Beatrice Offshore Windfarm Ltd

Routine Marine Surveys EPS Licence Application

EPS and Protected Sites & Species Risk Assessment

ASSIGNMENT **A100631-S07**
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CONTENTS

ACRONYMS

AA	Appropriate Assessment
AUV	Autonomous Underwater Vehicle
BOWL	Beatrice Offshore Windfarm Ltd
DGPS	Differential Global Positioning System
EPS	European Protected Species
EU	European Union
FCS	Favourable Conservation Status
HF	High Frequency
HRA	Habitats Regulations Appraisal
Hz	Hertz
IROPI	Imperative Reason of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
kHz	kilohertz
LF	Low Frequency
LSE	Likely Significant Effect
MBES	Multi Beam Echosounder
MHWS	Mean High Water Spring
MMPP	Marine Mammal Protection Plan
MMO	Marine Mammal Observer
MD-LOT	Marine Directorate Licensing Operations Team
MU	Management Units
NCMPA	Nature Conservation Marine Protected Area
NMFS	National Marine Fisheries Service
NMPi	National Marine Plan Interactive
NOAA	National Oceanic and Atmospheric Administration
PAM	Passive Acoustic Monitoring
pSPA	proposed Special Protection Area
PCW	Phocid Carnivores in Water
ROV	Remotely Operated Vehicle
ROTV	Remotely Operated Towed Vehicle
SAC	Special Area of Conservation
SBI	Sub-Bottom Imager
SBP	Sub-Bottom Profiler
SEL	Sound Exposure Level
SMWWC	Scottish Marine Wildlife Watching Code
SPA	Special Protection Area
SPL	Sound Pressure Level
SVP	Sound Velocity Profiler
UK	United Kingdom
USBL	Ultra-short Baseline
USV	Uncrewed Surface Vehicle
VHF	Very high-frequency
WCA	Wildlife and Countryside Act 1981

1 INTRODUCTION

In 2009, Scottish and Southern Energy Renewables (SSE Renewables) received seabed exclusivity from the Crown Estate Scotland for the development of the Beatrice Offshore Wind Farm in the Moray Firth. Following on from 7 years of development and three years of construction, the wind farm became fully operational in June 2019. The construction of the wind farm began in May 2016. This involved installing several onshore and offshore components which include 84 fixed wind turbines and two offshore transformer modules (wind farm array). The site is operated by SSE Renewables on behalf of Beatrice Offshore Windfarm Ltd (BOWL).

BOWL has a duty to ensure that all aspects of the wind farm are working effectively and efficiently, without posing any hazards to the marine environment or its users. As such, BOWL are required to perform operational surveys to monitor the components of the wind farm.

The proposed survey activities will enable BOWL to:

- Carry out asset integrity/ management to ensure the assets are in good working order;
- Identify potential faults and help shape future repair strategy; and
- Inform asset protection and decommissioning decisions.

The Beatrice Offshore Wind Farm has an installed capacity of 588 MW, enough to provide 450,000 homes with renewable energy. As such, it provides a long-term environmental benefit by reducing the carbon emissions associated with energy usage. This will help enable the UK to reach their net-zero emissions by 2050. The monitoring of components of the wind farm array therefore constitutes work of overriding public need.

1.1 Project Overview

The Beatrice Offshore Wind Farm is located approximately 13.5 km south of the Caithness coastline in the Moray Firth marine region, which is an inlet of the North Sea located on the north east coast of Scotland (Figure 1-1). BOWL will appoint competent contractors to undertake geophysical and benthic surveys and inspections. The survey scope extends to the wind turbine jacket substructures and inter-array cables. The wind farm array encompasses a total of 84 individual fixed wind turbines (Figure 1-1).

The wind farm array (and potential survey area) covers a total area of approximately 119 km^2, as shown on Figure 1-1. The survey area encompasses the wind farm array, with a 500 m buffer surrounding the array site.

The survey activities covered by this document are scheduled to be undertaken within a four-year period spanning 1st January 2024 to 31st December 2027. However, it is expected that multiple intermittent surveys will be carried out throughout this time, amounting to a total survey duration of 485 days. Further detail on the survey activity schedule can be found in Section 2.2.

The co-ordinates for the wind farm array survey area have been provided in Appendix A – Beatrice Offshore Wind Farm Coordinates.

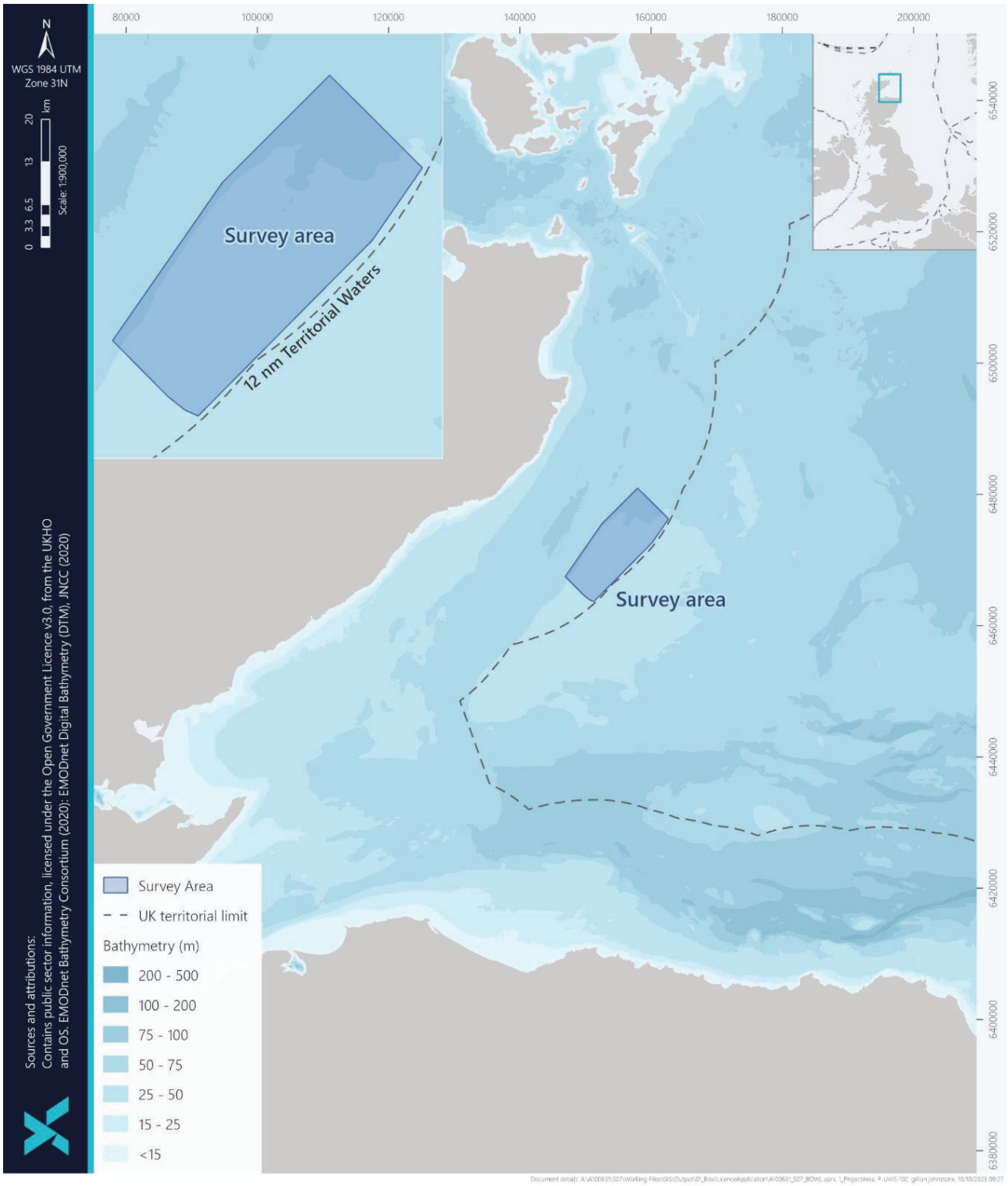

Figure 1-1 Location of Beatrice Windfarm Survey Area

1.2 Purpose

Ahead of any survey activities, all relevant consents and licences need to be in place. This document provides the necessary information to support the following:

1. An assessment of potential impacts on cetaceans, and determination of the need for a European Protected Species (EPS) Licence under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) (the Habitats Regulations). Where an EPS licence is required, this document also provides the marine mammal risk assessment to support the application;
2. An assessment of potential impact on basking sharks, and determination of whether a derogation licence will be required under the Wildlife and Countryside Act 1981 (as amended) (from hereon, 'the WCA');
3. An assessment of the potential for likely significant effects on designated sites and designated seal haul-outs, as required by Marine (Scotland) Act 2010 (as amended) and Protection of Seals (Designated Sea Haul-out Sites) (Scotland) Order 2014; and
4. Notice of intention to carry out a Marine Licence exempted activity for the sediment sampling component of benthic surveys, which may be undertaken.

1.3 Protected Species Overview

1.3.1 European Protected Species

Cetaceans (whales, dolphins, porpoise) are designated as European Protected Species in Scotland under The Conservation (Natural Habitats, &c) Regulations 1994 (as amended) within Scottish Territorial Waters (within the 12 NM limit). Further to this, cetaceans are offered additional protection on an individual level, with the specific inclusion of Regulation 39(2) which states that "*it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean)*".

An EPS Licence will therefore be required for any activity that might result in injury to any cetacean or other EPS, and/or disturbance to any individual cetacean within Scottish inshore waters as stated in the relevant regulations above.

Determining the Need for an EPS Licence

The purpose of the assessments presented in this report is to determine whether, when considering appropriate mitigation which will be implemented, there is potential for the wind farm array inspection or marine survey activities to injure or disturb cetaceans or other protected species. Where there is still potential for harm or disturbance to occur, an EPS Licence may be required. The need for an EPS Licence will be determined based on findings from the EPS Risk Assessment.

If an EPS licence is required, MD-LOT's consideration of whether an EPS Licence can be granted will comprise three tests:

1. To ascertain whether the licence is to be granted for one of the purposes specified in the Regulations;
2. To ascertain whether there are no satisfactory alternatives to the activity proposed (that would avoid the risk of offence); and
3. That the licensing of the activity will not be detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status.

