[redacted]

# HT1 Hydrogen Demonstrator Project

## EPS Risk Assessment Additional Survey Route

80925

**NOVEMBER 2021**

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# RSK GENERAL NOTES

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# Abbreviations & Definitions

| Abbreviation | Definition |
|---|---|
| AOWF | Aberdeen offshore wind farm |
| AOWFL | Aberdeen Offshore Wind Farm Limited |
| CI | Confidence Interval |
| EOWDC | European Offshore Wind Deployment Centre |
| EPS | European Protected Species |
| ES | Environmental Statement |
| Habitats Directive | European Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna |
| HF | High-frequency |
| Habitats Regulations | The Conservation (Natural Habitats, &c.) Regulations 1994 |
| IAMMWG | Inter-Agency Marine Mammal Working Group |
| JNCC | Joint Nature Conservation Committee |
| LF | Low-frequency |
| MBES | Multibeam echo sounder |
| MS-LOT | Marine Scotland Licensing Operations Team |
| MU | Management Unit |
| NMFS | National Marine Fisheries Service |
| PTS | Permanent Threshold Shift |
| rms | Root mean square |
| ROV | Remotely operated vehicle |
| RSK | RSK Environment Ltd |
| SAC | Special Area of Conservation |
| SBP | Sub-bottom profiler |
| SCANS | Small Cetaceans in European Atlantic waters and the North Sea |
| SSS | Side-scan sonar |
| SEL | Sound Exposure Level |
| SL | Sound Level |
| SNH | Scottish Natural Heritage[1] |
| SPL | Sound Pressure Level |
| TTS | Temporary Threshold Shift |
| UBSL | Ultra-short baseline |
| VHF | Very high-frequency |

[1] Scottish Natural Heritage rebranded as NatureScot in the summer of 2020.



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| Abbreviation | Definition |
|---|---|
| **Units** | |
| dB | decibel |
| $dB_{ht}$ | dB values above hearing threshold |
| Hz | hertz |
| kHz | kilohertz |
| km | kilometre |
| MW | Megawatt |
| nm | nautical mile |
| µPa | micropascal |



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**TABLES**






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# 1 INTRODUCTION

## 1.1 Background

Aberdeen offshore wind farm (AOWF), also known as the European Offshore Wind Deployment Centre (EOWDC), has an installed energy capacity of 96.8 MW. The site consists of 11 x 8.8 MW turbines with a 13 km long array cable connecting to an offshore transformer which transmits the energy from the turbines to the onshore substation at Blackdog village.

The EOWDC received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 26 March 2013 (the S36 Consent), which was varied on 07 January 2020. The EOWDC was also granted a Marine Licence from the Scottish Ministers on 15 August 2014 (reference 04309/16/0). This Marine Licence was most recently varied on 30 September 2020 (reference 00008967).

Aberdeen Offshore Wind Farm Limited (AOWFL) is a company wholly owned by Vattenfall and was established to develop, finance, construct, operate, maintain, and decommission the EOWDC.

As part of the continuous innovative approach adopted for the demonstration site, Vattenfall are now looking to locate a hydrogen electrolyser in shipping containers on an extended transition piece platform at one of the Aberdeen turbines (B06). The electrolyser would be connected to land via an 8" internal diameter (maximum) buried flowline.

## 1.2 Objectives of this Document

The objective of this report is to assess the potential impact of a survey programme including geophysical surveys on European Protected Species (EPS) in Aberdeen Bay in order to determine the need for an EPS licence under Annex IV of the Habitats Directive (Council Directive 92/43/EEC).

RSK Environment Ltd (RSK) has compiled this report on behalf of Vattenfall **in order to reflect a second survey route which has been added to the proposed geophysical/ geotechnical surveys planned for Winter 2021**. **This risk assessment and associated application follows an initial application for the original survey route for a potential flowline route from the AOWF to Aberdeen South Harbour Extension, which was submitted to MS-LOT for consideration on 27/08/2021 (ref: 09522/09523). This report has been prepared to support an additional application to MS-LOT for an EPS Licence for the second proposed Survey route (Route 3A, Appendix 3). It should be noted that there is no geographical overlap between the two licence applications and the survyes considered within this application will take place in the same time frame as the original survey campaign. The report follows the same template that was originally submitted, with any changes to the text highlighted in BOLD TEXT where appropriate.**



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# 2 SURVEY SCOPE AND METHODOLOGY

## 2.1 Survey Overview

Vattenfall are seeking to undertake a geophysical, environmental, and geotechnical survey campaign to support the development of the HT1 hydrogen project and the associated siting of a hydrogen flowline between Aberdeen offshore wind farm and Aberdeen South Harbour **or Aberdeen Harbour. The route considered in this assessment is from Aberdeen Harbour to where the route intersects the original survey route running towards AOWF**. The planned surveys will provide an overview of the seabed topography to aid the siting of the flowline (including feasibility of burial) and highlight any anomalies that may be of archaeological or UXO interest. A programme of grab sampling, including video profiling, and CPT and vibrocore sampling will also be conducted.

The surveys will be undertaken by two dedicated survey vessels (nearshore and offshore), which will be equipped with geophysical survey systems and positioning equipment that will be utilised during the works (see Table 2.3). **These vessels are the same as originally provided in the previous application.**

### 2.1.1 Survey Programme

**As with the previous EPS Licence application submission** the scope of the proposed surveys can be split into the following 4 elements:

1. Offshore geophysical surveys which includes offshore geophysical and UXO surveys, as well as offshore non-ferrous UXO surveys
2. Offshore environmental surveys which includes the use of sediment grabs and drop-down video surveys
3. Offshore geotechnical surveys which includes CPT and vibrocore sampling
4. Nearshore and near WTG geophysical & UXO surveys.

The surveys are proposed to take place in **December 2021**, although an EPS licence is requested for the period between **December 2021** and May 2022 to cover any unforeseen weather or consenting delays. Despite the extended licence period, the surveys are expected to take C. 6 weeks to complete. A copy of the proposed survey schedule can be found in Appendix 1.

The equipment proposed to deliver the above surveys and the potential impact on EPS is discussed in section 2.3.

## 2.2 Proposed Vessels

Vattenfall are proposing to use a separate nearshore and offshore vessel to undertake the survey works.

The proposed offshore survey vessel will be either the Fugro Pioneer or Fugro Frontier. The vessels are 53 m sister survey vessels and almost identical in specification (see Table 2.1).

The proposed nearshore survey vessel is the Fugro Seeker, a fully equipped 12 m catamaran (see Table 2.2).



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Full vessel specifications are provided in Appendix 2 with a summary of the survey equipment to be used onboard both proposed vessels available in section 2.3 below.

Please note that the proposed vessels and associated survey equipment are subject to change but would be replaced with vessels / equipment of similar specification which would thus produce similar impacts on EPS.

**Table 2.1: Fugro Pioneer and Frontier vessel specification and characteristics**

| Vessel | Length (m) | Beam (m) | Gross Tonnage | Draught (m) | Survey Speed (Kts) | Max Speed (Kts) |
|---|---|---|---|---|---|---|
| Fugro Pioneer and Frontier | 53.7 | 12.5 | 1400 | 3.1 (Total of 4.6 with the USBL pole) | 4.0 – 4.4 | 11.2 |

**Table 2.2: MV Fugro Seeker vessel specification and characteristics**

| Vessel | Length (m) | Beam (m) | Gross Tonnage | Draught (m) | Survey Speed (Kts) | Max Speed (Kts) |
|---|---|---|---|---|---|---|
| MV Fugro Seeker | 12.00 | 4.88 | 17 | 1.07 | 4 | 18/20 |

## 2.3 Survey Equipment

Table 2.3 provides an overview of all proposed survey equipment for the proposed surveys offshore geophysical, nearshore geophysical, environmental and geotechnical surveys. As noted above, survey equipment is subject to change but the potential of impacts will be within the order of magnitude indicated below and discussed throughout this report.

Further information on the survey equipment that produces anthropogenic noise which is the largest potential impact on EPS is provided in section 2.4.



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**Table 2.3: Proposed survey equipment**

| Survey Equipment Theme | Purpose | Device(s) | Summary Specification | Potential Impact on EPS |
|---|---|---|---|---|
| **Offshore geophysical survey equipment** | | | | |
| Surface Positioning | To provide horizontal and vertical vessel position with accuracy better than 0.2 m. | Primary Positioning Fugro StarPack with Starfix G2+;<br><br>Secondary positioning Fugro Starfix G2, HP and XP corrections<br><br>Post-processed GNSS heights;<br><br>Navigat X MKI Gyro Compass | Accuracy of 3 cm and 6 cm (2σ) in the horizontal and vertical planes respectively | **No**<br>(Does not emit underwater noise or create any potential impact on EPS) |
| Motion Sensor | | Applanix POS MV; Coda Octopus F-175 (Frontier) / Hydrins; iXSea Octans (Pioneer) | Accuracy of 0.1° secant latitude (= 1 / cosine latitude – (2) RMS value) | **No** (as above) |
| USBL Underwater Acoustic Positioning | To provide accurate positioning of 1.5 meters (+/- 0.75m) or better for the horizontal positioning of towed devices. | Kongsberg HiPAP 501;<br><br>Kongsberg cNODE MiniS 34 – 180 beacons<br><br>Kongsberg cNODE Mini S Transponders;<br><br>Kongsberg Maxi Transponders | 21 – 31 kHz | **Yes**<br>(anthropogenic noise source) |



