CALEDONIA
Offshore Wind Farm

**Code:** UKCAL-CWF-CON-EIA-RPT-00008-1028

# Volume 8 Additional Information

## Appendix 28: Marine Mammals RIAA Updates

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# Volume 8 Appendix 28: Marine Mammals RIAA Updates

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# Acronyms and Abbreviations

| | |
|---|---|
| **AA** | Appropriate Assessment |
| **ADD** | Acoustic Deterrent Device |
| **AEOSI** | Adverse Effect on Site Integrity |
| **CES** | Coastal East Scotland |
| **CI** | Confidence Interval |
| **CO** | Conservation Objective |
| **DAS** | Digital Aerial Survey |
| **dB** | Decibel |
| **EIAR** | Environmental Impact Assessment Report |
| **EPS** | European Protected Species |
| **FCS** | Favourable Conservation Status |
| **HRA** | Habitat Regulation Appraisal |
| **Hz** | Hertz |
| **HND** | Holistic Network Design |
| **iPCoD** | Interim Population Consequences of Disturbance |
| **JNCC** | Joint Nature Conservation Committee |
| **kJ** | kilojoules |
| **km** | kilometres |
| **LSE** | Likely Significant Effects |
| **MU** | Management Unit |
| **MD-LOT** | Marine Directorate – Licensing Operations Team |
| **MMMP** | Marine Mammal Mitigation Plan |
| **NESO** | National Energy System Operator |

| | |
|---|---|
| **OEC** | Offshore Export Cable |
| **OECC** | Offshore Export Cable Corridor |
| **O&M** | Operation and Maintenance |
| **OSP** | Offshore Substation Platform |
| **OWF** | Offshore Wind Farm |
| **PCW** | Phocid in Water |
| **PS** | Piling Strategy |
| **PTS** | Permanent Threshold Shift |
| **RIAA** | Report to Inform Appropriate Assessment |
| **SAC** | Special Area of Conservation |
| **SEA** | Strategic Environmental Assessment |
| **SCOS** | Special Committee on Seals |
| **$SEL_{cum}$** | Cumulative Sound Exposure Level |
| **$SEL_{ss}$** | Single-strike Sound Exposure Level |
| **SMU** | Seal Management Unit |
| **$SPL_{peak}$** | Peak Sound Pressure Level |
| **TLP** | Tension Leg Platform |
| **UXO** | Unexploded Ordnance |
| **VMP** | Vessel Management Plan |
| **WTG** | Wind Turbine Generator |
| **ZoI** | Zone of Influence |

# 1 Introduction

## 1.1 Background

1.1.1.1 This appendix has been prepared to supplement and update elements of the Report to Inform Appropriate Assessment (RIAA) for the offshore infrastructure component of the Caledonia Offshore Wind Farm (OWF) (hereafter referred to as the Proposed Development (Offshore)'), specifically relating to marine mammals. The RIAA was submitted by Caledonia Offshore Wind Farm Limited (hereafter referred to as 'the Applicant'), to the Marine Directorate – Licensing Operations Team (MD-LOT) in November 2024 to provide information to enable the competent authority to undertake the Habitat Regulations Appraisal (HRA).

1.1.1.2 The submitted RIAA documentation split the Proposed Development (Offshore) into two consent applications, referred to as Caledonia North and Caledonia South. The specific documentation that this appendix applies to is the following:

- Application Document 12: Proposed Development (Offshore) Habitat Regulations Appraisal Stage 1 Screening Report;
- Application Document 13: Caledonia North Report to Inform Appropriate Assessment (Parts 1-4);
- Application Document 13, Appendix 13-3: Caledonia North Integrity Matrices;
- Application Document 14: Caledonia South Report to Inform Appropriate Assessment (Parts 1-4); and
- Application Document 14, Appendix 14-3: Caledonia South Integrity Matrices.

1.1.1.3 The RIAA documentation drew upon information from the Environmental Impact Assessment Report (EIAR) and the HRA Stage 1 Screening Report, submitted originally to accompany the Offshore Scoping Report (Volume 7, Appendix 2) to provide baseline information, impact pathways and assessment of potential effects on relevant European sites.

1.1.1.4 Supporting information referenced in this appendix includes documentation submitted as part of the original consent applications in November 2024 and additional information submitted as part of this additional information package. This includes the following:

- Volumes 2, 3 and 4, Chapter 7: Marine Mammals;
- Volume 7B, Appendix 7-1: Marine Mammal Baseline Characterisation;
- Volume 7B, Appendix 7-2: Marine Mammal Underwater Noise Assessment Methodology;

- Volume 7B, Appendix 7-3: Marine Mammals Piling Results (Auditory Injury and Disturbance);
- Volume 7B, Appendix 7-4: Marine Mammals Population Modelling (iPCoD);
- Volume 8, Appendix 22: Marine Mammal Clarifications and Piling Re-Assessment Methodology;
- Volume 8, Appendix 23: Marine Mammals iPCoD Results (Caledonia OWF);
- Volume 8, Appendix 24: Marine Mammals iPCoD Results (Caledonia North);
- Volume 8, Appendix 25: Marine Mammals iPCoD Results (Caledonia South);
- Volume 8, Appendix 26: Marine Mammals Results and Discussion; and
- Volume 8, Appendix 27: Marine Mammals Cumulative Offshore Export Cable Corridor Vessel Disturbance Technical Note.

## 1.2 Purpose of this Document

1.2.1.1 This appendix has been prepared in response to feedback from NatureScot on the submitted RIAAs (Application Documents 13 and 14), to address three points, specifically:

- Additional site screening to include Dornoch Firth and Morrich More Special Area of Conservation (SAC);
- Re-assessment of the Moray Firth SAC; and
- Expansion of the in-combination assessment of vessel disturbance associated with Offshore Export Cable (OEC) installation.

1.2.1.2 NatureScot advised that the Dornoch Firth and Morrich More SAC, designated for harbour seals (*Phoca vitulina*), should have been retained in the assessment in accordance with the precautionary 50km screening threshold as set out in their advice on the Proposed Development (Offshore) HRA Stage 1 Screening Report.

1.2.1.3 In line with this advice, this appendix revisits the screening conclusions for the Dornoch Firth and Morrich More SAC and undertakes a fresh assessment of Likely Significant Effects (LSE) for the qualifying harbour seal feature, considering all relevant impact pathways associated with the Proposed Development (Offshore). Where LSE cannot be excluded, the appendix proceeds to provide information to inform Appropriate Assessment (AA), to determine whether there would be an adverse effect on site integrity (AEoSI), both alone and in-combination with other relevant plans and projects for both Caledonia North and Caledonia South. This screening update is presented in Section 2, with the assessment and underpinning baseline and methodology presented in Sections 3 to 6.

1.2.1.4 With regards to the Moray Firth SAC, NatureScot advised that they were unable to conclude no adverse effect on site integrity for this designated site with respect to behavioural disturbance from pile driving during construction of Caledonia North, Caledonia South or the Proposed Development (Offshore) alone (and therefore also in-combination with other plans and projects), despite the RIAA concluding no adverse effect on site integrity.

1.2.1.5 The Applicant has engaged with NatureScot on this matter and has agreed changes in the approach to the assessment. This has been undertaken alongside refinement of the project design. Therefore, this appendix presents a revised assessment for the Moray Firth SAC, specifically the assessment regarding behavioural disturbance from pile driving during construction of Caledonia North, Caledonia South or the Proposed Development (Offshore) alone and in-combination with other plans and projects, to determine whether there would be an AEoSI. This assessment is presented in Section 7.

1.2.1.6 NatureScot also highlighted that the Proposed Development (Offshore), along with numerous other projects with cable routes intersecting the Coastal East Scotland (CES) Management Unit (MU), may give rise to in-combination vessel disturbance impacts on the bottlenose dolphin (*Tursiops truncatus)* qualifying feature of the Moray Firth SAC. While the original RIAA (Application Documents 13 and 14, Part 4) included an in-combination assessment of vessel activity and concluded no AEoSI, NatureScot requested that additional details be provided specifically on OEC installation. This appendix therefore incorporates an expanded in-combination assessment of vessel disturbance, presented in Section 7 and drawing on cumulative analysis presented in Volume 8, Appendix 27: Marine Mammals Cumulative Offshore Export Cable Corridor Vessel Disturbance Technical Note.

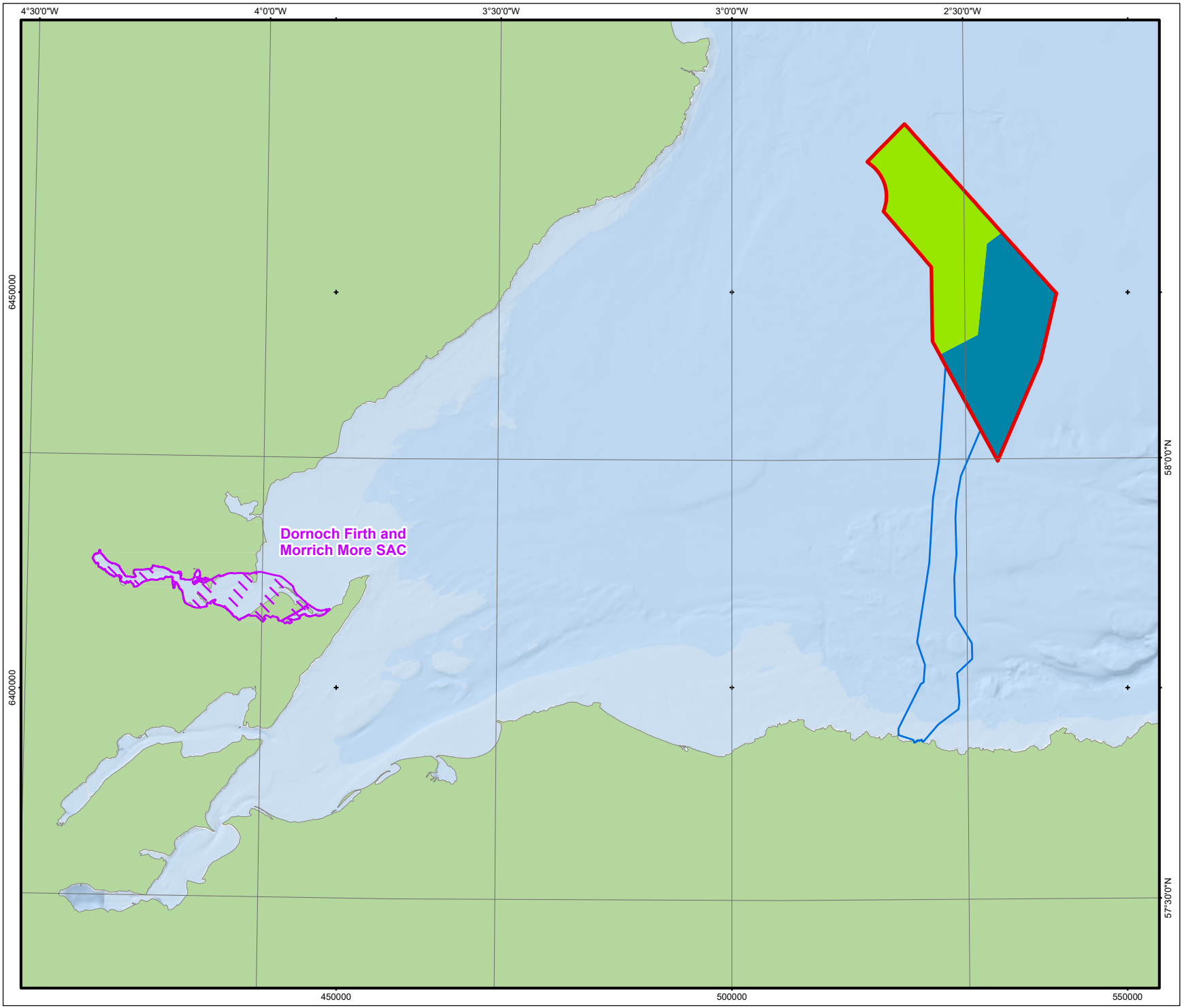
# 2 Screening Update

2.1.1.1 Within the original HRA Stage 1 Screening Report (Application Document 12), the Dornoch Firth and Morrich More SAC was screened in for both Caledonia North and Caledonia South as it is proximate to the Proposed Development (Offshore) (Figure 2-1). The Dornoch Firth and Morrich More SAC lies within the same Seal Management Unit (SMU) as the Proposed Development (Offshore) and a LSE could not be ruled out.

2.1.1.2 In the subsequent RIAAs (Application Documents 13 and 14 (Part 1), Section 2.1.1.4), the Dornoch Firth and Morrich More SAC was screened out through the application of a 50km zone of influence (ZoI) for harbour seals, based on typical foraging distances from haul-out sites. The shortest distance between the Proposed Development (Offshore) and the Dornoch Firth and Morrich More SAC is approximately 83.3km to the Caledonia OWF (i.e., Array Area) and 73.5km to the Caledonia Offshore Export Cable Corridor (OECC).

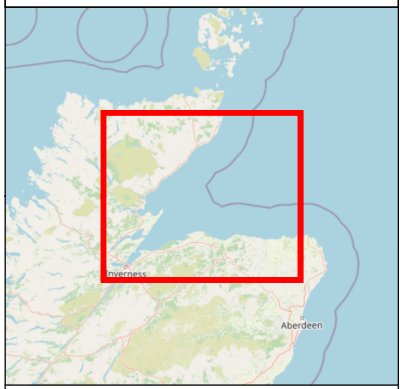
2.1.1.3 Having reviewed the consent applications, NatureScot's representation advised "*screening sites in for assessment if the project site/impact radius is within 50km of the SAC"*. The Dornoch Firth and Morrich More SAC is within 50km of the impact ranges from predicted underwater piling noise and, therefore, the assessment of the site has been revised in line with the NatureScot advice and the site screened in for both Caledonia North and Caledonia South. This should be considered an update to the conclusions in Caledonia North and Caledonia South RIAAs, as set out in Sections 8.1.1 and 9.1.1 of Application Documents 13 and 14, Parts 2 and 3.

2.1.1.4 Only underwater noise from piling (construction and decommissioning) is considered further in this assessment. All other previously identified impact pathways listed in Table 5-3 of the HRA Stage 1 Screening Report (collision risk, accidental pollution, entanglement, barrier effects, water quality and changes to prey) are localised in terms of their ZoI, which is restricted to the footprint of the Caledonia OWF (Caledonia North Site and Caledonia South Site), Caledonia OECC and/or vessels. These ZoIs do not overlap with the screening distance advised by NatureScot and are therefore considered to result in no LSE, in line with the conclusion in the HRA Stage 1 Screening Report submitted as part of the consent applications.