1.3.2 Basking sharks

Basking sharks are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). For fully protected Schedule 5 species, it is an offence to intentionally or recklessly kill, injure or take fish, possess, sell or intentionally or recklessly disturb or harass fish. Additionally, this species is protected in Scotland under the Nature Conservation (Scotland) Act 2004 and is listed as a priority marine feature (PMF) in Scotland's seas since 2014.

Basking sharks are generally very rarely present within Moray Firth marine region (Paxton *et al.*, 2014). Considering information on their known distribution, it is considered extremely unlikely that interactions with basking sharks will occur, hence, the potential for the proposed survey operations to result in intentional or reckless disturbance or harassment of this species is equally limited. However, during summer 2023, exceptional number of basking shark sightings were recorded within Moray Firth, with at least 40 individuals reported to Hebridean Whale and Dolphin Trust, with animals mostly congregating off the coast at Nairn (HWDT, 2023). Considering recent increase in sightings within Survey Area, this assessment will also consider the requirement for a basking shark derogation licence under the WCA.

1.4 Protected Sites Overview

1.4.1 European Sites

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, known as the Habitats Directive, provides for the conservation of natural habitats and of wild flora and fauna including in offshore areas. The Council Directive 2009/147/EC on the Conservation of Wild Birds, known as the Birds Directive, applies to the conservation of all species of naturally occurring wild birds including in offshore areas. In the UK, sites designated as SACs (Special Areas of Conservation) and SPAs (Special Protection Areas), collectively referred to as European sites, form part of the UK site network, delivering the requirements of the Directives. The Directives were transposed into Scottish Law in Scottish Territorial Waters by the Conservation (Natural Habitats &c.) Regulations 1994 (as amended).

The Habitat Regulations require that where a project is likely to have a significant effect on a designated site, either alone or in-combination with other plans or projects, it shall be subject to an Appropriate Assessment of its implications for the site in view of the site's conservation objectives by the competent authority.

This is implemented through the HRA process. The HRA process requires that any proposal which has the potential to result in a negative likely significant effect (LSE) on the conservation objectives of the site to be subject to an HRA by the Competent Authority, and if necessary, an Appropriate Assessment (AA). The HRA and AA processes ensure that no activity can be consented if it may cause adverse effects on the integrity of a European Site, unless there no alternatives, and there is an Imperative Reason of Overriding Public Interest (IROPI) for the development to be constructed.

If it is necessary to apply for an EPS or basking shark derogation licence, this report will provide sufficient detail to support the HRA process.

1.4.2 NCMPAs

Under Section 82 of the Marine (Scotland) Act 2010, MD-LOT is required to consider whether a licensable activity is capable of affecting (other than insignificantly) a protected feature in a Nature Conservation Marine Protected Area (NCMPA), or any ecological or geomorphological process on which the conservation of any protected feature in an NCMPA is dependent. If MD-LOT determine there is or may be a significant risk of a project hindering the

achievement of the conservation objectives, then they must notify the relevant conservation bodies (NatureScot in this case).

It is an offence to intentionally or recklessly kill, remove, damage, or destroy any protected feature of an NCMPA. MD-LOT must be sure that consenting/licensing decisions do not cause a significant risk to the conservation objectives of any NCMPA.

If it is necessary to apply for an EPS or basking shark derogation licence, sufficient detail will be provided to allow MD-LOT to ascertain potential effects on NCMPAs.

1.4.3 Designated Seal Haul-Out

Seal haul-outs are coastal locations that seals use to breed, moult and rest. Almost 200 seal haul-out sites have been designated through The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014, which was amended with additional sites in 2017. These haul-out sites are protected under Section 117 of the Marine (Scotland) Act 2010. The Act is designed to assist in protecting the seals when they are at their most vulnerable, and as such provide additional protection from intentional or reckless harassment.

1.4.4 Selection Criteria for Protected Sites

Over and above potential impacts on protected species, the potential for the proposed survey activities to impact protected sites (including designated seal haul-outs) needs to be considered. The following criteria has been used to select those designated sites which may have connectivity to the proposed survey activities, and hence where potential impacts need to be assessed:

- SACs and NCMPAs (including proposed and candidate sites) with cetaceans as qualifying features within 50 km of the proposed survey area;
- SACs (including proposed and candidate sites) with harbour seal features within 50 km of the proposed survey area and breeding grey seals within 20 km of the proposed survey area;
- Designated seal haul-outs or grey seal breeding sites that overlap with or located within 500 m of the proposed survey area;
- SPAs and NCMPAs (including proposed and candidate sites) with birds as qualifying features that overlap with or are located within 2 km of the proposed survey area.
- SACs and NCMPAs (including proposed and candidate sites) with otter features that overlap with or located within 500 m of the proposed survey area; and Designated seal haul-outs or grey seal breeding sites that overlap with or located within 500 m of the proposed survey area;
- SACs and NCMPAs (including proposed and candidate sites) with seabed / benthic protected features that overlap with the proposed survey area.

1.5 Document Structure

This document provides the information to support the EPS licencing and protected sites assessment process:

- Section 2 provides a general description of the proposed survey activities and their proposed location;
- Section 3 provides an assessment of risks to EPS and basking sharks;
- Section 4 provides an assessment of potential impacts to protected sites and their conservation features;
- Section 5 outlines the proposed species protection measures to be implemented;
- Section 6 presents the overall conclusions of the assessment; and
- Appendix A – Beatrice Offshore Wind Farm Coordinates.

2 DESCRIPTION OF PROJECT ACTIVITIES

2.1 Overview

Geophysical, benthic surveys and visual inspections of the Beatrice Offshore Windfarm transmission infrastructure and turbine sub structures are required to ensure the assets are in good working order. This is in line with BOWL's asset integrity and management procedures, and to comply with consent requirements. The results of the survey and inspection works will be used to inform future maintenance requirements.

2.1.1 Testing and Calibration of Survey Equipment

Prior to survey activities commencing, the survey equipment and sensors will need to be tested and calibrated. Testing and calibration may be required for all survey equipment that will be utilised during the survey activity, as detailed in Table 2-1. It is anticipated that the testing and calibration will take approximately 12 hours per mobilisation. All testing and calibration activities will be conducted within the survey area covered by this assessment.

Since the vessel(s), equipment, and activities required for testing and calibration will be the same as those used during geophysical survey works, the potential impacts on protected species and sites resulting from testing and calibration will be analogous to those resulting from the main survey phase. As such, testing and calibration is not specifically considered by this assessment.

2.1.2 Survey Activities

The surveys will be carried out by an offshore survey vessel, although it is noted that additional vessels may be mobilised if required by operational requirements. Table 2-1 presents the types of activity that are associated with the geophysical and environmental surveys.

Table 2-1 Summary of the activities associated with the different survey types

ACTIVITIES	
Vessels and Vehicles	Survey Vessel
	Remotely Operated Vehicle (ROV)
	Remotely Operated Towed Vehicle (ROTV)
	Autonomous Underwater Vehicle (AUV)
	Uncrewed Surface Vehicle (USV)
Geophysical Survey	Ultra-short Baseline (USBL) positioning system
	Side Scan Sonar (SSS)
	Multi Beam Echosounder (MBES)
	Single Beam Echosounder (SBES)
	Sub-Bottom Profiler (SBP)
	Sub-Bottom Imager (SBI)

ACTIVITIES	
Benthic Habitat Analysis	ROV survey / inspection
	Drop-down camera video / photo
	Benthic sediment grab sampling

2.1.3 Survey Equipment

A range of different equipment may be employed during the survey activities (see Table 2-1). The potential survey techniques are described in Table 2-2.

Table 2-2 Details of the equipment to be employed for the survey activities

SYSTEM / SURVEY EQUIPMENT	DESCRIPTION
Geophysical Survey	
Ultra-Short Baseline (USBL) Positioning	USBL systems are used to determine the position of subsea survey items, including ROVs, towed devices, grab samplers, etc. This involves the emission of sound from a vessel-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. A USBL system consists of a transducer, which is mounted on the vessel and a transponder attached to the ROV. The transducer transmits acoustics through the water and the transponder sends a response which is detected by the transducer. The USBL calculates the bearing and time taken for the transmissions to be completed 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.
Multibeam Echosounder (MBES)	Multi-beam echo-sounders 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). Multi-beam echo-sounders can, typically, carry out 200 or more simultaneous measurements. With regards to this Project, the MBES specifications are to be high resolution; Max ping space of 25 cm or 9 pings per square metre with towed set up.
Side-Scan Sonar (SSS)	Side-scan sonar 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 ROV. The frequencies used by side-scan sonar are generally very high and outside of the main hearing range of all marine species (NOAA, 2018). The higher frequency systems provide higher resolution but shorter-range measurements.
Single Beam Echosounder (SBES)	Single-beam echo-sounders operate in a similar manner to MBES; rather than measuring multiple points per acoustic echo wave (echo) emitted, SBES can only measure one point at a time. The nature of the sound emitted by SBES is impulsive.

SYSTEM / SURVEY EQUIPMENT	DESCRIPTION
Sub-Bottom Profilers (SBP)	SBP systems are used to identify and characterise layers of sediment under the seafloor. A transducer emits a sound pulse vertically downwards towards the seafloor, and a receiver records the return of the pulse once it has been reflected off the seafloor. There are numerous SBP technologies which may be deployed during survey operations, including; pingers, chirpers, boomers, and sparkers. These devices can operate across a range of frequencies depending on the purpose of the survey. Higher frequencies of operation provide the highest resolution but are limited in amount of penetration below the sea floor. The high frequency profilers are particularly useful for delineating shallow features such as faults, gas accumulations and relict channels. Lower frequencies yield more penetration but provide less resolution; lower frequency systems are more general-purpose tools that provide a good compromise between penetration capacity and resolution.
Sub-Bottom Imagers (SBI)	SBI systems are used to identify features within the upper layers of the seabed. SBIs use continuous beamforming of signals produced by a high-frequency chirp array to provide high-resolution mapping.
Benthic Habitat Analysis	
ROV survey / Observations	An ROV is a tethered underwater mobile device. ROVs are commonly used for visual surveys of the seafloor. For underwater positioning a USBL system is used. The ROV is manoeuvrable by the use of thrusters.
Drop-Down Video / Photography	Ground-truthing of acoustic data will be undertaken using drop-down video/photography (drop frame and/or ROV) and grab sampling techniques (see below). This survey technique does not interact with the seabed. Visual surveys are required to provide detail on epifaunal species (animals living on the surface of the substrate), habitats and geological features.
Benthic Sediment Sampling	Grab samples will be taken of the seabed to provide detail on the sediment itself and infauna (animals living within the substrate) which cannot be provided by the use of video and photography (see above). Grab samples will not be collected on hard substrates or at locations with sensitive habitats (e.g. Maerl); therefore, grab sampling will be preceded with video/camera drops. Grabs will be collected at selected video/photo sites on sedimentary substrate unless they support sensitive habitats; data collected will therefore be complementary and allow biotope classification to include consideration of infaunal components. A sediment sub-sample will also be retained from the grab for Particle Size Analysis (PSA) with the remainder sieved for infaunal analysis. The survey methodology will follow the NatureScot Guidance Notice No. 45 – Subsea Cable and Oil and Gas Pipeline Proposals – Benthic Habitat and Species Survey Requirements and consultation will be undertaken with NatureScot and the Marine Directorate to ensure sufficient sampling frequency. The benthic sediment sampling equipment does not generate potentially significant levels of sound. Therefore, this technology does not require any further consideration with respect to potential injury or disturbance of protected species.

