FLOW PARK INVESTMENT

Moray FLOW-Park

OFFSHORE SOLUTIONS GROUP


# European Protected Species (EPS) Risk Assessment:

# Geophysical Survey Campaign 2025

FLOW Park Investment Limited - 5 South Charlotte Street, Edinburgh, EH2 4AN. #SC834194
Offshore Solutions Group Limited – 4th Floor, 205 Regent Street, London, W1B 4HH. #12566753

## CHANGE LOG:

| Rev. | Issue date: | Changes: | Prep. by: | Appr. by: | Status: |
|---|---|---|---|---|---|
| 01 | 14/08/2025 | First version | GoBe Consultants | WR | Final |
| | | | | | |
| | | | | | |
| | | | | | |

## Contents

## Acronyms and Abbreviations

| Term | Definition |
|---|---|
| AEoSI | Adverse Effect on Site Integrity |
| BEIS | Business, Energy and Industry Strategy |
| CES | Coastal East Scotland |
| CGNS | Celtic and Greater North Sea |
| EDR | Effective Deterrent Range |
| EPS | European Protected Species |
| FCS | Favourable Conservation Status |
| FLOW | Floating Offshore Wind |
| IAMMWG | Inter-Agency Marine Mammal Working Group |
| IUCN | International Union for Conservation of Nature |
| JNCC | Joint Natural Conservation Council |
| LSE | Likely Significant Effect |
| MAG | Magnetometer |
| MBES | Multibeam Echosounder |
| MMO | Marine Mammal Observer |
| MU | Management Unit |
| NCMPA | Nature Conservation Marine Protected Area |
| NOAA | National Oceanic and Atmospheric Administration |
| OSG | Offshore Solutions Group |
| OWF | Offshore Wind Farm |
| PAM | Passive Acoustic Monitoring |
| PTS | Permanent Threshold Shift |
| RMS | Root Mean Squared |
| ROV | Remotely Operated Vehicle |

| Term | Definition |
|---|---|
| SAC | Special Area of Conservation |
| SBP | Sub-Bottom Profile |
| SCOS | Special Committee on Seals |
| SEL | Sound Exposure Levels |
| SNH | Scottish Natural Heritage |
| SPL | Sound Pressure Levels |
| SSS | Side Scan Sonar |
| TTS | Temporary Threshold Shift |
| UHRS | Ultra-High Resolution Seismic |
| USBL | Ultra-short baseline |
| WTG | Wind Turbine Generators |

## Units

| Unit | Definition |
|---|---|
| ° | Degree |
| % | Percentage |
| µPa | Micro Pascal |
| cm | Centimetres |
| db | Decibel |
| Hz | Hertz |
| kHz | Kilohertz |
| km | Kilometres |
| $km^2$ | Kilometres squared |
| m | Metres |
| m/s | Metres per Second |

| Unit | Definition |
|---|---|
| MW | Megawatt |
| nm | Nautical mile |
| nT | NanoTesla |

# 1 Introduction

## 1.1 Project Background

Offshore Solutions Group Ltd (OSG), working on behalf of FLOW Park Investment Ltd, are developing the Moray FLOW-Park, to be installed within the Moray Firth (Figure 1). These facilities will provide safe anchorage (or wet storage) for FLOW foundations and / or fully integrated FLOW units with wind turbine generators (WTGs) for temporary storage.

The Moray Firth-South and Moray Firth-North FLOW-Park areas, referred to together as the Moray FLOW-Park, are to be located offshore of Nairn and Findhorn respectively, within the inner Moray Firth. The Moray FLOW-Park covers an approximate area of 36 $km^2$ divided almost equally (i.e., c. 18 $km^2$) between the FLOW Park areas (Figure 1). The capacity of storage allows anchoring for a maximum of 100 FLOW foundations and/or fully integrated FLOW units (i.e. 50 at each FLOW Park), with WTGs of most offshore designs.

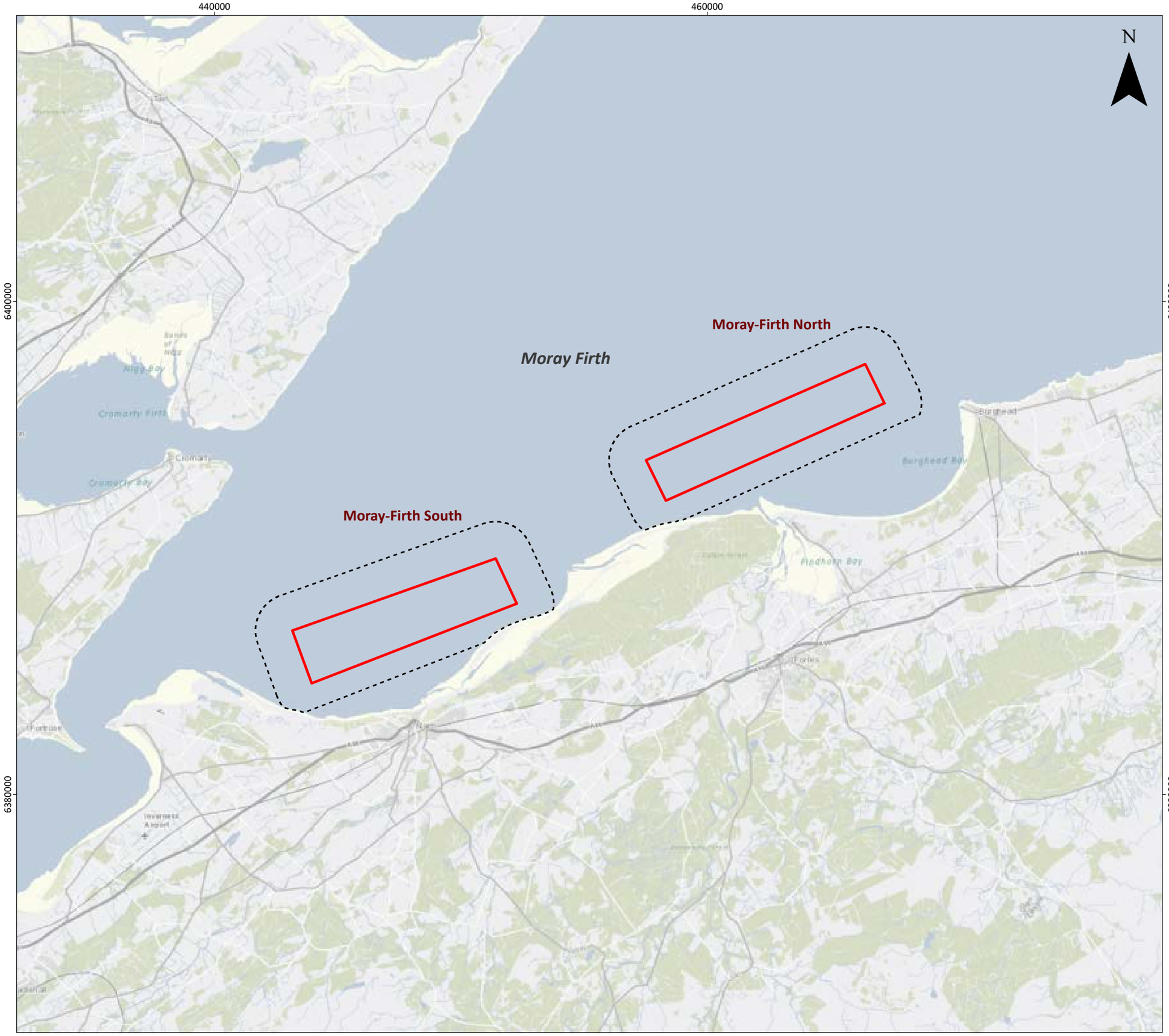
OSG plan to undertake baseline geophysical surveys of the Moray FLOW-Park to ascertain site-specific bathymetry, seabed characteristics and the potential for geophysical and protected habitat features (such as sandwaves, crevices and rocky reefs). A description of the proposed activities is given in Section 2.

Ahead of any geophysical surveys, a European protected species (EPS) Licence needs to be secured where:

- Within 12 nautical miles (nm) of the coast (territorial sea): An EPS Licence may be required under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended) where there is potential for the presence of vessels or underwater noise from the proposed survey activities to kill, injure or cause disturbance to an EPS; and
- Outside 12 nm: An EPS Licence may be required under the Conservation of Offshore Marine Habitats and Species Regulations 2017 where there is potential for the presence of vessels or underwater noise from the proposed survey activities to kill, injure or cause significant disturbance to an EPS (population level effect rather than individual animals).

In addition, a Basking Shark Licence (under the Wildlife and Countryside Act 1981, as amended) may also be needed.

The FLOW Park geophysical surveys will fully occur within the 12 nm limit. OSG has commissioned GoBe Consultants Ltd to prepare this document to provide the necessary information in support of the EPS Licence and Basking Shark Licence applications, which will be submitted to the Marine Directorate - Licensing Operations Team (MD-LOT).



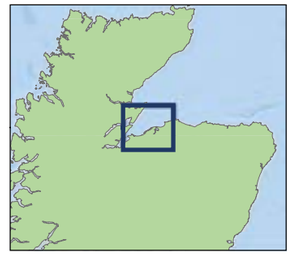

OFFSHORE SOLUTIONS GROUP | working on behalf of Flow Park Investment Ltd

# Moray FLOW-Park
EPS Assessment Report

## Location of Moray FLOW-Park

**Legend**

- Moray FLOW-Park
- Geophysical Survey Area



**Notes**

Contains OS data © Crown Copyright and database right 2020
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors
Contains Ordnance Survey data © Crown copyright and database rights (2025). OS OpenData.

Coordinate System:
WGS 1984 UTM Zone 30N

0 5 10 km

0 2 4 nm

| Scale | Date | Drawn by | Checked by | Approved by |
|---|---|---|---|---|
| 1:150,000 @A3 | 11/08/2025 | EV | BPHB | CC |

Offshore Solutions Group
4th Floor,
205 Regent Street,
London,
W1B 4HB

www.offshoresolutionsgroup.com
+44 208 123 3783

GoBe APEMGroup

**Figure 1**

## 1.2 European Protected Species

### 1.2.1 EPS Protection

All species of cetacean (whale, dolphin and porpoise) occurring in UK waters are listed in Annex IV of the Habitats Directive (European Commission Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna) as an EPS.

Species qualifying as an EPS means that they are species of community interest in need of strict protection, as directed by Article 12 of the Directive. This protection is afforded in Scottish territorial waters (out to 12 nm) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Regulation 39(1) of the Habitats Regulations makes it an offence, with certain exceptions, to:

- Deliberately or recklessly capture, injure or kill a wild animal of an EPS;
- Deliberately or recklessly:
    - Harass a wild animal or group of wild animals of an EPS;
    - Disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;
    - Disturb such an animal while it is rearing or otherwise caring for its young;
    - Obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place;
    - Disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs;
    - Disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed, or reproduce, or rear or otherwise care for its young; or
    - Disturb such an animal while it is migrating or hibernating.

Further protection is afforded through an additional disturbance offence given under Regulation 39(2) which states:

*"...it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean)".*

Outside of 12 nm, the extent of legislative protection against injury is the same as afforded within 12 nm, however the definition of disturbance outside of 12 nm does not extend to individual animals. Therefore, for an EPS licence to be required outside of 12 nm, there must be disturbance of a significant group of animals, not just an individual (not relevant to this particular risk assessment).

### 1.2.2 Disturbance of an EPS

Whether or not an activity could cause disturbance depends on the nature of the particular activity and the impact on the particular species. Whilst disturbance is not defined in the Habitats Regulations (for waters within 12 nm of the coast), The Marine Directorate (Marine Scotland 2014) advise that the following matters should be taken into account when considering what constitutes disturbance:

- 'Disturbance' in Article 12(1) (b) should be interpreted in light of the purpose of the Habitats Directive to which this Article contributes. In particular, Article 2(2) of the Directive provides that measures taken pursuant to the Habitats Directive must be designed to maintain or restore protected species at Favourable Conservation Status (FCS);
- Article 12(1)(b) affords protection specifically to species and not to habitats;
- The prohibition relates to the protection of 'species' not 'specimens of species';
- Although the word 'significant' is omitted from Article 12(1)(b) in relation to the nature of the disturbance, that cannot preclude an assessment of the nature and extent of the negative impact and ultimately a judgement as to whether there is sufficient evidence to constitute prohibited 'disturbance' of the species;
- It is implicit that activity during periods of breeding, rearing, hibernation and migration is more likely to have a sufficient negative impact on the species and constitute prohibited 'disturbance' than activity at other times of the year;
- Article 12(1)(b) is transposed into domestic legislation by Habitats Regulation 39(1) and 39(2). Therefore, when considering what constitutes 'disturbance', thought should be given to Habitats Regulation 39(1)(b) which provides a number of specific circumstances where an EPS could be disturbed, and which can potentially have an impact on the status of the species; and
- Disturbance that could be considered an offence may occur in other circumstances and, therefore, be covered under Habitats Regulation 39(2) (see paragraph 1.2.3).

The Marine Directorate (Marine Scotland 2020) advise that while the likelihood of acute injury can be relatively easy to determine, auditory injury accumulated over a period of time, and disturbance are not so straightforward. Therefore, assessments of potential disturbance will need to be based on a number of factors including:

- The spatial and temporal distribution of the animal in relation to the activity;
- The duration of the activity;
- Any behaviour learned from prior experience with the activity;
- Similarity of the activity to biologically important signals (particularly important in relation to activities creating sound); and

- The motivation for the animal to remain within the areas (e.g., food availability).