Caledonia OWF
Caledonia North Site
Caledonia South Site
Offshore Export Cable Corridor
Special Area of Conservation (SAC)



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| REV | DATE | DOC STATUS | ORIGIN | REVIEW | APP |
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| 01 | 17/09/2025 | Approved | EV | BB | DH |

CALEDONIA Offshore Wind Farm

GoBe APEM Group

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE

Figure 2-1: Dornoch Firth and Morrich More SAC and the Proposed Development (Offshore)

| STATUS | SCALE | |
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| N/A | 01 of 01 | N/A |

# 3 Environmental Baseline and Site Context

## 3.1 Harbour Seals

3.1.1.1 This section presents new information to be considered included within and apply to Sections 8.2.1 and 9.2.1 in the Caledonia North and Caledonia South RIAAs, Application Documents 13 and 14, Parts 2 and 3.

3.1.1.2 The baseline data presented in this appendix for marine mammals are consistent with those provided in Volume 7B, Appendix 7-1: Marine Mammal Baseline Characterisation, which was summarised in Section 7.4 of Volumes 2, 3 and 4, Chapter 7: Marine Mammals of the EIAR.

3.1.1.3 Harbour seals are widely distributed around the UK, with the highest concentrations on the west coast of Scotland, including the Hebrides, Northern Isles, and Moray Firth (Joint Nature Conservation Committee (JNCC), 2019[1]; Special Committee on Seals (SCOS), 2023[2]). At the UK level, harbour seals are currently assessed as having an Unfavourable – Inadequate conservation status, primarily due to population declines and poor future prospects (JNCC, 2019[1]).

3.1.1.4 The most recent UK-wide population estimate for harbour seals is approximately 42,900 seals in 2021 (95% Confidence Interval (CI): 35,100 – 57,100), with 36,600 seals (95% CI: 30,000 – 48,800) located in Scotland, representing around 85% of the UK population (SCOS, 2023[2]). These estimates are derived from August-haul out counts, adjusted and scaled by the proportion of the population predicted to be ashore during the surveys (Lonergan *et al*., 2013[3]).

3.1.1.5 Along the east coast of Scotland, the distribution of harbour seals is concentrated around the major estuaries, specifically the Moray Firth, the Firth of Forth and the Firth of Tay. These east coast populations have undergone pronounced long-term declines since the 1990s (Morris *et al*., 2021[10]).

3.1.1.6 Harbour seals use specific locations on land known as haul-out sites, typically on sandbanks, beaches, or rocky shores, for resting, breeding, and moulting. Breeding occurs primarily between June and July, when females give birth and nurse pups on land. Moulting follows between July and September, during which seals shed and replace their fur coat. Individuals typically return to their natal haul-out site annually (NatureScot, 2025a[4]).

3.1.1.7 Harbour seals are generalist predators, relying on a thick layer of blubber for energy storage, which is critical during haul-out periods and energetically demanding life stages such as breeding and moulting periods (Wilson and Hammond, 2019[5]). Disturbance near haul-out sites, especially during the breeding season, can increase energy expenditure and stress,

potentially leading to pup abandonment or starvation if nursing is disrupted or mothers are displaced.

3.1.1.8 Foraging behaviour is thought to vary with life stages. Adult harbour seals may forage over wider areas, including offshore habitats, while juveniles and recently weaned pups tend to forage closer to shore (Booth *et al.*, 2019[6]). This coastal tendency may reduce their exposure to disturbances in offshore waters, but younger individuals are more vulnerable due to limited fat reserves and developing foraging skills.

## 3.2 Site-Specific Characterisation

3.2.1.1 Two years of Digital Aerial Surveys (DAS) conducted at the Caledonia OWF recorded no confirmed harbour seal sightings, although 13 unidentified seals were observed over ten months of survey effort (Volume 7, Appendix 19: Caledonia OWF Digital Aerial Surveys).

3.2.1.2 Telemetry data demonstrate limited evidence of harbour seal connectivity between the Moray Firth SMU and other adjacent SMUs (East Scotland SMU and North Coast and Orkney SMU), though the dataset is limited and cannot fully define wider population connectivity. There was one seal tagged in the Moray Firth SMU that showed connectivity with Caledonia North, one that showed connectivity with Caledonia South and three that showed connectivity with the Proposed Development (Offshore) (i.e., Caledonia North and Caledonia South). This resulted in a total of five harbour seals tracked within the Caledonia OWF (see Volume 7B, Appendix 7-1: Marine Mammal Baseline Characterisation for full details).

3.2.1.3 Harbour seal at-sea distribution within the Moray Firth SMU is highly coastal, with highest usage in the inner Moray Firth and extending out of the Dornoch Firth. At-sea densities in the vicinity of the Caledonia OWF are very low in comparison to the high density estimates in the inner Moray Firth. This is reflected in the grid-specific density estimate used in the EIAR assessment, of 0.0003 – 0.0025 based on the Carter *et al.* (2020[7]) and Carter *et al.* (2022[8]) habitat preference maps.

## 3.3 Moray Firth Seal Management Unit

3.3.1.1 The Proposed Development (Offshore) is located within the Moray Firth SMU, which supports a stable but depleted population. Historical declines were substantial, particularly between 1994 and 2003, with populations remaining at least 40% below the pre-2002 level, the year of the second phocine distemper virus outbreak (SCOS, 2023[2]; Thompson *et al.*, 2019[9]).

3.3.1.2 The closest known haul-outs to the Proposed Development (Offshore) are at Boyne Bay (Moray Firth SMU) for Caledonia South, and Ness of Huna (North Coast & Orkney SMU) for Caledonia North.

3.3.1.3 The latest harbour seal count for the Moray Firth SMU was 609 harbour seals in 2021. After adjusting for individuals likely to be at-sea during the count, the total population is estimated at 958 individuals. This SMU estimate is used as the baseline reference population in the assessment as it represents the full population connected to the SAC.

## 3.4 Dornoch Firth and Morrich More SAC

3.4.1.1 The Dornoch Firth and Morrich More SAC is designated for harbour seal as a qualifying feature. The SAC provides critical haul-out, breeding, and foraging habitat and is situated within the Moray Firth SMU. The distances between the Proposed Development (Offshore) and the SAC are approximately 83.3km to Caledonia North, 83.5km to Caledonia South, and 73.5km to the Caledonia OECC.

3.4.1.2 Harbour seals in the SAC are currently assessed as being in Unfavourable – Declining condition (NatureScot, 2025a[4]). This corresponds to an overall decline of approximately 90% since the 1990s (Morris *et al.,* 2021[10]). Specifically, the Dornoch Firth and Morrich More SAC population has undergone a long-term decline of 91.2% since 1992 (SCOS, 2024[11]). A decline has also been observed the short-term, comprising a 7.5% decline between 2023 and 2024, and 37.6% decline between 2018 and 2024 (SCOS, 2024[11]). This long- and short-term decline is consistent with the broader pattern of severe declines on Scotland's east coast.

3.4.1.3 In 1997, the SAC population comprised approximately 42% of the total SMU population, declining to around 6% in 2019. While this decline is pronounced at the SAC, it is not representative of the wider SMU, which is considered stable (NatureScot, 2025a[4]). The latest count in the SAC was of 55 individuals in 2023 (SCOS, 2024[11]).

3.4.1.4 The establishment of Culbin Sands, just over 30km from the SAC, as the main haul-out in the Moray Firth may have contributed to the observed decline in harbour seal numbers within the SAC (NatureScot, 2025a[4]; Morris *et al.,* 2021[10]; SCOS, 2022[12]). However, the exact causes remain unclear, and no site-specific conservation measures have yet been identified to directly address these declines.

3.4.1.5 Ongoing research is investigating potential wider potential drivers, including predation, competition for prey, prey quality and availability, and exposure to harmful algal toxins (NatureScot, 2025a[4]; Arso Civil *et al*., 2019[13]). The Conservation Objectives (COs) for the site therefore focus on maintaining suitable conditions to support population recovery should wider external factors be mitigated.

3.4.1.6 At Dornoch Firth and Morrich More SAC, seals use the sandbars and shores at the mouth of the estuary as haul-out and breeding sites (NatureScot, 2025a[4]). Harbour seals from Dornoch Firth and Morrich More SAC normally feed within 40 to 50km around their haul-out site (NatureScot, 2025a[4]).

# 4 Assessment Criteria

## 4.1 Overview

4.1.1.1 This section presents new information to be considered included within and apply to Sections 8.2.1 and 9.2.1 in the Caledonia North and Caledonia South RIAAs, Application Documents 13 and 14, Parts 2 and 3.

4.1.1.2 This section describes the approach used to assess the potential effects of piling noise on harbour seals in the context of the Dornoch Firth and Morrich More SAC. It outlines the project parameters and associated worst-case scenarios (spatial and temporal), identifies the relevant mitigation measures, and summarises the underwater noise criteria applied in the assessment.

## 4.2 Proposed Development (Offshore) Parameters

### 4.2.1 Design Envelope Changes

4.2.1.1 Since submission of the EIAR and RIAA, the Applicant has been developing the project design and has refined the maximum number of anchors per floating WTG which has in turn reduced the total number of piling days associated with constructing the floating component of the Proposed Development (Offshore). The number of anchors required for tension leg platform (TLP) outline design has been reduced from 18 anchors per Wind Turbine Generator (WTG) to six anchors per WTG. Consequently, the number of piled anchors required is now the same for both TLPs and semi-submersibles, with each requiring up to six anchors per WTG.

4.2.1.2 All revised piling scenarios now assume that four pin piles would be installed per day for bottom-fixed foundations (one full substructure jacket per day) and one anchor pile would be installed per day for floating substructures. Given that semi-submersible structures assume the installation of one pile per day, compared to 1.71 piles per day for TLPs, the assumptions for the semi-submersible foundations were adopted as the worst-case temporal scenario because they result in the longest duration.

4.2.1.3 For full details on design changes and what this means for the Marine Mammal EIAR assessment, see Volume 8, Appendix 12: Marine Mammals Clarifications and Piling Re-Assessment Methodology.

### 4.2.2 Worst-case Scenarios

4.2.2.1 The following project parameters are used to define the worst-case spatial and temporal scenarios for underwater noise exposure to harbour seals.

4.2.2.2 The total number of WTGs varies depending on whether the Proposed Development (Offshore) is built (or in this context, assessed) as:

- Caledonia OWF (i.e, Array Area of the Proposed Development (Offshore));
- Caledonia North Site; or
- Caledonia South Site.

4.2.2.3 Importantly, the number of WTGs as part of the Proposed Development (Offshore) is not simply the sum of Caledonia North and Caledonia South in isolation. Therefore, the assessment considers these different build scenarios separately:

- Concurrent Construction Scenario – Caledonia North and Caledonia South are built at the same time; and
- Sequential Construction Scenario – Caledonia North and Caledonia South are built one after the other, with no gap between the two.

4.2.2.4 Although the design envelope includes different foundation and anchor technologies for fixed bottom and floating WTGs, both scenarios modelled assess installation using pin piles for jackets and anchors as this results in a temporal worst-case scenario. The Sequential Scenario represents the longest construction duration and, therefore, the worst case for temporal disturbance, and it forms the basis of the quantitative piling assessment. The Concurrent Scenario is also presented, mainly for comparison, and has been included in the cumulative population modelling to show how impacts differ between concurrent and sequential build options.

4.2.2.5 For the purposes of this assessment, monopile installation is considered the spatial worst-case scenario, as it requires the highest hammer energies and, therefore, represents the greatest potential for disturbance at any given location. Jacket foundations with pin-piles are considered the temporal worst-case scenario, as they require longer installation durations, resulting in extended periods of underwater noise exposure. Both spatial and temporal scenarios are presented here to define the full project design envelope.

4.2.2.6 In the context of the Dornoch Firth and Morrich More SAC, assessment of effects on harbour seals primarily focused on the spatial worst-case scenario, as this determines the extent to which underwater noise may propagate into the SAC. However, the temporal worst-case scenario is also relevant, since harbour seals designated within the SAC are part of the wider Moray Firth SMU and are known to range beyond the SAC boundary. Duration of piling is therefore an important consideration for assessing

exposure of SAC seals when foraging in connected areas, and in considering potential in-combination effects at the SMU scale.

4.2.2.7 Piling is anticipated to take place between 2028 and 2032, depending on the construction scenario (concurrent or sequential). Key piling parameters are summarised below:

- Caledonia North (see Table 8-2 within Application Document 13: Caledonia North RIAA (Part 2) for full details):
  - 77 WTGs and two Offshore Substation Platforms (OSPs); all bottom-fixed foundations.
  - Spatial worst-case scenario: 79 monopile installation, up to 6,600 kilojoules (kJ) hammer energy, 14m diameter, two monopiles installed per day with concurrent piling at two locations, total of 40 piling days.
  - Temporal worst-case scenario: 79 jackets with pin piles, up to 4,400kJ hammer energy, four legs per jacket, 4m diameter, four pin piles installed per day, total of 79 piling days over three years.
- Caledonia South (see Table 9-2 within Application Document 14: Caledonia South RIAA (Part 3) for full details):
  - 78 WTGs (39 bottom-fixed and 39 floating) and two OSPs (bottom-fixed); mix of bottom-fixed and floating foundations.
  - Spatial worst-case scenario: 80 monopiles, up to hammer energy 6,600kJ, 14m diameter, two monopiles installed per day with concurrent piling at two locations, total of 40 piling days.
  - Temporal worst-case scenario (bottom-fixed foundations): 41 jackets with pin-piles, up to 4,400kJ hammer energy, four legs per jacket, 4m diameter, four pin piles installed per day, total of 41 piling days;
  - Temporal worst-case scenario (floating foundations): 39 pin-piles for anchors, up to 2,000kJ hammer energy, three legs with six tendons per leg, six anchor per WTG, 4.8m diameter, one pile installed per day, total of 234 piling days (1 anchor/day);
  - Total temporal worst-case scenario: up to 275 piling days across three years.
- Proposed Development (Offshore) (see Table 10-6 within Application Documents 13 and 14: Proposed Development (Offshore) RIAA (Part 4) for full details):
  - Combined areas of Caledonia North and Caledonia South; maximum of 140 WTGs (101 bottom-fixed and 39 floating) and four OSPs (4 bottom-fixed); mix of bottom-fixed and floating foundations.
  - Spatial worst-case scenario: 144 monopiles, up to hammer energy 6,600kJ, 14m diameter, two monopiles installed per day with concurrent piling at two locations, total of 72 piling days.