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| Survey Equipment Theme | Purpose | Device(s) | Summary Specification | Potential Impact on EPS |
|---|---|---|---|---|
| Multibeam Echosounder (MBES) | To create a densely-sampled digital terrain model to help define topography and detailed seabed information. | Dual-head hull-mounted Kongsberg EM 2040<br>Applanix POS MV motion reference unit;<br>iXBlue Octans 3000 motion reference unit;<br>Minos_X sound velocity probe (SVP);<br>Valeport mini Sound Velocity Sensor (SVS) | 400 KHz multibeam echo sounders, with dual-receive multi-ping functionality (range 200 – 400 kHz)<br>Max ping rate 50 Hz | **Yes** (anthropogenic noise source) |
| Sidescan Sonar (SSS) | To determine the texture, topography and character of the seabed sediments and to detect features such as boulders, outcrops, pipelines, wellheads and other equipment lying on, attached to, or buried immediately beneath the seafloor. | Edgetech 4200 side scan sonar (300/600 kHz) (supported by USBL positioning) | 300/900 kHz (interchangeable with survey requirements). High frequency minimum of 600 kHz. | **Yes** (anthropogenic noise source) |
| Sub bottom profiler (SBP) | To identify the geological structures in the upper 8m below seabed;<br><br>To identify geohazards, especially buried boulders, peat layers close to seabed and very shallow gas. | Innomar SES-2000 Medium 100 (supported by USBL positioning) | Primary frequency 85-115 kHz, secondary low frequency between 4 kHz and 15 kHz, and transmit beam approx. ±1° / footprint <3.5% of water depth<br>Primary source level SBM > 245 dB//µPa re 1m, QBM > 235 dB//µPa re 1m | **Yes** (anthropogenic noise source) |


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| Survey Equipment Theme | Purpose | Device(s) | Summary Specification | Potential Impact on EPS |
|---|---|---|---|---|
| Single Magnetometer (outer corridor) | To detect minimum threat items as detailed in the UXO desk study. | G882 Caesium Vapour marine magnetometer (supported by USBL positioning system) | Each sensor fitted with a 500 kHz altimeter | **No** (Magnetometers do not generate significant levels of noise to be considered as potential sources of noise-related injury or disturbance to EPS). |
| Magnetometer Array (inner corridor) | | (2x) 4 x Geometrics G-882 caesium-vapour marine magnetometers;<br>(2x) EVIA Scanfish Katria III ROTV including altimeter, motion- and depth sensors and terrain following flight control;<br>(Supported by USBL sub-sea positioning system) | | |
| Non-Ferrous UXO Survey | To detect German LMB mines (i.e. non-ferrous UXO) sub seabed to 1-2 m. | Innomar SES-2000 Quattro | Primary frequencies:<br>approx. 100 kHz (band 85 – 115 kHz)<br>secondary low frequencies:<br>4, 5, 6, 8, 10, 12, 15kHz (band 2 – 22 kHz) | **Yes**<br>(anthropogenic noise source) |
| Passive Acoustic Monitoring | For detection of porpoise and dolphin clicks and whale vocalisations. | Fugro / Seiche Passive Acoustic Monitoring System | Sampling frequency 400 kHz Band Width 2 kHz – 200 kHz Sensitivity -204 dB Software PAMGUARD | **No** (used to identify EPS in the vicinity of vessel as required) |


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| Survey Equipment Theme | Purpose | Device(s) | Summary Specification | Potential Impact on EPS |
|---|---|---|---|---|
| **Nearshore geophysical survey equipment** | | | | |
| Positioning and Navigation | To provide horizontal and vertical vessel position with accuracy better than 0.2 m. | Fugro Starpack with StarFix G2+ corrections (primary);<br>FugroStarpack with StarFix XP2 corrections (secondary);<br>PPK Positioning System: Applanix POS MV 320;<br>Applanix POS MV utilising GNSS-derived heading | N/A | **No** (Does not emit underwater noise or create any potential impact on EPS) |
| USBL Underwater Positioning | To provide accurate positioning of 1.5 meters (+/- 0.75m) or better for the horizontal positioning of towed devices. | Kongsberg HiPAP 351 + SSBL;<br>cNODE MiniS USBL beacon | 21 – 31 kHz | **Yes** (anthropogenic noise source) |
| Multibeam Echosounder (MBES) | To create a densely-sampled digital terrain model to help define topography and detailed seabed information. | Teledyne RESON dual-head SeaBat 7125 SV2 FP3 400 kHz multibeam echosounders with full rate dual head technology;<br>Applanix POS MV motion reference unit (MRU);<br>Valeport Mini-Sound Velocity Probe (SVP);<br>Teledyne RESON AML SVP70 Mini-Sound Velocity Sensor (SVS);<br>CARIS HIPS and SIPS. | 200 or 400 kHz<br>Max ping rate 50 Hz | **Yes** (anthropogenic noise source) |


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| Survey Equipment Theme | Purpose | Device(s) | Summary Specification | Potential Impact on EPS |
|---|---|---|---|---|
| Sidescan Sonar (SSS) | To determine the texture, topography and character of the seabed sediments and to detect features such as boulders, outcrops, pipelines, wellheads and other equipment lying on, attached to, or buried immediately beneath the seafloor. | Edgetech 4200MP (300/900 kHz) towfish with a spare towfish;<br>Edgetech Discover | 300/900 kHz dual simultaneous | **Yes** (anthropogenic noise source) |
| Sub bottom profiler (SBP) | To identify the geological structures in the upper 8m below seabed;<br><br>To identify geohazards, especially buried boulders, peat layers close to seabed and very shallow gas. | INNOMAR SES 2000 Medium 100 | Primary frequencies approx. 100 kHz (band 85 – 115);<br>Secondary low frequencies: 4, 5, 6, 8, 10, 12, 15 kHz (2 – 22 kHz)<br>Primary source level > 247 dB//µPa re 1m<br>Pulse width 0.07 – 2ms<br>Pulse rate up to 40/s<br>Acquisition sample rate 96 kHz @ 24 bit | **Yes** (anthropogenic noise source) |
| Single Magnetometer (outer corridor) | To detect minimum threat items as detailed in the UXO desk study. | G882 Caesium Vapour marine magnetometer | Magnetometers do not generate significant levels of | **No** |


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| Survey Equipment Theme | Purpose | Device(s) | Summary Specification | Potential Impact on EPS |
|---|---|---|---|---|
| Ferrous UXO Survey | To detect potential German 50 kg (nearshore) bombs | Dual EIVA Katria Scanfish | noise to be considered as potential sources of noise-related injury or disturbance to EPS | **No** |
| Fugro Miniwing (inner corridor) | To measure the gradient (rate of change) of the magnetic field. | Miniwing gradiometer frame equipped with four Geometrics G-882 caesium-vapour marine magnetometers;<br>USBL sub-sea positioning | Each sensor fitted with a 500 kHz altimeter | **No** |
| **Environmental Survey Equipment** | | | | |
| Drop-down video | To obtain underwater video footage. | Bowtech Sea Knight (or similar) | N/A | **No** |
| Grab Sampling | To obtain samples of seabed sediments. | 0.1m$^2$ Hamon Grab<br>0.1m$^2$ Day Grab | N/A | **No**<br>(indirect effects considered in section 5.3) |
| **Geotechnical Survey Equipment** | | | | |
| CPT | To determine geotechnical properties of sediments. | SEASCOUT®35 MkII | N/A | **No**<br>It is unlikely that vibrocorer or CPT will create significant levels of noise to impact EPS |
| Vibrocoring | To penetrate into seabed. | Vibrocorer-Zenkovitch type-standard VC | N/A | |


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## 2.4 Underwater Noise Sources

Geophysical survey systems and positioning equipment increase levels of anthropogenic noise in the marine environment because they operate by producing and receiving sound. As outlined above, the proposed survey programme will utilise the following noise producing survey equipment which should be considered as potential sources of noise-related injury or disturbance to EPS and considered further:

- Multibeam Echo Sounder (MBES) to gather detailed bathymetry data
- Side Scanning Sonar (SSS) to provide information on seabed debris/features
- Sub-bottom profiler (SBP) to provide information on marine sediment layers that exist below the sediment / water interface
- Ultra-Short Baseline (USBL) positioning systems and transponder beacons to monitor positioning of any remotely operated equipment such as an ROV.

All other survey equipment identified in Table 2.3 is not considered to cause disturbance to EPS and thus is not assessed further in this risk assessment. This includes the vibrocorer, magnetometers and CPT equipment which are all unlikely to generate any significant noise and thus do not require any further consideration with respect to potential disturbance or injury to EPS.

### 2.4.1 Multibeam echo sounder (MBES)

MBES are commonly used to create densely-sampled digital terrain models that can be used to further define topography with detailed seabed information.

MBES transmit sound energy and analyse the return signal (echo) that has bounced off the seafloor or other objects. This is done by emitting sound waves from directly beneath a vessel's hull (or similar) to produce fan-shaped coverage of the seafloor. The MBES system records the time taken for the acoustic signal to travel from the transmitter (transducer) to the seafloor (or object) and back to the receiver. MBES produce a “swath” of soundings (i.e. depths) to ensure full coverage of an area. The coverage area on the seafloor is dependent on the depth of the water, with coverage typically being two to four times the water depth.

### 2.4.2 Side-scan sonar (SSS)

SSS is used to determine the texture, topography and character of the seabed sediments and to detect features such as boulders, outcrops, pipelines, wellheads and other equipment lying on, attached to, or buried immediately beneath the seafloor.

A side-scan sonar transmits sound energy and analyses the return signal (echo) that has bounced off the seafloor or other objects. Side-scan sonar typically consists of three basic components: towfish or hull mounted transducer, transmission cable, and topside processing unit.