As noise can cause disturbance to cetaceans, any application for an EPS licence will require detailed information on the source level of the sound and its frequency. Where there is the possibility for disturbance to any individual EPS to occur, an EPS risk assessment must be carried out and the need for an EPS Licence determined.

As Habitats Regulation 39(2) is not applicable to offshore waters (outside 12 nm), disturbance of an individual animal would not necessarily qualify as significant disturbance requiring an EPS Licence out with 12 nm. Instead, under the Conservation of Offshore Marine Habitats and Species Regulations 2017, disturbance must occur to a sufficiently large or important group of animals such that the ability of that group of animals to survive, breed or rear or nurture their young would be compromised. Alternatively, disturbance could be also considered to occur if the local distribution or abundance of the species was significantly changed.

### 1.2.3 Determining the Requirement for an EPS Licence

Where there is potential to harm or disturb a EPS, it is necessary to assess and determine whether an EPS Licence is required before an activity takes place. The need for an EPS Licence will be determined by MD-LOT as the licensing authority (for purely marine species) with advice from NatureScot based on findings from the EPS risk assessment. The findings from the assessment presented in this document are designed to support the decision-making process regarding the requirement for an EPS Licence, where the granting of an EPS Licence depends on the following three tests:

- That the licence is to be granted for one of the purposes specified in the Regulations;
- That there are no other satisfactory alternatives to the activity proposed; and
- That the licensing of the activity will not be detrimental to the maintenance of the population of the species concerned at FCS.

## 1.3 Basking Shark Protection

Basking sharks (*Cetorhinus maximus*) are listed on Schedule 5 of the Wildlife and Countryside Act (WCA) 1981, which prohibits the killing, injuring or taking by any method of those wild animals. Basking shark are protected from disturbance up to 12 nm offshore from the Countryside and Rights of Way Act (2000) in England and Wales, and from the Nature Conservation (Scotland) Act (2004) in Scotland. The Nature Conservation (Scotland) Act 2004, Part 3 and Schedule 6 make amendments to the WCA, strengthening the legal protection for threatened species to include 'reckless' acts, and specifically makes it an offence to intentionally or recklessly disturb or harass basking sharks.

### 1.3.1 Determining the need for a Basking Shark Licence

Where there is potential to harm or disturb a basking shark, it is necessary to assess and determine whether a Basking Shark Licence is required before an activity takes place. The need for a Basking Shark Licence will be determined by MD-LOT as the licensing authority, with advice from NatureScot based on findings from the EPS and Protected Species Risk Assessment. The granting of a Basking Shark Licence is dependent on the same three tests required for granting of an EPS Licence (see section above Determining the Requirement for an EPS Licence).

# 2 Description of Proposed Activities

## 2.1 Location of Proposed Activities

The proposed geophysical survey works will take place within the boundaries of the Moray Firth-North and Moray Firth-South FLOW-Park areas, located approximately 2.6 km north from Nairn and 2.5 km north from Findhorn within the Moray Firth (see Figure 1). The two sites are approximately 9 km apart and cover an area of 36 $km^2$ in total (c. 18 $km^2$ for each FLOW-Park). The survey area will cover both Moray Firth-South and Moray Firth-North and will include a buffer area covering distances of run-in and run-out (vessel turning space) to ensure the data within the site boundaries are of good quality (total survey area of 106.1 $km^2$).

## 2.2 Survey Vessels

Table 2.1describes the vessel that is anticipated to be used during the geophysical survey works.

*Table 2.1 Vessels to be used during the proposed Moray FLOW-Park geophysical survey campaign*

| Vessel | Description |
|---|---|
| **Roman Rebel** | Roman Rebel is a semi-SWATH DP1 survey vessel of 27.5 m, launched in 2014. It is a multi-purpose seismic, metocean and geotechnical operations vessel. The vessel is coded for work in all sea areas up to 150 nm from safe haven and has an endurance of 10 days operation at sea, running 24 hour operations. |

## 2.3 Survey Techniques

The geophysical survey will comprise the survey equipment listed below and discussed further in Table 2.2:

- Multibeam Echosounder (MBES) Bathymetry;
- Sidescan Sonar (SSS);
- Ultra-short baseline (USBL);
- Sub-bottom profiler (SBP);
- Magnetometer (MAG); and
- Ultra-High Resolution Seismic (UHRS).

*Table 2.2 Geophysical survey equipment to be used*

| Survey Equipment | Description |
|---|---|
| MBES Bathymetry | MBES are used to obtain detailed 3-dimensional (3D) maps of the seafloor which show water depths. They measure water depth by recording the two-way travel time of a high frequency pulse emitted by a transducer. The beams produce a fanned arc composed of individual beams (also known as a swathe). MBES can typically carry out 200 or more simultaneous measurements. The frequencies used by shallow water MBES (<1,000 m) are generally very high and outside of the main hearing range of all marine mammal hearing groups (Joint Nature Conservation Council (JNCC) *et al.*, 2010). This survey technique does not interact with the seabed.<br><br>The proposed system is the Teledyne RESON SeaBat T50-R, which has frequency options from 190 to 420 kHz, with resolution varying from 1° to 2° respectively. This equipment can operate in water depth varying from 0.5 to 500 m with a maximum angular coverage of 165° and maximum ping rate of 50 Hz. |
| SSS | SSS is used to generate an accurate image of the seabed, which may include 3D imagery. An acoustic beam is used to obtain an accurate image of a narrow area of seabed to either side of the instrument by measuring the amplitude of back-scattered return signals. The instrument can either be towed behind a ship at a specified depth or mounted on to a Remotely Operated Vehicle (ROV). The frequencies used by SSS are generally very high and outside of the main hearing range of all marine species (JNCC *et al.*, 2010; National Oceanic and Atmospheric Administration (NOAA) (NOAA, 2018). The higher frequency systems provide higher resolution, but shorter-range measurements. This survey technique does not interact with the seabed.<br><br>The proposed SSS system is EDGETECH 4205 MP (towfish and TPU) operates at a frequency of 230/540/850 kHz and range setting of 40-75 m and a vertical beam width of 50°. This system uses a positioning USBL system primary, manual layback and T-Count pulley system back-up. |
| USBL | USBL systems are used to determine the position of subsea survey items, including ROVs, towed sensors etc. This involves the emission of sound from a hull-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. A complete USBL system consists of a small transducer array, which is mounted under a ship, and a transponder attached to the subsea unit. An acoustic pulse is transmitted by the transducer, travels through the water and is detected by the shipboard transducer on an onboard computer, which calculates the time from the transmission of the initial acoustic pulse until the reply is detected and is measured by the USBL system. This is converted into a range and bearing, and thus the position of the subsea unit/sampling equipment is determined. These systems can either be used continuously or intermittently through the operation they are supporting. This survey technique does not interact with the seabed.<br><br>The proposed USBL system is kPAP 201-H, which operates at a frequency between 20 – 30 kHz and sound pressure level of 190 dB re 1µPa. |
| SBP | SBP systems are used to identify and characterise layers of sediment or rock under the seafloor. The survey will utilise a parametric SBP. The parametric sound source ensures that the beam width of the sound is extremely spatially limited (the angle of the beam spread is approximately 2°) and this combined with the high frequency of |

| | |
|---|---|
| | the generated sound (focused at 100kHz) ensures that any propagation of the sound source is extremely limited. Additionally, it should be noted that the generated sound from the parametric SBPs is a non-impulsive sound source which reduces the risk of any potential injury to marine mammals and the potential for injury impacts is considered unlikely. This survey technique does not interact with the seabed.<br><br>There are two proposed SBP systems:<br><br>Innomar SES-2000 Compact PES operates at a depth range of 0.5 to 400 m and has a range/layer resolution of approximately 1 to 5 cm, a transmit beamwidth of 2°, a primary frequency of 100 kHz, secondary frequencies of 2 to 22 kHz and a ping rate of 40 Hz.<br><br>Innomar SES-2000 Standard PES which operates at a depth of 0.5 to 500 m, a range/layer resolution of approximately 1 to 5 cm, a transmit beamwidth of approximately 2°, primary frequencies of 100 kHz, secondary frequencies of 2 to 22 kHz and a ping rate of up to 40 Hz. |
| MAG | MAG surveys are used to detect any ferrous metal objects on the seabed, such as wrecks, unexploded ordinance or any other obstructions. Marine MAG come in two types: surface towed and near-bottom. Both are towed a sufficient distance (about two ship lengths) away from the ship to allow them to collect data without it being polluted by the ship's magnetic properties. Surface towed MAG allow for a wider range of detection at the price of precision accuracy that is afforded by the near-bottom MAG. These surveys use equipment to record spatial variation in the Earth's magnetic field. This survey technique does not interact with the seabed. The proposed MAG system is a Geometrics G-882 Marine MAG at an operating range of 20,000 to 100,000 nT, with an absolute accuracy of <2 nT, either a USBL or manual layback, a depth sensor and 500 kHz Altimeter. |
| UHRS | UHRS geophysical survey is used to assess the subsurface condition of the seabed. This survey technique does not interact with the seabed. Green Rebel is proposing to use a sparker system for UHRS surveys. Sparker systems are cheaper and easier to operate than any air-gun system. The proposed system is based on negative discharge technology, which can generate a stable, repetitive acoustic pulse with much less maintenance required on the tips.<br><br>There are two SSS proposed system:<br><br>Dura-Spark UHD high-voltage power supply unit. The system operates at a frequency between 300 Hz and 1.2 kHz. The system consists of 3 to 5 arrays of 80 tips, which are towed at the surface;<br><br>SES-2000 Medium 100 with water range depth between 2 to 2,000 m and a seabed penetration up to 70 m. The system operates at a frequency between 4 Hz and 100 kHz. |

## 2.4 Activity Schedule

The offshore geophysical survey campaign is anticipated to commence mid-September 2025 and it is estimated the works would take a maximum of 12 days.

# 3 EPS Risk Assessment

## 3.1 Overview

This section outlines the presence and the use of the survey area by EPS, as well as an assessment of potential effects of the proposed geophysical survey activities on those EPS. As part of the survey campaign, the survey activities include the following key categories:

- Vessel activity; and
- Geophysical surveys of the seabed.

## 3.2 EPS Presence in the Geophysical Survey Area

As listed in Annex IV of the Habitats Directive, all cetacean species are of community interest in need of strict protection as EPS. These species are fully protected in Scottish territorial waters (out to 12 nm) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and are protected by the Conservation of Offshore Marine Habitats and Species Regulations 2017 outwith 12 nm. Harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*) are listed individually, while the remaining cetacean species are encapsulated in the Habitats Directive as *"all other cetacea"*.

A total of 19 cetacean species have been recorded in UK waters (Reid *et al*., 2003). Of these, there are 12 cetacean species known to be present off the east coast of Scotland (Reid *et al*., 2003; Hammond *et al*., 2017) comprising:

- Harbour porpoise (*Phocoena phocoena*);
- Bottlenose dolphin (*Tursiops truncatus*);
- White-beaked dolphin (*Lagenorhynchus albirostris*);
- Killer whale (*Orcinus orca*);
- Risso's dolphin (*Grampus griseus*);
- Fin whale (*Balaenoptera physalus*);
- Sperm whale (*Physeter microcephalus*);
- Humpback whale (*Megaptera novaengliae*);
- Long-finned pilot whale (*Globicephala melas*);
- White-sided dolphin (*Lagenorhynchus acutus*);
- Minke whales (*Balaenoptera acutorostrata*); and
- Short-beaked common dolphin (*Delphinus delphis*).

Of these, harbour porpoise, bottlenose dolphin, common dolphin, white-beaked dolphin, white-sided dolphin and minke whale regularly occur in the central North Sea

(Reid *et al.*, 2003; Gilles *et al.*, 2023). The following section provides a summary of the most common species in the survey area.

### 3.2.1 Cetacean Species Potentially Present in the Survey Area

Small Cetaceans in European Atlantic waters and the North Sea (SCANS) IV aerial and ship-based surveys were carried out by the ObSERVE2 project in 2021/2022, following SCANS III in 2016, and used to estimate the abundance of cetaceans across European Atlantic waters (Hammond *et al.*, 2021; Gilles *et al.*, 2023). Table 3.1 summarises density (individuals/km$^2$) and abundance estimates of the most common species present across the geophysical survey area, which is located in SCANS IV survey Block CS-K[1] (covering the north-east coast of Scotland; Gilles *et al.*, 2023).

[1] The block CS-K covers an area of approximately 40,738 km$^2$ from the Moray Firth in the south to approximately 200 km offshore from Orkney Islands in the north.