- Temporal worst-case scenario (bottom-fixed foundations): 105 jackets with pin-piles, up to 4,400 kJ hammer energy, four legs per jacket, 4m diameter, four pin piles installed per day, total of 105 piling days;
- Temporal worst-case scenario (floating foundations): 39 pin-piles for anchors, max 2,000kJ hammer energy, three legs with six tendons per leg, six anchor per WTG, 4.8m diameter, one pile installed per day, total of 234 piling days (1 anchor/day);
- Total temporal worst-case scenario: up to 339 piling days across three years.

4.2.2.8 It is highlighted that, whilst it is not the spatial worst-case scenario, concurrent pin piles are also included within the proposed development parameters.

### 4.2.3 Project Mitigation

4.2.3.1 Project-specific mitigation of relevance for underwater noise from piling includes:

- M-11 – Development of and adherence to a Piling Strategy (PS);
  - The PS will detail the method of pile installation and associated noise levels, including mitigation measures to be put in place (for example, soft starts and ramp ups, use of Acoustic Deterrent Devices (ADDs) during piling).
- M-16 – Development of and adherence to a Marine Mammal Mitigation Plan (MMMP)
  - The MMMP will identify appropriate mitigation measures during offshore activities that are likely to produce underwater noise and vibration levels capable of causing injury or disturbance to marine mammals, including piling, unexploded ordnance (UXO) clearance, and geophysical surveys. This will be developed alongside the PS and referred to in European Protected Species (EPS) licence applications.

4.2.3.2 These measures provide a high-level mitigation framework and allow commitment to refined post-consent design development. Of note, these mitigation measures primarily focus on managing and reducing the risk of auditory injury or mortality rather than reducing the risk of behavioural disturbance.

## 4.3 Underwater Noise Criteria

### 4.3.1 Overview

4.3.1.1 The technical evidence base for underwater noise assessment is provided in Volume 7B, Appendix 7-2: Marine Mammals Underwater Noise Assessment Methodology, which details the assessment methodology for the underwater noise from various sources including piling.

4.3.1.2 Underwater noise modelling was undertaken to estimate the underwater noise levels likely to arise during the construction of the offshore infrastructure across eight representative locations across the Proposed Development (Offshore), covering a range of water depths, distances to shore and foundation types (bottom-fixed and floating). Full results are provided in Volume 7B, Appendix 7-3: Marine Mammal Piling Results (Auditory Injury and Disturbance).

4.3.1.3 This assessment focuses on underwater noise from piling specifically and considers two effects pathways for quantitative assessment:

- Auditory injury (Permanent Threshold Shift (PTS); assessed using a dual-threshold criteria of using Southall *et al*. (2019[14]).
- Behavioural disturbance; assessment using species-specific dose-response functions (Whyte *et al*., 2020[15]).

4.3.1.4 Harbour seals belong to the Phocid in Water (PCW) functional hearing group from Southall *et al*. (2019[14]), with a generalised hearing range of 50 hertz (Hz) to 86 kilohertz (kHz). PCW have an estimated region of greatest sensitivity at frequencies between 1.9 - 30kHz, peaking at 13kHz.

### 4.3.2 Auditory Injury

4.3.2.1 The risk of auditory injury (PTS-onset) was assessed against both peak sound pressure level ($SPL_{peak}$) and cumulative sound exposure level ($SEL_{cum}$) thresholds presented in Southall *et al*. (2019[14]). $SPL_{peak}$ typically defines the near-field risk close to piling, while $SEL_{cum}$ reflects potential cumulative exposure at greater distances.

4.3.2.2 The distances at which $SPL_{peak}$ and $SEL_{cum}$ thresholds were exceeded were assessed for monopile, jacket, and anchor foundations across single and concurrent piling scenarios (see Volume 7B, Appendix 7-3: Marine Mammal Piling Results). Maximum ranges for $SPL_{peak}$ were up to 60m (at any location) and for $SEL_{cum}$ up to 22km (concurrent piling at Caledonia North and South). Using the aforementioned at-sea harbour seal density estimates, less than one individual harbour seal was predicted to be exposed to noise levels that could cause PTS, under all scenarios.

4.3.2.3 Given these distances relative to the Dornoch Firth and Morrich More SAC (86.4km from the Proposed Development (Offshore)), there is no plausible pathway for auditory injury to harbour seals associated with the SAC. Seals present outwith the site, but within their typical range of 50km, would not be exposed to noise levels that could lead to auditory injury. Consequently, auditory injury from underwater noise associated with piling is not assessed further within this appendix.

### 4.3.3 Behavioural Disturbance from Piling

4.3.3.1 The potential for behavioural disturbance was assessed using modelled 5 decibel (dB) noise contours overlaid on harbour seal at-sea surface densities from Carter *et al*. (2020[7]), with responses estimated using the dose-response function derived by Whyte *et al*. (2020[15]). This dose-response function was based on telemetry data from harbour seals in the Wash which demonstrated how seal at-sea habitat usage changed in relation to the pile driving activities during the construction of the Lincs OWF in 2011-2012.

4.3.3.2 For the purpose of this assessment, the dose is the received single-strike sound exposure level ($SEL_{ss}$) which is considered to be best practice for this type of assessment (Southall *et al*., 2021[16]). $SEL_{ss}$ contours at 5dB intervals were generated through noise modelling (see Volume 7B, Appendix 7-3: Marine Mammal Piling Results (Auditory Injury and Disturbance) to quantify the number of animals receiving each $SEL_{ss}$, and subsequently the number of animals likely to be disturbed based on the dose-response curve.

4.3.3.3 For the full set of results (all modelling locations, all foundation designs and sets of densities) and more information regarding the assessment method (application of dose-response), see Volume 7B, Appendix 7-3: Marine Mammals Piling Results (Auditory Injury and Disturbance).

## 4.4 Population Modelling

4.4.1.1 To assess whether the disturbance associated with piling activities at the Proposed Development (Offshore) could lead to population-level impacts, Interim Population Consequences of Disturbance (iPCoD) modelling was undertaken. Full details of the methodology, its assumptions and limitations, together with the complete set of results, are presented in Volume 7B, Appendix 7-4: Marine Mammals Population Modelling (iPCoD).

4.4.1.2 When interpreting the iPCoD results for harbour seals, it is important to note that the two SMUs used in the EIAR assessments of relevance to the Proposed Development (Offshore) (Moray Firth SMU and the North Coast and Orkney SMU) have different population trajectories and demographic parameters (as recommended in Sinclair *et al*., 2020[17]). The Moray Firth SMU population is considered to be stable, whereas the North Coast and Orkney SMU is in decline, with an average rate of decrease of approximately 8.5% per year over the past five years (SCOS, 2023[2]). Accordingly, the original iPCoD modelling was ran separately for each SMU population to reflect these differences.

4.4.1.3 Following consultation, updated modelling was subsequently undertaken (see Volume 8, Appendix 22: Marine Mammals Clarifications and Piling Re-Assessment for full details). Regarding harbour seals, the cumulative assessment only was re-modelled using iPCoD; no re-modelling of the alone assessment was undertaken.

4.4.1.4 For harbour seals specifically, the cumulative re-assessment followed NatureScot advice to:

- Apply the dose-response function from Whyte *et al*. (2020[15]);
- Recalculate the number of animals affected using the newest Carter *et al.* (2025[18]) at-sea density surfaces, tested at worst-case locations (CAL04 and CAL08); and
- Align SMU sizes with those reported in SCOS (2024[11]) rather than SCOS (2023[2]).

4.4.1.5 The re-calculation of the number of animals using the newest Carter *et al.* (2025[18]) provided a higher estimate of animals affected (as shown in Volume 8, Appendix 22: Marine Mammals Clarifications and Piling Re-Assessment for full detail). Therefore, these values were carried forward to the cumulative iPCoD assessment.

4.4.1.6 The cumulative iPCoD outputs, incorporating the updated densities and SMU sizes, are presented in Volume 8, Appendices 23, 24 and 25 and considered within the in-combination section of this appendix (Section 6).

4.4.1.7 It is highlighted that the outputs presented in Volume 7B, Appendix 7-4: Marine Mammals Population Modelling (iPCoD) remain applicable to the Proposed Development (Offshore) alone assessment.

4.4.1.8 It should also be noted that the assessment provided for the Proposed Development (Offshore) (both concurrent and sequential installation scenarios) covers the cumulative effects of Caledonia North and Caledonia South. Accordingly, separate iPCoD modelling has not been undertaken for Caledonia North versus Caledonia South individually.

# 5 Assessment of Adverse Effects on Site Integrity Alone

## 5.1 Overview

5.1.1.1 This section presents new information to be considered included within and apply to Sections 8.2.1 and 9.2.1 in the Caledonia North and Caledonia South RIAAs, Application Documents 13 and 14, Parts 2 and 3.

5.1.1.2 This section assesses whether piling noise from the Proposed Development (Offshore) could have an AEoSI on the harbour seal qualifying feature of the Dornoch Firth and Morrich More SAC. Potential for LSE was identified at screening for underwater noise impacts from piling during construction and decommissioning (see Section 2).

5.1.1.3 Piling generates levels of underwater noise that can pose a risk of auditory injury and behavioural disturbance to harbour seals during the construction stage. The assessment focuses solely on disturbance from piling noise, as risk of auditory injury (PTS) is predicted to occur at distances well outside the ZoI for the SAC and is not considered a realistic pathway (see Section 4.3.2.3).

5.1.1.4 The HRA Stage 1 Screening Report (Application Document 12) determined that the potential for LSE in relation to underwater noise during decommissioning would be similar to, and potentially less, than that outlined in the construction phase. The potential for effect during decommissioning would fall within, and be no worse than, the degree of effect during construction, with any such decommissioning being subject to the relevant licensing requirements at that time. Therefore, the conclusions for the construction phase of underwater noise from piling are considered to also apply to decommissioning.

5.1.1.5 The Dornoch Firth and Morrich More SAC is located approximately:

- 83.3km from the Caledonia North Site;
- 83.5km from the Caledonia South Site;
- 83.3km from the Caledonia OWF; and
- 73.5km from the Caledonia OECC.

5.1.1.6 Harbour seals designated within the Dornoch Firth and Morrich More SAC are considered part of the wider Moray Firth SMU population. Harbour seals are highly mobile species that routinely move between the SAC and wider foraging grounds across the SMU, meaning that their condition within the SAC is closely linked the status of the SMU population. For this reason, assessment of disturbance effects (in terms of number of animals disturbed as a proportion of a reference population) is undertaken at the SMU scale.

## 5.2 Dornoch Firth and Morrich More SAC

### 5.2.1 Conservation Objectives

5.2.1.1 The assessment is undertaken with respect to the COs for the harbour seal qualifying feature of the Dornoch Firth and Morrich More SAC (NatureScot, 2025a[4]). The COs for the site are:

- CO 1: To ensure that the qualifying features of Dornoch Firth and Morrich More SAC are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status (FCS).
- CO 2: To ensure that the integrity of Dornoch Firth and Morrich More SAC is restored in the context of environmental changes by meeting the following objectives (2a, 2b and 2c) for each qualifying feature. For harbour seal:
  - 2a: Harbour seals are a viable component of the site;
  - 2b: The distribution of harbour seals throughout the site are maintained by avoiding significant disturbance; and
  - 2c: The supporting habitats and processes relevant to harbour seal are maintained.

### 5.2.2 Site-specific Advice on Conservation Objectives

5.2.2.1 The following advice provides further detail on how the above COs should be interpreted and applied for the harbour seal feature of the Dornoch Firth and Morrich More SAC:

- For CO 2a: This objective seeks to minimise the risk to harbour seals from injury or mortality posed by activities to ensure the species has the ability to recover. It protects the species from significant risk of incidental injury and injury within and outwith the site.
- For CO 2b: It is expected that significant disturbance will lead to more than a transient effect on harbour seals and may result in the following effects:
  - contributes to the long-term decline in the use of the site by harbour seals;
  - changes to the distribution of harbour seals on a continuing or sustained basis; and
  - changes to harbour seal behaviour such that it reduced the ability of the species to survive, breed, or rear their young.
- For CO 2c: Maintain the extent, quality and distribution of the supporting habitat required by breeding and moulting seals. Supporting habitat refers to the characteristics of the haul-out areas used by harbour seals for breeding and moulting.

## 5.3 Assessment of Piling Noise (Disturbance)

### 5.3.1 Overview

5.3.1.1 This section considers whether the Proposed Development (Offshore) alone could result in behavioural disturbance to harbour seals associated with the Dornoch Firth and Morrich More SAC during construction that would lead to an AEoSI to the site. The assessment is undertaken with reference to the following site COs:

- CO 1: To ensure that the qualifying features of Dornoch Firth and Morrich More SAC are in favourable condition and make an appropriate contribution to achieving FCS; and
- CO 2b: The distribution of harbour seals throughout the site are maintained by avoiding significant disturbance.

5.3.1.2 Evidence from tagging studies (Russell *et al*., 2016[19]) and expert elicitation workshops (Booth *et al*., 2019[6]) indicates that harbour seals generally tolerate short-term displacement from piling due to their mobility, generalist diet and energy reserves.

5.3.1.3 Experts noted that the impact of disturbance depends on location, with greater effects if animals are displaced from foraging grounds rather than transit areas. While repeated disturbance could theoretically reduce fertility in animals in poor condition, this remains highly uncertain (Booth *et al*., 2019[6]).

5.3.1.4 The predicted 5dB $SEL_{ss}$ disturbance contours (Whyte *et al*., 2020[15]) from the Proposed Development (Offshore) are located approximately 19-82km from the Dornoch Firth and Morrich More SAC when considering the worst-case location for Caledonia North (CAL04; see Figure 5-1). The contours are located approximately 12-85km from the SAC when considering the worst-case location for Caledonia South (CAL08; see Figure 5-2).

5.3.1.5 In both cases, the predicted disturbance contours do not overlap with the Dornoch Firth and Morrich More SAC boundary, indicating that no underwater noise effects from piling are predicted within the designated site itself. However, harbour seals designated within the SAC are known to range outside the site boundary, with foraging trips commonly undertaken up to 40-50km from the SAC boundary (NatureScot, 2025a[4]). Disturbance could therefore occur to SAC-associated individuals within this foraging range when using connected areas of the Moray Firth SMU.