2.2 Activity Schedule

The Beatrice Offshore Windfarm survey operations are scheduled to be undertaken within the timeframe of 1st January 2024 – 31st December 2027. There will be numerous survey campaigns within this period, which are anticipated to have total duration of survey activities of approximately 485 days.

Within each year, the various survey campaigns are anticipated to have the following indicative durations, subject to operational need, weather and sea state:

- 2024: four (4) months;
- 2025: four (4) months;
- 2026: four (4) months; and
- 2027: four (4) months.

3 EUROPEAN PROTECTED SPECIES AND BASKING SHARK RISK ASSESSMENT

3.1 Overview

The primary function of this Risk Assessment is to determine whether an EPS or Basking Shark Derogation licence is required for the proposed survey works, by identifying the potential for injury and disturbance to cetaceans and basking sharks. This section of the risk assessment addresses potential impacts to cetaceans and basking sharks, regardless of their inclusion as qualifying features of protected sites. An assessment of potential impacts to protected sites and their qualifying features is provided in Section 4.

Underwater sound emitted from geophysical survey equipment is the primary source of potential injury and disturbance to cetaceans. It is acknowledged that underwater sound emitted by the survey vessel and the physical presence of the vessels during the survey operations also have the potential to cause disturbance to cetaceans and basking shark.

An overview of survey activities and their potential impacts to EPS is provided in Table 3-1 below.

While some survey techniques and activities may introduce sound to the marine environment, other activities do not operate in relevant frequency ranges or generate sufficient levels of sound to be considered as potential sources of sound-related injury or disturbance to EPS, and have been screened out of the detailed assessment, as indicated in Table 3-1.

Table 3-1 Overview of potential impacts of marine survey activities on EPS and other protected species within the vicinity of the Beatrice Offshore Wind Farm

ACTIVITY / EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (kHz)	SPL_{PEAK} (dB re 1 µPa)[1]	FURTHER INFORMATION REQUIRED AS PART OF THE EPS RISK ASSESSMENT?
Vessels and Vehicles				
Survey vessel	Propellers, engines, and propulsion activities form the primary sound sources of survey vessels. Vessel sound is generally continuous and comes in both narrowband and broadband emissions. Potential impacts on EPS and other protected species depend on the duration of the survey activities, location of the survey area and species of cetacean potentially present in the area. Increased vessel activity additionally has the potential to cause injury from collisions. The risk of collision with an animal is influenced by the dimensions of the vessel and its speed.	Acoustic energy from vessels is strongest at frequencies <1 kHz	< 50 m length vessel = 160 – 175 RMS > 50 m length vessel = 165 – 185 RMS	**No** –The source levels associated with vessels are likely to be too low to result in injury, and the presence of three survey vessels in the Moray Firth region does not constitute a change from baseline conditions. It is acknowledged that vessels pose a collision risk to EPS and basking sharks. While this does not constitute a change from baseline, all vessels will adhere to The Scottish Marine Wildlife Watching Code (SMWWC) (NatureScot, 2017) and Basking Shark Code of Conduct (The Shark Trust, undated), as detailed in Section 5.
Remotely Operated Vehicle (ROV) Automated Underwater Vehicle (AUV) Uncrewed Surface Vehicle (USV)	Potential impacts to EPS and other protected species include disturbance from sound emissions associated with movements underwater. However, these are anticipated to be limited in scale, given the small size of the vehicles. Collision risk is considered an unlikely impact, given the high level of manoeuvrability and slow movement associated with these vehicles.	N/A	N/A	**No** – the predominant sound source during such activities is the USBL, and other geophysical survey sensors deployed on the vehicle, which is expected to mask any sound generated by the vehicle itself. Sound generated by geophysical survey devices has been considered separately (see below).
Geophysical Survey				
Ultra-Short Baseline (USBL) positioning system	USBL systems involve the emission of impulsive 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.	19.5 – 33.5	170 – 207	**Yes** – The pressure levels and frequencies at which the USBL operate are not of a level where injury is expected but have the potential to cause disturbance to EPS.
Side Scan Sonar (SSS)	Side-scan sonar equipment produces impulsive sound emissions through high frequency pulses used to image the seabed habitat. Potential impacts to EPS and other marine mammals depend upon the frequency, location, and duration of the pulses.	200 – 800	190 - 230	**No** – The SSS used for the proposed survey operations will operate at frequencies above 200 kHz. This is above the hearing threshold of all marine mammals and protected species which may be present in the area (as detailed in Table 3-3). Hence no potential for injury or disturbance exists (NOAA, 2018).
Multibeam echosounder (MBES) and Single beam echosounder (SBE)	High frequency sound pulses created by multi-beam echo sounder equipment generate sound waves which produce impulsive underwater sound. Depending on the frequency of the pulses, location and duration of the operations, and the species present, there could be potential impacts on cetaceans.	200 – 400	180 – 240	**No** – The MBES/SBES used for the proposed survey operations will operate at frequencies between 200-400 kHz. This is above the hearing threshold of all marine mammals and protected species which may be present in the area, as detailed in Table 3-3. Hence no potential for injury or disturbance exists (NOAA, 2018).
Sub-Bottom Profiling (SBP)	Sub-bottom profiling involves the vertical emission of sound pulses (impulsive sound) to characterise the layers of sediment comprising the seabed. Such activities introduce sound emissions into the 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. There are numerous SBP technologies may be deployed during the survey operations including; pingers, chirpers, and boomers. Another SBP technology which may be employed during survey activities is a sparker. A sparker uses a spark across a pair of electrodes to create a gas bubble which resonates sound.	0.5 – 12 (chirp) 4 (pinger) 100 (pinger)	200 – 230 (chirp) 200 – 235 (both pingers)	**Yes** – Although source pressure levels emitted by this equipment been identified as below the threshold result in a realistic risk of injury to any marine mammal species, this equipment may be a source of disturbance to EPS.
Sub-Bottom Imager (SBI)	Sub-bottom imagers use beamforming chirp arrays to produce a 3D view of the sub-seabed. The potential impacts of this sound on cetaceans depends upon the abundance, distribution and sensitivity of the species, and the duration of the operations.	4 - 14	192	**Yes** – Although source pressure levels emitted by this equipment been identified as below the threshold result in a realistic risk of injury to any marine mammal species, this equipment may be a source of disturbance to EPS.

[1] *SPLs are presented as SPL_{PEAK} unless otherwise stated.*

3.2 European Protected Species

Around 20 species of cetacean have been recorded off the coast of Scotland; however, only eight species are recorded as either regularly or occasionally visiting the Moray Firth region: harbour porpoise, bottlenose dolphin, minke whale (*Balaenoptera acutrostrata*), white-beaked dolphin (*Lagenorhynchus albirostris*), killer whale (*Orcinus orca*), Risso's dolphin (*Grampus griseus),* Fin whale *(Balaenoptera physalus)* and long-finned pilot whale (*Globicephala melas*) (Reid *et al.*, 2003; Hammond *et al.*, 2017; Robinson *et al.*, 2007). The following summarises those species regularly sighted in the vicinity of the Beatrice Offshore Wind Farm:

- Harbour porpoise are the most numerous cetacean in the Moray Firth and are generally observed in small groups of one to three individuals (Reid *et al.*, 2003; Robinson *et al.*, 2007). Based on SCANS IV survey results, the density of harbour porpoises in block CS-K, including Moray Firth, is approximately 0.2813 animals/km^2, with estimated abundance of 11,137 individuals (CL 4,946 – 21,173 individuals) (Gilles *et al.*, 2023).
- Bottlenose dolphin are prevalent in the coastal waters of the east Scottish coast, with animals belonging to the Coastal East Scotland Management Unit which ranges from Orkney to the Forth of Firth. There is no estimates of density and abundance of bottlenose dolphins in block CS-K from SCANS IV survey due to no sightings. Most up to date numbers come from SCANS III. Although the density of bottlenose dolphins was estimated at 0.0037 animals/km^2 in block S including Moray Firth due to the fact that the Moray Firth survey block also includes the waters north of Orkney which are outwith the range of bottlenose dolphins (Hammond *et al.*, 2017). As such, the density within the Moray Firth is anticipated to be higher than this estimate. The highest densities of this species have been observed in the inner and southern Moray Firth in waters less than 25 m deep (Robinson *et al.*, 2007; Cheney *et al.*, 2013). Abundance in block S was estimated to be 151 individuals (95% CI:0-527) (Hammond *et al.*, 2021).
- Minke whale are the smallest, most prevalent baleen whales to occur in Scottish waters. They feed mainly in shallower waters over the continental shelf (< 200 m deep) and regularly appear around shelf banks and mounds, or near fronts where zooplankton and fish are concentrated at the surface. They are also commonly seen in the strong currents around headlands and small islands, where they can come close to land, even entering estuaries, bays and inlets. Based on SCANS IV survey results, the density of minke whales in block CS-K, including Moray Firth, is approximately 0.116 animals/km^2, with estimated abundance of 467 individuals (CL: 2 – 1,655 individuals) (Gilles *et al.*, 2023). In the southern Moray Firth, where minke whale are frequently encountered, a preference for waters at a depth of 20 and 50 m and with sandy-gravel sediments has been observed. This is likely attributed to the abundance of key prey species (e.g. sandeels (*Ammodytes* spp.) in this habitat type (Robinson *et al.*, 2009). Although large aggregations of minke whale have been observed in the southern Moray Firth, associated with the Southern Trench NCMPA which is designated for this species, individuals have been observed throughout the survey area, most frequently between May and October (Reid *et al.*, 2003).
- White-beaked dolphin are common in Northern European continental shelf seas from Iceland and Norway south to Ireland and Southwest England, including the northern and central North Sea. The white-beaked dolphin is recorded around the survey area throughout the year (Reid *et al.*, 2003) and have and based on SCANS IV survey results, its density in block CS-K, including Moray Firth, was estimated to approximately 0.1352 animals/km^2, with estimated abundance of 5,460 individuals (CL: 191 – 12,812 individuals) (Gilles *et al.*, 2023).
- Other species, such as killer whale, Risso's dolphin, fin whale, and long-finned pilot whale, are seen on occasion throughout the survey area (Reid *et al.*, 2003; Robinson *et al.*, 2007; Robinson *et al.*, 2017). A recent study on killer whale habitat use confirmed individuals typically sited along the coastline of the Moray Firth are associated with the small community of roving animals which also utilise the Northern Isles. Encounter rates of these individuals