*Table 3.1 Density and population estimates for the regularly occurring cetaceans off the north- east coast of Scotland and wider Management Unit (MU).*

| Cetacean | General Distribution | Density Estimates (individual/km$^2$) | Estimated Population | |
|---|---|---|---|---|
| | | Survey Block CS-K | UK MU | MU |
| Harbour porpoise | Individuals can be found in nearshore and offshore waters throughout the North Sea | 0.2813 (Gilles *et al.*, 2023) | 159,632 (Inter-Agency Marine Mammal Working Group (IAMMWG), 2023)) | 346,601 (North Sea MU; IAMMWG, 2023) |
| Common dolphin | Predominantly an offshore species | 0 (Gilles *et al.*, 2023) | 34,025 (IAMMWG, 2023) | 102,656 (Celtic and Greater North Sea (CGNS) MU; IAMMWG, 2023) |
| Bottlenose dolphin | The coastal east Scotland population is predominantly found in nearshore areas, whilst other populations are found in deeper offshore areas | 0 (Gilles *et al.*, 2023) | 226 (Cheney *et al.*, 2024) | 226 (Coastal East Scotland (CES) MU; Cheney *et al.*, 2024) |
| White-beaked dolphin | Predominantly an offshore species | 0.1352 (Gilles *et al.*, 2023) | 34,025 (IAMMWG, 2023, 2023) | 43,951 (CGNS MU; IAMMWG, 2023) |
| White-sided dolphin | Predominantly an offshore species which prefers shelf habitat | 0 (Gilles *et al.*, 2023) | 12,293 (IAMMWG, 2023) | 18,128 (CGNS MU; IAMMWG, 2023) |
| Minke whale | Individuals can be found in nearshore and offshore waters throughout the North Sea | 0.0116 (Gilles *et al.*, 2023) | 10,288 (IAMMWG, 2023) | 20,118 (CGNS MU; IAMMWG, 2023) |

Harbour porpoise is the most widespread and frequently recorded species in the North Sea and are found in abundance throughout Scottish waters, usually as pairs or groups of three with larger foraging groups sometimes appearing (Evans *et al.,* 2003, Reid *et al*. 2003; Duck and Morris, 2014; Gilles *et al.*, 2023). Globally, harbour porpoise appear on the International Union for Conservation of Nature (IUCN) Red List as a species of 'Least Concern'; however, there is a gap in the knowledge regarding the current population trend (Braulik *et al*. 2020). The relevant IAMMWG MU for harbour porpoise covers the entire North Sea (North Sea MU). The conservation status of the harbour porpoise in the UK is currently unknown due to insufficient data (JNCC, 2019).

Common dolphin are found in continental shelf waters, occur along the shelf edge and in deep waters of the west coast of the UK and Europe (Reid *et al*. 2003). Common dolphin were not recorded in Block CS-K of the SCANS IV survey, or SCANS III, however, they have been recorded throughout the CGNS MU (IAMMWG, 2023; Gilles *et al.*, 2023) and in the Moray Firth (Robinson *et al.*, 2010; Moray West, 2018). In the Moray Firth, over 1,218 common dolphins were sighted between 2001 and 2009, and the estimated density was 0.074 individuals/km$^2$ (Robinson *et al.*, 2010). The conservation status of common dolphin in the UK is currently unknown owing to data limitations and is listed in the IUCN Red List as a species of 'Least Concern' (JNCC, 2019; Braulick *et al.*, 2021).

There are two ecotypes of bottlenose dolphin present in UK waters, a coastal and offshore ecotype (Cheney *et al.,* 2013). With respect to the coastal ecotype, there is a resident bottlenose dolphin population within the Moray Firth, where the geophysical survey area is located. Estimates for this population do vary between years, however, recent survey data indicates that half of the estimated population occupy the area regularly (Graham *et al.*, 2016). Bottlenose dolphins off the east coast of Scotland are regularly observed with calves and juveniles, indicating a breeding population (Arso Civil *et al.,* 2021). The conservation status of bottlenose dolphin in the UK within the species range is currently listed as unknown due to insufficient data and is listed in the IUCN Red List as a species of 'Least Concern' (JNCC, 2019; Wells *et al.*, 2019). The Moray Firth Special Area of Conservation (SAC) has been designated for the protection and conservation of this resident population and the habitat they rely on (NatureScot, 2021). Please see Section 6 for further information on this designated site and the designated features.

White-beaked dolphin are usually found along the east coast of Scotland during the summer months, in small groups of 10 or less (however, they can be seen in groups of 50 or more) at water depths of 50 – 100 m (Reid *et al.*, 2003). The estimated density of white-beaked dolphin for Block CS-K was 0.1352 individuals/km$^2$, which is relatively high compared to neighbouring regions of the North Sea (Gilles et *al.*, 2023). The conservation status of white-beaked dolphin in the UK is currently unknown and is listed in the IUCN Red List as a species of 'Least Concern' (JNCC, 2019; Kiszka and Braulik, 2018).

Atlantic white-sided dolphins are sighted throughout the year across UK waters, particularly in the north and northwest coasts of Scotland during the summer months (Paxton *et al.*, 2016). Their main habitat is offshore along the outer continental shelf and slope. The Scottish Marine Atlas shows that some sightings have been reported in the east and northeast (Scottish Government, 2011). White-sided dolphin were not recorded in Block CS-K of the SCANS IV survey or SCANS III. The conservation status for the Atlantic white-sided dolphin in the UK is currently unknown due to insufficient data and is listed in the IUCN Red List as a species of 'Least Concern'(Braulik, 2019). Due to white-sided dolphins not being regularly sighted in the Moray Firth they have not been included in this assessment.

Minke whale are geographically wide-ranging and are the most abundant baleen whale species within Scottish waters, usually present along the east coast of Scotland during the summer months (June – September) (Reid *et al.*, 2003; Hammond *et al.*, 2017, Robinson *et al.*, 2009). Minke whale are found in water depths up to 200 m, usually individually or as pairs but they do form larger groups (up to 15 individuals) whilst foraging. The Southern Trench Nature Conservation Marine Protected Area (NCMPA) has been designated for the protection of minke whale. Specifically, this designated site has the conservation objective to ensure:

"*minke whale in the Southern Trench NCMPA are not at significant risk from injury or killing, conserve the access to resources (e.g. for feeding) provided by the NCMPA for various stages of the minke whale life cycle, and conserve the distribution of minke whale within the site by avoiding significant disturbance*".

The estimated density of minke whale in the area was 0.0116 individuals/km$^2$. The UK conservation status for the minke whale is currently unknown due to insufficient data is listed as a species of Least Concern on the IUCN Red List (JNCC, 2019; Cooke, 2018).

### 3.2.2 Other Protected Species – Basking Sharks

Within UK waters, the basking shark is a seasonal visitor, arriving in significant numbers in May and remaining until October. In the early spring and summer months, warmer waters move from the Atlantic into the coastal waters of Scotland, England, and Wales, which encourages greater marine productivity, which is thought to be the driver of for the higher abundancies of basking sharks during these months (Miller *et al.*, 2015).

During the summer of 2023, an estimate of 250 basking shark sightings were reported across Scotland, including an estimated 40 individuals in the Moray Firth. Observations in the area suggest the sharks were engaged in feeding and possibly mating (Gorvett, 2023). Furthermore, data from HWDT (2025) indicate that between 2017 and 2025, there were 179 recorded basking shark sightings within the Moray Firth. As an elasmobranch, the basking shark is considered to have low sensitivity to noise vibrations due to the fact they do not have a swim bladder (Popper *et al.*, 2014). The hearing range of basking sharks

is not known; however, five other elasmobranchs have been found to have a hearing range between 20 Hz to 1 kHz with greatest sensitivities at lower frequencies (Mickle *et al.*, 2020), this data may or may not be transferable to basking sharks (Macleod *et al.*, 2011). As 20 Hz - 1 kHz only encompass a small proportion of the noise emitted during the proposed geophysical surveying, and the activities will be intermittent, noise disturbance is not expected to impact basking sharks. On this basis, the potential for noise emissions to impact upon basking sharks is screened out of further assessment.

Vessel collision also poses a threat to this slow-moving species and basking sharks have a medium sensitivity to collision (NatureScot, 2020a. Collision risk increases with increasing vessel speed; as the survey vessels will be moving slowly, collision risk is generally low.

The NMPi (2025) reports basking sharks to be present off the East coast at an observed adjusted density in of 0.00-0.010 animals/km$^2$.

### 3.2.3 Potential Impacts on EPS

The objective of this risk assessment is to identify the potential for injury and disturbance to EPS from the proposed geophysical survey activities. This section highlights potential impacts to protected species, including EPS, regardless of their inclusion as qualifying features of protected sites. A summary of proposed survey activities and their potential impacts to EPS is provided in Table 3.2.

The Marine Scotland (2020) guidance states the following two key factors that have the potential to cause death or injury to an animal:

- Physical contact (e.g., collision with vessels); and
- Anthropogenic sound (underwater noise).

Cetaceans are considered particularly susceptible to these impacts as underwater noise emitted by vessels and the physical presence of the vessels have the potential to cause injury or disturbance to EPS. While some techniques may introduce noise to the marine environment, other activities do not generate sufficient levels of noise to be considered as potential sources of noise-related injury or disturbance to EPS and have been screened out of the detailed assessment, as indicated in Table 3.2.

*Table 3.2 Summary of proposed survey activities and their impacts on EPS*

| Activity/equipment | Potential impacts | Predicted source levels and frequencies relevant to the marine environment | Further information required as part of the EPS Risk Assessment |
|---|---|---|---|
| **Survey vessels** | | | |
| Noise impacts | Propellers, engines, and propulsion activities form the primary noise sources of survey vessels. Vessel noise is generally continuous and comes in both narrowband and broadband emissions. Potential impacts on EPS depend on the duration and location of the surveys and EPS potentially present in the area. | Vessel emissions typically range from 150 – 190 dB re 1µPa (root mean squared (rms)). Acoustic energy vessel noise emissions are strongest at frequencies <1 kHz (Prideaux, 2017). | Yes – although source levels are likely to be too low to result in injury, they will be audible to most species and thus have the potential to result in disturbance. |
| Collision risk | Increased vessel activity has the potential to cause injury from collisions. The risk of collision with an EPS is influenced by the size of the vessel and its speed. | Vessels will be most at risk of colliding with a cetacean whilst moving from port to the survey area and returning to port as this will be when the vessel is travelling at faster speeds. | Yes – Mitigation measures such as a Marine Mammal Observer (MMO) and vessel adherence to the Scottish Marine Wildlife Watching code will be used to reduce the risk of collision. |
| **Geophysical survey** | | | |
| MBES | High frequency pulses created by MBES equipment generate sound waves which produce impulsive underwater noise. Depending on the frequency of the pulses, location and duration of the operations, and the species present, there could be potential impacts on EPS. | MBES source levels typically range from 200 – 240 dB re 1µPa (rms) (Hartley Anderson Ltd, 2020), the equipment specifications describe the MBES to emit noise over a frequency of 200 - 400 kHz. | Yes – source levels have a minimum peak pressure level which has been identified as having the potential to cause injury to harbour porpoise (physical injury or Permanent Threshold Shift (PTS)) (200 - 202 dB re 1µPa). |

| Activity/equipment | Potential impacts | Predicted source levels and frequencies relevant to the marine environment | Further information required as part of the EPS Risk Assessment |
|---|---|---|---|
| UHRS | UHRS geophysical survey to assess the subsurface condition of the seabed. | Geo-source 400 sparkers used in UHRs have a frequency range of 50 Hz to 3.5 kHz. Sparker surveys source levels (peak) range from 220 – 226 dB re 1µPa at 1m (Hartley Anderson Ltd, 2020). | Yes – they will be audible to most species and thus have the potential to result in disturbance or injury. |
| SSS | SSS equipment produces impulsive sound emissions through high frequency pulses used to image the seabed habitat. Potential impacts to EPS depend upon the frequency, location, and duration of the pulses. | SSS source levels (peak) range from 205 – 230 dB re 1µPa at 1m (Hartley Anderson Ltd, 2020). The SSS specifications report frequencies between 230/540/850 kHz. | Yes – source levels have a minimum peak pressure level which has been identified as having the potential to cause injury to harbour porpoise (200 dB re 1µPa) and a maximum peak pressure level which has been identified as having the potential to cause injury to bottlenose dolphins (230 dB re 1µPa). |
| USBL | USBL systems are used to determine the position of subsea items. This involves the emission of sound from a hull-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. The potential impacts of this sound on cetaceans depends upon the abundance, distribution and sensitivity of the species, and the duration of the operations. | USBL typically emit noise within the frequency range of 20 – 30kHz and source level (peak) typically of 190db re 1µPa at 1m. | Yes – although source levels are likely to be too low to result in injury, they will be audible to most species and thus have the potential to result in disturbance. |
| SBP | SBP involves the vertical emission of sound pulses (impulsive noise) to characterise the layers of sediment comprising the seabed. Such activities introduce noise emissions into the | SBP typically emit noise within the frequency range 100 Hz to 22 kHz, although primary frequency may emit up to 115 kHz. SBP source levels (peak) typically range between 185 – | Yes – although source levels are likely to be too low to result in injury, they will be audible to most species and thus have the potential to result in disturbance. |

| Activity/equipment | Potential impacts | Predicted source levels and frequencies relevant to the marine environment | Further information required as part of the EPS Risk Assessment |
|---|---|---|---|
| | marine environment. The potential impacts of this sound depend upon the type of profiler technology used, as well as the abundance, distribution and sensitivity of the species, and the duration of the operations. | 250 dB re 1µPa at 1m (Hartley Anderson Ltd, 2020). | |
| MAG | A MAG will be employed to detect magnetic anomalies in the seabed. | Not applicable | No - MAG do not emit noise as a part of their normal functioning, so there is no possibility of injury or disturbance from noise emissions. |

## 3.3 Impact Assessment – Underwater Noise

Noise emissions present the highest potential risk of disturbance to cetaceans within the vicinity of the survey area. Underwater noise has the potential to impact cetaceans, either through injury or disturbance. Injury from noise emissions includes physiological damage to auditory or other internal organs, while disturbance can result in temporary or continuous disruption to behavioural patterns such as migration, breathing, nursing, feeding, foraging, socialising and sheltering.

Vessel strike has a higher likelihood of resulting in injury or death to cetaceans than noise emissions and so has also been assessed here.