### 5.3.2 Predicted Disturbance within the Moray Firth SMU

5.3.2.1 Predicted maximum numbers of harbour seals disturbed per day by piling under different scenarios are summarised for each phase below, with percentages calculated relative to the Moray Firth SMU population estimate of 958 individuals (see Section 3.3).

#### Caledonia North

5.3.2.2 The number of harbour seals predicted to be disturbed by piling of a single monopile on any given day within the Moray Firth SMU is a maximum of 61 individuals, representing 6.37% of the SMU (CAL04; see Figure 5-1). For concurrent piling, a maximum of 63 animals are predicted to be disturbed (6.58% SMU; CAL01 and CAL04).

5.3.2.3 The number of harbour seals predicted to be disturbed by pin-piling on any given day within the Moray Firth SMU is a maximum of 53 individuals, representing 5.53% of the SMU (CAL04). For concurrent piling, a maximum of 63 animals are predicted to be disturbed (6.58% SMU; CAL01 and CAL04).

#### Caledonia South

5.3.2.4 The number of harbour seals predicted to be disturbed by single monopile on any given day within the Moray Firth SMU is a maximum of 71 individuals, representing 7.41% of the SMU (CAL08; see Figure 5-2). For concurrent piling, a maximum of 75 animals are predicted to be disturbed (7.83% SMU; CAL03 and CAL08).

5.3.2.5 The number of harbour seals predicted to be disturbed by pin-piling for jackets on any given day within the Moray Firth SMU is a maximum of 58 individuals, representing 6.05% of the SMU (CAL08). For concurrent piling, a maximum of 62 animals are predicted to be disturbed (6.47% of SMU; CAL03 and CAL08).

5.3.2.6 The number of harbour seals predicted to be disturbed by pin-piling for anchors on any given day within the Moray Firth SMU is a maximum of 39 individuals, representing 4.07% of the SMU (CAL08). For concurrent piling, a maximum of 42 animals are predicted to be disturbed (4.38% of SMU; CAL05 and CAL08).

### Proposed Development (Offshore)

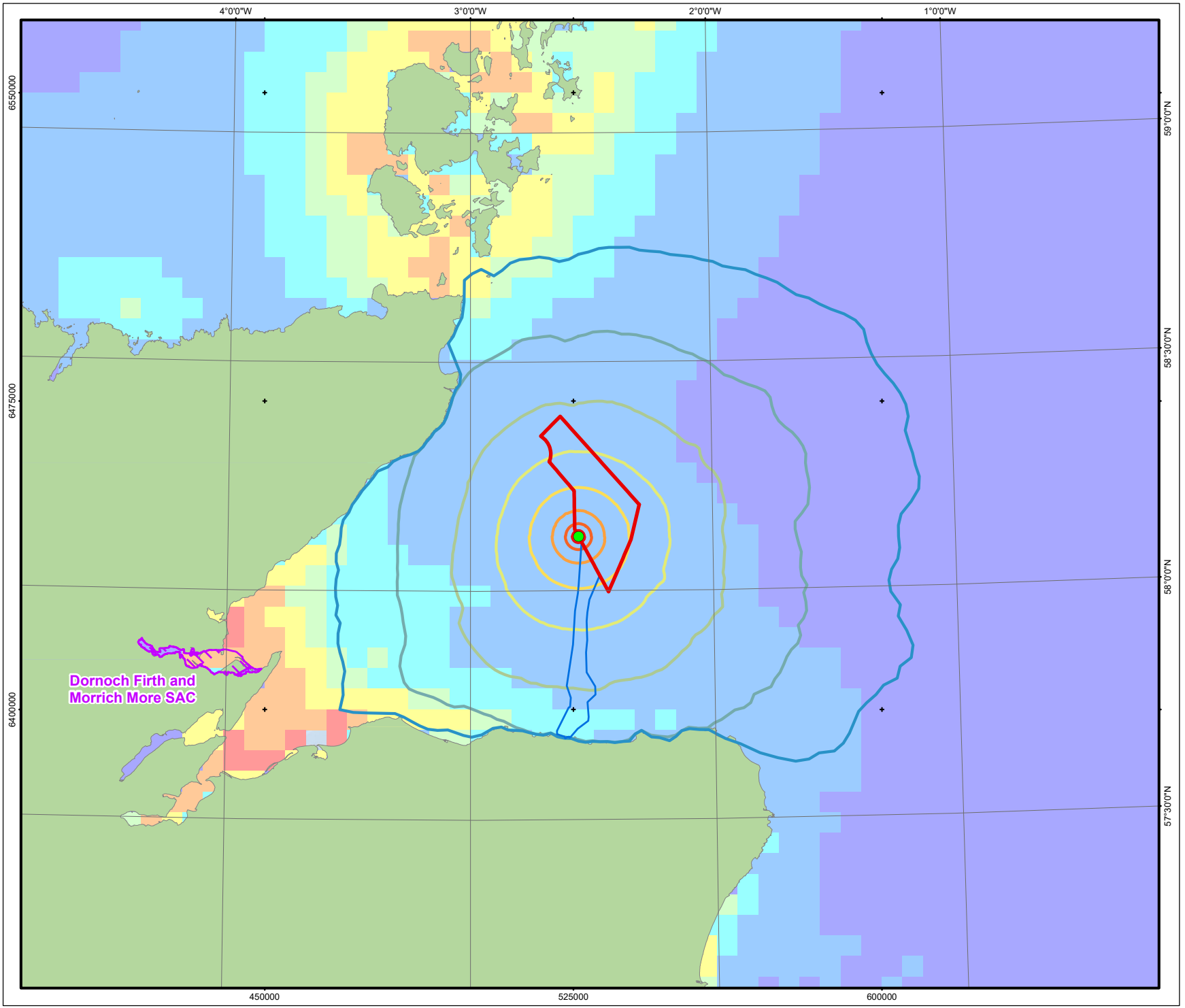
5.3.2.7 The number of harbour seals predicted to be disturbed by single piling on any given day within the Moray Firth SMU is a maximum of 71 individuals, representing 7.41% of the SMU (CAL08; see Figure 5-2). For concurrent piling, a maximum of 77 animals are predicted to be disturbed (8.04% SMU; CAL01 and CAL08).

5.3.2.8 The number of harbour seals predicted to be disturbed by pin-piling for jackets on any given day within the Moray Firth SMU is a maximum of 58 individuals, representing 6.05% of the SMU (CAL08). For concurrent piling, a maximum of 65 animals are predicted to be disturbed (6.78% of SMU; CAL01 and CAL08).

5.3.2.9 The number of harbour seals predicted to be disturbed by pin-piling for anchors on any given day within the Moray Firth SMU is a maximum of 39 individuals, representing 4.07% of the SMU (CAL08). For concurrent piling, a maximum of 42 animals are predicted to be disturbed (4.38% of SMU; CAL05 and CAL08).

## 5.3.3 iPCoD Results

5.3.3.1 The results of the iPCoD modelling for the Moray Firth SMU indicates, for all construction scenarios (concurrent or sequential), the predicted level of disturbance is not sufficient to result in any changes at the population level. The Moray Firth SMU is predicted to continue at a stable trajectory and at the same size as the un-impacted population. Refer to Volume 7B, Appendix 7-4: Marine Mammals Population Modelling (iPCoD) for detailed iPCoD results.




Caledonia OWF

Offshore Export Cable Corridor

Modelling Location 4

Special Area of Conservation (SAC)

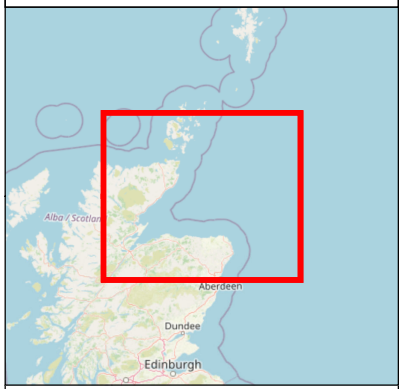
**% of the British Isles At-Sea Population Per Cell**

- 0
- 0 - 0.001
- 0.001 - 0.005
- 0.005 - 0.01
- 0.01 - 0.025
- 0.025 - 0.05
- >0.05

**Noise Contours (SELss, dB re 1 µPa2s) - Probability of response based on Whyte *et al.* (2020) in brackets**

- 145 (36.37%)
- 150 (47.31%)
- 155 (48.72%)
- 160 (48.52%)
- 165 (54.38%)
- 170 (76.26%)
- 175 (64.8%)
- 180 (100%)






0 10 20 30 40 km

| REV | DATE | DOC STATUS | ORIGIN | REVIEW | APP |
|---|---|---|---|---|---|
| 01 | 17/09/2025 | Approved | EV | BB | DH |

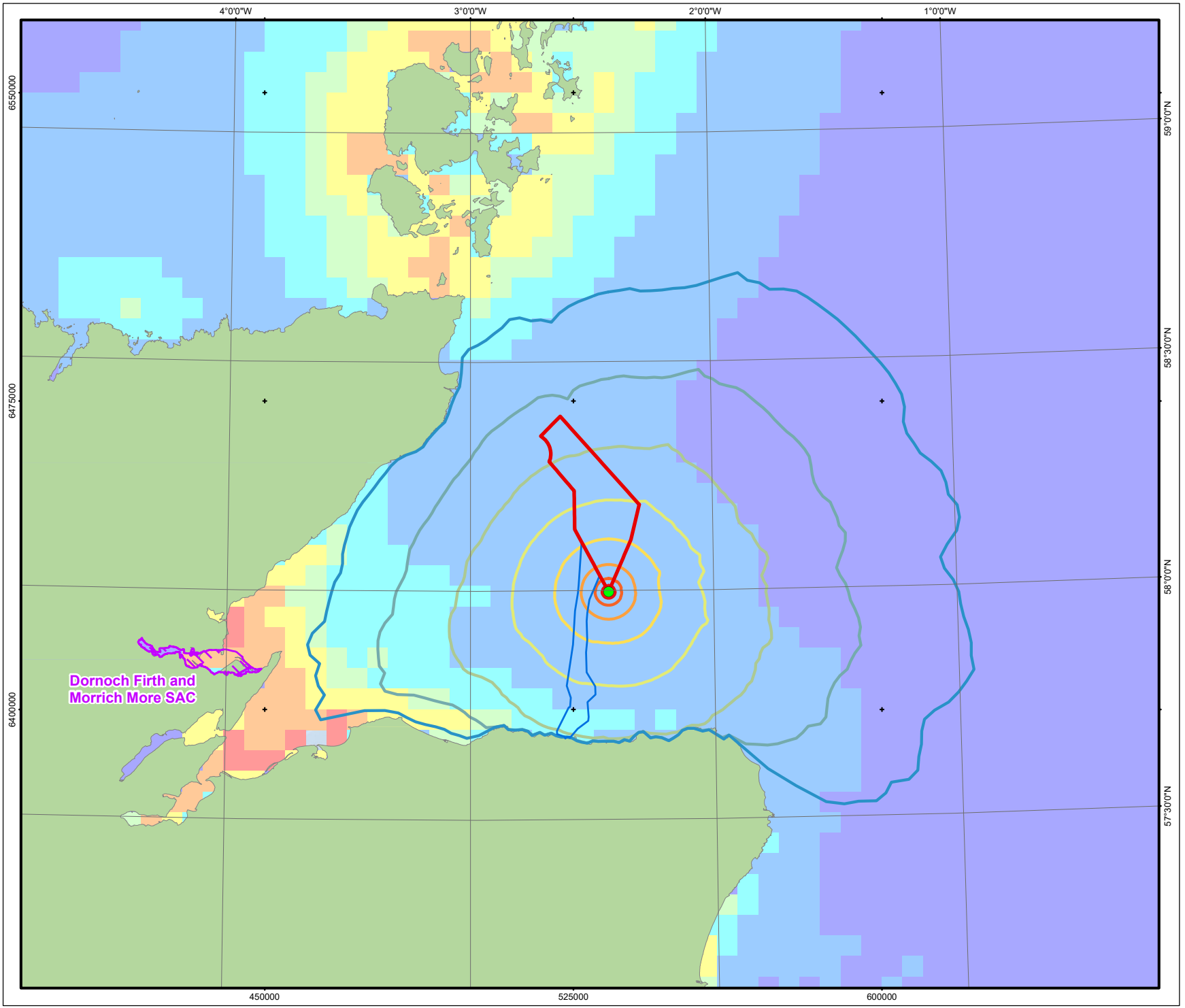
CALEDONIA Offshore Wind Farm

GoBe APEM Group

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE
Figure 5-1: Behavioural Disturbance Contours for the Installation of a Monopile at 6,600 kJ at Location 4 and Harbour Seal Density based on Carter et al. (2020)

| STATUS | SCALE | |
|---|---|---|
| Approved | 1:1,250,000 | |
| DRAWING NUMBER | SHEET NO | REV |
| N/A | 01 of 01 | N/A |




Caledonia OWF

Offshore Export Cable Corridor

Modelling Location 8

Special Area of Conservation (SAC)

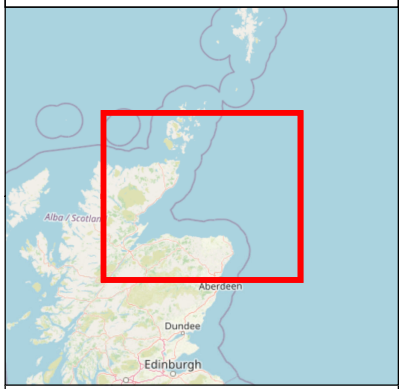
**% of the British Isles At-Sea Population Per Cell**

- 0
- 0 - 0.001
- 0.001 - 0.005
- 0.005 - 0.01
- 0.01 - 0.025
- 0.025 - 0.05
- >0.05

**Noise Contours (SELss, dB re 1 µPa2s) - Probability of response based on Whyte *et al.* (2020) in brackets**

- 145 (36.37%)
- 150 (47.31%)
- 155 (48.72%)
- 160 (48.52%)
- 165 (54.38%)
- 170 (76.26%)
- 175 (64.8%)
- 180 (100%)






0 10 20 30 40 km

| REV | DATE | DOC STATUS | ORIGIN | REVIEW | APP |
|---|---|---|---|---|---|
| 01 | 17/09/2025 | Approved | EV | BB | DH |

CALEDONIA Offshore Wind Farm

GoBe APEM Group

GEODETIC PARAMETERS
WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE
Figure 5-2: Behavioural Disturbance Contours for the Installation of a Monopile at 6,600 kJ at Location 8 and Harbour Seal Density based on Carter et al. (2020)

| STATUS | SCALE | |
|---|---|---|
| Approved | 1:1,250,000 | |
| DRAWING NUMBER | SHEET NO | REV |
| N/A | 01 of 01 | N/A |

### 5.3.4 Proposed Development (Offshore) Alone Conclusion

5.3.4.1 Harbour seals are known to tolerate short-term displacement and typically return to affected areas once activity ceases. Disturbance from piling is expected to be temporary, intermittent, and localised, and the Dornoch Firth and Morrich More SAC lies approximately 86km from the Proposed Development (Offshore), and no disturbance contours extend into the SAC boundary, meaning disturbance within the site itself is expected to be negligible. However, SAC-associated seals are part of the wider Moray Firth SMU and are known to range beyond the SAC boundary. Predicted disturbance levels at the SMU scale therefore capture the potential effects on SAC animals via this connectivity pathway.

