolphin is a member of the family Delphinidae (oceanic dolphins), which are odontocete cetaceans found in temperate and tropical waters worldwide. This species is the largest of the beaked dolphins and can reach up to 4 m when full grown (NatureScot, 2024b). Bottlenose dolphin can live on average between 20 to 30 years, and may live up to 50 years (NatureScot, 2024b). On average, males reach sexual maturity at ten to 12 years and females at five to ten years. Mating occurs during the summer months, with gestation taking 12 months and calves suckling for 18 to 24 months. Females generally reproduce every three to six years (Mitcheson, 2008; Vollmer and Rosel, 2013).
- 6.2.12 The distribution of this species is influenced by factors such as tidal state, weather conditions, resource availability, life cycle stage, or season (Hastie *et al.*, 2004), and there is variation in the patterns of habitat use, even within a population. Distribution is further influenced by the availability of their primary prey, which includes cod, saithe *Pollachius virens*, whiting *Merlangius merlangus*, haddock *Melanogrammus aeglefinus* and Atlantic salmon (Boyse *et al.*, 2024).

³ As defined in Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) of the Offshore EIA Report as “the Site Boundary plus a 12 km buffer”.

- 6.2.13 Bottlenose dolphins are more frequently seen in groups rather than individually, although group size in inshore populations may be smaller than in offshore populations. Two distinct ecotypes of bottlenose dolphin are recognised in UK waters, a wide-ranging offshore ecotype (offshore population), and an inshore ecotype (coastal population). The Export Cable Corridor is located within the Coastal East Scotland MU, associated with the coastal population. The Array Area and a small section of the Export Cable Corridor are located in the Greater North Sea MU, associated with the offshore ecotype. However, this assessment focuses on the coastal bottlenose dolphin population as the Coastal East Scotland MU population is considered to be functionally linked to the Moray Firth SAC (Paragraph 6.2.37). In the Northern North Sea, only the inshore population, distributed within the 2 m to 20 m depth contour and approximately 2 km from the shore, is well studied (Geelhoed *et al.*, 2022).
- 6.2.14 There were 12 bottlenose dolphins recorded during site-specific DAS for the Proposed Development (Volume 3, Technical Appendix 10.2: Marine Mammal Digital Aerial Survey Report (TWP-BOW-RPS-OFE-RPT-00016) of the Offshore EIA Report). Lacey *et al.* (2022) maps reflect the inshore distribution of the Coastal East Scotland MU bottlenose dolphin population. Moreover, it should be noted that Lacey *et al.* (2022) used SCANS III data alongside the environmental covariates such as depth and slope in the density surface modelling. Depth is an important predictor for bottlenose dolphin distribution. The density estimate derived from Lacey *et al.* (2022) was taken forward to the assessment, as it reflects the best available data in terms of both methodological robustness and ecological relevance for bottlenose dolphins in inshore waters. Figure 6.2 show the density of bottlenose dolphin within the Coastal East Scotland MU. Therefore, a density of 0.007 animals per km² has been used in this Stage 2 assessment (see Paragraph 6.2.49 in Volume 3, Technical Appendix 10.1: Marine Mammal Technical Report (TWP-BOW-RPS-OFE-RPT-00017) of the Offshore EIA Report for more details regarding the most appropriate density value to be taken forward to the assessment) as it is considered sufficiently precautionary for the Coastal East Scotland MU.

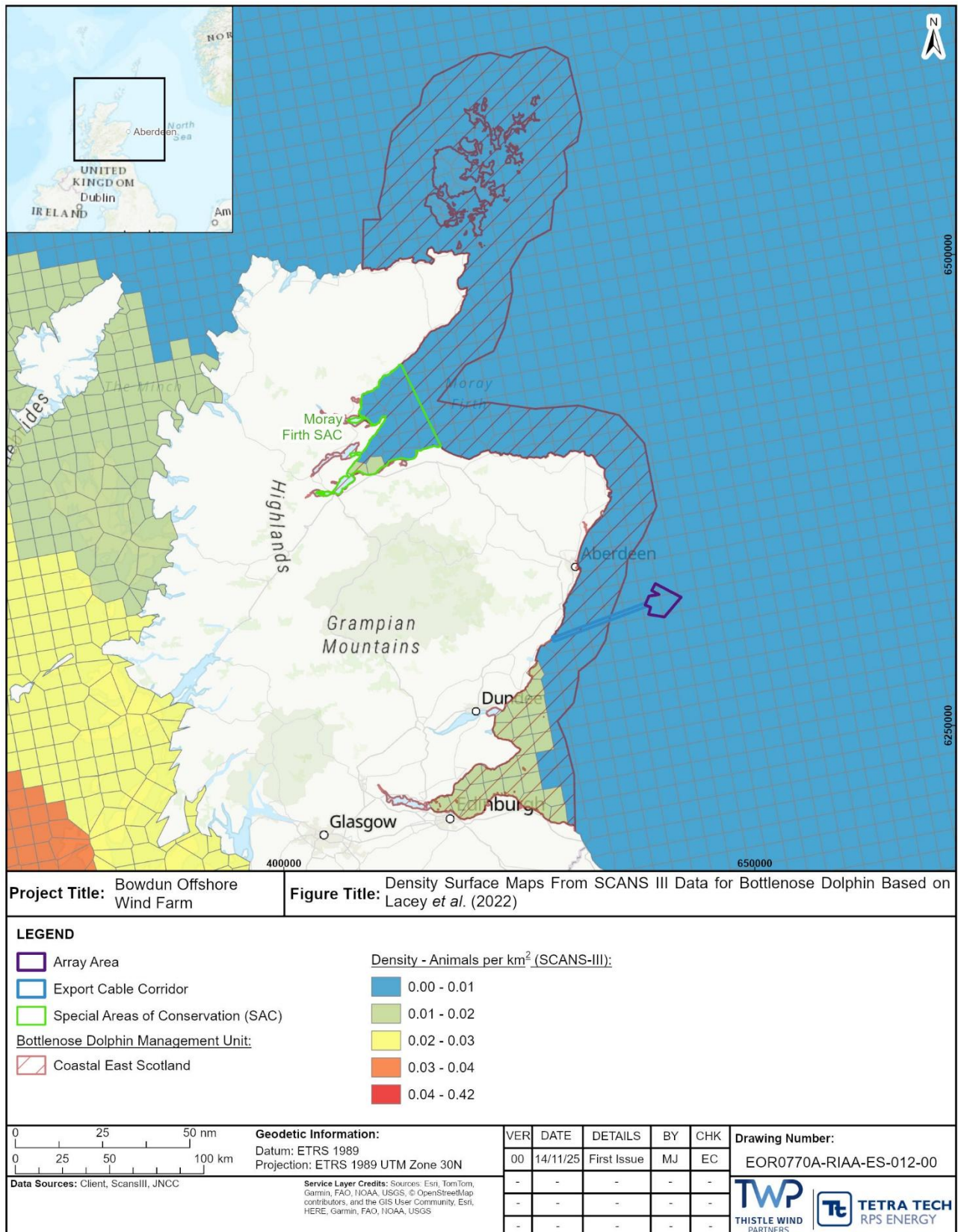


Figure 6.2: Density Surface Maps from SCANS III Data for Bottlenose Dolphin Based on Lacey *et al.*, 2022

Firth of Tay and Eden Estuary SAC

Site Description

- 6.2.15 Firth of Tay and Eden Estuary SAC is 42.3 km south-west of the Site Boundary at the closest point (to the Export Cable Corridor). The site consists of a high-quality estuary complex, which incorporates a mosaic of estuarine and coastal habitats, and encompasses an area of 154.4 km² (JNCC, 2025i). The SAC is considered “an example of a Northern North Sea estuary” (NatureScot, 2024c), with the Tay the least-modified of the large east coast estuaries in Scotland, while the Eden estuary represents a smaller ‘pocket’ estuary (JNCC, 2025i).
- 6.2.16 The harbour seal is the primary Annex II species underpinning the designation of Firth of Tay and Eden Estuary SAC, as the site supports haul-out habitat for breeding and moulting seals. The ecology of harbour seal is described in Paragraphs 6.2.2 to 6.2.6. The harbour seal population present in the Firth of Tay and Eden Estuary SAC is part of the East Scotland SMU, which is depleted and still declining (SCOS, 2024). The population estimate for the entire East Scotland SMU (scaled to account for those at sea at the time of the count) is 364 harbour seal, based on 2021 survey counts (SCOS, 2022). The population of the SAC represented around 16% of the East Scotland SMU in the 2021 count (SCOS, 2024). The SAC population has declined by over 90% since the early 2000s and no longer hosts the majority of harbour seals in the East Scotland SMU (SCOS, 2024). No site-reference population is set for harbour seal at the Firth of Tay and Eden Estuary SAC due to the variation and large scale fluctuations in harbour seal populations across Scotland so the abundance of the wider East Scotland SMU is considered within this assessment (NatureScot, 2024c).
- 6.2.17 The telemetry data confirmed that harbour seal usage within the Local Marine Mammal Study Area is limited. However, all nine tagged seals that showed usage of the Local Marine Mammal Study Area, also showed connectivity with the Firth of Tay and Eden Estuary SAC (all tagged in East Scotland SMU) (Marwood and Stevens, 2024).

Conservation Objectives

- 6.2.18 NatureScot developed the Firth of Tay and Eden Estuary SAC conservation objectives as part of the site’s CMA (NatureScot, 2024c). The overarching conservation objectives for this SAC are:
- 1. to ensure that the Qualifying Features of Firth of Tay and Eden Estuary SAC are in favourable condition and makes an appropriate contribution to achieving FCS; and
 - 2. to ensure that the integrity of Firth of Tay and Eden Estuary SAC is maintained in the context of environmental changes by meeting objectives 2a, 2b and 2c for each Qualifying Feature.

- 6.2.19 The specific conservation objectives for seek to maintain harbour seals within the Firth of Tay and Eden Estuary site and ensure:
- 2a. harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality;
 - 2b. the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance; and
 - 2c. the supporting habitats and processes relevant to harbour seal are maintained.

Condition Assessment

- 6.2.20 The condition of harbour seal was last assessed in 2024 (NatureScot, 2025b) as:
- unfavourable declining.
- 6.2.21 Harbour seal was assessed as being in unfavourable condition due to the overall decline in the number of seals using the site since the 1990s (approximately 95%) (Morris *et al.*, 2021). Reasons for the declines are unclear, although it is most likely that off-site factors such as predation, competition for prey, prey quality and availability, and toxin exposure from harmful algae are causing the decline in harbour seals using the Firth of Tay and Eden Estuary SAC (NatureScot, 2024c).
- 6.2.22 As the reasons for the decline in the SAC are considered to be off-site factors, the focus of the conservation objectives are that the conditions on the site are suitable to support a recovery should the population start to recover.

Isle of May SAC

Site Description

- 6.2.23 The Isle of May SAC is 68.3 km south-west of the Site Boundary at the closest point (to the Export Cable Corridor). The SAC lies at the entrance to the Firth of Forth and is predominantly marine (sea inlets), encompassing an area of 3.6 km² (JNCC, 2025j). The SAC is primarily designated for grey seal and supports the largest east coast breeding colony in Scotland (JNCC, 2025j). The ecology of grey seal is described in Paragraphs 6.2.7 to 6.2.10.
- 6.2.24 The grey seal population present in the Isle of May SAC is part of the East Scotland SMU (SCOS, 2024). No site-reference population is set for grey seal at the Isle of May SAC due to the variation and large scale fluctuations in grey seal populations across Scotland so the abundance of the wider East Scotland SMU is considered within this assessment (NatureScot, 2025d). Pup production in the East Scotland SMU is increasing, although pup production within the Isle of May SAC is declining and represents only about 25% of the total production within the SMU (SCOS, 2024). The latest population estimate for the East Scotland SMU (scaled to account for those at sea at the time of the count) is 10,784 grey seal, based on 2016 to 2019 survey counts (Marwood and Stevens, 2024).

- 6.2.25 The telemetry data suggests connectivity with the East Scotland SMU and the Local Marine Mammal Study Area. Connectivity between the Local Marine Mammal Study Area and the Isle of May SAC was observed by ten adult grey seals (Marwood and Stevens, 2024).

Conservation Objectives

- 6.2.26 NatureScot developed the Isle of May SAC conservation objectives as part of the site's CMA (NatureScot, 2025d). The overarching conservation objectives for this SAC are:
- 1. to ensure that the Qualifying Features of Isle of May SAC are in favourable condition and makes an appropriate contribution to achieving FCS; and
 - 2. to ensure that the integrity of Isle of May SAC is maintained or restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each Qualifying Feature.
- 6.2.27 The specific conservation objectives seek to maintain grey seals within the Isle of May site and ensure:
- 2a. grey seals are a viable component of the Isle of May SAC;
 - 2b. the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals; and
 - 2c. the supporting habitats relevant to grey seal are maintained.

Condition Assessment

- 6.2.28 The condition of grey seal was last assessed in 2024 (NatureScot, 2025b) as:
- favourable maintained.

Berwickshire and North Northumberland Coast SAC

Site Description

- 6.2.29 Berwickshire and North Northumberland Coast SAC is 93.4 km south-west of the Site Boundary at the closest point (to the Export Cable Corridor). The site is a diverse stretch of coastline in north-east England and South-East Scotland, stretching from Alnmouth to north of St Abbs head and includes marine sea inlets, mudflats and sandflats not covered by seawater at low tide, as well as submerged or partially submerged sea caves. It encompasses an area of 652.3 km² (JNCC, 2025k).
- 6.2.30 The grey seal is the primary Annex II species underpinning the designation of Berwickshire and North Northumberland Coast SAC, with the section in north-east England representative of grey seal breeding colonies in the south-east of its UK breeding range (JNCC, 2025k). The Berwickshire and North Northumberland Coast SAC supports approximately 3% of the annual pup production in the UK, with the Farne Islands (Staple Island) of particular importance as breeding habitat (Natural England, 2020). The Farne Islands and Holy Island sands within Lindisfarne National Nature Reserve are also the main

haul-out sites within the SAC, although no breeding has been recorded on Holy Island (Natural England, 2020). The ecology of grey seal is described in Paragraphs 6.2.7 to 6.2.10.

- 6.2.31 The grey seal population present in the Berwickshire and North Northumberland Coast SAC is part of the East Scotland SMU in Scotland and the Northeast England SMU in England (SCOS, 2024). There has been a rapid increase in pup production at Fast Castle colony, which the SAC boundary transects, with approximately 60% of the Fast Castle pup production as assigned to the Berwickshire and North Northumberland Coast SAC within the East Scotland SMU (SCOS, 2024). The English Berwickshire and North Northumberland Coast SAC component represents more than 90% of the Northeast England SMU and so mirrors trends in the Northeast England SMU (SCOS, 2024). Pup production within the Berwickshire and North Northumberland Coast SAC as a whole is rapidly increasing (SCOS, 2024). The latest population estimate for the East Scotland SMU is 10,784 grey seal (Marwood and Stevens, 2024). Latest August haul-out count in the Northeast England SMU was 5,446 seals (SCOS, 2024), which results in an estimated population size of 20,498 grey seals in the SMU, when using a multiplier of 3.75.
- 6.2.32 The telemetry data suggests connectivity with the East Scotland SMU and the Local Marine Mammal Study Area. Connectivity between the Local Marine Mammal Study Area and the Berwickshire and North Northumberland Coast SAC was observed for 18 adult grey seals (Marwood and Stevens, 2024).

Conservation Objectives

- 6.2.33 Natural England and NatureScot jointly developed the Berwickshire and North Northumberland Coast SAC conservation objectives (Natural England, 2020). The conservation objectives apply to the site and the individual species (e.g. grey seal) for which the site has been classified. The high-level conservation objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the FCS of its Qualifying Features, by maintaining or restoring:
- the extent and distribution of qualifying natural habitats and habitats of the qualifying species;
 - the structure and function (including typical species) of qualifying natural habitats;
 - the structure and function of the habitats of the qualifying species;
 - the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
 - the populations of each of the qualifying species; and
 - the distribution of qualifying species within the site.

- 6.2.34 The second conservation objective: ‘the structure and function (including typical species) of qualifying natural habitats’ is only relevant to the Annex I habitat features of the Berwickshire and North Northumberland Coast SAC and is therefore not included further in this assessment on Annex II marine mammals.

Condition Assessment

- 6.2.35 There was no condition assessment of grey seal currently available on the Natural England Designated Sites Portal (Natural England, 2020), however, the condition of grey seal was last assessed by NatureScot in 2024 (NatureScot, 2025b) as:

- favourable maintained.

Moray Firth SAC

Site Description

- 6.2.36 Moray Firth SAC is 159.6 km north-west of the Site Boundary at the closest point (to the Array Area). The SAC is fully marine and encompasses an area of 1,512.7 km² (JNCC, 2025l). It extends from the inner firths to Helmsdale on the north coast and Lossiemouth on the south coast, and includes areas that are regularly used by the only known resident population of coastal bottlenose dolphins in the North Sea (JNCC, 2025l). The SAC is primarily designated for bottlenose dolphin as a result. The ecology of bottlenose dolphin is described in Paragraphs 6.2.11 to 6.2.14.
- 6.2.37 Whilst bottlenose dolphins are known to range widely throughout the Coastal East Scotland MU area, they appear to favour particular areas within the Moray Firth (JNCC, 2025l; NatureScot, 2025e). The SAC is considered a core part of the Coastal East Scotland MU for bottlenose dolphin’s range, frequenting nearshore waters around the Sutors at the entrance to the Cromarty Firth, Chanonry Point and Fort George at the entrance to the Inverness Firth and North and South Kessock at the entrance to the Beaully Firth (NatureScot, 2025e). Current understanding is that the population of the Moray Firth SAC is considered equivalent to that of the Coastal East Scotland MU (NatureScot, 2025e). Therefore, the Coastal East of Scotland MU population of 226 (Cheney *et al.*, 2024) is functionally linked to the Moray Firth SAC and was used as the Moray Firth SAC population in this assessment.
- 6.2.38 Whilst there is inter-annual variability in the number of dolphins using the SAC, numbers between 2001 and 2022 appear stable, with data suggesting that the east coast population of dolphins is increasing (Cheney *et al.*, 2024; NatureScot, 2025e). The SAC is used by more than 50% of the Coastal East Scotland MU population annually, although the proportion of the population that uses the Moray Firth SAC has declined due to an overall increase in population size; statistical analysis suggests that the number of births has been increasing both within and outwith the SAC (Cheney *et al.*, 2024). Bottlenose dolphins are present within the Moray Firth SAC throughout the year and individuals have

been resighted since photo identification data collection first started in 1989 (NatureScot, 2025e).

Conservation Objectives

6.2.39 NatureScot developed the Moray Firth SAC conservation objectives as part of the site's CMA (NatureScot, 2025e). The overarching conservation objectives for this SAC are:

- 1. to ensure that the Qualifying Features of Moray Firth SAC are in favourable condition and makes an appropriate contribution to achieving FCS; and
- 2. to ensure that the integrity of Moray Firth SAC is maintained or restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each Qualifying Feature.

6.2.40 The specific conservation objectives for seek to maintain bottlenose dolphins within the Moray Firth site and ensure:

- 2a. the population of bottlenose dolphin is a viable component of the site;
- 2b. the distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance; and
- 2c. the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.

Condition Assessment

6.2.41 The condition of bottlenose dolphin was last assessed in 2024 (NatureScot, 2025b) as:

- favourable maintained.

Reference Populations and Densities

6.2.42 A summary of the various MUs and SMUs, associated reference populations, and densities (animals per km²) used within this part of the RIAA are presented in Table 6.3. For reference, the MUs and SMUs are illustrated in Figure 6.2.

Table 6.3: Densities and Reference Populations Used for the Assessment on Designated Sites with Relevant Annex II Marine Mammal Features

SAC	Annex II Species	Relevant Management Unit	Population in MU (Number of Animals)	Density (Animals per km ²)
Firth of Tay and Eden Estuary SAC	Harbour seal	East Scotland SMU	364 (Marwood and Stevens, 2024)	0.009 (Carter <i>et al.</i> , 2025)
Isle of May SAC	Grey seal	East Scotland SMU	10,784 (Marwood and Stevens, 2024)	0.56 (Carter <i>et al.</i> , 2022)
Berwickshire and North Northumberland Coast SAC		East Scotland SMU and Northeast England SMU	10,784 + 20,498 = 31,282 (Marwood and Stevens, 2024; SCOS, 2024)	
Moray Firth SAC	Bottlenose dolphin	Coastal East Scotland MU	226 (Cheney <i>et al.</i> , 2024)	0.007 (Lacey <i>et al.</i> , 2022)

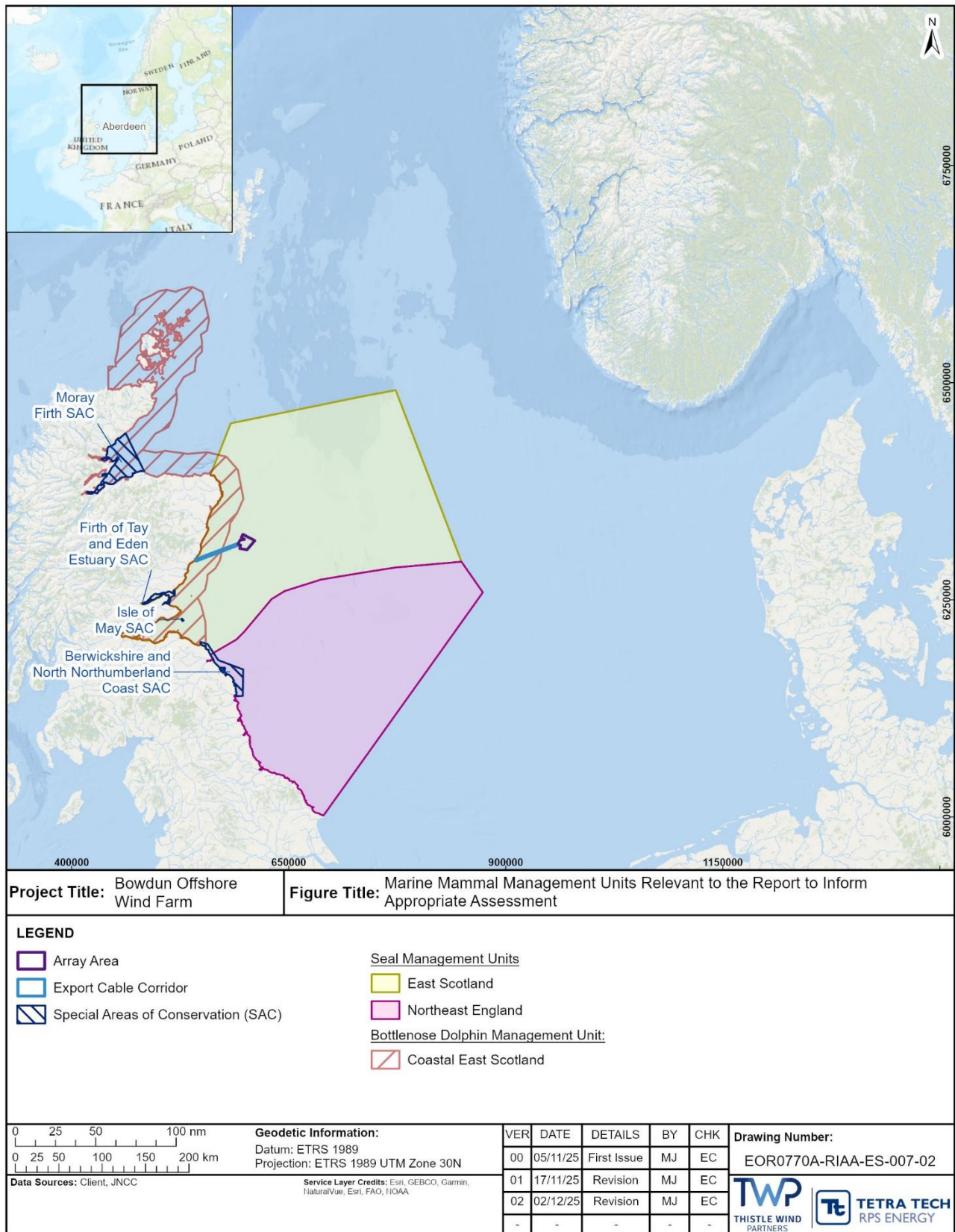


Figure 6.3: Marine Mammal Management Units Relevant to the RIAA

Marine Mammals and Subsea Noise

- 6.2.43 Marine mammals, in particular cetaceans, are dependent on sound for many aspects of their life, including prey identification, predator avoidance, communication and navigation (Bailey *et al.*, 2010). There is therefore the potential for noise emissions from all phases of the Proposed Development to adversely affect marine mammals. Subsea Noise has the potential to affect marine life in different ways depending on the sound level and characteristics, and distance from source. These effects range from physical trauma at very close range to high intensity noise (e.g. underwater explosions), to hearing impairment, and behavioural reactions. Beyond these impact ranges, masking (the presence of one sound that makes it difficult to hear another) can also occur.
- 6.2.44 Given that there is sparse scientific evidence to properly evaluate masking (e.g. no relevant threshold criteria to enable a quantitative assessment), the assessment of impacts associated with Subsea Noise on marine mammals will consider auditory injury and behavioural responses (disturbance) only.

Injury

- 6.2.45 Exposure to very high intensity sounds at close ranges could result in physical trauma or in extreme cases, death (e.g. underwater explosions). However, exposure to less intense sounds can result in injury to marine mammals' hearing. Auditory injury is considered to have occurred when there is a permanent change to the individual's hearing sensitivity. Hearing impairment can occur where there is a temporary reduction in hearing sensitivity (known as TTS). TTS is considered to be impairment rather than injury because an animal's auditory system can recover.
- 6.2.46 Auditory injury criteria are used to assess potential impacts to marine mammals. The threshold criteria as published in Southall *et al.* (2019) has been used as industry standard. However, recently updated guidance has been published by the National Marine Fisheries Service (NMFS, 2024). NMFS (2024) has compiled, interpreted and synthesised the scientific literature to produce criteria for the onset of TTS and Auditory Injury (AUD INJ), which includes (but is not limited to) Permanent Threshold Shifts (PTS). This updated guidance is considered to reflect the current state of knowledge regarding the characteristics of sound exposure that has the potential to affect marine mammal hearing sensitivity.
- 6.2.47 The Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report has modelled the risk of injury to marine mammals using both Southall *et al.* (2019) and NMFS (2024) criteria. In this section the results using NMFS (2024) are presented as these represent the latest scientific understanding. Please see the Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report for more detail and comparison of both sets of threshold criteria. TTS threshold information is presented in the section primarily for context but is used specifically as a proxy for the assessment of

potential disturbance impacts arising from UXO clearance activities as advised in the Scoping Opinion (MD-LOT, 2024).

- 6.2.48 The dual metric approach is applied as per the latest guidance (NMFS, 2024). This approach includes evaluating both the unweighted SPL_{PK} and the hearing weighted cumulative SEL and the use of whichever of the two metrics that results in the larger isopleth for the assessment of the onset of auditory injury. Marine mammal species are grouped into functional hearing groups based on generalised hearing ranges for the species group as a whole. The relevant functional hearing groups are ‘HF cetaceans’, which includes bottlenose dolphin and ‘Phocid pinnipeds (underwater)’ (PW), which includes harbour seal and grey seal (Table 6.4). Weighting functions are defined using the frequency characteristics (bandwidth and sound level) for each hearing group within which acoustic signals can be perceived, and therefore, assumed to have potential auditory effects. The weighting functions used in noise modelling act as filters, to de-prioritise frequency content that is less relevant for the species hearing group.

Table 6.4: Marine Mammal Hearing Groups with their Generalised Hearing Ranges (NMFS, 2024)

Hearing Group	Example Species	Generalised Hearing Range
Phocid pinnipeds (underwater) (PW)	True seals (e.g. harbour seal and grey seal)	40 Hz to 90 kHz
High Frequency cetaceans (HF)	Delphinids (e.g. bottlenose dolphin)	150 Hz to 160 kHz

- 6.2.49 It is worth noting that the hearing group nomenclature has varied slightly over the development of the threshold criteria guidance. NMFS (2024) refer to ‘phocid pinnipeds’ (underwater) as PW, whereas Southall *et al.* (2019) call this group ‘Phocid Carnivores in Water’ (PCW). Aside from the differences in nomenclature, the hearing groups are effectively the same and are henceforth referred to as PCW.
- 6.2.50 This RIAA follows the terminology used in Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) and Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report, and uses Southall *et al.* (2019) terminology (i.e. uses PCW for the pinniped hearing group). The TTS and auditory injury thresholds used for this assessment are summarised in Table 6.5.

Table 6.5: Summary of TTS and Auditory Injury Acoustic Thresholds (NMFS, 2024)

Hearing Group	Parameter	Impulsive		Non-Impulsive	
		TTS	AUD INJ	TTS	AUD INJ
PCW	Peak SPL, unweighted	217	223	-	-
	SEL, PCW weighted	168	183	175	195
HF cetaceans	Peak SPL, unweighted	224	230	-	-
	SEL, HF weighted	178	193	181	201

6.2.51 The dual metric approach means that as well as calculating the unweighted peak sound level at various distances, it is also necessary to calculate the received levels of noise in terms of the accumulated exposure over time (SEL weighted). Simplified modelling assumes that the animal is static at a fixed distance from the noise source. This, however, would give a highly unrealistic level of exposure as animals are highly unlikely to remain stationary when exposed to loud noise. The assumption is that the animals move directly away from the sound. The exposure assessment has made a simplistic assumption that an animal would be exposed over the duration of the noise generating activity (i.e. piling) and that there would be no breaks in activity during this time. It was assumed that an animal would swim away from the noise source at the onset of activity at a constant rate and subsequently, conservative species-specific swim speeds were incorporated into the model, summarised in Table 6.6.

Table 6.6: Assessment Swim Speeds of Annex II Marine Mammals for the Purposes of Exposure Modelling

Species	Hearing group	Swim speed (m/s)	Source reference
Harbour seal	PCW	1.8	Thompson <i>et al.</i> (2015)
Grey seal	PCW	1.8	Thompson <i>et al.</i> (2015)
Bottlenose dolphin	HF	1.52	Bailey <i>et al.</i> (2010)

Disturbance

- 6.2.52 As noise intensity decreases beyond the zone of injury, sound levels are such that auditory or physical injury is less likely to occur but could be sufficient to elicit a behavioural response. A marine mammal's response to disturbance will depend on the individual and the context. Previous experience and motivation will affect whether an individual exhibits an aversive response to sound, particularly in an area with high sound levels related to human activities.
- 6.2.53 Non-trivial disturbance, which is defined as disturbance to the marine European Protected species that is "likely to at least increase the risk of a certain negative impact on the species at FCS" (JNCC *et al.*, 2010), may occur when there is a risk of animals incurring sustained or chronic disruption of behaviour. The determination of the likelihood and extent of disturbance is difficult. There are no agreed upon disturbance criteria from SNCBs, primarily because there are no clear threshold criteria that can be used due to the variability of documented animal responses to similar levels of noise.
- 6.2.54 Therefore, this assessment has applied several disturbance thresholds considered to be most appropriate relative to the noise generating activities assessed for the Proposed Development (Table 6.7), as per expert judgment. When referring to mild disturbance this refers to trivial disturbance, which is defined as "*Sporadic disturbances without any likely negative impact on the animals...such as that resulting in short term behavioural reactions*" whereas strong disturbance refers to non-trivial disturbance (JNCC *et al.*, 2010). See

Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report for more detail.

Table 6.7: Summary of Disturbance Criteria Used in the Assessment

Effect	Non-impulsive Threshold (SPLrms)	Impulsive Threshold (Other Than UXO) (SPLrms)	UXO Clearance	Impulsive Threshold (piling)
Mild disturbance (all marine mammals)	-	140 dB re 1µPa	-	Dose-Response
Strong disturbance (all marine mammals)	120 dB re 1µPa	160 dB re 1µPa	TTS onset	

- 6.2.55 The disturbance assessment for continuous (non-impulsive) noise (e.g. vessel activity) has used the NMFS (2005); (NMFS, 2025) guidance Level B harassment threshold (analogous to disturbance) for continuous noise at 120 dB re 1 µPa (rms). Level B harassment is defined by NMFS (2005) as having the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioural patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild. This is similar to the JNCC *et al.* (2010) description of non-trivial disturbance and has therefore been used as the basis for onset of behavioural change in the assessment. Given the limited and highly variable data on the onset of behavioural effects from continuous sound exposure, any ranges derived from this number should be regarded as probabilistic in nature and reflect a precautionary approach.
- 6.2.56 For impulsive noise sources (other than piling and UXO clearance) this assessment has adopted the NMFS (2005) Level B harassment threshold of 160 dB re 1 µPa (rms).
- 6.2.57 UXO clearance assessment has used the TTS threshold as the proxy for disturbance (NMFS, 2024). The TTS threshold is used to assess behavioural response where one detonation occurs per day, and the behavioural threshold (- 5 dB from TTS onset) is taken for multiple detonations within a 24-hour period.
- 6.2.58 The NMFS (2005) guidance is based on thresholds above which strong or mild disturbance could occur and has been widely applied to piling assessments within UK OWF assessments. However, there have been further studies using empirical evidence from data gathered in the field during impact piling activity, which demonstrate a proportional disturbance response of animals corresponding to decreasing levels of received sound moving further away from the source. The risk of disturbance from impact piling has been assessed using a dose-response approach, as supported in the EIA Scoping Opinion (MD-LOT, 2024), with further detail on this approach taken as detailed below.

Dose-response

- 6.2.59 The application of a dose-response function allows for a more realistic assessment of the risk of disturbance as this takes into account the likelihood of a response, in comparison to a fixed noise threshold, as this assumes all individuals within the fixed noise threshold respond, whereas outside the contour there is no response.
- 6.2.60 Southall *et al.* (2019) stated that “*Apparent patterns in response as a function of received noise level (sound pressure level) highlighted a number of potential errors in using all or nothing “thresholds” to predict whether animals will respond. Tyack and Thomas (2019) subsequently and substantially expanded upon these observations. The clearly evident variability in response is likely attributable to a host of contextual factors, which emphasises the importance of estimating not only a dose-response function but also characterising response variability at any dosage.*”
- 6.2.61 See Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) of the Offshore EIA Report for more information on the dose-response approach used for assessment.

Assumptions and Limitations

- 6.2.62 By applying noise impact threshold criteria (both for injury and disturbance impacts), the magnitude of impact can be quantified with respect to the spatial extent of impact, and subsequently the number of animals potentially affected based on available density information. However, Southall *et al.* (2021) noted that it is challenging to develop a comprehensive set of empirically derived criteria for such a diverse group of animals. The study identified data gaps where extrapolation from other species has been necessary. Where species-specific data is lacking for harbour seal or bottlenose dolphin, evidence from other PCW or HF cetaceans has been considered as a proxy. However, since there are broad differences in hearing across the frequency spectrum for different marine mammal hearing groups, noise that disturbs one species may be irrelevant or inaudible to other species. Variance in responses even across individuals of the same species are well documented to be context and sound-type specific (Ellison *et al.*, 2012). In addition, the potential interacting and additive effects of multiple stressors (e.g. reduction in prey, noise and disturbance, contamination, etc.) is likely to influence the severity of responses (Lacy *et al.*, 2017).
- 6.2.63 Marine mammal ability to compensate for chronic exposure to sound will also depend on a range of ecological factors, including the relative importance of the disturbed area and prey availability within their wider home range, the distance to and quality of other suitable sites, the relative risk of predation or competition in other areas, individual exposure history, and the presence of concurrent disturbances in other areas of their range (Gill *et al.*, 2001). Animals may be able to compensate for short term disturbances by feeding in other areas, for example, which would reduce the likelihood of longer-term population consequences. Booth (2019) reported that although minimising the anthropogenic disturbance is an important factor to animal’s health, if animals

can find suitable high-energy-density prey they may be capable of recovering from some lost foraging opportunities. Studies of changes in abundance as a result of disturbance should be considered in light of findings presented in Gill *et al.* (2001) who reported that if there is no suitable habitat nearby animals may be forced to remain in an area despite the disturbance, regardless of whether or not it could affect survival or reproductive success.

- 6.2.64 The Annex II marine mammal species considered in this RIAA vary biologically and therefore have different ecological requirements that may affect their sensitivity to disturbance. Grey seals are capital breeders and store energy for reproduction and survival, whilst harbour seals and bottlenose dolphins are income breeders and they use energy that is acquired on a continual basis, including during the reproductive period (Stephens *et al.*, 2009).
- 6.2.65 Recognising the inherent uncertainty in the quantification of effects using fixed threshold approaches, this assessment has adopted a precautionary approach at all stages of assessment, including additional conservative assumptions in the:
- marine mammal baseline (e.g. the use of the most appropriate highest density estimates (Table 6.3));
 - the MDS for all activities assessed; and
 - noise modelling conservatism.
- 6.2.66 These assumptions have been referred to throughout this RIAA, illustrating that the systematic incorporation of layers of conservatism is likely to result in a very precautionary assessment.
- 6.2.67 Limitations imposed by uncertainty have been addressed throughout through the conservative approach, as well as Embedded Mitigation and post-consent monitoring. Throughout the assessment it has been assumed that the Embedded Mitigation measures will be effective.

Conservatism in the Subsea Noise Modelling

- 6.2.68 In order to ensure that the assessment is precautionary, a number of conservative assumptions were adopted in the Subsea Noise model. These measures of conservatism are summarised in this section and highlight that both auditory injury (and TTS onset ranges) predicted using the cumulative Sound Exposure Levels (SEL_{cum}) threshold are likely to lead to overestimates in the ranges and therefore should be interpreted as precautionary estimates. For more details, refer to Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report.
- 6.2.69 For impact piling, the Subsea Noise modelling assumed that the maximum hammer energy would be reached and maintained at all locations, whereas this is unlikely to be the case based on examples from other OWFs (e.g. Beatrice OWF (Beatrice OWF Limited, 2018)).

- 6.2.70 Additionally, the piling procedure simulated in the model does not allow for short pauses in piling (e.g. for realignment) and therefore the modelled SEL_{cum} is likely to be an overestimate since, in reality, these pauses will reduce the noise exposure that animals experience whilst moving away.
- 6.2.71 The Subsea Noise modelling assessment also assumed that animals swim directly away from the noise source at constant and conservative average speeds based on published values. Whilst this buffers the uncertainty with respect to the directionality of their movement, it may lead to overestimates of the potential range of effect as animals are likely to exceed these speeds.
- 6.2.72 The Subsea Noise model accounts for the SEL_{cum} metric as an equal-energy rule, where exposures of equal-energy are assumed to produce the same noise-induced threshold shift regardless of how the energy is distributed over time. Since for intermittent noise (such as piling) the quiet periods between noise exposures will allow some recovery of hearing compared to continuous noise, the equal-energy rule is likely to overestimate the extent of impact. Additionally, modelling of concurrent piling assumed piling will exactly coincide and strike piles simultaneously, whereas in reality this is highly unlikely and could lead to overestimates in the injury and/or disturbance ranges.
- 6.2.73 The impulsive noise is likely to undergo transition into non-impulsive noise at distance from the noise source due to a combination of factors (e.g. dispersion of the waveform, multiple reflections from sea surface and seafloor, and molecular absorption of HF energy). The empirical evidence suggest that such shifts in impulsivity could occur within 10 km from the noise source (Hastie *et al.*, 2019). The Offshore Renewables Joint Industry Programme (ORJIP) RaDIN study (ORJIP, 2024) concluded that “*there was a marked decrease in impulsiveness as sounds travel away from the source within 5 km of the piling location*” and that, “*there is still insufficient evidence to establish a range of distances from which these sounds are no longer impulsive*”. However, since the precise range at which this transition occurs is unknown, the Subsea Noise model adopted the impulsive thresholds at all ranges. This is likely to lead to an overly precautionary estimate of injury ranges at larger distances (tens of kilometres) from the noise source.

Sensitivities of Marine Mammals to Subsea Noise

- 6.2.74 Scientific understanding of the biological impact of auditory threshold shifts is limited to the results of controlled exposure studies on small numbers of captive animals (Finneran, 2015) where TTS was experimentally induced (given it is unethical to induce auditory injury in animals) and thresholds for auditory injury were extrapolated using TTS growth rates. Kastelein *et al.* (2013) demonstrated that hearing impairment as a result of exposure to piling noise is likely to only occur where the source frequencies overlap the range of peak sensitivity for the receptor species, rather than across the whole frequency hearing spectrum.

- 6.2.75 The duty cycle of fatiguing noise is also likely to affect the magnitude of a hearing shift, (i.e. hearing may recover to some extent during any inter-pulse intervals (Kastelein *et al.*, 2014)). Other studies reported that whilst a threshold shift can accumulate across multiple exposures, the resulting shift will be less than the shift from a single, continuous exposure with the same total SEL (Finneran, 2015).
- 6.2.76 Booth and Heinis (2018) presented the conclusions from the expert elicitation workshop on the effects of an auditory injury on vital rates in marine mammal species. The aim of the workshop was to update the relevant parameters for the Interim Population Consequences of Disturbance (iPCoD) model and was focused on the potential for auditory injury from low frequency broadband noise (i.e. pile driving). Key conclusions were that individuals predicted to be at risk of exceeding the auditory injury thresholds did not mean the animals were deaf, but that there could be a reduction in hearing sensitivity within a specific hearing range.
- 6.2.77 Conclusions were that effects on vital rates were lowest on harbour and grey seals (PCW). Effects were thought to be slightly larger for delphinid species (HF), because dolphins use lower frequencies for communication, rather than they were more sensitive. However, for both hearing groups, the conclusions were that auditory injury was unlikely to result in an impact to either survival or reproductive rates.

Harbour Seal and Grey Seal

Injury

- 6.2.78 In comparison to cetaceans, seals are less dependent on hearing for foraging but may rely on sound for communication and predator avoidance (e.g. Deecke *et al.* (2002)). Seals can detect swimming fish with their vibrissae (Schulte-Pelkum *et al.*, 2007) but, in certain conditions, they may also listen to noises produced by vocalising fish in order to hunt for prey. Consequently, the ecological consequences of a significant noise-induced threshold shift in seals may be a reduction in fitness, reproductive output and longevity (Kastelein *et al.*, 2018). A study by Hastie *et al.* (2015) reported that, based on calculations of the sound exposure of tagged harbour seals during the construction of the Lincs OWF (Greater Wash, UK), at least half of the tagged seals could have received noise levels from pile driving that exceeded auditory injury thresholds for pinnipeds. Nevertheless, population estimates indicated that the relevant population trend at that time was increasing and therefore (whilst there are many other ecological factors that will influence the population health) this indicated that predicted levels of auditory injury did not affect a sufficient number of individuals to cause a decrease in the population trajectory (Hastie *et al.*, 2015). Hastie *et al.* (2015) did note that the paucity of data on effects of noise on seal hearing means the exposure criteria used are intentionally conservative and therefore the predicted numbers of individuals in this study thought to be affected by auditory injury would also have been highly conservative.

- 6.2.79 Despite the uncertainty in the ecological effects of auditory injury on seals, seals rely on hearing much less than cetaceans and therefore would exhibit some tolerance (i.e. the effect is unlikely to cause a change in either reproduction or survival rates). In addition, it has been proposed that seals may be able to self-mitigate (i.e. reduce their hearing sensitivity in the presence of loud noises in order to reduce their perceived noise level).

Behaviour Disturbance

- 6.2.80 There are limited studies that consider pinniped sensitivity to disturbance. However, this has been reviewed and discussed during the expert elicitation workshops conducted for the iPCoD model (Booth *et al.*, 2019) where parameters were assigned for use within the model to reflect the likely effect of disturbance. The initial elicitation carried out in 2013 assumed that one day of disturbance results in a 24 hour period with no foraging. In 2019, this was considered to be over precautionary as the true effects of disturbance were likely to be much more short lived (e.g. Russell *et al.* (2016)). Although there are likely to be alternative foraging sites for both harbour seal and grey seal, avoidance behaviour during piling could either prevent seals from travelling to forage from haul-out sites or force seals to travel greater distances than is usual during periods of piling (Booth *et al.*, 2019; Russell *et al.*, 2016; Russell *et al.*, 2014). However, in general, both seal species are considered to have a reasonable ability to compensate for lost foraging opportunities due to their generalist diet, mobility, life history and adequate fat stores (Booth *et al.*, 2019).
- 6.2.81 Hastie *et al.* (2021) measured the relative influence of perceived risk of a sound (silence, pile driving, and a tidal turbine) and prey patch quality (low density versus high density), in grey seal in an experimental pool environment. The study found foraging success was highest under silence, but under tidal turbine and pile driving treatments success was similar at the high density prey patch but significantly reduced under the low density prey patch. Therefore, avoidance rates were dependent on the quality of the prey patch as well as the perceived risk from the anthropogenic sound and therefore it can be anticipated such decisions are consistent with a risk/profit balancing approach.
- 6.2.82 Seal behaviour during OWF installation has been studied based on empirical data (Russell *et al.*, 2016). Movements of tagged harbour seal during piling at the Lincs OWF in the Greater Wash showed significant avoidance of the OWF by harbour seal (Russell *et al.*, 2016). Within this study, seal abundance significantly reduced during the piling activity up to a distance of 25 km, with a 19% to 23% decrease in usage within this range. Nevertheless, displacement was limited to pile driving activity only, and harbour seal returned rapidly to baseline levels of activity within two hours of cessation of the piling (Russell *et al.*, 2016). Diverse reactions of tracked grey seal to pile driving during construction of the Luchterduinen and Gemini wind farms was reported in (Aarts *et al.*, 2018). Reactions ranged from altered surfacing and diving behaviour, changes in swimming direction, or coming to a halt. In some cases, however, no apparent changes in diving behaviour or movement were observed (Aarts *et al.*, 2018). Similar to the conclusions drawn by Hastie *et al.* (2021), the

study at the Luchterduinen and Gemini wind farms indicated animals were balancing risk with profit.

- 6.2.83 Pinnipeds may also be vulnerable to disturbance during sensitive periods (e.g. during and prior to reproduction). For example, female seals increase their foraging effort, and therefore increasing their diving behaviour, this is to accumulate energy reserves for reproduction and lactation during the breeding season (Sparling *et al.*, 2006). Maternal energy storage is extremely important to offspring survival and female fitness, but during this time of increased foraging may be when grey seal are most vulnerable (Hall *et al.*, 2001; Mellish *et al.*, 1999). As a result, potential exclusion from foraging grounds due to disturbance from impact piling during this time could affect reproduction rates and probability of survival.

Bottlenose Dolphin

Injury

- 6.2.84 Individual dolphins experiencing auditory injury would suffer a biological effect that could impact the animal's health and vital rates (Erbe *et al.*, 2018). Expert elicitation on the effects of PTS on the probability of survival and fecundity of bottlenose dolphins suggested that the effects of a 6 dB PTS in the 2 kHz to 10 kHz band would have a very small effect on the species' survival or fertility (i.e. <5% reduction) (Booth and Heinis, 2018).