peak between May and July (Robinson *et al.*, 2017). Risso's dolphins are also infrequent visitors to the area, with encounters occurring predominantly in September (Robinson *et al.*, 2007). All other species are encountered intermittently throughout the year with no obvious spatial or temporal trend (Robinson *et al.*, 2007). As these species of cetacean are encountered irregularly within the Moray Firth, there is insufficient data to assess habitat use, including defining localised abundance or density. As such, impacts to these species are considered unlikely and they have not been included in this EPS risk assessment.

The distribution, average density, and abundance of the most commonly occurring cetacean species in the Moray Firth are described in Table 3-2 below.

Table 3-2 Population parameters of cetacean species potentially present in the survey area (Gilles et al., 2023, Hammond et al., 2021))

SPECIES NAME	ESTIMATED DENSITY* ACROSS THE PROJECT AREA (Individuals/km^2)	ESTIMATED ABUNDANCE WITHIN THE PROJECT AREA (119 km^2)	MANAGEMENT UNIT (MU) / BIOGEOGRAPHICAL POPULATION ESTIMATE (IAMMWG, 2022)	PROPORTION OF THE MU POTENTIALLY AFFECTED BY PROJECT ACTIVITIES
Harbour porpoise (*Phocoena phocoena*)	0.2813*	33.5	346,601	0.01 %
Bottlenose dolphin (*Tursiops truncatus*)	0.004**	0.48	224	0.21 %
Minke whale (*Balaenoptera acutrostrata*)	0.0116*	1.4	20,118	< 0.01 %
White-beaked dolphin (*Lagenorhynchus albirostris*)	0.1352*	16.1	43,951	< 0.01 %

Note: Density estimates reported for SCANS-IV Survey Block CS-K (*) and if unavailable from SCANS III Block S (**);

3.3 Basking Sharks

Basking sharks are one of the only three species of shark which filter feed and are the second largest fish in the world (Sims, 2008). This species can be found throughout the offshore waters in the UK continental shelf (Sims, 2008) and are considered frequent visitors to the west coast of Scotland (HWDT, 2018; Witt *et al.*, 2012). They are widely distributed in cold and temperate waters and feed predominantly on plankton and zooplankton e.g., barnacles, copepods, fish eggs and deep-water oceanic shrimps by filtering large volumes of water through their wide-open mouth. They typically move very slowly (around four miles per hour). In the winter, they dive to great depths to get plankton while in the summer they are mostly near the surface, where the water is warmer.

Basking sharks were hunted in Scotland up to 1995. However, they are now protected in the UK waters principally under Schedule 5 of the WCA Act 1981 and under the Nature Conservation (Scotland) Act 2004 and are classed as a Scottish PMF, as well as a species on the OSPAR list of Threatened and Declining species. Due to their size, slow swimming speeds and preference for swimming in coastal waters during the summer months, basking sharks are considered to be at potential risk of collision with vessels associated with the proposed survey activities. Given that basking sharks are slow to mature and have a long gestation period, the species can be slow to recover if populations are depleted.

Basking sharks seasonally arrive in Scottish waters during spring and leave in autumn. They appear to aggregate in summer to breed, with peak sighting densities in the west coast of Scotland occurring in August (Witt *et al.*, 2012). During summer 2023, exceptional number of basking shark sightings were recorded within Moray Firth and hence in the vicinity of the proposed survey activities, with at least 40 individuals reported to Hebridean Whale and Dolphin Trust, with animals mostly congregating off the coast at Nairn (HWDT, 2023)

Potential Impacts

The basking shark is an elasmobranch (sharks and rays) which is a group with generally low sensitivity to sound pressure due to the fact they do not have a swim bladder. 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, although, this 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 sound profiles emitted during the proposed geophysical surveys, and considering the temporary nature of activities, acoustic disturbance is not expected to impact basking sharks. On this basis, the potential for underwater sound emissions to impact upon basking sharks is screened out of further assessment.

Vessel collision and disturbance also poses a threat to this slow-moving species. Collision and disturbance risk increases with increasing vessel speed. As the survey vessels will be slow-moving during the survey campaign, collision risk is low. Risk will be reduced further through the mitigation measures outlined in Section 5. The above notwithstanding, a Basking Shark Derogation Licence for vessel disturbance will be sought as conservative approach.

3.4 Potential Impacts from Project Underwater Sound Emissions

Sound emissions constitute the greatest potential risk of injury or disturbance to cetaceans within the vicinity of the survey area. Sound has the potential to impact cetaceans in two ways:

- Injury – physiological damage to auditory structures and/or other tissues; and
- Disturbance (temporary or continuous) – disruptions to behavioural patterns, including, but not limited to, migration, breathing, nursing, breeding, foraging, socialising and / or sheltering.

To determine the potential for sound impacts to cetaceans and pinnipeds, predicted sound emission levels are compared to the best available information empirically estimated thresholds for injury and disturbance. Several threshold criteria and methods for determining how sound levels are perceived by marine mammals are available (e.g., the decibel hearing threshold (dBht) method and other hearing weighted and linear measures) and each has its own advantages and disadvantages. Scottish Government (2020) guidance recommends using the injury and disturbance criteria proposed by 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 the publication of this paper (Southall *et al.*, 2007), an increasing body of evidence has emerged on marine mammal auditory abilities in novel species and well-researched species alike (e.g., harbour porpoise) which has led to amendments to the auditory thresholds for injury (National Marine Fisheries Service (NMFS), 2018; Southall *et al.*, 2019). In accordance with recent regulator

feedback, these amended hearing groups and thresholds for acoustic injury have been adopted herein; they are detailed in Tables 3-3 and 3-4 below.

If a sound emission is composed of frequencies which lie outwith the estimated auditory bandwidth for a given species, then disturbance or injury is extremely unlikely (NMFS, 2018). To understand the potential for sound-related impacts, the likely hearing sensitivities of different cetacean hearing groups has been summarised below in Table 3-3, which is the basis for screening out SSS, MBES and SBES from further assessment as detailed in Table 3-1.

Table 3-3 Auditory bandwidths estimated for cetaceans (Southall et al., 2019; NOAA, 2018)

HEARING GROUP	ESTIMATED AUDITORY BANDWIDTH
Low-frequency cetaceans (LF): (e.g. baleen whales, such as humpback whales, minke whales, sei whales, etc.)	7 Hz to 35 kHz
High-frequency cetaceans (HF): (e.g. dolphins, toothed whales, beaked whales and bottlenose whales)	150 Hz to 160 kHz
Very high-frequency cetaceans (VHF): (e.g. marine mammal species such as harbour porpoises and other 'true' porpoises)	275 Hz to 160 kHz
Phocid carnivores in water (PCW): (e.g. earless or 'true' seals, such as grey and harbour seals)	75 Hz to 100 kHz

3.4.1 Sound Assessment Criteria

Injury

Injury criteria proposed by NOAA (2018) are devised for two different types of sound:

- 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; and
- 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.

The geophysical surveys comprise acoustic equipment which emits multiple pulsed sound. The sound emitted from the equipment listed in Table 3-1 will disperse through the water column, with sound pressure generally reducing as distance from the sound source increases. Correspondingly, exposure of marine mammals to sound is expected to decrease similarly when farther from the sound source. Therefore, for the survey equipment with potential to cause injury to marine mammals, the dispersion of sound through the water column has been modelled to assess the appropriate mitigation zone in which the source pressure levels received by marine mammals are reduced below potentially injurious levels.

A dual-metric approach has been adopted which identifies the range of potential injury to marine mammals which have been derived from the source SPL, including the peak pressure and cumulative SELs experienced for each

equipment type identified to require consideration for sound-related injury (see Table 3-1). The thresholds above which each marine mammal hearing group may experience sound-related injury are presented in Table 3-4 below. These thresholds are derived from measurements of marine mammal hearing using weighting functions which account for peak hearing abilities for each hearing group (NOAA, 2018).

Table 3-4 Criteria considered in this assessment for the onset of injury in marine mammals from impulsive sound (NOAA, 2018; Southall et al., 2019)

MARINE MAMMAL HEARING GROUP[2]	IMPULSIVE SOUND		NON-IMPULSIVE SOUND
	Peak pressure (dB re 1 µPa)	Cumulate SEL (dB re 1 µPa^{2}s)	Cumulate SEL (dB re 1 µPa^{2}s)
Low-frequency (LF) cetaceans	219	183	199
High-frequency (HF) cetaceans	230	185	198
Very high-frequency (VHF) cetaceans	202	155	173
Phocid carnivores in water (PCW)	218	185	201

Disturbance

There are two regulations which govern disturbance to EPS: Regulation 39(1) and Regulation 39(2) from the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Regulation 39(1) defines disturbance for all EPS in Scottish Territorial Waters. Regulation 39(2) goes beyond the disturbance definitions provided in Regulation 39(1) by making it an offence to deliberately or recklessly disturb any cetacean in Scottish Territorial (Scottish Government, 2020). The definitions of disturbance are provided in Figure 3-1 below.