### 3.3.1 Types of Noise

According to Southall *et al.* (2019) and NOAA (2018), sound can be categorised into distinct 'types', as detailed in Table 3.3.

*Table 3.3 Types of sound as defined by Southall et al (2019) and NOAA (2018).*

| Noise type | Description |
|---|---|
| Impulsive | Sounds which are short in duration (i.e. less than 1 second long) and temporary, occupy a broadband bandwidth, and have rapid rise and decay times with a high peak pressure level. This can be further defined as:<br>• Multiple pulsed sound – sound comprising two or more discreet acoustic events in a 24-hour period (e.g., from MBES, SSS or SBP); and<br>• Single pulse sound – sound comprising a single discreet acoustic event in a 24-hour period (e.g., an underwater explosion). |
| Non-impulsive | Sounds which may occupy a broadband, narrowband or tonal bandwidth, can be brief, prolonged, continuous or intermittent in nature, and are not characterised by rapid rise and decay times or a high peak pressure level. Vessel noise would be an example of non-impulsive/continuous sound. |

### 3.3.2 Assessment Criteria – Lethal and Auditory Injury Thresholds

To determine the potential for noise to impact cetaceans, perceived sound levels are compared to available empirically-estimated thresholds for injury and disturbance. JNCC *et al.,* (2010) and Scottish Government (2022) recommend using the injury and disturbance criteria proposed in Southall *et al.,* (2007) which is based on a combination of linear (un-weighted) peak sound pressure levels (SPL) and weighted sound exposure levels (SEL). Since publication there has been additional evidence which has led to amendments to the auditory thresholds for injury, with updated guidance presented in Southall *et al*. (2019) (from Southall *et al.*, (2007)).

Southall *et al*. (2019) present the sound level at which it is expected that a marine mammal may be at risk of experiencing hearing impairment as a result of the received

sound. Hearing impairment, specifically, a change in the hearing sensitivity (or threshold at which a sound can be detected) can either be temporary (Temporary Threshold Shift; TTS) or permanent (Permanent Threshold Shift; PTS). PTS is considered to be an injury under UK legislation. All experiment studies are limited to identification of TTS-onset, with no studies able to directly identify PTS-onset as this would be unethical; as such, PTS-onset is extrapolated from the measured TTS-onset values. The likelihood of individual animals experiencing PTS and TTS is dependent on both the received sound level and the frequency of the sound received.

PTS and TTS thresholds are based on a dual-criteria approach involving two metrics:

- Energy-based metric – a measure of the accumulated sound energy an animal is exposed to over a period of time (exposure period). For single pulses, this is referred to as the SEL. For multiple pulses over an exposure period, this is referred to as the cumulative Sound Exposure Level ($SEL_{cum}$). The SEL thresholds for PTS therefore consider received noise levels and duration of exposure over a 24-hour period and are weighted to acknowledge the different hearing sensitivities of each function hearing group (see Table 3.4); and
- Pressure-based metric – referred to as the SPL. This is measured as peak sound pressure level ($SPL_{peak}$). Any single exposure at or above this pressure-based metric is considered to have the potential to cause PTS regardless of exposure duration (Southall *et al.*, 2019). The peak SPL criterion is for unweighted received sound level.

*Table 3.4 Southall et al (2019) cetacean functional groups and PTS/TTS criteria.*

| Functional Hearing Group | Generalised Hearing Ranges | PTS Onset | | | TTS Onset | |
|---|---|---|---|---|---|---|
| | | Impulsive | | Non-Impulsive | Impulsive | Non-Impulsive |
| | | $SEL_{cum}$ | $SPL_{peak}$ | $SEL_{cum}$ | $SEL_{cum}$ | $SEL_{cum}$ |
| Low-frequency cetaceans (e.g., minke whale) | 7 Hz – 35 kHz | 183 | 219 | 199 | 168 | 179 |
| High frequency cetaceans (e.g., bottlenose dolphins) | 150 Hz – 160 kHz | 185 | 230 | 198 | 170 | 178 |
| Very high-frequency cetaceans (e.g., harbour porpoise) | 275 Hz – 160kHz | 155 | 202 | 173 | 140 | 153 |

### 3.3.3 Disturbance

Marine Scotland (2020) specifies disturbance as occurring if the activity is likely:

"*to significantly affect the local distribution or abundance of the species to which it belongs"*.

Behavioural disturbance has been assessed using a qualitative approach based on the consideration of factors such as source level, mitigation measures and length of operations, but also a quantitative assessment of animals impacted has also been done in Table 3.6. In addition, factors likely to influence interaction between the survey works and cetaceans likely to be present in the survey area is assessed.

European Commission (2007) guidance indicates that a disturbance must significantly impact the local distribution or abundance of a species, including temporary impacts, while guidance proposed by JNCC *et al*. (2010) states the following:

*"any action that is likely to increase the risk of long-term decline of the population(s) of (a) species could be regarded as disturbance under the Regulations"*.

In order to consider the possibility of a disturbance offence as a result of the proposed geophysical survey, it is necessary to consider the likelihood that exposure of the animal(s) produces a response which is likely to generate a significant population-level effect.

Assessment of population-level impacts from a temporary disturbance is complex due to the highly variable nature of the introduced disturbance, the variability of the behavioural response between different species and individuals, and the availability of population estimates for EPS in a given area of the North Sea.

A method for assessing a potential disturbance is to compare the factors the proposed geophysical survey works are predicted to produce with empirical studies (Southall *et al*., 2007). However, there are currently no agreed thresholds or criteria for modelling the disturbance of marine mammals from underwater noise.

Noise propagation modelling has therefore not been undertaken for this assessment. Table 3.5 shows a scoring system developed by JNCC *et al*. (2010) where a score of 5 or more on the Southall *et al*. (2007) behavioural response severity scale, could be significant.

*Table 3.5 Behavioural disturbance scale (Southall et al., 2007).*

| Response Score | Corresponding behaviours in free-ranging subjects |
|---|---|
| 0 | No observable response |
| 1 | Brief orientation response (investigation / visual orientation). |
| 2 | Moderate or multiple orientation behaviours;<br>Brief or minor cessation/modification of vocal behaviour; and<br>Brief or minor change in respiration rates. |
| 3 | Prolonged orientation behaviour; Individual alert behaviour;<br>Minor changes in locomotion speed, direction, and/or dive profile but no avoidance of sound source;<br>Moderate change in respiration rate; and<br>Minor cessation or modification of vocal behaviour (duration < duration of source operation). |
| 4 | Moderate changes in locomotion speed, direction, and/or dive profile but no avoidance of sound source;<br>Brief, minor shift in group distribution; and<br>Moderate cessation or modification of vocal behaviour (duration more or less equal to the duration of source operation). |
| 5 | Extensive or prolonged changes in locomotion speed, direction, and/or dive profile but no avoidance of sound source;<br>Moderate shift in group distribution;<br>Change in inter-animal distance and/or group size (aggregation or separation); and<br>Prolonged cessation or modification of vocal behaviour (duration > duration of source operation). |
| 6 | Minor or moderate individual and/or group avoidance of sound source;<br>Brief or minor separation of females and dependent offspring;<br>Aggressive behaviour related to sound exposure (e.g., tail/flipper slapping, fluke display, jaw clapping/gnashing teeth, abrupt directed movement, bubble clouds);<br>Extended cessation or modification of vocal behaviour;<br>Visible startle response; and<br>Brief cessation of reproductive behaviour. |
| 7 | Extensive or prolonged aggressive behaviour;<br>Moderate separation of females and dependent offspring;<br>Clear anti-predator response;<br>Severe and/or sustained avoidance of sound source; and<br>Moderate cessation of reproductive behaviour. |

| Response Score | Corresponding behaviours in free-ranging subjects |
|---|---|
| 8 | Obvious aversion and/or progressive sensitisation;<br>Prolonged or significant separation of females and dependent offspring with disruption of acoustic reunion mechanisms;<br>Long-term avoidance of area (> source operation); and<br>Prolonged cessation of reproductive behaviour. |
| 9 | Outright panic, flight, stampede, attack of conspecifics, or stranding events; and<br>Avoidance behaviour related to predator detection. |

The more severe the response on the scale, the less time animals will likely tolerate the disturbance before there could be significant negative effects, which could constitute a disturbance under the relevant Regulations.

The assessment of disturbance by the proposed survey methods incorporates the potential of the behaviours described by Southall *et al*. (2007) that would occur within the limited duration of the geophysical survey activities. As such, the potential for those behaviours to result in a population-level effect is assessed, the impact on the FCS of any species will then be assessed.

## 3.4 Assessment of Potential Impacts to EPS (Cetaceans)

The results of the impact assessment for the proposed geophysical survey of the FLOW Park area are outlined below in the following sections. The assessment considers both injury (PTS) and disturbance impacts to EPS (cetaceans) under each of the following activities and geophysical survey techniques:

- Vessels;
- USBL;
- SSS and MBES; and
- SBP and UHRS.

### 3.4.1 Vessels

The presence of vessels potentially impacts cetaceans through underwater noise and collision risk. The risk of collision along with the level of noise emitted into the marine environment by a vessel depends on the vessel type, size, mode of propulsion, operational factors and speed. Different frequencies of sound are emitted from different sizes of vessels, where larger vessels tend to emit lower frequency noise, though this noise tends to fall below several hundred Hz.

Injury to cetaceans through collision with survey vessels can include blunt trauma to the body or injuries consistent with propeller strikes. The risk of collision is directly influenced by the type of vessel and the speed with which it is travelling (Laist *et al*., 2001) and indirectly by ambient noise levels underwater and the behaviour the marine mammal is engaged in. Marine mammals are able to detect and avoid vessels, it is unclear why some individuals do not always move out of the path of an approaching vessel (Schoeman *et al.,* 2020).

There is a relatively high vessel movement in area so the addition of one vessel is unlikely to increase the risk of collision. In addition, all vessel operators will follow the Scottish Marine Wildlife Watching Code (NatureScot, 2017) and the Basking Shark Code of Conduct (The Shark Trust, undated), as good practice to reduce any risk of collision with marine mammals.

#### *3.4.1.1 Injury Impact*

Laist *et al*. (2001) predicted that the most severe injuries resulting from collision are with vessels travelling at over 14 knots, and the probability of lethal injury of a large whale species decreases from 0.79 at a speed of 15 knots to 0.21 at 8.6 knots (Vanderlaan and Taggart, 2007). The risk of collision with a cetacean appears to increase with increased vessel speeds and also vessel size. There is also a correlation between increased severity of injury and vessel speed and size.

Given that the geophysical survey vessel will be moving along defined line spacings at slow speeds (<5 knots), the potential for collisions is negligible. Furthermore, Van Waerebeek *et al*. (2007) have reported that non-lethal collisions do occur between vessels and marine mammals, suggesting that in the instance of vessel collisions with marine mammals, they are not necessarily always fatal.

In relation to PTS in cetaceans as a result of vessel noise, Richardson *et al*. (1995) reported that peak emissions that range between 160 – 175 dB re 1µPa, are predicted to impact an animal swimming at a constant speed of 1.5 m/s from the source at zero metres from the vessel. As such it is concluded that physical and auditory injury impacts are highly unlikely to occur, as this would require an animal to be in close vicinity of the noise source for a prolonged duration.

Therefore, it is predicted that there will be no risk of injury to any species of cetacean as a result of underwater noise from vessels or collision risk from the geophysical survey vessel. Consequently, there is no potential to commit an offence with regards injury or impact on the FCS of any EPS, and thus no requirement for an EPS Licence in this respect.

#### *3.4.1.2 Disturbance Impact*

Despite noise levels from the geophysical survey vessels being unlikely to cause physical or auditory injury, they could be sufficient to cause local disturbance to marine mammals

that are in close proximity to the vessels, depending on ambient noise levels. Thomsen *et al.* (2006) used species hearing detection thresholds to conclude that noise from larger vessels (around 0.25 kHz) will be detected by harbour porpoise at distances of approximately 1 km, and noise from smaller vessels around (2 kHz) will be detected at around 3 km.

Harbour porpoise have been reported to be more sensitive to vessels that produce medium to high frequency noise (e.g., Hermannsen *et al.*, 2014). Where porpoise are exposed to vessel noise that contains low levels of high frequencies, they appear to avoid vessels (e.g., Dyndo *et al.*, 2015). Wisniewska *et al.* (2018) have also recorded changes in harbour porpoise foraging rates in response to vessel presence, indicating the potential for a reduction in foraging activity where animals are exposed to vessel noise greater than 96 dB re 1 µPa for prolonged periods of time.

Behavioural responses can vary greatly depending on context and as data specific to harbour porpoise is also limited, the distance at which animals may react to vessels is challenging to predict. However, Thomsen *et al.* (2006) documented that harbour porpoise might be expected to respond to geophysical survey vessels at approximately 400 m.

There is a possibility that responses from marine mammals can arise due to the simple presence of vessels. A study by Graham *et al.* (2019) indicated that harbour porpoise were effectively displaced by approximately 1 km due to the presence of construction vessels which would be of a similar size to geophysical survey vessel. Pirotta *et al.* (2015) concluded that the response of bottlenose dolphin in the Moray Firth was related to the number of boats present, rather than the levels of overall noise. However, while this study provides evidence that a perception of risk can be related to the presence of boats, silent and stationary boats did not elicit a response.

Although the predicted source levels associated with the survey vessel have the potential to elicit a behavioural response in cetacean species, it would require the vessel noise to be emitted over an extended period to cause a significant disturbance offence as defined under the Habitats Regulations. As the survey vessel will be continuously moving across the survey area, animals within a particular location will not be exposed to extended periods of noise from the vessel.