Behavioural Disturbance

- 6.2.85 Bottlenose dolphin is thought to be less vulnerable to the effects of disturbance than harbour porpoise; with larger body sizes and lower metabolic rates, the necessity to forage frequently is lower in comparison.
- 6.2.86 Limited information is available regarding the specific sensitivities of bottlenose dolphin as most studies have concentrated on harbour porpoise. However, one study of the response of bottlenose dolphin to piling noise during harbour construction works at the Nigg Energy Park in the Cromarty Firth (North-East Scotland) found that there was a measurable (albeit weak) response to impact and vibration piling with animals reducing the amount of time they spent in the vicinity of the construction works (Graham *et al.*, 2017).
- 6.2.87 Another study investigating dolphin detections in the Moray Firth during impact piling at the Moray East and Beatrice OWFs found surprising results at small temporal scales with an increase in dolphin detections on the Southern Moray Firth coast on days with impulsive noise compared to days without (Fernandez-Betelu *et al.*, 2021). Predicted maximum received levels in coastal areas were 128 dB re 1 $\mu\text{Pa}^2\text{s}$ and 141 dB re 1 $\mu\text{Pa}^2\text{s}$ during piling at Beatrice OWF and Moray East OWF, respectively (Fernandez-Betelu *et al.*, 2021). The authors of this study caution these results as increased click changes do not necessarily equate to larger groups sizes but may result from modification in behaviour (e.g. an increase in vocalisations during piling). The results, however, do suggest that impulsive noise generated during piling at the OWFs did not cause any displacement of bottlenose dolphins from their population range. Notably, the received levels during piling at Moray East OWF, are higher than those predicted for the outer contours (130 dB and 135 dB re 1 $\mu\text{Pa}^2\text{s}$) that overlap with the

Coastal East Scotland MU during piling at the Array Area, suggesting that disturbance at these lower noise levels is unlikely to lead to displacement effects.

- 6.2.88 The Southall (2021) severity spectrum applies across all marine mammals and therefore it is expected that strong disturbance in the near field could result in displacement whilst mild disturbance over greater ranges would result in other, less severe behavioural responses. Bottlenose dolphin may be able to avoid the disturbed area and whilst there may be some impacts on reproduction in closer proximity to the source (i.e. within the area of ‘strong disturbance’), these are unlikely to impact on survival rates as some tolerance is expected to build up over the course of the piling. It is anticipated that animals would return to previous activities once the impact had ceased.

6.3 Assessment of the Adverse Effects of the Proposed Development Alone

Injury and Disturbance from Subsea Noise Generated During Piling

- 6.3.1 The LSE assessment during the HRA screening process identified that during the construction phase, LSE could not be ruled out for potential injury and disturbance from Subsea Noise generated during piling for all four of the SACs screened in for Annex II marine mammals (see Table 3.1).
- 6.3.2 The MDS and Embedded Mitigation measures considered for the assessment of injury and disturbance from Subsea Noise generated during piling are shown in Table 6.8 and Table 6.9, respectively.

Table 6.8: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Injury and Disturbance from Subsea Noise Generated during Piling during the Construction Phase

Proposed Development Phase	MDS	Justification
Construction	Maximum temporal scenario: <u>Fixed foundations – 15 MW 4-legged jacket</u> • Number of piled jacket foundations – 67 • Maximum number of piles – 268 • Maximum pile diameter – 3.8 m • Maximum pile length – 70 m, with final pile penetration depth of 65 m • Maximum hammer energy – 4,500 kJ • Maximum duration of piling per pile – 12.4 hours • Maximum duration of piling per day – 22 hours • Maximum duration of piling – 3,323.3 hours (12.4 hours per day over 268 days)) Maximum spatial scenario: <u>Fixed foundations – 25 MW monopile</u> • Number of monopile foundations – 40 • Maximum number of piles – 40 • Maximum pile diameter – 15 m • Maximum pile length – 123 m, with final pile penetration depth of 45 m • Maximum hammer energy – 6,250 kJ • Maximum duration of piling per pile – 8.6 hours • Maximum duration of piling per day (based on 2 piles installed concurrently) – 17.1 hours • Minimum total hours of piling – 172 hours (8.6 hours per day over 20 days)	The impact assessment for marine mammals will consider the maximum impact ranges from both single and concurrent piling scenarios. Noise modelling will estimate impact ranges for instantaneous auditory injury, accumulated auditory injury (over the duration of the installation period) and disturbance. Three scenarios have been chosen for modelling purposes: Maximum temporal scenario The maximum temporal scenario is identified as the greatest number of days on which piling could occur based on the number of pin piles that could be installed within a 24-hour period (1 per day). This utilised the 15 MW 4-legged jacket foundation option. The parameters modelled for this option will encompass the OSPs. Maximum spatial scenario The maximum spatial scenario is identified as the 25 MW monopile fixed foundation option which presents the largest hammer energy and maximum spacing between concurrent piling events which would lead to the largest spatial extent of ensonification at any one time. The parameters modelled for this option will encompass the OSPs. Realistic spatial scenario The realistic spatial scenario is based on 25 MW monopile foundations, applying an average maximum hammer energy and average maximum piling duration per pile (in place of maximums) in order to provide

Proposed Development Phase	MDS	Justification
	Realistic scenario: <u>Fixed foundations – 25 MW monopile</u> • Number of monopile foundations – 40 • Maximum number of piles – 40 • Maximum pile diameter – 15 m • Maximum pile length – 123 m, with final pile penetration depth of 45 m • Average maximum hammer energy – 6,000 kJ • Average maximum duration of piling per pile – 4.3 hours • Maximum total hours of piling – 172 hours (4.3 hours per day over 40 days) Concurrent piling – all 3 scenarios • up to 2 vessels piling concurrently; and • minimum 1 km and maximum 20 km distance between concurrent piling events	context to the maximum spatial scenario. A key parameter in the estimation of accumulated injury is the duration of impact piling. The parameters modelled for this option will encompass the OSPs. Concurrent piling will be modelled in addition to single piling events. In all cases concurrent piling would lead to a larger spatial extent of ensonification in total, in comparison to a single piling event. Minimum spacing between concurrent piling represents the highest risk of auditory injury to animals as noise from adjacent foundations could combine to produce a greater radius of effect compared to a single piling event. This represents the MDS for concurrent piling injury impacts. Maximum spacing between concurrent piling represents a larger area of ensonification. This represents the MDS for concurrent piling disturbance impacts.

Table 6.9: Embedded Mitigation Measures Considered for the Assessment of Potential Impacts to Annex II Marine Mammals to Injury and Disturbance from Subsea Noise Generated during Piling during the Construction Phase

Embedded Mitigation Measures	Justification
Development of, and adherence to, a Piling Strategy. This will detail use of ADDs, slow start, soft start, and ramp up procedures, as appropriate, as well as any Additional Mitigation measures, where determined to be required, in consultation with stakeholders including NatureScot and MD-LOT.	Implementation of initiation stage and soft start during piling. This will involve the use of a low hammer energy with a low number of strikes used initially, followed by lower hammer energies at a higher strike rate at the beginning of the piling sequence before energy input is ‘ramped up’ (increased) over time to required higher levels. The Piling Strategy will be submitted post-consent prepared in collaboration with stakeholders, including but not limited to, MD-LOT and NatureScot, following collation of additional data and final design parameters (e.g. piling locations, hammer energies). Noise modelling will be reviewed with the additional information and inform the final Piling Strategy, which will be submitted to MD-LOT. These measures will reduce the likelihood of injury from elevated Subsea Noise to marine mammals in the immediate vicinity of piling operations as far as practicable, allowing individuals to move away from the area before sound levels reach a level at which injury may occur. This is in line with the most up to date guidance for piling operations (JNCC, 2010) and, in most cases, compliance with this guidance reduce the likelihood of injury to marine mammal receptors to negligible levels. Secured in the Section 36 Consent and Marine Licence, via the Piling Strategy , which will be submitted to MD-LOT for approval.
Development of and adherence to a Marine Mammal Mitigation Protocol (MMMP), to reduce the risk of auditory injury to marine mammals from noise generating activities resulting from the construction of the Proposed Development. Mitigation will include measures such as Marine Mammal Observers (MMOs), Passive Acoustic Monitoring (PAM) and ADDs.	<u>Outline Marine Mammals Mitigation Protocol</u> The development of and adherence to a MMMP which will present appropriate mitigation for activities that could potentially lead to injurious effects on marine mammals (e.g. piling, UXO clearance and geophysical surveys). For piling, measures will include setting a mitigation zone based on the maximum predicted injury range using unweighted peak SPL metric for the maximum spatial scenario across all marine mammal species. The outline

Embedded Mitigation Measures	Justification
	MMMP sets out measures to be applied in advance of and during piling activity, including: • Visual monitoring carried out by MMOs, • Acoustic monitoring by PAM Operators: and • ADDs to discourage marine mammals from approaching an area where injury may occur. An outline MMMP has been developed on the basis of the most recent published statutory guidance in place at time of writing (JNCC, 2010, 2017, 2023, 2025h). The implementation of the finalised MMMP will mitigate for the risk of permanent auditory injury to marine mammals within a pre-defined ‘mitigation zone’ for each activity. The mitigation zone is determined considering the largest injury zone across all species for each relevant activity. The outline MMMP includes visual and acoustic monitoring as a minimum over the defined mitigation zones so that animals are clear before the activity commences. Together with ADDs to deter animals from injury risk zones. The Applicant will consult with NatureScot and MD-LOT with regards to mitigation should Unmanned Surface Vehicles (USVs)/Autonomous Underwater Vehicles (AUVs) be used for activities associated with the Proposed Development and relevant European Protected Species (EPS) Licences will be sought. Secured in the Section 36 Consent and Marine Licence, via the requirement for a finalised and agreed MMMP, which will be submitted to MD-LOT for approval.
Development of, and adherence to a Construction Method Statement (CMS) along with a Code of Construction Practice (CoCP).	The CMS and CoCP are the overarching documents prepared to set out the construction methods, good working practices and mitigation measures. Secured in the Section 36 Consent and Marine Licence, via the requirement for a CMS, which will be submitted to MD-LOT for approval.

Embedded Mitigation Measures	Justification
Adoption of JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys, piling noise and use of explosives if and where required	An outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report) has been developed on the basis of the most recent published statutory guidance (JNCC, 2010, 2017, 2023, 2025h). Secured in the Section 36 Consent and Marine Licence, via the requirement for a finalised and agreed MMMP.
Development of, and adherence to, a Project Environmental Monitoring Plan (PEMP) to include details of any agreed surveys or monitoring requirements. The PEMP will provide the mechanism to validate the impact assessment, assess the effectiveness of mitigation measures, and inform adaptation of mitigation measures throughout the construction phase of the Proposed Development.	The PEMP will detail the methodology that will be used validate the impact assessment predictions made within the RIAA and Offshore EIA. Subsea Noise levels will be measured and monitored during the construction phase (impact piling operation). The PEMP will also provide for the mechanism for any adaptation of marine mammal mitigation measures if required to reduce impacts from the Proposed Development. Secured in the Section 36 Consent and Marine Licences, via the requirement for a PEMP.

Information to Inform the Assessment

Overview of Subsea Modelling Conducted for the Proposed Development

- 6.3.3 Pile driving during the construction phase will elevate levels of Subsea Noise when compared to background levels and could result in auditory injury and/or potential behavioural effects on Annex II marine mammal features of the four SACs identified for AA. A detailed Subsea Noise modelling assessment was carried out to investigate the potential for such effects to occur, using the latest assessment criteria (see Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report).
- 6.3.4 The impact piling scenarios modelled were as follows:
- maximum design single piling scenarios for monopiles and pin pile jacket foundations for fixed Wind Turbines (which included OSPs);
 - realistic single piling scenario for monopile foundations for fixed Wind Turbine foundation;
 - maximum design concurrent piling for two monopile foundations for fixed Wind Turbines;
 - maximum design concurrent piling for two pin pile jacket foundations for fixed Wind Turbines (including OSPs);
 - realistic concurrent piling for two monopile foundation for fixed Wind Turbines;
 - maximum design consecutive scenario (over 24 hours, assuming no pause between piling events) for monopiles for fixed Wind Turbines;
 - maximum design consecutive scenario (over 24 hours, assuming no pause between piling events) for pin pile jacket foundations for fixed Wind Turbines (including OSPs); and
 - realistic consecutive scenario (over 24 hours, assuming no pause between piling events) for monopile foundations for the fixed Wind Turbine foundation.
- 6.3.5 All scenarios were modelled with and without the use of 15 minutes of ADD activation prior to the installation. The inclusion of the ADD in the model assumes that the animal is further away from the piling before being exposed to the piling sound. Impact ranges were modelled for two locations within the Array Area, incorporating the deepest areas within the Site Boundary.
- 6.3.6 The impact piling scenarios used in the subsea model were based on the MDS parameters, the actual values of hammer energy and duration are expected to be lower.
- 6.3.7 The maximum hammer energy modelled was 6,250 kJ for the monopile foundations. The piling associated with the OSPs were considered to fall within the parameters used for the fixed jacket foundation scenario, and therefore not modelled separately. A third piling schedule was modelled to represent a likely, or more realistic piling scenario for the monopile foundation type only.

- 6.3.8 The modelling for concurrent piling assumed two cases, one to represent the maximum adverse scenario for injury risk (closest potential separation distance of 1 km). The second assumed the widest separation distance (of 20 km) as the maximum adverse scenario for disturbance.
- 6.3.9 Concurrent piling assessed a single combination of the two modelling locations; one location in the north and one location in the south. For the single impact piling scenario, the maximum design impact ranges were predicted from the north location modelled. Consequently, only the north location predictions have been used for the assessment of impact in this RIAA (see Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report, for full detail of the scenarios modelled).
- 6.3.10 The piling programme (see Table 4.21 and Figure 4.11 in RIAA Part 1: Introduction) highlights that it is likely to require concurrent piling. This will either be single piling for the foundation throughout the piling window in conjunction with piling for the OSP foundation(s). Or, that there will be concurrent piling throughout the piling window, of either two foundations, or one foundation plus one OSP.

Injury

- 6.3.11 The impact ranges presented in this RIAA are based on the NMFS (2024) thresholds for auditory injury. The Southall *et al.* (2019) values can be found in the Subsea Noise report (Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report).
- 6.3.12 The maximum spatial effect for grey seal and harbour seal (PCW) and bottlenose dolphin (HF), was predicted for concurrent piling of jacket foundations, with a maximum hammer energy of 4,500 kJ.
- 6.3.13 The maximum temporal effect was predicted as the longest duration of piling (single piling of jacket foundations). Whilst the effect of auditory injury is considered to result in permanent injury to animals, the risk of animals being exposed to sound levels leading to auditory injury would occur during piling only. As shown in Table 6.8, piling will be intermittent over a three-year piling phase and will occur on up to a maximum of 268 days.
- 6.3.14 The maximum SEL_{cum} impact range predicted for the PCW hearing group (grey seal and harbour seal) and HF hearing group (bottlenose dolphin) arises from the concurrent piling of two jacket foundation piles. The largest impact range is 8,907 m for the PCW hearing group (grey seal and harbour seal) without ADD activation. With ADD activation the impact range was reduced to 2,345 m (Table 6.10). The HF hearing group (bottlenose dolphin) were only exposed to accumulated levels that exceeded the auditory injury threshold for concurrent installation of jacket foundation piles (no ADD) at a range of 10 m (Table 6.10).

Table 6.10 Potential Marine Mammal Injury Ranges for Concurrent Pile Installation of Monopile Foundations and Jacket Piles, based on the NMFS (2024) SEL Metric (N/E denotes threshold Not Exceeded)

Scenario	Species/ Group	AUD INJ Threshold, SEL (dB re 1 μ Pa ² s)	Range (m)	
			No ADD	15 min ADD
Monopile Foundations	PCW	185	5,626	N/E
	HF		N/E	N/E
Monopile Foundations (realistic)	PCW	185	3,751	N/E
	HF		N/E	N/E
Jacket Piles	PCW	185	8,907	2,345
	HF		10	N/E

Behavioural Disturbance

- 6.3.15 Disturbance during piling was predicted to have far-reaching potential effects across the Eastern North Sea. However, it is noted that the disturbance ranges predicted from Subsea Noise modelling is likely to be an overestimate because the modelling assumes that the noise from piling maintains its impulsive characteristics at large distances, which is unlikely to be the case.
- 6.3.16 Since there is no agreed approach to modelling the transition from impulsive to non-impulsive noise and this is an ongoing active area of research (see Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report for more details), it was not possible to account for this phenomenon in the Subsea Noise modelling.
- 6.3.17 Applying associated impulsive noise thresholds for the whole contour range is likely to overestimate predicted impact distances and therefore leads to a potentially over precautionary assessment.
- 6.3.18 The dose-response methodology from Whyte *et al.* (2020) has been used for both seal species (Table 6.11). The impact at population-level has been assessed against the East Scotland SMU for harbour seal as proxy for the Firth of Tay and Eden Estuary SAC; and the East Scotland SMU for grey seal as proxy for the Isle of May SAC and the combined East Scotland SMU and Northeast England SMU for Berwickshire and North Northumberland Coast SAC.
- 6.3.19 Disturbance ranges have been calculated by applying a dose-response approach, using the Graham *et al.* (2017) response functions for bottlenose dolphins. At the time of writing, it is understood that the Graham *et al.* (2017) response functions are likely to be highly over precautionary (Thompson *et al.*, 2025), therefore as there is not at this time an agreed alternative method, both the full dose-response (>120 dB single-strike SEL (SEL_{ss})) and the capped (> 140 dB SEL_{ss}) are presented in Table 6.12 for bottlenose dolphin.

Table 6.11: Number of Seal at Risk of Disturbance Using the Dose-Response Approach (Whyte *et al.*, 2020), and the Resulting Percentage of the Population at Risk for Maximum Spatial Scenario (Monopile Foundation)

SAC	Species (Hearing Group)	Reference Population	Piling Scenario	Number of Animals	Percentage of SMU population
Firth of Tay and Eden Estuary SAC	Harbour seal (PCW)	East Scotland SMU	Single	8	2.2%
			Concurrent	9	2.5%
Isle of May SAC	Grey seal (PCW)	East Scotland SMU	Single	1,235	11.5%
			Concurrent	1,772	16.4%
Berwickshire and North Northumberland Coast SAC		Combined East Scotland and Northeast England SMU	Single	1,235	3.9%
			Concurrent	1,772	5.7%

Table 6.12: Number of Bottlenose Dolphin at Risk of Disturbance Using the Dose-Response Approach (Graham *et al.*, 2017) for the Maximum Spatial Scenario (Monopile Foundation)

Species (Hearing Group)	Reference Population	Piling Scenario	Number of Animals (>120 dB)	Percentage of MU population	Number of Animals (>140 dB)	Percentage of MU population
Bottlenose dolphin (HF)	Coastal East Scotland MU	Single	102	N/A*	41	N/A*
		Concurrent	141	N/A*	58	N/A*

*See the Moray Firth SAC section for discussion on why it is not applicable (N/A) to calculate the percentage of the Coastal East Scotland MU population.

Summary of iPCoD Modelling

- 6.3.20 To support the assessment of magnitude of effect for piling, the potential for population-level consequences of auditory injury and behavioural disturbance has been conducted using the iPCoD approach for harbour seal, grey seal and bottlenose dolphin (Volume 3, Technical Appendix 10.3: Marine Mammal iPCoD Modelling Report (TWP-BOW-RPS-OFE-RPT-00079) of the Offshore EIA Report).
- 6.3.21 The iPCoD framework applies simulated changes in vital rates to infer the number of animals that may be affected by disturbance as a means to iteratively project the size of the population. While it is noted that iPCoD modelling takes into account combined reference populations from multiple MUs, not just those relevant to the SACs, the results have been presented to provide context to population-level effects.
- 6.3.22 For harbour seal, the combined estimated populations of the Moray Firth SMU and East Scotland SMU were taken as the reference population ($958 + 364 = 1,322$ animals).
- 6.3.23 For grey seal, the combined estimated populations of the North Coast and Orkney SMU, Moray Firth SMU and East Scotland SMU were taken as the reference population ($34,191 + 7,380 + 10,784 = 52,355$).

- 6.3.24 For bottlenose dolphin, it was considered most appropriate given the location of the Proposed Development sits within both the Greater North Sea MU and Coastal East Scotland MU, to consider the potential impact of disturbance from Subsea Noise during piling impacts against the sum of the Greater North Sea MU and Coastal East Scotland MU population ($2,022 + 226 = 2,248$ animals).
- 6.3.25 The population estimates used to parameterise iPCoD models were taken from IAMMWG (2023) for bottlenose dolphin and from Marwood and Stevens (2024) for harbour seal and grey seal. For details see Volume 3, Technical Appendix 10.3: Marine Mammal iPCoD Modelling Report (TWP-BOW-RPS-OFE-RPT-00079) of the Offshore EIA Report.

Construction Phase

- 6.3.26 Potential effects from the Proposed Development on the relevant conservation objectives of the four SACs screened in for Annex II marine mammals are discussed in Table 6.13. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 6.13.

Firth of Tay and Eden Estuary SAC

- 6.3.27 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.13.

Harbour Seal

Injury

- 6.3.28 Based on the SEL_{cum} metric, the maximum range for injury to harbour seal was estimated as 8,907 m during concurrent pile installation of jacket piles (Table 6.10). This was reduced to 2,345 m with ADD activation (Table 6.10). The Firth of Tay and Eden Estuary SAC is located 89.9 km south-west of the Array Area, there is therefore no potential for spatial overlap with the SAC itself, or with the 50 km connectivity buffer to the SAC.
- 6.3.29 Applying a density value of 0.009 animals per km^2 (Table 6.3), a maximum of three harbour seals would be at risk of experiencing auditory injury from concurrent pile installation of jacket piles, suggesting a low risk of accumulated auditory injury using the modelled impact ranges for the 'no ADD' scenario. This equates to 0.8% of the East Scotland SMU, assuming that all harbour seals at risk of auditory injury are from the Firth of Tay and Eden Estuary SAC. Given that harbour seals from other SMUs (i.e. the Moray Firth SMU) are likely to be present in the Local Marine Mammal Study Area, 0.8% is a conservative estimate. As the Array Area and injury range are outside of the 50 km connectivity buffer used for harbour seal SACs, it is unlikely that individuals connected with Firth of Tay and Eden Estuary SAC would be within the Site Boundary.

- 6.3.30 Embedded Mitigation in the form of an outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report) will be implemented to further reduce the likelihood of auditory injury. Such mitigation will include deployment of an ADD as recommended in the guidelines (JNCC, 2010). The exact duration of ADD activation will, however, be discussed and agreed with consultees as part of the outline MMMP to be submitted post-consent and in respect of any refinements in the project description that may be available at a later stage and included within the outline MMMP (RIAA Part 1: Introduction; Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report). The adherence to a MMMP is considered to reduce the risk of auditory injury from impact piling to negligible levels.
- 6.3.31 Therefore, given the potential impact range, together with Embedded Mitigation measures, there is no risk of auditory injury for harbour seals. Furthermore, Russell *et al.* (2016) found that harbour seals avoided the area during the piling activity therefore, there is no realistic impact pathway for auditory injury due to piling for harbour seals connected to Firth of Tay and Eden Estuary SAC.

Behavioural Disturbance

- 6.3.32 For the single piling (monopile foundation) scenario, up to eight individuals (mean) (based on density estimates in Table 6.3) are estimated to be at risk of disturbance (Table 6.11). This equates to the mean of 2.2% of the East Scotland SMU population (Table 6.11). For the concurrent piling scenario, up to nine individuals (mean) (based on density estimates in Table 6.3) are estimated to be at risk of disturbance (Table 6.11). This equates to the mean of 2.5% of the East Scotland SMU population (Table 6.11). As described above for auditory injury (Paragraph 6.3.29), these are conservative estimates of the SMU (and therefore SAC) population disturbed, as it is unlikely that all disturbed seals will be connected to the Firth of Tay and Eden Estuary SAC population. Only nine of the 48 tagged harbour seals showed connectivity with both the Local Marine Mammal Study Area and the SAC, and only one of these seals showed telemetry tracks within the Array Area (see Figure 5-2 in Marwood and Stevens (2024)).
- 6.3.33 Figure 6.4 illustrates that there is some overlap of the 135 dB SEL_{ss} Subsea Noise contours (mild disturbance; Table 6.7) for both the single and concurrent scenario with the Firth of Tay and Eden Estuary SAC. Therefore, there may be mild disturbance to harbour seals within the Firth of Tay and Eden Estuary SAC due to the impact of piling noise.

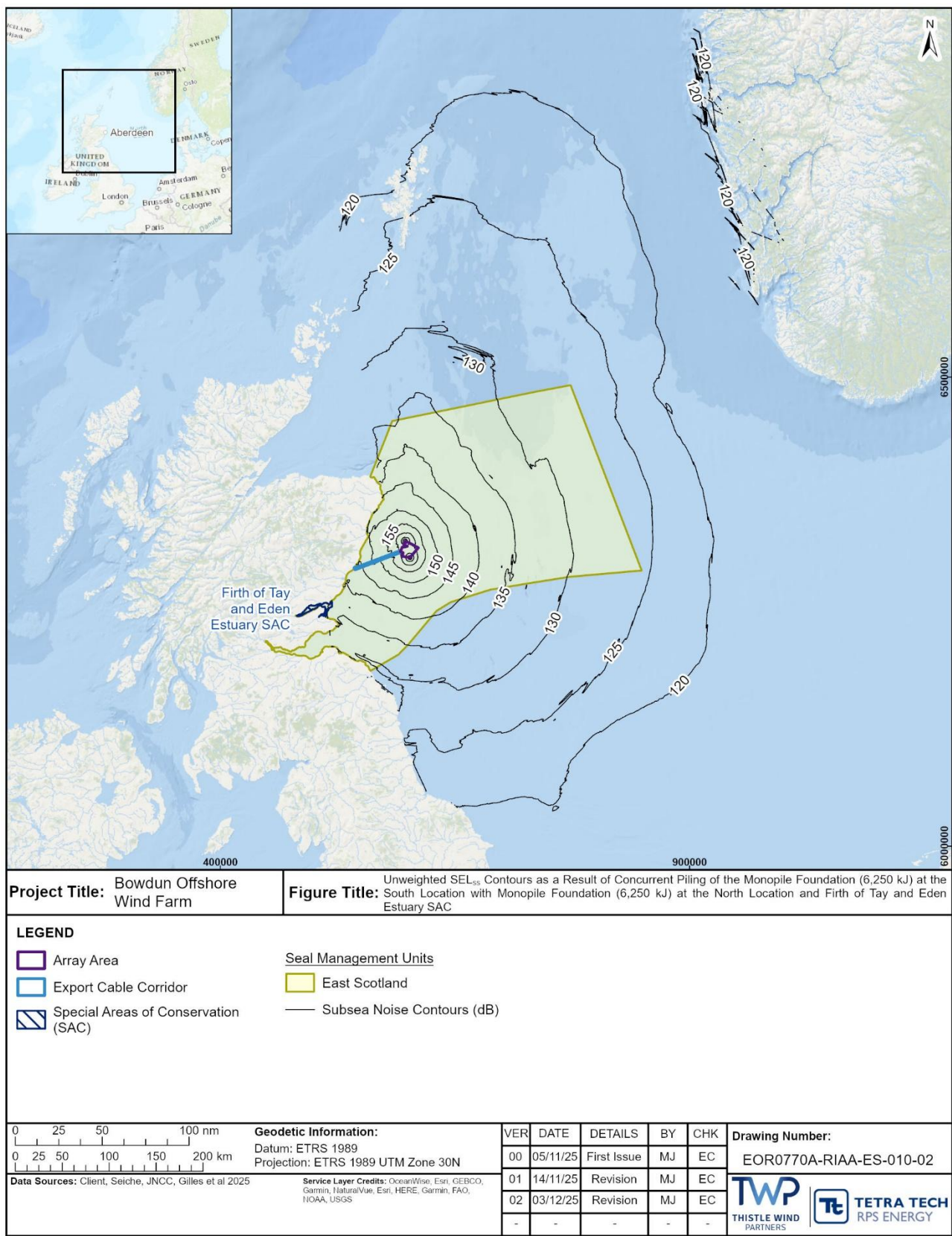


Figure 6.4: Unweighted SEL_{ss} Contours as a Result of Concurrent Piling of the Monopile Foundation (6,250 kJ) at the South Location with Monopile Foundation (6,250 kJ) at the North Location and Firth of Tay and Eden Estuary SAC

- 6.3.34 Potential disturbance effects from the Proposed Development are considered short term (occurring intermittently over the five year construction duration within a 20+ year lifespan) and reversible, and harbour seal are expected to return to the area within two hours of piling ceasing (Russell *et al.*, 2016).
- 6.3.35 For the purposes of this RIAA, the number of animals potentially disturbed cannot be directly attributed or allocated to the specific population within the Firth of Tay and Eden Estuary SAC. Nevertheless, the results of iPCoD modelling still provide important context at a population-level to help inform the overall assessment, as the East Scotland SMU (approximately 28% of the combined SMUs; Paragraph 6.3.22) is functionally linked with the Firth of Tay and Eden Estuary SAC.
- 6.3.36 Results of the iPCoD modelling for harbour seal against the reference population (n=1,322) for the single installation scenario and concurrent scenario (monopile foundation) showed that the median ratio of the impacted population to the un-impacted population at five, ten and 25 years was 1.00, which indicates there is no significant difference between the population trajectories for an un-impacted population and the impacted population (Volume 3, Technical Appendix 10.3: Marine Mammal iPCoD Modelling Report (TWP-BOW-RPS-OFE-RPT-00079) of the Offshore EIA Report). At five, ten and 25 years, there was no difference between the impacted population and un-impacted population. There are small changes in the impacted population size over time, which are similar to those predicted for an un-impacted population. The population modelling suggests that there is no predicted impact to the population from the construction of the Proposed Development over the 25-year modelled period from the single monopile foundation installation scenario and concurrent scenario. It is therefore considered that there would be no potential long term effects on the harbour seal population of the East Scotland SMU resulting from elevated Subsea Noise arising during piling.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.3.37 Potential effects from the Proposed Development on the Isle of May SAC or Berwickshire and North Northumberland Coast SAC conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.13.

Grey Seal

Injury

- 6.3.38 Based on the SEL_{cum} metric, the maximum range for injury to grey seal was estimated as 8,907 m during concurrent pile installation at jacket piles (Table 6.10). This was reduced to 2,345 m with ADD activation (Table 6.10). The Isle of May SAC is located 104.5 km south-west of the Array Area and Berwickshire and North Northumberland Coast SAC is 116.2 km south-west of the Array Area, there is therefore no potential for spatial overlap for injury with either SAC. Both SACs are outside of the 20 km connectivity buffer used for grey seal SACs (as per NatureScot guidance), however, the Proposed

Development is within the East Scotland SMU, which is functionally linked with the Isle of May SAC and Berwickshire and North Northumberland Coast SAC.

- 6.3.39 Applying a density value of 0.56 animals per km² (Table 6.3), a maximum of 140 grey seals would be at risk of experiencing auditory injury from concurrent pile installation of jacket piles ('no ADD' scenario). This equates to 1.3% of the East Scotland SMU assuming that all grey seals at risk of auditory injury are from the Isle of May SAC and 0.4% of the combined East Scotland and Northeast England SMU assuming that all grey seals at risk of auditory injury are from the Berwickshire and North Northumberland SAC. Given that grey seals from other SMUs (i.e. the North Coast & Orkney SMU and Moray Firth SMU (Marwood and Stevens, 2024)) are likely to be present in the Local Marine Mammal Study Area, these are a conservative estimates.
- 6.3.40 Embedded Mitigation in the form of an outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report) will be implemented to further reduce the likelihood of auditory injury. Such mitigation will include deployment of an ADD as recommended in the guidelines (JNCC, 2010). The exact duration of ADD activation will, however, be discussed and agreed with consultees as part of the outline MMMP to be submitted post-consent and in respect of any refinements in the project description that may be available at a later stage and included within the outline MMMP (RIAA Part 1: Introduction; Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report). The adherence to a MMMP is considered to reduce the risk of auditory injury from impact piling to negligible levels.
- 6.3.41 Therefore, given the potential impact range, together with Embedded Mitigation measures, there is no risk of auditory injury for grey seals. Furthermore, there is no realistic impact pathway for auditory injury due to piling for grey seals connected to either the Isle of May SAC or the Berwickshire and North Northumberland Coast SAC.

Behavioural Disturbance

- 6.3.42 For the single piling scenario (monopile foundation), up to 1,235 individuals (mean) (based on density estimates in Table 6.3) are estimated to be at risk of disturbance (Table 6.11). This equates to the mean of 11.5% of the East Scotland SMU population and 3.9% of the combined East Scotland and Northeast England SMU (Table 6.11). For the concurrent piling scenario, up to 1,772 individuals (mean) (based on density estimates in Table 6.3) are estimated to be at risk of disturbance (Table 6.11). This equates to the mean of 16.4% of the East Scotland SMU population and 5.7% of the combined East Scotland and Northeast England SMU (Table 6.11). As described above for auditory injury (Paragraph 6.3.39), these are conservative estimates of the SMU (and therefore SAC) population disturbed, as it is unlikely that all disturbed seals will belong to the Isle of May SAC population or the Berwickshire and North Northumberland Coast SAC population.

- 6.3.43 Figure 6.5 illustrates that there is some overlap of the 130 to 135 dB SEL_{ss} Subsea Noise contours (mild disturbance; Table 6.7) for both the single and concurrent scenario (monopile foundation) with the Isle of May SAC and the Berwickshire and North Northumberland Coast SAC. Therefore, there may be mild disturbance to grey seals within the Isle of May SAC and the Berwickshire and North Northumberland Coast SAC due to the impact of piling noise.

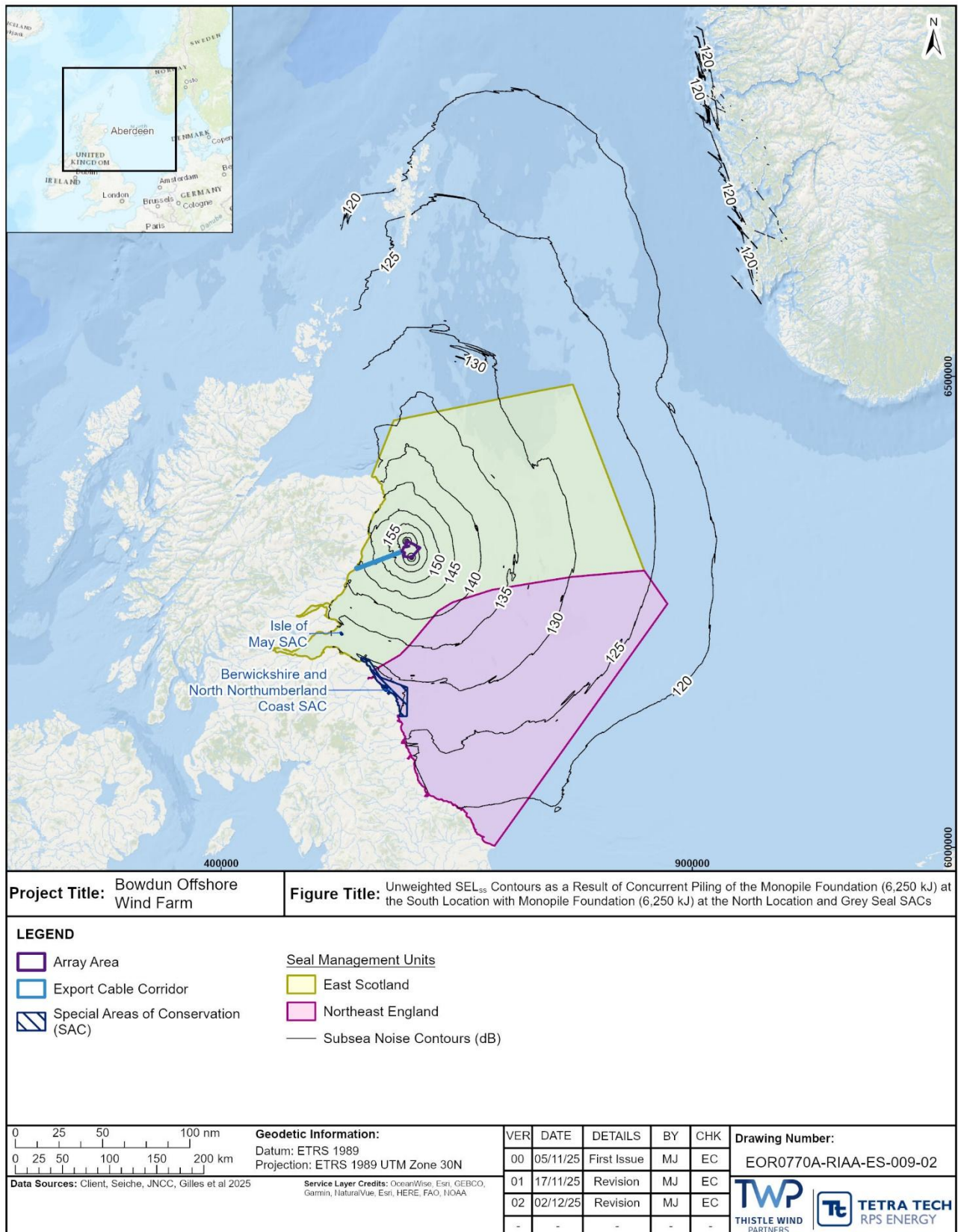


Figure 6.5: Unweighted SEL_{ss} Contours as a Result of Concurrent Piling of the Monopile Foundation (6,250 kJ) at the South Location with Monopile Foundation (6,250 kJ) at the North Location and Grey Seal SACs

- 6.3.44 Potential disturbance effects from the Proposed Development are considered short term (occurring intermittently over the five year construction duration within a 20+ year lifespan) and reversible.
- 6.3.45 For the purposes of this RIAA, the number of animals potentially disturbed cannot be directly attributed or allocated to the specific population within the Isle of May SAC and the Berwickshire and North Northumberland Coast SAC. Nevertheless, the results of iPCoD modelling still provide important context at a population-level to help inform the overall assessment, as the East Scotland SMU (approximately 21% of the combined SMUs; Paragraph 6.3.23) is functionally linked with the Isle of May SAC and the Berwickshire and North Northumberland Coast SAC.
- 6.3.46 Results of the iPCoD modelling for grey seal against the reference population (n=52,355) for the single installation scenario and concurrent scenario showed that the median ratio of the impacted population to the un-impacted population at five, ten and 25 years was 1.00, which indicates there is no significant difference between the population trajectories for an un-impacted population and the impacted population (see Volume 3, Technical Appendix 10.3: Marine Mammal iPCoD Modelling Report (TWP-BOW-RPS-OFE-RPT-00079) of the Offshore EIA Report). There are small changes in the impacted population size over time, which are similar to those predicted for an un-impacted population. The population modelling suggests that there is no predicted impact to the population from the construction of the Proposed Development over the 25-year modelled period from the single monopile foundation installation scenario or the concurrent scenario. It is therefore considered that there would be no potential long term effects on the grey seal population of the East Scotland SMU and/or Northeast England SMU resulting from elevated Subsea Noise arising during piling.

Moray Firth SAC

- 6.3.47 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (Paragraph 6.2.40) are presented in Table 6.13.

Bottlenose Dolphin

Injury

- 6.3.48 Based on the SEL_{cum} metric, the maximum range for injury to bottlenose dolphin was estimated as 10 m during concurrent pile installation of jacket piles (Table 6.10). The auditory injury range was not exceeded with ADD activation (Table 6.10). The Moray Firth SAC is located 159.6 km south-west of the Array Area, therefore there is no potential for spatial overlap with the SAC itself, nor the functionally linked Coastal East Scotland MU (Paragraphs 6.2.13 and 6.2.37).
- 6.3.49 Applying a density value of 0.007 animals per km^2 (Table 6.3), less than one bottlenose dolphin would be at risk of experiencing auditory injury from concurrent pile installation of jacket piles, suggesting a low risk of accumulated auditory injury using the modelled impact ranges for the 'no ADD' scenario. While it may be possible that the coastal population of dolphins (the Coastal East Scotland MU) may be in the Array Area or piling injury impact range, there is a very low risk of auditory injury for these dolphins as the population generally

remain closer to the coast. The Moray Firth SAC is functionally linked with the Coastal East Scotland MU (Paragraph 6.2.37) and so there is a very low risk to the SAC population. Therefore, there is no realistic impact pathway for auditory injury due to piling for bottlenose dolphin connected to Moray Firth SAC.

Behavioural Disturbance

- 6.3.50 For the single piling scenario (monopile foundation), up to 41 individuals (mean) (based on density estimates in Table 6.3) are estimated to be at risk of disturbance using the >140 dB dose-response methodology, while up to 102 are estimated to be at risk of disturbance using the >120 dB dose-response methodology (Table 6.12). For the concurrent piling scenario (monopile foundation), up to 58 individuals (mean) (based on density estimates in Table 6.3) are estimated to be at risk of disturbance using the >140 dB dose-response methodology, while up to 141 are estimated to be at risk of disturbance using the >120 dB dose-response methodology (Table 6.12). As described above for auditory injury (Paragraph 6.3.49), it is unlikely that many, if any, of the disturbed bottlenose dolphin will belong to the Moray Firth SAC population (synonymous to the Coastal East Scotland MU population; Paragraph 6.2.37).
- 6.3.51 Due to the landmass to the north-east of the Local Marine Mammal Study Area it is uncertain which Subsea Noise contour would overlap with the Moray Firth SAC, but it is assumed that the MDS would be an overlap of the 130 to 135 dB SEL_{ss} Subsea Noise contours (mild disturbance) for both the single and concurrent scenario. At this distance the received level from piling will have likely lost much of the impulsive characteristics. However, noise contours modelled reach the coastal areas and overlap the Coastal East Scotland MU (with a range of 140 to 160 dB SEL_{ss}) and therefore the noise levels within may result in mild to strong disturbance to the inshore ecotype bottlenose dolphin, within Coastal East Scotland MU.
- 6.3.52 Available evidence has shown that coastal bottlenose dolphins do not leave the area during piling activities (Fernandez-Betelu *et al.*, 2021; Graham *et al.*, 2017). Therefore, although strong disturbance (Table 6.7) may occur to a small number of dolphins belonging to the Coastal East Scotland MU (i.e. the Moray Firth SAC), potential disturbance effects from the Proposed Development are considered short term (occurring intermittently over the five year construction duration within a 20+ year lifespan) and reversible.

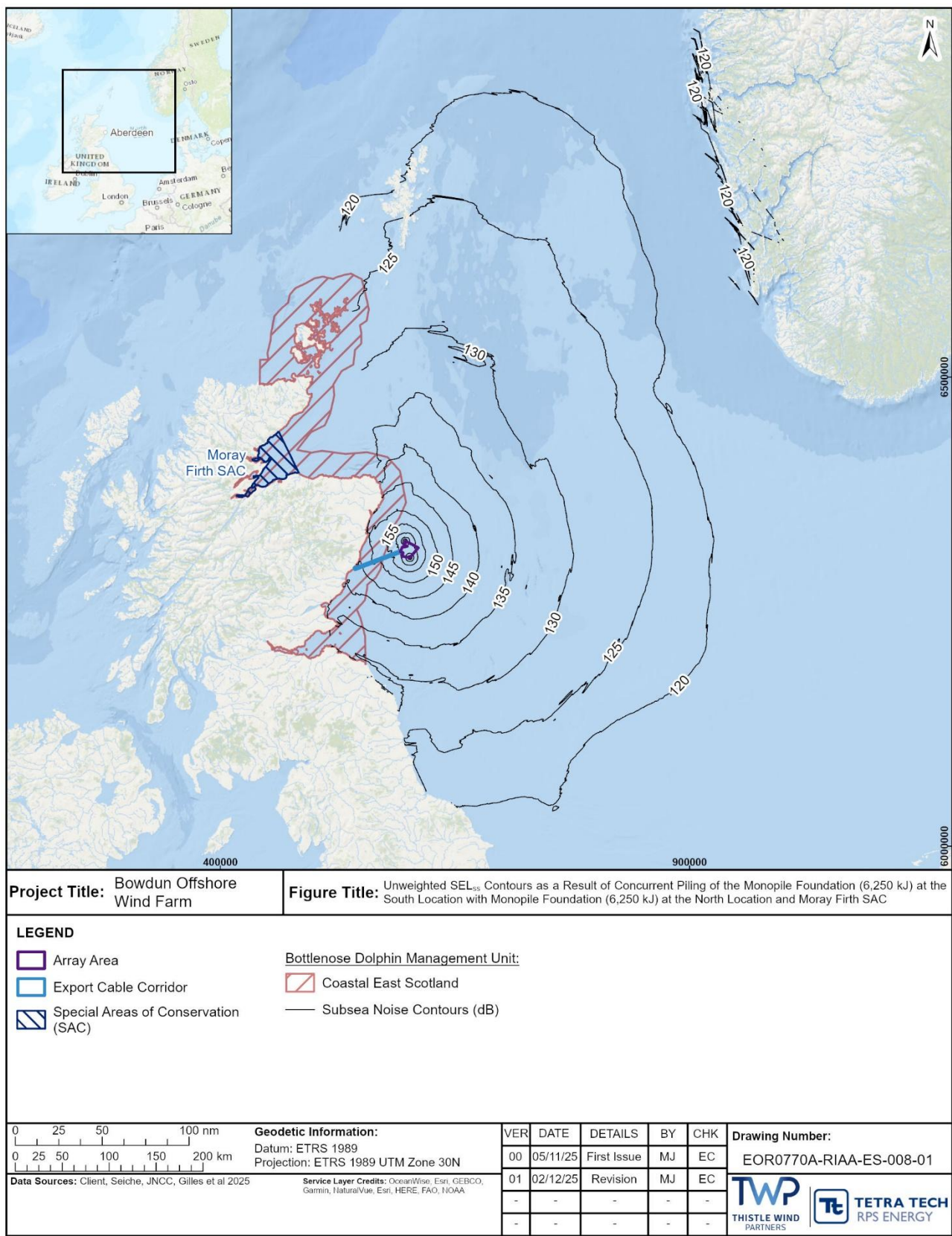


Figure 6.6: Unweighted SEL_{ss} Contours as a Result of Concurrent Piling of the Monopile Foundation (6,250 kJ) at the South Location with Monopile Foundation (6,250 kJ) at the North Location and Moray Firth SAC

- 6.3.53 For the purposes of this RIAA, the number of animals potentially disturbed cannot be directly attributed or allocated to the specific population within the Moray Firth SAC. Nevertheless, the results of iPCoD modelling still provide important context at a population-level to help inform the overall assessment, as the Coastal East Scotland MU (approximately 10% of the combined MUs; Paragraph 6.3.24) is functionally linked with the Moray Firth SAC.
- 6.3.54 Results of the iPCoD modelling for bottlenose dolphin using the Coastal East Scotland MU vital rates for the single installation scenario and the concurrent scenario showed a general increase in the population trajectory of the combined Coastal East Scotland MU and Greater North Sea MU reference population (n=2,246). The median ratio of the impacted population to the un-impacted population at five, ten and 25 years was 1.00 for both scenarios, which indicates there is no significant difference between the population trajectories for an un-impacted population and the impacted population (see Volume 3, Technical Appendix 10.3: Marine Mammal iPCoD Modelling Report (TWP-BOW-RPS-OFE-RPT-00079) of the Offshore EIA Report). The population modelling therefore suggests that there is no impact to the Coastal East Scotland MU and Greater North Sea MU bottlenose dolphin population from the construction of the Proposed Development over the 25-year modelled period from the single installation scenario or the concurrent scenario (monopile foundation). It is therefore considered that there would be no potential long term effects on the bottlenose dolphin population of the Coastal East Scotland MU resulting from elevated Subsea Noise arising during piling.

Conclusion

- 6.3.55 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of injury and disturbance from Subsea Noise generated during piling, with Embedded Mitigation (secured as per Table 6.9) in place, with respect to the construction phase of the Proposed Development.