To consider the possibility of a disturbance offence resulting from the proposed survey, it is necessary to consider the likelihood that survey activities would generate a non-trivial disturbance based on the sensitivity of the species present. Where there is a possibility of disturbing an individual animal, it is necessary to apply for an EPS Licence to ensure that an offence is not committed. However, in issuing an EPS Licence, the Marine Directorate must consider whether the Favourable Conservation Status (FCS) of any species will be affected. Consequently, the impacts of proposed activities on the FCS of all protected species must be considered to satisfy both Regulations 39(1) and 39(2). The impact assessment below addresses the impacts of survey activities on the existing conservation status of protected species within the area.

[2] *Hearing groups have been defined using the naming conventions provided in Southall et al. (2019), which are based on accepted frequency ranges commonly used in acoustics; however, the groupings and their respective criteria do not differ from NOAA (2018)*

The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)

Regulation 39 (1) makes it an offence —

(a) deliberately or recklessly to capture, injure, or kill a wild animal of a European protected species;

(b) deliberately or recklessly –

(i) to harass a wild animal or group of wild animals of a European protected species;

(ii) to disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;

(iii) to disturb such an animal while it is rearing or otherwise caring for its young;

(iv) to 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;

(v) to 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;

(vi) to 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

(vii) to disturb such an animal while it is migrating or hibernating.

Regulation 39(2) provides that it is an offence —

to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).

Figure 3-1 Disturbance regulations in Scottish territorial waters

Acoustic Disturbance Criteria

Auditory thresholds for disturbance, as defined by NMFS (2014), coupled with behavioural response criteria detailed in Southall *et al.* (2007) have been adopted for the assessment of potential marine mammal disturbance from both non-impulsive and impulsive sound sources. These thresholds and behavioural response severity ratings are provided in Table 3-5 below.

Table 3-5 Disturbance threshold criteria for impulsive sounds (NMFS, 2014 & Southall et al., 2007).

BEHAVIOURAL EFFECT	THRESHOLD CRITERIA SPL_{RMS} (dB re 1 µPa)
Potential strong behavioural reaction (6 or more on the severity scale)	160

3.4.2 Sound Related Impacts to EPS

Sound modelling approach

USBL and SBP

Sound propagation modelling is as conducted in support of the previous BOWL EPS licence (MS EPS 09/2020/0). Modelling to identify the potential range (i.e. the straight-line distance from the source) in which sound impacts to marine mammals could occur was undertaken using Xposure, a semi-empirical propagation model developed by

Xodus. Modelling was conducted at water depths bookending those expected in the survey area. The dual-metric modelling approach disseminated in NOAA (2018) was used to identify impacts from: (1) SPL_{PEAK}; and (2) cumulative SEL. The SEL represents the total energy produced by a sound-generating activity standardised to a one-second interval. This enables comparison of the total energy attributed to different activities with different inter-pulse intervals. As described in Section 3.4.1 above, empirically-based weighting functions (NOAA, 2018; Southall *et al.*, 2019) were applied to the modelling outputs to account for frequency-dependent hearing sensitivities of the respective marine mammal hearing groups. The following assumptions were applied to the model:

- Maximum SPL_{PEAK} has been used for all calculations;
- Maximum pulse length and minimum turn around has been used where provided;
- Where source frequencies occur across a range of frequencies, acoustic power has been distributed evenly across a flat 3rd octave spectrum;
- Where data is unavailable, the time between pulses has been calculated as 1.5 times the ping length;
- Mammals swim at seabed depths (this represents the worst-case);
- Vessels are moving at slow speeds; and
- Survey equipment likely to be used in the nearshore shallow water environment (i.e. <10 m) will be very high frequency to provide better resolution and will have a lower SPL, and so does not constitute a worst-case scenario.

The directional characteristics of the sound sources are also an important factor affecting the received sound pressure levels from sound-generating activities. In geophysical surveys, source arrays are designed so that the majority of acoustic energy is directed downwards towards the ocean floor for data collection purposes. As such, the amount of energy emitted across the horizontal plane is significantly less (≥20 dB) than that emitted directly downwards.

Due to the frequency-dependent nature of sound, the loss of pressure on the horizontal plane is more pronounced at higher frequencies than at lower frequencies. Directivity corrections can be applied to the model outputs, which provide broadband normalised amplitudes at varying angles of azimuth[3] and dip angle[4]. Directivity corrections have been applied to the modelling outputs under the assumption that the animal is directly in-line with the vessel.

SBI

Given the source levels of the SBI were <200 dB re 1µPa, it is considered that this devices poses minimal risk of injury to cetaceans. However, in the interests of completeness acoustic injury and disturbance ranges resulting from the operation of the SBI sound were estimated using a simple logarithmic regression model, after Götz & Janik (2015). The following equation defines the model:

$$RL = SL - 18.3 \log_{10} r$$

Where; RL is the received level, SL is the source level and *r* is the range from the sound source. It should be noted that this approach is conservative, as it does not account for the movement of the survey vessel or the cetaceans.

Injury impacts

For the proposed surveys, the expected frequency range of sound emissions from USBL, SBP and SBI operations overlap with the hearing ranges of all cetacean hearing groups (Table 3-1 and Table 3-3). Potential injury to cetaceans (i.e. injury which results from a permanent threshold shift in hearing abilities) is limited to impulsive sound sources which exceed the injury thresholds defined in Table 3-4.

[3] *The azimuth is taken as the angle of circumference around the boat which lies parallel to the surface of the water, progressing around the boat from port to starboard.*
[4] *The dip angle is taken as the angle under the boat, progressing from prow to stern.*

Modelling of ranges at which injury impacts are likely to result from deployment of survey equipment has been undertaken, as described above. Example equipment has been selected to represent the realistic worst-case scenario for each survey technique, including the greatest SPLs across source frequencies meant to encapsulate the hearing abilities of all representative hearing groups. Impacts from noise sources which are strictly behavioural in nature (i.e. disturbance) are covered in the following subsection.

Table 3-6 Sound modelling results for injury impacts from impulsive sound sources (N/E = no exceedance of thresholds)

ACTIVITY	EXAMPLE EQUIPMENT MODELLED	FREQUENCY (kHz)	SPL_{PEAK} (dB re 1 µPa)	DEPTH (m)[5]	INJURY RANGE (m)											
					CUMULATIVE SEL (STATIC MAMMALS)				CUMULATIVE SEL (MOVING MAMMALS)				PEAK SPL			
					VHF	HF	LF	PCW	VHF	HF	LF	PCW	VHF	HF	LF	PCW
USBL	1000 Series Mini Beacon, Applied Acoustics Underwater Technology	19.5 – 33.5	207	100	43	8	4	5	38	2	1	1	3	N/E	N/E	N/E
				10	4	4	2	3	4	2	N/E	N/E	3	N/E	N/E	N/E
SBP	EdgeTech 2000 series[6]	0.5 - 12	230	100	40	38	38	38	38	38	38	38	61	3	8	9
				10	5	4	4	4	5	4	4	4	73	4	13	15
	Innomar SES 2000 sub-bottom profiler, 4 kHz	4	235	100	9	5	9	9	9	5	6	5	255	28	68	73
				10	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	445	98	178	188
	Innomar SES 2000 sub-bottom profiler, 100 kHz	100	235	100	28	17	17	17	19	17	16	17	30	12	17	18
				10	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	29	11	16	17
SBI[7]	PanGeo sub-bottom imager	4 – 14	192	-	-	-	-	-	-	-	-	-	N/E	N/E	N/E	N/E

[5] Depth refers to depth below the survey activity, which has been assumed to be hull-mounted or towed at the surface. These depths have been identified as representative of the survey area, based on available bathymetry data. SBI was modelled using a depth-independent model, and thus no value is stated.

[6] For modelling purposes, the specifications of the 2000-CSS have been used.

[7] Only the Peak SPL criteria were assessed using the logarithmic regression model for SBI – cumulative SEL thresholds could not be assessed using this method.

All of the survey technologies modelled have the potential to cause injury to EPS and other marine mammals (Table 3-4 and Table 3-6). As such, survey activities associated with the project may be potentially injurious to EPS species without appropriate mitigations.

Across modelling scenarios and metrics, the injury ranges were generally highest for the VHF hearing group (Table 3-6), which is represented by harbour porpoise in UK waters. Conversely, HF cetaceans seemed to constitute the hearing group with the lowest potential impact ranges for the peak SPL metric, while LF cetaceans had the lowest impact ranges for the cumulative SEL metric, when comparing between activity types (Table 3-6).

Higher frequency sounds attenuate more quickly than lower frequency sounds. Therefore, for given sound source level, animals would generally need to be closer to a high-frequency sound source to experience received levels capable of causing injury. For this reason, injury ranges were of the order of metres to tens of metres for the SBP operating at 100 kHz.

The deployment of a hull-mounted USBL in 100 m depths elevated the potential range of impact to a maximum of 43 m for VHFs, when considering cumulative SEL metric. However, the likelihood of a cetacean being this close to operational equipment is extremely low when considering that the source is deployed from a moving vessel travelling at more than 2 ms^{-1} (i.e. 4 knots) and, in some cases, is being towed at depth (e.g. a USBL may be mounted on a an ROV within a few metres of the seabed). Whilst USBL may be deployed from a static vessel during particular activities (e.g. inspection works), these are anticipated to be limited to a period of up to a few hours. As such, injury is not expected from the use of USBL, and no marine mammal mitigation is proposed for USBL operations.

The greatest injury range comes from the SBP operating at 4 kHz during shallow water operations (i.e. 10 m), wherein refraction off the seabed causes nearly immediate cylindrical spreading of sound emissions, causing the sound to travel farther along the horizontal plane of the water column more quickly. Whilst deployment of a low frequency SBP in nearshore waters constitutes a worst-case scenario of the potential injury range attributable to this survey technique, this scenario is highly unlikely. Geophysical survey technologies generally employ higher frequency sounds in shallow waters where sound loss to absorption and transmission are much lower. As such, sound penetration below the seabed is achievable at lower powers and higher frequencies, which offer higher resolution imagery to the surveyor. Furthermore, when considering the directionality of these equipment types, the impact ranges are further reduced. This is because the beam of sound generated by the equipment is directed downward towards the seabed, so the vast majority of power is contained within a roughly 45° angle from the source (the slant height of the conical sound source) to maximise penetration and the resultant imagery. Animals would need to be at the seabed below the sound source to experience the full sound levels behind the modelled impact ranges.