In a side-scan, the transmitted energy is formed into the shape of a fan that sweeps the seafloor from directly under the towfish or vessel hull to either side, typically to a distance of 100 metres (depending on factors including water depth, and signal strength). The strength of the return echo is continuously recorded, creating a "picture" of the ocean bottom. For example, objects that protrude above the seabed create a dark area (strong return) and shadows from these objects are light areas (little or no return). Side-scan



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sonar is typically used in conjunction with multibeam to meet full bottom coverage specifications.

### 2.4.3 Sub-bottom profiler (SBP)

SBP systems are used to identify and measure the various marine sediment layers that exist below the sediment / water interface.

These acoustic systems use a technique that is similar to single beam echo sounders and emit an acoustic signal vertically downwards into the water with a receiver monitoring the return signal reflected off the seafloor. Some of the acoustic signal will penetrate the seabed and be reflected when it encounters a boundary between two layers that have different acoustic impedance. Acoustic impedance is related to the density of the material and the rate at which sound travels through the material. When there is a change in acoustic impedance, part of the transmitted sound is reflected. The system uses this reflected energy to record a profile of the marine sediment layers beneath.

### 2.4.4 Ultra-short baseline (USBL) positioning systems and transponder beacons

USBL positioning systems and transponder beacons are used to monitor the position of any remotely operated equipment. These will only be used when the towed or remotely operated equipment is in operation. As soon as these are recovered on the deck of the vessel, the vessel's USBL can be switched off.

The USBL transceiver mounted on the vessel transmits an acoustic pulse that is detected by the transponder mounted on the subsea equipment (e.g. towed SBP or magnetometer). The subsea transponder replies with its own acoustic pulse, which is detected by the shipboard transceiver. The two units work together to communicate the towed devices position relative to the vessel.

This increase in anthropogenic noise has the potential to affect marine mammals occurring in the Aberdeen Bay area due to the sensitivity of marine mammal hearing. As sound travels much further underwater compared to airborne noise, the resulting effects on marine mammals can be at distance from the sound source.

The USBL equipment likely to be used for the survey has a frequency between 21 and 31 kHz, and the assessment is based on a realistic worst-case scenario.

It should be noted that the acoustic sources proposed for the survey are a number of orders of magnitude lower in intensity than those used in conventional seismic surveys.

Likely survey equipment systems are presented in Table 2.4 below. These devices are currently associated with the proposed survey vessels and are thus subject to change should the survey vessels change. However, the equipment outlined in Table 2.4 would remain representative of the equipment required for the proposed surveys even if specific brand changes occur.



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**Table 2.4: Geophysical survey systems noise specifications**

| Geophysical equipment | Operating Frequencies (kHz) | Sound Pressure Level (SPL) reported by Manufacturer (dB re 1 µPa) |
|---|---|---|
| **Multibeam Echo Sounder (MBES)** | | |
| Teledyne Reson SeaBat 7125 Dual Head | 200 - 400 | 220 (rms) |
| Kongsberg EM2040 Dual Head | 200 – 400 | 210 (peak), 205 (rms) |
| **Side-Scan Sonar (SSS) (dual frequency)** | | |
| EdgeTech 4200 | 300 / 600 | 208 – 213 (peak), 205 – 210 (rms) |
| **Sub-Bottom Profiler (SBP)** | | |
| INNOMAR SES -2000 medium – 100 Parametric Sub-bottom profiler | Primary: 100 kHz (band 85 – 115 kHz) | >247 |
| | Secondary: 4, 5, 6, 8, 10, 12, 15 kHz (band 2 – 22 kHz) | |
| INNOMAR SES quattro Parametic sub-bottom profiler | Primary: 100 kHz (band 85 – 115 kHz) | SBM >245<br>QBM >235 |
| | Secondary: 4, 5, 6, 8, 10, 12, 15 kHz (band 2 – 22 kHz) | |
| **Subsea Positioning Ultra Short Baseline (USBL)** | | |
| Kongsberg HiPAP 501 | 21 - 31 | 220 (rms) |
| Kongsberg HiPAP 351 + SSBL | 21 - 31 | Approx. 220 (rms) |
| Kongsberg cNODE MiniS 34-180 | 21 - 31 | 188 (rms) |
| cNODE MiniS USBL | 21 - 31 | Approx. 188 – 203 (rms) |



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# 3 LEGAL REQUIREMENT

All species of cetacean in waters around the UK are considered EPS under Annex IV of the European Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna). The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland[2]; known as the Habitats Regulations) transposes the Habitats Directive into Scottish Law, and the species listed in Annex IV of the Directive are listed in Schedule 2 of these Habitats Regulations. The Habitats Regulations covers Scottish inshore waters (within 12 nm of the coast). Although there are non-cetacean marine European Protected Species listed within the regulations (such as some species of marine turtles and the Atlantic sturgeon), the only EPS aside from cetaceans present in the Aberdeen Bay area is the [Red **Although** [Reda **are potentially present within the proposed survey area, the main focus of this assessment is on cetaceans in order to ensure that this assessment is in line with other recent EPS Licence applications. However, impacts on** [Reda **are considered in chapter 4.**

The Habitats Regulations state, under Regulation 39(1), that it is an offence to:

a) deliberately or recklessly capture, injure, or kill a wild animal of an EPS

b) deliberately or recklessly –

   i. harass a wild animal or group of wild animals of an EPS

   ii. disturb such an animal while it is occupying a structure or place which it uses for shelter or protection

   iii. disturb such an animal while it is rearing or otherwise caring for its young

   iv. 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. 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. 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

   vii. 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)”.

It is therefore an offence to disturb, capture, injure or kill deliberately or recklessly a single cetacean in Scottish inshore waters.

If it is determined that an activity would cause an offence under Regulation 39, a licence may be granted which would allow otherwise illegal activities to go ahead in certain specified circumstances.

[2] The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 continue to transpose the Habitats Directive after Brexit.



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Three tests must be passed before a licence can be granted:

- the licence must relate to one of the purposes referred to in Regulation 44
- there must be no satisfactory alternative (Regulation 44(3a))
- the action authorised must not be detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status in their natural range (Regulation 44(3b)).

## 3.1 Guidance

In July 2020 Marine Scotland, in conjunction with Scottish Natural Heritage, produced an update of the guidance document (entitled 'The protection of Marine European Protected Species from injury and disturbance'), for Scottish inshore waters (Marine Scotland and SNH, 2020). This document relates to Regulation 39 (2) in the Habitats Regulations.

Marine Scotland recognises that this guidance, which relates to Scottish inshore waters, represents a very precautionary approach to the interpretation of the Habitats Directive with regards to EPS '…This guidance reflects a precautionary approach…', and requires careful examination of the potential impacts of proposed offshore activities, and the resultant noise produced, on individual animals likely to be present at the location.

The guidance states that the two main potential causes of death or injury are physical contact (with a vessel) and anthropogenic noise.

Likelihood of disturbance for individuals includes factors such as:

- spatial and temporal distribution of the animal in relation to 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)
- the motivation of the animal to remain within the areas (e.g. food availability)
- duration of the activity.

Assessment of likelihood of potential impacts should include the following considerations:

- type of activity
- duration and frequency of the activity
- extent of the activity
- timing and location of the activity
- other known activities in the area at the same time.



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# 4 EUROPEAN PROTECTED SPECIES IN ABERDEEN BAY

## 4.1 Species

The sea off Aberdeen is an important area for cetaceans, with up to fifteen species recorded from sighting or stranding records in Aberdeen Bay and the surrounding area.

Two years of monthly site-specific visual and passive acoustic boat-based surveys were conducted from 2007 to 2008 and 2010 to 2011 as part of the AOWF baseline. Four EPS (harbour porpoise, *Phocoena phocoena*, bottlenose dolphin, *Tursiops truncatus*, white-beaked dolphin, *Lagenorhynchus albirostris* and minke whale, *Balaenoptera acutorostrata*) were encountered and are considered to be common in Aberdeen Bay. A summary of the usage and seasonal occurrence of these four species is shown in Table 4.1. In general terms, there is high usage of the area in summer for all four species which reduces for all species across the other seasons except for Bottlenose dolphins which remain moderate-high all year round.

**Table 4.1: Presence of four main EPS in Aberdeen Bay area**

| Species | Usage | Winter | Spring | Summer | Autumn |
|---|---|---|---|---|---|
| Harbour porpoise *(Phocoena phocoena)* | Resident | Moderate | | High | Moderate - High |
| Bottlenose dolphin (*Tursiops truncatus*) | Resident | Moderate - High | High | | Moderate - High |
| White-beaked dolphin (*Lagenorhynchus albirostris*) | Seasonal | Moderate - absent | Absent - Low | High | Moderate-low |
| Minke whale *(Balaenoptera acutorostrata)* | Seasonal | Absent - low | Low-moderate | High | Absent - low |

Source: Adapted from AOWFL (2011), Genesis (2012), Aberdeen Harbour (2015) and Hague *et al*. (2020).

EPS have been recorded in the Aberdeen Harbour area (Hague *et al*., 2020) including

- minke whale
- humpback whale (*Megaptera novaengliae*)
- short-beaked common dolphin (*Delphinus delphis*)

although humpback whales and common dolphins are considered occasional to rare visitors to the area. Risso's dolphin (*Grampus griseus*) was observed during vantage point surveys for the AOWF baseline but is considered an occasional visitor to the area.

Other species may also be present in North East Scotland / East Grampian region, but this area (including Aberdeen Bay) is only a marginal part of their habitat, with restricted use by relatively few individuals and most likely further offshore (AOWFL, 2011; Genesis, 2012; Aberdeen Harbour, 2015; Hague *et al*., 2020). This includes the white-sided


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dolphin (*Lagenorhynchus acutus*) and long-finned pilot whale (*Globicephala melas*) occasionally.