Table 6.13: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of Injury and Disturbance from Subsea Noise Generated during Piling during the Construction Phase

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	As described in Paragraphs 6.3.28 to 6.3.31, piling during the construction phase is unlikely to lead to injury (and therefore mortality) of harbour seals as there is no realistic impact pathway for auditory injury due to piling. The auditory injury range from piling is out to 2,345 m with the Embedded Mitigation measure of ADD activation and the SAC is located 89.9 km south-west of the Array Area. This ensures that the recovery of harbour seal at a population-level (noting that the condition of harbour seal within the SAC was last assessed as unfavourable – declining; see Paragraph 6.2.20) is not impeded and animals can move safely between the SAC and important areas of functionally linked sea outwith the SAC (NatureScot, 2024c). Therefore, harbour seals within the SAC will not be at significant risk of injury or mortality and this impact will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.3.32 to 6.3.36, significant disturbance of harbour seals throughout the SAC from piling during the construction phase will not occur. Only the mild disturbance contours overlap with the SAC (Figure 6.4). Even outwith the SAC the number of harbour seal disturbed is low (9 seals during concurrent piling). There is limited connectivity between the Array Area (Paragraph 6.3.32) as only one tagged seal showed connectivity with the SAC. This ensures harbour seals will continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided and this impact will not prevent the distribution of harbour seals throughout the SAC from being maintained.

SAC	Feature	Target/Conservation Objectives	Conclusion
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no impact pathway between Subsea Noise generated during piling and the supporting habitats and processes within the SAC relevant to harbour seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats and processes within the SAC from being maintained.
Isle of May SAC	Grey seal	2a. ensure grey seals are a viable component of the Isle of May SAC.	As described in Paragraphs 6.3.38 to 6.3.46, piling during the construction phase is unlikely to lead to injury or strong behavioural disturbance of grey seals. There is no realistic impact pathway for injury during piling in the construction phase, as the auditory injury range is out to 2,345 m with the Embedded Mitigation measure of ADD activation and the SAC is located 104.5 km south-west of the Array Area. Similarly, only the mild disturbance contours overlap with the SAC (Figure 6.5), ensuring grey seals can move safely between the SAC and important areas of functionally linked sea outwith the SAC (NatureScot, 2025d). Importantly, this means that there is no effect on reproductive capability of grey seal during the breeding season and pup production would not be expected to decline as a result of this impact, ensuring stable or increasing grey seal numbers are maintained. Therefore, this impact will not prevent the population of grey seals from being maintained as a viable component of the SAC.
		2b. ensure the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals.	This conservation objective refers to potential for long term declines in the use of the SAC, changes in the distribution of the species on a sustained basis or changes in their behaviour such that it reduces the ability of the species to survive, breed or rear young (NatureScot, 2025d). As described in Paragraphs 6.3.44 to 6.3.46, only the mild disturbance contours from piling overlap with the SAC (Figure 6.5). Furthermore, modelling demonstrated there would be no population-level effect on the species and therefore no effect of Subsea Noise during piling on the survival of this

SAC	Feature	Target/Conservation Objectives	Conclusion
			species or their ability to use and access all areas within the SAC used for pupping and nursing. Therefore, significant disturbance will be avoided, and this impact will not prevent the distribution of grey seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats relevant to grey seal are maintained.	There is no impact pathway between Subsea Noise generated during piling and the supporting habitats within the SAC relevant to grey seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats relevant within the SAC relevant to grey seal from being maintained.
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no impact pathway between Subsea Noise generated during piling and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal. There is no overlap with the area of significant disturbance with the SAC including haul-out sites). Furthermore, the ensonified area would not impede connectivity between the SAC and the wider environment as grey seal are able to forage widely and disturbance during piling would only occur as short term reversible events after which animals would return to baseline levels. Therefore, as there is no impact pathway, this impact will not prevent the extent and distribution of habitats of the qualifying features, the structure and function of the habitats of the qualifying species and the supporting processes on which the habitats of qualifying species rely (Natural England, 2023), from being maintained.
		The structure and function of the habitats of the qualifying species are maintained.	
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	
		The populations of each of the qualifying species are maintained	
		The distribution of qualifying species within the site are maintained.	As described in Paragraphs 6.3.38 to 6.3.46, piling during the construction phase is unlikely to lead to injury or significant disturbance of grey seals as only the mild disturbance contours overlap with the SAC (Figure 6.5). There is no realistic impact pathway for injury during piling in the construction phase, as the auditory injury range is out to 2,345 m with the Embedded Mitigation measure of ADD activation and the SAC is located

SAC	Feature	Target/Conservation Objectives	Conclusion
			116.2 km from the Array Area. In addition, population modelling has demonstrated that there are no long term population-level effects on this species as a result of potential disturbance during piling and therefore with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023). Therefore, this impact will not prevent the population and distribution of grey seal within the SAC from being maintained.
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	As described in Paragraphs 6.3.48 and 6.3.49, there is no realistic impact pathway for injury during piling in the construction phase, as the maximum auditory injury range was 10m. There is no overlap of the auditory injury range with either the SAC, located 159.6 km from the Array Area nor the functionally linked Coastal East Scotland MU (NatureScot, 2025e). As such, there is no risk of injury or mortality to bottlenose dolphin from Subsea Noise from piling during the construction phase. Therefore, this impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.
		2b. ensure the distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.3.50 to 6.3.54, as a maximum design, the mild disturbance contours from piling may overlap with the SAC (Figure 6.6), and strong disturbance contours may overlap with the functionally linked Coastal East Scotland MU (NatureScot, 2025e). However, this is unlikely to prevent bottlenose dolphins from using and accessing all areas of the SAC. Therefore, significant disturbance will be avoided, and this impact will not prevent the distribution of bottlenose dolphin throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	The focus of this conservation objective is on maintaining sufficient prey resources and supporting habitats and processes to support the distribution and population of bottlenose dolphin associated with the SAC (NatureScot, 2025e). There is no impact pathway

SAC	Feature	Target/Conservation Objectives	Conclusion
			between Subsea Noise generated during piling and the supporting habitats and processes relevant to bottlenose dolphin (i.e. no overlap with the area of significant disturbance with the SAC nor functionally linked Coastal East Scotland MU). With respect to the availability of prey, no adverse effects were predicted on prey species (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report) and so prey species populations are expected to be maintained. Therefore, this impact will not prevent the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources from being maintained.

Injury and Disturbance from Subsea Noise Generated During UXO Clearance

- 6.3.56 The LSE assessment during the HRA screening process identified that during the construction phase, LSE could not be ruled out for potential injury and disturbance from Subsea Noise generated during UXO clearance for all four of the SACs screened in for Annex II marine mammals (see Table 3.1).
- 6.3.57 The MDS and Embedded Mitigation measures considered for the assessment of injury and disturbance from Subsea Noise generated during piling are shown in Table 6.14 and Table 6.15, respectively.

Table 6.14: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Injury and Disturbance from Subsea Noise Generated during UXO Clearance during the Construction Phase

Proposed Development Phase	MDS	Justification
Construction	• Maximum realistic charge weight of UXO 227 kg (NEQ) • A maximum of 40 UXOs are anticipated to require clearance (based on most probable case for the Array Area and Export Cable Corridor combined) • A maximum of 2 detonations during 24 hrs • A maximum of 40 days of UXO clearance activities (assuming one clearance per day)	Maximum number used in the MDS (reflecting the most realistic maximum design) and the maximum size of UXOs encountered within the Site Boundary is based on the UXO Hazard Assessment undertaken for the Proposed Development. As the precise nature and location of UXOs requiring clearance is not known at this stage, the assessment adopts a precautionary approach. In accordance with the JNCC (2025h) and the UK Government’s Joint Position Statement (DEFRA, 2025; UK Government, 2025), the default clearance method will be a low noise technique. The MDS represents the maximum charge weight likely to require clearance. Noise modelling will estimate impact ranges for low order as the default scenario, with high order impact ranges provided for context. This ensures that the assessment captures the full range of potential acoustic impacts while remaining grounded in realistic operational assumptions.

Table 6.15: Embedded Mitigation Measures Considered for the Assessment of Potential Impacts to Annex II Marine Mammals to Injury and Disturbance from Subsea Noise Generated during UXO Clearance during the Construction Phase

Embedded Mitigation Measures	Justification
Development of and adherence to a MMMP, to minimise the risk of auditory injury to marine mammals from noise generating activities resulting from the construction of the Proposed Development. Mitigation will include measures such as MMOs, PAM and ADDs.	<u>Outline Marine Mammals Mitigation Protocol</u> The development of and adherence to a MMMP which will present appropriate mitigation for activities that could potentially lead to injurious effects on marine mammals (e.g. piling, UXO clearance and geophysical surveys). For UXO clearance, measures will include setting a mitigation zone of at least 1 km in line with current guidance (JNCC, 2025m). The extent of the mitigation zone will be informed by the Subsea Noise modelling, and the injury ranges Standard industry measures including visual and acoustic monitoring by PAM and MMO operatives so that animals are outside the injury zone, plus the use of an ADD to deter animals over the injury zone. An outline MMMP has been developed on the basis of the most recent published statutory guidance in place at time of writing (JNCC, 2010, 2017, 2023, 2025h). The implementation of the finalised MMMP will mitigate for the risk of permanent auditory injury to marine mammals within a pre-defined ‘mitigation zone’ for each activity. The mitigation zone is determined considering the largest injury zone across all species for each relevant activity. The outline MMMP includes visual and acoustic monitoring as a minimum over the defined mitigation zones so that animals are clear before the activity commences. Together with ADDs to deter animals from injury risk zones. In line with the most recent guidance for UXO clearance (JNCC, 2025m). Low order clearance methods are the default. If high order clearance is considered to be unavoidable, potential Additional Mitigation measures have been discussed in the outline MMMP.

Embedded Mitigation Measures	Justification
	The Applicant will consult with NatureScot and MD-LOT with regards to mitigation should USVs/AUVs be used for activities associated with the Proposed Development and relevant EPS Licences will be sought. Secured in the Section 36 Consent and Marine Licence, via the requirement for a finalised and agreed MMMP, which will be submitted to MD-LOT for approval.
Where practicable, the use of low order disposal of UXOs will be implemented (i.e. deflagration).	Low order UXO clearance techniques generate less Subsea Noise than high order detonation and therefore present a lower risk of injury to sound-sensitive receptors such as marine mammals during UXO clearance. Noting the position statement from statutory authorities on UXO clearance (UK Government, 2025) the option to clear UXOs with low order techniques has been considered as a preferred method for the Proposed Development. Secured in the Section 36 Consent and Marine Licence, via the requirement for an EMP, which will be submitted to MD-LOT for approval.
Adoption of JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys, piling noise and use of explosives if and where required.	An outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report) has been developed on the basis of the most recent published statutory guidance (JNCC, 2010, 2017, 2023, 2025h). Secured in the Section 36 Consent and Marine Licence, via the requirement for a MMMP, which will be submitted to MD-LOT for approval.
Low order clearance techniques are the default method for UXO clearance and would not require Additional Mitigation over and above the Embedded Mitigation measures within the outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report). However, should high order clearance be unavoidable Additional Mitigation may be required dependant on the results of the UXO Risk Assessment. Appropriate mitigation measures will be discussed and agreed with	Low order clearance is the default method for the Proposed Development, consistent with the guidance set out in the SNCB joint position statement on UXO clearance (UK Government, 2025). Low noise alternatives to high order detonation are commercially available and cause less environmental harm. In line with this guidance high order clearance methods as a contingency will be considered once the results of the UXO geophysical survey are available. Should high order clearance be considered necessary, mitigation measures proportionate

Embedded Mitigation Measures	Justification
MD-LOT and NatureScot with the detail to be agreed for the finalised MMMP.	to the identified risk will be implemented for the Proposed Development in order to mitigate the impacts to marine mammals. Secured in the Section 36 Consent and Marine Licences, via the requirement for a MMMP, which will be submitted to MD-LOT for approval.
Development of, and adherence to, a Project Environmental Monitoring Plan (PEMP) to include details of any agreed surveys or monitoring requirements. The PEMP will provide the mechanism to validate the impact assessment, assess the effectiveness of mitigation measures, and inform adaptation of mitigation measures throughout the construction phase of the Proposed Development.	The PEMP will detail the methodology that will be used validate the impact assessment predictions made within the RIAA and offshore EIA. The PEMP will also provide for the mechanism for any adaptation of marine mammal mitigation measures if required to reduce impacts from the Proposed Development. Secured in the Section 36 Consent and Marine Licences, via the requirement for a PEMP, which will be submitted to MD-LOT for approval.

Information to Inform the Assessment

Overview of Subsea Modelling Conducted for the Proposed Development

- 6.3.58 Injury and disturbance from Subsea Noise generated during UXO clearance may arise due to all seabed preparation activities, the installation of the Wind Turbines and OSP foundations, the installation and/or maintenance of IAC and the Offshore Export Cables.
- 6.3.59 The precise details and locations of potential UXOs is unknown at the time of writing. Therefore, subsea modelling was undertaken for a range of charge configurations as set out in Table 6.16 (see Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report for full detail).
- 6.3.60 It is anticipated that up to 40 UXOs within the Site Boundary may require clearance. The maximum size is 720 kg NEQ (Table 6.16). The aim will be to enable clearance of two UXO targets within 24 hours, although this would be tide and weather dependent.

Table 6.16: Details of UXO and their Relevant Charge Sizes Employed for Modelling

Charge Size (kg NEQ)	Notes/Assumptions
Low Order and Low-Yield Donor Charge Configurations	
0.08 kg	Estimated size of donor charge used for low order technique.
0.5 kg	Estimated size of clearing shot to neutralise any residual explosive material.
Potential UXOs (High Order Disposal)	
227 kg	Realistic worst-case UXO charge weight, based on British WWII mine Mk XIV.
720 kg	Estimated UXO size that is anticipated to be encountered, based on a 1,000 kg German WWII mine BM1000.

- 6.3.61 Acoustic modelling for UXO clearance was conducted following the approach outlined in Soloway and Dahl (2014). The modelled estimates are conservative, because the model assumes the charge to be freely positioned in mid-water, unlike a UXO which could be resting on the seabed, or completely or partially buried thus impeding noise propagation. Further, it is likely that the explosive material will have deteriorated over time, making estimated maximum sound levels probable overestimations of actual sound levels.
- 6.3.62 Frequency-dependent weighting functions were applied to facilitate comparison with marine mammal hearing weighted thresholds. As per Robinson *et al.* (2020), low order deflagration yields a considerably lower amplitude of peak sound pressure compared to high order detonations. This study concluded that peak sound pressure during deflagration is due only to the size of the shaped charge used to initiate deflagration.

- 6.3.63 Potential impacts of Subsea Noise resulting from UXO clearance on marine mammals could include mortality, physical injury or auditory injury depending on the individuals' proximity to the detonation. The duration of impact (elevated noise) for each UXO detonation is very short (seconds) therefore behavioural effects are considered to be negligible in this context. As such, TTS represents temporary auditory impairment but can be also considered as a threshold for strong behavioural disturbance (or a moving away response).
- 6.3.64 A detailed Subsea Noise modelling assessment was carried out to investigate the potential for auditory injury and TTS to occur, using the latest assessment criteria (Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report). A project-specific outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report) has been developed to mitigate the potential for injury.
- 6.3.65 Whilst the clearance of UXO has historically been undertaken using a high order detonation, in line with the UK Government (2025) Joint Position Statement (DEFRA, 2025), the Applicant commits to the use of low order clearance techniques as the default method (Table 6.14 and Table 6.15). However, to ensure a precautionary approach, the assessment of significance for auditory injury and behavioural disturbance (using TTS onset as a proxy) is presented for both the high order and low order scenarios.

Injury

- 6.3.66 The assessment of auditory injury has used the impulsive threshold criteria, but as highlighted in Paragraphs 6.2.45 to 6.2.51, impulsive sound is likely to undergo transition to non-impulsive sound with distance from the sound source. Therefore, sound is unlikely to remain impulsive in character once it has propagated more than a few kilometres (Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report). The precise range at which this transition occurs is currently unknown (ORJIP, 2024). Hastie *et al.* (2019) suggested that some measures of impulsiveness change markedly within approximately 10 km of the source (the study focused on seismic surveys and piling, but this is also likely to be the case with UXO clearance). As such, predicted injury ranges in the order of tens of kilometres should be interpreted with care, as the actual auditory injury ranges are likely to be significantly lower.
- 6.3.67 Auditory injury ranges for low and high order clearance are presented in Table 6.17. The number of animals predicted to be at risk of auditory injury due to low and high order clearance is presented in Table 6.18.

Table 6.17: Maximum Potential Auditory Injury Ranges for Low Order Clearance and High Order Clearance (N/E = Threshold Not Exceeded) (NMFS, 2024)

Species/ Group	Metric	AUD INJ Threshold	Range (m)			
			Low Order Donor Charge (0.08 kg)	Low Order Clearing Shot (0.5 kg)	High Order Realistic (227 kg)	High Order (720 kg)
PCW	Peak SPL	223 dB re 1µPa	81	149	1,140	1,675
	SEL _{cum}	183 dB re 1µPa ² s	16	39	740	1,245
HF	Peak SPL	230 dB re 1µPa	40	73	560	825
	SEL _{cum}	193 dB re 1µPa ² s	N/E	N/E	79	138

Table 6.18: Maximum Potential Number of Animals with the Potential to Experience Auditory Injury Due to Low order Clearance and High order Clearance (N/E = Threshold Not Exceeded)

Metric	Number of Animals		
	Harbour seal	Grey seal	Bottlenose dolphin
Low Order Donor Charge (0.08 kg)			
Peak SPL	<1	<1	<1
SEL_{cum}	<1	<1	N/E
Low Order Clearing Shot (0.5 kg)			
Peak SPL	<1	<1	<1
SEL_{cum}	<1	<1	N/E
High Order Realistic (227 kg)			
Peak SPL	<1	3	<1
SEL_{cum}	<1	<1	<1
High Order (720 kg)			
Peak SPL	<1	5	<1
SEL_{cum}	<1	3	<1

6.3.68 The maximum auditory injury range estimated for harbour seal or grey seal was 1,675 m using the peak SPL metric, for the high order detonation of 720 kg NEQ; reduced to 1,140 m for 227 kg NEQ (Table 6.17). The number of individuals that could be at risk of auditory injury was less than one harbour seal and five grey seal for the maximum high order detonation of 720 kg NEQ (Table 6.18), based on average densities within the Local Marine Mammal Study Area in Table 6.3. This equates to less than 0.5% of the relevant SMUs functionally linked to the SACs (discussed within the SAC sections below). For low order donor charge (0.08 kg NEQ) and clearance shot (0.5 kg NEQ), the injury ranges were considerably lower with a maximum of 81 m and 149 m (peak SPL) respectively

(Table 6.17) resulting in less than one harbour seal and grey seal at risk within these ranges (Table 6.18).

- 6.3.69 The Subsea Noise assessment found that the maximum auditory injury range estimated for bottlenose dolphin using the peak SPL metric was 825 m for the high order detonation of 720 kg NEQ, reduced to 560 m for the realistic maximum case (227 kg NEQ) Table 6.17). Given relatively low densities of bottlenose dolphin within the Local Marine Mammal Study Area (Table 6.3), the high order detonation of 720 kg and 227 kg could result in the risk of injury for no more than one individual (Table 6.18). The number of individuals predicted to be at risk, relates to a small proportion of the Coastal East Scotland MU (i.e. less than 0.5%; discussed within the SAC section below). For low order donor charge (0.08 kg NEQ) and clearance shot (0.5 kg NEQ), the injury ranges were considerably lower with a maximum of 40 m and 73 m respectively (Table 6.17), and there would be no more than one bottlenose dolphin at risk of auditory injury within these ranges (Table 6.18).
- 6.3.70 The auditory injury ranges will not overlap with the Firth of Tay and Eden Estuary SAC, Isle of May SAC, Berwickshire and North Northumberland SAC or Moray Firth SAC. However, the 50 km connectivity buffer means that harbour seals connected to the Firth of Tay and Eden Estuary SAC could be at risk of auditory injury. Further, should UXO clearance be required within the Export Cable Corridor, there could be a risk to bottlenose dolphin within the Coastal East Scotland MU. It is unlikely there will be a risk of auditory injury to grey seals within the 20 km connectivity buffer, although seals from the East Scotland SMU may be in the area (i.e. MU functionally linked with the Isle of May SAC and Berwickshire and North Northumberland SAC).
- 6.3.71 The risk of injury in relation to high order clearance as worst-case, is anticipated to occur over a highly localised scale spatial extent in the context of the relevant geographic frame of reference. UXO clearance is anticipated to occur occasionally/intermittently for short periods of time. The proportion of the population is less than 0.5% for all species and these estimates are conservative as it is unlikely all animals will be from the MU populations functionally linked to the SACs (Table 6.3). Therefore, whilst there may be a small risk of auditory injury to Annex II marine mammals, effects will be at an individual level and therefore no population-level effects for any species.
- 6.3.72 As part of Embedded Mitigation measures adopted as part of the Proposed Development (Table 6.15), an outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report) has been developed for the purpose of mitigating the risk of auditory injury to marine mammals from potential UXO clearance activities at the Proposed Development. The measures included within the outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report) (Table 6.15) are in line with JNCC guidelines for minimising the risk of injury to marine mammals from using explosives (JNCC, 2025m).

- 6.3.73 Low order techniques will be applied as the default methodology for clearance of UXO. However, current guidance is to design mitigation based on maximum design high order scenario.
- 6.3.74 Given the potential for auditory injury from high order detonations for harbour seal and grey seal is at a greater range than can be mitigated by monitoring the 1 km zone, an ADD will be deployed to deter marine mammals to a greater distance before any detonation as part of the Embedded Mitigation measures.
- 6.3.75 This RIAA has presented the auditory injury range based on high order detonation of a 720 kg NEQ UXO (Table 6.17). At the time of writing, the actual number and size of the UXOs within the Proposed Development are unknown and therefore, the example ADD mitigation approach has been designed for a range of UXO munitions sizes so that the most appropriate approach can be applied to balance the risk of injury from UXO detonation with any additional noise introduced into the marine environment as deterrent measures.
- 6.3.76 The duration of the application of an ADD prior to UXO detonation is informed by marine mammal swim speeds (Table 6.6). The assumption being that individual animals will continue to flee. An ADD will be activated within the 60-minute pre-detonation search, provided no marine mammals have been observed within the mitigation zone for a minimum of 20 minutes.
- 6.3.77 The indicative analysis presented in Table 6.17 and Table 6.19 suggests that for UXO sizes of up to 720 kg, the pre-detonation search and use of 60 minutes of ADD will be sufficient to reduce the risk of experiencing auditory injury by grey seals, harbour seals and bottlenose dolphin to negligible magnitude.

Table 6.19: UXO Clearance Application of ADD Mitigation

Species/ Group	Metric	Range (m)		Activation Duration of the ADD		
		Low Order Clearing Shot (0.5 kg)	High Order (720 kg)	Low Order (0.5 kg)	High Order (720 kg)	Using Max Activation Time of 60 mins – Deterrence Range (m)
PCW	Peak SPL	149	1,675	83 seconds	16 minutes	N/A
HF	Peak SPL	73	825	48 seconds	9 minutes	N/A

- 6.3.78 While seals may only react within a certain distance, it is expected that small numbers of animals could potentially be exposed to the risk of auditory injury in the high order worst-case scenario. The assessment has considered the worst-case high order detonation of 720 kg NEQ, but details about UXO clearance technique to be used and charge sizes will not be available until after the consent is granted (following a pre-construction UXO survey), and so it is not possible to quantify the effects of UXO detonations and therefore, a residual number of animals potentially impacted is not presented within this RIAA,

although this is likely to only be up to one harbour seal, one grey seal and one bottlenose dolphin.

- 6.3.79 The Applicant will undertake a UXO risk assessment prior to construction to fully understand the possible UXOs present that require clearance. This will include size and type of UXO. The measures needed to successfully clear the identified UXOs will be detailed as per UK Government (2025) guidance (DEFRA, 2025). Therefore, prior to the commencement of UXO clearance work, final mitigation measures will be agreed post-consent, in consultation with MD-LOT and NatureScot, and proposed as part of the final MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report).

Behavioural Disturbance

- 6.3.80 As noted in Paragraph 6.3.63, the duration of noise emission for each UXO detonation is seconds, and therefore, behavioural effects are considered to be negligible in this context. Southall *et al.* (2007) recommended that the use of TTS onset threshold to be the most appropriate for single pulses (such as UXO detonation). This assessment for behavioural disturbance has used the onset of TTS as a proxy for disturbance. Although this assumes the potential temporary loss in hearing, which may mean some ecological functions could be inhibited in the short term, TTS is reversible on recovery of the animal's hearing and therefore not considered likely to lead to any long term-effects on the individual.
- 6.3.81 Disturbance ranges for low order and high order clearance of UXO are presented in Table 6.20. Ranges predicted for high order clearance using peak SPL exceeded 1,000 m for all three qualifying species, with the largest behavioural disturbance range predicted using the SEL_{cum} metric for both seal species at 8,785 m (Table 6.20).
- 6.3.82 For low order clearance of UXO, the largest ranges using the SEL_{cum} metric were predicted for the clearance shot of 0.5 kg NEQ; of up to 535 m for both seal species (Table 6.20). Ranges predicted for the Annex II marine mammals using peak SPL were 274 m for seals and 134 m for bottlenose dolphin (Table 6.20).

Table 6.20: Maximum Potential TTS Ranges for Low Order and High Order Clearance

Species/ Group	Metric	Threshold	Range (m)			
			Low Order Donor Charge (0.08 kg)	Low Order Clearing Shot (0.5 kg)	High Order Realistic (227 kg)	High Order (720 kg)
PCW	Peak SPL	217 dB re 1µPa	149	274	2,105	3,090
	SEL _{cum}	168 dB re 1µPa ² s	222	535	6,300	8,785
HF	Peak SPL	224 dB re 1µPa	73	134	1,030	1,515
	SEL _{cum}	178 dB re 1µPa ² s	6	14	985	1,595

- 6.3.83 The number of animals predicted to experience a behavioural disturbance due to low order clearance and high order clearance is presented in Table 6.21.
- 6.3.84 Up to three harbour seals and 136 grey seals were predicted to be disturbed as a result of the high order detonation of 720 kg NEQ (Table 6.21). For bottlenose dolphin the number of animals predicted to be disturbed was very small with no more than one animal within the predicted effect zones for low order clearance or high order clearance (Table 6.21).

Table 6.21: Maximum Potential Number of Animals With the Potential to Experience TTS onset Due to Low Order Clearance and High Order Clearance

Metric	Number of Animals		
	Harbour seal	Grey seal	Bottlenose dolphin
Low Order Donor Charge (0.08 kg)			
Peak SPL	<1	<1	<1
SEL_{cum}	<1	<1	<1
Low Order Clearing Shot (0.5 kg)			
Peak SPL	<1	<1	<1
SEL_{cum}	<1	<1	<1
High Order Realistic (227 kg)			
Peak SPL	<1	8	<1
SEL_{cum}	2	70	<1
High Order (720 kg)			
Peak SPL	<1	17	<1
SEL_{cum}	3	136	<1

- 6.3.85 The behavioural disturbance ranges will not overlap with the Firth of Tay and Eden Estuary SAC, Isle of May SAC, Berwickshire and North Northumberland SAC or Moray Firth SAC. However, due to the 50 km connectivity buffer there is the potential for an impact overlap for harbour seals connected to the Firth of Tay and Eden Estuary SAC should high order clearance be required as the largest disturbance range for seals is 8.8 km (SEL_{cum}). As grey seals within the East Scotland SMU are functionally linked to the Isle of May SAC and Berwickshire and North Northumberland SAC, there is the potential for overlap with habitat use by these seals, although there is no impact overlap with the 20 km connectivity buffer recommended by NatureScot (Table 2.1).
- 6.3.86 Should UXO clearance be required within the Export Cable Corridor close to the mainland, there is the potential for overlap with habitat use by bottlenose dolphin connected to the Moray Firth SAC (within the Coastal East Scotland MU). However, the range of potential disturbance overlap with this SAC for the low order scenario is minimal. Should UXO clearance be required within the Export Cable Corridor close to the mainland, there may be a risk to bottlenose

dolphin within 134 m. This impact range will be fully mitigable using standard JNCC mitigation (Table 6.15 and Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report).

- 6.3.87 The assessment has considered the maximum design high order detonation of 720 kg NEQ. The impact (high order detonation) is predicted to be of localised or medium spatial extent in the context of the relevant geographic frame of reference, the duration is anticipated to be momentary, and occurring intermittently, and both the impact itself (i.e. the elevation in Subsea Noise during detonation event) and effect of disturbance, is reversible). As TTS is a temporary and reversible hearing impairment, it is anticipated that any animals experiencing this shift in hearing would recover after they have moved beyond the ensonified area and are no longer exposed to elevated sound levels.
- 6.3.88 All species considered are deemed to have the ability to avoid or adapt behaviour in response to this impact. For all Annex II marine mammals only a small proportion of the relevant MU is predicted to be affected by strong behavioural disturbance. As such, whilst there may be effects at an individual level, these are not predicted to be at a scale that would lead to any population-level effects.

Construction Phase

- 6.3.89 Potential effects from the Proposed Development on the relevant conservation objectives of the four SACs screened in for Annex II marine mammals are presented in Table 6.22. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 6.22.

Firth of Tay and Eden Estuary SAC

- 6.3.90 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.22.

Harbour Seal

Injury

- 6.3.91 As presented in Paragraph 6.3.68, the maximum auditory injury range estimated for harbour seal was 1,675 m using the peak SPL metric for the high order detonation of 720 kg NEQ. However, this was reduced to 1,140 m for the realistic maximum scenario: 227 kg NEQ (Table 6.17). The number of individuals that could be potentially injured, based on average densities within the Local Marine Mammal Study Area (Table 6.3) was estimated as no more than one animal (Table 6.18), which equates to 0.3% of the East Scotland SMU population. For low order donor charge (0.08 kg NEQ) and clearance shot (0.5 kg NEQ), the injury ranges were considerably lower with a maximum of 81 m and 149 m (peak SPL), respectively (Table 6.17) and there would be no more than one animal potentially injured within these ranges (Table 6.18). The maximum auditory injury range for

harbour seal (1,675 m) does not overlap with the Firth of Tay and Eden Estuary SAC itself, which is 42.3 km south-west of the Export Cable Corridor. However, this maximum auditory injury range will overlap with the 50 km connectivity buffer around the SAC resulting in a small risk of auditory injury for harbour seals associated with the SAC.

- 6.3.92 Based on the maximum auditory injury range (estimated using the peak SPL metric) this potential impact would be localised within several kilometres of the detonation. UXO clearance would occur intermittently throughout the construction phase of the Proposed Development and be very short term (40 days maximum). Although the potential impact itself is reversible (i.e. the elevation in Subsea Noise only occurs during the detonation event), the effect of auditory injury on harbour seal is permanent. However, with Embedded Mitigation applied (Table 6.15), it is anticipated that harbour seal would be deterred from the injury zone and therefore the likelihood of auditory injury is considered to be very low (Paragraph 6.3.77), and result in no adverse effects on the population of the Firth of Tay and Eden Estuary SAC.

Behavioural Disturbance

- 6.3.93 As presented in Paragraphs 6.3.80 to 6.3.88, the largest range of strong behavioural disturbance to harbour seal (using TTS as a proxy) was predicted for high order detonation of the 720 kg NEQ using the SEL_{cum} metric: 8,785 m (Table 6.17). The SEL_{cum} metric yielded higher strong disturbance ranges during high order detonation than the peak SPL metric (Table 6.17). It should be noted that impulsive noise thresholds (TTS onset) were used in the Subsea Noise modelling for strong behavioural disturbance as a result of UXO clearance, and therefore due to the likely transition from impulsive to non-impulsive in character, the predicted ranges are likely to be conservative. Based on SEL_{cum} , the number of harbour seals at risk of experiencing strong behavioural disturbance within a predicted 8,785 m disturbance range was estimated as three animals (0.8% of the East Scotland SMU) (Table 6.18). The strong behavioural disturbance ranges will not overlap with the Firth of Tay and Eden Estuary SAC itself, which is a minimum of 42.3 km south-west of the Export Cable Corridor, but may affect a small number of seals associated with the Firth of Tay and Eden Estuary SAC (maximum three individuals, equating to 0.8% of the East Scotland SMU, assuming all potentially disturbed animals originate from the SAC population) within the 50 km connectivity buffer. However, disturbance to three seals will not undermine the viability of harbour seal as a component of the SAC.
- 6.3.94 Kastelein *et al.* (2018) measured recovery rates of harbour seal following exposure to a sound source of 193 dB re 1 μPa^2s (SEL_{cum}) over 360 minutes and found that recovery from TTS to the pre-exposure baseline was estimated to be complete within 72 minutes following exposure. To note, this is a significantly longer exposure than would be expected from a UXO clearance event. Findings reported in SEAMARCO (2011), showed that for small TTS values, recovery in seal species was very fast (around 30 minutes). Ketten (1995) also reported relatively fast recovery, with full hearing recovery within two hours following exposure.

- 6.3.95 Impaired hearing for a short period of time is therefore anticipated to have little effect on the total foraging period of a seal. It is therefore likely that harbour seal can tolerate the effect of short term hearing impairment without any impact on either reproduction or survival rates and would be able to return to previous behavioural states or activities once the impacts had ceased.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.3.96 Potential effects from the Proposed Development on the relevant conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.22.

Grey Seal

Injury

- 6.3.97 As presented in Paragraph 6.3.68, the maximum auditory injury range estimated for grey seal was 1,675 m using the peak SPL metric for the high order detonation of 720 kg NEQ. However, this was reduced to 1,140 m for the realistic maximum scenario: 227 kg NEQ (Table 6.17). The number of individuals that could be potentially injured, based on average densities within the Local Marine Mammal Study Area (Table 6.3) was estimated as no more than five animals (Table 6.18). This equates to 0.05% of the East Scotland SMU population (functionally linked to the Isle of May SAC) and 0.02% of the combined East Scotland SMU and Northeast England SMU (functionally linked to the Berwickshire and North Northumberland SAC). Given that it unlikely that all injured seals will belong to only these SMUs (see Paragraph 6.3.42), these are conservative estimates.
- 6.3.98 For low order donor charge (0.08 kg NEQ) and clearance shot (0.5 kg NEQ), the injury ranges were considerably lower with a maximum of 81 m and 149 m (peak SPL), respectively (Table 6.17) and there would be no more than one animal potentially injured within these ranges (Table 6.18). The maximum auditory injury range for grey seal (1,675 m) does not overlap with the Isle of May SAC, which is 68.3 km south-west of the Export Cable Corridor or the Berwickshire and North Northumberland SAC, which is 93.4 km south-west of the Export Cable Corridor. This maximum auditory injury range will not overlap with the 20 km connectivity buffer around the Isle of May SAC, but as the Proposed Development is within the East Scotland SMU there is a small risk of auditory injury for grey seals associated with both SACs.
- 6.3.99 Based on the maximum auditory injury range (estimated using the peak SPL metric) this potential impact would be localised within several kilometres of the detonation. UXO clearance would occur intermittently throughout the construction phase of the Proposed Development and be very short term (40 days maximum). Although the potential impact itself is reversible (i.e. the elevation in Subsea Noise only occurs during the detonation event), the effect of auditory injury on grey seal is permanent. With Embedded Mitigation applied (Table 6.15), it is anticipated that grey seal would be deterred from the injury zone and therefore the likelihood of auditory injury is considered to be very low

(Paragraph 6.3.77), and result in no adverse effects on the population of the SAC.

Behavioural Disturbance

- 6.3.100 As presented in Paragraphs 6.3.80 to 6.3.88, the largest range of strong behavioural disturbance to grey seal (using TTS as a proxy) was predicted for high order detonation of the 720 kg NEQ using the SEL_{cum} metric: 8,785 m (Table 6.20). The SEL_{cum} metric yielded higher strong disturbance ranges during high order detonation than the peak SPL metric (Table 6.20). It should be noted that impulsive noise thresholds (TTS onset) were used in the Subsea Noise modelling for strong behavioural disturbance as a result of UXO clearance, and therefore due to the likely transition from impulsive to non-impulsive in character, the predicted ranges are likely to be conservative. Based on SEL_{cum}, the number of grey seals at risk of experiencing strong behavioural disturbance within a predicted 8,785 m disturbance range was estimated as 136 animals (1.3% of the East Scotland SMU and 0.4% of the combined East Scotland SMU and Northeast England SMU) (Table 6.21). The strong behavioural disturbance ranges will not overlap with Isle of May SAC, which is 68.3 km south-west of the Export Cable Corridor or the Berwickshire and North Northumberland SAC, which is 93.4 km south-west of the Export Cable Corridor. However, seals associated with the SACs that belong to the East Scotland SMU (136 individuals) may experience behavioural disturbance. However, disturbance to less than 1.3% of the East Scotland SMU grey seal population (maximum 136 seals assuming all potentially disturbed animals originate from the SAC populations) will not undermine the viability of grey seal as a component of the Isle of May SAC nor affect the population of the Berwickshire and North Northumberland SAC.
- 6.3.101 Findings reported in SEAMARCO (2011), showed that for small TTS values, recovery in seal species was very fast (around 30 minutes). Ketten (1995) also reported relatively fast recovery, with full hearing recovery within two hours following exposure.
- 6.3.102 Impaired hearing for a short period of time is therefore anticipated to have little effect on the total foraging period of a seal. It is therefore likely that grey seal can tolerate the effect of short term hearing impairment without any impact on either reproduction or survival rates and would be able to return to previous behavioural states or activities once the impacts had ceased.

Moray Firth SAC

- 6.3.103 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.22.

Bottlenose Dolphin

Injury

- 6.3.104 As presented in Paragraph 6.3.69, the maximum auditory injury range estimated for bottlenose dolphin using the peak SPL metric was 825 m for the high order detonation of 720 kg NEQ. However, this was reduced to 560 m for the realistic MDS: 227 kg (NEQ) (Table 6.20). Given relatively low densities of bottlenose dolphin within the Local Marine Mammal Study Area and small injury ranges, the high order detonation of 720 kg and 227 kg could result in injury for no more than one animal (Table 6.17), which equated to 0.44% of the Coastal East Scotland MU. For low order clearance donor charge (0.08 kg NEQ) and clearance shot (0.5 kg NEQ), the injury ranges were considerably lower with a maximum of 40 m and 73 m respectively (Table 6.17), and there would be no more than one animal potentially injured within these ranges (Table 6.18). The maximum auditory injury range for bottlenose dolphin (825 m) does not overlap with the Moray Firth SAC itself, which is a minimum of 159.6 km north-west from the Export Cable Corridor. However, coastal bottlenose dolphins from the Coastal East Scotland MU population may be present within the Site Boundary, particularly in the Export Cable Corridor, which could result in a small risk of auditory injury for bottlenose dolphin associated with the SAC as the SAC population is functionally linked with the Coastal East Scotland MU population (Paragraph 6.2.37).
- 6.3.105 There is limited scientific information available regarding the sensitivity of bottlenose dolphins to underwater blasting or explosive noise. During clearance of relatively small explosives (35 kg charge) within an important feeding area for a resident community of bottlenose dolphin in Portugal (dos Santos *et al.*, 2010), noise levels in excess of 170 dB re 1 μ Pa (SPL) were measured. However, no adverse effects were recorded in the behaviour of the resident community. In the absence of species-specific data, the RIAA adopts a precautionary approach in relation to HF cetaceans and Embedded Mitigation is designed to address this uncertainty.
- 6.3.106 Based on the maximum auditory injury range (825 m; estimated using the peak SPL metric) this potential impact would be localised within 1 km of the detonation. UXO clearance would occur intermittently throughout the construction phase of the Proposed Development and be very short term (40 days maximum). Although the potential impact itself is reversible (i.e. the elevation in Subsea Noise only occurs during the detonation event), the effect of auditory injury on bottlenose dolphin is permanent. With Embedded Mitigation applied (Table 6.18), it is anticipated that bottlenose dolphin would be deterred from the injury zone and therefore the likelihood of auditory injury is considered to be very low (Paragraph 6.3.77) and result in no adverse effects on the population associated with the SAC.

Behavioural Disturbance

- 6.3.107 As presented in Paragraphs 6.3.80 to 6.3.88, the largest range of strong behavioural disturbance to bottlenose dolphin (using TTS as a proxy) was predicted for high order detonation of the 720 kg NEQ using the SEL_{cum} metric: 1,595 m (Table 6.20). The SEL_{cum} metric yielded larger strong disturbance ranges during high order detonation than the peak SPL metric (Table 6.20). For bottlenose dolphin, the number of animals predicted to be disturbed was very small with no more than one animal within the predicted effect zones (Table 6.21). The behavioural disturbance ranges will not overlap with the Moray Firth SAC itself, which is a minimum of 159.6 km north-west from the Export Cable Corridor. However, coastal bottlenose dolphins from the Coastal East Scotland MU population may be present within the Site Boundary, particularly in the Export Cable Corridor. This could result in a small risk of behavioural disturbance for bottlenose dolphins associated with the SAC as the SAC population is functionally linked with the Coastal East Scotland MU population (Paragraph 6.2.37). However, disturbance to up to one dolphin will not undermine the viability of bottlenose dolphin population within the SAC.
- 6.3.108 Kastelein *et al.* (2021) found that the susceptibility to TTS depends on the frequency of the fatiguing sound causing the shift and the greatest TTS depends on the SPL (and related SEL). In a series of studies reviewed in Finneran (2015), which measured TTS occurrence in harbour porpoise (Very High Frequency cetacean) at a range of frequencies typical of high-amplitude anthropogenic sounds, the greatest shift in mean TTS occurred at 0.5 kHz with hearing recovery within 60 minutes after the fatiguing sound stopped. Whilst there are no available species-specific recovery rates for HF cetaceans (i.e. bottlenose dolphins) to TTS, there is no evidence to suggest that recovery will be significantly different to harbour porpoise recovery rates, therefore these animals can recover their hearing after they are no longer exposed to elevated sound levels. It can therefore be anticipated that bottlenose dolphins would be able to tolerate the effect without any impact on reproduction or survival rates with the ability to return to previous behavioural states or activities once the impacts had ceased.

Conclusion

- 6.3.109 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of injury and disturbance from Subsea Noise generated during UXO clearance, with Embedded Mitigation (secured as per Table 6.15) in place, with respect to the construction phase of the Proposed Development.

Table 6.22: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of Injury and Disturbance from Subsea Noise Generated during UXO Clearance during the Construction Phase

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	As described in Paragraphs 6.3.91 and 6.3.92, Subsea Noise generation from UXO clearance during the construction phase is unlikely to lead to injury (and therefore mortality) of harbour seals as the auditory injury range with the Embedded Mitigation of low order detonation, is out to a maximum of 81 m (low order), such that there is no residual risk. Even in the unlikely event of a high order clearance the range is out to 1.7 km and can be mitigated with standard measures including the use of an ADD. This ensures that the recovery of harbour seal at a population-level is not impeded (noting that the condition of harbour seal within the SAC was last assessed as unfavourable – declining; see Paragraph 6.2.20) and animals can move safely between the SAC and important areas of functionally linked sea outwith the SAC (NatureScot, 2024c). Therefore, harbour seals within the SAC will not be at significant risk of injury or mortality and this impact will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.3.93 to 6.3.95, disturbance would occur as a very short term event, which would be reversible and the area ensonified by UXO detonation would not overlap the SAC either from low order or high order clearance, as the SAC is located 42.3 km away from the Site Boundary. This ensures harbour seals continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided and this impact will not prevent the distribution of harbour seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no impact pathway between Subsea Noise generation from UXO clearance (high or low order) and the supporting habitats and processes within the SAC relevant to harbour seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats and processes within the SAC from being maintained.

SAC	Feature	Target/Conservation Objectives	Conclusion
Isle of May SAC	Grey seal	2a. ensure grey seals are a viable component of the Isle of May SAC.	As described in Paragraphs 6.3.97 to 6.3.102, Subsea Noise generation from UXO clearance during the construction phase is unlikely to lead to injury or strong behavioural disturbance of grey seals. The auditory injury range with the Embedded Mitigation of low order detonation, is out to a maximum of 81 m (low order), such that there is no residual risk. Even in the unlikely event of a high order clearance the range is out to 1.7 km and can be mitigated with standard measures including the use of an ADD. Similarly, grey seal would not be disturbed within the SAC as the ensonified area does not overlap the SAC either from low order or high order clearance, as the SAC is located 68.3 km from the Site Boundary, ensuring grey seals can move safely between the SAC and important areas of functionally linked sea outwith the SAC (NatureScot, 2025d). Importantly, this means that there is no effect on reproductive capability of grey seal during the breeding season and pup production would not be expected to decline as a result of this impact, ensuring stable or increasing grey seal numbers are maintained. Therefore, this impact will not prevent the population of grey seals from being maintained as a viable component of the SAC.
		2b. ensure the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals.	This conservation objective refers to potential for long term declines in the use of the SAC, changes in the distribution of the species on a sustained basis or changes in their behaviour such that it reduces the ability of the species to survive, breed or rear young (NatureScot, 2025d). As described in Paragraphs 6.3.100 to 6.3.102, the area ensonified by UXO clearance does not overlap the SAC, which is located 68.3 km from the Site Boundary. Only a small proportion of the relevant SMU would potentially be impacted by strong behavioural disturbance, which would not lead to changes in behaviour that would reduce the ability of seals to survive, breed or rear young. Therefore, significant disturbance will be avoided, and this impact will not prevent the distribution of grey seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats relevant to grey seal are maintained.	There is no impact pathway between Subsea Noise generation from UXO clearance (high or low order) and the supporting habitats within the SAC relevant to grey seal (i.e. no overlap with the area of

SAC	Feature	Target/Conservation Objectives	Conclusion
			significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats relevant within the SAC relevant to grey seal from being maintained.
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no impact pathway between Subsea Noise generation from UXO clearance (high or low order) and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal. There is no overlap with the area of significant disturbance with the SAC including haul-out sites. Therefore, this impact will not prevent the extent and distribution of habitats of the qualifying features, the structure and function of the habitats of the qualifying species and the supporting processes on which the habitats of qualifying species rely (Natural England, 2023), from being maintained.
		The structure and function of the habitats of the qualifying species are maintained.	
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	
		The populations of each of the qualifying species are maintained	As described in Paragraphs 6.3.97 to 6.3.102, Subsea Noise generation from UXO clearance during the construction phase is unlikely to lead to injury or significant disturbance of grey seals as there is no overlap of the ensonified area with the SAC, which is located 93.4 km from the Site Boundary. Only a small proportion of the relevant SMUs would potentially be impacted by strong behavioural disturbance and therefore with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023). Therefore, this impact will not prevent the population and distribution of grey seal within the SAC from being maintained.
		The distribution of qualifying species within the site are maintained.	
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	As described in Paragraphs 6.3.104 to 6.3.106, Subsea Noise generation from UXO clearance during the construction phase is unlikely to lead to injury of bottlenose dolphin. The auditory injury acoustic threshold was not exceeded for low order clearance. There is no overlap of the auditory injury range with the SAC, located 159.6 km from the Site Boundary. In the unlikely event of a high order clearance the auditory injury range is out to 825 m, which could be within the functionally linked Coastal East Scotland MU (NatureScot, 2025e), should UXO clearance occur within the Export

SAC	Feature	Target/Conservation Objectives	Conclusion
			Cable Corridor. Furthermore, it was predicted that the Embedded Mitigation measure of ADD activation would reduce the risk of auditory injury to negligible. As such, there is no risk of injury or mortality to bottlenose dolphin from Subsea Noise generation from high or low order UXO clearance during the construction phase. Therefore, this impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.
		2b. ensure the distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.3.107 and 6.3.108, the area ensonified by UXO clearance does not overlap the SAC itself, which is located 159.6 km from the Site Boundary. The disturbance range (for 720 kg high order clearance: 1.6 km) will, however, overlap with the functionally linked Coastal East Scotland MU (NatureScot, 2025e) should UXO clearance occur in the Export Cable Corridor. However, this is unlikely to prevent bottlenose dolphins from using and accessing all areas of the SAC. Therefore, significant disturbance will be avoided, and this impact will not prevent the distribution of bottlenose dolphin throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	The focus of this conservation objective is on maintaining sufficient prey resources and supporting habitats and processes to support the distribution and population of bottlenose dolphin associated with the SAC (NatureScot, 2025e). There is no impact pathway between Subsea Noise generation from UXO clearance and the supporting habitats and processes relevant to bottlenose dolphin (i.e. no overlap with the area of significant disturbance with the SAC and a 1.6 km disturbance range within functionally linked Coastal East Scotland MU). With respect to the availability of prey, no adverse effects were predicted on prey species (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the EIA Report) and so prey species populations are expected to be maintained in the long term. Therefore, this impact will not prevent the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources from being maintained.