The majority of injury ranges were at least slightly reduced when considering animal movement during cumulative SEL estimation. Swim speeds of the species most likely to be observed in the survey area have been shown to be several ms^{-1} (e.g. cruising minke whale swim speed is 3.25 ms^{-1} and harbour porpoise may swim up to 4.3 ms^{-1}) (Blix and Folkow, 1995; Otani *et al.*, 2000). Further, NatureScot (2016a) has provided standard values for mean swimming speeds of various marine mammal species likely to occur in the project area, including harbour porpoise (1.4 ms^{-1}; Westgate *et al.*, 1995); harbour / grey seal (1.8 ms^{-1}; Thompson, 2015); and minke whale (2.1 ms^{-1}; Williams, 2009). To offer a representative model of the predicted sound exposure ranges of marine mammals moving away from the sound source, a mean swim speed of 1.5 ms^{-1} has been used in the calculations. Considering that the surveys themselves will take place while the vessel is moving, the cumulative SELs of all equipment types are expected to be even lower based on the premise that animals are likely to move away from the mobile sound source at some angle opposing the direction of vessel travel.

The SBI did not exceed the Peak SPL injury threshold at any distance. As such this device does not have the potential to injure EPS, and hence no marine mammal mitigation is proposed for this device.

It should also be noted that the modelling scenarios are meant to define the worst-case injury ranges associated with the deployment of the project's survey equipment. The *in-situ* deployment of the sound-generating survey equipment will most frequently occur in waters of intermediate depths (i.e. somewhere between 10-100 m). Moreover, the frequency ranges depicted constitute the lowest and highest reasonably practicable settings for the survey activities modelled, meaning that the spread of sound in the marine environment is also likely to fall somewhere between the modelled extremes. The injury ranges anticipated to result from equipment use are thus likely to fall within the spectrum of those defined by the model outputs, thereby reducing the impact ranges associated with the low frequency survey equipment.

Due to the potential for injury to EPS resulting from SBP operations, marine mammal mitigation will be implemented if SBP is used. Available mitigation measures specifically designed for geophysical surveys (JNCC, 2017) have been incorporated into mitigation measures described in Section 5 below. These measures include deployment of a Marine Mammal Observer (MMO) to monitor for the presence of cetaceans within a 500 m mitigation zone prior to the commencement of, and during, any SBP surveys (JNCC, 2017).

In consideration of the relevant mitigation measures for SBP, none of the modelled scenarios indicate any injury events are likely to exceed the 500 m mitigation zone. As EPS and other marine mammal species would need to come within 500 m of, and likely follow, the moving vessel or vehicular platforms from which the survey equipment will be deployed, injury to EPS from survey activities will not occur when the mitigations are applied. For these reasons, the survey activities are not anticipated to result in any injury to EPS, and hence an EPS Licence for injury is not required.

Disturbance impacts

In addition to physical injury, sound emissions have the potential to affect the behaviour of cetaceans in the vicinity of the sound source. Significant or strong disturbance (see Table 3-5; Southall *et al.*, 2007) may occur when an animal is at risk of a sustained or chronic disruption of behaviour or habitat use resulting in population-level effects. An assessment of potential disturbance impacts from USBL, SBP and SBI operations is provided in the sections below. The outputs of the sound modelling assessment against the disturbance thresholds are provided in Table 3-7.

USBL, SBP and SBI survey activities have the potential to generate a strong disturbance event (i.e. a disturbance offence) as described in Section 3.4.1. The potential for a disturbance offence to result from these types of technology varies between activity type. The SBI and USBL, having the lowest source levels of the equipment types, are of least concern for behavioural disturbance. For the SBP models, the predicted disturbance range is much greater for the low frequency sound sources given these frequencies propagate farther within the marine environment. The sounds emitted by the SBP operating at 0.5 – 12 kHz or at 4 kHz form the lowest frequency sounds and have the potential to generate disturbance impacts on the order of several km, whilst those from the SBI, USBL and higher frequency (i.e. 100 kHz) SBP are on the order of tens of metres (Table 3-7).

The number of individuals which may experience disturbance from the worst-case scenario for each activity type has been calculated in Table 3-8 below, based on the population parameters supplied in Table 3-2 above. In these calculations, the impact range serves as a radius with which to calculate the total area of coverage for a potential disturbance event associated with each survey activity.

Table 3-7 Sound modelling results for disturbance impacts from impulsive sound sources

ACTIVITY	EXAMPLE EQUIPMENT MODELLED	FREQUENCY (kHz)	SPL_{RMS} (dB re 1 µPa)	DEPTH[8] (m)	RANGE OF BEHAVIOURAL CHANGE (m)
USBL	1000 Series Mini Beacon, Applied Acoustics Underwater Technology	19.5 – 33.5	190	100	63
				10	64
SBP	EdgeTech 2000 series[9]	0.5 - 12	227	100	3,250
				10	2,750
	Innomar SES 2000 sub-bottom profiler, 4 kHz	4	230	100	4,220
				10	3,120
	Innomar SES 2000 sub-bottom profiler, 100 kHz	100	230	100	125
				10	120
SBI	PanGeo Sub-bottom imager	4 -14	188	-	34

Table 3-8 Number of cetacean individuals and proportion of the MU which may experience a disturbance offence from impulsive survey activities, based on known population parameters of the most frequently occurring species

SPECIES	NUMBER OF INDIVIDUALS WHICH MAY INCUR A STRONG DISTURBANCE				PROPORTION OF THE MU POTENTIALLY AFFECTED BY PROJECT ACTIVITIES[10]
	USBL (0.013 km^2 area)	SBP - 0.5 – 12 kHz (33 km^2 area)	SBP – 4kHz[11] (56 km^2 area)	SBI – 4 – 14 kHz (0.004 km^2 area)	
Harbour porpoise	<0.01	9.28	15.75	<0.01	< 0.01 %
Bottlenose dolphin	<0.01	0.13	0.22	<0.01	0.10 %
Minke whale	<0.01	0.38	0.65	<0.01	< 0.01 %
White-beaked dolphin	<0.01	4.46	7.57	<0.01	0.02 %

As detailed in Table 3-8, considering the predicted area of acoustic disturbance from the operation of USBL and SBI, the number of animals of any species within the disturbance range at any one time is predicted to be <0.01. This means that on average, there will be no marine mammals within the disturbance range of USBL and SBI operations,

[8] *SBI was modelled using a depth-independent model, and thus no value is stated.*
[9] *For modelling purposes, the specifications of the 2000-CSS have been used.*
[10] *Calculated based upon the 56 km^2 disturbance area of the SBP operating at 4 kHz as a worst case. Where multiple equipment types are in use, it is assumed they would be operating from the same vehicle, and therefore that areas of impact are not mutually exclusive.*
[11] *The Innomar SES 2000 sub-bottom profiler at an operational frequency of 4 kHz has been taken as a worst case.*

making potential disturbance impacts at the population level arising from this survey equipment negligible. As such the use of USBL and SBI do not have the potential to result in an EPS disturbance offence under either regulation 39(1) or 39(2) of the Habitats Regulations. Therefore, an EPS licence for disturbance is not anticipated to be required for the use of USBL and SBI.

The source levels associated with the example SBP survey equipment have the potential to elicit a strong behavioural response in EPS which could be classed as a disturbance offence as defined under Regulations 39(1) or 39(2) of the Habitats Regulations. However, none of the biogeographical population MUs for any of the EPS species known to regularly occur within the project areas will incur significant impacts. For each of the proposed survey activities, ≤0.1 % of the relevant biogeographic populations will be impacted by sound-related disturbance (Table 3-8).

As the survey vessel will not be stationary for prolonged periods during these activities, animals within a particular area will not be exposed to extended periods of underwater sound. Rather, individuals would have to follow the moving equipment to be subjected to lasting or prolonged periods of sound which may have detrimental effects at the individual or population level (i.e. a significant disturbance).

The programme of geophysical surveys will take place *ad hoc*, with the use of survey technologies and vessels being intermittent therein. There will be periods of inactivity during weather downtime. Given the transient and short-term nature of the survey and vessel activities, it is highly unlikely that any disturbance offences from use of SBP would negatively impact upon the FCS of any of the cetacean species which may be present in the survey area. This is on the basis that the modelled level of disturbance is unlikely to affect the ability of any individual animal to survive or reproduce and will not have significant population-level impacts to any EPS (Table 3-8).

The above notwithstanding, it is possible that a small number of animals may experience some level of disturbance for the short period that they encounter the proposed SBP survey activities. As such, an EPS Licence is expected to be required for the SBP survey activities (as per Regulation 39(2)).

3.5 Conclusions

There will be no injurious impacts to cetaceans as a result of project activities and no requirement to apply for an EPS Licence in that respect, once the proposed mitigation measures are applied (Section 5). However, there is potential for disturbance to cetaceans from the SBP operations, and BOWL will therefore apply for an EPS Licence in respect to this disturbance. However, the disturbance is expected to be limited to one or a few individuals of the local population and will therefore not result in any adverse impact to the FCS of any cetacean species. A basking shark derogation licence will also be sought, considering the recent uptick in basking shark activity in the Moray Firth and the limited potential for the presence of survey vessels to disturb this species.

Overall, the proposed survey operations constitute work of overriding public interest while presenting a trivial and temporary disturbance to a few individual animals in a limited area.

4 PROTECTED SITES IMPACT ASSESSMENT

4.1 Relevant Protected Sites

Given that BOWL will be applying for both and EPS and Basking Shark Derogation Licence for the proposed survey operations, it is also necessary to assess potential impacts from this activity on designated sites to inform the Habitats Regulation Appraisal (HRA) process.

The designated sites located in the vicinity of Beatrice Offshore Wind Farm Survey Area are shown in Figure 4-1. Sites which have the potential to be impacted by the survey activities outlined in Table 4-1 are selected based on the criteria outlined in Section 1.4. For each designated site that has the potential to be impacted by the surveys, mitigation measures have been identified relevant to site-specific qualifying features and these are also included within Table 4-1. Further details of the mitigation measures are provided in Section 5.

Note: Some of the mitigation measures included in Section 5 may not be listed in Table 4-1 if they are not related to protecting designated features of those sites. However, all mitigation measures in Section 5 will be applied to all activities, regardless of proximity to a protected site.