Due to the temporary and transient nature of the geophysical survey works, it is unlikely that vessel noise emissions would influence the ability of an animal to survive or reproduce or result in significant impacts to the population abundance or distribution. It has therefore been concluded that there will be no negative impact of the FCS of any EPS.

### 3.4.2 USBL

The length of time the USBL systems will be required is dependent on the specific survey activities, however there is potential that a USBL could be used continuously throughout a proposed geophysical survey works. The potential impacts of continuous sound from USBL equipment on cetaceans that may be present in the survey area are described in the sections below.

The USBL system is used for controlling the position of subsea equipment during the survey, and it operates by emitting a low frequency acoustic pulse between the transponder on the vessel and the transducer on the subsea unit. As low frequency emissions travel further than high frequency sounds, cetaceans may be exposed to these noise emissions over a greater spatial area than they would with higher frequency sounds such as those associated with SSS or MBES.

The low frequency sound generated by the USBL system are within the hearing range of the cetacean species anticipated to be within the project area. As such, there is potential for USBL survey activities to potentially cause a disturbance response in animals that are present during the proposed geophysical survey works (JNCC *et al.*, 2010).

#### *3.4.2.1 Injury Impact*

The USBL system is likely to be employed intermittently, with time spent deactivated in-between noise emissions. This would allow animals to move away from the source and avoid continuous exposure. In addition, this survey USBL operates below the PTS onset thresholds for marine mammals, therefore there is no risk of auditory injury (PTS) by this equipment.

As such, there is no potential to commit an offence with regards to injury or to affect the FCS of any EPS through the use of the USBL system. Therefore, there is no risk of offence and an EPS licence for injury will not be required.

#### *3.4.2.2 Disturbance Impact*

The survey period is anticipated to span up to 12 days. During this time the survey vessel will be traversing the survey routes, resulting in localised and temporary noise generation. For a disturbance impact to occur, cetaceans would need to stay within close proximity to the vessel during USBL operation.

Survey activities will be temporary and short-term in nature and so it is unlikely that USBL would have a negative impact on the FCS of the cetacean species present across the survey area. This assumes that the level of disturbance is unlikely to impact the animals ability to survive and reproduce. There is, however, a possibility of disturbance occurring for a short period of time as a result of noise impacts and so an EPS licence is required for proposed survey activities within 12 nm (as per Regulation 39(2)), or in the case of the proposed geophysical survey works within the survey area.

Further mitigation measures will be implemented in order to minimise the risk of further impacts from the geophysical survey works (see Section 4).

### 3.4.3 SSS and MBES

SSS and MBES techniques use continuous sound and generally operate at higher frequencies, the potential impacts from this are outlined in the following sections.

For the proposed geophysical survey, the expected frequency range for SSS and MBES operations is anticipated to be above 200 kHz. These frequencies are generally beyond the hearing range of most cetaceans, including high-frequency sensitive species such as harbour porpoise.

#### *3.4.3.1 Injury Impact*

In shallow depths, sound emitted by MBES may be audible to some cetaceans, particularly high frequency species such as harbour porpoise. However, higher frequency sounds diminish faster such that the received sound level rapidly decreases with distance from the source. As such, the animals would have to remain in close proximity to the sound source for potential auditory injury to occur. The likelihood of this occurring is low, particularly as the source will be emitted from a moving vessel, thus the subsequent risk to cetaceans in the survey area is very low (JNCC *et al.*, 2010). Harbour porpoise have been identified as a very high frequency species, with an estimated auditory band width of 200 Hz to 180 kHz, with improved hearing ability for sounds of higher frequencies (Southall *et al*. 2017). It is thought that surveys occurring at depths greater than 200 m which utilise frequencies below 100 kHz may impact EPS (JNCC, 2017). As this survey utilises frequencies higher than 200 kHz and also utilises mitigation measures (see Section 4) this is not thought to be as significant a risk here.

MBES surveys in shallower waters (less than 200 m) will further reduce potential injury to cetaceans around the survey area. JNCC (2017) do not advise that mitigation to avoid the risk of injury is necessary in shallow waters (less than 200 m), which is the case of the geophysical surveys of the FLOW Park area.

EPS guidance by JNCC *et al*. (2010) on the use of SSS states that 'this type of survey is of a short-term nature and results in a negligible risk of an injury or disturbance offence (under the regulations)', therefore no mitigation is required.

Given the increased noise attenuation associated with these high frequencies, it can be concluded that these surveys present a negligible risk of injury to cetaceans (JNCC *et al.*, 2010). Consequently, the potential to commit an offence is negligible and thus there is no requirement for an EPS Licence in this respect.

#### *3.4.3.2 Disturbance Impact*

Underwater noise has the potential to modify the behaviours of animals in the vicinity of the noise source. As outlined previously in this section, significant disturbance may occur when an animal is at risk of a sustained or chronic disruption of behaviour or habitat use resulting in population-level effects. SSS and MBES largely operate beyond the hearing sensitive frequencies of most cetaceans (Table 3.4) (JNCC *et al*., 2010); thus, the potential for a disturbance having negative impact on the FCS of a species is extremely low. Please see Section 4 for further details of mitigation measures that will be utilised.

The geophysical surveys will last for a period of 12 days. For a disturbance impact to occur, cetaceans would need to stay within close proximity to the vessel during SSS and MBES operation.

Survey activities will be temporary and short-term in nature and so it is unlikely that SSS and MBES would have a negative impact on the FCS of the cetacean species present across the survey area. This assumes that the level of disturbance is unlikely to impact the animals ability to survive and reproduce. There is, however, a possibility of disturbance occurring for a short period of time as a result of noise impacts and so an EPS licence is required for proposed survey activities within 12 nm (as per Regulation 39(2)), or in the case of the proposed geophysical survey works within the survey area.

Further mitigation measures will be implemented in order to minimise the risk of further impacts from the geophysical survey works (see Section 4).

### 3.4.4 SBP and UHRS

The potential impacts that SBP and UHRS (sparker) might have on cetacean species present within the survey area are detailed below. The frequencies used for these surveys are in the sensitive hearing range of cetaceans and so this is a key assessment within this EPS risk assessment.

#### *3.4.4.1 Injury Impact*

SBP and UHRS sparkers emit a low frequency sound to maximise seabed penetration. Cetaceans will be exposed to this low frequency sound over a greater spatial area than they would as a result of higher frequency sounds (e.g., from SSS and MBES). Modelling of SBP systems suggests that an animal swimming at a constant speed of 1.5 m/s from the noise source, showed that injury may occur at a range of 20 m for the majority of cetaceans and up to 400 m for harbour porpoise. These results are dependent on the cetacean swimming in a direct and narrow ‘beam’ from the transducer (Department for Business, Energy and Industrial Strategy (BEIS), 2020).

The majority of acoustic energy will be directed at the seabed rather than being emitted horizontally which reduces the impacts of noise emissions on nearby animals. SBP and

UHRS are designed to have a highly focused beam that aims directly at the seabed, meaning there is limited horizontal transmission of noise. This limits the potential impact ranges compared to spherical spreading assumptions.

Section 4 outlines the mitigation measures that will be used to significantly reduce the risk of cetacean injury as a result of SBP and UHRS geophysical survey activity. Measures include the deployment of an MMO to monitor the presence of cetaceans within a 500 m mitigation zone ahead of surveys commencing as well as during survey activity (see Section 4). The combination of mitigation measures and the characteristics of the noise resulting from SBP and UHRS activity mean that the potential risk of injury offence to cetaceans is significantly reduced. An EPS license is therefore not required.

#### *3.4.4.2 Disturbance Impact*

SBP and UHRS operate at lower frequencies relative to MBES and SSS which overlap with the hearing range of marine mammals and therefore have the potential to cause short-term impacts on behaviour such as avoidance (JNCC *et al.*, 2010). BEIS (2020) predicted a maximum impact range of 2.5 km for behavioural disturbance from SBP for harbour porpoises and that there is a low risk of disturbance. For UHRS, the majority of acoustic energy will be directed at the seabed therefore the impacts of noise emissions and disturbance on nearby marine mammals will be reduced.

Survey activity will be short-term and temporary in nature. It is anticipated to span up to 12 days. During this time the survey vessel will be traversing the survey routes, resulting in localised and temporary noise generation.

Graham *et al.* (2019) indicated that vessel disturbance to cetaceans is 1 km and so a vessel moving into an area will cause a reduction in cetaceans found in the immediate area. This would reduce the chance of cetaceans in the area being disturbed by SBP and UHRS as they will leave the area. Failing this, the 'narrow' beam emitted by these systems that aims directly at the seabed means that a cetacean would need to swim directly through the beam to be disturbed.

## 3.5 Impact Ranges Associated with the Geophysical Survey

A desk-based review of available data sources has been carried out to determine the impact ranges of geophysical survey activity on cetaceans. Table 3.6 indicates the estimated number of EPS that may be impacted by the geophysical surveys.

Assessment guidance from JNCC for noise disturbance against conservation objectives of SACs designated for harbour porpoise recommends a 5 km effective deterrent range (EDR) for high resolution geophysical surveys, based on SBP sources (JNCC *et al.*, 2020). This gives an overall coverage of 78.5 $km^2$ from one potential location (assuming a spherical range) and is considered a conservative estimate based on a study by CSA

(2020). The number of individuals that could potentially be impacted in and around the survey area is presented in Table 3.6.

Several studies have indicated that displacement effects of surveys on cetaceans do not have significant impacts and that cetaceans return to survey areas a few hours after displacement (Thompson *et al.*, 2013; Pirotta *et al.*, 2014). A study by Thompson *et al.* (2013) indicated that noise produced by seismic surveys did not lead to significant displacement over a large spatial scale. Cetaceans were detected within the survey area several hours after displacement and cetacean response levels to the sound from surveys decreased throughout the survey. The results of these surveys indicate that any impacts of the geophysical surveys will be temporary, small-scale and reversible in nature. The transitory nature of the geophysical surveys means that following initial displacement, cetaceans will be able to return to an area relatively quickly.

The behavioural response severity scale by Southall *et al.* (2007) (Table 3.5) has been used as a precautionary approach to the severity of a potential behavioural response and potential behavioural response has been assessed as a four or less and are not considered significant in causing disturbance to any EPS in the area. It is concluded that the impacts will not result in any significant disturbance or be detrimental to the maintenance of the population at a FCS within their natural range for any EPS.

The assessment of disturbance to cetaceans in the FLOW Park survey area is the same for harbour porpoise, common dolphin, white-beaked dolphin, and minke whale. This is due to species all being within Block CS-K of the SCANS IV survey and all having a significant MU that covers the survey area. Bottlenose dolphin being assessed for the surveys are in the CES MU, which has a smaller area and therefore Cheney *et al.* (2024) population estimate has been used instead of SCANS. .

*Table 3.6 Assessment of disturbance to cetaceans off the east coast of Scotland based on a 5 km EDR (78.5 km$^2$) and survey area (106.1 km$^2$).*

| Species | Density Estimates (individuals/km$^2$) | No. of Individuals Within Potential Impact Area (EDR) | % of Population Potentially Disturbed (EDR) | | No. of Individuals Within Potential Impact Area (Survey Area) | % of Population Potentially Disturbed (Survey Area) | | Potential for Significant Disturbance (EDR and Survey Area) |
|---|---|---|---|---|---|---|---|---|
| | | | UK MU | MU | | UK MU | MU | |
| Harbour porpoise | 0.2813 | 23 | 0.01 | <0.01 | 30 | 0.02 | <0.01 | No – Less than 1% of North Sea MU population temporarily disturbed. |
| Common dolphin | 0.074 | 6 | 0.02 | <0.01 | 8 | 0.02 | <0.01 | No – Less than 1% of CGNS MU population temporarily disturbed. |
| Bottlenose dolphin | 0.01[2] | <1 | 0.35 | | 2 | 0.47 | | No – Less than 1% of CES MU population temporarily disturbed. |
| White-beaked dolphin | 0.1352 | 11 | 0.03 | 0.02 | 15 | 0.04 | 0.03 | No – Less than 1% of CGNS MU population temporarily disturbed. |
| Minke whale | 0.0116 | <1 | <0.01 | <0.01 | 2 | 0.01 | <0.01 | No – Less than 1% of CGNS MU or East Coast population temporarily disturbed. |

[2] Uniform density across the CES MU.

# 4 EPS Mitigation Strategy

## 4.1 Overview

This EPS Mitigation Strategy has been prepared with the intention to reduce injury and disturbances to EPS from proposed geophysical survey activities (SBP and UHRS). Visual and acoustic measures have been included and the measures listed here are based on JNCC guidance for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017). Survey vessels will be required to adhere to the Scottish Marine Wildlife Watching Code provisions (Scottish National Heritage (SNH), 2017a) and all parties contracted as part of the survey works will be made aware of the presence of any EPS within the area.

### 4.1.1 Marine Mammal Observer (MMO) and Passive Acoustic Monitoring (PAM)

When possible (i.e., during daylight hours and when visibility is good) MMO(s), will carry out visual observations to monitor the presence and occurrence of cetaceans and `1 sharks before the soft-start commences. During periods of poor weather and/or visibility conditions, including the hours of darkness, PAM will be undertaken.

MMOs and PAM operators are trained personnel who will advise on how to minimise disturbance to mammals and will ensure mitigation guidelines are adhered to.