5.3.4.2 In summary, the assessment has taken a precautionary approach by applying worst-case disturbance parameters and has determined that the maximum number of harbour seals predicted to be disturbed on any piling day is up to 8.04% of the Moray Firth SMU, or 77 individuals, under the combined Proposed Development (Offshore) scenario. When considering with Caledonia North and Caledonia South separately, a maximum disturbance of up to 6.58% and 7.83% of the Moray Firth SMU (63 and 75 individuals) is predicted, respectively.

5.3.4.3 Furthermore, the iPCoD results shows no population-level consequences for the Moray Firth SMU under concurrent or sequential build out. Therefore, behavioural disturbance from piling is not predicted to result in significant negative effects on individuals or the population associated with the Dornoch Firth and Morrich More SAC, nor is it expected to compromise favourable condition (CO 1) or result in changes to distribution (CO2b).

5.3.4.4 **It is therefore concluded that the Proposed Development (Offshore) alone will not result in any AEoSI in relation to behavioural disturbance from piling during construction or decommissioning, and that, subject to natural change, the population of harbour seal will be maintained in the long-term.**

# 6 Assessment of AEoSI In-Combination

## 6.1 Overview

6.1.1.1 This section presents new information to be considered included within and apply to Section 10.3.2 in the Caledonia North and Caledonia South RIAAs, Application Documents 13 and 14, Part 4.

6.1.1.2 This section presents an assessment of AEoSI on the Dornoch Firth and Morrich More SAC harbour seal feature in-combination with other plans and projects.

6.1.1.3 This assessment only considers the impact pathway of behavioural disturbance from piling noise. All other potential impacts were concluded to cause no LSE to the Dornoch Firth and Morrich More SAC and are excluded from the in-combination assessment due to highly localised nature of impacts.

6.1.1.4 This section builds upon the piling disturbance alone assessment presented in Section 5.3 and considers potential in-combination effects with other plans or projects identified through the screening process (Section 6.2).

6.1.1.5 The in-combination assessment of AEoSI has been undertaken on the basis of the Proposed Development (Offshore) as a whole. Caledonia North and Caledonia South are therefore not considered as separate projects for this assessment.

6.1.1.6 Piling for the Proposed Development (Offshore) is anticipated between 2028 and 2032. For the purpose of the assessment, an additional year either side of the proposed piling window is included for contingency. Therefore, the resulting temporal window for consideration of other projects between 2027 and 2033.

6.1.1.7 Each phase of piling (Caledonia Noth and Caledonia South) is estimated to take up to three years to complete. Therefore, the two construction scenarios are considered:

- Concurrent scenario: 2028 to 2030; and
- Sequential scenario (assuming no gap): 2028 to 2032.

6.1.1.8 While the design envelope allows for a sequential scenario with up to a five-year gap between Caledonia North and South, this has not been taken forward for the in-combination assessment because it results in fewer overlapping projects and is therefore less conservative. The sequential no-gap scenario maximises overlap with the greatest number of other projects and therefore represents the worst-case in terms of potential cumulative disturbance to harbour seals (see Volume 8, Appendix 22: Marine Mammal Clarifications and Piling Re-Assessment Methodology for full details).

6.1.1.9 Decommissioning timeframes for all projects are highly uncertain and, therefore, an assessment of the potential for an in-combination effect during decommissioning cannot be made at this time. However, it is likely that the potential for effects during decommissioning would be lower than those during construction and would be addressed at the time under the relevant regulatory requirements.

## 6.2 Screening

6.2.1.1 The methodology for screening of other plans and projects follows the approach set out in Section 10.1.2 of the RIAA (Application 13: Caledonia North RIAA (Part 4) and Application 14: Caledonia South RIAA (Part 4)) as submitted in November 2024. For the marine mammals assessment, screening was undertaken on a species-specific basis using the relevant MUs as a precautionary spatial scale. Projects were screened in if they had a temporal overlap with the construction of the Proposed Development (Offshore).

6.2.1.2 Following consultation with NatureScot post-submission of the consent applications, updates were made to the EIAR Marine Mammal Cumulative Environmental Assessment (CEA), including minor adjustments to project construction timeframes and tier definitions (see Volume 8, Appendix 22: Marine Mammals Classification and Piling Re-Assessment Methodology for full details).

6.2.1.3 The screening process identified the projects and plans that could contribute to in-combination effects with the Proposed Development (Offshore), summarised in Table 6-1. Only Broadshore and Sinclair OWFs are taken forward for the in-combination assessment as both are within the Moray Firth SMU, the same SMU as the Proposed Development (Offshore) and the SMU in which the Dornoch Firth and Morrich More SAC is located.

Table 6-1: Projects screened in for assessment.

| Project | Technology | Tier | Source | Harbour Seal SMU | Included in the In-combination Assessment |
|---|---|---|---|---|---|
| Berwick Bank | Bottom-fixed | 1 | EIA | ES | No |
| Cenos | Floating | 1 | EIA | ES | No |
| Green Volt | Floating | 1 | EIA | ES | No |
| Ossian | Floating | 1 | EIA | ES | No |
| Salamander | Floating | 1 | EIA | ES | No |
| West of Orkney | Bottom-fixed | 1 | EIA | NC&O | No |
| Muir Mhòr | Floating | 1 | EIA | ES | No |
| Ayre | Floating | 2 | Scoping | NC&O | No |
| Bowdun | Bottom-fixed | 2 | Scoping | ES | No |
| Broadshore | Floating | 2 | Scoping | MF | Yes |
| Buchan | Floating | 2 | Scoping | NC&O | No |
| Morven | Bottom-fixed | 2 | Scoping | ES | No |
| Sinclair | Floating | 2 | Scoping | MF | Yes |
| Bellrock | Floating | 2 | Scoping | ES | No* |
| Stromar | Floating | 2 | Scoping | NC&O | No |
| Havbredy | Floating | 2 | Scoping | WI | No |
| Talisk | Floating | 2 | Scoping | WI | No |
| Spiorad na Mara | Bottom-fixed | 2 | Scoping | WI | No |

* Bellrock OWF does not overlap with grid cell at-sea density surface from Carter *et al*. (2025[18]).

ES SMU = East Scotland SMU; NC&O SMU = North Coast and Orkney SMU; MF SMU = Moray Firth SMU; WI = Western Isles SMU.

# 6.3 Assessment of Piling Noise (Disturbance)

## 6.3.1 Overview

6.3.1.1 This section considers whether the Proposed Development (Offshore), in-combination with other projects and plans, could result in behavioural disturbance from piling noise to harbour seals associated with the Dornoch Firth and Morrich More SAC during construction. The assessment is undertaken with reference to the following site COs:

- CO 1: To ensure that the qualifying features of Dornoch Firth and Morrich More SAC are in favourable condition and make an appropriate contribution to achieving FCS; and
- CO 2b: The distribution of harbour seals throughout the site are maintained by avoiding significant disturbance.

## 6.3.2 Predicted Disturbance within the Moray Firth SMU

6.3.2.1 The re-assessment of harbour seal behavioural disturbance from piling for the CEA and subsequent cumulative iPCoD applies Carter *et al.* (2025[18]) density surface estimates in place of the Carter *et al*. (2022[8]) estimates used in the original iPCoD and EIAR submission (see Section 4.4 and Volume 8, Appendix 22: Marine Mammals Classification and Piling Re-Assessment Methodology for full details). Consequently, the number of animals predicted to be potentially disturbed presented here differ from the alone assessment (Section 5.3).

6.3.2.2 Broadshore and Sinclair OWFs are at an early stage of project development. Therefore, in the absence of project-specific dose-response modelling, predicted numbers of individuals potentially disturbed are based on Effective Deterrent Ranges (EDRs) derived from indicative foundation types. EDRs assume a fixed radius of disturbance, which for floating projects like Broadshore and Sinclair OWFs, is predicted to be 15km. Application of the EDRs to this assessment is considered precautionary as they do not take into account site-specific conditions and were developed for harbour porpoise (*Phocoena phocoena*), a species with greater sensitivity to noise.

6.3.2.3 Table 6-2 presents the numbers of harbour seals predicted to be disturbed at any given time by each of the projects screened into the in-combination assessment.

Table 6-2: Predicted numbers of harbour seals disturbed by underwater piling noise within the Moray Firth SMU (re-assessment basis).

| Project | Number Animals Impacted | Data Source |
|---|---|---|
| Proposed Development (Offshore) | 77 (Caledonia North); and<br>87 (Caledonia South) | Whyte *et al*. (2020[15]); Carter *et al*. (2025[18]) |
| Broadshore OWF | 1 | EDR; Carter *et al*. (2025[18]) |
| Sinclair OWF | 1 | EDR; Carter *et al*. (2025[18]) |

6.3.2.4 Table 6-3 presents the number of harbour seals predicted to be disturbed in each year under each project's construction scenario. The concurrent scenario reflects the number of individuals potentially disturbed across the Proposed Development (Offshore) when the two phases overlap in time (avoiding double-counting of the same individuals within a single year). The sequential scenario reflects Caledonia North piling first (2028–2029), followed by Caledonia South (2030–2032), with no intervening gap. Years outside the assessed piling windows show no predicted disturbance.

Table 6-3: Number of harbour seals potentially disturbed by underwater noise from piling for projects within the Moray Firth SMU.

| Project | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|
| Caledonia North | | 77 | 77 | 77 | | | |
| Caledonia South | | 87 | 87 | 87 | | | |
| Proposed Development (Offshore) Concurrent | | 87 | 87 | 87 | | | |
| Proposed Development (Offshore) Sequential | | 77 | 77 | 87 | 87 | 87 | |
| Broadshore OWF | | 1 | 1 | 1 | | | |
| Sinclair OWF | | 1 | 1 | | | | |

6.3.2.5 The maximum proportion of the Moray Firth SMU potentially disturbed in any year is 6.52%, which is predicted under the Caledonia South and the Proposed Development (Offshore) concurrent scenarios, for the years 2028 and 2029 when Broadshore and Sinclair OWFs are also constructing (Table 6-4). The Proposed Development (Offshore) sequential scenario prolongs the period over which disturbance could occur (up to five years) but is predicted to lead to disturbance of a slightly lower proportion of the population in each year of construction.

Table 6-4: Summary of number harbour seals potentially disturbed by underwater noise from piling for projects within the Moray Firth SMU.

| Parameter | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|
| **Caledonia North** | | | | | | | |
| Number of animals | 0 | 79 | 79 | 78 | 0 | 0 | 0 |
| % SMU | 0.00% | 5.79% | 5.79% | 5.71% | 0.00% | 0.00% | 0.00% |
| **Caledonia South** | | | | | | | |
| Number of animals | 0 | 89 | 89 | 88 | 0 | 0 | 0 |
| % SMU | 0.00% | 6.52% | 6.52% | 6.45% | 0.00% | 0.00% | 0.00% |
| **Proposed Development (Offshore) Concurrent** | | | | | | | |
| Number of animals | 0 | 89 | 89 | 88 | 0 | 0 | 0 |
| % SMU | 0.00% | 6.52% | 6.52% | 6.45% | 0.00% | 0.00% | 0.00% |
| **Proposed Development (Offshore) Sequential** | | | | | | | |
| Number of animals | 0 | 79 | 79 | 88 | 87 | 87 | 0 |
| % SMU | 0.00% | 5.79% | 5.79% | 6.45% | 6.37% | 6.37% | 0.00% |

## 6.3.3 Cumulative iPCoD Results

6.3.3.1 Across all scenarios modelled included in the re-assessment for the Moray Firth SMU harbour seal population, the results of the cumulative iPCoD modelling are that the population is predicted to continue at a stable trajectory and at the size of the un-impacted population.

### Caledonia North

6.3.3.2 The results of the cumulative iPCoD modelling show that for the Moray Firth SMU the level of cumulative disturbance is not sufficient to result in any changes at the population level as the impacted population is predicted to continue at a stable trajectory and at 100% of the size of the un-impacted population. See Volume 8, Appendix 24: Marine Mammals iPCoD Results (Caledonia North) for full details.

### Caledonia South

6.3.3.3 The results of the cumulative iPCoD modelling show that for the Moray Firth SMU the level of cumulative disturbance is not sufficient to result in any changes at the population level as the impacted population is predicted to continue at a stable trajectory and at 100% of the size of the un-impacted population. See Volume 8, Appendix 25: Marine Mammals iPCod Results (Caledonia South) for full details.

### Proposed Development (Offshore)

6.3.3.4 Under the cumulative concurrent scenario, the results of the cumulative iPCoD modelling show that the impacted population for harbour seals in the Moray Firth SMU is predicted to continue at a stable trajectory, the same as the un-impacted population, and at a mean population size greater than 99.9% of the size of the un-impacted population.

6.3.3.5 Under the cumulative sequential (no gap), the results of the cumulative iPCoD modelling show that the impacted population for harbour seals in the Moray Firth SMU is predicted to continue at a stable trajectory, the same as the un-impacted population, and at 100% the size of the un-impacted population. See Volume 8, Appendix 23: Marine Mammals iPCoD Results (Caledonia OWF) for full details

## 6.4 In-Combination Conclusion

6.4.1.1 In summary, the assessment has been undertaken on the basis of maximum assumptions, including updated higher density surfaces (Carter *et al*., 2025[18]), using EDRs to determine disturbance distances for harbour seals from other projects (Broadshore and Sinclair OWFs), and a sequential construction scenario as the worst-case temporal programme (each phase up to three years with no gap). Under these assumptions, the maximum proportion of the Moray Firth SMU predicted to be disturbed in any year is 6.52%. This scenario arises in 2028 and 2029, when construction for the Proposed Development (Offshore) alongside Broadshore and Sinclair OWFs is predicted.