Table 4-1 Protected Sites in the Vicinity of Survey Area

DESIGNATED SITE	CRITERIA FOR POTENTIAL CONNECTIVITY TO THE SITE	DISTANCE FROM NEAREST PART OF SURVEY AREA TO PROTECTED SITE (km)	RELEVANT FEATURES OF DESIGNATED SITE	ACTIVITY	PROPOSED MITIGATION MEASURES	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT (LSE)
Moray Firth SAC	The designated site is within 50 km of the survey area.	37.8	Bottlenose dolphin (*Tursiops truncatus*)	Vessel presence, geophysical surveys.	M1, M2, M3, M4, M5, M6	No
Southern Trench NCMPA	The designated site is within 50 km of the survey aera.	31	Minke whale (*Balaenoptera acutorostrata*)	Vessel presence, geophysical surveys.	M1, M2, M3, M4, M5, M6	No

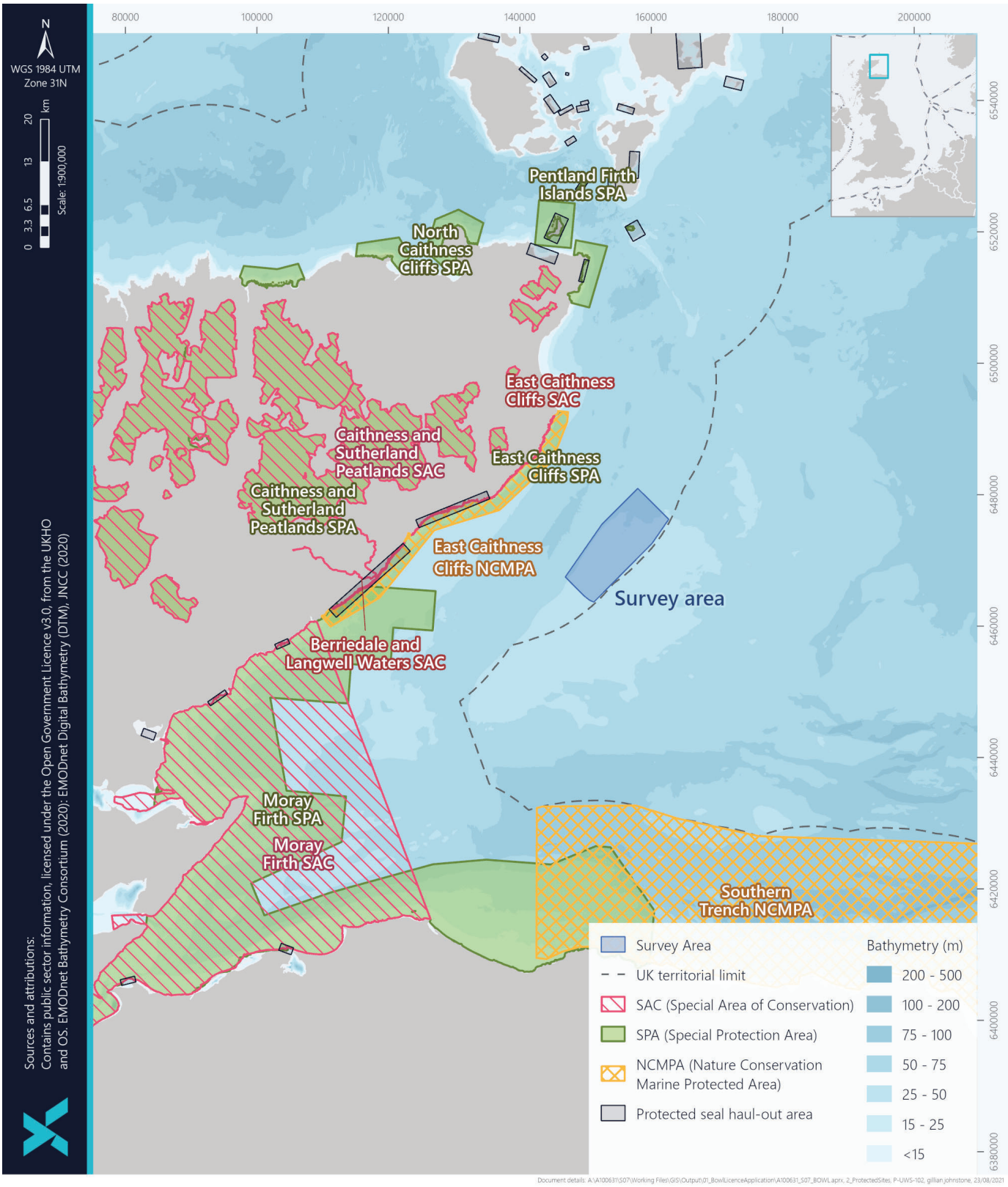

Figure 4-1 Designated Sites within the Vicinity of the Beatrice Windfarm Survey Area

4.2 Assessment of Impacts on Protected Sites

4.2.1 SACs and NCMPAs with Cetaceans as Qualifying Features

Moray Firth SAC

At its closest point, the survey area is located 37.8 km from the Moray Firth SAC which is designated for a strictly coastal population of bottlenose dolphins of approximately 101 to 250 individuals which remain within the Moray Firth throughout the year (JNCC, 2019a; JNCC, 2019b). This is the only known resident population of bottlenose dolphins in the North Sea. The wider east coast bottlenose dolphin population is estimated to be around 224 individuals, and therefore, the SAC likely supports over half of this population (IAMMWG, 2022; Civil *et al.*, 2021).

Bottlenose dolphins fall within the HF cetacean hearing range (150 Hz to 160 kHz) (Table 3-3). According to Table 3-6, the injury ranges of all survey equipment for HF cetaceans are all < 100 m. Moreover, as described in Section 3.4, given this injury range, the likelihood for a circumstance arising which would place a cetacean at risk of injury is considered very low, once the mitigation measures in Section 5 are implemented. However, there is the potential for disturbance to a small number of individuals at this SAC. A maximum of < 1 bottlenose dolphin could be disturbed by the survey activities (see Table 3-8) and this equates to a maximum of 0.4% of the resident population within the Moray Firth SAC and 0.1 % of the CES MU population. Given this small percentage, and the fact that the risk of injury to bottlenose dolphin is considered to be very low, no significant adverse effects are expected on the FCS of bottlenose dolphins as a qualifying feature of the Moray Firth SAC.

Southern Trench NCMPA

The survey area at its closest point, is located 31 km away from the Southern Trench NCMPA, designated in part for the protection of minke whale (NatureScot,2023). This area is comprised of large frontal zones which support a high diversity of phytoplankton, a key prey species for minke whale (NatureScot, 2014). The highest densities of minke whale reported within central and western section of this NCMPA, with densities dropping dramatically once beyond the western boundary (NatureScot, 2019b). Although it should be noted that the fronts which attract minke whale do extend beyond this boundary (NatureScot, 2019b).

Minke whale fall within the LF cetacean hearing group (7 Hz to 35 kHz) (Table 3-3). As detailed in Table 3-6, the greatest injury range for LF cetaceans is <200 m for any equipment which may be utilised during BOWL's routine geophysical surveys. This is considered to be below a distance likely of inducing any injurious impacts, once the mitigation measures set out in Section 5 are implemented, and as such the proposed activities do not have the potential to injure minke whales associated with the Southern Trench NCMPA.

Taking the SCANS IV density estimate of minke whale within the region (0.0116 animals/ km^2) and the area of the Southern Trench NCMPA (2,398 km^2), a population of 28 minke whale is expected to reside in the Southern Trench NCMPA (Gilles *et al.*, 2017; NatureScot, 2023). Although this likely underestimates the population here, given the importance of this NCMPA for minke whale, this provides a worst-case scenario when considering disturbance from the survey activities. With this population estimate, and the estimated number of individuals likely to be disturbed by the survey activities (< 1 individuals), approximately 3.6% of the Southern Trench NCMPA population and 0.1 % of the European North Atlantic MU may be potentially disturbed by the survey activities. Considering that the population estimate for the Southern Trench NCMPA likely underestimates the population within this NCMPA, the percentage of individuals disturbed is expected to be lower than this calculated value. Given this, and the mitigation measures presented in Section 5, no significant adverse effects are expected on the FCS of the minke whale as a qualifying feature of the Southern Trench NCMPA.

Conclusion

As stated in the above sections and in Section 3.4, there will be no injurious impacts to cetaceans from the proposed survey operations, and disturbance effects will be extremely limited in both space and time. Additionally, shipping density in the Moray Firth is considered to be moderate, with an average density of 20-50 transits per week (composed mainly of tankers, port and non-port service crafts and passenger vessels) (Marine Directorate, 2016). Cetaceans in this area are therefore well accustomed to vessel activity, and the vessels used for the proposed survey works will not constitute a discernible change from baseline conditions. The survey operations also have an extremely limited spatial extent and duration, and hence, there is no potential for adverse significant effects to result on the conservation objectives of the Moray Firth SAC or the Southern Trench NCMPA.

4.2.2 SACs with Seals as a Qualifying Feature and Designated Seal Haul-Outs

There are no SACs with harbour seals as qualifying features that overlap with or are located within 50 km of the proposed survey area, similarly there are no SACs with grey seals as qualifying features that overlap or are within 20 km of the proposed survey area.

There are no designated seal haul-outs or grey seal breeding sites within 500 m of the survey area. Therefore, no disturbance to seals at these sites is expected from the survey activities.

4.2.3 SPAs and NCMPAs with Birds as Qualifying Features

There are no SPAs and NCMPAs with birds as qualifying features that overlap with or are located within 2 km of the proposed survey area. As such, no impacts to SACs or NCMPAs with birds as a feature are anticipated.

4.2.4 SACs and NCMPAs with Otters as Qualifying Features

There are no designated sites with otters as a feature within 500 m of the survey area. As such, no impacts to SACs or NCMPAs with otters as a feature are anticipated.

4.2.5 SACs and NCMPAs with Benthic Qualifying Features

There are no SACs or NCMPAs with seabed / benthic protected features that overlap with the proposed survey area. As such, no impacts to SACs or NCMPAs with benthic qualifying features are anticipated.