### 4.1.2 Marine Mammal Monitoring

Marine mammal monitoring will be carried out throughout the duration of survey activity. MMOs and PAM operators will be qualified and will work standard 12-hour shifts. MMOs and PAM operators will have training and experience in working at sea. MMOs will carry out visual monitoring from an elevated location around the source vessel, ensuring an unobstructed view of the mitigation zone in all directions. PAM operators will be positioned to manage the equipment and maintain communication with the vessel crew.

### 4.1.3 Pre-start Search

MMOs and/or PAM operators will carry out visual and acoustic monitoring (if required) prior to geophysical survey commencement for at least 30 minutes to assess the presence of EPS and basking sharks within a 500 m mitigation zone. Should an EPS be detected within 500 m of a survey vessel, geophysical survey activity will not commence until the EPS has passed through the area or the vessel has moved resulting in the EPS being further than 500 m away from the geophysical survey source. There should be a 20-minute delay from the time of the last sighting within the mitigation zone prior to the soft-start commencement (recommencement) of survey activities. Once the geophysical survey has started, activities will not be stopped should an EPS approach the vessel.

### 4.1.4 Soft Start

When feasible, the geophysical survey equipment will not be operated at full power straight away and will build up to full power over a minimum of 20 minutes. This will give any EPS and/or basking shark warning that surveys are commencing and they will have the chance to leave the survey area. A soft start will only begin upon completion of pre-start monitoring by the MMO and/or PAM operator. Monitoring must continue uninterrupted throughout the entire pre-start and soft-start phase.

#### *4.1.4.1 Breaks in Operation*

In the event of unplanned interruptions in survey activity, protocols described in JNCC (2017) will be followed. If a break in operations lasts less than 10 minutes, surveys can resume at the required power, so long as no marine mammals were detected in the mitigation zone during the break. However, if the break is longer than 10 minutes, then a full pre-search and soft-start procedure will be required before resuming. This will reduce the potential to injure any cetaceans that enter the area during survey 'downtime'.

The survey will utilise high resolution survey equipment and if starts are sequential or interchanged during their operation, only one pre-shooting search will be required prior to the start of acoustic output. This is only valid if there are no gaps in data acquisition greater than 10 minutes and there is an audible source active. During vessel turns (run-in and run-outs), JNCC (2017) guidance will be adhered to and geophysical survey equipment will be turned off if a turn will exceed 40 minutes.

### 4.1.5 Reporting

JNCC Standard Forms will be used to report cetacean and basking sharks recorded. Monitoring reports will be submitted to MD-LOT and NatureScot and will include cetacean and basking sharks records, survey methodology and limitations. MMOs and/or PAM operators will contact MD-LOT or NatureScot if there are any queries about the application of guidance during surveys.

### 4.1.6 Survey Vessel Speed and Course

Survey vessels will move at approximately four knots during geophysical operations in order to allow cetaceans and basking sharks to move away from the vessel if they are disturbed by vessel presence and/or noise emissions.

During transit periods between port and the survey area, the vessel will be moving at speeds greater than four knots and not surveying so this will not be different to normal vessel traffic. However, if an EPS or basking shark is seen within the direct path of a survey vessel outside of survey times, the survey vessel will slow down to allow the EPS or basking shark to swim outside of the vessel path, alternatively if safe to do so, the vessel will deviate from the intended course to avoid the cetacean in its original path.

### 4.1.7 Toolbox Talks

As part of routine Toolbox Talks, survey crew will be made aware of all potential EPS that may be encounter during surveys and good practice measures of boat control near wildlife through the Scottish Marine Wildlife Watching Code (SNH, 2017a), Guide to Best Practice for Watching Marine Wildlife (SNH, 2017b) and Basking Shark Code of Conduct (The Shark Trust, undated).

# 5 Consideration of Cumulative Impacts

Potential cumulative impacts could occur with other projects taking place near the FLOW-PARK area and the geophysical survey works for this project. No other projects were identified in the Marine Directorate Licence Application Register as taking place at the same time and in a similar area to the geophysical survey work.

Therefore, cumulative impacts are not expected to arise as a result of spatial or temporal overlap between projects and all effects of the geophysical survey are expected to be localised and short-term, and therefore not result in significant adverse impacts. There are also no other surveys specific to the project that might result in cumulative impacts on EPS.

It is therefore predicted that the relatively localised areas of disturbance and the short period of time that cumulative impacts could arise are such that they will not cause an impact that will affect the FCS of any EPS. Based on the assumption that all the planned projects and activities with the potential for injury or significant disturbance will have mitigation in place, which is similar to or more extensive than the measures being undertaken for the geophysical survey, no EPS will be at risk of injury from these activities.

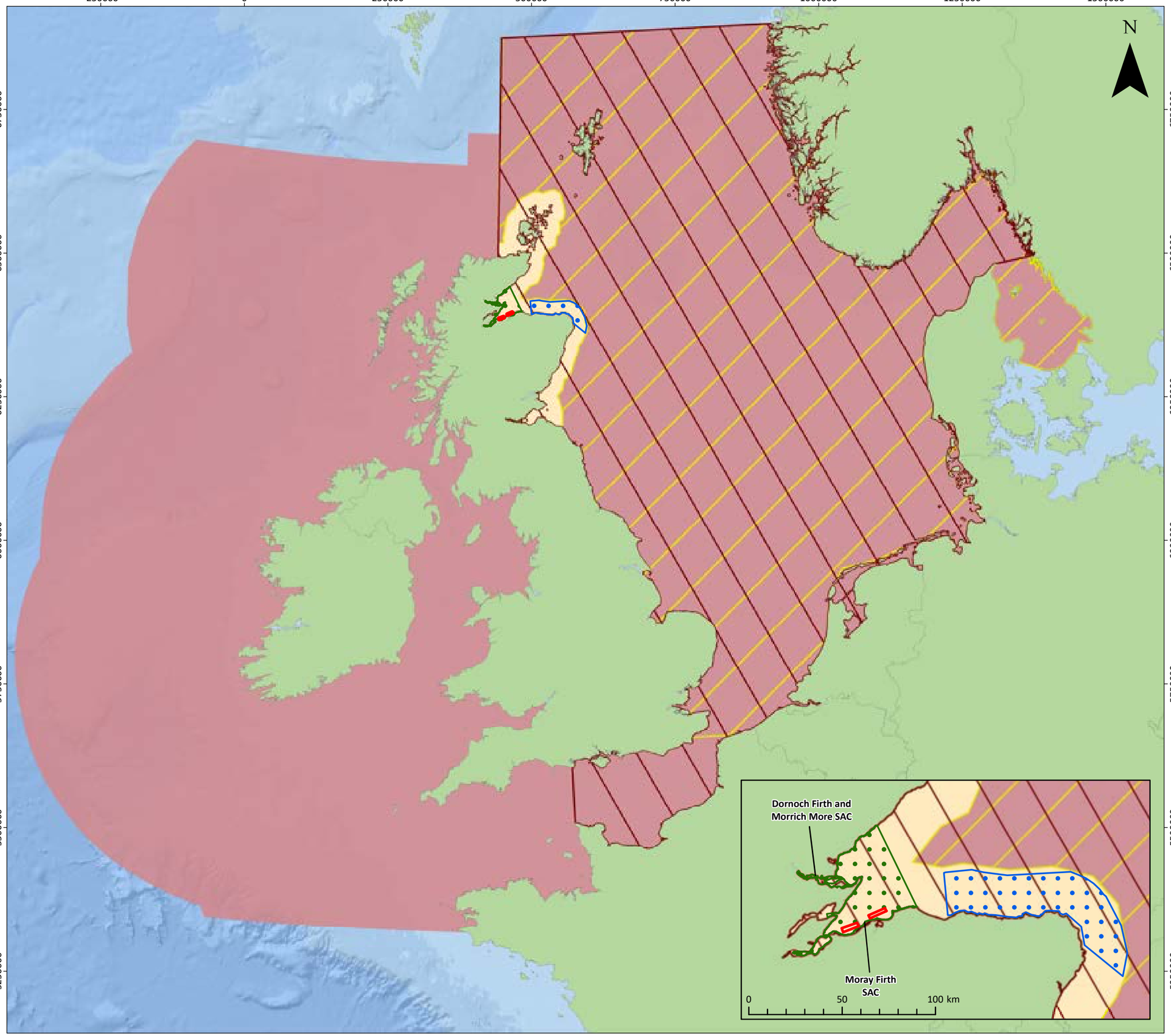
No cumulative effects are considered likely to arise as a result of the proposed geophysical survey works with any other project. It should be noted that the surveying of the Moray-Firth North and Moray-Firth South FLOW-Parks are being undertaken sequentially and in quick succession, so there is limited potential for cumulative impacts from both surveys.

# 6 Consideration of Likely Significant Effects (LSE)

This section of the EPS risk assessment discusses the potential adverse effect that the geophysical surveys may have on the integrity of sites designated for nature conservation in proximity to the survey location. The following sites are in proximity to the geophysical survey areas and include marine mammals as qualifying features (Figure 2).

- Southern Trench NCMPA;
- Moray Firth SAC; and
- Dornoch Firth and Morrich More SAC.

FigureReference: MFP_EPS_Fig2_Designat




OFFSHORE SOLUTIONS GROUP | working on behalf of Flow Park Investment Ltd

# Moray FLOW-Park
EPS Assessment Report

## Moray FLOW-Park, Designated Nature Conservation Sites and Management Units (IAMMWG, 2023)

**Legend**

- Moray FLOW-Park
- Southern Trench NCMPA
- Special Area of Conservation (SAC)

**Harbour Porpoise**
- North Sea

**Bottlenose Dolphin**
- Coastal East Scotland
- Greater North Sea

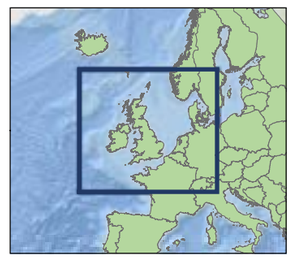
**Common Dolphin**
- Celtic and Greater North Sea

**Rissos Dolphin**
- Celtic and Greater North Sea

**White-beaked Dolphin**
- Celtic and Greater North Sea

**White-sided Dolphin**
- Celtic and Greater North Sea

**Minke Whale**
- Celtic and Greater North Sea



**Notes**

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors
Contains Ordnance Survey data © Crown copyright and database rights (2025). OS OpenData.

Coordinate System: WGS 1984 UTM Zone 30N

0 200 400 km

0 100 200 nm

| Scale | Date | Drawn by | Checked by | Approved by |
|---|---|---|---|---|
| 1:6,500,000@A3 | 04/08/2025 | EV | BPHB | CC |

Offshore Solutions Group
4th Floor,
205 Regent Street,
London,
W1B 4HB

www.offshoresolutionsgroup.com
+44 208 123 3783

GoBe APEMGroup

**Figure 2**

## 6.1 Designated Sites

### 6.1.1 Southern Trench NCMPA

This site is located on the south-eastern corner of the Moray Firth. The inshore region of the site stretches from Buckie to Peterhead. The nearest points to the Moray FLOW-Park geophysical survey area are approximately 33 km and 48 km, from the Moray Firth-North and Moray Firth-South FLOW-Park areas respectively (Figure 2).

This site protects minke whale, burrowed mud, shelf deeps and fronts. The fronts are the results of cold and warm waters mixing, which create highly productive areas which support the local and regional ecosystem and encourage apex predators including minke whale which are attracted to the fish species brought into the area by the fronts. It is therefore NatureScot's advice that access to the site's resources should be maintained and supporting features should be conserved.

The Conservation Objectives of this site are to conserve the features, specifically to ensure:

"*Minke whale in the Southern Trench NCMPA are not at significant risk from injury or killing, conserve the access to resources (e.g. for feeding) provided by the NCMPA for various stages of the minke whale life cycle, and conserve the distribution of minke whale within the site by avoiding significant disturbance*" .

The supporting features of the minke whale is also protected under the Conservation Objectives for the Southern Trench NCMPA.

### 6.1.2 Moray Firth SAC

The Moray Firth SAC is located within the inshore region of the Moray Forth from Lossiemouth on the south coast to Helmsdale on the north coast of the Moray Firth. Both Moray Firth-North and Moray Firth-South FLOW-Park areas are located within the southern part of the Moray Firth SAC (Figure 2). The site has been designated for Annex I sandbanks which are slightly covered by sea water at all times (1110) and bottlenose dolphin (1349) (Arso Civil *et al.*, 2021).

The Moray Firth supports the only known resident bottlenose dolphin population in the North Sea, with an estimated 150 individuals which are present year-round. This particular population is known to travel extensively along the eastern Scottish coastline, with individuals travelling to the Firth of Tay, Firth of Forth and as far south as northern England. However, this species tend to stay within inshore waters (2 km from the coast).

The Conservation Objectives for the Moray Firth SAC are:

"*to avoid deterioration of the habitats of the qualifying species (bottlenose dolphin) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to achieving FCS for the qualifying interest*".

Owing to the assessment set out in Section 3 it is considered unlikely that the geophysical survey will have an impact on the Moray Firth SAC bottlenose dolphin population.

### 6.1.3 Dornoch Firth and Morrich More SAC

This site has been designated for harbour seal (Phoca vitulina) and otter (Lutra lutra). The site is approximately 18 km and 20 km north from the Moray Firth-North and Moray Firth-South FLOW-Park areas respectively (Figure 2).

As seals are not EPS, an assessment in relation to the nearby Dornoch Firth and Morrich More SAC has been included in this report. Otter is an EPS, albeit they are typically associated with coastal/riverine waters (as opposed to the offshore marine environment).