6.4.1.2 The cumulative iPCoD modelling predicts no population-level consequences for the Moray Firth SMU under either concurrent or sequential build. Therefore, behavioural disturbance from piling by the Proposed Development (Offshore) in-combination with other projects is not predicted to result in significant negative effects on the population associated with the Dornoch Firth and Morrich More SAC, nor is it expected to compromise favourable condition (CO 1) or result in significant disturbance (CO2b).

6.4.1.3 **It is therefore concluded that the Proposed Development (Offshore), in-combination with other projects, will not result in any AEoSI in relation to behavioural disturbance from piling during construction or decommissioning, and that, subject to natural change, the population of harbour seal will be maintained in the long-term.**

# 7 Moray Firth SAC

## 7.1 Overview

7.1.1.1 This section presents new information to be considered included within and apply to Sections 8.2.1, 9.2.1 and 10.3.2 in the Caledonia North and Caledonia South RIAAs, Application Documents 13 and 14, Parts 2, 3 and 4.

7.1.1.2 This appendix has been prepared in response to feedback from NatureScot on the RIAAs (Application Documents 13 and 14). Specifically, NatureScot advised that it was unable to conclude no AEoSI for the Moray Firth SAC with respect to behavioural disturbance from pile driving during construction of Caledonia North, Caledonia South or the Proposed Development (Offshore) alone (and therefore also in-combination with other plans and projects), despite the RIAA concluding no AEoSI.

7.1.1.3 Since submission of the consent applications, the Applicant has engaged with NatureScot on the topic of marine mammals. Subsequent consultation has occurred on 04 June, 13 June and 05 August 2025 and written feedback provided on 21 August and 03 September 2025. This consultation has included discussion on the refinement of piling parameters (outlined in paragraph 7.1.1.4) approach to assessing disturbance from piling noise on bottlenose dolphin, which is of relevance to the assessment of impacts to the Moray Firth SAC in the RIAAs. A revised approach to assessing disturbance has been proposed and agreed with NatureScot. Therefore, this appendix presents the results of the revised assessment in the context of the Moray Firth SAC and applies to Sections 8.2.1 and Section 9.2.1. of the Caledonia North and Caledonia South RIAAs, Application Documents 13 and 14, Parts 2 and 3.

7.1.1.4 Furthermore, the Applicant has been developing the project design and has refined the maximum number of anchors per floating WTG which has in turn reduced the total number of piling days associated with constructing the floating component of the Proposed Development (Offshore). Therefore, these design envelope changes have been taken into account in this revised assessment of disturbance to the bottlenose dolphin qualifying species of the Moray Firth SAC. A description of the design envelope changes and methodology for the re-assessment of disturbance is provided in Section 7.2. This is presented alongside a description of how the changes have been taken into account in the population modelling undertaken for bottlenose dolphin.

7.1.1.5 In addition, the approach to cumulative assessment has been revised on the basis of changes to other plans and project since the submission of the application. Therefore, a revised assessment of in-combination impacts from piling disturbance has also been presented in the context of the bottlenose dolphin qualifying species of the Moray Firth SAC.

7.1.1.6 NatureScot also requested that a full in-combination assessment of the impact of vessel disturbance on the bottlenose dolphin qualifying species of the Moray Firth SAC, in reference to vessel operations during the works for OEC installation. To note, NatureScot stated that this was required only if it was not addressed satisfactorily as part of the National Energy System Operator (NESO) Strategic Environmental Assessment (SEA) and HRA for the Holistic Network Design (HND). Nevertheless, an assessment has been undertaken by the Applicant as this stage.

7.1.1.7 While vessel activity during both construction and Operation and Maintenance (O&M) phases was assessed in the RIAA (Application Documents 13 and 14, Part 4) and concluded no AEoSI, this appendix provides further assessment focused specifically on potential in-combination disturbance arising from vessels associated with OEC installation, particularly within the Coastal East Scotland Management Unit (CES MU) that is utilised by bottlenose dolphin associated with the Moray Firth SAC.

7.1.1.8 As a result of the updated re-assessment methodology outlined in Section 7.2 for piling disturbance, the predicted level of impact to the bottlenose dolphin qualifying species of the Moray Firth SAC has been revised. In addition, the methodology for the further assessment undertaken for vessel disturbance is provided in Section 7.2. The outcome of the assessments are provided in Section 7.3.

## 7.2 Re-assessment Methodology

### 7.2.1 Design Envelope Changes

7.2.1.1 Since submission of the application, the Applicant has been developing the project design and has refined the maximum number of anchors per floating WTG which has in turn reduced the total number of piling days associated with constructing the floating component of the Proposed Development. The number of anchors required for TLP outline design has been reduced from 18 anchors per WTG to six anchors per WTG. Consequently, the number of piled anchors required is now the same for both TLPs and semi-submersibles, with each requiring up to six anchors per WTG.

7.2.1.2 All revised piling scenarios now assume that four pin piles would be installed per day for bottom-fixed foundations (one full substructure jacket per day) and one anchor pile would be installed per day for floating substructures. Given that semi-submersible structures assume the installation of one pile per day, compared to 1.71 piles per day for TLPs, the assumptions for the semi-submersible foundations were adopted as the worst-case temporal scenario because they result in the longest duration. For comparison, number of piling days used in the RIAAs is provided in Table 7-1.

### 7.2.2 Assessment of Piling Disturbance

7.2.2.1 To estimate the number of bottlenose dolphins predicted to experience behavioural disturbance as a result of piling, the assessment presented in the RIAAs used the porpoise dose-response function presented in Graham *et al*. (2017[20]), developed using data on harbour porpoise collected during the first six weeks of piling during Phase 1 of the Beatrice OWF monitoring program.

7.2.2.2 As a result of consultation with Paul Thompson (University of Aberdeen), SMRU Consulting and NatureScot, an interim approach to the assessment of behavioural disturbance of bottlenose dolphin due to piling was suggested. Details of the considerations taken into account for the interim approach are outlined in the *DRAFT Policy briefing on the use of behavioural-response functions within impact assessments for pile installation at offshore wind farms* (this document is available upon request) document and are not discussed in detail in this appendix. It has been recommended that regulatory assessments are based upon the deterrence function derived from the Beatrice OWF monitoring data in Graham *et al*. (2019[21]) instead of the dose-response function presented in Graham *et al*. (2017[20]). As such, the numbers of animals disturbed was re-calculated using the deterrence function based on the analysis of the full Beatrice data set, as published in the peer-reviewed paper by Graham *et al*. (2019[21]). Predictions were based upon the responses to the first location piled, which is more conservative compared to probability of response based on the final location piled.

7.2.2.3 Additionally, in a written response provided on 21 August 2025, NatureScot requested the assessment also to be provided using the Effective Deterrence Ranges (EDR) approach. The EDR thresholds are area-based and, as defined by Tougaard *et al*. (2013[22]), represent the overall habitat loss that would occur if all animals vacated the area within the EDR range. The Joint Nature Conservation Committee (JNCC, 2020[23]) guidance advises EDRs of 26km and 15km around the source location is used to determine the impact area from piling of monopiles and pin piles, respectively. A recent PrePARED report estimated an EDR of 9.4km for harbour porpoise response 24-hour after piling the first two monopiles at the Moray West OWF (Benhemma-Le Gall *et al*., 2024[24]).

7.2.2.4 As such, numbers of animals affected by piling at the Proposed Development (Offshore) alone were calculated using three different approaches:

- Dose-response presented in Graham *et al*. (2017[20]);
- Deterrence function based on the responses to the first location piled presented in Graham *et al*. (2019[21]); and
- 26km, 15km and 9.4km EDRs.

7.2.2.5 It should be noted that the re-assessment was not carried out for all possible piling locations but the worst-case scenario locations in terms of number of bottlenose dolphins affected:

- Location 4 (North); and
- Location 8 (South).

7.2.2.6 The worst-case for the Proposed Development (Offshore) is assumed to be the highest number of animals affected across the two locations.

## Population Modelling

7.2.2.7 NatureScot concluded significant impacts for disturbance from piling from the iPCoD for the Proposed Development (Offshore) alone for bottlenose dolphin within the CES MU as part of the determination response. It is noted that the CES MU population and the Moray Firth SAC population is in effect synonymous, therefore these results are relevant to the Moray Firth SAC assessment in the RIAAs.

7.2.2.8 Due to changes in the project design envelope, NatureScot requested that the iPCoD model be run for the Proposed Development (Offshore) alone, using the same approach as in the original HRA submission (e.g., dose-response results presented in Graham *et al*., 2017[20]) with the updated number of piling days.

7.2.2.9 The modelling includes the updated piling scenarios with reduced number of piling days and number of bottlenose dolphins affected calculated using:

- Dose-response presented in Graham *et al*. (2017[20]);
- Deterrence function based on the responses to the first location piled presented in Graham *et al*. (2019[21]); and
- The most conservative EDR of 26km (JNCC, 2020[23]).

7.2.2.10 As requested by NatureScot, the iPCoD for bottlenose dolphin was carried out using increasing and stable population demographic parameters (Harwood and King, 2017[25]; Sinclair *et al*., 2020[17]; see Volume 8, Appendix 22: Marine Mammals Clarifications and Piling Re-assessment Methodology for details).

7.2.2.11 For more detail on the iPCoD scenarios run, see Volume 8, Appendix 22: Marine Mammals Clarifications and Piling Re-assessment Methodology.

## Summary of Changes

7.2.2.12 Table 7-1 provides a summary of changes in the Proposed Development (Offshore) design taken forward to the re-assessment at the determination phase. Table 7-2 summarises the approach to the assessment for the Proposed Development (Offshore) alone for bottlenose dolphin.

Table 7-1: Summary of changes in the Proposed Development (Offshore) design with respect to anchors for floating foundations.

| Parameter | Original HRA/EIA | Revised Assessment |
|---|---|---|
| Worst case floating WTG type | TLP | Semi-submersible |
| Maximum number of piled anchors per floating WTG | 18 anchors/WTGs x 39 WTGs = 702 piled anchors | 6 anchors/WTGs x 39 WTGs = 234 piled anchors |
| Number of anchors piling days | 410 days assuming an average of 1.71 anchors/day | 234 days assuming 1 anchors/day |

Table 7-2: Summary of changes in the approach to the assessment of disturbance due to piling for the Proposed Development (Offshore) alone for bottlenose dolphin.

| Stage | Assessment Aspect | Bottlenose Dolphin |
|---|---|---|
| Original HRA/EIA | Density | Moray Firth density surface (modified from Thompson *et al*., 2015[26]) assuming a population size of 245 (Cheney *et al*., 2024[27]) |
| | Method | Dose-response (Graham *et al*., 2017[20]) |
| Determination | Density | Moray Firth density surface (modified from Thompson *et al*., 2015[26]) assuming a weighted mean population size of 226 (Cheney *et al*., 2024[27])* |
| | Method | Deterrence function Graham *et al*., 2019[2121])<br>9.4km, 15km and 26km EDRs (JNCC, 2020[23]; Benhemma-Le Gall *et al*., 2024[24]) |
| * Note, the density outside of the 2km buffer discussed in paragraph 7.3.1.10 and applied in the cumulative impact assessment was not applied to the Proposed Development (Offshore) alone assessment, as there would be no overlap with spatial extent of impacts. | | |

## In-combination Assessment

7.2.2.13 The NatureScot representation stated that they were unable to conclude no AEoSI for the Moray Firth SAC with respect to behavioural disturbance from pile driving in-combination with other plans and projects.

7.2.2.14 Since the submission of the consent applications, the cumulative assessment has been revised by the Applicant. A detailed overview of the updates to the cumulative assessment is provided in Volume 8, Appendix 22: Marine Mammals Clarifications and Piling Re-assessment Methodology.

7.2.2.15 The results of the updated cumulative assessment are presented here in the context of the in-combination assessment against the Moray Firth SAC bottlenose dolphin qualifying feature.

## 7.2.3 Assessment of In-combination Vessel Disturbance

7.2.3.1 The Proposed Development (Offshore) requires up to four OECs, with two associated with Caledonia North and two associated with Caledonia South. Each OEC will be installed within separate trenches, all within a single OECC leading to a common landfall point. These activities represent the main pathway by which construction-phase vessel traffic could interact with bottlenose dolphins associated with the Moray Firth SAC.

7.2.3.2 Construction and operation of the Proposed Development (Offshore), along with other projects with infrastructure overlapping with the CES MU, may result in increased vessel movements in the CES MU. Movements in and out from ports and along the OECCs have the potential to cause temporary behavioural disturbance to bottlenose dolphins. This may occur through underwater noise and visual stimuli from the physical presence of vessels, potentially leading to short-term displacement or changes in foraging behaviour, including increased swimming speeds and alterations to whistle characteristics (Constantine *et al.*, 2004[28]; La Manna *et al.*, 2013[29]; Pirotta *et al.*, 2013[30]; 2015[31]; Marley *et al.*, 2017a[32]; 2017b[33]; Piwetz, 2019[34]).

7.2.3.3 By adopting the CES MU as a spatial scale for the assessment, this ensures that cumulative vessel activity is considered across the functionally-linked habitat used by the Moray Firth SAC bottlenose dolphin population. This approach aligns with NatureScot (2024[35]) guidance, which advises the use of the CES MU as a spatial scale for assessing impacts on the SAC's qualifying features, and allows potential in-combination vessel impacts to be evaluated in the context of the SAC's COs.

7.2.3.4 The potential for in-combination effects is determined by both temporal and spatial overlap in vessel activity. Temporal overlap is assessed by reference to published construction windows for each project, while spatial overlap is assessed by mapping OECC alignments relative to the CES MU and known distribution of bottlenose dolphins.

7.2.3.5 A temporal worst-case scenario assumes sequential installation of OECs, with a five-year gap between Caledonia North and Caledonia South. Seabed preparation would occur first, followed by a pause for other construction activities, after which the OECs would be installed and terminated consecutively. This scenario results in approximately 18 months of OEC installation activity spread across four years, within an overall timeframe of 2029–2038. For assessment purposes, the broader construction window considered spans 2028-2040 to capture scheduling uncertainties.

### Screening of Overlapping Projects

7.2.3.6 A screening exercise considered known and indicative OECC routes along the east coast of Scotland that overlap with the CES MU. Screening ensures that only those projects with a plausible pathway for interaction are considered further and identified several reasonably foreseeable projects and developments that may act cumulatively with the Proposed Development (Offshore) in terms of vessel activity.

7.2.3.7 The following projects have been screened in for the in-combination assessment due to potential vessel overlap within the CES MU (see Figure 4-1 within Volume 8, Appendix 27 for a visual representation of other project locations):

- Berwick Bank OWF;
- Salamander OWF;
- Muir Mhòr OWF;
- Cenos OWF;
- Bowdun OWF;
- Buchan OWF; and
- Stromar OWF.