4.3 Conclusions

The survey area lies within 50 km of two protected sites with cetaceans as qualifying features. This includes the Moray Firth SAC, designated for bottlenose dolphin, and the Southern Trench NCMPA, designated for minke whale. Although these sites lie in proximity to the survey area, no injurious impacts from the survey activities are expected and only 0.1% and 0.01% of the estimated populations of bottlenose dolphin and minke whale relevant MUs are expected to be disturbed respectively. Moreover, given the conservative approach of the underwater sound assessment, the actual disturbance to the qualifying interests at these sites is expected to be lower than calculated. As such, no adverse significant effects are expected on the FCS of bottlenose dolphin and minke whale as qualifying features of the Moray Firth SAC and Southern Trench NCMPA, respectively and hence there is not potential to adversely affect the conservation objectives of these sites.

Due to the temporary and localised nature of the proposed activities within the overall survey window and the mitigation measures outlined in Section 5 below, no significant impact is anticipated on the conservation objectives of any protected site. The proposed survey operations are required to ensure the ongoing success of Beatrice Offshore Wind Farm and hence constitute work of an overriding public need whilst presenting a trivial and temporary disturbance in a limited area.

5 SPECIES PROTECTION MEASURES

5.1 Overview

This section summarises the proposed mitigation measures to be implemented for avoiding and reducing potential impacts on species that may be present in the vicinity of the survey activities. The M1 to M8 mitigations detailed below for marine mammals, basking sharks and otter are applicable only for use of SBP and will not be used if USBL or SBI is used without the SBP being active

Although species and task specific mitigation is provided below, the following measures will be implemented during all survey activities:

- All vessels will adhere to the provisions of the Scottish Marine Wildlife Watching Code (NatureScot, 2017);
- All vessels will adhere to the provisions of the Basking Shark Code of Conduct (Shark Trust, undated); and
- Survey crew will be made aware of all protected species within the marine environment, and their responsibility to implement the mitigation in this document.

5.2 Marine Mammals

The Marine Mammal Protection Plan (MMPP) is implemented through the adherence to the mitigations set out below. Compliance with these mitigations will reduce risk of injury and disturbance to marine mammals resulting from SBP survey operations, these mitigations are aligned with the JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017). It is noted that most SBPs are not capable of performing a soft-start, and hence this procedure is not included. The key components of the MMPP for SBP include:

- Deployment of an MMO to monitor for the presence of cetaceans and seals, prior to the commencement of SBP operations;
- For SBP operations during hours of darkness and/or in periods of poor visibility and/or during periods when the sea state is greater than Beaufort 3, deployment of Passive Acoustic Monitoring (PAM) system to detect for the presence of cetaceans that cannot be detected by the MMO;
- 500 m mitigation zone for cetaceans;
- 500 m mitigation zone for seals, reducing to 200 m in the event of a need to avoid critical delay to the project; and
- Reporting of survey activities and marine mammal sightings.

5.2.1 M1 – Marine mammal monitoring

There will be MMO coverage for the duration of the SBP activities, with adequately trained and experienced MMO(s) working standard 12-hour shifts. They will have experience of working at sea and will have successfully deployed and used PAM equipment previously and be equipped with binoculars offering at least 8x magnification. The MMO will be located at a high point on the vessel, providing good all-round visibility.

5.2.2 M2 – Marine Mammal Observer (MMO)

During daylight hours the MMO(s) will carry out visual observations to monitor for the presence of cetaceans, seals and basking sharks before the SBP is activated and will recommend delays in the commencement of the operation should any cetaceans be detected within the 500 m mitigation zone for cetaceans. This distance will be 500 m for seals and basking sharks, except in the event of a need to avoid critical delay to the project in which case the mitigation zone for both species' groups will be 200 m. The criteria as to what constitutes a critical delay leading to reduction

in mitigation zone distance from 500 m to 200 m would be agreed on a case-by-case basis in consultation with MD-LOT.

5.2.3 M3 – Passive Acoustic Monitoring (PAM)

If SBP operations are required when visibility is poor (i.e. due to fog or during hours of darkness) and/or during periods when the sea state is greater than Beaufort 3, the PAM system will be operated by a single MMO/PAM operator. The PAM system shall comprise of at least 3 hydrophone elements, allowing for directional localisation of detections, together with software allowing real time automated detection of cetacean vocalisations (e.g. PAMGuard or equivalent). It is noted that PAM is not cable of detecting non-vocalising cetaceans, seals or basking sharks.

5.2.4 M4 – Pre-start search

Visual (MMO) (and acoustic (PAM) monitoring if required) will be conducted for a pre-start search of 30 minutes i.e. prior to the commencement of SBP operations. This will involve a visual (during daylight hours) or PAM watch (during poor visibility or at night) to determine if any cetaceans, seals, or basking sharks are within 500 m of the activities (or 200 m for seals and basking sharks in the event of the critical delay described in mitigation measure M2).

5.2.5 M5 – Mitigation zone

The mitigation zone is defined as the area within 500 m of the SBP; noting that if the SBP is deployed on a remote platform (ROV/ROTV/AUV/USV), this will be the centre of the mitigation zone, and not the vessel. Should any marine mammals or basking sharks be detected within the mitigation zone prior to the commencement of SBP operations (or after breaks in SBP survey activity of more than 10 minutes), operations will be delayed until their passage, or the transit of the vessel, results in the animals being outwith the mitigation zone. There will be a 20-minute delay from the time of the last sighting within the mitigation zone to the commencement/recommencement of the SBP operations.

As outlined in mitigation measure M2, the mitigation zone for seals and basking sharks may be reduced from 500 m to 200 m in the event of a need to avoid critical delay to the project, subject to agreement with MD-LOT.

5.2.6 M6 – Reporting

During survey campaigns involving SBP operations, all recordings of marine mammals and basking sharks will be made using JNCC Standard Forms. At the end of the operations, a monitoring report detailing the species recorded, methods used to detect them, and details of any problems encountered will be submitted to the Marine Directorate and NatureScot. The report will also include feedback on how successful the mitigation measures were. This requirement will be communicated to the MMOs at project start up meetings and at crew change.

5.3 Basking Shark

The following mitigation measures will be implemented during SBP operations in order to reduce disturbance to basking sharks.

5.3.1 M7 – Basking Shark Monitoring

There will be MMO coverage for the duration of the marine activities, with adequately trained and experienced MMO(s) working standard 12-hour shifts. The MMO will also monitor for the presence of basking shark following the mitigation measures described above for Marine Mammal Monitoring (see Section 5.2.1). Should any basking sharks be detected within the mitigation zone prior to the commencement of SBP surveys (or after breaks in geophysical survey activity of more than 10 minutes), operations will be delayed until their passage, or the transit of the vessel,

results in the animals being out-with the mitigation zone. In all cases, there will be a 20-minute delay from the time of the last sighting within the mitigation zone to the commencement/recommencement of the operations.

5.3.2 M8 – Basking Shark Mitigation Zone

During survey works, the MMO will monitor for the presence of basking sharks, in addition to marine mammals and otters, and will delay start of the survey if any are seen within 500 m of the SBP. The mitigation zone for basking sharks may be reduced from 500 m to 200 m in the event of a need to avoid critical delay to the project subject to agreement with MD-LOT.

6 CONCLUSION

This risk assessment has assessed the risk posed by the routine survey activities (including equipment calibration) associated with the Beatrice Offshore Wind Farm to cetaceans and protected sites. This has included assessing the risk caused by sound emitted from the vessel and the geophysical survey equipment, collision impact and disturbance to the following receptors:

- Cetaceans;
- Basking sharks;
- SACs with cetacean, seal, otter and benthic features;
- NCMPAs with cetacean, bird, otter and benthic features;
- Designated seal haul-outs and seal breeding sites; and
- SPAs with ornithological features.

This assessment has concluded that the nature of the survey activities, in combination with the proposed mitigation, means that no adverse impact through injury to EPS or basking sharks is anticipated, and EPS and Basking Shark Derogation Licences are not required in this regard. However, the use of SBP equipment may cause disturbance to cetaceans through underwater sound emissions, and as such an application for EPS Licences for disturbance of EPS within onshore waters will be sought by BOWL. It is also acknowledged, that while considered very unlikely, the presence of the survey vessels could be a source of disturbance to basking sharks, and as such BOWL will also apply for a Basking Shark Derogation Licence

The survey area is located within 50 km away from Southern Trench NCMPA, with minke whale as a qualifying feature and within 50 km of the Moray Firth SAC, designated for the protection of bottlenose dolphins. However, due to the temporary and localised nature of the survey activities, adverse impacts to the qualifying interests of these protected sites will not be significant. A number of mitigation strategies will also be followed to further reduce any potential impacts. Therefore, the proposed works will not affect the conservation objectives of the Southern Trench NCMPA and Moray Firth SAC.

Overall, the proposed survey operations constitute work of an overriding public need while presenting a trivial and temporary disturbance in a limited area.

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APPENDIX A BOWL SURVEY AREA COORDINATES (WGS84)

POINT	Coordinates for the Beatrice Offshore Windfarm Survey Area (WGS 84)[12]					
	Degrees, Minutes and Seconds		Degrees and Decimal Minutes		Decimal Degrees	
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
1	58° 10' 33.070860" N	2° 56' 1.2797440" W	58° 10.551181' N	2° 56.021329' W	58.175853	-2.933689
2	58° 10' 40.956659" N	2° 56' 43.991056" W	58° 10.682611' N	2° 56.733184' W	58.178044	-2.945553
3	58° 11' 0.3136570" N	2° 57' 39.816788" W	58° 11.005228' N	2° 57.663613' W	58.183420	-2.961060
4	58° 12' 23.665598" N	3° 00' 46.559295" W	58° 12.394427' N	3° 00.775988' W	58.206574	-3.012933
5	58° 16' 58.050763" N	2° 55' 49.633722" W	58° 16.967513' N	2° 55.827229' W	58.282792	-2.930454
6	58° 20' 8.4914670" N	2° 50' 46.222358" W	58° 20.141524' N	2° 50.770373' W	58.335692	-2.846173
7	58° 17' 50.272984" N	2° 45' 33.212332" W	58° 17.837883' N	2° 45.553539' W	58.297298	-2.759226
8	58° 15' 45.123591" N	2° 47' 49.013332" W	58° 15.752060' N	2° 47.816889' W	58.262534	-2.796948

[12] *Longitude and latitude coordinates are provided in WGS 1984 CRS (EPSG: 4326).*