The region is an estuarine system with bordering habitat that includes sand dunes, woodland and small lochans. The River Evelix and River Oykel feed into the site and provide habitat for the population of otters the area supports.

The area supports a significant population of harbour seals (approximately 2% of the UK population) which use sand-bars and shores at the mouth of the estuary as haul-out and breeding sites.

The Conservation Objectives of the site ensure that obligations of the Habitats Regulations are met, there will not be significant disturbance to qualifying features and the integrity of the site is maintained. The total population of harbour seals in Scotland was estimated at 34,475 based on surveys between 2016-2023, with 1,365 within the Moray Firth Seal Monitoring Unit (Special Committee on Seals (SCOS), 2020).

Otter populations are susceptible to anthropogenic change in habitat as they are dependent on freshwater sources (Roos *et al.*, 2015) and the location of holts is therefore restricted. It is not anticipated that the geophysical survey will have a significant impact on this otter population owing to distance from the area and the limited nature of the potential effects.

### 6.1.4 Basking Shark Sites

There are no designated sites for basking sharks in the vicinity of the survey areas, although there is the potential for this species to be present in Moray Firth. However, the assessment found the proposed survey works have a very low potential to result in

adverse impacts on this species, due to the localised and temporary nature of the proposed works. Impacts have been further reduced through implementation of mitigation.

## 6.2 Potential Effects

Section 3 indicates the potential effects from underwater noise produced by the geophysical surveys to the qualifying/protected features of the above designated sites. However, owing to the mitigation measures that are being implemented (listed in Section 4), the impacts on the sites as a result of the geophysical survey works are not likely to be significant.

## 6.3 Assessment of Potential Offence

The proposed geophysical survey work is located within the 12 nm inshore boundary of Scottish territorial waters, at their closest the Moray Firth-North and Moray Firth-South FLOW-Parks are 0.54 nm and 0.39 nm respectively from the coast. The mitigation measures being implemented indicate that any potential impacts of the survey work are unlikely to result in harassment, disturbance, injury or mortality of an EPS as defined under Regulation 39(1) of the Habitats Regulations.

In relation to Regulation 39(2) of the Habitats Regulations, the percentage of the total population which has the potential to be disturbed by the geophysical survey activity is considered to be negligible (less than 1% of the MU for all cetaceans occurring in Block CS-K (Table 3.6)). Therefore, the impact is considered to not be detrimental to the maintenance of the population of the species concerned at a FCS. It is also thought that disturbance will be short-term and small-scale in nature.

It is therefore assumed that disturbance will not cause a population level effect and therefore an EPS Licence (to disturb) can be issued under Section 39 of the Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) and Conservation of Offshore Marine Habitats and Species Regulations 2017.

As stated in Section 1.2, three tests must be passed before an EPS licence can be granted, as discussed below.

### 6.3.1 Test 1 – Licence must relate to a relevant purpose (Regulation 44)

The Scottish Government can only issue EPS Licenses under Regulation 44(2) of the Habitats Regulations (as amended) for specific purposes. These purposes include:

(a) Scientific, research or educational purposes;

(b) Ringing or marking, or examining any ring or mark on, wild animals;

(c) Conserving wild animals, including wild birds, or wild plants or introducing them to particular areas;

(ca) Conserving natural habitats;

(d) Protecting any zoological or botanical collection;

(e) Preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment;

(f) Preventing the spread of disease; or

(g) Preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber or any other form of property or to fisheries.

The Moray FLOW-Park meets the Regulation 44(2)(e) requirement listed above as the planned safe anchorage or wet storage facility for FLOW foundations for wind farms demonstrates a direct environmental benefit on a national and international scale and complies with national and international environmental policies. There is an overarching requirement for sustainable energy supply from renewables within Scotland subject to national planning and energy policy. The Project will have long-term environmental benefits and will significantly reduce carbon emissions (Scottish Government, 2022).

### 6.3.2 Test 2 – Must be no satisfactory alternative (Regulation 44(3)(a))

There are no satisfactory alternatives to these proposed geophysical surveys. Alternative equipment could be used; however, this may limit the effectiveness of the geophysical surveys and the survey results.

The geophysical surveys aim to achieve a 100% coverage of the seabed survey area and to detect objects on the seabed to 0.5 m. The geophysical survey results will be used within the Environmental Impact Assessment (EIA) and will offer a robust archaeological assessment.

The key areas where the geophysical survey results will be used within the EIA are within the baseline characterisation of multiple technical topics. For example, within the modelling of coastal processes, benthic ecology and marine archaeology. This survey is fundamental to ensure a robust EIA is carried out for the Project. It is therefore considered that the 'no satisfactory alternative test' has been met and the project cannot be safely developed without the survey.

### 6.3.3 Test 3 – Action / authorisation must not be detrimental to maintenance of relevant species population at a FCS in their natural range (Regulation 44(3)(b))

The percentage of the reference population of each species which has the potential to be disturbed by use of the geophysical survey techniques is considered to be negligible (<1% for all species) and, therefore, not detrimental to the maintenance of the population of the species concerned at a FCS level.

# 7 Moray Firth SPA

## 7.1 Overview

As requested by NatureScot, an additional assessment has been undertaken on the Moray Firth SPA. The Moray Firth SPA is a designated marine site in northeast Scotland, covering the coastal and marine areas around the Moray Firth (1,762.18km$^2$). The qualifying features designated at the Moray First SPA is provided in Table 7.1 (it is noted that the qualifying features are not EPS species).

*Table 7.1 Moray Firth SPA qualifying features (NatureScot, 2020b).*

| Species | Latin Name | Designation |
|---|---|---|
| **Great northern diver** | *Gavia immer* | Non-breeding |
| **Red-throated diver** | *Gavia stellata* | Non-breeding |
| **Slavonion grebe** | *Podiceps auritus* | Non-breeding |
| **Greater scaup** | *Aythya marila* | Non-breeding |
| **Common eider** | *Somateria mollissima* | Non-breeding |
| **Long-tailed duck** | *Clangula hyemalis* | Non-breeding |
| **Common scoter** | *Melanitta nigra* | Non-breeding |
| **Velvet scoter** | *Melanitta fusca* | Non-breeding |
| **Common goldeneye** | *Bucephala clangula* | Non-breeding |
| **Red-breasted merganser** | *Mergus serrator* | Non-breeding |
| **European shag** | *Phalacrocorax aristotelis* | Breeding and non-breeding |

The Conservation Objectives for these qualifying features are (NatureScot, 2022):

1. To ensure that the qualifying features of the Moray Firth SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status; and
2. To ensure that the integrity of the Moray Firth SPA is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature:

a) The populations of qualifying features are viable components of the site.
b) The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.
c) The supporting habitats and processes relevant to qualifying features and their prey resources are maintained, or where appropriate restored, at the Moray Firth SPA.

## 7.2 Assessment of Potential Impacts

The potential impacts on the qualifying ornithological features are:

- Temporary disturbance/displacement from vessel traffic;
- Temporary underwater noise; and
- Indirect impacts through effects on habitats and prey species.

### 7.2.1 Disturbance / Displacement

The Proposed Activities have the potential to temporarily affect bird populations in the marine environment through disturbance from vessels both from transiting to and during the surveys. This can result in temporary habitat loss through reduction in the area available for feeding, loafing and moulting. Nevertheless, due to the temporary nature (12 days) and small spatial extent associated with the Proposed Activities (36 $km^2$, 2% of the Moray First SPA), impacts are likely to be minimal, with birds disturbed from the area expected to return once the surveys are complete. Moreover, survey activities will occupy only a small part of the licence area at any one time, therefore the potential area for disturbance will be much smaller than 2% of the Moray Firth. Therefore, although there is potential for disturbance, and potential impact will not be significant.

Additionally, to reduce any potential disturbance, the following vessel best practice will be followed:

- Avoid and minimise vessel traffic, where possible, during the most sensitive season (surveys estimated to be complete by November 1st);
- Restrict vessel movements where possible to existing navigation routes (where a baseline level of disturbance is already expected to occur; and
- Avoid over-revving of engines (to minimise noise disturbance).

Overall, any disturbance or displacement from the Proposed Activities are considered to be short-term, temporary and reversible in nature, lasting only for the duration of the activity, as birds would return to the area once the activities have ceased. It is therefore concluded that there will be negligible effect from disturbance/displacement, and therefore no potential for AEoSI on the Moray Firth SPA (and its associated conservation objectives) as a result of the Proposed Activities.

### 7.2.2 Underwater Noise

Although there is potential for underwater noise during these surveys, and potential impacts are likely to be minimal and temporary:

- Survey Footprint: Survey activities will occupy only a small part of the Licence area at any time. Even with a 2 km deterrence range, only a minimal portion of the SPA would be affected at any one time; and
- Survey Duration: Surveys generating novel underwater noise (e.g. geophysical or geotechnical drilling) will occur briefly during the survey period (during the 12 days of surveys, the survey vessel will be traversing the survey routes, resulting in localised and temporary noise generation).

Additionally, scientific understanding of avian hearing suggests that birds have limited auditory sensitivity underwater, making them unlikely to be affected by underwater noise while diving. Anatomical studies, such as those by Dooling and Therrien (2012), indicate that diving birds have ear adaptations that help protect against pressure changes, potentially shielding them from acoustic overexposure. Additionally, unlike marine mammals, birds can avoid underwater noise by remaining above the surface or flying away from the area.

It is therefore concluded that there will be negligible effect from underwater noise, and therefore no potential for adverse effect on site integrity (AEoSI) on the Moray Firth SPA (and its associated conservation objectives) as a result of the Proposed Activities.

### 7.2.3 Indirect Impacts on Habitats and Prey

Considering the broadscale nature of any prey supporting habitats in the area, and the discrete nature of the works, it is concluded that there will be a negligible effect and therefore can also be concluded that any effects from indirect effects on habitat/prey, would also be negligible. Therefore, there is no potential for AEoSI on the Moray Firth SPA (and its associated conservation objectives) as a result of the Proposed Activities.

# 8 Conclusions

The conclusions of this EPS risk assessment are as follows:

- The geophysical surveys will create a temporary, localised disturbance to EPS in the area. However, the overwhelming benefits that the Moray FLOW-Park will have to Scotland and the UK's renewable energy contributions are significant and in accordance with Scottish planning policies (e.g. draft NPF4). The proposed development will align with the UK Government's Energy Security Strategy and Scotland's National Marine Plan;
- A low percentage of the population of EPS in a localised area will be impacted for a short period of time. This disturbance will likely arise as a result of noise impacts arising from geophysical survey operations;
- The mitigation measures (detailed in Section 4) will significantly reduce the risk of injury to EPS and basking sharks as a result of the geophysical survey work and therefore an offence will not be caused. Therefore, an EPS licence and Basking Shark Licence for *injury* will not be required.
- Potential cumulative impacts have been considered for both existing projects and projects currently in development and it has been concluded that no potential cumulative impacts will result from the Moray FLOW-Park geophysical survey and other projects. No projects or plans within the immediate vicinity of Moray Firth FLOW-Park have been identified. The assumption has been made that all future projects will have mitigation in place to reduce the potential to cause injury. It is also assumed that, similarly to this project, the predicted impact level resulting from disturbance will be temporary and localised in nature;
- There is no potential for injury or disturbance to EPS and basking shark in the vicinity of the geophysical survey works where there is a designated nature conservation site; and
- There is no potential for adverse effect on site integrity (AEoSI) on the Moray Firth SPA (and its associated conservation objectives) as a result of the Proposed Activities.

An EPS Licence and Basking Shark Licence are required for activities where there is potential for disturbance to cetaceans as per Habitats Regulation 39(2) and for basking sharks in accordance with the Wildlife and Countryside Act (1981 as amended). In conclusion, the proposed survey activities are not considered to cause significant long-term disturbance or be detrimental to the FCS of EPS and basking sharks within the region. Any disturbance will not be sufficient to cause any *population level effects*, and thus it is considered that an EPS Licence and Basking Shark Licence to disturb can be issued.

As there is no potential for injury or significant disturbance to EPS and basking shark in the vicinity of the survey works, it is considered that there is no potential for any LSE on nature conservation designated sites in relation to the Conservation Objectives for marine mammals.

# 9 References

Arso Civil, M., Quick, N., Mews, S., Hague, E. Cheney, B.J., Thompson, P.M. and Hammond, P.S. (2021). Improving understanding of bottlenose dolphin movements along the east coast of Scotland. Final report. Report number SMRUCVAT-2020-10 provided to European Offshore Wind Deployment Centre (EOWDC), March 2021.

BEIS. (2020). Review of Consented Offshore Wind Farms in the Southern North Sea Harbour Porpoise SAC., The Department for Business Energy and Industrial Strategy.

Braulik, G.T., Jefferson, T.A. & Bearzi, G. 2021. Delphinus delphis (amended version of 2021 assessment). The IUCN Red List of Threatened Species 2021: e.T134817215A199893039. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T134817215A199893039.en. (Accessed August 2025).

Braulik, G., Minton , G., Amano, M. and Bjørge, A. (2020). *Phocoena phocoena*. The IUCN Red List of Threatened Species 2020: e.T17027A50369903. Available online at: https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T17027A50369903.en (Accessed July 2025).

Braulik, G.T. 2019. *Lagenorhynchus acutus*. The IUCN Red List of Threatened Species 2019: e.T11141A50361160. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T11141A50361160.en. (Accessed August 2025).