Injury and Disturbance from Subsea Noise Generated During Site Investigation Surveys

- 6.3.110 The LSE assessment during the HRA screening process identified that during the construction and O&M phases, LSE could not be ruled out for potential injury and disturbance from Subsea Noise generated during site investigation surveys for all four of the SACs screened in for Annex II marine mammals (see Table 3.1).
- 6.3.111 The MDS and Embedded Mitigation measures considered for the assessment of injury and disturbance from Subsea Noise generated during site investigation surveys are shown in Table 6.23 and Table 6.24, respectively.

Table 6.23: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Injury and Disturbance from Subsea Noise Generated during Site Investigation Surveys during the Construction and O&M Phases

Proposed Development Phase	MDS	Justification
Construction	Typical Geophysical equipment: • MBES; • Frequency 400 kHz • Source level 225 dB re 1 µPa (rms) • SSS; • Low frequency 230 kHz • High frequency 550 kHz • Source level 210 dB re 1 µPa (rms) • Parametric SBP • 100 kHz (primary); 4, 5, 6, 8, 10, 12 kHz selectable secondary frequencies • Source level 248 dB re 1 µPa (rms); and • 2D UHRS • Frequency 0.05 to 4 kHz • Source level 219 dB re 1 µPa (rms). Typical Geotechnical equipment: • Vibrocore; and • Boreholes. Geophysical and geotechnical surveys will take place during the pre-construction period, involving up to 14 vessels on site at any one time and up to 110 vessel movements (return trips) in total.	Site investigation surveys are conducted in the pre-construction phase. However, details of the specific equipment types are not yet known. The assessment will be based on literature/known acoustic characteristics associated with typical equipment used for site surveys.
O&M	MDS based on the same geophysical and geotechnical equipment used for the construction phase. The O&M phase will last for up to 30 years.	Site investigation surveys may also be required during the O&M phase. The assessment conducted for the pre-construction phase will be applied to the O&M phase as the same types of equipment are used.

Table 6.24: Embedded Mitigation Measures Considered for the Assessment of Potential Impacts to Annex II Marine Mammals to Injury and Disturbance from Subsea Noise Generated during Site Investigation Surveys during the Construction and O&M Phases

Embedded Mitigation Measures	Justification
Development of and adherence to a MMMP, to minimise the risk of auditory injury to marine mammals from noise generating activities resulting from the construction of the Proposed Development. Mitigation will include measures such as MMOs, PAM and ADDs.	<u>Outline Marine Mammals Mitigation Protocol</u> The development of and adherence to a MMMP which will present appropriate mitigation for activities that could potentially lead to injurious effects on marine mammals (e.g. piling, UXO clearance and geophysical surveys).
Adoption of JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys, piling noise and use of explosives if and where required.	For geophysical surveys, measures will include setting a mitigation zone of at least 500 m in line with current guidance (JNCC, 2017), with the extent of the mitigation zone informed by the largest injury range across all types of geophysical surveys. Mitigation during geophysical surveys will involve visual and acoustic monitoring using MMOs and PAM so that the risk of injury over the defined mitigation zone is reduced in line with JNCC guidance (JNCC, 2017). An outline MMMP has been developed on the basis of the most recent published statutory guidance in place at time of writing (JNCC, 2010, 2017, 2023, 2025h). The implementation of the finalised MMMP will mitigate for the risk of permanent auditory injury to marine mammals within a pre-defined ‘mitigation zone’ for each activity. The mitigation zone is determined considering the largest injury zone across all species for each relevant activity. The outline MMMP includes visual and acoustic monitoring as a minimum over the defined mitigation zones so that animals are clear before the activity commences. Together with ADDs to deter animals from injury risk zones. The Applicant will consult with NatureScot and MD-LOT with regards to mitigation should USVs/AUVs be used for activities associated with the Proposed Development and relevant EPS Licences will be sought. Secured in the Section 36 Consent and Marine Licence, via the requirement for a MMMP, which will be submitted to MD-LOT for approval.

Embedded Mitigation Measures	Justification
Development of, and adherence to, a Project Environmental Monitoring Plan (PEMP) to include details of any agreed surveys or monitoring requirements. The PEMP will provide the mechanism to validate the impact assessment, assess the effectiveness of mitigation measures, and inform adaptation of mitigation measures throughout the construction phase of the Proposed Development.	The PEMP will detail the methodology that will be used validate the impact assessment predictions made within the RIAA and Offshore EIA. The PEMP will also provide for the mechanism for any adaptation of marine mammal mitigation measures if required to reduce impacts from the Proposed Development. Secured in the Section 36 Consent and Marine Licences, via the requirement for a PEMP, which will be submitted to MD-LOT for approval.

Information to Inform the Assessment

Overview of Subsea Modelling Conducted for the Proposed Development

- 6.3.112 Site investigation surveys during the construction and O&M phases have the potential to cause direct or indirect effects (including injury or disturbance) on marine mammal receptors (Table 6.23). A detailed Subsea Noise modelling assessment has been carried out to investigate the potential for injurious and behavioural effects on marine mammals as a result of geophysical and geotechnical surveys, using the latest criteria (Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report). Several sonar-like sources will potentially be used for the geophysical surveys, including MBES, SSS, SBP and UHRS. The equipment likely to be used, can typically work at a range of signal frequencies depending on the distance to the seabed and the required resolution. For sonar-like sources the signal is highly directional, acts like a beam and is emitted in pulses. Sonar-based sources are considered by the NMFS (2018) as continuous (non-impulsive) because they generally comprise a single (or multiple discrete) frequency. Unlike the sonar-like survey sources, the UHRS is likely to utilise a sparker, which produces an impulsive, broadband source signal. Additionally, a magnetometer may be used to measure and detect anomalies within the existing magnetic field, although no Subsea Noise is generated. The survey parameters, such as source sound levels used in the Subsea Noise modelling are presented in detail in Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report. For geotechnical surveys, potential equipment to be used may include vibrocore and borehole (Table 6.23).

Injury

- 6.3.113 As detailed in Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report, injury ranges for impulsive survey sources (UHRS) are based on a comparison to the Southall *et al.* (2019) and NMFS (2024) thresholds for impulsive noise, whereas results from non-impulsive survey sources (MBES, SSS, SBP, borehole, vibrocore) are compared against the non-impulsive thresholds. Please note that in this RIAA, only the NMFS (2024) results will be presented.
- 6.3.114 Ruppel *et al.* (2022) categorised marine acoustic sources into four tiers based on their potential to injure marine mammals using physical criteria about the sources (e.g. source level, transmission frequency, directionality, beamwidth, and pulse repetition rate). Those in Tier 4 were considered unlikely to result in 'incidental take' (i.e. loss of individuals) of marine mammals and therefore termed *de minimis*, and included most high-resolution geophysical sources (MBES, SSS, SBP, low-powered sparkers). For context, Tier 1 refers to high-energy airgun surveys with a total volume larger than 1500 in or arrays with more than 12 airguns, Tier 2 covers the remaining low/intermediate energy airgun and Tier 3 covers most non-airgun seismic sources, which either have characteristics that do not meet the *de minimis* category (e.g. some sparkers) or could not be fully evaluated in Ruppel *et al.* (2022) (e.g. bubble guns, some

boomers). The study also suggested surveys that simultaneously deploy multiple, non-impulsive *de minimis* sources are unlikely to result in incidental take of Annex II marine mammals.

- 6.3.115 The maximum auditory injury range across all geophysical surveys for harbour seal, grey seal and bottlenose dolphin is estimated to occur out to 86 m (SBP: Table 6.25). However, it is noted that as sonar-like sources have very strong directivity (Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report), there is only potential for injury when a marine mammal is directly underneath the noise source. Once the animal moves outside of the main beam, there is no potential for injury.
- 6.3.116 The auditory injury threshold was not exceeded for any Annex II marine mammal species for geotechnical investigation activities. Therefore, as non-impulsive sound sources, these are not discussed further in this RIAA.
- 6.3.117 The number of marine mammals potentially injured within the modelled auditory injury ranges were estimated using species-specific density estimates (Table 6.26). Given that the potential auditory injury ranges are small, no more than one animal of each species is deemed to be at risk of experiencing auditory injury across all types of geophysical and geotechnical surveys (Table 6.26). Embedded Mitigation is designed based on the largest impact to species considered in Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) of the Offshore EIA Report, and therefore is considered sufficiently precautionary to address the uncertainty where species-specific data is lacking.

Table 6.25: Potential Auditory Injury Impact Ranges (m) for Geophysical Site Investigation Surveys (N/E = Threshold Not Exceeded)

Survey type	Potential AUD INJ Range (m)	
	Harbour seal and grey seal	Bottlenose dolphin
MBES	N/E	8
SSS LF	5	60
SSS HF	N/E	N/E
SBP (chirp/pinger)	86	86
UHRS (sparker)	N/E	N/E

Table 6.26: Estimated Number of Animals with the Potential to Experience Auditory Injury during Geophysical Site Investigation Surveys (N/A = Not Applicable As the Threshold Was Not Exceeded)

Survey type	Number of Animals		
	Harbour seal	Grey seal	Bottlenose dolphin
MBES	<1	<1	<1
SSS LF	<1	<1	<1
SSS HF	N/A	N/A	N/A
SBP (chirp/pinger)	<1	<1	<1
UHRS (sparker)	N/A	N/A	N/A

6.3.118 The auditory injury ranges will not overlap with the Firth of Tay and Eden Estuary SAC, Isle of May SAC, Berwickshire and North Northumberland SAC or Moray Firth SAC. However, the 50 km connectivity buffer means that harbour seals connected to the Firth of Tay and Eden Estuary SAC could be at risk of auditory injury during geophysical surveys within the Export Cable Corridor. Further, during geophysical surveys within the Export Cable Corridor, there could be a risk to bottlenose dolphin within the Coastal East Scotland MU. It is unlikely there will be a risk of auditory injury to grey seals within the 20 km connectivity buffer, although seals from the East Scotland SMU may be in the area (i.e. MU functionally linked with the Isle of May SAC and Berwickshire and North Northumberland SAC).

6.3.119 Site investigation surveys are considered to be short term activities. In line with good practice guidance, measures designed during geophysical surveys will involve the use of MMOs and PAM so that the risk of injury over the defined mitigation zone is reduced (JNCC, 2017). The largest auditory injury range was estimated as 86 m for SBP and it is considered that standard industry measures will be effective at reducing the risk of injury to negligible over this distance (JNCC, 2017). Since the injury is presumed to be fully mitigated via Embedded Mitigation measures, there is considered to be no residual risk of injury and therefore no population-level effects on any Annex II marine mammal.

Behavioural Disturbance

6.3.120 It is widely recognised that the transmission frequencies of commercial sonar systems (approximately 12 kHz to 1800 kHz) overlap with the hearing ranges of many marine mammal species (Richardson *et al.*, 1995). Many frequencies associated with sonar systems are very high and have peak frequencies well above marine mammal hearing ranges.

6.3.121 Ruppel *et al.* (2022) reported that in response to sonar-like sound sources (e.g. MBES, Singlebeam Echosounder (SBES)), marine mammals may show subtle behavioural responses, although species, behavioural context, location, and prey availability are likely to play more of a role than the acoustic signals themselves. In a study undertaken by MacGillivray *et al.* (2014), seven acoustic sources (including air guns, SBP, MBES and SSS) were compared, and the sound level above hearing threshold was documented as a function of horizontal

distance. Weighting sounds according to hearing sensitivity allows assessment of relative risks associated with exposure, and whilst this analysis did not directly relate to the potential for behavioural responses, it allowed comparison of modelled acoustic sources. The modelling undertaken in MacGillivray *et al.* (2014) suggested that odontocetes were most likely to hear sounds from mid-frequency sources (such as fisheries, communication, and hydrographic systems), whilst pinnipeds were most likely to hear sounds from both mid and low frequency sources. For all species included within the study, modelled sensation levels were lowest for the HF sources (e.g. SSS and MBES), which operate at the upper limits of the audible spectrum.

- 6.3.122 Behavioural response tests to two sonar systems (200 kHz and 375 kHz systems) have been carried out on grey seals at the SMRU seal holding facility (Hastie *et al.*, 2014). Results showed that both systems had significant effects on seal behaviour, with significantly more time spent hauled out during the 200 kHz sonar operation and although animals remained swimming during operation of the 375 kHz sonar, they were distributed further from the sonar. Similar responses are expected from harbour seals.
- 6.3.123 A recent study by Kates Varghese *et al.* (2021) on MBES surveys showed that the only marine mammal metric that was identified as changing was vocalisation rate, with neither changes in displacement nor foraging being observed. Similarly, Quick *et al.* (2017) reported that tagged short-finned pilot whale *Globicephala macrorhynchus* that were exposed to a SBES did not change their foraging behaviour, but variance in directionality of movement was observed, suggesting increased vigilance whilst the SBES was active. It was, however, stated that the range of behaviours exhibited could not be directly attributed to SBES operation, and that changes in behaviour were unlikely to be biologically significant. A study by Cholewiak *et al.* (2017) investigated the impact of SBES on toothed whales and reported that fewer beaked whale vocalisations were recorded when the source was actively transmitting. This suggested that animals either move away from the area or reduced foraging activity (although findings were not statistically significant).
- 6.3.124 Many studies to date have focused on the effects of multi-array seismic surveys on marine mammals, and therefore there is less widely available evidence for behavioural responses to seismic sources (e.g. MBES, SSS, SBPs). Multi-array impulsive sound sources are broadband in character (i.e. produce sound across a wide range of frequencies), unlike seismic sources, which typically produce more tonal sound either at a discrete frequency or a range of discrete frequencies. However, findings from studies of multi-array impulsive sources may be useful in supporting predictions of behavioural responses of marine mammals to geophysical survey sources in general, given the overlap of parameters that typically characterise sound sources (i.e. transmission frequency; source level; pulse duration) (see MacGillivray *et al.* (2014) and Ruppel *et al.* (2022)). Whilst evidence on the behavioural responses to MBES is limited, an Independent Scientific Review Panel deemed a 12 kHz MBES to be the most plausible trigger for an extreme behavioural response in melon-headed whale *Peponocephala electra*, which resulted in a mass group stranding in a shallow lagoon in Madagascar in 2008 (Southall *et al.*, 2013) (an area where

such open-ocean species would not usually frequent). Whilst an unequivocal cause and effect relationship between MBES and the strandings cannot be concluded, the paper states that intermittent, repeated sounds of this nature could present a salient and potential aversive stimulus and suggests potential for such behavioural responses (or indirect injury) from MBES should be considered in environmental assessments (Southall *et al.*, 2013).

- 6.3.125 A ten-month study of overt responses to seismic exploration in humpback whale *Megaptera noveangliae*, sperm whale *Physeter macrocephalus* and Atlantic spotted dolphin *Stenella frontalis*, demonstrated no evidence of prolonged or large scale displacement of each species from the region during the survey (Weir, 2008).
- 6.3.126 For impulsive noise sources (UHRS) the Subsea Noise modelling adopted the NMFS (2005) thresholds of 140 dB re 1 μ Pa for mild disturbance and 160 dB re 1 μ Pa for strong disturbance. For non-impulsive noise sources (MBES, SSS, SBP, borehole, vibrocore) the Subsea Noise modelling used the NMFS (2005) threshold of 120 dB re 1 μ Pa. The Subsea Noise modelling predicted that the behavioural effects as a result of site investigation surveys can occur within a range of between 283 m (SSS HF) and up to 9,145 m (vibrocore) (Table 6.27) for all species.
- 6.3.127 For impulsive noise sources (UHRS), the strong behavioural disturbance ranges vary from 80 m during UHRS (Table 6.27). No more than one animal of each species would be at risk of experiencing strong behavioural disturbance. Mild disturbance may occur within 552 m during UHRS and for all species (Table 6.27); however, no more than one animal could be affected (Table 6.28). It is considered that low-level disturbance could lead to mild disruptions of normal behaviours, but prolonged or sustained behavioural effects, including displacement, are unlikely to occur.
- 6.3.128 For non-impulsive noise sources (MBES, SSS, SBP, borehole drilling, vibrocore), no more than one harbour seal or one bottlenose dolphin is predicted to be disturbed during MBES, SSS, SBP and borehole drilling. With the use of SBP, up to three grey seals are at risk of experiencing disturbance. Vibrocore may also lead to disturbance of up to three harbour seals, 148 grey seals and two bottlenose dolphins (Table 6.28). However, for those animals disturbed, there is likely to be a proportional response (i.e. not all animals will be disturbed to the same extent). There is no dose-response curve available to apply in the context of site investigation surveys. However, Joy *et al.* (2019) derived a dose-response for killer whales *Orcinus orca* and Subsea Noise from vessels, indicating that marine mammals display a proportional response to non-impulsive noise. It is important to note that the life history of an individual and the context will also influence the likelihood of an individual to exhibit an aversive response to noise. Furthermore, this threshold does not consider ambient sound levels in the area, which may already be above the 120 dB re 1 μ Pa (Farcas *et al.*, 2020). Considering that the Subsea Noise modelling used a single threshold that does not consider the ambient noise, the numbers of animals potentially disturbed presented for vibrocore and other site investigation surveys are likely to be an overestimate.

- 6.3.129 The behavioural disturbance ranges presented in Table 6.27 will not overlap with the Firth of Tay and Eden Estuary SAC, Isle of May SAC, Berwickshire and North Northumberland SAC or Moray Firth SAC. However, site investigation surveys within the Export Cable Corridor could overlap with habitat use by harbour seals within the 50 km connectivity buffer of the Firth of Tay and Eden Estuary SAC. Site-investigations surveys within the Array Area would not overlap with the 50 km connectivity buffer. Further, during geophysical surveys within the Export Cable Corridor, there could be a risk to bottlenose dolphin within the Coastal East Scotland MU. It is unlikely there will be a strong behavioural disturbance to grey seals within the 20 km connectivity buffer, although seals from the East Scotland SMU may be in the area (i.e. MU functionally linked with the Isle of May SAC and Berwickshire and North Northumberland SAC).
- 6.3.130 The effect of behavioural disturbance is highly context-specific, although animals are expected to return to baseline levels after surveys have ceased (Paragraphs 6.3.122 to 6.3.125). Whilst there may be minor effects at an individual level, these are not predicted to adversely affect the integrity of SACs for Annex II marine mammals.

Table 6.27: Potential Disturbance Ranges for Geophysical and Geotechnical Site Investigation Surveys

Survey type	Potential Disturbance Range (m) for All Species	
Geophysical Surveys		
MBES	490	
SSS LF	530	
SSS HF	283	
SBP (chirp/pinger)	1,275	
UHRS (mild)	Mild: 80	Strong: 552
Geotechnical Surveys		
Borehole drilling	294	
Vibrocoring	9,154	

Table 6.28: Estimated Number of Animals with the Potential to be Disturbed During Geophysical and Geotechnical Site Investigation Surveys (N/A = Not Applicable As the Threshold Was Not Exceeded)

Survey type	Number of Animals		
	Harbour seal	Grey seal	Bottlenose dolphin
Geophysical Surveys			
MBES	<1	<1	<1
SSS LF	<1	<1	<1
SSS HF	<1	<1	<1

Survey type	Number of Animals		
	Harbour seal	Grey seal	Bottlenose dolphin
SBP (chirp/pinger)	<1	3	<1
UHRS (mild)	N/A	N/A	N/A
UHRS (strong)	<1	<1	<1
Geotechnical Surveys			
Borehole drilling	<1	<1	<1
Vibrocoring	5	148	2

Construction and O&M Phase

6.3.131 Potential effects from the Proposed Development on the relevant conservation objectives of the four SACs screened in for Annex II marine mammals are presented in Table 6.29. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 6.29.

6.3.132 The site investigation surveys as listed in Table 6.23 will take place during the pre-construction period (included within the construction phase in this RIAA) and O&M phase. During the pre-construction phase up to 14 geophysical and geotechnical vessels will be on site at any one time, with up to 110 vessel movements (return trips) in total. The number of vessels and return trips for geophysical and geotechnical surveys in the O&M phase is expected to be similar to the pre-construction phase.

Firth of Tay and Eden Estuary SAC

6.3.133 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary SAC conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.29.

Harbour Seal

6.3.134 An overview of potential auditory injury due to elevated Subsea Noise during site investigation surveys is described in Paragraphs 6.3.113 to 6.3.119 and for potential behavioural disturbance is described in Paragraphs 6.3.120 to 6.3.130.

Injury

6.3.135 As detailed in Table 6.25, the modelled auditory injury impact ranges were low for harbour seal for geophysical site investigation techniques. The threshold was not exceeded for MBES, SSS HF or UHRS, and ranged from 5 m (SSS LF) and 86 m (SBP) for the other geophysical survey techniques. Sound from vessels themselves is likely to deter marine mammals beyond a few tens of metres. Based on these modelled injury ranges, no more than one harbour seal from

the East Scotland SMU would have the potential to experience auditory injury as a result of SSS LF and SBP, and none for MBES, SSS HF or UHRS (Table 6.26).

- 6.3.136 The auditory injury ranges for any geophysical survey equipment will not overlap with the Firth of Tay and Eden Estuary SAC itself, which is a minimum of 42.3 km south-west of the Export Cable Corridor. However, this maximum auditory injury range will overlap with the 50 km connectivity buffer around the SAC resulting in a small risk of auditory injury for harbour seals associated with the SAC.
- 6.3.137 Overall, since the risk of injury is assumed to be fully mitigated via Embedded Mitigation measures (Table 6.24) there is considered to be no residual risk of injury for harbour seal, and therefore no adverse effects on the population of the SAC.

Behavioural Disturbance

- 6.3.138 As detailed in Table 6.27, behavioural disturbance due to non-impulsive site investigation survey equipment could occur within a range of between 283 m (SSS HF) and up to 9,154 m (vibrocoring) for all species, including harbour seal. For impulsive sources behavioural disturbance ranges from 80 m (mild UHRS) to 552 m (strong UHRS). Based on these modelled injury ranges, no more than one harbour seal from the East Scotland SMU is predicted to be disturbed as a result of MBES, SSS LF/HF, SBP, UHRS or borehole drilling. Due to relatively large disturbance ranges predicted for vibrocoring, based on average densities within the Local Marine Mammal Study Area (Table 6.3), up to three harbour seals could experience disturbance (Table 6.28).
- 6.3.139 The behavioural disturbance ranges associated with geophysical and geotechnical survey equipment will not overlap with the Firth of Tay and Eden Estuary SAC itself, which is a minimum of 42.3 km south-west of the Export Cable Corridor, but may affect a small number of seals associated with the SAC (maximum three individuals during vibrocoring, assuming all potentially disturbed animals originate from the SAC population) within the 50 km connectivity buffer. However, disturbance to three seals will not undermine the viability of harbour seal as a component of the SAC.
- 6.3.140 Overall, the effect of behavioural disturbance is highly context-specific, although seals are expected to have some tolerance to behavioural disturbance from Subsea Noise (Farcas *et al.*, 2020); harbour seals behavioural responses are assumed similar to grey seals in Hastie *et al.* (2014). Whilst there may be minor effects at an individual level, these are not predicted to be at a scale that would lead to adverse effects for the harbour seal feature of the Firth of Tay and Eden Estuary SAC.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.3.141 Potential effects from the Proposed Development on the relevant conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.29.

Grey Seal

- 6.3.142 An overview of potential auditory injury due to elevated Subsea Noise during site investigation surveys is described in Paragraphs 6.3.113 to 6.3.119 and for potential behavioural disturbance is described in Paragraphs 6.3.120 to 6.3.130.

Injury

- 6.3.143 As detailed in Table 6.25, the modelled auditory injury impact ranges were low for grey seal for geophysical site investigation techniques. The threshold was not exceeded for MBES, SSS HF or UHRS, and ranged from 5 m (SSS LF) and 86 m (SBP) for the other geophysical survey techniques. Sound from vessels themselves is likely to deter marine mammals beyond a few tens of metres. Based on these modelled injury ranges, no more than one grey seal from the East Scotland SMU or combined East Scotland SMU and Northeast England SMU would have the potential to experience auditory injury as a result of SSS LF and SBP, and none for MBES, SSS HF or UHRS (Table 6.26).
- 6.3.144 The auditory injury ranges for any geophysical equipment will not overlap with the Isle of May SAC, which is 68.3 km south-west of the Export Cable Corridor or the Berwickshire and North Northumberland SAC, which is 93.4 km south-west of the Export Cable Corridor. This maximum auditory injury range will not overlap with the 20 km connectivity buffer around the Isle of May SAC. However, as the Proposed Development is within the East Scotland SMU there is a small risk of auditory injury for grey seals associated with both SACs, as the East Scotland SMU is functionally linked to both SACs.
- 6.3.145 Overall, since the risk of injury is assumed to be fully mitigated via Embedded Mitigation measures (Table 6.24) there is considered to be no residual risk of injury for grey seal, and therefore no adverse effects on the populations of either SAC.

Behavioural Disturbance

- 6.3.146 As detailed in Table 6.27, behavioural disturbance due to non-impulsive site investigation survey equipment could occur within a range of between 283 m (SSS HF) and up to 9,154 m (vibrocoring) for all species, including grey seal. For impulsive sources behavioural disturbance ranges from 80 m (mild UHRS) to 552 m (strong UHRS). Based on these modelled injury ranges, no more than one grey seal from the relevant SMUs (East Scotland SMU and Northeast England SMU) is predicted to be disturbed as a result of MBES, SSS LF/HF, UHRS or borehole drilling. Due to relatively large disturbance ranges predicted for SBP and vibrocoring, based on average densities within the Local Marine Mammal Study Area (Table 6.3), up to three grey seals could experience disturbance from the SBP, and up to 148 seals during vibrocoring (Table 6.28).
- 6.3.147 The behavioural disturbance ranges associated with geophysical and geotechnical survey equipment will not overlap with the Isle of May SAC, which is 68.3 km south-west of the Export Cable Corridor or the Berwickshire and North Northumberland SAC, which is 93.4 km south-west of the Export Cable Corridor. The behavioural disturbance ranges will not overlap with the 20 km connectivity buffer around the Isle of May SAC. However, disturbance to less than 1.5% of the East Scotland SMU grey seal population (maximum 148 seals

assuming all potentially disturbed animals originate from the SAC populations) will not undermine the viability of grey seal as a component of the Isle of May SAC nor affect the population of the Berwickshire and North Northumberland SAC.

- 6.3.148 Overall, the effect of behavioural disturbance is highly context-specific, although seals are expected to have some tolerance to behavioural disturbance from Subsea Noise (Farcas *et al.*, 2020; Hastie *et al.*, 2014). Whilst there may be minor effects at an individual level, these are not predicted to be at a scale that would lead to adverse effects for the grey seal feature of the Isle of May SAC or Berwickshire and North Northumberland Coast SAC.

Moray Firth SAC

- 6.3.149 Potential effects from the Proposed Development on the relevant conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.29.

Bottlenose Dolphin

- 6.3.150 An overview of potential auditory injury due to elevated Subsea Noise during site investigation surveys is described in Paragraphs 6.3.113 to 6.3.119 and for potential behavioural disturbance is described in Paragraphs 6.3.120 to 6.3.130.

Injury

- 6.3.151 As detailed in Table 6.25, the modelled auditory injury impact ranges were low for bottlenose dolphin for geophysical site investigation techniques. The threshold was not exceeded for SSS HF and UHRS, or either geotechnical survey techniques, and ranged from 8 m (MBES), 60 m (SSS LF) and 86 m (SBP) for the other geophysical survey techniques. Sound from vessels themselves is likely to deter marine mammals beyond a few tens of metres. Based on these modelled injury ranges, no more than one bottlenose dolphin from the Coastal East Scotland MU would have the potential to experience auditory injury as a result of MBES, SSS LF and SBP, and none for SSS HF and UHRS (Table 6.26).
- 6.3.152 The auditory injury ranges for any geophysical and geotechnical survey equipment will not overlap with the Moray Firth SAC itself, which is a minimum of 159.6 km north-west from the Export Cable Corridor. However, bottlenose dolphins from the Coastal East Scotland MU population may be present within the Site Boundary, particularly in the Export Cable Corridor, which could result in a small risk of auditory injury for bottlenose dolphin associated with the SAC as the SAC population is functionally linked with the Coastal East Scotland MU population (Paragraph 6.2.37).
- 6.3.153 Overall, since the risk of injury is assumed to be fully mitigated via Embedded Mitigation measures (Table 6.24) there is considered to be no residual risk of injury for bottlenose dolphin, and therefore no adverse effects on the population of the SAC.

Behavioural Disturbance

- 6.3.154 As detailed in Table 6.27, behavioural disturbance due to non-impulsive site investigation survey equipment could occur within a range of between 283 m (SSS HF) and up to 9,154 m (vibrocoring) for all species, including bottlenose dolphin. For non-impulsive sources behavioural disturbance ranges from 80 m

(mild UHRS) to 552 m (strong UHRS). Based on these modelled injury ranges, no more than one bottlenose dolphin from Coastal East Scotland MUs is predicted to be disturbed as a result of MBES, SSS LF/HF, SBP, UHRS or borehole drilling. Due to relatively large disturbance ranges predicted for vibrocoring, based on average densities within the Local Marine Mammal Study Area (Table 6.3), up to one bottlenose dolphin could experience disturbance (Table 6.28).

- 6.3.155 The behavioural disturbance ranges for any geophysical and geotechnical survey equipment will not overlap with the Moray Firth SAC itself, which is a minimum of 159.6 km north-west from the Export Cable Corridor. However, bottlenose dolphins from the Coastal East Scotland MU population may be present within the Site Boundary, particularly in the Export Cable Corridor, which could result in a small risk of behavioural disturbance for bottlenose dolphins associated with the SAC. However, disturbance of up to one dolphin will not undermine the viability of the bottlenose dolphin population (i.e. 0.4% of the Coastal East Scotland MU; Paragraph 6.2.37) within the SAC.
- 6.3.156 Overall, the effect of behavioural disturbance is highly context-specific, although dolphins are expected to have some tolerance to behavioural disturbance from Subsea Noise (Farcas *et al.*, 2020; Weir, 2008). Whilst there may be minor effects at an individual level, these are not predicted to be at a scale that would lead to adverse effects for the bottlenose dolphin feature of the Moray Firth SAC.

Conclusion

- 6.3.157 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of injury and disturbance from Subsea Noise generated during site investigation surveys with respect to the construction phase of the Proposed Development.

Table 6.29: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of Injury and Disturbance from Subsea Noise Generated during Site Investigation Surveys during the Construction and O&M Phases

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	As described in Paragraphs 6.3.134 to 6.3.137, site investigation surveys are unlikely to lead to injury (and therefore mortality) of harbour seals as the auditory injury range is out to a maximum of 86 m (SBP) and this will be mitigated with Embedded Mitigation measures such that there is no residual risk. This ensures that the recovery of harbour seal at a population-level is not impeded (noting that the condition of harbour seal within the SAC was last assessed as unfavourable – declining; see Paragraph 6.2.20) and animals can move safely between the SAC and important areas of functionally linked sea outwith the SAC (NatureScot, 2024c). Therefore, harbour seals within the SAC will not be at significant risk of injury or mortality and this impact will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.3.138 to 6.3.140 disturbance would not be significant as maximum disturbance range (9.2 km during vibrocoring) from site investigation surveys would not overlap the SAC, which is located 42.3 km away from the Site Boundary. This ensures harbour seals continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided and this impact will not prevent the distribution of harbour seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no impact pathway between site investigation surveys and the supporting habitats and processes within the SAC relevant to harbour seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats and processes within the SAC from being maintained.
Isle of May SAC	Grey seal	2a. ensure grey seals are a viable component of the Isle of May SAC.	As described in Paragraphs 6.3.143 to 6.3.148, site investigation surveys are unlikely to lead to injury or strong behavioural disturbance of grey seals. The range of auditory injury is out to a maximum of 86 m (SBP) and this will be mitigated with Embedded Mitigation measures such that there is no residual risk. Similarly, grey seal would not be disturbed within the site as the maximum disturbance range does not overlap the SAC from site investigation surveys, as the SAC is located

SAC	Feature	Target/Conservation Objectives	Conclusion
			68.3 km from the Site Boundary, ensuring grey seals can move safely between the SAC and important areas of functionally linked sea outwith the SAC (NatureScot, 2025d). Importantly, this means that there is no effect on reproductive capability of grey seal during the breeding season and pup production would not be expected to decline as a result of this impact, ensuring stable or increasing grey seal numbers are maintained. Therefore, this impact will not prevent the population of grey seals from being maintained as a viable component of the SAC.
		2b. ensure the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals.	This conservation objective refers to potential for long term declines in the use of the SAC, changes in the distribution of the species on a sustained basis or changes in their behaviour such that it reduces the ability of the species to survive, breed or rear young (NatureScot, 2025d). As described in Paragraphs 6.3.146 to 6.3.148, the maximum disturbance range (9.2 km during vibrocoring) does not overlap the SAC, which is located 68.3 km from the Site Boundary. Only a small proportion of the relevant SMU would potentially be impacted by behavioural disturbance, which would not lead to changes in behaviour that would reduce the ability of seals to survive. Therefore, significant disturbance will be avoided, and this impact will not prevent the distribution of grey seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats relevant to grey seal are maintained.	There is no impact pathway between site investigation surveys and the supporting habitats within the SAC relevant to grey seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats relevant within the SAC relevant to grey seal from being maintained.
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no impact pathway between site investigation surveys and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal. There is no overlap with the area of significant disturbance with the SAC including haul-out sites. Therefore, this impact will not prevent the extent and distribution of habitats of the qualifying features, the structure and function of the habitats of the qualifying species and the supporting processes on
		The structure and function of the habitats of the qualifying species are maintained.	

SAC	Feature	Target/Conservation Objectives	Conclusion
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	which the habitats of qualifying species rely, from being maintained (Natural England, 2023).
		The populations of each of the qualifying species are maintained	As described in Paragraphs 6.3.143 to 6.3.148, site investigation surveys are unlikely to lead to injury or significant disturbance of grey seals as there is no overlap of the maximum auditory injury or disturbance range with the SAC, which is located 93.4 km from the Site Boundary. Only a small proportion of the relevant SMUs would potentially be impacted by behavioural disturbance and therefore with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023). Therefore, this impact will not prevent the population and distribution of grey seal within the SAC from being maintained.
		The distribution of qualifying species within the site are maintained.	
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	As described in Paragraphs 6.3.151 to 6.3.156, site investigation surveys are unlikely to lead to injury of bottlenose dolphin as the auditory injury range is out to a maximum of 86 m (SBP), which could occur within the functionally linked Coastal East Scotland MU (NatureScot, 2025e). However, this will be mitigated with Embedded Mitigation measures such that there is no residual risk, and there is no overlap of the auditory injury range with either the SAC, located 159.6 km from the Site Boundary. As such, there is no risk of injury or mortality to bottlenose dolphin from site investigation surveys. Therefore, this impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.
		2b. ensure the distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.3.154 to 6.3.156, the maximum disturbance range (9.2 km during vibrocoring) does not overlap the SAC, which is located 159.6 km from the Site Boundary. The disturbance range will, however, overlap with the functionally linked Coastal East Scotland MU (NatureScot, 2025e) should site investigation surveys occur within the Export Cable Corridor. However, this is unlikely to prevent bottlenose dolphin from using and accessing all areas of the SAC. Therefore, significant disturbance will be avoided, and this impact will not prevent the distribution of bottlenose dolphin throughout the from being maintained.

SAC	Feature	Target/Conservation Objectives	Conclusion
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	The focus of this conservation objective is on maintaining sufficient prey resources and supporting habitats and processes to support the distribution and population of bottlenose dolphin associated with the SAC (NatureScot, 2025e). There is no impact pathway between site investigation surveys and the supporting habitats and processes relevant to bottlenose dolphin (i.e. no overlap with the area of significant disturbance with the SAC nor functionally linked Coastal East Scotland MU). With respect to the availability of prey, no adverse effects were predicted on prey species (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report) and so prey species populations are expected to be maintained in the long term. Therefore, this impact will not prevent the supporting habitats relevant to bottlenose dolphin and their prey/food resources from being maintained.

Injury and Disturbance from Subsea Noise Generated by Vessel Use and Other Noise Producing Activities

- 6.3.158 The LSE assessment during the HRA screening process identified that during the construction, O&M and decommissioning phases, LSE could not be ruled out for potential injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities for all four of the SACs screened in for Annex II marine mammals (see Table 3.1).
- 6.3.159 The MDS and Embedded Mitigation measures considered for the assessment of injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities are shown in Table 6.30 and Table 6.31, respectively.

Table 6.30: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Injury and Disturbance from Subsea Noise Generated by Vessel Use and Other Noise Producing Activities during the Construction, O&M and Decommissioning Phases

Proposed Development Phase	MDS	Justification
Construction	During the pre-construction phase, a total of 18 vessels will be on site at any one time resulting in a total of 140 return trips. During the construction phase, a total of 16 vessels will be on site in the Export Cable Corridor at any one time, with an estimated 449 return trips in total. A total of 25 vessels will be on site in the Array Area at any one time with an estimated 1,671 return trips in total. Vessel types include installation (jack-up/dynamic positioning), cargo barge/heavy transport, Scour Protection installation, grouting, drilling, support (dive/trenching, including Service Operation Vessel), tug/anchor, cable laying (and burial), guard, survey, crew transfer vessels, sandwave clearance, pre-lay grapnel run, rock dumping, boulder clearance, UXO clearance, and micro-tunnelling or trenchless technique installation (e.g. HDD support vessels). Other noise producing activities, include drilling activities (if required): drilling of up to a maximum of 32.5 hours per pile over a maximum realistic duration of 268 days (15 MW 4-leg piled jacket).	Maximum numbers of vessels on site at any one time and largest numbers of return trips during each phase will result in the greatest potential impact. Range of other activities producing underwater noise, including maximum timescales were also included. Drilling noise will be assessed using an appropriate source level and modelled as continuous noise over a 24-hour period. Injury and disturbance from vessel use during UXO clearance and site investigation surveys is included under this potential impact pathway.
O&M	For the Array Area, a total of 12 vessels will be on site at any one time, over the duration of O&M phase (up to 30 years) resulting in a total of up to 588 return trips per year. In addition to this, a further number of vessels will undertake another 146 return trips spread over entire 30-year O&M phase. Vessels will be associated with a range of O&M activities, including routine inspections, repairs and replacements, removal of marine growth and painting. For the Export Cable Corridor, a total of 8 vessels will be on site at any one time, over the duration of O&M phase (up to 30 years) resulting in a total of up to 125 return trips per year. In addition to this, a further number of vessels will undertake another 114 return trips spread over entire 30-year O&M phase. Vessels will be associated with a range of O&M activities, including routine inspections, repairs and replacements, removal of marine growth and painting.	

Proposed Development Phase	MDS	Justification
Decommissioning	A Decommissioning Programme will be submitted to MD-LOT for consultation and approval. The Decommissioning Programme will be updated during the Project's lifespan to take account of changing best practice and new technologies. The approach for decommissioning is yet to be determined, however, for the purposes of this MDS it is assumed there will be a range of vessels used for decommissioning activities such as removal of foundations, cables and cable protection. Noise from vessels assumed to be as per vessel activity described for construction phase.	

Table 6.31: Embedded Mitigation Measures Considered for the Assessment of Potential Impacts to Annex II Marine Mammals to Injury and Disturbance from Subsea Noise Generated by Vessel Use and Other Noise Producing Activities during the Construction, O&M and Decommissioning Phases

Embedded Mitigation Measures	Justification
Development of and adherence to a combined Navigation Safety and Vessel Management Plan (NSVMP) (Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan of the Offshore EIA Report), describing Project vessels' requirements, passages, monitoring and controls.	The Outline NSVMP (Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan of the Offshore EIA Report) includes measures to reduce disturbance to marine mammal receptors from transiting vessels, requiring them to: • not deliberately approach marine mammals as a minimum; • avoid abrupt changes in course or speed should marine mammals approach the vessel to bow-ride; • remain at safe speeds at all times and reduce speed if appropriate when a marine mammal is in the vicinity; and • adhere to guidelines laid out in the Scottish Marine Wildlife Watching Code. The Outline NSVMP (Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan of the Offshore EIA Report) will be adhered to at all times. Secured in the Section 36 Consent and Marine Licence, via the requirement for an NSVMP, which will be submitted to MD-LOT for approval.

Information to Inform the Assessment

Overview of Subsea Noise from Vessel Use and Other Noise Producing Activities

- 6.3.160 Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities may arise due to vessel movements and other activities during the installation of the Wind Turbine and OSP/ foundations, the installation and/or maintenance of IACs, Interconnector Cables and the Offshore Export Cables. Disturbance may result from both the presence of vessels and vessel noise emissions, however, at present it is not possible to disentangle the effect from presence versus noise, therefore the assessment has focused on the risk of disturbance due to the noise emissions.
- 6.3.161 Increased vessel movements and other Subsea Noise producing activities during the construction, O&M, and decommissioning phases have the potential to result in a range of effects to marine mammals such as injury, avoidance behaviour or displacement and masking of vocalisations or changes in vocalisation rate.
- 6.3.162 The main drivers influencing the magnitude of the impact of Subsea Noise are vessel type, speed and ambient sound levels, and reactions are different dependent on vessel type, distance and speed (Wisniewska *et al.*, 2018). As detailed in Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report, source levels for vessels depend on the vessel size and speed as well as propeller design and other factors and there can be considerable variation in magnitude and character between vessels even within the same class. Therefore, source data for the assessment has been based on the MDS (Table 6.30) and precautionary assumptions (i.e. using data toward the higher end of the scale for the relevant class of ship as a proxy).
- 6.3.163 A detailed Subsea Noise modelling assessment has been carried out to investigate the potential for injurious and behavioural effects on marine mammals resulting from elevated Subsea Noise from vessels and other (non-piling) noise generating activities, using the latest criteria from NMFS (2024). Vessel noise is classed as non-impulsive, see Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report. A conservative assumption has been made that all individual marine mammals will respond aversively to increases in vessel noise (i.e. that there is no intra or interspecific variation or context-dependent differences). This is a precautionary approach as in reality, the distance over which effects may occur will vary according to the species, the ambient sound levels, hearing ability, vertical space use and behavioural response differences. Furthermore, vessel noise will be temporary and transitory, as opposed to permanent and fixed. In this respect, construction sound is unlikely to differ significantly from vessel traffic already in the area. However, several activities could be potentially occurring at the same time and therefore ranges of effects may extend from several vessels/locations where the activity is carried out and potentially overlap.

- 6.3.164 Embedded Mitigation measures adopted as part of the Proposed Development include the development of and adherence to an Outline NSVMP (Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan of the Offshore EIA Report), which includes adherence by vessels to guidelines laid out in the Scottish Marine Wildlife Watching Code (Table 6.31). The Outline NSVMP (Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan) will include requirements to not deliberately approach marine mammals as a minimum, avoid abrupt changes in course or speed should marine mammals approach the vessel to bow-ride and to remain at safe speeds at all times and reduce speed when a marine mammal is in the vicinity.

Injury

Vessel Noise

- 6.3.165 For vessel noise, sound exposure (SEL_{cum}) has been estimated for each source based on 24 hours continuous operation; however, due to the mobile nature of marine mammals, it is highly unlikely that any marine mammal would stay at a stationary location or within a fixed radius of a vessel (or any other sound source, particularly for 24 hours) and therefore the Subsea Noise modelling has been undertaken based on an animal swimming away from the source (or the source moving away from an animal, see Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report for more details).
- 6.3.166 The Subsea Noise modelling results indicate that the threshold for auditory injury was not exceeded for all species, for all vessel types. Furthermore, it should be noted that the injury ranges based on SEL threshold do not take into account any ambient noise levels and therefore are likely to be over precautionary. With Embedded Mitigation measures in place, e.g. adherence to a NSVMP (see Table 6.31 and Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan of the Offshore EIA Report) where vessels will not deliberately approach animals and will remain at low speeds, the risk of auditory injury to marine mammals is considered to be negligible. The Embedded Mitigation measures to further reduce the risk of injury to marine mammals (Table 6.31) will be followed at all times.

Other Activities

- 6.3.167 There could be up to 268 days of drilling foundations rather than impact piling (for 4-leg piled jacket) (Table 6.30). The Subsea Noise modelling found that the auditory injury threshold will not be exceeded for all marine mammals exposed to drilled pile installation (Volume 3, Technical appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report).
- 6.3.168 The auditory injury ranges from vessels or other activities will not overlap with the Firth of Tay and Eden Estuary SAC, Isle of May SAC, Berwickshire and North Northumberland SAC or Moray Firth SAC. However, the 50 km connectivity buffer means that harbour seals connected to the Firth of Tay and Eden Estuary SAC could be at risk of auditory injury within the Export Cable Corridor. During vessel use or other non-piling activities within the Export Cable Corridor, there could be a risk to bottlenose dolphin within the Coastal East Scotland MU. It is

unlikely there will be a risk of auditory injury to grey seals within the 20 km connectivity buffer, although seals from the East Scotland SMU may be in the area (i.e. MU functionally linked with the Isle of May SAC and Berwickshire and North Northumberland SAC).

Behavioural Disturbance

- 6.3.169 Behavioural disturbance from vessel noise is likely to occur only where vessel noise associated with the Proposed Development exceeds the background ambient sound level. The Site Boundary is located in waters with relatively high traffic (see Paragraph 6.3.190) associated with maritime transport, hence the presence of a high proportion of cargo vessels amongst all recorded vessels. Considering the current baseline levels of vessel traffic, it can be anticipated that marine mammals present in the vicinity of the Local Marine Mammal Study Area are exposed to some level of background noise.
- 6.3.170 The degree of disturbance experienced by marine mammal receptors will be dependent on a number of factors, including: individual hearing ranges and background noise levels, together with individual context (e.g. habituation to noise/vessel presence) and motivation to remain in the area (i.e. key foraging area) (IWC, 2006; Senior *et al.*, 2008).
- 6.3.171 The evidence presented here relating to behavioural responses draws upon observed reactions relative to large ship activity (e.g. tankers) and shipping lanes, to smaller planing craft. The size and speed affect the noise characteristics for each vessel type (Richardson *et al.*, 1995) and therefore marine mammal response to vessel activity is also likely to be influenced on the size and speed of each vessel. The evidence is highly linked to the circumstances of each source described and is presented to highlight the variability in response that can be observed.
- 6.3.172 Oakley *et al.* (2017) found varied negative reactions in response to boat speed. Cargo, recreational fishing and speedboats were the main vessel types accounting for negative reactions in this study. It is worth noting that these vessel types already occur frequently as part of the baseline for the Proposed Development (Paragraph 6.3.166). Species such as bottlenose dolphin have been observed to react only once a boat is close by and quickly resume their natural behaviour once the boat had passed (Lemon *et al.*, 2006).
- 6.3.173 Dolphins can both be attracted to and displaced by vessels depending on context. For example, resting dolphins are likely to avoid vessels, foraging dolphins will ignore them, and socialising dolphins may approach vessels and 'bow-ride' (Richardson *et al.*, 1995). The level of any behavioural response can vary depending on circumstance, each study may represent a snapshot in time. Anderwald *et al.* (2013) showed that bottlenose dolphin presence was positively correlated with total number of vessels, while grey seal were displaced by high levels of vessel traffic. A study by Richardson (2012) on the effect of disturbance on bottlenose dolphin community structure in Cardigan Bay, Wales, found that group size was significantly smaller in areas of high vessel traffic.