Table 4.2 summarises the densities and reference population abundances for the four most commonly observed species in Aberdeen Bay.

**Table 4.2: Estimated density and abundance of the EPS considered to occur regularly in the Aberdeen Bay area**

| Species | Density (individual / km$^2$)* | Abundance |
|---|---|---|
| Harbour porpoise *(Phocoena phocoena)* | 0.599 | 159,632<br>(95% CI 127,422 – 199,954)<br>(UK portion of the North Sea MU) |
| Bottlenose dolphin (*Tursiops truncatus*)** | 0.030 | **224**<br>**(95% CI 214 - 234)**<br>(Coastal East Scotland MU) |
| White-beaked dolphin (*Lagenorhynchus albirostris*) | 0.243 | 34,025<br>(95% CI 20,026 – 57,807)<br>(UK portion of the Celtic and Greater North Sea MU) |
| Minke whale *(Balaenoptera acutorostrata)* | 0.039 | 10,288<br>(95% CI 6,210 – 17,042)<br>(UK portion of the Celtic and Greater North Sea MU) |

* based on SCANS III Block R

**** based on weighted management units for bottlenose dolphin recommended by NatureScot (Knott, 2021)**

MU = Management Unit; a geographical area in which the animals of a particular species are found to which management of human activities is applied.

Sources: Knott, 2021; Hammond *et al*., 2021

**Having recalculated the survey route it is estimated that the Moray Firth Special Area of Conservation is approximately 138 km NW of the survey location. The SAC is designated** for bottlenose dolphins, and individuals from the East Scotland population that utilise Aberdeen Bay are also likely to be part of the resident population the SAC is designated for. The overall East Scotland population of bottlenose dolphins was estimated to be 213 animals in 2019 (Arso Civil *et al*., 2021), and includes individuals from the Moray Firth, as well as the Tay Firth area. This population abundance is slightly lower than the abundance estimated in Table 4.2 for the Coastal East Scotland management unit (CES MU). This variation is likely due to seasonal differences in habitat use by the bottlenose dolphins, as well as the fact that a MU may be smaller than what is believed to be a 'population' to reflect spatial differences in human activities and their management, and so there may be interchange of individuals between MUs (IAMMWG, 2021; **Knott, 2021**).

Whilst not considered specifically in this assessment due to their low likelihood of occurrence, any assessment of, or mitigation measures put in place for, the species



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assessed are considered to be appropriate/relevant for other less commonly occurring species of cetacean in Aberdeen Bay. Such mitigation measures are also relevant for non-EPS such as seals (harbour seal, *Phoca vitulina*, and grey seal, *Halichoerus grypus*, are considered to be common in Aberdeen Bay), and the EPS the [Redacted] . The [Red is a qualifying species of the River Dee SAC, and may use [Redacted] . **However, it is unlikely to utilise the area to the north/north-west of Aberdeen Harbour's North Pier and thus are unlikely to be present within the survey area.**

The survey route also crosses the Ythan Estuary, Sands of Forvie and Meikle Loch Special Protection Area (SPA), supporting breeding common tern *(Sterna hirundo)*, [Re and sandwich tern *(Sterna sandvicensis)*, and non-breeding eider *(Somateria mollissima)*, lapwing *(Vanellus vanellus)*, pink-footed goose *(Answer brachyrhynchus)* and redshank *(Tringa totanus)*. Other SPAs close to the survey route include the Fowlsheugh SPA to the south and Buchan Ness to Collieston Coast SPA, supporting fulmar *(Fulmarus glacialis)*, guillemot *(Uria aalge)*, herring gull *(Larus argentatus)*, kittiwake *(Rissa tridactyla)*, razorbill *(Alca torda)* and shag *(Phalacrocorax aristotelis)*.

## 4.2 Favourable Conservation Status

Favourable Conservation Status of a species is defined in Article 1(i) of the Habitats Directive as when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable element of its natural habitats
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future
- there is, and will probably continue to be, a sufficiently large habitat to maintain its population on a long-term basis.

Table 4.3 summarises the conservation status of cetaceans around Great Britain. Conservation status from the 2019 assessment is unknown as the method used to assign conservation status had changed. There has been no genuine change in conservation status of any of the four most commonly occurring EPS in the Aberdeen Bay area (JNCC, 2019).



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**Table 4.3: Favourable Conservation Status of the EPS considered to occur regularly in the Aberdeen Bay area**

| Species | Conservation Status 2013 Assessment | Conservation Status 2019 Assessment | Population estimates used in 2019 Assessment* |
|---|---|---|---|
| Harbour porpoise *(Phocoena phocoena)* | Favourable | Unknown | 197,579 (95% CI 163,294 – 239,063) |
| Bottlenose dolphin (*Tursiops truncatus*) | Unfavourable | Unknown | 10,610 (95% CI 6,302 – 17,865) |
| White-beaked dolphin (*Lagenorhynchus albirostris*) | Favourable | Unknown | 30,172 (95% CI 17,346 – 52,483) |
| Minke whale *(Balaenoptera acutorostrata)* | Favourable | Unknown | 12,340 (95% CI 6,912 – 22,032) |

* population estimates are for the Marine Atlantic region

Source: JNCC, 2013, 2019



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# 5 RISK ASSESSMENT

Cetaceans have been recorded within the Aberdeen Bay area all year round.

It is possible that at least some of the species listed in Section 4 above will be present during the survey programme, most likely those listed in Table 4.1:

- harbour porpoise
- bottlenose dolphin
- white-beaked dolphin
- minke whale.

The main routes to impact are considered to be:

- anthropogenic noise from geophysical survey systems
- increased noise from vessels
- collision risk.

## 5.1 Anthropogenic Noise

Due to the high sensitivity of marine mammals to noise impacts, additional background information is presented on sound propagation, marine mammal hearing sensitivities and thresholds.

**Sound propagation**

In general, sound sources that have high sound pressure levels and low frequency (i.e. large airgun array seismic sources) travel the greatest distance underwater. The spread of low frequency sound in the sea is efficient, with little loss due to attenuation (i.e. due to absorption and scattering). Conversely, high frequency sources (such as those emitted from geophysical survey equipment, such as MBES and side scan sonar) tend to have greater attenuation over distance. The process is non-linear with the rate of absorption varying roughly as the square of the frequency. The overall degree of attenuation is also dependent on the water pressure, temperature and salinity.

Spherical spreading describes the decrease in level when a sound wave propagates away from a source uniformly in all directions. Overall, the intensity of sound waves decay exponentially and although low-level signals travel for long distances, higher amplitude waves lose much of their energy very close to the sound source (Gisiner, 1998). Sound also propagates further in deeper water.

**Marine mammal hearing sensitivities and thresholds**

An animal's ability to detect sounds produced by anthropogenic activities depends on the amount of natural ambient or background sound. Wind, precipitation, vessel traffic, and biological sources all contribute to ambient sound.

Marine mammals are sensitive to underwater noise, with the sensitivity of marine mammals to noise being dependent on the specific hearing abilities of the species.

The species present have differing auditory ranges, and hence are not equally sensitive to the same noise sources. Table 5.1 presents the estimated auditory bandwidths for the



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functional hearing group relevant to the four species likely to be present in the vicinity of the proposed survey activities.

**Table 5.1: Hearing sensitivity information for the four main EPS likely to present in the vicinity of the survey area**

| Functional hearing group | Relevant species | Generalised hearing range* | Species specific information |
|---|---|---|---|
| Low-frequency (LF) cetaceans<br>(Baleen whales) | Minke whale | 7 Hz to 35 kHz | No species-specific studies |
| High-frequency (HF) cetaceans<br>(Most toothed whales and dolphins) | Bottlenose dolphin | 150 Hz to 160 kHz | BEH: 0.4 to 146 kHz<br>AEP: <5 to 169 kHz |
| | White-beaked dolphin | | AEP: <16 to 160 kHz |
| Very high-frequency (VHF) cetaceans<br>(Certain toothed whales/dolphins and porpoises) | Harbour porpoise | 250 Hz to 180 kHz | BEH: 0.3 to 160 kHz<br>AEP: <10 to 160 kHz |

* Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad.

BEH – behavioural studies

AEP – auditory evoked potential studies

Sources: adapted from NMFS (2018) and Southall *et al.* (2019)

There are various potential effects of exposure to sound from anthropogenic activities such as geophysical and geotechnical surveys, that can be characterised as physiological or behavioural. The main potential effects can be summarised as:

- auditory injury
- behavioural response, such as disturbance effects.

*Auditory injury*

A brief exposure to extremely high sound levels or more prolonged exposure to lower levels of continuous sound can cause injury to the auditory system of marine mammals (Richardson *et al*., 1995). This auditory injury may be in the form of permanent threshold shifts (PTS) and/or temporary threshold shifts (TTS).

Indicative thresholds for Sound Exposure Levels (SELs) and Sound Pressure Levels (SPLs) that have the potential to cause auditory injury (PTS and TTS) in marine mammals were provided by Southall et al. (2007; updated in 2019), which correspond with the US National Marine Fisheries Service (NMFS) indicative thresholds (NMFS, 2016; revised in 2018).

These thresholds are based on unweighted, instantaneous peak (SPLs) and M-weighted SELs where:



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- SEL: Expression of total energy of a sound wave which incorporates both the SPL and duration; and
- M-weighted function: Frequency weighting applied to the SEL allowing functional hearing bandwidths of different marine mammal groups (low frequency cetaceans e.g. minke whales, mid frequency cetaceans e.g. bottlenose dolphins and high frequency cetaceans e.g. harbour porpoises) and taking a relevant or derived species audiogram into account.