Cheney, B., Thompson, P., Durban, J., Culloch, R., Elwen, S., Robinson, K., Eisfeld-Pierantonio, S., Reid, R. and Reid, J. (2013), 'Integrating multiple data sources to assess the distribution and abundance of bottlenose dolphins Tursiops truncatus in Scottish waters', Mammal Review, 43: 71–88.

Cheney, B.J., Arso Civil, M., Hammond, P.S. and Thompson, P.M. (2024). Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area of Conservation 2017-2022. NatureScot Research Report 1360.

Cooke, J.G. (2018), 'Balaenoptera acutorostrata. The IUCN Red List of Threatened Species 2018: e.T2474A50348265', https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T2474A50348265.en. (Accessed August 2025).

CSA Ocean Sciences Inc. (2020). Orsted Wind Power North America, LLC Application for Incidental harassment Authorization for the Non-Lethal Taking of Marine Mammals: Site Characterization Surveys Lease OCS-A 0486, 0517, 0487, 0500 and Associated Export Cable Routes. Available online at: https://media.fisheries.noaa.gov/dam-migration/orsted_hrg_2020proposediha_app_opr1.pdf (Accessed July 2025).

Department for Business, Energy and Industrial Strategy (BEIS) (2020). Record of the Habitats Regulations Assessment undertaken under Regulation 65 of the Conservation of Habitats and Species 2017, and Regulation 33 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. Review of Consented Offshore Wind Farms in the Southern North Sea Harbour Porpoise SAC. (Accessed July 2025).

Dooling, R. J. and Therrien, S. C.(2012), 'Hearing in birds: what changes from air to water'. Advances in Experimental Medicine and Biology 730:77-82.

Duck, C.D. and Morris, C.D. (2014). Surveys of harbour and grey seals on the east, north and north-west coast of Scotland and in Orkney, including the Moray Firth and the Firth of Tay, in August 2013. Scottish Natural Heritage Commissioned Report No. 759.

Dyndo, M., Wiśniewska, D.M., Rojano-Doñate, L. and Madsen, P.T. (2015). Harbour porpoises react to low levels of high frequency vessel noise. Scientific Reports 5:11083 (Accessed July 2025).

Evans, P.G.H., Anderwald, P. and Baines, M.E. (2003), 'UK cetacean status review', Report to English Nature and the Countryside Council for Wales, Sea Watch Foundation, Oxford. 160.

European Commission (2007). Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC.

Gilles, A., Authier, M., Ramirez-Martinez, N.C., Araújo, H., Blanchard, A., Carlström, J., Eira, C., Dorémus, G., Fernández Maldonado, C., Geelhoed, S.C.V., Kyhn, L., Laran, S., Nachtsheim, D., Panigada, S., Pigeault, R., Sequeira, M., Sveegaard, S., Taylor, N.L., Owen, K., Saavedra, C., Vázquez-Bonales, J.A., Unger, B., Hammond, P.S. (2023). Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. Final report published 29 September 2023. 64 pp.

Gorvett (2023). A Summer of Superb Sightings: Whale Track Summary. A Summer of Superb Sightings: Whale Track Summary — Hebridean Whale & Dolphin Trust (Accessed August 2025).

Graham, I. M., Cheney, B. Hewitt, R.C., Cordes, L.S., Hastie, G.D., Russell, D.J.F., Arso Civil, M., Hammond, P.S. and Thompson, P.M. (2016). Strategic Regional Pre-Construction Marine Mammal Monitoring Programme Annual Report 2016. University of Aberdeen (Accessed July 2025).

Graham, I.M., Merchant, N.D., Farcas, A., Barton, T.R., Cheney, B., Bono, S., Thompson, P.M. (2019). Harbour porpoise responses to pile-driving diminish over time. Royal Society Open Science, 6: 190335.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J., and Øien, N. (2017). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Available online at: https://synergy.st-andrews.ac.uk/scans3/files/2017/04/SCANS-III-design-based-estimates-2017-04-28-final.pdf (Accessed July 2025).

Hammond, PS, Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J., Øien, N. (2021). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys Final report published June 2021. 41pp.

Hartley Anderson Ltd. (2020). Underwater acoustic surveys: review of source characteristics, impacts on marine species, current regulatory framework and recommendations for potential management options. NRW Evidence Report No: 448, 119pp, NRW, Bangor, UK.

Hermannsen, L., Beedholm, K., Tougaard, J. and Madsen, P.T. (2014). High frequency components of ship noise in shallow water with a discussion of implications for harbor porpoises (Phocoena phocoena). The Journal of the Acoustical Society of America 136: 1640-1653 (Accessed July 2025).

HWDT (2025). HWDT Sighting Map. Hebridean Whale & Dolphin Trust » Sightings Map (Accessed August 2025).

IAMMWG (2023). Review of Management Unit boundaries for cetaceans in UK waters (2023). JNCC Report 734, JNCC, Peterborough, ISSN 0963-8091.

JNCC, Natural England and Countryside Council for Wales (2010). The Protection of Marine European Protected Species from Injury and Disturbance. Draft Guidance for the Marine Area in England and Wales and the UK Offshore Marine Area. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/850708/Draft_Guidance_on_the_Protection_of_Marine_European_Protected_Species_from_Injurt_and_Disturbance.pdf (Accessed July 2025).

JNCC (2017). JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys. Available online at: https://data.jncc.gov.uk/data/e2a46de5-43d4-43f0-b296-c62134397ce4/jncc-guidelines-seismicsurvey-aug2017-web.pdf (Accessed July 2025).

JNCC (2019). Article 17 Habitats Directive Report 2019: Species Conservation Status Assessments 2019. Available online at: https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019-species/#regularly-occurring-species-vertebrate-species-mammals-marine (Accessed July 2025).

JNCC, Natural England, and DAERA (2020). Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales & Northern Ireland). Report No. 654, JNCC, Peterborough.

Kiszka, J. & Braulik, G.T. 2018. Lagenorhynchus albirostris. The IUCN Red List of Threatened Species 2018: e.T11142A50361346. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T11142A50361346.en. (Accessed August 2025).

Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M. (2001). Collisions between ships and whales. Marine Mammal Science 17 (1): 30-75.

Macleod, K., Lacey, C., Quick, N., Hastie, G. and Wilson, J. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 2. Cetaceans and Basking Sharks. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.

Marine Scotland. (2014). The protection of Marine European Protected Species from injury and disturbance Guidance for Scottish Inshore Waters. Available online at: https://webarchive.nrscotland.gov.uk/3000/https://www.gov.scot/Resource/0044/00446679.pdf (Accessed July 2025).

Marine Scotland (2020). The protection of Marine European Protected Species from injury and disturbance. Guidance for Scottish Inshore Waters (July 2020 Version). Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/07/marine-european-protected-species-protection-from-injury-and-disturbance/documents/marine-european-protected-species-guidance-july-2020/marine-european-protected-species-guidance-july-2020/govscot%3Adocument/EPS%2Bguidance%2BJuly%2B2020.pdf (Accessed July 2025).

Mickle, M.F., Pieniazek, R.H. and Higgs, D.M. (2020). Field assessment of behavioural responses of southern stingrays (Hypanus americanus) to acoustic stimuli. Royal Society open science, 7(1), p.191544.

Miller, P.I., Scales, K.L., Ingram, S.N., Southall, E.J., Sims, D.W. (2015). Basking sharks and oceanographic fronts: quantifying associations in the north-east Atlantic. Functionla Ecology 29 (8): 1099-1109.

Moray West (2018) Offshore Environmental Impact Assessment Report. https://marine.gov.scot/data/moray-west-offshore-windfarm-environmental-impact-assessment-report (Accessed August 2025).

NatureScot (2020a). Conservation and Management Advice - Southern Trench MPA. NatureScot.

NatureScot (2020b). Citation for Special Protection Area (SPA): Moray Firth (UK9020313). Available online at: https://www.nature.scot/sites/default/files/special-protection-area/10490/spa-citation.pdf (Accessed August 2025).NatureScot (2021). Conservation and Management Advice. Moray Firth SAC. Available online at: https://sitelink.nature.scot/site/8327 (Accessed July 2025).

NatureScot (2022). Conservation and Management Advice. Moray Firth SPA. Available online at: https://www.nature.scot/sites/default/files/special-protection-area/10490/conservation-and-management-advice.pdf (Accessed August 2025).

NMPi (National Marine Plan Interactive) (2025). Marine Scotland Maps NMPI. https://marinescotland.atkinsgeospatial.com/nmpi/

NOAA (2018). Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing, Technical Memorandum NMFS-OPR-55, 2018 (Accessed July 2025).

Paxton, C.G.M., Scott-Hayward, L., Mackenzie, M., Rexstad, E., & Thomas, L. (2016), 'Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resource', JNCC Report, 517.

Pirotta, E., Merchant, N.D., Thompson, P.M., Barton, T.R. and Lusseau, D. (2015). Quantifying the effect of boat disturbance on bottlenose dolphin foraging activity. Biological Conservation 181: 82-89 (Accessed July 2025).

Pirotta, E., Brookes, K. L., Graham, I. M. and Thompson, P. M. (2014), 'Variation in harbour porpoise activity in response to seismic survey noise', Biology letters, 10/5: 20131090.

Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D. A., Bartol, S., Carlson, T. J., Coombs, S., Ellison, W. T., Gentry, R. L., Halvorsen, M. B., Løkkeborg, S., Rogers, P. H., Southall, B. L., Zeddies, D. G. and Tavolga, W. N. (2014). Sound exposure guidelines for Fishes and Sea Turtles, Springer Briefs in Oceanography, DOI 10.1007/978-3-319-06659-2.

Prideaux, G. (2017). Technical Support Information to the CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities. Convention on Migratory Species of Wild Animals, Bonn (Accessed July 2025).

Reid, J., Evans, P. and Northridge, S. (2003). Atlas of cetacean distribution in north-west European waters. JNCC Peterborough, ISBN 1 86107 550 2.

Richardson, W.J., Greene, C.R., Malme, C.I. and Thomson, D.H. (1995). Marine Mammals and Noise. Academic Press, San Diego, CA, 576 pp (Accessed July 2025).

Robinson, K.P., Eisfeld, S.M., Costa, M. and Simmonds, M.P. (2010). Short-beaked common dolphin (Delphinus delphis) occurrence in the Moray Firth, north-east Scotland. Marine Biodiversity Records, 3.

Robinson, K.P., Tetley, M.J. and Mitchelson-Jacob, E.G. (2009), 'The distribution and habitat preference of coastally occurring minke whales (Balaenoptera acutorostrata) in the outer southern Moray Firth, northeast Scotland', Journal of Coastal Conservation, 13: 39-48.

Roos, A., Loy, A., de Silva, P., Hajkova, P. and Zemanová, B. (2015) Lutra lutra. The IUCN Red List of Threatened Species 2015: e.T12419A21935287. Available online at: https://www.iucnredlist.org/species/12419/21935287 (Accessed July 2025).

Scottish Government. (2022). National Planning Framework 4. Available online at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2022/11/national-planning-framework-4-revised-draft/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4-revised-draft.pdf (Accessed July 2025).

Scottish Government (2011), 'Scotland's Marine Atlas: Information for The National Marine Plan', https://www.gov.scot/publications/scotlands-marine-atlas-information-national-marine-plan/pages/36/ (Accessed August 2025).

SNH (2017a). The Scottish marine wildlife watching code.

SNH (2017b). A guide to best practice for watching marine wildlife.

Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr, C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A. and Tyack, P.L. (2007). Marine Mammal Noise-Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals 33(4): 411-521 (Accessed July 2025).

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P. and Tyack, P.L. (2019). Marine mammal noise exposure criteria: updated scientific recommendations for residual hearing effects. Aquatic Mammals 45(2): 125-232 (Accessed July 2025).

Special Committee on Seals (SCOS). (2024). Scientific Advice on Matters Related to the Management of Seal Populations: 2024. Natural Environment Research Council Special Committee on Seals.

The Shark Trust (undated). The Basking Shark Code of Conduct. Available online at: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.sharktrust.org/Handlers/Download.ashx?IDMF=6137b1a1-8518-4327-9922-7b280acb8336 (Accessed August 2025).

Thompson, P.M., Brookes, K.L., Graham, I.M., Barton, T.R., Needham, K., Bradbury, G. and Merchant, N.D. (2013). Short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises. Proc R Soc Lond. B. Biol Sci. 2013, 280:20132001 (Accessed July 2025).

Thomsen, F., Lüdemann, K., Kafemann, R. and Piper, W. (2006). Effects of offshore windfarm noise on marine mammals and fish, on behalf of COWRIE Ltd (Accessed July 2025).

Vanderlaan, A.S. and Taggart, C.T. (2007). Vessel collisions with whales: the probability of lethal injury based on vessel speed. Marine Mammal Science 23:144-156 (Accessed July 2025).

Van Waerebeek, K., Baker, A.N., Félix, F., Gedamke, J., Iñiguez, M., Sanino, G.P., Secchi, E., Sutaria, D., van Helden, A. and Wang, Y. (2007). Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere, an initial assessment. Latin American Journal of Aquatic Mammals 6:43-69 (Accessed July 2025).

Wells, R.S., Natoli, A. & Braulik, G.T. 2019. Tursiops truncatus (errata version published in 2019). The IUCN Red List of Threatened Species 2019: e.T22563A156932432. https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T22563A156932432.en. (Accessed August 2025).

Wisniewska, D.M., Johnson, M., Teilmann, J., Siebert, U., Galatius, A., Dietz, R. and Madsen, P.T. (2018). High rates of vessel noise disrupt foraging in wild harbour porpoises (Phocoena phocoena). Proc. R. Soc. B 285: 20172314 (Accessed July 2025).