- 6.3.174 Mikkelsen *et al.* (2019) recorded a change to the diving behaviour of a tagged grey seal, that switched rapidly from a dive ascent to descent in response to ship sound. Hastie *et al.* (2021) demonstrated how foraging context is important when interpreting avoidance behaviour in grey seals. In this study, avoidance rates appeared to depend on the perceived risk (e.g. silence, pile driving sound, operational sound from tidal turbines) versus the quality of the prey patch. Therefore, sound exposure in different prey patch qualities may result in markedly different behavioural response. Thomsen *et al.* (2006) estimated that both harbour and grey seals will respond to small (~2 kHz) and large (~0.25 kHz) vessels at approximately 400 m. Jones *et al.* (2017) showed a high co-occurrence between grey seal/harbour seal and shipping traffic within 50 km of the coastline near to haul-out sites were shown in a national scale assessment of seals and shipping in the UK.
- 6.3.175 Joy *et al.* (2019) monitored a voluntary commercial vessel slowdown trial through 16 nm of shipping lanes which overlapped with critical habitat of southern resident killer whales (HF cetacean). The disturbance metric used in this study was 'lost foraging time'. The slowdown trial achieved 22% reduction in 'potential lost foraging time' for killer whales (with 40% reductions when 100% of vessels were under the 11 kts speed limit).
- 6.3.176 Most vessels involved in the construction phase of the Proposed Development (with the exception of crew transfer vessels) are likely to be travelling considerably slower than 11 kts. All vessels will travel at safe speeds at all times and reduce speed when a marine mammal is in the vicinity, as detailed in the Outline NSVMP (Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan of the Offshore EIA Report; Table 6.31).
- 6.3.177 Pirotta *et al.* (2015) found that the transit of vessels in the Moray Firth resulted in a reduction (by almost half) of the likelihood of recording bottlenose dolphin prey capture buzzes. The study also suggested that vessel presence, not just vessel sound, resulted in disturbance. In areas that are important for foraging, it is likely that animals are not displaced and instead choose to remain despite increased vessel activity.
- 6.3.178 Increased noise levels as a result of an increase in vessel traffic in an area could lead to altered vocalisation patterns. This has been observed in delphinids. Fouda *et al.* (2018) found that an increase in shipping resulted in simplified vocal calls. Dolphin whistles exhibited an upward shift in frequency content and with less complexity in the vocalisation. Bottlenose dolphins have been found to both increase and decrease whistle frequencies in noisy environments, thought to be responses to acoustic masking and efforts to improve signal transmission (Heiler *et al.*, 2016; La Manna *et al.*, 2013; May-Collado and Wartzok, 2008; Peters, 2018; Rako Gospić and Picciulin, 2016).
- 6.3.179 Evidence suggests that other characteristics of individual ship encounters in addition to noise and proximity, such as route predictability (steady vs. erratic paths) or speed may be important drivers of negative reactions (Baş *et al.*, 2015; Oakley *et al.*, 2017), and therefore marine mammals may be accustomed to regular and predictable transits such as those in the Local Marine Mammal Study Area (see Paragraph 6.3.190) resulting in minimal additional disturbance.

- 6.3.180 There is therefore an observed tolerance to boat traffic (and anthropogenic sounds and activities in general) and so a slight increase from the existing levels of traffic in the vicinity of the Proposed Development may not result in high levels of disturbance (Vella *et al.*, 2001). Whilst it cannot be assumed that tolerance to vessel activity is evidence of absence of detrimental consequences (e.g. physiological responses are not easily detectable in free-ranging wild animals), there is evidence of animals (from multiple species) persistence in areas of high vessel traffic. Furthermore, where displacement effects have been observed in relation to vessel presence, animals have been shown to quickly return to the areas in question.
- 6.3.181 The evidence for behavioural disturbance is highly context driven, and highlights that there are differences inter- and intra-species. The level of any behavioural response will depend on the activity of the individual exposed, how motivated they are to remain in the area, and their previous exposure to vessel activity. The evidence from scientific peer reviewed literature indicates whilst there might be an initial immediate avoidance behaviour as a result of vessels activity, animals would likely return to the area, and therefore vessel presence is unlikely to elicit a lasting effect of ongoing displacement.
- 6.3.182 For non-impulsive (continuous) sound sources, such as from vessels, there is a single available threshold (120 dB re 1 μ Pa (rms) based on NMFS (2005)), proposed as the basis for the onset of a behavioural reaction. However, it must be noted that thresholds that relate single exposure parameters (e.g. received sound level) to behavioural responses across species and sound types may lead to oversimplification in prediction of effects. Ideally, differences between species, situational context, spatial scales and interacting effects of multiple stressors would be quantified to predict effects, but Southall (2021) highlights that few studies report this critical data in a systematic, structured way. Using a single threshold assumes that 100% of animals above this threshold are disturbed, whilst in reality, for those animals disturbed there is likely to be a proportional response (i.e. not all animals will be disturbed to the same extent). Joy *et al.* (2019) derived a dose-response for killer whales and Subsea Noise from vessels, indicating that marine mammals display a proportional response to non-impulsive noise. However, there is no dose-response curve available to apply in the context of non-impulsive sound sources for key species in the North Sea.
- 6.3.183 JNCC *et al.* (2010) state that “*it is most unlikely that a passing vessel would cause more than trivial disturbance. It is the repeated or chronic exposure to vessel noise that could cause disturbance*”. Therefore, it is important to note that the 120 dB re 1 μ Pa (rms) criterion is very precautionary and that ambient sound levels in the North Sea could well exceed this value (NMFS, 2005; Xodus, 2014). This conservative assumption has been corroborated by Farcas *et al.* (2020) where the authors constructed a computational model of Subsea Noise levels in the North-East Atlantic using Automatic Identification System (AIS) data and environmental parameters and found that the annual median broadband noise level exceeded 120 dB re 1 μ Pa around offshore installations in the Northern North Sea. It is anticipated that the background noise levels within the Local Marine Mammal Study Area are likely to often exceed the

120 dB re 1 µPa (rms) criterion. Therefore, behavioural disturbance ranges and number of animals potentially disturbed presented in this section should be interpreted as precautionary estimates.

- 6.3.184 The estimated ranges within which there is a potential for disturbance to marine mammals are presented in Table 6.32. Scour/cable protection/seabed preparation/installation vessels, survey vessel and support vessels resulted in the greatest modelled disturbance out to 5,597 m for all species (Table 6.32). The greatest disturbance range for other non-vessel continuous sound behavioural effects was predicted to be 4,493 m due to cable trenching/cutting (Table 6.32).
- 6.3.185 The Subsea Noise modelling found that disturbance range for drilled piling was out to 407 m, comparable to disturbance ranges from boulder clearance and offshore construction vessel (Table 6.32).

Table 6.32: Estimated Potential Disturbance Ranges from Vessels and Other Subsea Noise Generating Activities for All Marine Mammals (N/E= Threshold Not Exceeded)

Source/Vessel	Potential Disturbance Range (m) for All Species
Sandwave clearance	4,743
Boulder clearance, offshore construction vessel	474
Installation vessel, construction vessel (Dynamic Positioning)	4,743
Jack-up rig	N/E
Tug/anchor handlers	4,436
Rock placement vessel and cable installation vessels	4,743
Guard vessels	4,436
Survey vessel and support vessels	5,597
Crew transfer vessel	5,597
Scour/Cable Protection/Seabed Preparation/Installation Vessels	5,597
Cable laying	4,540
Cable trenching/cutting	4,493
Drilled piling	407

- 6.3.186 The number of animals predicted to experience behavioural disturbance due to vessel use and other noise producing activities is presented in Table 6.33. For harbour seal and bottlenose dolphin, the number of animals predicted to be disturbed was very small with no more than one animal within the predicted effect zones. For grey seals up to 56 animals could experience disturbance as a result of scour/cable protection/seabed preparation/installation vessels, survey vessel and crew transfer vessels. It is important to highlight that multiplying numbers of animals presented in Table 6.33 by the numbers of vessels expected over the site preparation and construction phases (Table 6.30)

could lead to unrealistic estimates as it does not allow for any overlap between vessels (and therefore would double count), nor does it account for periods when vessels are stationary.

- 6.3.187 The behavioural disturbance ranges will not overlap with the Firth of Tay and Eden Estuary SAC, Isle of May SAC, Berwickshire and North Northumberland SAC or Moray Firth SAC. However, vessel activity or other noise producing activities within the Export Cable Corridor could overlap with habitat use by harbour seals within the 50 km connectivity buffer of the Firth of Tay and Eden Estuary SAC. Vessel activity or other non-piling activities within the Array Area would not overlap with the 50 km connectivity buffer. During vessel activity or other non-piling activities within the Export Cable Corridor, there could also be a risk to bottlenose dolphin within the Coastal East Scotland MU. It is unlikely there will be a strong behavioural disturbance to grey seals within the 20 km connectivity buffer, although seals from the East Scotland SMU may be in the area (i.e. MU functionally linked with the Isle of May SAC and Berwickshire and North Northumberland SAC).

Table 6.33: Maximum Number of Animals with the Potential to Experience Disturbance due to Vessel Use and Other Subsea Noise Generating Activities (N/A = Not Applicable As the Threshold Was Not Exceeded)

Survey type	Number of Animals		
	Harbour seal	Grey seal	Bottlenose dolphin
Sandwave clearance, Installation vessel, construction vessel (Dynamic Positioning), Rock placement vessel and cable installation vessels	<1	40	<1
Boulder clearance, offshore construction vessel	<1	<1	<1
Jack-up rig	N/A	N/A	N/A
Tug/anchor handlers and Guard vessels	<1	35	<1
Survey vessel and support vessels, Scour/Cable Protection/Seabed Preparation/ Installation Vessels	<1	56	<1
Crew transfer vessel	<1	56	<1
Cable laying	<1	37	<1
Cable trenching/cutting	<1	36	<1
Drilled piling	<1	<1	<1

All Phases

- 6.3.188 Potential effects from the Proposed Development on the relevant conservation objectives of the four SACs screened in for Annex II marine mammals are presented in Table 6.34. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 6.34.
- 6.3.189 During the construction phase of the Proposed Development, the increased levels of vessel activity will contribute to background Subsea Noise levels. The MDS for pre-construction activities associated with the Proposed Development assumes up to a total of 18 vessels to be present within the Site Boundary at any one time making up to 140 return trips over the duration of the pre-construction phase (over two years). During construction, a total of 16 vessels will be working on the Offshore Export Cables at any one time, with an estimated 449 return trips in total. During construction, predicted vessel activity for the Array Area in terms of the number of vessels onsite at any one time (25 vessels) and return trips (1,671). Detailed information about numbers of each type of vessel along with number of return trips for each is provided in Table 6.30. Vessel types include Jack-up/Dynamic Positioning, heavy transport, scour protection, grouting, drilling, support vessels (dive, trenching), tugs, cable laying/installation (and burial), guard, survey, crew transfer vessels, boulder, sandwave and UXO clearance vessels.
- 6.3.190 Whilst there will be an uplift in vessel activity during the site preparation and construction phases of the Proposed Development, the movements will be limited to within the Site Boundary and are likely to follow existing shipping routes to and from the ports. Based on long term vessel AIS traffic data vessels over the 12-months between May 2024 and April 2025, defined routes of heavy traffic were recorded through the Shipping and Navigation Study area (Volume 3, Technical Appendix 14.1: Shipping and Navigation Navigational Risk Assessment (TWP-BOW-RPS-OFE-RPT-00030) of the Offshore EIA Report). Baseline vessel traffic types through the Shipping and Navigation Study area included cargo vessels (2,238 tracks), tankers (1,126 tracks), ferries (10 tracks), cruise ships (247 tracks), fishing vessels (1,365 tracks), recreational vessels (310 tracks), and tug and service vessels (5,316 tracks). Within the Array Area, there were 768 cargo vessel tracks, 166 tankers tracks, 1 ferry track, 46 cruise ships tracks, 197 fishing vessel tracks, 10 recreational vessels tracks, and 547 tug and service vessel tracks. The AIS data shows a seasonal trend that peaks over the summer months (May to July) and remains slightly elevated until after September, largely driven by cruise visits and recreational activity in summer months, as well as fishing vessels. Within the Offshore Export Cable Corridor there were 779 cargo vessel tracks, 862 tanker tracks, 6 ferry tracks, 177 cruise ships tracks, 550 fishing vessel tracks, 105 recreational vessels tracks and 1,565 tug and service vessel tracks.

- 6.3.191 During site-specific vessel traffic surveys in summer (July 2023 and July 2025) and winter (January 2024 and December 2025), an average of 25.3 vessels per day (354 in total) was recorded in the Survey Area (Array Area plus 10 nm) in the summer and average of 17.2 vessels per day (241 in total) in the winter. Within the Array Area, an average of 5.8 per day were recorded during summer and 3.8 per day during the winter. Recreational and cruise vessels were only recorded during the summer surveys, all other vessel types were recorded in both winter and summer surveys in the Survey Area. Therefore, the increased levels of vessel activity in the construction phase is unlikely to represent a significant uplift in vessels from the baseline.
- 6.3.192 During the O&M phase of the Proposed Development, the increased levels of vessel activity will also contribute to background Subsea Noise levels. The MDS for O&M activities associated with the Proposed Development assumes up to a total of 12 vessels to be present within the Proposed Development at any one time making up to 588 return trips over the duration of O&M phase (30 years). In addition to this, a further number of vessels will undertake another 146 return trips spread over the entire 30-year O&M phase (Table 6.30). A total of eight vessels will be present within the Export Cable Corridor at any one time, resulting in up to 125 return trips per year over the duration of the O&M phase. In addition to this, a further number of vessels will undertake another 114 return trips spread over the entire 30-year O&M phase (Table 6.30).
- 6.3.193 As in the construction phase, the uplift in vessel activity during the O&M phase is considered to be relatively small in the context of the baseline levels of vessel traffic in the vicinity and within the Proposed Development. Presence of the operational wind farm may divert some of the vessel routes and therefore, current traffic within the Site Boundary, which is not associated with the Proposed Development, is likely to be reduced. It is likely that this reduction will ultimately be counterbalanced by presence of maintenance vessels. Vessel movements will be limited to within the Site Boundary and are likely to follow existing shipping routes to and from the ports. The Embedded Mitigation measures to reduce the behavioural disturbance to marine mammals, the Outline NSVMP (Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan) (Table 6.31) will be followed at all times.
- 6.3.194 The size and sound outputs from vessels during the O&M phase will be similar to those used in the construction phase. However, the number of vessels and round trips will be much lower for the O&M phase compared to the construction phase.
- 6.3.195 The MDS for decommissioning activities associated with the Proposed Development (Table 6.30) assumes that noise from vessels is likely to be the same as the vessel activity described for construction phase.

Firth of Tay and Eden Estuary SAC

- 6.3.196 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary SAC conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.34.

Harbour Seal

- 6.3.197 An overview of potential auditory injury due to elevated Subsea Noise from vessel noise and other noise producing activities is described in Paragraphs 6.3.165 to 6.3.168 and for potential behavioural disturbance is described in Paragraphs 6.3.169 to 6.3.187.
- 6.3.198 As detailed in Paragraph 6.3.166, the threshold for auditory injury was not exceeded by vessel noise or other noise producing activities for harbour seal.
- 6.3.199 As detailed in Table 6.32, behavioural disturbance from vessel noise and other noise producing activities could occur between 407 m (drilled piling) and 5,597 m (scour/cable protection/seabed preparation/installation vessels, survey vessel and support vessels) for all species, including harbour seal.
- 6.3.200 The behavioural disturbance range for Subsea Noise generated by vessel use and other noise producing activities will not overlap with the Firth of Tay and Eden Estuary SAC itself, which is a minimum of 42.3 km south-west of the Export Cable Corridor, but may affect a small number of seals associated with the SAC (maximum one individual) within the 50 km connectivity buffer. However, disturbance to one seal will not undermine the viability of harbour seal as a component of the SAC.
- 6.3.201 Overall, since the risk of injury is assumed to be fully mitigated via Embedded Mitigation measures (Table 6.31) there is considered to be no residual risk of injury for harbour seal. The effect of behavioural disturbance is highly context-specific (Paragraph 6.3.181), although seals are expected to have some tolerance to behavioural disturbance from Subsea Noise (Vella *et al.*, 2001). Whilst there may be minor effects at an individual level, these are not predicted to be at a scale that would lead to adverse effects for the harbour seal feature of the Firth of Tay and Eden Estuary SAC.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.3.202 Potential effects from the Proposed Development on the Isle of May SAC and Berwickshire and North Northumberland Coast SAC conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.34.

Grey Seal

- 6.3.203 An overview of potential auditory injury due to elevated Subsea Noise from vessel noise and other noise producing activities is described in Paragraphs 6.3.165 to 6.3.168 and for potential behavioural disturbance is described in Paragraphs 6.3.169 to 6.3.187.
- 6.3.204 As detailed in Paragraph 6.3.166, the threshold for auditory injury was not exceeded by vessel noise or other noise producing activities for grey seal.
- 6.3.205 As detailed in Table 6.32, behavioural disturbance from vessel noise and other noise producing activities could occur between 407 m (drilled piling) and 5,597 m (scour/cable protection/seabed preparation/installation vessels, survey vessel and support vessels) for all species, including grey seal.

6.3.206 The behavioural disturbance range for Subsea Noise generated by vessel use and other noise producing activities will not overlap with the Isle of May SAC, which is 68.3 km south-west of the Export Cable Corridor or the Berwickshire and North Northumberland SAC, which is 93.4 km south-west of the Export Cable Corridor. The behavioural disturbance ranges will not overlap with the 20 km connectivity buffer around the Isle of May SAC. However, disturbance to 0.5% of the East Scotland SMU grey seal population (maximum 56 seals assuming all potentially disturbed animals originate from the SAC populations) will not undermine the viability of grey seal as a component of the Isle of May SAC nor affect the population of the Berwickshire and North Northumberland SAC.

6.3.207 Overall, since the risk of injury is assumed to be fully mitigated via Embedded Mitigation measures (Table 6.31) there is considered to be no residual risk of injury for grey seal. The effect of behavioural disturbance is highly context-specific (Paragraph 6.3.181), although seals are expected to have some tolerance to behavioural disturbance from Subsea Noise (Vella *et al.*, 2001). Whilst there may be minor effects at an individual level, these are not predicted to be at a scale that would lead to adverse effects for the grey seal feature of the Isle of May SAC or Berwickshire and North Northumberland Coast SAC.

Moray Firth SAC

6.3.208 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.34.

Bottlenose Dolphin

6.3.209 An overview of potential auditory injury due to elevated Subsea Noise from vessel noise and other noise producing activities is described in Paragraphs 6.3.165 to 6.3.168 and for potential behavioural disturbance is described in Paragraphs 6.3.169 to 6.3.187.

6.3.210 As detailed in Paragraph 6.3.166, the threshold for auditory injury was not exceeded by vessel noise or other noise producing activities for bottlenose dolphin.

6.3.211 As detailed in Table 6.32, behavioural disturbance from vessel noise and other noise producing activities could occur between 407 m (drilled piling) and 5,597 m (scour/cable protection/seabed preparation/installation vessels, survey vessel and support vessels) for all species, including bottlenose dolphin.

6.3.212 The behavioural disturbance range for Subsea Noise generated by vessel use and other noise producing activities will not overlap with the Moray Firth SAC, which is a minimum of 159.6 km north-west from the Export Cable Corridor. However, behavioural disturbance could occur within the Coastal East Scotland MU as a result of vessel and other noise producing activities within the Export Cable Corridor, although disturbance of up to two dolphin will not undermine the viability of the bottlenose dolphin population (i.e. 0.9% of the Coastal East Scotland MU; Paragraph 6.2.37) within the SAC.

- 6.3.213 Overall, since the risk of injury is assumed to be fully mitigated via Embedded Mitigation measures (Table 6.31) there is considered to be no residual risk of injury for bottlenose dolphin. The effect of behavioural disturbance is highly context-specific (Paragraph 6.3.181), although dolphins are expected to have some tolerance to behavioural disturbance from Subsea Noise (Vella *et al.*, 2001). Whilst there may be minor effects at an individual level, these are not predicted to be at a scale that would lead to adverse effects for the bottlenose dolphin feature of the Moray Firth SAC.

Conclusion

- 6.3.214 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities with respect to all phases of the Proposed Development.

Table 6.34: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of Injury and Disturbance from Subsea Noise Generated by Vessel Use and Other Noise Producing Activities during the Construction, O&M and Decommissioning Phases

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	As described in Paragraphs 6.3.165 to 6.3.168, vessel use and other noise producing activities is unlikely to lead to injury (and therefore mortality) of harbour seals. There is no impact pathway for injury from vessel use or other noise producing activities, as auditory injury thresholds are not exceeded. and Embedded Mitigation measures fully mitigate the risk of injury. This ensures that the recovery of harbour seal at a population-level is not impeded (noting that the condition of harbour seal within the SAC was last assessed as unfavourable – declining; see Paragraph 6.2.20) and animals can move safely between the SAC and important areas of functionally linked sea outwith the SAC (NatureScot, 2024c). Therefore, harbour seals within the SAC will not be at significant risk of injury or mortality and this impact will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.3.169 to 6.3.187, disturbance would not be significant as the maximum disturbance range from vessel use and other noise producing activities (5.6 km) does not overlap the SAC, which is located 42.3 km away from the Site Boundary. This ensures harbour seals continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided and this impact will not prevent the distribution of harbour seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no impact pathway between vessel use and other noise producing activities and the supporting habitats and processes relevant to harbour seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats and processes within the SAC from being maintained.

SAC	Feature	Target/Conservation Objectives	Conclusion
Isle of May SAC	Grey seal	2a. ensure grey seals are a viable component of the Isle of May SAC.	As described in Paragraphs 6.3.165 to 6.3.187, vessel use and other noise producing is unlikely to lead to injury or strong behavioural disturbance of grey seals. There is no impact pathway for injury from vessel use or other noise producing activities, as auditory injury thresholds are not exceeded and Embedded Mitigation measures fully mitigate the risk of injury. Similarly, grey seal would not be disturbed within the SAC as the maximum disturbance range (5.6 km) does not overlap the SAC, as the SAC is located 68.3 km from the Site Boundary, ensuring grey seals can move safely between the SAC and important areas of functionally linked sea outwith the SAC (NatureScot, 2025d). Importantly, this means that there is no effect on reproductive capability of grey seal during the breeding season and pup production would not be expected to decline as a result of this impact, ensuring stable or increasing grey seal numbers are maintained. Therefore, this impact will not prevent the population of grey seals from being maintained as a viable component of the SAC.
		2b. ensure the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals.	This conservation objective refers to potential for long term declines in the use of the SAC, changes in the distribution of the species on a sustained basis or changes in their behaviour such that it reduces the ability of the species to survive, breed or rear young (NatureScot, 2025d). As described in Paragraphs 6.3.169 to 6.3.187, the maximum disturbance range of vessel use and other noise producing activities (5.6 km) does not overlap the SAC, which is located 68.3 km from the Site Boundary. Only a small proportion of the relevant SMU would potentially be impacted by behavioural disturbance, which would not lead to changes in behaviour that would reduce the ability of seals to survive. Therefore, significant disturbance will be avoided, and this impact will not prevent the distribution of grey seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats relevant to grey seal are maintained.	There is no impact pathway between vessel use and other noise producing activities and the supporting habitats within the SAC relevant to grey seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats relevant within the SAC relevant to grey seal from being maintained.

SAC	Feature	Target/Conservation Objectives	Conclusion
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no impact pathway between vessel use and other noise producing activities and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal. There is no overlap with the area of significant disturbance with the SAC including haul-out sites. Therefore, this impact will not prevent the extent and distribution of habitats of the qualifying features, the structure and function of the habitats of the qualifying species and the supporting processes on which the habitats of qualifying species rely (Natural England, 2023), from being maintained.
		The structure and function of the habitats of the qualifying species are maintained.	
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	
		The populations of each of the qualifying species are maintained	As described in Paragraphs 6.3.165 to 6.3.187, vessel use and other noise producing activities is unlikely to lead to injury or significant disturbance of grey seals as there is no overlap of the maximum auditory injury or disturbance range with the SAC, which is located 93.4 km from the Site Boundary. Only a small proportion of the relevant SMUs would potentially be impacted by behavioural disturbance and therefore with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023). Therefore, this impact will not prevent the population and distribution of grey seal within the SAC from being maintained.
		The distribution of qualifying species within the site are maintained.	
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	As described in Paragraph 6.3.210, there is no impact pathway for injury from vessel use or other noise producing activities, as auditory injury thresholds are not exceeded and Embedded Mitigation measures fully mitigate the risk of injury. As such, there is no risk of injury or mortality to bottlenose dolphin from vessel use or other noise producing activities (NatureScot, 2025e). Therefore, this impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.
		2b. ensure the distribution of bottlenose dolphin throughout the site is maintained by	As described in Paragraphs 6.3.169 to 6.3.187, the maximum disturbance range from vessel use and other noise producing activities does not overlap the SAC, which is located 159.6 km from

SAC	Feature	Target/Conservation Objectives	Conclusion
		avoiding significant disturbance.	the Site Boundary. The disturbance range (5.2 km) will, however, overlap with the functionally linked Coastal East Scotland MU (NatureScot, 2025e) for vessel use and activities within the Export Cable Corridor. However, this is unlikely to prevent bottlenose dolphin from using and accessing all areas of the SAC. Therefore, significant disturbance will be avoided, and this impact will not prevent the distribution of bottlenose dolphin throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	The focus of this conservation objective is on maintaining sufficient prey resources and supporting habitats and processes to support the distribution and population of bottlenose dolphin associated with the SAC (NatureScot, 2025e). There is no impact pathway between vessel noise and other noise producing activities and the supporting habitats and processes relevant to bottlenose dolphin (i.e. no overlap with the area of significant disturbance with the SAC nor functionally linked Coastal East Scotland MU). With respect to the availability of prey, no adverse effects were predicted on prey species (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report) and so prey species populations are expected to be maintained in the long term. Therefore, this impact will not prevent the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources from being maintained.

Effects on Marine Mammals Due to Altered Prey Availability

- 6.3.215 The LSE assessment during the HRA screening process identified that during the construction, O&M and decommissioning phases, LSE could not be ruled out for potential injury and disturbance from Subsea Noise generated during piling for all four of the SACs screened in for Annex II marine mammals (see Table 3.1).
- 6.3.216 The MDS considered for the assessment of effects on marine mammals due to altered prey availability is shown in Table 6.35. There are no Embedded Mitigation measures applicable to this impact specifically, however, Embedded Mitigation measures for Subsea Noise impacting fish and shellfish receptors (Table 5.4) and EMF (Table 5.21) are relevant.

Table 6.35: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Effects due to Altered Prey Availability during the Construction, O&M and Decommissioning Phases

Proposed Development Phase	MDS	Justification
Construction	- Up to 19,414,805 m² of subtidal temporary habitat loss and/or disturbance due to a trenchless technique installation e.g. HDD exit pit excavation, sandwave clearance, sandwave clearance material deposition, cable installation (including boulder clearance) and jack-up events; - An additional 13,987 m² of temporary habitat loss and/or disturbance could occur due to crater formation from the clearance of UXO; - up to 2,251,000 m² (0.77% of the total area of the Site Boundary) of long term subtidal habitat loss due to infrastructure installed in the construction phase, which will persist into the O&M phase; - Introduction of up to 2,705,020 m² of hard structure surface area installed throughout the construction phase which will persist into the O&M phase; - Effects on fish and shellfish receptors due to underwater noise from piling, UXO clearance, site investigation surveys and vessel noise and other noise producing activities; and - Effects on fish and shellfish receptors from SSC from drill arising, IAC installation, offshore export cable installation, sandwave clearance, HDD exit pit excavation, and HDD drilling fluid release (at Landfall).	MDS as described for fish and shellfish receptors (Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report) will result in the greatest potential impact on prey availability.
O&M	- A total of up to 11,688,813 m² of temporary subtidal habitat loss (up to 4.01% of the total area of the Site Boundary) and/or disturbance due to jack-up events and disturbance caused by reburial of IACs, Interconnector Cables and Offshore Export Cables; - Up to 2,705,020 m² of hard substrate will be installed in the construction phase could be colonised by benthic species; - Effects on fish and shellfish ecology due to SSC from drilling for pile installation, IAC installation, Offshore Export Cable installation, sandwave clearance, HDD exit pit excavation and HDD drilling fluid release (at Landfall);	

Proposed Development Phase	MDS	Justification
	- Effects on fish and shellfish ecology due to EMFs from subsea electrical cabling due to presence of: - up to 151 km of 132 kV IACs - up to 36 km of 275 kV Interconnector Cables - up to 210 km of 275 kV Offshore Export Cables; and - Effects on fish and shellfish receptors due to underwater noise from site investigation surveys, operational noise from Wind Turbines, and vessel noise and other noise producing activities.	
Decommissioning	A Decommissioning Programme will be submitted to MD-LOT for consultation and approval. The Decommissioning Programme will be updated during the Project's lifespan to take account of changing best practice and new technologies. The approach for decommissioning is yet to be determined, however, for the purposes of this MDS it has been assumed that all Scour Protection, cable protection, and cable crossing protection will be left <i>in situ</i>. Therefore, up to 2,232,100 m² (up to 0.77% of the total area of the Site Boundary) of long term habitat loss will persist past the decommissioning.	

Information to Inform the Assessment

- 6.3.217 Potential effects on fish and shellfish during the construction, O&M and decommissioning phases of the Proposed Development, are detailed in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report. There is the potential for changes in availability or distribution of prey species as a result, which could affect the foraging ability of marine mammal species.
- 6.3.218 The key prey species for marine mammals include sandeels, gadoids (including cod, haddock and whiting), scombrids (including mackerel *Scomber scombrus* and horse mackerel *Trachurus trachurus*), clupeids (including sprat *Sprattus sprattus* and herring) and righteye flounders (including plaice *Pleuronectes platessa*). These prey species have been identified as being of regional or national importance within the marine environment encompassing the Proposed Development.
- 6.3.219 However, effects on most prey fish populations across all phases of the Proposed Development are likely to be temporary, of a short duration, localised and not significant. The exception is for herring, for which Subsea Noise generated during piling may be a significant effect (Paragraph 6.3.229 and Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report).

Construction Phase

- 6.3.220 Potential effects from the Proposed Development on the relevant conservation objectives of the four SACs screened in for Annex II marine mammals are presented in Table 6.36. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 6.36.
- 6.3.221 Potential impacts on marine mammal prey species during the construction phase have been assessed in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report. Impacts on prey species include temporary habitat loss and disturbance, long term habitat loss and disturbance, introduction of artificial habitat and subsequent colonisation of hard structures, increased SSC and associated depositions, injury and/or disturbance to fish and shellfish from elevated Subsea Noise.
- 6.3.222 The installation of Offshore Infrastructure within the Proposed Development will lead to temporary habitat loss/disturbance as a result of a range of activities including boulder and sandwave clearance, disturbance from IACs. Offshore Export Cables and Interconnector Cables, and use of jack-up vessels for the OSP installation. There is the potential for temporary habitat loss/disturbance to affect up to 19,414,805 m² of the seabed during the construction phase (Table 6.35, which equates to 6.67% of the Proposed Development and represents a relatively small proportion of the area assessed for fish and shellfish ecology (i.e. the Fish and Shellfish Ecology Study Area; see

Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). Temporary habitat loss and disturbance has the potential to affect spawning, nursery or feeding grounds of fish and shellfish receptors, and therefore impact prey availability for marine mammals. However, as presented in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, this potential impact was assessed as being of minor adverse significance for all fish and shellfish receptors.

- 6.3.223 Construction phase activities associated with the Proposed Development may also lead to increased SSCs and associated deposition. During the construction phase, these activities will include drilling/piling for foundation installation, cable installation, sandwave levelling, HDD exit pit excavation and drilling fluid release. As presented in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, this potential impact was assessed as being of minor adverse significance for all fish and shellfish receptors.
- 6.3.224 The Subsea Noise modelling for all fish hearing groups (i.e. Groups 1 to 4, as opposed to just the results of Groups 1 and 2 presented in Paragraphs 5.3.3 to 5.3.47 for the Annex II Diadromous Fish assessment) was summarised and assessed in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report.
- 6.3.225 Piling of the foundations and OSP foundations could lead to injury and disturbance for fish and shellfish receptors during the construction phase of the Proposed Development. For peak SPL, the maximum recoverable injury range is estimated at 888 m to 1,389 m for the monopile foundations and 544 m to 882 m for a jacket. However, this is considered to be highly conservative due to the implementation of soft starts during piling activities, which will allow fish to move away from the areas of highest noise levels, before the received noise reaches a level that would cause an injury. As such, the maximum injury ranges predicted for soft start initiation (i.e. of the order of tens of metres) are likely to be more realistic. Using the SEL_{cum} metric, Subsea Noise modelling showed that injury may occur out to ranges of 10,430 m for monopile and out to 7,384 m for jacket. However, as presented in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, this potential impact was assessed as being of minor adverse significance for all fish and shellfish receptors.
- 6.3.226 The mortality and potential mortal injury ranges for the low order clearance activities were modelled, based on peak SPL, to 81 m for all fish hearing groups, with these increasing to 910 m for high order clearance activities. However, as presented in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, this potential impact was assessed as being of minor adverse significance for all fish and shellfish receptors.
- 6.3.227 Annex II marine mammals forage over extensive distances and exploit a wide range of different prey items, with the ability to switch prey sources depending on season and availability. The impacts resulting from the construction of the Proposed Development on fish and shellfish receptors will be highly localised

and largely restricted to the boundaries of the Proposed Development. In context of the wider available foraging habitat within the Northern North Sea, the area of impact is very small, and if animals do have to travel further to alternative foraging grounds, the impacts are expected to be short term in nature and reversible.

- 6.3.228 The fish and shellfish communities found within the Fish and Shellfish Ecology Study Area are deemed to be characteristic of the fish and shellfish assemblages in the wider Northern North Sea. It is considered highly likely that, considering the highly mobile nature of harbour seals and bottlenose dolphins, there will be similar prey resources available in the wider Northern North Sea region. Foraging over greater distances could result in an energetic cost, however, if animals do have to travel further to alternative foraging grounds, the impacts are expected to be short term in nature and reversible.
- 6.3.229 Most impacts on fish and shellfish receptors were assessed as minor adverse significance within Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report. The exception is for herring, for which Subsea Noise generated during piling is predicted to result in a significant adverse effect. However, this adverse significant effect is only concluded during the spawning periods for herring and both the harbour seal and bottlenose dolphin are considered to be generalist feeders and are thus not reliant on a single prey species. Therefore, given the expected adaptability of marine mammals foraging ability, altered prey availability is not predicted to affect the integrity of the SACs during the construction phase of the Proposed Development.
- 6.3.230 The results of the Subsea Noise modelling suggest that prey species may be impacted due to Subsea Noise up to 1 km from the Site Boundary (Paragraph 6.3.341 and 6.3.342). Therefore, Subsea Noise only has the potential to impact prey species over a relatively small area in terms of the area available to marine mammals as a whole.

Firth of Tay and Eden Estuary SAC

- 6.3.231 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary SAC conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.36.

Harbour Seal

- 6.3.232 As detailed in Paragraph 6.2.3, harbour seals are generalist feeders and generally forage within 50 km of their haul-out sites. Given that the impacts on prey species (including Subsea Noise) will be temporary, of a short duration and localised (Paragraph 6.3.217 et seq.), only a small area will be affected when compared to available foraging habitat for harbour seal in the Regional Marine Mammal Study Area. There may be an energetic cost associated with increased travelling if prey patches are disturbed, however, harbour seal is not considered to be particularly vulnerable, as foraging trips tend to be relatively wide-ranging (NatureScot, 2024a). The availability of wider suitable habitat across the Regional Marine Mammal Study Area suggest that individuals may move to alternative foraging grounds without health impairment. It is expected that the

harbour seal population would be able to tolerate the effect without any potential impact on reproduction and survival rates.

- 6.3.233 Therefore, this potential impact is not predicted to result in adverse effects (i.e. disruption to foraging) for the harbour seal feature of the Firth of Tay and Eden Estuary SAC.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.3.234 Potential effects from the Proposed Development on the Isle of May SAC and Berwickshire and North Northumberland Coast SAC conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.36.

Grey Seal

- 6.3.235 As detailed in Paragraph 6.2.9, grey seals have a selective diet and forage widely, although during the breeding season they generally forage within 20 km of the breeding sites. Given that the impacts on prey species (including Subsea Noise) will be temporary, of a short duration and localised (Paragraph 6.3.217 *et seq.*), only a small area will be affected when compared to available foraging habitat for grey seal in the Regional Marine Mammal Study Area. There may be an energetic cost associated with increased travelling if prey patches are disturbed, however, grey seal is not considered to be particularly vulnerable, as foraging trips tend to be relatively wide-ranging outside of the breeding season (NatureScot, 2024a). The availability of wider suitable habitat across the Regional Marine Mammal Study Area suggest that individuals may move to alternative foraging grounds without health impairment. It is expected that the grey seal population would be able to tolerate the effect without any potential impact on reproduction and survival rates.
- 6.3.236 Therefore, this potential impact is not predicted to result in adverse effects (i.e. disruption to foraging) for the grey seal feature of the Isle of May SAC or Berwickshire and North Northumberland Coast SAC

Moray Firth SAC

- 6.3.237 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.36.

Bottlenose Dolphin

- 6.3.238 Like harbour seals, bottlenose dolphins are also considered generalist feeders, and as detailed in Paragraph 6.2.13, habitat use varies even within a population, with distribution influenced by a variety of factors, including but not limited to tidal state, resource availability or season. There is a seasonal pattern of bottlenose dolphin movement from the Tay estuary and adjacent waters to the Moray Firth SAC in the early summer months, and from the Moray Firth SAC to the Tay estuary and adjacent waters in late summer (Arso Civil *et al.*, 2021). This movement is anticipated to be driven by environmental and biological factors (Arso Civil *et al.*, 2021). Studies by Wilson *et al.* (1997) and Hastie *et al.* (2004) reported that these two areas share topographically distinct characteristics

with increased observations of dolphins foraging. Seasonal altered prey presence over variable temporal scales throughout the year may therefore enable bottlenose dolphins to exploit these areas within their range at different times. It is therefore expected that the bottlenose dolphin population associated with the SAC would be able to tolerate the effect without any potential impact on reproduction and survival rates.

- 6.3.239 Therefore, this potential impact is not predicted to result in adverse effects (i.e. disruption to foraging) for the bottlenose dolphin feature of the Moray Firth SAC.

O&M Phase

- 6.3.240 Potential impacts on marine mammal prey species during the O&M phase have been assessed in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report. The assessment includes temporary habitat loss and disturbance, long term habitat loss and disturbance, introduction of artificial habitat and subsequent colonisation of hard structures, increased SSCs and associated depositions, injury and/or disturbance to fish and shellfish from Subsea Noise, and impacts to fish and shellfish receptors due to EMF.
- 6.3.241 The MDS is for up to 11,688,813 m² of temporary habitat loss/disturbance during the O&M phase. This equates to 3.99% of the Proposed Development and represents a very small proportion of the Fish and Shellfish Ecology Study Area (Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). In addition, up to 2,251,000 m² of long term habitat loss is anticipated, representing 0.77% of the Proposed Development. These impacts will be similar to those identified for temporary habitat loss/disturbance during the construction phase and will be highly restricted to the immediate vicinity of these operations. Therefore, as presented in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, this potential impact was assessed as being of minor adverse significance for all fish and shellfish receptors.
- 6.3.242 During the O&M phase, Subsea Noise could arise from site investigation surveys, vessel activity, and Wind Turbine operations. These sources are expected to produce noise levels similar to or lower than those during construction. The overall risk to fish and other marine fauna from operational Subsea Noise is considered very low, with impacts being local, long term, continuous at low levels, and reversible upon decommissioning. Therefore, as presented in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, this potential impact was assessed as being of minor adverse significance for all fish and shellfish receptors.
- 6.3.243 EMFs generated by up to 397 km of electrical subsea cables associated with the Proposed Development may have potential effects on fish and shellfish species. These EMFs, emitted from both buried and unburied cables, are strongest close to the source but decrease rapidly with distance, returning to background levels within a few to tens of metres. The majority of cables will be buried, which significantly reduces EMF exposure at the seabed, whilst unburied cables may expose species to higher EMF levels over short distances.

However, due to the rapid attenuation of EMFs and the limited spatial extent of exposure, fish and shellfish are unlikely to experience significant behavioural changes or barrier effects. As presented in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, this potential impact was assessed as being of minor adverse significance for all fish and shellfish receptors.

- 6.3.244 During the O&M phase, the Proposed Development will maintain up to 2.34 km² of artificial hard structures on the seabed, including Wind Turbine and OSP foundations, scour protection, and cable protection. These structures will persist throughout the 30-year operational lifespan. These structures introduce a hard substrate into the water column, although their exact surface area is not quantified due to design uncertainties. Whilst these structures are dispersed across the Proposed Development and not concentrated in one area, they represent a long term, continuous alteration of the seabed environment. As presented in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, this potential impact was assessed as being of minor adverse significance for all fish and shellfish receptors.
- 6.3.245 As presented in Paragraph 6.3.227, harbour seals, grey seals and bottlenose dolphins are highly mobile and wide-ranging, it is therefore expected that individuals could forage in alternative areas if required. However, infrastructure (e.g. Wind Turbines) provides a hard substrate for the potential colonisation by various marine life (Delefosse *et al.*, 2018). Faecal deposits from animals colonising structures, such as suspension feeders, likely alter the surrounding seafloor communities by increasing food availability in the Proposed Development (Degraer *et al.*, 2020). This increased food availability is likely to attract fish and marine mammals, who can exploit the increased foraging opportunities in the Proposed Development.
- 6.3.246 Species such as harbour seal and grey seal have been frequently recorded around offshore oil and gas structures (Delefosse *et al.*, 2018; Lindeboom *et al.*, 2011; Todd *et al.*, 2015). Fernandez-Betelu *et al.* (2022) deployed an array of C-PODs within the vicinity of four offshore structures, which demonstrated that marine mammals are attracted to man-made structures. Further evidence suggesting that wind farms are used for foraging includes a study by Russell *et al.* (2014) where the movements of tagged harbour seals commonly exhibited grid-like movement patterns within two active wind farms in the North Sea. Brandt *et al.* (2009) suggested, however, that a small increase in detections during the night at hydrophones deployed in close proximity to single Wind Turbines may indicate increased foraging behaviour near the monopiles. Whilst there is some mounting evidence of potential benefits of man-made structures in marine environment (Coolen *et al.*, 2020), the statistical significance of such benefits and details about trophic interactions in the vicinity of artificial structures and their influence on ecological connectivity remain largely unknown (Elliott and Birchenough, 2022; Inger *et al.*, 2009; McLean *et al.*, 2022; Rouse *et al.*, 2020).

- 6.3.247 As all impacts on fish and shellfish receptors were assessed as minor adverse significance within Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, and given the expected adaptability of marine mammals foraging ability, altered prey availability is not predicted to affect the integrity of the SACs or have population-level effects upon Annex II marine mammals during the O&M phase of the Proposed Development.

Firth of Tay and Eden Estuary SAC

- 6.3.248 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary SAC conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.36.

Harbour Seal

- 6.3.249 As outlined in Paragraph 6.3.240 *et seq.*, no significant adverse effects were predicted to occur to fish and shellfish receptors during the O&M phase of the Proposed Development (Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report).
- 6.3.250 Therefore, this potential impact is not predicted to result in adverse effects (i.e. disruption to foraging as presented in Paragraph 6.3.232 and 6.3.233) for the harbour seal feature of the Firth of Tay and Eden Estuary SAC.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.3.251 Potential effects from the Proposed Development on the Isle of May SAC and Berwickshire and North Northumberland Coast SAC conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.36.

Grey Seal

- 6.3.252 As outlined in Paragraph 6.3.240 *et seq.*, no significant adverse effects were predicted to occur to fish and shellfish receptors during the O&M phase of the Proposed Development (Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report).
- 6.3.253 Therefore, this potential impact is not predicted to result in adverse effects (i.e. disruption to foraging as presented in Paragraph 6.3.235 and 6.3.236) for the grey seal feature of the Isle of May SAC or Berwickshire and North Northumberland Coast SAC

Moray Firth SAC

- 6.3.254 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.36.

Bottlenose Dolphin

- 6.3.255 As outlined in Paragraph 6.3.240 *et seq.*, no significant adverse effects were predicted to occur to fish and shellfish receptors during the O&M phase of the Proposed Development (Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report).
- 6.3.256 Therefore, this potential impact is not predicted to result in adverse effects (i.e. disruption to foraging as presented in Paragraph 6.3.238 and 6.3.239) for the bottlenose dolphin feature of the Moray Firth SAC.

Decommissioning Phase

- 6.3.257 Potential impacts on marine mammal prey species during the decommissioning phase have been assessed in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report. The significance of impacts is anticipated to be the same as for the construction phase: minor adverse. Therefore, altered prey availability is not predicted to affect the integrity of the SACs or have population-level effects upon Annex II marine mammals during the decommissioning phase of the Proposed Development.
- 6.3.258 As outlined in Paragraph 6.3.220 *et seq.* for the construction phase, no significant adverse effects were predicted to occur to fish and shellfish receptors during the construction phase of the Proposed Development (Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). Therefore, the assessment for the SACs during the construction phase (Paragraphs 6.3.232 to 6.3.239) is considered relevant to the decommissioning phase of the Proposed Development and not repeated here. The potential effects during the decommissioning phase on the relevant conservation objectives are presented in Table 6.36.

Conclusion

- 6.3.259 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of effects on marine mammals due to altered prey availability with respect to the construction, O&M and decommissioning phases of the Proposed Development.

Table 6.36: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of Effects due to Altered Prey Availability during the Construction, O&M and Decommissioning Phases

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	There is no direct impact pathway from altered prey availability that could result in significant risk of injury to harbour seal. Effects due to altered prey availability are not predicted to lead to a significant risk of mortality of harbour seals, as impacts to most prey species are predicted to be not significant. Impacts to herring from Subsea Noise during piling are likely to be of moderate adverse significance; however, Additional Mitigation detailed and secured through the Piling Strategy developed post-consent will reduce the significance of the impact to minor adverse. Harbour seals are expected to adapt quickly to any altered prey availability given their mobile nature and generalist feeding strategy. Therefore, the recovery of harbour seal at a population-level is not anticipated to be impeded (noting that the condition of harbour seal within the SAC was last assessed as unfavourable – declining; see Paragraph 6.2.20) (NatureScot, 2024c). Therefore, the impact of altered prey availability on harbour seals within the SAC will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	Effects due to altered prey availability will not cause significant disturbance of harbour seals throughout the SAC, as impacts on prey species (including Subsea Noise) will be temporary, of a short duration and localised (Paragraph 6.3.217 <i>et seq.</i>). As such there is a negligible risk of disruption of foraging activities of harbour seal given their mobile nature and generalist feeding strategy. This ensures harbour seals continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided and this impact will not prevent the distribution of harbour seals throughout the SAC will not be adversely affected and will be maintained.
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no impact pathway between altered prey availability and the supporting habitats and processes within the SAC relevant to harbour seal. Impacts to most species are predicted to be not significant and prey species populations are expected to be maintained in the long term. Therefore, this impact will not prevent the supporting habitats and processes with the SAC from being maintained.