Sources of sound were divided into impulsive[3] and non-impulsive:

- Impulsive: produce sounds that are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay
- Non-impulsive: produce sounds that can be broadband, narrowband or tonal, brief or prolonged, continuous or intermittent) and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do (NOAA, 2018).

SEL thresholds for impulsive and non-impulsive sources are presented in Table 5.2, with SPL thresholds for impulsive sources in Table 5.3.

**Table 5.2: M-weighted SEL onset thresholds for PTS and TTS (dB re 1 µPa$^2$·s)**

| Functional Hearing Group | Impulsive | | Non-impulsive | |
|---|---|---|---|---|
| | PTS | TTS | PTS | TTS |
| LF cetaceans | 183 | 168 | 199 | 179 |
| HF cetaceans | 185 | 170 | 198 | 178 |
| VHF cetaceans | 155 | 140 | 173 | 153 |

Source: adapted from NMFS (2018) and Southall *et al*. (2019)

**Table 5.3: Unweighted SPL onset thresholds for PTS and TTS (dB re 1 µPa Peak)**

| Functional Hearing Group | Impulsive | |
|---|---|---|
| | PTS | TTS |
| LF cetaceans | 219 | 213 |
| HF cetaceans | 230 | 224 |
| VHF cetaceans | 202 | 196 |

Source: adapted from NMFS (2018) and Southall *et al*. (2019)

[3] The term "impulsive" relates specifically to noise-induced hearing loss and specifies the physical characteristics of an impulsive sound source, which likely gives them a higher potential to cause auditory TTS/PTS. This definition captures how these sound types may be more likely to affect auditory physiology and is not meant to reflect categorizations associated with behavioural disturbance (NMFS, 2018).



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The fundamental difference between SPL and SEL, is that SPL can be an instantaneous value, while SEL is the accumulated sound energy to which the marine mammal is exposed during a given duration:1 second in this case.

It should be stressed that no marine mammal mortality or damage to tissue has been documented for exposure to geophysical surveys, and that the exposure level for injury is a theoretical value extrapolated from experimental data. Also, it is recognised that many variables affect the nature and extent of responses to a particular stimulus. Such variables may include the recent experience of marine mammals with the sound stimulus, and their current activity (e.g. feeding vs. migrating).

*Behavioural response*

The estimated hearing sensitivities of species present in Aberdeen Bay are shown in Table 5.1. For VHF cetaceans, such as harbour porpoise, the frequency of best hearing is thought to be 105 kHz, while for HF cetaceans (dolphin species including the bottlenose dolphin and white-beaked dolphin), the frequency of best hearing is 55kHz (Southall *et al*., 2019). While there are no species-specific studies for minke whales, indirect evidence suggests they are most sensitive to frequencies between 20 Hz and 19 kHz (Erbe, 2002; Tubelli et al., 2012).

The $dB_{ht}$ (species) metric (Nedwell et al., 2007) has been developed as a means of quantifying the potential for a behavioural effect on a species in the underwater environment. As sound is perceived differently by different species the species' name must be appended e.g. $dB_{ht}$ (harbour porpoise). Table 5.4 summarises the dBht assessment criteria for a behavioural response.

**Table 5.4: Assessment criteria to estimate the potential responses by EPS to underwater noise**

| Level in $dB_{ht}$ (species) | Reaction |
|---|---|
| 0 | None |
| 0 to 50 | Mild reaction in minority of individuals, probably not sustained |
| 50 to 90 | Stronger reaction by majority of individuals, but habituation may limit effect |
| 90 and above | Strong avoidance reaction by virtually all individuals |
| Above 110 | Tolerance limit of sound; unbearably loud |
| Above 130 | Possibility of traumatic hearing damage from single event |

Source: Nedwell *et al*., 2007

### 5.1.1 Anthropogenic Noise from Geophysical Survey Systems

As described in Sections 2.1 and 2.3, the survey will use acoustic survey and positioning equipment. The geophysical survey systems and positioning equipment onboard the vessel will increase levels of anthropogenic noise in the marine environment because they operate by producing and receiving sound.


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As sound travels much further underwater compared to airborne noise, the resulting effects on marine mammals can be at distance from the sound source, depending on the species-specific hearing sensitivities.

#### *5.1.1.1 Impact on EPS*

Thompson et al. (2013) observed harbour porpoise avoidance of (seismic) survey vessels in the Moray Firth out to 10 km, with animals detected again at the affected sites within a few hours. This 10 km disturbance radius is considered highly conservative as

a) it was observed as a consequence of oil and gas seismic surveys, using equipment that produces significantly higher source levels (and also a different frequency content) than the equipment to be used in this survey
b) the water of the Moray Firth is much deeper than Aberdeen Bay, and as stated above, sound travels further in deeper water, although certain frequencies, particularly mid/high frequencies, can propagate in shallow waters depending on sea surface and seabed; however, these frequencies are likely to be outside the hearing range of many of the species present (see discussion below)
c) displacement cannot occur 10 km landward due to the coastal location of the survey.

As a consequence, and as described in EPS Risk Assessment: USBL use for operational survey work (document 1197777-1-A), the impact radius has been decreased to 5 km, and an impact area of 78.5 km$^2$ was used in Table 5.5 (simple calculation of $\pi r^2$), and this disturbance radius was also used for the consideration of potential impacts on dolphin species and minke whales, due to the lack of comparative studies. This is considered a conservative proxy **for the offshore end of the additional survey route. As this route is closer into shore the disturbance radius is likely to be smaller, with the numbers of indivuals potentially disturbed presented here (Table 5.5) a worst-case, conservative estimate.**

**Table 5.5: Number of individuals of the four main EPS potentially disturbed during the operation of geophysical survey systems and positioning equipment**

| Species | No. of individuals within the area of potential impact | % of reference population which has the potential to be affected |
|---|---|---|
| Harbour porpoise | 47 | 0.03 |
| Bottlenose dolphin | 2 | **1.05** |
| White-beaked dolphin | 19 | 0.06 |
| Minke whale | 3 | 0.03 |

Source: SCANS III density estimates used in calculations from Hammond *et al.* (2021) and reference population abundance estimates used in calculations from IAMMWG (2021; see Section 4.1)

**Auditory injury**

The equipment stated in Table 2.4, or variations of this equipment will be used during the survey programme. The SSS and 500 kHz altimeter (associated with the Magnetometers) operate at relatively high frequencies that are outside the hearing range of the cetaceans known to be present in the study area (see Table 5.1). The MBES equipment proposed


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also operates on frequencies outside the hearing range of LF and HF cetaceans. There is the potential for any of this equipment to cause auditory injury to LF and VHF cetaceans at very close range due to their (high) source levels, however: the PTS onset threshold for VHF cetaceans is an SPL of 202 dB re 1 µPa and the TTS onset threshold is 196 dB re 1 µPa; while the PTS onset threshold for LF cetaceans is 219 dB re 1 µPa, and the TTS onset threshold 213 dB re 1 µPa.

VHF cetaceans, such as harbour porpoise, are sensitive to certain frequencies within the operational capability of the MBES systems. There is the potential for auditory injury to occur. However, considering natural avoidance behaviour, the peak source level of the sound source and the SPL and SEL for injury that injury is unlikely to occur. It should be noted that the proposed peak source level of 220 dB re 1µPa @1 m is a maximum and will drop exponentially due to spherical spreading and greater attenuation of high frequencies, and that as Aberdeen Bay is relatively shallow (<200 m as defined in the JNCC guideline), particularly along the survey route where water depths are between 0-30 m LAT, the high frequency sounds produced by this equipment are likely to attenuate more quickly than lower frequencies used in deeper waters (JNCC, 2017).

The SBPs and the USBL positioning systems and transponder beacons operate at a much lower frequency and are therefore audible to the cetaceans likely to be present in the survey area. However, the USBL equipment in particular are operating at a very low sound pressure intensity level. The onset of PTS from this equipment may be induced at greater distances from source if animals remain stationary and associated with the vessel. In modelling done for Vattenfall (Binnerts *et al*., 2020), stationary harbour porpoise within 2.8 km of USBL equipment operating at 18 kHz in 35 m water depth may suffer PTS onset, while stationary animals would need to be within 1.7 km of the USBL equipment operating at 32 kHz; this is considered overly precautionary as animals are unlikely to be stationary. Passing harbour porpoise within 970 m of equipment operating at 18 kHz and 570 m of equipment operating at 32 kHz in 35 m water depth may be at risk of PTS onset. In shallower waters the effect distances increase: harbour porpoise passing equipment operating in 5 m of water may be at risk of the onset of PTS at 2.3 km (18 kHz) and 1.1 km (32 kHz). The risk of the onset of PTS for all other species was negligible unless the animal was assumed stationary throughout the entire period of operation the USBL system (Binnerts *et al*., 2020).

It is also possible that the source level of the SBP sound source (>247 dB re 1µPa @1 m) may cause an auditory injury (PTS/TTS) for cetaceans, although the amplitude will drop off rapidly from the source. However, an individual animal would need to be in a relatively small zone of ensonification and stay in that zone associated with the vessel for a period of time. The risk to cetaceans from use of this lower frequency acoustic equipment is further reduced by the orientation of the sound source (hull mounted in relatively shallow water). As previously noted the equipment and resulting sound waves are directed downwards to the seabed, reducing the area impacted by noise. The pulse duration of SBPs is also extremely short.

**Behavioural response**

As noted above, most of the sound emitted by geophysical equipment will not be audible to the marine mammals in the survey area. Therefore, it is unlikely these systems will cause disturbance to **the EPS marine mammals**.