7.2.3.8 All projects screened into the in-combination assessment for vessel disturbance include OECCs intersecting the CES MU, meaning that vessel activity could occur within the MU in any construction year. While the reported construction windows reflect overall build-out programmes, detailed scheduling of OECC preparation and installation activities is not yet available for all projects. On a precautionary basis, the assessment assumes that OECC preparation and installation may occur in any of the reported construction years, to ensure that potential temporal overlap of vessel activity is not underestimated.

## 7.3 Results and Discussion

### 7.3.1 Piling Disturbance

7.3.1.1 The full results of the iPCoD modelling can be found in the following appendices supporting the additional information request:

- Volume 8, Appendix 23: Marine Mammals iPCoD Results (Caledonia OWF);
- Volume 8, Appendix 24: Marine Mammals iPCoD Results (Caledonia North);
- Volume 8, Appendix 25: Marine Mammals iPCoD Results (Caledonia South); and
- Volume 8, Appendix 26: Marine Mammals Results and Discussion.

7.3.1.2 This section presents information from Appendix 26: Marine Mammal Results and Discussion of relevance to the bottlenose dolphin qualifying feature of the Moray Firth SAC.

7.3.1.3 To note, Volume 8, Appendices 23, 24 and 25 present the results for the iPCoD modelling for the different disturbance methods (presented in Table 7-3) for comparison purposes only, as requested by NatureScot. Given the most recent consultation from 03 September 2025, NatureScot advised that the deterrence function approach can be applied in the re-assessment for dolphin species. As such, the conclusions of the revised assessment are based on the deterrence function only.

## Proposed Development (Offshore) Alone Results

7.3.1.4 The number of bottlenose dolphins predicted to be disturbed within the Moray Firth SAC (synonymous with the CES MU) by a single pile driving event on any given day is a maximum of six individuals (2.65% of the SAC population) from Location 8 (South) (Table 7-3).

7.3.1.5 It is highlighted that the number of bottlenose dolphins predicted to be disturbed per piling day using the deterrence function is only 11-13% of the number predicted by the dose-response function. The comparison between results estimated in the original HRA/EIA submission (based on dose-response approach) and re-assessment as a part of determination (based on deterrence function) is included in Table 7-3.

7.3.1.6 To determine potential impacts on the population over time, iPCoD modelling was undertaken for the CES MU (synonymous with the SAC population). The worst-case scenario, identified through the iPCOD modelling, was where the North and South of the Proposed Development (Offshore) are installed concurrently (Table 7-3).

7.3.1.7 Disturbance from piling can occur over a medium spatial extent (disturbance impact out to a maximum of 60km). The probability of the effect is high close to the piling location, but decreases to low levels further from source. The duration of the effects is medium term (up to 79, 275 and 339 piling days for Caledonia North, Caledonia South and Proposed Development (Offshore), respectively, with construction over three to six years). The effect will occur at a moderate frequency, intermittently across a period of up to three years. For bottlenose dolphins within the CES MU population (synonymous with the SAC population), behavioural disturbance resulting from the worst-case scenario may affect a low proportion of the population (between 2.2% to 2.7% of the CES MU). This may lead to a deviation in population size of up to 1.3% when compared to the un-impacted population. While the impacted CES MU population size is reduced compared to the un-impacted population size (remaining at >98% of the mean size of the unimpacted population), no change to the population trajectory is predicted through iPCoD modelling, even throughout the piling activities.

Table 7-3: Proposed Development (Offshore) alone bottlenose dolphin comparison – original HRA/EIA submission and re-assessment.

| Assessment | Number Impacted Per Day | iPCoD Result (%) | | | |
|---|---|---|---|---|---|
| | | Caledonia North | Caledonia South | Proposed Development (Offshore) (C) | Proposed Development (Offshore) (S) |
| HRA/EIA | Caledonia North: 48<br>Caledonia South: 52 | >97.4 | >93.0 | >92.3 | >90.5 |
| Re-assessment | Caledonia North: 5<br>Caledonia South: 6 | >99.6 | >98.8 | >98.4 | >98.7 |
| Note, a proportion of impacted population size to unimpacted population size, comparison presented for increasing population only as this was presented in the original HRA submission.<br>C = Concurrent; S = Sequential with five-year gap. | | | | | |

7.3.1.8 It is important to note that the assessment undertaken is highly precautionary, inherent to adopting the harbour porpoise deterrence response function for bottlenose dolphin.

7.3.1.9 Furthermore, the relatively dynamic social structure of bottlenose dolphins (Connor, 2001[36]) and the fact that they have no significant predation threats and do not appear to face excessive competition for food with other marine mammal species, have potentially resulted in a higher tolerance (compared to porpoise) to perceived threats or disturbances in their environment, which may make them less sensitive to disturbance.

7.3.1.10 Given the distance (57.7km) between the Proposed Development (Offshore) and the known distribution of bottlenose dolphins associated with the SAC (namely the SAC and a 2km buffer from the coastline), the potential likelihood of individuals being exposed to disturbance is low. Furthermore, while there remains the potential for disturbance to affect individual behaviour this is unlikely to result in an overall change in individual energy budget since animals are predicted to compensate for time lost due to disturbance (New *et al.*, 2013[37]). Thus, it is considered that bottlenose dolphins are not particularly adversely affected by disturbance and no change to vital rates is expected.

7.3.1.11 **It is determined that there is no AEoSI on the bottlenose dolphin feature of the Moray Firth SAC with respect to behavioural disturbance caused by piling from the construction and decommissioning of the Proposed Development (Offshore) alone.**

## In-combination Results

7.3.1.12 Volume 8, Appendix 26: Marine Mammals Results and Discussions provides the results of the updated cumulative assessment and comparison with the results in the EIA. This detail is therefore not provided here; instead, this section provides a standalone, updated in-combination assessment against the Moray Firth SAC bottlenose dolphin qualifying species.

7.3.1.13 Table 7-4 presents the projects included in the in-combination re-assessment and the estimated numbers of bottlenose dolphins potentially disturbed by underwater noise for Caledonia North, Caledonia South, the Proposed Development (Offshore) (concurrent and sequential installation), and all other plans and projects, in each year across the construction period. This approach to the assessment is inherently precautionary as it assumes that all projects that could undertake piling in the same year(s) go ahead; in reality the number of projects potentially piling at any one time is expected to be lower, in part due to the supply chain capability.

Table 7-4: Number of bottlenose dolphin potentially disturbed by underwater noise from all projects.

| Project | Tier | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|---|
| Caledonia North | - | | 5 | 5 | 5 | | | |
| Caledonia South | - | | 6 | 6 | 6 | | | |
| Proposed Development (Offshore) Concurrent | - | | 6 | 6 | 6 | | | |
| Proposed Development (Offshore) Sequential | - | | 5 | 5 | 6 | 6 | 6 | |
| Berwick Bank* | 1 | 12 | | | | 12 | | |
| Ossian* | 1 | | | | | 1 | 1 | 1 |
| Salamander | 1 | | 8 | | | | | |
| Green Volt | 1 | 1 | | | | | | |
| Muir Mhòr | 1 | | | 2 | 2 | 2 | | |
| Morven* | 2 | 3 | 3 | 3 | 3 | 3 | 3 | |
| Ayre | 2 | | | | 1 | 1 | 1 | 1 |
| Bowdun | 2 | | | 9 | 9 | 9 | 9 | 9 |
| Broadshore | 2 | | 3 | 3 | 3 | | | |
| Buchan | 2 | | 1 | 1 | 1 | | | |
| Sinclair | 2 | | 1 | 1 | | | | |
| Stromar | 2 | | | | 1 | 1 | 1 | 1 |
| * Piling at some projects extend outside of the CEA 2027 – 2033 timeframes. The complete duration of piling at these projects, e.g. 2026 – 2032 for Morven, was included in the iPCoD modelling. | | | | | | | | |

7.3.1.14 The number of bottlenose dolphin predicted to be disturbed within the CES MU per day (the MU within which the Moray Firth SAC sits) ranges between 12 (5.31% CES MU) in 2033 to 35 individuals (15.49% CES MU) in 2031, based on the sequential scenario (Table 7-5). When considering the 35 individuals in 2031, the Proposed Development (Offshore) contributes six individuals or 17% of the total disturbed on any given day, with a higher number of individuals disturbed by the Berwick Bank and Bowdun OWFs on any given day in 2031.

Table 7-5: Summary of number of bottlenose dolphin potentially disturbed by underwater noise from all projects.

| Parameter | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
|---|---|---|---|---|---|---|---|
| **Caledonia North with other plans and projects** | | | | | | | |
| Number of animals | 16 | 21 | 24 | 25 | 29 | 15 | 12 |
| % CES MU | 7.08% | 9.29% | 10.62% | 11.06% | 12.83% | 6.64% | 5.31% |
| **Caledonia South with other plans and projects** | | | | | | | |
| Number of animals | 16 | 22 | 25 | 26 | 29 | 15 | 12 |
| % CES MU | 7.08% | 9.73% | 11.06% | 11.50% | 12.83% | 6.64% | 5.31% |
| **Proposed Development (Offshore) Concurrent with other plans and projects** | | | | | | | |
| Number of animals | 16 | 22 | 25 | 26 | 29 | 15 | 12 |
| % CES MU | 7.08% | 9.73% | 11.06% | 11.50% | 12.83% | 6.64% | 5.31% |
| **Proposed Development (Offshore) Sequential with other plans and projects** | | | | | | | |
| Number of animals | 16 | 21 | 24 | 26 | 35 | 21 | 12 |
| % CES MU | 7.08% | 9.29% | 10.62% | 11.50% | 15.49% | 9.29% | 5.31% |

7.3.1.15 It is highlighted that the assessment of disturbance by other projects used the deterrence function for harbour porpoise (see Volume 8, Appendix 22: Marine Mammals Clarifications and Piling Re-assessment Methodology). Therefore, these are likely to be over-estimations of the number of bottlenose dolphins impacted. To determine whether this level of disturbance is expected to result in population level impacts, cumulative iPCoD modelling was conducted for the MU population.

7.3.1.16 For the CES MU, the sequential and concurrent scenario produced the same worst-case scenario in terms of impact to the population. Under both scenarios, the impacted population size is predicted to reach a minimum of 94.16% of the unimpacted population size (both under the increasing population assumption). For the concurrent installation, this is reached in

2039, a year after all cumulative piling has ended. For the sequential installation (no gaps), this is reached in 2032, coinciding with the end of the final year of piling at the Caledonia OWF. Following the cessation of piling at the Proposed Development (Offshore), the population size fluctuates and at the end of 2050 it is at 94.22% of the un-impacted population size under the concurrent scenario, and 94.64% of the un-impacted population size under the sequential scenario.

7.3.1.17 Under the stable population assumptions, the impacted population size is predicted to reach a minimum of 94.32% of the unimpacted population size, under the sequential installation scenario (which is the worst-case). This is reached in 2032, coinciding with the end of the final year of piling at the Caledonia OWF. Following the cessation of piling at the Proposed Development (Offshore), the population size fluctuates and at the end of 2050 it is at 94.74% of the un-impacted population size under the sequential scenario.

7.3.1.18 The results of the iPCoD modelling show that although the level of disturbance has the potential to result in changes at the population level, the impacted population is predicted to continue on an increasing or stable trajectory, the same as the un-impacted population.

7.3.1.19 It is worth noting that both the disturbance numbers and modelling presented above are for the CES MU as a whole rather than the Moray Firth SAC specifically. However, it is considered that the Moray Firth SAC population is accounted for within the overall CES MU population, and therefore as the CES MU population is determined to continue an increasing or stable trajectory, the same is anticipated for the Moray Firth SAC population.

7.3.1.20 The impact will cover a wide area and will occur regularly within the timeframe considered due to different projects piling at different times. There is the potential for a temporary change in distribution of bottlenose dolphins from the underwater noise generation, of up to 6% of the CES MU (which includes the Moray Firth SAC population). However, it is considered that this disturbance will be intermittent and not continuous over the construction phase, meaning that the individuals will not be permanently disturbed from the SAC during the construction phase of the Proposed Development (Offshore). Furthermore, there is evidence to suggest that bottlenose dolphins are less vulnerable than harbour porpoises to disturbance effects from underwater noise.

7.3.1.21 A study on bottlenose dolphins within the Moray Firth has shown that bottlenose dolphins have the ability to compensate for behavioural responses as a result of increased commercial vessel activity, where longer term overall activity time budget remained the same despite the immediate behavioural response to disturbance (New *et al.*, 2013[37]). Therefore, while there remains the potential for disturbance and displacement to affect individual behaviour, it is not expected that this would result in an overall change in individual energy budget since animals have been shown to

compensate for time lost due to disturbance. Additionally it is considered that the dynamic social structure of populations (Connor, 2001[36]), the lack of predation or competition for food, and wide range of the species, result in a higher perceived tolerance of disturbance when compared to other marine mammal species (for example, porpoises).

7.3.1.22 While the assessments present a potential impact on the Moray Firth SAC population, the assessment outcomes are considered to be over precautionary, resulting in exaggerated impacts compared to what would be realistically expected. With respect to the disturbance numbers for the CES MU as a whole, the harbour porpoise deterrence function was used, which is considered to be precautionary for bottlenose dolphins, given they are considered to be less sensitive to disturbance than harbour porpoises..

7.3.1.23 With respect to the iPCoD modelling, the model for bottlenose dolphin disturbance is much more precautionary because it has not been updated as recently as the model used for harbour porpoises. The dolphin model was last updated following the expert elicitation in 2013 (Harwood *et al*., 2014[38]), which at the time assumed that a disturbed individual would not forage for 24 hours. In contrast, a more recent 2018 expert elicitation that focussed on harbour porpoises highlighted that this was an unrealistic assumption for this species (generally considered to be more responsive than minke whales and bottlenose dolphins). The iPCoD model for harbour porpoises was therefore updated to assume that disturbance resulted in six hours of non-foraging time (Booth *et al*., 2019[6]).