SAC	Feature	Target/Conservation Objectives	Conclusion
Isle of May SAC	Grey seal	2a. ensure grey seals are a viable component of the Isle of May SAC.	Impacts to most prey species are predicted to be not significant, and therefore grey seal are expected to adapt and recover quickly to any altered prey availability given their mobile nature, availability of wider foraging grounds and the distance of effects on prey from the SAC (68.3 km). Impacts to herring from Subsea Noise during piling are likely to be of moderate adverse significance; however, Additional Mitigation detailed and secured through the Piling Strategy developed post-consent will reduce the significance of the impact to minor adverse. Importantly, this means that there is no effect on reproductive capability of grey seal during the breeding season and pup production would not be expected to decline as a result of this impact, ensuring stable or increasing grey seal numbers are maintained. Therefore, this impact will not prevent the population of grey seals from being maintained as a viable component of the SAC.
		2b. ensure the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals.	This conservation objective refers to potential for long term declines in the use of the SAC, changes in the distribution of the species on a sustained basis or changes in their behaviour such that it reduces the ability of the species to survive, breed or rear young (NatureScot, 2025d). Effects due to altered prey availability will not cause significant disturbance of grey seals throughout the SAC, as impacts on prey species (including Subsea Noise) will be temporary, of a short duration and localised (Paragraph 6.3.217 <i>et seq.</i>). As such there is a negligible risk of disruption of foraging activities of grey seals given their mobile nature, availability of wider foraging grounds and the distance of effects on prey from the SAC (68.3 km). Therefore, significant disturbance will be avoided, and this impact will not prevent the distribution of grey seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats relevant to grey seal are maintained.	There is no impact pathway between altered prey availability and the supporting habitats within the SAC relevant to grey seal. Impacts to most species are predicted to be not significant and prey species populations are expected to be maintained in the long term. Therefore, this impact will not prevent the supporting habitats relevant within the SAC relevant to grey seal from being maintained.

SAC	Feature	Target/Conservation Objectives	Conclusion
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no impact pathway between altered prey availability and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal. Impacts on prey species (including Subsea Noise) will be temporary, of a short duration and localised (Paragraph 6.3.217 <i>et seq.</i>) and would not impede connectivity between the SAC and the wider environment as grey seal are able to forage widely. Therefore, this impact will not prevent the extent and distribution of habitats of the qualifying features, the structure and function of the habitats of the qualifying species and the supporting processes on which the habitats of qualifying species rely, from being maintained (Natural England, 2023).
		The structure and function of the habitats of the qualifying species are maintained.	
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	
		The populations of each of the qualifying species are maintained	Impacts to most prey species are predicted to be not significant, and therefore grey seal are expected to adapt and recover quickly to any altered prey availability given their mobile nature, availability of wider foraging grounds and the distance of effects on prey from the SAC (93.4 km). Impacts to herring from Subsea Noise during piling are likely to be of moderate adverse significance; however, Additional Mitigation detailed and secured through the Piling Strategy developed post-consent will reduce the significance of the impact to minor adverse. Therefore with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023). Therefore, this impact will not prevent the population and distribution of grey seal within the SAC from being maintained.
		The distribution of qualifying species within the site are maintained.	
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	Impacts to most prey species are predicted to be not significant, and given their mobile nature, generalist feeding strategy, availability of wider foraging grounds and the distance of effects on prey from the SAC (159.6 km). Impacts to herring from Subsea Noise during piling are likely to be of moderate adverse significance; however, Additional Mitigation detailed and secured through the Piling Strategy developed post-consent will reduce the significance of the impact to minor adverse. As such, there is no risk of injury or mortality to bottlenose dolphin from effects of altered prey availability (NatureScot, 2025e).

SAC	Feature	Target/Conservation Objectives	Conclusion
			Therefore, this impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.
		2b. ensure the distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.	Effects due to altered prey availability will not cause significant disturbance of bottlenose dolphins throughout the SAC, as impacts on prey species (including Subsea Noise) will be temporary, of a short duration and localised (Paragraph 6.3.217 et seq.). As such there is a negligible risk of disruption of foraging activities of bottlenose dolphins given their mobile nature, generalist feeding strategy, availability of wider foraging grounds and the distance of effects on prey from the SAC (159.6 km) Bottlenose dolphin from using and accessing all areas of the SAC. will continue to use and have access to all areas of the SAC and therefore, the significant disturbance will be avoided, and this impact will not prevent distribution of bottlenose dolphin throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	The focus of this conservation objective is on maintaining sufficient prey resources and supporting habitats and processes to support the distribution and population of bottlenose dolphin associated with the SAC (NatureScot, 2025e). There is no impact pathway between effect of altered prey availability and the supporting habitats and processes relevant to bottlenose dolphin. Impacts to most species are predicted to be not significant and prey species populations are expected to be maintained in the long term. Therefore, this impact will not prevent the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources from being maintained.

6.4 Assessment of Adverse Effects of the Proposed Development In-Combination with Other Plans and Projects

Plans and Projects Screened into the In-Combination Assessment for Annex II Marine Mammals

- 6.4.1 The long list of other projects screened into the in-combination assessment for Annex II marine mammals are based on those identified for the CEA within Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) of the Offshore EIA Report, as outlined in Table 6.37 and illustrated in Figure 6.7. Tier 1 encompasses only the onshore elements of the Project. There are not anticipated to be any impact pathways for Annex II marine mammals between the onshore elements of the Project and the Proposed Development, therefore there is no Tier 1 assessment included in the in-combination assessment for this topic.
- 6.4.2 The Regional Marine Mammal Study Area (Figure 6.7; Volume 3, Technical Appendix 10.1: Marine Mammal Technical Report (TWP-BOW-RPS-OFE-RPT-00017) of the Offshore EIA Report) was used as the initial screening buffer to identify relevant plans and projects for in-combination assessment. The short list of relevant plans and projects has been derived from consideration of the spatial and temporal scale of impacts along with connectivity to SACs where there is potential for impacts from the Proposed Development alone. This ensures a proportionate approach as detailed in Table 6.38. The specific projects that are progressed and the justification for such is presented in the individual impact sections below.

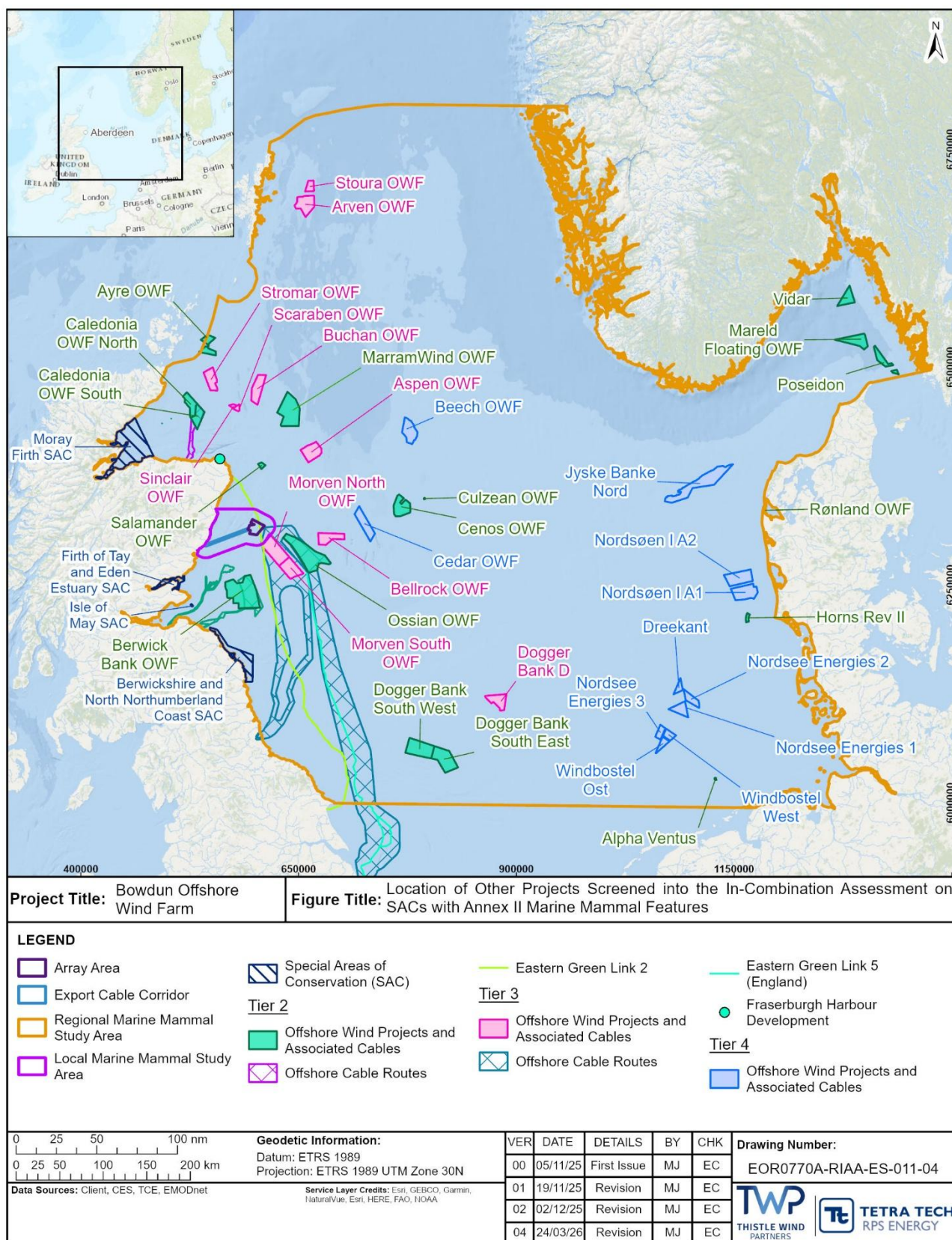


Figure 6.7: Location of Other Projects Screened into the In-Combination Assessment on SACs with Annex II Marine Mammal Features

Table 6.37: List of Other Projects with Potential for In-Combination Effects on Annex II Marine Mammal Features

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Tier 1						
There were no Tier 1 projects brought forwards for the in-combination assessment.						
Tier 2						
Offshore Wind Projects and Associated Cables						
Seagreen 1A Project	Consented	19.47	Seagreen 1A is made up of the 36 remaining Wind Turbines consented as part of the Seagreen 1 OWF. Seagreen 1A submitted a variation in consent to allow construction to take place between 2029 and 2032.	2029-2032 ⁴	2033-2057	The construction and O&M phases and potentially the decommissioning phases of the Seagreen 1A Project overlap with those of the Proposed Development.
Ossian OWF	Application submitted but not yet determined	25.36	The Ossian Floating Wind project is proposed for up to 265 floating wind turbines with a capacity of 3,600 MW. Operational lifetime 35 years.	2031-2038	2039-2073	The construction and O&M phases and potentially the decommissioning phases of the Ossian OWF overlap with those of the Proposed Development.

⁴ Seagreen 1A Project is a Tier 2 project and the construction dates have been amended since the initial CEA assessment with the construction phase now overlapping with the Proposed Development. However, according to the CEA methodology described in Volume 1, Chapter 4; Environmental Impact Assessment Methodology (TWP-BOW-RPS-OFE-RPT-00006) of the Offshore EIA Report, this project has remained as part of the baseline within the in-combination presented here for marine mammals.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Berwick Bank OWF	Consented/Pre-construction	46.53	Berwick Bank OWF is proposed for up to 307 Wind Turbines with a capacity of up to 4,100 MW. Operational lifetime 35 years.	2027-2032	2033-2067	The construction and O&M phases and potentially the decommissioning phases of the Berwick Bank OWF overlap with those of the Proposed Development.
Muir Mhòr OWF	Application submitted but not yet determined	52.50	Muir Mhòr OWF is proposed for up to 67 Wind Turbine at a capacity of 798 MW.	2027-2030	2031-2056	The construction and O&M phases of the Muir Mhòr OWF overlap with those of the Proposed Development.
Salamander OWF	Consented	58.68	Salamander OWF is proposed for up to 100 MW.	2027-2029	2030-2054	The construction, O&M and potentially the decommissioning phases of the Salamander OWF overlap with the construction and O&M phases of the Proposed Development.
Aspen OWF	Application submitted but not yet determined	88.37	Floating OWF proposed for up to 1,000 MW and up to 72 Wind Turbines.	2027-2031	2032-2056	The construction, O&M and decommissioning phases of the Aspen OWF overlap with the construction and O&M phases of the Proposed Development.
MarramWind OWF	Application submitted but not yet determined	112.04	Proposed floating OWF for up to 147 wind turbines at a capacity of 3000 MW.	2030-2040	2041-2065	The construction, O&M and potentially the decommissioning phases of the MarramWind OWF overlap with those of the Proposed Development.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Caledonia OWF South	Application submitted but not yet determined	121.35	The South Site is proposed for up to 78 wind turbines with up to 140 wind turbines across the two sites (North and South). Caledonia Offshore Wind Farm (North and South) has an indicative generation capacity of 2,000 MW with an anticipated 35 years operational lifespan.	2028-2030	2031-2065	The construction, O&M and potentially the decommissioning phases of the Caledonia OWF South overlap with those of the Proposed Development.
Buchan OWF	Application submitted but not yet determined	131.73	Floating OWF is proposed for up to 70 floating Wind Turbines at a capacity of 1,000 MW. Project lifetime of 35 years.	2028-2030	2031-2065	The construction and O&M phases of the Buchan OWF overlap with those of the Proposed Development. The decommissioning phases may also overlap.
Caledonia OWF North	Application submitted but not yet determined	136.29	The North Site is proposed for up to 77 Wind Turbines with up to 140 Wind Turbines across the 2 sites (North and South). Caledonia Offshore Wind Farm (North and South) has an indicative generation capacity of 2,000 MW with an anticipated 35 years operational lifespan.	2028-2030	2031-2065	The construction, O&M and potentially the decommissioning phases of the Caledonia OWF North overlap with those of the Proposed Development.
Cenos OWF	Application submitted but not yet determined	149.39	Proposed for up to 1,350 MW with up to 95 floating Wind Turbines.	2030-2034	2035-2059	The construction, O&M and potentially the decommissioning phases of the Cenoss OWF overlap with those of the Proposed Development.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Culzean Floating Offshore Wind Turbine Pilot Project	Consented	185.50	Culzean Floating Offshore Wind Turbine Pilot Project aims to deploy 1 floating Wind Turbine with a capacity of 3 MW, test floater and mooring system technologies. The marine licence is being sought for a period of 10 years.	2026	2027-2036	The O&M and the decommissioning phases of the Culzean Floating Offshore Wind Turbine Pilot Project overlap with the construction and O&M phases of the Proposed Development.
Ayre OWF	Application submitted but not yet determined	192.87	Up to 1,000 MW with proposed up to 67 Wind Turbines.	2030-2034	2035-2059	The construction, O&M and potentially the decommissioning phases of the Ayre OWF overlap with those of the Proposed Development.
Dogger Bank South West	Application submitted but not yet determined	291.47	Dogger Bank South West is proposed for up to 100 Wind Turbines at a capacity of 1,500 MW.	2026-2030	2031-2055	The construction, O&M and potentially the decommissioning phases of the Dogger Bank South West overlap with the construction and O&M phases of the Proposed Development.
Dogger Bank South East	Application submitted but not yet determined	316.71	Dogger Bank South East is proposed for up to 100 Wind Turbines at a capacity of 1,500 MW.	2026-2030	2031-2055	The construction, O&M and potentially the decommissioning phases of the Dogger Bank South West overlap with the construction and O&M phases of the Proposed Development.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Horns Rev II	Operational	562.60	The Horns Rev II OWF consists of up to 91 Wind Turbines at a capacity of 209.3 MW.	NA	2009-2035	The O&M and decommissioning phases of the Horns Rev II overlap with the construction and O&M phases of the Proposed Development.
Rønland OWF	Operational	574.88	Eight Wind Turbines with a capacity of 17.2 MW. Wind park established in 2003.	NA	2003-2028	The decommissioning phase of Rønland OWF overlaps with the construction phase of the Proposed Development.
Alpha Ventus	Operational	592.28	Alpha Ventus consists of up to 12 Wind Turbines at a capacity of 60 MW. Potential for dismantle after 15 years of operation (news released March 2025) with no current decommissioning programme.	NA	2010-2035	The O&M and decommissioning phases of the Alpha Ventus overlap with the construction and O&M phases of the Proposed Development.
Energy Park Vidar	Application submitted but not yet determined	728.67	Energy Park Vidar is proposed for up to 91 Wind Turbines with a capacity of 2,000 MW.	2027-2030	2031-2055	The construction, O&M and potentially the decommissioning phases of the Energy Park Vidar Project overlap with the construction and O&M phases of the Proposed Development.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Mareld Floating OWF	Application submitted but not yet determined	728.67	Mareld OWF is consented for 2,500 MW. The project has received a Natura 2000 permit but is awaiting 2 more permits before the project can proceed.	2029–2031	2032–2056	The construction, O&M and potentially the decommissioning phases of the Mareld Floating OWF Project overlap with those of the Proposed Development.
Poseidon Wind Power Project	Consented	728.67	Proposed 81 Wind Turbines with a capacity up to 1,400 MW. Permit for the construction and operation of the wind farm granted in November 2024. The permit is valid for 40 years from the start of the wind farm.	2029–2031	2032–2069	The construction, O&M and potentially the decommissioning phases of the Poseidon Wind Power Project overlap with those of the Proposed Development.
Offshore Export Cable Routes and Carbon Capture and Storage						
Seagreen Phase 1A OFTO	Consented	28.05	Consent includes an export cable approximately 110 km in length to a landfall location at Cockenzie.	2029–2032	2033–unknown	The construction, O&M and decommissioning phases of the Seagreen Phase 1A OFTO overlap with the construction and O&M phases of the Proposed Development. The decommissioning phases may also overlap.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Inch Cape OFTO	Under construction	35.14	Two export cables with a capacity of 220 kV approximately 85 km in length between the landfall point at Cockenzie in East Lothian and the development area.	2025-2026	2027-unknown	The O&M and the decommissioning phases of the Inch Cape OFTO overlap with the construction, O&M and potentially the decommissioning phases of the Proposed Development.
Berwick Bank OFTO (Cambois Connection)	Application submitted but not yet determined	46.53	Berwick Bank transmission is proposed for up to 8 cables with an operational lifetime of 35 years.	2026-2029	2030-2064	The O&M and the decommissioning phases of the Berwick OFTO (Cambois Connection) overlap with the construction, O&M and potentially the decommissioning phases of the Proposed Development.
Caledonia OWF North Export Cable Route	Application submitted but not yet determined	96.84	The Caledonia North Offshore Export Corridor runs south through the Caledonia Site (North and South) to the landfall site at Stake Ness. Up to 2 export cables with maximum voltage of 275 kV and stretching up to 180 km.	2028-2030	2031-unknown	The O&M and the decommissioning phases of the Caledonia OWF North Export Cable Route overlap with the construction, O&M and potentially the decommissioning phases of the Proposed Development.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Caledonia OWF South Export Cable Route	Application submitted but not yet determined	96.84	The Caledonia South Offshore Export Corridor runs south to the landfall site at Stake Ness. Up to 2 export cables with maximum voltage of 275 kV and stretching up to 150 km.	2028-2030	2031-unknown	The O&M and the decommissioning phases of the Caledonia OWF South Export Cable Route overlap with the construction, O&M and potentially the decommissioning phases of the Proposed Development.
Moray West OFTO	Operational	146.79	2 export cables with a capacity of 132 – 400 kV.	NA	2025-unknown	The O&M and the decommissioning phases of the Moray West OFTO overlap with the construction, O&M and potentially the decommissioning phases of the Proposed Development.
Cables within 100 km of the Proposed Development						
Eastern Green Link 2	Under construction	0.00	2 GW subsea cable connecting Peterhead in Aberdeenshire and Drax in North Yorkshire. Onshore construction commenced in 2025. Offshore construction begins in 2027.	2025-2028	2029-unknown	The O&M phase of the Eastern Green Link 2 overlaps with the construction and O&M phases of the Proposed Development. The decommissioning phases may also overlap.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Spittal to Peterhead HVDC Link Project	Under construction	62.49	Construction of a new 172 km, 2 GW, 525 kV subsea HVDC electricity transmission link in the Moray Firth. Marine licence granted 18 November 2025. Enabling works underway with main works starting in April 2026.	2026-2029	2030-unknown	The O&M phase of the Spittal to Peterhead HVDC Link Project overlaps with the construction and O&M of the Proposed Development. The decommissioning phases may also overlap.
Tier 3						
Offshore Wind Projects and Associated Cables						
Morven North OWF	Pre-Application	10.03	Morven North OWF Project is proposed for up to 96 wind turbines at a capacity of 1,500 MW. Application of relevant consents and licences expected in 2026 with decision in 2027.	2030-2026	2037-2061	The construction and O&M phases of the Morven North OWF overlap with those of the Proposed Development. The decommissioning phases may also overlap.
Morven South OWF	Pre-Application	43.61	Morven South OWF Array Project is proposed for up to 95 wind turbines at a capacity of 1,500 MW. Application of relevant consents and licences expected in 2026 with decision in 2027.	2030 - 2036	2036-2061	The construction and O&M phases of the Morven South OWF overlap with those of the Proposed Development. The decommissioning phases may also overlap.
Bellrock OWF	Pre-Application	62.23	Bellrock OWF is proposed for a capacity of 1,800 MW with between 42 and 80 Wind Turbines.	2027-2030	2031-2055	The construction and O&M phases of the Bellrock OWF overlap with those of the Proposed Development.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Scaraben OWF	Pre-Application	125.19	Proposed between 3 and 6 Wind Turbines with a capacity of up to 99.5 MW	2028-2029	2030-2054	The O&M and decommissioning phases of the Scaraben OWF overlap with those of the Proposed Development.
Sinclair OWF	Pre-Application	128.11	Proposed between 3 and 6 Wind Turbines with a capacity of up to 99.5 MW.	2028-2029	2030-2054	The O&M and decommissioning phases of the Sinclair OWF overlap with the construction and O&M phases of the Proposed Development.
Stromar OWF	Pre-Application	153.38	Proposed floating OWF for up to 1,500 MW capacity. Scoping Opinion issued April 2024.	2028-2032	2033-2057	The construction, O&M and decommissioning phases of the Stromar OWF overlap with the construction and O&M phases of the Proposed Development.
Dogger Bank D	Pre-Application	319.71	Proposed wind farm with up to 122 Wind Turbines and a capacity of 2,000 MW. Up to 4 export cables making landfall south-east of Skipsea. Scoping report part 1 and 2 submitted June 2024. Application is expected to be submitted between July and September 2026.	2029-2034	2035-2059	The construction, O&M and decommissioning phases of the Dogger Bank D overlap with the construction and O&M phases of the Proposed Development.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Arven OWF	Pre-Application	352.16	Arven is a 2,300 MW floating offshore wind development located to the east of the Shetland Islands. Scoping application for 2 array areas, Arven Array Area (360 km ²) and Arven South Array Area (100 km ²). Up to 161 Wind Turbines and 8 export cables. Arven OWF is proposed for a capacity of 1,800 MW.	2030-2034	2035-2059	The construction, O&M and decommissioning phases of the Arven OWF overlap with the construction and O&M phases of the Proposed Development.
Stoura Offshore Wind	Pre-Application	381.15	Proposed or up to 500 MW capacity from up to 40 Wind Turbines. Anticipated 35 years lifetime. Scoping Opinion issued October 2025.	2031-2035	2036-2070	The construction and O&M phases of the Stoura Offshore Wind overlap with those of the Proposed Development. The decommissioning phases may also overlap.
Offshore Export Cable Routes and Carbon Capture and Storage						
Morven Hawthorn Pit Grid Connection Project	Pre-Application	1.81	Consists of the onshore and offshore infrastructure associated with the Morven OWF. Up to 6 export cables with a capacity of 525 kV.	2029-2032	2033-unknown	The construction and O&M phases of the Morven Hawthorn Pit Grid Connection Project overlap with those of the Proposed Development. The decommissioning phases may also overlap.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Ossian Transmission Infrastructure	Pre-Application	25.28	Up to 6 export cables with a maximum total length of offshore cable route of 509 km. Anticipated application submission in the latter half of 2026. Operational lifetime 35 years.	2030-2033	2034-2068	The construction and O&M phases of the Ossian Transmission Infrastructure overlap with those of the Proposed Development. The decommissioning phases may also overlap.
Pipelines within 100 km of the Proposed Development						
CNSE Project	Pre-Application	36.00	Scoping request for the electrification of existing oil and gas infrastructure in the central North Sea. The infrastructure includes an onshore convertor station, an offshore convertor station, 66 kV offshore cabling connecting CNSE assets, 80 kV cabling to landfall, and 80 kV cabling from landfall to the onshore convertor station. Scoping Report submitted in May 2023.	2027-2028	2029-unknown	The O&M phase of the CNSE Project overlaps with that of the Proposed Development. The decommissioning phases may also overlap.
Eastern Green Link 5	Pre-Application	72.20	Eastern Green Link 5 is a new primarily offshore high voltage electricity link between Scotland and England. Approximately 555 km of subsea HVDC cable from the Lincolnshire coastline to Scotland. Cable landfall in Scotland to be confirmed.	2030-2034	2035-unknown	The construction and O&M phases of the Eastern Green Link 5 overlap with those of the Proposed Development. The decommissioning phases may also overlap.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Coastal						
Fraserburgh Harbour Development	Pre-Application	78.98	Proposed works to existing harbour improvement and construction of New South Harbour. Proposed works include relocation of existing south breakwater box berth, dredging and widening of the entrance of 2 harbours, a jetty and a pier, installation of pontoons and dredging the existing channel, extension of breakwater, installation of new breakwater, dredging and installation of new dry dock.	2028-2032	2033-unknown	The construction and O&M phases of the Fraserburgh Harbour Development overlap with those of the Proposed Development. The decommissioning phases may also overlap.
Tier 4						
Offshore Wind Projects and Associated Cables						
Cedar OWF	Pre-Planning	104.26	Cedar OWF is proposed for up to 1,008 MW. Anticipating 50 plus years of operations.	2026-2027	2028-2077	The O&M phase of the Cedar OWF overlap with that of the Proposed Development. The decommissioning phases may also overlap.
Beech OWF	Pre-Planning	189.50	Floating wind farm for up to 1,008 MW. Anticipating 50 plus years of operations.	2026-2027	2028-2077	The O&M phase of the Beech OWF overlaps with that of the Proposed Development. The decommissioning phases may also overlap.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Jyske Banke Nord	Planned	460.32	Proposed 1,100 MW in the North Sea, Denmark.	2027-2030	2031–2055	The construction, O&M and decommissioning phases of the Jyske Banke Nord overlap with the construction and O&M phases of the Proposed Development.
Dreekant	Planned	507.90	Proposed at a capacity of 1,000 MW.	2030–2031	2032–2056	The construction, O&M and decommissioning phases of the Dreekant Project overlap with the construction and O&M phases of the Proposed Development.
Nordsee Energies 3	Planned	508.67	Proposed for up to 10 Wind Turbines at a capacity of 1,000 MW.	2030-2031	2032–2056	The construction, O&M and decommissioning phases of the Nordsee Energies 3 Project overlap with the construction and O&M phases of the Proposed Development.
Nordsee Energies 1	Planned	509.30	Proposed for a capacity of 2,000 MW.	2028-2030	2031-2055	The construction, O&M and decommissioning phases of the Nordsee Energies 1 Project overlap with the construction and O&M phases of the Proposed Development.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Nordsee Energies 2	Planned	516.40	Proposed for a capacity of 1,500 MW.	2029-2031	2032-2056	The construction, O&M and decommissioning phases of the Nordsee Energies 2 Project overlap with the construction and O&M phases of the Proposed Development.
Windbostel West (N-9.2)	Planned	516.60	Proposed for a capacity of 2,000 MW. Expected commissioning 2031.	2029-2031	2032-2056	The construction, O&M and decommissioning phases of the Windbostel West overlap with the construction and O&M phases of the Proposed Development.
Windbostel Ost (N-9.1)	Planned	517.45	Proposed for a capacity of 2,000 MW.	2029-2030	2031-2055	The construction, O&M and decommissioning phases of the Windbostel Ost overlap with the construction and O&M phases of the Proposed Development.
Nordsøen I - A2	Planned	530.39	Wind farm is currently out to tender with bid deadline in 2026. Planning and environmental impact report anticipated to start in 2026. Capacity of up to 1,000 MW.	2028-2032	2033-2057	The construction, O&M and decommissioning phases of the Nordsøen I - A2 Project overlap with the construction and O&M phases of the Proposed Development.

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation	Temporal Overlap with the Proposed Development
Nordsøen I – A1	Planned	540.27	Wind farm is currently out to tender with bid deadline in 2027. Planning and environmental impact report anticipated to start in 2027. Capacity of up to 1,000 MW.fr	2028–2033	2034–2058	The construction, O&M and decommissioning phases of the Nordsøen I – A1 Project overlap with the construction and O&M phases of the Proposed Development.

* Proposed Development Phase refers to construction (C), O&M (O) and decommissioning (D).

Table 6.38: Other Projects Identification Criteria for In-combination Assessment

Impact Pathway	Long List	Firth of Tay and Eden Estuary SAC	Isle of May SAC	Berwickshire and North Northumberland SAC	Moray Firth SAC
Injury and disturbance from Subsea Noise generated during piling (Construction phase)	Projects within the Regional Marine Mammal Study Area. Projects with impact piling occurring within 3 years of the piling at the Proposed Development	Projects with the impact overlap within the 50 km harbour seal connectivity buffer where the other plan/project RIAA identifies potential LSE	Projects with the impact overlap within the 20 km grey seal connectivity buffer where the other plan/ project RIAA identifies potential LSE	Projects with the potential to impact individuals within the East Scotland SMU where the other plan/project RIAA identifies potential LSE	Projects with the potential to impact individuals within the Coastal East Scotland MU where the other plan/project RIAA identifies potential LSE
Injury and disturbance from Subsea Noise generated during UXO clearance (Construction phase)	Within 100 km from Proposed Development, projects whose UXO clearance phase overlaps with the UXO clearance phase of the Proposed Development				
Injury and disturbance from Subsea Noise generated during site investigation surveys (Construction and O&M phases)	Within 50 km from Proposed Development				
Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities (all phases)	Within 50 km from Proposed Development				
Effects on marine mammals due to altered prey availability (all phases)	Within 50 km from Proposed Development for all impacts except Subsea Noise where 100 km buffer was applied				

Injury and Disturbance from Subsea Noise Generated During Piling

- 6.4.3 The LSE assessment during the HRA screening process identified that LSE could not be ruled out for potential injury and disturbance from Subsea Noise generated during piling in the construction phase of the Proposed Development in-combination with other projects for three of the SACs screened in for Annex II marine mammals (Table 3.1).
- 6.4.4 No projects were identified for the in-combination assessment of injury and disturbance from Subsea Noise generated during piling for the Isle of May SAC as all relevant projects are outwith the 20 km connectivity buffer for grey seal within Scottish waters (Table 6.37 and Table 6.38).
- 6.4.5 The MDS considered for the in-combination assessment is shown in Table 6.39. The Embedded Mitigation measures are presented in Table 6.38 for the assessment of the Proposed Development alone. For the purposes of the MDS for the in-combination assessment, projects have been screened in and out as per the connectivity criteria identified in Table 6.38 and on the following basis for injury and disturbance from Subsea Noise generated during piling:
- Construction phase – the ZoI for piling can extend beyond the boundaries of proposed OWFs. Therefore, adopting a precautionary approach, the assessment has screened in projects within the Regional Marine Mammal Study Area whose construction phases overlap with the construction phase of the Proposed Development (2031 to 2036, with piling anticipated between 2031 and 2034).
 - In addition, projects whose construction phase concludes within the three years preceding the commencement of piling for the Proposed Development (i.e. projects finishing between 2027 and 2030) have also been included. This accounts for the potential In-Combination Effects of sequential piling and recognises that while these projects are likely to be operational, delays in offshore construction of up to three years could result in overlapping activity.
- 6.4.6 Projects which will already be operational by the construction phase of the Proposed Development (2031 to 2036) have also been excluded.

Table 6.39: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Injury and Disturbance from Subsea Noise Generated during Piling in the Construction Phase of the Proposed Development In-Combination with Other Projects

Proposed Development Phase	Tier	MDS
Construction	1	No projects identified.
	2	The MDS is as detailed for the Proposed Development alone in Table 6.8 in-combination with the following projects: Offshore Wind Projects and Associated Cables • Ossian OWF (construction phase); • Berwick Bank OWF (construction phase); • Muir Mhòr OWF (construction phase); • Salamander OWF (construction phase); • Aspen OWF (construction phase); • MarramWind OWF (construction phase); • Caledonia OWF South (construction phase); • Buchan OWF (construction phase); • Caledonia OWF North (construction phase); • Cenos OWF (construction phase); • Ayre OWF (construction phase); • Dogger Bank South West (construction phase); and • Dogger Bank South East (construction phase).
	3	The MDS is as detailed for the Proposed Development alone in Table 6.8 in-combination with the following projects: Offshore Wind Projects and Associated Cables • Morven North OWF (construction phase); • Morven South OWF (construction phase); • Bellrock OWF (construction phase); • Scaraben OWF (construction phase); • Sinclair OWF (construction phase); • Stromar OWF (construction phase);

Proposed Development Phase	Tier	MDS
		• Ayre OWF (construction phase); • Dogger Bank D (construction phase); • Arven OWF (construction phase); and • Stoura Offshore Wind (construction phase). Coastal Construction • Fraserburgh Harbour Development (construction phase).
	4	The MDS is as detailed for the Proposed Development alone in Table 6.8 in-combination with the following projects: Offshore Wind Projects and Associated Cables • Cedar OWF (construction phase); and • Beech OWF (construction phase).

In-Combination Assessment

- 6.4.7 The risk of auditory injury from impact piling is expected to be limited in spatial scale and geographic scale. The Subsea Noise modelling (Volume 2, Chapter 10: Marine Mammals (TWP-BOW-RPS-OFE-RPT-00018) and Volume 3, Technical Appendix 10.4: Subsea Noise Technical Report (TWP-BOW-RPS-OFE-RPT-00015) of the Offshore EIA Report) for the Proposed Development alone demonstrated that the maximum auditory injury range was 90 m for bottlenose dolphin, and 168 m for the harbour seal based on the peak SPL metric. Accumulated auditory injury (SEL_{cum}) was not predicted for either species. As a requirement under European Protected Species legislation, suitable mitigation measures must be put in place to reduce the risk of auditory injury to negligible across all projects considered for the in-combination assessment. As such, the risk of auditory injury is considered highly unlikely and therefore the potential for In-Combination Effects as a result of injury from impact piling is not considered further.
- 6.4.8 Table 6.40 lists which of the publicly available RIAAs (for Tier 2 projects in Table 6.39) and HRA Screening documents (for Tier 3 projects in Table 6.39) also screened in the four SACs considered for Proposed Development alone impacts (Section 6.3) for further assessment. Of the Tier 2 project listed, Cenoss OWF, Dogger Bank South West and Dogger Bank South East have been excluded from further assessment in this in-combination RIAA as Subsea Noise from piling was not screened into their RIAAs (Cenoss Offshore Windfarm Limited, 2024; RWE Renewables UK, 2025).
- 6.4.9 For Tier 3 and Tier 4 projects (Table 6.39) detailed Subsea Noise modelling results could not be used to inform the in-combination assessment of disturbance from Subsea Noise due to piling. However, within the HRA screening documents available for Tier 3, disturbance from Subsea Noise due to piling was screened in for further assessment for each project (Table 6.40). There are currently no HRA documents available for Scaraben OWF and Sinclair OWF (Tier 3 projects) or Cedar OWF and Beech OWF (Tier 4 projects). None of the four SACs relevant to the Proposed Development were assessed in the Stoura HRA LSE Screening Report, and so this project was not taken further in this in-combination assessment (ESB, 2025).
- 6.4.10 Refined construction dates for the Tier 3 or Tier 4 projects are currently unknown, however the preliminary construction periods presented in Table 6.37 suggest that there may be some overlap with the Proposed Development and Tier 2 projects.
- 6.4.11 The consistent conclusion between the Proposed Development and the Tier 2, 3 and 4 projects is that Subsea Noise generated during piling is anticipated to be short term in nature across all the construction phases.

Table 6.40: SACs Designated for Annex II Marine Mammals Included in the Proposed Development also Included in Other Projects for the Assessment of In-Combination Effects due to Disturbance from Subsea Noise Generated During Piling

Project	Reference	Firth of Tay and Eden Estuary SAC	Berwickshire and North Northumberland SAC	Moray Firth SAC
Tier 2				
Ossian OWF	Ossian OWFL (2024b)		X	X
Berwick Bank OWF	Berwick Bank Wind Farm Ltd. (2022)	X	X	X
Muir Mhòr OWF	Muir Mhòr Offshore Wind Farm (2024a)			X
Salamander OWF	Salamander OWF (2024b)			X
Aspen OWF	Cerulean Winds Aspen Project Limited (2025b)			X
MarramWind OWF	MarramWind Limited (2025)			X
Caledonia OWF South	Caledonia OWF Limited (2024a)			X
Caledonia OWF North	Caledonia OWF Limited (2024b)			X
Cenos OWF	Cenos Offshore Windfarm Limited (2024)			
Ayre OWF	Ayre OWF Limited (2025)			X
Dogger Bank South West	RWE Renewables UK (2025)			
Dogger Bank South East				
Buchan OWF	Buchan Offshore Wind (2025)		X	X
Tier 3				
Morven North OWF	MvOWL (2023b)	X	X	X
Morven South OWF		X	X	X
Bellrock OWF	Bellrock Offshore Wind Farm (2024b)	X	X	X
Stromar OWF	Stromar Offshore Wind Farm (2024a)			X

Project	Reference	Firth of Tay and Eden Estuary SAC	Berwickshire and North Northumberland SAC	Moray Firth SAC
Dogger Bank D	Dogger Bank D Offshore Wind Farm (2025)		X	X
Arven OWF	Arven OWF (2024)			X
Fraserburgh Harbour Development	Fraserburgh Harbour Development (2025b)			X

Construction Phase

- 6.4.12 Potential effects from this activity on the relevant conservation objectives of the three SACs screened in for Annex II marine mammals are presented in Table 6.41. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 6.41.

Firth of Tay and Eden Estuary SAC

- 6.4.13 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary SAC conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.41.

Harbour Seal

- 6.4.14 As shown in Table 6.40, the Proposed Development only has the potential to disturb harbour seals associated with the Firth of Tay and Eden Estuary SAC in combination with one Tier 2 project (Berwick Bank OWF) and two Tier 3 projects (Morven OWF and Bellrock OWF) due to piling.
- 6.4.15 The Berwick Bank OWF assessment included the Firth of Tay and Eden Estuary SAC in their RIAA. The RIAA stated that the 135 dB disturbance contour has the potential to overlap with the SAC itself, so while there may be mild behavioural disturbance, prolonged or sustained behavioural effects, including displacement, are unlikely to occur. The assessment concluded that potential mild disturbance is unlikely to result in a barrier effect or significant behavioural responses that could affect the distribution of harbour seal within the SAC (Berwick Bank Wind Farm Ltd., 2022).
- 6.4.16 There is no information available for use at the time of writing relating to the Tier 3 projects identified (Paragraph 6.4.9).
- 6.4.17 The CEA assessment for the Proposed Development concluded that there was no long term population effect from the cumulative piling scenario using population modelling (Volume 3, Technical Appendix 10.3: Marine Mammal iPCoD Modelling Report (TWP-BOW-RPS-OFE-RPT-00079) of the Offshore EIA Report).

It is worth highlighting that assessment did not focus only on the projects identified for the in-combination assessment but considered a wider number of projects on the east coast of Scotland as relevant for the CEA.

- 6.4.18 Overall, the levels of behavioural response to impact piling of harbour seals associated with the SAC (within 50 km SAC connectivity buffer) is not anticipated to be significant. Whilst there may be minor effects at the individual level, these are not predicted to be at a scale that would lead to any adverse effects for the harbour seal feature of the Firth of Tay and Eden Estuary SAC.

Berwickshire and North Northumberland Coast SAC

- 6.4.19 Potential effects from the Proposed Development on the Berwickshire and North Northumberland Coast SAC conservation objectives (as presented in Paragraph 6.2.33) are presented in Table 6.41.

Grey Seal

- 6.4.20 As shown in Table 6.40, the Proposed Development has the potential to disturb grey seals associated with the Berwickshire and North Northumberland Coast SAC in-combination with three Tier 2 project (Ossian OWF, Berwick Bank OWF and Buchan OWF) and four Tier 3 projects (Morven North OWF, Morven South OWF, Bellrock OWF and Dogger Bank D).
- 6.4.21 The Berwick Bank OWF RIAA stated that there was a potential overlap with the 135 dB disturbance contour with the northern end of the Berwickshire and North Northumberland Coast SAC. This overlap was considered unlikely to cause significant disturbance to grey seals as it is the southern half of the SAC that is considered an important breeding site for grey seals. Therefore, piling activity was highly unlikely to disrupt normal behaviours of grey seals or cause any changes in population viability nor any long-lasting changes in distribution. The assessment also concluded that Subsea Noise generated during piling is unlikely to result in a barrier effect or significant behavioural responses at the Berwickshire and North Northumberland Coast SAC that could affect the distribution or population of grey seal within the SAC (Berwick Bank Wind Farm Ltd., 2022).
- 6.4.22 The Buchan OWF RIAA stated that no noise impact contours overlapped with the Berwickshire and North Northumberland Coast SAC. The iPCoD modelling also showed that there was no effect on the viability of the grey seal population within the reference SMUs considered. Therefore, the assessment concluded that Subsea Noise generated during piling is unlikely to result in significant behavioural responses that could affect the distribution or population of grey seal within the Berwickshire and North Northumberland Coast SAC (Buchan Offshore Wind, 2025).
- 6.4.23 The Ossian OWF RIAA stated that no noise impact contours overlapped with the Berwickshire and North Northumberland Coast SAC. Therefore, the assessment concluded that Subsea Noise generated during piling is unlikely to result in a barrier effect or significant behavioural responses that could affect the distribution or population of grey seal within the Berwickshire and North Northumberland Coast SAC (Ossian OWFL, 2024b).

- 6.4.24 There is no information available for use at the time of writing relating to the Tier 3 projects identified (Paragraph 6.4.9).
- 6.4.25 The CEA assessment for the Proposed Development concluded that there was no long term population effect from the cumulative piling scenario using population modelling (Volume 3, Technical Appendix 10.3: Marine Mammal iPCoD Modelling Report (TWP-BOW-RPS-OFE-RPT-00079) of the Offshore EIA Report). It is worth highlighting that the CEA did not focus only on the projects identified for the in-combination assessment but considered a wider number of projects on the east coast of Scotland as relevant for the CEA.
- 6.4.26 Overall, the levels of behavioural response to impact piling of grey seals associated with the Berwickshire and North Northumberland Coast SAC (within East Scotland SMU predominantly) is not anticipated to be significant. Whilst there may be minor effects at the individual level, these are not predicted to be at a scale that would lead to any adverse effects for the grey seal feature of the Berwickshire and North Northumberland Coast SAC.

Moray Firth SAC

- 6.4.27 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.41.

Bottlenose Dolphin

- 6.4.28 As shown in Table 6.40, the Proposed Development has the potential to disturb bottlenose dolphins associated with the Moray Firth SAC in-combination with all listed Tier 2 and 3 projects.
- 6.4.29 The potential for In-Combination Effects for the Moray Firth SAC includes any potential connectivity to the Coastal East Scotland MU as this management unit is considered to be functionally linked to the SAC (Paragraph 6.2.37). There are established photo ID data that shows bottlenose dolphin individuals observed within the SAC, which are also observed using areas outside the SAC (Cheney *et al.*, 2024). Although, the current industry standard good practice is to consider connectivity for bottlenose dolphin within the Coastal East Scotland MU, it should be recognised that most use outside the SAC is seen along the coast to the south of the SAC; therefore, usage to the north appears to be of lower importance to Moray Firth SAC bottlenose dolphins.
- 6.4.30 The Ossian OWF assessment and Berwick Bank OWF assessment both included the Moray Firth SAC in their RIAAs (Berwick Bank Wind Farm Ltd., 2022; Ossian OWFL, 2024b). The RIAAs stated that the impact noise contours have the potential to overlap with the Coastal East Scotland MU, but not the SAC itself. The RIAAs found that the received levels of noise within the Coastal East Scotland MU to be approximately equivalent to the NMFS mild disturbance threshold (140 dB rms). Both assessments concluded that this mild disturbance is unlikely to result in a barrier effect or significant behavioural responses that could affect the distribution or population of bottlenose dolphin within the SAC (Berwick Bank Wind Farm Ltd., 2022; Ossian OWFL, 2024b).

- 6.4.31 The Muir Mhòr OWF assessment included the Moray Firth SAC in their RIAA (Muir Mhòr Offshore Wind Farm, 2024a). The RIAA stated that the worst-case scenario for piling could disturb a maximum of eight dolphins, equating to 3.23% of from the Coastal East Scotland MU. The iPCoD modelling illustrated no significant change to the Coastal East Scotland MU population's trajectory. Therefore, the assessment concluded that disturbance from Subsea Noise generated during piling is unlikely to result in any long term decline in population use of the site or any change in distribution of bottlenose dolphin within the SAC (Muir Mhòr Offshore Wind Farm, 2024a).
- 6.4.32 The Salamander OWF assessment included the Moray Firth SAC in their RIAA (Salamander OWF, 2024b). Their RIAA considered population modelling and predicted no long term population-level impacts for the Coastal East Scotland MU, with the population expected to continue increasing over time. Therefore, the assessment concluded that there was no potential for an adverse effect on integrity to the conservation objectives of the Moray Firth SAC alone and therefore, subject to natural change, the bottlenose dolphin feature of the Moray Firth SAC will be maintained in the long term with respect to population and distribution (Salamander OWF, 2024b).
- 6.4.33 The Aspen OWF assessment included the Moray Firth SAC in their RIAA (Cerulean Winds Aspen Project Limited, 2025b). The RIAAs showed that the impact noise contours have the potential to overlap with the Coastal East Scotland MU, but not the SAC itself, with the worst-case scenario for piling potentially disturbing a maximum of five dolphins, equating to 2.03% of from the Moray Firth SAC population (i.e. the Coastal East Scotland MU). The iPCoD modelling illustrated predicated the Coastal East Scotland MU population would continue on an increasing trajectory. Therefore, the assessment concluded that disturbance from Subsea Noise generated during piling is unlikely to result in any significant negative effects on individuals or the population of bottlenose dolphins within the SAC (Cerulean Winds Aspen Project Limited, 2025b).
- 6.4.34 Both Caledonia OWF assessments (North and South) included the Moray Firth SAC in their RIAAs (Caledonia OWF Limited, 2024a, b). The RIAAs stated that the auditory injury noise contours have no predicted overlap with the SAC itself but had the potential to overlap with the Coastal East Scotland MU. The RIAA found that, given the distance from the project and the known distribution of the Coastal East Scotland MU, the potential likelihood of individuals being exposed to disturbance is low. The assessment concluded that there would be no adverse effect on the bottlenose dolphin feature of the SAC (Caledonia OWF Limited, 2024a, b).
- 6.4.35 The Buchan OWF assessment included the Moray Firth SAC in their RIAA. The RIAA stated that the 123 dB-130 dB contours overlapped with a small portion of the SAC. However, the received noise levels are such that 89% to 97% of individuals potentially present are unlikely to respond (using the Graham *et al.* (2017) dose-response relationship). Therefore, the assessment concluded that Subsea Noise generated during piling is unlikely to result in significant

behavioural responses that could affect the distribution or population of bottlenose dolphins within the SAC (Buchan Offshore Wind, 2025).