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However, some of the MBES systems may cause a behavioural response, such as temporary avoidance, in VHF cetaceans (harbour porpoise). Estimates provided by Nedwell *et al*. (2008) using comparable MBES specifications (maximum source level of 220 dB re 1µPa @1 m and an operating frequency of 200 kHz), using harbour porpoise as the worst case scenario and a 90 dBht strong avoidance impact criterion, suggest that a strong avoidance reaction might occur up to a distance of 30 m from the sound source.

The lower frequencies generated by USBL positioning systems and transponder beacons, and SBPs have the potential to cause localised short-term impacts on behaviour for all cetaceans present in the survey area, possibly resulting in avoidance at close proximities (Nedwell *et al*., 2008). In modelling done for Vattenfall, harbour porpoise were disturbed up to 8.5 km from a 18 kHz USBL system and up to 4.0 km from a 32 kHz system in 35 m water depth (Binnerts *et al*., 2020). It is not considered likely that this geophysical equipment will cause significant disturbance to these marine mammals, due to the low operating frequencies of the acoustic pulses from the USBL positioning systems and transponder beacons.

#### *5.1.1.2 Conclusions*

Increased anthropogenic noise from the geophysical survey systems and positioning equipment has the potential to induce the onset of auditory injury (threshold shifts) at relatively close proximity. With mitigation (see Section 7) the potential for the onset of auditory injury to be induced is negligible. The potential for onset of auditory injury is also only likely to affect a small percentage of the reference populations of EPS in the survey area. **Furthermore, though the survey is expected to take place over six weeks, the use of higher-noise emitting equipment will likely be limited to a shorter time period, thus the activities will be short-term and localised.**

Following the 2020 Marine Scotland and SNH guidance (Marine Scotland and SNH, 2020) for inshore waters, there is the potential for disturbance of marine mammals, as defined in Regulations 39 (1) (a) and (b) and 39 (2) of the Habitats Regulations, from the operation of geophysical systems and positioning equipment used for the proposed survey programme. Therefore, **an EPS disturbance licence will be required**. As noted above, temporary behavioural avoidance is the most likely response. Up to 47 harbour porpoises, 2 bottlenose dolphins, 19 white-beaked dolphins and 3 minke whales have the potential to be disturbed. This disturbance will not be sufficient to cause any population level effects (i.e. it will not be detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status in their natural range), and thus it is considered that an EPS licence (to disturb) can be issued under Regulation 39 of the Habitats Regulations.

### 5.1.2 Increased Noise from Vessels

The survey programme will add an additional vessel into the marine environment of Aberdeen Bay. Therefore, it will potentially increase levels of anthropogenic noise and thus has the potential to affect marine mammals. Increased vessel noise has the potential to cause behavioural responses in marine mammals, as well as auditory injury such as PTS or TTS, and may mask naturally occurring sounds.



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Noise varies from vessel to vessel (Table 5.6) but is a continuous noise source; different vessels will generate different frequency characteristics and sound levels depending upon factors such as the propulsion system they are using.

**Table 5.6: Noise specifications of vessels**

| Size | Length | Type | Sound intensity level | Frequencies | Comments |
|---|---|---|---|---|---|
| Large | >100 m | Container / cargo ships, super-tankers, cruise liners | 180-190 dB re 1µPa @ 1m rms | Few hundred Hz | depends on type, size and operational mode |
| Medium | 50 – 100 m | crew-boats, larger fishing / trawler, research vessels, tug-boats | 165-180 dB re 1µPa @ 1m rms | mimics large vessels | tend to have slower revving engines and power trains, with majority of sound energy below 1 kHz |
| Small | <50 m | jet skis, speed boats, light commercial runabouts, motor yachts, fishing vessels, small trawlers | 160 – 180 dB re 1µPa @ 1m rms | 20 Hz - >10 kHz | greater portion of sound produced is mainly above 1kHz mostly from propeller cavitation |

Source: adapted from Prideaux, 2017 and references therein

The vessels proposed to carry out the survey will be of medium and small size (one of each, Section 2.2),

#### *5.1.2.1 Impact on EPS*

The impact prediction in EPS Risk Assessment: Construction Phase Works (document 1148902-1-B4) is still relevant and information within that document is utilised here.

**Auditory injury**

Auditory injury may occur from noise from large vessels if animals of any hearing group are less than one metre from the sound source.

**Behavioural response**

Predicted 90 $dB_{ht}$ (species) impact ranges for medium vessels (ICOL, 2013) are presented below (Table 5.7). VHF cetaceans, harbour porpoise in the survey area, have the greatest potential to be disturbed by the vessel noise, with an impact range of 11 m.

**Table 5.7: 90 $dB_{ht}$ (species) impact ranges predicted for vessel noise from medium and large sized vessels**

| Species | Medium vessels (<100 m) Impact range (m) |
|---|---|
| Harbour porpoise | 11 |


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| Species | Medium vessels (<100 m) Impact range (m) |
|---|---|
| Bottlenose dolphin (also used as a proxy for white-beaked dolphin) | 4 |
| Minke whale | 2 |

Source: adapted from ICOL (2013) and Barham *et al*. (2014)

Noise from vessels is unlikely to cause disturbance to individual animals, except when in very close proximity to a vessel. Given that the largest potential impact range predicted for a strong avoidance reaction is 11 m (for harbour porpoise), coupled with existing vessel movements within the area, it is considered that sound from vessel activity associated with the construction activities will not significantly add to the background noise levels from vessels already present.

To put the predicted displacement impact ranges caused by vessels into context, the number of individuals likely to be disturbed is estimated for the 90 $dB_{ht}$ (species) impact range. Using the density estimates from SCANS III Block R (Hammond et al., 2021) (Section 4.1), and the predicted impact ranges as radii in the simple calculation of area $\pi r^2$, less than one individual of any species is likely to be disturbed by noise from large vessel noise at the 90 $dB_{ht}$ (Table 5.8).

**Table 5.8: Numbers of individuals of the four main EPS that have the potential to be affected by vessel noise**

| Species | Medium Vessels (50-100 m) | | |
|---|---|---|---|
| | 90 $dB_{ht}$ (species) Impact range (m) | Area of potential impact ($km^2$) | Number of individuals within the area of potential impact |
| Harbour porpoise | 11 | <0.001 | <1 |
| Bottlenose dolphin | 4 | <0.001 | <1 |
| White-beaked dolphin (bottlenose dolphin impact range used) | 4 | <0.001 | <1 |
| Minke whale | 2 | <0.001 | <1 |

### *5.1.2.2 Conclusions*

It is highly unlikely that vessel noise will cause auditory injury in any species of cetacean or will elicit a behavioural response over and above that caused by the usual vessel activity within the area.

Following Marine Scotland and SNH guidance (Marine Scotland and SNH 2020) for inshore waters, it is considered that there is no potential for an offence to be committed as defined in Regulations 39 (1) (a), (b) and 39 (2) of the Habitats Regulations 1994 (as amended in Scotland).



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## 5.2 Collision Risk

Vessel strikes are a known cause of mortality in marine mammals and basking sharks (Laist *et al*., 2001; Schoeman *et al*., 2020). Collisions can occur with vessels of all sizes, although the more serious incidents tend to be caused by very large vessels, and those going at speeds of 14 knots or more. Injuries sustained can include fracturing, bruising, nicks or slicing off parts of fins, and the most serious accidents can result in death of the animal, although death may not be immediate (Sea Watch Foundation, 2009).

Large slow-moving whales are considered to be most susceptible to vessel strike as smaller cetaceans are generally sufficiently mobile to avoid vessels either in their path or moving towards them. However, there may be a reporting bias towards larger whales as many vessels may not be aware that they had collided with smaller species (Schoeman *et al*., 2020).

Avoidance behaviour by cetaceans is often associated with fast, unpredictable boats such as speedboats and jet-skis (Bristow & Reeves, 2001; Gregory & Rowden, 2001; Leung Ng & Leung, 2003; Buckstaff, 2004), while neutral or positive reactions have been observed with larger, slower moving vessels such as cargo ships (Leung Ng & Leung, 2003; Sini *et al*., 2005). Harbour porpoise, in particular, generally respond negatively to high-speed planing-hulled vessels (Oakley *et al*., 2017).

### 5.2.1 Impact on EPS

Two survey vessel will be used for the survey programme (see Section 2.2). The vessels will transit to and from the survey route along predefined corridors. Furthermore, during the surveys themselves, the vessels will follow a predefined survey corridor, and will be travelling at a working speed of approximately less than 4 knots with a transit speed of approximately 10 knots.

The predefined transit corridors to site and pre-defined linear route for the surveys themselves makes it easy for animals to predict and avoid survey vessels, and thus greatly reduces the risk of collision.

### 5.2.2 Conclusions

Following Marine Scotland and SNH guidance (Marine Scotland and SNH 2020) for inshore waters, there is negligible potential for injury or disturbance to EPS, as defined in Regulations 39 (1) (a) and (b) and 39 (2) of the Habitats Regulations, from collision with vessels associated with the proposed work.

No offence will be committed under Regulation 39 of the Habitats Regulations and therefore an EPS licence will not be required for this potential impact (collision with vessels).

## 5.3 Indirect Effects

There is potential that some of the survey activities may result in a small number of very small indirect effects on marine mammals, due to grab sampling and vibrocoring, or noise impacts on fish and shellfish prey resources (Table 5.9). However, significance of these potential effects is deemed to be negligible. Therefore, no offence will be committed, no



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mitigation is considered to be necessary, and an EPS licence will not be required for these potential impacts (indirect effects).