7.3.1.24 Bottlenose dolphins were not included in the 2018 updated expert elicitation for disturbance, and thus the iPCoD model still assumes 24 hours of non-foraging time for bottlenose dolphins; even though this species is recognised to be less responsive to disturbance than harbour porpoises. This is unrealistic considering what we now know about marine mammal behavioural responses to pile driving. A recent study estimated energetic costs associated with disturbance from sonar, where it was assumed that one hour of feeding cessation was classified as a mild response, two hours of feeding cessation was classified as a strong response and eight hours of feeding cessation was classified as an extreme response (Czapanskiy *et al*., 2021[39]). Assuming 24 hours of feeding cessation for bottlenose dolphins in the iPCoD model is significantly beyond that which is considered to be an extreme response, and is therefore considered to be unrealistic and has over-estimated the true disturbance levels expected from the Proposed Development (Offshore).

7.3.1.25 Furthermore, the iPCoD model assumes there is no density dependence for the species based on an insufficient amount of data to parameterise this relationship. This means that the model does not reflect the ability of the population to increase in size and return to carrying capacity following disturbance, whereas in reality it is possible for populations with a positive growth rate and increasing population (such as the Moray Firth SAC) to continue to increase in the absence of disturbance.

7.3.1.26 At a recent expert elicitation, conducted for the purpose of modelling population impacts of the Deepwater Horizon oil spill (Schwacke *et al*., 2021[40]), experts agreed that there would likely be a concave density dependence on fertility. That means, for a population which is assumed to be stable (specifically, neither increasing or decreasing), it would be expected that if the impacted population declines, it would later recover to carrying capacity, rather than continuing at a stable trajectory that is smaller than that of the un-impacted population. It is noted that in the iPCoD model, for stable populations, carrying capacity is assumed to be equal to the size of unimpacted population; specifically, it is assumed the un-impacted population is at carrying capacity.

7.3.1.27 Demographic stochasticity (variation among individuals in their realised vital rates as a result of random processes) and environmental variation (the variation in demographic rates among years as a result of changes in environmental conditions) are also important factors that need to be considered within the models (Harwood *et al*., 2014[38]). The model tries to account for this; however, ultimately the results demonstrate that the change in population size resulting from the impact of disturbance is significantly smaller than that driven by the environmental and demographic stochasticity in the model.

7.3.1.28 **Therefore, based on the intermittent nature of effect, high tolerance for disturbance, lack of evidence to suggest any long-term population level effects, and limitations within the models and assessments, it is considered that there is no potential for AEoSI in-combination with any other plans or projects for the bottlenose dolphin at Moray Firth SAC in relation to underwater noise during construction and decommissioning.**

## 7.3.2 In-combination Vessel Disturbance

7.3.2.1 The potential for vessel disturbance from Caledonia North, Caledonia South and Proposed Development (Offshore) was assessed within Section 8.2.1, 9.2.1 and 10.2.2 of the corresponding RIAA documents (Application Documents 13 and 14, Parts 2, 3 and 4). Both construction and O&M vessel activity were considered, and in each case the conclusion was that no AEoSI would arise for the bottlenose dolphin feature of the Moray Firth SAC. These conclusions were reached on the basis of the distance of the Proposed Development (Offshore) from the SAC, the localised and transient nature of potential vessel disturbance, and the implementation of best-practice vessel management measures (including a Vessel Management Plan (VMP) and adherence to a Code of Conduct (WiSe Scheme; NatureScot, 2017[41])) to reduce the risk of vessel disturbance.

7.3.2.2 This further assessment builds on these conclusions in that it considers the potential for in-combination vessel disturbance to bottlenose dolphins associated with the Moray Firth SAC during the construction phases of the

Proposed Development (Offshore), alongside other relevant plans and projects, specifically in relation to the OECC works. The assessment is undertaken with reference to the following site COs:

- CO 1: To ensure that the qualifying features of Moray Firth SAC are in favourable condition and make an appropriate contribution to achieving FCS; and
- CO 2b: The distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance.

7.3.2.3 Cumulative effects may arise where multiple projects overlap temporally and spatially, also considering the scale and character of the vessel operations for each project.

7.3.2.4 Temporally, peak activity is predicted in 2029–2031, when up to seven projects could be constructing concurrently, producing the greatest potential for sustained and repeated vessel presence within the CES MU (Table 7-6). It should be noted that the construction timelines provided represent overall construction timeframes, and there is a paucity of information surrounding which construction years shall include OEC preparation and installation works within the OECC.

Table 7-6: Temporal overlap between projects which overlap the CES MU.

| Year | Active Projects |
|---|---|
| 2028 | Berwick Bank, Bowdun, Buchan, Salamander, |
| 2029 | Berwick Bank, Bowdun, Buchan, Caledonia, Muir Mhòr, Salamander, Stromar |
| 2030 | Berwick Bank, Bowdun, Buchan, Caledonia, Cenos, Muir Mhòr, Stromar |
| 2031 | Berwick Bank, Bowdun, Buchan, Caledonia, Cenos, Muir Mhòr, Stromar |
| 2032 | Berwick Bank, Bowdun, Caledonia, Cenos, Muir Mhòr, Stromar |
| 2033 | Berwick Bank, Bowdun, Caledonia, Cenos, Muir Mhòr, Stromar |
| 2034 | Caledonia, Cenos |
| 2035 | Caledonia, Cenos |
| 2036 | Caledonia |
| 2037 | Caledonia |
| 2038 | Caledonia |

7.3.2.5 The information available on anticipated construction vessels during OEC installation for screened in projects overlapping with the CES MU is as follows:

- Bowdun, Buchan, Stromar: EIARs not yet available, Scoping Reports note potential for disturbance from vessel noise and presence;
- Berwick Bank: baseline vessel traffic of 18 – 24 vessels per day within the OECC study area (17 - 21 within the OEC itself; in winter and summer, respectively). Up to six cable-installation vessels and up to ten cable-protection vessels present on site during a phased installation, limiting active works to a small section of the OECC at any one time (RPS, 2022[42]);
- Cenos: baseline levels of shipping traffic were only recorded for the Cenos array area and thus, there is no data available to be able to predict the potential increase in vessel traffic across the OECC. Up to 22 construction vessels will be required to simultaneously operate for the OWF in general, but no OECC-specific estimate (Floatation Energy, 2025[43]);
- Muir Mhòr: baseline vessel traffic of 45 - 62 vessels per day were recorded within the proposed OECC (in winter and summer, respectively). Seven vessels will be directly involved in export cable installation, representing a 11.3-15.5% increase from the baseline (SMRU Consulting, 2024[44]);
- Salamander: baseline vessel traffic of 28 - 35 vessels per day were recorded across the project area (in winter and summer, respectively). Twelve simultaneous vessels are anticipated to be present along the OECC, representing a 34.3 - 42.8% increase from the baseline (Salamander Offshore Wind Farm, 2024[45]); and
- Proposed Development (Offshore): Baseline vessel traffic of 11 vessels per day in the OECC study area (in summer and winter, respectively). Up to eight installation vessels may be involved in the OEC construction at any one time, representing a 73% increase from the average baseline. However, it is anticipated that only two vessels will be working in coastal OECC sections areas performing activities associated with export cable and connection to landfall, noting this is the area that overlaps with the CES MU.

7.3.2.6 The accumulation of these vessel numbers presented above represent a theoretical worst-case scenario. In practice, OEC installation will not occur continuously across all projects, and vessel availability will constrain simultaneous operations. Therefore, it is highly unlikely that the full cumulative vessel presence would occur simultaneously across at CES MU.

7.3.2.7 Spatially, the OECCs of most of the projects screened in converge on a relatively limited stretch of coastline, within the eastern Moray Firth portion of the CES MU. This creates high-overlap zones where repeated vessel transits could act as temporary barriers to movement. This is particularly

prominent along the area off the Aberdeen coast, close to Peterhead, where the Buchan, Cenos, Muir Mhòr, and Salamander OECCs all converge.

7.3.2.8 Bowdun and Berwick Bank OECCs are located further south along the Aberdeenshire coast, and therefore do not contribute to this high-overlap zone. Each of these projects will cause localised increases in vessels in their respective OECC areas, but this will not be compounded by additional OECCs and associated vessels in the same area. The relative increase in vessel disturbance will be lower in these areas compared to the high-overlap area, hence this assessment has focussed on the high-overlap area as the potential for impact is greater.

7.3.2.9 Average baseline vessel activity across the Muir Mhòr, Salamander, and Caledonia OECC areas is approximately 36 vessels per day (daily counts ranging from 11 – 62). During peak construction years (2029–2031), combined additional traffic across all six OECCs (Buchan, Stromar, Cenos, Muir Mhòr, Salamander and the Proposed Development (Offshore)) could total approximately 54 vessels per day, representing an increase of up to 149% over baseline levels (see Volume 8, Appendix 27 for details on how these values were calculated).

7.3.2.10 The high-overlap zone of vessel activity covers around 3.45% of the CES MU area (excluding port transfer routes, which remain uncertain). Although there is uncertainty regarding the precise scheduling of OECC works, cumulative vessel activity during peak overlap years could increase the frequency of temporary disturbance requiring bottlenose dolphins to adjust movements or temporarily avoid nearshore habitats within these high-use areas. For example, if multiple large vessels are operating at low speed or holding position in narrow corridors, dolphins may be required to increase travel distances or temporarily alter habitat use within the CES MU. However, these effects are expected to remain spatially limited to the immediate vicinity of vessels, confined to periods of OEC construction, and reversible.

7.3.2.11 It is also worth noting that knowledge of bottlenose dolphin habitat use along the Aberdeenshire coast, where most projects will be constructing their OECCs, is limited. Most long-term studies of the CES MU population have focused on the Moray Firth SAC as well as Firth of Tay and Forth estuaries, and therefore distribution in the eastern Moray Firth is comparatively less understood.

7.3.2.12 Although vessel presence and associated underwater noise can temporarily affect bottlenose dolphin behaviour (e.g., reduced foraging efficiency, increased travel time, or changes in vocalisations), these responses are typically short-lived and reversible, with animals resuming normal activity once vessels move away (Constantine *et al*., 2004[28]; La Manna *et al*., 2013[29]; Pirotta *et al*. 2013[30]; 2015[31]; Marley *et al*., 2017a[32]; 2017b[33]; Piwetz, 2019[34]). Evidence from areas with sustained high levels of vessel traffic indicates that bottlenose dolphins can develop a degree of tolerance to such disturbances (La Manna *et al*., 2010[29]; Pirotta *et al*., 2013[30]). Furthermore, all projects are expected to adopt VMPs and/or comply with the existing Scottish Marine Wildlife Watching Codes (Scottish Natural Heritage, 2017a[46] ; 2017b[47]), which will minimise the risk of significant or sustained disturbance.

7.3.2.13 Although multiple projects may generate vessel disturbance within areas used by bottlenose dolphins associated with the Moray Firth SAC, the cumulative exposure across all Proposed Development (Offshore) phases is not predicted to compromise the site's COs. Any predicted disturbance effects are expected to be temporary, spatially limited, and reversible, and therefore will not result in sustained changes to bottlenose dolphin distribution or any reduction in the species' natural range.

7.3.2.14 With respect to CO 2b, the distribution of bottlenose dolphin within the site will not be adversely affected. Temporary avoidance or altered movement patterns may occur as a result of noise from vessels, within the high-overlap zone and/or OECCs. However, the OECCs lie outside the SAC boundary and represent a very small proportion of the functionally-linked habitat for bottlenose dolphin within the wider CES MU (<4%). Within the SAC, bottlenose dolphins typically concentrate in nearshore waters within 3km of the coast, and use the area for breeding and calving in the summer months (NatureScot, 2025b[48]). It can be assumed that bottlenose dolphin behaviour would be similar in other parts of the CES MU.

7.3.2.15 The duration of vessel activities within the 3km coastal zone is expected to be much lower than the total duration of OECC activities given it is only a small proportion of the total OECC length. Whilst there is potential that these works would occur in the summer months and therefore overlap potential breeding behaviour, any disturbance is expected to be limited and fully recoverable given the small scale. Dolphins will still be able to use the majority of the wider CES MU for feeding and other critical behaviours, and all of the SAC as it will not be directly impacted by vessel disturbance due to distance to the OECCs. As a result, dolphins will continue to access all parts of the SAC, and the predicted disturbance is neither significant in scale nor sustained in time, and does not meet the threshold of "significant disturbance" outlined in the site's conservation advice.

7.3.2.16 With respect to CO 1, the integrity of the Moray Firth SAC will be maintained such that its contribution to FCS for bottlenose dolphin is not undermined and the favourable condition of the feature will not be affected. Dolphins may be temporally restricted from small areas of the CES MU, however they will continue to have year-round access to suitable foraging and breeding habitat both within wider CES MU and the SAC which will not be directly impacted. Given their use of extensive areas of the Scottish east coast, short-term localised behavioural responses (e.g., avoidance) of vessels will not affect individual survival or reproductive success, nor directly affect the SAC, therefore ensuring that the features' favourable condition is maintained and continues to contribute to the FCS of bottlenose dolphin.

7.3.2.17 **In conclusion, the cumulative vessel activity associated with the Proposed Development (Offshore), specifically during OEC installation, in-combination with other relevant plans and projects, will not result in an AEoSI for bottlenose dolphins associated with the Moray Firth SAC, and that subject to natural change, the population will be maintained in the long-term.**

# 8 Summary

8.1.1.1 This appendix updates the marine mammals sections of the Caledonia North and Caledonia South RIAAs (Application Documents 13 and 14) to reflect consultation feedback and refinements to the design envelope of the Proposed Development (Offshore).

8.1.1.2 The Dornoch Firth and Morrich More SAC was re-screened for potential piling impacts on harbour seal. An environmental baseline and site context is established for the Dornoch Firth and Morrich More SAC, and Sections 5 and 6 assesses the impacts, concluding that the Proposed Development (Offshore), Caledonia North and Caledonia South will not result in an AEoSI, either alone or in-combination with other projects and plans.

8.1.1.3 Separately, additional modelling and iPCoD analysis has been carried out for bottlenose dolphin in relation to piling disturbance at the Moray Firth SAC. The information necessary to inform the AA on impacts on the bottlenose dolphin qualifying interest of the Moray Firth SAC has been updated with consideration for the updates to the modelling approach, as presented in Section 7. The assessment concludes no AEoSI from the Proposed Development (Offshore), Caledonia North and Caledonia South alone and in-combination with other projects and plans.

8.1.1.4 A further assessment of in-combination vessel disturbance associated with OEC installation was also undertaken and is presented in Section 7.3.2, supported by Volume 8, Appendix 27: Marine Mammals Cumulative Offshore Export Cable Corridor Vessel Disturbance Technical Note. This has concluded that vessel activity from the Proposed Development (Offshore), in-combination with other relevant projects, will not result in an AEoSI for the bottlenose dolphin feature of the Moray Firth SAC.

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