- 6.4.36 The MarramWind OWF assessment included the Moray Firth SAC in their RIAA (MarramWind Limited, 2025). Their RIAA concluded there was negligible risk of auditory injury from piling. Using a dose-response approach, the RIAA predicted a maximum of 26.55% of the Coastal East Scotland MU would be disturbed. However, given the distance of the Coastal East Scotland MU and the SAC from the MarramWind OWF, any disturbance was considered negligible. Therefore, the assessment concluded that there would be no adverse effect on the integrity of the site in relation to auditory injury or behavioural disturbance from piling during construction, and that, subject to natural change, the population of bottlenose dolphins would be maintained in the long-term (MarramWind Limited, 2025).
- 6.4.37 The Ayre OWF assessment included the Moray Firth SAC in their RIAA (Ayre OWF Limited, 2025). The RIAA concluded no realistic pathway for auditory injury due to piling for bottlenose dolphin connected to Moray Firth SAC. The 130 dB-135 dB contours overlapped with a small portion of the SAC, with up to ten dolphins predicted to experience ‘mild disturbance’. The assessment concluded that this mild disturbance is unlikely to result in an adverse effect on the integrity of the Moray Firth SAC (Ayre OWF Limited, 2025).
- 6.4.38 The CEA assessment for the Proposed Development concluded that there was no long term population effect from the cumulative piling scenario using population modelling (Volume 3, Technical Appendix 10.3: Marine Mammal iPCoD Modelling Report (TWP-BOW-RPS-OFE-RPT-00079) of the Offshore EIA Report). It is worth highlighting that the CEA did not focus only on the projects identified for the in-combination assessment but considered a wider number of projects on the east coast of Scotland as relevant for the CEA.
- 6.4.39 Fernandez-Betelu *et al.* (2021) used a ten year data set on the occurrence of coastal bottlenose dolphins to investigate the far field effects of impulsive noise from offshore activities in the Moray Firth. Activities included in the assessment were 2D seismic survey, and impact piling for the construction of two OWFs. The study looked at the differences in acoustic detection between a reference (un-impacted) area and an impacted area. The passive acoustic equipment was located at distances of 18 km to 52 km from the seismic and piling activities. The results showed that dolphins used the inshore areas of the Moray Firth regularly, that there was inter-annual variability in the detections, but that the variability did not have a consistent relationship with the impulsive noise generated by offshore activities. The authors concluded that the offshore activities did not cause any displacement for the area.
- 6.4.40 There is no information available for use at the time of writing relating to the Tier 3 projects identified (Paragraph 6.4.9).

- 6.4.41 Overall, the levels of behavioural response to impact piling within the Coastal East Scotland MU is not anticipated to be significant. Whilst there may be minor effects at the individual level, these are not predicted to be at a scale that would lead to adverse effects for the bottlenose dolphin feature of the Moray Firth SAC.

Conclusion

- 6.4.42 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of in-combination behavioural disturbance from Subsea Noise generated during piling in the construction phase.

Table 6.41: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of In-Combination Disturbance from Subsea Noise Generated during Piling during the Construction Phase

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	There is no realistic impact pathway for injury to harbour seals from Subsea Noise generated during piling at the Proposed Development in-combination with the piling of other projects within the SAC. Therefore, harbour seal within the SAC will not be at significant risk of injury or mortality and this in-combination impact will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	As described in Paragraph 6.4.15, significant disturbance of harbour seals throughout the SAC from Subsea Noise generated during piling at the Proposed Development in-combination with the piling of other projects will be avoided. There is no significant disturbance from project alone piling from any project; only the mild disturbance contour from Berwick Bank OWF overlapped with the SAC, and no population effect was demonstrated from the population modelling. This ensures harbour seals will continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of harbour seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no impact pathway between Subsea Noise generated during piling at the Proposed Development in-combination the piling of other projects and the supporting habitats and processes within the SAC relevant to harbour seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this in-combination impact will not prevent the supporting habitats and processes within the SAC from being maintained.
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no impact pathway between Subsea Noise generated during piling at the Proposed Development in-combination with the piling of other projects and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal (i.e. no overlap with the area of significant disturbance with the SAC including haul-out sites). Only the mild disturbance contours overlapped the SAC from Proposed Development and Berwick Bank OWF. However, the area
		The structure and function of the habitats of the	

SAC	Feature	Target/Conservation Objectives	Conclusion
		qualifying species are maintained.	ensonified by in-combination piling would not impede connectivity between the SAC and the wider environment as grey seal are able to forage widely and disturbance during piling would only occur as short term reversible events after which animals would return to baseline levels. Therefore, this in-combination impact will not prevent the extent and distribution of qualifying natural habitats and habitats of the qualifying features, the structure and function of the habitats of the qualifying species and the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely from being maintained (Natural England, 2023),.
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	
		The populations of each of the qualifying species are maintained	There is no realistic impact pathway for injury to grey seals from Subsea Noise generated during piling at the Proposed Development in-combination with the piling of other projects within the SAC. As described in Paragraph 6.4.21 to 6.4.26, Subsea Noise generated during piling at the Proposed Development in-combination with the piling of other projects is unlikely to lead to significant disturbance of grey seals. There is no significant disturbance from project alone piling from any project; only the mild disturbance contours overlapped the SAC from Proposed Development and Berwick Bank OWF; and no population effect was demonstrated from the population modelling. Therefore, with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023) and this in-combination impact would not prevent the population and distribution of grey seal within the SAC from being maintained.
		The distribution of qualifying species within the site are maintained.	
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	There is no realistic impact pathway for injury to bottlenose dolphin from Subsea Noise generated during piling at the Proposed Development in-combination with the piling of other projects within the SAC. As such, there is no risk of injury or mortality to bottlenose dolphin from Subsea Noise from piling during the construction phase. Therefore, this in-combination impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.
		2b. ensure the distribution of bottlenose dolphin throughout the site is	As described in Paragraphs 6.4.29 to 6.4.41, Subsea Noise generated during piling at the Proposed Development in-combination with the piling of other projects is unlikely to lead to injury or strong behavioural

SAC	Feature	Target/Conservation Objectives	Conclusion
		maintained by avoiding significant disturbance.	disturbance of bottlenose dolphin. There is no significant disturbance from project alone piling from any project as none of the relevant disturbance contours extended to the SAC and no population effect was demonstrated from the population modelling. Bottlenose dolphins will continue to use and have access to all areas of the SAC (NatureScot, 2025e) and therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of bottlenose dolphin throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	There is no impact pathway between Subsea Noise generated during piling at the Proposed Development in-combination with the piling of other projects and the habitats and processes that support bottlenose dolphin within the SAC and the availability of food. With respect to the availability of prey, long term effects were not predicted (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report and the assessment of 'Effects on Marine Mammals due to Altered Prey Availability' in this section), therefore prey species populations are expected to be maintained in the long term. Therefore, this in-combination impact will not prevent the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources from being maintained.

Injury and Disturbance from Subsea Noise Generated During UXO Clearance

- 6.4.43 The LSE assessment during the HRA screening process identified that LSE could not be ruled out for potential injury and disturbance from Subsea Noise generated during UXO clearance in the construction phase of the Proposed Development in-combination with other projects for all four of the SACs screened in for Annex II marine mammals (see Table 3.1).
- 6.4.44 The MDS considered for the in-combination assessment is shown in Table 6.42. The Embedded Mitigation measures are presented in Table 6.9 for the assessment of the Proposed Development alone. For the purposes of the MDS for the in-combination assessment, projects have been screened in and out as per the connectivity criteria identified in Table 6.38 and on the following basis for injury and disturbance from Subsea Noise generated during UXO clearance:
- Construction phase – the ZoI for UXO clearance can extend beyond the boundaries of other proposed OWFs. Therefore, adopting a precautionary approach, the assessment has screened in projects within 100 km of the Array Area and/or the Export Cable Corridor (which is greater than the largest disturbance range of ~34 km for the Proposed Development alone, and acknowledges that disturbance ranges from other projects may be substantial) whose construction phases (which would include pre-construction UXO clearance) overlap with the construction phase for the Proposed Development (2031 to 2036, with UXO clearance anticipated in 2031).
- 6.4.45 Projects which will already be operational by the construction phase of the Proposed Development (2031 to 2036) have also been excluded as have projects where UXO clearance is not expected to be required.

Table 6.42: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Injury and Disturbance from Subsea Noise Generated during UXO Clearance in the Construction Phase of the Proposed Development In-Combination with Other Projects

Proposed Development Phase	Tier	MDS
Construction	1	No projects identified.
	2	The MDS is as detailed for the Proposed Development alone in Table 6.14 in-combination with the following projects: Offshore Wind Projects and Associated Cables • Ossian OWF (construction phase); • Berwick Bank OWF (construction phase); • Muir Mhòr OWF (construction phase); • Salamander OWF (construction phase); • Caledonia OWF South (construction phase); • Caledonia OWF North (construction phase); • Cenos OWF (construction phase); and • Ayre OWF (construction phase).
	3	The MDS is as detailed for the Proposed Development alone in Table 6.14 in-combination with the following projects: Offshore Wind Projects and Associated Cables • Morven North OWF (construction phase); • Morven South OWF (construction phase); • Stromar OWF (construction phase); • Dogger Bank D (construction phase); and • Arven OWF (construction phase). Offshore Export Cable Routes and Carbon Capture Storage • Morven Hawthorn Pit Grid Connection Project (construction phase); and • Ossian Transmission Infrastructure (construction phase).
	4	• No projects identified.

In-Combination Assessment

- 6.4.46 Potential impacts of Subsea Noise resulting from UXO clearance on marine mammals could include mortality, physical injury or auditory injury depending on the individuals' proximity to the detonation. The duration of impact (elevated noise) for each UXO detonation is very short (seconds) therefore behavioural effects are considered to be negligible in this context. Whilst the clearance of UXO has historically been undertaken using high order detonation, in line with line with the UK Government (2025) joint interim position statement and guidance (DEFRA, 2025), the Proposed Development commits to the use of low order clearance techniques as the default. It is assumed that all other projects will follow the recommended position.
- 6.4.47 As well as low order clearance techniques, a requirement under European Protected Species legislation, is that suitable mitigation measures must be put in place to reduce the risk of auditory injury to negligible across all projects considered for the in-combination assessment. As such, the risk of auditory injury is considered highly unlikely and therefore the potential for In-Combination Effects as a result of injury from UXO clearance is not considered further. Therefore, the in-combination assessment provided here focuses on behavioural disturbance only.
- 6.4.48 Table 6.43 lists which of the publicly available RIAAs (for Tier 2 projects in Table 6.42) and HRA Screening documents (for Tier 3 projects in) also screened the four SACs considered for Proposed Development alone impacts (Section 6.3) for further assessment.
- 6.4.49 For Tier 3 projects (Table 6.42) detailed Subsea Noise modelling results could not be used to inform the in-combination assessment of disturbance from Subsea Noise during UXO clearance. However, within the HRA screening documents available for Tier 3, disturbance from Subsea Noise from UXO clearance was screened in for further assessment for each project (Table 6.43).
- 6.4.50 Refined construction dates for the Tier 3 projects are currently unknown, however the preliminary construction periods presented in Table 6.37 suggest that there may be some overlap with the Proposed Development and Tier 2 projects.

Table 6.43: SACs Designated for Annex II Marine Mammals Included in the Proposed Development also Included in Other Projects for the Assessment of In-Combination Effects due to Disturbance from Subsea Noise Generated During UXO clearance

Project	Reference	Firth of Tay and Eden Estuary SAC	Isle of May	Berwickshire and North Northumberland Coast SAC	Moray Firth SAC
Tier 2					
Ossian OWF	Ossian OWFL (2024b)			X	X
Berwick Bank OWF	Berwick Bank Wind Farm Ltd. (2022)	X		X	X

Project	Reference	Firth of Tay and Eden Estuary SAC	Isle of May	Berwickshire and North Northumberland Coast SAC	Moray Firth SAC
Muir Mhòr OWF	Muir Mhòr Offshore Wind Farm (2024a)				X
Salamander OWF	Salamander OWF (2024b)				X
Caledonia OWF South	Caledonia OWF Limited (2024a)				X
Caledonia OWF North	Caledonia OWF Limited (2024b)				X
Cenos OWF	Cenos Offshore Windfarm Limited (2024)				X
Tier 3					
Morven OWF	MvOWL (2023b)	X	X	X	X
CampionWind OWF	CampionWind (2025)				X
Stromar OWF	Stromar Offshore Wind Farm (2024a)				X
Ayre OWF	Ayre OWF Limited (2024)				X
Dogger Bank D	Dogger Bank D Offshore Wind Farm (2025)			X	X
Arven OWF	Arven OWF (2024)				X

Construction Phase

- 6.4.51 Potential effects from this activity on the relevant conservation objectives of the four SACs screened in for Annex II marine mammals are presented in Table 6.45. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 6.45.

- 6.4.52 TTS has been applied as a proxy for strong disturbance, noting that TTS onset could potentially result in a temporary reduction in hearing. Whilst some behaviours (e.g. feeding, communication, socialisation) could be inhibited in the short term these are reversible and therefore not considered likely to lead to any long term effects on the individual. As the duration of effect for each UXO detonation is very small (seconds), therefore, the potential for realistic temporal overlap in UXO detonations is considered to be negligible in this context.

Firth of Tay and Eden Estuary SAC

- 6.4.53 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary SAC conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.45.

Harbour Seal

- 6.4.54 As shown in Table 6.43, the Proposed Development only has the potential to disturb harbour seals associated with the Firth of Tay and Eden Estuary SAC in-combination with one Tier 2 project (Berwick Bank OWF) and two Tier 3 projects (Morven North OWF and Morven South OWF) due to UXO clearance.
- 6.4.55 The Proposed Development predicted a maximum disturbance range for harbour seal of 8.8 km for the high order clearance (720 kg) based on the TTS impact threshold as the proxy for disturbance (Table 6.20). The predicted range for the low order scenario is significantly reduced at 535 m (0.5 kg clearing shot; Table 6.20).
- 6.4.56 In the Berwick Bank OWF RIAA, the disturbance range for harbour seals from a high order clearance charge of 300 kg was 6.4 km, while the low order scenario (0.5 kg clearing shot) was reduced to a range of 455 m (Berwick Bank Wind Farm Ltd., 2022). UXO clearance disturbed less than one harbour seal, and therefore the viability or distribution of the SAC population would not be impacted or altered.
- 6.4.57 There is no information available for use at the time of writing relating to the Tier 3 projects identified (Paragraph 6.4.49). However, it is expected that the risk of injury and disturbance will be reduced by standard industry measures (including visual and acoustic monitoring) at the Tier 3 projects. Therefore, the in-combination risk is expected to be minimised as a result.
- 6.4.58 Overall, the behavioural disturbance ranges associated with UXO clearance at the Proposed Development are likely to be similar to those associated with the Tier 2 and Tier 3 projects. Therefore, due to these limited ranges together with the duration of impact (seconds) and reversibility of disturbance (animals return after clearance activities have ceased), it is not likely that the harbour seal feature of the Firth of Tay and Eden Estuary SAC could experience an in-combination effect.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.4.59 Potential effects from the Proposed Development on the Isle of May SAC or Berwickshire and North Northumberland Coast SAC conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.45.

Grey Seal

- 6.4.60 As shown in Table 6.43, the Proposed Development only has the potential to disturb grey seals associated with the Isle of May SAC in-combination with two Tier 3 projects (Morven North OWF and Morven South OWF) due to UXO clearance. The Proposed Development also has the potential to disturb grey seals associated with the Berwickshire and North Northumberland Coast SAC in-combination with two Tier 2 project (Ossian OWF and Berwick Bank OWF) and three Tier 3 projects (Morven North OWF, Morven South OWF and Dogger Bank D) due to UXO clearance.
- 6.4.61 The Proposed Development predicted a maximum disturbance range for grey seal of 8.8 km for the high order clearance (720 kg) based on the TTS impact threshold as the proxy for disturbance (Table 6.20). The predicted range for the low order scenario is significantly reduced at 535 m (0.5 kg clearing shot; Table 6.20).
- 6.4.62 In the Berwick Bank OWF RIAA, the disturbance range for grey seals from a high order clearance charge of 300 kg was 6.4 km, while the low order scenario (0.5 kg clearing shot) was reduced to a range of 455 m (Berwick Bank Wind Farm Ltd., 2022). UXO clearance disturbed up to 156 grey seals due to high order clearance, and up to one grey seal due to low order clearance. The high order clearance equated to 15.6% of the Berwickshire and North Northumberland Coast SAC population potentially being disturbed, while the low order clearance disturbed less than 0.1% of the SAC population. Therefore, UXO clearance was unlikely to influence the population trajectory of grey seal within Berwickshire and North Northumberland Coast SAC long term.
- 6.4.63 In the Ossian OWF RIAA, the disturbance range for grey seals from a high order clearance charge of 698 kg NEQ was 6.1 km (SEL_{cum}), while the low order scenario (0.5 kg clearing shot) was reduced to a range of 477 m (peak SPL) (Ossian OWFL, 2024b). UXO clearance disturbed up to 22 grey seals due to high order clearance, and less than one grey seal due to low order clearance. The high order clearance equated to 0.06% of the combined East Scotland and Northeast England SMUs population (as proxy for the Berwickshire and North Northumberland Coast SAC) potentially being disturbed. Therefore, UXO clearance was unlikely to influence the population trajectory of grey seal within the Berwickshire and North Northumberland Coast SAC long term.
- 6.4.64 There is no information available for use at the time of writing relating to the Tier 3 projects identified (Paragraph 6.4.49). However, it is expected that the risk of injury and disturbance will be reduced by standard industry measures (including visual and acoustic monitoring) at the Tier 3 projects. Therefore, the in-combination risk is expected to be minimised as a result.

6.4.65 Overall, the behavioural disturbance ranges associated with UXO clearance at the Proposed Development are likely to be similar to those associated with the Tier 2 and Tier 3 projects. Therefore, due to these limited ranges together with the duration of impact (seconds) and reversibility of disturbance (animals return after clearance activities have ceased), it is not likely that the grey seal feature of the Isle of May SAC or Berwickshire and North Northumberland Coast SAC could experience an in-combination effect.

Moray Firth SAC

6.4.66 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.45.

Bottlenose Dolphin

6.4.67 As shown in Table 6.40, the Proposed Development has the potential to disturb bottlenose dolphins associated with the Moray Firth SAC in-combination with all listed Tier 2 and 3 projects.

6.4.68 The Proposed Development predicted a maximum disturbance range for bottlenose dolphin of 1.6 km for the high order clearance (720 kg) based on the SEL_{cum} TTS impact threshold as the proxy for disturbance (Table 6.20). The predicted range for the low order scenario is significantly reduced at 134 m (peak SPL, 0.5 kg clearing shot; Table 6.20).

6.4.69 Table 6.44 presents the disturbance range for bottlenose dolphin from a high order clearance charge for the Tier 2 projects and the number of animals disturbed. For most projects less than 0.5% of the Moray Firth SAC population (synonymous to the Coastal East Scotland MU; Paragraph 6.2.37), although the Cenos OWF RIAA stated up to 0.9% of the Coastal East Scotland MU population could be affected (Cenos Offshore Windfarm Limited, 2024). The Caledonia OWF RIAAs (North and South) only assessed the low order scenario, which gave a maximum disturbance range of 100 m, and similar to other projects, less than one bottlenose dolphin disturbed (Caledonia OWF Limited, 2024a, b).

Table 6.44: Disturbance Ranges and Number of Bottlenose Dolphins from the Moray Firth SAC Population for High Order UXO Clearance from Other Tier 2 Projects Using TTS Onset as a Proxy for Disturbance

Project	Reference	High order charge (kg)	Disturbance range (km)	Number of animals
Ossian OWF	Ossian OWFL (2024b)	698	1.6	<1
Berwick Bank OWF	Berwick Bank Wind Farm Ltd. (2022)	300	1.1	<1
Muir Mhòr OWF	Muir Mhòr Offshore Wind Farm (2024a)	750	1.5	<1
Salamander OWF	Salamander OWF (2024b)	698	1.4	<1

Project	Reference	High order charge (kg)	Disturbance range (km)	Number of animals
Cenos OWF	Cenos Offshore Windfarm Limited (2024)	227	1.0	2.1

6.4.70 There is no information available for use at the time of writing relating to the Tier 3 projects identified (Paragraph 6.4.49). However, it is expected that the risk of injury and disturbance will be reduced by standard industry measures (including visual and acoustic monitoring) at the Tier 3 projects. Therefore, the in-combination risk is expected to be minimised as a result.

6.4.71 Overall, the behavioural disturbance ranges associated with UXO clearance at the Proposed Development are likely to be similar to those associated with the Tier 2 and Tier 3 projects. Therefore, due to these limited ranges together with the duration of impact (seconds) and reversibility of disturbance (animals return after clearance activities have ceased), it is not likely that the bottlenose dolphin feature of the Moray Firth SAC could experience an in-combination effect.

Conclusion

6.4.72 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of in-combination behavioural disturbance from Subsea Noise generated during UXO clearance in the construction phase.

Table 6.45: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of In-Combination Disturbance from Subsea Noise Generated UXO Clearance during the Construction Phase

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	There is no realistic impact pathway for injury to harbour seals from Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects within the SAC. Therefore, harbour seal will not be at significant risk of injury or mortality and this in-combination impact will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.4.54 to 6.4.58 there is no significant disturbance from project alone UXO clearance from any project and no population effect was demonstrated. This ensures harbour seals will continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of harbour seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no impact pathway between Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects and the supporting habitats and processes relevant to harbour seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this in-combination impact will not prevent the supporting habitats and processes within the SAC from being maintained.
Isle of May SAC	Grey seal	2a. ensure grey seals are a viable component of the Isle of May SAC.	There is no impact pathway between Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects within the SAC. As described in Paragraph 6.4.60 to 6.4.65, there is no significant disturbance from project alone UXO clearance from any project and no population effect was demonstrated. This ensures grey seals can move safely between the SAC and important areas of functionally linked sea outwith the SAC and that there is no effect on reproductive capability of grey seal during the breeding season and pup production would not be

SAC	Feature	Target/Conservation Objectives	Conclusion
			expected to decline as a result of this impact, ensuring stable or increasing grey seal numbers are maintained (NatureScot, 2025d). Therefore, this in-combination impact will not prevent the population of grey seals from being maintained as a viable component of the SAC.
		2b. ensure the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals.	As described in the row above, there is no significant disturbance from project alone UXO clearance from any project and so significant in-combination disturbance will be avoided, maintaining their ability to use and access all areas within the SAC used for pupping and nursing. Therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of grey seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats relevant to grey seal are maintained.	There is no impact pathway between Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects and the supporting habitats and processes within the SAC relevant to grey seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats relevant within the SAC relevant to grey seal from being maintained.
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no impact pathway between Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal (i.e. no overlap with the area of significant disturbance with the SAC including haul-out sites). The low order clearance range did not overlap the SAC from Proposed Development or Berwick Bank OWF. Therefore, the area ensonified by in-combination UXO clearance would not impede connectivity between the SAC and the wider environment as grey seal are able to forage widely and disturbance during piling would only occur as short term reversible events after which animals would return to baseline levels. Therefore, this in-combination impact will not prevent the extent and distribution of habitats of the qualifying features, the structure and function of the habitats of the
		The structure and function of the habitats of the qualifying species are maintained.	
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	

SAC	Feature	Target/Conservation Objectives	Conclusion
			qualifying species and the supporting processes on which the habitats of qualifying species rely (Natural England, 2023), from being maintained.
		The populations of each of the qualifying species are maintained	There is no realistic impact pathway for injury to grey seals from Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects within the SAC. As described in Paragraph 6.4.60 to 6.4.65, Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects is unlikely to lead to significant disturbance of grey seals. There is no significant disturbance from project alone UXO clearance from any project and therefore, with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023). Therefore, this in-combination impact will not prevent the population and distribution of grey seal within the SAC from being maintained.
		The distribution of qualifying species within the site are maintained.	
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	There is no realistic impact pathway for injury to bottlenose dolphin from Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects within the SAC. As such, there is no risk of injury or mortality to bottlenose dolphin from Subsea Noise from UXO clearance during the construction phase. Therefore, this in-combination impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.
		2b. ensure the distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.4.67 to 6.4.71, Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects is unlikely to lead to injury or strong behavioural disturbance of bottlenose dolphin. There is no significant disturbance from project alone UXO clearance from any project as none of the relevant disturbance ranges extended to the SAC. Therefore, bottlenose dolphins will continue to use and have access to all areas of the SAC (NatureScot, 2025e) and significant disturbance will be avoided, and this in-combination impact

SAC	Feature	Target/Conservation Objectives	Conclusion
			will not prevent the distribution of bottlenose dolphin throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	There is no impact pathway between Subsea Noise generated during UXO clearance at the Proposed Development in-combination with UXO clearance from other projects and the habitats and processes that support bottlenose dolphin within the SAC and the availability of food. With respect to the availability of prey, long term effects were not predicted (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report and the assessment of 'Effects on Marine Mammals due to Altered Prey Availability' in this section), therefore prey species populations are expected to be maintained in the long term. Therefore, this in-combination impact will not prevent the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources from being maintained.

Injury and Disturbance from Subsea Noise Generated During Site Investigation Surveys

- 6.4.73 The LSE assessment during the HRA screening process identified that LSE could not be ruled out for potential injury and disturbance from Subsea Noise generated during site investigation surveys in the construction and O&M phases of the Proposed Development in-combination with other projects for all four of the SACs screened in for Annex II marine mammals (see Table 3.1).
- 6.4.74 The MDS considered for the in-combination assessment is shown in Table 6.46. The Embedded Mitigation measures are presented in Table 6.24 for the assessment of the Proposed Development alone. For the purposes of the MDS for the in-combination assessment, projects have been screened in and out as per the connectivity criteria identified in Table 6.38 and on the following basis for injury and disturbance from Subsea Noise generated during site investigation surveys:
- Construction and O&M phases – it is anticipated that the magnitude of the impacts will be of a similar scale to that described for the Proposed Development (i.e. tens to low hundreds of metres for auditory injury up to a maximum of 9.15 km for behavioural disturbance), with the potential to experience disturbance by marine mammal receptors expected to be localised to within the boundaries of the respective projects. Therefore, the CEA has focused only on those projects within the close vicinity (up to 50 km buffer) of the Array Area and/or Export Cable Corridor, and whose construction phase temporally overlaps with that of the Proposed Development (2031 to 2036, with site investigation surveys expected in 2031).
- 6.4.75 Projects where site investigation surveys have already been completed and no further surveys are proposed were excluded, as were projects that will be operational by the construction phase of the Proposed Development (2031 to 2036) and/or have not assessed site investigation surveys during their O&M phase have also been excluded.

Table 6.46: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Injury and Disturbance from Subsea Noise Generated during Site Investigation Surveys in the Construction and O&M Phases of the Proposed Development In-Combination with Other Projects

Proposed Development Phase	Tier	MDS
Construction and O&M	1	No projects identified.
	2	The MDS is as detailed for the Proposed Development alone in Table 6.23 in-combination with the following projects: Offshore Wind Projects and Associated Cables • Ossian OWF (construction and O&M phases); and • Berwick Bank OWF (construction and O&M phases).
	3	The MDS is as detailed for the Proposed Development alone in Table 6.23 in-combination with the following projects: Offshore Wind Projects and Associated Cables • Morven North OWF (construction and O&M phases); and • Morven South OWF (construction and O&M phases). Offshore Export Cable Routes and Carbon Capture Storage • Morven Hawthorn Pit Grid Connection Project (construction and O&M phases). Pipelines within 100 km of the Proposed Development • CNSE Project (O&M phases only).
	4	• No projects identified.

In-Combination Assessment

- 6.4.76 The risk of AUD INJ due to Subsea Noise from site investigation surveys is expected to be localised to within the boundaries of the respective projects. The noise modelling assessment for the Proposed Development alone demonstrated that the maximum auditory injury impact range was 86 m for geophysical surveys (for SBP for the HF and PCW hearing groups) with thresholds not exceeded for any hearing group due to geotechnical surveys. These highly localised potential injury ranges resulted in very low numbers of animals potentially impacted (see Section 6.3). Furthermore, any risk of injury will be mitigated via the outline MMMP (Volume 4, Appendix 27: Outline Marine Mammal Mitigation Protocol (TWP-BOW-RPS-ENV-RPT-00025) of the Offshore EIA Report) and therefore the potential for in-combination injury is unlikely and not considered further in this in-combination assessment. The in-combination assessment provided here focuses on behavioural disturbance only.
- 6.4.77 Geophysical survey activities during the construction and O&M phases vary across the projects. The RIAAs for both Ossian OWF and Berwick Bank OWF considered site investigation surveys in the construction and O&M (Berwick Bank Wind Farm Ltd., 2022; Ossian OWFL, 2024b). Berwick Bank OWF will undertake a broad range of geophysical surveys, including MBES, SSS, SBES, SBP, UHRS and magnetometers, alongside geotechnical investigations such as boreholes, Cone Penetration Tests (CPTs), and vibrocores (Berwick Bank Wind Farm Ltd., 2022). Ossian OWF will undertake similar geophysical surveys with the exception of an SBES survey, and similar geotechnical surveys with the addition of box and piston cores (Ossian OWFL, 2024b).
- 6.4.78 Noise modelling was undertaken for both Ossian OWF and Berwick Bank OWF for behavioural disturbance due to site investigation surveys and are presented alongside the Proposed Development disturbance ranges in Table 6.47.

Table 6.47: Disturbance Ranges for Annex II Marine Mammals During the Geotechnical Site Investigation Surveys for the Project Development and Tier 2 Projects (N/A denotes Not Applicable)

Project	Disturbance Range (m)							
	MBES	SSS	SBES	SBP	UHRS	Borehole	CPT	Vibro coring
Proposed Development	490	530	N/A	1,275	552	294	N/A	9,154
Ossian OWF	375	320	N/A	1,340	565	27	1,330	9,101
Berwick Bank OWF	865	675	735	2,045	585	20	1,500	7,459

- 6.4.79 Both the Ossian OWF and Berwick Bank OWF RIAAs concluded that the majority of acoustic energy will be directed at the seabed rather than being emitted horizontally, which reduces the impacts of noise emissions on nearby marine mammals (Berwick Bank Wind Farm Ltd., 2022; Ossian OWFL, 2024b).

- 6.4.80 For the Proposed Development and the Tier 2 projects, site investigation surveys are anticipated to be short term in nature (weeks to a few months) for their construction phases and occur intermittently over their O&M phases.
- 6.4.81 As for Tier 3 projects, only a HRA Screening Report is available in the public domain for the Morven North OWF and Morven South OWF (MvOWL, 2023b). Geophysical surveys were not screened into the O&M phase, and therefore the Tier 3 assessment focuses on the construction phase only. There is currently no HRA screening document for Morven Hawthorn Pit Grid Connection Project or the CNSE Project, although geophysical surveys were proposed to be scoped into the assessment in the construction phase of the EIA Scoping Report (Stromar Offshore Wind Farm, 2024b). Lower potential disturbance ranges were modelled for the Proposed Development for geophysical surveys compared to geotechnical surveys (Section 6.3), which further reduces the potential for In-Combination Effects.
- 6.4.82 As for the Tier 3 assessment, site investigation surveys are anticipated to be short term in nature (weeks to a few months) for the construction phase of the Morven North OWF, Morven South OWF, Morven Hawthorn Pit Grid Connection Project and CNSE Project.

Construction and Operation and Maintenance Phase

- 6.4.83 Potential effects from this activity on the relevant conservation objectives of the four SACs screened in for Annex II marine mammals are presented in Table 6.48. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately. The sections below provide evidence to support the justifications provided per conservation objective in Table 6.48.

Firth of Tay and Eden Estuary SAC

- 6.4.84 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary SAC conservation objectives (as presented in Paragraph 6.2.190) are presented in Table 6.48.

Harbour Seal

- 6.4.85 The Proposed Development only has the potential to disturb harbour seals associated with the Firth of Tay and Eden Estuary SAC in-combination with one Tier 2 project (Berwick Bank OWF⁵) and all Tier 3 projects (Morven North OWF, Morven South OWF and Morven Hawthorn Pit Grid Connection Project) due to site investigation surveys.
- 6.4.86 The impact ranges of site investigation surveys do not overlap with the Firth of Tay and Eden Estuary SAC for any of the in-combination projects. Behavioural disturbance from site investigation surveys should be considered in relation to the 50 km connectivity buffer to the SAC. As shown in Table 6.47, the behavioural disturbance ranges associated with site investigation surveys at the

⁵ The Ossian OWF RIAA did not assess any SACs for harbour seals (Ossian OWFL, 2024b).

Proposed Development are similar to Berwick Bank OWF (Berwick Bank Wind Farm Ltd., 2022) and expected to be similar for both Tier 3 projects.

- 6.4.87 Due to the staggered timescales of each project's site investigation surveys, and the limited range of effect it is highly unlikely that the harbour seal feature of the Firth of Tay and Eden Estuary SAC could experience an in-combination effect at these varied locations throughout the 50 km connectivity buffer.
- 6.4.88 In addition, the effect of behavioural disturbance is context-specific, although seals are expected to have some tolerance to behavioural disturbance from Subsea Noise (Farcas *et al.*, 2020). Whilst there may be minor effects at an individual level from in-combination disturbance, behavioural disturbance will not be significant nor at a scale that would lead to adverse effects for the harbour seal feature of the Firth of Tay and Eden Estuary SAC.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.4.89 Potential effects from the Proposed Development on the Isle of May SAC or Berwickshire and North Northumberland Coast SAC conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.48.

Grey Seal

- 6.4.90 The Proposed Development has the potential to disturb grey seals associated with the Isle of May SAC in-combination with all Tier 3 project (Morven North OWF, Morven South OWF and Morven Hawthorn Pit Grid Connection Project) due to site investigation surveys. The Proposed Development has the potential to disturb grey seals associated with the Berwickshire and North Northumberland Coast SAC in-combination with both Tier 2 projects (Ossian OWF and Berwick Bank OWF) and Tier 3 projects (Morven North OWF, Morven South OWF and Morven Hawthorn Pit Grid Connection Project) due to site investigation surveys.
- 6.4.91 The impact ranges of site investigation surveys do not overlap with either the Isle of May or the Berwickshire and North Northumberland Coast SAC for any of the in-combination projects. Behavioural disturbance from site investigation surveys should be considered in relation to East Scotland SMU. As shown in Table 6.47, the behavioural disturbance ranges associated with site investigation surveys at the Proposed Development are similar to both Tier 2 projects (Berwick Bank Wind Farm Ltd., 2022; Ossian OWFL, 2024b) and expected to be similar for both Tier 3 projects.
- 6.4.92 Due to the staggered timescales of each project's site investigation surveys, and the limited range of effect it is highly unlikely that the grey seal feature of either the Isle of May or the Berwickshire and North Northumberland Coast SAC could experience an in-combination effect at these varied locations throughout East Scotland SMU.

- 6.4.93 In addition, the effect of behavioural disturbance is context-specific, although seals are expected to have some tolerance to behavioural disturbance from Subsea Noise (Farcas *et al.*, 2020). Whilst there may be minor effects at an individual level from in-combination disturbance, behavioural disturbance will not be significant nor at a scale that would lead to adverse effects for the grey seal feature of either the Isle of May or the Berwickshire and North Northumberland Coast SAC.

Moray Firth SAC

- 6.4.94 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.48.

Bottlenose Dolphin

- 6.4.95 The Proposed Development has the potential to disturb bottlenose dolphin associated with the Moray Firth SAC in-combination with both Tier 2 projects (Ossian OWF and Berwick Bank OWF) and Tier 3 projects (Morven North OWF, Morven South OWF and Morven Hawthorn Pit Grid Connection Project) due to site investigation surveys.
- 6.4.96 The impact ranges of site investigation surveys for any of the in-combination projects do not overlap with the Moray Firth SAC. The impacts from site investigation surveys are therefore considered in relation to the Coastal East Scotland MU due to the functional connectivity to the Moray Firth SAC (Paragraph 6.2.37). As shown in Table 6.47, the behavioural disturbance ranges associated with site investigation surveys at the Proposed Development are similar to both Tier 2 projects (Berwick Bank Wind Farm Ltd., 2022; Ossian OWFL, 2024b) and expected to be similar for both Tier projects.
- 6.4.97 Due to the staggered timescales of each project's site surveys, and the limited range of effect it is highly unlikely that the bottlenose dolphin feature of the Moray Firth SAC could experience an in-combination effect at these varied locations throughout the Coastal East Scotland MU.
- 6.4.98 In addition, the effect of behavioural disturbance is context-specific, although dolphins are expected to have some tolerance to behavioural disturbance from Subsea Noise (Farcas *et al.*, 2020). Whilst there may be minor effects at an individual level from in-combination disturbance, behavioural disturbance will not be significant nor at a scale that would lead to adverse effects for the bottlenose dolphin feature of the Moray Firth SAC.

Conclusion

- 6.4.99 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of in-combination behavioural disturbance from Subsea Noise generated during site investigation surveys in the construction and O&M phases.

Table 6.48: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of Injury and Disturbance from Subsea Noise Generated during Site Investigation Surveys during the Construction and O&M Phases

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	There is no realistic impact pathway for injury to harbour seals from Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects within the SAC. Therefore, harbour seal within the SAC will not be at significant risk of injury or mortality and this in-combination impact will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.4.85 to 6.4.88, significant disturbance of harbour seals throughout the SAC from Subsea Noise generation from site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects will be avoided. There is no significant disturbance from project alone site investigation surveys from any project and no population effect was demonstrated. This ensures harbour seals will continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of harbour seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no impact pathway between Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects and the supporting habitats and processes within the SAC relevant to harbour seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this in-combination impact will not prevent the supporting habitats and processes within the SAC from being maintained.
Isle of May SAC	Grey seal	2a. ensure grey seals are a viable component of the Isle of May SAC.	There is no impact pathway between Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects within the SAC. As described in Paragraph 6.4.90 to 6.4.93, there is no significant disturbance from project alone

SAC	Feature	Target/Conservation Objectives	Conclusion
			site investigation surveys from any project and no population effect was demonstrated. This ensures grey seals can move safely between the SAC and important areas of functionally linked sea outwith the SAC and that there is no effect on reproductive capability of grey seal during the breeding season and pup production would not be expected to decline as a result of this impact, ensuring stable or increasing grey seal numbers are maintained (NatureScot, 2025d). Therefore, this in-combination impact will not prevent the population of grey seals from being maintained as a viable component of the SAC.
		2b. ensure the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals.	As described in the row above, there is no significant disturbance from project alone site investigation surveys from any project and so significant in-combination disturbance will be avoided, maintaining their ability to use and access all areas within the SAC used for pupping and nursing. Therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of grey seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats relevant to grey seal are maintained.	There is no impact pathway between Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects and the supporting habitats and processes within the SAC relevant to grey seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats relevant within the SAC relevant to grey seal from being maintained.
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no impact pathway between Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal (i.e. no overlap with the area of significant disturbance with the SAC including haul-out sites). Due to staggered timescales of site
		The structure and function of the habitats of the qualifying species are maintained.	

SAC	Feature	Target/Conservation Objectives	Conclusion
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	investigation surveys and the limited disturbance ranges, this impact would not impede connectivity between the SAC and the wider environment as grey seal are able to forage widely. Therefore, this in-combination impact will not prevent the extent and distribution of habitats of the qualifying features, the structure and function of the habitats of the qualifying species and the supporting processes on which the habitats of qualifying species rely, from being maintained (Natural England, 2023).
		The populations of each of the qualifying species are maintained.	There is no realistic impact pathway for injury to grey seals from Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects within the SAC. As described in Paragraph 6.4.90 to 6.4.93, Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects is unlikely to lead to significant disturbance of grey seals. There is no significant disturbance from project alone site investigation surveys from any project and, therefore, with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023). Therefore, this in-combination impact will not prevent the population and distribution of grey seal within the SAC from being maintained.
		The distribution of qualifying species within the site are maintained.	
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	There is no realistic impact pathway for injury to bottlenose dolphin from Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects within the SAC. As such, there is no risk of injury or mortality to bottlenose dolphin from Subsea Noise from site investigation surveys during the construction and O&M phases. Therefore, this in-combination impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.

SAC	Feature	Target/Conservation Objectives	Conclusion
		2b. ensure the distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.	As described in Paragraphs 6.4.95 to 6.4.98, Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects is unlikely to lead to injury or strong behavioural disturbance of bottlenose dolphin. There is no significant disturbance from project alone site investigation surveys from any project as none of the relevant disturbance ranges extended to the SAC. Therefore, bottlenose dolphins will continue to use and have access to all areas of the SAC (NatureScot, 2025e) and significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of bottlenose dolphin throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	There is no impact pathway between Subsea Noise generated during site investigation surveys at the Proposed Development in-combination with site investigation surveys of other projects and the habitats and processes that support bottlenose dolphin within the SAC and the availability of food. With respect to the availability of prey, long term effects were not predicted (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report and the assessment of 'Effects on Marine Mammals due to Altered Prey Availability' in this section), therefore prey species populations are expected to be maintained in the long term. Therefore, this in-combination impact will not prevent the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources from being maintained.

Injury and Disturbance from Subsea Noise Generated by Vessel Use and Other Noise Producing Activities

- 6.4.100 The LSE assessment during the HRA screening process identified that LSE could not be ruled out for potential injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities in the construction and O&M phases of the Proposed Development in-combination with other projects for all four of the SACs screened in for Annex II marine mammals (see Table 3.1).
- 6.4.101 The MDS considered for the in-combination assessment is shown in Table 6.49. The Embedded Mitigation measures are presented in Table 6.31 for the assessment of the Proposed Development alone. For the purposes of the MDS for the in-combination assessment, projects have been screened in and out as per the connectivity criteria identified in Table 6.38 and on the following basis for injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities:
- All phases – it is expected that each project will contribute to the increase of vessel traffic and hence to the amount of vessel noise in the environment during all phases.

Table 6.49: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Injury and Disturbance from Subsea Noise Generated by Vessel Use and Other Noise Producing Activities in All Phases of the Proposed Development In-Combination with Other Projects

Proposed Development Phase	Tier	MDS
All phases	1	No projects identified.
	2	The MDS is as detailed for the Proposed Development alone in Table 6.30 in-combination with the following projects: Offshore Wind Projects and Associated Cables • Ossian OWF (all phases); and • Berwick Bank OWF (all phases). Offshore Export Cable Routes and Carbon Capture Storage • Seagreen Phase 1A OFTO (O&M and decommissioning phases); • Inch Cape OFTO (O&M and decommissioning phases); and • Berwick Bank OFTO (Cambois Connection) (all phases). Cables within 100 km of the Proposed Development • Eastern Green Link 2 (O&M and decommissioning phases).
	3	The MDS is as detailed for the Proposed Development alone in Table 6.30 in-combination with the following projects: Offshore Wind Projects and Associated Cables • Morven North OWF (all phases); • Morven South OWF (all phases). Offshore Export Cable Routes and Carbon Capture Storage • Morven Hawthorn Pit Grid Connection Project (construction and O&M phases); and • Ossian Transmission Infrastructure (construction and O&M phases). Coastal Construction • Fraserburgh Harbour Development (all phases).
	4	• No projects identified.

In-Combination Assessment

- 6.4.102 The risk of auditory injury due to Subsea Noise from vessel use and other noise producing activities would be expected to be localised to within the boundaries of the respective projects. The noise modelling assessment for the Proposed Development alone demonstrated that auditory injury thresholds were not exceeded for any marine mammal hearing group for any vessel type or other noise producing activity (drilled piling, cable laying, cable trenching and cutting, or boulder clearance; see Section 6.3). The potential for in-combination injury is unlikely and not considered further in this assessment. Therefore, the in-combination assessment provided here focuses on behavioural disturbance only.

All phases

Tier 2

- 6.4.103 As detailed in Table 6.49, there were six Tier 2 projects identified with the potential for cumulative impact associated with vessel noise and other noise producing activities in the construction and O&M phases of the Proposed Development. However, only two of the Tier 2 projects had publicly available RIAAs, which also screened in at least one of the of the four SACs considered for Proposed Development alone impacts (Section 6.3) for further assessment of vessel noise and other noise producing activities:
- Berwick Bank OWF (all phases); and
 - Eastern Green Link 2 (O&M and decommissioning phases).
- 6.4.104 The Berwick Bank OWF RIAA included a range of vessels, similar to the Proposed Development but had higher vessel numbers and return trips due to the scale of the project (Berwick Bank Wind Farm Ltd., 2022). The Berwick Bank OWF RIAA concluded that for the potential behavioural disturbance range associated with the construction activities the greatest modelled disturbance range was 4,320 m for vessels for all marine mammal species and for non-vessel sound 4,389 m from cable laying (Berwick Bank Wind Farm Ltd., 2022). The estimated potential disturbance ranges for excavator, backhoe dredgers, pipe laying, geophysical survey vessel and jack-up vessel and the non-vessel noise from jack-up rig were much smaller at 300 m (Berwick Bank Wind Farm Ltd., 2022).
- 6.4.105 For Berwick Bank OWF these behavioural disturbance ranges do not overlap with any of the Annex II marine mammal SACs assessed. Given that this Tier 2 project is 56.5 km away from the Proposed Development there will be no overlap of the projects predicted disturbance ranges with the Proposed Development. As for the Proposed Development the O&M phase of the Berwick Bank OWF the assessment of auditory injury and behavioural disturbance was not reiterated.
- 6.4.106 As detailed in Table 6.37, the decommissioning phase of Berwick Bank OWF is estimated to be taking place from 2067, with that of the Proposed Development also estimated from 2067. Within the RIAA for Berwick Bank OWF, disturbance from decommissioning vessels and activities was considered to be equal to or

lesser than that of the construction phase (Berwick Bank Wind Farm Ltd., 2022). Similarly, for the Proposed Development, behavioural disturbance due to Subsea Noise from these sources in the decommissioning phase was also considered to be lesser than or equal to that of the construction phase.

- 6.4.107 In the Eastern Green Link 2 RIAA, disturbance to marine mammals from Subsea Noise was only taken forward for AA for the construction phase (National Grid, 2022b). Therefore, as the construction phase of Eastern Green Link 2 project will not overlap with any phase of the Proposed Development (Table 6.37) the project was not considered further for the in-combination assessment of Tier 2 projects.
- 6.4.108 Vessel noise and other construction activities will occur intermittently over the duration of the construction phase of the Proposed Development and the Tier 2 projects with vessel noise also occurring intermittently throughout the O&M phases of the Proposed Development and Tier 2 projects. Although animals in the vicinity of the vessels and other noise producing activities may experience behavioural disturbance, they may move away from the activity outside of the Zol. The impact is therefore expected to be temporary and intermittent.
- 6.4.109 Embedded Mitigation for the Proposed Development includes the development of and adherence to a NSVMP (Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan of the Offshore EIA Report), which include adherence by vessels to guidelines laid out in the Scottish Marine Wildlife Watching Code (Table 6.31). The Outline NSVMP will include requirements to not deliberately approach marine mammals, avoid abrupt changes in course or speed should marine mammals approach the vessel to bow-ride, and to remain at safe speeds at all times and reduce speed when a marine mammal is in the vicinity. Therefore, these measures will further reduce the risk of behavioural disturbance associated with vessel noise, and the scale of effect (potential Zol and number of animals affected) was predicted to be very small. This Embedded Mitigation is an industry standard plan, with Berwick Bank OWF also committed to one (Berwick Bank Wind Farm Ltd., 2022).