**Table 5.9: Assessment of potential indirect effects of the survey programme**

| Cause of potential indirect effect | Prediction | Significance |
|---|---|---|
| Sediment disturbance | Predicted to be highly localised and therefore will not result in significant areas of seabed being disturbed. | Negligible |
| Localised increases in suspended sediment concentrations | Predicted to be highly localised and therefore will not result in significant levels of sediment being released into the water column.<br>Following disturbance, levels of suspended sediment are not expected to be significantly greater than background levels and are likely to settle back to the seabed relatively rapidly. In addition, mobile marine mammal species are able to avoid localised areas disturbed by increased suspended sediment concentration. | Negligible |
| Release of sediment contaminants | Levels of hydrocarbon and metals in sediments across the Offshore Wind Farm (OWF) did not show significant levels of contamination (EOWDC, 2011). As a result of this, and the dispersive and dilutive nature of the environment, any minor elevated levels of contaminants in the water column following survey work are unlikely to result in adverse effects on marine mammals. | Negligible |
| Changes in fish and shellfish prey resources | Impacts to fish species are considered to not be significant; therefore, any potential indirect effects on the marine mammals that target these species are also expected to not be significant. | Negligible |

## 5.4 Cumulative Impacts

Other works taking place at the AOWF may result in cumulative impacts. These may include annual operation and maintenance survey campaigns. However, as these surveys are likely to use similar equipment and vessels as for this campaign, works and survey operations are unlikely to directly overlap.

Other projects taking place in a similar area to the AOWF have been identified via Marine Scotland's Licence Application Register as follows:

- Aberdeen Harbour Board is currently applying for extensions to marine licences for construction works at Aberdeen Harbour. The extension licence will include the use of explosives, dredging and an EPS for the use of explosives. Aberdeen Harbour Board also holds a licence for maintenance dredging and sea deposits at Aberdeen Harbour, expiring in March 2022.


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- Aberdeenshire Council holds a licence for sheet pile repair at Stonehaven Harbour expiring at the end of August 2021, and a licence for maintenance dredging.
- Aberdeenshire Council holds a licence for construction of a new slipway at Banff Harbour, expiring in March 2022.
- Aberdeenshire Council holds a licence for maintenance dredging at Macduff Harbour.
- There is a licence in place for mooring south east of Cruden Bay.

Further afield but still close to the AOWF are the following projects that may interact:

- Portsoy Harbour holds a licence for capital dredging, expiring in May 2022.

As the majority of these other projects are coastal, there are unlikely to be cumulative impacts with this project except for short periods of time when the survey vessel is close to shore. The only significant potential for cumulative impacts may be if the use of explosive materials and dredging activities associated with harbour developments takes place at the same time as the use of certain geophysical survey equipment, e.g. the USBL system. This may result in a cumulative impact due to increased underwater anthropogenic noise. However, as the geophysical survey equipment will generally be used further from the shore, cumulative impacts with inshore works are very unlikely.



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# 6 ASSESSMENT OF POTENTIAL OFFENCE

Following the Marine Scotland and SNH (2020) guidance it can be concluded that, with mitigation for the geophysical survey systems and positioning equipment, potential impacts from the proposed survey campaign are unlikely to result in the harassment, disturbing, injuring or killing of an EPS as defined under Regulation 39(1) of the Habitats &c.) Regulations 1994 (as amended in Scotland).

In relation to Regulation 39(2) of the Habitats Regulations, the percentage of the reference population of each species which has the potential to be disturbed by use of the geophysical survey equipment is considered to be negligible (less than 1.5% for the bottlenose dolphin population and less than 1% for the three other cetacean species which commonly occur in the Aberdeen Bay area) and therefore not detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status.

Disturbance is likely to be localised and short-term, and with mitigation is considered to be negligible. This disturbance is considered unlikely to have an impact on the Favourable Conservation Status of any cetacean EPS. Disturbance will not be sufficient to cause any population level effects, and thus it is considered that an EPS licence (to disturb) can be issued under Regulation 39 of the Habitats Regulations 1994 (as amended in Scotland).

As stated in Section 3, three tests must be passed before an EPS licence can be granted.

## 6.1 Test 1:

*The licence must relate to one of the purposes referred to in Regulation 44.*

Regulation 44 (2) of the Habitats Regulations 1994 (as amended in Scotland) provides a list of purposes where an EPS licence can be granted. These are as follows:

a) scientific or educational purposes
b) ringing or marking, or examining any ring or mark on, wild animals
c) conserving wild animals or wild plants or introducing them to particular areas
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
g) preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber or any other form of property or to fisheries.

The proposed HT1 Hydrogen Demonstrator Project meets the requirements of Regulation 44 (2) (e) by providing a direct environmental benefit on a national and international scale and helps to deliver national and international environmental policies in relation to climate change, the achievement of renewable energy targets and reduction of greenhouse gasses. The project offers a unique opportunity to test the viability of offshore production of green hydrogen and help to move towards commercial scale operations and the associated positive environmental benefits that come from this. This would mainly be associated with the decrease in greenhouse gas emissions, the



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increased efficiency of energy from green hydrogen and the resultant contribution to moving towards net zero.

The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019, which amends the Climate Change (Scotland) Act 2009, sets targets to reduce Scotland's emissions of all greenhouse gases to net-zero by 2045 at the latest, with interim targets for reductions of at least 56% by 2020, 75% by 2030 and 90% by 2040. The Scottish Government's Climate Change Plan update demonstrates a pathway to meeting Scotland's emissions reduction targets over the period to 2032.

In addition, the UK Government's 'Ten Point Plan for a Green Industrial Revolution' (November 2020), establishes a framework for achieving net-zero, which prominently identifies hydrogen as a key part of the solution. This is manifested in a target of 5 GW of low-carbon hydrogen (a mix of blue and green) production by 2030. The commercialisation of offshore hydrogen production in the UK will help to meet these targets and broader targets within the UK government's sixth Carbon Budget and commitments within the Climate Change Act 2008, Energy Act 2013 and the 2015 Paris Agreement.

As demonstrated by the policies above, there is an overarching European, UK and Scottish policy requirement for sustainable energy supply from renewables, including the production of hydrogen. This need is also the subject of national planning and energy policy.

This EPS licence application is for the implementation of a survey programme, including geophysical surveys, to inform the siting of the hydrogen flowline from the Aberdeen Offshore Wind Farm turbine (B06) to shore and enable further design and ultimately construction and operation of the project. The EPS licence application is founded on Imperative Reasons of Overriding Public Interest (IROPI) identified in the policy requirement to achieve (or exceed) the set targets for energy from renewables. Vattenfall believe that the proposed HT1 Hydrogen Demonstrator Project is of national importance in relation to proving the commercial viability of offshore hydrogen and thus delivering these policy requirements.

The production of green hydrogen at the Aberdeen Offshore Wind Farm will not only help the future commercialisation of this technology but will provide benefits to the local environment and economy in terms of the availability of hydrogen which could be used by various users, including transportation and marine operations. This would provide a direct local, national and international environmental benefit by significantly reducing carbon emissions to the atmosphere compared to emissions from fossil-fuel for transportation and marine operations.

Furthermore, the lifespan of the project is predicted to be 8 – 10 years and therefore a medium to long-term development that will not only help prove the concept of offshore green hydrogen production but also directly contribute to ensuring the security of local fuel supply, with long-term environmental benefits.

Vattenfall therefore consider that there is significant overriding public interest for the development of the HT1 project and thus the granting of an EPS licence for the proposed survey campaign which will help to enable the projects development.



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## 6.2 Test 2:

*There must be no satisfactory alternative (Regulation 44, 3a).*

To fulfil regulation 44, 3a of the Habitats Regulations, Vattenfall have considered alternatives to the proposed geophysical, environmental, and geotechnical survey campaign. The alternatives identified and assessed are the use of lower impact survey equipment than that listed in chapter 2.3 and a "do nothing" scenario consisting of not conducting the proposed survey campaign at all.

**Alternative Option 1 – Use of lower impact survey equipment:**

As explained in chapter 5, the most significant risk to EPS (cetaceans) from the survey campaign is the potential impacts of anthropogenic noise produced by the survey equipment. The equipment likely to cause the biggest impact is the low frequency SBP and USBL which operate within the hearing frequency of cetaceans known to be in the area. The use of the SBP is vital to obtain an accurate picture of the seabed, sediment, and any likely obstructions. SBP gives greater confidence that there will be no anomalies encountered on the seabed during flowline installation, which could have severe economic and/or environmental consequences at later stages of the project. Similarly, the USBL is needed to accurately position and control the survey equipment underwater. Not tracking the equipment would have potentially severe consequences including loss of equipment, having both economic and environmental impacts, and potential health and safety effects on other sea users. Vattenfall have explored options for the use of alternative higher frequency devices but conclude that the specification of the proposed devices (chapter 2.4) are the least impactful whilst still providing the required level of detail. Impacts on cetaceans in the area are minimised as far as possible, whilst the survey still provides the required data to identify seabed obstructions (including UXOs) and sediment information to allow an accurate burial assessment, ensuring the flowline can be safely installed and operated. While there is a range of subsea positioning equipment (i.e., USBL / transponders) available on the market, our assessment has concluded that they would all utilise the same range of frequencies described in chapter 2.4, as this is currently the best available technology and industry standard. It is therefore concluded that the use of lower impact survey equipment is not a viable alternative option.