Tier 3

- 6.4.110 Of the Tier 3 projects detailed in Table 6.49, only Morven North OWF, Morven South OWF and the Fraserburgh Harbour Development had publicly available HRA screening documents, which also screened in at least one of the four SACs considered for Proposed Development alone impacts (Section 6.3). The combined Morven North OWF and Morven South OWF HRA Screening Report screened in disturbance to marine mammals from vessel use and other noise producing activities in all phases for all four SACs (MvOWL, 2023b), while the Fraserburgh Harbour HRA Screening Supporting Document screened in Subsea Noise in the construction phase for the Moray Firth SAC only, although the sources of Subsea Noise were not defined (Fraserburgh Harbour Development, 2025b).

- 6.4.111 Based upon the Tier 2 assessment presented in Paragraphs 6.4.103 *et seq.*, disturbance could occur over ranges in the hundreds of metres to several kilometres from Subsea Noise associated with vessels and other activities at the Tier 3 projects.
- 6.4.112 Like the Proposed Development and the Tier 2 project, the Tier 3 projects are likely to commit to Embedded Mitigation of the development of and adherence to a NSVMP (Volume 4, Appendix 29: Outline Navigational Safety and Vessel Management Plan of the Offshore EIA Report or equivalent), which will help to reduce the potential for in-combination impact.

All Phases

- 6.4.113 Potential effects from the Proposed Development on the relevant conservation objectives of the four SACs screened in for Annex II marine mammals are presented in Table 6.50. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately.

Firth of Tay and Eden Estuary SAC

- 6.4.114 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary SAC conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.50.

Harbour Seal

- 6.4.115 Overall, the behavioural disturbance ranges associated with vessel use and other activities at the Proposed Development (to a maximum of 5.6 km; Table 6.32) are likely to be similar or greater than those associated with the relevant Tier 2 (Berwick Bank OWF; Paragraph 6.4.104) and Tier 3 (Morven North OWF and Morven South OWF) projects. Therefore, due to these limited ranges and the distance between the SAC and these two projects (approximately 45 km from Berwick Bank OWF (Berwick Bank Wind Farm Ltd., 2022) and 96 km from Morven North OWF and Morven South OWF (MvOWL, 2023b)), it is not likely that the harbour seal feature of the Firth of Tay and Eden Estuary SAC would experience an adverse in-combination effect. Although Berwick Bank OWF is within the 50 km connectivity buffer the disturbance ranges are unlikely to overlap (Paragraph 6.4.105), which reduces the potential for an adverse in-combination effect.
- 6.4.116 In addition, the effect of behavioural disturbance is highly context-specific (Paragraph 6.3.181), although seals are expected to have some tolerance to behavioural disturbance from Subsea Noise (Vella *et al.*, 2001). Whilst there may be minor effects at an individual level within the East Scotland, these are not predicted to be at a scale that would lead to adverse effects for the harbour seal feature of the Firth of Tay and Eden Estuary SAC.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.4.117 Potential effects from the Proposed Development on the Isle of May SAC or Berwickshire and North Northumberland Coast SAC. conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.50.

Grey Seal

- 6.4.118 Overall, the behavioural disturbance ranges associated with vessel use and other activities at the Proposed Development (to a maximum of 5.6 km; Table 6.32) are likely to be similar or greater than those associated with the relevant Tier 2 (Berwick Bank OWF; Paragraph 6.4.104) and Tier 3 (Morven North OWF and Morven South OWF) projects. Due to these limited ranges and the distance between the Isle of May SAC and these two projects (approximately 21 km from Berwick Bank OWF (Berwick Bank Wind Farm Ltd., 2022) and 105 km from Morven North OWF and Morven South OWF (MvOWL, 2023b)), it is not likely that the grey seal feature of the Isle of May SAC would experience an adverse in-combination effect. While the Berwickshire and North Northumberland Coast SAC is only approximately 4 km from Berwick Bank OWF (Berwick Bank Wind Farm Ltd., 2022) (but 97 km from Morven North OWF and Morven South OWF (MvOWL, 2023b)) the disturbance ranges are unlikely to overlap (Paragraph 6.4.105), which reduces the potential for an adverse in-combination effect on the grey seal feature.
- 6.4.119 In addition, the effect of behavioural disturbance is highly context-specific (Paragraph 6.3.181), although seals are expected to have some tolerance to behavioural disturbance from Subsea Noise (Vella *et al.*, 2001). Whilst there may be minor effects at an individual level within the East Scotland SMU, these are not predicted to be at a scale that would lead to adverse effects for the grey seal feature of the Isle of May SAC or Berwickshire and North Northumberland Coast SAC.

Moray Firth SAC

- 6.4.120 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.50.

Bottlenose Dolphin

- 6.4.121 Overall, the behavioural disturbance ranges associated with vessel use and other activities at the Proposed Development (to a maximum of 5.6 km; Table 6.32) are likely to be similar or greater than those associated with the relevant Tier 2 (Berwick Bank OWF; Paragraph 6.4.104) and Tier 3 (Morven North OWF, Morven South OWF and Fraserburgh Harbour Development) projects. Therefore, due to these limited ranges and the distance between the SAC and these three projects (approximately 45 km from Berwick Bank OWF (Berwick Bank Wind Farm Ltd., 2022), 96 km from Morven North OWF and Morven South OWF (MvOWL, 2023b) and 76 km from the Fraserburgh Harbour Development (Fraserburgh Harbour Development, 2025b)), it is not likely that the bottlenose dolphin feature of the Moray Firth SAC could experience an in-combination

effect, within the SAC, as this SAC is located 159.6 km from the Array Area (where the majority of Subsea Noise will be generated) nor in-combination within the Coastal East Scotland MU due to the dispersed locations of the Tier 2 and 3 projects.

- 6.4.122 In addition, the effect of behavioural disturbance is highly context-specific (Paragraph 6.3.181), although bottlenose dolphins are expected to have some tolerance to behavioural disturbance from Subsea Noise (Vella *et al.*, 2001). Whilst there may be minor effects at an individual level within the Coastal East Scotland MU, these are not predicted to be at a scale that would lead to any adverse effects for the bottlenose dolphin feature of the Moray Firth SAC.

Conclusion

- 6.4.123 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of in-combination disturbance from Subsea Noise generated by vessel use and other noise producing activities in the construction, O&M and decommissioning phases.

Table 6.50: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of Injury and Disturbance from Subsea Noise Generated by Vessel Use and Other Noise Producing Activities during the Construction, O&M and Decommissioning Phases

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	There is no realistic impact pathway for injury to harbour seals from vessel use and other noise producing activities at the Proposed Development in-combination with vessel use and other noise producing activities of other projects within the SAC. Therefore, harbour seal will not be at significant risk of injury or mortality and this in-combination impact will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	As described in Paragraph 6.4.115 and 6.4.116, the limited disturbance ranges from each project and the distance to the SAC from the Proposed Development and other projects make it unlikely there will be significant disturbance from project alone vessel use and other noise producing activities from any project. This ensures harbour seals will continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of harbour seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no impact pathway between Subsea Noise generated during vessel use and other noise producing activities at the Proposed Development in-combination with vessel use and other noise producing activities of other projects and the supporting habitats and processes relevant to harbour seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this in-combination impact will not prevent the supporting habitats and processes within the SAC from being maintained.
Isle of May SAC	Grey seal	2a. ensure grey seals are a viable component of the Isle of May SAC.	There is no impact pathway between Subsea Noise generated during vessel use and other noise producing activities at the Proposed Development in-combination with vessel use and other noise producing activities of other projects within the SAC. As described in Paragraph 6.4.118 and 6.4.119, the limited disturbance ranges from each project and the distance to the SAC from the Proposed

SAC	Feature	Target/Conservation Objectives	Conclusion
			Development and other projects make it unlikely there will be significant disturbance from project alone vessel use and other noise producing activities from any project. This ensures grey seals can move safely between the SAC and important areas of functionally linked sea outwith the SAC and that there is no effect on reproductive capability of grey seal during the breeding season and pup production would not be expected to decline as a result of this impact, ensuring stable or increasing grey seal numbers are maintained (NatureScot, 2025d). Therefore, this in-combination impact will not prevent the population of grey seals from being maintained as a viable component of the SAC.
		2b. ensure the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals.	As described in the row above, there is no significant disturbance from project alone vessel use and other noise producing activities from any project and so significant in-combination disturbance will be avoided, maintaining their ability to use and access all areas within the SAC used for pupping and nursing. Therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of grey seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats relevant to grey seal are maintained.	There is no impact pathway between Subsea Noise generated during vessel use and other noise producing activities at the Proposed Development in-combination with vessel use and other noise producing activities of other projects and the supporting habitats and processes within the SAC relevant to grey seal (i.e. no overlap with the area of significant disturbance with the SAC). Therefore, this impact will not prevent the supporting habitats relevant within the SAC relevant to grey seal from being maintained.
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no impact pathway between Subsea Noise generated during vessel use and other noise producing activities at the Proposed Development in-combination with site investigation surveys of other projects and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal (i.e. no overlap with the area of significant disturbance with the SAC including haul-out sites). Due to the limited disturbance ranges from each project and
		The structure and function of the habitats of the qualifying species are maintained.	

SAC	Feature	Target/Conservation Objectives	Conclusion
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	the distance to the SAC from the Proposed Development and other projects, this impact would not impede connectivity between the SAC and the wider environment as grey seal are able to forage widely. Therefore, this in-combination impact will not prevent the extent and distribution of habitats of the qualifying features, the structure and function of the habitats of the qualifying species and the supporting processes on which the habitats of qualifying species rely, from being maintained(Natural England, 2023).
		The populations of each of the qualifying species are maintained	There is no realistic impact pathway for injury to grey seals from Subsea Noise generated during vessel use and other noise producing activities at the Proposed Development in-combination with vessel use and other noise producing activities of other projects within the SAC. As described in Paragraph 6.4.118 and 6.4.119, Subsea Noise generated during vessel use and other noise producing activities at the Proposed Development in-combination with vessel use and other noise producing activities of other projects is unlikely to lead to significant disturbance of grey seals. The limited disturbance ranges from each project and the distance to the SAC from the Proposed Development and other projects make it unlikely there will be significant disturbance from project alone vessel use and other noise producing activities from any project. Therefore, with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023) and this in-combination impact will not prevent the population and distribution of grey seal within the SAC from being maintained.
		The distribution of qualifying species within the site are maintained.	
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	There is no realistic impact pathway for injury to bottlenose dolphin from Subsea Noise generated during vessel use and other noise producing activities at the Proposed Development in-combination with vessel use and other noise producing activities of other projects within the SAC. As such, there is no risk of injury or mortality to bottlenose dolphin from Subsea Noise from vessel use and other noise producing activities. Therefore, this in-combination impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.

SAC	Feature	Target/Conservation Objectives	Conclusion
		2b. ensure the distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.	As described in Paragraph 6.4.121 and 6.4.122, Subsea Noise generated during vessel use and other noise producing activities at the Proposed Development in-combination with vessel use and other noise producing activities of other projects is unlikely to lead to injury or strong behavioural disturbance of bottlenose dolphin. The limited disturbance ranges from each project and the distance to the SAC from the Proposed Development and other projects make it unlikely there will be significant disturbance from project alone vessel use and other noise producing activities from any project. Therefore, bottlenose dolphins will continue to use and have access to all areas of the SAC (NatureScot, 2025e) and significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of bottlenose dolphin throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	There is no impact pathway between Subsea Noise generated during vessel use and other noise producing activities at the Proposed Development in-combination with vessel use and other noise producing activities of other projects and the habitats and processes that support bottlenose dolphin within the SAC and the availability of food. With respect to the availability of prey, long term effects were not predicted (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report and the assessment of 'Effects on Marine Mammals due to Altered Prey Availability' in this section), therefore prey species populations are expected to be maintained in the long term. Therefore, this in-combination impact will not prevent the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources from being maintained.

Effects on Marine Mammals Due to Altered Prey Availability

- 6.4.124 The LSE assessment during the HRA screening process identified that LSE could not be ruled out for potential effects on marine mammals due to altered prey availability in the construction, O&M and decommissioning phases of the Proposed Development in-combination with other projects for all four of the SACs screened in for Annex II marine mammals (see Table 3.1).
- 6.4.125 The MDS considered for the in-combination assessment is shown in Table 6.51. There are no Embedded Mitigation measures applicable to this impact specifically, however, Embedded Mitigation measures for Subsea Noise impacting fish and shellfish receptors (Table 5.4) and EMF (Table 5.21) are relevant. For the purposes of the MDS for the in-combination assessment, projects have been screened in and out as per the connectivity criteria identified in Table 6.38 and on the following basis for effects on marine mammals due to altered prey availability:
- All phases - potential In-Combination Effects on fish and shellfish assemblages, as identified in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report, may have indirect effects on marine mammals. In-Combination Effects for fish and shellfish have been assessed within a representative 50 km buffer of the Site Boundary for all impacts except Subsea Noise, where a larger buffer of 100 km was used (see Paragraph 5.4.2). Therefore, only the projects considered in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report are included.

Table 6.51: MDS Considered for the Assessment of Potential Impacts to Annex II Marine Mammals due to Effects due to Altered Prey Availability in All Phases of the Proposed Development In-Combination with Other Projects

Proposed Development Phase	Tier	MDS
All Phases	1	No projects identified.
	2	The MDS is as described in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report. Potential in-combination impacts on fish and shellfish include temporary and long term habitat loss and disturbance, introduction of artificial hard structures and subsequent colonisation, increased SSCs and associated deposition, Subsea Noise, and EMF. Relevant projects for the in-combination assessment vary per impact and phase as listed in Table 6.52, Table 6.53 and Table 6.54 but include: Offshore Wind Projects and Associated Cables • Kincardine OWF; • Seagreen 1A Project; • Seagreen 1 OWF; • Seagreen Phase 1A OFTO; • Aberdeen OWF; • Ossian OWF; • Berwick Bank OWF; • Berwick Bank OFTO (Cambois Connection); • Hywind Scotland Wind Farm (Buchan Deep Demo); • Muir Mhòr OWF; • Salamander OWF; • Aspen OWF; and • Green Volt OWF. Cables within 100 km of the Proposed Development • Eastern Green Link 2.

Proposed Development Phase	Tier	MDS
	3	The MDS is as described in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report. Potential in-combination impacts on fish and shellfish include temporary and long term habitat loss and disturbance, introduction of artificial hard structures and subsequent colonisation, increased SSCs and associated deposition, Subsea Noise, and EMF. Relevant projects for the in-combination assessment vary per impact and phase as listed in Table 6.52, Table 6.53 and Table 6.54 but include: Offshore Wind Projects and Associated Cables • Morven Hawthorn Pit Grid Connection Project; • Morven North OWF; • Morven South OWF; • Ossian Transmission Infrastructure; and • Bellrock OWF. Cables within 100 km of the Proposed Development • Eastern Green Link 3; and • CNSE Project. Coastal Construction • Fraserburgh Harbour Development.
	4	The MDS is as described in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report. Potential in-combination impacts on fish and shellfish include temporary and long term habitat loss and disturbance, introduction of artificial hard structures and subsequent colonisation, increased SSCs and associated deposition, Subsea Noise, and EMF. Relevant projects for the in-combination assessment vary per impact and phase as listed in Table 6.52, Table 6.53 and Table 6.54 but include: Offshore Wind Projects and Associated Cables • Flora Floating Wind Farm.

In-Combination Assessment

Tier 2

Construction Phase

- 6.4.126 The construction of the Proposed Development alongside other projects may lead to changes in the available prey resources for Annex II marine mammals if there are in-combination impacts upon the fish and shellfish community. Potential in-combination impacts on fish and shellfish prey species during the construction phase have been assessed in Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report using the appropriate MDSs for these receptors and have been used to inform this assessment for Annex II marine mammals. The following in-combination impacts upon fish and shellfish ecology were assessed in the construction phase of the Proposed Development:
- temporary habitat loss and/or disturbance;
 - long term habitat loss and/or disturbance (combined with the O&M phase);
 - introduction of artificial habitat and subsequent colonisation (combined with the O&M phase);
 - increased SSCs and associated deposition; and
 - Subsea Noise impacting fish and shellfish receptors.
- 6.4.127 A summary of the potential in-combination impacts upon fish and shellfish receptors is provided in Table 6.52. As illustrated in this table, no In-Combination Effects were predicted to occur in the construction phase of the Proposed Development for fish and shellfish ecology. With respect to indirect effects on Annex II marine mammals, no additional In-Combination Effects due to altered prey availability are therefore predicted. The marine mammals considered in this assessment are considered to be generalist opportunistic feeders and are thus not reliant on a single prey species. Given that marine mammals are wide-ranging in nature with the ability to exploit numerous food sources, there would be a variety of prey species available for marine mammal foraging.

Table 6.52: Summary of In-Combination Impacts for Tier 2 Projects for Fish and Shellfish Receptors in the Construction Phase of the Proposed Development (N/A denotes Not Applicable)

Impact	Projects	Total Impact (if applicable)	Conclusion
Temporary habitat loss and/or disturbance	Offshore Wind Projects and Associated Cables • Kincardine OWF; • Seagreen 1 OWF; • Seagreen 1A Project; • Seagreen Phase 1 OFTO; • Hywind Scotland OWF; • Ossian OWF; and • Berwick Bank OWF. Cables within 100 km of the Proposed Development • Eastern Green Link 2.	236,223,653 m ² (236.2 km ²)	The maximum in-combination temporary habitat loss and/or disturbance associated with the Tier 2 projects together with the construction phase of the Proposed Development was estimated at up to 236.2 km ² . This represents up to 0.73% of the Fish and Shellfish Ecology Study Area. However, it is important to note that the in-combination footprint of 236.2 km ² will not be one continuous area. Instead, this footprint is comprised of isolated areas of temporary habitat loss and disturbance. There will be no spatial overlap between the Site Boundary and the majority of Tier 2 projects, except Eastern Green Link 2 (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). The in-combination impact of the Proposed Development with Tier 2 projects is therefore not expected to represent a material additional impact to that defined for the assessment of the Proposed Development alone.
Long term habitat loss and/or disturbance (combined with the O&M phase)	Offshore Wind Projects and Associated Cables • Seagreen 1A Project; • Ossian OWF; • Berwick Bank OWF; • Berwick Bank OFTO (Cambois Connection); and	29,823,334 m ² (29.8 km ²)	The maximum in-combination long term habitat loss and/or disturbance associated with the Tier 2 projects together with that of the Proposed Development was estimated at up to 29.8 km ² . This represents up to 0.09% of the Fish and Shellfish Ecology Study Area. It is important to note that the in-combination footprint will not be one continuous area but comprised of isolated areas of habitat loss and/or disturbance. There will be no spatial overlap between the Site Boundary and the majority of Tier 2 projects, except Eastern Green Link 2 (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). The in-combination impact of the Proposed Development with the Tier 2 projects is therefore not expected to represent a material additional

Impact	Projects	Total Impact (if applicable)	Conclusion
	- Hywind Scotland Wind Farm (Buchan Deep Demo). Cables within 100 km of the Proposed Development - Eastern Green Link 2.		impact to that defined for the assessment of the Proposed Development alone.
Introduction of artificial habitat and subsequent colonisation (combined with the O&M phase)	Offshore Wind Projects and Associated Cables - Seagreen 1A Project; - Ossian OWF; - Hywind Scotland OWF (Buchan Deep Demo); - Berwick Bank OWF; and - Berwick Bank OFTO (Cambois Connection). Cables within 100 km of the Proposed Development - Eastern Green Link 2.	39,963,655m ² (40.0 km ²)	The maximum in-combination footprint for introduction of artificial structures and subsequent colonisation associated with the Tier 2 projects together with the construction and O&M phases of the Proposed Development is estimated at up to 40.0 km ² . This represents up to 0.12% of the Fish and Shellfish Ecology Study Area. It is important to note that the in-combination footprint will not be one continuous area but comprised of isolated areas of introduced artificial structures and their subsequent colonisation. There will be no spatial overlap between the Site Boundary and the majority of Tier 2 projects, except Eastern Green Link 2 (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). The in-combination impact of the Proposed Development with the Tier 2 projects is therefore not expected to represent a material additional impact to that defined for the assessment of the Proposed Development alone.
Increased SSCs and associated deposition	Offshore Wind Projects and Associated Cables Ossian OWF.	N/A	There is potential for sediment-disturbing activities such as drilling foundations, Mass Flow Excavation sandwave clearance, and dredging to occur simultaneously for the Proposed Development and Ossian OWF. This overlap may potentially result in cumulative changes in SSC and associated deposition.

Impact	Projects	Total Impact (if applicable)	Conclusion
			The Ossian array area is located approximately 25 km to the east of the Proposed Development Array Area. The distance between the 2 projects is greater than the extent of the spring tidal excursion ellipse and they are not aligned in the direction of the tidal axis. This therefore suggests any in-combination impacts are very unlikely. This conclusion is underpinned by and consistent with the relevant available guidance set out in Volume 2, Chapter 7: Physical Processes (TWP-BOW-RPS-OFE-RPT-00011) of the Offshore EIA Report.
Subsea Noise impacting fish and shellfish receptors	Offshore Wind Projects and Associated Cables • Kincardine OWF; • Seagreen 1 OWF; • Seagreen 1A Project; • Aberdeen OWF; • Ossian OWF; • Berwick Bank OWF; • Hywind Scotland OWF (Buchan Deep Demo); • Muir Mhòr OWF; • Salamander OWF; and • Green Volt OWF.	N/A	Injury and disturbance associated with Subsea Noise in the various phases of the Tier 2 projects overlapping with the construction phase of the Proposed Development were not concluded to be significant for the fish and shellfish species assessed in their individual EIAs (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). Subsea Noise modelling results of the Tier 2 projects (where available) were of a similar scale to those associated with the Proposed Development. Given the location of the Tier 2 projects within the North Sea, the fish and shellfish species assessed are comparable to the Diadromous Fish and shellfish features identified for the Proposed Development alone assessment.

O&M Phase

6.4.128 The in-combination impacts upon fish and shellfish ecology that were assessed in the O&M phase are the same as for the construction phase (Paragraph 6.4.126) of the Proposed Development, with the exception of increased SSCs and associated deposition and the addition of:

- Impacts to fish and shellfish receptors due to EMF.

6.4.129 A summary of the potential in-combination impacts upon fish and shellfish receptors is provided in Table 6.53. As illustrated in this table, no In-Combination Effects were predicted to occur in the O&M phase of the Proposed Development for fish and shellfish ecology. With respect to indirect effects on Annex II marine mammals, no additional In-Combination Effects due to altered prey availability are therefore predicted. The marine mammals considered in this assessment are considered to be generalist opportunistic feeders and are thus not reliant on a single prey species. Given that marine mammals are wide-ranging in nature with the ability to exploit numerous food sources, there would be a variety of prey species available for marine mammal foraging.

Decommissioning Phase

6.4.130 The in-combination impacts upon fish and shellfish ecology assessed in the decommissioning phase of the Proposed Development are the same as for the construction phase (Paragraph 6.4.126).

6.4.131 A summary of the potential in-combination impacts upon fish and shellfish receptors is provided in Table 6.54. As illustrated in Table 6.54, no In-Combination Effects were predicted to occur in the decommissioning phase of the Proposed Development for fish and shellfish ecology. With respect to indirect effects on Annex II marine mammals, no additional In-Combination Effects due to altered prey availability are therefore predicted. The marine mammals considered in this assessment are considered to be generalist opportunistic feeders and are thus not reliant on a single prey species. Given that marine mammals are wide-ranging in nature with the ability to exploit numerous food sources, there would be a variety of prey species available for marine mammal foraging.

Table 6.53: Summary of In-Combination Impacts for Tier 2 Projects for Fish and Shellfish Receptors in the O&M Phase of the Proposed Development (N/A denotes Not Applicable)

Impact	Projects	Total Impact (if applicable)	Conclusion
Temporary habitat loss and/or disturbance	Offshore Wind Projects and Associated Cables • Kincardine OWF; • Seagreen 1A Project; • Seagreen 1 OWF; • Seagreen Phase 1A OFTO; • Ossian OWF; • Hywind Scotland Wind Farm (Buchan Deep Demo); • Berwick Bank OWF; and • Berwick Bank OFTO (Cambois Connection). Cables within 100 km of the Proposed Development • Eastern Green Link 2.	103,147,613 m ² (103.2 km ²)	The maximum in-combination temporary habitat loss and/or disturbance associated with the Tier 2 projects together with the O&M phase of the Proposed Development was estimated at up to 103.2 km². This represents up to 0.32% of the Fish and Shellfish Ecology Study Area. However, it is important to note that the in-combination footprint of 103.2 km² will not be one continuous area. Instead, this footprint is comprised of isolated areas of temporary habitat loss and disturbance over the O&M phase. There will be no spatial overlap between the Site Boundary and the majority of Tier 2 projects, except Eastern Green Link 2 (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). The in-combination impact of the Proposed Development with Tier 2 projects is therefore not expected to represent a material additional impact to that defined for the assessment of the Proposed Development alone.
Long term habitat loss and/or disturbance (combined with the construction phase)	Offshore Wind Projects and Associated Cables • Seagreen 1A Project; • ; • Berwick Bank OWF;	29,823,334 m ² (29.8 km ²)	The maximum in-combination long term habitat loss and/or disturbance associated with the Tier 2 projects together with that of the Proposed Development was estimated at up to 29.8 km². This represents up to 0.09% of the Fish and Shellfish Ecology Study Area. It is important to note that the in-combination footprint will not be one continuous area but comprised of isolated areas of habitat loss and/or disturbance. There will be no spatial overlap between the Site Boundary and the majority of Tier 2 projects, except Eastern Green

Impact	Projects	Total Impact (if applicable)	Conclusion
	- Berwick Bank OFTO (Cambois Connection); and - Hywind Scotland Wind Farm (Buchan Deep Demo). Cables within 100 km of the Proposed Development - Eastern Green Link 2.		Link 2 (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). The in-combination impact of the Proposed Development with the Tier 2 projects is therefore not expected to represent a material additional impact to that defined for the assessment of the Proposed Development alone.
Introduction of artificial habitat and subsequent colonisation (combined with the construction phase)	Offshore Wind Projects and Associated Cables - Seagreen 1A Project; - Ossian OWF; - Hywind Scotland OWF (Buchan Deep Demo); - Berwick Bank OWF; and - Berwick Bank OFTO (Cambois Connection). Cables within 100 km of the Proposed Development - Eastern Green Link 2.	39,963,655 m ² (40.0 km ²)	The maximum in-combination footprint for introduction of artificial structures and subsequent colonisation associated with the Tier 2 projects together with the construction and O&M phases of the Proposed Development is estimated at up to 40.0 km ² . This represents up to 0.12% of the Fish and Shellfish Ecology Study Area. It is important to note that the in-combination footprint will not be one continuous area but comprised of isolated areas of introduced artificial structures and their subsequent colonisation. There will be no spatial overlap between the Site Boundary and the majority of Tier 2 projects, except Eastern Green Link 2 (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). The in-combination impact of the Proposed Development with the Tier 2 projects is therefore not expected to represent a material additional impact to that defined for the assessment of the Proposed Development alone.

Impact	Projects	Total Impact (if applicable)	Conclusion
Subsea Noise impacting fish and shellfish receptors	Offshore Wind Projects and Associated Cables • Kincardine OWF; • Seagreen 1 OWF; • Seagreen 1A Project; • Aberdeen OWF; • Ossian OWF; • Berwick Bank OWF; • Hywind Scotland OWF (Buchan Deep Demo); • Muir Mhòr OWF; • Salamander OWF; • Aspen OWF; and • Green Volt OWF.	N/A	There were 10 Tier 2 projects with the potential for in-combination impacts associated with Subsea Noise in the O&M phase of the Proposed Development. All of the Tier 2 projects will be in their O&M and/or decommissioning phases during the O&M phase of the Proposed Development. This greatly reduces the potential for In-Combination Effects as the highest potential for impact is associated with piling noise in the construction phase of an OWF. The risk of effects on fish (either injury or behavioural responses) from operational Wind Turbine noise is very low. Therefore, it is unlikely that wide-ranging in-combination impacts would occur, given the limited nature of operational noise disturbance to fish and shellfish receptors.
Impacts to fish and shellfish receptors due to EMF	Offshore Wind Projects and Associated Cables • Kincardine OWF; • Seagreen 1 OWF; • Seagreen Phase 1A OFO; • Aberdeen OWF; • Ossian OWF; • Berwick Bank OWF; • Hywind Scotland OWF (Buchan Deep Demo);	6,073 km	EMFs emitted by subsea cables are influenced by a variety of design and installation factors, including distance between cables, cable sheathing, number of conductors, and internal cable configuration. The intensity of EMF from subsea cables decreases at approximately the inverse square/power of the distance away from the cable (Hutchison <i>et al.</i> , 2021). This attenuation is applicable to buried, unburied, and dynamic cables (Hutchison <i>et al.</i> , 2021). Therefore, the in-combination impact of the Proposed Development with the Tier 2 projects is likely to be highly localised to within metres to tens of metres from cables.

Impact	Projects	Total Impact (if applicable)	Conclusion
	Cables within 100 km of the Proposed Development Eastern Green Link 2.		

Table 6.54: Summary of In-Combination Impacts for Tier 2 Projects for Fish and Shellfish Receptors in the Decommissioning Phase of the Proposed Development

Impact	Projects	Total Impact (if applicable)	Conclusion
Temporary habitat loss and/or disturbance	Offshore Wind Projects and Associated Cables - Ossian OWF (O&M phases); - Berwick Bank OWF (O&M phases); and - Hywind Scotland Wind Farm (Buchan Deep Demo). Cables within 100 km of the Proposed Development - Eastern Green Link 2 (O&M phase).	70,826,305 m ² (70.8 km ²)	The maximum in-combination temporary habitat loss and/or disturbance associated with the Tier 2 projects together with the decommissioning phase of the Proposed Development was estimated at up to 70.8 km². This represents up to 0.22% of the Fish and Shellfish Ecology Study Area. However, it is important to note that the in-combination footprint of 109.7 km² will not be one continuous area. Instead, this footprint is comprised of isolated areas of temporary habitat loss and disturbance. There will be no spatial overlap between the Site Boundary and the majority of Tier 2 projects, except Eastern Green Link 2 (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). The in-combination impact of the Proposed Development with Tier 2 projects is therefore not expected to represent a material additional impact to that defined for the assessment of the Proposed Development alone.

Impact	Projects	Total Impact (if applicable)	Conclusion
Long term habitat loss and/or disturbance (combined with the construction and O&M phase)	Offshore Wind Projects and Associated Cables • Seagreen 1A Project; • ; • Berwick Bank OWF; • Berwick Bank OFTO (Cambois Connection); and • Hywind Scotland Wind Farm (Buchan Deep Demo). Cables within 100 km of the Proposed Development • Eastern Green Link 2.	29,823,334 m ² (29.8 km ²)	As a precautionary approach, it was assumed that all infrastructure from all Tier 2 projects and the Proposed Development would be left <i>in situ</i> . The maximum in-combination long term habitat loss and/or disturbance associated with the Tier 2 projects together with that of the Proposed Development was estimated at up to 29.8 km ² . This represents up to 0.09% of the Fish and Shellfish Ecology Study Area. It is important to note that the in-combination footprint will not be one continuous area but comprised of isolated areas of habitat loss and/or disturbance. There will be no spatial overlap between the Site Boundary and the majority of Tier 2 projects, except Eastern Green Link 2 (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). The in-combination impact of the Proposed Development with the Tier 2 projects is therefore not expected to represent a material additional impact to that defined for the assessment of the Proposed Development alone.
Introduction of artificial habitat and subsequent colonisation (combined with the construction and O&M phase)	Offshore Wind Projects and Associated Cables • Ossian OWF; and • Berwick Bank OWF. Cables within 100 km of the Proposed Development • Eastern Green Link 2.	21,503,058 m ² (21.5 km ²)	As a precautionary approach, it was assumed that much of the introduced artificial hard infrastructure from all Tier 2 projects and the Proposed Development would be left <i>in situ</i> . The maximum in-combination footprint for introduction of artificial structures and subsequent colonisation associated with the Tier 2 projects together with the decommissioning phases of the Proposed Development is estimated at up to 21.5 km ² . This represents up to 0.07% of the Fish and Shellfish Ecology Study Area. It is important to note that the in-combination footprint will not be one continuous area but comprised of isolated areas of introduced artificial structures and their subsequent colonisation.

Impact	Projects	Total Impact (if applicable)	Conclusion
			There will be no spatial overlap between the Site Boundary and the majority of Tier 2 projects, except Eastern Green Link 2 (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report). The in-combination impact of the Proposed Development with the Tier 2 projects is therefore not expected to represent a material additional impact to that defined for the assessment of the Proposed Development alone.
Increased SSCs and associated deposition	N/A	N/A	The removal of infrastructure associated with the Proposed Development is expected to result in some localised seabed disturbance accompanied by temporary increases in SSCs. However, the potential for In-Combination Effects is expected to be less than or equal to the construction phase and so has not been considered further.
Subsea Noise impacting fish and shellfish receptors	Offshore Wind Projects and Associated Cables • Ossian OWF; and • Berwick Bank OWF.	N/A	As for the Proposed Development, each of these projects are likely to submit a Decommissioning Programme to MD-LOT for consultation and approval and specific detail around Subsea Noise generated during this phase is not currently available. As there will be no piling during the decommissioning phase, which is the source of Subsea Noise with the highest potential for impact, it has been assumed that the in-combination impact in the decommissioning phase is no greater than that defined for the construction phase.

Tier 3 and 4

All Phases

- 6.4.132 The impacts listed in Paragraphs 6.4.126, 6.4.128 and 6.4.130 were also assessed alongside the Tier 3 and 4 projects identified in the fish and shellfish ecology assessment (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report for full detail). As there were no detailed RIAA/EIA documents or project parameters in the public domain for the Tier 3 and 4 projects, a detailed assessment like that summarised in Table 6.52, Table 6.53 and Table 6.54 was not possible for the Tier 3 and 4 assessments, and they have been combined here, for brevity.
- 6.4.133 Overall, there were no significant in-combination impacts upon fish and shellfish prey species concluded for any of the impacts considered in any phases of the Proposed Development (see Volume 2, Chapter 9: Fish and Shellfish Ecology (TWP-BOW-RPS-OFE-RPT-00072) of the Offshore EIA Report for full detail). Therefore, no adverse effect on the integrity of the Annex II marine mammal features of the SACs considered here are expected to occur with respect to altered prey availability. The marine mammals considered in this assessment are considered to be generalist opportunistic feeders and are thus not reliant on a single prey species. Given that marine mammals are wide-ranging in nature with the ability to exploit numerous food sources, there would be a variety of prey species available for marine mammal foraging.

All Phases

- 6.4.134 Potential effects from the Proposed Development on the relevant conservation objectives of the two SACs are discussed in Table 6.55. Where the justifications are the same for more than one conservation objective, the presentation of justifications in the RIAA has been grouped, however, each conservation objective and Qualifying Feature has been assessed separately.

Firth of Tay and Eden Estuary SAC

- 6.4.135 Potential effects from the Proposed Development on the Firth of Tay and Eden Estuary SAC conservation objectives (as presented in Paragraph 6.2.19) are presented in Table 6.55.

Harbour Seal

- 6.4.136 Adverse effects on the qualifying Annex II marine mammal features of the Firth of Tay and Eden Estuary SAC, which undermine the conservation objectives of the SAC, will not occur as a result of In-Combination Effects on marine mammals due to altered prey availability during all phases of the Proposed Development.

Isle of May SAC and Berwickshire and North Northumberland Coast SAC

- 6.4.137 Potential effects from the Proposed Development on the Isle of May SAC or Berwickshire and North Northumberland Coast SAC conservation objectives (as presented in Paragraph 6.2.27 for the Isle of May SAC and Paragraph 6.2.33 for the Berwickshire and North Northumberland Coast SAC) are presented in Table 6.55.

Grey Seal

- 6.4.138 Adverse effects on the qualifying Annex II marine mammal features of the Isle of May SAC or Berwickshire and North Northumberland Coast SAC, which undermine the conservation objectives of either SAC, will not occur as a result of In-Combination Effects on marine mammals due to altered prey availability during all phases of the Proposed Development.

Moray Firth SAC

- 6.4.139 Potential effects from the Proposed Development on the Moray Firth SAC conservation objectives (as presented in Paragraph 6.2.40) are presented in Table 6.55.

Bottlenose Dolphin

- 6.4.140 Adverse effects on the qualifying Annex II marine mammal features of the Moray Firth SAC, which undermine the conservation objectives of the SAC, will not occur as a result of In-Combination Effects on marine mammals due to altered prey availability during all phases of the Proposed Development.

Conclusion

- 6.4.141 It can be concluded beyond reasonable scientific doubt that there is no risk of an adverse effect on the integrity of any of the SACs screened in for Annex II marine mammals as a result of In-Combination Effects on marine mammals due to altered prey availability in the construction, O&M and decommissioning phases.

Table 6.55: Conclusions Against the Conservation Objectives of the SACs for Annex II Marine Mammals Screened in for Assessment of Effects due to Altered Prey Availability during the Construction, O&M and Decommissioning Phases

SAC	Feature	Target/Conservation Objectives	Conclusion
Firth of Tay and Eden Estuary SAC	Harbour seal	2a. ensure harbour seal within the Firth of Tay and Eden Estuary SAC are not at significant risk from injury or mortality.	There is no realistic impact pathway for injury to harbour seals from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects within the SAC, given their ability to adapt quickly to any altered prey availability given their mobile nature and generalist feeding strategy. Therefore, harbour seal will not be at significant risk of injury or mortality and this in-combination impact will not prevent this conservation objective from being met.
		2b. ensure the distribution of harbour seal throughout the site is maintained by avoiding significant disturbance.	There is no significant disturbance to harbour seals from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects within the SAC. In-combination impacts to prey species are not expected to be significant and therefore, there will be limited disturbance to harbour seals foraging as a result of altered prey availability. Prey species populations are expected to be maintained in the long term. This ensures harbour seals will continue to have access to, and can utilise, all habitats suitable for haul-outs and breeding associated within the SAC (NatureScot, 2024c). Therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of harbour seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to harbour seal are maintained.	There is no realistic impact pathway for injury to harbour seals from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects within the SAC. Prey species populations are expected to be maintained in the long term. Therefore, this in-combination impact will not prevent the supporting habitats and processes within the SAC from being maintained.

SAC	Feature	Target/Conservation Objectives	Conclusion
Isle of May SAC	Grey seal	2a. ensure grey seals are a viable component of the Isle of May SAC.	There is no realistic impact pathway for injury to grey seals from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects within the SAC. In-combination impacts to prey species are not expected to be significant and therefore, there will be no significant disturbance to grey seals foraging as a result of altered prey availability. Prey species populations are expected to be maintained in the long term. This ensures grey seals can move safely between the SAC and important areas of functionally linked sea outwith the SAC and that there is no effect on reproductive capability of grey seal during the breeding season and pup production would not be expected to decline as a result of this impact, ensuring stable or increasing grey seal numbers are maintained (NatureScot, 2025d). Therefore, this in-combination impact will not prevent the population of grey seals from being maintained as a viable component of the SAC.
		2b. ensure the distribution of grey seal throughout the site is maintained by avoiding significant disturbance of grey seals.	There is no significant disturbance to grey seals from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects within the SAC, as in-combination impacts to prey species are not expected to be significant and prey species populations are expected to be maintained in the long term. Therefore, grey seals' ability to use and access all areas within the SAC used for pupping and nursing are maintained. Therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of grey seals throughout the SAC from being maintained.
		2c. ensure the supporting habitats relevant to grey seal are maintained.	There is no realistic impact pathway for injury or significant disturbance to grey seals from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects within the SAC. Prey species populations are expected to be maintained in the long term. Therefore, this impact will not prevent the supporting habitats relevant within the SAC relevant to grey seal from being maintained.

SAC	Feature	Target/Conservation Objectives	Conclusion
Berwickshire and North Northumberland Coast SAC	Grey seal	The extent and distribution of qualifying natural habitats and habitats of the qualifying species are maintained.	There is no realistic impact pathway for injury to grey seals from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal. In-combination impacts to prey species are not expected to be significant and therefore, there will be no significant disturbance to grey seals foraging as a result of altered prey availability. Prey species populations are expected to be maintained in the long term. This impact would not impede connectivity between the SAC and the wider environment as grey seal are able to forage widely. Therefore, this in-combination impact will not prevent the extent and distribution of habitats of the qualifying features, the structure and function of the habitats of the qualifying species and the supporting processes on which the habitats of qualifying species rely, from being maintained(Natural England, 2023).
		The structure and function of the habitats of the qualifying species are maintained.	
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely are maintained.	
		The populations of each of the qualifying species are maintained	There is no realistic impact pathway for injury to grey seals from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects and the extent, distribution, structure, and function of the habitats and supporting processes of grey seal. In-combination impacts to prey species are not expected to be significant and therefore, there will be no significant disturbance to grey seal foraging as a result of altered prey availability. Prey species populations are expected to be maintained in the long term and therefore, with respect to the supplementary advice the reproductive and recruitment capability of the species would be maintained (Natural England, 2023). Therefore, this in-combination impact will not prevent the population and distribution of grey seal within the SAC from being maintained.
		The distribution of qualifying species within the site are maintained.	
Moray Firth SAC	Bottlenose dolphin	2a. ensure the population of bottlenose dolphin is a viable component of the site.	There is no realistic impact pathway for injury to bottlenose dolphin from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects within the SAC. Prey species populations are expected to be maintained in the

SAC	Feature	Target/Conservation Objectives	Conclusion
			long term. As such, there is no risk of injury or mortality to bottlenose dolphin from Subsea Noise from effects due to altered prey availability. Therefore, this in-combination impact will not prevent the population of bottlenose dolphin from being maintained as a viable component of the SAC.
		2b. ensure the distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.	There is no significant disturbance to bottlenose dolphin from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects within the SAC. In-combination impacts to prey species are not expected to be significant and therefore, there will be negligible disturbance to bottlenose dolphin foraging activities given their mobile nature, generalist feeding strategy and availability of wider foraging grounds. Prey species populations are expected to be maintained in the long term. Therefore, bottlenose dolphins will continue to use and have access to all areas of the SAC (NatureScot, 2025e) and therefore, significant disturbance will be avoided, and this in-combination impact will not prevent the distribution of bottlenose dolphin throughout the SAC from being maintained.
		2c. ensure the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources for bottlenose dolphins are maintained.	There is no realistic impact pathway for injury to bottlenose dolphin from effects due to altered prey availability at the Proposed Development in-combination with effects due to altered prey availability from other projects and the habitats and processes that support bottlenose dolphin within the SAC and the availability of food. In-combination impacts to prey species are not expected to be significant and therefore, there will be negligible disturbance to bottlenose dolphin foraging activities as prey species populations are expected to be maintained in the long term. Therefore, this in-combination impact will not prevent the supporting habitats and processes relevant to bottlenose dolphin and their prey/food resources from being maintained.

7 Summary

- 7.1.1 A summary of the assessments presented in this RIAA is provided in the sections below. Table 7.1 presents the conclusions of Adverse Effects on Integrity of European Sites in relation to the Proposed Development and in-combination with other projects.

Table 7.1: Summary of Conclusions

Site ID	Site Name	Relevant Qualifying Features	Proposed Development Phase	Potential Impact	Conclusion for the Assessment on the Proposed Development Alone	Conclusion for the Assessment on the Proposed Development In-Combination with other Projects
Annex II Diadromous Fish and Shellfish						
UK0030262	River South Esk SAC	Atlantic salmon Freshwater pearl mussel	Construction	Subsea Noise impacting fish and shellfish	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Impacts to fish and shellfish due to EMF	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
UK0030251	River Dee SAC	Atlantic salmon and freshwater pearl mussel	Construction	Subsea Noise impacting fish and shellfish	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Impacts to fish and shellfish due to EMF	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
UK0030312	River Tay SAC	Atlantic salmon Sea lamprey	Construction	Subsea Noise impacting fish and shellfish	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Impacts to fish and shellfish due to EMF	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
UK0012691	River Tweed SAC	Atlantic salmon	Construction	Subsea Noise impacting fish and shellfish	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Impacts to fish and shellfish due to EMF	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
UK0019811	River Spey SAC	Atlantic salmon Freshwater pearl mussel	Construction	Subsea Noise impacting fish and shellfish	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Impacts to fish and shellfish due to EMF	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site

Site ID	Site Name	Relevant Qualifying Features	Proposed Development Phase	Potential Impact	Conclusion for the Assessment on the Proposed Development Alone	Conclusion for the Assessment on the Proposed Development In-Combination with other Projects
UK0030263	River Teith SAC	Atlantic salmon	Construction	Subsea Noise impacting fish and shellfish	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Impacts to fish and shellfish due to EMF	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
Annex II Marine Mammals						
UK0030311	Firth of Tay and Eden Estuary SAC	Harbour seal	Construction	Injury and disturbance from Subsea Noise generated during piling	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated during UXO clearance	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated during site investigation surveys	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Injury and disturbance from Subsea Noise generated during site investigation surveys	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site

Site ID	Site Name	Relevant Qualifying Features	Proposed Development Phase	Potential Impact	Conclusion for the Assessment on the Proposed Development Alone	Conclusion for the Assessment on the Proposed Development In-Combination with other Projects
				Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			Decommissioning	Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
UK0030172	Isle of May SAC	Grey seal	Construction	Injury and disturbance from Subsea Noise generated during piling	No adverse effect on the integrity of the site	Not applicable
				Injury and disturbance from Subsea Noise generated during UXO clearance	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated during site investigation surveys	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated by vessel	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site

Site ID	Site Name	Relevant Qualifying Features	Proposed Development Phase	Potential Impact	Conclusion for the Assessment on the Proposed Development Alone	Conclusion for the Assessment on the Proposed Development In-Combination with other Projects
				use and other noise producing activities		
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Injury and disturbance from Subsea Noise generated during site investigation surveys	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			Decommissioning	Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
UK0017072	Berwickshire and North Northumberland Coast	Grey seal	Construction	Injury and disturbance from Subsea Noise generated during piling	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site

Site ID	Site Name	Relevant Qualifying Features	Proposed Development Phase	Potential Impact	Conclusion for the Assessment on the Proposed Development Alone	Conclusion for the Assessment on the Proposed Development In-Combination with other Projects
				generated during UXO clearance		
				Injury and disturbance from Subsea Noise generated during site investigation surveys	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Injury and disturbance from Subsea Noise generated during site investigation surveys	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			Decommissioning	Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site

Site ID	Site Name	Relevant Qualifying Features	Proposed Development Phase	Potential Impact	Conclusion for the Assessment on the Proposed Development Alone	Conclusion for the Assessment on the Proposed Development In-Combination with other Projects
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
UK0019808	Moray Firth SAC	Bottlenose dolphin	Construction	Injury and disturbance from Subsea Noise generated during piling	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated during UXO clearance	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated during site investigation surveys	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			O&M	Injury and disturbance from Subsea Noise generated during site investigation surveys	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site

Site ID	Site Name	Relevant Qualifying Features	Proposed Development Phase	Potential Impact	Conclusion for the Assessment on the Proposed Development Alone	Conclusion for the Assessment on the Proposed Development In-Combination with other Projects
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
			Decommissioning	Injury and disturbance from Subsea Noise generated by vessel use and other noise producing activities	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site
				Effects on marine mammals due to altered prey availability	No adverse effect on the integrity of the site	No adverse effect on the integrity of the site

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