**Alternative Option 2 – Do Nothing:**

As it is not viable to use alternative lower impact equipment to conduct the proposed surveys, the only remaining alternative would be to not undertake the survey campaign (i.e., "do nothing"). The surveys are required to inform the impact assessment of the proposed flowline installation and operation and thus a "do nothing" alternative presents significant risks to the project including unknown seabed conditions, unknown locations of potential UXOs and other obstructions, unknown habitat locations and unknown geotechnical conditions resulting in an inaccurate impact assessment. The lack of this information would also result in any works in the area to lay the proposed flowline being dangerous, unjustifiable, and thus non-viable. Therefore, it can be reasonably concluded that if the proposed survey campaign was not to go ahead then the proposed HT1 Hydrogen Demonstrator Project would not be able to be developed. **This additional survey route is required to ensure all flowline route options are robustly considered with the most environmental, social and economic option being selected.** As identified in chapter 6.1, the project offers a unique opportunity to test the



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viability of offshore production of green hydrogen and help move towards commercial scale operations and the associated positive environmental benefits that come from this. This is predominantly associated with the decrease in greenhouse gas emissions, the increased efficiency of energy from green hydrogen and the resultant contribution to moving towards net zero energy generation. The risk of not developing the hydrogen demonstrator project is that none of the associated benefits would be realised and it will become increasingly difficult to meet the UK's commitment of achieving net zero by 2050 and its associated target within the 'Ten Point Plan for a Green Industrial Revolution' (November 2020), of 5 GW of low-carbon hydrogen production by 2030.

It can therefore be reasonably concluded that there are no satisfactory alternatives to the proposed survey campaign and associated use of positioning and survey equipment due to the need to accurately position and control the underwater equipment and characterise obstructions on the seabed, as well as the layers of sediment or rock below the seabed. This survey is essential to the development of the flowline route for the HT1 Hydrogen demonstrator, with the project being uniquely placed to support the development of offshore hydrogen production and thus support the Scottish and UK Governments in reaching their renewable energy targets. Vattenfall therefore considers that the 'no satisfactory alternative test' has been met.

## 6.3 Test 3:

*The action authorised must not be detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status (FCS) in their natural range (Regulation 44, 3b).*

The percentage of the reference population of each species which has the potential to be disturbed by use of the USBL positioning systems and positioning transponders, and the SBPs are considered to be negligible (less than 1.5% for the bottlenose dolphin population and less than 1% for the three other cetacean species which occur in the Aberdeen Bay area). Therefore, the use of geophysical equipment is not detrimental to the maintenance of the population of the species concerned at Favourable Conservation Status.



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# 7 MARINE MAMMAL MITIGATION PLAN

Operation of geophysical survey systems and positioning equipment during the survey has the potential to cause auditory injury to EPS (cetaceans) at very close range. Therefore, mitigation in the form of pre-work searches will be undertaken prior to the use of geophysical survey systems and positioning equipment. Where possible, soft-start procedures will also be implemented, with sound emitting equipment "ramped up" to operating frequencies.

Since the release of the JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys in April 2017, MBES surveys in shallow waters (<200 m) are not subject to mitigation requirements as it is thought the higher frequencies typically used fall outside the hearing frequencies of cetaceans and the sounds produced are likely to attenuate more quickly than the lower frequencies used in deeper waters. JNCC does not, therefore, advise mitigation is required for multi-beam surveys in shallow waters'. However, although the survey will take place outside of designated areas or other 'areas of importance', and the fact that the majority of the work is in inshore waters, upon the advice of NatureScot (Knott, 2019, pers. comm.), mitigation is to be put in place for the use of all geophysical equipment, including MBES.

These mitigation measures for cetacean EPS (JNCC, 2017) are also deemed to be appropriate for seals and basking shark, as well as [Red

## 7.1 Pre-work Searches

It is acknowledged that adherence to the measures outlined in the JNCC guidelines (2017) constitutes best practice and minimises the risk of disturbing marine mammals. Principles of this guidance will be applied in order to ensure that auditory injury is not induced in any cetaceans present within the injury zone, from the equipment.

Given the low level of risk to marine mammals from the positioning equipment (low likelihood of encounter and low risk of PTS due to power source level of equipment), it is considered that a suitably briefed member of the vessel's crew can fulfil the role of Marine Mammal Observer (MMO) and will be able to undertake the pre-work searches. **The crew member will be dedicated to the role during all required pre-watch periods, and will be positioned at a location on the vessel that allows for sufficient visibility around the entire sound source.** Although there is a limited range for auditory injury and/or disturbance from the equipment in use, the recommended mitigation zone is the quoted 500 m, due to the fact the operating frequencies of some of the equipment being within the hearing range of cetaceans and as per recommendation of NatureScot (Knott, 2019, pers. comm.). **Reticule binoculars will be utilised, to ensure judgement of the mitigation zone boundaries. As the MMO role can only be undertaken effectively during periods of good visibility (sea state 3 or less) and in daylight, the commencement of pre-work searches will only take place under these conditions. As works are planned to operate over 24 hours, the MMO dedicated crew member, also trained as a PAM operator, will operate the PAM at night or in poor visibility.**



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**In line with the advice from NatureScot, where relevant noise-producing activities (sub-bottom profiling) are due to commence during night time hours or poor visibility, an MMO who has been trained as a PAM operator will operate the PAM to provide the same mitigation as provided by visual observations during the day.**

Due to the nature of the positioning equipment and anticipated operational mode, once any subsea equipment (e.g. towed device) is deployed, the USBL positioning system and transponder beacons will be activated and remain operational for the duration of the survey. It follows that USBL positioning system and associated subsea survey equipment (which emits sound across all cetacean group hearing ranges i.e. 0.007 – 180 kHz), once deployed, will normally be functioning until the subsea equipment is removed from the water.

It is assumed that as the USBL positioning system and transponder beacons are effectively in continual operational mode while the subsea equipment is in the water, this initial and constant signal would act as an acoustic deterrent thereby preventing susceptible cetaceans from entering the localised area in which they may be predisposed to PTS onset (auditory injury). When the USBL positioning system and transponder beacons are working alongside other geophysical equipment emitting sound, it is therefore proposed that additional pre-work mammal watches would only be required if there was a significant break in the operation with deactivation of the USBL positioning system, and as per the revised JNCC guidance (2017). JNCC guidance states that if there is an unplanned break in the USBL positioning system 'activation' of longer than 10 minutes, then a 30-minute pre-watch before starting up again is necessary. If the break is planned, then the observer would watch during the 'deactivation' period, and if there are no cetaceans seen then the USBL positioning system and transponder beacons can be started again even if the break is longer than 10 minutes.

However, pre-work watches should be carried out prior to the activation of all geophysical systems, particular MBES, SSS and SBPs, conducted by a suitably briefed member of the vessel's crew, as per NatureScot's recommendation (Knott, 2019, pers. comm.). Additional pre-work mammal watches would be required where there is a significant break in the operation with deactivation of the sound source, as per the revised JNCC guidance (2017) stated above.

## 7.2 Soft Start

As per the revised JNCC guidance (2017) and advice from NatureScot (Knott, 2019, pers. comm.), where practical, the power of electromagnetic sources (i.e. MBES, SSS, SBPs) should be ramped up in a uniform manner. This controlled build-up of acoustic energy output shall occur in consistent stages to provide a steady and gradual increase over the ramp-up period (e.g., output peak sound pressure level of 170 dB→180 dB→190 dB→200 dB→200+ dB over 20 minutes).

However, the JNCC guidance (2017) does acknowledge that it is not possible for some SBP equipment to be ramped up; it is either on or off. It is assumed this will be the case for the SBP used during this survey programme. In this instance, and where soft starts are not possible according to the operational parameters of any other equipment, the device shall be switched "on" and "off" in a consistent sequential manner over a period of 20 minutes prior to commencement of the full necessary output.



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Soft start should commence after a 500 m area around the vessel has been confirmed clear of species during the pre-work searches.

## 7.3 Transit Watches

A nominated competent observer on the bridge of the survey vessels will keep watch for marine mammals during transit between port and the survey corridor. Any sightings will be communicated to the Master of the vessel as soon as is practicable and the following actions, as per the Scottish Marine Wildlife Watching Code (SNH, 2017), implemented:

- The Master of the vessel will ensure that marine mammals are avoided to a safe distance (100 m or more) in all possible circumstances.
- The Master of the vessel will minimise high powered manoeuvres where this does not impair safety.

## 7.4 Reporting

A log of all MMO (suitably briefed crew member) effort and geophysical survey systems and positioning equipment operations will be kept (using the JNCC Marine Mammal Recording Forms).

Following completion of the survey programme, Vattenfall will submit a report to MS-LOT which will include the following:

- completed Marine Mammal Recording Forms
- dates, locations and details of activity
- details of all MMO operator effort including information about any marine mammals detected
- details of any technical problems encountered and actions taken.

The Marine Noise Registry close-out report (https://mnr.jncc.gov.uk/) will also be completed.



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# 8 CONCLUSIONS

This assessment of the potential for impacts on cetacean EPS from geophysical survey activities **associated with route 3a** (increased anthropogenic noise from use of the survey systems, increased vessel noise, collision with vessels and indirect effects) from a worst-case scenario concluded that, post-mitigation:

- the potential for auditory injury is considered to be negligible
- the potential for disturbance is considered to be negligible within the context of the wider populations of EPS.

Following the 2020 Marine Scotland and SNH guidance (Marine Scotland and SNH, 2020) entitled "The protection of Marine European Protected Species from injury and disturbance: Guidance for Scottish Inshore Waters (July 2020 Version)", there is potential for (auditory) injury to marine EPS, as defined in Regulations 39 (1) (a) and (b) and 39 (2) of the Habitats Regulations 1994 (as amended in Scotland), from increased anthropogenic noise during the survey programme.

Therefore an EPS licence will be required for this potential impact (increased anthropogenic noise from the survey / positioning systems).

It is considered that a licence can be granted because the three tests relating to the requirements of Regulation 44 of the Habitats Regulations that must be passed before a licence can be granted (detailed in Section 3) have been satisfied (see Section 6).



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